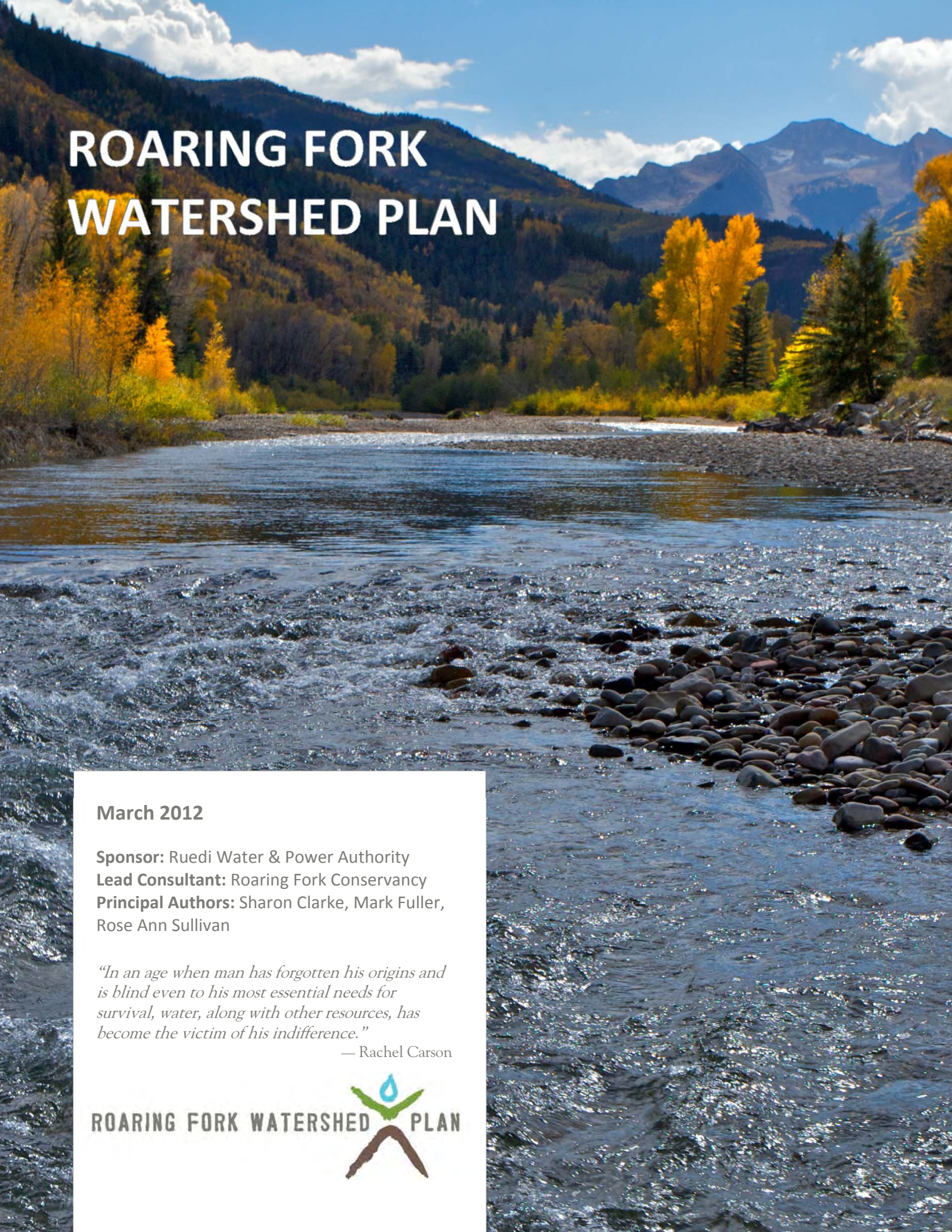

ROARING FORK WATERSHED PLAN

March 2012

Sponsor: Ruedi Water & Power Authority
Lead Consultant: Roaring Fork Conservancy
Principal Authors: Sharon Clarke, Mark Fuller, Rose Ann Sullivan

"In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water, along with other resources, has become the victim of his indifference."

— Rachel Carson

ROARING FORK WATERSHED PLAN

This document is formatted to print double-sided to save paper. Some pages are left blank so that sections begin on odd numbered pages. When placed in a three-ring binder, each section can be divided by a tab for easy reference. When the plan is updated, sections, rather than the whole document can be replaced. Cover photo of Crystal River by Greg Watts.

Acknowledgements

The Ruedi Water and Power Authority, an intergovernmental agency made up of the towns and counties in the Roaring Fork Valley, has sponsored the Watershed Plan process. All of the members of the Authority support the concept of comprehensive water planning for the Roaring Fork Watershed and have contributed to the Plan. Roaring Fork Conservancy served as the lead consultant on the Plan. Kootenay Resources, LLC also assisted with work on all aspects of the Plan.

The following additional people and organizations provided input to the Plan:

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Kootenay Resources, LLC
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Dedication

Randy Russell

September 11, 1948 - November 21, 2009

The seeds for this plan began nearly a decade ago when Randy Russell, a long-range planner for Garfield County, assembled a diverse group of people to discuss water issues within the Roaring Fork Watershed. We were planners, biologists, hydrologists, and land and water managers from local, state, and federal agencies. We were directors of water-related non-profits, ranchers, and interested citizens. From that meeting began a collaborative effort between government agencies, watershed organizations, and local landowners. With the help of Randy's enthusiasm, we convened regularly, sharing water related information and seeking collective solutions to the challenges facing the Roaring Fork River system.

Randy had a keen understanding of the value of comprehensive watershed planning. An example of his foresight was his efforts to secure financial support from Garfield County Commissioners for three distinct and concurrent investigations: stream health, water quality, and water quantity. To avoid competition for funding between the studies he created a "water study" line item to support each analysis equally. Together with funds from agencies and organizations throughout the valley, each of these studies was completed and, together, established the foundation of the Roaring Fork Watershed Plan.

Randy possessed an acerbic wit and sharp intellect that demanded pragmatism. Yet he had a generous and playful side that netted him life-long friends from all walks of life. His passion, however, was collaboration, its potential to stimulate a broad exchange of ideas and its promise to transcend jurisdictional boundaries that inspired true community. He freely shared his wealth of knowledge and expertise in what he often called "brain dumps," and we in the Roaring Fork watershed benefitted greatly from them. It is fitting that this Plan be dedicated to the memory of Randy's vision, passion, and commitment towards protecting and improving the health of the Roaring Fork Watershed.

Contents

Roaring Fork Watershed Plan Purpose: To plan for and work toward an environmentally and economically healthy watershed that benefits all who have a stake in it.

1. Introduction/Overview

> *"The Collaborative started several years ago to bring municipalities and counties together to try to think as a watershed. All decisions were being made with local communities here and counties over there. We made an effort to start thinking as a watershed instead of our own unique municipality or county."*
> — Andrea Holland-Sears, USFS, White River National Forest

The Roaring Fork Watershed Plan is the product of over four years of effort by more than a hundred people, representing dozens of agencies, governments, and interests throughout the Roaring Fork Valley and beyond. The Plan is the culmination of countless meetings, conversations, debates, and iterations, all of them aimed at creating a document that will be meaningful and useful to both water managers and the general public.

The Plan had its origins in the work of the Roaring Fork Watershed Collaborative, an informal gathering of local officials, planners, resource managers, and interested citizens, which began meeting on an irregular basis in 2002. Collaborative members concluded that water, as one of the critical resources common to the entire valley, deserved special attention. This led to the formation of a Water Committee in 2005. The Water Committee, in turn, began formulating the outline of a Watershed Plan aimed at surveying and assessing the condition of our local water resources and recommending actions to preserve those resources.

Why do we need a Watershed Plan? Water is one of our most precious natural resources and one which can readily be physically removed from the watershed by transmountain diversions. Local water resources are also threatened by global climate change, pollution from both natural and man-made sources, and overuse. Specifically:

- The state's population of 5 million is expected to increase to almost 8 million by 2030. Eighty percent of the state's population lives in the half of the state that receives about 20 percent of the precipitation. Recent studies identify a need for another 600,000 to one million acre-feet of raw water by 2030. Those figures do not include water needs that might be generated by the effects of climate change, environmental and recreational uses, and energy development. By 2050 climate change could cause Colorado River flows to decline by 18 percent. Average Colorado Basin water storage could decline by 32 percent. Energy development could consume up to 200,000 acre-feet of water.

- On average, 37 percent of the Upper Roaring Fork Watershed (40,600 acre-feet) and 41 percent of the Upper Fryingpan Watershed (61,500 acre-feet) is already diverted annually to the Front Range. These are the 5th and 3rd largest transmountain diversions in the state.

- Almost 140 of 185 miles of streams surveyed in the Roaring Fork Watershed have moderately modified to severely degraded riparian habitat. In Colorado, riparian habitat represents less than three percent of the landmass but has the highest species richness with 75 - 80 percent of wildlife species using riparian habitat during some part of their life cycles. Functioning riparian areas reduce the risk of flooding and increase stream base flows.

If our water resources are damaged or reduced, impacts will be felt by instream and riparian habitats, the wildlife and recreation that depends on those resources, and by the local agricultural operations that rely on irrigation. Lower water levels in local streams and rivers will increase water treatment costs as the benefits of dilution are lost. Changes in the management of Ruedi Reservoir could impact the Fryingpan and Roaring Fork Rivers' world class fishery and reduce the availability of flat water recreation. All of these factors, plus the importance of water to our overall quality of life, led to the decision to create a Plan aimed at safeguarding the valley's precious water resources.

In late 2006 the Ruedi Water and Power Authority (RWAPA), a consortium of local governments, became involved as the official sponsor of the Plan. RWAPA engaged Roaring Fork Conservancy as the lead consultant on the project and secured funding for Phase I, the *State of the Roaring Fork Watershed Report 2008*. That report was widely recognized as a comprehensive, accessible, and valuable compendium of watershed conditions. It was supplemented by two guidance documents: (i) *Why the Roaring Fork Watershed Plan Matters* (October 15, 2008), and (ii) *Illuminating the Way Ahead* (February 12, 2010). The findings of the *State of the Roaring Fork Watershed Report 2008* and the guidance documents became the basis for a series of meetings with the public and technical advisors aimed at translating the Phase I findings into a series of goals, objectives, and actionable recommendations which would make up Phase II of the Plan. This document is the result of that process and, in tandem with the *State of the Roaring Fork Watershed Report 2008* and the two guidance documents, represents the final product of the watershed planning process that began with those Watershed Collaborative discussions of several years ago.

BENEFITS OF A WATERSHED PLAN:

- Provides a structure for continued input from and dialogue between all stakeholders.
- Improves community understanding, interest, and leadership in watershed issues.
- Encourages partnerships to identify and fund mutually beneficial projects, allowing project prioritization and collaboration on major grant applications.
- Provides a framework for efficient use of financial resources and effective use of agency and organizational personnel.
- Provides guidance on means for protection of riparian and aquatic resources, while providing for a viable economic community.
- Provides available watershed information and data to all stakeholders, thereby precluding duplicative work efforts.
- Facilitates collaboration on public outreach and education efforts on water resource issues within the watershed.

The watershed planning process has, by design, been very broad and deliberate. Our overriding concerns have been to be inclusive, transparent, thorough and detailed in our effort, which has led us down many pathways that were not anticipated when this process was started. The result is a highly detailed Plan which is daunting in its scope and ambition, but which sets lofty goals, and which challenges the community to take on a vast responsibility for critical resources.

One way to describe this Plan is to note the things that it is not. It is not a political document which lays blame or points fingers at any entity. It is not a technical document meant to be used as a work plan by engineers, hydrologists, or biologists. It is not a survey that represents a statistically valid sampling of public opinion. It is, rather, a compendium of proposals and recommendations developed by both

experts and interested citizens, meant to be implemented by a variety of agencies, governments, and other entities, as resources allow.

One of this Plan's key objectives is to provide a reference to enable laymen, students, activists, and recreationists to get involved in watershed management. With this in mind, we have made a special effort to use non-technical language, to limit the use of academic jargon, and to address a wide range of topics and issues. One of our most important goals is to engage the broadest possible constituency in the work of watershed management.

To that end, the Plan provides more than one avenue for accessing its goals, objectives, and recommendations. The Narrative section describes the various goals, objectives, and recommended actions according to five broad topic areas: Regional Water Management, Surface Water, Groundwater, Water Quality, and Riparian and Instream Habitat. This extensive overview of goals, objectives, and recommended actions is the basis for the matrices that follow. The Matrix section takes the recommendations of the five narratives and reformats them to provide a variety of perspectives. The recommended actions are broken out according to topic area and then further organized by geographic area and priority, coordinating entities/key participants, and action type (*i.e.*, project or program/legislation or regulation/further study required). These matrices are intended to shed light on the findings of the Plan by organizing those findings according to a variety of distinguishing characteristics and to assist in determining implementation strategies, timetables, and partnerships. Finally, the Implementation section of the Plan offers a framework for moving forward and catalogs a variety of resources that can be called upon to assist with implementation in both the short and long term.

We recognize that in order for this Plan to have long-term meaning and impact, those of us who have worked on the Plan in the past will need to continue our efforts towards implementation. Our presentations of the Plan to local and regional leaders and to the public at large will be the beginning of this process as we discuss alternative implementation strategies with water managers, government officials, and citizen activists. Although this is the end of a long process, it is the beginning of another one that will have no end. The implementation, follow-up, and future revision of this Plan will be the ultimate measure of its worth and will be a process that we hope will become an ingrained part of the community.

> *"After experiencing three of these input sessions and listening to the dialogue, I have come to understand that we are really talking about changing the culture of our relationship to water in the region. We can propose some regulatory changes that could have some impact, but the real change will be based on people having a different relationship with water and a culture of water responsibility becoming part of our regional ethic. That cannot be mandated."*
>
> — Bob Schultz, Roaring Fork Watershed Plan public meeting facilitator, 2009

2. Urgent Actions

A handful of actions from each of the five broad water topics are suggested for immediate implementation. These actions were selected based on a combination of factors, including the environmental and economic value of the resource to be protected or restored, the threat of future adverse impacts, and the likelihood that the actions can be successfully completed in the near term. Also, most of these actions provide benefits throughout the watershed and offer significant opportunities for collaboration and education. Some of these actions are opportunistic, in that they build upon ongoing work and take advantage of current political will and public enthusiasm. Successful implementation of these actions will provide momentum for accomplishing the 200+ recommended actions identified in this Plan.

Regional Water Management

❖ **Create a Unified Voice for Regional Water Management**

RWM B2a. Appoint a Working Group to identify mechanisms for consolidating and coordinating the Roaring Fork Valley's involvement in regional water management and to advise local governments on participation in regional water management planning.

❖ **Assess the Impacts of Climate Change on the Watershed**

RWM D1g. Assess the vulnerability of the Roaring Fork Watershed to climate change. Develop an adaptive management strategy that integrates findings from the vulnerability assessment with watershed planning priorities and decision support.

Surface Water

❖ **Ensure that Water Availability Studies Include Environmental and Recreational Water Needs**

SW A1c. Ensure that the Colorado River Basin Water Availability Phase II Study adequately assesses and addresses the Roaring Fork Watershed's non-consumptive needs, including projected needs with climate alteration.

❖ **Quantify Non-consumptive Flow Needs**

SW A1f. Conduct site-specific studies of environmental and recreational flows needed for stream reaches that are currently significantly flow-altered or threatened by significant flow alteration. Include an analysis of how often these flows are not met.

❖ **Pursue a Water Conservation Campaign that Benefits Rivers**

SW B1f. Investigate if water conservation translates to environmental benefits under Colorado water law. Pursue opportunities for water conservation, if appropriate.

- Complete the report, *Opportunities for Water Conservation – Options and Recommendations for the Roaring Fork Watershed* and pursue a water conservation campaign utilizing the report's analysis.

Groundwater

❖ **Ensure an Adequate Groundwater Supply for New Land Uses and Developments**

GW A2a. Adopt local regulations, policies, and procedures to ensure that there is a sufficient technical and legal demonstration of the availability and sustainability of an adequate water supply for any new land use or development reliant upon groundwater.

Water Quality

❖ **Onsite Wastewater Treatment System Education Campaign**

WQ E1h. Improve public education regarding individual onsite wastewater treatment systems, particularly the need for regular system inspections – not just pumping.

Riparian and Instream Areas

❖ **Plan and Implement Key Riparian and Instream Protection and Restoration Projects**

RI B1a. Working with landowners, resource experts, and other interested parties, plan and implement riparian/ instream protection and restoration projects.

> *Fostering Implementation of the Roaring Fork Watershed Plan*. (December, 2010).
> Recommendation #3: Pursue an initial voluntary project.

- Four areas have been identified that have high visibility and are ecologically significant. To varying degrees they provide opportunities for collaboration/partnerships, take advantage of ongoing projects/program support, and offer relatively uncomplicated access to the riparian and instream area. The four areas are: Upstream and downstream of the Town of Basalt, the Northstar area of the Roaring Fork River, the Cattle Creek confluence with the Roaring Fork River, and the Coal and East Creeks confluence with the Crystal River.

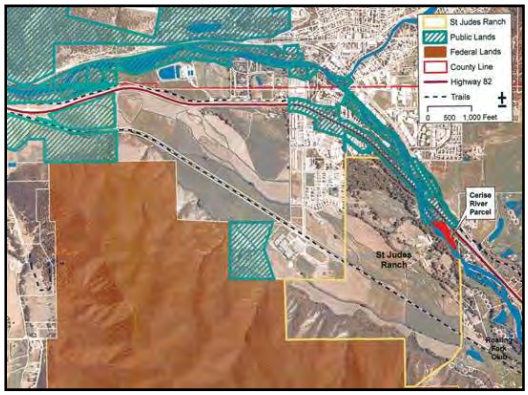


Figure 1. The Roaring Fork River near Basalt is ecologically significant and much of the riparian area is in public ownership (Map: Pitkin County Open Space and Trails)**.**

❖ **Provide Adequate Stream Setbacks Throughout the Watershed**

RI C1c. Develop and enforce stream setbacks that protect riparian areas throughout the watershed.

❖ **Increase Awareness of the Importance of Riparian Areas**

RI D1a. Provide education to the public about the important functions of riparian areas, of development and other threats to riparian areas, what can be done to protect and restore riparian areas, and potential sources of funding for riparian projects.

- Roaring Fork Conservancy's *"Citizen's Guide to Riverfront Property"* provides information on the benefits of riparian areas and what people can do to protect these areas.

3. Watershed Management Topics

> *"All the water that will ever be is, right now."*
> — National Geographic, October 1993

The Narrative section of the Plan is divided into five water-topic sections mirroring the organization of the *State of the Roaring Fork Watershed Report 2008.* These include **Regional Water Management**, **Surface Water Management**, **Ground Water Management**, **Water Quality**, and **Riparian and Instream Areas.** Under each of these headings is a topic goal addressing what the Plan hopes to achieve. For instance, the goal for Groundwater Management is ***"To protect the availability and sustainability of our groundwater."*** Each topic's goal is accompanied by brief explanatory text. This is followed by four to six objectives which speak to the various aspects of achieving the goal. Each objective is described in more detail and has an associated Summary Statement of action required. Each Summary Statement identifies the most likely Coordinating Entities and other Key Participants. The companion matrices (Section 5) also identify the Coordinating Entities and Key Participants for each individual action. The Summary Statements and connected Recommended Actions are where the Plan addresses the practical realities associated with implementation. At the end of each action are letters signifying the type of action: (P) "Project or Program," (S) "Study," or (L) "Legislative and Regulatory" or any combination of the three. "Projects" are activities which require physical alterations to the landscape, such as revegetation of a riparian area or the construction of a kayak park, while "Programs" require an active effort using legislative, educational, legal, regulatory or other tools to carry out a recommendation. A "Study" is just what its name implies - an effort to learn more through research, inquiry, and analysis about a given topic. The "Study" designation often indicates a knowledge gap - an aspect of the watershed which is poorly understood or documented. "Studies" are often paired with one of the other categories because they are a necessary precursor to more direct action. "Legislative and Regulatory" recommendations refer to those actions which will require a governing body to take official action, including adopting standards, imposing penalties, and providing resources. The category distinctions in this narrative are somewhat subjective and are not intended to exclude other approaches to implementation nor to value one type of implementation action over another. They are intended to act as a starting point for further discussion and as an aid in assigning responsibility for actions.

Each Goal, Objective, Summary of Action Required, and Recommended Action is coded with an alpha-numeric identifier to clarify relationships to each other. The following Recommended Action to achieve the Surface Water Goal is an example:

SW C3a. *Complete a comprehensive climate impacts assessment on stream flows for the Roaring Fork Watershed. (S)*

This Recommended Action is associated with the Surface Water (SW) section and is designated *"a"* under Summary of Action Required #3 under Objective C. The (S) indicates it is a Study. Some elements of this outline format require further explanation, including:

Coordinating Entity or Entities: This sub-head identifies that agency or agencies which have immediate jurisdiction over the subject of the recommendation or have the most readily-identified responsibility

for that subject. This is not to suggest that Coordinating Entities have sole responsibility or a legal obligation to implement a given recommendation. It is instead a guide as to what entities would need to be closely involved if the recommendation were to be implemented.

Key Participants: This sub-head identifies the other participants that would be potential partners or referral agencies to the Coordinating Entities. As noted above, partnerships and sharing of resources will be a key factor in determining the success of this Plan.

The listing of Coordinating Entities and Key Participants recognizes existing relationships and also provides a starting place for establishing partnerships around one implementation action or another. The critical involvement and participation of amorphous groups, such as landowners and schools, while recognized for many of the Plan's action items, has not been explicitly called out.

Section 4 of the Narrative is a Key which lists and defines all of the acronyms used to identify Coordinating Entities and Key Participants.

Sidebars: Sidebars are presented in boxes interspersed throughout the Narrative and provide further explanation or background on the various actions. These additions to the Narrative generally include details, resources, examples or definitions which shed further light on the actions with which they are associated.

I. Recommended Actions to Achieve Regional Water Management (RWM) Goals and Objectives

<u>RWM Goal</u>: To ensure that solutions to water management issues meet both our consumptive needs for water and the need to keep water in our rivers and streams for instream uses.

During the last decade, Colorado has seen rapidly increasing demands on water by both traditional consumptive uses and, more recently, by non-consumptive recreational and environmental uses. By the year 2030, Colorado's population is expected to grow to about 7.1 million people from the current estimate of 4.5 million. This population growth, together with the recent drought (1999-2004) and the threat of global climate change, raises serious concerns about the ability of Colorado's water supplies to meet the needs of its citizens and the environment.

Water use and stream flows in the Roaring Fork Watershed are affected by transmountain diversions, water rights within the Roaring Fork Watershed and the broader Upper Colorado River Basin, multi-state river compacts, and pressure by many interests to develop water supplies for future growth and development. What happens in the Roaring Fork Watershed has a significant impact on water management in the region and in the state, and vice versa.

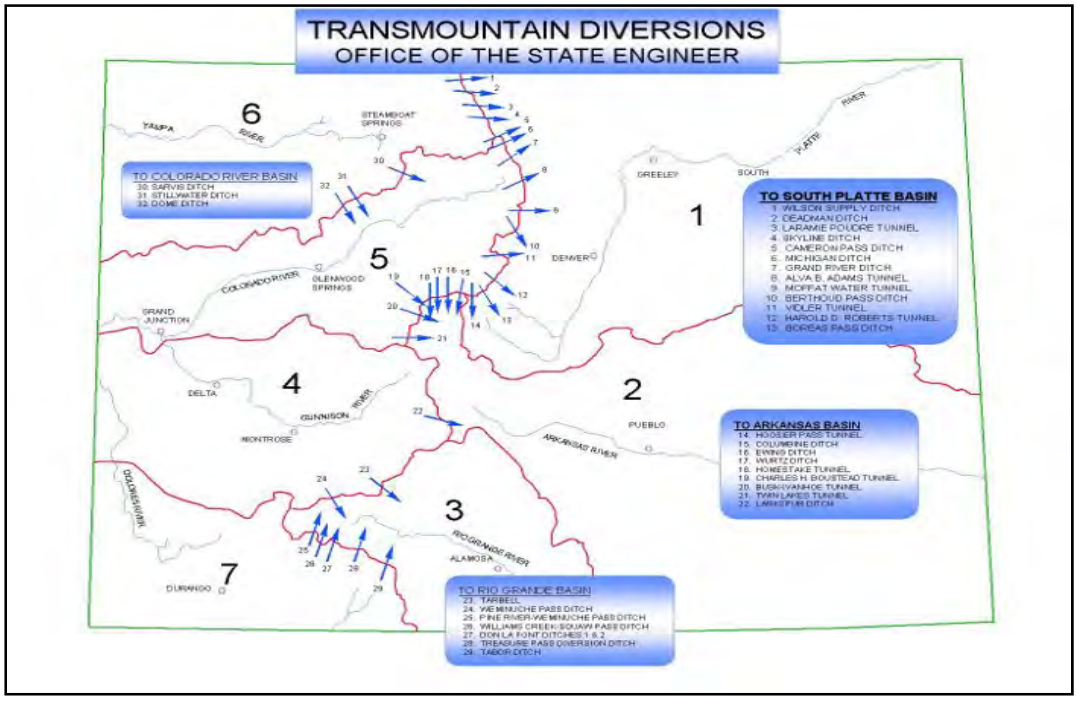


Figure 2. Transmountain diversions in the State of Colorado.

Water distribution and management in the watershed is influenced primarily by Colorado's Prior Appropriation Doctrine, which determines timing and allocations of water rights. Other important factors include water management agreements like the Colorado River Compact, and planning initiatives and policies, including the Colorado Interbasin Compact negotiation process, Endangered Species Act and Wild and Scenic Rivers Act. Finally, structural projects play a key role in the watershed, with the Fryingpan-Arkansas Project and Independence Pass Transmountain Diversion System directly affecting water availability and stream flows. Looking to the future, the development of conditional water rights,

uncertainty surrounding the Colorado River Compact, additional water demands, and structural project proposals, such as the Ruedi Pumpback, Colorado River Return Project, and Preferred Storage Options Plan, are some of the issues with potential implications for water availability and management in the Roaring Fork Watershed.

RWM A. Objective: Improve public education and understanding concerning complex federal and state water policies/programs affecting management of our rivers and streams.

The *State of the Roaring Fork Watershed Report 2008* summarizes the most important federal and state laws, regulations, and policies influencing water use in the Roaring Fork Watershed. The programs and structural projects implementing these laws, regulations, and policies tend to be complex and can be hard to understand unless significant time is devoted to their study. Yet, some level of understanding is important for the community to be able to knowledgeably engage in water management planning. Enhanced media coverage of federal and state initiatives affecting our watershed is needed and ways must be found to improve public education and outreach on the issues so our community is better prepared to influence water management policy.

The Roaring Fork Watershed Plan's Phase II Guidance Documents (*Why the Roaring Fork Watershed Plan Matters* and *Illuminating the Way Ahead*) discuss the state's Interbasin Compact Process. The Roaring Fork Watershed participates in the Interbasin Compact Process through its representatives on the Colorado Basin Roundtable (CBRT) which meets monthly in Glenwood Springs. CBRT representatives include appointees from local municipalities and counties, representatives from water supply agencies, and from the public at large.

To date, there has been little public attendance at the CBRT meetings and limited public participation on the CBRT's working groups, Most members of the community are not aware of the work being done by the CBRT and the other basin roundtables. The discussions, studies and projects being conducted by these basin roundtables will influence the long-term management of the Roaring Fork Watershed's water resources. The CBRT's interface with its constituents needs to be improved. Otherwise, the decisions being made on behalf of the watershed in the Interbasin Compact Process may not be supported by the community.

The CWCB's website (cwcb.state.co.us) has information on the Roaring Fork Watershed's **CBRT representatives**, upcoming **CBRT meetings**, as well as **minutes** from past meetings. The website also includes **reports** generated by the CBRT and other basin roundtables.

RWM A1. *Summary of Action Required*: Improve media coverage of federal and state water policies/programs affecting management of our rivers and streams.

- ***Coordinating Entity*: CRWCD**
- ***Key Participants*: CBRT, CFWE, CTU, CWCB, local jurisdictions, NWCCOG Q/Q, RFC, RWAPA**

RWM A1a. Regularly broadcast, via webcast, local cable TV, and other outlets, educational presentations on federal and state water policies/programs affecting management of our rivers and streams. Presentations given at basin roundtable and other meetings can be recorded and rebroadcast in edited form for easy consumption. (P)

RWM A1b. Issue regular press releases from the CBRT, CRWCD, and RWAPA. Include "tie-ins" to the Roaring Fork Watershed whenever possible in press communications. (P)

RWM A1c. Use social networking opportunities (*e.g.*, Facebook, Twitter) to improve communication with respect to meetings, workshops, and other educational opportunities concerning water issues. (P)

RWM A2. *Summary of Action Required*: Develop and implement outreach and education programs that translate and convey consistent information on complex water policies/programs affecting management of our rivers and streams.

- ***Coordinating Entities*: CRWCD, RFC**
- ***Key Participants*: CBRT, CFWE, CTU, CWCB, local jurisdictions, NWCCOG Q/Q, RWAPA**

RWM A2a. Fund and distribute videos (*e.g.*, the Roaring Fork Watershed video by Greg Poschman), PowerPoint presentations, brochures, and other media that tell the story of the Roaring Fork Watershed. Exhibit and promote these products as widely as possible. (P)

RWM A2b. Create a graphical tool or an educational game (like "Risk") illustrating the relationship between downstream calls, transmountain diversions, in-basin diversions (*e.g.*, ditches), and flows in the Roaring Fork Watershed. Include an illustration of how transmountain and local diversions and downstream calls may support or harm instream values (*e.g.*, kayaking, fishing, rafting). Make this tool available for schools and for presentations on water issues. (P)

When a **"call"** is placed on a river by a water rights holder it means that the water rights holder is requesting the CDWR to shut down (curtail) all upstream junior water rights until their senior water rights downstream are satisfied. The primary "call" on the Roaring Fork Watershed is the "Cameo Call," a group of senior irrigation rights near Grand Junction, which can curtail even transmountain diversions.

RWM A2c. Support projects such as the CRWCD/NWCCOG Q/Q's "It's the Same Water Campaign" and the RFC's River Center, including exhibits to enhance public awareness of complex regional water management issues. (P)

RWM A2d. Create a portable plumbing model of the Roaring Fork Watershed similar to the NRCS stream trailer. (P)

RWM A2e. Publish and distribute the RWAPA document, *Front Range Water Supply Planning Update: Increased Storage, Increased Demands, Increased Transmountain Diversions*. Translate and graphically represent key findings from this document. (P)

RWM A2f. Support projects such as the Univ. of Michigan Master's Project, *Fostering Implementation of the Roaring Fork Watershed Plan*. Evaluate and utilize recommendations for improving public education and outreach from the Univ. of Michigan Master's Project, as appropriate. Seek out opportunities to engage academia in research and implementation projects. (P)

RWM A3. *Summary of Action Required*: Improve communication between the Colorado Basin Roundtable and the public on Roundtable activities, projects, and policies.

- ***Coordinating Entity*: CBRT**
- ***Key Participants*: CRWCD, CWCB, local jurisdictions, RFC, RWAPA**

RWM A3a. Advertise the CBRT meetings and their agendas. Include information on subcommittee/working group meetings that are open for public participation. (P)

RWM A3b. Broadcast CBRT meetings and publicize the broadcasts. (P)

OPPORTUNITIES TO IMPROVE COMMUNICATION BETWEEN THE CBRT & ITS CONSTITUENTS INCLUDE:

- Local cable TV and webcast coverage of CBRT meetings.
- Announcements of CBRT meetings and agendas in local newspapers, on local radio and cable TV and through social networking channels.
- A monthly Q&A with CBRT representatives published in local newspapers and on the RFC website.
- Interviews with CBRT representatives on local cable TV and radio.
- A Facebook page for CBRT representatives.

RWM A3c. Institute regular reporting to constituents by the Roaring Fork Watershed CBRT representatives in "user friendly" formats including social media, e-mail mailing lists, and bulk mailings. (P)

RWM A3d. Create a mechanism to capture and relay public comment to the CBRT on issues affecting the Roaring Fork Watershed. (P)

RWM A3e. Support/fund a touring educational program on regional water management issues (*e.g.*, "Flowing Uphill -Diversions, Rivers and Water in Colorado" by Ken Neubecker of the Western Rivers Institute). (P)

RWM B. Objective: Ensure that Roaring Fork Valley decision makers consistently evaluate and pursue strategic opportunities for obtaining environmentally and economically beneficial stream flows in the Roaring Fork Watershed, striving to achieve a unified watershed approach whenever possible.

Both the *State of the Roaring Fork Watershed Report 2008* and the Phase II Guidance Document, *Illuminating the Way Ahead*, discuss the legal framework under which our water resources are managed. Many different federal, state and local entities monitor and enforce a complicated array of statutes, regulations, and agreements. Inadequate resources (*e.g.*, insufficient field staff, lack of gaging stations, inadequate funding for data analysis) will almost certainly continue to be a problem for all of these entities individually. Collaborative efforts, utilizing all of the technical and legal resources at hand, represent our best opportunity for vigilant protection of our water resources.

Currently, local governments in the watershed vary widely in the resources they devote to federal and state water policies and programs. Few, if any, of the local governments have the technical and legal staff available to consistently analyze federal and state initiatives and recommend positions to be taken by elected officials. Multi-jurisdictional entities, such as the CRWCD, RWAPA and NWCCOG Q/Q, provide additional resources for local governments. However, the positions they advocate on behalf of their membership may not reflect the views of all of the decision makers in the Roaring Fork Watershed.

The Roaring Fork Watershed lacks a unified local voice able to draw from technical and legal resources from across the watershed. Establishing mechanisms and institutions to promote cooperation among decision makers will be critical for implementation of the Roaring Fork Watershed Plan and for effective management of our water resources in the future.

The 2002 drought that affected streams throughout the region was a reminder that water supplies are a function of climate more than any other single factor. Climate change will continue to impact water availability in the Roaring Fork Valley. Energy development and future transmountain diversions may further impact local water resources. Our community should not wait for the next crisis before taking action to address current and potential stream flow issues in the Roaring Fork Valley. Increased demands and unpredictable supplies create a fragile system where even a temporary deviation from normal flow regimes can have instantaneous and lasting impacts.

The Phase II Guidance Document, *Illuminating the Way Ahead*, discusses the CWCB's instream flow lease and loan program and other tools available for local governments to protect stream flows. Regional collaboration aimed at maintaining or increasing stream flows should be a priority for our watershed.

As discussed in the *State of the Roaring Fork Watershed Report 2008* and the Phase II Guidance Document, *Illuminating the Way Ahead*, augmentation plans and temporary substitute supply plans are important water management tools for dealing with changing land use in Colorado. However, in their current form, these plans are primarily concerned with satisfying the requirements of other water *users*. There are few protections in place for non-consumptive water needs. A plan which adversely impacts streamflow amounts or timing can still be approved if it protects other water users.

As part of the Interbasin Compact Process, the CBRT and the other basin roundtables are responsible for conducting non-consumptive needs assessments in their respective watersheds. Through this process, Colorado has already taken a significant step towards recognizing the standing of its non-consumptive water needs. Augmentation and substitute supply plan requirements that recognize the importance of non-consumptive water uses in Colorado should be the next step towards assuring that those needs are met in the future.

RWM B1. *Summary of Action Required*: Ensure that decision makers consistently review and take positions on federal and state water policies/programs affecting management of the Roaring Fork Watershed.

- ***Coordinating Entities*: CRWCD, local jurisdictions, RWAPA**
- ***Key Participants*: BLM, BOR, CBRT, CDWR, CPW, CTU, CVEPA, CWCB, DOI, NWCCOG Q/Q, River Board, transmountain diverters, USFS, USFWS, USGS**

RWM B1a. Appoint a Working Group to study and make recommendations on how the CRWCD can better foster collaboration among its Roaring Fork Watershed Board members. Evaluate and utilize the recommendations of projects such as the Univ. of Michigan Master's Project, *Fostering Implementation of the Roaring Fork Watershed Plan*, as appropriate. (S)

RWM B1b. Cultivate collaborative relationships with state and federal water resource experts and decision makers. Look for opportunities for agencies to partner on multi-jurisdictional projects. (P)

RWM B1c. Hold public meetings on significant water issues affecting the Roaring Fork Watershed with CBRT and RWAPA representatives, CRWCD Directors, and local elected officials. Publicize these meetings through various means. (P)

RWM B1d. Identify streams in the watershed that may be candidates for federal wild, scenic, and recreational status. Determine community support for a designation and work to meet community goals. (S&L)

RWM B1e. Encourage Pitkin County's River Board to publicize its priorities and activities and to take steps to coordinate those activities with local water managers and interest groups. (P)

In the Roaring Fork Watershed**, the BLM found Thompson Creek to be eligible for scenic designation**. Public participation in the BLM's resource management planning process will help determine suitability for inclusion within the Wild and Scenic Federal System. **Most of the National Forest lands adjacent to the Crystal River are also eligible for inclusion in the Wild and Scenic Rivers System.** The White River National Forest's *2002 Revised Forest Plan* established Scenic and Recreation River management prescriptions for the land adjacent to the Crystal River and its tributaries.

RWM B1f. Cultivate collaborative relationships with the entities diverting water from the Roaring Fork Watershed to the East Slope. Look for opportunities to partner on creative solutions to meet both East and West Slope water supply requirements. (P)

RWM B1g. Revitalize the Roaring Fork Watershed Collaborative Water Committee as a focal point for regional cooperation and communication. (P)

RWM B2. *Summary of Action Required*: Investigate mechanisms for consolidating and coordinating the Roaring Fork Valley's involvement in regional water management and to advise local governments on participation in regional water management planning.

- ***Coordinating Entities*: CRWCD, local jurisdictions, RWAPA**
- ***Key Participants*: CBRT, local fishing industry, NWCCOG Q/Q, RFC**

RWM B2a. Appoint a Working Group to identify mechanisms for consolidating and coordinating the Roaring Fork Valley's involvement in regional water management and to advise local governments on participation in regional water management planning. Evaluate and utilize the results of projects such as the Univ. of Michigan Master's Project, *Fostering Implementation of the Roaring Fork Watershed Plan*, as appropriate. (S)

RWM B3. *Summary of Action Required*: Evaluate and recommend changes in regulations to require implementation of augmentation and substitute supply plans which meet both consumptive and non-consumptive water needs within the context of Colorado water law.

- ***Coordinating Entities*: CDWR, NWCCOG Q/Q**
- ***Key Participants*: CRWCD, CWCB, local jurisdictions, RWAPA**

RWM B3a. Create a Working Group (with both technical and legal representatives) to investigate and recommend changes to regulations governing augmentation and substitute supply plans that reflect the importance of maintaining natural hydrology in the development of these plans. Evaluate the scope of local jurisdictions' legal authority in this area as part of this process, as well as the economic (*e.g.*, restricted development) and environmental consequences (*e.g.*, increased storage requirements) associated with any recommended changes to existing regulations. Strive to develop recommendations

which work within existing legal boundaries and which do not trade off one environmental value against another. Pursue regulatory amendments, as necessary, through all appropriate channels. (S&L)

The basic principles of **augmentation plans** and **substitute supply plans** are described in the Colorado Foundation for Water Education's *Citizen's Guide to Colorado Water Law*.

RWM B4. *Summary of Action Required*: Affirmatively use environmental laws and regulations (*e.g.*, local 1041 powers, NEPA, and the Fry-Ark Operating Principles), as necessary to protect the watershed and enforce existing agreements (*e.g.*, the Twin Lakes exchange) designed to protect the watershed. Seek out opportunities to use regulatory authority to encourage cooperative rather than punitive or compulsory solutions.

- ***Coordinating Entities*: CRWCD, local jurisdictions, RWAPA**
- ***Key Participants*: BLM, BOR, CBRT, CTU, CWCB, transmountain diverters, USEPA, USFS, USGS**

RWM B4a. Formalize the existing *ad hoc* arrangement among the CRWCD, USFS, Pitkin County, City of Aspen and CPW for establishing the annual flow regime for the Twin Lakes exchange and identify the entity (ies) in the watershed responsible for monitoring implementation of the Twin Lakes exchange on behalf of the Western Slope. Foster communications with managers and clients of the Twin Lakes diversions and seek out cooperative solutions which do not threaten their water supplies. (P)

RWM B4b. Maintain active participation by Roaring Fork Watershed decision makers in the 10,825 Working Group to ensure that watershed interests are protected and obligations under existing agreements (*e.g.*, the Fry-Ark Operating Principles) are met. (P)

RWM B4c. Cultivate collaborative relationships with those entities responsible for ensuring an adequate and sustainable water supply for the East Slope. Seek mutually-agreeable solutions to East and West Slope water supply requirements whenever possible. (P)

RWM B5. *Summary of Action Required*: Investigate the potential impacts of the perfection of conditional water rights on stream flows.

- ***Coordinating Entities*: CDWR, RWAPA**
- ***Key Participants*: Local jurisdictions**

RWM B5a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law. (S&P)

A **conditional water right** is a water right obtained through water court proceedings where the right is given a priority date, even though actual water appropriation has not occurred. The holder of the conditional water right is given time to complete the appropriation, but every 6 years the water court reviews the progress made by the rights holder to ensure "diligence." Once the right has been perfected by use, the holder of the conditional water right must still request the water court to convert the conditional right to an absolute right in further proceedings.

RWM C. Objective: Ensure coordination of local land use actions to prevent or mitigate water resource impacts throughout the watershed.

Land use planning and development in the Roaring Fork Valley should adopt a "watershed perspective" whenever possible. For example, approval of a development in the headwaters that is reliant upon a nonexempt groundwater well may result in an augmentation plan that is satisfied by a release miles downstream on the Roaring Fork River. Absent a "watershed perspective," the land use approval may ignore potential impacts on stream flows between the point of withdrawal and the augmentation plan's point of release downstream. Individually, the impact from a single headwaters development approval may be small. Cumulatively, the impact from multiple development approvals with similar augmentation plans may be significant.

Any development in the Roaring Fork Valley involving water resources typically impacts other local water users and will draw the attention of more than just the local planning department. For example, an ornamental pond may divert and store water that needs to be released to senior water rights holders during dry summer months. The proper maintenance and accessibility of the head gate on the pond will be of interest to the local water commissioner, who is responsible for administering water rights. During the dry summer months the same pond may be viewed as a critical water storage facility for fire protection in a remote area. The local fire protection district may want the pond to remain full, or be replaced with a storage tank. If the interested parties are not talking to each other early in the planning process, a property owner may be left to deal with conflicting directives after a project has been engineered and completed.

The Roaring Fork Watershed Plan provides an ideal opportunity to improve cooperation and information sharing among local planning and engineering departments, state water commissioners, local fire protection districts, and other interested entities.

RWM C1. *Summary of Action Required:* Improve collaboration among Roaring Fork Watershed decision makers on local land use and development issues.

- ***Coordinating Entities*: RWAPA**
- ***Key Participants*: BOR, CDWR, CFWE, CRWCD, local jurisdictions NWCCOG Q/Q, RFC, SI, USFS**

RWM C1a. Periodically conduct watershed explorations for local decision makers (*e.g.*, the RFC's Floating Summit). (P)

Figure 3. Roaring Fork Watershed Summit, June 10, 2010. Planned as a "Floating Summit," dangerously high flows resulted in a "Dry Land Summit" for the nearly 80 elected officials, agency staff, and water experts who came together to discuss critical water issues in the Roaring Fork Watershed (Photo credit: Greg Poschman).

RWM C1b. Conduct a periodic retreat for Roaring Fork Watershed decision makers on specific land use and water issues of common interest/concern. (P)

RWM C1c. Identify and collect all IGAs, MOUs, etc. between/among Roaring Fork Valley jurisdictions with applicability to water issues. Make all such agreements easily accessible to the public online. Analyze those agreements and look for opportunities to consolidate, clarify, or revise those documents to improve interagency collaboration. (P, S & L)

RWM C1d. Identify jurisdictional and substantive gaps on water issues in existing IGAs, MOUs, etc. between/among local jurisdictions in the Roaring Fork Watershed. Recommend and pursue modifications to existing agreements, as well as new agreements, to close identified gaps. (S&L)

RWM C2. *Summary of Action Required*: Improve communication between local entities and state water commissioners on projects of common interest (*e.g.*, local land use and development approvals for micro-hydro facilities and ornamental ponds).

The Roaring Fork Watershed (Division 5, District 38) has only **two water commissioners** assigned to cover the entire watershed.

- ***Coordinating Entities*: Local jurisdictions**
- ***Key Participants*: CDWR, fire protection districts**

RWM C2a. Modify local land use regulations to require referrals to state water commissioners and local fire protection districts during the land use application review phase. (L)

RWM C2b. Request that local land use planning departments adopt a policy of offering state water commissioners and local fire protection districts an opportunity to participate on any technical advisory/working groups developing amendments to land use regulations and/or forms addressing water resource matters of common interest. (L)

RWM C2c. Conduct a bi-annual meeting of local land use planners, local fire protection district personnel, and state water commissioners to provide a forum for discussing land use and water resource matters of common interest. (P)

RWM D. Objective: Ensure that the potential effects of climate change are considered as an element in future water management decision-making.

Many studies have focused on how climate change can affect the Upper Colorado River Basin over the course of this century. One of them, the *Colorado River Water Availability Study – Phase I Report (Draft)*, issued March 22, 2010, has projected some dramatic changes to hydrologic conditions in the Colorado River Basin based on anticipated 2040 climate conditions. Among the report's findings:

- Temperature will increase basin-wide by 3.3 to 3.7 degrees Fahrenheit, with lower elevations showing the largest increase and temperature increases occurring each month of the year.
- Winter precipitation (November-March) will increase basin-wide by 6 to 13 percent.
- Summer precipitation (April-October) will decrease basin-wide by 4 to 10 percent.
- Annual streamflow will shift toward an earlier peak runoff and streamflow will decrease in late summer and early fall.
- Higher elevations will generally have less annual streamflow available to meet future demands, as a percent of modeled streamflow.

As discussed in the *State of the Roaring Fork Watershed Report 2008*, physical climate changes will impact the ecosystems and socioeconomics of the watershed. Climate change must be considered in all aspects of our water management planning.

RWM D1. *Summary of Action Required:* Ensure that provisions for climate change-driven impacts, as well as adaptations necessary to account for climate change, are integrated into all regional water management planning.

- ***Coordinating Entities*: AGCI, local jurisdictions**
- ***Key Participants*: Aspen SkiCo, CBRT, CDWR, CPW, CRWCD, CWCB, local fishing industry, major water diverters, NWCCOG Q/Q, Public Safety Council, RFC, RWAPA, Sunlight Mt. Resort, USEPA, USFS, water conservancy districts, water and sanitation districts**

RWM D1a. Improve collaboration among local jurisdictions and key stakeholders (*e.g.*, Aspen Skiing Company) in the watershed to ensure that adequate physical, chemical, and biological data are collected to monitor local climate change and assess its impacts. (P)

RWM D1b. Improve our decision makers' understanding of the potential impacts of climate change on our water resources. (P)

RWM D1c. Conduct site-specific research and modeling within the Roaring Fork Watershed to improve projections of the impacts of climate change on the watershed. (S)

RWM D1d. Review existing master plans in the watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage. (S)

RWM D1e. Review the existing water-related infrastructure and operational procedures in the Roaring Fork Watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage. (S)

RWM D1f. Research the impact that climate change may have on the water resource-related economy in the Roaring Fork Watershed (*e.g.*, skiing, fishing, rafting, etc.). (S)

RWM D1g. Assess the vulnerability of the Roaring Fork Watershed to climate change. Develop an adaptive management strategy that integrates findings from the vulnerability assessment with watershed planning priorities and decision support. (S)

A 3D hydrologic study, using for example the University of Washington's Variable Infiltration Capacity Macroscale Hydrologic Model of the Roaring Fork combined with climate change models could provide a more complete picture of projected water availability to improve planning efforts.

II. Recommended Actions to Achieve Surface Water (SW) Management Goals and Objectives

***SW Goal*: To protect the availability and sustainability of surface waters.**

> *Any river is really the summation of the whole valley. To think of it as nothing but water is to ignore the greater part.*
>
> — Hal Borland, *This Hill, This Valley*

Healthy rivers are defined by adequate and consistent flows which follow the natural hydrograph. The consequences of inadequate flows are often highly visible, such as unmet calls, a dewatered stream reach, or, in extreme cases, dying fish. Flood flows that exceed streambed capacity can also have serious consequences, such as threatening human safety and causing property damage. However, these high flows also have benefits. They maintain healthy streams and riparian areas and recharge the groundwater that contributes to stream base flow and well production.

Snowpack in Colorado provides approximately 75 percent of streamflow, with most of Colorado's snow falling on its western mountain ranges. Snowmelt-driven systems, including the upper basin tributaries of the Colorado River such as the Roaring Fork River and its tributaries, are particularly prone to disruption in the historical pattern of spring runoff. One of the consequences of the increasing temperatures associated with climate change is change to historic runoff timing and amounts.

Changes in historic patterns of snowmelt and runoff will influence local and regional surface water supply and demand. Although most of Colorado's water supply is on the West Slope, most of the state's population and agricultural production occurs on the East Slope, where low precipitation results in semi-arid climate conditions. Many headwater streams on the west side of the Continental Divide, including the Roaring Fork and Fryingpan Rivers, have been partially diverted to the East Slope to support Front Range agriculture and development, impacting the ability of West Slope streams to sustain aquatic wildlife and provide other benefits.

SW A. Objective: Identify flows needed to meet non-consumptive needs.

The Colorado Water for the 21st Century Act (*see* C.R.S. §§ 37-75-101 through 37-75-106) was passed to facilitate discussions and negotiations among the various river basins within Colorado. The Act created nine basin roundtables, including the CBRT. The basin roundtables are required to complete basin-wide needs assessments, including an assessment of non-consumptive water needs (environmental and recreational) and based on this work identify projects or methods to meet any identified water needs.

Examples of important non-consumptive water uses and values include:

- Sufficient flows for channel and riparian area maintenance,
- Seasonal flushing flows to remove sediment deposition that may smother fish spawning beds and benthic organisms,
- Maintenance or restoration of high quality habitat for fish and aquatic life,
- Groundwater recharge,
- Adequate flows to maintain high water quality,
- Support of popular water-based recreation, including rafting, kayaking, and angling, and
- Adequate flows to support hydropower generation.

Understanding and defining the non-consumptive uses of water in the watershed is a complicated endeavor. It requires evaluation of a broad set of hydrologic parameters influencing biological and

geomorphological processes, including the magnitude, timing, and duration of flows, the rate of change in flows, and the frequency of flow events. However, environmental flow needs must consistently be met for other non-consumptive uses to be accommodated in the Roaring Fork Watershed.

Assessment of environmental flow needs requires good, hard science – not guesswork. However, scientific analysis is often hampered by spatially and temporally limited stream gage and flow data, a lack of adequate ecological and geomorphical data, and a limited understanding of the specific relationships among biological and geomorphological processes and flows. For example, what are the relationships between sediment, flows, fish, and macroinvertebrates? Similarly, flow needs for rafting and kayaking activities are based on judgments from the recreational community about the level of flows necessary to sustain a quality recreational experience. Adequate flows for angling need to correlate with levels needed to maintain a healthy fishery and, in the case of fly fishing, flow levels suitable for angler access to the stream (sometimes called "wadeability"). Sometimes the needs of one group conflict with those of another (*e.g.*, the high waters sought by rafters and the calmer waters sought by anglers).

SW A1. *Summary of Action Required*: Identify environmental flow needs, including an assessment of historical flow alterations and their ecological consequences.

- ***Coordinating Entities*: CBRT, local jurisdictions**
- ***Key Participants*: AGCI, BOR, CDWR, CPW, CRWCD, CSU, CTU, CWCB, FERC, local utilities, NWCCOG Q/Q, RFC, RWAPA, TNC, USFS, USGS, WRI**

SW A1a. At the state and local level, support the funding of research projects designed to address the non-consumptive needs knowledge gap. (L&S)

SW A1b. Work with the CBRT Non-Consumptive Needs Assessment (NCNA) Working Group and the designated NCNA contractors to assess the utility and limitations of the Watershed Flow Evaluation Tool. Evaluate the suitability of other tools/methods developed to provide a regional assessment of ecological risk conditions related to flow and, if warranted, revise the regional assessment using the most suitable approach. (S)

EXAMPLES OF TOOLS/METHODS TO QUANTIFY ENVIRONMENTAL FLOWS:

- Clipperton *et al. Instream Flow Needs Determinations for the South Saskatchewan River Basin, Alberta, Canada.* (2003).
- Richter *et al. Ecologically Sustainable Water Management (ESWM) Methodology.* (2003).
- Poff *et al. The Ecological Limits of Hydrologic Alteration (ELOHA): a New Framework for Developing Regional Environmental Flow Standards.* (2010).

SW A1c. Ensure that the Colorado River Basin Water Availability Study adequately assesses and addresses the Roaring Fork Watershed's non-consumptive needs, including projected needs with climate alteration. (S)

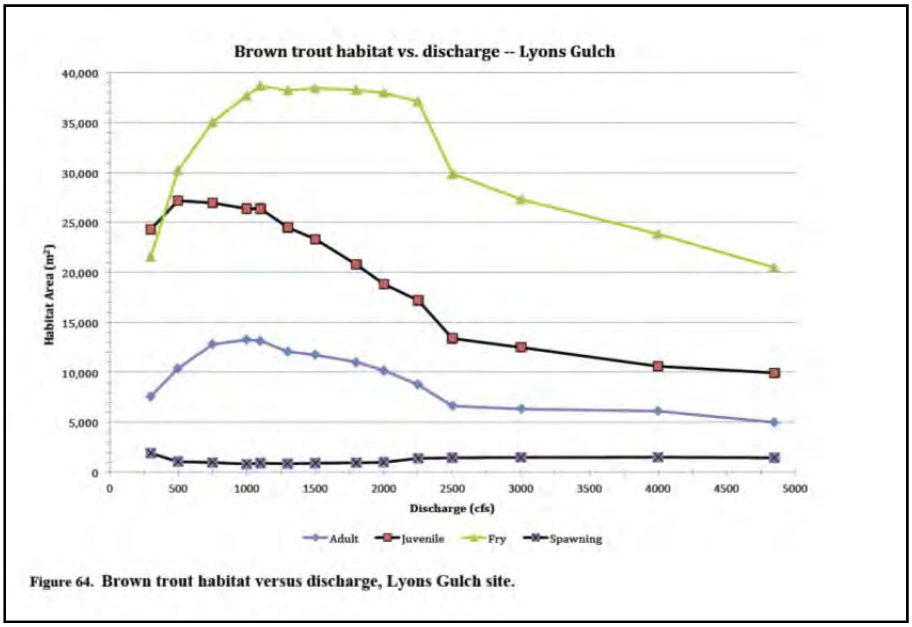
SW A1d. Create and maintain an adequate network of stream gages in the watershed. (P)

Figure 4. CDWR Roaring Fork above Lost Man Creek near Aspen stream flow gage, July 8, 2005. Ice and snow in the winter and the rocky substrate hinder accurate, year-round stream flow readings.

Highest priorities for stream gages in the watershed are: (1) Castle and Maroon creeks, (2) the Lower Crystal River (year-round), (3) the Upper Roaring Fork, and (4) tributaries in the Upper Fryingpan. Second order and higher streams in the watershed with significant diversions and no active stream gage or no gage located below the major diversion structures include: Brush, Fourmile, Threemile, Cattle, Woody, Sopris, Capitol, Maroon, Owl, Landis and Thompson creeks. Several creeks with by-pass flows associated with the Fry-Ark Project are not gaged. Gages at Cattle, Fourmile, Maroon, Thompson, Castle Lime, Cunningham, Middle Cunningham, Mormon, Carter, Granite, Sawyer, and Lily Pad creeks are no longer operating.

SW A1e. Assess flow alteration in stream reaches where stream gage or modeled data are lacking. (S)

SW A1f. Conduct site-specific studies of environmental and recreational flows needed for stream reaches that are currently significantly flow-altered or threatened by significant flow alteration. Include an analysis of how often these flows are not met. (S)



Two-dimensional (2D) depth averaged models are useful to understand local details of velocity and depth distributions. Miller and Swaim's *Instream Flow Report for the Colorado River from Kremmling, Colorado Downstream to Dotsero, Colorado* (2010) used the Rivers 2D model to quantify non-consumptive needs.

Figure 5. Example graph of brown trout habitat for all life stages versus discharge (Miller and Swaim, 2010).

Figure 6. Rafters on the Roaring Fork River.

SW A1g. Assess the direct and indirect economic consequences associated with non-optimal flows. (S)

SW A1h. Ensure that local land use policies and regulations adequately assess all of the costs and benefits associated with hydropower development and mitigate the impact of hydropower development on other non-consumptive water uses. Ensure that hydropower development is considered and addressed in local Master Plans. (L)

SW A1i. Assess potential local and regional recreational and environmental advantages and disadvantages associated with Recreational In-Channel Diversions (RICDs) in the watershed. As appropriate, obtain RICDs and ensure that they do not impact riparian and aquatic habitat. (S&P)

Recreational in-channel diversions sites are **under consideration** on the Roaring Fork River in Basalt and Carbondale

SW B. Objective: Ensure that Colorado Water Conservation Board instream flow rights are adequate to preserve or improve the natural environment to a reasonable degree and are consistently being met.

The Colorado Water Conservation Board (CWCB) Instream Flow Program is designed to address environmental non-consumptive needs. Generally, these needs are based on biological recommendations provided to the CWCB by various state and federal agencies and follow the premise that the amount of water necessary to preserve an aquatic indicator species (*e.g.*, a trout species) is also adequate to preserve the entire natural environment. The program has several limitations: (i) instream flow rights are not always met because all new appropriations are dated post-1973 and administered within the state's prior appropriation system, (ii) the ability of the Colorado Division of Water Resources to place calls to meet instream flows is hampered where stream gages are not present to provide an accurate real-time measurement of flow conditions, and (iii) instream flow amounts do not address the entire annual hydrograph (including peak flows) and all components of the stream environment, such as riparian flora and fauna. Completion of the Recommended Actions under Objective A will help determine the flows needed to meet non-consumptive needs, where additional CWCB instream flow rights are needed, and where existing rights are inadequate.

SW B1. *Summary of Action Required*: Identify the cause(s) of flow alterations and potential solutions.

- ***Coordinating Entities*: CWCB, local jurisdictions**
- ***Key Participants*: Aspen SkiCo, CDWR, CPW, CRWCD, CSU, CTU, CWT, major water diverters, MSCD, NWCCOG Q/Q, RFC, RWAPA, Sunlight Mt. Resort, TNC, USFS**

SW B1a. Based on assessments of flow alteration and ecological consequences, quantify instream flow needs in streams with and without instream flow rights. Pursue instream flow rights for streams with inadequate or no instream flow rights. (S&P)

SW B1b. Investigate why CWCB instream flows are not being met (*e.g.*, junior water rights, inadequate flow monitoring) and institute appropriate projects to remedy the problems identified (*e.g.*, acquire water rights, enhance stream gage network). (S&P)

TOOLS AVAILABLE TO IMPROVE INSTREAM FLOWS INCLUDE:
- Short-term loan program,
- Longer-term lease or loan arrangements, and
- Tax credits for donating water.

SW B1c. Increase the utilization of tools and funding available to improve instream flows. (P)

SW B1d. Identify stream reaches where irrigation return flows and groundwater recharge provide late summer and fall flows and investigate opportunities to maintain these important sources of supplemental stream flows whenever possible. (S&L)

OPPORTUNITIES TO IMPROVE WATER STORAGE INCLUDE:
- Introduction of beavers,
- Constructed wetlands,
- Healthy forest coverage, and
- Private ponds.

SW B1e. Identify and pursue opportunities for improving natural and artificial water storage to improve low stream flows. (S&P)

SW B1f. Investigate if water conservation translates to environmental benefits under Colorado water law. Pursue opportunities for water conservation, if appropriate. (S& L)

SW B1g. Quantify the role of snow making in flow alteration and, where warranted, pursue opportunities for decreasing the environmental impact of snowmaking. (S&P)

SW C. Objective: Identify stream reaches that are vulnerable to increased flow alteration and pursue opportunities to prevent additional impacts on flows.

Flow-altered stream reaches include the Roaring Fork, Fryingpan, and Crystal Rivers, as well as Hunter, Lincoln, Maroon, Castle, West Willow, Woody, Snowmass, Capitol, Collins, Sopris, Nettle, Thompson, Cattle, Fourmile, and Threemile creeks.

As discussed in the *State of the Roaring Fork Watershed Report 2008*, changes in water policy and management, the creation of new water rights, more calls on rivers and streams to meet the demands of existing water rights, new or enlarged structural storage and diversion projects, additional out-of-basin water demands, and climate change all have the potential to affect the quantity of water in the Roaring Fork Watershed's rivers and streams. Additionally, local land use changes will continue to affect water quantity. Throughout the watershed, the flow regime is being altered by urbanization, road development, and developed recreation activities. The replacement of soil and vegetation with impervious (*i. e.,* paved) surfaces changes stream dynamics and the hydrologic cycle.

SW C1. *Summary of Action Required*: Factor in water quantity needs when making land use decisions.

- ***Coordinating Entities*: Local jurisdictions**

- ***Key Participants*: CDWR, fire protection districts, water conservancy districts, water and sanitation districts**

SW C1a. Ensure that local land use planning requires an adequate technical assessment and legal review of the availability, sustainability, and (as applicable) potability of an adequate water supply for a proposed use prior to the grant of a development approval. (L)

HB 08-1141 requires that an **adequate supply of water** must be demonstrated before a local government can issue a development permit for projects that include new water use in an amount greater than that used by 50 single-family equivalents, or fewer, as determined by the local government.

SW C1b. Quantify the direct and cumulative effects of changes in land use (*e.g.*, increases in impervious surfaces, changes from agricultural to developed land uses) on surface flows (both increases and decreases to flows). Incorporate the results in the review of local land use applications and investigate opportunities for mitigation. (S&L)

Impervious surfaces contribute to flood risk and lower baseflows. **Opportunities for mitigation** include reducing density, use of porous surfaces, and water detention features such as ponds, wetlands, and swales. These opportunities can be encouraged through education and incentives, and required through regulations and fees.

SW C1c. Enhance communication and collaboration between local land use planners and water commissioners (*e.g.*, reduce the number of illegal ponds/diversions by having land use planners notify and seek the input of CDWR water commissioners when ponds are being permitted/approved and to discuss the appropriate conditions of approval to ensure adequate and timely diversion headgate repairs). (P&L)

SW C1d. Quantify expected proximal stream flow changes associated with a planned development's augmentation plan. Investigate and pursue opportunities for mitigating the impact to these streams within the confines of Colorado water law. (S&L)

SW C1e. Evaluate the need for ponds designed for fire mitigation and, where necessary, require that steps be taken to minimize their evaporative losses. (S& L)

SW C2. *Summary of Action Required*: Investigate the potential impacts of the perfection of conditional water rights on stream flows.

- ***Coordinating Entities*: Local jurisdictions, RWAPA**
- ***Key Participants*: CDWR, CDWCD, major water diverters**

Streams with significant direct flow or storage flow conditional water rights in the watershed (not associated with transmountain diversions) include: the Roaring Fork, Fryingpan, and Crystal Rivers, as well as Maroon, Sopris, Snowmass, Brush, Threemile, and Thompson creeks.

SW C2a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law. (S&P)

SW C3. *Summary of Action Required*: Investigate the potential impacts of climate change.

- ***Coordinating Entity*: AGCI**
- ***Key Participants*: Aspen SkiCo, BLM, CRWCD, CSU, CTU, CWCB, local jurisdictions, RFC, RMI, RWAPA, TNC, USFS**

SW C3a. Complete a comprehensive climate impacts assessment on stream flows for the Roaring Fork Watershed. (S)

SW D. Objective: Improve our community's understanding of the importance of maintaining adequate stream flows for the environment.

The *State of the Roaring Fork Watershed Report 2008* summarizes the primary issues related to depletions in water quantity, including the prospect of insufficient water for consumptive uses (including high quality drinking water), and alteration to the timing, frequency, duration, magnitude, and rate of change of flows, which can harm stream ecosystems, affect water-based recreation activities, and/or decrease the supply of water for hydropower generation. The major factors that lead to reduced water availability and flow alteration in the watershed are: (i) transmountain and in-basin diversions, (ii) downstream water calls, (iii) reservoir operations, (iv) changes in land use, and (v) anticipated reductions in streamflow and timing from climate change. Improved public education and outreach on these matters will allow our community to be better prepared to prevent or mitigate their impacts on stream flows.

SW D1. *Summary of Action Required*: Implement outreach and education programs that address the importance of streams flows, the causes of flow alterations, and encourage citizen/stakeholder involvement.

- ***Coordinating Entity*: local jurisdictions, RFC, RWAPA**
- ***Key Participants*: ACES, CDWR, CBRT, CFWE, CPW, CRWCD, CTU, CWCB, major water diverters, NWCCOG Q/Q, SI, USFWS, water conservancy districts, water and sanitation districts, WRI**

SW D1a. Support and distribute films, videos, PowerPoint presentations, etc. illustrating local water conditions and issues. (P)

SW D1b. Develop projects such as the RFC's River Center, with exhibits to enhance public awareness of the importance of maintaining adequate streams flows in the watershed and the consequences of drought. (P)

SW D1c. Support projects such as the Univ. of Michigan Master's Project, *Fostering Implementation of the Roaring Fork Watershed Plan*. Utilize the Univ. of Michigan Master's Project's recommendations for improving public education and outreach, as appropriate. (P)

SW D1d. Improve education/outreach on the connection between water availability and sustainability and land use planning and design strategies. (P)

SW D1e. Improve education/outreach and opportunities for involvement in mitigating the effects of drought. (P)

SW D1f. Improve education/outreach on the connection between high flows and healthy riparian and instream areas. (P)

SW D1g. Increase awareness of water conservation techniques and the importance of conservation. Identify and implement the most strategic water conservation measures. (S&P)

SW D1h. Improve education on the basis for obtaining and perfecting conditional water rights under Colorado water law. (P)

SAMPLE WATER CONSERVATION MEASURES:

- Lawn and garden watering restrictions,
- Fines and tiered rates for high water use,
- Metering of water usage,
- Distribution/transmission system leak detection,
- Water conservation cooperative agreements/operating agreements,
- Alternative irrigation practices,
- Xeric landscaping,
- Lining of ditches and canals,
- Conjunctive use of surface and groundwater, and
- Use of recycled water.

SW E. Objective: Reduce the negative impacts of drought and floods.

Water conservation and drought are topics of continuing interest, given the arid climate and landscapes of the Roaring Fork Watershed and the Upper Colorado River Basin. In 2004, the CWCB's Office of Water Conservation and Drought Planning produced a statewide *Drought and Water Supply Assessment* based on results of an opinion survey administered to water managers and planners. Major needs identified for future water supply planning and potential drought mitigation projects included:

- Funding to support water development and infrastructure projects (including capital, repair and maintenance).
- Development of new water supplies.
- Improvement of the ability to predict the weather (as it relates to predicting drought).
- Development of new infrastructure (including surface water and groundwater storage, transmission and distribution systems, large-scale multi-basin projects, and water reuse projects).
- Repair and rehabilitation of existing infrastructure (including lining ditches and canals, dredging and repairing existing reservoirs and dams, repairing existing diversion structures, and upgrading water transmission and distribution systems).
- Improvement of water conservation measures and programs, as well as measurement techniques.
- Additional public education and involvement programs.
- Provision of technical assistance in water supply, water conservation, and drought planning.

High flows are desirable to support numerous ecosystem services within river systems. A functioning flood plain attenuates flood flows and contributes to base flows. However, development in flood plains and controlled flows related to operation of dams and diversions, in combination with large storm events, can lead to flooding issues. Climate-driven changes to the hydrological system will likely increase the frequency, magnitude, and financial costs of extreme weather events. Snowmelt-driven basins like the Roaring Fork Watershed are at especially high risk. High flows associated with spring melt of the snowpack, particularly if it is above average, is tied to spring temperature fluctuations. A rapid spring warm-up and sustained high temperatures pose a serious risk of flooding. Other important considerations are dust and rain on snow events that may contribute to flooding by accelerating snowpack melting.

SW E1. *Summary of Action Required*: Plan for drought to reduce its impacts.

- ***Coordinating Entities*: CWCB, local jurisdictions**
- ***Key Participants*: CDWR, CPW, CRWCD, CWT, major water diverters, MSCD, RFC, RWAPA, TNC, USFS, water conservancy districts, and water and sanitation districts**

AREAS PRONE TO FLOODING INCLUDE:
- Pan-Fork Mobile Home Park,
- Roaring Fork Mobile Home Park,
- Redstone,
- Lazy Glen, and
- Lower Roaring Fork.

SW E1a. Utilize the CWCB's 2010 Drought Mitigation and Response Plan and Drought Planning Toolbox. (P)

SW E1b. Work with the CWCB's Office of Water Conservation and Drought Planning to obtain technical assistance and grants to help develop local drought mitigation plans. Evaluate opportunities to use groundwater to augment flows. (P)

The *Big Hole Drought Management Plan* provides an example of a drought management plan. The plan identifies reach-specific flow triggers and associated escalating actions ranging from raising awareness to fishing closure.

SW E1c. Create "shovel-ready" drought-mitigation projects that can be quickly implemented. (P)

SW E1d. Investigate the potential benefits and disadvantages of acquiring small storage water rights that can be delivered for municipal uses in times of need and used to mitigate low stream flows. Pursue a streamlined approval process for landowners, if warranted. (S&L)

SW E1e. Investigate opportunities to temporarily loan water to streams using C.R.S. § 37-83-105. Discuss triggering criteria, such as low snowpack levels on specific spring dates, and draft agreements with critical water rights holders, the CDWR Division Engineer, and CWCB that can be quickly implemented when needed. (S&P)

While **small storage ponds** may be useful for **drought mitigation** they could provide a breeding opportunity for whirling disease and a home for mosquitoes that carry West Nile Virus.

SW E1f. Identify flow and temperature triggers and draft emergency drought fishing regulations. (S&L)

SW E2. *Summary of Action Required*: Develop plans that address the public health and safety issues associated with high flows while recognizing and retaining their environmental benefits.

- **Coordinating Entities: Local jurisdictions**
- **Key Participants: AVLT, BLM, BOR, CDOT, CPW, CTU, CWCB, FERC, MSCD, Public Safety Council, RFAS, RFC, RWAPA, TNC, USFS**

SW E2a. Ensure that county and municipal emergency management plans minimize the potential for harmful flooding in developed floodplains. (S&P)

FEMA defines a **floodplain** as "any land area susceptible to being inundated by water from any source."

SW E2b. Where feasible, restore the natural function of floodplains. (S&P)

SW E2c. Ensure that the Federal Emergency Management Agency (FEMA) floodplain maps for the watershed used by local jurisdictions are up to date and available digitally for public access. (P)

SW E2d. Develop and enforce local regulations that minimize development in the flood plain. (L)

SW E2e. Identify and pursue opportunities to maintain decision makers' and the public's interest in flooding issues after flood events have passed, like creating "shovel-ready" flood mitigation projects that can be quickly implemented. (S&P)

Figure 7. Eroded riverbank and road damage caused by high water near Basalt, 1995.

III. Recommended Actions to Achieve Groundwater (GW) Management Goals and Objectives

***GW Goal*: To protect the availability and sustainability of our groundwater**

> *We forget that the water cycle and the life cycle are one.*
> — Jacques Cousteau, Oceanographer

Understanding the connection between surface water and groundwater is vitally important as our water resources continue to be developed. Withdrawing water from streams may affect groundwater and pumping water from groundwater may affect streams. The dynamic interaction between groundwater and surface water influences water supply, water quality, and aquatic ecosystems.

The *State of the Roaring Fork Watershed Report 2008* identified the lack of comprehensive groundwater information as an issue. Little specific reference was made to groundwater in the report because of the lack of information available about groundwater tables, aquifers and connections between groundwater and surface water in the Roaring Fork Watershed. Lack of groundwater information was called out as a data gap for each of the nine sub-watersheds.

GW A. Objective: Obtain, compile and utilize information on groundwater availability and sustainability in local land use and development decisions.

Generally, the process of modeling a groundwater system requires identifying and quantifying inputs and outputs from multiple variables, including geology, soils and geomorphology, climatic factors (*e.g.*, precipitation and snowmelt), stream functions (*e.g.*, water gains and losses), vegetation (*e.g.*, loss to evapotranspiration), topography (*e.g.*, slope steepness and aspect), and human activity (*e.g.*, wells and irrigation). Any modeling effort in the Roaring Fork Watershed can be a frustrating exercise. The Valley continues to experience periods of drought, water rights transfers, and land uses change, all of which affect groundwater resources.

Where groundwater information is available, such as the "high-level" GIS-based groundwater resources studies completed for Pitkin County by Hydrologic Systems Analysis, LLC, we know that the availability of some local groundwater supplies is inconsistent and that sustainable groundwater supplies are unavailable in many locations. In some areas of the watershed leakage from unlined ditches and ponds is likely recharging local groundwater systems and influencing groundwater flow direction. Similarly, irrigation return flows may be recharging the groundwater supply in certain locales. Taking irrigated land out of production could have an impact on local groundwater supplies. Even onsite wastewater treatment systems are recharging the groundwater systems in some portions of the watershed.

Groundwater availability and sustainability is not just an issue for rural areas in the Roaring Fork Watershed. Groundwater well pumping can deplete the amount of water available to replenish surface waterways used for cities' and towns' public water supplies. Much of the surface water in local rivers and streams was once groundwater, and what affects surface water will inevitably affect groundwater as well, and vice versa.

There is a need to better understand the groundwater systems on which so many people rely for their water supply in the Roaring Fork Watershed. The land use and development decisions made must use this information to protect the availability and sustainability of these supplies for the future.

GW A1. *Summary of Action Required*: Conduct hydrogeological assessments of all sub-watersheds lacking detailed hydrogeologic information.

- ***Coordinating Entities*: Local jurisdictions**
- ***Key Participants*: CDWR, CWCB, major water diverters, USGS, water conservancy districts, water and sanitation districts**

HIGH-LEVEL HYDROGEOLOGICAL ASSESSMENTS WHICH HAVE BEEN COMPLETED:

- The Upper & Middle Roaring Fork Valley,
- Central Roaring Fork Tributaries,
- The Capitol & Snowmass Creek watersheds,
- The East Sopris Creek watershed,
- The West Sopris Creek watershed,
- The Sopris Creek watershed below the confluence of East & West Sopris Creeks, and
- The Crystal River.

GW A1a. Identify all sub-watersheds lacking detailed hydrogeologic information and prioritize the sub-watersheds for study on the basis of threats posed to the groundwater supply. Conduct hydrogeological assessments of all sub-watersheds lacking detailed hydrogeologic information, working collaboratively across sub-watershed jurisdictional boundaries. (S&P)

The Colorado Division of Water Resources' ***WellView Web* search tool** provides access to detailed information about well applications and issued permits, including permitting details and location information.

GW A1b. Ensure that local governments obtain, utilize, and regularly update information from: (i) state well databases, and (ii) onsite wastewater treatment system permitting in their hydrogeological assessments. (P)

GW A1c. Delineate areas of interaction between groundwater and surface water, including quantification and assessment of interaction type. For aquifers that are currently used or have the potential to be used: (i) quantify the water budget, (ii) rate the importance of the aquifers, and (iii) prioritize the need for additional detailed studies that include assessments of water budgets, flows, and water table interactions. (S)

GW A2. *Summary of Action Required*: Ensure that local land use planning requires a sufficient technical and legal demonstration of the availability and sustainability of an adequate groundwater supply for any new land use or development.

- ***Coordinating Entities*: Local jurisdictions, CDWR**
- ***Key Participants*: Water conservancy districts, water and sanitation districts**

GW A2a. Adopt local regulations, policies, and procedures to ensure that there is a sufficient technical and legal demonstration of the availability and sustainability of an adequate water supply for any new land use or development reliant upon groundwater. (L)

GW B. Objective: Sustain and improve groundwater recharge in the watershed.

The adverse impacts of land development on groundwater recharge have long been recognized. Development activities that either cover permeable soils with impervious surfaces or reduce the soil's permeability as a result of disturbance and compaction will reduce the rate of groundwater recharge that occurred under pre-developed site conditions. Loss of groundwater recharge areas can adversely impact the groundwater supply as well as the health of streams and riparian areas. Groundwater

recharge is an important part of the hydrologic cycle and needs to be an element of a comprehensive Roaring Fork Watershed Plan.

GW B1. *Summary of Action Required*: Provide and improve opportunities for groundwater recharge through such methods as maintaining and restoring wetlands and, where possible, restoring overbanking flows.

- ***Coordinating Entities*: Local jurisdictions**
- ***Key Participants*: AVLT, BLM, CDWR, CFWE, CPW, CRWCD, CTU, RFAS, RFC, SI, USFS, water conservancy districts, and water and sanitation districts**

MAJOR WETLAND AREAS REQUIRING RESTORATION INCLUDE:

- The Northstar area on the Roaring Fork River east of Aspen,
- The Roaring Fork River near Emma,
- The Roaring Fork River between Carbondale and Basalt,
- The Roaring Fork River near Cattle Creek,
- The Placita area on the Crystal River south of Redstone,
- The Coal Creek confluence with the Crystal River, and
- The Thompson Creek confluence with the Crystal River.

GW B1a. Restore major wetlands areas in the watershed. (P)

GW B1b. Identify and protect major wetlands areas in the watershed (*e.g.*, the lower Woody Creek area). (P&L)

GW B1c. Institute programs to promote water reuse, particularly in areas that are using groundwater beyond its ability to recharge. (P)

GW B1d. Study and pursue opportunities, as appropriate to enhance natural recharge by slowing down sheet runoff and runoff in creeks and recharging potentially good aquifers such as terraces and fans. (S&P)

GW B1e. Quantify the effect of changes in land use and development (*e.g.*, increases in impervious surfaces, changes from agricultural to residential land uses) on groundwater recharge in both rural and urbanized areas of the watershed and disseminate the information to decision makers. (S)

GW B1f. Adopt local regulations, policies and procedures to ensure that the impacts on groundwater recharge are understood and taken into consideration by decision makers in the review and approval of land use applications (*e.g.*, encouraging dense, vertical development within urban growth boundaries to minimize sprawl). (L)

Utilize past modeling studies of groundwater and surface water interaction at Northstar (Kolm *et al.* 2000) and Warren Lakes (Kolm and Glover, 1999).

GW B1g. Develop and implement a prioritized well-monitoring program for local jurisdictions to allow them to determine trends in groundwater levels, in coordination with ongoing studies (*e.g.*, the Basalt Water Conservancy District study on Missouri Heights, monitoring being conducted in the Woody Creek area). (S&P)

GW B1h. Create and maintain an inventory of groundwater monitoring data and results. (P)

GW B1i. Conduct detailed monitoring of groundwater levels and fluctuations in important wetland and groundwater discharge zones, including collection of information on aquifer thickness and development of parameters and information for development of detailed water budgets and modeling. (S)

GW C. Objective: Improve our community's understanding and enforcement of federal, state, and local regulations designed to protect groundwater availability and sustainability.

The Colorado Division of Water Resources has published a ***Guide to Well Permits, Water Rights, and Water Administration***.

Groundwater wells provide the water supply for hundreds of parcels of land in the watershed. Many of these wells are for single residences and are "exempt" from the state's water rights priority system. These wells are generally limited to 15 gallons per minute and require non-evaporative onsite wastewater treatment systems, so that the bulk of the wastewater is returned to the land on which the water is used. Wells for other uses, such as large-scale irrigation and multi-home subdivisions, are "non-exempt" and administered within the priority system. Non-exempt wells require augmentation plans to prevent injury to senior water rights.

In the Roaring Fork Watershed there are hundreds of exempt and non-exempt wells and not all of these wells are compliant with the terms of their permits. Wells permitted for use by a single household may be drawing water to service multiple residences. Wells that have only been permitted for indoor, household use may be used to irrigate large outdoor landscaped areas. These non-permitted uses of water may be injuring the availability and sustainability of the groundwater supply for legally permitted uses, but may continue unabated for years. Many landowners are unaware of the terms and conditions of their well permit. With only two CDWR water commissioners assigned to the Roaring Fork Watershed, it is imperative that local jurisdictions start to play a more active role in monitoring compliance with well permit conditions.

GW C1. *Summary of Action Required*: Improve enforcement of exempt and non-exempt well permit conditions.

- ***Coordinating Entities*: Local jurisdictions, CDWR**
- ***Key Participants*: CRWCD, NWCCOG Q/Q, water and sanitation districts**

GW C1a. Adopt local regulations requiring confirmation of compliance with well permit conditions in connection with land use approvals and building permits. (L)

GW C1b. Adopt local policies and procedures for notifying CDWR of any noncompliance with well permit conditions observed in connection with land use approvals and building permits. (L)

GW C1c. Assess the need for additional resources in the administration of water rights. (S)

GW C1d. Create maps of the watershed showing the location of exempt and non-exempt wells. (P)

GW D. Objective: Improve our community's understanding of groundwater.

Groundwater plays an essential role in the hydrologic cycle. Groundwater provides much of the water that flows in streams, especially during periods of low precipitation and when cold temperatures prevent snow from melting. Along rivers and streams, groundwater flows into surface water in some areas, while in other areas, surface water flows into groundwater. Unfortunately, the watershed's residents and decision makers are largely unaware of the significant relationship between groundwater and surface water availability. Many also share a misconception that large aquifers underlie the Roaring Fork Valley and that our groundwater resources will always be available to support existing and future development. As a result, we have been slow to undertake and fund programs and initiatives to better understand and protect our groundwater resources.

Overuse of groundwater to meet the demands of development in the Roaring Fork Watershed can have far-reaching environmental and economic consequences that cross jurisdictional boundaries. It will take a coordinated, collaborative education/outreach campaign to raise awareness and heighten involvement in groundwater issues in the Roaring Fork Watershed. Multi-jurisdictional initiatives are necessary to reach all of our watershed's citizens and ensure groundwater availability and sustainability for the future.

GW D1. *Summary of Action Required*: Improve our community's understanding of the connection between land use and groundwater recharge.

- ***Coordinating Entities*: Local jurisdictions**
- ***Key Participants*: CDWR, CFWE, CRWCD, CTU, NWCCOG Q/Q, RFC, USGS**

GW D1a. Create and disseminate educational materials on the impact of land use on groundwater resources, including: (i) a graphic representation of groundwater recharge pathways and the influence of land use, (ii) why people should care about groundwater issues, and (iii) what people can do to protect groundwater resources. (P)

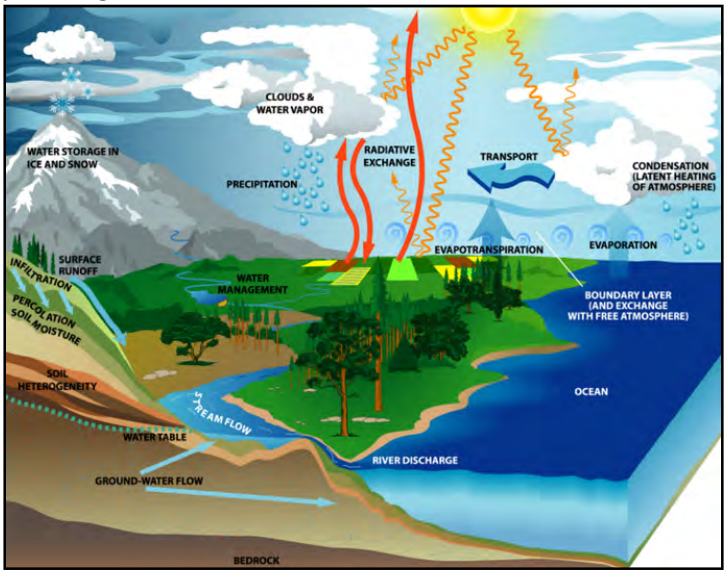


Figure 8. The hydrologic cycle showing groundwater recharge.

GW D1b. Create maps of groundwater availability in the watershed. (P)

GW D1c. Create and disseminate educational materials on the purpose of augmentation plans associated with new non-exempt wells and the potential for detrimental effects on local streams. (P)

Pitkin County has defined and mapped groundwater availability, sustainability, and vulnerability for non-federal lands. Van der Heijde and Kolm. (2011) *Development of County-wide Hydrogeological and Hydrological GIS Maps for Pitkin County, Colorado*.

GW D2. *Summary of Action Required*: Improve our community's understanding of hydrogeology and its relationship to the groundwater supply.

- ***Coordinating Entities*: Local jurisdictions**
- ***Key Participants*: CDWR, CFWE, CRWCD, RFC, water conservancy districts, water and sanitation districts**

GW D2a. Create summaries of all sub-watershed hydrogeological assessments targeted at the layperson, using a consistent format for all sub-watersheds. Make all summaries available online and publicize their availability. (P)

COMPLETED HYDROGEOLOGICAL ASSESSMENT SUMMARIES:

- Upper and Middle Roaring Fork Valley,
- Capitol and Snowmass Creek Areas, and
- Crystal River and West Sopris Creek Areas.

GW D2b. Create and periodically broadcast local cable television programs discussing the hydrogeological assessments and explaining their importance for understanding groundwater supplies in the Roaring Fork Watershed. (P)

GW D2c. Implement pricing mechanisms that better reflect the true value of a local groundwater supply and that encourage a decrease in usage (*e.g.*, increased fees associated with obtaining and maintaining well permits in "water-short" areas). (P&L)

GW D2d. Develop projects such as the RFC's River Center, with exhibits to enhance public understanding of hydrogeology in the watershed and its relationship to the groundwater supply. (P)

IV. Recommended Actions to Achieve Water Quality (WQ) Goals and Objectives

<u>WQ Goal</u>: To protect our groundwater, rivers and streams from degradation, and to restore water quality when and where necessary.

> *Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land.*
> — Luna Leopold, Hydrologist

Water quality is one of the most important elements in maintaining adequate water resources. If quality is compromised, water quantity, riparian habitat, recreation, wildlife, health and safety, and all other water-dependent ecosystems and activities are threatened. Maintenance of water quality has a spillover effect on other elements of the environment because it requires that streamside habitats, man-made environments and disruptions from development be managed responsibly.

Water quality in the Roaring Fork Watershed is generally good, but is subject to constant threat from both natural and man-made events - ranging from mud slides to mine drainage, to polluted runoff, to dysfunctional wastewater treatment systems. It is vital that activities and events that might impact water quality be managed in a way that preserves or enhances natural water quality and does not export water quality problems downstream. Consistent regulations, regular communication between jurisdictions, coordinated responses to events, and ongoing monitoring of water quality conditions will be vital to reaching water quality goals and objectives.

<u>WQ A. Objective: Obtain water quality data to adequately assess status and trends.</u>

Water quality data is currently collected in the watershed by the U. S. Geological Survey (USGS), the U. S. Forest Service (USFS), Roaring Fork Conservancy (RFC) (in collaboration with River Watch), municipal utilities, high school students, and many other entities and individuals. While a considerable amount of time and resources are being devoted to water quality monitoring in the Roaring Fork Watershed, collection techniques vary, and a "clearinghouse" that is consistently utilized for reporting and analyzing datasets has not been fully realized, although the USGS has developed the Roaring Fork Water Quality Data Repository.

The *<u>State of the Roaring Fork Watershed Report 2008</u>* compiled and summarized readily available water quality data. Unfortunately, surface water quality data was limited or entirely absent in certain areas. Water quality data for groundwater was consistently identified as a data gap. The reliability of some of the data was questionable, and the general lack of adequate time-series data prohibited the detection of trends.

Common indicators for gauging water quality include nitrogen, phosphorus, sediment, turbidity and dissolved/suspended solids, conductivity, dissolved oxygen, temperature, and pH. However, other parameters might need to be regularly measured in all or portions of the watershed to secure adequate baseline data and data necessary to assess current status and trends. For example:

- Endocrine disrupting compounds (EDCs) (*e. g.*, birth control pills, steroids, and pesticides) and other emerging contaminants deserve attention.
- In areas with near-term potential for oil and gas development (*e. g.*, the Thompson, Fourmile, and Coal Creek drainages), comprehensive baseline water quality testing is needed.

- The water quality impacts associated with magnesium chloride, a salt used for de-icing and dust suppression on roadways, and for weed prevention and control, should be assessed. Salts are highly soluble and easily wash off pavement into surface waters and leach into soil and groundwater.
- Regular monitoring going into and out of storm drain catchments, such as the City of Aspen's Jenny Adair Park artificial wetlands system, is needed to help determine their efficacy and identify problem areas for mitigation. Monitoring should include suspended solids, hydrocarbons, pesticides, fertilizers, and heavy metals – for example copper from brake-lining dust. A related issue is the fate of extracted sediments and vegetation from catchments like Jenny Adair -- where does it go and how secure is the extracted material deposits from possible stream or groundwater contamination?
- The presence of fecal coliforms (*e. g.*, *E. coli*), bacteria found in the digestive tract of warm-blooded animals, indicates that pollution from sewage may have occurred and that other harmful microorganisms may be present. *E. coli* testing should be routinely conducted in the watershed, given the proliferation of onsite wastewater treatment systems (OWTSs) (a/k/a septic systems).
- Benthic macroinvertebrate species (*i.e.,* aquatic insects, mollusks, and crustaceans) have a broad range of trophic levels and pollution tolerances, providing good information on both short-term and cumulative effects of environmental variations. A consistent, coordinated collection and interpretation effort for macroinvertebrates should be initiated.
- Groundwater quality issues caused by natural sources, such as radioactive water in granites and tertiary sandstones, hard water in Leadville limestone, and sulfides in tertiary intrusions and altered sedimentary rock, need to be understood.

It is critical that water quality monitoring programs include consistent and long-term flow data, since low flow is a major physical constraint affecting water quality in many areas of the watershed.

Currently only a snapshot of water quality exists in the watershed. Integrated and coordinated water quality monitoring needs to be established to generate complete datasets that can be used as a basis for watershed decisions. Communication and collaboration/coordination among regulatory agencies and others currently engaged in water quality monitoring must be improved to enhance data collection and sharing, data analysis and reporting, as well as funding opportunities.

***WQ A1. Summary of Action Required*: Develop and implement integrated and coordinated water quality monitoring programs for groundwater and surface waters.**

- ***Coordinating Entities*: local jurisdictions, RFC, USGS**
- ***Key Participants*: CPW, CDPHE, CRWCD, RWAPA, USFS, water and sanitation districts**

WQ A1a. Convene a Water Quality Working Group to identify monitoring objectives, parameters, and protocols. Charge the Working Group with the following tasks:

- Gather and collate baseline data to assess water quality status and trends;
- Provide recommendations for new, consolidated, or modified water quality data collection efforts, taking into account the need to coordinate with existing data collection efforts and databases;
- Identify and prioritize locations to be studied to fill data gaps; and
- Identify funding sources and recommend strategies for securing funding for water quality monitoring. (S&P)

WQ A1b. Develop and implement a consistent process for analyzing and reporting on water quality monitoring results; build on the RFC's 5-year Water Quality Reports. (S&P)

WQ A1c. Undertake targeted water quality monitoring studies to investigate water quality issues identified through routine water quality monitoring, and to capture the impacts or benefits of developments, projects, or other activities. (P)

WQ A1d. Promote/support a sampling program for groundwater aimed at testing the integrity and water quality impacts of individual onsite wastewater treatment systems. (P)

WQ A1e. Promote/support a sampling program for groundwater and surface waters aimed at testing the water quality impacts of snow dump facilities. (P)

WQ B. Objective: Meet state water quality standards in all of our rivers and streams.

Surface water quality classifications and standards applicable to the watershed are available on the CDPHE Water Quality Control Commission's website.

Meeting state water quality standards throughout the watershed is a long-term objective. The first step should be identification of naturally-occurring versus human-caused exceedances in water quality standards. Second, the contamination source(s) should be identified. Finally, mitigation measures to address the source(s) of contamination should be developed and implemented, where possible.

The water quality overview provided in the *State of the Roaring Fork Watershed Report 2008* identified a number of problematic stream reaches and attempted to highlight the most probable causes for observed exceedances. For example, elevated levels of selenium can cause reproductive failure and deformities in fish and aquatic birds. Selenium concentrations were observed to exceed the chronic water quality standard in numerous locations. However, the likely source of this contaminant is the Mancos shale which is prevalent throughout the watershed. Total recoverable iron exceedances, such as those observed in Coal Creek, are more likely to be attributable to mining activities. In such areas, better land reclamation and incorporating the natural filtration function of wetlands may improve water quality.

Salinity (a measure of the total amount of dissolved salts in water) has been a concern throughout Western Colorado for years. High salinity levels are often observed at the same locations as elevated levels of selenium, due to leaching from shale-derived soils. High salinity can significantly reduce crop production and damage water-exposed equipment. Glenwood Springs is currently investigating geothermal opportunities. This might provide a good opportunity for a demonstration project to address naturally-occurring salinity in the watershed (*e. g.*, desalination as heat is extracted). Regional funding is needed to further explore this opportunity.

Review and revision of water quality standards is an ongoing process. State and federal law require this review at least once every three years (the "triennial review process"). Our watershed needs to be fully engaged in this process.

WQ B1. *Summary of Action Required*: Take action to meet state water quality standards in all streams and rivers within the Roaring Fork Watershed.

- ***Coordinating Entities*: Local jurisdictions**
- ***Key Participants*: BLM, CDOT, CDPHE, CDRM&S, CWCB, major water diverters, MSCD, RFC, USFS, water and sanitation districts**

WQ B1a. Investigate and pursue opportunities for reducing water quality impacts from natural salinity (*e.g.*, selenium loading). (S&P)

WQ B1b. Identify human-based sediment sources; develop and implement strategies for reducing sediment from those sources. (S&P)

WQ B1c. Incorporate water quality goals into local land use plans and regulations. Treat the maintenance and improvement of water quality as a priority in Master Plans and development approvals. (L)

PROGRAMS/PRACTICES TO REDUCE SELENIUM LOADING INCLUDE:

- Lining irrigation ditches in areas where selenium rich soils (*e.g.*, Mancos shale) are prevalent;
- Discouraging the use of unlined ponds and/or water features in pervious selenium rich soils; and
- Encouraging native landscaping, limiting irrigated landscape areas, and requiring efficient irrigation systems on selenium rich lands.

WQ B2. *Summary of Action Required*: Work to assure that water quality standards are adequate to protect local waterways.

- ***Coordinating Entity*: CDPHE, NWCCOG Q/Q, USEPA**
- ***Key Participants*: CRWCD, CTU, CWQF, local jurisdictions, major water diverters, USFS, water conservancy districts, water and sanitation districts**

WQ B2a. Assess the adequacy of current water quality standards and recommend modifications. Specifically consider (i) the need for water quality standards for contaminants that are not currently monitored or controlled (*e.g.*, emerging contaminants), and (ii) the adequacy of proposed water quality standards to limit nutrients (total nitrogen and total phosphorus) in water bodies. (S)

WQ B2b. Consider the need/process for developing standards for private drinking water supplies. (S)

WQ B2c. Evaluate the implications of securing "outstanding waters" designations for local waterways. (S)

An **"outstanding waters" designation** may be applied by the state CDPHE's WQCD, to certain high quality surface waters that constitute outstanding natural resources. No degradation of such waters by regulated activities is permitted.

WQ C. Objective: Minimize nonpoint source pollution of surface waters and groundwater.

Nonpoint source pollution is the largest source of water quality problems in Colorado and the rest of the nation. The identification of nonpoint source pollutants, their sources and impacts, as well as implementation of best management practices (BMPs) to address identified sources of nonpoint source pollution should be a significant part of our watershed protection planning effort.

Sources of nonpoint source pollution in the watershed encompass both natural and anthropogenic sources. Examples include:

- Nutrient loading from fertilizers, failing or improperly maintained onsite wastewater treatment systems, sediment and eroded soils, and pet wastes;
- Soil erosion and sedimentation of surface waters due to runoff from construction sites, roadways, buildings, and other hard surfaces;
- Elevated levels of pathogens, like *E. coli,* from pet, livestock, wildlife, and human waste washed into surface waters from fields and parks, from holding tank waste (from a boat, RV, or mobile home) dumped into a storm drain or roadside swale, and from failing or improperly maintained onsite wastewater treatment systems;
- Debris and litter that has been dropped, washed, or dumped into gutters, roadside swales, and surface waters;
- Organic compounds (*e. g.* , PCBs) and heavy metals (*e. g.* , lead, mercury) introduced into surface waters or groundwater due to accidental spills, illicit discharges, improper disposal of gasoline, used motor oil, pesticides and herbicides, leaching from mine tailings, or washed into surface waters in agricultural, lawn, golf course, and road runoff;
- Pharmaceuticals and personal care products (PPCPs) and endocrine disrupting compounds (EDCs) entering the water from onsite wastewater treatment systems and runoff from confined animal feeding operations and other areas with animal waste; and
- High levels of salts from road de-icing operations or from water softener backwash discharge.

In the Roaring Fork Watershed, stormwater runoff and improperly functioning, privately-owned onsite wastewater treatment systems can have a profound and ongoing impact on water quality.

Onsite wastewater treatment systems (OWTSs) can fail for many reasons, including inappropriate design for the soil conditions or water table, faulty construction or installation, extended use beyond service life expectancy, and lack of proper maintenance or use. By carrying nutrients (phosphorus and nitrogen), bacteria, pharmaceutical agents, and other pollutants to surface waters and groundwater, with little or no treatment, onsite wastewater treatment systems can create public health risks (*e. g.* , bacterial contamination of drinking water supplies) and impair the aquatic environment (*e. g.* , reduction of dissolved oxygen from plant growth). The glacial and alluvial geomorphology which exists in much of our watershed increases the risk of contamination in areas with high concentrations of these systems due to the high permeability of the underlying geologic strata.

In undisturbed areas, stormwater is able to infiltrate through the soil, allowing most pollutants to be removed by filtration. When land is disturbed and the natural filtration functions are not replaced (with infiltration, detention, or restoration measures), nearby water resources can be harmed by increased flows and pollutant loading. Increased stormwater flows are problematic for a number of reasons. Soil, litter and other pollutants (*e. g.*, motor oil, de-icing chemicals and pet waste) are picked up by stormwater as it flows over impervious surfaces, such as roads and buildings, into surface waters. The impact from agricultural lands can be either positive or negative depending on the management practices used. Agricultural practices that minimize the amount of pollutants and promote infiltration can help filter non-point source pollutants from other sources, such as roads. High flows from stormwater runoff can also have enough energy to scour soils and destabilize stream banks, carrying sediments downstream and changing the natural contour of the stream. In addition to the deleterious effects of chemical pollutants, excessive deposits of fine sediment fill in spawning beds and impair macroinvertebrate communities, an important food source for fish.

Figure 9. Urban runoff is concentrated in storm drains.

The Roaring Fork Watershed is comprised of diverse communities and includes both rural areas and urban centers. A variety of structural and non-structural management practices need to be evaluated throughout the watershed, considering factors such as cost, drainage area served, available land, pollutant loading and removal efficiency, as well as a variety of site specific factors such as soil types, slopes, and depth to groundwater. Opportunities to improve the natural functions of wetland and riparian areas should be sought, and areas which are still fairly intact should be prioritized for preservation, given their critical importance for filtering pollutants and stabilizing stream banks.

WQ C1. *Summary of Action Required*: Institute and enforce best management practices necessary to minimize nonpoint source pollution.

- ***Coordinating Entities*: local jurisdictions, NWCCOG Q/Q**
- ***Key Participants*: BLM, CDOT, CDPHE, CDRM&S, COGCC, CWQF, DOLA, Industry Associations, IPF, major water diverters, MSCD, NNI, Public Safety Council, RFOV, SI, USACE, USEPA, USFS, water and sanitation districts, WRFC, WW**

WQ C1a. Provide incentives for the implementation of BMPs (*e.g.*, higher scoring on land use approvals) in connection with the control of nonpoint source pollution from development sites and activities. (L)

THE 3 GENERAL CATEGORIES OF BEST MANAGEMENT PRACTICES (BMPS):

- ***Structural BMPs*** – site-specific engineered and constructed systems that improve the quality and/or control the quantity of runoff (*e.g.*, detention ponds, constructed wetlands). *Example*: City of Aspen's Jenny Adair project.
- ***Vegetative BMPs*** – preservation of natural features and processes, such as existing vegetative buffers along water bodies and established ground cover, which reduce soil erosion and naturally filter pollutants carried in runoff. *Example*: wetlands at the Aspen Glen golf course, the use of swales instead of gutters.
- ***Managerial BMPs (Non-Structural)*** - institutional, educational, or regulatory nonpoint source pollution prevention practices designed to reduce stormwater runoff, or reduce the level of pollutants contained in the runoff. *Example*: proper application of limited amounts of fertilizers.

WQ C1b. Develop a training program to help communities assess the adequacy of local regulations and land use policies regarding water quality, and the impacts of development on water quality. (P)
hh

WQ C1c. Assess the impacts of agricultural and commercial (*i. e.*, golf courses) irrigation on water quality. Mandate/recommend mitigation strategies through local regulation, as warranted. (S&L)

WQ C1d. Ensure that local regulations addressing stormwater impact mitigation and BMPs for stormwater management are effective, stringent, and enforced. (L)

WQ C1e. Identify and prioritize stormwater mitigation improvement projects in each jurisdiction (including programs specifically designed to reduce the sediment impacts from hard surfaces, such as roadways) and plan for implementing such projects. (S&P)

Information on CDPHE's **Water Quality Control Division's Stormwater Program** (including permit requirements) is available on the agency's website.

WQ C1f. Support state funding to inspect sites and enforce relevant regulations where stormwater management plans are required under WQCD Stormwater Construction General Permits. (L)

WQ C1g. Assess current regulation of onsite wastewater treatment systems. Impose more stringent regulations, as warranted. Coordinate with the State of Colorado's plans to revise its regulatory framework. (S&L)

WQ C1h. Require training and licensing of onsite wastewater treatment system installers, cleaners/pumpers, and inspectors. (L)

Performance-based OWTS regulations would require that OWTSs meet specific performance standards, but would not prescribe the methods or site conditions for meeting those standards. The goal of a performance-based approach is to promote a desired level of wastewater treatment in a manner that protects both public health and water quality.

WQ C1i. Support development of state and local financing mechanisms to provide incentives/assistance to individuals and subdivisions to upgrade or consolidate onsite wastewater treatment systems. (L)

Inspection of an OWTS may reveal that pumping is unnecessary – eliminating the need for expensive sludge disposal.

WQ C1j. Maintain and publicize information on financial assistance available for upgrades to onsite wastewater treatment systems. (P)

WQ C1k. Investigate the feasibility of creating regional wastewater treatment facilities that would consolidate or incorporate existing scattered onsite wastewater treatment systems and package plants. Pursue opportunities, as appropriate. (S&P)

WQ C1l. Improve opportunities for the use of constructed wetlands as an element of onsite wastewater or stormwater treatment, including the development of performance-based state regulations addressing constructed wetlands for onsite wastewater treatment and mirroring those regulations at the local level. (L)

WQ C1m. Assess surface water and groundwater quality impacts associated with snow dump sites. Ensure that local regulations addressing the location and impacts of snow dumping and runoff from snow dumps are effective, stringent, and enforced. (S&L)

WQ C1n. Assess the impacts of magnesium chloride on water quality. Mandate/recommend alternatives/mitigation, as necessary, through local regulation. (S&L)

WQ C1o. Support the enforcement of federal and state regulations addressing oil and gas development. (L)

WQ C1p. Support disclosure of chemicals used in drilling and fracking and mandatory frack fluid tagging. Encourage owners and operators to use environmentally friendly alternatives. Support scientific studies of fracking impacts on the environment and public health. (S&L)

MAJOR MINING SITES REQUIRING SUSTAINED RECLAMATION INCLUDE:

- Coal Creek,
- Ruby Mine,
- Thompson Creek, and
- Smuggler Mountain.

WQ C1q. Ensure that local land use policies and regulations limiting and mitigating the impacts of mining and oil and gas development on water quality are stringent and enforced. (L)

WQ C1r. Address and regulate runoff from hazardous sites, including mines, landfills, junkyards, and similar locations. Address and regulate the disposal/use of materials from sites potentially contaminated by hazardous materials (*e. g.,* use of soil from abandoned mine sites as fill dirt in other locations). (L)

WQ C1s. Work with the State of Colorado to identify reclamation sites and work with responsible parties to assure that reclamation of mining sites is adequate and sustainable to mitigate impacts on water quality. Perform additional reclamation work as necessary. (P)

WQ C1t. Work with local emergency and public safety agencies to assure that they are adequately trained and equipped to respond to releases of hazardous materials and spills. (P)

KNOWN USFS DISPERSED RECREATION IMPACTED AREAS:

- Cunningham Creek,
- Lime Creek/Lime Park, and
- North Thompson Creek.

WQ C1u. Support enforcement of streamside camping restrictions and development/enforcement of other recreational use restrictions by the USFS necessary to protect waterways. Work with the USFS to remove/reclaim campsites near rivers and streams. (L&P)

USFS CAMPGROUNDS NEAR WATER BODIES:

- Chapman,
- Ruedi Reservoir Complex,
- Elk Wallow,
- Bogan Flats,
- Avalanche,
- Difficult,
- Lincoln,
- Silver Bar,
- Silver Bell, and
- Silver Queen.

WQ C1v. Inventory and protect areas around natural springs. (P)

WQ C1w. Support new and additional funding mechanisms for water technology research and development. (L)

WQ C2. *Summary of Action Required*: Institute and enforce best management practices necessary to protect our drinking water sources from nonpoint sources of pollutants.

- ***Coordinating Entities*: CDPHE, CRWA, local jurisdictions**
- ***Key Participants*: BLM, CDWR, CPW, MSCD, RFC, USFS, USGS, water and sanitation districts**

WQ C2a. Support the completion of the State Source Water Assessments for the watershed. (P)

WQ C2b. Develop Source Water Protection Plans for all of the major water supply systems in the watershed. (P)

WQ C2c. Implement a private wellhead protection program. (P)

CDPHE's Water Quality Control Division and the Colorado Rural Water Association have developed a **source water protection planning DVD/CD toolkit.** The toolkit is free and available from CDPHE.

WQ D. Objective: Improve our local ability to address point source water quality issues.

Colorado Discharge Permit System (CDPS) permits, issued as part of the U.S. EPA's National Pollution Discharge Elimination System (NPDES) program, regulate point source discharges of wastewater in the watershed.

WQ D1. *Summary of Action Required:* Institute actions necessary to improve our community's ability to address point source water quality issues.

- ***Coordinating Entities*: Water and sanitation districts**
- ***Key Participants*: CDPHE, Industry Associations, local jurisdictions, NNI, USEPA**

WQ D1a. Upgrade technology and treatment methods at local wastewater treatment facilities as funding and infrastructure allow. (P)

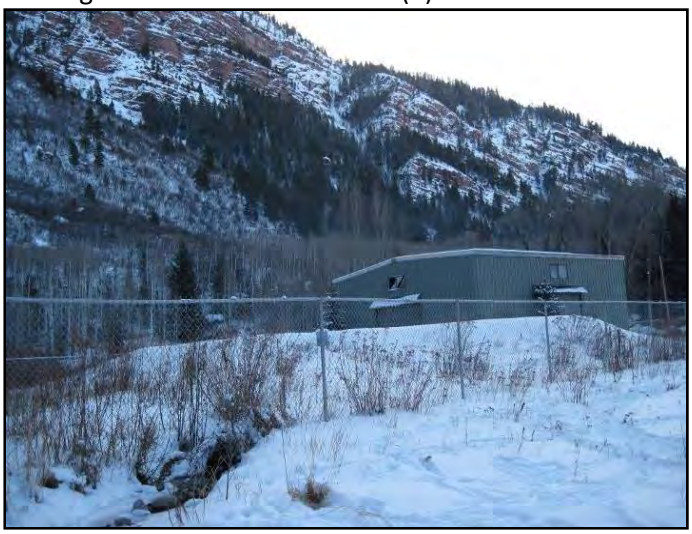


Figure 10. Redstone wastewater treatment plant, January 13, 2011. The Redstone treatment plant recently received a grant to assist with financing the upgrades necessary to remedy the treatment issues which have existed at the facility for several years.

WQ D1b. Investigate the potential for reusing waste products from landfills, wastewater treatment plants, and commercial activities (*e. g.,* the use of sludge as fertilizer) in order to reduce the need for increased treatment capacity at concentrated waste disposal sites. (S)

WQ D1c. Support new and additional funding mechanisms for water technology research and development. (L)

WQ E. Objective: Improve public awareness and support of water quality protection and improve public engagement in water quality protection activities.

The watershed's growing population is still largely unaware of the wide range of human behavior that affects water quality and the primary sources of pollution in the watershed. The significant relationship between water quantity and water quality is not commonly understood. Lack of public awareness of the water quality problems that already exist in the watershed and a failure to appreciate the magnitude of the additional threats leads to complacency and a lack of personal responsibility. This in turn translates into a lack of community-based action to protect and restore local surface water and groundwater resources. Absent public awareness and support, local decision makers are less likely to undertake or fund new programs and initiatives to either protect or restore water resources.

It is also important that the education/outreach campaigns conducted in the watershed strive for a unified and consistent message across jurisdictional boundaries. Water issues are complex enough without the additional task of sorting through multiple program initiatives independently instituted by local jurisdictions, nonprofits and other stakeholders throughout the Valley. A coordinated effort is required for efficiency and success.

WQ E1. *Summary of Action Required*: Undertake action to improve public support for water quality protection and improvement, as well as public engagement in water quality protection/improvement activities.

- ***Coordinating Entities*: CFWE, RFC**
- ***Key Participants*: ACES, CDPHE, Colo Prof in Onsite Wastewater, CPW, CRWCD, CTU, Industry Associations, local jurisdictions, NNI, NWCCOG Q/Q, RWAPA, USEPA, USFS, water and sanitation districts**

WQ E1a. Improve local understanding of the importance of water quality and the relationship between water quality and quantity. Install signs and notices in appropriate areas (*e. g.*, campgrounds, high-use recreation areas adjacent to rivers and streams) noting the importance of maintaining water quality. (P)

WQ E1b. Improve the public's understanding of the importance of water quality to public health and safety and to the local lifestyle, economy, and environment, and of the consequences of a degraded or contaminated water supply. (P)

WQ E1c. Educate the public about daily activities that impact water quality and how individuals can modify their behavior and reduce water quality impacts on the watershed. Include education about the hazards associated with emerging contaminants and implementation of programs to halt their improper disposal and foster alternative disposal methods. (P)

WQ E1d. Improve local decision makers' understanding of federal, state, and local regulations addressing water quality by creating an illustration of the hierarchy of water quality agencies and regulations in a manner aimed at a lay audience. (P)

CANDIDATES FOR EMERGING CONTAMINANT DISPOSAL PROGRAMS INCLUDE:

- Local hospitals,
- Local medical offices,
- Pharmacies, and
- Retail outlets.

WQ E1e. Educate the public about issues surrounding

the development of new water technologies, such as nanotechnology-based systems. (P)

WQ E1f. Improve public understanding of the risk of groundwater pollution by creating maps showing areas vulnerable (based on natural underlying geologic conditions) and susceptible (based on land use, concentrations of onsite wastewater treatment systems, agricultural practices, etc.) to groundwater contamination. (P)

WQ E1g. Implement a stream segment adoption program (*i. e.,* the "Adopt a Stream" program) to facilitate cleanup and monitoring activities. Incorporate the program in school curriculums where possible. Create and publicize a map of "Adopted Streams". (P)

WQ E1h. Improve public education regarding individual onsite wastewater treatment systems, particularly the need for regular system inspections – not just pumping. (P)

WQ E1i. Educate the public on the benefits of BMPs and encourage public implementation of structural, vegetative, and non-structural BMPs whenever possible. Create incentive programs for voluntary retrofits of residential sites (*e.g.*, removal of lawns and establishment of streamside buffers, removal of non-native plants and incorporation of native landscaping, installation of on-site water quality treatment areas). (P&L)

EDUCATE THE PUBLIC ABOUT OWTSs BY:

- Conducting seminars to teach local realtors, engineers, homeowners, HOAs, caucuses, and planners the basics of OWTS planning, design, construction, and maintenance,
- Incorporating educational opportunities into real estate closings,
- Providing information on OWTSs in property information, and
- Creating educational materials for local TV and other media outlets.

WQ F. Objective: Develop a strategic plan for dealing with potential future water quality threats.

The *State of the Roaring Fork Watershed Report 2008* highlighted some of the changes that can be expected to occur to the watershed's environmental resources as a result of population growth and new development (*e. g.*, as a result of a shift in water usage patterns, increases in impervious surfaces). These changes will impact water quality in ways that are already familiar today. However, there are other reasonably foreseeable events (including some potentially catastrophic events) that warrant attention as part of the watershed's longer-term planning process. For example:

- How will escalating oil and gas drilling affect the quality of our Valley's water supply?
- How will beetle kill impact the quantity and quality of runoff from our watershed?
- Where are the high fire danger areas and what would be the impact of a catastrophic fire on our water supplies?
- What are the water quality impacts associated with additional transmountain diversions, or changes in the timing of existing diversions?
- How will climate change impact our watershed?

Our planning process should always be looking 5 to 10 years ahead in order to ensure that the capability to develop strategic plans exists to address changing circumstances.

***WQ F1. Summary of Action Required*: Develop a strategic plan for dealing with potential future water quality threats.**

- ***Coordinating Entities*: local jurisdictions, NWCCOG Q/Q,**
- ***Key Participants*: AGCI, ACES, Aspen Skico, BLM, CBRT, CDPHE, CPW, CRWCD, CSU, CWCB, RFC, USEPA, USFS, water and sanitation districts, WRFC, WW**

WQ F1a. Quantify the needs of our watershed as they relate to water quality (*e. g.*, maintenance of adequate stream flows for dilution of contaminants). Support and participate in the Non-Consumptive Needs Assessment being carried out by the Colorado Basin Roundtable. (S)

WQ F1b. Ensure that local land use policies and regulations adequately address the water quality impacts of development, and that requisite mitigation measures imposed as conditions of land use approvals are both implemented and enforced (*e.g.*, construction and ongoing maintenance of stormwater retention ponds designed to capture pollutant loading associated with an increase in impervious surfaces). (L)

SIGNIFICANT PROPOSED DEVELOPMENTS THAT MAY IMPACT WATER QUALITY INCLUDE:

- Spring Valley Ranch,
- Snowmass Base Village,
- Cattle Creek, and
- Sunlight.

WQ F1c. Monitor and address the impacts of high-use, paved trails on water quality. (S&L)

High use paved trails which may be impacting water quality include the Crystal River Trail and the Rio Grande Trail.

WQ F1d. Ensure that activities aimed at mitigating or responding to pine beetle and other insect infestations and diseases do not generate detrimental water quality impacts. (S&L)

WQ F1e. Monitor and address the impacts of climate change on water quality (*e. g.*, higher water temperatures reducing dissolved oxygen levels, changes in the timing, intensity, and duration of precipitation producing more sedimentation from runoff, etc.). (S&P)

V. Recommended Actions to Achieve Riparian and Instream (RI) Goals and Objectives

> *"Rivers are places that renew our spirit, connect us with our past, and link us directly with the flow and rhythm of the natural world."*
> — Ted Turner, The Rivers of South Carolina

<u>RI Goal</u>: To protect and restore the functions of riparian and instream areas.

Riparian areas have the highest species richness of all major ecosystems in Colorado, but they cover only one to two percent of the land area. In addition to providing high quality wildlife habitat and supporting biological diversity, these ecosystems perform numerous other critical natural functions. Riparian areas remove nutrients and other constituents that can impair water quality, enhance the structural diversity of aquatic habitat, and support hydrologic processes. Riparian vegetation stabilizes stream channels and maintains sustainable instream flows by facilitating the infiltration of flooding flows. Riparian areas are critical to fisheries in that they provide shelter, shade, and food along streambanks. Finally, riparian areas provide aesthetically and naturally rich places for human use.

The Roaring Fork Watershed is dominated by montane headwater streams that provide high quality water for downstream habitats supporting a wide array of aquatic and terrestrial species. Streams serve as important conduits for natural materials - transporting water, nutrients, sediments, and other substances. They provide recreational opportunities, such as boating, fishing, and wildlife viewing, and support hydropower production and consumptive water uses like agricultural irrigation and the provision of municipal drinking water

Figure 11. A healthy riparian area, Cattle Creek (Photo credit: Dee Malone).

<u>RI A. Objective: Assess the condition of riparian and instream habitat for all major streams in the watershed.</u>

A monitoring program is needed to determine the status of riparian and instream areas (including associated wildlife populations), as well as trends impacting their overall condition. Ongoing monitoring would allow identification of areas where conditions are improving (including assessment of the effectiveness of protection and restoration activities), as well as areas where protection and restoration efforts should be focused.

RI A1. *Summary of Action Required*: Develop and implement a riparian and instream monitoring program.

- ***Coordinating Entities*: BLM, CPW, RFC, USFS**
- ***Key Participants*: CNHP, CTU, local jurisdictions, MSCD, NWCCOG Q/Q, RFAS, USEPA**

RI A1a. Convene a Riparian and Instream Areas Working Group to develop a riparian and instream monitoring program for the watershed. Charge the Working Group with the following tasks:

- Identify parameters (indicators), sampling locations, sampling protocols, and monitoring intervals to adequately assess riparian and instream area status and trends.

BLM's riparian monitoring protocol is called *Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation*.

  - Ensure compatibility with existing riparian and instream assessments (*e.g.,* the Stream Health Initiative's use of the U.S. Environmental Protection Agency's Rapid bioassessment protocol for use in wadeable streams and rivers and the Natural Resource Conservation Service's Riparian Assessment Method).
  - Include species distribution information and population status and trends for breeding, resident, and wintering birds; amphibians; and small, medium, and large mammals. Identify important migratory stopover sites. Develop a Bird Index of Biotic Integrity specifically tailored to the watershed.
  - Identify desirable fish (including non-game fish), fish habitat, and macroinvertebrates. Work with the Water Quality Working Group to ensure that adequate stream temperature and dissolved oxygen data are collected across the watershed to monitor impacts on aquatic wildlife from changes in land use, etc., and to help inform studies on the impact of climate change on aquatic organisms.
  - Include an assessment of upland habitat conditions (including soil disturbance/erosion, vegetative ground cover/deforestation, browse level), that influence stream health. (S &P)

- Collect and analyze riparian and instream data on stream reaches where assessments have not been completed. (P)
- Review and provide recommendations for the modification/consolidation of existing riparian and instream data collection programs. (S)
- Identify sources of ongoing funding for the riparian and instream monitoring program and make strategic recommendations for securing funding. (S&P)
- Develop a mechanism to analyze and report the results of the riparian and instream monitoring program and to address areas of concern. (P)
- Design a companion monitoring strategy for more intensive, site-specific assessments of riparian and instream management impacts, restoration efforts, and adaptive management actions. (P)

Riparian and Instream habitat assessments are needed in Hunter, Woody, Lincoln, Capitol, Sopris, Coal, Prince, Thompson, and Threemile Creeks, as well as the upper Fryingpan River watershed.

RI B. Objective: Enhance and preserve native riparian and instream flora and fauna including wild, naturally reproducing fish communities.

As discussed in the *State of the Roaring Fork Watershed Report 2008,* healthy riparian areas provide the diverse natural resources necessary to support a rich community of wildlife. The functions and values of riparian areas fall into five categories: protecting water quality, maintaining sustainable instream flows, maintaining the natural shape of the stream channel, maintaining biodiversity, and providing sustainable wildlife habitat.

Sustainable and functional riparian ecosystems require native vegetation with high quality, vigor, good cover, even distribution of all age-classes of woody plant species, and no noxious weeds. Where woody species are an important component of the historic plant community, an even distribution of all age-classes of woody plant species provides ecosystem resilience and is essential to site maintenance and recovery from disturbance.

Wildlife species can be used to indicate habitat condition and to monitor and assess the effects of land uses and management strategies. They respond to environmental characteristics, selecting preferred habitat based on the presence and quality of those characteristics. Mammal species whose presence indicates good quality riparian habitat include mink, western jumping mouse, and water shrew. In the Roaring Fork Watershed the presence of disturbance-intolerant, riparian-dependent songbirds such as Lincoln's Sparrow, Wilson's Warbler, Willow Flycatcher, MacGillivray's Warbler, Red-Naped Sapsucker, Swainson's Thrush, and Lewis's Woodpecker are good indicators of intact riparian habitat. The American Dipper is a good indicator of the quality of stream habitat.

Today, the decline of native Colorado River cutthroat trout (CRCT) and boreal toad populations are of particular concern in the watershed. In addition to the economic benefit derived from the Roaring Fork Watershed's thriving trout populations in its Gold Medal streams, trout are an important aquatic species in mountain stream ecosystems and an important indicator species whose decline signals environmental imbalance or disturbance. CRCT historically occupied 34,500 km of Colorado's streams. Today, unhybridized populations of CRCT, or those of particular ecological significance, occupy less than 10 percent of their historical range. As discussed in the *State of the Roaring Fork Watershed Report 2008,* hybridization with rainbow trout, competition with non-native trout, and whirling disease have all impacted CRCT populations. Additionally, trout are dependent on clear and cold water, both of which are at risk from global warming. The cumulative effects of alterations to streams' thermal regimes and flow patterns will likely affect trout spawning in the future. The USFS has designated the CRCT a sensitive species, the BLM has provided the CRCT with a similar status and in the State of Colorado they have been designated a Species of Special Concern by Colorado Parks and Wildlife.

Since 1970, there has been a dramatic decline in boreal toad and other amphibian populations. Reasons for the decline have not been definitively identified, but may include the presence of toxins or a habitat disturbance that suppresses the immune system, making the toad more susceptible to a fungus - *Chytridiomycosis* (which also kills chorus frogs). Already, one breeding population of boreal toads in the Roaring Fork Watershed is believed to have been extirpated by *Chytridiomycosis* and the fungus has been documented in another population. The boreal toad is listed by the State of Colorado as an endangered species.

RI B1. *Summary of Action Required*: Maintain/increase the extent and continuity of native riparian plant communities so that riparian and aquatic systems are functionally connected.

- ***Coordinating Entities*: Local jurisdictions**

- ***Key Participants*: AVLT, BLM, CNHP, CPW, CWT, CTU, MSCD, NRCS, NWCCOG Q/Q, RFAS, RFC, RMI, TNC, USACE, USEPA, USFS, USFWS, USGS, WW**

RI B1a. Working with landowners, resource experts, and other interested parties, plan and implement riparian and instream protection and restoration projects, including:

- Working with landowners on conservation easements or acquisitions;
- Identifying and revitalizing historic wetlands and reconnecting stream channels to the historic floodplain;
- Working with the USFS and BLM to protect or restore high quality and priority riparian areas;
- Introducing beavers to create dams and wetland areas in appropriate stream reaches; and
- Working on ways to manage the timing of available streamflows (high and low), their duration, rise and fall rate, and inter-annual variation to maintain or restore riparian and instream health.

Example locations where significant ecological benefit may be derived from changes in land management or a project include large alluvial areas such as Northstar area on the Roaring Fork River, Cattle Creek confluence with the Roaring Fork River, the Roaring Fork River near Emma, the USFS Tree Farm, Thompson Creek confluence with the Crystal River, Coal Creek confluence with the Crystal River, and the Crystal River at Placita.

Pursue opportunities for riparian and instream protection and restoration where:

- Small changes in land management or small projects will yield significant riparian and instream improvements;
- Significant ecological benefit will be derived from changes in land management or a project;
- Program support exists and access to the riparian and instream area is relatively uncomplicated;
- Partnerships can be developed (*e.g.*, using the Wyden Amendment for USFS involvement); and
- An in-lieu-fee program can be developed with a regulatory agency (S&P).

Under an **in-lieu-fee agreement**, the mitigation sponsor collects funds from an individual or a number of individuals who are required to conduct compensatory mitigation required under the federal USACE Section 404 program, or another state or local wetland regulatory program. The sponsor may use the funds pooled from multiple permittees to create one or more sites under the authority of the agreement to satisfy the permittees' required mitigation.

RI B1b. On an ongoing basis, reassess the Colorado Natural Heritage Program's Potential Conservation Areas for changes in resource conditions or management needs. (S)

RI B1c. Assess greenbelts/greenways as effective tools for protecting riparian areas in the watershed and pursue, as appropriate. (S&P)

A **green belt** is an invisible line encircling a certain area, preventing development of the area and allowing wildlife to return and be established.

RI B1d. Research wetland mitigation banks and work to expand such a program, if warranted. (S&P)

A **mitigation bank** is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 or a similar state or local wetland regulation. Rocky Mountain Institute has a **wetlands mitigation bank** in Snowmass with a service area covering the Roaring Fork drainage.

RI B1e. Investigate regional planning mechanisms available for protection of riparian areas (*e.g.,* a special district crossing local governments'

jurisdictional boundaries) and funding available to support such a regional effort. Pursue suitable opportunities, if warranted. (S,P&L)

RI B1f. Support state and federal tax credits for donations of conservation easements. Investigate additional tax incentives for such donations; work with interested parties on adoption of new incentives. (S,P&L)

RI B2. *Summary of Action Required*: Maintain or increase the population size and distribution of all riparian-dependent wildlife species, particularly indicator species.

- ***Coordinating Entity*: BLM, local jurisdictions, USFS,**
- ***Key Participants*: AGCI, CPW, CNHP, CSU, CTU, CU, MSCD, NWCCOG Q/Q, RFAS, RFC, TNC**

RI B2a. Using the results of the watershed-specific Bird Index of Biotic Integrity, implement habitat improvement projects. (P)

RI B2b. Determine the potential impact of climate change on riparian-dependent wildlife. (S)

RI B2c. Proactively develop the NEPA documentation necessary to relocate beavers to federal lands. Implement projects that promote beaver activity. (P)

RI B2d. In conjunction with local land use approvals, require the design and execution of site-specific adaptive management plans to evaluate and minimize the impacts of development on riparian areas. (L)

RI B2e. Inventory and maintain or increase the population size and range of plant species and communities of concern, as appropriate. (S&P)

Figure 12. Ute Ladies' Tresses August 25, 2010. This species is listed as *Threatened* by the US Fish and Wildlife Service

PLANT SPECIES AND COMMUNITIES OF CONCERN INCLUDE:

- All federally and state listed threatened and endangered species;
- USFS and BLM sensitive species;
- State species of special concern; and
- Colorado Natural Heritage Program's globally and state 1-3 (1: critically imperiled, 2: imperiled, and 3: vulnerable) ranked species and communities. (*See* Appendix 1 for list).

RI B3. *Summary of Action Required*: Maintain or increase the population size, range, and purity of all existing Colorado River cutthroat trout populations.

- ***Coordinating Entity*: BLM, CPW, USFS**
- ***Key Participants*: AGCI, CSU, CTU, CU, USEPA, USFWS, USGS**

RI B3a. Determine the optimum number and distribution of CRCT populations and implement projects that work toward achieving this goal, including projects that:

- Reduce whirling disease transmission to CRCT populations;
- Protect CRCT spawning areas;
- Create barriers for non-native fish;
- Improve CRCT passage by replacing culverts;
- Reduce land use impacts (*e.g.*, sedimentation, chemicals in stormwater runoff from roads, grazing, oil and gas development activities, low flows, and stream channelization) affecting CRCT populations;
- Encourage the propagation of recreational CRCT populations, increasing public awareness of our native trout ; and
- Reflect the 2006 *Conservation Strategy for Colorado River Cutthroat Trout*, the revised 2011 strategy, and any subsequent agreements. (P,S &L)

RI B3b. Conduct fish surveys above natural and man-made barriers to determine if there are additional populations of CRCT in the watershed. Increase/institute monitoring of all identified CRCT populations. (S&P)

RI B3c. Study the potential effects of climate change on CRCT populations (*e.g.*, Dr. Kurt Fausch's research, CSU). (S)

RI B4. *Summary of Action Required*: Assess the current condition of wild, naturally-reproducing fish communities; undertake actions to improve existing communities, and monitor their effectiveness.

- ***Coordinating Entity*: CPW**
- ***Key Participants*: AGCI, BLM, CDOT, CDPHE, CSU, CTU, CU, local jurisdictions, RFC, USFS, USFWS, Whirling Disease Foundation**

RI B4a. Monitor wild, naturally-reproducing fish populations (including non-game fish) and conduct spawning surveys. (S&P)

RI B4b. Identify, protect, and restore important trout spawning habitat. In areas of high spawning importance, evaluate seasonal closures and, if warranted, implement closures. (S&P)

RI B4c. Follow the *Range-wide Conservation Agreement and Strategy for Bluehead Sucker and Flannelmouth Sucker*. (S&P)

RI B4d. Determine the effect of stream temperature on wild, naturally-reproducing fish species distribution and initiate actions to ensure that threshold temperatures are not exceeded. (S&P)

RI B4e. Inventory road/stream crossings and improve fish passage, as needed. (P)

Opportunities to improve fish passage exist in the Fryingpan River and Crystal River, and the Cattle Creek and East and West Sopris Creek watersheds.

Figure 13. Before photo –These culverts were complete barriers to fish due to high velocity, no natural substrate, and location above the stream channel creating a jump barrier. After photo – This elliptical pipe dissipates stream velocity reducing the velocity barrier; pipe is embedded into the stream bottom at same grade as stream; and the bottom of the pipe is covered with gravels and cobbles creating a more natural substrate (Photo credit: Mark Weinhold, USFS).

RI B4f. Improve education regarding methods to reduce whirling disease transmission, including installing education stations in areas of high fishing use. (P)

RI B4g. Address the problem of illegal introduction of fish in the watershed (increasing disease potential, causing increased predation, and posing hybridization issues), through education and regulatory initiatives. (P&L)

RI B5. *Summary of Action Required*: Assess key amphibian populations (boreal toads, chorus frogs, tiger salamanders, and Northern leopard frogs); undertake actions to restore or increase key amphibian populations and assess their effectiveness.

- ***Coordinating Entity*: BLM, CPW, USFS**
- ***Key Participants*: AGCI, CNHP, CSU, CU, USFWS, USGS**

RI B5a. Monitor key amphibian populations to determine their status. (S)

RI B5b. Restore important amphibian habitats and, if appropriate, pursue opportunities for the reintroduction of species. (P)

RI B5c. Study the potential impact of climate change on amphibian populations. (S)

RI B5d. Survey potential boreal toad habitats to determine if additional populations exist in the watershed. (S)

RI B5e. Increase awareness of the dangers to toad populations associated with *Chytridiomycosis* fungus transmission and provide education about proper equipment/gear disinfection. (P)

RI B5f. Follow the ***Conservation Plan and Agreement for the Management and Recovery of the Southern Rocky Mountain Population of the Boreal Toad***. (P&L)

RI C. Objective: Minimize the impact of development and other activities in riparian and instream areas.

As discussed in the *State of the Roaring Fork Watershed Report 2008*, development, including roads, recreational trails and campsites, agriculture and mining can have severe and enduring impacts on riparian and instream areas. The impacts from some of these activities, such as agriculture, are often easier and less expensive to reverse - with dedicated funding sources available for protection and restoration activities. The juxtaposition of high-quality riparian areas with the open space provided by agricultural lands is valuable for many wildlife species and the large acreages often provide opportunities for protection or restoration of contiguous riparian areas. For these reasons, our agricultural lands provide excellent opportunities for protecting and restoring riparian areas.

Beaver populations in the watershed are much diminished from historic levels due to loss of riparian habitat and trapping. Reductions in beaver populations results in a loss of the benefits to riparian and instream habitat that result from beaver activity. Beavers modify stream channels, thereby slowing flooding flows and increasing out-of-bank flows, water storage, and groundwater recharge. Beaver activity results in the entrapment of sediment and nutrients - improving water quality and nutrient cycling. By enhancing the environmental conditions necessary for the establishment and maintenance of riparian vegetation, beavers create the habitat necessary for numerous aquatic and semi-aquatic species to thrive. Beavers can cause impacts to necessary infrastructure due to flooding and vegetation removal. Critical infrastructure can be protected from beaver damage by careful location of roads and trails and through a variety of structural techniques.

Figure 14. Left photo, Castor Master - A PVC pipe is inserted through a beaver dam extending both upstream and downstream. The upstream end of the pipe in the pond has a grate or the pipe is perforated. The beaver pond will be lowered to the level of the grate or the perforated pipe. Right photo, Beaver Deceiver- A perforated pipe is placed on the upstream side of a culvert and extends into the pond. A fence is constructed at the culvert inlet which the beavers plug, but they cannot plug the perforated pipe that runs into the culvert and extends into the upstream side of the pool (Photo credit: Skip Lisle).

RI C1. *Summary of Action Required*: Address the impacts of development and other activities on riparian and instream areas.

- ***Coordinating Entities*: BLM, local jurisdictions, USFS**
- ***Key Participants*: ACES, ACOE, CDOT, CDWR, CPW, CDRM&S, CNHP, COGCC, CSU, CTU, Ditch Companies, MSCD, NWCCOG Q/Q, RFAS, RFC, RWAPA, TDC, TNC, USACE**

RI C1a. Evaluate and address the impacts of riparian alteration/disturbance on native riparian-dependent wildlife and plant species and communities of concern (*see* Appendix 1 for list) and native wildlife species. (S&P)

RI C1b. Investigate the effects of acute and chronic sediment pulses on aquatic ecosystems, differentiating between natural and human-influenced sources of sediment. (S)

RI C1c. Develop and implement Best Management Practices (BMPs) for instream projects that minimize sedimentation and turbidity to reduce impacts to spawning fish movement, incubating eggs and fry, and spawning habitat. (P)

RI C1d. Implement the Travel Management Plan for the White River National Forest, including closing, obliterating, and signing select roads. (P)

RI C1e. Develop and enforce stream setbacks that protect riparian areas throughout the watershed. (L)

Coal, Thompson, and Brush Creeks, as well as the Lower Fryingpan and Crystal Rivers all **have significant sediment issues**.

Castle Creek, Lime Creek/Lime Park, the North Fork of the Crystal River, Middle Thompson Creek, and Coal Creek all **have significant sediment issues resulting from roads**.

RI C1f. Inventory developed and dispersed recreation sites, trails, and access points and assess their impacts on riparian and instream areas; work to reduce impacts through relocation, removal, or mitigation. Minimize the impact of new recreational sites, access points, and trails on riparian and instream areas. (S&P)

RI C1g. Prevent or mitigate riparian and instream impacts associated with agricultural activities. For example, work with willing landowners on riparian planting projects, managing cattle, and, where appropriate, fencing riparian areas and providing stock water. (P)

Good opportunities to explore mitigation of grazing impacts exist on the Roaring Fork and Crystal Rivers, and on Sopris, Lower North Thompson, Middle Thompson, Coal, and Cattle Creeks.

Figure 15. Fencing to exclude cattle on Middle Thompson Creek, September, 2010 (Photo credit: Mark Lacy, USFS). For more information on fencing see the CPW's brochure, *Fencing with Wildlife in Mind*.

RI C1h. Minimize instream impacts and improve fish habitat by reengineering instream structures intended to move water into head gates. (P)

RI C1i. Restore riparian and instream areas impacted by historical mining activities. (P)

RI C1j. Ensure that future oil and gas development does not adversely impact riparian and instream areas. (L)

RI C1k. Work to minimize/mitigate the effects of bridges on riparian and instream habitat. (P)

RI D. Objective: Improve understanding of the importance of riparian and instream areas.

RI D1. *Summary of Action Required*: Increase education/outreach programs on the importance of riparian and instream areas.

- ***Coordinating Entity*: RFC**
- ***Key Participants*: ACES, AVLT, BLM, CNHP, CPW, CRWCD, CSU, CTU, local jurisdictions, MSCD, NWCCOG Q/Q, RFAS, RFOV, RWAPA, USFS**

RI D1a. Provide education to the public (particularly streamside landowners, local decision makers, realtors, and developers) about the important functions of riparian areas, development and other threats to riparian areas, what can be done to protect and restore riparian areas, and potential sources of funding for riparian projects. Incorporate site-specific information from the Stream Health Initiative's riparian and instream assessments in educational initiatives. Educational opportunities include:

- Institution of a volunteer program partnering streamside property owners and birders to identify bird species occurring on properties;
- Site visits with streamside property owners to discuss current conditions and ideas for improvements;
- A brochure for new streamside property owners, providing guidance on the "dos" and "don'ts" of living near rivers, costs of mitigation, and ideas for landscaping;
- Increasing realtor involvement (*e.g.*, a "Realtors for Rivers" organization);
- Increasing opportunities for watershed explorations and programs; and
- Education materials, such as newspaper inserts illustrating the impact of invasive species in riparian and instream areas. (P)

EDUCATION MESSAGES SHOULD INCLUDE:

- The important functions of riparian areas,
- Impacts of development and other threats to riparian areas,
- What can be done to protect and restore riparian areas,
- Local regulations protecting riparian areas,
- Fines and cost associated with required riparian mitigation, and
- Potential sources of funding for riparian projects.

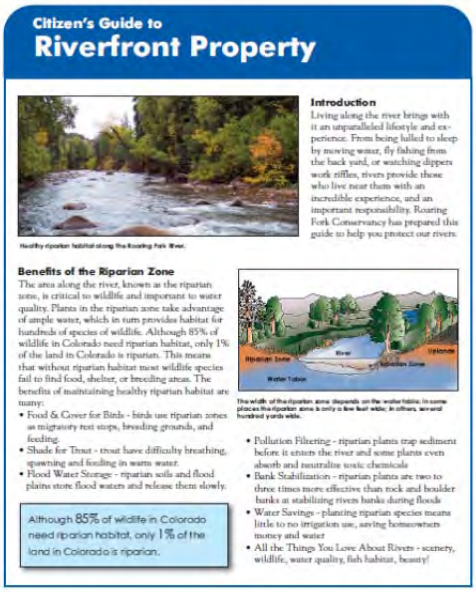


Figure 16. Roaring Fork Conservancy's *Citizen's Guide to Riverfront Property* provides information on the benefits of riparian areas and what people can do to protect these areas.

RI D1b. Develop the RFC's River Center, with its exhibits on the importance of riparian and instream areas to the watershed. (P)

RI D1c. Provide publicity, tours, and interpretation of riparian and instream restoration projects. (P)

RI D1d. Involve the public in restoration projects (*e.g.*, weed pulls, plantings). (P)

RI E. Objective: Eradicate/control invasive species in riparian and instream areas.

> **Noxious weeds** are non-native invasive plants that displace desirable vegetation and degrade natural and agricultural lands. They threaten our drinking water supply, agricultural crops, pasture lands, and native habitats.
> State of Colorado Noxious Weed List.

Noxious weeds, zebra and quagga mussels, New Zealand mud snails, and other invasive species threaten the health of riparian and instream areas, and climate change threatens to increase the likelihood of invasions. Some invasive species, like New Zealand mud snails, are almost impossible to contain once they have entered an area. Even native species can take on "invasive" aspects and become problematic. For example, the *Didymosphenia geminata* (*Didymo*) algae forms extensive masses that can cover almost all of the organisms that live on or in the bottom of a stream, preventing the growth of other algae that are an important food for aquatic invertebrates. Some species also have the potential to do substantial economic damage when they appear (*e.g.*, zebra and quagga mussels can fasten themselves to almost any surface - coating and damaging docks, boats and structures).

RI E1. *Summary of Action Required*: Create an invasive species task force for the watershed to coordinate efforts to control riparian weeds, reestablish native species, and provide education about invasive species.

- ***Coordinating Entities*: BLM, local jurisdictions, MSCD, USFS**
- ***Key Participants*: Ditch companies, NWCCOG Q/Q, RFOV, WRFC**

Figure 17. Canada thistle.

EXAMPLE INVASIVE PLANT SPECIES OF CONCERN IN RIPARIAN AREAS
(*See* Appendix 2 for list):

- *Listed Noxious Weeds:*
  Canada, Russian, and Plumeless thistle; tamarisk; leafy spurge; oxeye daisy; purple loosestrife; common mullein; scentless chamomile; and butter and eggs.
- *Other Problem Weeds:*
  Reed canary grass and pasture grasses.

RI E1a. Convene an Invasive Species Task Force to:

- Identify the invasive species of greatest concern in riparian areas in the Roaring Fork Watershed, including vegetation not designated as "noxious" that is a problem in riparian zones because it prohibits cottonwood and willow seedlings from becoming established on bare soils;
- Identify and prioritize locations to address invasive species in the watershed;
- Identify and disseminate information on the least harmful method(s) of eradication/control;
- Develop a plan to eradicate/control invasive species in the Roaring Fork Watershed (including an education component and the organization of community events to remove invasive species); and
- Study the potential impact of climate change on invasive species. (P&S)

RI E1b. Work with local jurisdictions' weed boards (or other appropriate contact(s)), the USFS, BLM, MSCD, and private land owners to eradicate/control invasive plant species that are a significant concern, particularly adjacent to riparian areas and along roads. Eradicate tamarisk in the watershed and ensure that any new infestations are removed (*e.g.*, Threemile Creek). Where possible, revive more natural flow regimes (small and large floods) to help control weeds. (P)

RI E2. *Summary of Action Required*: Prevent Aquatic Nuisance Species (ANS), such as the New Zealand mud snail, *Didymo* algae, quagga and zebra mussels, and rusty crayfish, from establishing in the watershed.

- ***Coordinating Entities*: CPW, RWAPA, USFS**
- ***Key Participants*: BLM, BOR, CSU, CTU, local jurisdictions, RFC, USEPA, USGS**

RI E2a. Research and survey the *Didymo* algae to determine the cause of its rapid spread, the ecological implications, and possible methods of control. (S)

RI E2b. Improve our understanding of the economic and ecological consequences of ANS invasion and the methods for preventing the spread of such species. Provide education on the spread of ANS. (S&P)

RI E2c. Implement invasive species inspection/monitoring programs. Require proper cleaning and disinfection of boats and construction equipment used in watercourses. (P&L)

RI E2d. Institute new regulations, as necessary, to address the movement of aquatic species within and between drainages to prevent the movement of ANS. (S&L)

Figure 18. Boat inspection for invasive species at Ruedi Reservoir.

EXAMPLES OF INSPECTION/ MONITORING PROGRAMS INCLUDE:

- Funding/staffing boat cleaning for non-native mussels, and
- Participating in the USGS's efforts to create a *Didymo* algae monitoring program.

4. Key

Project Type

S Study
P Project or program
L Legislative or regulatory

Key Participants and Coordinating Entities (Listed alphabetically under summary statements)

Local

Conservancy Districts	Basalt Water, West Divide
Fire protection districts	Aspen - Pitkin County, Aspen Park - Elk Creek Fire Department, Basalt Fire & Rescue, Carbondale & Rural Fire Protection District, Glenwood Springs Fire Department, and Snowmass Wildcat Fire Protection District
Local jurisdictions	Counties (Eagle, Garfield, Gunnison, and Pitkin) and Municipalities (Aspen, Basalt, Carbondale, Glenwood Springs, and Snowmass Village)
River Board	Pitkin County River Board
Local utilities	
Major water diverters	Large inbasin and transmountain diverters
MSCD	Mount Sopris Conservation District
Public Safety Council	
RWAPA	Ruedi Water and Power Authority
Water and Sanitation Districts	

Regional

CBRT	Colorado Basin Roundtable
CFWE	Colorado Foundation for Water Education
CRWCD	Colorado River Water Conservation District
NWCCOG Q/Q	Northwest Colorado Council of Governments Quality/Quantity

State

CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and the Environment
CDRM&S	Colorado Division of Reclamation, Mining, and Safety
CDWR	Colorado Division of Water Resources
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Park & Wildlife
CRWA	Colorado Rural Water Association
CSU	Colorado State University
CNHP	Colorado Natural Heritage Program
CU	University of Colorado
CWCB	Colorado Water Conservation Board
CWQF	Colorado Water Quality Forum
DOLA	Colorado Department of Local Affairs

Federal

BLM	Bureau of Land Management
BOR	Bureau of Reclamation
DOI	US Department of Interior
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
NNI	National Nanotechnology Initiative
NRCS	National Resource Conservation Service
USACE	Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service - White River National Forest
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Nonprofits

ACES	Aspen Center for Environmental Studies/ For the Forest
AGCI	Aspen Global Change Institute
AVLT	Aspen Valley Land Trust
CRWA	Colorado Rural Water Association
CTU	Colorado Trout Unlimited
CVEPA	Crystal Valley Environmental Protection Association
CWT	Colorado Water Trust
IPF	Independence Pass Foundation
RFAS	Roaring Fork Audubon Society
RFC	Roaring Fork Conservancy
RFOV	Roaring Fork Outdoor Volunteers
RMI	Rocky Mountain Institute
SHI	Stream Health Initiative
SI	Sonoran Institute
TDC	Thompson Divide Coalition
TNC	The Nature Conservancy
WRFC	White River Forest Conservancy
WRI	Western Rivers Institute
WW	Wilderness Workshop

Other

Aspen SkiCo	Aspen Skiing Company
CPOW	Colorado Professionals in Onsite Wastewater
Industry Associations	
Local Schools	
Major Water Diversions	
Transmountain Diversions	Independence Pass Transmountain Diversion System, Fryingpan-Arkansas Project and Busk-Ivanhoe System

5. Matrices

The following matrices provide a direct entry point to the Plan's recommendations. They are intended to give another perspective on the Plan's recommendations by tying them to a number of important parameters.

- One matrix presents prioritized Recommended Actions in terms of the geographic areas to which they apply (*i.e.*, the major segments of the Roaring Fork, Fryingpan and Crystal Rivers).
- A second prioritized matrix breaks down the Recommended Actions according to the Coordinating Entities and Key Participants in the implementation of the Recommended Actions. This matrix is intended to identify those organizations, governments, or agencies whose participation in one action or another will be key to the successful accomplishment of that action. The list is long but not exhaustive. It is intended to be a starting point for discussions, acknowledging that other important parties will be identified as Plan implementation moves forward.
- In the third matrix the Recommended Actions are designated as a Study, a Project/Program, or a Legislative/Regulatory action. This division makes it possible to distinguish easily between the action-oriented recommendations, the political elements of implementation, and the recommendations that are attached to areas of continued uncertainty and knowledge gaps.

It is important to note that the matrices were subject to the same input and review process that was applied to the Plan as a whole, but that to some extent the final product was developed according to the subjective judgment of the Plan's principal authors. Although the authors of this Plan have many years of experience with both the general and specific issues affecting the Roaring Fork Watershed, one of the lessons of this planning process has been that many perspectives and interests have influenced water management in the past and will continue to do so in the future. The matrices are intended to provide guidance, food for thought, and a starting place for more focused discussion, rather than a set of strict prescriptions. We encourage the users of this Plan to bring their own perspectives to bear on the recommendations and not to get caught up in the minutiae of the matrix designations.

These matrices are also available as a companion Excel Workbook to allow users to sort them for their particular uses. The coding used in these matrices mirrors the codes in the Plan Narrative, allowing the user to refer back to the Narrative for more detail and context.

The following describes each of the matrix categories in more detail:

1. Geographic Area Matrix. In Phase I of the Watershed Plan, the *State of the Roaring Fork Watershed Report 2008*, the Roaring Fork Watershed was broken down into nine areas corresponding with the four main sections of the Roaring Fork River and five major tributaries. The Geographic Area Matrix takes this breakdown a step further and divides the watershed into nineteen subareas corresponding to reaches of the main streams in the watershed or their major tributaries, plus a column for "Watershed-Wide" recommendations. Clearly some recommendations of the Plan are applicable in one part of the

watershed but not another, while others apply to the entire watershed. The purpose of this matrix is to illustrate those physical distinctions, while also noting that some recommendations of the Plan fall into both categories. That is, they are applicable watershed-wide but are more urgent or farther along in one or more areas of the watershed. To make this distinction, recommendations are color-coded to indicate "Urgent," "High," or "Medium" priorities by geographic area or on a watershed-wide basis, and are also assigned an overall implementation priority. A key is included to interpret the various priority designations.

2. Coordinating Entities and Key Participants Matrix. As noted above, this listing of public agencies, organizations, and governments is intended to identify those entities whose participation and support (as either a "Coordinating Entity" or a "Key Participant") will be vital to successful implementation of this Plan. To add to the utility of this matrix, the overall priority of a Recommended Action is also shown. The "Coordinating Entity" has a direct interest or jurisdiction, or a strong influence relative to a given recommendation. "Key Participants" are those entities whose participation or support would be instrumental in implementation of a Recommended Action. This does not always imply that an identified entity has the current capacity or direction to accomplish the action. In some cases selection is simply intended to identify the most likely entity that could accomplish a Recommended Action if funding or staffing changes or priorities shift. Most of the parties identified have been active participants in the planning process or are aware that the Plan is underway. Moreover, most of these entities have participated at one time or another in the discussions of the Roaring Fork Watershed Collaborative Water Committee relative to implementation of the Plan and have expressed their support for both the planning process and the Plan's recommendations. As the implementation process moves forward, it will be incumbent on these organizations to act as custodians and investors in the Plan through their support for implementation as either a Key Participant or a Coordinating Entity. As previously noted, this list is not exhaustive and will no doubt be expanded as implementation moves forward.

3. Type of Recommendation Matrix. The Recommended Actions fall into three general categories: (i) "Project or Program," (ii) "Study," and (iii) "Legislative and Regulatory." "Projects" are activities which require physical alterations to the landscape, such as a riparian area revegetation effort or the construction of a kayak park, while "Programs" require an active effort using legislative, educational, legal, regulatory, or other tools to carry out a recommendation. A "Study" is just what its name implies - an effort to learn more through research, inquiry, and analysis about a given topic. The Study designation often indicates a knowledge gap - an aspect of the watershed which is poorly understood or documented. Studies are often paired with one of the other categories because they are a necessary precursor to more direct action. "Legislative and Regulatory" recommendations refer to those Recommended Actions which will require a governing body to take official action, including adopting standards, imposing penalties, and providing resources. The category distinctions in this matrix are somewhat subjective and are not intended to exclude other approaches to implementation, or to value one type of implementation action over another. They are intended to act as a starting point for further discussion and as an aid in assigning responsibility for one action or another. For instance, it would be counterproductive to assign a complex water quality study to a fishing club, and it would be equally inappropriate to assign a river clean-up project to a Front Range university.

Recommended Action CE = Coordinating Entity X = Key Participant Yellow 3 = Priority, Orange 2 = High Priority, Red 1 = Urgent	Overall Priority	Aspen Ctr for Envi Studies	Aspen Global Change Inst	Aspen Valley Land Trust	Bureau of Land Management	Colo Basin Roundtable	Colo Dept Transportation	Colo Div of Parks & Wildlife	Colo Dept Pub Health & Envi	Colo Dept Water Resources	Colo Found Water Education	Colo Natural Heritage Prog	Colo River Water Cons Dist	Colo State University	Colo Trout Unlimited	Colo Water Cons Board	Local Jurisdictions	Major Water Diverters	Mt. Sopris Conservation Dist	NW Colo Council Govts QQ	Roaring Fork Audubon Society	Roaring Fork Conservancy	Ruedi Water & Power Authority	The Nature Conservancy	US Envr Protection Agency	US Fish & Wildlife Service	US Forest Service	US Geological Survey	Water Conservancy Districts	Water and San Districts	Other
RWM A1a. Regularly broadcast educational presentations on federal and state water policies/programs.	3					X					X		CE		X	X				X		CE	X								
RWM A1b. Issue regular press releases from the CBRT, CRWCD, and RWAPA. Include "tie-ins" to the Roaring Fork Watershed whenever possible in press communications.	3					CE							CE										X								
RWM A1c. Use social networking opportunities to improve communication with respect to meetings, workshops, and other educational opportunities concerning water issues.	3					X					X		CE									CE	X								
RWM A2a. Fund and distribute videos, PowerPoint presentations, brochures, and other media that tell the story of the Roaring Fork Watershed. Exhibit and promote these products as widely as possible.	3										X		CE			X	X					CE	X								
RWM A2b. Create a graphical tool, or an educational game illustrating the relationship between downstream calls, transmountain diversions, in-basin diversions and flows in the Roaring Fork Watershed. Make this tool available for schools and for presentations on water issues.	3										X		X									CE									
RWM A2c. Support projects such as the CRWCD/NWCCOG Q/Q's "It's the Same Water Campaign" and the RFC's River Center, including exhibits to enhance public awareness of complex regional water management issues.	2												X				X			X		CE	X								
RWM A2d. Create a portable plumbing model of the Roaring Fork Watershed similar to the NRCS stream trailer.	3										X		X			X						CE									
RWM A2e. Publish and distribute the RWAPA document, "Front Range Water Supply Planning Update: Increased Storage, Increased Demands, Increased Diversions." Translate and graphically represent key findings from this document.	2																						CE								
RWM A2f. Support projects such as the Univ. of Michigan Master's Project, "Fostering Implementation of the Roaring Fork Watershed Plan." Evaluate and utilize recommendations for improving public education and outreach from the Univ. of Michigan Master's Project, as appropriate. Seek opportunities to engage academia in research and implementation projects.	2												X		X		X					CE	CE				X	X			
RWM A3a. Advertise the CBRT meetings and their agendas Include information on subcommittee/working group meetings that are open for public participation.	3					CE							X			X							X								
RWM A3b. Broadcast CBRT meetings and publicize the broadcasts.	3					CE							X			X															
RWM A3c. Institute regular reporting to constituents by the Roaring Fork Watershed CBRT representatives in "user friendly" formats.	2					CE							X				X														
RWM A3d. Create a mechanism to capture and relay public comment to the CBRT on issues affecting the Roaring Fork Watershed.	3					CE							X																		
RWM A3e. Support/fund a touring educational program on regional watershed management issues.	2												X				X					CE	X								
RWM B1a. Appoint a Working Group to study and make recommendations on how the CRWCD can better foster collaboration among its Roaring Fork Watershed Board members.	3												CE				X						X								

Recommended Action CE = Coordinating Entity X = Key Participant Yellow 3 = Priority, Orange 2 = High Priority, Red 1 = Urgent	Overall Priority	Aspen Ctr for Envi Studies	Aspen Global Change Inst	Aspen Valley Land Trust	Bureau of Land Management	Colo Basin Roundtable	Colo Dept Transportation	Colo Div of Parks & Wildlife	Colo Dept Pub Health & Envi	Colo Dept Water Resources	Colo Found Water Education	Colo Natural Heritage Prog	Colo River Water Cons Dist	Colo State University	Colo Trout Unlimited	Colo Water Cons Board	Local Jurisdictions	Major Water Diverters	Mt. Sopris Conservation Dist	NW Colo Council Govts QQ	Roaring Fork Audubon Society	Roaring Fork Conservancy	Ruedi Water & Power Authority	The Nature Conservancy	US Envr Protection Agency	US Fish & Wildlife Service	US Forest Service	US Geological Survey	Water Conservancy Districts	Water and San Districts	Other
RWM B1b. Cultivate collaborative relationships with state and federal water resource experts and decision makers. Look for opportunities for agencies to partner on multi-jurisdictional projects.	2				X	X				X			X			X	X			X			CE			X	X	X			BOR
RWM B1c. Hold public meetings on significant water issues affecting the Roaring Fork Watershed with CBRT and RWAPA representatives, CRWCD Directors, and local elected officials. Publicize these meetings through various means.	3					CE							CE				X							CE							
RWM B1d. Identify streams in the watershed that may be candidates for federal wild, scenic, and recreational status. Determine community support for a designation and work to meet community goals.	3												X				X							X				CE				DOI, CVEPA
RWM B1e. Encourage Pitkin County's River Board to publicize its priorities and activities and to take steps to coordinate those activities with local water managers and interest groups.	3																X															River Board
RWM B1f. Cultivate collaborative relationships with the entities diverting water from Roaring Fork Watershed to the East Slope. Look for opportunities to partner on creative solutions to meet both East and West Slope water supply requirements.	2												CE				X					X	CE									Transmountain Diverters
RWM B1g. Revitalize the Roaring Fork Watershed Collaborative Water Committee as a focal point for regional cooperation and communication.	2				X			X		X			X				CE					CE	X				X	X				
RWM B2a. Appoint a Working Group to identify mechanisms for consolidating and coordinating the Roaring Fork Valley's involvement in regional water management and to advise local governments on participation in regional water management planning.	1					X							CE				CE			X		X	CE									Local fishing industry
RWM B3a. Create a Working Group to investigate and recommend changes to regulations governing augmentation and substitute supply plans that reflect the importance of maintaining natural hydrology in the development of these plans. Pursue regulatory amendments, as necessary, through all appropriate channels.	3									CE			X			X	X			CE			X									
RWM B4a. Formalize the existing ad hoc arrangement among the CRWCD, USFS, Pitkin County, City of Aspen and CPW for establishing the annual flow regime for the Twin Lakes exchange and identify the entity(ies) in the watershed responsible for monitoring implementation of the Twin Lakes exchange on behalf of the Western Slope.	2							X		X			CE				CE					X					X					Transmountain Diverters
RWM B4b. Maintain active participation by Roaring Fork Watershed decision makers in the 10,825 Working Group to ensure that watershed interests are protected and obligations under existing agreements are met.	2					X		X					X				X						CE									BOR
RWM B4c. Cultivate collaborative relationships with those entities responsible for ensuring an adequate and sustainable water supply for the East Slope. Seek mutually-agreeable solutions to water supply issues whenever possible.	2					CE							X			X	X						CE									Transmountain Diverters

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RWM B5a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law.	2									CE							X						CE								
RWM C1a. Periodically conduct watershed explorations for local decision makers.	3										X		X									CE	X								
RWM C1b. Conduct a periodic retreat for Roaring Fork Watershed decision makers on specific land use and water issues of common interest/concern.	3				X					X			CE				X					X	CE				X				SI
RWM C1c. Identify and collect all IGAs, MOUs, etc. between/among Roaring Fork Valley jurisdictions with applicability to water issues. Make all such agreements easily accessible to the public online. Analyze those agreements and look for opportunities to consolidate, clarify, or revise those documents to improve interagency collaboration.	2				X								X				X			X		X	CE				X				
RWM C1d. Identify jurisdictional and substantive gaps on water issues in existing IGAs, MOUs, etc. between/among local jurisdictions in the Roaring Fork Watershed. Recommend and pursue modifications to existing agreements, as well as new agreements, to close identified gaps.	2				X								X				X			X		X	CE				X				
RWM C2a. Modify local land use regulations to require referrals to state water commissioners and local fire protection districts during the land use application review phase.	2									X							CE														Fire Protection Districts
RWM C2b. Request that local land use planning departments adopt a policy of offering state water commissioners and local fire protection districts an opportunity to participate on any technical advisory/working groups developing amendments to land use regulations and/or forms addressing water resource matters of common interest.	3									X							CE														Fire Protection Districts
RWM C2c. Conduct a bi-annual meeting of local land use planners, local fire protection district personnel, and state water commissioners to provide a forum for discussing land use and water resource matters of common interest.	3									X							CE														Fire Protection Districts
RWM D1a. Improve collaboration among local jurisdictions and key stakeholders to ensure that adequate physical, chemical, and biological data are collected to monitor local climate change and assess its impacts.	2		X										X				CE					X			X		X				Aspen SkiCo
RWM D1b. Improve our decision makers' understanding of the potential impacts of climate change on our water resources.	2		X										X				CE					X			X		X				
RWM D1c. Conduct site-specific research and modeling within the Roaring Fork Watershed to improve projections of the impacts of climate change on the watershed.	2		CE										X				X					X	X		X						
RWM D1d. Review existing master plans in the watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage.	2		X														CE						X								

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RWM D1e. Review the existing water-related infrastructure and operational procedures in the Roaring Fork Watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage.	2		X							X			X				X	X					CE				X		X	X	Public Safety Council
RWM D1f. Research the impact that climate change may have on the water resource-related economy in the Roaring Fork Watershed.	2		CE					X					X				CE					CE					X				Aspen SkiCo; Sunlight Mt. Resort; local fishing industry
RWM D1g. Assess the vulnerability of the Roaring Fork Watershed to climate change. Develop an adaptive management strategy that integrates findings from the vulnerability assessment with watershed planning priorities and decision support.	2		CE														X														
SW A1a. At the state and local level, support the funding of research projects designed to address the non-consumptive needs knowledge gap.	3					X		X								CE	CE										X				
SW A1b. Work with the CBRT Non-Consumptive Needs Assessment (NCNA) Working Group and the designated NCNA contractors to assess the utility and limitations of the Watershed Flow Evaluation Tool. Evaluate the suitability of other tools/methods developed to provide a regional assessment of ecological risk conditions related to flow and if warranted, revise the regional assessment using the most suitable approach.	3					CE		X						X	X	X				CE		X		X							WRI
SW A1c. Ensure that the Colorado River Basin Water Availability Study adequately assesses and addresses the Roaring Fork Watershed's non-consumptive needs, including projected needs with climate alteration.	1		X			CE										CE	X			X		X	X	X							WRI
SW A1d. Create and maintain an adequate network of stream gages in the watershed.	2									CE			X				X					X						CE			
SW A1e. Assess flow alteration in stream reaches where stream gage or modeled data are lacking.	2													X	CE	X	CE			X		X	X	X			X	X			
SW A1f. Conduct site-specific studies of environmental and recreational flows needed for stream reaches that are currently significantly flow-altered or threatened by significant flow alteration. Include an analysis of how often these flows are not met.	1					CE		X						X	X	X	CE			X		X	X	X			CE				
SW A1g. Assess the direct and indirect economic consequences associated with non-optimal flows.	3																CE					X	X								
SW A1h. Ensure that local land use policies and regulations adequately assess all of the costs and benefits associated with hydropower development and mitigate the impact of hydropower development on other non-consumptive water uses. Ensure that hydropower development is considered and addressed in local Master Plans.	2																CE														FERC, Local Utilities
SW A1i. Assess potential local and regional recreational and environmental advantages and disadvantages associated with Recreational In-Channel Diversions (RICDs) in the watershed. As appropriate, obtain RICDs and ensure that they do not impact riparian and aquatic habitat.	2							CE		X							CE					X	X								

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SW B1a. Based on assessments of flow alteration and ecological consequences, quantify instream flow needs in streams with and without instream flow rights. Pursue instream flow rights for streams with inadequate or no instream flow rights.	2							X		X						CE	CE					X	X								
SW B1b. Investigate why CWCB instream flows are not being met and institute appropriate projects to remedy the problems identified.	2							X		CE							CE	X				X	X	X							
SW B1c. Increase the utilization of tools and funding available to improve instream flows.	2							X		X					X	CE	CE					X	X	X							CWT
SW B1d. Identify stream reaches where irrigation return flows and groundwater recharge provide late summer and fall flows and investigate opportunities to maintain these important sources of supplemental stream flows whenever possible.	3									X							CE	X	X												
SW B1e. Identify and pursue opportunities for improving natural and artificial water storage to improve low stream flows.	3							X		CE							CE		X			X	X				X				
SW B1f. Investigate if water conservation translates to environmental benefits under Colorado water law. Pursue opportunities for water conservation, if appropriate.	1												X				CE	X		X		CE	X							X	
SW B1g. Quantify the role of snow making in flow alteration and, where warranted, pursue opportunities for decreasing the environmental impact of snowmaking.	3									X							CE										CE				Aspen SkiCo; Sunlight Mt. Resort
SW C1a. Ensure that local land use planning requires an adequate technical assessment and legal review of the availability, sustainability, and (as applicable) potability of an adequate water supply for a proposed use prior to the grant of a development approval.	2																CE														
SW C1b. Quantify the direct and cumulative effects of changes in land use on surface flows. Incorporate the results in the review of local land use applications and investigate opportunities for mitigation.	3																CE														
SW C1c. Enhance communication and collaboration between local land use planners and water commissioners.	3									CE							CE														
SW C1d. Quantify expected proximal stream flow changes associated with a planned development's augmentation plan. Investigate and pursue opportunities for mitigating the impact to these streams within the confines of Colorado water law.	2									CE							CE												CE	CE	
SW C1e. Evaluate the need for ponds designed for fire mitigation and, where necessary, require that steps be taken to minimize their evaporative losses.	3									X							CE														Fire Protection Districts
SW C2a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law.	2									X			X				CE	X					CE								
SW C3a. Complete a comprehensive climate impacts assessment on stream flows for the Roaring Fork Watershed.	3		CE		X								X	X	X	X	X					X	X	X			X				Aspen SkiCo; RMI

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SW D1a. Support and distribute films, videos, PowerPoint presentations, etc. illustrating local water conditions and issues.	3					X							X				X					CE	X								
SW D1b. Develop projects such as RFC's River Center, with exhibits to enhance public awareness of the importance of maintaining adequate streams flows in the watershed and the consequences of drought.	3	X															X					CE									
SW D1c. Support projects such as the Univ. of Michigan Master's Project Fostering Implementation of the Roaring Fork Watershed Plan. Utilize the Univ. of Michigan Master's Project's recommendations for improving public education and outreach, as appropriate.	3	X																				CE	CE								
SW D1d. Improve education/outreach on the connection between water availability and sustainability and land use planning and design strategies.	2										X						CE					X	X								SI
SW D1e. Improve education/outreach and opportunities for involvement in mitigating the effects of drought.	3										X		X			X	CE	X				X	X								
SW D1f. Improve education/outreach on the connection between high flows and healthy riparian and instream areas.	3	X						X			X				X							CE	X			X					WRI
SW D1g. Increase awareness of water conservation techniques and the importance of conservation. Identify and implement the most strategic water conservation measures.	2										X		CE				CE	X		X		CE	X						X	CE	
SW D1h. Improve education on the basis for obtaining and perfecting conditional water rights under Colorado water law.	3									X	X		X									X	CE								
SW E1a. Utilize the CWCB's 2010 Drought Mitigation and Response Plan and Drought Planning Toolbox.	3												X			CE	CE	X												X	X	
SW E1b. Work with the CWCB's Office of Water Conservation and Drought Planning to obtain technical assistance and grants to help develop local drought mitigation plans.	2												X			CE	CE	X												X	X	
SW E1c. Create "shovel-ready" drought-mitigation projects that can be quickly implemented.	3									X			X				CE	X				X					CE			X	X	
SW E1d. Investigate the potential benefits and disadvantages of acquiring small storage water rights that can be delivered for municipal uses in times of need and used to mitigate low stream flows. Pursue a streamlined approval process for landowners, if warranted.	3									X			X				CE	X	X											X	CE	
SW E1e. Investigate opportunities to temporarily loan water to streams using C.R.S. § 37-83-105. Discuss triggering criteria such as low snowpack levels on specific spring dates and draft agreements with critical water rights holders, CDWR Division Engineer, and CWCB that can be quickly implemented when needed.	3							X		X			X			CE	CE	X				X	X	X						X		CWT
SW E1f. Identify flow and temperature triggers and draft emergency drought fishing regulations.	3							CE																								
SW E2a. Ensure that county and municipal emergency management plans minimize the potential for harmful flooding in developed floodplains.	3																CE															FEMA
SW E2b. Where feasible, restore the natural function of floodplains.	3			X	CE			X							X	X	CE		X		X	X		X			CE					

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SW E2c. Ensure that the Federal Emergency Management Agency (FEMA) floodplain maps for the watershed used by local jurisdictions are up to date and available digitally for public access.	3																CE														FEMA
SW E2d. Develop and enforce local regulations that minimize development in the flood plain.	2																CE														
SW E2e. Identify and pursue opportunities to maintain decision makers' and the public's interest in flooding issues after flood events have passed, such as by creating "shovel-ready" flood mitigation projects that can be quickly implemented.	3				X		X	X							X	X	CE					X	X	X			X				Public Safety Council, BOR
GW A1a. Identify all sub-watersheds lacking detailed hydrogeologic information and prioritize the sub-watersheds for study on the basis of threats posed to the groundwater supply. Conduct hydrogeological assessments of all sub-watersheds lacking detailed hydrogeologic information, working collaboratively across sub-watershed jurisdictional boundaries.	2									X						X	CE	X											X	X	X	
GW A1b. Ensure that local governments obtain, utilize, and regularly update information from: (i) state well databases, and (ii) onsite wastewater treatment system permitting in their hydrogeological assessments.	3									X						X	CE														X	
GW A1c. Delineate areas of interaction between groundwater and surface water, including quantification and assessment of interaction type. For aquifers that are currently used or have the potential to be used: (i) quantify the water budget, (ii) rate the importance of the aquifers, and (iii) prioritize the need for additional detailed studies that include assessments of water budgets, flows, and water table interactions.	3									X							CE													X	X	
GW A2a. Adopt local regulations, policies, and procedures to ensure that there is a sufficient technical and legal demonstration of the availability and sustainability of an adequate water supply for any new land use or development reliant upon groundwater.	1									CE							CE													X	X	
GW B1a. Restore major wetlands areas in the watershed.	3			X	CE			X							X		CE				X	X					CE					
GW B1b. Identify and protect major wetlands areas in the watershed.	3			X	CE			X							X		CE				X	X					CE					
GW B1c. Institute programs to promote water reuse, particularly in areas that are using groundwater beyond its ability to recharge.	3										X		X				CE					X								X	CE	
GW B1d. Study and pursue opportunities, as appropriate to enhance natural recharge by slowing down sheet runoff and runoff in creeks and recharging potentially good aquifers such as terraces and fans.	3				CE												CE					X									CE	
GW B1e. Quantify the effect of changes in land use and development on groundwater recharge in both rural and urbanized areas of the watershed and disseminate the information to decision makers.	3									X							CE					X										SI

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GW B1f. Adopt local regulations, policies and procedures to ensure that the impacts on groundwater recharge are understood and taken into consideration by decision makers in the review and approval of land use applications.	3																CE													X	
GW B1g. Develop and implement a prioritized well-monitoring program for local jurisdictions to allow them to determine trends in groundwater levels, in coordination with ongoing studies.	3									X							CE												X	X	
GW B1h. Create and maintain an inventory of groundwater monitoring data and results.	3									X							CE														
GW B1i. Conduct detailed monitoring of groundwater levels and fluctuations in important wetland and groundwater discharge zones, including collection of information on aquifer thickness and development of parameters and information for development of detailed water budgets and modeling.	3																CE														
GW C1a. Adopt local regulations requiring confirmation of compliance with well permit conditions in connection with land use approvals and building permits.	2																CE													X	
GW C1b. Adopt local policies and procedures for notifying CDWR of any noncompliance with well permit conditions observed in connection with land use approvals and building permits.	2									X							CE													X	
GW C1c. Assess the need for additional resources in the administration of water rights.	3									CE			X				X			X											
GW C1d. Create maps of the watershed showing the location of exempt and non-exempt wells.	3									X			X				CE														
GW D1a. Create and disseminate educational materials on the impact of land use on groundwater resources.	3										X						CE					X									
GW D1b. Create maps of groundwater availability in the watershed.	3									X			X				CE			X		X						X			
GW D1c. Create and disseminate educational materials on the purpose of augmentation plans associated with new non-exempt wells and the potential for detrimental effects on local streams.	3										X		X		X		X					X									
GW D2a. Create summaries of all sub-watershed hydrogeological assessments targeted at the layperson, using a consistent format for all sub-watersheds. Make all summaries available online and publicize their availability.	3												X				CE					X									
GW D2b. Create and periodically broadcast local cable television programs discussing the hydrogeological assessments and explaining their importance for understanding groundwater supplies in the Roaring Fork Watershed.	3												X				CE					X									
GW D2c. Implement pricing mechanisms that better reflect the true value of a local groundwater supply and that encourage a decrease in usage.	3									CE							CE												X	X	
GW D2d. Develop projects such as the RFC's River Center, with exhibits to enhance public understanding of hydrogeology in the watershed and its relationship to the groundwater supply.	3										X											CE									

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WQ A1a. Convene a Water Quality Working Group to identify monitoring objectives, parameters, and protocols.	3							X	X				X				CE					CE	X				X	CE		X	
WQ A1b. Develop and implement a consistent process for analyzing and reporting on water quality monitoring results; build on the RFC's 5-year Water Quality Reports.	3																CE					CE						CE		X	
WQ A1c. Undertake targeted water quality monitoring studies to investigate water quality issues identified through routine water quality monitoring, and to capture the impacts or benefits of developments, projects, or other activities.	3							X									CE					X					X	X			
WQ A1d. Promote/support a sampling program for groundwater aimed at testing the integrity and water quality impacts of individual onsite wastewater treatment systems.	3								X								CE														
WQ A1e. Promote/support a sampling program for groundwater and surface waters aimed at testing the water quality impacts of snow dump facilities.	3								X								CE														
WQ B1a. Investigate and pursue opportunities for reducing water quality impacts from natural salinity.	3																CE	X	X			X									
WQ B1b. Identify human-based sediment sources and develop and implement strategies for reducing sediment from those sources.	3				X		X		X								CE		X			X					X				CDRM&S
WQ B1c. Incorporate water quality goals into local land use plans and regulations. Treat the maintenance and improvement of water quality as a priority in Master Plans and development approvals.	3																CE													X	
WQ B2a. Assess the adequacy of current water quality standards and recommend modifications.	2								X								X			CE					X						CWQF
WQ B2b. Consider the need/process for developing standards for private drinking water supplies.	3								CE								X			X					CE						CWQF
WQ B2c. Evaluate the implications of securing "outstanding waters" designations for local waterways.	3					X							CE		X		X	X		X							X		X	X	
WQ C1a. Provide incentives for the implementation of BMPs in connection with the control of nonpoint source pollution from development sites and activities.	3																CE														
WQ C1b. Develop a training program to help communities assess the adequacy of local regulations and land use policies regarding water quality, and the impacts of development on water quality.	3																			CE											DOLA, SI
WQ C1c. Assess the impacts of agricultural and commercial irrigation on water quality. Mandate/recommend mitigation strategies through local regulation, as warranted.	3								X								CE	X	X												
WQ C1d. Ensure that local regulations addressing stormwater impact mitigation and BMPs for stormwater management are effective, stringent, and enforced.	3																CE														
WQ C1e. Identify and prioritize stormwater mitigation improvement projects in each jurisdiction in each jurisdiction and plan for implementing such projects.	3																CE														
WQ C1f. Support state funding to inspect sites and enforce relevant regulations where stormwater management plans are required under WQCD Stormwater Construction General Permits.	3																CE			CE											

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WQ C1g. Assess current regulation of onsite wastewater treatment systems. Impose more stringent regulations, as warranted. Coordinate with the State of Colorado's plans to revise its regulatory framework.	3								X								CE														
WQ C1h. Require training and licensing of onsite wastewater treatment system installers, cleaners/pumpers, and inspectors.	3								X								CE														
WQ C1i. Support development of state and local financing mechanisms to provide incentives/assistance to individuals and subdivisions to upgrade or consolidate onsite wastewater treatment systems.	3								X								CE			CE											
WQ C1j. Maintain and publicize information on financial assistance available for upgrades to onsite wastewater treatment systems.	3								X								CE			X											DOLA
WQ C1k. Investigate the feasibility of creating regional wastewater treatment facilities that would consolidate or incorporate existing scattered onsite wastewater treatment systems and package plants. Pursue opportunities, as appropriate.	3																CE								X					CE	
WQ C1l. Improve opportunities for the use of constructed wetlands as an element of onsite wastewater or stormwater treatment, including the development of performance-based state regulations addressing constructed wetlands for onsite wastewater treatment, and mirroring those regulations at the local level.	3								CE								CE														USACE
WQ C1m. Assess surface water and groundwater quality impacts associated with snow dump sites. Ensure that local regulations addressing the location and impacts of snow dumping and runoff from snow dumps are effective, stringent, and enforced.	3																CE														
WQ C1n. Assess the impacts of magnesium chloride on water quality. Mandate/recommend alternatives/mitigation, as necessary, through local regulation.	2						CE										CE														
WQ C1o. Support the enforcement of federal and state regulations addressing oil and gas development.	2																CE			CE											COGCC
WQ C1p. Support disclosure of chemicals used in drilling and fracking and mandatory frack fluid tagging. Encourage owners and operators to use environmentally friendly alternatives. Support scientific studies of fracking impacts on the environment and public health.	2																CE			CE											COGCC
WQ C1q. Ensure that local land use policies and regulations limiting and mitigating the impacts of mining and oil and gas development on water quality are stringent and enforced.	2																CE														
WQ C1r. Address and regulate runoff from hazardous sites including mines, landfills, junkyards, and similar locations. Address and regulate the disposal/use of materials from sites potentially contaminated by hazardous materials.	3																CE								X						CDRM&S

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WQ C1s. Work with the State of Colorado to identify reclamation sites and work with responsible parties to assure that reclamation of mining sites is adequate and sustainable to mitigate impacts on water quality. Perform additional reclamation work as necessary.	3																CE										X				CDRM&S
WQ C1t. Work with local emergency and public safety agencies to assure that they are adequately trained and equipped to respond to releases of hazardous materials and spills.	3								X								X														Public Safety Council
WQ C1u. Support enforcement of streamside camping restrictions and development/enforcement of other recreational use restrictions by the USFS necessary to protect waterways. Work with the USFS to remove/reclaim campsites near rivers and streams.	3																										CE				IPF, RFOV, WW, WRFC
WQ C1v. Inventory and protect areas around natural springs.	3				X												CE										X			CE	
WQ C1w. Support new and additional funding mechanisms for water technology research and development.	3																								CE						NNI, Industry Associations
WQ C2a. Support the completion of the State Source Water Assessments for the watershed.	3								CE								X													X	CRWA
WQ C2b. Develop Source Water Protection Plans for all of the major water supply systems in the watershed.	3				X			X	X	X							X		X			X					X	X		X	CRWA
WQ C2c. Implement a private wellhead protection program.	3																CE														CRWA
WQ D1a. Upgrade technology and treatment methods at local wastewater treatment facilities as funding and infrastructure allow.	3								X																X					CE	
WQ D1b. Investigate the potential for reusing waste products from landfills, wastewater treatment plants, and commercial activities in order to reduce the need for increased treatment capacity at concentrated waste disposal sites.	3								CE								CE													CE	
WQ D1c. Support new and additional funding mechanisms for water technology research and development.	3																								CE						NNI, Industry Associations
WQ E1a. Improve local understanding of the importance of water quality and the relationship between water quality and quantity. Install signs and notices in appropriate areas noting the importance of maintaining water quality.	3										CE		X		X		X					CE	X				X			X	
WQ E1b. Improve the public's understanding of the importance of water quality to public health and safety and to the local lifestyle, economy, and environment, and of the consequences of a degraded or contaminated water supply.	3								CE		X		X				CE			X		X									
WQ E1c. Educate the public about daily activities that impact water quality and how individuals can modify their behavior and reduce water quality impacts on the watershed.	3								X		CE						X					CE									
WQ E1d. Improve local decision makers' understanding of federal, state, and local regulations addressing water quality by creating an illustration of the hierarchy of water quality agencies and regulations in a manner aimed at a lay audience.	3										CE		X										X								

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WQ E1e. Educate the public about issues surrounding the development of new water technologies, such as nanotechnology-based systems.	3																								CE						NNI, Industry Associations
WQ E1f. Improve public understanding of the risk of groundwater pollution by creating maps showing areas vulnerable and susceptible to groundwater contamination.	3																CE					CE									SI
WQ E1g. Implement a stream segment adoption program to facilitate cleanup and monitoring activities. Incorporate the program in school curriculums where possible. Create and publicize a map of "Adopted Streams".	3	X						X			X						X					CE									
WQ E1h. Improve public education regarding individual onsite wastewater treatment systems, particularly the need for regular system inspections – not just pumping.	1								X								CE								X						Colo Prof in Onsite Wastewater
WQ E1i. Educate the public on the benefits of BMPs and encourage public implementation of structural, vegetative, and non-structural BMPs whenever possible. Create incentive programs for voluntary retrofits of residential sites.	2								X		X						CE					X									
WQ F1a. Quantify the needs of our watershed as they relate to water quality. Support and participate in the Non-Consumptive Needs Assessment being carried out by the Colorado Basin Roundtable.	2					CE		X					X			X				CE		X									
WQ F1b. Ensure that local land use policies and regulations adequately address the water quality impacts of development, and that requisite mitigation measures imposed as conditions of land use approvals are both implemented and enforced.	2							X									CE														
WQ F1c. Monitor and address the impacts of high-use trails on water quality.	3				CE			X									CE										CE				WW
WQ F1d. Ensure that activities aimed at mitigating or responding to pine beetle and other insect infestations and diseases do not generate detrimental water quality impacts.	3	X			X				CE								X			X							X				Aspen SkiCo, WRFC
WQ F1e. Monitor and address the impacts of climate change on water quality.	3		CE						X				X	X		X	X														
RI A1a. Convene a Riparian/Instream Working Group to develop a riparian/instream monitoring program.	3				CE			CE				X			X		X		X	X	X	CE			X		CE				
RI B1a. Working with landowners, resource experts, and other interested parties, plan and implement riparian/ instream protection and restoration projects.	1			X	CE			X							X		CE		CE	X		X					CE				
RI B1b. On an ongoing basis, reassess the Colorado Natural Heritage Program's Potential Conservation Areas for changes in resource conditions or management needs.	3				X			X				CE				X	X				X						X				WW
RI B1c. Assess greenbelts/greenways as effective tools for protecting riparian areas in the watershed and pursue, as appropriate.	3			X											X		CE					X									
RI B1d. Research wetland mitigation banks and work to expand such a program, if warranted.	3			X													CE							X							RMI, USACE
RI B1e. Investigate regional planning mechanisms available for protection of riparian areas and funding available to support such a regional effort.	3																CE			X					X	X		X			NRCS

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RI B1f. Support state and federal tax credits for donations of conservation easements. Investigate additional tax incentives for such donations; work with interested parties on adoption of new incentives.	3			CE													CE					X									CWT
RI B2a. Using the results of the watershed-specific Bird Index of Biotic Integrity, implement habitat improvement projects.	3				CE			X				X			X		CE		X	X	X	X		X			CE				
RI B2b. Determine the potential impact of climate change on riparian-dependent wildlife.	3		CE					X						X													X				CU
RI B2c. Proactively develop the NEPA documentation necessary to relocate beavers to federal lands. Implement projects that promote beaver activity.	3				CE			X									CE					X		X			CE				
RI B2d. In conjunction with local land use approvals, require the design and execution of site-specific adaptive management plans to evaluate and minimize the impacts of development on riparian areas.	2							X									CE														
RI B2e. Inventory and maintain or increase the population size and range of plant species and communities of concern, as appropriate.	3				X							X															X				
RI B3a. Determine the optimum number and distribution of CRCT populations and implement projects that work toward achieving this goal.	2				CE			CE							X												CE				
RI B3b. Conduct fish surveys above natural and man-made barriers to determine if there are additional populations of CRCT in the watershed. Increase/institute monitoring of all identified CRCT populations.	3				CE			CE																			CE				
RI B3c. Study the potential effects of climate change on CRCT populations.	3		CE		CE			X						CE											CE	CE	CE	CE			CU
RI B4a. Monitor wild, naturally-reproducing fish populations (including non-game fish) and conduct spawning surveys.	3				X			CE																			X				
RI B4b. Identify, protect, and restore important trout spawning habitat. In areas of high spawning importance, evaluate seasonal closures and, if warranted, implement closures.	3				X			CE																			X				
RI B4c. Follow the "Range-wide Conservation Agreement and Strategy for Bluehead Sucker and Flannelmouth Sucker".	3				X			CE																		CE	X				
RI B4d. Determine the effect of stream temperature on wild, naturally-reproducing fish species distribution and initiate actions to ensure that threshold temperatures are not exceeded.	3		X		X			CE	CE					X												X	X				
RI B4e. Inventory road/stream crossings and improve fish passage, as needed.	3				CE		X	CE							X		X										CE				
RI B4f. Improve education regarding methods to reduce whirling disease transmission.	3				CE			CE						X	CE		X					X					CE				Whirling Disease Foundation
RI B4g. Address the problem of illegal introduction of fish in the watershed through education and regulatory initiatives.	3				X			CE							X												X				CU
RI B5a. Monitor key amphibian populations to determine their status.	3				CE			CE				X														X	CE	X			

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RI B5b. Restore important amphibian habitats and, if appropriate, pursue opportunities for the reintroduction of species.	3				CE			CE				X														X	CE	X			
RI B5c. Study the potential impact of climate change on amphibian populations.	3		X		CE			CE				X		X												X	CE	X			CU
RI B5d. Survey potential boreal toad habitats to determine if additional populations exist in the watershed.	3				CE			CE				X														X	CE	X			
RI B5e. Increase awareness of the dangers to toad populations associated with Chytridiomycosis fungus transmission.	3				X			CE				X														X	X	CE			CU
RI B5f. Follow the Conservation Plan and Agreement for the Management and Recovery of the Southern Rocky Mountain Population of the Boreal Toad.	3				X			CE																			X	CE			
RI C1a. Evaluate and address the impacts of riparian alteration/disturbance on native riparian-dependent wildlife and plant species and communities of concern and native wildlife species.	3				CE			X				X		CE	X		X				X	X		X			CE				
RI C1b. Investigate the effects of acute and chronic sediment pulses on aquatic ecosystems, differentiating between natural and human-influenced sources of sediment.	3				CE			X						CE			X										CE				
RI C1c. Develop and implement Best Management Practices (BMPs) for instream projects that minimize sedimentation and turbidity to reduce impacts to spawning fish movement, incubating eggs and fry, and spawning habitat.	3				CE			CE							X		X					X					CE				USACE
RI C1d. Implement Travel Management Plan for the White River National Forest, including closing, obliterating, and signing select roads.	3																										CE				
RI C1e. Develop and enforce stream setbacks that protect riparian areas throughout the watershed.	1				X												CE										X				
RI C1f. Inventory developed and dispersed recreation sites, trails, and access points, and assess their impacts on riparian and instream areas; work to reduce impacts. Minimize the impact of new recreational sites, access points, and trails on riparian and instream areas.	3				CE			X									CE										CE				
RI C1g. Prevent or mitigate riparian and instream impacts associated with agricultural activities.	3				CE														CE								CE				
RI C1h. Minimize instream impacts and improve fish habitat by reengineering instream structures intended to move water into headgates.	3				CE			CE		X				CE	CE		CE		CE	X		X					CE				Ditch companies
RI C1i. Restore riparian and instream areas impacted by historical mining activities.	3				CE										X		CE										CE				CDRM&S
RI C1j. Ensure that oil and gas development does not adversely impact riparian and instream areas.	3				CE			CE									CE										CE				TDC, COGCC
RI C1k. Work to minimize/mitigate the effects of bridges on riparian and instream habitat.	3				CE		CE	CE									CE										CE				
RI D1a. Provide education to the public about the important functions of riparian areas, development and other threats to riparian areas, what can be done to protect and restore riparian areas, and potential sources of funding for riparian projects.	1	X		X	CE			X				CE		CE	CE		CE		CE	X		CE	X				CE				

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RI D1b. Develop the RFC's River Center, with its exhibits on the importance of riparian and instream areas to the watershed.	2																					CE									
RI D1c. Provide publicity, tours, and interpretation of riparian and instream restoration projects.	3	X			CE												X		CE	X		CE	X				X				
RI D1d. Involve the public in restoration projects.	3	CE			CE			CE					X		X		X		CE	X		X					CE				RFOV
RI E1a. Convene an Invasive Species Task Force.	2				CE		X										CE		CE	X							CE				
RI E1b. Work with local jurisdictions' weed boards, the USFS, BLM, MSCD, and private land owners to eradicate/control invasive plant species that are a significant concern, particularly adjacent to riparian areas and along roads.	3				CE		CE										CE		CE	X							CE				WRFC, RFOV, ditch companies
RI E2a. Research and survey the Didymo algae to determine the cause of its rapid spread, the ecological implications, and possible methods of control.	3				X			X	X					CE	X										CE		X	CE			
RI E2b. Improve our understanding of the economic and ecological consequences of ANS invasion and the methods for preventing the spread of such species. Provide education on the spread of ANS.	2				X			CE						CE	X		CE					CE	CE				CE	X			BOR
RI E2c. Implement invasive species inspection/monitoring programs. Require proper cleaning and disinfection of boats and construction equipment used in watercourses.	2							CE															CE				CE				
RI E2d. Institute new regulations, as necessary, to address the movement of aquatic species within and between drainages to prevent the movement of ANS.	3							CE															CE				CE				
TOTALS		8	14	8	55	19	7	62	25	40	21	11	61	16	31	26	164	16	18	37	7	84	56	14	16	11	77	21	15	30	69

Recommended Action	Project/ Program	Study	Legislative/ Regulatory
RWM A1a. Regularly broadcast educational presentations on federal and state water policies/programs.	X		
RWM A1b. Issue regular press releases from the CBRT, CRWCD, and RWAPA. Include "tie-ins" to the Roaring Fork Watershed whenever possible in press communications.	X		
RWM A1c. Use social networking opportunities to improve communication with respect to meetings, workshops, and other educational opportunities concerning water issues.	X		
RWM A2a. Fund and distribute videos, PowerPoint presentations, brochures, and other media that tell the story of the Roaring Fork Watershed. Exhibit and promote these products as widely as possible.	X		
RWM A2b. Create a graphical tool, or an educational game illustrating the relationship between downstream calls, transmountain diversions, in-basin diversions and flows in the Roaring Fork Watershed. Make this tool available for schools and for presentations on water issues.	X		
RWM A2c. Support projects such as the CRWCD/NWCCOG Q/Q's "It's the Same Water Campaign" and the RFC's River Center, including exhibits to enhance public awareness of complex regional water management issues.	X		
RWM A2d. Create a portable plumbing model of the Roaring Fork Watershed similar to the NRCS stream trailer.	X		
RWM A2e. Publish and distribute the RWAPA document, "Front Range Water Supply Planning Update: Increased Storage, Increased Demands, Increased Diversions." Translate and graphically represent key findings from this document.	X		
RWM A2f. Support projects such as the Univ. of Michigan Master's Project, "Fostering Implementation of the Roaring Fork Watershed Plan." Evaluate and utilize recommendations for improving public education and outreach from the Univ. of Michigan Master's Project, as appropriate. Seek opportunities to engage academia in research and implementation projects.	X		
RWM A3a. Advertise the CBRT meetings and their agendas Include information on subcommittee/working group meetings that are open for public participation.	X		
RWM A3b. Broadcast CBRT meetings and publicize the broadcasts.	X		
RWM A3c. Institute regular reporting to constituents by the Roaring Fork Watershed CBRT representatives in "user friendly" formats.	X		
RWM A3d. Create a mechanism to capture and relay public comment to the CBRT on issues affecting the Roaring Fork Watershed.	X		
RWM A3e. Support/fund a touring educational program on regional watershed management issues.	X		
RWM B1a. Appoint a Working Group to study and make recommendations on how the CRWCD can better foster collaboration among its Roaring Fork Watershed Board members.		X	
RWM B1b. Cultivate collaborative relationships with state and federal water resource experts and decision makers. Look for opportunities for agencies to partner on multi-jurisdictional projects.	X		
RWM B1c. Hold public meetings on significant water issues affecting the Roaring Fork Watershed with CBRT and RWAPA representatives, CRWCD Directors, and local elected officials. Publicize these meetings through various means.	X		
RWM B1d. Identify streams in the watershed that may be candidates for federal wild, scenic, and recreational status. Determine community support for a designation and work to meet community goals.		X	X
RWM B1e. Encourage Pitkin County's River Board to publicize its priorities and activities and to take steps to coordinate those activities with local water managers and interest groups.	X		
RWM B1f. Cultivate collaborative relationships with the entities diverting water from Roaring Fork Watershed to the East Slope. Look for opportunities to partner on creative solutions to meet both East and West Slope water supply requirements.	X		
RWM B1g. Revitalize the Roaring Fork Watershed Collaborative Water Committee as a focal point for regional cooperation and communication.	X		
RWM B2a. Appoint a Working Group to identify mechanisms for consolidating and coordinating the Roaring Fork Valley's involvement in regional water management and to advise local governments on participation in regional water management planning.		X	
RWM B3a. Create a Working Group to investigate and recommend changes to regulations governing augmentation and substitute supply plans that reflect the importance of maintaining natural hydrology in the development of these plans. Pursue regulatory amendments, as necessary, through all appropriate channels.		X	X
RWM B4a. Formalize the existing ad hoc arrangement among the CRWCD, USFS, Pitkin County, City of Aspen and CPW for establishing the annual flow regime for the Twin Lakes exchange and identify the entity(ies) in the watershed responsible for monitoring implementation of the Twin Lakes exchange on behalf of the Western Slope.	X		
RWM B4b. Maintain active participation by Roaring Fork Watershed decision makers in the 10,825 Working Group to ensure that watershed interests are protected and obligations under existing agreements are met.	X		
RWM B4c. Cultivate collaborative relationships with those entities responsible for ensuring an adequate and sustainable water supply for the East Slope. Seek mutually-agreeable solutions to water supply issues whenever possible.	X		
RWM B5a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law.	X	X	
RWM C1a. Periodically conduct watershed explorations for local decision makers.	X		
RWM C1b. Conduct a periodic retreat for Roaring Fork Watershed decision makers on specific land use and water issues of common interest/concern.	X		

Recommended Action	Project/ Program	Study	Legislative/ Regulatory
RWM C1c. Identify and collect all IGAs, MOUs, etc. between/among Roaring Fork Valley jurisdictions with applicability to water issues. Make all such agreements easily accessible to the public online. Analyze those agreements and look for opportunities to consolidate, clarify, or revise those documents to improve interagency collaboration.	X	X	X
RWM C1d. Identify jurisdictional and substantive gaps on water issues in existing IGAs, MOUs, etc. between/among local jurisdictions in the Roaring Fork Watershed. Recommend and pursue modifications to existing agreements, as well as new agreements, to close identified gaps.		X	X
RWM C2a. Modify local land use regulations to require referrals to state water commissioners and local fire protection districts during the land use application review phase.			X
RWM C2b. Request that local land use planning departments adopt a policy of offering state water commissioners and local fire protection districts an opportunity to participate on any technical advisory/working groups developing amendments to land use regulations and/or forms addressing water resource matters of common interest.			X
RWM C2c. Conduct a bi-annual meeting of local land use planners, local fire protection district personnel, and state water commissioners to provide a forum for discussing land use and water resource matters of common interest.	X		
RWM D1a. Improve collaboration among local jurisdictions and key stakeholders to ensure that adequate physical, chemical, and biological data are collected to monitor local climate change and assess its impacts.	X		
RWM D1b. Improve our decision makers' understanding of the potential impacts of climate change on our water resources.	X		
RWM D1c. Conduct site-specific research and modeling within the Roaring Fork Watershed to improve projections of the impacts of climate change on the watershed.		X	
RWM D1d. Review existing master plans in the watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage.		X	
RWM D1e. Review the existing water-related infrastructure and operational procedures in the Roaring Fork Watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage.		X	
RWM D1f. Research the impact that climate change may have on the water resource-related economy in the Roaring Fork Watershed.		X	
RWM D1g. Assess the vulnerability of the Roaring Fork Watershed to climate change. Develop an adaptive management strategy that integrates findings from the vulnerability assessment with watershed planning priorities and decision support.		X	
SW A1a. At the state and local level, support the funding of research projects designed to address the non-consumptive needs knowledge gap.		X	X
SW A1b. Work with the CBRT Non-Consumptive Needs Assessment (NCNA) Working Group and the designated NCNA contractors to assess the utility and limitations of the Watershed Flow Evaluation Tool. Evaluate the suitability of other tools/methods developed to provide a regional assessment of ecological risk conditions related to flow and if warranted, revise the regional assessment using the most suitable approach.		X	
SW A1c. Ensure that the Colorado River Basin Water Availability Study adequately assesses and addresses the Roaring Fork Watershed's non-consumptive needs, including projected needs with climate alteration.		X	
SW A1d. Create and maintain an adequate network of stream gages in the watershed.	X		
SW A1e. Assess flow alteration in stream reaches where stream gage or modeled data are lacking.		X	
SW A1f. Conduct site-specific studies of environmental and recreational flows needed for stream reaches that are currently significantly flow-altered or threatened by significant flow alteration. Include an analysis of how often these flows are not met.		X	
SW A1g. Assess the direct and indirect economic consequences associated with non-optimal flows.		X	
SW A1h. Ensure that local land use policies and regulations adequately assess all of the costs and benefits associated with hydropower development and mitigate the impact of hydropower development on other non-consumptive water uses. Ensure that hydropower development is considered and addressed in local Master Plans.			X
SW A1i. Assess potential local and regional recreational and environmental advantages and disadvantages associated with Recreational In-Channel Diversions (RICDs) in the watershed. As appropriate, obtain RICDs and ensure that they do not impact riparian and aquatic habitat.	X	X	
SW B1a. Based on assessments of flow alteration and ecological consequences, quantify instream flow needs in streams with and without instream flow rights. Pursue instream flow rights for streams with inadequate or no instream flow rights.	X	X	
SW B1b. Investigate why CWCB instream flows are not being met and institute appropriate projects to remedy the problems identified.	X	X	
SW B1c. Increase the utilization of tools and funding available to improve instream flows.	X		
SW B1d. Identify stream reaches where irrigation return flows and groundwater recharge provide late summer and fall flows and investigate opportunities to maintain these important sources of supplemental stream flows whenever possible.		X	X
SW B1e. Identify and pursue opportunities for improving natural and artificial water storage to improve low stream flows.	X	X	
SW B1f. Investigate if water conservation translates to environmental benefits under Colorado water law. Pursue opportunities for water conservation, if appropriate.		X	X
SW B1g. Quantify the role of snow making in flow alteration and, where warranted, pursue opportunities for decreasing the environmental impact of snowmaking.	X	X	

Recommended Action	Project/ Program	Study	Legislative/ Regulatory
SW C1a. Ensure that local land use planning requires an adequate technical assessment and legal review of the availability, sustainability, and (as applicable) potability of an adequate water supply for a proposed use prior to the grant of a development approval.			X
SW C1b. Quantify the direct and cumulative effects of changes in land use on surface flows. Incorporate the results in the review of local land use applications and investigate opportunities for mitigation.		X	X
SW C1c. Enhance communication and collaboration between local land use planners and water commissioners.	X		X
SW C1d. Quantify expected proximal stream flow changes associated with a planned development's augmentation plan. Investigate and pursue opportunities for mitigating the impact to these streams within the confines of Colorado water law.		X	X
SW C1e. Evaluate the need for ponds designed for fire mitigation and, where necessary, require that steps be taken to minimize their evaporative losses.		X	X
SW C2a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law.	X	X	
SW C3a. Complete a comprehensive climate impacts assessment on stream flows for the Roaring Fork Watershed.		X	
SW D1a. Support and distribute films, videos, PowerPoint presentations, etc. illustrating local water conditions and issues.	X		
SW D1b. Develop projects such as RFC's River Center, with exhibits to enhance public awareness of the importance of maintaining adequate streams flows in the watershed and the consequences of drought.	X		
SW D1c. Support projects such as the Univ. of Michigan Master's Project Fostering Implementation of the Roaring Fork Watershed Plan. Utilize the Univ. of Michigan Master's Project's recommendations for improving public education and outreach, as appropriate.	X		
SW D1d. Improve education/outreach on the connection between water availability and sustainability and land use planning and design strategies.	X		
SW D1e. Improve education/outreach and opportunities for involvement in mitigating the effects of drought.	X		
SW D1f. Improve education/outreach on the connection between high flows and healthy riparian and instream areas.	X		
SW D1g. Increase awareness of water conservation techniques and the importance of conservation. Identify and implement the most strategic water conservation measures.	X	X	
SW D1h. Improve education on the basis for obtaining and perfecting conditional water rights under Colorado water law.	X		
SW E1a. Utilize the CWCB's 2010 Drought Mitigation and Response Plan and Drought Planning Toolbox.	X		
SW E1b. Work with the CWCB's Office of Water Conservation and Drought Planning to obtain technical assistance and grants to help develop local drought mitigation plans.	X		
SW E1c. Create "shovel-ready" drought-mitigation projects that can be quickly implemented.	X		
SW E1d. Investigate the potential benefits and disadvantages of acquiring small storage water rights that can be delivered for municipal uses in times of need and used to mitigate low stream flows. Pursue a streamlined approval process for landowners, if warranted.		X	X
SW E1e. Investigate opportunities to temporarily loan water to streams using C.R.S. § 37-83-105. Discuss triggering criteria such as low snowpack levels on specific spring dates and draft agreements with critical water rights holders, CDWR Division Engineer, and CWCB that can be quickly implemented when needed.	X	X	
SW E1f. Identify flow and temperature triggers and draft emergency drought fishing regulations.		X	X
SW E2a. Ensure that county and municipal emergency management plans minimize the potential for harmful flooding in developed floodplains.	X	X	
SW E2b. Where feasible, restore the natural function of floodplains.	X	X	
SW E2c. Ensure that the Federal Emergency Management Agency (FEMA) floodplain maps for the watershed used by local jurisdictions are up to date and available digitally for public access.	X		
SW E2d. Develop and enforce local regulations that minimize development in the flood plain.			X
SW E2e. Identify and pursue opportunities to maintain decision makers' and the public's interest in flooding issues after flood events have passed, such as by creating "shovel-ready" flood mitigation projects that can be quickly implemented.	X	X	
GW A1a. Identify all sub-watersheds lacking detailed hydrogeologic information and prioritize the sub-watersheds for study on the basis of threats posed to the groundwater supply. Conduct hydrogeological assessments of all sub-watersheds lacking detailed hydrogeologic information, working collaboratively across sub-watershed jurisdictional boundaries.	X	X	
GW A1b. Ensure that local governments obtain, utilize, and regularly update information from: (i) state well databases, and (ii) onsite wastewater treatment system permitting in their hydrogeological assessments.	X		
GW A1c. Delineate areas of interaction between groundwater and surface water, including quantification and assessment of interaction type. For aquifers that are currently used or have the potential to be used: (i) quantify the water budget, (ii) rate the importance of the aquifers, and (iii) prioritize the need for additional detailed studies that include assessments of water budgets, flows, and water table interactions.		X	
GW A2a. Adopt local regulations, policies, and procedures to ensure that there is a sufficient technical and legal demonstration of the availability and sustainability of an adequate water supply for any new land use or development reliant upon groundwater.			X
GW B1a. Restore major wetlands areas in the watershed.	X		
GW B1b. Identify and protect major wetlands areas in the watershed.	X		X

Recommended Action	Project/ Program	Study	Legislative/ Regulatory
GW B1c. Institute programs to promote water reuse, particularly in areas that are using groundwater beyond its ability to recharge.	X		
GW B1d. Study and pursue opportunities, as appropriate to enhance natural recharge by slowing down sheet runoff and runoff in creeks and recharging potentially good aquifers such as terraces and fans.	X	X	
GW B1e. Quantify the effect of changes in land use and development on groundwater recharge in both rural and urbanized areas of the watershed and disseminate the information to decision makers.		X	
GW B1f. Adopt local regulations, policies and procedures to ensure that the impacts on groundwater recharge are understood and taken into consideration by decision makers in the review and approval of land use applications.			X
GW B1g. Develop and implement a prioritized well-monitoring program for local jurisdictions to allow them to determine trends in groundwater levels, in coordination with ongoing studies.	X	X	
GW B1h. Create and maintain an inventory of groundwater monitoring data and results.	X		
GW B1i. Conduct detailed monitoring of groundwater levels and fluctuations in important wetland and groundwater discharge zones, including collection of information on aquifer thickness and development of parameters and information for development of detailed water budgets and modeling.		X	
GW C1a. Adopt local regulations requiring confirmation of compliance with well permit conditions in connection with land use approvals and building permits.			X
GW C1b. Adopt local policies and procedures for notifying CDWR of any noncompliance with well permit conditions observed in connection with land use approvals and building permits.			X
GW C1c. Assess the need for additional resources in the administration of water rights.		X	
GW C1d. Create maps of the watershed showing the location of exempt and non-exempt wells.	X		
GW D1a. Create and disseminate educational materials on the impact of land use on groundwater resources.	X		
GW D1b. Create maps of groundwater availability in the watershed.	X		
GW D1c. Create and disseminate educational materials on the purpose of augmentation plans associated with new non-exempt wells and the potential for detrimental effects on local streams.	X		
GW D2a. Create summaries of all sub-watershed hydrogeological assessments targeted at the layperson, using a consistent format for all sub-watersheds. Make all summaries available online and publicize their availability.	X		
GW D2b. Create and periodically broadcast local cable television programs discussing the hydrogeological assessments and explaining their importance for understanding groundwater supplies in the Roaring Fork Watershed.	X		
GW D2c. Implement pricing mechanisms that better reflect the true value of a local groundwater supply and that encourage a decrease in usage.	X		X
GW D2d. Develop projects such as the RFC's River Center, with exhibits to enhance public understanding of hydrogeology in the watershed and its relationship to the groundwater supply.	X		
WQ A1a. Convene a Water Quality Working Group to identify monitoring objectives, parameters, and protocols.	X	X	
WQ A1b. Develop and implement a consistent process for analyzing and reporting on water quality monitoring results; build on the RFC's 5-year Water Quality Reports.	X	X	
WQ A1c. Undertake targeted water quality monitoring studies to investigate water quality issues identified through routine water quality monitoring, and to capture the impacts or benefits of developments, projects, or other activities.	X		
WQ A1d. Promote/support a sampling program for groundwater aimed at testing the integrity and water quality impacts of individual onsite wastewater treatment systems.	X		
WQ A1e. Promote/support a sampling program for groundwater and surface waters aimed at testing the water quality impacts of snow dump facilities.	X		
WQ B1a. Investigate and pursue opportunities for reducing water quality impacts from natural salinity.	X	X	
WQ B1b. Identify human-based sediment sources and develop and implement strategies for reducing sediment from those sources.	X	X	
WQ B1c. Incorporate water quality goals into local land use plans and regulations. Treat the maintenance and improvement of water quality as a priority in Master Plans and development approvals.			X
WQ B2a. Assess the adequacy of current water quality standards and recommend modifications.		X	
WQ B2b. Consider the need/process for developing standards for private drinking water supplies.		X	
WQ B2c. Evaluate the implications of securing "outstanding waters" designations for local waterways.		X	
WQ C1a. Provide incentives for the implementation of BMPs in connection with the control of nonpoint source pollution from development sites and activities.			X
WQ C1b. Develop a training program to help communities assess the adequacy of local regulations and land use policies regarding water quality, and the impacts of development on water quality.	X		
WQ C1c. Assess the impacts of agricultural and commercial irrigation on water quality. Mandate/recommend mitigation strategies through local regulation, as warranted.		X	X
WQ C1d. Ensure that local regulations addressing stormwater impact mitigation and BMPs for stormwater management are effective, stringent, and enforced.			X
WQ C1e. Identify and prioritize stormwater mitigation improvement projects in each jurisdiction in each jurisdiction and plan for implementing such projects.	X	X	
WQ C1f. Support state funding to inspect sites and enforce relevant regulations where stormwater management plans are required under WQCD Stormwater Construction General Permits.			X
WQ C1g. Assess current regulation of onsite wastewater treatment systems. Impose more stringent regulations, as warranted. Coordinate with the State of Colorado's plans to revise its regulatory framework.		X	X

Recommended Action	Project/ Program	Study	Legislative/ Regulatory
WQ C1h. Require training and licensing of onsite wastewater treatment system installers, cleaners/pumpers, and inspectors.			X
WQ C1i. Support development of state and local financing mechanisms to provide incentives/assistance to individuals and subdivisions to upgrade or consolidate onsite wastewater treatment systems.			X
WQ C1j. Maintain and publicize information on financial assistance available for upgrades to onsite wastewater treatment systems.	X		
WQ C1k. Investigate the feasibility of creating regional wastewater treatment facilities that would consolidate or incorporate existing scattered onsite wastewater treatment systems and package plants. Pursue opportunities, as appropriate.	X	X	
WQ C1l. Improve opportunities for the use of constructed wetlands as an element of onsite wastewater or stormwater treatment, including the development of performance-based state regulations addressing constructed wetlands for onsite wastewater treatment, and mirroring those regulations at the local level.			X
WQ C1m. Assess surface water and groundwater quality impacts associated with snow dump sites. Ensure that local regulations addressing the location and impacts of snow dumping and runoff from snow dumps are effective, stringent, and enforced.		X	X
WQ C1n. Assess the impacts of magnesium chloride on water quality. Mandate/recommend alternatives/mitigation, as necessary, through local regulation.		X	X
WQ C1o. Support the enforcement of federal and state regulations addressing oil and gas development.			X
WQ C1p. Support disclosure of chemicals used in drilling and fracking and mandatory frack fluid tagging. Encourage owners and operators to use environmentally friendly alternatives. Support scientific studies of fracking impacts on the environment and public health.		X	X
WQ C1q. Ensure that local land use policies and regulations limiting and mitigating the impacts of mining and oil and gas development on water quality are stringent and enforced.			X
WQ C1r. Address and regulate runoff from hazardous sites including mines, landfills, junkyards, and similar locations. Address and regulate the disposal/use of materials from sites potentially contaminated by hazardous materials.			X
WQ C1s. Work with the State of Colorado to identify reclamation sites and work with responsible parties to assure that reclamation of mining sites is adequate and sustainable to mitigate impacts on water quality. Perform additional reclamation work as necessary.	X		
WQ C1t. Work with local emergency and public safety agencies to assure that they are adequately trained and equipped to respond to releases of hazardous materials and spills.	X		
WQ C1u. Support enforcement of streamside camping restrictions and development/enforcement of other recreational use restrictions by the USFS necessary to protect waterways. Work with the USFS to remove/reclaim campsites near rivers and streams.	X		X
WQ C1v. Inventory and protect areas around natural springs.	X		
WQ C1w. Support new and additional funding mechanisms for water technology research and development.			X
WQ C2a. Support the completion of the State Source Water Assessments for the watershed.	X		
WQ C2b. Develop Source Water Protection Plans for all of the major water supply systems in the watershed.	X		
WQ C2c. Implement a private wellhead protection program.	X		
WQ D1a. Upgrade technology and treatment methods at local wastewater treatment facilities as funding and infrastructure allow.	X		
WQ D1b. Investigate the potential for reusing waste products from landfills, wastewater treatment plants, and commercial activities in order to reduce the need for increased treatment capacity at concentrated waste disposal sites.		X	
WQ D1c. Support new and additional funding mechanisms for water technology research and development.			X
WQ E1a. Improve local understanding of the importance of water quality and the relationship between water quality and quantity. Install signs and notices in appropriate areas noting the importance of maintaining water quality.	X		
WQ E1b. Improve the public's understanding of the importance of water quality to public health and safety and to the local lifestyle, economy, and environment, and of the consequences of a degraded or contaminated water supply.	X		
WQ E1c. Educate the public about daily activities that impact water quality and how individuals can modify their behavior and reduce water quality impacts on the watershed.	X		
WQ E1d. Improve local decision makers' understanding of federal, state, and local regulations addressing water quality by creating an illustration of the hierarchy of water quality agencies and regulations in a manner aimed at a lay audience.	X		
WQ E1e. Educate the public about issues surrounding the development of new water technologies, such as nanotechnology-based systems.	X		
WQ E1f. Improve public understanding of the risk of groundwater pollution by creating maps showing areas vulnerable and susceptible to groundwater contamination.	X		
WQ E1g. Implement a stream segment adoption program to facilitate cleanup and monitoring activities. Incorporate the program in school curriculums where possible. Create and publicize a map of “Adopted Streams”.	X		
WQ E1h. Improve public education regarding individual onsite wastewater treatment systems, particularly the need for regular system inspections – not just pumping.	X		
WQ E1i. Educate the public on the benefits of BMPs and encourage public implementation of structural, vegetative, and non-structural BMPs whenever possible. Create incentive programs for voluntary retrofits of residential sites.	X		X

Recommended Action	Project/ Program	Study	Legislative/ Regulatory
WQ F1a. Quantify the needs of our watershed as they relate to water quality. Support and participate in the Non-Consumptive Needs Assessment being carried out by the Colorado Basin Roundtable.		X	
WQ F1b. Ensure that local land use policies and regulations adequately address the water quality impacts of development, and that requisite mitigation measures imposed as conditions of land use approvals are both implemented and enforced.			X
WQ F1c. Monitor and address the impacts of high-use trails on water quality.		X	X
WQ F1d. Ensure that activities aimed at mitigating or responding to pine beetle and other insect infestations and diseases do not generate detrimental water quality impacts.		X	X
WQ F1e. Monitor and address the impacts of climate change on water quality.	X	X	

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RWM A1a. Regularly broadcast educational presentations on federal and state water policies/programs.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A1b. Issue regular press releases from the CBRT, CRWCD, and RWAPA. Include "tie-ins" to the Roaring Fork Watershed whenever possible in press communications.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A1c. Use social networking opportunities to improve communication with respect to meetings, workshops, and other educational opportunities concerning water issues.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A2a. Fund and distribute videos, PowerPoint presentations, brochures, and other media that tell the story of the Roaring Fork Watershed. Exhibit and promote these products as widely as possible.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A2b. Create a graphical tool, or an educational game illustrating the relationship between downstream calls, transmountain diversions, in-basin diversions and flows in the Roaring Fork Watershed. Make this tool available for schools and for presentations on water issues.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A2c. Support projects such as the CRWCD/NWCCOG Q/Q's "It's the Same Water Campaign" and the RFC's River Center, including exhibits to enhance public awareness of complex regional water management issues.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM A2d. Create a portable plumbing model of the Roaring Fork Watershed similar to the NRCS stream trailer.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A2e. Publish and distribute the RWAPA document, "Front Range Water Supply Planning Update: Increased Storage, Increased Demands, Increased Diversions." Translate and graphically represent key findings from this document.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM A2f. Support projects such as the Univ. of Michigan Master's Project, "Fostering Implementation of the Roaring Fork Watershed Plan." Evaluate and utilize recommendations for improving public education and outreach from the Univ. of Michigan Master's Project, as appropriate. Seek opportunities to engage academia in research and implementation projects.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM A3a. Advertise the CBRT meetings and their agendas Include information on subcommittee/working group meetings that are open for public participation.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A3b. Broadcast CBRT meetings and publicize the broadcasts.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A3c. Institute regular reporting to constituents by the Roaring Fork Watershed CBRT representatives in "user friendly" formats.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM A3d. Create a mechanism to capture and relay public comment to the CBRT on issues affecting the Roaring Fork Watershed.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM A3e. Support/fund a touring educational program on regional watershed management issues.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B1a. Appoint a Working Group to study and make recommendations on how the CRWCD can better foster collaboration among its Roaring Fork Watershed Board members.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM B1b. Cultivate collaborative relationships with state and federal water resource experts and decision makers. Look for opportunities for agencies to partner on multi-jurisdictional projects.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B1c. Hold public meetings on significant water issues affecting the Roaring Fork Watershed with CBRT and RWAPA representatives, CRWCD Directors, and local elected officials. Publicize these meetings through various means.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

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RWM B1d. Identify streams in the watershed that may be candidates for federal wild, scenic, and recreational status. Determine community support for a designation and work to meet community goals.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM B1e. Encourage Pitkin County's River Board to publicize its priorities and activities and to take steps to coordinate those activities with local water managers and interest groups.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM B1f. Cultivate collaborative relationships with the entities diverting water from Roaring Fork Watershed to the East Slope. Look for opportunities to partner on creative solutions to meet both East and West Slope water supply requirements.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B1g. Revitalize the Roaring Fork Watershed Collaborative Water Committee as a focal point for regional cooperation and communication.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B2a. Appoint a Working Group to identify mechanisms for consolidating and coordinating the Roaring Fork Valley's involvement in regional water management and to advise local governments on participation in regional water management planning.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RWM B3a. Create a Working Group to investigate and recommend changes to regulations governing augmentation and substitute supply plans that reflect the importance of maintaining natural hydrology in the development of these plans. Pursue regulatory amendments, as necessary, through all appropriate channels.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM B4a. Formalize the existing ad hoc arrangement among the CRWCD, USFS, Pitkin County, City of Aspen and CPW for establishing the annual flow regime for the Twin Lakes exchange and identify the entity(ies) in the watershed responsible for monitoring implementation of the Twin Lakes exchange on behalf of the Western Slope.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B4b. Maintain active participation by Roaring Fork Watershed decision makers in the 10,825 Working Group to ensure that watershed interests are protected and obligations under existing agreements are met.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B4c. Cultivate collaborative relationships with those entities responsible for ensuring an adequate and sustainable water supply for the East Slope. Seek mutually-agreeable solutions to water supply issues whenever possible.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM B5a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM C1a. Periodically conduct watershed explorations for local decision makers.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM C1b. Conduct a periodic retreat for Roaring Fork Watershed decision makers on specific land use and water issues of common interest/concern.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM C1c. Identify and collect all IGAs, MOUs, etc. between/among Roaring Fork Valley jurisdictions with applicability to water issues. Make all such agreements easily accessible to the public online. Analyze those agreements and look for opportunities to consolidate, clarify, or revise those documents to improve interagency collaboration.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM C1d. Identify jurisdictional and substantive gaps on water issues in existing IGAs, MOUs, etc. between/among local jurisdictions in the Roaring Fork Watershed. Recommend and pursue modifications to existing agreements, as well as new agreements, to close identified gaps.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

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RWM C2a. Modify local land use regulations to require referrals to state water commissioners and local fire protection districts during the land use application review phase.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM C2b. Request that local land use planning departments adopt a policy of offering state water commissioners and local fire protection districts an opportunity to participate on any technical advisory/working groups developing amendments to land use regulations and/or forms addressing water resource matters of common interest.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM C2c. Conduct a bi-annual meeting of local land use planners, local fire protection district personnel, and state water commissioners to provide a forum for discussing land use and water resource matters of common interest.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RWM D1a. Improve collaboration among local jurisdictions and key stakeholders to ensure that adequate physical, chemical, and biological data are collected to monitor local climate change and assess its impacts.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM D1b. Improve our decision makers' understanding of the potential impacts of climate change on our water resources.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM D1c. Conduct site-specific research and modeling within the Roaring Fork Watershed to improve projections of the impacts of climate change on the watershed.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM D1d. Review existing master plans in the watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM D1e. Review the existing water-related infrastructure and operational procedures in the Roaring Fork Watershed to identify changes necessary to account for the impact of climate change on the timing and magnitude of stream flows and water usage.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM D1f. Research the impact that climate change may have on the water resource-related economy in the Roaring Fork Watershed.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RWM D1g. Assess the vulnerability of the Roaring Fork Watershed to climate change. Develop an adaptive management strategy that integrates findings from the vulnerability assessment with watershed planning priorities and decision support.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW A1a. At the state and local level, support the funding of research projects designed to address the non-consumptive needs knowledge gap.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW A1b. Work with the CBRT Non-Consumptive Needs Assessment (NCNA) Working Group and the designated NCNA contractors to assess the utility and limitations of the Watershed Flow Evaluation Tool. Evaluate the suitability of other tools/methods developed to provide a regional assessment of ecological risk conditions related to flow and if warranted, revise the regional assessment using the most suitable approach.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW A1c. Ensure that the Colorado River Basin Water Availability Study adequately assesses and addresses the Roaring Fork Watershed's non-consumptive needs, including projected needs with climate alteration.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
SW A1d. Create and maintain an adequate network of stream gages in the watershed.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW A1e. Assess flow alteration in stream reaches where stream gage or modeled data are lacking.	2		2	2	2	3	3		3			3	2	2	2	3	3						

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SW A1f. Conduct site-specific studies of environmental and recreational flows needed for stream reaches that are currently significantly flow-altered or threatened by significant flow alteration. Include an analysis of how often these flows are not met.	1		2	2	2		3	3	3	3	2	3	2	2	2	3	2	3		2	3	2	
SW A1g. Assess the direct and indirect economic consequences associated with non-optimal flows.	3		3		2			2		3								2		3			
SW A1h. Ensure that local land use policies and regulations adequately assess all of the costs and benefits associated with hydropower development and mitigate the impact of hydropower development on other non-consumptive water uses. Ensure that hydropower development is considered and addressed in local Master Plans.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW A1i. Assess potential local and regional recreational and environmental advantages and disadvantages associated with Recreational In-Channel Diversions (RICDs) in the watershed. As appropriate, obtain RICDs and ensure that they do not impact riparian and aquatic habitat.	2				2			2															
SW B1a. Based on assessments of flow alteration and ecological consequences, quantify instream flow needs in streams with and without instream flow rights. Pursue instream flow rights for streams with inadequate or no instream flow rights.	2		2	2	2	3	3		3	3	2	3	2	2	3	3	3	3		2	3	2	
SW B1b. Investigate why CWCB instream flows are not being met and institute appropriate projects to remedy the problems identified.	2		2	2	2															2			
SW B1c. Increase the utilization of tools and funding available to improve instream flows.	2		2	2	2								2	2						2	3	2	
SW B1d. Identify stream reaches where irrigation return flows and groundwater recharge provide late summer and fall flows and investigate opportunities to maintain these important sources of supplemental stream flows whenever possible.	3				3		2	3	3	3	3	3			3	3				2	3	2	
SW B1e. Identify and pursue opportunities for improving natural and artificial water storage to improve low stream flows.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW B1f. Investigate if water conservation translates to environmental benefits under Colorado water law. Pursue opportunities for water conservation, if appropriate.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
SW B1g. Quantify the role of snow making in flow alteration and, where warranted, pursue opportunities for decreasing the environmental impact of snowmaking.	3				3						3				3								
SW C1a. Ensure that local land use planning requires an adequate technical assessment and legal review of the availability, sustainability, and (as applicable) potability of an adequate water supply for a proposed use prior to the grant of a development approval.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW C1b. Quantify the direct and cumulative effects of changes in land use on surface flows. Incorporate the results in the review of local land use applications and investigate opportunities for mitigation.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW C1c. Enhance communication and collaboration between local land use planners and water commissioners.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW C1d. Quantify expected proximal stream flow changes associated with a planned development's augmentation plan. Investigate and pursue opportunities for mitigating the impact to these streams within the confines of Colorado water law.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW C1e. Evaluate the need for ponds designed for fire mitigation and, where necessary, require that steps be taken to minimize their evaporative losses.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

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SW C2a. Investigate existing conditional water rights and determine if the exercise of these water rights would pose a threat to stream flows. Assess and pursue opportunities for securing or modifying the exercise of such rights within the confines of Colorado water law.	2	3	2		3	3		3	3	3		3	3	3	3		2		2	3	3		
SW C3a. Complete a comprehensive climate impacts assessment on stream flows for the Roaring Fork Watershed.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW D1a. Support and distribute films, videos, PowerPoint presentations, etc. illustrating local water conditions and issues.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW D1b. Develop projects such as RFC's River Center, with exhibits to enhance public awareness of the importance of maintaining adequate streams flows in the watershed and the consequences of drought.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW D1c. Support projects such as the Univ. of Michigan Master's Project Fostering Implementation of the Roaring Fork Watershed Plan. Utilize the Univ. of Michigan Master's Project's recommendations for improving public education and outreach, as appropriate.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW D1d. Improve education/outreach on the connection between water availability and sustainability and land use planning and design strategies.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW D1e. Improve education/outreach and opportunities for involvement in mitigating the effects of drought.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW D1f. Improve education/outreach on the connection between high flows and healthy riparian and instream areas.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW D1g. Increase awareness of water conservation techniques and the importance of conservation. Identify and implement the most strategic water conservation measures.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW D1h. Improve education on the basis for obtaining and perfecting conditional water rights under Colorado water law.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E1a. Utilize the CWCB's 2010 Drought Mitigation and Response Plan and Drought Planning Toolbox.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E1b. Work with the CWCB's Office of Water Conservation and Drought Planning to obtain technical assistance and grants to help develop local drought mitigation plans.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SW E1c. Create "shovel-ready" drought-mitigation projects that can be quickly implemented.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E1d. Investigate the potential benefits and disadvantages of acquiring small storage water rights that can be delivered for municipal uses in times of need and used to mitigate low stream flows. Pursue a streamlined approval process for landowners, if warranted.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E1e. Investigate opportunities to temporarily loan water to streams using C.R.S. § 37-83-105. Discuss triggering criteria such as low snowpack levels on specific spring dates and draft agreements with critical water rights holders, CDWR Division Engineer, and CWCB that can be quickly implemented when needed.	3	3	2	3	3															2			
SW E1f. Identify flow and temperature triggers and draft emergency drought fishing regulations.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E2a. Ensure that county and municipal emergency management plans minimize the potential for harmful flooding in developed floodplains.	3				3			2		3									3				
SW E2b. Where feasible, restore the natural function of floodplains.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E2c. Ensure that the Federal Emergency Management Agency (FEMA) floodplain maps for the watershed used by local jurisdictions are up to date and available digitally for public access.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
SW E2d. Develop and enforce local regulations that minimize development in the flood plain.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

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SW E2e. Identify and pursue opportunities to maintain decision makers' and the public's interest in flooding issues after flood events have passed, such as by creating "shovel-ready" flood mitigation projects that can be quickly implemented.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW A1a. Identify all sub-watersheds lacking detailed hydrogeologic information and prioritize the sub-watersheds for study on the basis of threats posed to the groundwater supply. Conduct hydrogeological assessments of all sub-watersheds lacking detailed hydrogeologic information, working collaboratively across sub-watershed jurisdictional boundaries.	2	3	3	3	3		3	3		2	2	2	3	3			3	3		2		2	
GW A1b. Ensure that local governments obtain, utilize, and regularly update information from: (i) state well databases, and (ii) onsite wastewater treatment system permitting in their hydrogeological assessments.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW A1c. Delineate areas of interaction between groundwater and surface water, including quantification and assessment of interaction type. For aquifers that are currently used or have the potential to be used: (i) quantify the water budget, (ii) rate the importance of the aquifers, and (iii) prioritize the need for additional detailed studies that include assessments of water budgets, flows, and water table interactions.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW A2a. Adopt local regulations, policies, and procedures to ensure that there is a sufficient technical and legal demonstration of the availability and sustainability of an adequate water supply for any new land use or development reliant upon groundwater.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
GW B1a. Restore major wetlands areas in the watershed.	3	3	3					3															
GW B1b. Identify and protect major wetlands areas in the watershed.	3	3	3					3															
GW B1c. Institute programs to promote water reuse, particularly in areas that are using groundwater beyond its ability to recharge.	3	3				3																	
GW B1d. Study and pursue opportunities, as appropriate to enhance natural recharge by slowing down sheet runoff and runoff in creeks and recharging potentially good aquifers such as terraces and fans.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW B1e. Quantify the effect of changes in land use and development on groundwater recharge in both rural and urbanized areas of the watershed and disseminate the information to decision makers.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW B1f. Adopt local regulations, policies and procedures to ensure that the impacts on groundwater recharge are understood and taken into consideration by decision makers in the review and approval of land use applications.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW B1g. Develop and implement a prioritized well-monitoring program for local jurisdictions to allow them to determine trends in groundwater levels, in coordination with ongoing studies.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW B1h. Create and maintain an inventory of groundwater monitoring data and results.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW B1i. Conduct detailed monitoring of groundwater levels and fluctuations in important wetland and groundwater discharge zones, including collection of information on aquifer thickness and development of parameters and information for development of detailed water budgets and modeling.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW C1a. Adopt local regulations requiring confirmation of compliance with well permit conditions in connection with land use approvals and building permits.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

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GW C1b. Adopt local policies and procedures for notifying CDWR of any noncompliance with well permit conditions observed in connection with land use approvals and building permits.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
GW C1c. Assess the need for additional resources in the administration of water rights.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW C1d. Create maps of the watershed showing the location of exempt and non-exempt wells.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW D1a. Create and disseminate educational materials on the impact of land use on groundwater resources.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW D1b. Create maps of groundwater availability in the watershed.	3	3	3		3	3	3	3	3	3	3	3			3	3			3	3		3	
GW D1c. Create and disseminate educational materials on the purpose of augmentation plans associated with new non-exempt wells and the potential for detrimental effects on local streams.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW D2a. Create summaries of all sub-watershed hydrogeological assessments targeted at the layperson, using a consistent format for all sub-watersheds. Make all summaries available online and publicize their availability.	3	3	3		3	3	3	3	3	3	3	3			3	3			3	3		3	
GW D2b. Create and periodically broadcast local cable television programs discussing the hydrogeological assessments and explaining their importance for understanding groundwater supplies in the Roaring Fork Watershed.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW D2c. Implement pricing mechanisms that better reflect the true value of a local groundwater supply and that encourage a decrease in usage.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
GW D2d. Develop projects such as the RFC's River Center, with exhibits to enhance public understanding of hydrogeology in the watershed and its relationship to the groundwater supply.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ A1a. Convene a Water Quality Working Group to identify monitoring objectives, parameters, and protocols.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ A1b. Develop and implement a consistent process for analyzing and reporting on water quality monitoring results; build on the RFC's 5-year Water Quality Reports.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ A1c. Undertake targeted water quality monitoring studies to investigate water quality issues identified through routine water quality monitoring, and to capture the impacts or benefits of developments, projects, or other activities.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ A1d. Promote/support a sampling program for groundwater aimed at testing the integrity and water quality impacts of individual onsite wastewater treatment systems.	3		3		3	3	2	3	3	1	3	3	3	3	3	3	3	3	3	3		2	
WQ A1e. Promote/support a sampling program for groundwater and surface waters aimed at testing the water quality impacts of snow dump facilities.	3		3		3		3						3										
WQ B1a. Investigate and pursue opportunities for reducing water quality impacts from natural salinity.	3		3		3	3				3									3	3		3	
WQ B1b. Identify human-based sediment sources and develop and implement strategies for reducing sediment from those sources.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ B1c. Incorporate water quality goals into local land use plans and regulations. Treat the maintenance and improvement of water quality as a priority in Master Plans and development approvals.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ B2a. Assess the adequacy of current water quality standards and recommend modifications.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ B2b. Consider the need/process for developing standards for private drinking water supplies.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

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WQ B2c. Evaluate the implications of securing "outstanding waters" designations for local waterways.	3		3	3									3	3			3		3				
WQ C1a. Provide incentives for the implementation of BMPs in connection with the control of nonpoint source pollution from development sites and activities.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1b. Develop a training program to help communities assess the adequacy of local regulations and land use policies regarding water quality, and the impacts of development on water quality.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1c. Assess the impacts of agricultural and commercial irrigation on water quality. Mandate/recommend mitigation strategies through local regulation, as warranted.	3				3	3	3	3	3	3	3	3			3	3				3	3	3	
WQ C1d. Ensure that local regulations addressing stormwater impact mitigation and BMPs for stormwater management are effective, stringent, and enforced.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	urban areas, post construction
WQ C1e. Identify and prioritize stormwater mitigation improvement projects in each jurisdiction in each jurisdiction and plan for implementing such projects.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1f. Support state funding to inspect sites and enforce relevant regulations where stormwater management plans are required under WQCD Stormwater Construction General Permits.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1g. Assess current regulation of onsite wastewater treatment systems. Impose more stringent regulations, as warranted. Coordinate with the State of Colorado's plans to revise its regulatory framework.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1h. Require training and licensing of onsite wastewater treatment system installers, cleaners/pumpers, and inspectors.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1i. Support development of state and local financing mechanisms to provide incentives/assistance to individuals and subdivisions to upgrade or consolidate onsite wastewater treatment systems.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1j. Maintain and publicize information on financial assistance available for upgrades to onsite wastewater treatment systems.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1k. Investigate the feasibility of creating regional wastewater treatment facilities that would consolidate or incorporate existing scattered onsite wastewater treatment systems and package plants. Pursue opportunities, as appropriate.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1l. Improve opportunities for the use of constructed wetlands as an element of onsite wastewater or stormwater treatment, including the development of performance-based state regulations addressing constructed wetlands for onsite wastewater treatment, and mirroring those regulations at the local level.	3		3		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1m. Assess surface water and groundwater quality impacts associated with snow dump sites. Ensure that local regulations addressing the location and impacts of snow dumping and runoff from snow dumps are effective, stringent, and enforced.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1n. Assess the impacts of magnesium chloride on water quality. Mandate/recommend alternatives/mitigation, as necessary, through local regulation.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ C1o. Support the enforcement of federal and state regulations addressing oil and gas development.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

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WQ C1p. Support disclosure of chemicals used in drilling and fracking and mandatory frack fluid tagging. Encourage owners and operators to use environmentally friendly alternatives. Support scientific studies of fracking impacts on the environment and public health.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ C1q. Ensure that local land use policies and regulations limiting and mitigating the impacts of mining and oil and gas development on water quality are stringent and enforced.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ C1r. Address and regulate runoff from hazardous sites including mines, landfills, junkyards, and similar locations. Address and regulate the disposal/use of materials from sites potentially contaminated by hazardous materials.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1s. Work with the State of Colorado to identify reclamation sites and work with responsible parties to assure that reclamation of mining sites is adequate and sustainable to mitigate impacts on water quality. Perform additional reclamation work as necessary.	3		3										3						3		3		
WQ C1t. Work with local emergency and public safety agencies to assure that they are adequately trained and equipped to respond to releases of hazardous materials and spills.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1u. Support enforcement of streamside camping restrictions and development/enforcement of other recreational use restrictions by the USFS necessary to protect waterways. Work with the USFS to remove/reclaim campsites near rivers and streams.	3		3											3	3		3		3				
WQ C1v. Inventory and protect areas around natural springs.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C1w. Support new and additional funding mechanisms for water technology research and development.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ C2a. Support the completion of the State Source Water Assessments for the watershed.	3		3	3	3	3	3	3	3	3	3		3	3	3			3	3	3	3	3	
WQ C2b. Develop Source Water Protection Plans for all of the major water supply systems in the watershed.	3		3	3	3	3	3	3	3	3	3		3	3	3			3	3	3	3	3	
WQ C2c. Implement a private wellhead protection program.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ D1a. Upgrade technology and treatment methods at local wastewater treatment facilities as funding and infrastructure allow.	3		3		3	3		3		3									3	3			
WQ D1b. Investigate the potential for reusing waste products from landfills, wastewater treatment plants, and commercial activities in order to reduce the need for increased treatment capacity at concentrated waste disposal sites.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ D1c. Support new and additional funding mechanisms for water technology research and development.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1a. Improve local understanding of the importance of water quality and the relationship between water quality and quantity. Install signs and notices in appropriate areas noting the importance of maintaining water quality.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1b. Improve the public's understanding of the importance of water quality to public health and safety and to the local lifestyle, economy, and environment, and of the consequences of a degraded or contaminated water supply.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1c. Educate the public about daily activities that impact water quality and how individuals can modify their behavior and reduce water quality impacts on the watershed.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

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WQ E1d. Improve local decision makers' understanding of federal, state, and local regulations addressing water quality by creating an illustration of the hierarchy of water quality agencies and regulations in a manner aimed at a lay audience.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1e. Educate the public about issues surrounding the development of new water technologies, such as nanotechnology-based systems.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1f. Improve public understanding of the risk of groundwater pollution by creating maps showing areas vulnerable and susceptible to groundwater contamination.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1g. Implement a stream segment adoption program to facilitate cleanup and monitoring activities. Incorporate the program in school curriculums where possible. Create and publicize a map of "Adopted Streams".	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ E1h. Improve public education regarding individual onsite wastewater treatment systems, particularly the need for regular system inspections – not just pumping.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
WQ E1i. Educate the public on the benefits of BMPs and encourage public implementation of structural, vegetative, and non-structural BMPs whenever possible. Create incentive programs for voluntary retrofits of residential sites.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ F1a. Quantify the needs of our watershed as they relate to water quality. Support and participate in the Non-Consumptive Needs Assessment being carried out by the Colorado Basin Roundtable.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ F1b. Ensure that local land use policies and regulations adequately address the water quality impacts of development, and that requisite mitigation measures imposed as conditions of land use approvals are both implemented and enforced.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
WQ F1c. Monitor and address the impacts of high-use trails on water quality.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
WQ F1d. Ensure that activities aimed at mitigating or responding to pine beetle and other insect infestations and diseases do not generate detrimental water quality impacts.	3		3	3	3				3								3						
WQ F1e. Monitor and address the impacts of climate change on water quality.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI A1a. Convene a Riparian/Instream Working Group to develop a riparian/instream monitoring program.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B1a. Working with landowners, resource experts, and other interested parties, plan and implement riparian/ instream protection and restoration projects.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RI B1b. On an ongoing basis, reassess the Colorado Natural Heritage Program's Potential Conservation Areas for changes in resource conditions or management needs.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B1c. Assess greenbelts/greenways as effective tools for protecting riparian areas in the watershed and pursue, as appropriate.	3		3		3	3		3		3			3					3	3	3			
RI B1d. Research wetland mitigation banks and work to expand such a program, if warranted.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B1e. Investigate regional planning mechanisms available for protection of riparian areas and funding available to support such a regional effort.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B1f. Support state and federal tax credits for donations of conservation easements. Investigate additional tax incentives for such donations; work with interested parties on adoption of new incentives.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B2a. Using the results of the watershed-specific Bird Index of Biotic Integrity, implement habitat improvement projects.	3		3			3		3		3				3				3	3	3		3	

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RI B2b. Determine the potential impact of climate change on riparian-dependent wildlife.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B2c. Proactively develop the NEPA documentation necessary to relocate beavers to federal lands. Implement projects that promote beaver activity.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B2d. In conjunction with local land use approvals, require the design and execution of site-specific adaptive management plans to evaluate and minimize the impacts of development on riparian areas.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RI B2e. Inventory and maintain or increase the population size and range of plant species and communities of concern, as appropriate.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B3a. Determine the optimum number and distribution of CRCT populations and implement projects that work toward achieving this goal.	2		2	2					2		2		2	2	2	2	2		2		2	2	
RI B3b. Conduct fish surveys above natural and man-made barriers to determine if there are additional populations of CRCT in the watershed. Increase/institute monitoring of all identified CRCT populations.	3		3	3					3		3		3	3	3	3	3		3		3	3	
RI B3c. Study the potential effects of climate change on CRCT populations.	3		3	3					3						3	3	3		3		3	3	
RI B4a. Monitor wild, naturally-reproducing fish populations (including non-game fish) and conduct spawning surveys.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B4b. Identify, protect, and restore important trout spawning habitat. In areas of high spawning importance, evaluate seasonal closures and, if warranted, implement closures.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B4c. Follow the "Range-wide Conservation Agreement and Strategy for Bluehead Sucker and Flannelmouth Sucker".	3							3		3										3			
RI B4d. Determine the effect of stream temperature on wild, naturally-reproducing fish species distribution and initiate actions to ensure that threshold temperatures are not exceeded.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B4e. Inventory road/stream crossings and improve fish passage, as needed.	3		3	3	3	3	3	3	3	3	2	3	3	3	3	3	2	2	3	3	2	3	
RI B4f. Improve education regarding methods to reduce whirling disease transmission.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B4g. Address the problem of illegal introduction of fish in the watershed through education and regulatory initiatives.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B5a. Monitor key amphibian populations to determine their status.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B5b. Restore important amphibian habitats and, if appropriate, pursue opportunities for the reintroduction of species.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B5c. Study the potential impact of climate change on amphibian populations.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B5d. Survey potential boreal toad habitats to determine if additional populations exist in the watershed.	3		3	3									3	3	3	3	3		3		3		
RI B5e. Increase awareness of the dangers to toad populations associated with Chytridiomycosis fungus transmission.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI B5f. Follow the Conservation Plan and Agreement for the Management and Recovery of the Southern Rocky Mountain Population of the Boreal Toad.	3		3	3									3	3	3		3		3		3		
RI C1a. Evaluate and address the impacts of riparian alteration/disturbance on native riparian-dependent wildlife and plant species and communities of concern and native wildlife species.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI C1b. Investigate the effects of acute and chronic sediment pulses on aquatic ecosystems, differentiating between natural and human-influenced sources of sediment.	3					3												3	3	3	3		

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RI C1c. Develop and implement Best Management Practices (BMPs) for instream projects that minimize sedimentation and turbidity to reduce impacts to spawning fish movement, incubating eggs and fry, and spawning habitat.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI C1d. Implement Travel Management Plan for the White River National Forest, including closing, obliterating, and signing select roads.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI C1e. Develop and enforce stream setbacks that protect riparian areas throughout the watershed.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RI C1f. Inventory developed and dispersed recreation sites, trails, and access points and assess their impacts on riparian and instream areas; work to reduce impacts. Minimize the impact of new recreational sites, access points, and trails on riparian and instream areas.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI C1g. Prevent or mitigate riparian and instream impacts associated with agricultural activities.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI C1h. Minimize instream impacts and improve fish habitat by reengineering instream structures intended to move water into headgates.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI C1i. Restore riparian and instream areas impacted by historical mining activities.	3		3								3								3	3	3		
RI C1j. Ensure that oil and gas development does not adversely impact riparian and instream areas.	3										3								3	3	3		
RI C1k. Work to minimize/mitigate the effects of bridges on riparian and instream habitat.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI D1a. Provide education to the public about the important functions of riparian areas, development and other threats to riparian areas, what can be done to protect and restore riparian areas, and potential sources of funding for riparian projects.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RI D1b. Develop the RFC's River Center, with its exhibits on the importance of riparian and instream areas to the watershed.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RI D1c. Provide publicity, tours, and interpretation of riparian and instream restoration projects.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI D1d. Involve the public in restoration projects.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI E1a. Convene an Invasive Species Task Force.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RI E1b. Work with local jurisdictions' weed boards, the USFS, BLM, MSCD, and private land owners to eradicate/control invasive plant species that are a significant concern, particularly adjacent to riparian areas and along roads.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
RI E2a. Research and survey the Didymo algae to determine the cause of its rapid spread, the ecological implications, and possible methods of control.	3									3	3							3		3			
RI E2b. Improve our understanding of the economic and ecological consequences of ANS invasion and the methods for preventing the spread of such species. Provide education on the spread of ANS.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
RI E2c. Implement invasive species inspection/monitoring programs. Require proper cleaning and disinfection of boats and construction equipment used in watercourses.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

6. Implementation

I. Potential Implementation Strategies

Implementation of an ambitious and far-reaching plan such as this one is a long-term enterprise, one that must rely on partnership and persistence by those who are committed to a healthier watershed. Many agencies, governments, nonprofit organizations, private entities, and individuals will have a role to play in implementation, and the ability to carry out their implementation responsibilities will vary according to their resources, their priorities, and the individuals involved. Implementation is not going to be a perfectly coordinated, predictable, and orderly process. It will be intermittent, opportunistic, and sometimes messy. The key to successful implementation is going to be a willingness to push forward with implementation measures as opportunities arise, in spite of the unknowns, unintended consequences, and inevitable setbacks that will arise.

The sponsors of this Plan were fortunate to have the assistance of a team of graduate students from the University of Michigan who chose a study of the Roaring Fork Watershed's implementation options as a project .The study was extensive and included local interviews and documentation of 20 different watershed plans elsewhere in the Western United States. The study, *Fostering Implementation of the Roaring Fork Watershed Plan*, provides a wealth of examples, resources, and insight and provides an invaluable starting point for discussing the practical aspects of implementation. The study found the following values and characteristics to be common among successful watershed plans:

Diverse representation
Information sharing
Joint fact finding
Building partnerships and inter-jurisdictional relationships
Buy-in from the watershed and participants
Educational initiatives
Tailored roles for partners

The University of Michigan study also made the following specific recommendations, related to the above values, for local application:

Recommendation #1: Establish a Memorandum of Understanding between partner organizations
Recommendation #2: Trust and relationship-building
Recommendation #3: Pursue an initial voluntary project
Recommendation #4: Think creatively about solutions
Recommendation #5: Pursue varied funding opportunities
Recommendation #6: Continue and expand upon existing education programs
Recommendation #7: Research and evaluate education efforts
Recommendation #8: Consider a broad spectrum of education techniques

Those involved with implementation should keep these recommendations in mind as they move ahead with various aspects of the Plan.

Responsibility for implementation of the Watershed Plan will necessarily fall to a variety of organizations and government agencies. Coordinating Entities and Key Participants in the implementation of the recommendations are shown in the matrices and could change in the future. To recognize the benefits of a watershed plan these designations assume an increased focus on coordination and collaboration.

There has been extensive discussion between the authors of this Plan and other interested parties about whether or not a new entity should be created and charged with overall responsibility for Plan implementation. There has been a general reluctance to create yet another multi-jurisdictional entity in the Valley (the Roaring Fork Transportation Authority, the Northwest Colorado Council of Governments, and various special districts have been identified as examples) because it would take resources that could be put towards projects and use them to establish yet another bureaucratic entity. That entity, even if built on an established *ad hoc* group, such as the Watershed Collaborative Water Committee, would take resources to set up and run and would then need to establish itself as a representative of the Plan and a participant in local water management decision making. There has also been a recognition that the Valley-wide water management and advocacy agencies currently in place, such as the Ruedi Water and Power Authority, the Colorado River Water Conservation District, and Roaring Fork Conservancy, do not currently have the resources, geographic focus, buy-in of all stakeholders, nor organizational direction that would position them individually as ideal custodians of the Plan.

Despite the uncertainty about the specific mechanisms that will drive implementation, the Plan is being introduced to local governments and other agencies on the premise that much can be done to effect implementation by the stakeholders already in place. As implementation by various entities goes forward, the need for a long-term implementation structure and the ideal form of that structure will be clarified.

II. Potential Grant and Other Opportunities for Funding Implementation of the Roaring Fork Watershed Plan's Recommended Actions

Funding for project implementation was the most often cited challenge of watershed groups in *Fostering Implementation of the Roaring Fork Watershed Plan*. Although grant writing and administration can be daunting tasks, these funding sources provide the best opportunity to bring new resources to bear on local projects. One of the impediments to some grant funding in the past has been the absence of a comprehensive watershed plan in the Roaring Fork Valley. This Plan will provide an avenue to those previously unavailable funding sources.

SPECIFIC GRANT, FELLOWSHIP & OTHER PROGRAMS[1]

- **Adolph Coors Foundation.** The Adolph Coors Foundation.
  - Eligible Applicants: 501(c)(3) organizations. Organization must be in operation for at least one year.
  - Deadlines/Grant Cycle: Grant request deadlines are March 1, July 1, and November 1.
  - $$ Range: No minimum/maximum grant amounts specified.
  - Application Process: Submit a proposal in accordance with the guidelines available online.
  - Projects/Programs of Interest: Areas of interest include science education.

- **Ben & Jerry's Foundation (National Grassroots Grant Program).** http://www.benandjerrysfoundation.org/what-we-do.html.
  - Eligible Applicants: Grassroots, constituent-led, 501(c)(3) organizations using community-organizing strategies to accomplish their goals, or organizations providing technical support/resources to such entities. The Foundation generally funds organizations with budgets of $500,000 or less.
  - Deadlines/Grant Cycle: Grant requests can be submitted at any time. Letters of Interest/Inquiry ("LOIs") are considered on a rolling basis and reviewed within thirty days of submission. Full grant reviews occur nine times per year.
  - $$ Range: Up to $15,000 for a one-year period.
  - Application Process: Submit a one-page LOI in accordance with the guidelines available online. Organizations selected for further consideration will be requested to submit a full proposal within one year.
  - Projects/Programs of Interest: The Program funds environmental protection, among other activities. General operating support and project support grants are available. Grants are *not* available for research projects, among other specified activities.

- **Captain Planet Foundation.** Apply for Grants | Captain Planet Foundation.
  - Eligible Applicants: Tax exempt organizations.

[1] This summary was prepared in December of 2010. Due to changing program priorities and economic conditions, as well as the lack of currency of some program websites, all information should be verified at the time a decision is made to pursue any of the identified grant opportunities. Additionally, many grants require an applicant to provide some level of matching funds and/or in-kind contribution. The accounting requirements for acceptable matching funds and value-in-kind can be complex, and therefore typically have not been covered in this summary of programs and other opportunities.

- Deadlines/Grant Cycle: Deadlines are March 31, June 30, September 30, and December 31. Proposals are reviewed over a three-month period from the submission deadline. Applicants are notified of decisions within four months of proposal submission.
- $$ Range: Generally $250 - $2,500. "Adopt-a-stream" grants cannot exceed $400.
- Application Process: Online application.
- Projects/Programs of Interest: The Foundation funds projects that:
  - Promote understanding of environmental issues,
  - Focus on hands-on involvement,
  - Involve children and young adults, ages 6-18,
  - Promote interaction and cooperation within the group,
  - Help young people develop planning and problem solving skills, and
  - Include adult supervision.

❖ **Colorado Conservation Trust (Future Conservation Leaders Fellowships).** http://coloradoconservationtrust.org/programs/future-conservation-leaders-fellowship/. The Future Conservation Leaders Fellowship program places emerging conservation professionals with qualified conservation organizations for a two-year term. The program matches individuals with leading organizations that can meaningfully advance their work with the addition of a highly qualified staff member.

❖ **Colorado River Water Conservation District**. http://www.crwcd.org/page_193.
- Eligible Applicants: Guidelines available after December 1, 2010.
- Deadlines/Grant Cycle: Applications for the 2011 Grant Program must be submitted between December 1, 2010 and January 31, 2011.
- $$ Range: Grant program has $250,000 of funding available. A maximum of $150,000 (or 25% of the total project cost, whichever is less) can be awarded for a water supply project.
- Application Process: Online application packet.
- Projects/Programs of Interest: Guidelines available after December 1, 2010. Program focuses on:
  - Developing new water supplies,
  - Improving existing water supply projects,
  - Improving water use efficiency,
  - Improving water quality,
  - Improving sediment control,
  - Undertaking a watershed action,
  - Implementing tamarisk control, and
  - Protecting pre-1922 Colorado River Compact water rights.

❖ **Community Office for Resource Efficiency (CORE)**. Grants.
- Eligible Applicants: Private and nonprofit organizations, governmental entities, and individuals residing or working in the Roaring Fork Valley.
- Deadlines/Grant Cycle: Green Key Grants are awarded annually. Other grants are awarded on a rolling basis.
- $$ Range: Series of grants available for projects of local or regional significance in the Roaring Fork Valley: (i) Green Key Grants ($5,000-$250,000), (ii) Community Grants ($2,500-$10,000), (iii) Mini-Grants (<$2,500), (iv) Design Assistance Grants, and (v) Microhydro Feasibility Grants.

- Application Process: Applicants are encouraged to contact CORE to discuss their project prior to submitting an application. Applications and guidelines available online for all but the Microhydro Feasibility Grant.
- Projects/Programs of Interest: Varies by type of grant. Projects generally should promote research efficiency and sustainability. Green Key Grants may specifically be awarded for water conservation projects. Priority may be given to projects which benefit residents of Pitkin County.

❖ **El Pomar Foundation.** http://elpomar.org/what-we-do/grants.
- Eligible Applicants: Colorado nonprofit organizations and activities taking place in Colorado.
- Deadlines/Grant Cycle: Grant requests can be submitted at any time. The Foundation's Board of Trustees meets at regular intervals throughout the year to review grant requests.
- $$ Range: Capital grant requests cannot exceed $50,000. No maximum/minimum dollar amounts set for other types of grants.
- Application Process: No set form. Guidelines for grant applications are available online. Additionally, in 2011, each of the Foundation's nine Regional Councils can provide up to $200,000 in grant recommendations to the Board of Trustees.
- Projects/Programs of Interest: This is a general purpose foundation. Grants are available across a broad spectrum of areas, including education and community initiatives. Grants are *not* available for research projects/studies, media projects, conferences/meetings/seminars, among other activities.

❖ **The Environment Foundation.** (Aspen Skiing Company employee organization, in collaboration with the Aspen Skiing Company Family Fund and the Aspen Community Foundation). http://www.aspensnowmass.com/environment/foundation/foundation.cfm.
- Eligible Applicants: Private or nonprofit organizations, government agencies, or individuals. The Foundation is most interested in funding organizations that identify and work on root causes of problems, with a commitment to long-term change.
- Deadlines/Grant Cycle: Application deadlines for grant cycles post 2010 are not available. The Foundation's website should be consulted.
- $$ Range: It is suggested that grant requests not exceed $15,000. Requests for < $8,000 are more likely to be funded.
- Application Process: Email the Executive Director of the Foundation for an application, Grantmaking Guidelines and Selection Criteria.
- Projects/Programs of Interest: Funding is available for projects that improve or protect the Roaring Fork Valley environment. Support is available for environmental education, and projects that seek to reduce the impacts of climate change, foster responsible stewardship of natural resources, protect mountain ecosystems, or preserve and create unique opportunities for outdoor recreation. Projects must be innovative, have measurable results, and reflect a community or regional need.

❖ **The Harris Foundation.** http://www.harrisfoundation-nevada.com/index.htm.
- Eligible Applicants: 501(c)(3) organizations.
- Deadlines/Grant Cycle: Contact the Foundation for the next annual deadline for submission of an LOI and any subsequent grant application.
- $$ Range: $6,000 or less.
- Application Process: Submit an LOI in accordance with the guidelines available online prior to submission of any proposal.

- Projects/Programs of Interest: Environmental conservation and educational programs, among other activities. Areas of support include: environmental educational camps, animal field research, protection of natural resources and wildlife sanctuaries, and documentaries/videos/community outreach in the area of conservation education. Operational support is *not* available.

❖ **Laura Jane Musser Fund (Environmental Initiative Program – Environmental Stewardship).** http://www.musserfund.org/index.asp?page_seq=11.
- Eligible Applicants: 501(c)(3) organizations, organizations that are forming (if sponsored by a 501(c)(3) organization), local governments, organizations in the U.S. serving the U.S. population.
- Deadlines/Grant Cycle: Applications under the Environmental Initiative Program are due March 23, 2011. Funding decisions will be announced in June 2011.
- $$ Range: Up to $35,000.
- Application Process: Guidelines for grant applications are available online.
- Projects/Programs of Interest: Consensus-based environmental stewardship projects/programs in rural areas in their first three years (may be in the planning or implementation phase).

❖ **Liz Claiborne – Art Ortenberg Foundation.** http://lcaof.org/.
- Eligible Applicants: The Foundation's Program Director or Coordinator should be consulted.
- Deadlines/Grant Cycle: No submittal deadlines indicated. The Foundation's Program Director or Coordinator should be consulted.
- $$ Range: Historically, most grants have exceeded $10,000. The Foundation's Program Director or Coordinator should be consulted.
- Application Process: General guidelines for grant applications are available online. The Foundation's Program Director or Coordinator should be consulted for further details.
- Projects/Programs of Interest: Grants are available for western conservation.

❖ **Lorrie Otto Seeds for Education Grant Program.** http://www.for-wild.org/seedmony.html.
- Eligible Applicants: Schools, nature centers, and other non-profits that are learning centers and that have a site available for a stewardship project. Entities such as libraries, churches, and government agencies are eligible, subject to youth participation. Successful non-school applicants are typically a partnership between a site owner and a youth group.
- Deadlines/Grant Cycle: Applications are due October 15. Notification of grant awards will be made by February 15 of the subsequent year.
- $$ Range: $100 - $500. Successful projects are also eligible for discounts on seeds and plants from nursery partners.
- Application Process: Grant application available online.
- Projects/Programs of Interest: Grants are available for enhancement and development of an appreciation for native plants and native plant communities. Projects must emphasize student and volunteer involvement and increase the educational value of the project site. Examples of appropriate projects include development of a wetland area to study the effect of native vegetation on water quality, and planting native shrubs and trees that support birds and other wildlife.

❖ **Maki Foundation.** http://makifoundation.org/index.html.
- Eligible Applicants: 501(c)(3) organizations. The Foundation generally looks for small organizations. Many of its grantees are grassroots groups with a focus on activism and policy

change, particularly in the area of public lands management. Groups with annual budgets > $1 million are rarely funded.

- Deadlines/Grant Cycle: Proposals must be received by May 1 to be considered at the Board of Directors' annual meeting. Awards are announced by September 15.
- $$ Range: Typically grants range from $1,000 - $10,000.
- Application Process: New applicants need to contact Maki Foundation staff to discuss their organization and proposal before submitting a full application; alternatively, a one-page LOI may be submitted. The full grant application packet is available online.
- Projects/Programs of Interest: The Foundation is concerned with protection and preservation of the Rocky Mountain West's remaining wild lands, rivers, and wilderness, as well as the wildlife dependent on these lands. Its priorities are:
  - Wilderness and wild lands protection,
  - River and wetlands conservation,
  - Biological diversity conservation, and
  - Public lands management.

  Grants for general support will be considered, in addition to grants for specific projects.

❖ **National Fish and Wildlife Foundation.** A series of initiatives/programs are available, including the **Keystone Initiatives Program** (http://www.nfwf.org/Content/NavigationMenu/GrantPrograms/ProgramsOverview/Keystones/default.htm), and the two Programs described in more detail below.

- **Five Star Restoration Grant Program (2011).** http://www.nfwf.org/AM/Template.cfm?Section=Charter_Programs_List&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=60&ContentID=17901.
  - Eligible Applicants: Open to any public or private entity that can receive grants. Projects must include at least five organizations. Although partnerships are encouraged to include state and federal agencies, those entities may not serve as the grantee unless the community partners demonstrate that the state or federal agency is best suited to coordinate the community-based project.
  - Deadlines/Grant Cycle: February 14, 2011.
  - $$ Range: In general, smaller-scale, one-year projects will be eligible for grants $10,000 – $25,000. Two-year, larger-scale projects will be eligible for grants $10,000 – $40,000. The average grant award anticipated is $20,000 – $25,000. Limited funding available for rural Colorado.
  - Application Process: Application and guidelines are available online.
  - Projects/Programs of Interest: Projects must (i) include on-the-ground wetland, riparian, in stream and/ or coastal habitat restoration, (ii) integrate meaningful education into the restoration project either through community outreach, participation and/or integration with K-12 environmental curriculum, and (iii) result in measurable ecological, educational and community benefits.
- **Private Landowner Technical Assistance Program.** http://www.nfwf.org/AM/Template.cfm?Section=Charter_Programs_List&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=60&ContentID=18515.
  - Eligible Applicants: Non-profit 501(c) (3) organizations, educational institutions, tribes, and state or local units of governments (*e.g.,* state conservation agencies, counties, townships, cities, conservation districts, utility districts, drainage districts, etc.). Individuals, federal government agencies, and for-profit firms are not eligible.

- Deadlines/Grant Cycle: February 15, 2011.
- $$ Range: Typically grants range from $40,000 - $300,000.
- Application Process: Application and guidelines are available online.
- Projects/Programs of Interest: The program is a partnership with the NRCS to support field biologists and other habitat professionals (botanists, ecologists, foresters, etc.) working with NRCS field offices in providing technical assistance to farmers, ranchers, foresters, and other private landowners to optimize wildlife conservation on private lands.

❖ **National Forest Foundation.** http://nationalforests.org/conserve/grantprograms/whichprogram.
- Eligible Applicants: Varies, depending upon the type of funding sought. Includes collaborative community-based organizations and nonprofits.
- Deadlines/Grant Cycle: Varies by type of grant. Not all categories of grants are currently being funded.
- $$ Range: Varies by type of grant. Awards may be a few thousand dollars to >$100,000.
- Application Process: Varies by type of grant. Grant application packets available online.
- Projects/Programs of Interest: Grants can be awarded for a range of "On the Ground Programs" (*e.g.*, Matching Awards Program, Ski Conservation Fund) and "Capacity Building Programs" (*e.g.*, Collaboration Support Program). For example, the Matching Awards Program makes funding available for conservation/restoration projects on or adjacent to National Forest lands (including watershed health and restoration).

❖ **New Belgium Brewing Company**. http://www.newbelgium.com/Community/local-grants.aspx.
- Eligible Applicants: 501(c)(3) organizations.
- Deadlines/Grant Cycle: Information is not available post 2010. The company's website should be consulted.
- $$ Range: Small grants range from $500 - $5,000. The company will also partner with select nonprofits for capacity building and program support.
- Application Process: Online application form. Most applications are processed within three months.
- Projects/Programs of Interest: Areas of interest include both water stewardship and youth environmental education. Both project and program support is available.

❖ **Patagonia**. http://www.patagonia.com/us/patagonia.go?assetid=2942.
- Eligible Applicants: 501(c)(3) organizations. The company is interested in small, grassroots activist organizations with provocative direct-action agendas, working on multi-pronged campaigns that produce measurable results.
- Deadlines/Grant Cycle: Environmental Grants - applications to a retail store may be submitted at any time. Applications at the corporate level must be submitted by April 30 or August 31 to be considered. Applications received in April will be responded to in August. Applications received in August will receive a response in January of the following year. World Trout Initiative – no deadlines specified.
- $$ Range: Environmental Grants - most grants are in the range of $3,000 - $8,000. World Trout Initiative – typically grants range from $5,000 - $15,000.
- Application Process: Applicants should complete the online eligibility quiz for the grant program they are interested in. Qualifying applicants will be directed to an online grant application form.
- Projects/Programs of Interest: There are two grant programs:

- Environmental Grants – Funding is available for projects/programs to preserve and protect the environment, including projects/programs to protect local habitat. The company does *not* fund general environmental education or research that is not in direct support of a developed plan for specific action to alleviate an environmental problem, among other activities.
- World Trout Initiative – funding is available for work to protect various species of fish and their habitats, particularly projects/programs designed to work on the root causes of a problem and that approach the issues with a commitment to long-term change.

The company likes to support projects that force the government to abide by the law.

❖ **Pitkin County Healthy Rivers and Stream Fund.** Healthy Rivers and Streams | Pitkin County, Colorado.

- Eligible Applicants: No guidelines available. Contact the Pitkin County Attorney's Office for information.
- Deadlines/Grant Cycle: No guidelines available. Contact the Pitkin County Attorney's Office for information.
- $$ Range: No guidelines available. Contact the Pitkin County Attorney's Office for information.
- Application Process: No guidelines available. Contact the Pitkin County Attorney's Office for information.
- Projects/Programs of Interest: No guidelines available. Contact the Pitkin County Attorney's Office for information. Objectives of the Fund are:
  - Maintaining and improving water quality and quantity within the Roaring Fork watershed;
  - Purchasing, adjudicating changes of, leasing, using, banking, selling, and protecting water rights for the benefit of the Roaring Fork watershed;
  - Working to secure, create, and augment minimum stream flows in conjunction with non-profits, grant agencies, and appropriate State and Federal agencies to ensure ecological health, recreational opportunities, and wildlife and riparian habitat;
  - Promoting water conservation; and
  - Improving and constructing capital facilities that contribute to the objectives listed above.

❖ **Save the Colorado River Campaign.** http://www.savethecolorado.org/grants.php#apply**.**

- Eligible Applicants: 501(c)(3) environmental organizations working in the Colorado River basin and areas using Colorado River water.
- Deadlines/Grant Cycle: Annual grant cycle. Grant applications should be submitted between June 1, 2011 and June 30, 2011 for 2011. Decisions for 2011 will be made in August 2011.
- $$ Range: $2,500 - $25,000.
- Application Process: Online application.
- Projects/Programs of Interest:
  - Efforts that raise public awareness about the threats to the Colorado River and its water supplies;
  - Efforts that promote water conservation, or change public policy about water conservation in cities that receive Colorado River water; and
  - Efforts that protect and enhance the ecological health and biodiversity of the Colorado River and its tributaries, including but not limited to addressing the threats of new diversions and dams, mitigating past diversions and dams, and securing instream flows.

❖ **Smart Wool Advocacy Fund.** https://www.smartwool.com/default.cfm#/Smartprint/Advocacy/.

- Eligible Applicants: 501(c)(3) organizations.
- Deadlines/Grant Cycle: Applications must be submitted by March 1 for consideration at the April 1 meeting. Notification of decisions is made approximately six weeks after review.
- $$ Range: $500 -$5,000.
- Application Process: Submit a proposal in accordance with the guidelines available online.
- Projects/Programs of Interest: Funding is available for special programs/projects as well as general operating expenses of organizations that encourage responsible outdoor activity participation for youths age 18 and under, while promoting environmental stewardship. Strong grassroots characteristics (including volunteer and citizen involvement) to create long-term social change are important considerations for funding.

❖ **State of Colorado.**

- **Colorado Fish and Wildlife Resources Fund.** http://cwcb.state.co.us/LoansGrants/fish-and-wildlife-resources-fund-grants/Pages/main.aspx.
  - Eligible Applicants: Operators of existing water diversion, delivery, or storage facility projects and the CWCB. Entities that do not operate such facilities (e.g., certain municipalities, watershed groups) can explore opportunities for a joint application with the CWCB.
  - Deadlines/Grant Cycle: Applications accepted throughout the year.
  - $$ Range: Program is managed on an annual cycle beginning July 1, consistent with the state fiscal year. Annual funding amounts available and limitations should be discussed with CWCB staff.
  - Application Process: Potential applications should be discussed with CWCB staff and a pre-application submitted to the CWCB to determine whether a particular proposal is appropriate for funding. Grant application packet is available online.
  - Projects/Programs of Interest: Grants can be awarded for:
    - The appropriation of water rights to preserve, or the acquisition of water rights to preserve or improve the natural environment to a reasonable degree to mitigate the impact of an existing water facility. All acquisitions or appropriations must be in compliance with Instream Flow Rules and state water laws.
    - River restoration feasibility studies and construction projects designed to directly mitigate or significantly improve the environmental impacts of existing water facilities.
    - An appropriate combination of river restoration and water right acquisition or appropriation.

- **Colorado Fishing is Fun Program.** http://wildlife.state.co.us/Fishing/ResourcesTips/FishingIsFunProgram/.
  - Eligible Applicants: Local governments, park and recreation departments, water districts, individuals, conservation groups, and other non-profit organizations. Applicants may not participate in more than two projects annually. Separate chapters or units of statewide organizations are considered as separate applicants. Two or more local agencies may form a partnership to conduct a project.
  - Deadlines/Grant Cycle: Applications due March 1, 2011 to local regional or area Division of Wildlife office. Multiple deadlines for follow-up presentations, discussions, etc.
  - $$ Range: No dollar amount specified; awards can exceed $25,000. Federal matching funds available to reimburse project sponsors for up to 75% of approved expenses. Federal dollars cannot be used as the source for the local match, nor can donated labor from a federal agency be used for the match.

- Application Process: Applicants should contact their local Division of Wildlife Office early in the process and should address questions to the Program Coordinator. Application and instructions available online.
- Projects/Programs of Interest: The program has historically supported four categories of projects: (i) angler access, (ii) habitat development and site improvements, (iii) fishing site improvements, and (iv) motorboat access. Grants are not available for overhead, program administration, planning, or research.

- **Colorado Healthy Rivers Fund.** http://cwcb.state.co.us/LoansGrants/colorado-healthy-rivers-fund-grants/Pages/main.aspx.
  - Eligible Applicants: Locally-based collaborative watershed protection groups.
  - Deadlines/Grant Cycle: Application due by April 30. Grants awarded by September 30.
  - $$ Range: Project grants - suggested maximum is $50,000. Planning grants - suggested maximum is $25,000.
  - Application Process: Online application packet.
  - Projects/Programs of Interest: Locally-based, collaborative watershed protection efforts. Both planning (*e.g.*, data collection and assessment, analysis of project alternatives, project permitting, acquisition of funding, outreach efforts) and project grants (*e.g.*, water quantity and/or water quality monitoring, flood protection, channel stability, riparian, stream bank, and habitat restoration efforts) are available.

- **Colorado Nonpoint Source Management Program (FY2011).** http://npscolorado.com/index.html
  - Eligible Applicants: No restrictions identified.
  - Deadlines/Grant Cycle: Proposals due by December 15, 2010. Funding notification will occur by March 31, 2011. Funds will be available in the fall of 2011.
  - $$ Range: TBD. Program anticipates approximately $2 million to be available from the U.S. EPA.
  - Application Process: Online application packet.
  - Projects/Programs of Interest: Funding is available for projects that:
    - Address water quality impairments due to nonpoint source pollution,
    - Develop or update watershed plans ("extra consideration" will be given to such proposals), or
    - Provide education and outreach activities that help maintain or restore water quality impacted by nonpoint source pollution.

    "Priority watersheds" will be promoted in the evaluation process for FY2011 (this does not include the Roaring Fork Watershed).

- **Colorado Nonpoint Source Outreach Grants.** http://npscolorado.com/outreachgrant.htm.
  - Eligible Applicants: No restrictions identified.
  - Deadlines/Grant Cycle: Proposals accepted on a year-round basis.
  - $$ Range: $1,000-$5,000 (typically $1,000-$2,500 is awarded). Grants are provided on a cost-reimbursement basis and require a 40% match.
  - Application Process: Proposal guidelines available online.
  - Projects/Programs of Interest: The program's goal is to support information exchange, education, and hands-on efforts to provide information and alternative actions to citizens related to nonpoint source water pollution.

- **Colorado Source Water Assessment and Protection Program (Protection Planning Grants) .** http://www.cdphe.state.co.us/wq/sw/swaphom.html.
  - Eligible Applicants: - Active public water systems (excluding non-community private for profit water systems) and governmental entities.
  - Deadlines/Grant Cycle: Proposals are accepted throughout the year and reviewed on a first-come-first-served basis. Grants are awarded based on available funding.
  - $$ Range: Source Water Assessment and Protection Pilot Planning Project Grants ("PPP Grants") – maximum of $50,000 ($25,000 - $35,000 is the typical range). Protection Plan Development and Implementation Grants ("D&I Grants") - awards can range up to $5,000 per grant application. Applicants can apply for a second grant (up to $5,000) if a cost analysis supports additional funding and the initial grant has been expended.
  - Application Process: Online application packet.
  - Projects/Programs of Interest: PPP Grants are awarded to develop exemplary and comprehensive source water protection plans; projects should assist and promote source water protection planning efforts across Colorado. D&I Grants are awarded to prioritize potential contamination sources for raw drinking water supplies in a specific source area, and to identify and implement BMPs to minimize contamination threats to public water supplies.

- **Colorado Water Efficiency Grants.** http://cwcb.state.co.us/LoansGrants/water-efficiency-grants/Pages/main.aspx.
  - Eligible Applicants: Varies by type of grant. Includes water providers, state and local governmental entities, and public or private agencies whose primary purpose includes promotion of water conservation.
  - Deadlines/Grant Cycle: Varies by type of grant and the dollar amount sought. Some types of applications are accepted throughout the year. Others must be submitted by specific deadlines.
  - $$ Range: Program is managed on an annual cycle beginning July 1, consistent with the state fiscal year. Annual funding amounts available and limitations should be discussed with CWCB staff.
  - Application Process: Grant application packets available online for the different categories of grants.
  - Projects/Programs of Interest: Grants can be awarded for:
    - Water conservation planning;
    - Water conservation implementation;
    - Drought mitigation planning; and
    - Water resource conservation public education and outreach.

- **Colorado Watershed Restoration Grants.** http://cwcb.state.co.us/LoansGrants/colorado-watershed-restoration-grants/Pages/main.aspx.
  - Eligible Applicants: Organizations interested in developing watershed/stream restoration and flood mitigation studies and projects.
  - Deadlines/Grant Cycle: Applications due by January 31. Decision on awards made by April 15 and grants awarded July 1.
  - $$ Range: Program is managed on an annual cycle beginning July 1, consistent with the state fiscal year. Annual funding amounts available and limitations should be discussed with CWCB staff.

- Application Process: Potential applications should be discussed with CWCB staff prior to submittal. Grant application packet available online.
- Projects/Programs of Interest: Grants can be awarded for planning and engineering studies, including implementation measures, to address technical needs for watershed/stream restoration and flood mitigation. Special consideration is reserved for planning and project efforts that integrate multi-objectives in restoration and flood mitigation. This may include projects and studies designed to restore stream channels, provide habitat for aquatic and terrestrial species, restore riparian areas, reduce erosion, reduce flood hazards, and increase the capacity to utilize water.

- **Colorado Water Supply Reserve Account Grants.** http://cwcb.state.co.us/LoansGrants/water-supply-reserve-account-grants/Pages/main.aspx.
  - Eligible Applicants: Public and private entities (both for profit and nonprofit) and individuals are eligible for Basin Roundtable Account Funds. Public entities and private incorporated entities (both for profit and nonprofit) are eligible for Statewide Account Funds; individuals, partnerships, and sole proprietors are not eligible.
  - Deadlines/Grant Cycle: Applications are accepted throughout the year for Basin Roundtable Account Funds. Deadlines are available online and are sixty days in advance of the next CWCB bimonthly meeting. Monies from the Statewide Account are allocated in September of each year, and applications must be received by the CWCB no later than sixty days prior to the date of the CWCB's September meeting. Applicants are provided with a decision on their application within thirty days of CWCB review.
  - $$ Range: Grants vary in dollar amount, depending upon availability of funds and the merits of a proposal. No maximum/minimum dollar amount is specified under either fund.
  - Application Process: Funding requests must be approved by at least one of the Colorado Basin Roundtables before submission to the CWCB. Application packets, as well as Basin Roundtable contact information and meeting dates, are available online for each of the funding programs.
  - Projects/Programs of Interest: Funding is available from two separate accounts (a Basin Roundtable Account – which funds water activities from a Basin Roundtable, and the Statewide Account – which funds activities from a Basin Roundtable on a competitive basis). Eligible water projects/activities include:
    - Technical assistance regarding permitting, feasibility studies, and environmental compliance;
    - Studies/analysis of structural, non-structural, consumptive and non-consumptive water needs, projects, or activities; and
    - Structural and non-structural water projects or activities.

- **Colorado Wildlife Habitat Protection Program.** http://wildlife.state.co.us/LandWater/COwildlifehabitatprotectionprogram.
  - Eligible Applicants: Property owners, local government open space programs, land trusts, or other conservation organizations.
  - Deadlines/Grant Cycle: Information not available post-2010.
  - $$ Range: Funding availability not available post-2010.
  - Application Process: Specific proposal information not available post-2010. A Proposal Form is expected to be available online in the future.

- Projects/Programs of Interest: Proposals should address one or more of the following priorities:
  - Winter range for big game species,
  - Migration corridors for big game,
  - Important access for hunting and/or fishing opportunities,
  - Important habitat for Threatened or Endangered Species or Species of Concern,
  - Wetlands and/or riparian corridors, and
  - Property acquisitions that would enhance the management of a Colorado Division of Wildlife (DOW) State Wildlife Area (*i.e.*, provide a more manageable boundary, fill in an in-holding, improve public access, or enhance management of habitat or wildlife-related recreation on DOW property).

  Emphasis is on the purchase of permanent conservation easements. Additional financial consideration will be given to projects that separately convey to the DOW restricted or year-round public access for wildlife-related recreation, in addition to placing a conservation easement on the project property. Property owners may also submit proposals for projects whose sole purpose is to provide hunting or fishing access through an access easement or agreement, or conveyance of fee title.

- **Great Outdoors Colorado ("GOCO") Grants**. http://goco.org.s57353.gridserver.com/?page_id=5.
  - Eligible Applicants: Varies, depending upon grant program.
  - Deadlines/Grant Cycle: Trail grants offered once a year. Other grants offered twice each year, with spring and fall grant cycles.
  - $$ Range: Grants vary in dollar amount, depending upon the program.
  - Application Process: Online application packets are available for each of the grant programs.
  - Projects/Programs of Interest: GOCO grants are available for multiple programs:
    - Local Government Park and Outdoor Recreation ("LPOR") Grants & Mini-Grants – awarded to help acquire, expand and improve local parks and outdoor recreation and environmental education facilities;
    - Open Space Grants – awarded to help preserve natural areas, agricultural land, important wildlife habitat, park buffers, wildlife corridors, and scenic areas;
    - Planning Grants – awarded to help planning to protect and enhance open space, wildlife habitat and parks, while anticipating future outdoor needs;
    - Trails – awarded through the Colorado State Trails Program (http://parks.state.co.us/Trails/Grants/Pages/Grants.aspx) for trail planning, design, construction, maintenance, special projects, and equipment; and
    - Conservation Excellence Grants - awarded to existing organizations for conservation planning, staff training, open space assessment, expansion of services in underserved regions, planning for public access and education, and other activities which improve and expand the capacity of the organization to achieve quality land conservation.

- **Temper of the Times Foundation, Inc.** http://www.temperfund.org/index.html.
  - Eligible Applicants: 501(c)(3) organizations.
  - Deadlines/Grant Cycle: Information is not currently available for 2011. The organization's website should be consulted.
  - $$ Range: Grants are typically $5,000-$15,000.

- Application Process: Application information available online. LOI may be submitted prior to application, but is not required.
- Projects/Programs of Interest: Supports projects related to increasing awareness about wildland ecosystem conservation and restoration. Grants may be used to fund the production of print, radio, or TV ads, to pay for ad space or airtime, or to produce or distribute pamphlets, books, videos, or press packets. Funding may not be used for organizational newsletters.

❖ **The Tiffany & Co. Foundation.** http://www.tiffanyandcofoundation.org/default.aspx.
- Eligible Applicants: 501(c)(3) organizations.
- Deadlines/Grant Cycle: Applications may be submitted at any time. Grants are awarded by the Foundation's Board of Directors who meet twice annually.
- $$ Range: Grants vary in dollar amount. Most are several thousands of dollars.
- Application Process: Online application, beginning with submission of an LOI.
- Projects/Programs of Interest: Must be carefully tailored to meet the Foundation's program goals/strategies, which include restoration of environmentally significant sites and remediation of areas where mining has occurred.

❖ ***Together Green* Grants Program**. (National Audubon Society Program funded by Toyota). http://www.togethergreen.org/Grants/Default.aspx.
- Eligible Applicants: 501(c)(3) organizations in the Audubon network collaborating with at least one partner organization outside the Audubon network in their community.
- Deadlines/Grant Cycle: Deadline for applications post 2010 TBD in early 2011.
- $$ Range: Average Innovation Grant awarded in 2010 was $25,000 (with a range from $5,000 - $80,000). 2010 Planning Grants were $5,000 or less.
- Application Process: Grant application packets available online for both types of grants.
- Projects/Programs of Interest: There are two types of grants available. Innovation Grants are available for projects that: (i) conserve or restore habitat and protect species, improve water quality or quantity, and reduce the threat of global warming, (ii) engage new and diverse audiences in conservation, and (iii) inspire and use innovative approaches and technologies to engage people and achieve conservation results. Planning Grants are available to conduct preliminary work for a potential Innovation Grant project (e.g., monitoring or mapping of priority conservation areas, developing credibility with or researching a new audience, developing a relationship with a potential partner).

❖ **U.S. Government**

- **U.S. Dept. of Agriculture – Natural Resources Conservation Service (NRCS).** NRCS's natural resources conservation programs help reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. The programs enhance natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty. A series of programs and funding opportunities are available (*see* http://www.co.nrcs.usda.gov/programs/index.html), including the **Wetlands Reserve Program (WRP)**, the **Wildlife Habitat Incentive Program (WHIP)**, the **Small Watershed Program (SWP), Conservation Innovation Grants (CIG)**, and the Environmental Quality Incentives Program (EQIP), described below.

- **Environmental Quality Incentives Program (EQIP).** http://www.co.nrcs.usda.gov/programs/eqip/eqip.html; http://www.co.nrcs.usda.gov/programs/eqip/2011EQIP/2011ColoradoRiver.html.
  - Eligible Applicants: Owners of land in agricultural production or persons engaged in livestock or agricultural production that meet detailed program requirements ("producers"). The USDA NRCS Field Service Center should be contacted as a "first step" in the application process.
  - Deadlines/Grant Cycle: Information not currently available for FY 2012.
  - $$ Range: Information is not currently available for FY 2012.
  - Application Process: Online application packet.
  - Projects/Programs of Interest: Financial assistance available to help develop conservation plans and implement conservation practices on eligible agricultural land. Program practices and activities are carried out according to an EQIP plan of operation; practices are subject to NRCS technical standards adapted for local conditions. There are five EQIP national priorities:
    - Reduction of nonpoint source pollution in impaired watersheds consistent with Total Daily Maximum Loads, where available; reduction of surface and groundwater contamination; reduction of contamination from agricultural point sources;
    - Conservation of ground and surface water resources;
    - Reduction of emissions ;
    - Reduction in soil erosion and sedimentation; and
    - Promotion of at-risk species habitat conservation.

    EQIP programs include the Agricultural Water Enhancement Program (AWEP), which is specifically directed at implementing water enhancement activities on agricultural land.

- **U.S. EPA (Environmental Education Grants)**. http://www.epa.gov/enviroed/grants.html.
  - Eligible Applicants: Local education agency, state education or environmental agency, college or university, 501(c)(3) organization, noncommercial educational broadcasting entity, tribal education agency .
  - Deadlines/Grant Cycle: Annual program. Deadline for FY2011 grant proposals TBD.
  - $$ Range: Annual funding for the program is $2 - $3 million. Regional grants are awarded for $50,000 or less (they are typically in the range of $15,000 - $20,000). U.S. EPA headquarters grants range from $50,001 - $200,000.
  - Application Process: Application packet available online. Approximately six months after receipt of applications, finalists are requested to submit additional documentation.
  - Projects/Programs of Interest: Supports environmental education projects that enhance the public's awareness, knowledge, and skills to help people make informed decisions that affect environmental quality. RFP under development for the next funding cycle.

- **U.S. Fish & Wildlife Service – Division of Bird Habitat Conservation – North American Wetlands Act.** http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm.
  - Eligible Applicants: Public-private partnerships.
  - Deadlines/Grant Cycle: Annual program. In 2010 the Standard Grants Program deadline was July 30, 2010, and the Small Grants Program deadline was October 28, 2010.
  - $$ Range: Small Grants Program - up to $75,000. Standard Grants Program – No maximum/minimum dollar amount specified.

- Application Process: The Intermountain West Joint Venture Coordinator should be contacted for Small Grants Program projects in Colorado (http://iwjv.org/index.php). U.S. Fish & Wildlife staff should be contacted for direction with respect to the Standard Grants Program.
- Projects/Programs of Interest: A Small Grants Program (smaller scope projects) and a Standard Grants Program (larger projects) exist for the protection, restoration, and/or enhancement of wetlands and associated wetlands habitats for the benefit of wetlands-associated migratory birds. In the Small Grants Program funding priority is given to grantees or partners new to the program.

- **U.S. Fish & Wildlife Service – Partners for Fish and Wildlife (PFW).** http://www.fws.gov/mountain-prairie/pfw/colorado/co2.htm. The PFW Program works with owners of private lands for the benefit of wildlife, and the habitats in which they reside. Most habitat projects are for waterbirds, migratory song birds, boreal toads, leopard frogs, or cutthroat trout. Assistance is provided from both a technical and financial perspective with up to 75% of a project's cost being paid for by the Program. There is no public access requirement or landowner income thresholds. PFW prefers to match funds with other funding entities when possible. Projects need to be approved prior to any work being done and if a contractor needs to be hired he would work for the landowner.
  - Eligible Applicants: Private Landowners. Anyone is eligible, but larger ranches and properties are preferred.
  - Deadlines/Grant Cycle: No deadlines or cycles, call anytime and talk about your project idea.
  - $$ Range: $2,000-$50,000.
  - Application Process: Schedule an on-site visit by calling Bob Timberman 970-723-4926.
  - Projects/Programs of Interest: Depending upon the habitat project, private land benefits can include: Stream Fencing, livestock water, aspen regeneration, beaver dam control, spring improvements, riparian grazing plans, wetland restorations, shallow water projects, water level management, native plant restorations, native vegetation plantings, cutthroat trout stream restorations, head gate protections from beaver, and grazing plans to benefit livestock and wildlife.

❖ **Waste Management.** http://www.wm.com/wm/community/giving.asp.
- Eligible Applicants: 501(c)(3) organizations and public organizations where funding will be used exclusively for public purposes.
- Deadlines/Grant Cycle: Applications for funding are accepted year-round and reviewed on a continuous basis.
- $$ Range: No minimum/maximum dollar amount specified. In-kind or product donations can also be sought.
- Application Process: Proposal must be submitted containing all of the information specified online.
- Projects/Programs of Interest: Organizations and/or programs that preserve and/or enhance natural resources. Environmental education programs targeted at middle and high school students.

❖ **Wick Kenney Fund.** http://www.kenneybrosfdn.org/wickFund/grants.html.
- Eligible Applicants: 501(c)(3) organizations.

- Deadlines/Grant Cycle: LOIs may be submitted at any time. Grants are typically made only twice a year, in June and December.
- $$ Range: No minimum/maximum dollar amount specified. Grants in 2008 ranged from $5,000 - $15,000.
- Application Process: The Foundation makes only discretionary grants. A one-page LOI addressing the specifics outlined on the Fund's website must be submitted via email. Additional information may be requested by the Fund if the project has funding potential.
- Projects/Programs of Interest: Grants are available to protect and restore watersheds in the western U.S. Funding is available for projects that:
  - Provide a real opportunity to change western water policy on a local, state, or national level; or
  - Defend environmental laws critical for the protection of all western rivers; or
  - Focus on a specific strategy for protection of a biologically important western watershed; or Research and analyze issues that affect western water (e.g., alternatives for managing water demand, mechanisms for transferring water to environmental and recreational use).

  Grants may be used for arranging meetings. Preference will be given to projects that will be disseminated to reach advocates for the West's rivers.

❖ **The William and Flora Hewlett Foundation.**
http://www.hewlett.org/grants/grantseekers/environment-program

- Eligible Applicants: The Foundation does not fund individuals and generally does not fund unincorporated associations/groups or for-profit organizations.
- Deadlines/Grant Cycle: LOIs in open program areas may be submitted at any time.
- $$ Range: No minimum/maximum dollar amount specified. Recent grants have ranged from a few thousand dollars to millions of dollars.
- Application Process: Almost all grants are awarded to entities identified by the Foundation. However, unsolicited LOIs may be submitted (via an online application) in connection with certain programs. (The Foundation's Western Conservation Program was accepting LOIs as of October 2010). Unsolicited proposals are not accepted.
- Projects/Programs of Interest: In connection with its Western Conservation Program, grants are available for the restoration of river flows and conservation of riparian areas in Colorado and other western states. The Foundation will support organizations working to accomplish the following objectives:
  - Achieve West-wide policy changes that improve river flows and protect riparian areas;
  - Increase river flows and improve riparian land conservation through federal dam relicensing processes;
  - Improve state instream flow water policies and funding to increase river flows and riparian land conservation; and
  - Link surface and groundwater regulations to reduce aquifer depletion.

  Grants are also available for building broad-based support for land, water, and energy goals among key stakeholders. The Foundation will support organizations working to accomplish the following objectives:
  - Mobilize key constituencies to support land, water, energy, and climate outcomes;
  - Provide public feedback to decision makers on land, water, energy, and climate issues; and
  - Distribute analysis and research to educate decision makers on land, water, energy, and climate issues.

Activities the Foundation does *not* fund include: environmental education, habitat restoration, watershed restoration, stream and riverbank restoration, films and videos, conservation easements, land acquisition, and forest monitoring. The Foundation occasionally makes operating grants to organizations.

- **Wolcott Family Foundation.** http://www.dreamthefuture.org/forward/wolff/Downloads/WOLFF%20guidelines.pdf.
  - Eligible Applicants: 501(c)(3) organizations. The Foundation does not fund entities with annual budgets over $350,000.
  - Deadlines/Grant Cycle: Grant proposals must be submitted by the first Friday of September to be considered. Notification of grant awards generally occurs in December.
  - $$ Range: Generally grants range from $1,000 - $5,000.
  - Application Process: Submit a proposal following the guidelines available online.
  - Projects/Programs of Interest: Both general support and project support grants are available. The Foundation is interested in projects that emphasize environmental preservation, advocacy, and community involvement aimed at root causes of societal problems. The Foundation is also interested in funding organizations that demonstrate linkages and interdependence of ecosystems and economics with win-win solutions and collaborative approaches.

- **The Wyss Foundation (Wyss Fellows).** http://www.wyssfoundation.org/fellows/orgapply. Nonprofit, local, regional, and national conservation organizations that work on western public lands policy issues are eligible to apply to host 2-year, grant-funded, Wyss Fellow positions. Sponsoring organizations contribute staff time to mentor and monitor the Fellow's work, overhead expenses, and 20% of the Fellow's salary and benefits (the stipend must be between $35,000-$45,000). The Wyss Foundation provides host organizations a grant for programmatic support (project expenses and travel), and 80% of the Fellow's salary and benefits. Host organizations are responsible for the selection and hiring of the Fellow, in consultation with the Foundation. The next chance to apply to host a Wyss Fellow will be in the winter of 2011.

USEFUL WEB LINKS FOR IDENTIFYING ADDITIONAL GRANT OPPORTUNITIES

- Center for Invasive Plant Management- Resource Directory – Funding Opportunities: http://www.weedcenter.org/funding/funding.html.
- Colorado Outdoor Recreation Grants Summary List: http://parks.state.co.us/Trails/Grants/Other%20Outdoor%20Recreation%20Grants/Pages/Other%20Outdoor%20Recreation%20Grants.aspx.
- Colorado Watershed Assembly – Funding Opportunities List: Colorado Watershed Assembly - Funding Opportunities List.
- Environmental Grantmakers Association: Welcome | EGA.
- Federal Grants: http://www.grants.gov/.
- Multicultural Environmental Leadership Development Initiative – Environmental Grantmakers: http://meldi.snre.umich.edu/fellowships_and_funding/Environmental+Grantmaking.
- National Council for Science & the Environment Support/Funding Sources: Support & Funding | NCSE.
- NWCCOG List of Foundations in Colorado: http://www.nwccog.org/index.php/resources/grant-opportunities/.

- Sonoran Joint Venture List of Funding Sources: http://www.sonoranjv.org/funding/funding02.html.
- U.S. EPA - Catalog of Federal Funding Sources for Watershed Protection: http://cfpub.epa.gov/fedfund/.

7. Acronyms, Abbreviations, and Glossary

ACOE	Army Corps of Engineers
AGCI	Aspen Global Change Institute
AVLT	Aspen Valley Land Trust
BLM	Bureau of Land Management
BMP	Best Management Practices
BOR	U.S. Bureau of Reclamation
BWCD	Basalt Water Conservancy District
CBRT	Colorado Basin Roundtable
CDPHE	Colorado Department of Public Health and Environment
CDRM&S	Colorado Division of Reclamation, Mining, and Safety
CDWR	Colorado Division of Water Resources
CNHP	Colorado Natural Heritage Program
Collaborative	Roaring Fork Watershed Collaborative Water Committee
Conservancy	Roaring Fork Conservancy
CPW	Colorado Park & Wildlife
CRCT	Colorado River cutthroat trout
CRWCD	Colorado River Water Conservation District
CU	University of Colorado
CWCB	Colorado Water Conservation Board
CWT	Colorado Water Trust
DOI	US Department of Interior
EDCs	Endocrine disrupting compounds
ELOHA	Ecological Limits of Hydrologic Alteration
EPA	U.S. Environmental Protection Agency
ESWM	Ecologically Sustainable Water Management
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Forest Plan	2002 White River Land and Resource Management Plan
Fry-Ark	Fryingpan-Arkansas Project
GIS	Geographic Information System
ISF	Water Conservation Board (CWCB) Instream Flow Program appropriations
MSCD	Mount Sopris Conservation District
NRCS	National Resource Conservation Service
NWCCOG	Northwest Colorado Council of Governments
OWTS	Onsite Wastewater Treatment Systems
PPCPs	Pharmaceuticals and personal care products
RICD	Recreational In-channel Diversion
RWAPA	Ruedi Water and Power Authority
SI	Sonoran Institute

TNC	The Nature Conservancy
Twin Lakes	Twin Lakes Reservoir and Canal Company
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
West Divide	West Divide Water Conservancy District
WQCC	Water Quality Control Commission
WQCD	Water Quality Control Division

Glossary

Benthic – Of, relating to, or occurring at the bottom of a body of water.

Call – Demand for administration of water rights. In times of water shortages, the owner of a decreed water right will make a "call" for water. The call results in shut down orders against decreed water uses and decreed junior water rights as necessary to fill the beneficial use needs of the decreed senior calling rights.

Channel alteration – A measure of anthropogenic changes to the shape of the stream channel; includes channelization, clearing and snagging, selective snagging, riprapping, bank stabilization, realignment, lining, and dredge and fill activities. Channel alteration is present when artificial embankments, riprap, and other forms of artificial bank stabilization or structures are present; when the stream is very straight for significant distances; when dams and bridges are present; and when other such changes have occurred.

Channelization – Artificial straightening, stabilizing, or diverting of stream channels, resulting in a straighter and deeper channel.

Chitrid fungus – A fungus (*Batrachochytrium dendrobatidis*) that causes chytridiomycosis, a highly infectious disease of amphibians.

Confined channel – A stream channel which is in continuous or repeated contact with the outside of major meander bends.

Conservation population – Reference to Colorado River Cutthroat Trout. If a population is greater than 90 percent genetically pure, it is considered a "Conservation Population" according to the Colorado River Cutthroat Trout Conservation Team.

Consumptive use – The part of water withdrawn that is evaporated, transpired, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment.

Critical habitat – According to federal law, the ecosystem upon which endangered and threatened species depend.

Drought – A period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance.

Duration – The length of time that a specific flow condition lasts, such as the duration of extremely low flow conditions.

Ecosystem – The biotic community and its abiotic environment functioning as a system.

Effluent – An outward movement of water, as a stream from a lake or wastewater from a treatment plant.

Floodplain – Lowlands bordering a stream which are subject to recurrent flooding. Floodplains are composed of sediments carried by rivers and deposited on land during flooding.

Flow status – The degree to which the channel is filled with water.

Frequency – How often a particular condition, such as high pulse or flood, has occurred.

Gradient – The degree of inclination, ascent or descent.

Groundwater – That portion of the water below the ground surface that is under greater pressure than atmospheric pressure; that part of the subsurface that is in the zone of saturation.

Groundwater recharge – The movement, usually downward, of surface water or precipitation into the groundwater system.

Hydrology – The properties, distribution, and circulation of water.
Hydrologic alteration or flow alteration – Change in stream flow.
Macroinvertebrate - An animal lacking a backbone and generally visible to the unaided eye or generally larger than 0.5 mm at its greatest dimension.
Magnitude – The amount of water passing a fixed point in the river at a specific point in time (*e.g.,* how big is the high flow pulse or flood?).
Meander – A stream reach that includes one complete bend, curve, or loop.
Municipal and Industrial – Defined by SWSI as all publicly-supplied and self-supplied residential, commercial, institutional, and industrial water uses.
Neotropical migrant – Bird species that nest and reproduce in North America and then migrate to Mexico, Central or South America to overwinter.
Non-Conservation population – Reference to Colorado River Cutthroat Trout.
Nonpoint source (NPS) pollution – Pollution that is not discharged through pipes or a point source but rather originates from a multitude of sources over a large area. Common sources of non-point source pollution include failing onsite wastewater treatment systems, improper animal-keeping practices, forest cultivation practices, and urban and rural runoff.
Overbanking – Streamflow that moves out of the channel and onto the floodplain or into the riparian habitat.
Point source – A pipe, channel, conduit, or other discrete conveyance from which pollutants are discharged.
Potential - The highest ecologically stable state possible for a stream reach, without significant human interference. Potential is influenced by the natural interactions of hydrology, soils, and climate affecting the reach.
R2Cross – A method to determine streamflow requirements for habitat protection. R2Cross is used by the CWCB in the development of instream flow recommendations for Colorado's Instream Flow Program.
Rate of change – How quickly the stream flow changes, as flows rise or fall from day-to-day.
Redd – The nest that trout use to both reproduce and incubate the young.
Return flow – Water that reaches a groundwater or surface water source after release from the point of use and thus becomes available for further use.
Riffle – Shallow water area with rapid current and with flow broken by a substrate of gravel or rubble.
Riparian areas – Ecosystems that occur along watercourses and water bodies. These areas have high water tables and support plants that require saturated soils during all or part of the year. Riparian areas include both wetland and upland zones.
Riparian vegetation – Any extra-aquatic vegetation that directly or indirectly influences the stream environment.
Salmonid – Belonging to the family *Salmonidae*, which includes salmon, trout, and whitefish.
Sediment – Fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits and is transported by, suspended in, or deposited by water. Certain contaminants, including bacteria, tend to collect on and adhere to sediment particles.
Sediment deposition – A measurement of the amount of sediment that has accumulated in pools and the changes that have occurred to the stream bottom as a result of deposition. High levels of sediment

deposition are symptoms of an unstable and continually changing environment that is unsuitable for many organisms.

Stormwater runoff – Rainfall or snowmelt that runs off over the land surface, potentially carrying pollutants to streams, lakes, or reservoirs.

Stream – All sizes of flowing water channels and longitudinally linked drainage systems extending from the most meager headwater beginnings to an arbitrarily identified end, mouth, or estuary.

Substrate – The physical properties components and particles of materials within the stream channel.

Timing – The time of year at which particular flow events occur, such as the timing of annual floods or low flow conditions.

Turbidity – A measure of the amount of material suspended in the water. High levels of turbidity over extended periods are harmful to aquatic life.

Water quality – The biological, chemical, and physical conditions of a water body; a measure of a water body's ability to support life.

Watershed – The geographic region within which water drains into a particular river, stream or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains.

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Appendices

Appendix 1. Natural Communities and Species of Concern *.

Riparian and Wetland Natural Communities (CNHP).

SCIENTIFIC NAME	COMMON NAME	CNHP GLOBAL RANK*	CNHP STATE RANK*
Eleocharis quinqueflora Herbaceous Vegetation	Alpine Wetlands	G4	S3S4
Salix brachycarpa / Deschampsia caespitosa - Geum rossii Shrubland	Alpine Willow Scrub	G4	S3S4
Populus tremuloides / Pteridium aquilinum Forest	Aspen Wetland Forests	G4	S3S4
Salix boothii / Carex utriculata Shrubland	Booth's Willow/Beaked Sedge	G4	S3
Salix boothii / Mesic Forbs Shrubland	Booth's Willow/Mesic Forb	G3	S3
Abies lasiocarpa / Ribes (montigenum, lacustre, inerme) Forest	Coniferous Wetland Forests	G5	S3
Populus angustifolia / Cornus sericea Woodland	Cottonwood Riparian Forest	G4	S3
Eleocharis rostellata Herbaceous Vegetation	Emergent Wetland	G3	S2
Kobresia myosuroides - Thalictrum alpinum Herbaceous Vegetation	Extreme Rich Fens	G2	S1
Crataegus rivularis Shrubland	Foothills Riparian Shrubland	G2Q	S2
Shepherdia argentea Shrubland	Foothills Riparian Shrubland	G3G4	S1
Betula occidentalis / Maianthemum stellatum Shrubland	Foothills Riparian Shrubland	G4?	S2
Cornus sericea Shrubland	Foothills Riparian Shrubland	G4Q	S3
Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S2
Salix geyeriana / Carex utriculata Shrubland	Geyer's Willow/Beaked Sedge	G5	S3
(Picea engelmannii) / Betula nana / Carex aquatilis - Sphagnum angustifolium Woodland	Iron Fen	G2	S2
Pseudotsuga menziesii / Cornus sericea Woodland	Lower Montane Riparian Forests	G4	S2
Betula occidentalis / Mesic Graminoids Shrubland	Lower Montane Riparian Shrublands	G3	S2
Salix drummondiana / Calamagrostis canadensis Shrubland	Lower Montane Willow Carrs	G3	S3
Deschampsia caespitosa - Ligusticum tenuifolium Herbaceous Vegetation	Mesic Alpine Meadows	GU	SU
Glyceria borealis Herbaceous Vegetation	Montane Emergent Wetland	G4	S3
Sparganium angustifolium Herbaceous Vegetation	Montane Floating/submergent Palustrine Wetlands	G4	SU
Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2
Acer negundo / Cornus sericea Forest	Montane Riparian Deciduous Forest	G3?	S2
Populus angustifolia - Juniperus scopulorum Woodland	Montane Riparian Forest	G2G3	S2S3
Populus angustifolia - Pseudotsuga menziesii Woodland	Montane Riparian Forest	G3	S2
Populus angustifolia / Alnus incana Woodland	Montane Riparian Forest	G3	S3
Populus angustifolia / Betula occidentalis Woodland	Montane Riparian Forest	G3	S3
Picea pungens / Cornus sericea Woodland	Montane Riparian Forest	G4	S2
Abies lasiocarpa - Picea engelmannii - Populus angustifolia / Lonicera involucrata Forest	Montane Riparian Forest	G4	S3
Populus tremuloides / Acer glabrum Forest	Montane Riparian Forests	G2	S2
Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3
Populus angustifolia - Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3

Populus tremuloides / Alnus incana Forest	Montane Riparian Forests	G3	S3
Picea engelmannii / Cornus sericea Woodland	Montane Riparian Forests	G3	SU
Alnus incana - Salix drummondiana Shrubland	Montane Riparian Shrubland	G3	S3
Salix lucida ssp. caudata Shrubland [Provisional]	Montane Riparian Shrubland	G3Q	S2S3
Salix monticola / Carex utriculata Shrubland	Montane Riparian Willow Carr	G3	S3
Salix monticola / Mesic Graminoids Shrubland	Montane Riparian Willow Carr	G3	S3
Salix monticola / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S3
Picea pungens / Betula occidentalis Woodland	Montane Riparian Woodland	G2	S2
Populus balsamifera Woodland	Montane Riparian Woodland	GU	S2
Carex vesicaria Herbaceous Vegetation	Montane Wetland	G4Q	S1
Salix geyeriana / Carex aquatilis Shrubland	Montane Willow Carr	G3	S3
Salix monticola / Calamagrostis canadensis Shrubland	Montane Willow Carr	G3	S3
Salix drummondiana / Carex utriculata Shrubland	Montane Willow Carr	G4	S3
Acer negundo - Populus angustifolia / Cornus sericea Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2
Populus angustifolia / Crataegus rivularis Woodland	Narrowleaf Cottonwood Riparian Forests	G2?	S2
Populus angustifolia / Salix ligulifolia - Shepherdia argentea Woodland	Narrowleaf Cottonwood Riparian Forests	G3	S3
Populus angustifolia / Salix (monticola, drummondiana, lucida) Woodland	Narrowleaf Cottonwood/Mixed Willows Montane Riparian Forest	G3	S3
Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood/Skunkbrush	G3	S3
Salix boothii / Mesic Graminoids Shrubland	Riparian Willow Carr	G3?	S3
Juniperus scopulorum / Cornus sericea Woodland	Riparian Woodland	G4	S2
Catabrosa aquatica - Mimulus ssp. Spring Wetland	Spring Wetland	GU	S3
Betula nana / Mesic Forbs - Mesic Graminoids Shrubland	Subalpine Riparian Shrubland	G3G4	S3
Salix planifolia / Deschampsia caespitosa Shrubland	Subalpine Riparian Willow Carr	G2G3	S2S3
Salix wolfii /Calamagrostis canadensis Shrubland	Subalpine Riparian Willow Carr	G3	S2S3
Salix wolfii / Mesic Forbs Shrubland	Subalpine Riparian Willow Carr	G3	S3
Salix planifolia / Calamagrostis canadensis Shrubland	Subalpine Riparian Willow Carr	G4	S2S3
Salix wolfii / Carex aquatilis Shrubland	Subalpine Riparian Willow Carr	G4	S3
Salix wolfii / Carex utriculata Shrubland	Subalpine Riparian Willow Carr	G4	S3
Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2
Alnus incana - Salix (monticola, lucida, ligulifolia) Shrubland	Thinleaf Alder-Mixed Willow Species	G3	S3
Alnus incana / Cornus sericea Shrubland	Thinleaf Alder-Red-osier Dogwood Riparian Shrubland	G3G4	S3
Nuphar lutea ssp. polysepala Herbaceous Vegetation	Western Slope Floating/Submergent Palustrine Wetlands	G5	S3
Phragmites australis Western North America Temperate Semi-natural Herbaceous Vegetation	Western Slope Marsh	G5	S3
Carex nebrascensis Herbaceous Vegetation	Wet Meadows	G4	S3

Riparian and Wetland Plants (Source: Dee Malone, CNHP).

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK*	STATE RANK*	US ESA*	FEDERAL AGENCY SENSITIVE LIST
Eriophorum altaicum var. neogaeum	Altai cottongrass	G4?T3T4	S3	-	USFS
Cypripedium calceolus ssp. parviflorum	American yellow lady's-slipper	G5	S2	-	USFS
Luzula subcapitata	Colorado wood-rush	G3?	S3?	-	-
Carex viridula	green sedge	G5	S1	-	-
Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3	-	-
Parnassia kotzebuei	Kotzebue's grass-of-parnassus	G5	S2	-	USFS
Carex diandra	lesser panicled sedge	G5	S1	-	USFS
Salix lanata ssp. calcicola	lime-loving willow	G4G5T4	S1	-	-
Trichophorum pumilum	little bulrush	G5	S2	-	BLM
Cystopteris montana	mountain bladder fern	G5	S1	-	-
Listera borealis	northern twayblade	G4	S2	-	-
Drosera rotundifolia	roundleaf sundew	G5	S2	-	USFS
Eriophorum gracile	slender cottongrass	G5	S2	-	USFS
Carex stenoptila	small-winged sedge	G2	S2	-	-
Ranunculus gelidus ssp. grayi	tundra buttercup	G4G5	S2	-	USFS
Spiranthes diluvialis	Ute ladies' tresses	G2G3	S2	LT	-
Hippochaete variegata	variegated scouringrush	G5	S1	-	-
Eriophorum chamissonis	Chamisso’s cottongrass	G5	S1	-	USFS

*** Colorado Natural Heritage Program Global and State Ranked 1-3 natural communities and plants.**
1 - Critically imperiled; typically 5 or fewer occurrences
2 - Imperiled; typically 6 to 20 occurrences
3 - Vulnerable; typically 21 to 100 occurrences
- A range between two of the numeric ranks; indicates uncertainty about the rarity of the element
? - Unranked; element is not yet ranked
U - Unrankable; not enough information is known
Q - Taxonomic status is questionable

US ESA Endangered Species List
LT-Listed Threatened
C-Concern

Appendix 2. Noxious Weeds or Undesirable Disturbance-Induced Plant Species.

Associated with riparian and wetland areas found in the Roaring Fork Watershed (Source: Dee Malone).

SCIENTIFIC NAME	COMMON NAME
Agrostis gigantea*	Redtop
Agrostis stolonifera	Creeping Bentgrass
Alisma triaviale	Water Plantain
Amaranth spp.	Amaranth
Arctium minus*	Common Burdock
Asperugo procumbens	Catchweed
Brassica nigra*	Black Mustard
Bromus inermis*	Smooth Brome
Capsella bursa-pastoris*	Shepherd's Purse
Carduus acanthoides*	Plumeless Thistle
Carduuus nutans*	Musk Thistle
Centaurea pratensis	Meadow Knapweed
Centaurea repens	Russian Knapweed
Chenopodium spp.*	Goosefoot
Chrysanthemum leucanthemum*	Oxeye Daisy
Cichorium intybus*	Chicory
Cicuta douglasii	Water Hemlock
Cirsium arvense*	Canada Thistle
Cirsium vulgare*	Bull Thistle
Clematis orientalis	Chinese Clematis
Conium maculatum*	Poison Hemlock
Conoselinium scopulorum	Hemlock Parsley
Convolvulus arvensis*	Field Bindweed
Cynoglossum officianale*	Houndstongue
Dactylis glomerata	Orchard Grass
Descurainia incisa*	Tansy Mustard
Descurainia pinnata*	Western Tansy Mustard
Descurainia sophia*	Flixweed
Eleagnus angustifolia*	Russian-Olive
Euphorbia esula*	Leafy Spurge
Hesperis matrionalis*	Dame's Rocket
Lactuca serriola	Prickly Lettuce
Lepidium campestre	Field Pepperweed
Lepidium perfoliatum	Clasping Peppergrass
Linaria vulgaris	Butter and Eggs
Matricaria perforata	Scentless Chamomile
Medicago sativa	Alfalfa
Melilotus officinale*	Yellow Sweet Clover
Myriophyllum spicahim*	Eurasian Watermilfoil
Onopordum acanthium*	Scotch Thistle
Persicaria lepathifolia	Smartweed

Phalaris arundinaceae*	Reed Canarygrass
Phleum pratense	Common Timothy
Plantago lanceolata*	Lanceleaf Plantain
Plantago major*	Common Plantain
Planted Grasses	Planted Grasses
Poa pratense*	Kentucky Bluegrass
Rumex crispus	Curly Dock
Rumex densiflorus	Dense-flowered Dock
Rumex salicifolius	Willowleaf Dock
Salsola australis	Russian Thistle
Silene vulgaris	Bladder Campion
Sisymbrium altissimum*	Tumble Mustard
Solanum dulcamara*	Bittersweet Nightshade
Sonchus arvensis*	Sow-Thistle
Sonchus sp.*	Sow-Thistle
Tamarix ramosissima*	Tamarisk, Salt-Cedar
Tanacetum vulgare*	Common Tansy
Thlapsi arvense	Pennycress
Tragopogon pratensis	Salsify
Trifolium hybridium	Alsike Clover
Trifolium pratense	Red Clover
Trifolium repens	White Dutch Clover
Ulmus*	Siberian Elm
Verbascum thapsus	Common Mullein
Xanthium strumarium	Common Cocklebur