

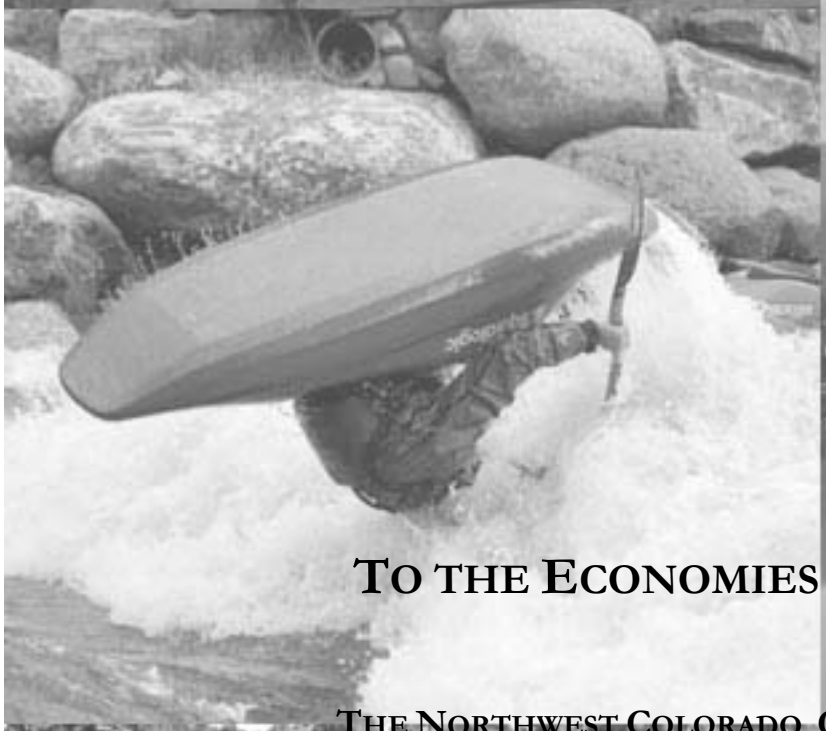
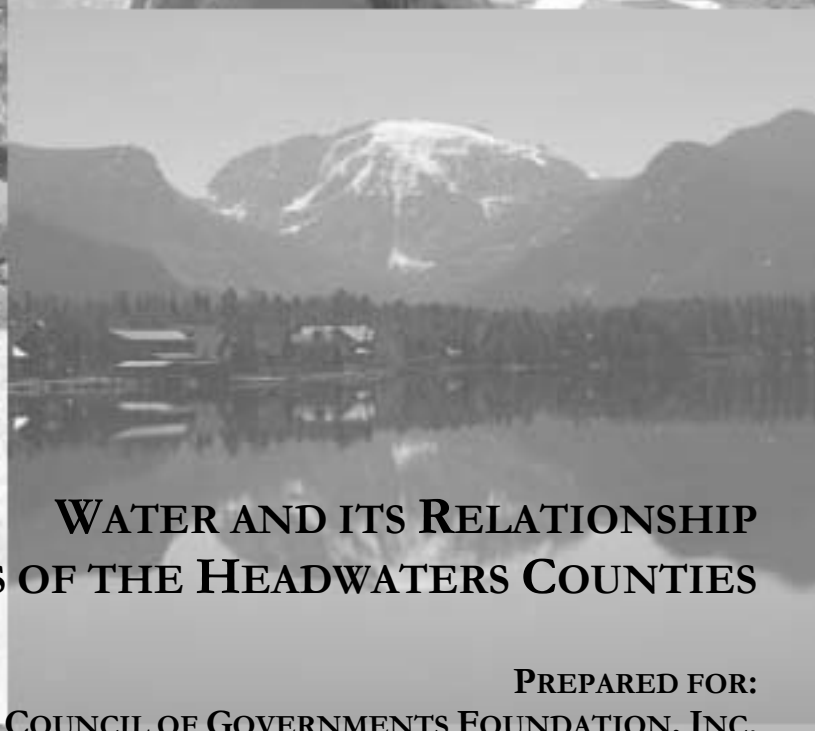

# WATER AND ITS RELATIONSHIP TO THE ECONOMIES OF THE HEADWATERS COUNTIES

**PREPARED FOR:**
**THE NORTHWEST COLORADO COUNCIL OF GOVERNMENTS FOUNDATION, INC.**

**PREPARED BY:**
**COLEY/FORREST, INC.**
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December 1, 2011

Ms. Pamela S. Caskie
Executive Director
Northwest Colorado Council of Governments Foundation, Inc.
P. O. Box 2308
Silverthorne, Colorado 80498-2308

Dear Ms. Caskie:

Attached is our report:

**WATER AND ITS RELATIONSHIP TO SIX HEADWATERS COUNTIES IN COLORADO**

It has been a pleasure preparing this assignment for your use. We have benefited not only from the extensive volume of previously prepared work regarding water supply and demand but also many individuals from each of the headwaters counties who have generously given of their time to provide supporting insight and guidance.

Respectfully,
Coley/Forrest, Inc.

Jean Coley Townsend
President

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# 1.0 INTRODUCTION, PURPOSE AND SUMMARY

## 1.1 PURPOSE

There has been focused attention on the adverse economic consequences of purchasing Eastern Plains agricultural water rights and transferring them to municipal use, leaving the agricultural land without water. The inferences are that this choice may be more adverse to Colorado's economic development initiatives than transmountain diversion projects.

The purposes of this report are to provide a counterbalancing perspective as a resource to policy makers. It describes:

- The unique characteristics of the local economies of six headwaters counties (Eagle, Grand, Gunnison, Pitkin, Routt and Summit) and their inextricable link with statewide economic development;
- The primary components of headwaters county economies, which include tourism, agriculture, and mineral resources, and their direct link to water;
- The direct link between water in the headwaters county economies and the effects of transmountain diversion projects, and;
- The currently compromised condition of water resources in the headwaters counties and ways that water users, advocacy organizations and regulators have worked together to manage these resources.

This report seeks to solidify the connection between water supply, the local economies of headwaters counties and the State and describe the hazards of over allocation of West Slope water to the headwaters county economies and by extension, to the State.

The report combines results of extensive and scholarly reports prepared by others, interviews with knowledgeable individuals and some limited primary research. The intent is to cull these existing resources together to describe the relationship of water to the headwaters county economies and these local economies to the State.

Local stakeholders plan to use this information to continue their productive dialogue with State elected and administrative officials regarding mutually beneficial and balanced management of Colorado's most precious resource, water.

This report is descriptive; it does not take issue with Front Range municipal water users or Eastern Plains agricultural water users. All parties have important worthy concerns and points of view.

## 1.2 REPORT OUTLINE

Section 1: **Introduction Purpose and Summary**
This section highlights key findings of this report.

Section 2: **Economies of the Headwaters Counties**
This section describes the key characteristics of the headwaters county economies including a focus on their major economic sectors (tourism, agriculture and mineral resource development) and describes how these local economies interrelate with the economies of counties in the Front Range and the Eastern Plains and with statewide economic development initiatives.

Section 3: **Water and the Economies of the Headwaters Counties**
This section describes how the water is fundamental to each major sector (tourism, agriculture and mineral resource development) of the headwaters counties' economies and the impact of transmountain water diversion projects on these counties. To the headwaters counties, water is more than a piped commodity; it is a fundamental and essential asset.

Section 4: **Water Policies and Problem-Solving Successes**
As streamflows have declined over the decades, the headwaters counties have had to manage their diminishing resource because they had no other choice. This section highlights some innovative management solutions designed and activated by West Slope water users, governmental agencies, and advocacy organizations.

## 1.3 SUMMARY OF FINDINGS AND CONCLUSIONS

Water is a foundation of the Colorado economy as well as the economies of states to the west and east. Water is a finite resource. The amount of water available at any one time is also extremely variable due to annual seasonal conditions and multi-year weather patterns. More than 130 years ago, John Wesley Powell, Western States explorer, USGS Director and originator of the term acre-feet, anticipated the issues around water that we now confront. [1]

> "The history of the American West will be written in acre-feet." *John Wesley Powell, 1878*

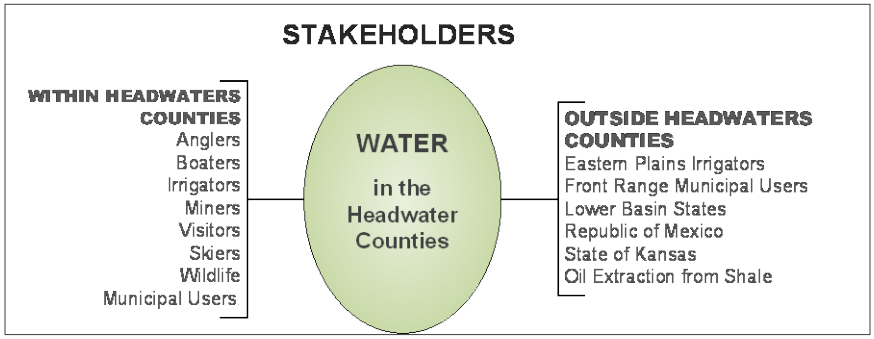
The abundance of West Slope water that is available to the Front Range is an illusion. "The West Slope contains 11% of the State's population and 84% of the State's water." [2] This often repeated adage can be misinterpreted because a substantial portion of this water is legally and physically spoken for by users along the Colorado Front Range, the Colorado Eastern Plains, states to the east and west and the Republic of Mexico. Most of this water was committed to entities inside and outside Colorado decades before the State developed a comprehensive understanding of the value of water to its headwaters or had an accurate streamflow estimate.

To illustrate this point and to focus attention on the economic relationships between water and local economies, this report focuses on the six Colorado counties that contain the West Slope headwaters of streams and rivers that are or may be partially diverted to the Front Range. These counties are Eagle, Grand, Gunnison, Pitkin, Routt and Summit.


The six headwaters counties, highlighted in the map to the right, are relatively small when measured in terms of population, employment, private land use, irrigated land, and consumptive water demand relative to the State as a whole. However, their economic contribution to the State of Colorado is beyond measurement as their world class venues attract national and

international visitors. Their linkages to the Front Range economies are strong and multi-dimensional and their images and recreational opportunities are the State's iconic economic development images.

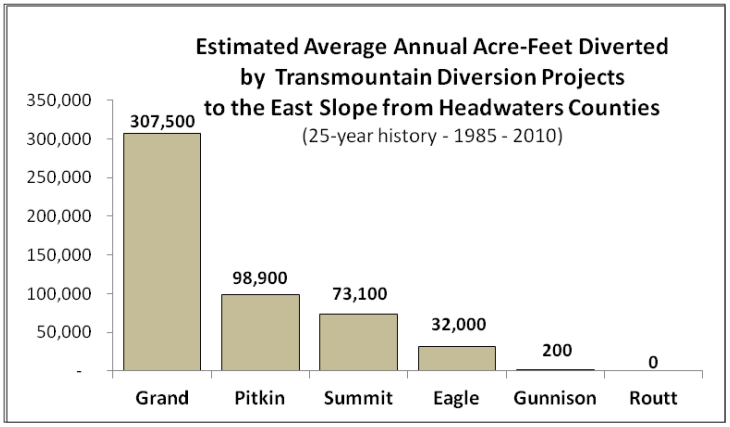
There are many stakeholders that rely on water that originates in the headwater counties. Most river basins in Colorado have either reached or are approaching the point where either new water management techniques are needed or one entity's use of water must be taken from another source.




The remainder of this section summarizes the main findings and messages of this report. References in the text that describe the findings are noted in parentheses.

### 1.3.1 Headwaters Counties and Water Supply

The six headwaters counties are unique in the State in that each contains the headwaters of rivers that must support not only their in-basin county needs but also are used to supply water to the Front Range and Eastern Plans of the State and must deliver legally mandated quantities of water to seven other states plus the Republic of Mexico.




Source: Colorado Division of Water Resources, CDSS data base.

Each county has experienced different volumes of out-of-basin water demands from the East Slope at different times from different sources. The graph to the right illustrates the historical average annual acre-feet of water diverted to the East Slope by transmountain water diverters. The proportion of total natural streamflow diverted to the East Slope varies depending on location.

In the headwaters along the continental divide in Grand and Summit counties, the proportion of native flows diverted by existing diversion projects is about 60% [3]. In Pitkin County, the major transmountain diversions that currently operate in the Roaring Fork Watershed (The Fry-Ark Project, the Busk-Ivanhoe System and the Twin Lakes / Independence Pass System) collectively divert over 40% of the native flow in the headwaters of the Roaring Fork and Fryingpan rivers for use in the Arkansas and South Platte basins. [4]

- Grand County's relatively substantial volume of transmountain diversions began in the 1890s; all transmountain diversion projects were constructed by 1937, before the negotiating benefits of HB-1041 Regulations were available.

Diversion Structure in Grand County

- Summit County was next in time to experience demand from municipal transmountain water diverters, including Colorado Springs, Denver, Englewood and Golden. The Boreas Pass Ditch, now owned by the City of Englewood, was completed in 1909; Hoosier Pass Tunnel, now owned by the City of Colorado Springs, was completed in 1962; the Roberts Tunnel, owned by Denver Water, was completed in 1962; the Vidler Tunnel, owned by the City of Golden, was completed in 1968.

- In Eagle County, there are three relatively small and one relatively large transmountain diversion projects. All are owned by Front Range municipalities. The largest, the Homestake Reservoir and Tunnel, owned by the cities of Aurora and Colorado Springs, was completed between 1963 and 1967.

- Bordering Pitkin and Eagle County, the Bureau of Reclamation's Fryingpan-Arkansas Project system, including the Twin Lakes, Busk-Ivanhoe and Charles Boustead Tunnels, was constructed between 1935 and 1982. Senior water rights from this project allow for substantial additional capacity in this system for future diversions.

- Gunnison County contains one relatively small East Slope transmountain diversion project. Its water issues relate to in-basin water supply, future potential demand from oil and gas resource development and Colorado River Compact obligations.

- Routt County has no East Slope transmountain water diversion projects at this time due to the relatively high expense associated with water transport over two mountain ranges. However, Routt County is being considered for future pipeline and pumpback projects to supply Front Range water needs.

The six headwaters counties have a spectrum of policy positions and practices with respect to transmountain water diversion. Their policies and practices reflect the issues they have confronted historically and will confront in future years. Some key water issues that each county confronts are highlighted below and discussed more fully in Section 4.1.

- Grand County aggressively focuses its efforts on retaining and managing the water that remains in the County and on restoring damaged river corridors, reservoirs and lakes to healthy standards.

- Pitkin County's position on all transbasin and transmountain diversions is that all environmental, economic and streamflow impacts must be fully mitigated in order to preserve the natural environment and quality of life existing in Pitkin County.

- Summit County's primary water policy practices currently focus on efforts to minimize additional water diversions and resist new projects unless significant benefits can be clearly identified and proven to accrue to the local environment and economy and to western Colorado.

- Eagle County directs its attention to remaining diligent, vigilant and proactive about how additional diversions and exchanges will be managed to keep their three watersheds healthy.

- Gunnison County focuses on careful management and protection of its in-basin water supply and on obtaining assurances that any future development, management or water use does not generate adverse impacts.

- Routt County's current water resource priorities relate to retaining its substantial base of agricultural land and assuring that any future out-of-basin diversion would provide appropriate compensatory water storage.

At the same time, these counties have also derived significant benefits by working together cohesively to evaluate water development issues. The extensive set of problem-solving agreements and management

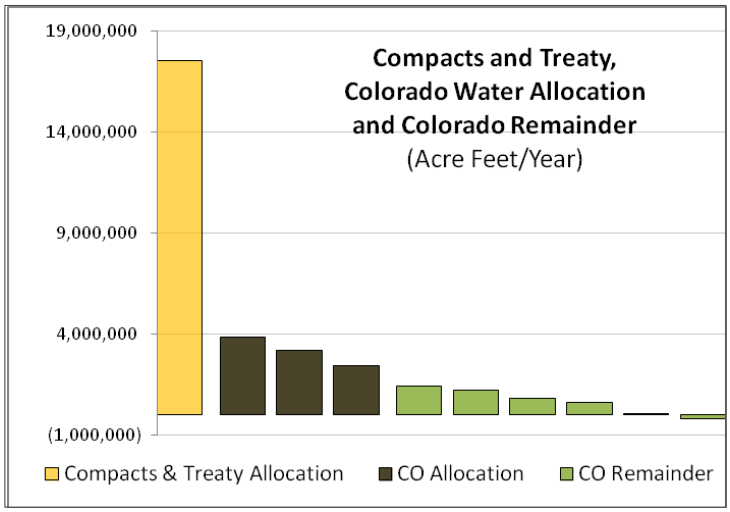
practices applied by both East Slope and West Slope governments and advocacy organizations is evidence of a willingness to minimize some potential adverse consequences of existing and future out-of-basin diversions. These are listed in Section 1.3.9 and summarized in further detail in Section 4.2.

### 1.3.2 Availability of West Slope Water *(Section 3.2)*

***Compact and Treaty Requirements, Colorado Allocation, Colorado Remainder.*** The Colorado River basin is constrained by two interstate Compacts that involve seven states (Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming) and a Treaty with the Republic of Mexico. The Compacts and Treaty allocate 17.5 million acre feet of water among the seven states and the Republic of Mexico. These agreements effectively cap consumptive use by the State of Colorado.

There are ambiguities in the language of the Compacts which lead to different interpretations of Colorado's allocation. The annual allocation to Colorado ranges between 2,432,000 and 3,855,000 acre feet, depending on interpretation. In 2008, the Colorado Water Conservation Board (CWCB) estimated that Colorado is currently consuming between 2,400,000 and 2,600,000 acre feet per year. So, the Colorado remainder might be more than 1 million acre feet or less than zero depending on the interpretation of Colorado's allocation under the Compacts and estimates of Colorado's current consumption and available supplies. Note that these figures exclude non-consumptive needs.

The graph to the right illustrates the 17.5 million acre-feet the water allocated by the Compacts; three alternative estimates of Colorado's allocation, and six alternative estimates of the remainder of water available to Colorado, based on estimates current consumptive use in Colorado.




Sources: CWCB & Colorado River Water Conservation District

In 2008, the CWCB further estimated that after subtracting the amount of water needed for firming existing transbasin diversion projects, future in-basin needs and oil shale development, the amount of "additional" water available for use in 2030 would range from 150,000 to 700,000 acre feet per year. This volume, if it physically exists, is a very small portion of native flow conditions; the calculated amount might be within the range of mathematical error. It is not likely that this water would be legally or physically available to all locations, especially to the headwaters counties.

In 2010 and 2011, the CWCB refined its analysis, extended its in-basin municipal and industrial (M&I) and self-supplied industrial (SSI) demand forecasts to 2050 and measured the 2050 gap.

2050 GAP = (2050 M&I Demand + 2050 SSI Demand)
− (Existing supply + 2050 identified projects and programs + 2050 conservation measures)

2050 forecasts for low, medium and high demand, identified projects and programs (IPP) and conservation measures were developed. The results for the Colorado, Gunnison and Yampa/Green water basins show a 2050 gap, as summarized below. These results exclude water demand for recreation and environmental purposes and irrigated agricultural water demands. West Slope interests have submitted a variety of concerns

that these figures understate the gap by omitting pertinent additional demand from non-consumptive needs and overstating the viability of identified projects and programs (IPPs).

| SUMMARY OF IN-BASIN M&I▫ AND SSI▪ DEMAND AND WATER GAP ANALYSIS FOR 2050 (Excluding demand for recreation and environmental purposes and irrigated agricultural water) Measured in Acre Feet Per Year | | | |
|---|---|---|---|
| Basin | 2050 Demand | Demand that Can be Met with Current Supply + 2050 IPPs + 2050 Conservation | 2050 Gap ♦ |
| Colorado | 132,000 to 179,000 | 110,000 to 131,000 | 22,000 to 48,000 |
| Gunnison | 36,650 to 43,650 | 33,850 to 37,150 | 2,800 to 6,500 |
| Yampa/White | 73,000 to 136,000 | 50,000 to 53,000 | 23,000 to 83,000 |
| ▫ M&I, municipal and industrial demand. ▪ SSI = self-supplied industrial, i.e., not supplied by a water provider<br>♦ Gap excludes demand for recreation and environmental purposes and irrigated agricultural water.<br><br>Source: CDM, Colorado, Gunnison and Yampa/White Needs Assessment Reports, developed with information from the 2010 Statewide Water Supply Initiative report series. (SWSI) | | | |

West Slope in-basin water users in the Colorado River and Gunnison River basins are already balancing water supply among its in-basin needs. In the Yampa/White River basin, future demand from oil development in Moffat and Rio Blanco counties and the State of Utah is expected to place significant demands on in-basin water supply.

In the six headwaters counties, the volume of consumptive water needed to keep the headwaters counties themselves economically "whole" is relatively modest. Collectively, these counties comprise 3% of State population, 4% of State jobs, 5% of the State's irrigated land; these are the largest types of consumptive water users. Recreation, the economic mainstay, requires virtually no consumptive water.

**1.3.3 Currently Compromised or Threatened Environmental Conditions**. In the headwaters counties, there are currently compromised or threatened environmental conditions that are triggered primarily by inadequate or engineered streamflows. Some environmental conditions may have reached the "tipping" point. These conditions trigger adverse economic effects on stream-based and reservoir-based recreation, irrigation, and related impacts on land development. Some examples follow:

- The Fraser River was designated "most endangered" by American Rivers in 2005. Mitigation solutions to recover the Fraser River have been estimated to cost millions of dollars. *(Section 3.2)*

- The Eagle River was designated "most endangered" by American Rivers in 2010. There are multiple reaches of the Eagle River where recommended minimum instream flows in average years might be less than actual instream flows in the late summer and early winter months. *(Section 3.2)*

- Grand Lake water clarity has declined from an estimated depth of 30.2 feet in the mid-1950s to 8.8 feet, during times when the Colorado-Big Thompson Project uses Grand Lake as its conduit. *(Section 3.4.2)*

- Each year, irrigators, anglers and rafters meet to negotiate a "second best" compromise among themselves to share streamflow in the Taylor River in Gunnison County. Once the users agree among themselves, they share their management

Taylor River in Gunnison County

plan with the regulators to secure approval. *(Section 3.4.2)*

- On Lincoln Creek, the Upper Roaring Fork River and Hunter Creek, (Pitkin County) CWCB minimum environmental instream flow rights are often not met because they are junior to two transmountain water diversion projects and other local in-basin diversions. [5]

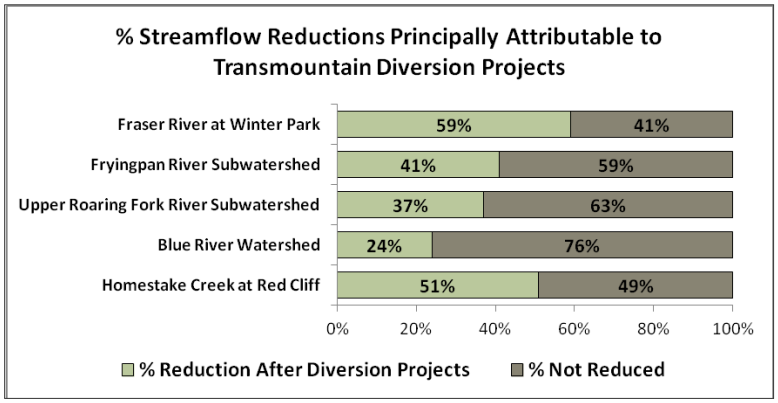
- In the Upper Roaring Fork watershed, more than one-half of the in-stream habitat quality, measured by the ability of the stream to sustain aquatic wildlife, has been moderately modified to severely degraded.[6]

- East Snowmass Creek has been dewatered in August and September in some years due to diversions. Significant impacts to riparian and instream habitat have been experienced on Snowmass Creek. Questions continue whether existing and future winter diversions will affect fish populations and aquatic habitat. [7]

There are other compromised environmental conditions that do not relate directly to inadequate or engineered streamflow but exacerbate conditions that the headwaters counties must manage. Some examples include impairment from excessive sediment loading from traction sand, water quality degradation from inactive mines, and urban development that generates rapid runoff of degraded quality water.

**1.3.4 Transmountain Diversion Projects**. *(Section 3.3)* The State Engineer reports that there are 45 transmountain water diversion projects in the State; 16 of these originate in the headwaters counties. Since 1985, these diversion projects have collectively diverted an average of about 511,700 acre feet of water per year to the East Slope from the six headwaters counties. From the basins-of-origin, transmountain diversions are 100% consumptive. As such, they can have unique and significant impacts on the headwaters counties. These projects divert water from headwaters streams near the fragile continental divide.

Streamflows fluctuate for a variety of reasons, including annual precipitation, in-basin recharge, municipal, industrial and recreational use and out-of-basin diversions. In some instances, the volume of streamflow downstream of a diversion project is substantially below natural streamflow conditions. For example, streamflows on the Fraser River at Winter Park (Grand County) are 59% below natural flows; streamflows in the Fryingpan River sub-watershed (Pitkin County) are 41% below natural flows. *(Section 3.3.2)*




Sources vary by location. See text (Section 3.2.2) and endnotes.

Some streamflow reductions have triggered substantial environmental compromises; examples are in the Fraser, Colorado and Upper Roaring Fork rivers and Snowmass Creek. Other diversion projects have not triggered environmental consequences either because their water rights or instream minimum requirements prevent it.

Significant environmental concerns regarding cumulative impacts and future diversions have been expressed broadly in Pitkin, Eagle and Grand counties. At risk are economic losses to:

- "Gold Medal" fishing designation and resorts, guides and ranchers that rely on fishing;
- Streamflow sufficient for kayaking and rafting and related impacts on visitor demand;
- Water clarity in Grand Lake and Lake Granby related impacts on visitor demand and property values;
- Irrigated land and related jobs, property values and scenic landscape losses;
- "Wild and scenic river" status and related impacts on visitor demand;

- Alpine skiing in November and early December due to inadequate water for snowmaking, and;
- Ranchers who experience costly repairs due to irrigation ditch failures triggered by low streamflow.

Some of the larger Front Range water providers have sufficient water rights to divert substantial additional water through their existing diversion systems without additional capital investment. So, there are concerns regarding the environmental consequences of even lower and more engineered streamflows that will exacerbate existing fragile conditions.

In other cases, additional water rights for additional diversions may need to be purchased. These water rights would likely come from West Slope agricultural property owners, thereby continuing a trend to dry up the relatively small amount of irrigated agricultural land that remains.

Construction of new transmountain diversion projects are daunting projects to undertake, particularly without the prospect of substantial federal subsidy, because of rising costs, extended time schedules, increasing regulation, and growing environmental opposition. Nevertheless, Front Range water providers are rigorously firming up delivery through existing diversion structures by constructing additional East Slope storage capacity, maximizing diversions through existing infrastructures, developing conditional water rights, and applying for change of use from agriculture to municipal and industrial. There are at least ten future transmountain water diversion projects that are under consideration by Front Range water users.

Headwaters communities have adjusted to the unmitigated impacts and adverse economic consequences of diversion projects because they have had no other choice. They cannot divert water from another source. They make thoughtful but compromised, second-best choices on a continuing basis. While these communities have become adept and innovative in developing water management choices, some continuing adverse economic impacts persist; there is no good science to predict the ecological tipping point where current mitigation practices will no longer work.

One good example of a collaborative settlement is the 2011 Colorado River Cooperative Agreement, which has been approved in concept but not executed. Thirty-four parties on the West Slope negotiated an agreement with Denver Water triggered by a proposed expansion of an existing transmountain diversion. The settlement addresses issues regarding future diversions, bypass flows, mitigation for current streamflow and water quality concerns, funding for wastewater treatment, Dillon Reservoir water levels, priority of conservation and reuse, investment in watershed health, and more assured water supplies for snowmaking and other uses.

### 1.3.5 Economic Development Relationships: Headwaters Counties and the State. (*Sections2.2.1, 2.2.2)*

There is a direct relationship between the enjoyment that the high mountain communities of the headwaters counties provide to current and future Front Range residents and businesses and economic development. Front Range economic developers promote the natural environment of the high mountain communities as a primary marketing tool in their pitch to businesses and high-income / high-value workers. Without these pristine environments, promoting Colorado would be like promoting many Midwestern states that have no comparable assets. Outdoor recreation activities in the headwaters counties are the iconic images for statewide economic development activity. Keeping these resources strong is a powerful, statewide economic development strategy.

> "This state has to realize, people in the metropolitan Denver have to realize, that their self-interest is served by treating water as a precious commodity and that its value on the Western Slope is just as relevant as its value in the metro area." *Governor John Hickenlooper. (Denver Post, April 29, 2011.)*

- The economies of the headwaters counties are inextricably linked with the external economies. One indication is homes owned by non-local households. The proportion homes owned by households outside of the headwaters counties (56%) exceeds the proportion of homes owned by local households (44%).

*Percent of Homes Owned in the Headwaters Counties by Place of Permanent Residence*

| | | | |
|---|---|---|---|
| *44% Local County* | *22% Front Range* | *2%** | *32% Out of State* |

*Source: Individual County Assessor Databases (* 2% = Other Colorado)*

- Recent studies show that the economic benefits of some recreation activities, such as fishing, hunting and skiing, that occur in the headwaters counties are greater in the Front Range counties than in the headwaters counties. For example, anglers frequently fish in the headwaters counties but their economic impact is felt statewide. While headwaters counties capture 14% of the total positive economic impact from fishing statewide, the Front Range counties capture 57% of the impact since a substantial portion of angler expenditures are on transportation and equipment that occur more often in the Front Range counties.

*Percent of Statewide Economic Impacts from Fishing - Attributable to Counties*

| | | |
|---|---|---|
| *14% Headwaters Counties* | *57% Front Range Counties* | *29% Other Colorado* |

*Source: The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado, BBC and the Colorado Division of Wildlife*

**1.3.6 Economies of the Headwaters Counties**. Headwaters counties are fundamentally different from the more urban economies of the Front Range and the more rural economies of the Eastern Plains.

- Privately-owned land in the headwaters counties comprises an average of only 30% of total land; publically-owned land comprises 70% of total land.

*Percent of Total Land in the Headwaters Counties that is Privately-Owned and Publically-Owned*

| | |
|---|---|
| *30% Privately-Owned Land* | *70% Publically-Owned Land* |

*Source: Individual County Assessor Databases*

In four of the six counties (Eagle, Gunnison, Pitkin and Summit), privately-owned land comprises 20% or less of total land. All headwaters counties must make wise economic and environmental use of their relatively low amount of privately-owned land.

- The headwaters counties are primarily driven by three economic activities: tourism, mineral resources and agriculture. Each requires water in a direct way.

**Tourism** *(Section 2.2)* is the predominant basic-sector industry in the headwaters counties. Each County ranks tourism as a top five economic development strategy.

- Among the headwaters counties, tourism comprises 48% of all jobs. In contrast, tourism comprises 8% of all jobs statewide. Headwaters counties are highly dependent on and vulnerable to changes in environmental conditions that impact tourism.

| % JOBS IN TOURISM | |
|---|---|
| Headwater Counties: | 48% |
| Statewide | 8% |

- Headwaters counties contain visitor attractions of world-class status, including ski resorts, Gold Medal fishing, National Parks and Wild and Scenic eligible rivers.

- Tourism in the headwaters counties is the State's primary window to attract visitors from other states and countries. Colorado has developed its international brand around world-caliber recreation activities that are heavily reliant on snow and flowing water in its natural stream courses.

  - In 2009, about 60% of skiers at Colorado ski resorts (882,000) came from out-of-State; in prior years, the proportion of out-of-State skiers has been higher.

  - In addition to lodging guests, in four of the six headwaters counties (Eagle, Gunnison, Pitkin and Summit), more than 30% of homes have been purchased by households from other states and countries.

Breckenridge

- Headwaters counties are very resourceful in using natural streams and forests as well as man-made reservoirs to their economic advantage. The US National Park Service properties generate millions of visitors annually; the Rocky Mountain National Park (Grand County) generates about 2.1 million visitors per year and the Curecanti National Recreation Area (Gunnison County) generates about 1.1 million visitors per year.

**Agriculture's** *(Section 2.3)* value to headwaters counties is often understated because some of its most valuable attributes are intrinsic and qualitative. It is valuable because it is an iconic part of the culture and heritage, its expansive landscape provides value to residents and visitors, it has a strong and complementary relationship to visitor enjoyment, return flows from irrigation sustain late season streamflows for fisheries and recreation and replenish underground aquifers needed for some rural residential real estate.

Sunnyside Ranch – Routt County

- Agriculture is the dominant land use among privately-owned property in the headwaters counties. An average of 73% of all privately-owned property is in agricultural use.

*Percent of Privately-Owned Property in the Headwaters Counties in Agricultural Use and All Other Uses*

| *73% Agricultural Use* | *27% All Other Uses* |
|---|---|

*Source: Individual County Assessor Databases*

- The amount of agricultural land in the headwaters counties is down 9% relative to the amount that existed in 1929. During this same time period, agricultural land among the Eastern Plains counties increased by 23%; statewide, the amount of agricultural land increased by 6%.

CHANGE IN AGRICULTURAL LAND: 1929 – 2007

| | |
|---|---|
| Headwater Counties: | - 9% |
| Eastern Plains Counties | + 23% |
| Statewide | + 6% |

*Source: US Census of Agriculture, Dept. of Agriculture*

- Similarly, irrigated land in the headwaters counties has decreased by 23% while irrigated land among the Eastern Plains counties has increased by 63%. The increase in irrigated land in the Eastern Plains counties is attributable to several actions principally including rural electrification and improved pumping technologies that reduced the cost of pumping water. The Colorado – Big Thompson and Fryingpan-Arkansas transmountain water diversion projects have contributed to sustaining irrigated acreage to the extent that their supplemental water have kept agricultural production economically viable and the Northern Colorado Water Conservancy District and the Southeastern Colorado Water Conservancy District have expanded their service boundaries. Statewide, the amount of irrigated land has decreased by 13%.

CHANGE IN IRRIGATED LAND: 1929 – 2007

| | |
|---|---|
| Headwater Counties: | – 23% |
| Eastern Plains Counties | + 63% |
| Statewide | – 13% |

*Source: US Census of Agriculture, Dept. of Agriculture*

- Throughout the State, losing agricultural land is at risk. In the headwaters counties, there has been market pressure to convert agricultural land to other land uses. Due to the recession, these market pressures are temporarily at bay. In addition, there are competing interests for leased federal land between ranchers and recreation interests. West Slope farmers and ranchers have an additional potential risk if a Lower Basin State, such as California or Nevada, initiates a Colorado River Compact call which could impact agricultural properties that own more junior water rights than the 1922 Compact. The recently released *Report to the Governor* by the Interbasin Compact Committee speaks to keeping "agriculture viable." [8] Agricultural land in the headwaters counties is particularly vulnerable.

**Mineral Resource** *(Section 2.4)* development activity is an important component of the economies of Gunnison and Routt County. In these counties, it generates the highest average annual wages ($80,000) of all economic sectors. Routt County contains the largest coal mining company in the State; Gunnison County contains the second and third largest companies. There is renewed interest in developing oil, gas and rare earth minerals resources in Gunnison County. Industry experts forecast that if the Green River Formation oil shale deposits, which are adjacent to Eagle, Pitkin and Routt counties, are extracted at forecasted rates, related water demands of 120,000 acre feet annually are expected. Summit County and Grand County contain among the largest molybdenum mines in the world; the mine in Summit County is restarting production. There is new interest in natural gas production in a remote area (the Thompson Divide) where Garfield, Pitkin, Gunnison and Mesa county boundaries come together.

### 1.3.7. Water, Streamflow and Headwaters County Economies *(Section 3.2)*

While all Colorado residents and businesses need clean water to function, water clarity, native streamflow and flushing flows are essential to the headwaters counties in ways that are more fundamental than to counties on the Front Range; water is more than a piped commodity.

To the headwaters counties, water is more than a piped commodity.

- Tourism, the dominant economic sector, uses water in its natural non-consumptive state, as an economic asset. The volume of streamflow impacts snowmaking, fishing, rafting, kayaking, and sightseeing. Water clarity impacts property values and visitation. Flushing flows are essential for healthy riparian and aquatic habitat, which, in turn, are essential to wildlife.

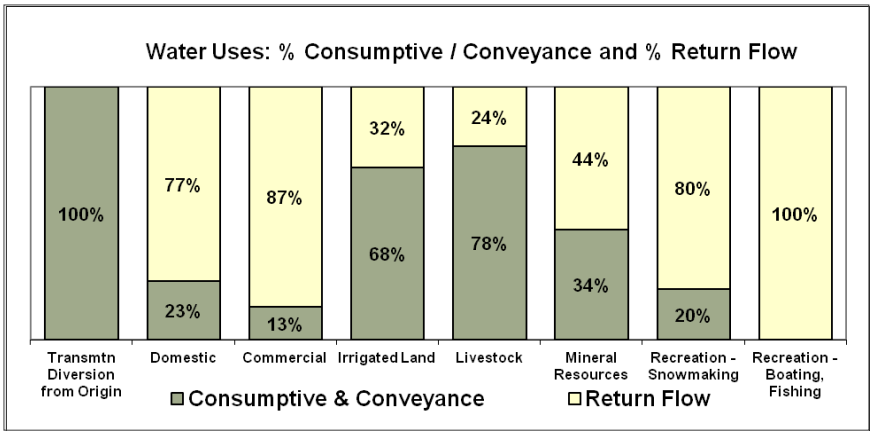
- Some ranches are impacted by low streamflows that prevent them from diverting all of the water to which they are legally entitled to irrigate their property.

- Some rural residential development with water wells rely on ground water that is replenished by the irrigation flood practices of ranchers with property that is connected to the aquifer they use.

- In some headwaters counties, such as Grand, there are few or no reservoirs available for in-basin water storage that can smooth out annual fluctuations in streamflow because of few geologically or politically acceptable sites.

- Some water and sanitation districts confront substantial capital expenses to upgrade their treatment facilities to comply with State water quality discharge standards. Some upgrade requirements are triggered by low streamflows from transmountain diversion projects.

- While transmountain water diversion is 100% consumptive from the basin-of-origin, the headwaters counties' in-basin water uses have lower consumptive values; recreational water uses are primarily or totally nonconsumptive, that is, the water needed for recreation is never removed from the native stream.




Sources: USGS for State of Colorado (most results) and Individual Ski Areas (snowmaking)

### 1.3.8 State Policy Considerations

In its December 2010 submittal to Governor Ritter, the Interbasin Compact Committee (IBCC) issued its "Report to the Governor" that set the stage for water policy deliberations. The IBCC framed four primary policy choices for new water supply: Conservation; (Eastern Plains) agricultural water transfers; "identified projects and processes" (IPPs), and; new water supply development. Among these choices, conservation is deemphasized and "drying up" (Eastern Plains) agriculture is discouraged because of adverse economic consequences; IPPs, other than new water supply development, were assigned a minor supporting role. This leaves new water supply development, i.e., West Slope transmountain diversions. The Report implies that transmountain diversions have fewer economic consequences. It concludes with suggested ways to fund diversions and streamline the local review and decision making process.

This potential policy direction has unintended but adverse and counterproductive consequences:

> "No segment of our agriculture production in Colorado is or should be considered expendable to benefit another region. There should be no presumption that wheat grown in Weld County or lambs fed in Larimer County are more valuable than peaches form Palisade, sweet corn from Olathe or beef from Gunnison." *Gunnison Basin Needs Assessment Report, Colorado's Water Supply Future, March 2011, page 7-3*

- "Protecting" agriculture by discouraging the sale of water devalues agricultural land. For some farmers and ranchers, their water rights are more valuable than their land.

- The policy direction would favor one sector (agriculture) over all others and one location (Eastern Plains agriculture) over another (West Slope agriculture). It is unclear why it would be wise to benefit one sector over others or one agricultural location over another without compelling reasons. Is this policy direction the most productive economic development initiative for the State?

- The adverse consequences of encouraging the expansion or addition of new transmountain water diversion projects in the headwaters counties would not only hamper the economies of the headwaters counties but would also adversely impact the Front Range and the State's economic development initiatives because tourism in the mountain communities is a primary and iconic factor in Front Range and statewide economic development.

- Many of the proposed transmountain water projects or expansions would divert agricultural water from the West Slope to the East Slope, if developed. Advocating for West Slope transmountain diversion projects as a means to avoid adverse impacts to agricultural land does not make sense.

There are other mutually advantageous alternatives to water management that also can enhance the long-term economic vitality of the State. Some of these are mentioned below.

### 1.3.9 Problem-Solving Practices and Moving Forward

Organizations within the headwaters counties have been innovative and pragmatic in conceiving and activating ways to manage water because they had no other choice. These are not practices that evaluate future potential conditions. Rather, these are practices used to manage current conditions.

A summary of these innovative solutions that demonstrate the ability of competing West Slope interests to work together creatively and negotiate successfully with Front Range water providers is listed below and detailed in Section 4.2. This does not imply that these same solutions will work effectively if there are additional depletions from the headwaters that push environmental conditions beyond the tipping point.

| WEST-SLOPE / EAST-SLOPE PROBLEM-SOLVING SUCCESSES – ILLUSTRATIVE PROJECTS AND DATES | |
|---|---|
| • Learning-By-Doing (proposed) | • Grand Valley / Gunnison Selenium Task Force (1998) |
| • Colorado River Cooperative Agreement *(approved in concept,* 2011) | • Eagle River Memorandum of Understanding (1998) |
| • Blue Mesa Plan (2010) | • Local Voter-Authorized Tax Rate Increases (1995 +) |
| • Wild & Scenic River Alternatives – Stake'hldr Groups (2008) | • Aspen Water Conservation Initiative (1993) |
| • Denver Water – Eagle County Settlement Agreement (2007) | • Wolford Mountain Reservoir Agreement (1992) |
| • Winter Park Master Plan – Zoning Density Constraint (2006) | • Clinton Reservoir-Fraser River Agreement (1992) |
| • Roaring Fork Watershed Collaborative (2002) | • Upper CO. Endangered Fish Recovery Program (1988) |
| • GMUG Pathfinder Project (2000) | • Summit County / Denver Water Agreement (1985) |
| • Blue River Restoration Projects (2001+) | • QQ Committee of the NWCCOG (1978) |

Enacted in 1974, HB-1041 authorizes counties and municipalities to regulate certain activities within their respective jurisdictions that are of "state interest." Headwaters counties have used these authorities as an effective tool to negotiate mitigation remedies with transmountain water diverters. But for the authorities

provided in HB-1041, Summit, Eagle and Grand counties would currently experience substantially greater adverse impacts associated with transmountain water diversion projects because transmountain water diverters would have no need to negotiate counterbalancing mitigation remedies with the basin-of-origin counties. HB-1041 has created a forum to resolve issues. Cooperation among parties on either side of the Continental Divide has increased significantly since HB-1041 authorities were granted to local jurisdictions. Notice that none of the innovative solutions summarized in the table above occurred prior to HB-1041 authorities.

The major transmountain diversion projects in the headwaters counties were developed prior to the enactment of HB-1041 and prior to other federal environmental regulations. Impacts associated with these early projects have not been fully mitigated.

Although beyond the scope of this descriptive analysis, numerous local, regional and State agencies, advocacy organizations and thoughtful individuals have identified policy, technical and funding initiatives that could enable the State to better manage its most precious resource, water. With leadership from the Governor and State legislature, these ideas should be pursued with intensity.

## 1.4 CONTEXT –THE IBCC REPORT TO THE GOVERNOR

**The IBCC Report**. In December 2010, the Interbasin Compact Committee (IBCC) submitted a "Report to the Governor" that summarizes "our discussions and accomplishments over the past four years and our proposed work plan for 2011." [9]

It implies that future municipal water demand is a given that must be satisfied and then describes four general strategies to meet future municipal water demand: (1) Conservation; (2) (East Slope) Agricultural transfers to municipal use; (3) Identified Projects and Processes (IPPs) and (4) new water supply development. Among these choices, the Report guides the reviewer to the conclusion that new water supply development is the best solution.

- Conservation is purported to be "exceedingly important." However, the role of conservation is deemphasized as the Report simply references the need to work with others to "understand the relationship between land use planning and water use." [10]

- Agricultural transfers of water (from the Eastern Plains) to municipal use are discouraged because of adverse impacts.

- IPPs other than new water supply development are relegated to a supporting role; only information sharing is recommended.

- New water supply development, which includes new transmountain water diversion projects, is a recommended path "to prevent the loss of significant amounts of agricultural land…" [11]

Preceding the release of the Report, there was focused attention on the potential adverse economic consequences of purchasing Eastern Plains agricultural land with water rights and transferring these water rights to municipal use. [12] [13]

**Responses from Local Headwaters Counties**. Local county and municipal governments in the headwaters counties are concerned with these findings and are concerned that this Report will become the foundation of the Governor's water policy agenda. Written remarks submitted to the IBCC staff from the Eagle County Commissioners, the Grand County Commissioners, the Gunnison County Commissioners, the Pitkin County Commissioners and the Town of Gypsum are summarized below. [14]

- Contrary to the intended process of inclusion and overt statements of inclusiveness, the IBCC Report to the Governor was compiled and released before receiving input from the headwaters counties most impacted by the results and several basin roundtables. It is a top-down rather than a bottom-up report. If input from the headwater counties had been received and incorporated into the document, then the Report findings would be different.

- The Report assumes that future consumptive municipal water demand in the Front Range is a given that must be satisfied without question rather than one of several important issues to be addressed.

- The Report was released before work on the non-consumptive demand was completed. This relegates non-consumptive requirements to a substantially inferior position.

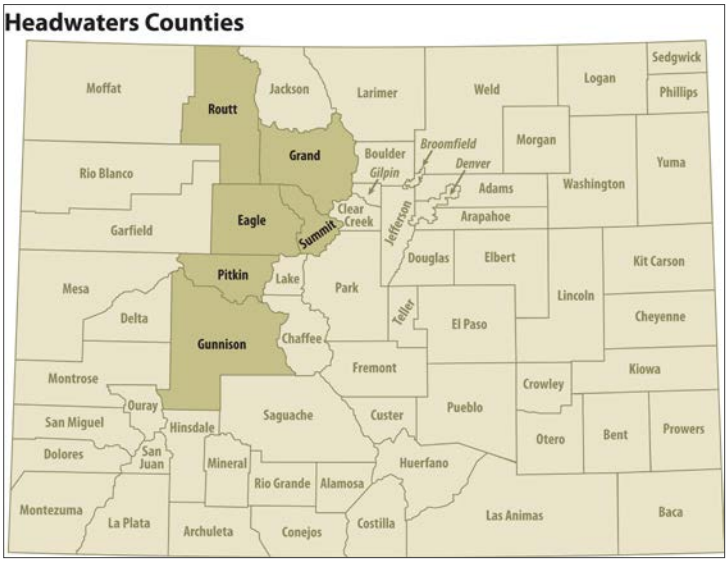
- The Report implies that State agencies should favor IPPs over other approaches, forcing State agencies into an advocacy role that was not contemplated.

- HB 1041 Regulations, a hallmark of local input, may be minimized in favor of State-mandated streamlined approval of transbasin water diversion projects if the Report's recommendations are followed.

# 2.0 ECONOMICS OF THE HEADWATERS COUNTIES

## 2.1 OVERVIEW

This report focuses on six West Slope headwaters counties (Eagle, Grand, Gunnison, Pitkin, Routt and Summit). These counties comprise 10% of the State's land, 3% of the State's population, 4% of the State's jobs and nearly 100% of the iconic images used to market Colorado to the world.




There are three sectors of the headwaters county economies that rely on water for more than accommodating needs of their employees, clients and customers. These sectors are tourism, agriculture and mineral resource development. This section describes the significance of each sector to the headwaters counties. Section 3 describes how water relates directly to each economic sector.

- Tourism generates the most jobs in these local economies and forms the iconic basis of Colorado's economic development initiatives. These counties offer world-class recreation opportunities that attract out-of-State and foreign visitors to Colorado as well as keep Front Range households in Colorado for some of their vacation travel.

- Agriculture defines the cultural roots of the local headwaters economies, is the dominant private land use, and is inextricably linked to sustaining wildlife and tourism. It has a synergistic and mutually-supportive relationship with livestock processing in the Eastern Plains counties. It is at risk and is the subject of extraordinary local preservation efforts.

- Mineral Resource Development provides the highest paying jobs and contributes significantly to the property tax base in three headwaters counties, Gunnison, Routt and Summit. Mineral resource development is not only part their cultural heritage but may be a growing sector as technology makes extraction more cost-effective and as demand increases for metals and minerals found in these counties

These six headwaters counties are unique among Colorado counties in several ways:

- 70% of the land is owned by the public sector, primarily the federal government. Privately-owned land, 30% of the total, is concentrated in the valleys. This condition is both an economic benefit and a constraint.

- Local residents occupy only 44% of the homes owned in the headwaters counties; 56% are owned by Front Range, out-of-State or other Colorado households.

## 2.2 TOURISM

### 2.2.1 Tourism – An Economic Development Priority

> "Almost every county summary and regional statement mentioned tourism as fundamental to local economies throughout Colorado." *Colorado Blueprint, page 12.*

**Statewide Perspective.** The Office of Economic Development and International Trade has drafted The Colorado Blueprint [15], which is an economic development plan developed from input at the individual county and regional level. Tourism is elevated in importance as part of the "Colorado Brand." Images of visitor opportunities in headwaters counties are the signature image used by the State and Front Range economic developers to attract new businesses and creative employees and to attract out-of-State visitors. Enhance tourism in the headwaters counties and the entire State benefits.

> "For Denver to do well, we have to have thriving mountain communities." *(Former) Mayor John Hickenlooper*

**Front Range Perspective.** Front Range economic developers promote the natural environment of the high mountain communities as a primary marketing tool. The illustration just below is a snapshot of the home page of the Denver Metro Chamber. (August 2011) It features skiing; but for Eldorado, skiing is only available in the high mountains and is highly dependent on water for snowmaking to create a predictable, early holiday ski season.

As described later (*Section 2.2.3),* the larger Front Range communities often experience a stronger economic benefit from recreation activities that occur in the headwaters counties than the smaller headwaters counties experience due to visitor purchases of recreation equipment and transportation.


**Headwaters Counties' Perspective.** Tourism is the predominant basic-sector industry in the headwaters counties. In the forthcoming statewide economic development plan, each county ranked tourism as a "top-five" economic development strategy.

- Routt County described the linkages between tourism, quality of life and its ability to retain and attract businesses in all sectors.
- Two counties (Routt and Summit) made specific reference to agritourism as a strategy to retain existing agricultural properties.
- Some counties focused on tourism opportunities to attract Front Range visitors; Eagle and Pitkin counties focused on strategies to attract international visitors.

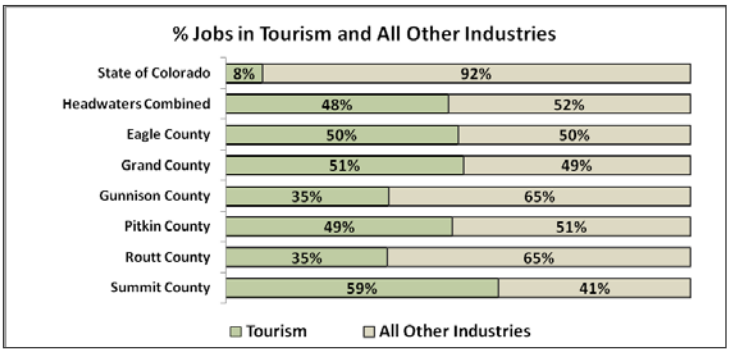
### 2.2.2 The Economic Contribution of Tourism in the Headwaters Counties

A comprehensive definition of tourism is applied in this section. It incorporates all aspects of the tourism sector, including second-homes, and measures tourism in terms of employment. It relies upon and updates information developed in the report, *Tourism Jobs in Colorado*, prepared by the Center for Business and Economic Forecasting, Inc. (CBEF) in partnership with the US Forest Service, the US Bureau of Land Management and the Colorado Tourism Office. [16]

The *Tourism Jobs in Colorado* report is the most comprehensive and definitive study on tourism in Colorado in that it estimates the direct link between tourism, not just travel, and jobs. With technical support from the Colorado Department of Local Affairs, the study developed specialized databases and held workshops with individual counties to verify or modify results. Since the definition of tourism is broader than the definitions used by the Longwoods / Dean Runyon analyses, the estimates of tourism jobs are higher but not inconsistent with these other analyses.[17]

***Tourism Jobs***. In the headwaters counties, tourism is a basic sector. [18] Unlike other basic sector activities, tourism creates jobs across traditional industry lines; there are tourism jobs in at least 20 industries in five sectors, as summarized in Appendix Table 1. The CBEF Report found that the industries with the highest percentage of statewide jobs in tourism are in the services, retail trade, real estate and transportation sectors.

The percent of total jobs that are attributable to tourism varies by county. This finer grain of analysis was developed through interviews and work sessions in each county. The CBEF Report found that tourism jobs comprised 8% of total jobs in Colorado. In the six headwaters counties, tourism jobs comprised between 35% and 59% of total jobs, as illustrated in the graph to the right. Clearly, tourism is the most significant economic activity in these counties, when measured by jobs.

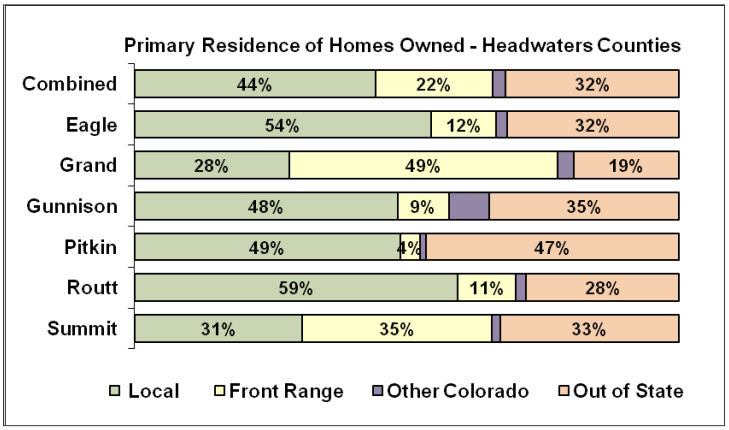



Source: Center for Bus. & Economic Forecasting, *Tourism Jobs in Colorado*.

Since this employment data is somewhat dated, a supplemental analysis has been completed to observe whether similar employment relationships hold statewide and in the six headwaters counties. Based on this analysis, it is reasonable to believe that the 1997 calculations are generally representative of the economies in 2010. The detailed comparison of employment data is presented in Appendix Table 2.

**Front Range, Other Colorado and Out-of-State Homeowners.** The economy of the headwaters counties is deeply intertwined with homeowners from the Front Range, other parts of Colorado and out of State. These second-home households rely on the headwaters counties as their respite from urban living.

Many who work in the Front Range moved to Colorado because of the mountains. Their presence is evidence that the Colorado mountain communities are a unique part of living in Colorado. The illustration to the right summarizes homeownership by primary residence. [19] Only 44% of the homes owned in the headwaters counties are owned by local county residents; 22% are owned by Front Range households; 32% are owned by households from other states or countries; 2% are owned by other Colorado households. In Grand and Summit counties, the volume of homes owned by Front Range households exceeds the volume owned by local residents. In Pitkin County, the proportion of homes owned by out-of-State residents (47%) comprises nearly one-half of all homes owned.



Source: County Assessors' data bases.

The magnet of mountain home ownership for urban workers is an economic development asset that distinguishes Colorado cities from most of its competition, such as Minneapolis, Phoenix, and Austin, and enables it to stay competitive with Salt Lake City, Portland and Seattle.

Second homes are also a significant economic component of each headwaters county. In 2003, the Northwest Colorado Council of Government (NWCCOG) study of second homes in four of the six headwaters counties (Eagle, Grand, Pitkin and Summit) found that the construction and servicing of these homes and the local purchases made by these relatively high household income families represented "$5.3 billion in outside dollars coming into the four counties." [20]

The NWCCOG study also found that the percent of jobs attributable to second homes, from both construction and owner spending, comprised 38% of total jobs in the four counties. (Eagle County, 45%, Grand County, 32%; Pitkin County, 41%; Summit County, 28%). [21]

Furthermore, second home homeowners attach high value and significance to the scenic and visual quality of the environment, water quality and water quantify recreational opportunities and wildlife habitat. All of these features are heavily dependent on streamflow in its natural water course.

| % OF SECOND HOME HOMEOWNERS THAT ATTRIBUTE HIGH VALUE TO THESE ATTRIBUTES: | |
|---|---|
| ATTRIBUTE | % RATING THE PRIORITY A 4 OR 5 ON A 5 POINT SCALE |
| Scenic / Visual Quality | 95% |
| Water Quality / Quantity | 91% |
| Recreational Opportunities | 91% |
| Wildlife Habitat | 81% |
| Source: *The Social and Economic Effects of Second Homes, Executive Summary*, Linda Venturoni, Northwest Council of Governments, June 2004. | |

**Out-of-State Visitors.** Vacationing visitors have many recreation choices; the headwaters counties attract millions of visitors each year.

- In 2010, 60% of all overnight skier visitors [(882,000, (60% x 1,470,000)] came from out-of-State; prior to the recent recession, about 80% of all overnight skier visits were from out-of-State. Most major ski resorts are in the six headwaters counties. Skiers spent an average of $931 per person during their average 4.6 day stay. [22] These expenditures occurred not only at the ski resorts but also in Front Range counties, since travel and equipment expenditures comprise an important component of the trip.

- Direct travel expenditures by out-of-state visitors in the six headwaters counties totaled $2,309,500 in 2009; this was 37% of total retail expenditures in these counties. Statewide, travel expenditures ($13,446,000) comprised 10% of total retail expenditures. Direct travel expenditures from six headwaters counties comprised 17% of statewide direct travel expenditures. [23]

| DIRECT TRAVEL EXPENDITURES (2009$) OUT-OF-STATE VISITORS | |
|---|---|
| Headwaters Counties | $2,309,500 |
| % of Total Retail | 37% |
| Statewide | $13,446,000 |
| % of Total Retail | 10% |

**Economic Impacts from Visitor Air Travel.** Another measure of the significance of tourism is the economic impacts [24] generated by visitors that travel to the headwaters counties by air. In the six headwaters counties, there are six airports that serve five of the six counties (There is no airport in Summit). The total economic impact generated by visitors to these six airports was $2.17 million in 2008. [25] Visitor impact comprised 81.6% of the total economic impact generated by the airports.

| VISITOR* AND TOTAL ECONOMIC IMPACT – AIRPORTS IN THE HEADWATERS COUNTIES | | | |
|---|---|---|---|
| Airport | Total Economic Impact | Visitor Economic Impact | Visitor / Total Impacts |
| Aspen / Pitkin County | $1,067,401,700 | $927,127,500 | 89.4% |
| Eagle Regional Airport | $982,170,400 | $757,824,200 | 77.2% |
| Granby / Grand County | $5,489,200 | $2,436,800 | 44.4% |
| Gunnison/ Crested Butte | $177,646,500 | $132,522,100 | 74.6% |
| Hayden / Yampa Valley | $412,033,800 | $341,677,800 | 82.9% |
| Steamboat / Bob Adams Field | $11,739,800 | $5,008,600 | 42.7% |
| TOTAL | $2,656,481,400 | $2,166,597,000 | 81.6% |
| * This includes business and pleasure travelers.<br>Source: Wilbur Smith & Associates, *The Economic Impact of Airports in Colorado 2008*, Tables A-12, A-13, and A-14. | | | |

## 2.2.3. Components of Tourism in Headwaters Counties

Tourism in the headwaters counties is linked to water-based and active recreation activities such as fishing, hunting, kayaking and rafting, lake and reservoir activities, and passive activities such as sightseeing and wildlife viewing. This section summarizes economic impacts associated with these activities.

Fishing in Summit County

**Fishing.** For the headwaters communities that are not part of major resorts, such as Granby, Kremmling, Oak Creek, and Basalt, a significant portion of summer and fall tourism is based on fishing. Tom Clark, Mayor of Kremmling, explains that fishing is a fundamental part of the local cultural heritage and is a key factor in

retaining the local rural atmosphere. [26]

Henry Kirwin, co-owner of Mo Henry's Trout Shop, reports that his 500 to 1,000 fishing guide clients may come to Grand County to fish its Gold Medal streams, but often extend their stay to enjoy other active and passive recreation opportunities. Fishing is a destination purpose for many summer visitors.

During 2007, the most recent year for which data are available, there were about 10.47 million fishing activity days in Colorado.[27] An activity day consists of one angler fishing for one day. Since 2002, statewide fishing activity days increased by 30% (8.05 million in 2002). However, 2002 was a poor year for fishing due to drought and wildfire conditions.

| FISHING – STATEWIDE IMPACT (2007) | |
|---|---|
| Activity Days | 10,466,000 |
| Direct Impact | $725,200,000 |
| Total Impact | $1,259,390,000 |
| Total Jobs | 14,610 |

Average daily fishing expenditures, measured in constant 2007 dollars, increased by 12% for resident anglers and by 73% for nonresident anglers. In recent years, headwater counties have stepped up their marketing efforts to attract, guide, house and entertain out-of-state anglers.

| FISHING – AVERAGE DAILY EXPENDITURES IN 2007 DOLLARS | | | |
|---|---|---|---|
| | 2002 Average Daily Expenditures | 2007 Average Daily Expenditures | % Change |
| Non-Resident | $60 | $67 | 12% |
| Resident | $68 | $118 | 73% |
| Source: BBC, *The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado*, 9/26/08 2008, page V-21. | | | |

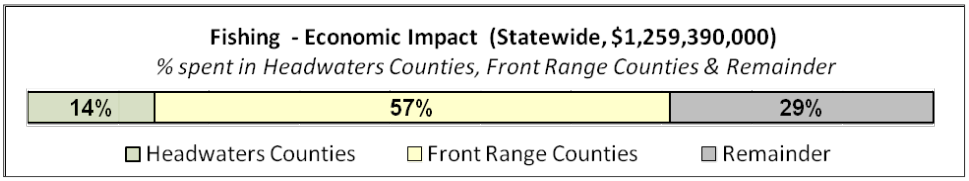
Statewide, these anglers spent about $725.2 million on goods and services (direct impact) and generated a total economic impact of about $1.26 billion and 14,610 jobs.

In 2007 in the six headwaters counties, anglers spent about $105.8 million on goods and services and generated a total economic impact of $180.68 million and 2,199 jobs.

| FISHING – HEADWATERS COUNTIES IMPACT | |
|---|---|
| Direct Impact (Estimate) | $105,746,000 |
| Total Impact | $180,680,000 |
| Total Jobs | 2,199 |

An earlier Division of Wildlife study estimated [28] that 27% of direct fishing and hunting expenditures are on sporting goods, 20% on transportation, 28% on food and lodging, 11% on boating, and 8% on guide fees and membership dues and 6% on other. The statistical breakdown of expenditures for fishing only is not available.

While many anglers fish in the mountain streams and reservoirs, the largest economic impact is felt in the larger Front Range counties, since this is where most equipment is purchased and transportation services are provided. As illustrated in the graphic to the right, about 14% of the statewide economic impact of fishing is experienced in the six headwaters counties; 57% is experienced in the Front Range counties. [29] The Appendix includes a map that highlights the 11 Front Range counties.




In the headwaters counties, about 65% of total fishing expenditures are from Colorado residents and 35% are from out-of-State residents. A substantial number of Colorado residents are from the Front Range.

*Gold Medal Fishing.* The Colorado Wildlife Commission has sparingly bestowed about 168 miles of Colorado's 9,000 miles of trout streams with the designation of "Gold Medal." [30] This prestigious designation signals the presence of large and abundant trout; it is a signal that attracts anglers nationally and internationally. Each headwaters county has one or several segments of river with the Gold Medal designation.

- Eagle County: Gore Creek from Red Sandstone Creek to the Eagle River
- Grand County: Colorado River from Fraser River to Troublesome Creek
- Summit County: Blue River, from Dillon Reservoir Dam to confluence with the Colorado River
- Eagle & Pitkin Counties: Fryingpan River, from the Ruedi Reservoir to the Roaring Fork River
- Eagle & Garfield Counties: Roaring Fork River from the Fryingpan River to the Colorado River
- Gunnison County: Gunnison River from the Crystal River Dam to the north Fork of the Gunnison
- Routt County at Steamboat Lake; North Platte River from the Routt National Forest to Wyoming

Fishing on the Fryingpan River

*Wild and Scenic River Designation.* The Bureau of Land Management (BLM) has determined that there are 22 river segments in the six headwaters counties that are eligible for "Wild and Scenic River Designation" status.[31] These are listed below. To be eligible, the river segment must have one or more "outstandingly remarkable values", have sufficient water to support those values and be free-flowing. If these segments are deemed "suitable", then the BLM will manage the segments to maintain their "outstandingly remarkable values." There is only one Wild and Scenic River in Colorado, the Cache la Poudre River in Larimer County.

| ELIGIBLE WILD AND SCENIC RIVER SEGMENTS – HEADWATERS COUNTIES | | | | |
|---|---|---|---|---|
| STREAM | SEGMENTS | MILES | COUNTY | CLASSIFICATION |
| Abrams Creek | 1 | 3.44 | Eagle | Recreational |
| Blue River | 3 | 4.52 | Grand & Summit | Wild, Recreational |
| Colorado River | 7 | 88.54 | Eagle, Grand | Recreational |
| Eagle River | 1 | 25.69 | Eagle | Recreational |
| Egeria Creek | 1 | 7.78 | Routt | Recreational |
| Hack Creek | 1 | 2.42 | Eagle | Scenic |
| Kinney Creek | 1 | 4.83 | Grand | Scenic |
| Muddy Creek | 1 | 8.95 | Grand | Recreational |
| Piney River | 1 | 2.42 | Eagle | Recreational |
| Rabbit Ears Creek | 1 | 4.24 | Grand | Wild, Recreational |
| Rock Creek | 1 | 4.78 | Routt | Recreational |
| Spruce Creek | 1 | 0.97 | Eagle | Recreational |
| Sulphur Gulch | 1 | 3.30 | Grand | Recreational |
| Troublesome Creek | 1 | 6.26 | Grand | Scenic, Recreational |
| TOTALS | 22 | 168.14 | | |
| Source: Bureau of Land Management, Wild and Scenic River Eligibility Report for Kremmling and Glenwood Springs Field Offices, Colorado, March 2007. | | | | |

In September 2011, BLM released its *Draft Resource Management Plan for the Colorado River Valley Field Office* [32] and its *Draft Resource Management Plan and Draft Environmental Impact Statement (*the Kremmling Field Office).[33] These two BLM offices have jurisdiction over seven of the 22 river segments under consideration. The Draft Plans include four management alternatives: the preferred alternative as it relates to Wild and Scenic Rivers (Alternative B) is divided into sub-alternatives, "B1" and "B2." Under "B1", there would be a finding of

suitability on the Colorado River Segments 4 and 5 (20.26 miles from the mouth of Gore Creek to State Bridge) and Segments 6 and 7 (63.3 miles from State Bridge to 1 mile east of No Name Creek / Glenwood Canyon). [34] Under "B2", BLM would defer suitability on these Colorado River segments and recommend adoption of the *Upper Colorado River Wild and Scenic Stakeholder Group Management Plan* [35] to protect outstandingly remarkable values (ORVs).

**Hunting.** Hunting wildlife is dependent on healthy forests, which depend on adequate streamflow and ground water resources. During 2007, the most recent year for which data are available, there were about 2.21 million hunting activity days in Colorado. Since 2002, hunting activity days increased by about 6% (2.09 million in 2002).

Statewide, hunters spent about $292.6 million on goods and services (direct impact) and generated a total economic impact of about $502.4 million and 6,010 jobs.

| HUNTING – STATEWIDE IMPACT (2007) | |
|---|---|
| Activity Days | 2,206,000 |
| Direct Impact | $292,600,000 |
| Total (Direct + Indirect) Impact | $502,370,000 |
| Total Jobs | 6,010 |

In the six headwaters counties, hunters spent about $63 million on goods and services and generated a total economic impact of $107.2 million and 1,453 jobs.

| HUNTING – HEADWATERS COUNTIES IMPACT | |
|---|---|
| Direct Impact | $63,007,000 |
| Total (Direct + Indirect) Impact | $107,240,000 |
| Total Jobs | 1,453 |

Statewide, big-game hunting activity days comprised about 72% and small-game hunting comprised about 28% of the total. Most big-game hunters use federal and State government land in the mountain communities; small-game hunters are spread more widely throughout the State. While the number of hunting activity days (2,206,000) is substantially lower than angler activity days (10,466,000), their expenditures are substantially higher per day and the proportion of hunters from out-of-state (28%) is higher than for fishing (4%) or many other sports. These two factors make their economic impact more significant.

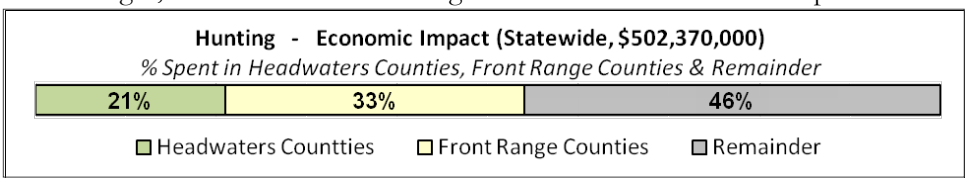
| STATEWIDE HUNTING ACTIVITY DAYS AND AVERAGE DAILY EXPENDITURES | | | | | |
|---|---|---|---|---|---|
| | Type of Hunting | Resident | Nonresident | TOTAL | % OF TOTAL |
| Activity Days | Big-Game | 1,005,000 | 596,000 | 1,601,000 | 72% |
| | Small-Game | 582,000 | 23,000 | 605,000 | 28% |
| | Total | 1,587,000 | 619,000 | 2,206,000 | 100% |
| Daily Expenditures | Big-Game | $106 | $216 | | |
| | Small-Game | $94 | $87 | | |
| Source: BBC and Colorado Division of Wildlife, *The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado*, Final Report, September 26, 2008, page III - 11. | | | | | |

Because nonresident big-game hunters spend two-times more per day than resident big-game hunters, their economic impact is more significant. Non-resident hunters comprise only 28% of total hunters but 44% of total economic impact.

| STATEWIDE HUNTERS – RESIDENT AND NON RESIDENT ACTIVITY DAYS AND ECONOMIC IMPACT | | | |
|---|---|---|---|
| | RESIDENTS | NON-RESIDENTS | TOTAL |
| Activity Days | 72% | 28% | 100% |
| Total Economic Impact | 56% | 44% | 100% |
| Source: BBC and Colorado Division of Wildlife, *The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado*, Final Report, September 26, 2008, pages III-11 and III-19. | | | |

Hunting is a particularly significant segment of the tourism market in Gunnison and Routt counties; in each county, nonresident hunters generate 63% of the economic impact attributable to hunters.

As illustrated in the graph to the right, the headwaters counties generate a sizeable economic impact relative to the size of their economies. Front Range counties also benefit from expenditures on equipment and travel. Hunting impacts are more widely spread throughout the State because there are significant hunting locations on the Eastern Plains and in the southwest portions of the State.




**Kayaking and Rafting**. There are numerous rivers and streams in the headwaters counties that are suitable for rafting and kayaking. (See Appendix Table 5 for details.)

- *Colorado River Basin.* American Whitewater lists 29 reaches in the Colorado River basin in Eagle, Grand, Summit or Pitkin that are suitable for rafting use. These locations are on the Blue, Colorado, Eagle, Fraser, and Fryingpan, Piney and Roaring Fork rivers plus the Gore, Grizzly, Homestake, Sweetwater, Tenmile and Willow creeks.

- *Gunnison River Basin.* In the Gunnison County portion of the Gunnison River basin, American Whitewater lists 16 reaches suitable for rafting use on the Crystal, East, Gunnison, Slate and Taylor rivers and on Anthracite, Cebotta, Daisy, Henson, and Oh Be Joyful creeks.

- *Yampa / White / Green River Basin.* Routt County portion of the Yampa/Green/White River basin has three reaches that suitable for rafting use. These are on the Elk and Yampa rivers.

- In Grand County, the Gore Canyon stretch of the Colorado River is one of two premiere Class 5 white water areas for kayaking and rafting in the nation. For the last several years, this area has hosted the U.S. National White Water *(rafting)* Championships. Event organizers report that this area will continue to host this event indefinitely into the future, assuming adequate water flows. In addition, championship organizers are currently working to have this segment of the Colorado River designated as one of four sanctioned events sponsored by the International Rafting Federation. This would bring internationally ranked competitors to Grand County.[36]

Teva Mountain Games on Gore Creek

- In recent years, the Town of Vail has hosted the Teva Mountain Games on Gore Creek. In recent years, this event has attracted over 30,000 visitors who spent more than $3 million in the Vail area. The photo to the right shows visitors gathered around a bridge over Gore Creek during the Teva Games.

For nearly 20 years, the Colorado River Outfitters Association (CROA) has estimated kayak and rafting user days generated by commercial outfitters on Colorado Rivers.[37] Their statewide estimate of user days for 2010 was 507, 392. At an average daily user expenditure of $115.71[38], the total direct economic impact was $58,711,260; the total economic impact was $150,300,826.[39]

KAYAKING & RAFTING – Commercial Outfitters – Statewide Impact ($2010 $)

| | |
|---|---|
| User Days | 507,392 |
| Expenditures Per User Day | $115.71 |
| Direct Impact | $58,711,260 |
| Total Impact | $150,300,826 |

The CROA calculates impacts for 27 river segments including nine segments in the headwaters counties. Collectively, these river segments contributed $9.37 million in direct economic impact and $23.99 million in total impact in 2010. Collectively, the headwaters counties impact is 16% of the statewide total. The Arkansas River, which traverses nearby Lake County, generates 42% ($62.5 million) in total impacts.

KAYAKING AND RAFTING USER DAYS AND ECONOMIC IMPACTS
RIVER SEGMENTS IN THE HEADWATERS COUNTIES

| COUNTY | RIVER SEGMENT | USER DAYS | DIRECT IMPACT ◆ | TOTAL IMPACT ▫ |
|---|---|---|---|---|
| Eagle | Eagle – Upper | 1,095 | $126,704 | $324,363 |
| | Eagle - Lower | 1,710 | $197,867 | $506,540 |
| Grand | Colorado – Upper | 41,504 | $4,802,504 | $12,294,410 |
| Gunnison | Gunnison – Upper | 2,669 | $308,835 | $790,617 |
| | Taylor | 14,332 | $1,658,382 | $4,245,458 |
| Pitkin | Roaring Fork – Upper | 2,404 | $278,171 | $712,118 |
| | Roaring Fork – Lower | 1,363 | $157,715 | $403,751 |
| Routt | Green / Yampa | 14,741 | $1,705,708 | $4,366,613 |
| Summit | Blue | 1,181 | $136,656 | $349,839 |
| | TOTAL | 80,999 | $9,372,542 | $23,993,709 |

◆User days x direct expenditures per user ($115.71) = Direct Impacts
▫ The multiplier, 2.56, was provided by the Colorado Tourism Board.
Source: Colorado River Outfitters Association, *Commercial River Use in the State of Colorado, 1988 – 2010.*

These figures exclude the significant economic impact generated by white water parks which have been developed in the City of Aspen and the Towns of Avon, Breckenridge, Gunnison, Steamboat Springs and Vail using minimum streamflows acquired with recreational in-channel diversion (RCID) water rights.

**White Water Parks.** White water parks enhance the natural flow of rivers and streams by strategically placing boulders and concrete structures to create a safe but exhilarating pace for kayaks and safe points of access. Six whitewater parks have been built in the headwaters counties (Avon, Aspen, Breckenridge, Eagle, Gunnison, Steamboat Springs). They have become viable economic investments because streamflow can be assured through the authorization of RICD water rights.[40]

"Whitewater parks are the equivalent to what snowmaking has done for skiing."
*Joe Health, Teva Mountain Games organizer*

The economic impacts of three of the whitewater parks in the headwaters counties have been estimated by Status Consulting and reported by American Whitewater. These results are summarized below.

WHITEWATER PARKS – HEADWATERS COUNTIES

| COUNTY, CITY OR TOWN | STREAM OR RIVER | YEAR COMPLETE | ANNUAL USER DAYS | ANNUAL LOCAL SPENDING ($000) | ANNUAL ECONOMIC IMPACT |
|---|---|---|---|---|---|
| Eagle – Vail | Gore Creek | 2000 | 1,000 – 2,300 | $3.5 - $4,000,000 | $4,000,000 |
| Routt – Steamboat | Yampa | n/a | 75,700 | $4,900,000 | $7,200,000 |
| Summit – Breckenridge | Blue | 2001 | 1,200 – 2,300 | $220,000 - $460,000 | $400,000 - $1,000,000 |
| Source: American Whitewater and Stratus Consulting. | | | | | |

**Lake and Reservoir Activities.** There are 18 man-made reservoirs in the six headwaters counties that are available for some recreation purposes. Among the largest facilities, nine are owned by the Bureau of Reclamation, two are owned by Denver Water and, one is owned jointly by the cities of Aurora and Colorado Springs. The Bureau of Reclamation, Denver Water and Aurora / Colorado Springs reservoirs were built for transmountain or transbasin water diversion. Stagecoach Reservoir, built by The Upper Yampa Water Conservancy district, was built for in-county and adjacent Moffat County water use. Grand Lake, a natural lake formed by runoff from glaciers, not only has substantial recreation visitors but also is also the heart and economic engine for the Town of Grand Lake. Each major reservoir that permits recreation is listed in Appendix Table 3; the recreation activities allowed are listed in Appendix Table 4.

Dillon Reservoir

The headwaters counties benefit because each is actively used by recreation visitors, campers and sightseers who purchase goods and services in the counties. Detailed visitor statistics and economic impact estimates have not been quantified. However, water supply, not recreation, is the primary purpose of these reservoirs. As demand for water increases, it is reasonable to anticipate lower and more fluctuating reservoir water levels, which will likely hamper recreation activity as marinas become inaccessible for boaters and as the scenic quality deteriorates for sightseers.

**Resort Developments on Rivers and Streams**. There are a number of significant residential developments and resorts that rely on the riparian health and passive beauty of the streams and rivers to attract guests, visitors and homebuyers. A sampling of developments follows.

Harmel's Ranch Resort on the Taylor River

| RESORT DEVELOPMENTS THAT RELY PRIMARILY ON HEALTHY RIVERS AND STREAMS | | |
|---|---|---|
| COUNTY | DEVELOPMENT | RELATIONSHIP TO STREAM/RIVER |
| Eagle | Town of Vail | Gore Creek is a featured attraction; hosts Teva Games |
| | The Lodge at Cordillera | One of five Orvis-endorsed fly-fishing lodges near Edwards |
| Grand | Winter Park Resort | Redesign of town center features the Fraser River |
| | Devil's Thumb Ranch | Fly fishing in the Fraser River and Ranch Creek |
| | C Lazy U Ranch | One of five Orvis-endorsed fly-fishing resorts |
| | Town of Grand Lake | Most desired and valuable properties abut the Lake. |
| | Elktrout Lodge | On the Colorado River; destination lodge; 5-star dining (just sold) |
| | Edgewater | Fly-fishing is the primary attraction to this development |
| Gunnison | Gunnison River Lodge | On the Gunnison River |
| | Three Rivers Resort | At confluence of the Taylor & East Rivers |
| | Black Canyon Anglers Fishing Lodge | Fishing on private ponds and on the Gunnison River |
| | Harmel's Ranch Resort | On the Taylor River (See photo above.) |
| Pitkin | Lodge on the Roaring Fork | On the Roaring Fork River |
| | Diamond J. Ranch | Located on the Fryingpan River in Meredith |
| Summit | Town of Breckenridge | Retail development |
| | Keystone | Snake River traverses core area |
| | Town of Silverthorne | Blue River Trail, Factory Outlet Stores, Pavilion |
| | Eagle Rock Ranch | Stillwater fishing on internal reservoirs |

**Wildlife Watching Activities.** The Colorado Division of Wildlife does not collect detailed information on wildlife watching and so data at the individual county level is not available. Statewide economic impacts from an estimated 9.4 million activity days on trip and equipment expenditures and related secondary impacts was approximately $1.2 billion in 2006; jobs to support this industry were estimated to total 12,780. The percent of in-State resident participants was about 74% of the total. The headwater counties likely capture a substantial portion of wildlife watching activity.

| ECONOMIC IMPACT OF WILDLIFE WATCHING IN COLORADO, 2006 | | | | | |
|---|---|---|---|---|---|
| Type of Participant | Activity Days | Direct Expenditures | Total Economic Impact | Total Jobs | Average Daily Expenditures |
| Out-of-State | 2,394,000 | $417,400,000 | $720,300,000 | 7,220 | $174 |
| State Resident | 7,010,000 | $285,800,000 | $497,900,000 | 5,560 | $41 |
| Total | 9,404,000 | $703,200,000 | $1,218,200,000 | 12,780 | $74 |
| Source: BBC and Colorado Division of Wildlife, *The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado*, Final Report, September 26, 2008, page III-13. | | | | | |

## 2.3 AGRICULTURE IN HEADWATERS COUNTIES

2.3.1. **Statewide and Local Priority.** Agriculture is important statewide economic activity. The Colorado Legislature has placed agriculture in a protected classification, unlike any other land use.

Ranch near Edwards

> "It is the declared policy of the state of Colorado to conserve, protect, and encourage the development and improvement of its agricultural land for the production of food and other agricultural products." *C.R.S. 25-3.5-101 – Legislative Declaration*

Preservation and protection of agricultural land is contained in planning documents of every headwaters county. In addition, several headwaters counties have adopted ordinances and resolutions to define and provide additional protection for agricultural operations and land. A quote from the Gunnison County - Crested Butte to Gunnison Corridor Comprehensive Plan is illustrative of the significance headwaters counties attribute to agriculture.

> *(Gunnison County)* Cattle ranching has throughout history been the heart, soul and the economic mainstay of the American West. Gunnison County has a rich history of agricultural production stretching back more than a century. Precisely because it is an activity that leaves the scenic landscape relatively intact, the economic and social importance of ranching for both the County and the state, its people and many visitors, goes well beyond the production of beef. In addition, agricultural uses contribute to the diversification of a growing tourism dependent economy." *(Gunnison County, Crested Butte to Gunnison Corridor, October 2005)*

Four headwaters counties (Grand, Eagle, Gunnison and Routt) have adopted Right to Farm and Ranch ordinances that expand upon the State's legislative authorization. Summit County acknowledges the importance of agriculture in its Lower Blue Master Plan. Pitkin County acknowledges "right to farm" practices in its land use code.

> *(Summit County)* "Ranching and agricultural activities in the Basin are integral elements necessary for the continued vitality of its history, landscape, lifestyle, and culture. Given their importance to the Basin and the State of Colorado, agricultural lands and operations are worthy of recognition and protection. … residents and visitors must be prepared to accept the activities, sights, sounds, and smells of the Basin's agricultural operations as a normal and necessary aspect of living there. (*Lower Blue Master Plan, page 18)*

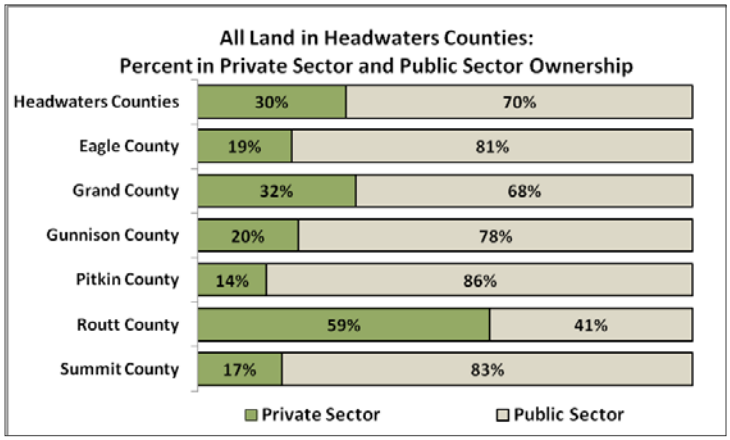
> *Pitkin County Land Use Code - 1-60-80:* Agricultural Preservation. (a) Productive agricultural land is a limited resource of environmental, cultural, open space, visual and economic value that should be conserved and preserved. (b) All new development in areas surrounding or incorporated within existing agricultural; properties should be designed to minimize impacts to agricultural operations.(c) Preservation and utilization of water for agricultural lands within the county is encouraged. (d) The fragmentation of large parcels of agricultural land is discouraged and the assemblage of smaller parcels into larger, more manageable and agriculturally productive tracts is encouraged. (e) Pitkin County supports "right-to-farm" legislation. (f) Pitkin County promotes the viability of agricultural lands and operations within Pitkin County and supports preservation of large tracts of land now committed to or capable of agricultural uses.

Voters of two headwaters counties (Pitkin and Gunnison) approved an increase in the sales and use tax rate to raise funds for conservation purposes, specifically including the protection of ranchland. Eagle County imposes a voter-approved property tax mill levy that is used, in part, to purchase agricultural easements and

agricultural / open space land. Routt County imposes a voter-approved 1.5 property tax mill levy that is used for the purchase of development rights and conservation easements; nearly all of this revenue has been used to purchase and conserve agricultural land. Summit County imposes a voter-approved 1.344 property tax mill levy for open space; at this time, there has been no specific allocation to conservation easements or preserving agricultural land.

### 2.3.2 Agricultural Land Ownership in the Headwaters Counties

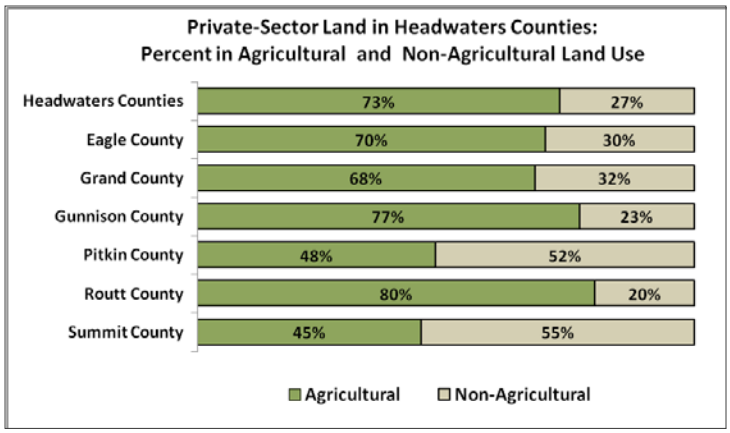
Privately-held land comprises an average of 30% of the total land in the six headwaters counties. In Eagle, Gunnison, Pitkin and Summit, privately-held land comprises 20% or less of total land. [41]




Source: Individual County Assessor data bases.

The remainder of land (70%) is in public ownership by the federal government (68%) plus State and local governments and other exempt properties.(2%) Land owned by the Bureau of Land Management and US Forest Service comprise a substantial portion of the federal, publically-held land. Portions of this federal land are also a significant contributing economic asset to headwaters counties since ranchers may lease some land for pastures, mineral extraction operators may lease some land to extract mineral resources and visitors may use the land for hiking, hunting and other active recreation.

Agriculture is the dominant private-sector land use in the six headwaters counties; it occupies an average of 73% of all private sector (privately-owned) land. (This information excludes land leased from the federal or state government.)

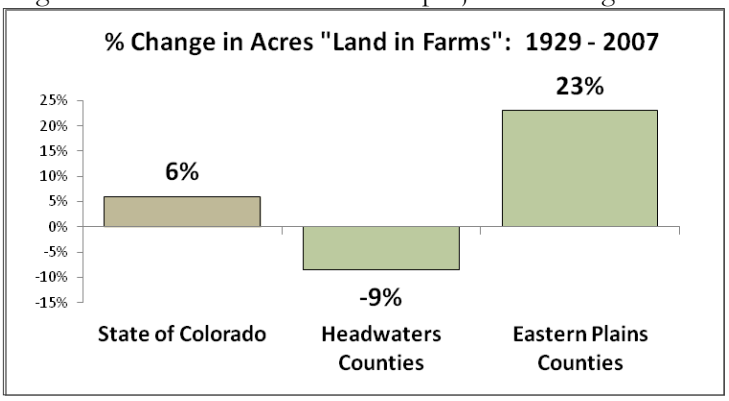



Source: Individual County Assessor data bases.

In Gunnison and Routt counties, agriculture has an even more dominant role, occupying 77% and 80% of all privately-held land, respectively. These two counties have also experienced the lowest amount of transmountain water diversion.

### 2.3.3 Historical Trends in Agricultural Land

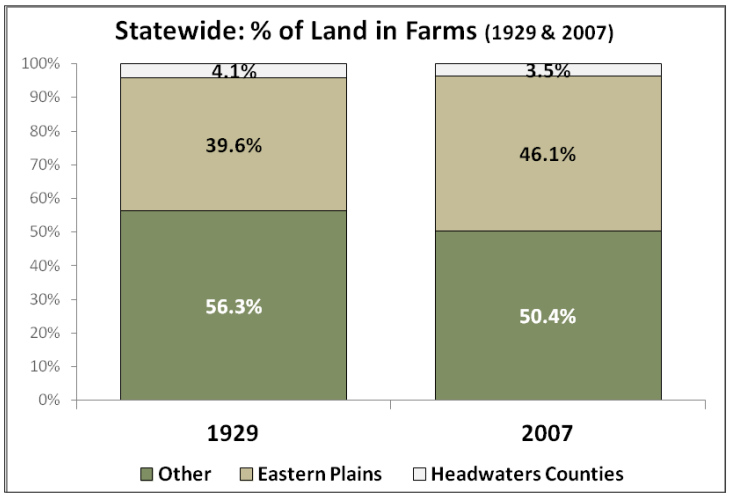
Since 1929, the amount of "land in farms" [42] throughout Colorado increased by 6%. 1929 was selected since this is generally before the construction of the large transmountain water diversion projects. During this same time period, the amount of land in farms among the six headwaters counties decreased by 9% and amount of "land in farms" among the 15 Eastern Plains counties [43] increased by 23%.




Source: Census of Agriculture, US Department of Agriculture

In some headwaters counties, the decrease in land in farms was very significant. For example, during this time period, land in farms decreased by 52% in Pitkin County, 27% in Eagle County, and 20% in Gunnison County. In other headwaters counties, the amount of land in farms remained relative constant or increased slightly. The amount of land in farms among the headwaters counties has never been a substantial portion of the State total. Any further loss of agricultural land among headwaters counties is a source of significant concern to these counties, as discussed below.

In 1929, headwaters counties' land in farms comprised 4.1% of the State total in 1929 and decreased to 3.5% in 2007. The Eastern Plains counties contained about 39.6% of land in farms in 1929; their proportion of land in farms increased to 46.1% by 2007.




Source: US Census of Agriculture, US Department of Agriculture

### 2.3.4 The Importance of Agriculture in Headwaters Counties

Agriculture is a valuable resource to headwaters counties that is often understated because some of its most important attributes are intrinsic and qualitative. Agriculture is valuable for these reasons.

> "All of us have a vested stake in agriculture- our very freedom depends on being able to feed ourselves. I hope that our valley serves as a reminder to people that agriculture does matter, that ranchers have a deep connection to the spirit of stewardship, and that a strong community is multi-dimensional." -*Tom Field, Gunnison native, Executive Director of Producer Education, National Cattlemen's Beef Association*

- It is an iconic part of the mountain community heritage and contributes to their rural lifestyle.
- The expansive landscape of working open lands has intrinsic value to residents and visitors.
- The land provides wildlife refuge that complements the expansive federal holdings.

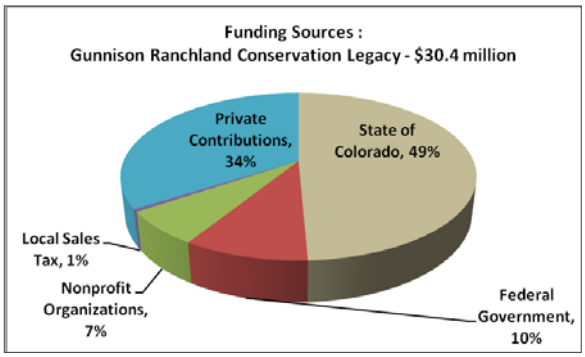
- It has a strong and complementary relationship to tourism, the largest and most rapidly growing sector.
- Its delayed return flows from irrigation practices sustain late season streamflows for fisheries and recreation.

Headwaters counties do not perceive agriculture as a growth industry or a source of high-paying employment. An excerpt from the Pitkin County "Guide to Rural Living" describes the significance of agriculture to this county.

> "Ranching and agricultural operations have been a part of Pitkin County since the earliest settlements. Productive agricultural and ranch land is a limited resource with significant open space, environmental, cultural, and economic value. The County's Land Use Code encourages the preservation and conservation of remaining agricultural and ranch land in Pitkin County." *Guide to Rural Living, page 16.*

***Environmental and Conservation Values of Agriculture.*** Agricultural land is such a significant asset to the headwaters counties that each county has invested substantial public and private funds and effort into keeping expansive agricultural land intact to preserve wildlife habitat, open space and scenic vistas and the continuation of agricultural activities. Local nonprofit organizations dedicated to agricultural preservation have been activated. The State of Colorado as well as the Federal government concur and have supported these efforts as well through significant matching funds for worthy projects.

One example is the work of the Gunnison Ranchland Conservation Legacy (GRCL). Between 1998 and 2011, the GRCL has preserved 17,795 acres of ranchland at a value of $30.4 million; agricultural water rights have been retained whenever available. As described in the chart to the right, the State of Colorado, through its Great Outdoors Colorado Open Space grants, the Division of Wildlife Colorado Special Conservation Partnership, Wetlands Initiative and Landscapes Legacy, has been the largest contributor; the State's collective contribution was 49% or $15 million. Other contributors have been nonprofit organizations, private contributions from ranching families and others and voter-approved local sales and use tax revenues.




Another example is the Routt County Purchase-of-Development-Rights program. In 1995, Routt County voters passed a referendum to increase the property tax mill levy for ten years to protect agricultural lands and natural areas through a voluntary purchase of development rights program. In 1996, tax revenues were $400,000. Voters elected to extend the program to 2024; in 2011, tax revenues for this program are anticipated to total $2.190 million from a 1.5 mill levy.

***Agriculture's Linkages to Tourism.*** There is a direct link between agriculture and tourism. Agricultural property provides a viewing opportunity that is appealing and valuable to visitors and provides a visual break from more densely developed resort towns. It also contributes directly to tourism by providing important habitat for wildlife and wildlife viewing.

One illustration is from the Gunnison Valley, where a study was conducted to measure the economic benefit of ranch open space to winter tourism. While it was assumed that ranching and ranch lands directly contributes to demand for Gunnison County vacations in the summer, but it was less clear if the working landscapes made a contribution to winter tourism.[44]

Sweetwood Ranch – Routt County

Respondents were asked what it is about Gunnison County that lead them to decide to vacation there in March 2003. A little over half (51.2%) deemed farm and ranch attributes to be an important consideration in their choice of Gunnison County as their vacation destination. Other attributes related to ranching that were deemed important were valley views, 83.2% and open vistas, 71.9%.

| IMPORTANCE OF NATURAL AND HUMAN ATTRIBUTES IN THE CHOICE OF GUNNISON COUNTY AS A VACATION DESTINATION IN MARCH 2003 (WINTER) | | | |
|---|---|---|---|
| Question: Please rate the importance of the following natural and human attributes in your decision to visit Gunnison County, Colorado during the year. (N = 330 to 337) | | | |
| ATTRIBUTE | % IMPORTANT | % NEUTRAL | % UNIMPORTANT |
| Agriculture-Related Values | | | |
| Farm/Ranch | 51.2% | 32.1% | 16.7% |
| Valley Views | 83.2% | 12.6% | 4.2% |
| Open Vistas | 71.9% | 21.9% | 6.3% |
| Other Values | | | |
| Snow Quality | 78.7% | 15.7% | 5.7% |
| Rivers, Lakes, Wetlands | 63.9% | 26.2% | 9.9% |
| Wildlife Viewing | 78.3% | 15.7% | 6.0% |
| Source: Adams Orens & Andrew Seidl, CSU Cooperative Extension, "Winter Tourism and Land Development in Gunnison County, Colorado", August 2004, page 8. | | | |

Respondents were also asked if all Gunnison farms and ranches were converted to higher density development (condos, resorts, etc.) would that impact their future visits; 58.4% said they would decrease their visits to Gunnison County if this occurred.

| EFFECT OF COMMERCIAL AND RESIDENTIAL DEVELOPMENT OF RANCH LAND ON TOURIST VISITATION, 3/03 | |
|---|---|
| Question: If all Gunnison farms and ranches were converted to higher density development, would you (a) increase, (b) decrease or (c) not change your visits to Gunnison County? (N: 332) | |
| Increase Visits | 2.1% |
| Decrease Visits | 58.4% |
| Not Change | 39.5% |
| Source: Adams Orens & Andrew Seidl, CSU Cooperative Extension, "Winter Tourism and Land Development in Gunnison County, Colorado", August 2004, page 12. | |

Respondent who would decrease their visits were asked at what percent of farm and ranch land conversion would you begin to change your visits. A majority said they would begin to reduce their visitation if 25% of the ranch land were developed.

| SENSITIVITY TO FARM AND RANCH LAND CONVERSION | |
|---|---|
| Question: Please estimate at what percentage of ranch land conversion you would begin to change your visits to Gunnison County. (N = 184) | |
| 25% Developed | 54.3% |
| 50% Developed | 42.9% |
| 75% Developed | 2.7% |
| Source: Adams Orens & Andrew Seidl, CSU Cooperative Extension, "Winter Tourism and Land Development in Gunnison County, Colorado", August 2004, page 13. | |

In 2005, a similar survey was conducted by CSU in Routt County among summer visitors; it produced similar results. Approximately 50% of these respondents would reduce both their expenditures and number of days spent in the Steamboat Springs area if ranch land were converted to urban and resort uses. (Ellington, Seidl and Mucklow, *Tourist's Value of Routt County's Working Landscape, 2005: Summary Report,* CSU Extension, May 2006, Economic Development Report No. 7)

Agritourism is a growing segment of the headwaters counties economies as ranchers and farmers look for additional ways to support their business activity. The Colorado Department of Agriculture defines agritourism as activities, events and services related to agriculture that take place on or off the farm or ranch, and that connects consumers with the heritage, natural resource or culinary experience they value.

A number of ranches in the headwaters counties are learning to use the precious amount of agricultural land that remains. Sixty-eight percent of all Colorado counties, including all headwaters counties have one or more farms or ranches that attract visitors and supplement rancher income through an agritourism activity. The last US Department of Agriculture Census (2007) indicated that 679 Colorado farms offered agritourism and recreational services, totaling nearly $33 million in farm income. [45]

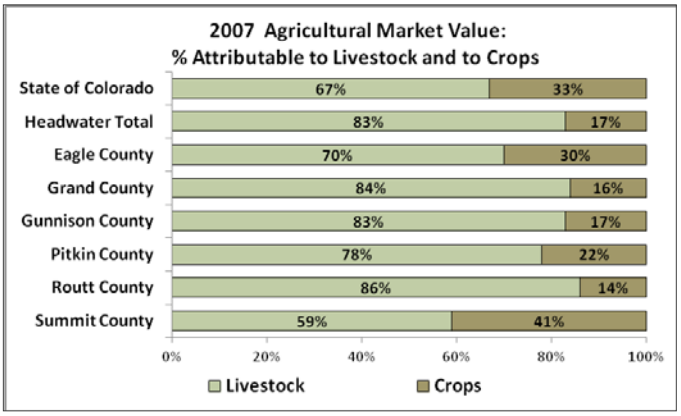
In 2006, an estimated 13.2 million visitors to Colorado engaged in some agritourism, spending about $1.26 billion. Out-of-state visitors spent nearly 80% of this total; two thirds of these expenditures were made by visitors whose primary trip focus was agritourism. [46]

The Department found that 92% of Colorado consumers would buy more Colorado grown and produced products if they were available and identified as being from Colorado.[47]

### 2.3.5 Crop and Livestock Market Values

As is true throughout the State, livestock production in the headwaters counties generates more market value than crop production. In Colorado, the 2007 market value of livestock production was 67% of total agricultural products sold; in the headwaters counties, the market value of livestock production averaged 83% of total agricultural products sold.

Headwaters county ranchers often combine substantial leased federal land with their own land in order to raise livestock (cow-calf




Source: US Census of Agriculture, US Dept. of Agriculture, 2007

operations).

There is a direct relationship between the cow-calf operations in headwaters counties and their sale of cattle to the feedlots located in the Eastern Plains counties. Both West Slope and Eastern Plains ranchers benefit from the cost-effective business relationship. A portion of the relatively high value of agricultural water attributed to the Eastern Plains counties in other reports and studies [48] actually originates and is shared by headwaters counties that raise livestock for sale.

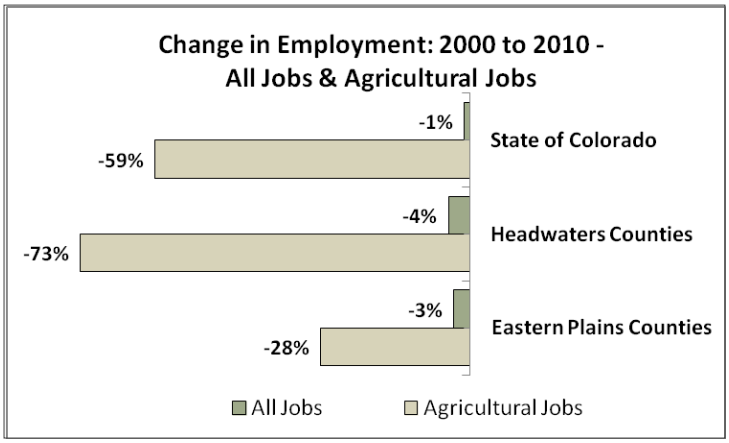
### 2.3.6 Agricultural Employment

Agriculture is an important component of the headwaters county economies but <u>not</u> because of the amount of, or changes in, employment.

| WAGE AND SALARY EMPLOYMENT: 2000 AND 2010 | | | | | |
|---|---|---|---|---|---|
| | Employment | 2000 | | 2010 | |
| | | # | % | # | % |
| Statewide | All | 2,186,765 | | 2,177,069 | |
| | Agricultural Only | 32,963 | 1.5% | 13,670 | 0.6% |
| Headwaters Counties | All | 90,439 | | 86,567 | |
| | Agricultural Only | 1,305 | 1.4% | 353 | 0.4% |
| Eastern Plains Counties ▫ | All | 90,470 | | 87,680 | |
| | Agricultural Only | 3,064 | 3.4% | 2,220 | 2.5% |
| ▫ These include Baca, Bent, Cheyenne, Crowley, Huerfano, Kiowa, Kit Carson, Las Animas, Lincoln, Otero, Phillips, Prowers, Pueblo, Sedgwick and Yuma. A map of the Eastern Plains counties is presented in the Appendix.<br>Source: CO Department of Labor and Employment, Wage and Salary Employment, Average Annual Statistics. | | | | | |

In 2010, agricultural wage and salary employment in Colorado [49] comprised 0.6% of total employment; in the six headwaters counties, agricultural employment comprised 0.4% the total. In the Eastern Plains counties, agricultural employment comprised 2.5% of the total.

As illustrated in the graph to the right, between 2000 and 2010, agricultural employment in Colorado declined by 59% (32,963 to 13,670); in the headwaters counties, agricultural employment declined by 73% (1,305 to 353). Among the 15 Eastern Plains counties, agricultural employment also declined by 28% (3,064 to 2,220).




Source: CO. Dept. of Labor and Employment,
Colorado ES202 Wage and Employment Tables, Avg. Annual.

### 2.3.7 Competing Pressure for West Slope Agricultural Land

Ranchers, as well as headwaters county governments, local nonprofit organizations and private individuals are actively engaged in preserving their remaining agricultural land.

- Historically, there has been market pressure to convert agricultural land to other land uses. Due to the recession, these market pressures are temporarily at bay.

- In addition, there are competing interests for leased federal land between ranchers and recreation interests.

- West Slope farmers and ranchers have an additional issue to contend with. If a Lower Basin State, such as California or Nevada, initiates a Compact water call [50], this action could impact West Slope agricultural interests that own more junior water rights than the 1922 Colorado River Compact. [51] (When a "call" is placed on a river by a water rights owner, it means that the owner is requesting the Colorado Division of Water Resources to shut down all upstream junior water rights until their senior water rights are satisfied.) Interstate Compact calls on East Slope agricultural and other water users do occur nearly every year.

## 2.4 MINERAL RESOURCE DEVELOPMENT IN THE HEADWATERS COUNTIES

In Colorado, mineral resource development comprises 24,232 or 1% of total wage and salary employment. It is the highest paid of all sectors as mineral resource workers earned an average annual salary of $99,132 in 2010, more than double the statewide average of $47,864. [52]

Among the headwaters counties, the State Department of Labor and Employment reports that mineral resource development comprises 10% of jobs in Gunnison County, 4% of jobs in Routt County, and few or no jobs in the other counties. Unfortunately, the State does not disclose data when it is from one or very few companies. The Climax Molybdenum mine extends into Eagle, Lake, and Summit counties. In January 2011, the operator, Freeport McMoRan, announced a scheduled restart of the mine and the need to hire an additional 145 employees to its base of 45.

All of the mineral resource jobs in Routt County are engaged in coal production. In Gunnison County, most mineral resource jobs are engaged in coal production; some are engaged in natural gas production.

In Gunnison County, 2010 mineral resource salaries averaged $81,700, more than double the average countywide salary of $34,133. In Routt County, the same relationships held, mineral resource development jobs averaged $78,387; county wide, salaries averaged $39,139.

2010 MINERAL RESOURCE EMPLOYMENT

| Location | Jobs | % of total |
|---|---|---|
| Eagle | 24 | 0.05% |
| Grand | 25 | 0.39% |
| Gunnison | 750 | 9.83% |
| Pitkin | 0 | 0.00% |
| Routt | 519 | 4.04% |
| Summit | 0 | 0.0% |

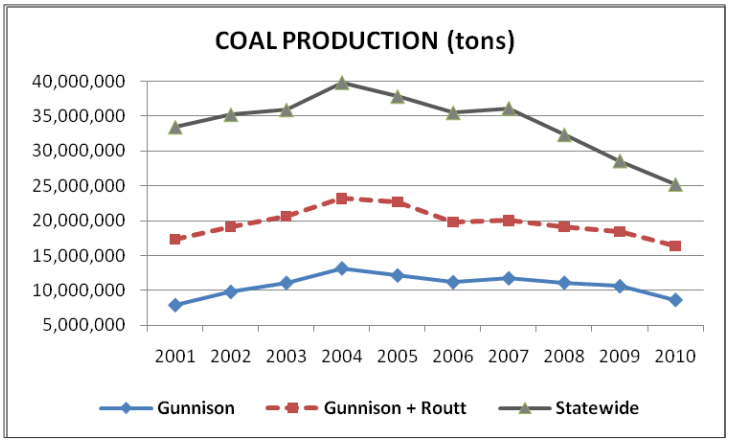
*Source: CO Department of Labor & Employment,*

**Coal**. Coal is produced from only 8 counties in Colorado; the two counties that produce the most coal are Gunnison County and Routt County.

In 2010, two coal companies in Gunnison County (Mountain Coal Company and Oxbow Mining) produced 8.67 million tons of coal which was 34% of the State's coal production. In terms of production, these companies ranked second and third statewide. One coal company in Routt County (Peabody Energy / Twenty-Mile Coal Company) produced 7.7 million tons of coal, 31% of the State's coal production; it is the largest coal mining operation in the State.

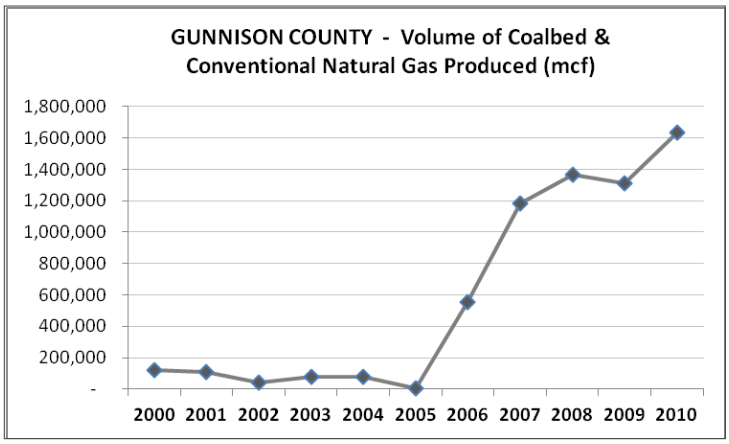
Over the last ten years, statewide coal production declined an average of 2.8% per year with slightly higher declines since 2004 as illustrated in the table to the right. Coal production in Gunnison County has been relatively stable; production in Routt County has declined at an average rate of 5.9% per year, since the Seneca Coal

Company ceased production in 2006.




Source: Colorado Division of Reclamation, Mining & Safety, Monthly Coal Detail Report

**Natural Gas.** Statewide, natural gas production has increased at an average annual rate of 7.3% per year since 2000. Among the six headwaters counties, the largest volume of natural gas is produced in Gunnison County. The volume has increased substantially over the last ten years as illustrated in the graph to the right. Still, this volume was only 0.1% of the statewide production volume in 2010. Due to improved technology and favorable pricing, two producers that are currently operating in Gunnison County are considering increasing their production activity on land each owns privately as well as on leases owned by the federal government.




Source: Colorado Division of Reclamation, Mining & Safety, Monthly Coalbed and Conventional Natural Gas Detail Report

Routt County has consistently produced a very small volume of natural gas, averaging 85,800 mcf per year. The largest natural gas producing counties in the State are Garfield, LaPlata and Weld Counties. There is also interest in activating natural gas leases in southern Pitkin County.

**Oil Shale.** Oil shale, a sedimentary rock from which liquid hydrocarbons can be produced, may be a substitute for conventional crude oil. Colorado and Utah contain 60% of the world's known oil shale deposits. Recent studies estimate that the Green River Formation, which is principally in the Yampa, White and Colorado River basins may contain from 1.5 to 1.8 trillion barrels of recoverable oil. [53] This resource is relatively undeveloped at this time; the US Department of Energy's National Technology Lab predicted in 2007

that oil shale development might directly employ an additional 70,000 workers on the West Slope of Colorado and eastern Utah. [54]

The Piceance Basin of the Green River Formation is primarily to the west of the headwaters counties and adjacent to Eagle, Pitkin and Routt counties. However, water requirements to sustain oil shale production may impact these counties.

**Rare Earth Metals.** Although industrial demand for rare earth elements (REEs) such as germanium and indirum, is relatively small in tonnage terms, these elements are essential for a diverse and expanding array of high-technology applications such as magnets, metal alloys for batteries and light-weight structures and emerging alternative energy technologies, such as electric vehicles, energy-efficient lighting, and wind power and defense weaponry. They are often found in proximity to other metals such as titanium and zinc.

No rare earth minerals are mined in the US at this time. However two deposits have been located in Colorado and one is in Gunnison County at the Iron Hill Carbonatite Complex near Powderhorn. [55] Three companies [56] are evaluating whether to pursue mining these metals in Gunnison County.

**Molybdenum.** There are two significant molybdenum mines in or near the headwaters counties and one proposed molybdenum mine.

- The Henderson Mine, recently purchased and operated by Freeport McMoRan since 2007, is located primarily in Clear Creek County on the southwestern boundary of Grand County; the Henderson Mine mill is in Grand County. This mine has been in production since 1976; in 2010, it produced 40 million pounds of recoverable ore, making it among the largest producers in the world.

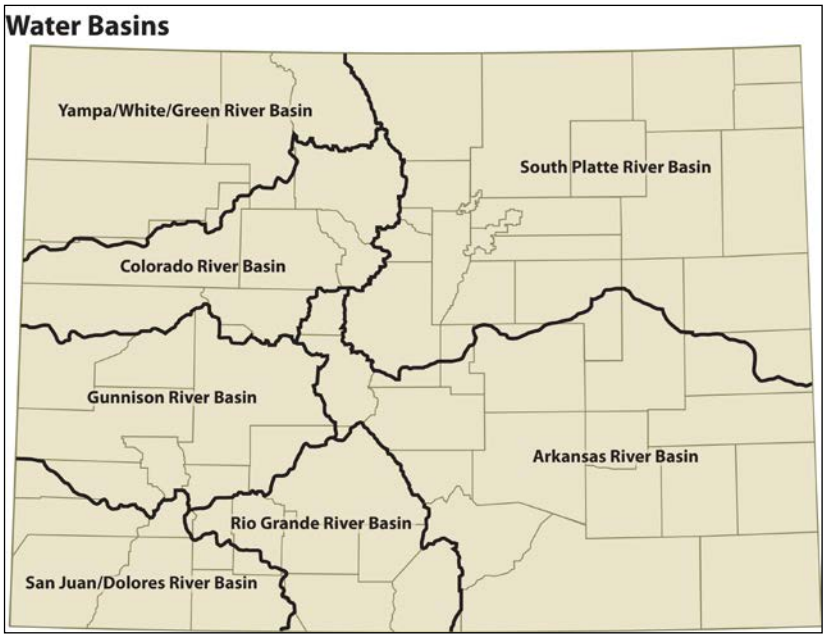
- The Climax Mine, also owned by Freeport McMoRan, is located in Summit and Lake Counties along the continental divide. It has been in inactive maintenance status since 1955, but is currently gearing up to begin production in 2012. Production is expected to reach 10 million pounds in 2012 and 20 million pounds by 2013.

- The Mount Emmons Project, a proposed molybdenum operation at the former Keystone Mine, is owned by US Energy and located outside of Crested Butte in Gunnison County. There are no production plans; environmental effects and related costs from the Keystone Mine operation have hampered operations.

# 3.0 WATER AND THE ECONOMIES OF THE HEADWATERS COUNTIES

## 3.1 OVERVIEW

This section summarizes the broad relationship between water and the economies of the headwaters counties (Section 3.2), the significance and economic effects of current and proposed transmountain diversion projects (Section 3.3), and specifically how water relates to the three mainstays of the local economies, which are tourism (Section 3.4), agriculture (Section 3.5) and mineral resource development (Section 3.6). The final sections discuss land development (Section 3.7) and water and sanitation districts (Section 3.8).




The headwaters counties are in three of the six river basins of the State. These are the Colorado, the Gunnison and the Yampa / White / Green, as depicted in the map to the right.

## 3.2 WATER & THE HEADWATERS ECONOMIES

In the headwaters counties, the volume of streamflow is relatively low and precious. In some instances, reduced streamflows due to transmountain diversion projects have or may become a constraint on economic growth. There are few in-basin opportunities to augment streamflow in the headwaters counties.

While all residents and businesses in Colorado need water to function, water quality and streamflow are essential to the economies of the headwaters counties in ways that are more fundamental than in most of the Front Range.

> Water is more than a piped commodity.

- Snowfall and rainfall are the only sources of this water. Very little water is imported into the headwaters counties from other locations. In several headwaters counties, most of the local water providers do not own raw water storage facilities that could temper water shortages in drought conditions because there are no remaining geologically or politically workable locations.

- In the headwaters counties, native water streamflow and related recreational opportunities are economic assets that fuel its primary basic sector industry, tourism. Streamflow and water quality are the driving forces that attract visitors to Colorado and enable Front Range economic developers to attract businesses.

- Water to irrigate agricultural land is vital to retain this important and threatened component of the economy and culture of each headwaters county.

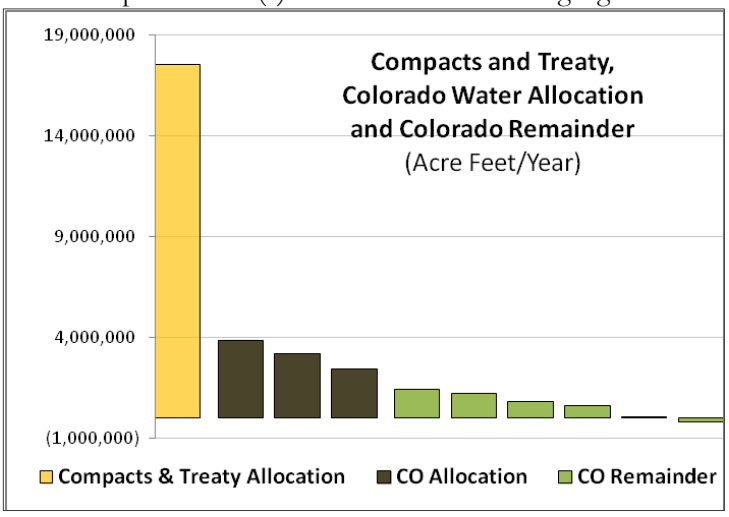
- There is a renewed interest in oil and gas resource development in Gunnison and other headwaters counties; it requires substantial volumes of water during the production process. In addition, Eagle, Pitkin and Routt counties are adjacent to the Piceance Basin of the Green River Formation, one of the richest oil shale deposits in the world; this oil shale production will require substantial volumes of water.

**Water Availability.** The West Slope contains 11% of the State's population and 84% of the State's water.[1] The often repeated adage can be misinterpreted because a substantial portion of this water is legally and physically spoken for by users along the Colorado Front Range, the Colorado Eastern Plains, states to the east and west, and the Republic of Mexico. Most of this water was committed decades before the State developed a comprehensive understanding of the value of water to its headwaters. The abundance of West Slope water is an illusion.

*Interstate Compacts*. The Colorado River basin is constrained by two interstate Compacts that involve seven states (Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming) and a Treaty with the Republic of Mexico. The intent of these agreements is to provide legal certainty regarding how much water each state and Mexico can develop using Colorado River flows. The Compacts also protect Colorado from downstream states claiming prior (senior) rights to the Colorado River water that would preclude Colorado's development of its full consumptive use entitlement.

- The 1922 Colorado River Compact, the 1948 Upper Colorado River Basin Compact and the 1944 Mexican Treaty allocate 17.5 million acre feet per year from the Colorado River, among seven states and the Republic of Mexico. This figure was selected prior to having accurate information about water availability.

- There are ambiguities in the language of the Compacts which lead to different interpretations of Colorado's available allocation. The allocation ranges between 2,432,000 and 3,855,000 acre feet per year, depending on whether one applies one of three interpretations: (a) the literal Contracts language that assumes the water is always physically available or the Upper Basin states may always consume their share of the mathematical calculation or (b) a hydrological model water availability calculation prepared by the Bureau of Reclamation, or (c) historic average annual yields. [57] [58]



Sources: CWCB (Consumption) and CO River Water Conservation District

- The CWCB estimates that the State of Colorado is currently consuming between 2,400,000 and 2,600,000 acre feet annually. So, the State either has more than 1,000,000 acre feet of Compact entitlement available or it is already in a deficit position, as highlighted in the graph to the right and the table below. Note that these figures exclude non-consumptive water needs.

ALTERNATIVE ESTIMATES OF CURRENTLY AVAILABLE WATER PER YEAR – COLORADO RIVER BASIN
FROM COLORADO RIVER COMPACTS
ALL FIGURES MEASURED IN ACRE FEET
"Currently Available" excludes additional water requirements due to firming of existing diversion projects, future in-basin needs, and future oil shale development.

| | Allocation Based on Document Terminology ◆ | | Allocation based on Bureau of Reclamation's Hydrology ▫ | | CO Allocation Based on historic hydrology estimates ▲ | |
|---|---|---|---|---|---|---|
| Compacts and Treaty Allocation Totals | 17,500,000 | 17,500,000 | 17,500,000 | 17,500,000 | 17,500,000 | 17,500,000 |
| Less Allocation to Arizona, California, Mexico, New Mexico, Utah & Wyoming | – 13,645,000 | – 13,645,000 | – 14,291,400 | – 14,291,400 | – 15,068,000 | – 15,068,000 |
| Colorado's Allocation | 3,855,000 | 3,855,000 | 3,208,500 | 3,208,500 | 2,432,000 | 2,432,000 |
| Colorado Current Consumption ⌑ | 2,400,000 | 2,600,000 | 2,400,000 | 2,600,000 | 2,400,000 | 2,600,000 |
| Remainder Currently Available ✖ | 1,455,000 | 1,255,000 | 808,500 | 608,500 | 32,000 | - 168,000 |

◆ Paragraph (a) of 1948 Compact: 51.75% x (7,500,000 – 50,000) = 3,855,000
▫ 14,500,000 – 8,250,000 = 6,250,000 acre feet. 51.75% x (6,250,000 – 50,000) = 3,208,500 acre feet
▲ 13,000,000 – 8,250,000 = 4,750,000 acres feet; 51.75% x 4,750,000 – 50,000) = 2,432,000 acre feet
⌑ Range estimated by CWCB: 2,400,000 to 2,600,000 acre feet
✖ Figures exclude water for existing firming projects, future in-basin demand and additional oil shale development.
Source: Figures excerpted from Peter Fleming, General Counsel, Colorado River Water Conservation District, "Colorado River Management – A West Slope Perspective," March 14, 2008.

In 2008, the CWCB estimated the amount of additional water needed for (a) firming existing transmountain water projects that have not been used to full capacity, (b) future in-basin municipal, industrial and agricultural requirements and (c) oil shale development. Based on these additional estimates, CWCB calculated the remaining amount of water available for use in 2030 ranged from 150,000 to 700,000 acre feet. This volume, if it physically exists, is a very small portion of native flow conditions; the calculated remainder might be within the margin of mathematical error. The figures also exclude impacts due to climate change. Finally, it is unlikely that this "available" water is physically or legally available in all locations, particularly in the headwaters counties.

In 2010 and 2011, the CWCB refined and extended its in-basin municipal and industrial (M&I) and self-supplied industrial (SSI) demand forecasts to 2050 and measured the 2050 gap.

*2050 GAP = (2050 M&I Demand + 2050 SSI Demand)*
*– (existing supply + 2050 identified projects and programs + 2050 conservation measures)*

For the year 2050, low, medium and high demand forecasts, identified projects and programs (IPPs) and conservation measures were developed. The results for the Colorado, Gunnison and Yampa/Green water basins show a 2050 gap, as summarized below.

The CWCB calculations exclude demand for recreational and environmental flows and for agricultural irrigation. They include climate change impacts. West Slope interests have submitted a variety of concerns that these figures understate the gap by omitting pertinent additional demand and overstating the availability of identified projects and programs (IPPs.)

- ***Colorado River Basin.*** The 2010 SWSI Report forecasted 2050 in-basin municipal, industrial and self-supplied industrial (M&I and SSI) water demand (existing + new) will total between 132,000 and 179,000 acre feet per year in the Colorado River basin. Of this total, between 110,000 (68,000 + 42,000) and 131,000 (68,000 + 63,000) acre feet can be met with existing water supplies plus identified projects and programs (IPPs) and conservation measures. Therefore, there is a gap of between 22,000 and 48,000 acre feet per year. Portions of this unmet demand are in Eagle, Grand, Pitkin and Summit Counties. [59]

| 2050 Water Supply and Demand Findings Colorado River Basin (acre feet per year) M&I and SSI Demand Only | |
|---|---|
| 2050 Total Demand | 132,000 to 179,000 |
| Less Existing Supply | 68,000 |
| Less New IPPs & Cons. | 42,000 to 63,000 |
| 2050 Gap | 22,000 to 48,000 |

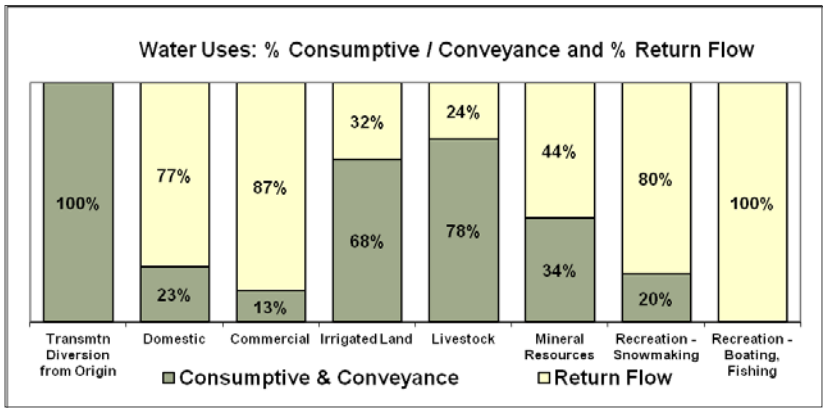
- ***Gunnison River Basin.*** The 2010 SWSI Report forecasted 2050 in-basin M&I and SSI water demand will total (existing + new) between 36,650 and 43,650 acre feet per year. Of this total, between 33,850 and 37,150 acre feet will be met by current supply plus identified projects and programs and conservation measures. Between 2,800 and 6,500 acre feet will not be met; this is the 2050 gap. Gunnison County comprises between 300 and 2,400 acre feet per year of the total gap. It is also pertinent to note that in May 2002, the State Engineer concluded that all water in the Gunnison River basin had been appropriated. [60]

| 2050 Water Supply and Demand Findings Gunnison River Basin (acre feet per year) M&I and SSI Demand Only | |
|---|---|
| 2050 Total Demand | 36,650 to 43,650 |
| Less Existing Supply | 20,650 |
| Less New IPPs & Cons. | 13,300 to 16,500 |
| 2050 Gap | 2,800 to 6,500 |

- ***Yampa / White River Basin.*** The 2010 SWSI Report forecasted 2050 in-basin M&I and SSI demand (existing + new) will total between 73,000 and 136,000 acre feet per year; between 50,000 and 53,000 acre feet will be met by current supply, indentified projects and programs and conservation measures. This leaves a gap from 23,000 to 83,000 acre feet per year. The Routt County share of this gap ranges between 10,700 and 18,600 acre feet. The significant variability in these water basin figures relates to demand from oil shale development. [61]

| 2030 Water Supply and Demand Findings Yampa/White River Basin (acre feet per year) M&I and SSI Demand Only | |
|---|---|
| 2050 Total Demand | 73,000 to 136,000 |
| Less Existing Supply | 40,000 |
| Less New IPPs & Cons. | 10,000 to 13,000 |
| 2050 Gap | 23,000 to 83,000 |

**Consumptive and Nonconsumptive Use.** Any water withdrawn is either (a) consumed (consumptive use), (b) lost in conveyance or transmission, or (c) returned to its native watershed (return flow). Water used for transmountain diversion purposes is 100% consumed or lost in conveyance. That is, no water is returned to its native watershed.




Sources: USGS for State of Colorado (most results) and Individual Ski Areas (snowmaking)

In-basin water used for domestic, commercial, agriculture, mineral resource development and some recreation purposes also consume water. [62] The average percent of water consumed or lost in

conveyance for these purposes varies significantly; livestock and irrigated land are the most consumptive. [63] The average percent of water returned to a native watershed (return flow) from these in-basin uses ranges from 24% to 100%. For recreation uses, the return flow can range from 80% to 100%. Uses with lower consumption use profiles, such as commercial and recreation uses, have been increasing in headwaters counties; irrigated land and livestock production, which have relatively high consumptive use profiles, have been decreasing. [64]

**Endangered Rivers**. Each year, American Rivers, a national conservation organization founded in 1973, selects the ten most endangered rivers in the United States based on pending decisions that impact each river, the significance of the threat to human and natural communities, and the degree to which the proposed action would exacerbate or alleviate stresses.

- In 2005, American Rivers ranked the Fraser River as the third most endangered river in the United States. "The Fraser is the poster child for Colorado's over-used rivers – its very survival as a flowing stream is threatened." [65]

- In 2010, American Rivers ranked the Upper Colorado River as the sixth most endangered river in the United States. "We can't continue to take and take water from the Upper Colorado without accounting for the serious impacts to fish and wildlife habitat. This is a river on the brink. A vibrant, healthy river system in the Upper Colorado is every bit as important to the future of Colorado as the water it supplies to our farms and cities." [66]

**Wild & Scenic River Designation.** There are 22 river segments in the six headwaters counties that are eligible for "Wild and Scenic River Designation by the Bureau of Land Management. To be eligible the river segment must have sufficient water to support one or more "outstandingly remarkable values" and be free-flowing. Transmountain diversions that lower or manage streamflows may threaten this designation; losing this designation would have a significantly adverse impact on the tourism economies of the headwaters counties.

**Endangered Species.** The US Fish and Wildlife Service administers the Endangered Species Act. Endangered species are those species that are at risk of extinction**.** There are four endangered fish species native to the Colorado, Gunnison and Yampa Rivers: the Colorado pikeminnow, the razorback sucker, the humpback chub and the bonytail. Many studies that evaluate ways to reestablish self-sustaining populations of endangered species have determined that creating access to critical historical habitat is key to recovering the endangered populations. There are several active efforts to protect the endangered fish.

- In 1988, Colorado, Utah, Wyoming, the Secretary of the Interior; and the administrator of the Western Area Power Administration entered into a cooperative agreement to initiate the Upper Colorado River Endangered Fish Recovery Program. The goal of the program is to stem further reductions in numbers of these species and, eventually, to create self-sustaining populations, while water development proceeds in compliance with State and federal law. A component of this Program included the construction of fish screens and fish ladders that allow selective passage of endangered fish to upstream habitat locations and prevent non-native fish upstream.

- East Slope and West Slope water providers in the Upper Colorado River basin have jointly committed to provide a permanently supply of 10,825 acre-feet of water per year to assist with the recovery of endangered fish. This water is supplied to the 15-Mile Reach of the Colorado River during late summer and early fall, a time when the River is substantially impacted by upstream water diversions and seasonal low flows.

- In 2004, the US Fish and Wildlife Service released a Management Plan for Endangered Fish on the Yampa River to assist in recovery as water depletions continue. The Plan recommends average base streamflows in critical locations and a plan to augment base flows to compensate for depletions.

> "The Yampa is the last remnant habitat of the best populations of the Upper Colorado River endangered fish." *David Harrison, senior advisor to The Nature Conservancy's Global Freshwater Team and Colorado Water Trust Board member*

**Shoshone Hydroelectric Power Plant Operations.** Senior water rights at the Shoshone hydroelectric power plant in Glenwood Canyon have long ensured water delivery through Grand and Eagle County to the power plant year around. If the plant is abandoned, then the result could significantly affect the entire streamflow regime of the Colorado River.

> "The basic message is that the certainty of the temperature increase trumps the uncertainty of precipitation changes." *Garfin, University of Arizona, "Effects on Southwest Water Resources" Southwest Hydrology, Jan/Feb 2007*

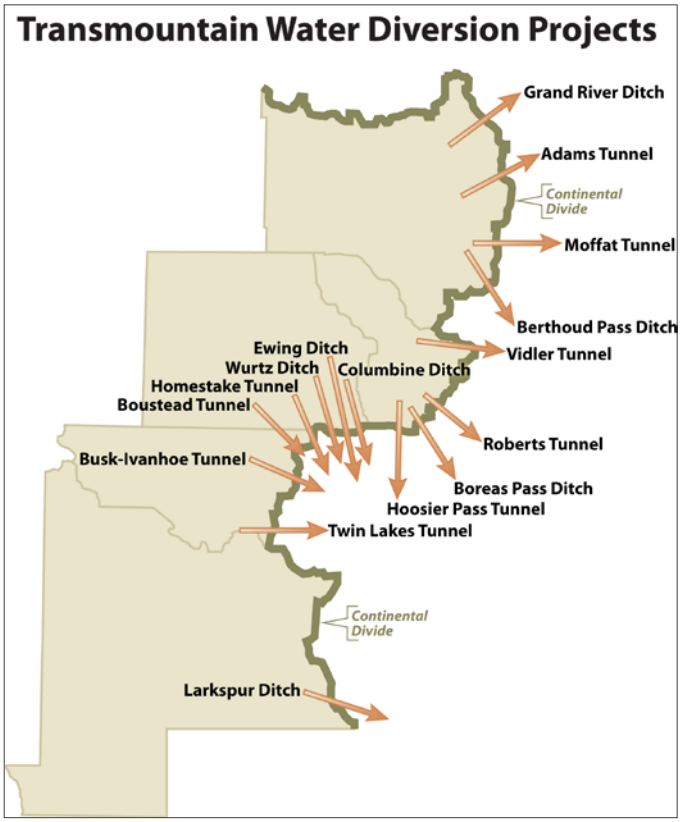
**Climate Change.** Climate change is an issue that has different types of impacts throughout the State. Climate change affects temperature and precipitation as well as the timing of streamflow patterns. Climate change models predict warmer temperatures, wetter winters and drier summers. Six major studies have estimated streamflow levels in the Colorado River basin will likely be reduced due to climate change. [67] For example, a report prepared for the CWCB predicts that by 2040 the Colorado River Basin will have 5% less streamflow due to climate change, compared to its historical annual average streamflow. [68]

Climate change also impacts Front Range water users. As growing seasons lengthen and temperatures rise, existing real estate, particularly residential development, will consume more water. For example, Denver Water estimates that it could see an increase in water demand of 6% due to climate change. [69]

Agriculture is also vulnerable to climate change. Higher temperatures can eventually reduce yields of desirable crops while encouraging weed and pest proliferation. Changes in precipitation patterns increase the likelihood of short-run crop failures and long-run production declines. [70]

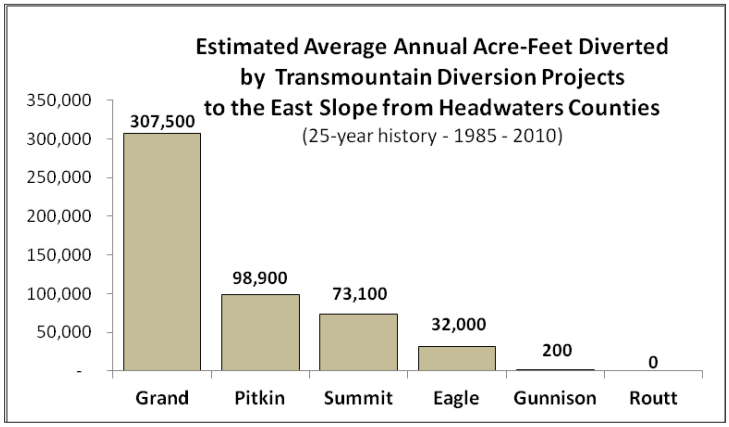
## 3.3 TRANSMOUNTAIN & TRANSBASIN WATER DIVERSION PROJECTS

### 3.3.1 Transmountain Water Diversion Projects




The need for large transmountain water diversion projects were first triggered by drought and "dustbowl" conditions of the 1930s. During this decade, supplemental irrigation systems were sought in northeastern Colorado and the City and County of Denver began its quest for additional municipal water sources.

Currently, the State Engineer reports that there are 45 water diversion projects in Colorado. Most are a network of ditches, tunnels and reservoirs. Among these, 16 projects are located in the headwaters counties; since 1985, projects have collectively diverted an average of about 511,700 acre feet of water each year to Front Range and other East Slope water users. Economic impacts of these 16 existing diversion projects as well as proposed expansions to these projects are the focus of this analysis. These projects are listed in Appendix Table 6 and illustrated on the map to the right.




Source: Colorado Division of Water Resources, CDSS Data Base

Each county has experienced different volumes of out-of-basin water demand from the East Slope at different times from different sources. The graph to the right illustrates the historic average annual acre-feet of water diverted to the East Slope by transmountain water diverters over the last 25 years.

The proportion of total natural streamflow diverted to the East Slope varies depending on location. In the headwaters along the continental divide in Grand and Summit counties, the proportion of native flows diverted by existing diversion projects is about 60%. [71] In Pitkin County, the major transmountain diversions that currently operate in the Roaring Fork Watershed (The Fry-Ark Project, the Busk-Ivanhoe System and the Twin Lakes / Independence Pass System) collectively divert over 40% of the native flow in the headwaters of the Roaring Fork and Fryingpan rivers for use in the Arkansas and South Platte basins. [72]

- Grand County's relatively substantial volume of transmountain diversions began in the 1890s; all transmountain diversion projects were constructed by 1937, before the negotiating benefits and resulting

mitigation remedies of HB-1041 Regulations were available. But for the protections in Senate Document 80, this was also before the value of nonconsumptive water usage was thoroughly understood.

- Summit County was next in time to experience demand from municipal transmountain water diverters, including Colorado Springs, Denver, Englewood and Golden. The Boreas Pass Ditch, now owned by the City of Englewood, was completed in 1909; Hoosier Pass Tunnel, now owned by the City of Colorado Springs, was completed in 1962; the Roberts Tunnel, owned by Denver Water, was completed in 1962; the Vidler Tunnel, owned by the City of Golden, was completed in 1968.

- In Eagle County, there are three relatively small and one relatively large transmountain diversion projects. All are owned by Front Range municipalities. The largest, the Homestake Reservoir and Tunnel, owned by the cities of Aurora and Colorado Springs, was completed between 1963 and 1967.

- Bordering Pitkin and Eagle County, the Bureau of Reclamation's Fryingpan-Arkansas Project system, including the Twin Lakes, Busk-Ivanhoe and Charles Boustead Tunnels, was constructed between 1935 and 1982. Senior water rights from this project allow for substantial additional capacity in this system for future diversions.

- Gunnison County contains one relatively small East Slope transmountain diversion project. Its water issues relate to in-basin water supply, future potential demand from oil and gas resource development and Colorado River Compact obligations.

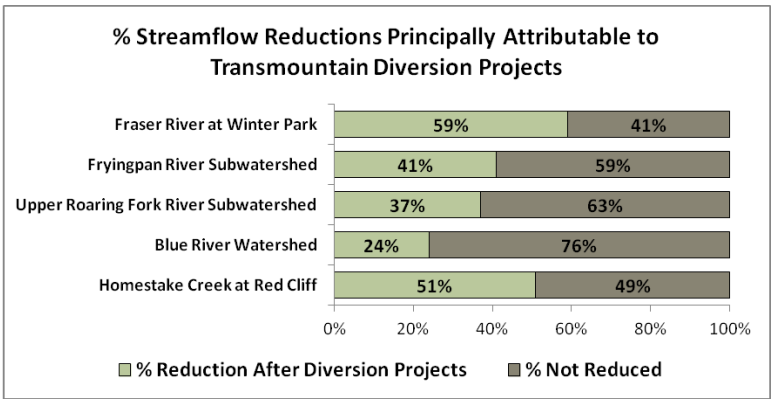
- Routt County has no East Slope transmountain water diversion projects at this time due to the relatively high expense associated with water transport over two mountain ranges. However, Routt County is being considered for future pipeline and pumpback projects to supply Front Range water needs

### 3.3.2 Changes in Streamflow

Actual water flows in many headwaters county streams and rivers are substantially less than native or natural flows. Streamflows fluctuate for a variety of reasons, depending on annual precipitation, in-basin recharge, municipal, industrial and recreational use, and out-of-basin diversions. As described and illustrated below, there are several locations in the headwaters counties where the streamflow reductions relative to a prior natural state have been principally triggered by specific transmountain diversion projects.

- 59% of the Fraser River at Winter Park (Grand County) has been diverted principally by Denver Water. [73]

- An average of 41% of the Fryingpan River Sub-watershed (Pitkin County) which drains westward from the Continental Divide into the Fryingpan River (Eagle County) to Basalt is diverted to the East Slope by transmountain diversions related to the Fry-Ark Project.[74]



Sources vary by location. See text and endnotes.

- On average, 37% of the Upper Roaring Fork sub-watershed (40,600 acre feet), Continental Divide downstream to Aspen via the Roaring Fork River (Pitkin County), is diverted to the East Slope via the Independence Pass (Twin Lakes Tunnel) transmountain diversion system. [75]

- There was a 51% decrease in average annual streamflow of Homestake Creek at Red Cliff (Eagle County) after the activation of the Homestake Tunnel transmountain diversion, from 62,800 acre-feet to 30,700 acre-feet. [76]

- An average of 24% of Blue River (Summit County) virgin flows (75,109 / 310,000 acre-feet) is diverted through the Straight Creek (Denver Water), Roberts Tunnel (Denver Water), Hoosier Pass Tunnel (Colorado Springs), Vidler Tunnel (City of Golden) and Boreas Pass ditch (Englewood).[77]

### 3.3.3 Historic Impacts / Compromised Conditions

Historic transmountain diversion projects have created environmental constraints that have begun to compromise the aquatic and riparian ecosystems in Pitkin and Grand counties and have triggered a number of related economic impacts.[78] These impacts are not potential conditions based on decade-long forecasts. Rather, they are current and on-going conditions. The types of environmental impacts and the types of economic consequences triggered by these impacts are listed below and explored more completely in the remainder of this section.

Colorado River below Windy Gap Project, Grand County

| TYPES OF ENVIRONMENTAL IMPACTS AND ECONOMIC CONSEQUENCES FROM WATER DIVERSION PROJECTS | |
|---|---|
| TYPES OF ENVIRONMENTAL IMPACT | TYPES OF ECONOMIC CONSEQUENCES |
| • Lower streamflows<br>• Reductions to flushing flows<br>• Increases in water temperature<br>• Degradation in water quality<br>• Degradation in water clarity<br>• Compromised riparian corridor<br>• Compromised aquatic environment<br>• Health and variety of fish | • Potential loss of "Gold Medal" fishing status and the related benefits of attracting anglers worldwide.<br>• Adverse impacts on fishing for trout that are reliant on adequate streamflow, water quality and temperature.<br>• Potential loss of Wild and Scenic River status and related adverse effects of fewer visitors, kayakers and rafters.<br>• Less reliable streamflows for kayaking and rafting that impact summer tourism.<br>• Water quality and water clarity degradation that impacts all visitors and property values.<br>• Reductions in irrigated land that adversely impact jobs and property values.<br>• Devaluation of real estate development that relies on healthy riparian corridors for scenic beauty and fishing.<br>• Higher costs for water and sewer treatment facilities that are borne by local rate payers. |

Many of these local environmental impacts and related economic consequences have gone substantially unmitigated in the past and many were approved before State authorization of local review authorities were put into place. Examples of projects without compensatory mitigation at the time of construction include the Dillon Reservoir / Roberts Tunnel, the Moffat Tunnel, the Grand River Ditch, the Independence Pass (Twin Lakes) diversion system, the Hoosier diversion system and the Homestake diversion system.

Federal and state mandates sometimes require compensatory water storage projects to be constructed. As a result,

- Green Mountain Reservoir was built in 1942 by the Bureau of Reclamation in conjunction with the Colorado-Big Thompson Project.

- The Ruedi Reservoir was built in 1968 by the Bureau of Reclamation as part of the Fryingpan-Arkansas Project.

- Wolford Reservoir was built in 1994 by the Colorado River Water Conservation District as part of the Northern Colorado Water Conservancy District's Windy Gap Project. [79]

- The Northern Colorado Water Conservancy District provided additional local mitigation support as part of its Windy Gap project. [80]

Colorado's water conservancy district act's requirements for compensatory storage projects apply only to water conservancy districts that divert water from the Colorado River basin. There are two water conservancy district-sponsored transmountain diversion projects to the Front Range. While not under federal mandate, a mediated settlement with Denver Water for a comprehensive resolution of mainstem Colorado River issues, the 2011 Colorado River Cooperative Agreement, provides for some mitigation for impacts related to past diversion projects by Denver Water. [81]

Headwaters communities have adjusted to these adverse economic consequences because they have had no other choice. They cannot divert water from another source. They make thoughtful but compromised, second-best choices continuously. While these communities have become adept and innovative in developing water management choices, the continuing adverse economic impacts persist, and there is no good science to predict the ecological tipping point.

### 3.3.4 Future Water Diversion Projects

Further reductions in headwaters county streamflows from transmountain diversion projects will exacerbate existing constraints may jeopardize the environment below the minimum streamflows necessary to maintain the already compromised ecosystem.

There are a number of potential water diversion projects and enhancements to existing water diversion projects under consideration. These projects are in the fragile headwaters of the Blue, Colorado, Eagle, Fraser, and Fryingpan Rivers in Eagle, Grand, Pitkin and Summit counties. The IBCC Report to the Governor encourages State action to streamline approvals and facilitate funding of identified projects and processes (IPPs) and new water supply development projects.

| **FUTURE TRANSMOUNTAIN WATER DIVERSION PROJECTS IN THE HEADWATERS COUNTIES THAT ARE UNDER CONSIDERATION** |
|---|
| • Increased diversion from currently underutilized projects including the Dillon Reservoir / Roberts Tunnel, The Municipal Subdistrict of the Northern Colorado Water Conservancy District's Windy Gap Firming Project, (30,000 acre feet) [82] and the Denver Water Moffat Expansion Project. [83] (18,000 acre feet) (in the approvals process) |
| • The Colorado River Return, also known as "The Big Straw", would pump water from the Colorado River at the Utah state border back up the main stem of the Colorado River to the Continental Divide near Avon for upstream uses in the South Platte, Arkansas and Colorado River basins.[84] |
| • The Ruedi Reservoir Pumpback would deliver winter reservoir water releases that are not applied to beneficial use in Colorado to the Arkansas River Basin via the Boustead Tunnel. [85] |
| • The Yampa Pumpback (Multi-Basin Water Supply Project) would divert water downstream of Craig near Maybell |

**FUTURE TRANSMOUNTAIN WATER DIVERSION PROJECTS IN THE HEADWATERS COUNTIES THAT ARE UNDER CONSIDERATION**

and pump it upstream through the North Platte River Basin to be discharged into the Poudre River and into the South Platte River Basin near Brighton.[86]

- A Flaming Gorge Pipeline would carry water from the Green River and the Flaming Gorge Reservoir (in southwestern Wyoming) to Colorado's Front Range. There are several independent proponents pursuing this project, including Aaron Million and the Colorado-Wyoming Cooperative Water Supply Project, a coalition of utilities and cities in Colorado and Wyoming. [87]

- The Blue Mesa Pumpback would pump water back from the Blue Mesa Reservoir to the Antero Reservoir where water would be gravity fed via the South Platte River. [88]

- The Green Mountain Pumpback would pump water from the Blue River and the Green Mountain Reservoir to the Dillon Reservoir and conveyed through the Roberts Tunnel to the North Fork of the South Platte River. [58]

- Structural improvements to the Fry-Ark Project collection system to firm up 14,400 additional acre feet to the project's current yield. (Southeastern Colorado Water Conservancy District) [89]

- Expansion of the Busk-Ivanhoe diversions and change in the beneficial use of a portion of the water rights. (City of Aurora) [90]

- Increased diversion of the Twin Lakes (Independence Pass) system due to increased East Slope storage capacity and development of remaining conditional water rights (Cities of Aurora, Colorado Springs, Pueblo) [91]

## 3.4 WATER & TOURISM

### 3.4.1 The Relationship of Water and Tourism in the Headwaters Counties

Tourism has grown to become the primary economic driver in the headwaters counties. In the headwaters counties, tourism is driven primarily by active and passive recreation opportunities. Unlike more urban environments, every tourist activity relies directly on water. Tourists and Front Range homeowners seek pristine natural environments and active outdoor recreation opportunities. If these are not offered in the headwaters counties, they will be compelled to choose other destinations. Water in its natural water course is the most significant asset of the headwaters economies. Tourism-related commerce was built on the expectation of natural flows.

Headwaters counties have been remarkably creative in their use of water in a non-consumptive manner to create economic benefits not only for the local economy but also for Front Range visitors and the State.

- Clear water streamflow in its natural water course is fundamental to many summer recreation activities in the headwaters counties including sightseeing, fishing, rafting, and kayaking.

- The presence of man-made reservoirs and natural lakes in a clarified condition attract many boaters, lake anglers, and sightseers.

- In some instances, these water-based recreation activities have become world-renowned, attracting national and international visitors. Examples are Gold Medal fishing and kayaking events. In other instances, water-based activities are not destination events but add to the visitor's stay and enjoyment, thereby increasing local sales and employment.

- Sufficient water for snowmaking each fall is essential to assure a financially successful, early ski season in November and December.

While the water usage associated with these recreation activities is non-consumptive, the activities do rely on adequate and predictable streamflow and good water quality. A number of these water-based recreation activities have been compromised by transmountain diversions that result in adverse reductions to streamflow and water quality degradation. Illustrative examples follow.

### 3.4.2 Visitor Activities and Water

This section describes the value that residents place on instream flow and illustrates the relationship of water to individual visitor activities in the headwaters counties, such as fishing, kayaking/rafting, skiing, and use of reservoirs and lakes.

**Instream Flow Recreation Values to Residents.** Dr. Loomis with Colorado State University recently conducted a survey to estimate the economic benefits of maintaining peak instream flows in the Cache la Poudre River in Fort Collins. [92] He concluded that Fort Collins residents are willing to pay to avoid a reduction in instream flows of the Cache la Poudre River during peak spring and summer flows. More specifically, this analysis found that:

- Fort Collins residents are willing to pay $15 per visit or $90 per year for assurance that instream flows will not be reduced. This converts to between $172 and $255 per acre foot per year.

- If peak flows in the Cache la Poudre River were reduced by half, visitation would decline by 33%, from a median of 6.0 to 3.2 annual visits per resident.

- The analysis concludes that the value of these instream flows to Fort Collins residents is of the same magnitude as the market value of the water for alternative uses.

Some individual visitor activities are directly linked with others; for example, anglers use streams as well as reservoirs and lakes. Some more passive visitor activities, such as wildlife viewing, sightseeing, and camping, may be secondary or supporting events that occur in the same day. The scenic value that streams, lakes and reservoirs offer not only attract but also extend the visitor's stay.

Many recreation visitors also shop, stay in lodges, eat, drink, buy gifts and recreation equipment, and purchase related services such as guides. Some Front Range visitors also own second homes. Economic impacts of tourism and related visitor activities are quantified in jobs in Section 2.2; economic impacts associated with individual activities are described by example in the table below.

| RECREATION ACTIVITIES AND RELATIONSHIP TO WATER | |
|---|---|
| ACTIVITY | RELATIONSHIP TO WATER |
| Fishing | Streamflow; flushing flows, water temperatures, water quality |
| Kayaking / Rafting | Streamflow volume and predictability |
| Skiing | Water supply in the late fall for snowmaking |
| Hiking, Hunting, Sightseeing | Streamflow and healthy riparian conditions |
| Reservoirs and Lake Activities | Water level and water clarity |
| Sightseeing and Wildlife Viewing | Healthy riparian corridor |

**Fishing**. The decision to fish in a stream or river relates directly to the anticipated quality and success of the fishing experience, which is a function of many factors, including sufficient streamflow, moderate water temperature, water quality and clarity including the absence of slippery moss and algae, the scenic environment of the river corridor, and the expectation of success. The longer distance one travels to a fishing destination, the pickier the angler is about anticipated conditions.

Rainbow and brown trout are the predominant fish found in mountain streams and rivers. These fish are highly dependent on low water temperature, high water quality and sufficient streamflow.

- Low streamflows in summer months increase water temperature, which stresses the fish. Experienced anglers and fishing guides will not fish under these conditions.

- Insufficient flushing flows deteriorate water quality because they (a) deter sediment transport downstream, (b) increase water temperature, (c) dry up the adjacent riparian environment which reduces vegetation diversity, and (d) facilitate non-native plant germination. [93]

- The headwaters counties contain "Gold Medal" streams which attract anglers on an international scale. These visitors are a critical component to the local economy.

Natural climatic conditions as well as transmountain diversions have decreased water flow. Transmountain diversion regimes have also decreased flushing flows. Some rivers in the headwaters counties already experience deteriorated conditions that hamper fishing activity. Currently, due to the existing compromised condition of some streams in Grand County, fishing guides, local fishing experts, and retailers report [94] that they are guarded in recommending some stream locations to fish and, in the summer months, also encourage anglers to use a temperature gauge and avoid fishing in the afternoon when water temperatures are higher.

- There are portions of the Fraser River (Grand County) and the Colorado River (Grand and Eagle counties) where additional water diversion may reduce flows below the minimum needed to support fish in some months [95] in what have been significant recreational fishing environments.

- In the Taylor River (Gunnison County), fishing, irrigation and boating interests meet annually to negotiate a "second best" allocation formula that will enable each user to function as well as possible.

A study recently completed by the Roaring Fork Conservancy [96] used survey research to measure the sensitivity of Fryingpan River users, 96% of whom were anglers, to the volume of streamflow. It found that 63% of respondents would adjust their decision to revisit the Fryingpan River based on anticipated streamflow.

| VISITOR SENSITIVITY TO STREAMFLOW – FRYINGPAN RIVER | |
|---|---|
| *"If you knew prior to your trip that streamflows on the Fryingpan River might vary from half as large as what you experienced to twice as large as what you experienced on this trip, would this affect your decision to visit the Fryingpan River next year?"* | |
| 63% Yes | 37% No |
| Source: Kristine Crandall, Roaring Fork Conservancy, *Fryingpan Valley Economic Study*, June 2002 | |

Among those who said this information would affect their trip plans, 61% indicated they would not visit if streamflows were double and 60% indicated they would not visit if streamflows were half.

**Kayaking / Rafting**. The American Whitewater Association has conducted a series of studies aimed at quantifying streamflow needs that support the "outstandingly remarkable" rafting, float-fishing and kayaking activities on the Colorado River.[97]

In Grand County, the quality of rafting and kayaking may be negatively impacted by additional reductions in streamflow in the Colorado River triggered by Denver Water and Northern Colorado Water Conservancy District diversion projects. The proposed diversions may cause the stretch of the Colorado River below the confluence with the Fraser River and above the Town of Kremmling to fall below minimal levels for kayaking during June in most years. [98] Also, the Gore Canyon stretch of the Colorado River below the Town of Kremmling may fall below optimal levels for rafting and kayaking for some periods of time between May and July. [99]

The Gore Race, an internationally acclaimed race that brings visitors and economic benefit to western Grand County, occurs annually in August in Reach 4 of the Colorado River. Streamflow for the time period leading up to and the day of the event is important since this is the time period where competitors are making a go/no go decision. Without mitigation, preferred streamflows are marginally achieved during August now and would not be achieved under cumulative effects of the proposed Moffat and Windy Gap Firming Projects. [100]

Kayaking on the Colorado River - Reach 4 - Gore Canyon

In Summit County, future streamflows in the Blue River below the Dillon Reservoir may frequently be below rafting low-flow levels and kayak low-flow levels. In the Blue River below Green Mountain, future kayaking flows are forecasted to be below minimum and optimum levels in all months except July. [101]

**Snowmaking.** Alpine ski resorts depend on a reliable supply of water for their fall snowmaking to assure sufficient snow during the early part of the season, give out-of-State visitors confidence to book vacations in November and early December and generate local and Front Range jobs and retail sales. Snowmaking has become an essential component of their financial health.

Snowmaking requires low volumes of water relative to the tremendous economic value generated. In a normal year, the ski areas in the headwater counties use an average of 499 acre feet of water per resort for an average of 459 acres of manmade snow terrain. Based on the year, between 18% and 24% is consumptive and the remainder returns to native streams.

SNOWMAKING – SKI AREAS IN HEADWATERS COUNTIES
NORMAL OR AVERAGE YEAR

| | |
|---|---|
| Acre-Feet of Water Used: | 260 to 750 |
| Average Acre-Feet Used: | 499 |
| Acres of Manmade Snow: | 200 to 650 |
| Average Acres of Manmade Snow: | 459 |
| Acre-Feet of Water per Acre of Snow: | 0.9 to 1.3 |
| Average Acre-Feet per Acre | 1.1 |
| % Consumptive: | 18% to 24% |

Each ski area works within its water rights, storage system (if any) and piping and, in some cases, relationships with water districts, to make manmade snow. There have been water shortages in some years; when this occurs, the snowmaking coverage is not as satisfactory. A summary of water issues related to snowmaking is presented below. More detailed information from the mountain managers of ski areas in the headwaters counties is provided in Appendix Table 7.

- In the case of Crested Butte, the USFS requires construction of a rather expensive reservoir if the Resort wants to provide additional snowmaking.

- To improve operational and physical supply shortages at Winter Park, a storage pond and new infrastructure is needed. As part of the 2011 Colorado River Cooperative Agreement, Denver Water is providing a portion of the needed funds to make these improvements.

- At Beaver Creek and Vail Resorts, water is supplied or augmented by Green Mountain Reservoir (a compensatory storage project built as part of the Colorado-Big Thompson project), Eagle Park Reservoir, Homestake Reservoir or the Blake Lakes. They have sufficient water for three consecutive drought years.

- At Keystone, when streamflow in the Snake River is adequate, water is augmented from the Clinton Reservoir; when streamflow is below minimum standards, water is pumped from the Roberts Tunnel, which is owned by Denver Water.

Snowmaking at Copper Mountain

- For Snowmass, the Aspen Ski Company draws water from Snowmass Creek. For Aspen Mountain, it uses municipal water from the City of Aspen which draws water from Castle Creek. For Buttermilk, the company draws water from Maroon Creek. There may be some minimum streamflow issues related to Castle and Maroon Creek if the City pursues some alternatives associated with the hydropower project it is considering.

- Steamboat draws water directly from the Yampa River without need for storage. While it has an augmentation plan to use water from the Upper Yampa Water Conservancy District, it has never needed to activate the plan. Since it is 35 miles from the headwaters of the Yampa, the streamflow volume is substantially more than at other ski resorts.

The significant individual investments in water-related infrastructure demonstrate the critical importance of streamflows and available water supply to the ski industry.

**Hiking, Hunting and Wildlife Viewing.** These activities rely on healthy forests, particularly riparian corridors along streams and rivers. Riparian corridors provide habitat to over 90% of the State's wildlife at some phase in their life. [102] Low streamflows in the summer months compromise the pastoral beauty of naturally flowing water courses, which is an essential aesthetic quality of the local environment that enhance visitor experiences.

**Reservoirs.** Many of the major reservoirs in the headwaters counties were constructed to accommodate transmountain or transbasin water diversion purposes, not recreation purposes. Water levels fluctuate not only due to climatic conditions but also to the needs and capacity of out-of-basin water users. A recent analysis by Smith and Hill [103] found that there was a strong correlation between water surface areas available for recreation and user satisfaction. This secondary research is corroborated with relevant and recent anecdotal information from local businesses that experienced reductions in demand when water levels were low in 2002 and 2003 in Lake Granby and Lake Dillon.

In Grand County, Lake Granby may be threatened by future transmountain water diversions. If the Windy Gap Firming Project proceeds, then the water surface area might decline, instream flows in the Colorado River below Lake Granby might decline below CWCB minimums, and increased pumping into Lake Granby might increase nutrient loading, which would hamper aquatic life.[104] If unmitigated, these actions threaten the health of the fisheries, their aesthetic beauty and the related visitor expenditures attributable to fishing, boating and sightseeing.

In Summit County, some forecasts suggest there will be significant increases in the frequency and duration of periods when Dillon Reservoir would be below levels needed for normal operation of the Dillon and Frisco marina and Denver Water diverts more of its firmed water supply to serve its growing Front Range customers. [105] The 2011 Colorado River Cooperative Agreement addresses some of these concerns.

**Grand Lake.** Grand Lake is a natural lake and a national treasure. It is the deepest natural lake in Colorado and has been a focal point of recreation and seasonal visitor activity for decades. Visitors and residents are attracted not only to the physical beauty of Grand Lake but also to its water clarity.

> "There is no doubt that the operation of the Colorado-Big Thompson (C-BT) project has diminished our water quality and enjoyment of Grand Lake. C-BT pumped water from Shadow Mountain reservoir is the source of weeds, silt, algae, and algal toxins, each of which negatively impact Grand Lake. 2011 is the perfect illustration; due to high snowpack, the C-BT project is not in operation. Grand Lake's water clarity is approaching 23 feet in August in sections. This is in stark contrast to 2006/2007 when the C-BT was pumping and clarity was at 8.8 feet. Anecdotally, locals are saying that Labor Day was as crowded as ever before." *Grand Lake Town Manager, Shane Hale, September 2011.*

By Congressional decree, water levels may not fluctuate.[106] However, water clarity and water quality have been impacted by use of Grand Lake as a conduit of the Colorado-Big Thompson (C-BT) and Windy Gap diversion projects. [107] In 1957, Dr. Robert Pennak, a world- renowned limnologist, measured the Lake's water clarity at 30.2 feet. This clarity level would have placed Grand Lake in the top 5% of all lakes in the world. In 2006/2007, when the C-BT Project was actively pumping water through Grand Lake, the water clarity level was 8.8 feet. As described in the box above, during a short time period in 2011 without transmountain diversion pumping, water clarity returned to 23 feet.

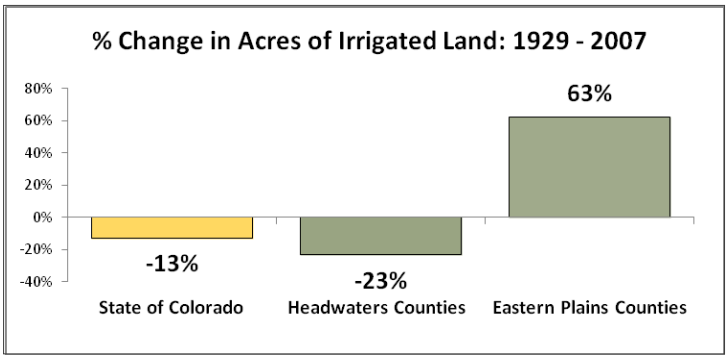
## 3.5 WATER & AGRICULTURE

Water is required for agricultural crop and livestock production. Within limits, the more water, the more productive agricultural land can be.

### 3.5.1 Irrigated Land

In the early twentieth century, water rights used for transmountain diversions were appropriated in water court. More recently, as unappropriated water became rarer, transmountain water diverters have purchased water rights from West Slope agricultural property owners. Transmountain water diversions are 100% consumptive from the basin-of-origin. If water rights were used to irrigate West Slope land before the diversion project, then the diversion had the effect of drying up West Slope agricultural land.

Since 1929, there has been a 13% statewide decline in irrigated land from 3.3 to 2.9 million acres. Among the Eastern Plains counties, there has been a net increase in irrigated land of 63%, as a substantial portion of water diverted from the headwaters counties was made available to agricultural properties in the Eastern Plains.




Source: US Census of Agriculture, US Department of Agriculture

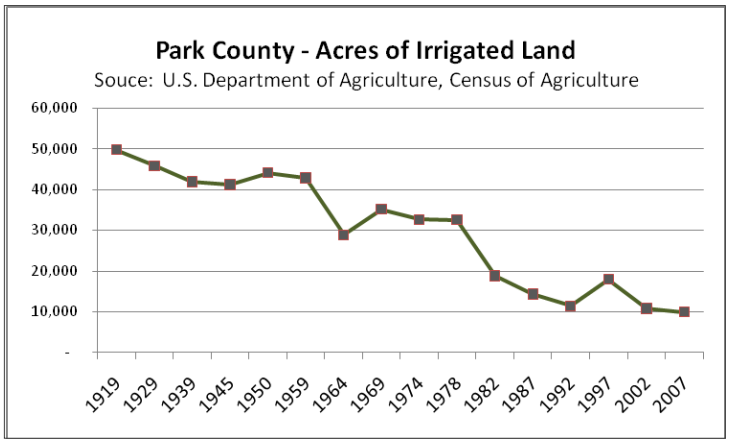
The increase in irrigated land in the Eastern Plains counties is attributable to several actions principally including rural electrification and improved pumping technologies that reduced the cost of pumping water. The Colorado – Big Thompson and Fryingpan-Arkansas transmountain water diversion projects have contributed to sustaining irrigated acreage to the extent that their supplemental water have kept agricultural production economically viable and the Northern Colorado Water Conservancy District and the Southeastern Colorado Water Conservancy District have expanded their service boundaries. Currently, the Colorado-Big Thompson Project provides supplemental water to irrigate nearly 650,000 acres of agricultural land and the Fryingpan-Arkansas Project provides supplemental water to irrigate nearly 281,000 acres of agricultural land. [108]

Among the headwaters counties, the decline has been a substantial 23% and was highest in Eagle County which experienced a 68% decline from 34,886 acres in 1929 to 11,128 acres in 2007.

| ACRES OF IRRIGATED LAND | | | |
|---|---|---|---|
| Jurisdiction | 1929 ▫ | 2007 | % Decline |
| State of Colorado | 3,284,535 | 2,867,957 | – 13% |
| Headwaters Counties | | | |
| Eagle | 34,886 | 11,128 | – 68% |
| Grand | 39,398 | 43,130 | + 10% |
| Gunnison | 58,661 | 40,729 | – 31% |
| Pitkin | 15,373 | 9,971 | – 35% |
| Routt | 49,130 | 43,527 | – 11% |
| Summit | 9,386 | 10,509 | + 12% |
| Sum – Headwaters Counties | 206,834 | 158,994 | – 23% |
| Eastern Plains Counties ▪ | 481,525 | 782,759 | + 63% |

Source: US Census of Agriculture, Table 1 Data Series.
▫ 1929 data is interpolated between 1919 and 1939 data.
▪ Baca, Bent, Cheyenne, Crowley, Huerfano, Kiowa, Kit Carson, Las Animas, Lincoln, Otero, Phillips, Prowers, Pueblo, Sedgwick, Yuma. A map in the Appendix highlights these counties.

While not among the West Slope headwaters counties, Park County is another headwater county where irrigated land has declined substantially. The number of irrigated acres in Park County declined by 78% from 49,793 in 1919 to 9,933 in 2007. By 2007, irrigated land comprised 3% of total Park County agricultural land, a significantly lower percentage than the average of headwaters counties, 12%, and of the State, 9%.



Source: US Census of Agriculture, US Department of Agriculture

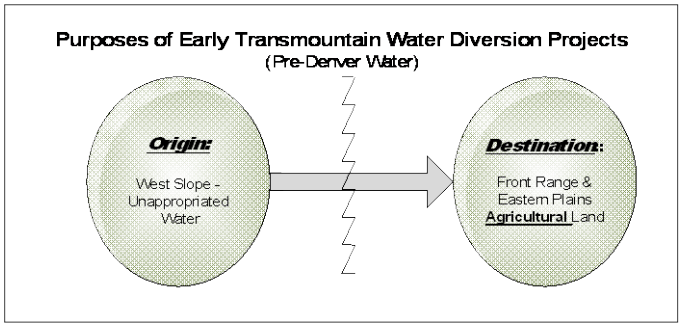
Water diversion projects were a substantial contributor to this decline. In 2010, Park County had only 17 agricultural workers, less than one percent of total jobs (2,190). [109]

In 1997, the Park County Land and Water Trust Fund was established to protect, preserve, acquire, improve and maintain Park County's remaining water resources. It is funded in part by a 1% countywide sales tax, which is used to leverage private, State and federal funding sources.

The reduction in irrigated land has a direct and adverse impact on the local economy. Agricultural employment declines since dry land requires significantly less labor than irrigated land. Also, agricultural equipment purchases decline as dry land requires less intensive care than irrigated land on a per acre basis. There are also related local government impacts on property tax revenues since dry land has a lower assessed value than irrigated land, reflective of the lower productivity of dry land. Some adverse economic effects currently experienced in some Eastern Plains counties have also been experienced over the decades in the headwaters counties.

### 3.5.2 Transmountain Water Diversion Projects - Agricultural to Municipal Purposes

The oldest transmountain diversion projects in Colorado were built by private companies for irrigation of East Slope agricultural properties. Examples included the Grand River Ditch (origin: Grand County), built by the Water Supply and Storage Company and the Larkspur Ditch (origin Gunnison County), owned by the Catlin Canal Company.



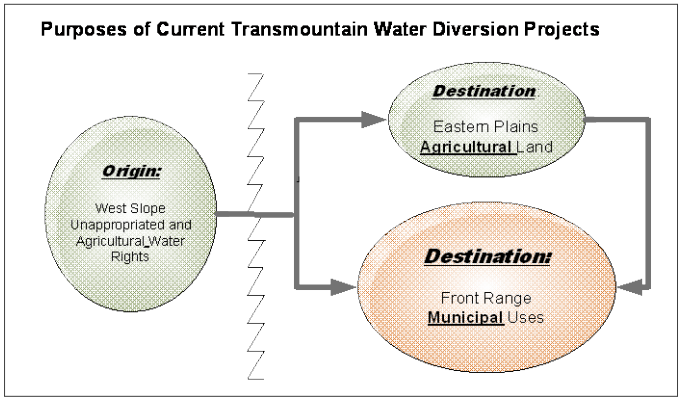

A number of other, older and smaller projects were originally built for irrigation purposes but were later purchased by Front Range municipalities and converted to municipal use. Examples include the Columbine Tunnel, the Ewing Ditch and Wurtz Ditch, which are now owned by the cities of Pueblo and Aurora.

Denver Water began its transmountain diversion activities with the purchase of agricultural water rights in the late 1920s in Grand County and in the 1940s in Summit County. It subsequently retrofitted the pilot fore of the Moffat Railroad Tunnel to convey water from Grand County and completed the Roberts Tunnel in 1962 to convey water from Summit County. Both projects serve its municipal customers in Denver and surrounding municipalities with which it has contracts.

The largest transmountain projects in Colorado were funded by Congress and built by the US Bureau of Reclamation include the Colorado-Big Thompson Project (Grand County) which was authorized for funding in 1937 and constructed between 1938 and 1957 and the Fryingpan-Arkansas Project (Eagle and Pitkin Counties) which was authorized in 1962 and constructed between 1964 and 1981. The Fry-Ark was among the last projects authorized for funding in the United States. [110]

The original purpose of the Bureau of Reclamation, established by the Reclamation Act of 1902, was to invest in agricultural irrigation projects in the west, using revenue from the sale of federal lands. [111] In the jargon of the early 1900s, "irrigation" projects were known as "reclamation" projects because the purpose was to irrigate arid land to encourage Western settlement by homemaking on family farms and "make the desert bloom."

The Bureau's early policies of supplying water for agricultural purposes at subsidized prices and long-term contracts and restrictions on the resale of water have resulted in a rigid allocation of major water resources to agriculture.[112] In more recent years, the Bureau broadened its purposes to include providing agricultural, municipal and industrial water; its mission is to "manage, develop and protect water and water related resources in an environmentally and economically sound manner…" [113] Both projects in Colorado were authorized and funded for irrigation and municipal purposes; the proportion of water used for municipal purposes has increased over the years.




More recently, additional Front Range water providers, such as the cities of Aurora, Colorado Springs, Fort Collins, and Golden, Centennial Water & Sanitation District (Highlands Ranch), and Pueblo West, have purchased West Slope agricultural water rights and constructed or purchased transmountain water diversion systems and have also begun to

purchase water rights from East Slope agricultural properties for their growing municipal purposes.

| PURPOSES AND OWNERS OF TRANSMOUNTAIN DIVERSION PROJECTS IN THE HEADWATERS COUNTIES | | |
|---|---|---|
| AGRICULTURAL | MUNICIPAL | AGRICULTURAL & MUNICIPAL |
| Water Supply & Storage<br>Catlin Cattle<br>Arkansas Valley Water Conservancy | Centennial Water & Sanitation Dist.<br>City of Aurora<br>City of Colorado Springs<br>City & County of Denver<br>City of Englewood<br>City of Fort Collins<br>City of Golden<br>City of Northglenn<br>Pueblo West | Pueblo Water Works<br>Bureau of Reclamation |

### 3.5.3 Transmountain Diversion Impacts on Ranch Irrigation

Ranchers rely on irrigation ditches to produce crops and livestock. Significant drops in streamflows, which can be caused by transmountain water diverters, create a lack of positive pressure in ditch heads and compromise the agricultural irrigation pump intake systems, making irrigation harder and more labor intensive. The combination of low flows and high water temperatures attract moths and algae and cause fish to die; these problems continuously clog irrigation pumps, sometimes to failure. Interviews with a rancher and former water commissioner and supplemented by the *Grand County Stream Management Plan – Draft Report* suggest than any additional streamflow reductions would hamper the currently compromised system even further. Some ranchers in Grand County that divert their water from the Fraser River and its tributaries currently experience problems with their irrigation ditch operations because of low streamflow and high water temperatures; further streamflow reductions due to proposed projects will exacerbate the compromised conditions.[114]

Lower streamflow and additional irrigation ditch structure failures is a relationship that the transmountain water diverters understand. The Municipal Subdistrict of the Northern Colorado Water Conservancy District paid $500,000 in mitigation to upgrade diversion structures for ranches below the Colorado River as part of the original construction of Windy Gap Reservoir.

Also, lower water levels add stress to ranchers' fisheries, handicapping their ability to lease fishing rights, a critical supplement to the income of many ranches on the riverfront. [115]

### 3.5.4 Streamflow and Crop Production

Ranches in headwaters counties are more vulnerable to annual variations in streamflows than ranches in the flatter portions of the State. A number of these ranches contain significant changes in topography with high plateaus. These high plateaus are typically irrigated only in high streamflow years; in low streamflow years, the high plateaus dry out and land reverts to less productive range for livestock. Although largest and oldest ranches typically have sufficient senior water rights, in low streamflow years, it is not financially feasible to irrigate higher plateaus by installing additional capital equipment such as pumps and sprinklers. In high elevation counties, there is typically only one hay crop per year and a short period of time when water can be diverted for irrigation. Crop production and streamflows are directly linked.

### 3.5.5 Residential Land Development and Irrigation Practices

Ranching and rural residential development are linked together by ranching irrigation practices. For example, in the Gunnison Valley, there are a number of situations where residential development use individual wells that rely on groundwater that is recharged by ranchers using flood irrigation practices in nearby upper meadows. Residential development not only benefits from and but also relies on these irrigation practices. There are no legal or regulatory relationships involved. In lower streamflow years, ranchers might not irrigate their upper meadows, thereby triggering an adverse impact on nearby residential development. [116]

Rural Residential Development – Gunnison County

## 3.6 WATER & MINERAL RESOURCE DEVELOPMENT

Several studies have recently been commissioned by the Colorado River and Yampa/White River Basin Roundtables to forecast water needs associated with energy development. The most recent study, *Energy Development Water Needs Assessment, Phase II Final Report* [117], concluded that water demands from energy development, including oil shale, natural gas, coal and uranium mining, could range from zero to 120,000 acre-feet annually. The significant range demands on factors such as technological and economic viability, environment and other local permitting constraints.

**Natural Gas.** In Gunnison County, natural gas is extracted underground through a hydraulic fracturing process, also called fracking, whereby water is pumped down a well to open a coal seam and them pumped up to the surface and separated from the gas at the wellhead. Extraction might or might not require additional water but does impact the groundwater table, water quality and air quality.

- The deeper the well, the more saline the water. As wells season, the amount of water declines and the methane production rises as the bed is dewatered. Methane gas is captured, compressed and piped off site.
- If surface water discharges become problematic, underground injection systems may be used, where additional water and wastewater are applied.
- Dewatering the seam can lower the indigenous water table and increase the possibility of spontaneous combustion.

Fracking Operation near Rifle

While there is no current natural gas production in Pitkin County, there are reportedly 81 existing gas leases in a 100,000 acre area that encompasses land that is owned by the US Forest Service; mineral leases are managed by the US Bureau of Land Management (BLM). The remote area is where Garfield, Pitkin, Gunnison and Mesa county boundaries come together; it is called the Thompson Divide area. It is at the headwaters of Thompson Creek which flows into the Crystal River and Divide Creek which flow into the Colorado River. A number of these gas leases are set to expire in 2012 and 2013. One natural gas company

has approached BLM requesting to unitize 16 gas leases in a 32,000 acre portion of this area; related plans include constructing a pipeline. Local opposition to changes to this remote area has emerged. [118]

**Oil Shale.** In Colorado, the extraction of oil from shale is water-intensive. There are significant water supply and water quality issues associated with oil shale extraction which also uses a fracking process. While oil shale deposits are not physically in the headwaters counties, demand for water associated with additional oil shale development could come from any one of these counties.

*Water Supply Considerations.* Significant amounts of water and energy are used during the production and reclamation processes. The oil shale industry estimates that extraction requires 1 to 3 barrels of water per barrel of oil. [119] Energy would come from coal-powered plants, which also require significant amounts of water. While the exact amount of water required is still under study, experts predict that the industry's water demand for oil shale could exceed the needs for all other energy sources. [120] The Yampa/White/Green Basin Roundtable and the Colorado Basin Roundtable collaborated on an Energy Development Water Needs Assessment to quantify the potential water demand of the oil and gas industry. Phase II [121] of this analysis concludes:

- Water demands from oil shale development could range between zero and 120,000 acre-feet annually. The future volume of water demand will depend on technological and economic viability, future energy demands, and other limitations including environmental concerns and permitting requirements.
- The bulk of water demands will occur in the White River Basin. White River water supplies are adequate to accommodate the forecasted level of demand modeled in the Report assuming an enlargement of Lake Avery or development of a new reservoir or both.

It is also possible that oil shale companies may seek to purchase water rights from local agricultural interests or from the Bureau of Reclamation's 16,700 acre-feet of unallocated water from the Ruedi Reservoir. If oil shale companies contract directly with the Bureau, it may be required to release significant amounts of water over a short period of time from the Ruedi Reservoir into the Fryingpan River, exacerbating the already problematic hydrology and flow regime of the Fryingpan River as well as the Roaring Fork River downstream of its confluence with the Fryingpan in Basalt.[122] Eagle and Pitkin Counties rely on predictable streamflow in these rivers for a significant portion of its summer fishing, camping and boating activities.

*Water Quality Considerations.* In the West, oil shale also has relatively high water content, up to 30 to 40 gallons per ton of shale. Much of this water can be recovered during processing and used to support operations, but produced water contains organic and inorganic substances that need to be removed. Most wells rely on hydraulic fracturing. The mix of chemicals used in hydraulic fracturing is proprietary information. Waste water sits in open pits until treated, recycled or disposed. The 2005 Energy Policy Act exempts hydraulic fracturing from the State Drinking Water Act.

**Residual from Inactive Mine Sites**. Statewide, there 23,000 hazardous abandoned mines and 1,300 miles of streams that have been impacted by past mining. While the Colorado Division of Reclamation, Mining and Safety is actively working to safeguard abandoned mines and mitigate environmental problems, funding is relatively minimal. [123]

In the headwaters counties, there are 1,799 inactive mines; the Division has safeguarded about 23% or 410 mines; the remainder, 1,389 mines have not been safeguarded. [124]

| Inactive Mines in Headwaters Counties | | | |
|---|---|---|---|
| County | Inactive Mines | Mines Safeguarded by State | Mines Not Safeguarded (6/04) |
| Eagle | 100 | 41 | 59 |
| Grand | 10 | 3 | 7 |
| Gunnison | 215 | 185 | 30 |
| Pitkin | 753 | 54 | 699 |
| Routt | 121 | 54 | 67 |
| Summit | 600 | 73 | 527 |
| Total | 1,799 | 410 | 1,389 |
| Source: Colorado Division of Reclamation, Mining and Safety web site | | | |

While there are good regulatory requirements in place and some State funds available to mitigate environmental impacts, there are still a substantial number of inactive mines that have not been safeguarded; many of these mines might continue to degrade water quality. One example is in Eagle County where persistent zinc concentrations has degraded water quality and compromised trout and sculpin in the upper reaches of the Eagle River. Another example is the Pennsylvania Mine in Summit County which is contributing to the sterilization of the Snake River above Keystone.

## 3.7 Water & Land Development

The CWCB reports that Gunnison, Grand, and Summit counties have insufficient water supply to meet their future in-basin consumptive (i.e., municipal, industrial and self-supplied industrial) needs.[125] Additional in-stream needs not accounted for in the CWCB forecasts include non-consumptive needs such as sufficient water for recreation uses, to dilute wastewater, and to maintain minimum CWCB streamflows and plus climate changes impacts. When properly quantified, these additional needs bring the water shortage calculations even higher.

Several of the headwaters counties, such as Grand County, have no or minimal raw water storage. These counties are not prepared to withstand unusually severe or sustained drought conditions because water flows may be insufficient to meet both transmountain diversion calls and local needs.[126]

Sustained water diversions in the upper reaches of the Fraser River basin have also created concerns about ground water aquifer recharge which is needed to serve existing development. The Town of Fraser, Winter Park Ranch and Tabernash rely on ground water for their water supply.

## 3.8 WATER & SANITATION DISTRICTS

Water temperature increases and lower streamflows triggered by transmountain water diversion projects generate concern among some headwaters county water and sanitation districts since these environmental effects can make it harder to achieve State water quality / discharge minimums and trigger the need for more expensive treatment methods to maintain their water quality permits. While these problems are exacerbated by increasing demands of the transmountain diverters, the State only has authority to impose constraints on the dischargers, not the diverters. Also, under drought conditions, some water and sanitation districts would not be able to deliver enough water to their anticipated customers. These concerns are have been expressed by managers of multiple districts in Grand County, the Silverthorne and Dillon Joint Sewer Authority in Summit County and the Town of Red Cliff. [127]

Blue River Wastewater Treatment Plant

A typical example is the Blue River Wastewater Treatment Plant, a facility of the Silverthorne / Dillon Joint Sewer Authority, located downstream of Dillon Reservoir and owned by Denver Water. The Authority's State water quality discharge permit is tied directly to streamflow at its discharge, which is controlled by Denver Water. If streamflow is below 50 cubic-feet-per-second even for a short period of time, then the discharge permit will be amended with more stringent requirements. While Denver Water works diligently to keep the streamflow above 50 cfs and has addressed the issue in the 2011 Colorado River Cooperative Agreement, streamflow did dip below this minimum threshold once in the 1990s; Denver Water forecasts indicate that lower streamflows are more likely in the future. Additional capital costs associated with improving the treatment plant to accommodate lower streamflows would be very significant. [128]

The Copper Mountain Consolidated Metropolitan District serves Copper Mountain Resort, using ground water from the West Ten Mile Creek drainage basin. The District is constrained in its need to withdraw more water from the aquifer by minimum streamflow rights and because the physically available water is owned by senior downstream owners, primarily Denver Water storage rights in Lake Dillon. In the future, if the District cannot acquire additional water within the West Ten Mile aquifer, it may be forced to withdraw water from the main stem of Ten Mile Creek, which has poorer water quality. This would require significant changes in water treatment and resulting higher costs.

# 4.0 WATER POLICIES AND PROBLEM - SOLVING SUCCESSES

## 4.1 WATER POLICIES OF THE SIX HEADWATERS COUNTIES

The six headwaters counties have a spectrum of policy positions and practices with respect to water supply generally and transmountain water diversion projects in particular. Their policies reflect the issues they have confronted and will confront in future years. This section summarizes key water policy perspectives from each headwaters county.

- **Eagle County.** Recreation and tourism drive Eagle County's economy; its water priorities correlate directly with this economic driver. The County is vigilant and proactive about knowing how additional diversions and exchanges will be managed to keep its three major watersheds healthy. The County believes that the legal interpretation of in-stream flows to "protect the natural environment to a reasonable degree" must go beyond the minimum amount of water necessary to keep fish alive and must include water necessary for ecological protection. Critical to Eagle County is protection of its "Gold Medal" fishing designations; the Bureau of Reclamation must not threaten quality recreational opportunities when managing reservoirs. While not a current threat, water demand for future oil shale development immediately west of Eagle County is a looming concern of unknown proportions.

- **Grand County.** The Fraser and Colorado Rivers originate in Grand County which is the most impacted headwater county from transmountain diversions beginning in the 1920s. John Wesley Powell's quote, "The history of the American West will be written in acre-feet" is reality in Grand County today. There are certain times of the year when one cubic foot per second (2 acre-feet in 24 hours) of flow in the Fraser River can make the difference in a sustainable resource for the aquatic environment and to allow wastewater discharges to meet permit requirements. Maintaining our water resources is essential to the economy of the County. Grand County has been aggressive in protecting its remaining water. It has established a fund to purchase water to protect and enhance streamflows, have worked with the Colorado Water Conservation Board to legally use the water for the environment, and have established a stream management plan to help direct the water to its most beneficial portion of our rivers and streams. Grand County was one the first counties to adopt HB-1041 regulations and has used these regulations to further assess the impacts of water projects on the local level and mitigate those impacts. Grand County has also hired a geo-chemist who serves as our water quality specialist. This person directs a substantial water quality monitoring program to protect our water quality.

- **Gunnison County.** The essence of Gunnison County's ability to survive and prosper historically has been, and will continue to be, its ability to have consistent, plentiful clean water. The natural environment is the heart of the economic and social well-being of the county, both now and in its future and water is its lifeblood. It is the policy of Gunnison County to: (a) assure that land use and other activities carried out within the County do not adversely affect the availability or suitability of water for present or future uses; (b) exercise its authority to ensure that the net effect of development, management and utilization of water resources do not generate significant adverse environmental, social or economic impacts to the County; (c) participate in all forums affecting the provision of water to meet out-of-basin needs or which would interfere with the ability of the county's citizens to determine the manner and extent to which the county's water resources should be used to meet its own present and future goals; (d) monitor and, when appropriate, participate in all state and federal legislation, regulations, policies or plans which could affect the Gunnison Basin's ability to provide water necessary to meet Gunnison County's present and future needs, and; (e) encourage and participate in the development of an in-basin water resource protection and development planning process that will insure that the economic, social and environmental goals of the

County are furthered. (*Excerpted from Gunnison County Position Statement: Protection and Development of Water Resources in Gunnison County and the Gunnison River Basin, October 18, 2005.)*

- **Pitkin County.** The citizens of Pitkin County adopted a sales tax in 2008 whose proceeds are dedicated to 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 these objectives. Pitkin County water policy reflects the scope of the authorization of the use of these dedicated funds approved by our electors.

  Pitkin County seeks to preserve and protect agricultural and historically irrigated lands in order to maintain or enhance agricultural productivity. In addition to other existing strategies, Pitkin County is pursuing innovative improvements to agricultural infrastructure as a means to preserve agricultural lands and to enhance stream flows. Pitkin County's commitment to riparian health reflects our desire to preserve and protect our natural environment and fisheries, maintain our economic base and enhance the quality of life for our citizens and guests.

- **Summit County.** Summit County has been heavily impacted by transbasin water diversion projects since the early 1960's. Over the last 20 years, average annual depletions from Denver Water's Dillon Reservoir have been approximately 72,000 acre feet with additional 9,000 acre feet from Colorado Springs Hoosier Tunnel Collection system. These amounts are expected to increase as population and growth continue along the Front Range.

  Since the early 1970's, Summit County Government as well as town governments, water providers, waste water treatment providers, local ski areas, the Northwest Colorado Council of Governments and numerous other agencies have worked to avoid any new water diversion projects and to minimize additional depletions. The goal of these groups has been to protect water quantity and quality, to maintain the flexibility to wisely use these resources for environmental and wildlife purposes and to further develop and support our local recreational based economy and local quality of life. The County recognizes the importance of water resources as key to a healthy regional economy and environment. Summit County entities have developed complex water rights portfolios and water storage facilities to sustain economic development opportunities as well as to maintain healthy streamflows and lake levels and as an insurance policy against an uncertain future including climate change and politics. Extensive investments have been and continue to be made in drinking and waste water treatment capabilities and for water based recreational amenities for boating, rafting, fishing and snowmaking at the four ski areas in the county. Local governments have spent millions to mitigate damaged streams and to treat pollution resulting from historic mining activities, improve habitat and restore wetlands for fishing and wildlife, to guarantee healthy water sheds through regulations and purchase of open space areas and have put in place precise water quality monitoring programs.

  Summit County and local entities will continue efforts to minimize additional water diversions and resist new water diversion projects unless significant benefits can be clearly identified and proven to accrue to the local environment and economy. Provisions contained within the 2011 Colorado River Cooperative Agreement will be helpful and used in these efforts. To the greatest extent possible we will fight to maintain valuable water resources for local uses and for regional benefits throughout western Colorado

## 4.2 EAST SLOPE / WEST SLOPE PROBLEM-SOLVING SUCCESSES

Water is precious to the headwater counties. Most of the native streamflow in four of the six headwaters counties has been diverted either to the Front Range or to other states. Organizations within the headwaters counties have been innovative and pragmatic in conceiving and activating ways to manage water because they had no other choice. These are not practices that evaluate future potential conditions. Rather, these are practices used to manage current conditions.

> *"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 become part of our regional ethic. That cannot be mandated." Bob Schultz, Roaring Fork Watershed Plan public meeting facilitator, 2009*

This section highlights a sampling of these innovative solutions to demonstrate the ability of competing West Slope interests to work together creatively and to negotiate effectively with East Slope water providers. This does not imply that these same remedies will work effectively if there are additional depletions from the headwaters that push environmental conditions beyond the tipping point.

| WEST-SLOPE / EAST-SLOPE PROBLEM-SOLVING SUCCESSES – ILLUSTRATIVE PROJECTS AND DATES | |
|---|---|
| • Learning-By-Doing (proposed) | • Grand Valley / Gunnison Selenium Task Force (1998) |
| • Colorado River Cooperative Agreement *(approved in concept,* 2011) | • Eagle River Memorandum of Understanding (1998) |
| • Blue Mesa Plan (2010) | • Local Voter-Authorized Tax Rate Increases (1995 +) |
| • Wild & Scenic River Alternatives – Stake'hldr Groups (2008) | • Aspen Water Conservation Initiative (1993) |
| • Denver Water – Eagle County Settlement Agreement (2007) | • Wolford Mountain Reservoir Agreement (1992) |
| • Winter Park Master Plan – Zoning Density Constraint (2006) | • Clinton Reservoir-Fraser River Agreement (1992) |
| • Roaring Fork Watershed Collaborative (2002) | • Upper CO. Endangered Fish Recovery Program (1988) |
| • Blue River Restoration Project (2001+) | • Summit County / Denver Water Agreement (1985) |
| • GMUG Pathfinder Project (2000) | • QQ Committee of the NWCCOG (1978) |

**Learning-by-Doing Cooperative Effort** *(Proposed).* A portion of the Colorado River Cooperative Agreement calls for Denver Water, the River District, Middle Park Water Conservancy District, and Grand County to execute an intergovernmental agreement establishing the Learning-by-Doing Cooperative Effort. Its purpose is to protect, restore, and when possible enhance, the aquatic environment in the Upper Colorado, Fraser and Williams Fork River basins. Denver Water and Grand County will jointly request that the US Army Corps of Engineers acknowledge the Learning-by-Doing Intergovernmental Agreement in the pending Record of Decision for the Denver Water - Moffat Firming Project. This Agreement will be executed after the Moffat Firming Project is permitted.

**Colorado River Cooperative Agreement** *(approved in concept and pending execution, 2011).* Drafted after six years of negotiation, this Agreement includes 34 parties on the East and West Slope. It is a product of mediated negotiations triggered by Denver Water's intention to enlarge Gross Reservoir and resolve water rights issues under the Blue River Decree. The settlement addresses issues regarding future diversions, bypass flows, mitigation for current streamflow and water quality concerns, funding for wastewater treatment, Dillon Reservoir water levels, priority of conservation and reuse, investment in watershed health, and more assured water supplies for snowmaking and other uses.

**Blue Mesa Plan** *(2010).* This plan was conceptually designed by the Arkansas and Gunnison basin roundtables. The plan calls for the State of Colorado to contract with the Bureau of Reclamation for water in the Aspinall Unit [129] or Ruedi Reservoir for meeting a portion of the State's Colorado River Compact obligations in case of a call on the Colorado River by the Lower Basin States (California, Arizona and Nevada). [130]

**Wild & Scenic River Determination – Stakeholder Groups** *(2008).* In the last few years, the Bureau of Land Management has prepared several Draft Resource Management Plans and nominated a number of river segments in Colorado for Wild and Scenic River designation. Local stakeholders, including property owners, local governments, rafters, environmentalists have convened voluntarily in several instances to carefully review the management practices required to sustain these designations for each river segment. In some instances, the river segment was deemed not suitable for designation; in other instances, the stakeholder groups recommended alternatives to defer suitability and more flexible management practices to sustain the values.

**Settlement Agreement – Denver Water and Eagle County Districts** *(2007).* The Eagle River Water and Sanitation District and the Upper Eagle Regional Water Authority reached a settlement with Denver Water which resulted in the abandonment of most of Denver's water rights in Eagle County and settlement of a law suit in Water Court.

**Winter Park Master Plan – Water Availability** (*2006*). The Town of Winter Park and the water and sanitation districts that serve the Town prepared an analysis of future water availability. The Town Master Plan states that "there is a real possibility of eventually approving development that exceeds the water actually available in the future." (Section 4.1.3) Based on this finding, the Town uses this policy to discourage applications to upzone the density of residential property. In one instance, the policy was used to deny a zoning application.

**Roaring Fork Watershed Collaborative** *(2002).* This organization began as an ad-hoc organization of four counties (Eagle, Garfield, Gunnison and Pitkin), the City of Glenwood Springs, the White River National Forest, the Roaring Fork Conservancy and Healthy Mountain Communities, a regional nonprofit. The group wanted to move beyond the siloed approach to water resource planning taken by individual organizations. A Water Committee of the Collaborative grew to include 144 participants, including municipal, county, regional, State and federal agencies, private consulting firms, nonprofit organizations, and districts. A nonprofit organization emerged to produce several scholarly documents regarding the Roaring Fork watershed which are used to educate, inform and guide future water resource decisions.

**Blue River Restoration Project** *(2001+).* The Blue River Restoration projects, totaling almost $1,000,000 were a collaborative effort involving the Town of Silverthorne, the White River National Forest, Summit County, the Colorado Division of Wildlife, Trout Unlimited, the Denver Water Board and the Northwest Colorado Council of Governments. These improvements, which have restored portions of the River to pre-dam conditions and re-established a natural stream within hydrological parameters to maintain Gold Medal fishing status also adapted the habitat to lower typical flows seen since the construction of the Dillon Dam. For example, for 20 months through June 2003, the Blue River streamflows downstream of the Dillon Reservoir were managed at 50 cubic feet per second.

**GMUG Pathfinder Project** *(2000).* The US Forest Service created the GMUG (Grand Mesa, Uncompahgre and Gunnison) Instream Flow Pathfinder Project to develop consensus recommendations regarding instream flow protection in the Forest Service's surface waters. The underlying purpose is to help the Forest Service decide what tools it should use to protect aquatic resources. There are 15 diverse stakeholders including business groups, such as Club 20, ranchers, environmental groups, water user organizations, the State and federal government.

**Grand Valley / Gunnison Basin Selenium Task Force** *(1998).* The State created this Task Force to search for ways to reduce selenium in the Grand Valley/Gunnison Basin "while maintaining the economic viability and lifestyle of the Lower Gunnison River Basin." The diverse group includes municipalities, ranchers, water conservation organizations, soil conservation districts, and the State. The Gunnison Basin Task Force was formed in 1998; the Grand Valley Task Force was formed in 2000; both groups have been meeting jointly since 2006.

**Eagle River Memorandum of Understanding** *(1998).* The intent of this Agreement was development of a joint use water project using Eagle River water that meets the water requirements of Front Range and West Slope participants, minimizes environmental impacts, is technically feasible and cost effective, can be permitted, and provides sufficient yield to meet the water requirements of all participants. The participants are the cities of Aurora and Colorado Springs, the Colorado River Water Conservation District, Cyprus Climax Metals Company, and the Vail Consortium consisting of the Eagle River Water and Sanitation District, the Upper Eagle Regional Water Authority and Vail Associates. Components of the MOU relate to cost sharing, rights to yield, permitting, water rights and water rights objections, and replacement water.

**Local Voter-Authorized Tax Rate Increases** *(1995+).* Two counties (Pitkin and Gunnison) impose local sales and use taxes with the express intent of using revenues to preserve open space, specifically including ranchland and agricultural conservation easements. Eagle County imposes a property tax mill levy and applies some of its revenues to purchase agricultural easements and agricultural / open space land. Routt County imposes a property tax mill levy which is dedicated to purchase transfer-of-development rights and conservation easements to retain agricultural property in the County.

**City of Aspen Water Conservation Initiative** *(1993).* The City of Aspen has reduced its municipal water use by 48% between 1993 and 2008 through proactive conservation measures. This has had a positive impact on Maroon and Castle Creeks, which are sources of City water supply and snowmaking.

**Wolford Mountain Reservoir Agreement** *(1992).* Colorado River Water Conservation District (River District) and Denver Water jointly constructed the Wolford Mountain Reservoir to be used for West Slope and East Slope needs. The 66,000 acre-foot reservoir, completed in 1996, is on Muddy Creek in Grand County. West Slope cities and districts may use up to 62% (41,000 acre feet) of storage which the River District makes available through water contracts, endangered fish releases, and wetland mitigation. In exchange for financial support, Denver Water may use up to 38% (25,000 acre feet) of Wolford's water.

**Clinton Reservoir – Fraser River Water Agreement** *(1992).* A nonprofit organization comprised of Summit County, the Summit Ski Areas, the Winter Park Recreational Association and the towns of Breckenridge, Dillon and Silverthorne acquired the Clinton Gulch Reservoir from Climax Molybdenum Company. Parties to the Agreement include Denver Water plus the "West Slope Parties" (five competing ski areas - Breckenridge, Keystone, Copper, A-Basin and Winter Park, Grand County, Summit County, the towns of Breckenridge, Dillon, Fraser, Granby, Frisco, Silverthorne, Grand County Water and Sanitation District and Winter Park Water and Sanitation District). The Agreement allows Denver Water to use the reservoir, allows other parties to divert Denver Water for their own purposes and assures Grand County users of some bypass water from Denver Water. But for the Clinton Agreement, these ski areas would not have sufficient water for snowmaking purposes in the winter or recreation purposes in the summer in dry years.

**Upper Colorado River Endangered Fish Recovery Program** *(1988)* involves the Bureau of Reclamation, the National Park Service, the US Fish and Wildlife Service, the states of Colorado, Utah and Wyoming, Colorado River District, Western Resource Advocates, the Colorado River Energy Distributors Association, the Colorado Water Congress and others. Its purpose is to recover fish species listed as endangered species. The Program relies on operations and releases from compensatory storage projects, such as Green Mountain and Ruedi Reservoir, to achieve recommended streamflows. Funding is principally from the federal government with State contributions.

**Summit County / Denver Water Agreement** *(1985).* Denver Water provided 3,100 acre-feet of storage water in Dillon Reservoir to Summit County, which distributes the water to local districts and towns. In exchange, Summit County agreed to approve Denver Water's 1041 application for the Straight Creek diversion, which is parallel to I-70 below the Dillon Dam, and not oppose the Two Forks project.

**Water Quality / Water Quantity (QQ) Committee of the Northwest Colorado Council of Governments** *(1978).* This committee includes towns, counties and water and sanitation districts in the

headwaters region of Colorado. Its purpose is to enable members to protect and enhance the quality of the region's waters while facilitating responsible use of those resources. The QQ Committee provides a forum for members to formulate policies and strategies and provides supportive assistance to further intergovernmental cooperation and members' clout with state and federal agencies.

**Responsible Application of HB-1041 Regulations**. Enacted in 1974, HB-1041 authorizes counties and municipalities to regulate certain activities within their respective jurisdictions that are of "state interest." Headwaters counties used these authorities as an effective tool to negotiate mitigation remedies with transmountain water diverters. Some recent examples are the mitigation remedies associated with the:

- 1985 Summit County / Denver Water Agreement;
- 1992 Clinton Reservoir Agreement;
- 1992 Wolford Reservoir Agreement;
- 1998 Eagle River Memorandum of Understanding,
- 2011 Colorado River Cooperative Agreement (approved in concept and pending execution), and;
- the proposed Windy Gap Firming Project.

But for the authorities provided in HB-1041, Summit, Eagle and Grand Counties would currently experience substantially greater adverse impacts associated with transmountain water diversion projects because transmountain water diverters would have no need to negotiate counterbalancing mitigation remedies with the basin-of-origin counties. HB-1041 has created a forum to resolve issues. While it has proved its value to West Slope counties over the years, there are limitations on what can be accomplished with 1041 regulations.

Headwaters counties have been responsible in their application of 1041 authorities. There has been only one water diversion project that has been denied by this process. In the late 1980s, Eagle County denied permits sought by Aurora and Colorado Springs to extend a transmountain diversion project (Homestake II) in the newly designated Holy Cross Wilderness Area. This case was subsequently appealed and upheld by the Colorado Appellate Courts; the United States Supreme Court rejected the cities' petition to reconsider the case.

# APPENDIX OF TABLES AND MAPS

| TABLE 1: PERCENT OF JOBS IN TOURISM BY SECTOR AND INDUSTRY | |
|---|---|
| INDUSTRIES | STATEWIDE % TOURISM JOBS |
| All | 8.0% |
| Services | 20.8% |
| Hotels & Other Lodging | 88.1% |
| Amusement & Recreation – Ski Resorts | 91.0% |
| Amusement & Recreation – All Other | 37.4% |
| Agricultural Services – Landscaping | 4.1% |
| All Other Tourism Services | 2.1% |
| | |
| Wholesale Groceries, Apparel, Inc. | 15.3% |
| Wholesale Groceries, Apparel, Inc. | 3.6% |
| Eating & Drinking Places | 28.1% |
| Building Material, Hardware, Garden | 8.8% |
| All Other Tourism-Related Retail | 12.3% |
| | |
| Real Estate & Construction | 10.9% |
| Real Estate | 19.8% |
| Building Specialty, Heavy Construction | 8.4% |
| | |
| Transportation | 23.8% |
| Local Transit & Taxi Services | 23.8% |
| Air Transportation | 32.7% |
| Arrangements, Car Rental Repairs | 14.5% |
| Public Utilities, Communication | 2.3% |
| Communications | 2.3% |
| Electric & Gas | 2.3% |
| Source: Tourism Jobs in Colorado, Center for Business and Economic Forecasting, Inc., March 15, 2001, page 16. | |

TABLE 2. EMPLOYMENT BY PLACE OF WORK – HIGH TOURISM SECTORS – 1997 AND 2010

| | State of Colorado | | Eagle County | | Grand County | | Gunnison County | |
|---|---|---|---|---|---|---|---|---|
| | 1997 | 2010 | 1997 | 2010 | 1997 | 2010 | 1997 | 2010 |
| High Tourism Sectors | | | | | | | | |
| Accommodations | 39,326 | 39,488 | 2,823 | 2,907 | 622 | 748 | 390 | 302 |
| Amusement & Rec. | 38,263 | 44,621 | 3,006 | 3,237 | 1,055 | 963 | 800 | 660 |
| Food & Drink | 150,400 | 178,888 | 3,184 | 3,768 | 729 | 796 | 1,112 | 981 |
| Real Estate | 30,518 | 41,348 | 1,434 | 1,360 | 492 | 349 | 277 | 202 |
| Air Transportation | 24,365 | 12,456 | 140 | 11 | 0 | 0 | 56 | 34 |
| Local Transportation | 5,292 | 5,126 | 332 | 137 | 0 | 68 | 0 | 0 |
| Subtotal | 288,164 | 321,527 | 10,919 | 11,420 | 2,898 | 2,924 | 2,635 | 2,179 |
| Total Employment | 1,952,986 | 2,177,069 | 24,729 | 27,459 | 5,896 | 6,481 | 7,065 | 7,628 |
| High Tourism % | 14.8% | 14.8% | 44.2% | 41.6% | 49.2% | 45.1% | 37.3% | 28.6% |

| | Pitkin County | | Routt County | | Summit County | |
|---|---|---|---|---|---|---|
| | 1997 | 2010 | 1997 | 2010 | 1997 | 2010 |
| High Tourism Sectors | | | | | | |
| Accommodations | 2,271 | 2,028 | 625 | 510 | 4,184 | 3,025 |
| Amusement & Rec. | 1,520 | 1,798 | 999 | 1,137 | 1,172 | 1,152 |
| Food & Drink | 2,315 | 1,880 | 1,486 | 1,418 | 2,536 | 2,631 |
| Real Estate | 1,024 | 1,143 | 718 | 587 | 950 | 932 |
| Air Transportation | 186 | 150 | 119 | 311 | 127 | 0 |
| Local Transportation | 0 | 20 | 0 | 0 | 106 | 75 |
| Subtotal | 7,316 | 7,019 | 3,947 | 3,963 | 9,075 | 7,815 |
| Total Employment | 15,571 | 15,003 | 11,383 | 12,829 | 17,216 | 17,167 |
| High Tourism % | 47.0% | 46.8% | 34.7% | 30.9% | 52.7% | 45.5% |

1997 SIC CODES AND "COMPARABLE" 2010 NAICS CODES

| 1997 SIC Codes | | 2010 NAICS Codes | |
|---|---|---|---|
| | SIC Code | | NAICS Code |
| Hotels & Lodging | 70 | Accommodations | 721 |
| Amusement, Rec., Museum, Zoos | | Art, Amusement & Recreation | 71 |
| Amusement & Recreation | 79 | | |
| Museums & Zoos | 84 | | |
| Eating & Drinking | 58 | Food Services & Drinking Places | 722 |
| Real Estate | 65 | Real Estate | 53 |
| Air Transportation | 45 | Air Transportation | 481 |
| Local Transportation | 41 | Local Transportation | |
| | | Transit & Ground Passenger | 485 |
| | | Scenic & Sightseeing | 487 |

Source: Colorado Department of Labor and Employment, QEW Data Series, Annual Average Figures

| TABLE 3: LAKES & RESERVOIRS IN THE HEADWATERS COUNTIES THAT ALLOW RECREATION | | | | |
|---|---|---|---|---|
| COUNTY | LAKE OR RESERVOIR | SURFACE ACRES | OWNER | PRIMARY PURPOSES |
| Eagle | Black Lakes | 27 + 9 | Eagle River Water & San Dist. | Storage for drinking water |
| | Eagle Park Reservoir | 61 | Eagle Park Reservoir Company; built t in 1999; expanded in 2005 | Drinking water; maintaining satisfactory flows and snowmaking |
| | Homestake Reservoir | 320 | Cities of Aurora & Co. Springs; built in 1967 | Divert water to East Slope |
| | LEDE Reservoir | | City of Gypsum | Drinking water |
| | Nottingham Lake | 19 | City of Avon; built in 1980 | |
| | Sylvan Lake | 42 | State Parks and Wildlife | Recreation |
| Grand | Grand Lake | 600 | | Natural lake; also used as conduit for CO Big Thompson Project |
| | Lake Granby | 7,256 | Bureau of Reclamation; completed in 1949 | Deliver water to East Slope through C-BT System |
| | Shadow Mountain Reservoir | 1,346 | Bureau of Reclamation, part of CO-Big Thompson | Deliver water from West Slope |
| | Williams Fork Reservoir | | Denver Water | |
| | Willow Creek Reservoir | 292 | Built between 1951 and 1953 | Divert water from Colorado River to Lake Granby for delivery through C-BT Project |
| Gunnison | Blue Mesa Reservoir | 9,180 | Built by Bureau of Reclamation; managed by US National Parks; Blue Mesa and Morrow Point completed in 1968; Crystal in 1976 | Part of the 1956 Colorado River Storage Project; diverts water to western Colorado and Lower Basin states. |
| | Crystal Reservoir | 301 | | |
| | Morrow Point Reservoir | 817 | | |
| | Taylor Park | 2,400 | Bureau of Reclamation; complete in 1937; recreation managed by US Forest Service | Divert water from Taylor River to Uncompahgre River for irrigation; part of Uncompahgre Project |
| Pitkin | Ruedi Reservoir | 997 | Bureau of Reclamation | Compensatory water storage for West Slope users |
| Routt | Stagecoach Reservoir | 780 | Upper Yampa Water Conservancy District; recreation managed by State Parks | Provide irrigation, municipal and industrial water to northwest Colorado |
| Summit | Dillon Reservoir | 3,233 | Denver Water; completed in 1963 | Divert water from Blue River thru Roberts Tunnel to Denver |
| | Green Mountain | 2,125 | Bureau of Reclamation, completed in 1943; recreation managed by U.S. Forest Service | Compensatory water storage for West Slope for water diverted via the C-BT Project. |

| TABLE 4: LAKES & RESERVOIRS IN HEADWATERS COUNTIES – ACTIVITIES & VISITORS | | |
|---|---|---|
| COUNTY | LAKE OR RESERVOIR | PRIMARY RECREATION ACTIVITIES |
| Eagle | Black Lakes | Fishing |
| | Eagle Park Reservoir | |
| | Homestake Reservoir | Non-motorized boats and fishing |
| | LEDE Reservoir | |
| | Nottingham Lake | Fishing |
| | Sylvan Lake | Non-motorized boating, fishing, hiking, camping; within 1427 acre park |
| Grand | Grand Lake | |
| | Lake Granby | All boating, wind surfing, fishing and ice-fishing, camping, picnicking, hiking and viewing scenery. |
| | Shadow Mountain Reservoir | All boating, camping, fishing |
| | Williams Fork Reservoir | Fishing, non-motorized boating, camping |
| | Willow Creek Reservoir | Fishing, camping, hiking |
| Gunnison | Blue Mesa Reservoir | All boating, fishing, camping |
| | Crystal Reservoir | Camping, hand-carried boats, fishing |
| | Morrow Point | Camping, hand-carried boats, fishing |
| | Taylor Park | All boating, fishing, ice-fishing, |
| Pitkin | Ruedi Reservoir | Camping, sailing, motorized boating, fishing, wind surfing |
| Routt | Stagecoach | Camping, power boating, jet skiing, ice fishing |
| Summit | Dillon Reservoir | All boating, sail boarding, windsurfing, and fishing. |
| | Green Mountain | Fishing, boating (all types), camping swimming |

| TABLE 5. RIVER REACHES LISTED FOR RAFTING USE BY AMERICAN WHITEWATER | | |
|---|---|---|
| COUNTY | REACH OF RIVER OR CREEK | CLASS |
| Eagle | Eagle River from Forest Service Visitor Center to Dowd Chute | III – IV (V) |
| | Eagle River from Riverbend bus stop to Edwards *Upper Eagle) | III |
| | Eagle River from Edwards to Eagle (Lower Eagle) | II – III |
| | Eagle River at Gilman Gorge | IV – V (V+) |
| | Gore Creek from East Vail to Eagle River | III – IV |
| | Homestake Creek above confluence with Eagle River | V |
| | Piney River from Piney Crossing to State Bridge | V+ |
| | Sweetwater Creek from Pine Valley Ranch to Anderson Camp | III – IV |
| | | |
| Grand | Colorado River from Hot Sulphur to Hwy 40 Bridge | IV |
| | Colorado River at Gore Canyon | IV – V |
| | Colorado River from Pumphouse campground to Rancho Del Rio | III |
| | Fraser River from Tabernash to Granby | III – IV |
| | Willow Creek from National Forest Campground to Reservoir | II |
| | | |
| Gunnison | Anthracite Creek from Ruby Fork Bridge to Erikson Springs Campground | V+ |
| | Cebolla Creek from Hwy 149 to Blue Mesa Reservoir | II |
| | Crystal River from Crystal Mill Falls to Crystal Gorge | III – IV (V) |
| | Crystal River from crystal to Beaver Lake | V+ |
| | Crystal River North Fork to scree slope | V+ |
| | Crystal River, South Fork to crystal | V+ |
| | Daisy Creek from Waterfall to Slate River | V |
| | East River from Gothic Bridge to above Stupid Falls | IV |
| | Gunnison River from Almont to Blue Mesa Reservoir | II |
| | Gunnison River / Black Canyon | IV – V |
| | Gunnison River / Gunnison Gorge | IV |
| | Gunnison River from Paonia Reservoir to below Somerset | III |
| | Henson Creek from Nellie Creek to Lake City | IV – V |
| | Oh Be Joyful Creek from Ankle Breaker to Beaver Ponds | V |
| | Slate River from Beaver Ponds to Oh Be Joyful Campground | V |
| | Taylor River from Taylor Park Reservoir to Almont | II – IV |
| | | |
| Pitkin | Crystal River from Marble to Redstone | III – IV |
| | Crystal River from Redstone to Penny Hot Springs | V+ |
| | Crystal River from Penny Hot Springs to Avalanche Creek | IV – V |
| | Crystal River from Avalanche Creek to B.R.B. Campground | III |
| | Fryingpan River, upper | IV – V |
| | Fryingpan River from Taylor Creek to Basalt | IV |
| | Roaring Fork River from Black Bridge to Veltus Park | II+ (III) |
| | Roaring Fork River from Upper Woody Creek Bridge to Lower Wood Creek | III |

| TABLE 5. RIVER REACHES LISTED FOR RAFTING USE BY AMERICAN WHITEWATER | | |
|---|---|---|
| COUNTY | REACH OF RIVER OR CREEK | CLASS |
| | Roaring Fork River from Lower Woody Creek Bridge to Route 82 Bridge | III |
| | Roaring Fork River from Aspen to Upper Woody Creek Bridge | IV – V |
| | Roaring Fork River from Aspen Music School to Slaughterhouse Bridge | IV+ |
| | Roaring Fork River from Norrie Colony to Ruedi Reservoir Inlet | IV+ |
| | Seven Castles to Basalt 7-11 | III+ |
| | | |
| Routt | Elk River at Mad Creek | II – IV |
| | Elk River from Box Canyon to Glen Eden Bridge | I – II |
| | Yampa River from Yampa River Park to 12th Street (Steamboat) | III |
| | | |
| Summit | Blue River from Blue River campground to FR 2400 | III – IV |
| | Blue River from Green Mountain Reservoir to Spring Creek Road | III |
| | Tenmile Creek from Near Copper Mountain Ski Area to Dillon Reservoir | III – IV |
| Source: American Whitewater web site and CDM, *Statewide Water Supply Initiative*, November 2004, Chapter 6. | | |

| TABLE 6. TRANSMOUNTAIN DIVERSION PROJECTS IN HEADWATERS COUNTIES | | | | | |
|---|---|---|---|---|---|
| NAME | SOURCE RIVER | YEAR BUILT | OWNER | MANAGER | AVG. ACRE FEET DIVERTED ¤ |
| ***Colorado River Basin into the South Platte River Basin*** | | | | | |
| ***Originating in Grand County*** | | | | | |
| Grand River Ditch | Colorado | 1890 | Water Supply & Storage Co. | | ~ 18,700 |
| Alva B. Adams Tunnel ▪ | Colorado | 1937 | US Bureau. of Reclamation | Northern CO Water Conservancy District | ~ 234,100 |
| Moffat Water Tunnel ◆ *Use Vasquez & Gumlick Tunnels* | Fraser River, Ranch Ck + | 1936 | Denver Water | | ~ 53,800 |
| Berthoud Pass Ditch | Fraser River | 1913 | Cities of Golden & Northglenn | | ~ 900 |
| ***Originating in Summit County*** | | | | | |
| Vidler Tunnel | Peru Creek, Blue River | 1968 | City of Golden | | ~ 600 |
| Harold D. Roberts Tunnel | Dillon Res. | 1962 | Denver Water | | ~ 62,400 |
| Boreas Pass Ditch | Indiana Creek, Blue | 1909 | City of Englewood | | ~ 200 |
| Hoosier Pass Tunnel *Includes Hoosier Ditches* | Blue | 1951 | City of Colorado Springs | | ~ 9,900 |
| ***Colorado River Basin into the Arkansas River Basin*** | | | | | |
| ***Originating in Eagle County*** | | | | | |
| Columbine Ditch | East Fork of Eagle | 1931 | City of Aurora, purchased from City of Pueblo | | ~ 1,500 |
| Ewing Ditch | Piney Creek | 1880 | City of Pueblo | | ~ 1,000 |
| Wurtz Ditch | South Fork of Eagle | 1929 | City of Pueblo | | ~ 2,500 |
| ***Originating in Eagle & Pitkin County*** | | | | | |
| Homestake Reservoir and Tunnel | Homestake Creek, Eagle River | 1963 - 1967 | Cities of Aurora & Colorado Springs | | ~ 27,000 |
| ***Originating in Pitkin County*** | | | | | |
| Charles Boustead Tunnel ▫ | Fryingpan | 1975 | US Bureau of Reclamation | SE CO Water Conservancy District | ~ 53,200 |
| Busk-Ivanhoe Tunnel ▫ | Ivanhoe & Busk Creeks; Fryingpan | 1982 | High Line Canal Company | High Line Canal Co. for cities of Aurora and Pueblo | ~ 4,600 |
| Twin Lakes Tunnel ▫ (Independence Pass System) | Roaring Fork Headwaters | 1935 | Twin Lakes Reservoir & Canal Company | Aurora, Colorado Springs, Pueblo, Pueblo West | ~ 41,100 |
| ***Gunnison River Basin into the Arkansas River Basin*** | | | | | |
| ***Originating from Gunnison County*** | | | | | |
| Larkspur Ditch | Hurry Creek, Gunnison | | Catlin Canal Company; Arkansas Valley Water Conservancy is purchasing shares | | ~ 200 |

¤ Average annual acre feet per year since 1985. Source: Colorado Division of Water Resources, CDSS
▪ Part of the Colorado – Big Thompson Project (CBT Project)
◆ Part of Denver Water Moffat Collection System.
▫ Part of the Fryingpan – Arkansas Project (Fry-Ark Project)

- **Crested Butte Mountain Resort Snowmaking**. Each year, the Mountain Resort uses about 85 million gallons of water (260 acre feet) to produce manmade snow for 200 acres of terrain which is one-third of its groomable terrain (600 acres) and 16% of its total terrain (1,276 acres). This assures the Resort of snow during its early season. Since 1981, the Mountain Resort has used its own conditional water rights decree to divert water from the East River for snowmaking each year as long as it meets a minimum flow requirement which is measured downstream at Almont. There have been years where the Resort could not divert as much water as it needed due to the downstream minimum flow constraint. In these circumstances, the Resort had to manage with less. The remedy to this situation is to install a reservoir which would accumulate water during the summer months. This is a very expensive undertaking. Its USFS Special Use Permit states that if the Resort wants to provide snowmaking on more than the approximately 200 acres currently covered, it will need to construct a reservoir that would hold 3 million gallons.

- **Winter Park Ski Area.** For most of its snowmaking needs, Winter Part Resort currently diverts water from the Denver Water Moffat Collection System's Vasquez Canal in exchange for Clinton Reservoir water. In the past, there have been some operational delivery and water shortage issues with this system. Infrastructure in the form of a storage pond and a pipeline to access water from Denver's east side portion of the Moffat Collection system is needed to eliminate the operational and physical supply shortages. As part of the Colorado River Cooperative Agreement, Denver Water is providing funds for infrastructure projects. A portion of those funds will help pay for the capital costs of the storage pond and pipeline infrastructure. The Winter Park Water and Sanitation District also provides a small amount of water for snowmaking at the Mary Jane portion of the Resort. This arrangement will continue until Winter Park Resort is able utilize the new infrastructure items as a replacement.

- **Aspen Ski Area**. For Snowmass, the Aspen Ski Company draws water from Snowmass Creek. For Aspen Mountain, it uses municipal water from the City of Aspen which draws water from Castle Creek. For Buttermilk, the company draws water from Maroon Creek. There may be some minimum streamflow issues related to Castle and Maroon Creek if the city pursues some alternatives associated with the hydropower project it is considering. The Company does not use the Fryingpan or Roaring Fork Rivers.

- **Vail Mountain.** In a normal year, Vail will use about 160 million gallons (490 acre feet) of water to produce manmade snow on about 460 acres of terrain. Water for snowmaking is supplied or augmented by the Green Mountain, Eagle Park, and Homestake reservoirs and by Black Lakes. Water for snowmaking is withdrawn from the diversion points on Gore Creek adjacent to the treatment plant owned by the Eagle River Water and Sanitation District and the Dowd Junction infiltration gallery located at the confluence of Gore Creek and the Eagle River. When streamflow is adequate, withdrawals are augmented from Green Mountain Reservoir; when the streamflows are inadequate, withdrawals are augmented from Eagle Park or Homestake reservoirs through the Dowd Junction diversion or from Black Lakes or the senior right of the return flows from the Eagle River Water and Sanitation District Plant on Gore Creek. The Resort has enough water in storage to provide for snowmaking for three consecutive severe drought years

- **Beaver Creek.** In a normal year, Beaver Creek could use up to 244 million gallons (750 acre feet) of water to produce manmade snow on about 650 acres of terrain. Water for snowmaking is supplied or augmented by the Green Mountain, Eagle Park, and Homestake reservoirs and by Black Lakes. Water for snowmaking is withdrawn from the diversion point on the Eagle River just below its confluence with Beaver Creek and pumped directly to the snowmaking system or to the 130 acre foot Trappers Reservoir above Bachelor Gulch. When streamflow is adequate, withdrawals are augmented from Green Mountain Reservoir, when the Eagle River is at or below minimum streamflow the withdrawals are augmented from Eagle Park or Homestake reservoirs or from Black Lakes. The Resort has enough water in storage to provide for snowmaking for three consecutive severe drought years

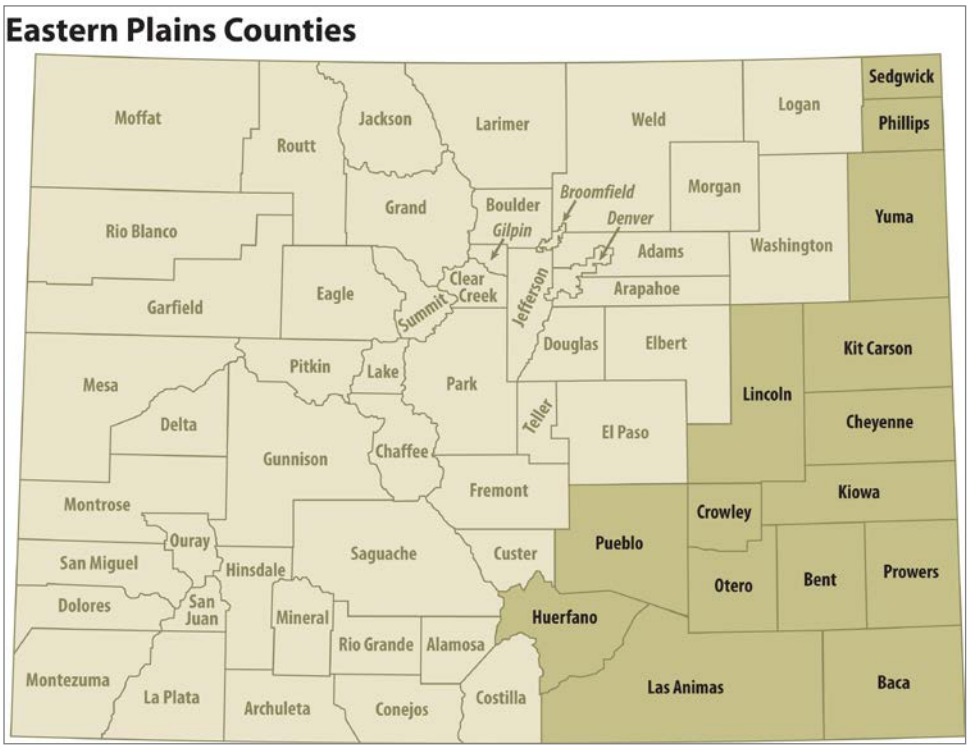
- **Breckenridge Resort**. In a normal year, Breckenridge uses up to 200 million gallons (615 acre feet) of water to produce manmade snow on about 550 acres of terrain. Water for snowmaking is supplied or augmented by the Green Mountain, Clinton and the Upper Blue River reservoirs and by the Goose Pasture Tarn. Water for snowmaking is withdrawn from the diversion point at Maggie's Pond off of the Blue River in Breckenridge. When streamflow is adequate, withdrawals are augmented from Green Mountain or the Clinton Reservoir. When the Blue River is at or below minimum streamflow, withdrawals are augmented from the Goose Pasture Tarn or the Upper Blue River Reservoir. Currently, in three consecutive severe drought years Breckenridge has a minimum of 500 acre-feet of snowmaking water.

- **Keystone**. On a normal year, Keystone will use 195 million gallon (600 acre feet) of water to produce manmade snow on approximately 600 acres of terrain. Water for snowmaking is supplied or augmented by the Clinton Reservoir. Water for snowmaking is withdrawn from a diversion point on the Snake River in Keystone. When streamflow is adequate on the Snake River, withdrawals are augmented from the Clinton Reservoir. When the Snake River is at or below minimum streamflow levels, the physical supply of snowmaking water is obtained by pumping water from the Montezuma Vent of the Roberts Tunnel which is transporting water from Dillon Reservoir and the Clinton Reservoir. Keystone has the perpetual agreement with Denver to pump this water from the Montezuma Vent. Keystone has enough water in storage in Clinton Reservoir to provide for snowmaking for three consecutive severe drought years through the Roberts Tunnel via the Montezuma Vent.

- **Steamboat Ski Resort.** The Steamboat Ski Resort draws water directly from the Yampa River for its snowmaking operation. In a typical year, 284 acre-feet of water are used for manmade snow on about 295 acres of terrain. The Resort has an augmentation plan to use water from the Upper Yampa Water Conservancy District but has never needed to activate the plan. Due to its newer and more efficient snowmaking equipment, consumptive use averages only 20%. Since Steamboat is 35 miles from the headwaters of the Yampa River, the streamflow volume is substantially more than streamflow at most other ski resorts.

## Front Range Counties


## Eastern Plains Counties



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[2] Based on 2010 Bureau of Census data and Colorado State Engineer's records. John N. Winchester, Hydrosphere Resource Consultants, Inc. "A Historical View: Transmountain Diversion Development in Colorado", page 1.

[3] Trout Unlimited article and video, accessed via web at www.befuddledanglersalmanac.com/index.php/atricles/tu-film-front-range-water and "Colorado River - It Shouldn't be about Power and Money," Summit County Voice, May 7, 2011.

[4] Elk Mountain Consulting, LLC, G. Moss Driscoll, Esq., *Front Range Water Supply Planning Update*, January 7, 2011, page 1.

[5] Roaring Fork Conservancy, *State of the Roaring Fork Watershed – Executive Summary 2008*, page 14

[6] *Ibid.,* page 14.

[7] *Ibid.*, page 24.

[8] Interbasin Compact Committee, Report to the Governor, December 2010, page 8. (IBCC Report)

[9] IBCC Report, page 1.

[10] IBCC Report, page 3.

[11] IBCC Report, page 4.

[12] Chris Woodka, "Water roundtable irked at snub of proposals," Pueblo Chieftain (August 13, 2009). "Lower Ark to look at 'tipping point' in water sales," Pueblo Chieftain (November 20, 2009) "Rep. Salazar stands firm on Aurora deal," Pueblo Chieftain (August 29, 2009). "Senators want Ark. Valley protection in deal," Pueblo Chieftain (August 29, 2009). "Enough" Editorial, Pueblo Chieftain (May 27, 2009).

[13] Arkansas Basin Roundtable Water Transfer Guidelines Committee, *Considerations for Agriculture to Urban Water Transfers.* September 10, 2008

[14] Letter responses from: Eagle County Commissioners, John Stavney, Chair to John Stulp, February 24, 2011; Gunnison County Commissioners, Hap Channel, Chair, to John Stulp, February 23, 2011; Pitkin County Commissioners to John Stulp, February 24, 2011; Grand County Commissioners to John Stulp, February 8, 2011; Town of Gypsum, Ramsey Kroph (attorney) to John Stulp, February 23, 2011.

[15] Colorado Office of Economic Development and International Trade, *Colorado Blueprint*. Accessed via the web, www.colorado.gov/cs/Satelite/OEDIT.

[16] Center for Business and Economic Forecasting, Inc., *Tourism Jobs in Colorado*, March 15, 2001. (CBEF)

[17] CBEF definition of tourism includes in-state, out-of-state US and international visitors and includes jobs associated with second homes, and proprietors. (CBEF, page 4) The Longwoods International report,

*Colorado Travel* and the Dean Runyan & Associates report, *Travel Spending Trends within Colorado*, include only overnight travelers from other US locations who visit for 30 days or less and exclude employment impacts from second homes and proprietors. (CBED, page 27)

[18] Basic sector industries "drive" the local economy since they generate outside income that, in turn, provides jobs and income to residents.

[19] This information has been estimated for each county using tax assessor data bases as of August 2011. The homes included in these calculations are all homes individually owned, including mobile homes and homes on agricultural property. The calculations exclude fractional (time share) ownership, homes that are still in the original developer's inventory, bank-owned homes and apartment units.

[20] Linda Venturoni, Northwest Colorado Council of Governments, *The Social and Economic Effects of Second Homes – Executive Summary*, page 4, June 2004. (Venturoni, 2004)

[21] Venturoni, 2004, Job *Generation in the Colorado Mountain Resort Economy*, Lloyd Levy Consulting, June 2004, pages 6, 8, 10, 12, and 14.

[22] Longwoods International, "Colorado Travel Year 2010", pages 19, 25, 44 and 45.

[23] Dean Runyon & Associates, *The Economic Impact of Travel on Colorado – 1996 – 2009(p).* Prepared for the Colorado Tourism Office. June 2010. Runyon defines travel as "All trips to Colorado by US residents and foreign visitors plus travel by Colorado residents to other destinations in Colorado, provided that it is neither commuting nor other routine travel." (page 50) Travel to non-Colorado designations by Colorado residents is excluded.

[24] Economic impacts include direct impacts that occur at the airport, indirect impacts associated with visitor spending and induced impacts associated with spin-offs from direct and indirect impacts.

[25] Wilbur Smith Associates, Inc., KRAMER aerotec, Inc., The Metropolitan College of Denver, *The Economic Impact of Airports in Colorado 2008,* prepared for the Colorado Department of Transportation – Division of Aeronautics, May 2008.

[26] Conversation with Mayor Clark, December 2006.

[27] BBC Research and Consulting, *The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado*, September 26, 2008, Section III, page 11.

[28] BBC Research and Consulting and Colorado Division of Wildlife, *The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado*, 2004 Study, updated on September 18, 2008, Section III, page 2. These estimates are for both hunting and fishing. Separate statistics for fishing only are unavailable.

[29] These include Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Elbert, El Paso, Jefferson, Larimer and Pueblo.

[30] Colorado Fishing Network web site, www.coloradofishing.net/goldmedal.htm.

[31] In 1968, the Wild and Scenic Rivers Act was passed to preserve selected rivers or river sections in their free-flowing condition to protect "the water quality of such rivers and to fulfill other vital national conservation purposes." Only Congress can make Wild and Scenic River designations. The Bureau of Land Management conducts eligibility and suitability studies

[32] Bureau of Reclamation, *Draft Resource Management Plan and Draft Environmental Impact Statement for the Colorado River Valley Field Office, Colorado,* September 2011, pages ES-19 and ES-20.

[33] U.S. Department of the Interior, Bureau of Land Management, *Draft Resource Management Plan, Draft Environmental Impact Statement*, Kremmling Field Office, September 2011. (BLM, Kremmling Office 2011)

[34] *Ibid.,* page 2-23.

[35] Twenty Colorado organizations, *Upper Colorado River Wild and Scenic Stakeholder Group Management Plan*, submitted to the US Bureau of Land Management, US Forest Service, February 2011.

[36] Telephone conversation with Mark Joffee, owner of Rapidpulse and white water rafting championship event producer, 11/29/06.

[37] Colorado River Outfitters Association, *Commercial River Use in the State of Colorado, 1988 – 2010.*

[38] This includes expenditures spent in the local area by one rafting customer per day. It includes rafting, food, lodging and souvenirs. The calculations are based on a report prepared by Joseph W. Roggenbuck, et. al., for the Bureau of Land Management, "The Use and User Characteristics, Management Preferences and Satisfaction of Boaters and Anglers on the Arkansas Headwaters Recreation Area (Colorado)."

[39] The multiplier to convert direct impacts to total impacts spent in the local area before being spent outside that area (2.56) was provided to the Colorado River Outfitters Association by the Colorado Tourism Board.

[40] A recreational in-channel diversion (RICD) is a type of water right that may be acquired to assure "the minimum streamflow as it is diverted, captured, controlled and placed to beneficial use …for a reasonable recreation experience." To authorize RICDs, the State legislature amended the definition of "Beneficial Use." (Senate Bills 01-216 and 06-037)

[41] This information was collected by the author with the technical assistance of staff within the Assessor's office of each headwaters county. Comparable data for other counties has not been collected.

[42] "Land in Farms" is the term used by the US Department of Agriculture in the Census of Agriculture reports. "Land in Farms" consists primarily of agricultural land used for crops, pasture or grazing. "Land in Farms" is also an operating unit concept and includes land owned and operated as well as land rented from others. All grazing land, except land used under government permits on a per-head basis, is included as "land in farms" provided it was part of a farm or ranch.

[43] Unless otherwise noted, for purposes of this report, the Eastern Plains counties include Baca, Bent, Cheyenne, Crowley, Huerfano, Kiowa, Kit Carson, Las Animas, Lincoln, Otero, Phillips, Prowers, Pueblo, Sedgewick and Yuma.

[44] Colorado State University Cooperative Extension, Adams Orens and Andrew Seidl, "Winter Tourism and Land Development in Gunnison, Colorado," August 2004.

[45] Colorado Department of Agriculture, Agritourism web site home page.

[46] Dawn Thimany, Marthy Sullins, and Alex Ansteth, *The 2006 Economic Contribution of Agritourism to Colorado: Estimates from a Survey of Colorado Tourists*, Economic Development Report #24, Department of Agricultural and Resource Economics, Colorado State University, November 2007.

[47] Dr. Alan D. Bright, Warner College of Natural Resources, Colorado State University, *Public Attitudes about Agriculture in Colorado – 2006*, June 2006, pages 32 and 39.

[48] Summit Economics and The Adams Group, *Water and the Colorado Economy,* Commissioned by the Front Range Water Council, December 2009.

[49] Wage and salary employment includes jobs where people work for an employer who pays unemployment compensation; it excludes self-employed proprietors. Colorado Department of Labor and Employment, Colorado QCEW Wage and Employment Tables, Average Annual 2010, Average Annual 2000.

[50] When a "call" is placed on a river by a water rights owner, it means that the owner is requesting the Colorado Division of Water Resources to shut down all upstream junior water rights until their senior water right is satisfied.

[51] Western Resource Advocates, *Water on the Rocks – Oil Shale Water Rights in Colorado*, 2009, page v. Also, Colorado River District News Release, June 5, 2009.

[52] Colorado Department of Labor and Employment, Wage and Salary Employment, Average Annual – 2010.

[53] URS, *Detailed Scope of Work - Water Needs Assessment for Yampa/White and Colorado River Basins*. Prepared for the Colorado River and Yampa/White Roundtables. September 3, 2007, page 1.

[54] Donna Gray, "Need Assessment Proposed for Northwest Colorado", Post Independent, Glenwood Springs, January 17, 2007.

[55] Keith R. Long, Bradley S. Van Gosen, Nora K. Foley, and Daniel Cordier *, Scientific Investigations Report, 2010-5220) The Principal Rare Earth Elements Deposits of the United States—A Summary of Domestic Deposits and a Global Perspective)*

[56] The companies considering rare earth exploration and extraction are Colorado Rare Earth, Teck Cominco and Seaglass Holding Company. Gunnison Country Times, March 17, 2011.

[57] Peter Fleming, General Counsel, Colorado River Water Conservation District, "Colorado River Management – A West Slope Perspective," March 14, 2008.

[58] Eric Kuhn, CEO, Colorado River Water Conservation District, "The Colorado River: The Story of a Quest for Certainty on a Diminishing River," May 8, 2007, page 100 +.

[59] CDM, *Colorado Basin Needs Assessment Report*, part of the 2010 Statewide Water Supply Initiative Report series, undated, pages 4-13, 5-11, and 5-17.

[60] CDM, *Gunnison Basin Needs Assessment Report*, part of the 2010 Statewide Water Supply Initiative Report series, March 2011, pages 4-11, 5-10 and 5-13.

[61] CDM, *Yampa White Needs Assessment Report*, part of the 2010 Statewide Water Supply Initiative Report series, undated, pages 2-13 and 3-12.

[62] These categories of users are from a source document, prepared for the USGS. Using words more typical in water resources, "domestic" is generally comparable to "municipal" and "commercial" is generally comparable to "industrial."

[63] Figures for domestic, commercial, irrigation and livestock are from: *Estimated Use of Water in the United States in 1995*, Wayne B. Solley, Robert R. Pierce, Howard A. Perlman, prepared for the USGS, Circular 1200. (domestic, page 27; commercial, page 31; irrigation, page 35; livestock, page 39; mining, page 47)

Figures for snowmaking are an average from "Estimated Consumptive Loss from Man-Made Snow," Kimberly D. Mills (Wright Water Engineers), Leo M. Eisel (Wright Water Engineers) and Charles F. Leaf (consulting hydrologist) plus information collected from individual ski areas in the headwater counties.

[64] According to the US Census of Agriculture, irrigated acreage in the six headwater counties has decreased from 206,834 acres in 1929 to 158,994 acres in 2007. See Report Section 3.5.1.

[65] Colorado Trout Unlimited web site.

[66] Ken Neubecker, Colorado Trout Unlimited web site.

[67] Brad Udall, April 9, 2010. "Projected Climate Change Impacts on our Water Resources," University of Denver School of Law, Water Law Symposium proceedings.

[68] AECOM, *et.al., Colorado River Water Availability Study – Phase 1 Draft Report,* prepared for the Colorado Water Conservation Board, March 22, 2010, page 5-42.

[69] See "Climate Change Through the Eye of Water Managers," Betsy Woodhouse, Southwest Hydrology Magazine, January /February 2007, page 22.

[70] International Food Policy Research Institute*, Climate Change: Impact on Agriculture and Costs of Adaptation*, November 6, 2009. Accessed via web site: www.ifpri.org/publication/climate-change-impact-agriculture-and-costs-adaptation.

[71] Trout Unlimited article and video, accessed via web at www.befuddledanglersalmanac.com/index.php/atricles/tu-film-front-range-water and "Colorado River - It Shouldn't be about Power and Money," Summit County Voice, May 7, 2011.

[72] G. Moss Driscoll, Esq., Elk Mountain Consulting, LLC, *Front Range Water Supply Planning Update*, January 7, 2011, page 1.

[73] Based on a streamflow gage managed by the USGS on the Fraser River in Winter Park, during the 25 years prior to the first diversion of water through the Moffat Tunnel (1911 through 1935), the average annual flow of water was 44.3 cubic-feet-per second (cfs). During the last 75 years since the Moffat Tunnel diversion (1936 through 2011), the annual flow of water has averaged 18.3 cfs. This more recent flow activity represents a 59% reduction in the average annual water flow relative to the years before the Moffat Tunnel diversion.

[74] State of the Roaring Fork Watershed – Executive Summary, 2008, page 26.

[75] State of the Roaring Fork Watershed – Executive Summary, 2008, page 14.

[76] Brian Bledsoe, *et. al.,* Colorado State University Engineering Research Center, *Eagle River Inventory and Assessment*, Fort Collins. August 2005, page 85.

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[77] *Blue River Water Quality Management Plan*, 2002, page B-5.

[78] The four trans-basin water diversion projects in Eagle County (Homestake, Wurtz, Ewing and Columbine) divert water from the Eagle River. Unlike projects in Grand and Pitkin, these projects have relatively junior decreed water rights. They divert water during the snowmelt runoff period and not during low flows because of water right constraints and instream flow bypass requirements. Eagle River Assembly, *Overview of Eagle River Basin Water Issues*, September 1994, pages 9 and 10.

[79] In 1937, Senate Document 80 required construction of Green Mountain Reservoir as compensatory storage for the Colorado Big-Thompson Project. In 1962, Congress authorized construction of the Fryingpan-Arkansas Project after it was agreed to construct Ruedi Reservoir in Pitkin County as a compensatory storage project; in 1970, The Municipal Subdistrict of the Northern Colorado Water Conservancy District was authorized to construct the Windy Gap Project, an expansion to the Colorado-Big Thompson Project, after providing financial support for the construction of Wolford Mountain Reservoir.
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[80] Mitigation provided by the Municipal Subdistrict of the NCWCD included the following: $10.2 million for the Wolford Mountain Reservoir; 3,000 acre feet of water for the Middle Park Water Conservation District (MPWCD); delivery of MPWCD Windy Gap water to Lake Granby; 11,000 acre feet of the 56,000 acre feet yield for bypass flows; $550,000 for rancher diversion improvements; $420,000 to Hot Sulphur Springs for water and wastewater facilities; $25,000 to Grand County for salinity studies; construction of the Windy Gap Watchable Wildlife Area, and; free use of rock and gravel from the Municipal Subdistrict's quarry pits.

[81] Colorado River Cooperative Agreement, April 28, 2011. This document has been approved in concept by the 34 participating parties but has not been executed.

[82] Northern Colorado Water Conservancy District web site. "Windy Gap Firming Project." http://www.ncwcd.org/project_features/wgp_firming.asp

[83] Denver Water website. "Moffat Collection System Project." Accessed via http://denverwater.org/SupplyPlanning/Planning/Planning/FutureWaterSupply/WaterSupplyProjects/Moffat/

[84] CDM, *Strategies for Colorado's Water Supply Future – Draft Report*, June 2009, Section 4.1.1.2, pages 4-13 and 4-20, 2009.

Also, Roaring Fork Conservancy, *State of the Roaring Fork Watershed Report*, Chapter 2, page 28, November 2008.

[85] Roaring Fork Conservancy, *State of the Roaring Fork Watershed Report*, Chapter 2, page 29, November 2008.

[86] CDM, *Strategies for Colorado's Water Supply Future – Draft Report, June 2009,"* Section 4.1.1.2, pages 4-15 and 4-16.

[87] *Ibid.,* Section 4.1.1.2, pages 4-14 and 4-19. Also, "Flaming Gorge pipeline: Colorado-Wyoming Coalition makes it official becoming the Colorado-Wyoming Cooperative Water Supply Project," March 26, 2010 and Chris Woodka, "Flaming Gorge Task Force OK'd", Pueblo Chieftain, September 17, 2011.

[88] CDM in association with Meurer, *Regional Water Master Plan*, prepared for the South Metro Water Supply Authority. June 2007, page 5-19.

[89] G. Moss Driscoll, Elk Mountain Consulting, "Front Range Water Supply Planning Update," prepared for the Ruedi Water and Power Authority, January 7, 2011, pages 1, 6 and 7.

[90] *Ibid.,* pages 1 and 19.

[91] *Ibid.,* pages 1, 16, and 17.

[92] Dr. John Loomis, Colorado State University. *Estimating the Economic Benefits of Maintaining Peak Instream Flows in the Poudre River through Fort Collins, Colorado*. April 2008.

[93] Coley/Forrest, Inc., Significance of Flushing Flows, November 2007.

[94] Fishing Experts and Fishing-Related Business Representatives. Conversation with owners of Mo Henry's Trout Shop, other experienced and knowledgeable anglers in Grand County and experts knowledgeable about fishing in Grand County. December 2008.

[95] Hydrosphere Resource Consultants, Inc., *Upper Colorado River Basin Study – Phase II Final Report*, May 29, 2003, pages vi-vii, and 31-32. (UPCO Report)

[96] Kristine Crandall, Roaring Fork Conservancy, *Fryingpan Valley Economic Study*, June 21, 2002.

[97] American Whitewater web site. Accessed at http://www.americanwhitewater.org.

[98] UPCO Report, pages vii, 32 and 40.

[99] UPCO Report, page 42.

[100] *Draft Windy Gap Firming Project – Draft Environmental Impact Statement* (DES 08-30), Figure 3-77, page 3-249.

[101] UPCO Report, page vii, viii.

[102] Letter: Liza Hunholz, Area Wildlife Manager, Colorado Department of Natural Resources, Division of Wildlife to Steve Koster, June 29, 2009.

[103] Roy E. Smith and Linda M. Hill, editors, *Arkansas River Water Needs Assessment*. Prepared for the Bureau of Land Management, Bureau of Reclamation, USDA Forest Service, and Colorado Department of Natural Resources, 2000.

[104] UPCO Report, page 32, Table 3.8 and *Windy Gap Firming Project – Draft Environmental Impact Statement* (DES 08-30).

[105] UPCO Report, page vii.

[106] Senate Document 80, Colorado – Big Thompson Project, June 15, 1937.

[107] Memorandum: Steve Gunderson, Colorado Department of Public Health and Environment to Water Quality Control Commission, October 31, 2006.

[108] Testimony: Mike Ryan, Great Plains Regional Director of the Bureau of Reclamation Before the Natural Resources Committee – Water and Power Subcommittee of the US House of Representatives, May 17, 2010. Accessed via the Bureau of Reclamation web site.

[109] Colorado Department of Labor and Employment, Colorado Employment and Wages (QCEW), Annual Average 2010.

[110] Bureau of Reclamation, Colorado-Big Thompson Project and Fryingpan-Arkansas Project, accessed from the Bureau of Reclamation web site, www.usbr.gov/projects.

[111] Bureau of Reclamation, "The Bureau of Reclamation - A Very Brief history." Accessed from the Bureau of Reclamation web site, www.usbr.gov/history.

[112] Congressional Budget Office, *Water Use Conflicts in the West: Implications of Reforming the Bureau of Reclamation's Water Supply Policies*, August 1997.

[113] Bureau of Reclamation, "The Bureau of Reclamation - A Very Brief history." Accessed from the Bureau of Reclamation web site, www.usbr.gov/history; also, Bureau of Reclamation web site home page.

[114] Telephone conversations with individual ranchers with property along the Fraser River and its tributaries, 2007; conversation with Bill Thompson, Grand County rancher and water commissioner, December,2006. Also, Tetra Tech, Walsh Aquatic Consultants, Inc., Habitech, Inc. *Draft Report – Grand County Stream Management Plan – Phase 2*. April 2008, pages CR4-2, CR5-2.

[115] George Stark, Grand County ranch owner, "Colorado River Diversions Where West Meets East, NWCCOG, Water Quality / Water Quantity Committee, 2003.

[116] Interview with Eric McPhail, CSU Extension Agent, Gunnison, Colorado, 7/21/11.

[117] AMEC, *Energy Development Water Needs Assessment Phase II Final Report*, prepared for the Colorado River Basin Roundtable and the Yampa / White River Basin Roundtable, January 2012, page iv.

[118] Aspen Times, "Wilderness vs. Energy: Battle Brews over Pipeline," Joel Stonington, 10/24/07; "Project Thompson Divide from Drilling," 7/8/11; "Thompson Drilling Decision 'Months Away'", John Colson, 10/3/11.

[119] US Department of Energy Office of Petroleum Reserves, Fact Sheet: *Oil Shale Water Resources*, page 1.

[120] Gary Harmon, "Oil Shale 800-pound gorilla with predictions of water use," Grand Junction Sentinel, September 19, 2008. Referenced in Roaring Fork Watershed Plan, Phase II Guidance Document, October 15, 2008.

[121] AMEC*, Energy Development Water Needs Assessment – Phase II – Final Report*. Prepared for the Colorado River Basin Roundtable and the Yampa/White River Roundtable, January 2012, pages iv, and v.

[122] *State of the Roaring Fork Watershed*, Section 2.2.4, page 30.

[123] Colorado Division of Reclamation Mining and Safety, web site home page, www.mining.co.us/ Abandoned Mines

[124] Colorado Division of Reclamation Mining and Safety, web site home page, www.mining.co.us/ AbandonedMines/inactivemine

[125] Colorado River Basin and Gunnison Basin, Fact Sheets, prepared by the Colorado Water Conservation Board and accessed at cwcb.state.co.us/public-information/publications/Pages/FactSheets.aspx.

[127] Interviews with local water and sanitation district operators and review of reports, 2006, 2007, 2011. (Districts include the Combined Grand County Wastewater Treatment Plant, Devil's Thumb Ranch,

Tabernash Meadows Water and Sanitation District, Town of Red Cliff, Silverthorne Water and Sanitation District.

[128] Zach Margolis, Town of Silverthorne, telephone interview, September 2011.

[129] The Aspinall Unit is a Bureau of Reclamation project on the Gunnison River consisting of the three dams and reservoirs: Blue Mesa, Crystal, and Morrow Point.

[130] G. Moss Driscoll, Esq., Elk Mountain Consulting, LLC, *Front Range Water Supply Planning Update*, prepared for the Ruedi Water and Power Authority, January 7, 2011, page 24.