Recreation in the Colorado River Basin: Is America's Playground Under Threat?

By Benjamen N. Taber

Key Findings:

-Recreation and Tourism accounted for 8.1% of 2010 private earnings in Basin States, compared to 5.2% nationally.

-"Soft-use" recreation is replacing "hard-use" extractive industries.

-Management needs for the environment and recreation are often the same.

-Ski areas will need to adapt to climate change through technological innovation and change in business practices.

The 2012 Colorado College State of the Rockies Report Card
The Colorado River Basin:
Agenda for Use, Restoration, and Sustainability for the Next Generation

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Will Stauffer-Norris

"The river is also a great economic engine because of all the tourism that revolves around the river, particularly in fishing. But much of the fishing is for non-native species like the rainbow trout, when in fact these introduced species are taking away from the native species and preying upon the native species."

-Jonathan Waterman, Author and Colorado River Explorer
speaking at the Colorado College, September 12th, 2011 as
part of the State of the Rockies Project Speakers Series

Introduction

The development of recreation in the Colorado River Basin has brought about a transition from the extraction-based economy of mining and forestry to the potentially more sustainable recreation-based economy. In 2008, recreation and tourism generated $23 billion in income and supported 1.2 million jobs in six basin states—not including California—and $37 billion in income and 1.7 million jobs in California alone.[1] However, the economic impact of tourism and recreation in California's portion of the Colorado River Basin is minimal.

The *2011 State of the Rockies Report Card* focused primarily upon the economic impacts of recreation in a section: "Nature Based Recreation in the Rockies: The New Value of the Region's Resources." While that report noted the importance of recreation to the Rocky Mountain West, and by extension the Colorado River Basin, the aim of this report is not to simply update the *2011 Report Card*, but rather to analyze the stresses on and evaluate the future of recreation in a specific and vulnerable part of the region: the Colorado River Basin.

For the purpose of this report on the basin, outdoor recreation activities are those in which participants have direct interactions with the environment and natural resources. For nature-based recreation, we follow the definition of the Outdoor Industry Foundation and include the following activities: backpacking, biking, camping, climbing, fishing, hiking, hunting, skiing (including nordic, alpine and telemark), trail running, and wildlife-viewing. In some sections motorized off-highway vehicle (OHV) and motorized boating use will be considered as well, but such considerations will be explicitly noted. When we look at the economic impact of various industries, however, the use of the broader "Tourism and Recreation" sector will be employed.

According to Dan Grossman, the Rocky Mountain Director of the Environmental Defense Fund, "Active outdoor recreation in the Colorado River Basin contributes more than $75 billion annually to the region's economy and supports more than 780,000 jobs."[2] Since much of this recreation is dependent upon the environmental health of the region, Grossman and others argue that this is a major reason for needing to protect the health of the Colorado River system—and the "economies it supports."

Recreation is generally a non-consumptive use of the waters and lands of the Colorado River Basin. Fishing, boating, and skiing use water "in passing," allowing the water to be used by agricultural, municipal, industrial, and environmental uses and "in passing" support recreation. Because recreation is almost exclusively a non-consumptive use of water, however—with the notable exception of much of the ski industry—recreation has not historically owned water rights. Instead, water used for recreational purposes is subject to the whims of the holders of the "beneficial" water rights. As Emily Brophy of Living Rivers asked, "Is this a pipeline system for water, or is this a source of recreation income?"[3]

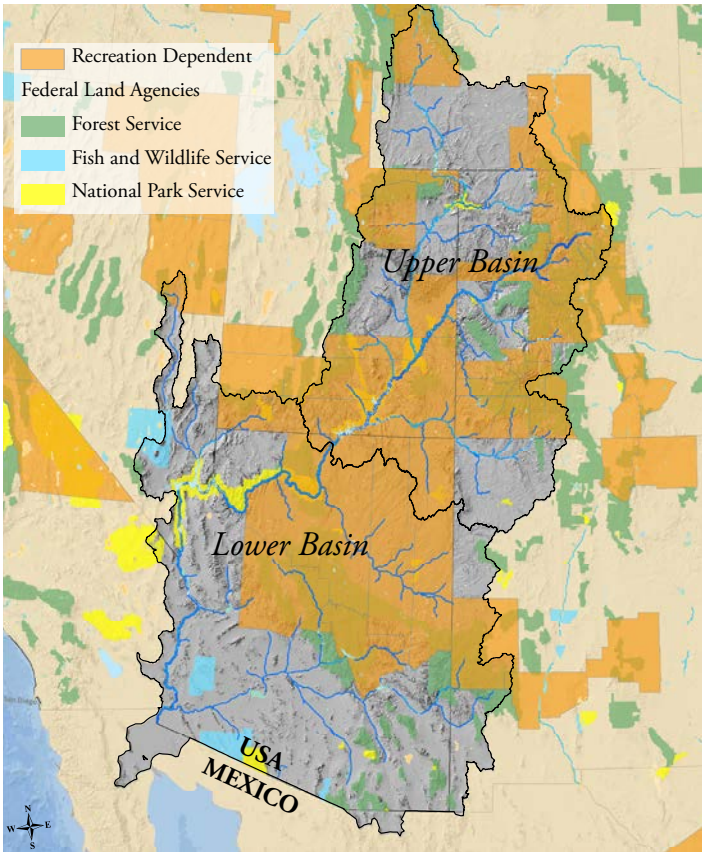
The Colorado River Basin is a massive playground of the United States and a world-renowned natural heritage—an area where millions flock annually to enjoy the myriad sources of nature-based entertainment. The tourism income generated provides major support to the local economies throughout the basin. But with increasing stresses on the water supply from climate change and confrontations between different water users, is America's and the world's playground under threat?

Economic Analysis of Recreation in the Basin

Prior to the recent economic downturn, tourism had been growing worldwide. Post 2008, however, international tourist arrivals world-wide dropped by 4.2% to 880 million in 2009, while international tourist arrivals to the United States decreased by 5.3% to 54.9 million.[4] International tourist arrivals in 2010, however, showed a marked recovery, increasing by 6.6% to set a new record of 940 million, and preliminary data for 2011 shows a further increase of around 4.5%.[5] The Colorado River Basin—home to majestic mountains, desert metropolises, iconic rivers, deep canyons, and sunshine—draws millions of these visitors annually. The economic impact of international, as well as domestic tourism, does and will continue to provide much to the economic benefits to the region: in 2010, recreation and tourism were responsible for 8.1% of private earnings in the basin states, compared to 5.2% nationally.

Many counties within the Colorado River Basin are dependent upon recreation. **Figure 1** highlights rural counties dependent upon recreation, as defined by the United States Department of Agriculture Economic Research Service (USDA ERS).[6] Note that the USDA ERS does not include metropolitan counties—such as Clark County, Nevada—as recreation-dependent. These rural counties have a higher percentage of seasonal housing and hotel/motel visits, and attract visitors, retirees, second-home owners, and new businesses than their non-recreation dependent counterparts.[7] There is some correlation between the presence of public lands and recreation dependence, as recreation centers like Moab, Utah, and Summit County, Colorado, are surrounded by federally-owned lands. Recreation dependent counties also have a

Figure 1: Colorado River Basin Recreation Dependent Counties with Federal Lands



Source: USDA Economic Research Service

natural amenity index of 5.3, higher than the Rockies average of 4.8,[8] demonstrating that environmental quality is an important feature for recreation and tourism.

Tourist and recreation-related spending is dispersed among many sectors of the economy, and no single definition of "tourism" exists. As such, for our economic analysis we define "recreation and tourism" as the sum of categories 71 and 72 in the North American Industry Classification System (NAICS)[9]: "arts, entertainment, and recreation" and "accommodation and food services," respectively. **Figures 2 and 3** employ this definition of tourism and recreation.

Figure 2 illustrates how the recreation and tourism industry compares to other selected industries. For the basin states of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, recreation and tourism at 8.1% represents a larger percentage of total private earnings than the national average. (California is excluded both due to its overwhelming size and economy, as well as the fact that only a small portion of California lies within the Colorado River Basin.) **Figure 4** shows that Nevada is notably reliant upon recreation and tourism, with 22.1% of total private earnings coming from said industry versus 5.2% for the U.S.—a figure boosted by the impact of gambling in Clark and Washoe counties. Some 44% of Nevada's total revenue in the arts, entertainment, and recreation industry is derived from gambling.[10] Of the basin states, only Utah has private earnings below the national average in recreation and tourism. What stands out is the robust size of recreation and tourism, verging on ten times the size of extractive industries and contrary to long-standing expectations, even myths, that mining, forestry, and related activities are a major sector in the economies of the American West.

Manufacturing at 8.6% of private earnings is less in the basin states than the national average of 13.3%, but extractive industry earnings at 2.9% —including mining, forestry, fishing, and related activities—is higher than the national average. Wyoming is the notable standout here. With large coal, oil, and gas reserves and a small population, 19.4% of private earnings in 2010 came from extractive industries. While construction in the basin at 8.0% remains higher than the national average of 6.6%, there has been a drop in the

Figure 2: Percent of Total Private Earnings in Selected Industries, 2010

Percent of Total Private Earnings in Selected Industries, 2010	Recreation and Tourism	Extractive Industries	Manufacturing	Construction	Information	Finance, Insurance and Real Estate	Professional, Scientific and Technical services
United States	5.2%	1.5%	12.3%	6.6%	4.1%	10.9%	12.2%
Basin States	8.1%	2.9%	8.6%	8.0%	4.1%	9.8%	11.7%
Arizona	6.2%	1.1%	10.4%	7.0%	2.3%	10.7%	10.0%
California	5.9%	1.1%	12.7%	6.0%	6.6%	9.6%	14.9%
Colorado	5.9%	2.9%	7.4%	7.4%	7.8%	10.5%	14.9%
Idaho	5.0%	2.1%	13.3%	8.8%	2.0%	7.1%	11.7%
Montana	7.0%	4.8%	5.9%	9.9%	2.3%	8.2%	8.4%
Nevada	22.1%	2.3%	4.5%	8.8%	1.7%	8.7%	8.6%
New Mexico	6.2%	5.6%	6.6%	8.8%	2.4%	6.8%	15.4%
Utah	4.6%	1.8%	13.3%	8.6%	3.4%	9.9%	10.4%
Wyoming	6.9%	19.4%	5.3%	13.2%	1.5%	6.8%	6.1%

Note: "Basin States" includes AZ, CO, NV, NM, UT, and WY (not CA) and "Extractive Industries" includes Mining, Forestry and related activities.

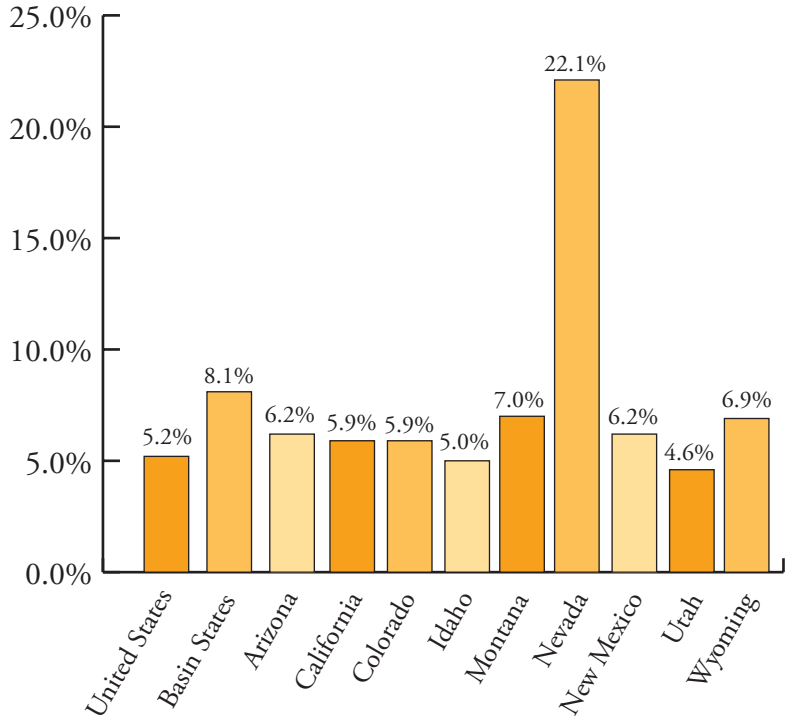
Source: Regional Economic Information System, Bureau of Economic Analysis, US Department of Commerce.

Figure 3: Percent of Total Employment in Selected Industries, 2010							
Percent of Total Private Earnings in Selected Industries, 2010	**Recreation and Tourism**	**Extractive Industries**	**Manufacturing**	**Construction**	**Information**	**Finance, Insurance and Real Estate**	**Professional, Scientific and Technical services**
United States	9.1%	1.2%	7.0%	5.1%	1.9%	9.8%	6.7%
Basin States	11.4%	1.7%	4.7%	5.6%	1.9%	11.7%	7.0%
Arizona	9.5%	1.0%	5.0%	5.1%	1.5%	12.3%	6.4%
California	9.7%	1.3%	6.8%	4.4%	2.6%	10.3%	8.6%
Colorado	10.2%	1.8%	4.5%	6.0%	2.6%	12.0%	8.7%
Idaho	8.2%	1.8%	6.7%	6.3%	1.5%	9.3%	3.8%
Montana	10.9%	2.8%	3.3%	6.7%	1.4%	8.9%	5.3%
Nevada	22.7%	1.2%	2.8%	5.1%	1.2%	12.5%	5.4%
New Mexico	9.9%	2.9%	3.4%	5.9%	1.6%	7.2%	7.4%
Utah	8.3%	1.1%	7.3%	5.7%	2.1%	12.9%	6.5%
Wyoming	10.1%	8.6%	2.8%	8.1%	1.2%	8.9%	4.3%

Note: "Basin States" includes AZ, CO, NV, NM, UT, and WY (not CA) and "Extractive Industries" includes Mining, Forestry and related activities.
Source: Regional Economic Information System, Bureau of Economic Analysis, US Department of Commerce.

percentage of private earnings in construction in every state since 2008.[11] The greatest of these reductions occurred in Nevada, which saw a reduction of six percentage points to below 9%. **Figure 2** shows that while there is variability within the basin states with regards to the Information, Finance, Insurance and Real Estate and Professional, Scientific and Technical Services Industries, the region is on par or slightly below the national average as a whole.

Figure 4: Percent of Total Private earnings from Recreation and Tourism, 2010

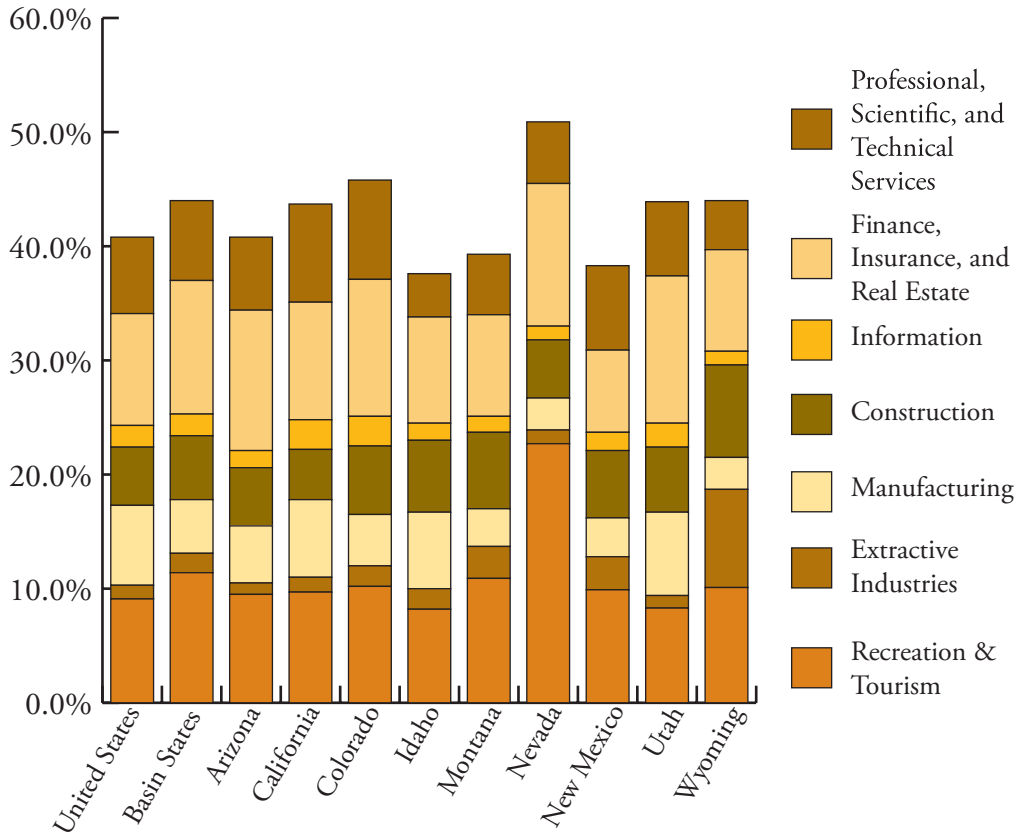


Note: "Basin States" includes AZ, CO, NV, NM, UT, and WY (not CA) and "Extractive Industries" includes Mining, Forestry and related activities.
Source: Regional Economic Information System, Bureau of Economic Analysis, US Department of Commerce.

The Painted Wall in Black Canyon of the Gunnison National Park

The 2010 employment figures in **Figure 3** echo those of the private earnings shares in **Figure 2**. **Figure 5** shows that in each of the basin states, as well as for the entire Colorado River Basin,—with the exception of Wyoming—employment in recreation and tourism is many times the size of employment in the extractive industries. While the percentage of private earnings in Finance, Insurance and Real Estate (including rentals and leasing) were over one percentage point higher nationally than in basin states, total employment in that sector is nearly two percentage points higher in basin states than the national average. This may be attributed to the transient nature of the tourism and recreation industry, the agricultural sector, and the preponderance of retirees and second-homes. This difference has likely been exacerbated by the economic downturn, as 2008 data shows a similar but smaller difference between the region and the national average.[12]

Figure 5: Percent of Total Employment for Selected Industries



Note: "Basin States" includes AZ, CO, NV, NM, UT, and WY (not CA) and "Extractive Industries" includes Mining, Forestry and related activities.
Source: Regional Economic Information System, Bureau of Economic Analysis, US Department of Commerce.

Another approach to demonstrating the vibrancy of recreation and tourism in the state economies of the Colorado River Basin region is shown in **Figure 6**, which quantifies both the jobs created by and output multipliers of different industries on Bureau of Land Management (BLM) lands. Jobs/$1 M denotes the number of jobs created per one million dollars spent for the specified industry's related activities on BLM land. For instance in Colorado, $1 million spent in recreation on BLM lands generates 15.98 million spent in recreation on BLM lands generates 15.98 jobs vs. the same $1 million spent in grazing generating 11.85 jobs, in timber 10.83 jobs, and in minerals 6.14 jobs. Recreation consistently creates the most jobs per $1 million spent on BLM lands, with grazing in Utah (at 21.64 jobs/$1 M) being the notable exception. Recreation on BLM land creates more jobs, but its output multiplier is less than that of some other industries, especially timber.

Figure 6: BLM Jobs Created and Multipliers by Industry, 2011

	Recreation		Grazing		Timber		Minerals		Wind and Geothermal	
State	Jobs/$1 M	Output Multiplier	Jobs/$1 M	Output Multiplier	Jobs/$1 M	Output Multiplier	Jobs/$1 M	Output Multiplier	Jobs/$1 M	Output Multiplier
Arizona	17.53	1.84	13.31	1.91	13.47	2.97	6.64	1.62	9.72	1.24
California	15.80	2.03	14.05	2.35	13.46	2.58	7.32	1.92	10.02	1.95
Colorado	15.98	1.75	11.85	1.89	10.83	3.40	6.14	1.65	N/A	N/A
Idaho	18.24	1.53	11.24	1.73	11.14	1.94	7.08	1.46	N/A	N/A
Montana	18.12	1.53	13.30	1.81	8.30	1.97	7.14	1.47	N/A	N/A
Nevada	14.44	1.61	10.17	1.68	11.55	1.83	7.82	1.55	10.64	1.67
New Mexico	17.33	1.56	12.01	1.67	8.11	2.91	6.43	1.43	N/A	N/A
Utah	18.93	1.77	21.64	1.64	13.00	2.73	6.98	1.57	11.55	1.35
Wyoming	15.76	1.37	13.95	1.56	9.72	1.70	4.69	1.33	8.00	1.18

Source: Department of Interior Economic Report, June, 21, 2011.

An output multiplier in the Impact Analysis for Planning (IMPLAN) model for a sector is defined as the total production in all sectors of the economy that is necessary to satisfy a dollar's worth of final demand for that sector's output.[13] [14] This means that for an output multiplier of 1.2, for every $100 spent within a particular sector, there is $120 worth of economic benefit to the region when the secondary and tertiary impacts are included.

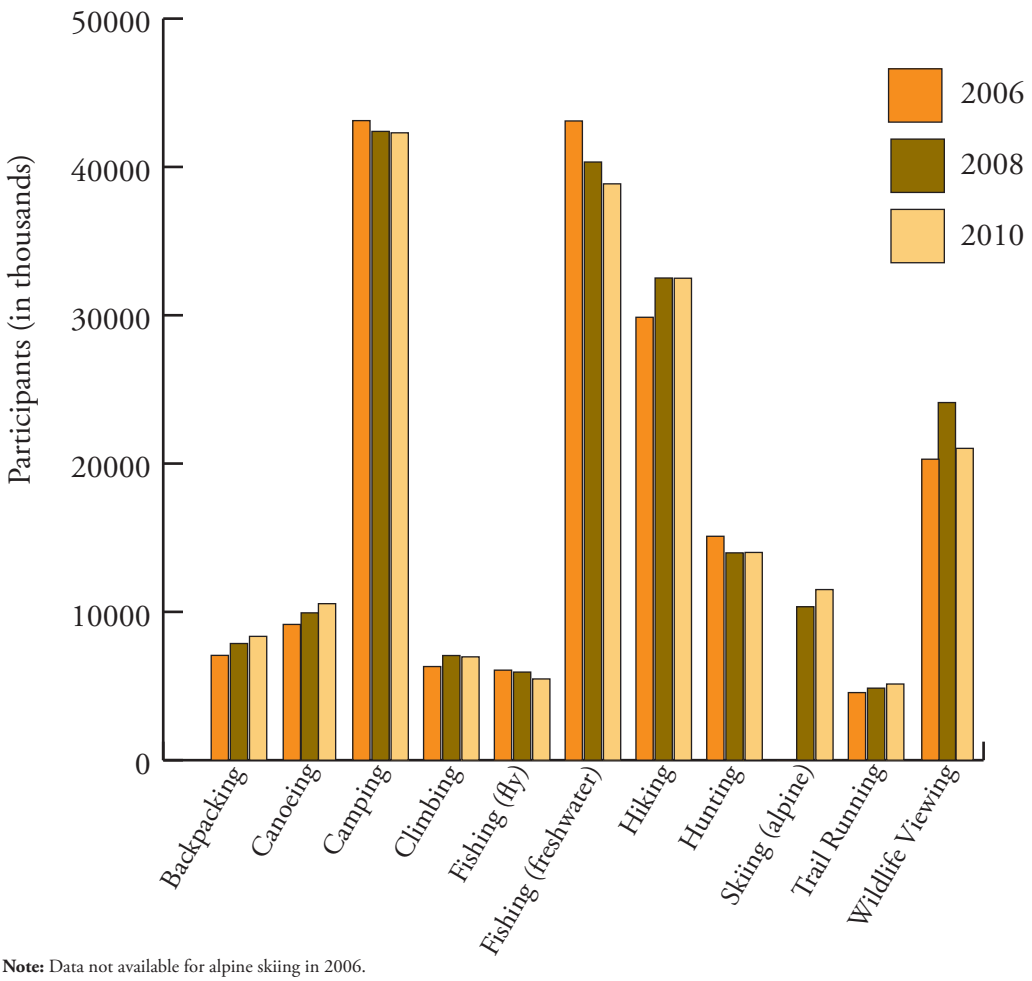
The data presented underpin the reality that recreation and tourism are very important facets to the economy of the Colorado River Basin. The Colorado River Basin remains a "resource-based" economy, but it is also highly dependent upon the water, environment, and other natural amenities that attract people to the region. The economic boom that is recreation and tourism faces an uncertain future, largely due to the immense challenges of water demands in the basin, soon to outpace supplies already put to "beneficial" uses. New and broader definitions of beneficial uses are required not only to underpin the region's environmental conditions, but as has been shown, to also maintain the tourism and recreation sector as an important part of a balanced regional economy. Population growth and climate uncertainty loom on the horizon as challenges, even threats, to the economic and environmental health of the basin.

First in the Nation

October 13, 2011: Only 100 days after closing on July 4th, Arapahoe Basin in Colorado became the first ski area to be open for every day of the season.[15] Though Las Vegas Ski and Snowboard Resort was the first in the nation to open—beating Colorado's Wolf Creek by 27 minutes—Arapahoe Basin, or A-Basin, was the first to offer skiing and snowboarding seven days a week.[16] Arapahoe Basin is able to achieve first-in-the-nation status because of a combination of high altitude—the area has a base elevation of 10,780 ft.[17]—and snowmaking ability. But with climate change and water shortages on the horizon, the landscape of skiing and other snow sports in the Colorado River Basin could greatly change over the next few decades.


Monica Mueller

Figure 7: Recent National Trends in Select Outdoor Activities



Note: Data not available for alpine skiing in 2006.
Source: Outdoor Recreation Participation Report 2011, Outdoor Foundation

Recent Trends in Recreation

The recent economic downturn has led to a reduction in entertainment and discretionary spending; however, participation in many sectors of outdoor recreation have only been moderately affected or have even increased. **Figure 7** shows national participation levels for select outdoor activities. The relatively inexpensive activity of wildlife viewing saw a peak in 2008, but has since returned in 2010 to pre-recession levels of around 20 million. Other inexpensive outdoor recreation options, such as backpacking and canoeing, have seen a surge in popularity, while the equipment-heavy activities of fishing—both fly and freshwater angling—have decreased. Paradoxically, there has been an increase in Alpine skiing participation since the 2006-7 season from 10.36 million to 11.50 million participants in 2009-10.[18] This is in addition to an increase from 6.84 million snowboarders to 8.20 million during the same time.

Winter Wonderland: Snow Sports and the Colorado River Basin

Figure 8 notes the rise in popularity of snow sports nationally. In the 2009-10 season, over 21 million people—representing 7.5% of the over-6-years-old population—participated in the six outdoor experiences combined.[19] The continued growth of snow sports, however, may reach a zenith as the principal ingredient—snow—falls naturally in more restricted areas and more restricted time windows. Since effects of climate change, including unforeseen factors such as red snow, are being witnessed first-hand at ski areas and resorts, many related organizations are promoting varying degrees of climate mitigation and adaptation.

The National Ski Areas Association's (NSAA) Sustainable Slopes program aims "to be leaders among outdoor recreation providers by managing our [ski] business in a way that demonstrates our commitment to environmental protection and stewardship while meeting public expectations."[20] The NSAA further acknowledges that it is committed to improving the environment and ensuring that future generations will be able to enjoy ski areas. Numerous agencies and organizations, from the U.S. EPA to the Colorado Department of Public Health and Environment, have partnered with the NSAA. The Sustainable Slopes program has many goals, and acknowledges the need to reduce water and energy consumption, as well as mitigate effects on wildlife habitat.

In addition to the NSAA, other groups like the Ski Area Citizens' Coalition (SACC) monitor the environmental efforts of ski areas in the western U.S. Among those areas in the top-ten for best ski areas—receiving an "A" grade—three are within the Colorado River Basin (Aspen Highlands, Aspen Mountain and Buttermilk—all in Colorado) and six others lie outside of the basin but within basin states (including first place Squaw Valley in California and third place Deer Valley in Utah).[21] Of the ten worst environmental offenders—receiving a grade of "D" or "C"—three are also within the Colorado River Basin (Breckenridge Ski Resort in Colorado, Arizona Snowbowl in Arizona, and Las Vegas Ski and Snowboard Resort in Nevada). Four others on the "Worst Ten" list are outside of the basin but within one of the seven basin states.[22]

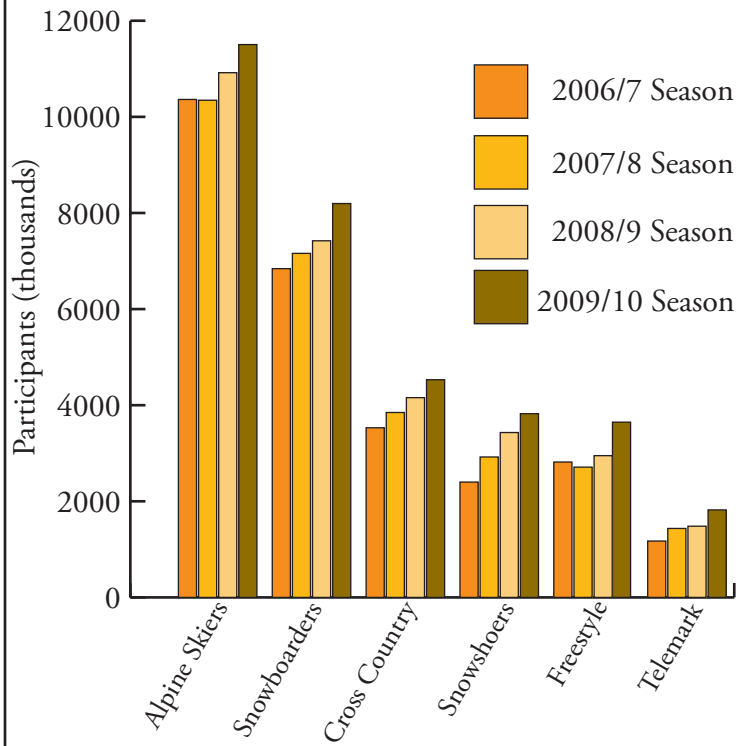
Aspen Skiing Company is a leader in addressing environmental concerns. They started in the late 1990s with recycling, philanthropy, and looking at their operational efficiency. In time, however, Vice President of Sustainability Auden Schendler noted that they realized that it was irrelevant without addressing the larger issues driving climate change.[23] "We decided to change the structure. We can do that because we're Aspen."[24]

Aspen Skiing Company decided "to tap the lever of Aspen": utilizing their influence as a destination for some of the wealthiest and most powerful people in the world in order to impact the larger conversation regarding climate change. Aspen installed a monitoring system in the largest suite, the one where former presidents and powerful CEOs stay. The visitors can see the real-time energy use of the biggest room there (which is also powered by a 5kw solar display), and policy-makers then have a direct link to their energy usage. "We can think of ourselves as an environmental organization as much as a corporation." "In a corporation in particular, you have to have CEO and ownership leadership,"[25] in order to promote environmental stewardship. Aspen has both.

Since the early 2000s, ski areas have been investing in alternative energy projects to reduce their carbon emissions.[26] In addition to photovoltaics and wind energy, Aspen Skiing Company is also pursuing using methane from coalmines as a source of power. Methane is approximately 30 times more efficient as a greenhouse gas than carbon dioxide,[27] so by burning it, power is acquired in a carbon-negative way as the methane is converted into carbon dioxide.[28] Another example of Aspen's influence is the Kimberly-Clark boycott. Kimberly-Clark did not employ sustainable forestry practices, so Aspen and many other companies boycotted their products.[29] The subsequent negative publicity for Kimberly-Clark resulted in a change in their policies.

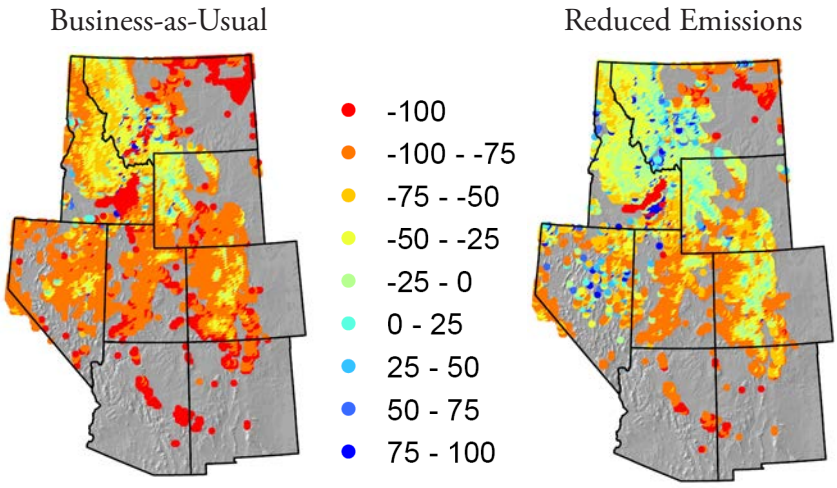
Climate change mitigation efforts may not prove to be enough for ski areas to combat climate change: adaptation strategies must also be pursued. A 2006 paper by Daniel Scott and Geoff McBoyle[30] described some adaptation options for ski resorts. They divided these into two main categories: technological practices (snowmaking systems, slope development, operational practices, geo-engineering) and business practices (ski conglomerates, revenue diversification, marketing, transition to indoor ski areas). They also noted that government adaptations, including improved climate forecasting and subsidies for snowmaking, could be part of an adaptation strategy. Scott and McBoyle conclude by noting that a critical knowledge gap with regards to

Figure 8: National Snowsports Participation by Discipline, 2006-10



Source: National Ski Areas Association

Figure 9: April 1st Snowpack Percentage Change, 1976-2085



Source: Gregory Zimmerman, Caitlin O'Brady, and Bryan Hurlbutt. "Climate Change: Modeling a Warmer Rockies and Assessing the Implications." In The 2006 Colorado College State of the Rockies Report Card, edited by Walter E. Hecox, Bryan Hurlbutt, and Caitlin O'Brady, Colorado Springs: Colorado College, 2006, p. 94.

demand-side adaptation in the ski industry needs to be addressed, as there is uncertainty to the response of skiers and riders to climate change.

The 2006 Colorado College State of the Rockies Report Card carried out path-breaking analysis of projected impacts of climate change using down-sized global climate modeling. **Figure 9** reveals predicted April 1st snowpack percentage change from 1976-2085.[31] Following a "business-as-usual" path, where no steps are taken to mitigate climate change, results in large snowpack losses—upwards of 100%. The hardest hit ski areas in the basin will likely be the southernmost resorts—and those with less snowmaking abilities—such as Arizona Snowbowl and Las Vegas Ski and Snowboard. Telluride is predicted to be the hardest hit of the major resorts in the basin, losing 82% of April 1st snowpack from 1976-2085. A "reduced emissions" trajectory still reveals changes in predicted snowpack, but while lower latitudes/elevations generally show less of a decrease in snowpack, some higher latitudes and elevations show predicted increases. This decrease in snowpack could have a disastrous effect on the ski industry: the less snow available, the fewer people who are willing to ski.[32]

Small-scale climate mitigation projects do not address the larger issues brought on by climate change. The root problem is that if someone is under water- or food- stress, they won't ski. "It is the economic impacts of climate change that we fear."[33] Only will a stable, sustainable society that addresses climate change be able to enjoy the leisure of snow sports into the next century.

Rafting and other Outdoor Recreation in the Colorado River Basin

Commercial rafting does not usually have an in-stream water right in the Colorado River system. Instead, rafters rely upon either normal river flows, in the case of the Yampa in Colorado, or upon releases of water down the "pipeline" of the Colorado River to downstream users. The latter is the case on much of the Colorado and its tributaries. Rafting out of Glenwood Springs, Colorado, falls into this category; in order to generate power, water is released from Shoshone Dam, a hydroelectric diversion dam in Glenwood Canyon, at a minimum of 1,200 cubic feet per second (cfs).[34] Since Shoshone is a top-release dam, it does not have the negative temperature effects of a bottom-release dam like Glen Canyon: colder water increases the likelihood of hypothermia.

Despite not being a primary draw for tourists, rafting still is an important economic use of the Colorado River's natural amenity. On the Colorado River and its tributaries in the state of Colorado alone, the value of rafting has been estimated to be $114.5 million a year.[35] In 2001, over 22,000 people rafted the Grand Canyon, using limited permits granted by the National Park Service. This contributed $21.1 million to the local economy; however, more than half of the rafting-related expenditures were not captured by the local economy.[36] Rafting is not a primary economic draw, but rather a secondary one. People generally travel to the basin to visit a national park, for example, and decide to raft as a secondary activity.[37] As a result, the economic downturn has affected places like Moab, Utah.

Moab was the uranium mining capital of the United States from the 1950s until the collapse of the market in the 1980s. In an effort to reshape the local economy, the city

Encouraging Cooperation

There are 19 outfitters that run the river trips on the Green and Colorado in Canyonlands National Park. For much of the latter twentieth century, they helped each other out by timing their trips, but NPS began having rescue boats parked below some intense rapids—especially the famous "Big Drop" rapids. This created a safety net and acted as a disincentive to cooperation among the commercial outfitters. In 2011, the NPS began to focus instead on education and ramp safety checks. "We have been entirely successful,"[38] as boaters are more prepared for self-rescue, and outfitters have been timing their trips so they can help each other. Encouraging cooperation among outfitters to be able to handle a wide variety of river levels is especially important in Cataract Canyon, as river conditions are largely due to the natural flow of the Colorado. As Paul Henderson stated regarding the Colorado River through Cataract Canyon versus the Grand Canyon, "Theirs is on a faucet: ours is real."

council of Moab decided to aggressively pursue tourism-friendly policies. As a result, Moab—located near Arches and Canyonlands National Parks—became a haven for climbers, hikers, rafters, bikers, and sightseers. But with the "Great Recession" of the late 2000s, disposable income for the average American has declined. This adversely affects recreation-based economies. Because of this, localities are often looking to other sources of revenue to replace the lost tourism income. Some officials in Moab have started once again looking to the rich uranium deposits in the surrounding area as a possible cash cow. This could potentially bring the conflict between recreation and extraction-based economies to a head.[39]

With water rights being of the utmost importance in the Southwest, sustainable and non-consumptive uses of the Colorado River present good options for rural economic development. An understanding of the potentially adverse and constraining economic impacts that occur via substantial leakage of income out of communities and low wages, along with negative social impacts that can coincide with recreation and tourism, should temper future recreational development in rural communities. An increased awareness of factors that can limit the benefits of recreation and tourism development, however, will foster greater compatibility between national parks and their surrounding rural economies.[40]

John Wesley Powell saw the Colorado River Basin as a watershed, and he advocated that jurisdictional divisions should be made along natural watershed boundaries. This is not the case today, but thinking along these lines will prove beneficial in the future. Rafting and other forms of water-based recreation can encourage this type of thinking.[41] As raft guide Emily Brophy stated, "We are not the Green, the Colorado, the Yampa; we are a watershed."[42]

Resource Management in the National Park System

Resource management does not solely apply to visitors using the water and forests of a national park. The vistas, the night sky, the sound-scape, and even the odor-scape are also important resources to an area. Paul Henderson is the Assistant Superintendent of the Southeast Utah Group of the National Park Service (NPS) consisting of Arches National Park, Canyonlands National Park, Natural Bridges National Monument, and Hovenweep National Monument. He stated that in certain areas of Canyonlands National Park, the ambient noise is less than that of a professional recording studio shut off from outside ambient sounds[43] (< 20 decibel A-weighting (dBA)).[44] Development can affect the park experience. The sky-, odor-, and sound-scapes, along with the night sky—are all a part of the NPS experience: though mineral development might not occur directly on NPS lands, it can still adversely affect this experience.

Canyonlands National Park is operating on a 20+ year-old river management plan. The user limit of 8,000 people a year through Cataract Canyon is much less than the approximately 22,000 people who annually raft the Grand Canyon,[45] but unlike the Grand Canyon permits, where in some cases it can take years to acquire one, the user limit for Cataract Canyon has never been exceeded. The NPS spends over 10 times more per visitor on the river versus visitors to, say, the Island in the Sky district, an area in Canyonlands popular for its sightseeing. As a result, in 2011 Canyonlands instituted river permits to help recoup costs—no sense in making visitors subsidize river trips. "Is it fair for all park visitors to subsidize what is a specialized recreation use?"

Brendan Boepple, A fly-fisherman on the Blue River in Breckenridge, Colorado

From a recreation perspective, low flows are easier to manage because there are fewer potentially dangerous rapids. Since flows in the Colorado and Green Rivers change seasonally, the National Park Service has to maintain rescue craft capable of operating in a variety of conditions. If each of the parks in the Southeast Utah Group were an island and did not share services, it would be 30-40% more expensive to maintain the parks. Only a minority of visitors to national parks fully utilize all of the recreation opportunities present and it is only fair to assign at least some of the extra cost associated with their activities to these visitors. These same visitors, however, often have the greatest appreciation for national parks.

At the Black Canyon of the Gunnison National Park, about 250,000 people visit each year. Most of them, about 238,000, come, look at the canyon, and leave. These visitors remain largely unaffected by instream flows in the Gunnison. But the 12,000 visitors who hike down the canyon, usually to enjoy some of the best trout fishing in the world, are the ones with the greatest stake in the river. These are the people most likely to support or challenge policy changes.[46]

"Soft Use": Fishing and Hunting in the Basin

Fishing, unlike rafting, has been directly linked to being a primary draw for tourists.[47] Trout fishing and soft, non-consumptive use of waters can be used as a basis for boosting instream flows. There are primarily two types of fish in the basin: warm-water and cold-water. Many exotic cold-water species, including Rainbow, Brown, and Brook trout, have been introduced to the basin. These species do not come into conflict with the four warm-water endangered species in the basin: the Bonytail, the Colorado Pikeminnow, the Humpback Chub, and the Razorback Sucker. Cold-water fish habitats are generally in high mountain streams and lakes, whereas warm-water fish are in larger, lower reservoirs and rivers.

With man-made structures and climate change altering the hydrology of the basin, many cold-water sport fisheries are under threat. While several structures—notably the Glen Canyon Dam that created some of the best trout fishing in the world—have created or improved cold-water fisheries, many dams, culverts, and other such structures fragment fish habitat. This fragmentation degrades the health, restricts access to habitat, and can reduce the genetic viability of a species. Warming climate leads to earlier snowmelt and changes the temperature of spawning habitat. Increasing occurrences of wildfires and the spreading of diseases degrade habitats. A three degree Celsius increase in average July temperature would reduce the range of the Colorado River Cutthroat Trout (CRCT) further, confining it to ever-smaller, high-mountain streams and lakes.[48]

Climate change is a major threat to cold-water fisheries, but it is not the only one. Historically, the CRCT was found throughout most of the Colorado River Basin upstream from Glen Canyon. Trout Unlimited's Conservation Success Index, however, notes that only 16% of the watersheds within the historic range are now occupied by the CRCT. The issues affecting the CRCT mirror those faced by many native trout species in the region: competition from non-native trout, over-fishing, habitat degradation due to timber harvests, grazing and wildfires, and the fragmentation of habitat by dams, diversions, and other barriers (including culverts).[49]

There is a great discrepancy between penalties for disrupting species health of large mammals and fish. In Colorado, poaching a trophy bull elk carries a $10,000 Samson fine—an extra fine levied in order to provide a further disincentive for the illegal harvest of trophy bull elk, which are often some of the healthiest members of a species—in addition to about a $1,000 fine.[50] [51] In many western states, game and fish are considered to be property of the state, and have associated fines for harvesting members of a species without state permission (be it in the form of a game tag and/or a fish/hunting license). While such poaching can be disruptive on a population—especially if it is widespread—the effects of one poaching incident are relatively small when compared to the effects of introducing exotic fish species. It takes only one breeding pair of an introduced exotic species potentially to decimate native populations, but fines associated with introducing exotic species into watershed are on the order of tens or hundreds of dollars, as opposed to thousands.[52]

Most state and federal fish and wildlife management agencies throughout the basin have long attempted to support both Endangered Species Act requirements and the desires of sport fishermen. Invasive species were removed from targeted waterways and relocated elsewhere. These exotic species, such as smallmouth bass and northern pike, are finding their way back into watersheds, resulting in ineffectual progress. Agencies have now begun to implement capture and kill programs.[53]

Hunting is another "soft-use" of the natural amenities of the Colorado River Basin. Hunting and recreational hiking are often portrayed as antithetical to each other, but studies have shown that environmental values, such as the need to preserve habitat and the desire for a "wilderness experience," are compatible.[54] Since hunting only indirectly uses water, in the form of water needing to be available for wildlife, it is another source of income for non-urban areas of the basin. Habitat loss, other stresses caused by climate change, and the scarcity of water may, however, reduce the opportunities for hunting. As habitat becomes more fragmented, the quantity of game that can be sustainably harvested is reduced.[55]

Agriculture and Recreation

Along many of the canals, and some storage reservoirs, within the Colorado River Basin there is a lot of winter camping. People park their RVs on the side of the canal and sit and fish all winter long. Senator Wash, a "storage" reservoir for excess flows, is a big attraction drawing thousands of campers and anglers (especially in the winter months) to the Imperial Valley of California, and is under management of the BLM.[56]

The Wellton-Mohawk Irrigation District in southern Arizona introduced carp to the canals as moss control. The

public is not allowed to swim or boat in the canal, but "catch and release" fishing is allowed and managed by the Arizona Department of Game and Fish.[57] [58] With the added bonus of increasing recreational opportunities, biological control methods, like introducing carp for moss control, can prove to be more efficient and cost effective than mechanical or chemical controls. Agriculture usage of water can provide recreation opportunities, from fish in canals to habitat for sport-game such as ducks, but often comes into conflict with the largest single source of tourism in the lower basin: Las Vegas.

The Desert Oasis: Las Vegas

The drier Lower Basin draws millions of people seeking sunshine but wanting the amenities of wetter climes. This can lead to a confrontation over water between tourist sectors and agriculture. Las Vegas, Nevada, has become a symbol of this. Forty-seven golf courses have been built in the Las Vegas area. Initially used as a way to sell houses, they were grossly overbuilt. There is currently, however, a moratorium on new golf courses.

But it is the casinos themselves that are often presented as the "bad guys" of the system. "Perception of water abundance is one of the primary tools of the gaming industry." Hence, there are the glittering lights, relaxing spas, and magnificent water features. Resorts in Las Vegas, however, only account for 6.3% (2007)[59] of the consumptive use in the Southern Nevada Water Authority, but account for 70% of the economic benefit[60] in Clark County. Homeowners, rather, use the majority of the water. In 2007, single- and multi-family residential housing used 55% of the municipal water, while golf courses used 7.6%.[61]

Conclusion: Is the World Renowned Colorado River Basin "Playground" Under Threat?

This discussion about the future of recreation along the Colorado River and its tributaries is meaningless without placing it in the context of climate change. According to Auden Schendler, Vice President of Sustainability with Aspen Skiing Company, "It's the economic impacts of climate change that we fear."[62] Even if there is snow to ski on in 50 years, people from around the nation and world will not go on a ski trip unless their basic economic needs have been met and exceeded. Even if there is still enough water to raft down Cataract Canyon, no one will without the dispensable income to do so.

So is America's Colorado River Basin playground under threat? In a word, yes. This threat stems from our increased reliance on the basin's water for historically established "beneficial uses" by households, industry, and agriculture. It is derived from our current water management system that views the basin largely as a pipeline, one that divvies up water among the Upper and Lower Basin regions and for Mexico even though the highly volatile water flows historically average less than the allocated 16.5 million acre-feet (maf).[63] It is accentuated by resistance to new uses proposed for water: loosely termed "instream" flows for aquatic systems and adjacent riparian areas. With the increasing scarcity of water and the struggle to fulfill the additional demands people have expressed for Colorado River water, the "new" demands for water of threatened and endangered species needed for their survival must compete with firmly entrenched and well-financed entities hell-bent on squeezing more water "out" of the basin.

What can today's youth bring to this debate and conflict? Elsewhere in this *Report Card* we discuss the results of a survey measuring the values of today's college-age youth, compared with values of more established "water experts" throughout the basin. We are encouraged by the strength of support for less-traditional water uses in the basin, including instream flows and a desire to remedy the unmet shares of water for Native Americans and Mexico. Tough choices and trade-offs are on the horizon in all aspects of the basin. Yet, we are hopeful that a broader "systems thinking" will prevail, so that balance arises between human demands for water and products from the basin versus the needs of the hydrologic region for sufficient water to remain healthy and supportive of the types of recreation and tourism discussed in this section. Taken together, the various sections of this *Report Card* weave a fabric of solutions and perspectives for today's youth and generations to come: we can have a healthy Colorado River Basin that supports vital economies without destroying vital hydrologic and environmental conditions that make the region world-class! We must keep it so.

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