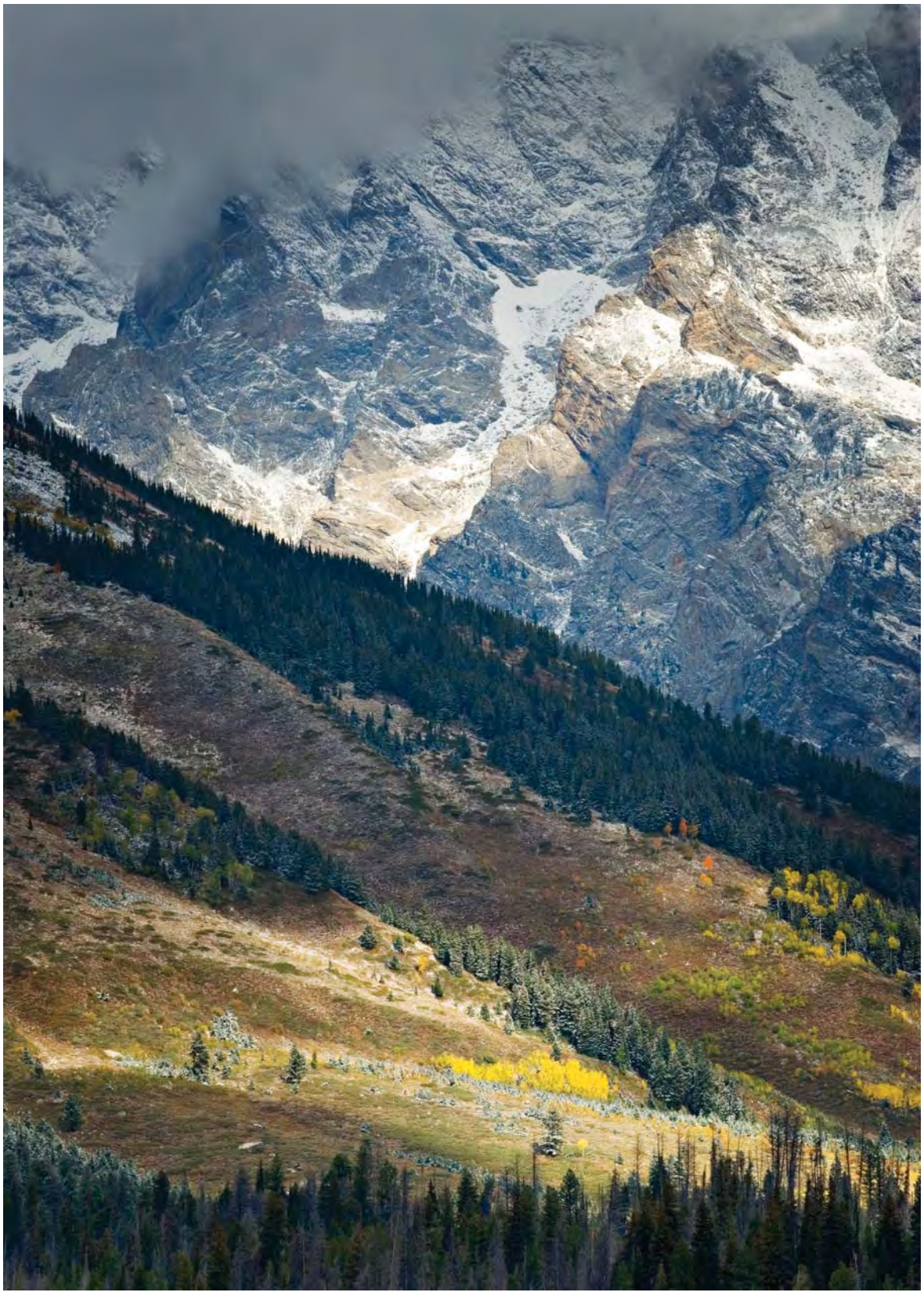


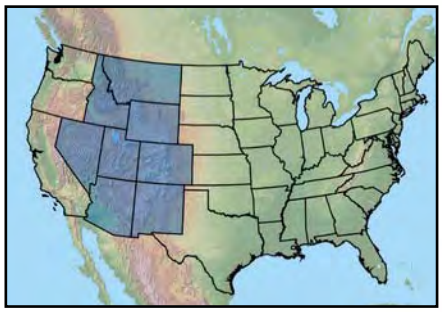
The 2007

COLORADO COLLEGE

STATE OF THE ROCKIES REPORT CARD

An Outreach Activity of Colorado College: Vision 2010

Colorado College's Rocky Mountain Study Region



The Colorado College State of the Rockies Project is designed to provide a thoughtful, objective voice on regional issues by offering credible research on problems faced by the Rocky Mountain West, and by convening citizens and experts to discuss the future of our region. Each year, the State of the Rockies provides:

- Opportunities for collaborative student-faculty research partnerships;
- An annual *State of the Rockies Report Card*;
- A companion State of the Rockies Conference.

Taken together, these three arms of the State of the Rockies Project offer the tools, forum, and accessibility needed for Colorado College to foster a strong sense of citizenship for both our graduates and the broader regional community.

THE COLORADO COLLEGE
STATE OF THE ROCKIES PROJECT

AN OUTREACH ACTIVITY OF
COLORADO COLLEGE
VISION 2010

Cover photo by:
Stephen G. Weaver

The 2007

COLORADO COLLEGE

STATE OF THE ROCKIES REPORT CARD

Edited By:

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Matthew K. Reuer, Ph.D.,
Christopher B. Jackson

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The Colorado College State of the Rockies Project

Research, Report, Engage!

THE 2007 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

An Introduction from the President

Thank you for exploring this, our fourth annual *State of the Rockies Report Card*, a comprehensive and accessible annual statement on the challenges and controversies facing the eight Rocky Mountain states: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. Our students, staff, and many of our alumni live and recreate in this spectacularly beautiful region and thus are invested heavily in maintaining its vitality. We know that many others have similar concerns and wish to protect the region's communities, environment, and economy. Our State of the Rockies Project, including student-based research, report cards, and conferences, is designed to make a positive regional difference future generations will come to value.

Founded in 1874, Colorado College has both prospered in and contributed to our Rockies "backyard". Over the decades we have responded to the constant change in this region of 281 counties with a population that in recent decades has grown at more than three times the national average. Colorado College is a private, four-year liberal arts and sciences college enrolling 1,900 students, located on a 90-acre campus in downtown Colorado Springs near the base of Pikes Peak. Our mission statement speaks to what we are all about:

> *At Colorado College our goal is to provide the finest liberal arts education in the country. Drawing upon the adventurous spirit of the Rocky Mountain West, we challenge students, one course at a time, to develop those habits of intellect and imagination that will prepare them for learning and leadership throughout their lives.*

To achieve these goals, Colorado College offers first and foremost an excellent undergraduate education in the liberal arts. In doing so we encourage a spirit of intellectual adventure, critical thinking, hands-on learning, and personal responsibility in





an environment of small learning communities where education and life intertwine. Strong student involvement in each year's State of the Rockies Project is one way we seek to connect with the challenging issues around us.

In prior years the report cards have delved into a host of issues and problems that challenge the Rockies Region. *The 2004 State of the Rockies Report Card* included an inaugural grading of the region's counties based on 15 indicators grouped together under land and environment, social and cultural capital, and economic conditions. An overall grade was also assigned for community "vibrancy and vitality." *The 2005 State of the Rockies Report Card* examined issues of regional energy demands, the condition of our national parks, urban sprawl, and toxic waste. Again an overall grade was assigned, this time concerning "creative occupations and civic engagement." A year ago *The 2006 State of the Rockies Report Card* explored a new set of issues important to our region, including: overlapping and linked issues of ranching and land conservation alongside threatened and endangered species; climate change in the Rockies; prospects for a Western presidential primary and enhanced regional political voice; and environmental justice. Counties were graded on their status in "nurturing youth".

The Rockies conference for 2006–07 has evolved into several distinct but related events. From December 2006 through March 2007 a series of monthly speakers addressed key parts of the immense energy boom in exploration and production confronting the region, one of the topics for this year's report card. This "Energizing the Rockies" series spanned global to national and regional perspectives with the help of four renowned energy experts speaking on campus: Rebecca Watson, former Department of Interior assistant secretary for land and minerals management; Raymond Plank, founder and chairman of Apache Corporation; Randy Udall, director of Aspen's Community Office for Resource Efficiency; and Matthew Simmons, chairman and CEO of Simmons & Co. Intl.

In April 2007 we inaugurated a "Champion of the Rockies" award, with the first recipient for 2007 being Ted Turner, recognized for his leadership as a major landowner and rancher in the Rockies and for balancing business and ecological concerns in our beautiful but fragile region. Both of these events helped set the stage for the April 9–11, 2007 Rockies Conference here on campus. While the "Energizing" series addressed one important topic in this year's report card, each of the three conference days has been dedicated to the remaining major topics:

- Kay Brothers, deputy general manager for the South Nevada Water Authority shared her expertise and experience in Rockies water issues and thirsty urban demands.
- James Hubbard, U.S. Forest Service's deputy chief for state and private forestry addressed innovative partner ships capable of helping return our national forests to healthy conditions.
- Peter Calthrope, renowned urban planner and architect, brought to campus expertise in new communities/ new urbanism.

Panels and case studies complemented each of these campus visitors as we explore issues, challenges, and solutions, in turn complementing the written materials in this *2007 State of the Rockies Report Card.*

Widespread and sustained public discussion continues on topics we address each year in report cards and conferences. Using print media circulation figures, the 2004 Rockies effort reached 2.3 million, and in 2005 this number grew to 4.4 million. Then new forms of media introduced dramatic changes to the coverage of State of the Rockies efforts. Traditional media print coverage gave way to Internet postings and web logs, opening up exciting new ways to engage people concerning the Rockies, with some 85 separate Internet links to coverage posted on the State of the Rockies Project website. Especially noteworthy this past year has been the excitement over and coverage of the climate change section in 2006, widely quoted in media and whose model projections were included in a brief filed before the U.S. Supreme Court.

As in past years I invite you to explore the Rockies through the material in this *State of the Rockies Report Card*. I am confident that it will inform, challenge, and stimulate your knowledge and thinking. We welcome you to a growing number of people who care to learn more about and contribute to protecting the unique features and character that make the Rockies Region everyone's special "backyard."

Richard F. Celeste
President of Colorado College



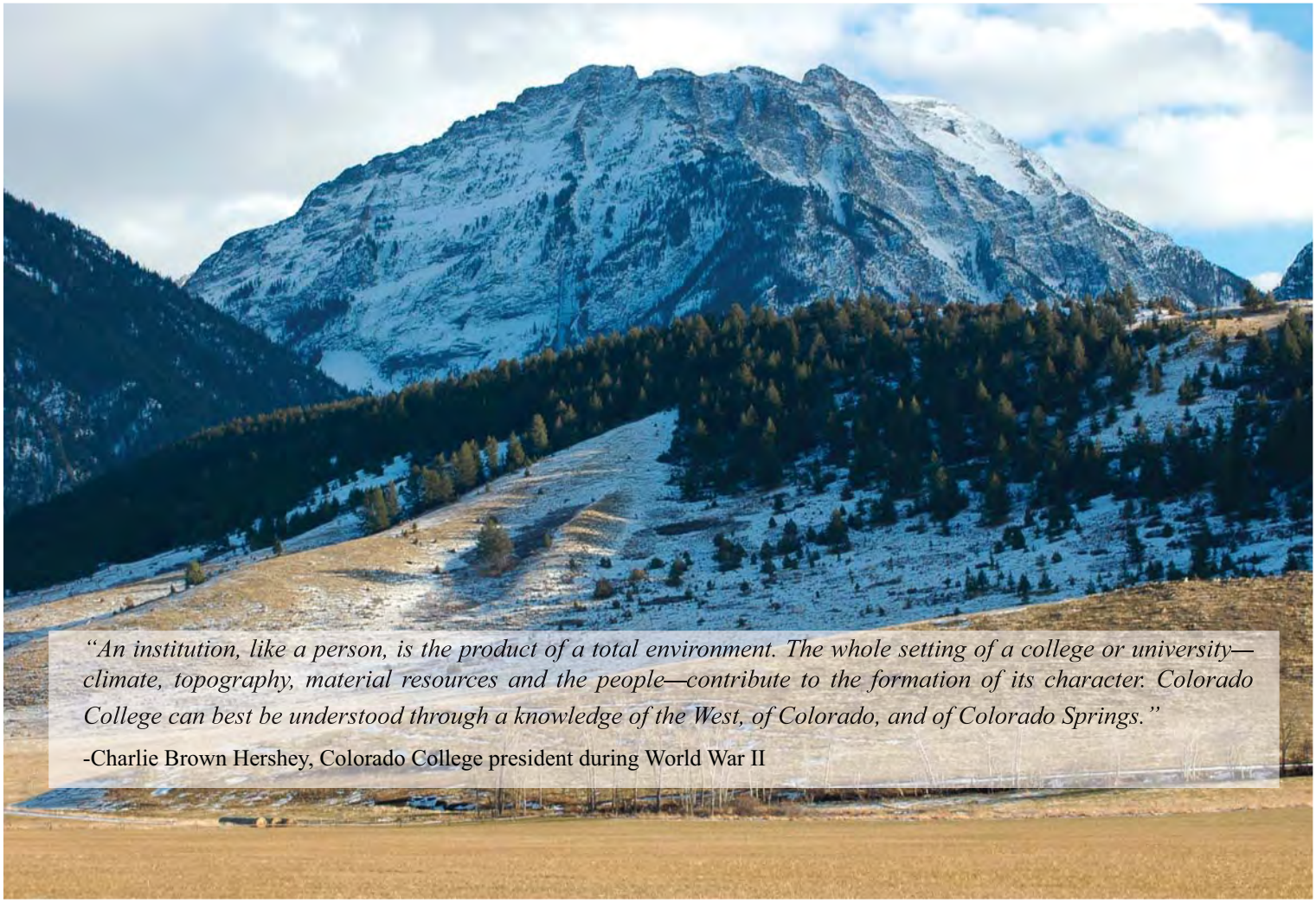
The 2007 Colorado College State of the Rockies Report Card

By Walter E. Hecox

Colorado College (CC) today, as for the past 130 years, is strongly defined by location and events of the 1800s. Pike's Peak abruptly rises out of the high plains that extend from the Mississippi and Missouri Rivers towards the west. This eastern-most sentinel of the Rocky Mountain chain of 14,000 ft. peaks first attracted early explorers and then was the focus of President Jefferson's call for the southern portion of the Louisiana Purchase to be mapped by Zebulon Pike in 1806. Gold seekers in 1858 spawned the start of the "Pike's Peak or Bust Gold Rush" of prospectors and all manner of suppliers to the mining towns. General William Jackson Palmer, while extending a rail line from Kansas City to Denver, in 1869 camped near what is now Colorado City and fell in love with the view of Pike's Peak and red rock formations now called the Garden of the Gods. An entrepreneur and adventurer, he selected that site to found a new town with the dream that it would be a famous resort, complete with a college to bring education and culture to the region. Within five years both Colorado Springs and Colorado College came into being in Colorado Territory, preceding Colorado statehood in 1876.

Early pictures of present day Cutler Hall, the first permanent building on campus that was completed in 1882, speak volumes to the magnificent scenery of Pike's Peak and the lonely plains. Katherine Lee Bates added an indelible image of the region. In 1893 she spent a summer teaching in Colorado Springs at a CC summer program and on a trip up Pike's Peak was inspired to write her "America the Beautiful" poem. It helped spread a celebration of the magnificent vistas and grandeur of Pike's Peak and the surrounding region–and provided bragging rights for CC as "The America the Beautiful College".

The last quarter of the eighteenth century was challenging both for Colorado Springs and Colorado College. Attempts to locate financial support in the east and ease the travails of a struggling



"An institution, like a person, is the product of a total environment. The whole setting of a college or university—climate, topography, material resources and the people—contribute to the formation of its character. Colorado College can best be understood through a knowledge of the West, of Colorado, and of Colorado Springs."

-Charlie Brown Hershey, Colorado College president during World War II

About the Author: Walter E. Hecox is professor of economics and environmental science at Colorado College and Project Director of the Colorado College State of the Rockies Project




college were grounded on the unique role of Colorado College in then President Tenney's "New West" that encompassed the general Rocky Mountain region. His promotion of this small college spoke of Colorado College being on the "very verge of the frontier" with a mission to bring education and culture to a rugged land. Even then, Tenney saw the college as an ideal place to study anthropology and archeology, use the geology of the region as a natural laboratory, and serve the mining industry by teaching the science of mineralogy and metallurgy. In the early 1900s a School of Engineering was established that offered degrees in electrical, mining and civil engineering. General Palmer gave the college 13,000 acres of forest land at the top of Ute Pass, upon which a forestry school was built, the fifth forestry school created in the US and the only one with a private forest.

Subsequent decades brought expansion of the college, wider recognition as a liberal arts college of regional and national distinction, and creation of innovative courses, majors, and programs. The unique Block Plan, implemented in the 1970s, consists of one-at-a-time courses that facilitate extended course field study, ranging across the Rockies and throughout the Southwest. Thus CC has a rich history indelibly linked to the Rockies.

Today is no different: CC has new programs that meet evolving challenges in the Rockies, including environmental science and Southwest studies programs, a sustainable development workshop, and exciting field work offered by a variety of disciplines. Students can thoroughly explore the Rockies through the block plan.

The Rockies Project:

The Colorado College State of the Rockies Project is designed to provide a thoughtful, objective voice in regional issues by offering credible research on problems facing the Rocky Mountain West, and through convening citizens and experts to discuss the future of our region. Each year the Project seek to:

- Opportunities for collaborative student-faculty research partnerships
- A *State of the Rockies Report Card*
- A companion State of the Rockies Conference.

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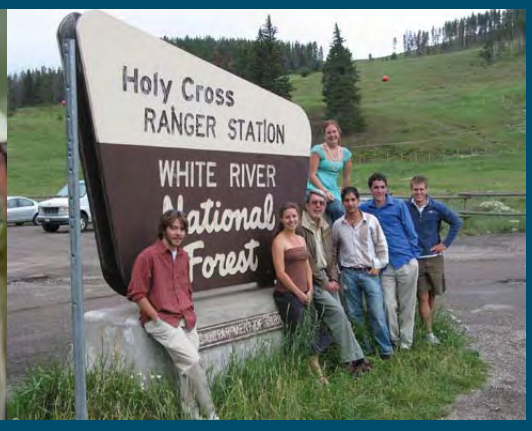


Editors' Preface and Executive Summary

The 2007 Colorado College State of the Rockies Report Card

By Walter E. Hecox, Matthew K. Reuer, and Christopher B. Jackson

Editors' Preface

As quickly as the Rockies Project addresses one set of challenges to the eight-state region, new issues appear on the horizon. For the *2007 Report Card* such challenges include forest health and the importance of fire mitigation and disease in this region, energy development impacts on Rockies' communities and infrastructure, water use in the Rockies and the growing need for agriculture to urban water transfers, and trends in new communities, including "new urbanism". Why these topics? Certainly many others may be equally deserving of attention and likely will be the focus of future report cards. But pressures have combined to make this year's selection of topics timely and compelling.

The combination of prolonged drought and continuing rapid population growth are key ingredients to a regional "perfect storm". Rockies' forests are stressed by drought, overgrown after decades of fire suppression, and now devastated by insects and disease. The implications for life and property within the fire-prone wildland urban interface as well as the economic health of communities reliant on recreation and tourism are increasingly profound. Drought has simultaneously stressed water uses, particularly agriculture, municipal supplies, industry, and natural ecosystems. Water rights law interacting with the power of markets to divert water to highest bidders is placing increasing pressure on agriculture. This results from decreasing agricultural commodity prices and the growing financial clout of Western cities: water still flows uphill towards money!

Another cloud in our "perfect storm" comes from increasing demands for enhanced domestic energy production. Exploding demand in India and China, unstable political situations in energy-producing nations, and continued U.S. appetite for energy are driving a boom of immense proportions in the Rockies. In prior decades similar booms have turned to "busts" as world oil prices collapsed and the financial viability of domestic energy production was undercut. For the Rockies, the repository for much of the nation's energy resources (conventional as well as solar and wind-based renewables), each boom is a mixed blessing, bringing rural communities jobs and prosperity while challenging the area's infrastructure, social fabric, and environmental health.

All of these "fronts" in the storm affecting the Rockies impact the distribution of people living throughout the region. Contrary to "conventional wisdom" 83 % of the population lives in urban areas. The vast majority of the Rockies is "urban" and growing at some 4.5 times the national average. As more people move into urban and suburban areas, there are opportunities and challenges. Urban growth manifests itself not just in the familiar "sprawl" pattern, but also in planned and thematic development. The trends in new communities result in exciting human-built dimensions to what makes the Rockies such a delightful place to live and visit.

In this, our fourth year of the State of the Rockies Project, we have built upon what worked well during the previous three. Summer 2006 witnessed a team of students working with faculty and staff to develop the chosen research topics. Field trips to conduct interviews and observe the particular issues were combined with campus-based research. Generous financial assistance allows this pattern of student involvement to continue and supports a recent Colorado College graduate as Program Coordinator throughout the academic year. Since the summer, the student researchers have met with other scientists and community leaders to fine-tune their research projects which form the substance for the *Report Card* sections.

This year's research topics, similar to those in the past, seek to offer fresh perspectives on critical regional topics. Our aim is to cultivate a new vision of our shared home and to challenge the Mountain West to decide on our collective fate as new arrivals or established locals in this region.

How have we organized this year's *Report Card*? Continuing a tradition, the first section examines key characteristics of the Rockies Region. We explore how it is changing through our "Rockies Baseline", presenting annually-updated demographic indicators for the U.S., the Rockies Region, and each of the eight Rockies states. These "vital signs" lay out basic facts and track trends in this rapidly changing region. Next come the major sections we have studied this year, formed by the "perfect storm" discussed above. Finally, we continue another tradition and "evaluate" the counties in the region on selected measures, including:

- "Democrats and their Rocky Mountain High (Hopes)": A close look at party voting patterns in the eight-state Rocky Mountain West;
- "How the West is Wired": broadband connectivity in the West; and
- "Feeding from the Federal Trough": patterns of federal government expenditures around the Rockies.

Central to this year's project activities, as in the past, are the three goals of the Colorado College State of the Rockies Project:

- **Research**: opportunities for collaborative student-faculty research partnerships.
- **Report**: publication of annual *State of the Rockies Report Card*.
- **Engage**: lectures and conferences that bring the community and public into a conversation about the Rockies.

Through these goals, the project aims to move beyond the educational benefits to involved students by inspiring conference attendees and report card readers to contemplate, discuss, and engage in shaping the future of our beloved region—the Rocky Mountain West.

About the Editors: Walter E. Hecox is professor of economics and environmental science at Colorado College and Project Director of the Colorado College State of the Rockies Project; Matthew K. Reuer is Technical Director for the Environmental Science Program and co-editor for the Rockies Project; Christopher B. Jackson, a May 2006 graduate of Colorado College, is the 2006-07 Program Coordinator for the Rockies Project.

Executive Summary

"Rockies Baseline: Vital Signs for a Region in Transition"
State of the Rockies – Chris Jackson

Similar to past years, we start this *State of the Rockies Report* by checking the region's "vital signs." Population growth in the Rockies continues to outpace the nationwide average. However, within the region, population change varies widely by state, with Nevada and Arizona recording double-digit values but Wyoming recording less than one percent growth. Jobs have also expanded in the region, with service, professional, and construction jobs expanding more than the national average. Overall, the vital signs reflect a vibrant region with a well educated and diverse population.

Challenge Essay **– "Democrats and Their Rocky Mountain High (Hopes): A Close Look at Party Voting Patterns in the Eight State Rocky Mountain West"**
Robert D. Loevy, Thomas E. Cronin, and Jonathan M. Goldstein – guest contributors

Why have the Democrats chosen Denver, in the heart of a "red state" region, for their national convention site in 2008? As Loevy, Cronin, and Goldstein detail in this report, the political landscape of the Rockies is more varied than shown by state-level maps and may be changing. The authors analyze state, county, and metropolitan electoral data to reveal the current political situation and suggest possible future voting trends.

Challenge Essay **– "How the West is Wired: Broadband Connectivity in the West"**
D. Corwin Jackson – guest contributor

Imagine working in Asia but never leaving your home office in rural Wyoming. The spread of high-speed Internet services has made such a prospect possible and is creating new workspaces, economies, and even communities throughout the Rockies Region. In this report, Jackson discusses the new frontier of broadband and its impact on the Rockies, where access is varied and demands high to "get on board" the new economy.

"Water Sustainability in the Rockies: Agriculture to Urban Transfers and Implications for Future Water Use"
State of the Rockies – Tyler McMahon, and Matthew Reuer

Do you know where your water comes from? In some parts of the Rockies, this scarce resource travels for hundreds of miles, through mountains and around thirsty fields, before ever reaching your field or faucet. But will there be enough water to supply the West's fast-growing cities and suburbs? Periodic drought, explosive population growth, and prospects for climate-induced changes in water supply all contribute to water being a fundamental determinant of how the Rockies will be shaped in the coming decades. In this report, McMahon and Reuer use a "water sustainability" construct to discuss water uses and policies and their impacts in the Rockies Region, focusing on agriculture to urban transfers and alternative strategies for addressing competing and increased demands in a water-scarce region.

Faculty Overview **– "The Healthy Forests Restoration Act"**
Phillip M. Kannan – guest contributor

Phillip M. Kannan, distinguished lecturer and legal scholar-in-residence in the Colorado College environmental science program introduces the topic of federal forest management with this overview of the Healthy Forests Restoration Act. A long history of federal forest management has been dramatically changed recently, in response to what many perceive as a "crisis" in the health and management of our forests. Congressional legislation and administrative action have sought to "speed up" forest management, in fundamental ways by selectively side-stepping other important legislation such as NEPA and the Endangered Species Act.

"Forest Health in the Rockies: Human Needs and Ecological Reality"
State of the Rockies – Carissa Look, and Matthew Reuer

Stately pines and golden aspens symbolize the West, but as Look and Reuer discuss in this report, forest management in the Rockies involves difficult challenges and debates. The authors examine forest management practices and their historical foundations, as well as the influences of fire, disease, and development on regional forest health. As they note, it is the people of the Rockies who will ultimately play critical roles in protecting our forests for future generations.

"Energy Development in the Rockies: Tempering the Boom, Avoiding the Bust"
State of the Rockies – Brian Hall and Chris Jackson

In the late 19th century, the gold rush lured prospectors to the West, with both prospectors and towns experiencing great prosperity and devastating busts. As Hall and Jackson discuss, today's energy boom towns can learn from this history, as well as from more recent success stories throughout the region. This report reviews the primary forces of energy supply and demand, examines the federal energy leasing process, and looks at the socioeconomic costs and benefits of energy development in the Rockies.

"The Growing Rockies: New People, New Communities, New Urbanism"
State of the Rockies – Julianne Kellogg and Chris Jackson

The effects of population growth and urban development run throughout the essays in this year's *State of the Rockies Report*, as they have in previous reports. While the *2005 State of the Rockies Report Card* examined urban sprawl, in this report Kellogg and Jackson focus on particular types of new urban development, namely "smart growth" and "new urbanism," retirement communities, and gated communities. These forms of development reflect not only population trends but reactions to urban sprawl in the Rockies.

"Feeding from the Federal Trough: Patterns of Federal Government Expenditures Around the Rockies"
State of the Rockies – Pablo Navarro

How are federal dollars divided up among the states and counties of the Rockies? Are some places benefiting more than others? In this section, Navarro presents data on federal funding to states and counties in the Rockies Region. The top-ten and bottom-tem county recipients of federal dollars are listed by total and per capita funding for the major federal agencies whose expenditures and obligations so vitally shape the Rockies Region.

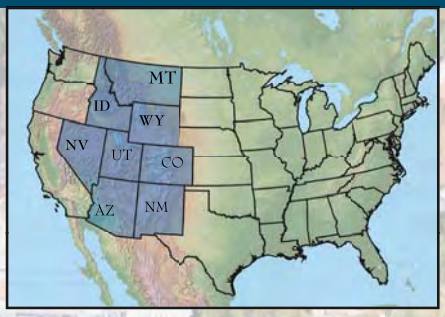
Rockies Baseline

Vital Signs for a Region in Transition

By Chris Jackson

The 2007 Colorado College State of the Rockies Report Card

Tracking key changes happening in the Rockies each year is an important goal for each annual Report Card. What are key measurements that "tell the Rockies story" of a dynamic region in transition? How fast are such indicators changing among the Rockies states and when compared to the Rockies' benchmarks for the eight-state Rockies Region and the U.S.? These and other perspectives can be quickly grasped by glancing at this year's Vital Signs.



Now a consistent feature of every *State of the Rockies Report Card*, the Rockies Baseline section presents a set of demographic and economic indicators. By tracking changes from 2000 to 2005 we can illustrate the intricacies of this region in transition. The statistics presented here are an important introduction to the later sections of the Report Card, as they are often the fundamental drivers of change in the region.

Integral to the Rockies Baseline are national and interstate comparisons that are critical to distilling the character of the West. Immediately apparent in this year's Rockies Baseline, the region's population growth continues to surpass that of the nation, now by more than four times. A related trend: job growth in the Rockies has outpaced the U.S., however, the Rockies mimics the national trend of high growth in service industry occupations. This year's Vital Signs depict a region that is economically thriving, socially diverse, and well-educated.

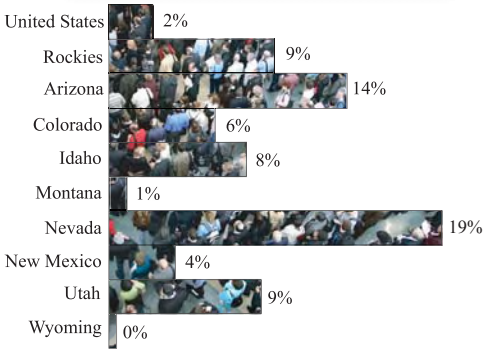
A clearer understanding of the characteristics that define our region, and where it is both similar and divergent from the U.S. as a whole, equips Rockies citizens to engage in the kind of thoughtful debate that will eventually help us define ourselves as a region and strengthen our common western voice.

About the author: Chris Jackson (Colorado College class of 2006) is Program Coordinator for the Colorado College State of the Rockies Project.

Population & Age, 2005

	Population	Population growth since 2000	Percentage of Population age 0-19	Percentage of Population age 65+	Median Age	Median Age Change since 2000
United States	288,378,137	2%	28%	12%	36	3%
Rockies	19,889,425	9%	29%	11%	34	2%
-Arizona	5,829,839	14%	30%	13%	35	1%
-Colorado	4,562,244	6%	28%	10%	35	1%
-Idaho	1,395,634	8%	30%	11%	35	4%
-Montana	910,651	1%	25%	13%	40	7%
-Nevada	2,381,281	19%	28%	11%	35	1%
-New Mexico	1,887,200	4%	29%	12%	36	5%
-Utah	2,427,350	9%	33%	9%	29	5%
-Wyoming	495,226	0%	25%	12%	39	8%

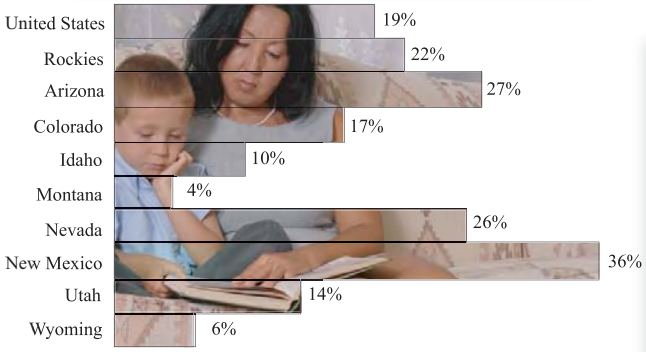
Population Growth, 2000 to 2005



Language, 2000 and 2005

percentage of the population age 5 and Older Who Speak the Following Language at Home	English Only, 2005	Language other than English, 2005	Language other than English 2000
United States	81%	19%	18%
Rockies	78%	22%	20%
-Arizona	73%	27%	26%
-Colorado	83%	17%	15%
-Idaho	90%	10%	9%
-Montana	96%	4%	5%
-Nevada	74%	26%	23%
-New Mexico	64%	36%	37%
-Utah	86%	14%	13%
-Wyoming	94%	6%	6%

Percentage of Population Who Speak a Language Other than English at Home, 2005



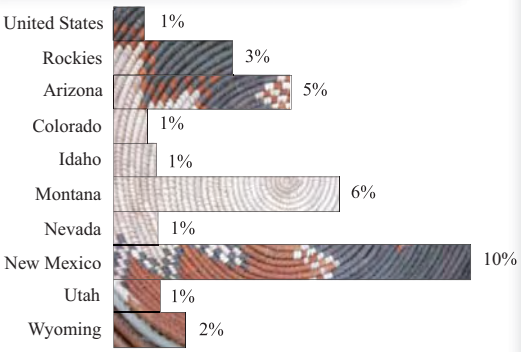
Families, 2005

	Family Housholds as a Percentage of all Housholds	Non-family Houshholds as a Percentage of all Housholds	Average Family Size in Number of People	Average Family Size, Change since 2000
United States	67%	33%	3.2	1%
Rockies	67%	33%	3.2	1%
-Arizona	66%	34%	3.2	2%
-Colorado	64%	36%	3.1	1%
-Idaho	70%	30%	3.1	-2%
-Montana	64%	36%	3.0	1%
-Nevada	65%	35%	3.2	3%
-New Mexico	66%	34%	3.2	-0%
-Utah	75%	25%	3.6	-0%
-Wyoming	65%	35%	3.0	-2%

Change in Median Age, 2000 to 2005

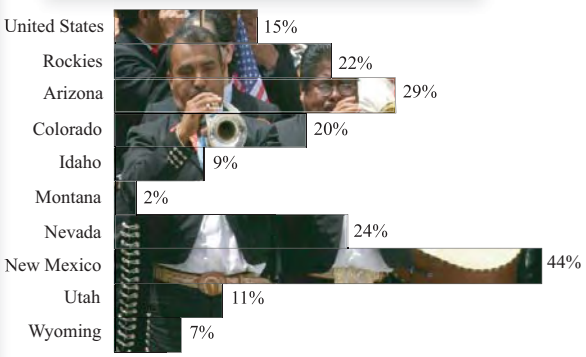
Race & Ethnicity, 2005

Percentage of Population Who Identify as American Indian or Alaska Native, 2005

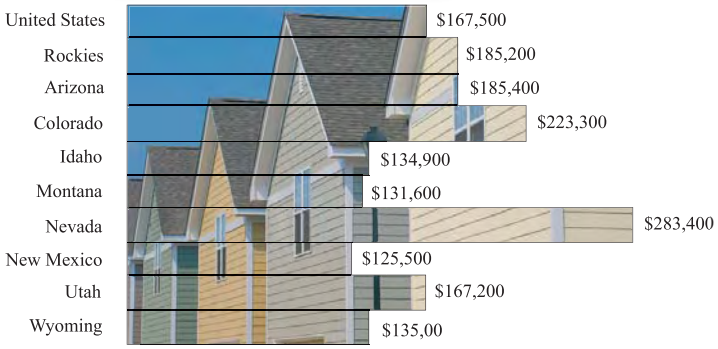


Percentage of Population Who Identifies as the Following	American Indian and Alaska Native	Black or African	White	Hispanic or Latino (any race)
United States	1%	12%	75%	15%
Rockies	3%	3%	81%	22%
-Arizona	5%	3%	76%	29%
-Colorado	1%	4%	83%	20%
-Idaho	1%	0%	92%	9%
-Montana	6%	0%	91%	2%
-Nevada	1%	7%	76%	24%
-New Mexico	10%	2%	70%	44%
-Utah	1%	1%	90%	11%
-Wyoming	2%	1%	92%	7%

Percentage of Population Who Identify as Hispanic or Latino, 2005



Median Home Value, 2005



Home Values & Costs, 2005

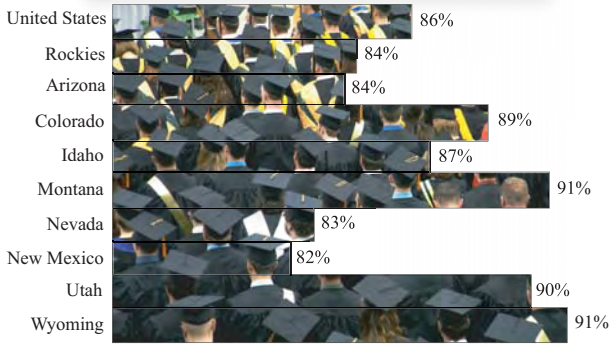
	Median Home Value	Median Home Value, Change since 2000	Median Monthly Costs for Housing Units Without Mortgage	Median Monthly Costs for Housing Units With Mortgage	Median Rent	Median Rent, Change since 2000
United States	$167,500	22%	$369	$1,295	$728	5%
Rockies	$185,200	20%	$311	$1,234	$710	1%
-Arizona	$185,400	33%	$299	$1,194	$717	1%
-Colorado	$223,300	17%	$350	$1,443	$757	-2%
-Idaho	$134,900	11%	$285	$996	$594	0%
-Montana	$131,600	15%	$326	$1,026	$552	8%
-Nevada	$283,400	74%	$371	$1,452	$861	7%
-New Mexico	$125,500	1%	$263	$1,004	$587	2%
-Utah	$167,200	-0%	$307	$1,200	$665	-3%
-Wyoming	$135,000	22%	$292	$988	$537	7%

Housing Units, 2005

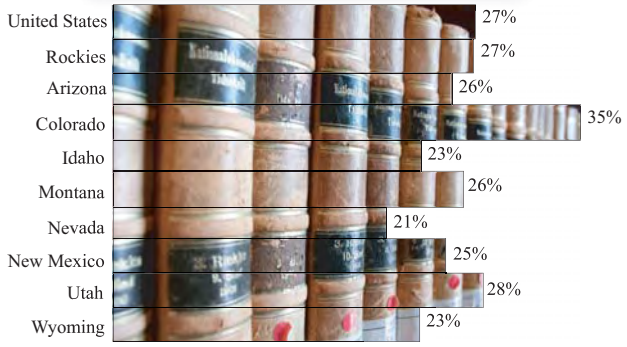
	Occupied Housing Units	Owner-occupied Units as a Percentage of Occupied Housing	Renter-occupied Units as a Percentage of Occupied Housing	Average Number of Residents in Owner-occupied Units	Average Number of Residents in Renter-occupied Units
United States	111,090,617	67%	33%	2.7	2.4
Rockies	7,554,856	68%	32%	2.7	2.4
-Arizona	2,204,013	68%	32%	2.7	2.5
-Colorado	1,819,037	68%	32%	2.6	2.2
-Idaho	532,135	71%	29%	2.7	2.4
-Montana	368,268	69%	31%	2.6	2.3
-Nevada	906,719	61%	39%	2.7	2.5
-New Mexico	727,820	69%	31%	2.7	2.4
-Utah	791,929	71%	29%	3.2	2.7
-Wyoming	204,935	71%	29%	2.5	2.2

Change in Median Home Value, 2000 to 2005

Percentage of Population 25 and Older Who at Least Graduated High School, 2005



Percentage of Population 25 and Older Who Earned Bachelor's Degree, 2005



Educational Attainment, 2000 and 2005

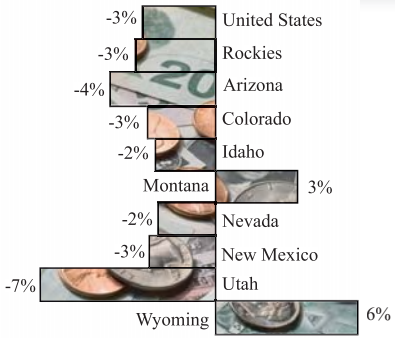
Percentage of Population 25 and Older Who at least	Earned High School Diploma (or Equivalency), 2005	Earned High School Diploma (or Equivalency), 2000	Earned Bachelors Degree, 2005	Earned Bachelors Degree, 2000	Earned Graduate or Professional Degreee, 2005	Earned Graduate or Professional Degreee, 2000
United States	86%	80%	27%	24%	10%	9%
Rockies	84%	84%	27%	25%	10%	9%
-Arizona	84%	81%	26%	24%	9%	8%
-Colorado	89%	87%	35%	33%	12%	11%
-Idaho	87%	85%	23%	22%	7%	7%
-Montana	91%	87%	26%	24%	8%	7%
-Nevada	83%	81%	21%	18%	7%	6%
-New Mexico	82%	79%	25%	24%	11%	10%
-Utah	90%	88%	28%	26%	9%	8%
-Wyoming	91%	88%	23%	22%	8%	7%

Income, 2005

	Median Household Income	Median Household Income, Change Since 2000	Mean Household Income	Median Family Income	Median Family Income, Change since 2000	Mean Family Income	Per Capita Income	Per Capita Income, Change since 2000
United States	$46,242	-4%	$62,556	$55,832	-3%	$72,585	$25,035	1%
Rockies	$45,545	-5%	$59,615	$53,790	-3%	$68,400	$23,597	1%
-Arizona	$44,282	-5%	$59,262	$51,458	-4%	$67,400	$23,365	0%
-Colorado	$50,652	-7%	$65,991	$62,470	-3%	$78,182	$27,081	-2%
-Idaho	$41,443	-4%	$51,745	$48,775	-2%	$59,387	$20,350	-1%
-Montana	$39,301	4%	$50,094	$47,959	3%	$58,774	$21,765	11%
-Nevada	$49,169	-4%	$63,103	$57,079	-2%	$71,576	$25,077	-1%
-New Mexico	$37,492	-4%	$51,325	$44,097	-3%	$58,138	$20,798	5%
-Utah	$47,934	-9%	$60,117	$54,595	-7%	$67,009	$20,814	-0%
-Wyoming	$46,202	6%	$56,436	$55,343	6%	$65,497	$23,936	9%

Median Family Income, 2005

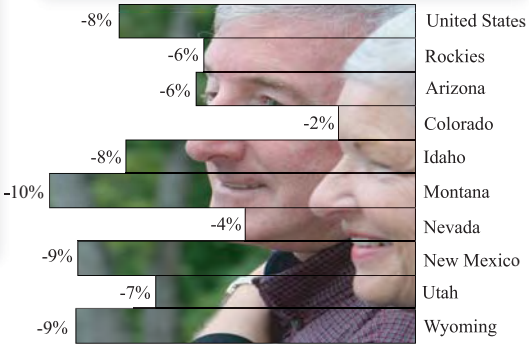
Change in Median Family Income, 2000 to 2005



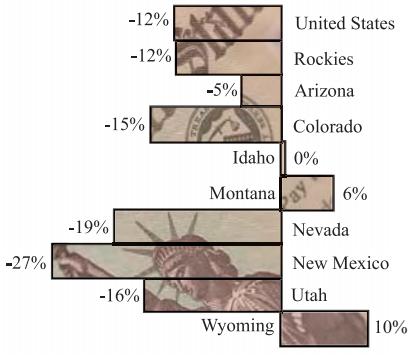
Income by Type, 2005

	Mean Earnings	Mean Earnings, Change Since 2000	Mean Social Security Income	Mean Social Security Income, Change Since 2000	Mean Retirement Income,	Mean Retirement Income, Change Since 2000	Mean Supplemental Security Income	Mean Supplemental Security Income, Change	Mean Cash Public Assistance Income	Mean Cash Public Assistance Income, Change Since 2000
United States	$63,834	-2%	$13,371	3%	$18,391	-8%	$7,148	-1%	$3,048	-12%
Rockies	$59,137	-3%	$13,405	2%	$19,651	-6%	$7,204	-1%	$2,596	-12%
-Arizona	$59,904	-1%	$14,079	3%	$19,739	-6%	$7,436	-1%	$2,843	-5%
-Colorado	$64,988	-5%	$12,967	3%	$21,755	-2%	$7,021	-3%	$2,355	-15%
-Idaho	$51,155	-4%	$13,268	2%	$16,737	-8%	$6,929	-1%	$2,104	0%
-Montana	$49,353	7%	$12,828	1%	$15,691	-10%	$7,563	8%	$2,966	6%
-Nevada	$62,213	-2%	$13,341	2%	$20,454	-4%	$7,255	-8%	$2,597	-19%
-New Mexico	$50,168	-0%	$12,294	1%	$19,388	-9%	$6,736	0%	$2,420	-27%
-Utah	$58,417	-7%	$13,858	2%	$18,907	-7%	$7,685	2%	$2,777	-16%
-Wyoming	$55,081	6%	$13,285	2%	$17,004	-9%	$7,221	-5%	$3,035	10%

Change in Mean Retirement Income, 2000 to 2005

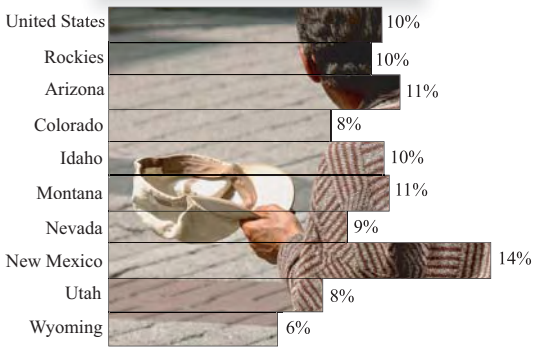


Change in Mean Cash Public Assistance Income, 2000 to 2005



Families in Poverty, 2005

As a Percentage of All Families



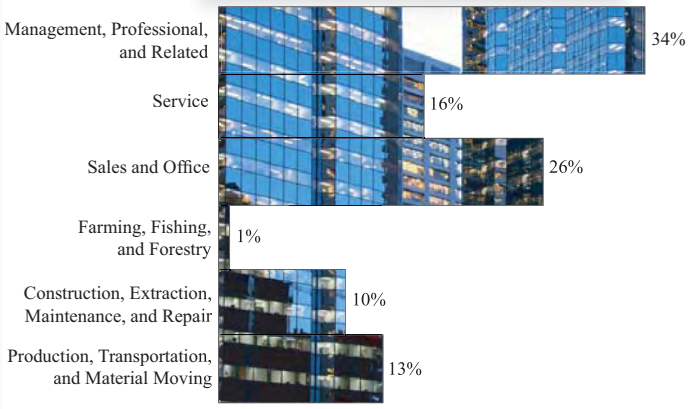
Poverty, 2000 and 2005

Percentage of the Following Groups Whose Income in the Past 12 Months is Below the Poverty Level	All Families, 2005	All Families, 2000	All People, 2005	All People, 2000
United States	10%	9%	13%	12%
Rockies	10%	9%	13%	12%
-Arizona	11%	10%	14%	14%
-Colorado	8%	6%	11%	9%
-Idaho	10%	8%	14%	11%
-Montana	11%	10%	14%	14%
-Nevada	9%	8%	11%	10%
-New Mexico	14%	15%	19%	18%
-Utah	8%	6%	10%	9%
-Wyoming	6%	8%	10%	11%

Employment by Occupation, 2005

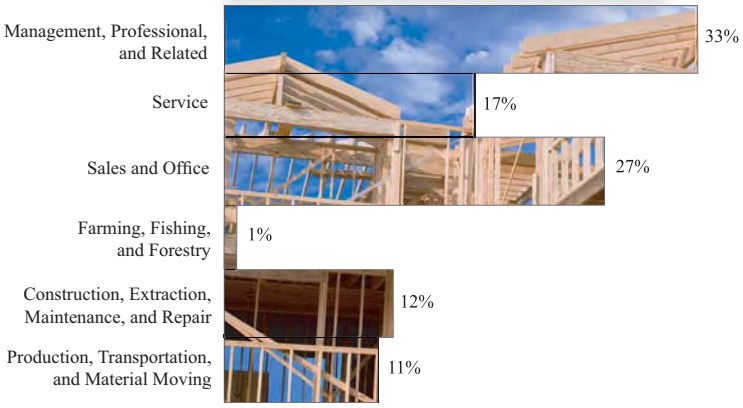
Percentage of Civilian Population 16 and Older in the Following Occupations	Management Professional and Related	Service	Sales and Office	Farming, Fishing and Forestry	Construction, Extraction, Maintenance, and Repair	Production, Transportation, and Material Moving	Employed Civilian Population 16 and Older
United States	34%	16%	26%	1%	10%	13%	136,458,810
Rockies	33%	17%	27%	1%	12%	11%	9,556,215
-Arizona	33%	17%	27%	1%	12%	10%	2,629,872
-Colorado	38%	16%	26%	1%	11%	9%	2,333,593
-Idaho	31%	16%	26%	3%	11%	13%	671,516
-Montana	32%	18%	26%	2%	12%	11%	466,509
-Nevada	25%	24%	27%	0%	14%	10%	1,161,150
-New Mexico	34%	19%	25%	1%	12%	10%	850,821
-Utah	32%	15%	29%	0%	11%	13%	1,177,505
-Wyoming	32%	16%	22%	2%	14%	13%	265,249

The United States
Employment by Occupation, 2005



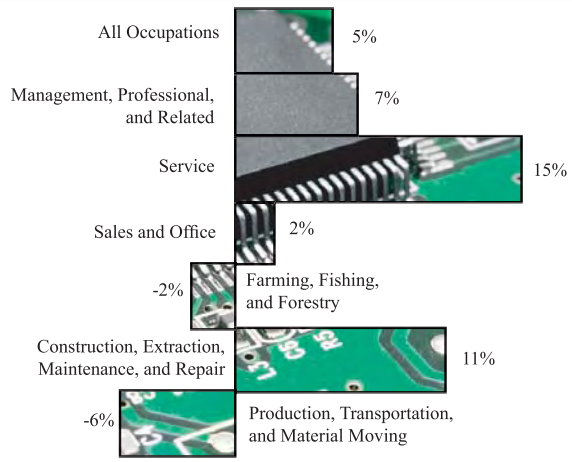
Employment Growth by Occupation, 2000 and 2005

The Rockies Region
Employment by Occupation, 2005

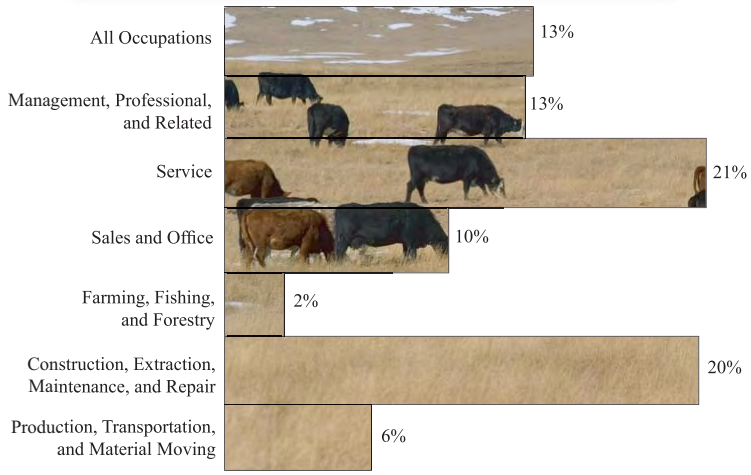


Percentage of Civilian Population 16 and Older in the Following Occupations	Management, Professional and Related	Service	Sales	Farming	Construction	Production	All Occupations
United States	7%	15%	2%	-2%	11%	-6%	5%
Rockies	13%	21%	10%	2%	20%	6%	13%
-Arizona	18%	26%	12%	2%	28%	12%	18%
-Colorado	8%	18%	1%	-5%	7%	-5%	6%
-Idaho	11%	18%	14%	11%	17%	1%	12%
-Montana	6%	14%	10%	-23%	23%	6%	10%
-Nevada	23%	21%	21%	-8%	48%	19%	24%
-New Mexico	10%	23%	7%	25%	16%	2%	11%
-Utah	11%	18%	14%	1%	13%	9%	13%
-Wyoming	19%	8%	1%	18%	5%	15%	10%

The United States
Employment Growth by Occupation, 2000 to 2005



The Rockies Region
Employment Growth by Occupation, 2000 to 2005



Employment by Industry, 2005

Percentage of Civilian Population 16 and Older Employed in the Following Industries	Agriculutre, Forestry, Fishing, Hunting, and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation, Warehousing, and Utilities	Information	Finance, Insurance, Real Estate, Rental, and Leasing	Professional, Scientific, Management, Administrative, and Waste Management Services	Educational Services, Health Care, and Social Assistance	Arts, Entertainment, Recreation, Accomodation, and Food Services	Other Services (except public administration)	Public Administration	Total Employed Civilian Population 16 and Older
United States	2%	8%	12%	4%	12%	5%	2%	7%	10%	21%	8%	5%	5%	136,458,810
Rockies	3%	10%	8%	3%	12%	5%	2%	7%	11%	19%	11%	5%	5%	9,556,215
-Arizona	1%	11%	8%	3%	12%	5%	2%	9%	11%	19%	10%	4%	5%	2,629,872
-Colorado	2%	9%	8%	3%	12%	5%	3%	8%	13%	18%	10%	5%	4%	2,333,593
-Idaho	6%	10%	10%	3%	12%	5%	2%	6%	9%	19%	9%	4%	6%	671,516
-Montana	7%	9%	5%	3%	13%	5%	2%	6%	7%	20%	10%	6%	6%	466,509
-Nevada	1%	12%	5%	3%	11%	5%	2%	7%	10%	13%	24%	4%	4%	1,161,150
-New Mexico	4%	9%	5%	3%	12%	4%	2%	5%	11%	23%	10%	5%	7%	850,821
-Utah	2%	8%	11%	4%	13%	5%	3%	7%	10%	20%	8%	5%	5%	1,177,505
-Wyoming	12%	8%	4%	2%	12%	7%	2%	5%	6%	22%	11%	5%	5%	265,249

All data, unless otherwise indicated, comes from the 2000 Census and the 2005 American Community Survey, both of which were conducted by the U.S. Census Bureau. The data are available at http://www.census.gov/.

Employment Growth by Industry, 2000 to 2005

Percentage of Civilian Population 16 and Older Employed in the Following Industries	Agriculutre, Forestry, Fishing, Hunting, and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation, Warehousing, and Utilities	Information	Finance, Insurance, Real Estate, Rental, and Leasing	Professional, Scientific, Management, Administrative, and Waste Management Services	Educational Services, Health Care, and Social Assistance	Arts, Entertainment, Recreation, Accomodation, and Food Services	Other Services (except public administration)	Public Administration	All Industries
United States	-2%	20%	-11%	3%	4%	2%	-15%	11%	12%	9%	13%	4%	6%	5%
Rockies	5%	28%	-5%	14%	12%	9%	-19%	21%	22%	16%	15%	13%	10%	13%
-Arizona	-4%	43%	-5%	19%	16%	11%	-21%	29%	22%	23%	18%	14%	18%	18%
-Colorado	5%	9%	-11%	5%	4%	4%	-25%	9%	16%	12%	15%	10%	2%	6%
-Idaho	8%	32%	-11%	6%	5%	9%	-10%	25%	30%	13%	20%	10%	22%	12%
-Montana	-6%	33%	-2%	1%	16%	2%	-16%	18%	26%	3%	8%	18%	13%	10%
-Nevada	0%	57%	20%	47%	21%	20%	-5%	35%	35%	23%	13%	30%	17%	24%
-New Mexico	14%	24%	-9%	8%	9%	-2%	-7%	8%	28%	18%	13%	-1%	4%	11%
-Utah	-2%	10%	4%	15%	15%	14%	-15%	24%	18%	16%	14%	19%	10%	13%
-Wyoming	26%	5%	-20%	6%	10%	15%	-18%	13%	10%	12%	23%	7%	-5%	10%

Challenge Essay

Democrats and Their Rocky Mountain High (Hopes):

A Close Look at Party Voting Patterns in the Eight-State Rocky Mountain West

The 2007 Colorado College State of the Rockies Report Card

By Robert D. Loevy, Thomas E. Cronin, and Jonathan M. Goldstein

For the first time since 1908, the Democratic National Convention will take place in Denver. In 1908, the Democrats nominated William Jennings Bryan for his third nomination and third resounding defeat. One hundred years later, the Democrats are hopeful for success, a hope reflected in their choice of convention location. Political strategists think Democrats could pick up a few of the eight states in the Rockies Region.

A number of factors in the region have encouraged Democrats. First, Bill Clinton won Colorado, Montana, Nevada, and New Mexico in 1992, and Arizona, Nevada, and New Mexico in 1996. However, his wins also reflected the influence of third-party candidate Ross Perot, who also did well in the Rocky Mountain region in both years, especially 1992.

Second, Democrats currently hold the governorships in Arizona, Colorado, Montana, New Mexico, and Wyoming. In 2006, Democrat Bill Ritter won nearly 59 percent of the vote in Colorado, and Democratic governors were reelected in Wyoming, New Mexico, and Arizona, receiving an impressive 70, 69, and 63 percent of the votes, respectively.

Third, U.S. Senator Ken Salazar's election in Colorado in 2004 and Montana's newly elected U.S. Senator Jon Tester have contributed to Democratic control of the U.S. Senate. Senate Majority Leader Harry Ried of Nevada was also easily reelected in 2004.

Fourth, the Rocky Mountain region is the fastest growing region in the nation, led by Nevada and Arizona and followed by Colorado, Utah, and Idaho. Although the region only has 44 electoral votes, as a block, the Rockies have more electoral votes than New England and the Northwest, as well as the recent political battleground states of Ohio and Florida.

Democrats have also won some notable U.S. House of Representatives seats in the region, including three in Arizona and two in Colorado over the past two election cycles. Recent races in Nevada, Wyoming and even in Idaho also ended up unexpectedly close.

Finally, in the last presidential race, John Kerry campaigned hard in Colorado and New Mexico and had a chance in these states. He could have won the presidency had he won Colorado, New Mexico, and Nevada. In 2000, Al Gore would have won if he had won Colorado.

Absolutely key in understanding the new Democratic strategy is this: Democratic presidential candidates are going to have to make up for their lost southern electoral votes by trying to pick off a few select Rocky Mountain States. Colorado, Nevada, and New Mexico hold promise for the party, as does Montana, however, the Democrats also face significant challenges in the region. Only 5 of the region's 16 senate seats are currently held by Democrats, as are only 11 of the 28 U.S. House seats. Party registration figures in those states that require registration reflect solid Republican loyalties except in New Mexico. In Utah, registered Republicans outnumber Democrats by about a 4 to 1 margin. In Wyoming, 62 percent of the voters register as Republicans as opposed to just 26 percent as Democrats. Colorado has a higher percentage of unaffiliated voters (30 percent) and a slightly higher percentage of Republicans than of Democrats (36 percent and 30 percent respectively). In Arizona, 40 percent of the voters register as Republicans and 33 percent as Democrats. Voters in Montana and Idaho do not require voters to register a party preference, yet Republicans plainly outnumber Democrats in those states as well – especially in Idaho.

Perhaps the most compelling challenge for Democrats is reflected in the governor, U.S. Senate, and presidential races from 1985 to 2004. As discussed later in this paper, the eight states of the Rocky Mountain West have averaged over 56 percent Republican in statewide partisan elections. These data show the Rocky Mountain West as the most Republican region in the United States, exceeding even the South, which has averaged 52.7 percent Republican votes in statewide elections over the past two decades.

Colorado is the only state in the region that has shifted towards the Democrats, although this shift is so modest that Colorado can be regarded as predominantly stable in statewide partisan voting behavior. Over the past two decades, Colorado's statewide partisan average has favored Republicans. The last Democratic president to win a real majority in Colorado was Lyndon B. Johnson in his 1964 national landslide. Arizona Senator Barry Goldwater has been the only major party nominee for president from this region. However, Goldwater only carried Arizona in the region and won his own state's popular vote by less than one percent.

As of Spring 2007, the Rocky Mountain region has produced serious contenders for each of the major parties in U.S. Senator John McCain from Arizona and New Mexico's Governor and former presidential cabinet member Bill Richardson. However, as the Goldwater case suggests, home region patriotism is not a main predictor of Election Day voting preferences.

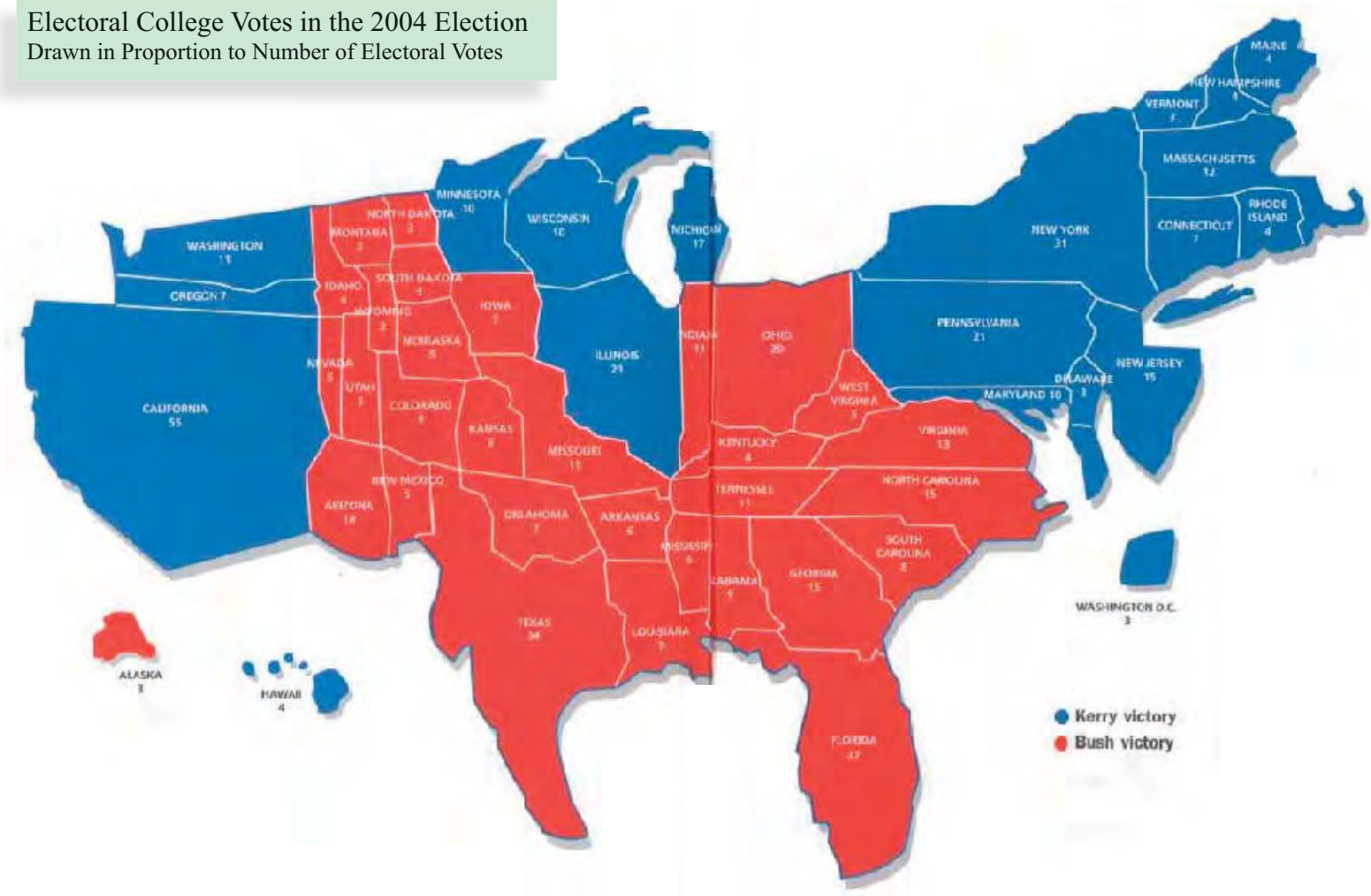
In this paper, we examine the place of the Rockies Region in the national political arena, focusing on trends in and within states. As outlined in other essays in this State of the Rockies Report, the Rockies Region is experiencing dramatic changes. One of these changes may be a shift in politics.

Voting Behavior in the Rocky Mountain West

As noted, from 1985 to 2004 the eight states of the Rocky Mountain region have averaged 56.1 percent Republican in statewide elections for U.S. president, U.S. senator, and state governor. This percentage makes the region the most Republican in the nation, which as a whole has averaged approximately 51 percent Republican. In presidential elections, the West has solidly supported Republican candidates, with Republicans winning 32 of 40 state votes

About the authors: Robert D. Loevy is Professor of Political Science at Colorado College. Thomas E. Cronin is the McHugh Professor of American Institutions and Leadership at Colorado College. Jonathan M. Goldstein is a senior International Political Economics major at Colorado College.

Electoral College Votes in the 2004 Election
Drawn in Proportion to Number of Electoral Votes



for president from 1985 to 2004. Over the same period, seven of the only eight Democratic victories occurred in 1992 and 1996, when the Republican presidential candidates were weakened by Ross Perot's candidacy.

Republican strength varies among the eight states. Idaho and Utah are two of the most Republican states in the United States, with both voting more than 60 percent Republican in statewide elections from 1985 to 2004. Nevada, however, averaged 51.7 percent Democratic and is the only state in the Rockies that falls in the Democratic category. Colorado was close behind Nevada in support for the Democrats, averaging 50.7 percent Republican from 1985 to 2004.

As in the nation as a whole, Republicans gained strength in the Rockies from 1976 to 2004. In 1976 the 20-year combined partisan average for the Rocky Mountain West was only 50.1 percent Republican, a figure that had risen to 56.1 percent in 2004. Some states gained more Republican votes than others. For instance, Utah had a notable 16 point shift to the Republicans from 1976 (50.1 percent Democratic) to 2004 (65.9 percent Republican). Colorado, however, dropped slightly from 52.3 percent Republican in 1976 to 50.7 percent Republican by 2004. Colorado is the only state in the Rockies Region to shift even slightly toward the Democrats. Although many observers characterize New Mexico as being more Democratic than Colorado, statewide data suggest otherwise. In 2004, the 20-year figure for Colorado was 50.7 percent Republican while that for New Mexico was 51.3 percent Republican. In addition, from 1976 to 2004 New Mexico shifted slightly Republican. Although Nevada is the most Democratic state in the region, it too has been trending toward the Republicans. In 1976 the 20-year partisan average for Nevada was 55.8 percent Democratic, a figure that had dropped to 51.7 percent Democratic by 2004.

If 1976 to 2004 trends extend into the future, Colorado should remain stable but continue a slow trend to the Democrats, perhaps even becoming slightly Democratic in its statewide voting behavior. The other seven Rocky Mountain states will continue moving Republican, with even Nevada possibly becoming a narrowly Republican state. Still, as mentioned above, political observers speculate that the Democrats may be able to pick up electoral votes in the Rockies in the 2008 presidential election. Their prospects are best in Colorado and Nevada and fairly good in New Mexico and Montana. The Democratic Party has selected Nevada for early caucuses in their 2008 nomination race for president.

Important political shifts have also taken place within individual states. For example, Denver and its inner suburbs have become increasingly Democratic, while other Colorado cities are becoming more strongly Republican. Throughout the region, population distributions vary widely. Colorado and Utah have large population concentrations in long urbanized corridors stretched along the bases of major mountain ranges. In Idaho, Montana, and Wyoming, populations are widely spread out in small to medium-sized cities. New Mexico is a combination of those two distributions, with a large population in the urbanized strip from Albuquerque to Santa Fe, but also substantial populations in small cities throughout the state. In Arizona and Nevada, the overwhelming majority of residents live in Phoenix/Tucson and Las Vegas/Reno, respectively.

State by State Analysis:

Table 1
Statewide 20-year election averages for U.S. President, U.S. Senator, and State Governor in the Rocky Mountain West

STATE	1976	2004	SHIFT
Arizona	54.5% R	59.8% R	5.3% R
Colorado	52.3% R	50.7% R	1.6% D
Idaho	51.4% R	61.9% R	10.5% R
Montana	54.5% D	52.3% R	6.8% R
Nevada	55.8% D	51.7% D	4.1% R
N. Mexico	51.5% D	51.3% R	2.8% R
Utah	50.1% D	65.9% R	16% R
Wyoming	54.7% R	58.8% R	4.1% R
REGION	50.1% R	56.1% R	6.0 %R

D= Democratic Percentage; R= Republican Percentage
Note, the value for 1976 is the average for all statewide elections for president, U.S. Senator, and governor from 1957 through 1976, while the value for 2004 represents that average from 1985 through 2004. The SHIFT is the percentage point change from 1976 to 2004.

Arizona

As noted in Table 1 above, Republicans have gained strength in Arizona, the third-most Republican state in the region in 2004. In 11 of 12 presidential elections from 1960 to 2004, Arizona has given its presidential electoral votes to the Republican candidate. The only deviation occurred in 1996, when third-party candidate Ross Perot split the Republican vote and enabled incumbent Bill Clinton to narrowly win Arizona.

U.S. Senator Barry Goldwater was Arizona's leading national politician in the 1960s and 1970s. A champion of conservative economic and foreign policy principles, Goldwater garnered the Republican nomination for president in 1964 but lost resoundingly to President Lyndon Johnson in the national election. Arizona stayed loyal to Goldwater but only barely, as Goldwater won his home state by a mere 4,782 votes.

However, as in other Rocky Mountain states, political upsets occasionally occur in Arizona. Democrat Bruce Babbitt was elected governor in 1978 and easily won reelection in 1982. Democrat Dennis DeConcini served 12 years in the U.S. Senate, following election in 1982 and reelection in 1988. Republicans dominated Arizona elections throughout the 1990s, but the Democrats re-emerged in 2002 when Janet Napolitano won the governorship and an easy reelection in 2006.

In Arizona, most of the voting population is concentrated in only two highly urbanized and suburbanized counties. In the 2004 presidential election in Arizona, 59.3 percent of the votes were cast in only one county, Maricopa County, which contains most of the Phoenix metropolitan area. The only other county casting more than 100,000 votes in that election was Pima County,

which includes Tucson and its suburbs. Maricopa County has a dominance of population, as well as Republicans, producing the largest Republican vote margins in Arizona and one of the largest in the Rocky Mountain West. In the 2000 presidential election, Maricopa County produced a 93,284 vote margin for Republican George W. Bush over Democrat Al Gore. In the most populous Democratic county, Pima County (Tucson metropolitan area), Al Gore held only a 23,109 margin over Bush, nowhere near enough to offset Bush's votes in Maricopa County. In 2004, Bush's margin increased in Maricopa County to 174,606.

The Tucson metropolitan area in Pima County is typical of Democratic areas throughout the Rocky Mountain West. The University of Arizona located in Tucson has attracted highly educated and economically upscale voters more likely to vote Democratic. Even though Pima County remained Democratic from 2000 to 2004, the Democratic vote margin over the Republicans dropped slightly. Al Gore received 23,109 more votes than George W. Bush in Pima County in 2000, but the Democratic margin dropped by 1,090 to 22,019 when John Kerry ran in 2004.

Arizona is one of the most firmly Republican states in the Rocky Mountain region. The prospects for the Democratic Party to win any electoral votes there in a presidential election are quite low.

Colorado

In partisan terms, Colorado is the most evenly balanced of the Rocky Mountain states. From 1985 to 2004, Colorado averaged 50.7 percent Republican in statewide elections. Although the Republicans have won most of Colorado's presidential votes, the Democrats have won some races at the gubernatorial and U.S. Senate levels. These Democrats, such as current Governor Bill Ritter and current U.S. Senator Ken Salazar, have tended to be ideologically to the right of most Democratic candidates for president.

Of the eight Rocky Mountain states, only Nevada, with a 1985–2004 statewide average of 51.7 percent Democratic, is more Democratic than Colorado. However, while Nevada has become more Republican in recent years, Colorado has trended slightly Democratic, the only state in the region to move in this direction.
County-level voting trends, especially those in Denver, help explain Colorado's slight shift to the Democrats. The city/county of Denver has long been the most Democratic part of Colorado, fitting with the national pattern whereby central cities have tended to be more strongly Democratic and their surrounding suburbs more strongly Republican. In the 2000 and 2004 presidential elections, however, the Denver suburbs of Arapahoe and Jefferson counties began to trend toward the Democrats. At the same time, Boulder County, which is home to the University of Colorado, joined Denver in strongly voting Democratic. Thus the Denver metropolitan area had more Democratic votes in 2004, but those votes were offset by equally strong gains by Republicans in populous counties at the outer fringes of Denver and in populous counties in other areas, including Douglas County (Castle Rock), El Paso County (Colorado Springs), Mesa County (Grand Junction), and Weld County (Greeley).

Although having smaller populations, Colorado's counties with major ski areas also tend to vote Democratic. Eagle County (Vail), Pitkin County (Aspen), and Summit County (Breckinridge) all voted for Democrat John F. Kerry in the 2004 presidential election. This trend can be found elsewhere in winter resort areas in the Rockies.

Thus, although Colorado has not changed its overall voting behavior dramatically in recent years, quite dynamic changes have taken place within the state's electorate. The Colorado electorate is becoming more polarized geographically along party lines. More than ever, it is the Denver metropolitan area, voting strongly Democratic, versus the remainder of the state voting predominantly Republican.

Idaho

Idaho is one of the most Republican states in the United States. In 2004 Idaho had a 20-year statewide voting average of 61.9 percent Republican, second in the Rockies only to Utah's 65.9 percent. Idaho was among just a handful of states, including Alaska, Mississippi, and Utah, with 20-year statewide voting averages in 2004 exceeding 60 percent Republican.

Idaho had not always been as strongly Republican. In 1976, Idaho had a 20-year statewide voting average of 51.4 percent Republican. In the 28 years that followed, however, Idaho's 10.5 point increase for the Republicans was the second highest in the Rocky Mountain states after Utah's 16 point shift.

However, as in other areas of the Rockies, some Democrats have had distinguished political careers in Idaho. One of the best known Idaho Democrats was U.S. Senator Frank Church, a leading liberal Democratic voice in the Senate from the mid-1950s to 1980. Another Democratic star in Idaho was Governor Cecil D. Andrus, who served two terms in the 1970s and then won two more terms in the late 1980s and early 1990s.

Republicans have won every U.S. Senate election in Idaho since 1980. In the 2004 U.S. Senate race in Idaho, the Democrats did not even run a candidate against incumbent Republican U.S. Senator Michael D. Crapo. Idaho Republicans have also won every gubernatorial race since 1990. The last time a Democrat won Idaho's presidential electoral votes was in 1964 for incumbent Democratic President Lyndon B. Johnson.

Unlike Colorado with Denver, Idaho lacks a major industrial city with large urban Democrat populations. The largest county in Idaho is Ada, which contains Boise, its suburbs, and a population of only about 300,904 according to the 2000 U.S. Census. All other cities in Idaho had less than 150,000 residents each in 2000.
Although there is no single major metropolis in Idaho, as in much of the Rocky Mountain West, the majority of Idaho residents live in urbanized areas. By county, Idaho is strongly Republican. In the 2000 and 2004 presidential elections, the Democrats won only one of Idaho's 44 counties, Blaine County, which contains the upscale Sun Valley resort. Among the other counties voting Republican in 2000, small Madison County voted 90.7 percent Republican.

However, there remains a glimmer of hope for Democrats in Idaho. As Frank Church and Cecil Andrus demonstrated, highly qualified Democratic candidates can win and then use the powers of incumbency to stay in office. The likelihood of a Democratic candidate for U.S. president winning Idaho's electoral votes, however, is remote.

Montana

Montana's small population qualifies it for only one member of the U.S. House of Representatives and three electoral votes. Although Montana contains vast areas of relatively empty territory, more than 60 percent of the state's population resides in the nine counties that contain or are near seven small cities. The majority of Montanans live in urban lives but do so in relatively small cities.

Montana has a 20-year statewide voting average of 52.3 percent Republican, making it fourth in the region after Nevada, Colorado, and New Mexico in its tendency to vote Democratic. Montana has a long history of supporting Democrats. In1976 the 20-year statewide voting average was 54.5 percent Democratic, second only to Nevada (55.8 percent Democratic) in the Rocky Mountain West at that time. Like other states in the region, Montana steadily shifted toward the Republicans from 1976 to 2004, giving that party a 6.8 point gain, comparable to the region-wide average shift of 6 points Republican.

Montanans elected Mike Mansfield as U.S. senator in 1952. Mansfield rose to become Senate Majority Leader from 1961 to 1977 and is most famous for maintaining civility in the Senate when northern liberals broke southern filibusters and enacted the Civil Rights Act of 1964 and the Voting Rights Act of 1965.

As with all the Rocky Mountain states, Montana votes strongly Republican for U.S. president, but Democratic candidates have won the state governorship and U.S. Senate seats. In 2004 Democrat Brian Schweitzer was elected governor, while in 2006 Montanans narrowly elected a second Democratic U.S. Senator to join incumbent Democrat Senator Max Baucus in Washington.

The most populous county in Montana is Yellowstone County, containing the city of Billings. Although populous by Montana standards, Yellowstone County only cast 14.4 percent of the statewide vote in the 2000 presidential election. Because it includes both the city of Billings and its surrounding suburbs, Yellowstone County votes Republican in presidential elections, and George W. Bush captured 62.5 percent of the vote in 2000.

Democratic strength is centered in Butte in Silver Bow County, the only populous county in Montana to vote (58.7%) for Democrat Al Gore in the 2000 presidential election. Only four other counties (Big Horn, Deer Lodge, Glacier, and Roosevelt) voted for Gore in 2000.

For the Republicans, Yellowstone County (Billings) and Flathead County (Kalispell) have produced large vote margins over the Democrats: George Bush had margins of 13,552 in Yellowstone County in 2000 and 16,783 in 2004 and of 14,190 in Flathead County in 2000 and 14,432 in 2004.

Yellowstone County (Billings) and Flathead County (Kalispell) are the only two counties in Montana that produced vote margins for the Republicans in excess of 10,000 votes. The Democrats' best prospect is Silver Bow County (Butte), but it only produced a 2,668 Democratic vote margin in 2000, which grew to a 2,926 Democratic vote margin in 2004. Missoula County was the only county in Montana that voted Republican in 2000 (a 4,233 Republican vote margin) but Democratic (a 2,994 Democratic vote margin) in 2004. That shift of 7,227 votes from the Republicans to the Democrats in Missoula County (Missoula) was the largest Republican-to-Democratic shift for any county in Montana between 2000 and 2004.

Lewis and Clark County (Helena) voted Republican in both 2000 and 2004, but the Republican vote margin dropped from 5,109 in 2000 to 3,777 in 2004. In Gallatin County (Bozeman), Bush won in both 2000 and 2004, but his vote margin over Gore in 2000 dropped by 2,837 votes when he faced Kerry in 2004.

If Democrats in Montana can solidify their past strong support in Silver Bow (Butte) and Missoula (Missoula) counties and can continue to make gains in Lewis and Clark (Helena) and Gallatin (Bozeman) counties, then the party may be able to win more elections in the state. Montana is a possible target for the Democratic presidential nominee in 2008, but likely only if the nominee is a moderate candidate who can appeal to Montana's middle-of-the-road voters.

Nevada

As described in Table 1, above, Nevada has been the most Democratic of the eight Rocky Mountain states for about three decades. While it too has seen shifts toward the Republicans, this 4.1-point shift in the 20-year statewide voting average from 1976 to 2004 is slightly less than the overall 6-point shift of all eight Rocky Mountain states.

Nevada presidential electoral votes have been up for grabs over the past 40 years. Democrat John F. Kennedy bested Republican Richard Nixon in Nevada in the 1960 presidential election, one of the closest in U.S. history. In another close election eight years later, however, Nevada supported Republican Nixon over Democratic candidate Hubert H. Humphrey. In 1976 Nevada voted for incumbent Republican President Gerald R. Ford over Democratic challenger Jimmy Carter. In 1992 and 1996, though, Nevada twice voted for Democrat Bill Clinton. Yet in the last two presidential elections Nevada voted for George W. Bush. The Republican margin of victory was exceptionally close in each election, with Bush winning 51.9 percent of the two-party vote in 2000 and 51.3 percent in 2004. These factors make Nevada the Democratic Party's best chance for presidential electoral votes in the Rocky Mountain West in 2008.

At the county level, Nevada in some ways resembles Arizona. While voting in Arizona is dominated by Maricopa County (Phoenix) and its Republican dominance, voting in Nevada is dominated by Clark County (Las Vegas), which strongly supports Democrats.

Clark County is large in both area and population, encompassing the southern "point" of Nevada and the cities of Las Vegas and Henderson and their suburbs. The 2000 U.S. Census placed more than 1.3 million (68.8%) of Nevada's almost 2 million residents in Clark County, and the county continues to growth rapidly.

The key question is: "Can Democrats accrue large enough margins in Clark County to offset Republican votes in the remainder of the state?" In the 2004 presidential election, John Kerry held a 26,430 vote margin over incumbent President George W. Bush. All of Nevada's 16 other counties voted for Bush, however, and those combined tallies enabled Bush to eke out a narrow victory statewide. Like Colorado with the Democratic Denver metropolitan area versus a Republican remainder of the state, Nevada has the Democratic Las Vegas metropolitan area versus a Republican remainder of the state.

In the 2004 presidential election, the Republican center of strength was Nevada's other major population area, the Reno area. Washoe County (Reno), Carson City County (Carson City), Douglas County (Lake Tahoe), and Lyon and Storey counties (eastern exurbs of Reno and Carson City) are located in the greater Reno area. The 2000 U.S. Census reported 471,702 people, or 23.6 percent of Nevada's total population, living in these areas. In the 2004 presidential election, these five counties produced a Republican vote margin of 23,232 votes, almost enough to match the 26,430 Democratic vote margin in Clark County (Las Vegas).

If the population of the five counties that comprise the Reno area are combined with the population of Clark County (Las Vegas), the total constitutes 92.4 percent of Nevada's population. Even more than Maricopa County (Phoenix) and Pima County (Tucson) dominate Arizona voting, Clark County (Las Vegas) and the five counties in the Reno area dominate Nevada voting.

Outside the Reno area, one other county produces significant vote margins for the Republican Party. Elko County in northeastern Nevada contains the city of Elko and voted 79.7 percent for George W. Bush in 2004, for a margin of 8,888 votes—the highest Republican vote margin for any county in Nevada in that race.

For Democrats, one bright spot from the 2000 presidential election to the 2004 election was the decline by nearly half in the Republican vote margin in Washoe County (Reno). While George W. Bush had an 11,543 vote margin over Al Gore in Washoe County in 2000, Bush's margin dropped to 6,704 in 2004.

If the Democrats in Nevada can maintain their stronghold of Clark County (Las Vegas) and continue to make gains in Washoe County (Reno), the party may have a more promising future in Nevada. Despite its 4.1 percent drift toward the Republicans from 1976 to 2004, Nevada remains the best place in the Rockies for Democrats to look for electoral victories.

New Mexico

New Mexico is nicknamed "The Land Of Enchantment," but to the voting behavior analyst, it might better by styled "The Land Of Contrast." New Mexico has seven counties that voted more than 60 percent Democratic in the 2000 presidential election. However, it also has 14 counties that voted more than 60 percent Republican in the same election. It is unusual to find a state in the Rocky Mountain region with such strong support for both major political parties. In most of the other Rocky Mountain states, only the Republicans can boast a significant number of counties voting more than 60 percent for their party in a presidential election. In contrast to other states in the region, New Mexico also has a number of less-populated rural counties that vote strongly Democratic.

Political observers also look to New Mexico for its strong record of voting for the winner of the popular vote in presidential elections. From 1948, when it voted for national winner Democrat Harry Truman, to 2004, when it narrowly sided with national winner George W. Bush, New Mexico has missed voting for the popular presidential winner only once. That one time was in 1976, a close national race in which New Mexico voted for incumbent Republican President Gerald R. Ford but Democrat Jimmy Carter won the national popular vote and the electoral vote.

Note that New Mexico's strong record of voting for the winning presidential candidate applies only to the popular vote winner, not to the Electoral College winner. In the hotly contested presidential election of 2000, New Mexico voted for Democratic candidate Al Gore by a mere 366 votes, a margin of less than one-tenth of one percent of the vote. Democrat Gore won the popular vote in that election but lost the Electoral College vote, and the presidency, to Republican candidate George W. Bush.

In 1976, New Mexico had a 20-year statewide voting average of 51.5 percent Democratic. By 2004, that average had shifted only 2.8 points in a Republican direction. Given this near balance between the major parties, New Mexico is considered up for grabs in presidential elections, as well as gubernatorial and U.S. Senator races. Republicans and Democrats have shared the New Mexico governorship fairly equally in recent decades. Republican Gary Johnson was elected New Mexico governor in 1994 and reelected in 1998. In 2002, the Democrats won the governorship with Bill Richardson, who was easily reelected in 2006 and promptly announced his candidacy for president in 2008.

In the U.S. Senate, New Mexico voters have recently been returning a popular Republican Senator, Pete V. Domenici, to Washington, just as they have popular Democratic Senator, Jeff Bingaman. Republican Domenici, first elected to the U.S. Senate in 1972, is one of the most popular Republicans in New Mexican history and has been reelected to the U.S. Senate five times. Democrat Bingaman has almost as impressive a record. He was first elected to

Gov. Bill Richardson addressing the 2005 State of the Rockies Conference

the U.S. Senate in 1982 and has been re-elected four times.

At the county level, 50 percent of the voting population resides in only three counties. The largest is Bernalillo County, which contains the central city and inner suburbs of Albuquerque, the most populous city in New Mexico. Next in size is adjacent Santa Fe County, which comprises the Santa Fe metropolitan area. The third center of voting strength is Dona Ana County, which includes the city of Las Cruces and the portion of New Mexico closest to El Paso, Texas. Dona Ana County, although much less well-known, casts almost as many votes as Santa Fe County.

In the 2000 presidential election, Bernalillo, Santa Fe, and Dona Ana counties cast 50 percent of the vote in New Mexico and also were centers of Democratic strength. Santa Fe County delivered a Democratic vote margin of 18,043 votes to Al Gore, while Bernalillo County (Albuquerque) and Dona Ana County (Las Cruces) added Democratic vote margins of 4,212 and 2,649, respectively.

A number of small rural counties also voted Democratic in the 2000 presidential election. Principal among these was Taos County (Taos City and Taos Pueblo) which provided the Democrats with a 4,295 vote margin despite its relatively small population. Other counties in the Democratic column in the 2000 presidential election were Cibola, Grant, Guadalupe, McKinley, Mora, Rio Arriba, San Miguel, and Socorro counties, all of which have relatively small populations, in rural and small town areas.

Because Bernalillo County includes the city of Albuquerque and its suburbs, it is not exclusively Democratic in its voting behavior. Republicans can win elections in New Mexico by using suburban votes to cut into Democratic margins in Bernalillo County and by doing well in the more rural areas to win the state. Popular Republican candidates in New Mexico often carry Bernalillo County on their way to statewide victory.

Good news for Democrats in New Mexico is that Bernalillo County voted more strongly for Democrat John Kerry in the 2004 presidential election than it did for Al Gore in 2000. The Democratic vote margin of 4,212 in Bernalillo County in 2000 more than doubled to 10,798 in 2004.

Republican voting strength in New Mexico is found in a number of less-populous rural counties scattered around the state. Foremost among these is San Juan County, which is in the northwest corner of New Mexico and contains the city of Farmington. San Juan County had a Republican vote margin of 9,454 in the 2000 presidential race, which increased to 14,682 in 2004.

The second most Republican county in New Mexico is Lea County (Hobbs), located in the southeast corner of the state along the Texas border in an area known as "Little Texas." Lea County gave George W. Bush a 6,302 vote advantage in 2000 and upped that substantially to a 10,784 Republican vote margin in 2004.

Other small rural counties that produced Republican vote margins of more than 1,000 votes in both the 2000 and 2004 presidential elections were Chaves (Roswell), Curry (Clovis), Eddy (Carlsbad), Lincoln, Otero (Alamogordo), Roosevelt, Sierra, and Torrance counties, all located in southern and southeastern New Mexico. In every one of these counties, George W. Bush's vote margins increased from 2000 to 2004.

The general trend in New Mexico is for increased Democratic voting in the Albuquerque–Santa Fe corridor and for continued Republican dominance in the remainder of the state. This Democratic Albuquerque–Santa Fe versus other Republican parts of the state gives New Mexico an almost even balance between the two major political parties and its legendary ability to "swing" with the national winner. New Mexico has long been a "battleground state," a status that should continue in the future.

Utah

Utah is one of the most Republican states in the United States. From 1985 to 2004, its statewide voting average was 65.9 percent Republican, 4 points higher than the second most Republican Rocky Mountain state, Idaho, and also exceeding Mississippi, the most Republican of the southern states. Utah was not always so Republican. From 1957 to 1976, Utah had a nearly perfect balance between the two major political parties of 50.1 percent Democratic. From 1976 to 2004, Utah's 20-year statewide voting average moved 16 points in favor of the Republicans. Only southern states such as Mississippi (34.4 points Republican) and Alabama (19.6 points Republican) made such dramatic shifts between 1976 and 2004.

The Republicans have long dominated in Utah at the presidential level. The last time Utahans voted Democratic in a closely contested presidential election was in 1948 for President Harry S. Truman over Republican challenger Thomas E. Dewey. In the ensuing 56 years, the only other time Utah voted Democratic for president was in 1964, when incumbent Democratic President Lyndon B. Johnson routed Republican U.S. Senator Barry Goldwater. In the 2004 presidential election, George W. Bush defeated John Kerry in Utah with a thumping 73.3 percent of the vote.

The bright spot for Utah Democrats used to be the governorship. From 1964 to 1984, two Democrats, Calvin L. Rampton (1964–1976) and Scott M. Matheson (1976–1984), occupied the governor's office. Since 1984, however, Republicans have occupied Utah governor's chair, all elected by comfortable majorities in excess of 55 percent or more Republican. The current Republican governor, John Huntsman, Jr., won with 58.3 percent of the vote. In the U.S. Senate, the most recent Democratic U.S. senator from Utah was Frank Moss, who left office in 1982.

Utah resembles Colorado in that the vast majority of the state's population is located in an urbanized strip running along the foot of a long north-to-south mountain range. In the 2000 presidential election, 81.1 percent of the vote in Utah was cast in this corridor running from Provo in the south to Ogden, Brigham City, and Logan in the north and spanning the counties of Utah (Provo), Salt Lake (Salt Lake City), Davis (Farmington), Weber (Ogden), Box

Elder (Brigham City), and Cache (Logan).

Democrats are more likely in the Provo-to-Logan urbanized strip, where city Democratic votes are counterbalanced by suburban Republican votes. However, even Salt Lake County, which contains Salt Lake City, the largest metropolis in the state, voted 61.5 percent for George W. Bush in 2000. The rest of the counties in the Provo-to-Logan strip were even more Republican in 2000, and all of the corridor counties increased their Republican vote margins from 2000 to 2004. In Garfield County in south-central Utah, 90.6 percent of voters voted Republican in the 2000 presidential election.

For the Democrats, the strongest county is Carbon (Price), located across the mountains to the east of Provo. Still, this railroading and mining center voted 53.3 percent for George W. Bush. The Republican vote margin of only 460 votes in Carbon County (Price) in 2000 increased to 1,535 in 2004. Democrats can hope to carry this strongly Republican state only in the case of a national Democratic presidential landslide.

Wyoming

In 1976, Wyoming was the most Republican of the eight Rocky Mountain states, with a 20-year statewide voting average of 54.7 percent Republican. By 2004, this average had increased to 58.8 percent Republican. Yet large Republican gains in other Rockies states have now placed Wyoming as the fourth "most Republican state" in the Rockies.

As in a number of other Rocky Mountain states, the last Democrat to win Wyoming in a presidential election was Lyndon Johnson over Barry Goldwater in 1964. However, as in other Rockies states, Democrats have enjoyed electoral success in Wyoming in the governor's office. Ed Herschler served as governor from 1974 to 1986. He was followed by another Democrat, Mike Sullivan, from 1986 to 1994. The Republicans took over the governorship for the next eight years, but then the Democrats reclaimed it with Dave Freudenthal in 2002.

The Democrats have had no such luck when it comes to the U.S. Senate in Wyoming. The last Democrat to serve Wyoming in the U.S. Senate was Gale McGee, who left office in 1976. Wyoming's best-known political celebrity is Republican Richard Cheney, who served 12 years as the state's lone member of the U.S. House of Representatives, starting in 1978. Cheney went on to become the U.S. Secretary of Defense in the first Bush Administration and Vice President in the second Bush Administration.

In terms of population distribution, Wyoming resembles the two adjoining states of Idaho and Montana in that it has no major metropolis or highly populated urban corridor. The state's citizens are spread out in nine small cities in nine counties that contained 72.6 percent of Wyoming voters in the 2004 presidential election.

The most populous city is the state capital, Cheyenne, located in Laramie County, but that county contained only 16.5 percent of the state's population at the time of the 2000 U.S. Census. Cheyenne thus in no way dominates the state's voting. Laramie County (Cheyenne) voted 66.3 percent Republican in the 2004 presidential election. Similar to most other counties containing small cities throughout the Rocky Mountain West, Laramie County (Cheyenne) is decidedly Republican.

Although Cheyenne is in Laramie County, the city of Laramie is in Albany County. As home to the University of Wyoming, Albany County has a somewhat less Republican character than Laramie County (Cheyenne). Whereas Laramie County (Cheyenne) voted 66.3 percent Republican in the 2004 presidential election, Albany County (Laramie) voted only 55.9 percent Republican in that election.

Teton County, location of the Grand Teton Mountains and the sophisticated resort city of Jackson, is the only Wyoming county that voted for Democrat John Kerry in 2004. As noted above, other Rockies resorts, including Vail, Aspen, and Breckinridge in Colorado and Sun Valley in Idaho, also have a large Democratic base. Table 2 summarizes the 2004 presidential election results in Wyoming's most populous counties

More than any other state in the Rocky Mountain West, Wyoming remained steadily Republican from 1976 to 2004. It will most likely continue to be one of the most Republican states in the Rocky Mountains as well as nationwide.

Table 2
The Nine Most Populous Counties in Wyoming with their Percentage Two-party Vote in the 2004 Presidential Election

Albany	55.9% Republican
Campbell	83.4% Republican
Fremont	68.2% Republican
Laramie	66.3% Republican
Natrona	68.6% Republican
Park	78.4% Republican
Sheridan	70.4% Republican
Sweetwater	67.2% Republican
Teton	53.8% Demoractic

Metropolitan Areas and Notable House Seats in the Rocky Mountain West

While romanticized notions of the Rocky Mountain West portray its people as farmers, cowboys, and ranch hands, 83 percent of the region's population lives in and around a handful of sprawling metropolitan areas. As these cities expand—many at some of the fastest rates nationwide—they increasingly define the politics of their respective states. A look at recent presidential voting trends in seven large metropolitan areas dramatizes the changing politics of the Rocky Mountain West and may help predict the region's future political landscape. This section examines presidential election results in Phoenix, Tucson, Denver, Colorado Springs, Las Vegas, Albuquerque, and Salt Lake City for the three general elections from 1996 to 2004 (Figure 1). It also looks at six of the region's most hotly contested 2006 congressional races to suggest possible 2008 general election outcomes.[1]

Overall, the electorate of the seven targeted metropolitan areas shifted four percent to the Republican Party nominee. On average, Republican presidential candidates could rely on roughly 52 percent of the vote from these voters. The most conservative of the seven metropolitan areas is Colorado Springs, which on average voted 67 percent Republican. Conversely, the most liberal urban area was Tucson, where Republican nominees on average garnered only about 45 percent of the vote. Overall, four of these metropolitan areas leaned Democratic and three Republican.

Not a single metropolitan area shifted towards the Democrats between 1996 and 2004, as anticipated when Ross Perot abandoned his presidential aspirations and traditional Republicans flocked back to GOP nominees. Nonetheless, some cities were more resistant than others to this rightward trend, most notably Denver and Albuquerque which both shifted less than one percent to the Republican column. Interestingly, the Denver suburbs shifted only 1.3 percent to the right during this time. To some analysts, this tiny shift suggests a greater statewide leftward shift in Colorado. While the presidential vote may not yet support the argument for an increasingly "blue" Colorado, the state's 2006 congressional results provide more hope for Democrats.

The most pronounced shift in voter sentiment occurred in Salt Lake City, which in 1996 gave Bob Dole only 52 percent of its vote but in 2004 sided with George W. Bush by 62 percent. In three election cycles, the Salt Lake metropolitan area, including Summit and Tooele counties, experienced a 10 percentage point shift to the right, with the GOP going from earning just over half of the city's total vote to nearly two-thirds. This shift can be attributed largely to the popularity of George W. Bush and his very public championing of the religious principles embraced by city's socially conservative Christian voters. Predictably, Salt Lake's large socially and religiously conservative populous has been increasingly attracted to Republican presidential nominees as the GOP has drifted rightward from moderate Bob Dole to conservative George W. Bush.

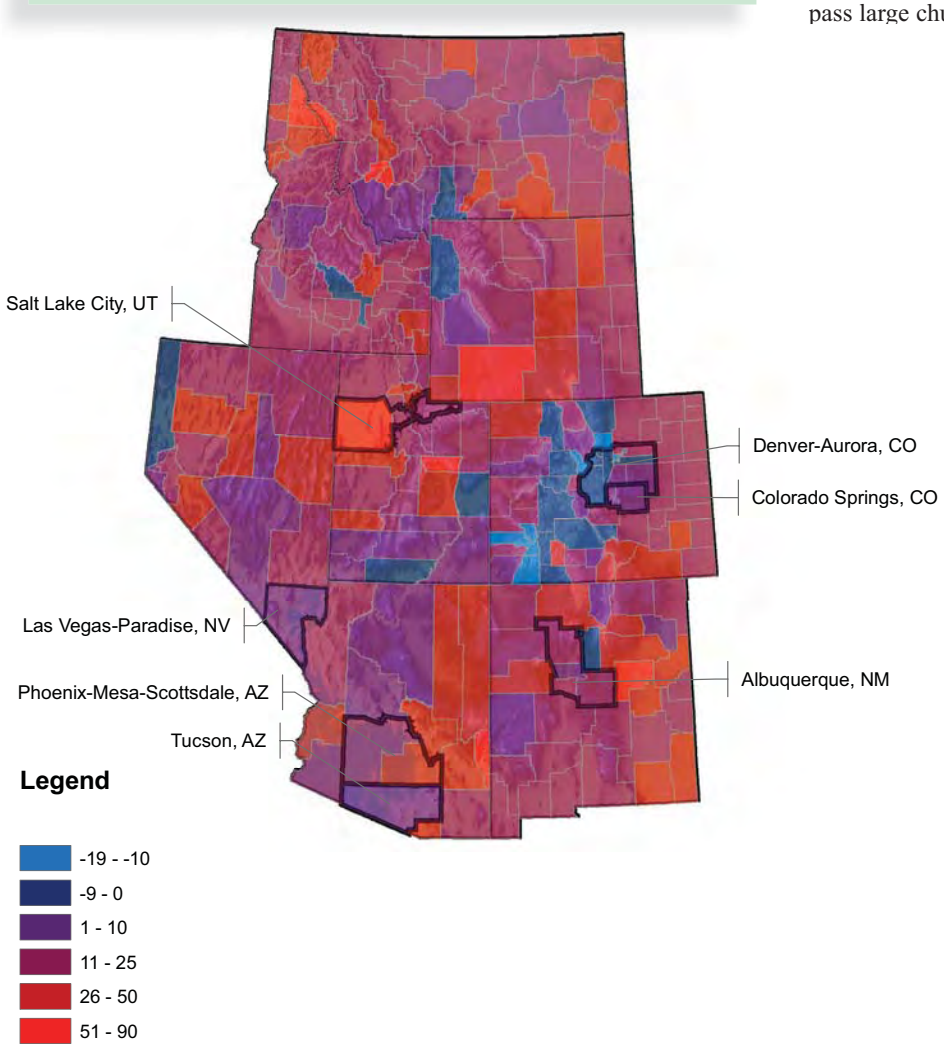
Like Salt Lake, the Phoenix metropolitan area has also experienced a substantial, though more gradual, shift to the right. Arizona's largest city gave Dole 51 percent of its vote in 1996, 55 percent to Bush in 2000 and 57.5 percent to Bush during his 2004 reelection bid. Overall, the city and its suburbs moved about 6.5 percentage points to the right, the second largest shift among metropolitan areas in the Rocky Mountain West. This shift reflects an increasing number of retirees migrating to the Scottsdale–Phoenix–Mesa area. Lured by warm weather, green fairways, and scenic developments, this

group is certain to grow as more Baby Boomers reach retirement age and affect Arizona's future political landscape.

No analysis of dramatic change would be complete without mentioning Las Vegas, one of America's fastest growing areas. Between 2000 and 2005, the Las Vegas metropolitan area (roughly defined as Clark County) has grown a stunning 25 percent as nearly 400,000 new residents have moved to this desert metropolis. For all its growth, Las Vegas is also one of the West's most liberal areas. Since 1996, only 46 percent of its votes on average have gone to Republican presidential candidates. With more than 1.7 million people (70 percent of the state's total population), Las Vegas increasingly dominates Nevada politics. Furthermore, the new early timing of the Nevada caucuses in the upcoming 2008 presidential nominating process has heightened its significance and will push it further into the national political spotlight.

In 2006, the seven metropolitan areas examined here—Phoenix, Tucson, Denver, Colorado Springs, Las Vegas, Albuquerque, and Salt Lake City—had some of the nation's most hotly contested congressional races. We conclude with an analysis of six of these election contests and their implications for the 2008 election cycle.
Before considering these races, it is important to note a few analytical benchmarks. First, although it is tempting to compare 2006 congressional election results to the presidential results of 1996, 2000, and 2004, congressional and presidential races differ greatly. Generally, voters may feel a more personal relationship with their members of Congress; unlike presidential candidates, congressional candidates are "locals" and thus more often immunized from national political trends. Moreover, congressional redistricting over the past few decades has increasingly locked in Democratic and Republican strongholds, rendering more and more districts non-competitive.[2] Therefore, we assess the 2006 midterms mainly to suggest possible future trends.

Figure 1
County and MSA Percent Change in Votes for a Republican Presidential Candidate, 1996-2004
Source: Data collected and generously provided by Robert J. Vanderbei, Ph.D.



Note: a negative percentage indicates a shift in voting trends toward the Democratic Candidate

Second, because of the strong disapproval of both the current Bush administration and the war in Iraq, 2006 was a dominant Democratic year nationwide. Analysts have identified several off-year elections over the last few decades in which opposition parties (defined as either the party in the congressional minority or the party not in control of the White House or both) were able to successfully nationalize election campaigns, as in 2006.[3] Nationwide, Democrats gained six Senate and 31 House seats for control of both chambers of Congress. Thus, because the 2006 numbers may have represented more of a disapproval of Republicans than a swing toward Democrats, the data from that race may be more of an anomaly than prologue. However, the six House races analyzed may still suggest larger trends shaping the Rocky Mountain West's political landscape.

Of these six races, two were in Arizona, two in Colorado, and one each in Nevada and New Mexico; all of these districts encompass large chunks of suburban counties. Demographically, each of these districts is closely representative of the Rocky Mountain West as a whole, with mostly suburban constituencies and a roughly 15–20 percent Hispanic population base. As some of the most competitive races in the country, these districts also were some of the most expensive.[4] Such ultra-competitive high-stakes races are similar to competitive presidential campaigns. Finally, it is highly likely that many of the same hot-button issues that shaped 2006 congressional races—among them the Iraq War and immigration reform—will likely remain key issues for voters in 2008.

In Colorado…

Three of these six House races suggest that the West is increasingly turning towards the Democratic Party. In Colorado's 7th congressional district, state representative Ed Perlmutter defeated Rick O'Donnell to gain the seat previously held by Republican gubernatorial candidate Bob Beauprez. Although John Kerry won Colorado's 7th in 2004, his 3 percent win margin paled in comparison to Perlmutter's impressive 13 point (nearly 23,000 vote) margin of victory. In 2002, the Democratic candidate lost this House seat by only 121 votes and the 7th gained a reputation as Colorado's most competitive district. Nonetheless, Perlmutter's impressive performance in 2006 bodes well for Democrats hoping for Colorado's electoral votes in 2008.

At the same time, Democrats did not fare as well in Colorado's 4th congressional district (which includes some of Denver's outer northeastern sub-

urbs). Although incumbent Republican Marilyn Musgrave failed to gain a majority of the district's votes—losing significant support to Reform Party candidate Eric Eidsness, who garnered 11 percent of the total vote—she nonetheless earned a 3-point victory over Democrat Angie Paccione. The year's anti-Republican character was perhaps best shown in this district. While Musgrave garnered five percent less of the vote than she did in 2004, Paccione effectively lost votes, ending with two percent less than Democrat Stan Matsunaka achieved against Musgrave in 2004. Thus while many voters in Colorado's 4th were clearly frustrated with the Republican-controlled Congress, they were simply unwilling to vote for a Democrat, instead supporting third-party candidate Eric Eidsness—even though Eidsness had little chance of winning. While Musgrave's win should come as no surprise, the inability of Democrats to make any significant gains in this district in such a Democratic friendly year and with a viable candidate suggests that parts of the Rocky Mountain West may simply be off-limits to Democratic candidates.

In Arizona…

While Arizona may remain a Republican stronghold for the foreseeable future, the state, and more specifically suburban Phoenix and Tucson, hosted two important victories for Democrats in the past election cycle. In Arizona's 8th district, a seat that only four years ago Democrats lost by almost 60,000 votes, Democratic state senator Gabrielle Giffords defeated Republican Randy Graf by slightly more than 25,000 ballots, a dramatic 85,000 vote swing. To the north, in Arizona's 5th surrounding the Phoenix area, incumbent Republican J.D. Hayworth was defeated by Democrat Harry Mitchell. Hayworth spent almost twice as much as Mitchell but still came up about four percentage points short of victory in a district where just two years prior George W. Bush won by a solid nine percent.

While many analysts saw Hayworth's loss as another example of the nation's unhappiness with the Republican-controlled Congress, Harry Mitchell's victory cannot be attributed exclusively to an anti-Republican environment. Overall, Mitchell gained 12 percent more votes than Democrat Elizabeth Rogers managed in 2004. The success of Democrats Mitchell and Giffords may portend a growing challenge for Arizona Republicans, signifying that voters in these previously secure GOP districts may be willing to vote for Democrats. This trend may prove perilous for Republican challengers in 2008 since many of the issues that dominated campaigns in 2006 are likely to remain central in voters' minds in 2008.

In Nevada…

Democrats also showed important gains in Nevada's fast growing 3rd congressional district. This suburban Las Vegas district accounts for much of the state's 66 percent population growth of the 1990s. Last year, incumbent Republican Jon Porter won a costly and close race against Democrat Tessa Hafen. A former press secretary and senior aide to Senate Majority Leader Harry Reid, Hafen was easily outspent by Porter, but nonetheless came close to defeating the two-term incumbent.

Overall, Hafen's 47 percent of the vote represents a significant gain for Democrats. She lost to Porter by only one percent and, critically, surpassed the dismal 40 percent of the vote achieved by Democrat Tom Gallagher in 2004. Although the district's demographics continue to change, many of the new residents are white-collar families and elderly retirees, both traditionally Republican voting groups. As such, the district may be a bellwether of which political party will come to dominate the suburban Rocky Mountain West.

In New Mexico…

It is noteworthy that while Democrats made gains in the Rocky Mountain West in 2006, most incumbent Republicans retained their seats even in that anti-Republican year. Perhaps best exemplifying this success was Heather Wilson's extremely close victory (by just 879 votes out of more than 200,000 cast) over challenger New Mexico Attorney General Patricia Madrid in a district that in 2004 tilted slightly to Democrat John Kerry. In the end, Wilson's resume—including extensive military experience—was probably enough to secure her reelection in a heavily military-oriented district. Madrid's strong showing in a historically Republican district coupled with her overall statewide popularity could bode well for her if, as some anticipate, she runs for the open U.S. Senate seat in 2008.

Conclusion

Overall, the Rocky Mountain West remains a Republican region, with voting trend data over the past two generations—and over the past few presidential election cycles—suggesting Republican gains, not losses. However, variation exists both within and among the Rocky Mountain States. Moderate Democrats can and do win statewide races in many states, though rarely in recent years in Utah, Wyoming, and Idaho. Democratic presidential and electoral prospects are somewhat promising in Nevada, New Mexico, and Colorado yet less promising in Montana and rather improbable in Arizona, Idaho, Utah, and Wyoming, unless a national Democratic landslide takes place, such as those that occurred in 1936 and 1964.

Thus, Democratic strategists will most likely target Nevada, New Mexico, and Colorado, focusing in on the Denver metropolitan area, greater Las Vegas (Clark County, Nevada), and the metro region from Santa Fe to Albuquerque in New Mexico. Ski resort communities and university counties also favor Democratic vote gains. Thus, Boulder, Denver, Albuquerque, Las Vegas, Aspen, Taos, Vail, and similar communities are trending Democratic in contrast to most rural areas and places such as Colorado Springs and northern Nevada.

Democrats have won a handful of congressional and Senate seats in the past two election cycles. While there is thus hope for the party, Democrats, even with these several new seats, only control 36 percent of this region's overall delegation (of 44 seats) in Congress.

No one knows whether the 2004 and 2006 Democratic gains represent a trend or are merely a temporary deviation (or even blip) in the partisan make up of this region. And we probably will not know for another two or three more election cycles. Yet what we do know is that the Democrats, if recent national patterns hold, will have to pick up at least two or three states in this region to secure an Electoral College victory.

Republicans are well aware of this and will likely redouble their efforts in the three most competitive states. Plainly, while the Rocky Mountain region comprises just 7 percent of the nation's population, its clout in the Senate (16 percent) and now in the Electoral College give the region prominence.

Endnotes

[1]Before addressing the data, it is important to note a key variable. Republican presidential candidates have preformed better nationwide in each election since Bob Dole's 1996 defeat to Bill Clinton in large part due to independent candidate Ross Perot's exit from the ballot after his impressive 1992 and 1996 showings. While Dole managed only 40 percent of the popular vote in 1996, Bush won about 48 percent in 2000 and achieved a slim 51 percent majority in 2004. Since we should expect an increase in the Republican vote, it is important to focus on the regions that have been least resistant to this rightward drift.

[2] The noncompetitive nature of many House races results (with some candidates even running unopposed) skews analyses of election results. For example, without controlling for Democrat Diana DeGette's uncontested reelection in Colorado's 1st congressional district, aggregate data would be contaminated by adding a 100 percent margin win for the Democratic candidate.

[3]Previous examples of so-called nationalized congressional elections include the Watergate-infused campaign of 1974, when Democrats overwhelmed Republicans coast to coast, and the "Contract with America" race in 1994, when Republicans took control of the House of Representatives for the first time in more than four decades.

[4]Aggregate spending by Republican and Democratic candidates in these six races surpassed a stunning $32 million. The Wilson-Madrid race in New Mexico alone cost a whopping combined $8.3 million.

[5]It should be noted that in 2001, Colorado Democrats gained majority control of the state Senate for the first time in 40 years and with it the state's congressional redistricting authority.

[6]Six-term incumbent Republican Senator Pete Domenici will be 76 in 2008 and reportedly is considering retiring.

How the West is Wired

Broadband Connectivity in the West

By D. Corwin Jackson, guest contributor

In Ten Sleep, a rural Wyoming town of roughly 300 residents, a state of the art high-speed communications network is allowing teachers to instruct language students on the nuances of English pronunciation over the Internet.[1] Their students, however, do not live in Ten Sleep or even in Wyoming. They live over 5,800 miles away in South Korea. High quality video conferencing enables teachers in Ten Sleep to *show* their students how to make English language sounds. South Korea has one of the most advanced "broadband" networks in the world, with residents enjoying fiber-optic connections to the Internet and extremely high-speed service. Ten Sleep is served by a similar network. Few such services exist elsewhere in the Rocky Mountain region, giving Ten Sleep a surprising advantage over other Rockies rural populations in attracting business opportunities such as the fledgling distance learning program.

Connectivity may revitalize the Rockies' existing communities and redefine their future in a globalized world while still accommodating local ideals. Many policymakers have linked broadband connectivity to economic development and growth. According to Federal Communications Commission (FCC) Chairman Kevin Martin,

> *Broadband technology is a key driver of economic growth. The ability to share increasing amounts of information, at greater and greater speeds, increases productivity, facilitates interstate commerce, and helps drive innovation. But perhaps most important, broadband has the potential to affect almost every aspect of our lives.*[2]

While the promise may be extraordinary, broadband availability in the United States lags behind that in many other nations. The Organization for Economic Co-operation and Development (OECD) reports that the United States, despite being home to many of the inventors of broadband technology, ranks 12th among OECD members in the number of broadband subscribers per 100 inhabitants.[3]

Understanding the current distribution and uses of domestic broadband services is critical as policymakers look to broadband technology as an engine for innovation and prosperity. This section of the *State of the Rockies Report Card* outlines what is meant by broadband service: a term used to describe high-speed Internet access. It then frames the burgeoning policy debate by describing some of the history driving the broadband discussion in the United States, and reasons why broadband connectivity matters. Finally, data from the FCC showing the state of the broadband market in the Rockies Region are presented. The data show robust competition for broadband consumers in some parts of the region. Though the data are not without problems, an empirical understanding of the state of this communication market is critical to crafting policies to promote connectivity in all parts of the Rockies.

Broadband and its Applications

Broadband is a central term in modern communications technology, policy, and colloquy. Like the name suggests, a broadband system has a wide band of frequencies (or a wide "bandwidth") for transmitting information. Wider bandwidth allows more information to be sent in shorter periods of time. For example, broadband connections allow information from the Internet to be more rapidly delivered to a user compared with older dial-up modem connections.

Definitions of what constitutes broadband vary. In general, however, broadband systems range from 200 kilobits per second ("kbps", or thousands of bits of information per second) at the low end, to between 1 and 5 megabits per second ("mbps", or millions of bits per second) for most commercial services. More advanced platforms, such as the network that serves Ten Sleep, Wyoming, can provide speeds as high as 100 mbps.

Broadband service is available over a variety of physical platforms. Americans most commonly subscribe to a cable modem service, which transmits data over a coaxial cable television system, or to a Digital Subscriber Line (DSL) service, which transmits data over a standard telephone line. Next-generation wireline connections include dedicated fiber-optic lines and broadband over power lines. Consumers may also subscribe to wireless services, both satellite and ground-based. Finally, cellular telephone companies are rapidly deploying *mobile* broadband services.

The applications offered by broadband telecommunication services are even more diverse. Consumers seek entertainment by watching their favorite television shows online, as well as parodies of those shows posted on YouTube. Firms try to increase productivity and security by storing critical data in remote locations connected by broadband links.

About the author: Cory Jackson is corporate counsel for the Tri County Telephone Association in Basin, Wyoming, and a 2002 graduate of Colorado College. Any views expressed herein are the author's own.

Finally, broadband affects lifestyles. Broadband connectivity is influencing the design of novel communities in the Rockies Region. Mesa del Sol is a planned community near Albuquerque, New Mexico, designed by Peter Calthorpe based on the principles of New Urbanism—a movement to transform urban centers and combat suburban sprawl and traffic congestion by creating walkable communities that integrate various businesses, services, and housing options around vibrant community centers. Central to this goal is Mesa del Sol's connectivity. High-quality Internet connections allow residents to videoconference with co-workers and clients around the world, without the personal sacrifice and energy dependence of commuting and extensive travel.[4] Connected communities need not be planned to facilitate such travel, nor is proximity to traditional commercial centers of primary concern.

Broadband Statistics and Policies

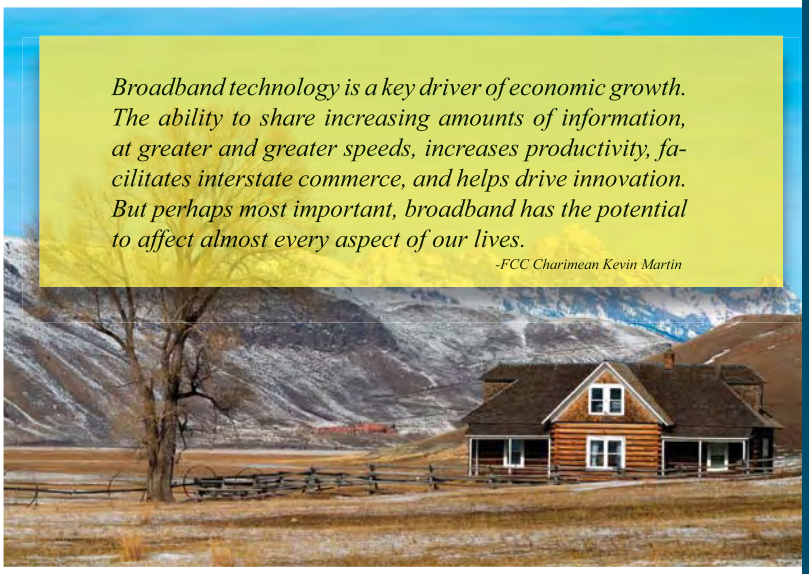
By many accounts, broadband service has the potential to improve the lives of Rockies' citizens. As noted above, the United States still lags behind a number of other countries in terms of broadband deployment. Thus, it is important to collect and examine statistics on broadband distribution to monitor our nation's connectivity: the current state of broadband deployment should guide policymakers who may regard the service as a tool for economic and social development.

For example, as part of a broader scheme announced in 2004 touted to promote economic growth and socially beneficial applications, President George W. Bush set a goal of "universal, affordable access to broadband technology by 2007."[5] The 2008 presidential candidate Barack Obama has suggested a system of "broadband lines through the heart on inner cities and rural towns all across America."[6] In 2006, Senator Hillary Clinton also proposed the Rural Broadband Initiative Act to encourage rural broadband availability.[7] Policymakers often promise that broadband will promote economic development and enhance social welfare. When it comes to implementing policy to achieve such availability, however, proposals differ.

The current policy trend for promoting broadband deployment is to craft a regulatory regime that will not inhibit innovation and yet promote deployment. Some measures aim to eliminate barriers to entry into the broadband market by rival platforms such as wireless and broadband over power line technologies. On the other hand, traditional telephone providers are heavily regulated but have achieved what is commonly referred to as "universal service." Despite the ubiquity of telephone service, regulators have been reluctant to impose similar regulations on broadband services for fear of stifling the nascent industry. These relatively minimal regulatory regimes are quite contrary to the history of the connectivity policy that historically helped deploy the telephone network.

Universal and affordable access to telephone service has long been a U.S. social policy, although the best methods for its implementation have been questioned. In 1907, for example, AT&T president Theodore Vail espoused "one system, one policy, universal service."[8] Vail's vision is subject to interpretation (One affordable rate? One interconnected network? One monopoly provider?), but the Telecommunications Act of 1996 evidences a national commitment to affordable and universal access to communications:

> *Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications…at rates that are reasonably comparable to rates charged for similar services in urban areas.*[9]



Universal service has been traditionally achieved through a system of implicit rate subsidies. Above cost rates for long-distance service, business service, local network interconnection and geographic rate averaging have historically been used to offset high rural telephone costs. Competition in this market from converging technological platforms and applications, as well as the increasing availability of lower cost alternatives to traditional telephone networks, undermines the allure and even the feasibility of such subsidies. Further, this national policy of affordable access to basic telephone service has been largely devoid of tests to determine whether consumers are willing to pay more cost based prices.[10] While needs-tested subsidies exist for low income telephone service consumers, most funds distributed under the current universal service regime merely target services that are above a nationwide average cost. The system of taxes and distributions is also confined to the communications industry itself and lacks the oversight and political accountability of the general appropriations process even though in 2006, $7.3 billion is estimated to have been distributed.[11]

The telephone system has historically been considered a regulated monopoly, and universal service policies have reflected this market structure. The telephone market service market, however, is becoming competitive. Certainly, competition stresses implicit subsidies, but even explicit support may be misguided in competitive industries. For example, the efficacy of universal service policies in fueling the growth in telephone service availability has been questioned.[12] It is argued that the early market for telephone service was competitive, and that this competition drove telephone service penetration into communities and rural areas. This suggests that instead of government intervention, short term unregulated monopoly as a reward for capital expense and innovation may more efficiently drive availability.

Nevertheless, the system of supporting and encouraging ubiquitous telephone service has spilled over into broadband service. The federal universal service support system finances Internet service in schools and libraries and supports a rural health care initiative. At the same time, a low cost loan program administered by the U.S. Department of Agriculture funds rural broadband access platforms.

While these are measured steps, broader economic rationales are sometimes used to argue in favor of added plans.

In network industries, the value of a network is directly proportional to the number of subscribers to it. Such "network effects" and "network externalities" (e.g., how the abandonment of a network by one subscriber impacts other subscribers) are guiding concepts for competition policy and sometimes universal service rhetoric.[13] Akin to the network effects principle outlined above is the idea that a robust platform market will spur the development of new applications—a sort of positive feedback loop. Thus, early yet active support for broadband platform deployment may be beneficial.[14]

Applications such as "telemedicine" initiatives benefit from this type of support. The Eastern Montana Telemedicine Network, for example, is a system of interconnected hospitals and health clinics. Specialists in a variety of fields from the Billings Clinic can examine patients and confer with other physicians in towns throughout eastern Montana, many hundreds of miles from Billings. Other telemedicine successes include remote dentistry in insolated parts of Alaska.[15] In this manner, rural areas can enjoy the benefits of medical specialists who are generally concentrated in urban areas.

A competitive, widely available service probably does not need a support system similar to that adopted for telephone service in the U.S. Should availability and competition prove scant, active support may become more attractive.. The following statistics provide a cursory view of the Rocky Mountain West's broadband connectivity.

Broadband Availability as of December 31, 2005 - The FCC's Data

The Federal Communications Commission is statutorily charged with promoting the deployment of "advanced services."[16] To this end, the FCC collects data on broadband deployment semiannually. The data collected by the FCC as of December 31, 2005, are the basis for the summary below.

For reporting purposes, the FCC defines broadband transmission as a customer's ability to send or receive information at 200 kbps in at least one direction (either uploading or downloading from the Internet). Holding companies (groups of affiliated providers) and other facilities-based broadband service providers (those who own or lease the physical facilities needed to transmit data, including for wireless transmission) are required to report the zip codes in which they serve at least one customer, with the assumption that subscribership indicates broadband availability. If subscribership to multiple entities is reported in a zip code, there is competition between those entities for subscribers. As discussed below, there may be some problems with the use of subscribership as a proxy for deployment.

According to the FCC's report, at the end of 2005 there were roughly 50 million broadband service subscribers (both residential and business) in the United States.[17] Of U.S. zip codes, 99% reported at least one high-speed service provider, with the vast majority having broadband service from a satellite-based service provider. Increasingly, cellular telephone companies are reporting broadband subscribers. Cable modem service and DSL are not as geographically ubiquitous as satellite service, but are by far the most widely adopted technologies.

The data show pervasive connectivity and robust competition in the Rocky Mountain region. Naturally, population centers such as Denver, Salt Lake, and Maricopa Counties have abundant providers (Figure 1). The overwhelming majority of Rockies counties—both rural and urban—have at least four providers of broadband service. Given the traditional difficulties of connecting rural citizens, this is a remarkable figure.

The FCC's collection and reporting methods, however, are often criticized. First, the FCC's defines "broadband" by a low minimum capacity value. It is difficult to provide many of the cutting-edge applications with a 200 kbps connection (note that the OECD statistics cited above also define broadband as only 256 kbps.). Further, few providers define their service territories on the basis of zip codes, and entities need only serve one customer in a zip code to report providing service there. It is thus unclear whether entire zip codes are served. The Governmental Accountability Office (GAO) has recently reported that "although these data indicate that broadband availability is extensive, we found that FCC's…data may not be useful for assessing broadband deployment at the local level."[18] Further, the GAO states that "we believe that the use of subscriber indicators at the zip-code level to imply availability, or deployment, may overstate terrestrially based deployment."[19] In Kentucky, for example, the GAO found that the FCC's statistics may have overstated availability by nearly 25%.[20]

The Road Ahead

While the FCC data are open to question, collecting data on a local level is important. Without understanding how the industry is developing and serving the Rockies Region now, it is difficult to craft policy to affect development in the future. To the extent that competition is an important factor for pushing service into new areas with better connectivity, the data collected for this snapshot of Rockies connectivity are encouraging. If, on the other hand, true access in rural and poor areas remains sparse but socially and politically desirable, then aggressive new policy initiatives are needed. Without world-class communication in all parts of the Rockies, the region risks being disconnected just as the world moves from traditional landline telephone service into the new frontier of rapid and robust broadband communications.

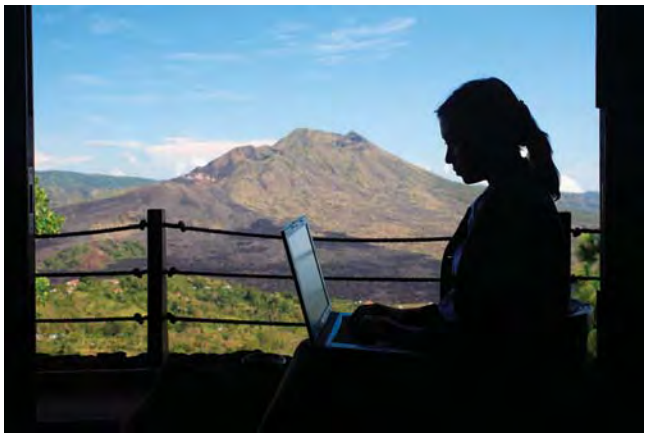
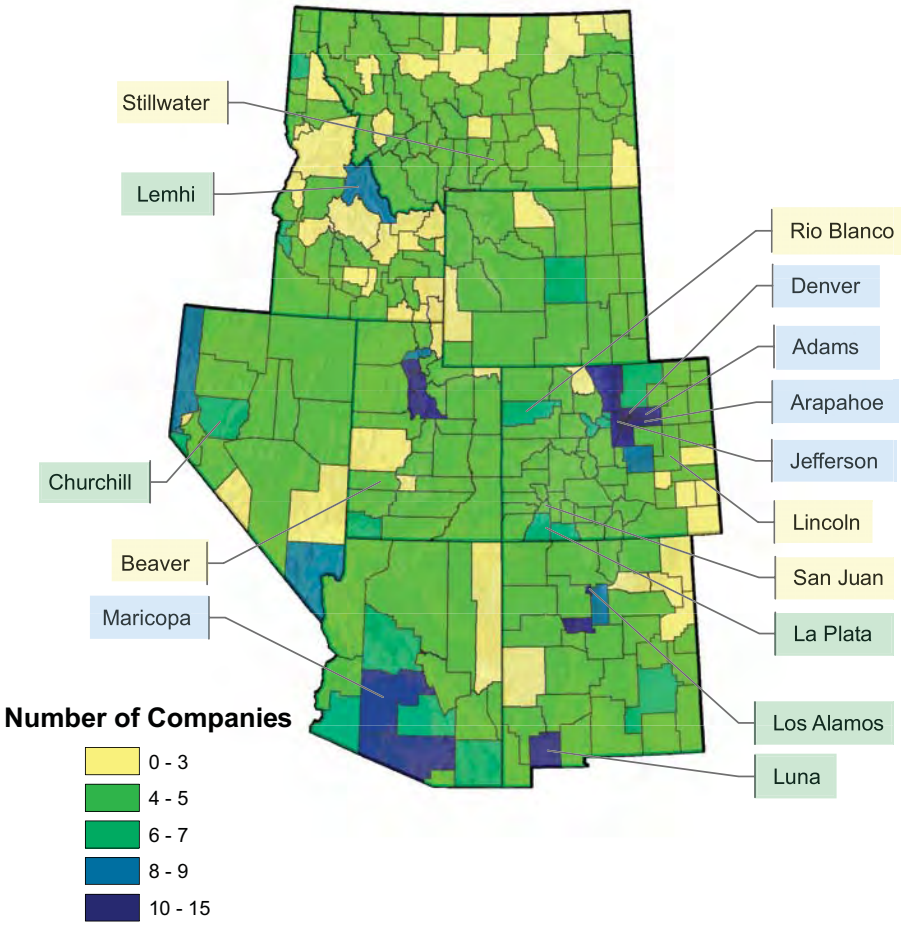


Figure 1
Average Number of Holding Companies Reporting High Speed Subscribers as of Dec. 31, 2005
Source: Federal Communications Commission



Top 5
Metropolitan Counties

County, State	Average number of holding companies
Arapahoe, CO	13.5
Denver, CO	13.1
Maricopa, AZ	13.0
Jefferson, CO	12.8
Adams, CO	12.6

Top 5
Micropolitan Counties

County, State	Average number of holding companies
Los Alamos, NM	11.0
Luna, NM	10.0
Lemhi, ID	8.5
La Plata, CO	7.2
Churchill, NV	7.0

Top 5
Rural Counties

County, State	Average number of holding companies
Rio Blanco, CO	6.0
San Juan, CO	5.0
Beaver, UT	4.9
Lincoln, CO	4.4
Stillwater, MT	4.1

Endnotes

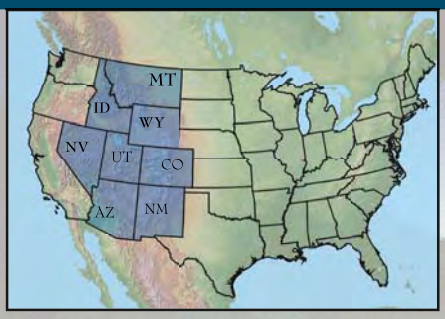
[1]Ruffin Prevost, "Wyoming Call Center Caters to S. Koreans," *Billings Gazette*, Feb. 20, 2007).
[2]Remarks of FCC Chairman Kevin J. Martin, "Imagining the Digital Healthcare Future in the Rural West," Montana State University – Bozeman Burns Technology Center July 7, 2006 http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266347A1.pdf .
[3]OCED Broadband Statistics to June 2006, http://www.oecd.org/document/9/0,2340,en_2649_34223_37529673_1_1_1_1,00.html#Data2005 .
[4]"The Easiest Commute of All," *BusinessWeek Online*, 12/12/05, http://www.businessweek.com/magazine/content/05_50/b3963137.htm .
[5]http://www.whitehouse.gov/infocus/technology/economic_policy200404/chap4.html .
[6]http://www.washingtonpost.com/wp-dyn/content/article/2007/02/10/AR2007021000879.html .
[7]http://clinton.senate.gov/news/statements/details.cfm?id=264465 .
[8]Jonathan E. Neuchterlein and Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age*, MIT Press, 2005: p 387.
[9]47 U.S.C. § 254(b)(3) (2007). The Telecommunications Act of 1996 was intended to make the traditionally implicit system of subsidization explicit, and purported to adopt an evolving standard of service to be subsidized.
[10]Jonathan E. Neuchterlein and Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age*, MIT Press, 2005: 352.
[11]Universal Service Fund Facts, Universal Service Administrative Company, http://www.usac.org/about/universal-service/fund-facts/fund-facts.aspx, (last accessed Feb. 22, 2007).
[12]Milton L. Mueller, *Universal Service: Monopoly in the Making of the American Telephone System*, MIT Press: 1996.
[13]Jonathan E. Neuchterlein and Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age*, MIT Press, 2005: p 4-10.
[14]Howard A. Shelanski, *Competition and Regulation in Broadband Communications in Broadband: Should We Regulate High-Speed Internet Access?* Brookings Institute Press, Crandall & Allman eds., 2002, p 167-69.
[15]Remarks of FCC Chairman Kevin J. Martin, "Imagining the Digital Healthcare Future in the Rural West," Montana State University – Bozeman Burns Technology Center July 7, 2006
[16]47 U.S.C. 157.
[17]High Speed Services for Internet Access: Status as of December 31, 2005, Industry Analysis and Technology Division, Wireline Competition Bureau (July, 2006) http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf .
[18]Broadband Deployment is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas 15, GAO Report to Congressional Committees, GAO-06-426 (May, 2006) available at http://www.gao.gov/new.items/d06426.pdf.
[19]*Ibid.* P. 17.
[20]*Ibid.*

Water Sustainability in the Rockies:

Agriculture to Urban Transfers and Implications for Future Water Use

By Tyler McMahon and Matthew Reuer, Ph.D

THE 2007 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD



Water—or more specifically the lack of it—has greatly shaped the American West. From the early settlers lured by the promise that "rain follows the plow" to recently arrived suburbanites expecting lush lawns and fountains in desert communities, access to clean, reliable water has dominated the region's economy, culture, and settlements. In the *2007 Colorado College State of the Rockies Report Card*, we examine water allocation in the Rockies, with emphasis on current water use patterns and agriculture to urban transfers.

The eight-state Rockies Region receives on average 30 inches of annual precipitation. However, as any resident or visitor to the Rockies knows, water availability varies widely by place, season, and year. Winter alpine snowpack melts into streams, rivers, and reservoirs, with some of this water diverted as far away as California or the eastern flank of the Rockies. In other places, scarcely any precipitation falls, and agriculture or human settlement would be impossible without a massive water transfer and pumping infrastructure. Las Vegas, for example, with its continuously running fountains and green golf courses, receives less than five inches of precipitation per year. Rocky Ford, Colorado, a town discussed later for its transfer of water rights to the city of Aurora, receives less than 12 inches a year. Figure 1 and Table 1 illustrate the general precipitation patterns in the Rockies relative to the rest of the U.S. This region shows minimum precipitation values among the lowest in the U.S. and a wide range in statewide precipitation.[1] The insert map shows that many of the counties have, on average, less than 20 inches of annual precipitation, the threshold below which irrigation is essential to grow crops. To compensate for low and sporadic precipitation, the region has historically transferred

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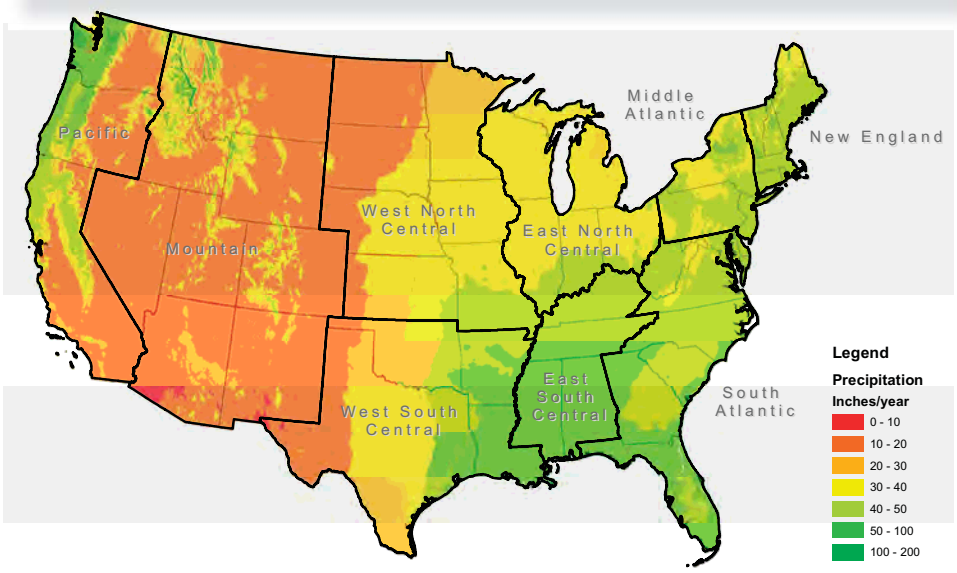
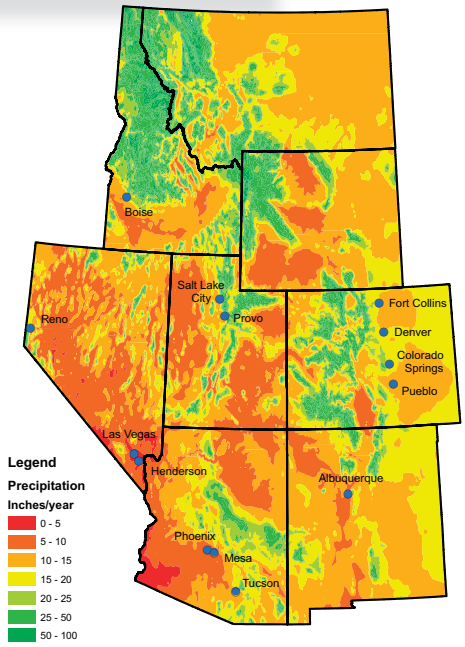
Figure 1
Average Annual Precipitation for the Conterminous United States and the Rockies, 1961-1990
Source: National Atlas of the United States





Only cities with populations greater than 100,000 are shown (2000 U.S. Census)

Table 1
Average Annual Precipitation in the U.S. by Region, Inches per Year
Source: National Atlas of the United States

Census Division	Mean	Minimum	Maximum
East North Central	32.6	27.5	42.5
East South Central	56.7	32.5	85.0
Middle Atlantic	43.9	30.0	65.0
Mountain	30.1	5.0	110.0
New England	48.8	32.5	110.0
Pacific	51.1	5.0	200.0
South Atlantic	49.7	32.5	110.0
West North Central	30.9	12.5	55.0
West South Central	38.5	10.0	75.0

water from areas of abundance (e.g., areas of alpine snowpack, major rivers, or aquifers) to areas of scarcity (semi-arid plains and deserts). These water transfers are increasingly important as urban areas rapidly develop in arid and semi-arid climates.

With increased population growth, how will the Rockies share water among several competing needs? One useful concept provided by hydrologists at the U.S. Geological Survey (USGS) is "water sustainability," which accounts for variable water supplies and balances human and environmental needs. As stated by Anderson and Woosley, "a sustainable water supply for a community ideally would provide enough water to support population and economic growth and be sufficient to endure protracted periods of drought."[2] They also note that for true water sustainability, water must be provided to natural hydrologic and ecological systems, such as groundwater recharge or riparian habitats:

> *Water availability traditionally has meant securing a volume of water to meet a current and projected demand on the basis of existing and projected usage. An added challenge today for water and natural-resource managers is that water is expected to be available for non-extractive uses, such as maintaining groundwater levels beneath riparian areas, preventing freshwater-saltwater interfaces from migrating landward, maintaining flows and water temperatures to support fishery needs, or restoring flooding to dammed rivers – all uses requiring prescriptions for which there is little historical precedent or experience.*[3]

While providing adequate water to natural systems should ensure greater reliability of future water sources, it also is another demand on a limited resource.

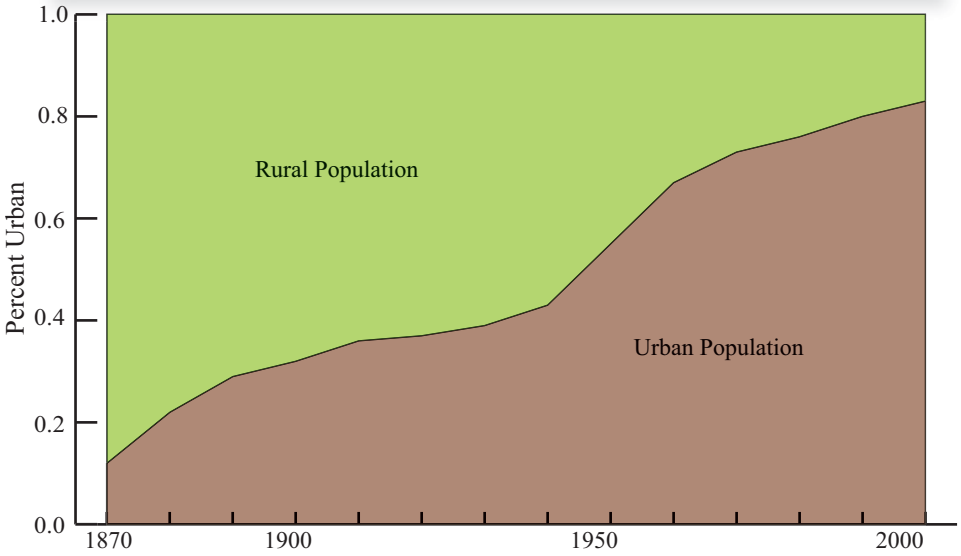
Although present water use in the Rockies is dominated by irrigation, as discussed below, future regional population growth will likely exceed that in other regions and will be concentrated in urban areas. The Rockies Region includes many of the fastest-growing states in the U.S., such as Nevada, Arizona, Colorado, Utah, and Idaho.[4] Despite its rural agricultural heritage, 83 percent of the Rockies population was classified as urban in 2000, and this percentage continues to increase (Figure 2). However, agricultural water use is much greater than current urban water consumption. For the Rockies Region, just 7 percent of agricultural water use is equivalent to twice the municipal water use in 2000, and this percentage varied from 1 percent in Montana to 30 percent in Nevada.[5] Further development of urban areas will increase demands for the region's limited water, likely removing more water from agriculture while also requiring greater urban conservation efforts for a sustainable future.

New urban water demands, combined with historically low agricultural commodity prices, have allowed urban financial resources to out-bid agriculture, resulting in transfers of water from agriculture to cities. These water transfers may involve the purchase or

Facing Page Photo: Homestake Creek in the White River National Forest, site of Homestake Reservoir. © Ken Papelo, courtesy of the Rocky Mountain News

lease of agricultural water rights by municipalities. Permanently removed from agricultural lands and rural areas, water diversions to cities can harm rural economies by diminishing tax revenue, reducing retail trade associated with agriculture, and spurring emigration of rural residents. But creative new tools and techniques are being developed to help urban and rural areas successfully coexist by sharing water.

Figure 2
Percent Urban vs. Rural Population of Rockies States 1870-2000
Source: U.S. Census Bureau



While these tools are being developed, both sides must examine their water consumption and the associated impacts on water supply and quality. Sprinkler irrigation of agricultural fields, for example, can result in water losses of only 20 percent, depending on the relative humidity, air temperature, wind speed, and irrigation system used.[6,7] Agricultural practices use can also degrade water quality, via nitrate runoff from fertilizer use, pesticide runoff associated with weed or disease control, and salinization of discharge water. Urban areas also often use water in ways that flout conservation concerns. Thirsty lawns and evaporative losses consume more than half of domestic household water use in arid climates. For example, outdoor water use in Scottsdale, Arizona, accounts for 72 percent of residential water consumption.[8] Urbanization can also degrade water quality, through storm-water discharges, industrial releases of aquatic toxins, and sewage discharges.

The *2007 Colorado College State of the Rockies Report Card* addresses these issues. First, we consider water use in the Rockies by examining the dominant water use categories, patterns in other U.S. regions and the Rockies, and changes in water use through time. Second, we discuss water allocation strategies, including agriculture to urban transfers and conservation initiatives. In future reports, we will focus on other key dimensions of water sustainability, including water for natural ecosystems, water use for recreation and tourism, and water quality in the Rockies.

Estimated Water Use in the United States

Before discussing future water use in the Rockies, we must consider regional water use patterns in the United States as a whole. The USGS estimated that in 2000 total water withdrawals nationwide equaled 408 billion gallons per day (Bgal/d).[9] These withdrawals originated either from surface water (e.g., rivers, streams, lakes, and reservoirs) or groundwater (e.g., aquifers), which, in 2000, comprised 79 percent and 21 percent of total water withdrawals, respectively.[10] The USGS further divides water withdrawals into eight water use categories: public supply, domestic supply, irrigation, livestock, aquaculture, industrial, mining, and thermoelectric power.

In 2000, thermoelectric power accounted for the largest percentage of water withdrawals in the United States (48 percent of the total), followed by irrigation (34 percent), public supply (11 percent), and industrial uses (5 percent) (see Figure 3). Cumulative water uses for domestic supply, livestock, aquaculture, and mining accounted for less than 2 percent of the total.[11]

As shown in Figure 4, total water withdrawals largely stabilized between 1980 and 2000. From 1950 to 1980, withdrawals increased 144 percent from 180 to 440 Bgal/d.[12] In 1985, total withdrawals dropped to 399 Bgal/d. Withdrawals have fluctuated by less than 9 Bgal/d between 1985 and 2000,[13] despite population increases. Changes in irrigation and thermoelectric power withdrawals largely account for this trend.[14] Nationwide, the number of irrigated acres has followed water use patterns, doubling from 1950 to 1980 and remaining constant from 1980 to 2000; a 7% increase in irrigated acres occurred from 1995 to 2000.[15] Water withdrawals for thermoelectric power plants have also stabilized since 1980, thanks to regulation of this industry and technological advances. As a response to both federal legislation requiring stricter water quality standards and concerns over water shortages, the thermoelectric power industry has largely switched from once-through cooling systems to closed-loop systems that can recycle the water in their systems, withdrawing additional water only as needed to replace losses.[16]

The number of U.S. residents served by public water supplies has also increased. The nation's population grew by 85 percent (151 to

Figure 3
Share of Total Water Withdrawals
in the United States by Category, 2000
Source: U.S. Geological Survey

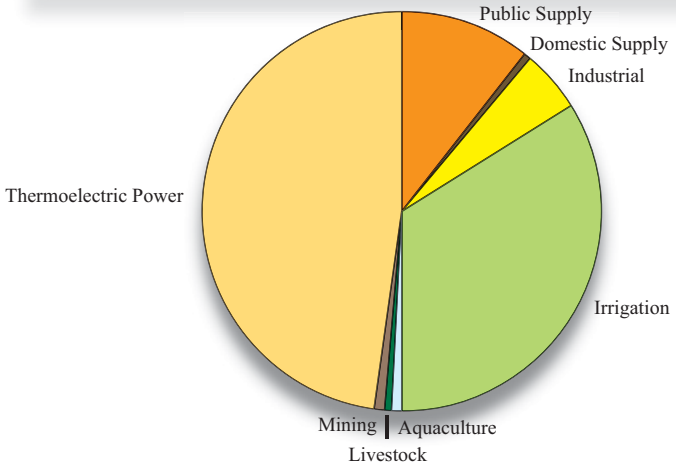
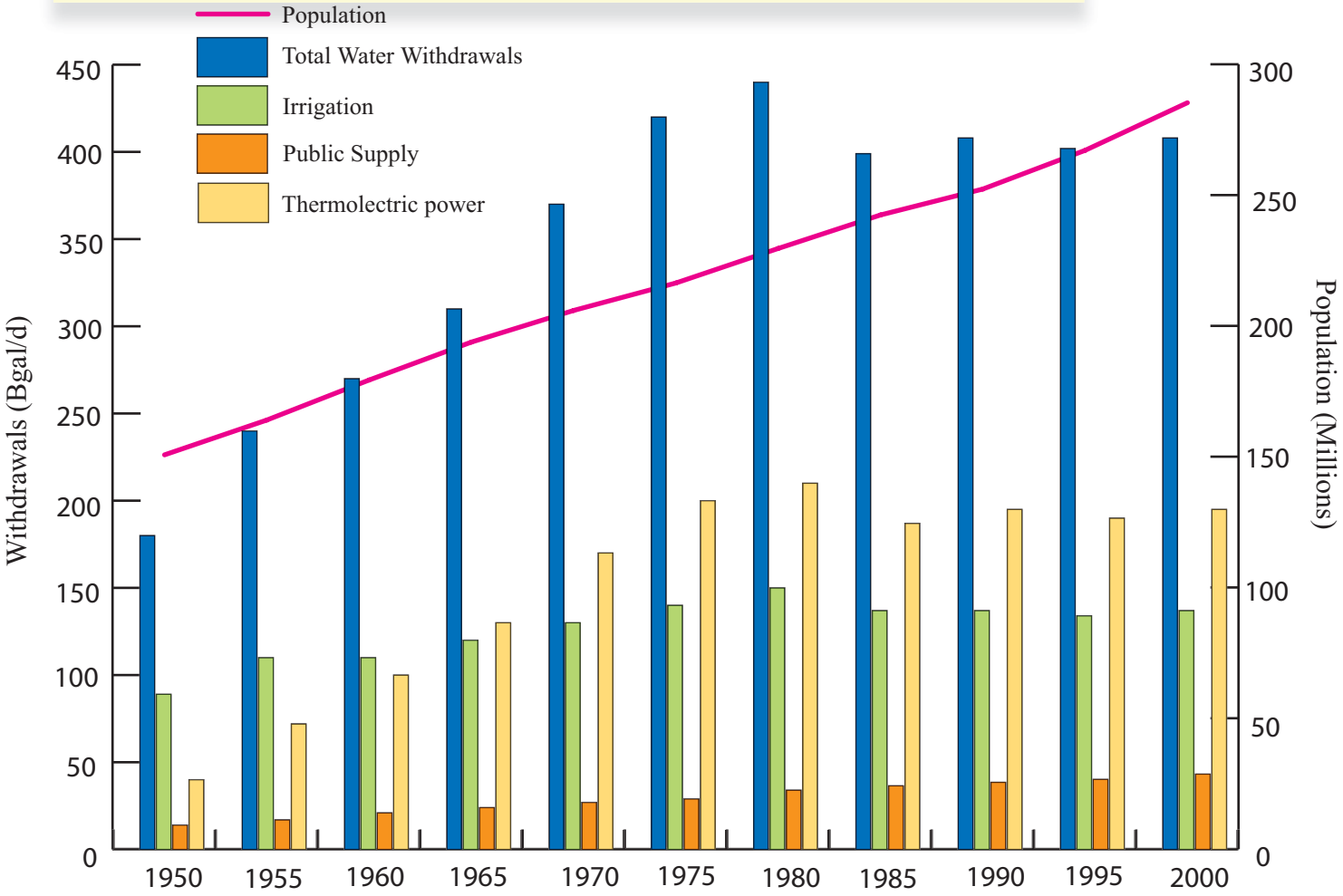


Figure 4
Trends in Population, Total Water Withdrawals, and Selected Categories, 1950-2000
Source: U.S. Geological Survey



281 million people) between 1950 and 2000, while during the same period the number of persons served by public water supplies tripled.[17] By the USGS definition, a public water supply can be either publicly or privately owned and supply water for domestic, industrial, commercial, or other purposes. However, in contrast to direct water withdrawal by a private user, the public water supply must provide water to at least 25 people or have a minimum of 15 service connections.[18] The growth trend in public supplies may relate not only to population growth but also to urbanization. As more Americans move to cities, the amount of water supplied by public entities has replaced self-supplied withdrawals from wells.

Estimated Water Use in the Rockies Compared to the U.S.

Figure 5 shows the geographic distribution of water withdrawals by U.S. region. Of the nine U.S. Census divisions, the Mountain Division (which corresponds to the eight-state Rockies Region) was responsible for 15.7 percent of total water withdrawals, ranking third behind the South Atlantic Division (16.9 percent) and the Pacific Division (15.9 percent).[19]

Water withdrawal patterns in the Rockies differ from those in the rest of the nation, as illustrated in Figure 6. Irrigation comprises the largest water use in the Rockies, equaling 87.2 percent in 2000. Thermoelectric power accounts for only 1.2 percent of total withdrawals, ranking fourth behind irrigation, public supplies, and aquaculture.[20] As shown in Figure 7, the historical trends in regional water use revealed (1) declining irrigation water use in the 1990s and (2) declining total water withdrawals over the same period. The correlation between total water withdrawals and irrigation withdrawals demonstrates the importance of irrigation in the West. Declines in agriculture in the agriculture sector may be one explanation for reduced irrigation withdrawals; the *2006 Colorado College State of the Rockies Report Card* notes that the region lost

Figure 5
Share of Total Water Withdrawals
by Census Division, 2000
Source: U.S. Geological Survey

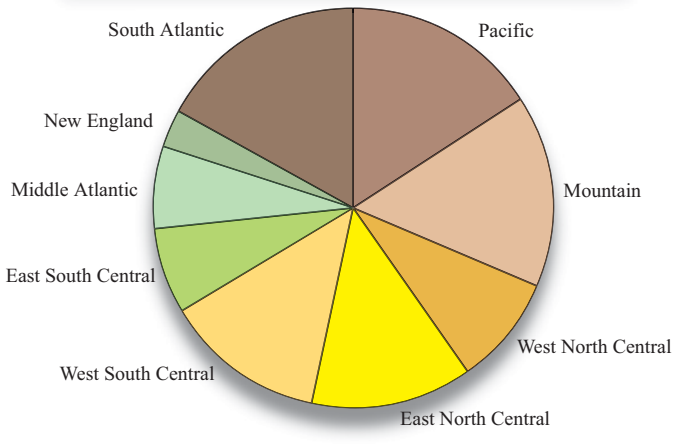


Figure 6
Water Withdrawals in U.S. by Census Region, 2000
Source: U.S. Geological Survey

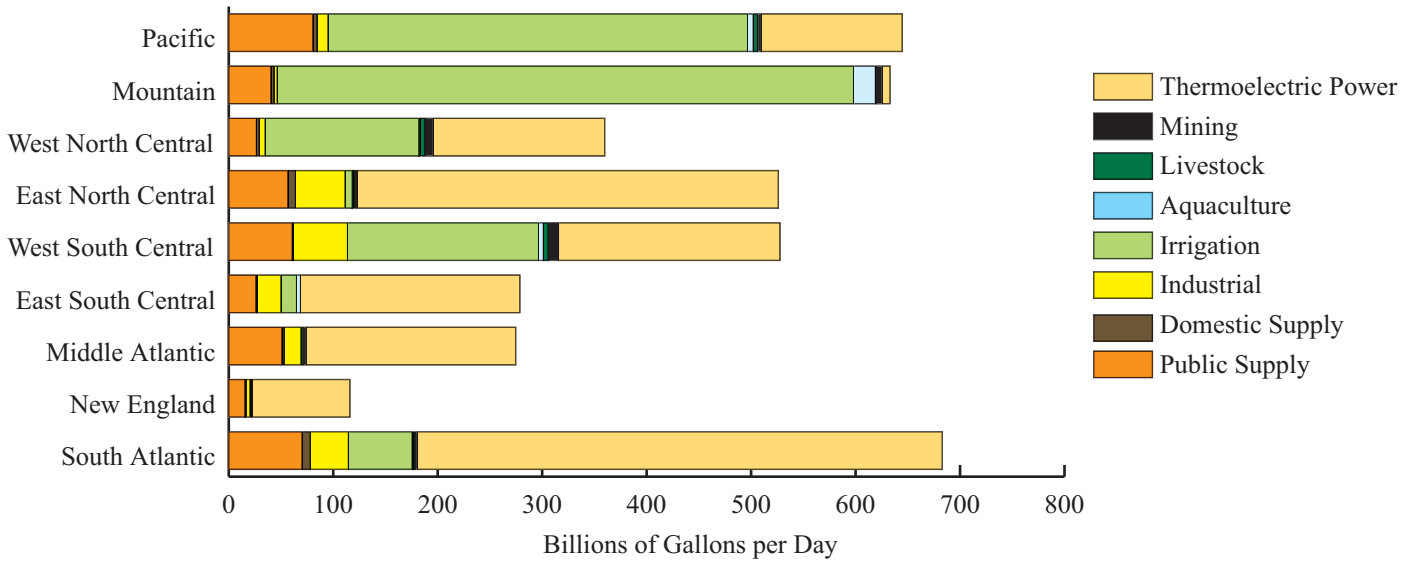


Figure 7
Change in Population, Total Water Withdrawals, and Irrigation Withdrawals in the Rockies, 1985-2000
Source: U.S. Geological Survey

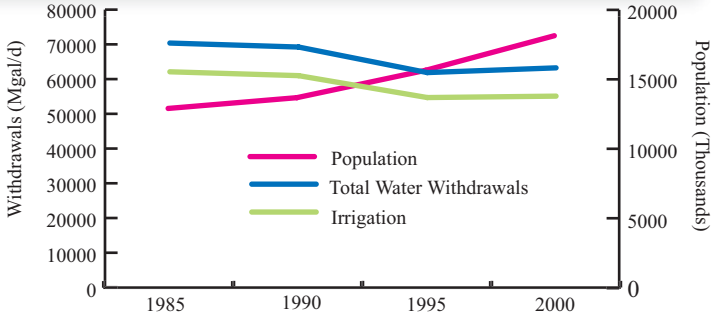


Figure 8
Change in Population and Public Supply Withdrawals in the Rockies, 1985-2000
Source: U.S. Geological Survey

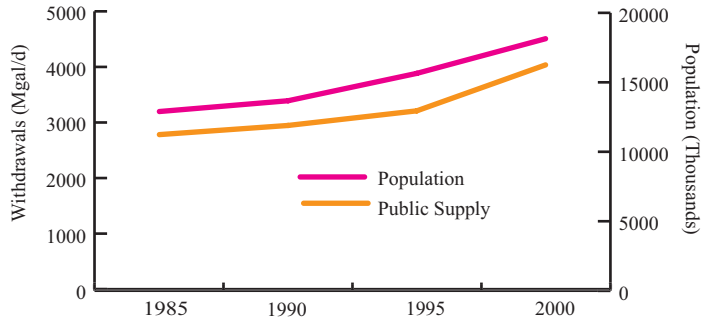
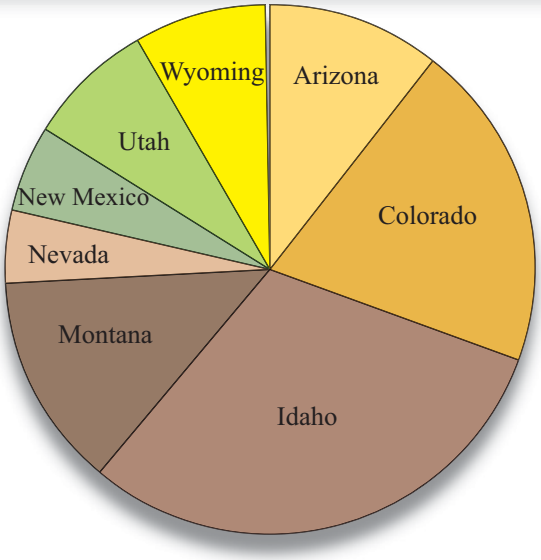


Figure 9
Share of Rockies Water Withdrawals by State, 2000
Source: U.S. Geological Survey



140,000 acres of farmland and ranchland annually from 1992 to 2002.[21]

Public supply withdrawals in the Rockies Region have increased steadily since 1985, but at a much higher pace than the national average (Figure 8). From 1985 to 2000, public supply withdrawals grew by 45 percent in the Rockies, approximately 2.5 times greater than the national average of 18 percent.[22] This high growth corresponds with the higher population growth in the Rockies relative to the U.S. average (2.8 times the national average) from 1980 to 2000.[23]

Estimated Water Use in the Rockies

Within the Rockies, Idaho had the highest total water withdrawals in 2000, equal to 30.7 percent of the total (Figure 9).[24] As shown in Figure 10 and Table 2, the majority of the Idaho withdrawals were for irrigation (87.7 percent of total withdrawals).[25] This large volume of irrigation withdrawals makes sense, considering that Idaho has the highest number of irrigated acres in the West and the fifth highest in the nation.[26] Colorado and Idaho together account for 50.9 percent of irrigated acres and 50.7 percent of total water withdrawals in the Rockies.[27] Idaho ranks second nationally in irrigation withdrawals, behind only California.[28] Thus, irrigation withdrawals dictate state water use patterns in the Rockies Region.

Public supply is the second highest water use in the Rockies, but only represents 6.4 percent of the region's total use. Arizona has the highest public supply withdrawals in the Rockies (27 percent). Combined, Colorado and Arizona account for 49 percent of the region's public supply withdrawals.[29] Although public supply represents a small percentage of total water use in this region, the accelerating and concentrated demands for reliable water supplies for the region's urban centers will create more tensions with agricultural water users.

Agricultural Transfers, Farm Economics, and Water Scarcity

Water use data collected by the USGS indicate the importance of agricultural water use in the Rockies. One option to address urban water supply problems is agricultural water transfers. Water transfers from agricultural to urban uses have been increasing in Western states due to urban growth, the declining agricultural economy, and groundwater overdraft concerns.[30] Other pressures on traditional water supplies include recent drought, fully appropriated rivers (where all water is reserved for existing water rights and other legal requirements such as interstate compact delivery requirements), and the decline of federal funding for large water projects. The lack of new water projects results in no additional storage capacity, providing abundant surface water during early spring but limited supplies in late summer.

Agricultural economics has been strongly affected by two factors: the decline of agriculture's profitability relative to other sectors and the concentration of agricultural operations into larger and more efficient units. In 1940, farm employment accounted for 26 percent of total employment in the Rockies, whereas in 2003 farm employment equaled only 2.6 percent of total employment.[31] The average farm size in the Rockies has also increased due to mechanization and economies of scale. In 1920, the average farm size was 528 acres, compared to 2,034 acres in 2000 (the historical maximum was 3,043 acres in 1975).[32] More efficient, larger farms and improvements in agricultural technology and inputs have led to higher crop yields and lower commodity prices, which have, in turn, promoted larger farms. Drought, natural disasters, and crop and livestock diseases have forced many smaller farms and ranches out of business.[33] For example, melon growers in Rocky Ford, Colorado, have suffered from low prices, storm damage, a salmonella scare, recurring drought, and warmer temperatures that harmed critical crops.[34] The significant economic pressures placed on agriculture over the last several decades have increased the importance of agriculture to urban water transfers.

Another motivation for agricultural water transfers is the ownership of senior water rights by Western farmers and ranchers. Since the early 1900s, most of the rivers in this region have been fully appropriated. To obtain a new water source, a city must purchase water rights from another entity (unless the city already owns undeveloped rights). The market value of the water right is largely determined by seniority. Seniority is based on the year the water right was established (known as the "priority date" or "appropriation date"): an 1865 water right is senior to an 1870 water right. Each year, the water user with the most senior right may use their full allocation, assuming the water source can provide it. Then the user with the next senior right can use their allocation, and so on. In times of water scarcity, junior right holders might not receive part or all of their allocation. Because the Homestead Act of 1862 attracted ranchers and farmers to Western lands in close proximity to rivers, these early settlers generally obtained the most valuable, senior rights.

Climate factors, including cyclical droughts and the possibility of human-induced global climate change, will also influence future water availability. Climate change may affect precipitation rates, the amount of snowpack available for spring runoff, and the timing of snow melt in the Rockies. *The 2006 State of the Rockies Report Card* featured a climate model showing a 50 percent reduction of April 1 snowpack by 2085, assuming

Figure 10
Water Withdrawals in the Rockies by State and Category, 2000
Source: U.S. Geological Survey

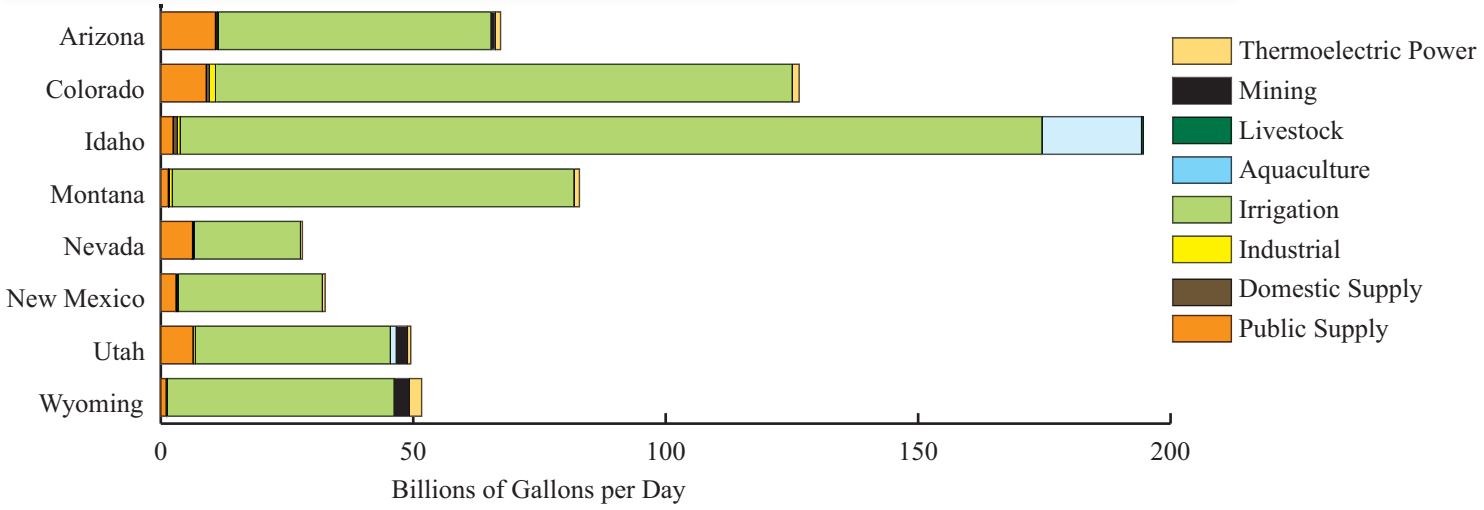


Table 2
Rockies State Water Use by Category (percent), 2000
Source: U.S. Geological Survey

State	Public Supply	Domestic Supply	Industrial	Irrigation	Aquaculture	Livestock	Mining	Thermoelectric Power	Total Mgal/d
Arizona	16.1%	0.4%	0.3%	80.3%	0.0%	0.0%	1.4%	1.5%	6,729
Colorado	7.1%	0.5%	1.0%	90.3%	0.0%	0.0%	0.0%	1.1%	12,645
Idaho	1.3%	0.4%	0.3%	87.7%	10.1%	0.2%	0.0%	0.0%	19,460
Montana	1.8%	0.2%	0.7%	95.9%	0.0%	0.0%	0.0%	1.3%	8,292
Nevada	22.4%	0.8%	0.4%	75.1%	0.0%	0.0%	0.0%	1.3%	2,805
New Mexico	9.1%	1.0%	0.3%	87.9%	0.0%	0.0%	0.0%	1.7%	3,257
Utah	12.9%	0.0%	1.0%	78.0%	2.3%	0.0%	4.5%	1.3%	4,950
Wyoming	2.1%	0.1%	0.1%	87.2%	0.0%	0.0%	5.8%	4.7%	5,166
Percent of Total Usage	6.4%	0.4%	0.5%	87.2%	3.3%	0.1%	1.0%	1.2%	100.0%

"business as usual" carbon dioxide emission growth rates and a medium sensitivity climate model.[35] An example of potential climate change impacts on the Rockies Region is shown for the river basins in Figure 11 and Table 3, including winter temperature, annual precipitation, and snowpack (as of April 1). Although major changes in snowpack are projected, the impacts on annual precipitation are more modest and range from river basins that may have increased total precipitation (e.g. the Pacific Northwest and Missouri) as well as some expected to have lower levels (e.g. the Arkansas-White-Red). Such projected variability will likely impact future water supplies, making the acquisition of senior water rights even more important to reduce users' risk of water shortages during times of drought.

Reliance on non-renewable groundwater also contributes to water supply problems. Many groundwater sources are not replenished by surface water flows. At the time of founding, many cities in the Rockies tapped into non-renewable groundwater given its close proximity and large apparent capacities. For example, the Denver Basin Aquifer, which serves a large portion of Colorado's Front Range, was estimated to contain approximately 300 million acre-feet of water (an acre-foot generally can serve one to three households for a year).[36] What planners and developers did not consider was that lowering the water table through groundwater withdrawals leads to higher pumping costs.[37,38] Several states in the Rockies are currently addressing the problem of decreasing groundwater supplies. For example, Arizona has sustainable pumping requirements for groundwater, and Idaho has limits on new groundwater pumping from the East Snake Plains Aquifer. Given these concerns related to over use and depletion of groundwater sources, other water sources are increasingly sought.

As noted above, irrigation currently dominates water use in the Rockies. However, farmers have suffered both from natural events such as droughts and from economic factors such as low profit margins. Given the scarcity of Western water resources, the transfer of water from agriculture to cities could be an important means of addressing water availability problems. The "agricultural reser-

voir" is the largest existing source of water in the Rockies (see discussion above), but such transfers have long-term implications and it is unknown how they will affect rural economies and communities.

The Evolution of Western Water Transfers

Water transfers have a long history in the Rockies and have evolved since the 19th century. Early transfers were known as "water farming," by which cities would purchase a farm, leave the land fallow or lease water back to an irrigator while waiting to convert the associated water rights. In 1891 the legal precedent for transfers in Colorado was established by the Colorado Supreme Court, approving an irrigation water transfer to Colorado Springs.[39] In the 1970s and 1980s, the cities of Aurora and Thornton, Colorado, bought most of the irrigation water rights in rural South Park, Colorado, approximately 90 miles to the southwest.[40] In Arizona, water farming became more and more common with groundwater depletion in the 1970s and 1980s.

With the declining economic importance of agriculture, water rights have become a sort of pension or bail-out plan for many farmers in the Rockies. However, the drying up of agricultural land has significant implications for rural economies. One example is the property tax base of Morgan County, Colorado. In 2006, 400 junior wells were shut down to protect senior surface water rights,[41] with estimated property value losses of $30 million as once-irrigated lands were reclassified as dry land.[42]

The secondary costs of water transfers have spurred public outcry in rural areas and increased awareness of equity issues. Following the 1985 transfer of Rocky Ford Ditch water from rural Rocky Ford to urban Aurora, Colorado, the city of Aurora addressed third-party impacts of the water transfer by reseeding the affected land with native plants and compensating rural Otero County for lost tax revenue as irrigated lands were reclassified as lower value dry lands.[43] While many cities have pursued various types of equitable solutions to water transfers, the general public frequently blames the region's growing cities and limited conservation efforts. However, lower commodity prices are what promote water transfers for struggling farmers That in turn degrades the rural economy and further pushes small operators off the land.

Economic Impacts of Water Transfers

Although the agricultural sector has declined in economic importance in the Rockies, agricultural areas have responded quite differently to the economic impacts of water transfers. Howe and Goemans studied the impact of water transfers in the South Platte Basin and Arkansas river basin of Colorado. Several factors related to water transfers and the regional economy

Figure 11
River Basins and Major Rivers

Table 3
Change in River Basin Region Temperature, Precipitation, and Snowpack, 1976 to 2085

River Basin Regions	**Winter Temperature**, Degrees Celsius			**Precipitation**, Centimeters (cm) Per Year				**Snowpack**, Centimeters (cm) of Snow Water Equivalence on April 1			
	1976	2085	Change, 1976 to 2085	1976	2085	Change, 1976 to 2085		1976	2085	Change, 1976 to 2085	
						(cm)	Percent			(cm)	Percent
Arkansas-White-Red	-0.7	4.4	+5.1	42	40	-2	-5%	4.3	2.0	-2.3	-53%
California	2.7	7.8	+5.1	23	25	+2	+7%	0.6	0.0	-0.6	-100%
Great Basin	-2.4	2.9	+5.3	31	32	+1	+4%	2.8	0.5	-2.3	-83%
Lower Colorado	5.0	9.8	+4.8	32	34	+2	+5%	1.2	0.0	-1.2	-99%
Missouri	-6.3	-1.0	+5.3	42	46	+4	+10%	6.7	4.6	-2.1	-31%
Pacific Northwest	-6.2	-1.6	+4.6	71	82	+11	+15%	20.3	10.7	-9.6	-47%
Rio Grande	1.2	5.8	+4.6	37	40	+3	+7%	9.8	3.5	-6.3	-65%
Texas-Gulf	4.4	8.8	+4.5	43	44	+1	+3%	-	-	-	-
Upper Colorado	-5.7	-0.3	+5.3	39	41	+2	+6%	8.8	4.1	-4.7	-53%

contributed to a much larger impact in the Arkansas Basin than in the Platte basin. Specifically, the economic impacts depended on (1) the size of the transfer; (2) the vitality of the region's pre-transfer economy; and (3) the ultimate destination and use of the transfer (e.g., inside or outside the basin, new water use or not).[44] In the Arkansas Valley, 88 percent of the water transfers were large (114,320 acre feet were transferred from 1980–1995 and left the basin). In contrast, in the South Platte Basin, transfers were generally smaller and stayed within the basin. The Arkansas River Basin also had a less robust pre-transfer economy than the Platte River basin. The resulting impacts on income and taxes in the basins were estimated at $187 per acre foot and $83 per acre foot, respectively.[45]

The concentration of agriculture also affects the economic impact of water transfers. For example, in the six counties in Colorado's Lower Arkansas Valley (Bent, Crowley, Las Animas, Otero, Pueblo, and Kiowa), the proportion of farm income (1 percent) was double the Colorado average (0.5 percent) for 2004; excluding Pueblo County, the region's farm income jumps to 6 percent of total personal income (Table 4).[46] This demonstrates the importance of agriculture in the Lower Arkansas Valley. In past decades, this area has experienced large water transfers from the basin (see above), including the Rocky Ford purchases and a 100,000 acre-foot purchase from the Colorado Canal (1985). Figure 12,[47] which shows the decrease in irrigated acres from 1997 to 2002 in these counties, suggests the impact of water transfers. Although such transfers provide short-term economic benefits to struggling farms, the long-term and regional impact of lower tax revenues, weaker retail sales, and population losses threaten the economic vitality of the Arkansas Valley.

Alternative Water Transfer Strategies

Water transfers need not harm rural areas to provide water to a municipality, and new water strategies have been developed to benefit both town and county. Some of the methods that have been developed include interruptible supply agreements, rotational fallowing (or "crop management") arrangements, water banking, alternative cropping or irrigation practices, and purchase/lease-back arrangements. Cities have also initiated conservation programs to extend their water supplies and limit drought impacts.

Interruptible supply agreements (ISAs) allow cities (or other water users) to contract with water rights holders for use of the right in times of drought.[48] Agreements may include an individual payment during a drought, annual payments, or a "signing bonus." ISAs are helpful in supplementing urban supplies only when necessary, rather than transferring a right permanently at the risk of drying up agricultural land and harming rural economies. However, ISAs are not a long-term solution for municipalities; ISAs can create problems such as landscape management (e.g., weed control with no water available for agricultural pesticides) during urban drought periods, and they are not feasible if the water transfer infrastructure does not already exist.[49]

Rotational crop management agreements are established by a group of farmers who agree to periodically fallow portions of their lands, transferring a consistent water supply to the buyer. These agreements provide supplemental annual base water sources to urban areas, reduce demands on aquifers, and decrease agricultural land dry-up rates. The major limitations of rotational crop management agreements include higher transaction costs than permanent land dry-up, and lower water availability during drought years (the agricultural provider might be a junior right holder, in which case a portion of the allocation might not be available). Similar to ISAs, an existing water infrastructure must also be in place to deliver the water.[50]

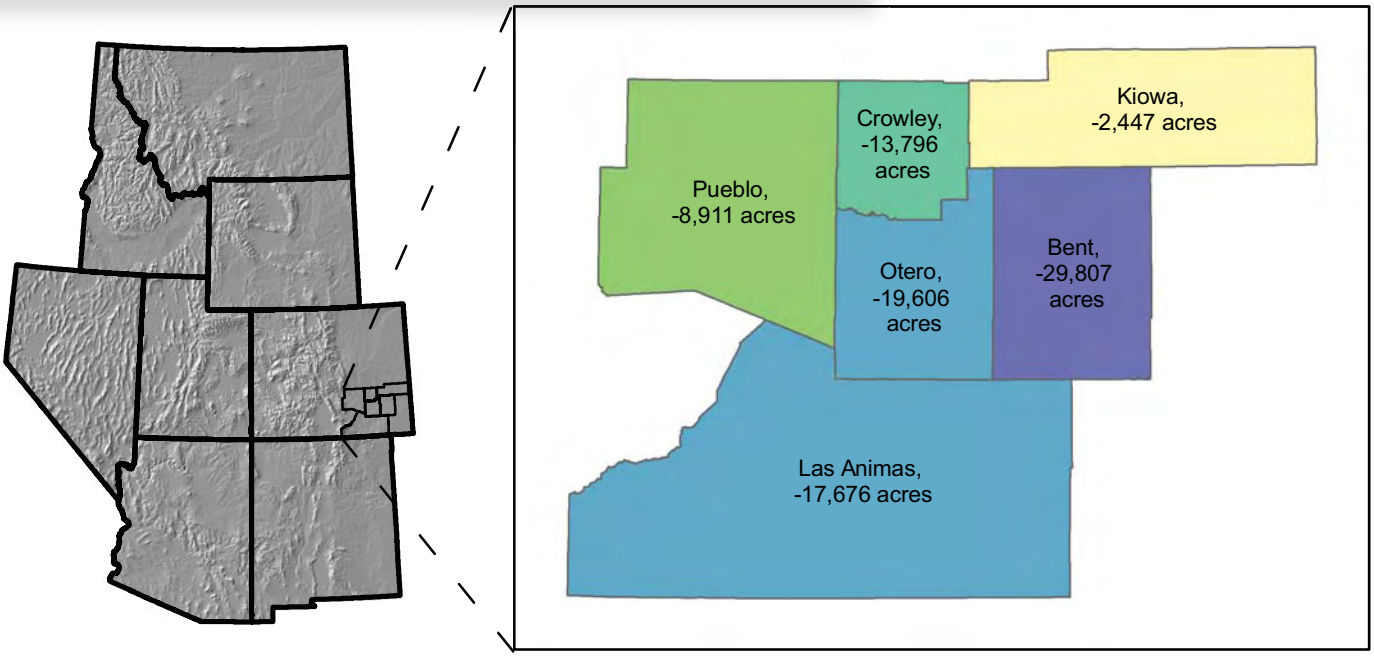
Water banking is another useful transfer tool. Water banks serve as an intermediary between water users and rights holders, allowing unused water rights to be leased for present or future use. Water banks allow users to store excess water for their own future use and protect against excess water loss. Given that agreements can be short-term in nature, water banks also protect downstream users as well (i.e., water can be released from the bank). As one example, Idaho's Water Supply Bank consists of two types of water banks: storage water rights and direct flow rights (see Case Study 1: Idaho Water Bank).[51] Water banks can also be used to satisfy interstate water compact obligations by budgeting water in groundwater and surface water banks. For example, Nevada and Arizona have a groundwater banking agreement by which unused portions of Nevada's Colorado River allocation are to be stored in Arizona's groundwater aquifer. The water banking agreement will allow Nevada to start using its "credits" toward water withdrawals in 2007 and allows Nevada to store excess Colorado River water for future water use.[52]

The biggest drawback of water banks is their reliance on non-use; if water banks are solely direct-flow right based and there is no additional storage capacity then water availability is not guaranteed; if everybody uses their water in a given year none is available for leasing.[53] Successful water banks rely on adequate storage capacities to hold the banked water. However, water banking provides an open-market solution and may avoid potential conflicts among users. For example, water banks cannot harm downstream users by excessive "deposits." It is possible to store only the amount of water equal to the former consumptive use, which protects return flows to the system.

Table 4
Farm Income as a Percent of Total Personal Income in the Arkansas Valley and State, 2004
Source: Bureau of Economic Analysis, Regional Economic Information System

County	Percent Farm Income
Pueblo County	-0.06%
Crowley County	20.25%
Kiowa County	35.31%
Otero County	3.69%
Bent County	4.67%
Las Animas County	-0.69%
Arkansas River Valley	1.05%
Colorado	0.45%

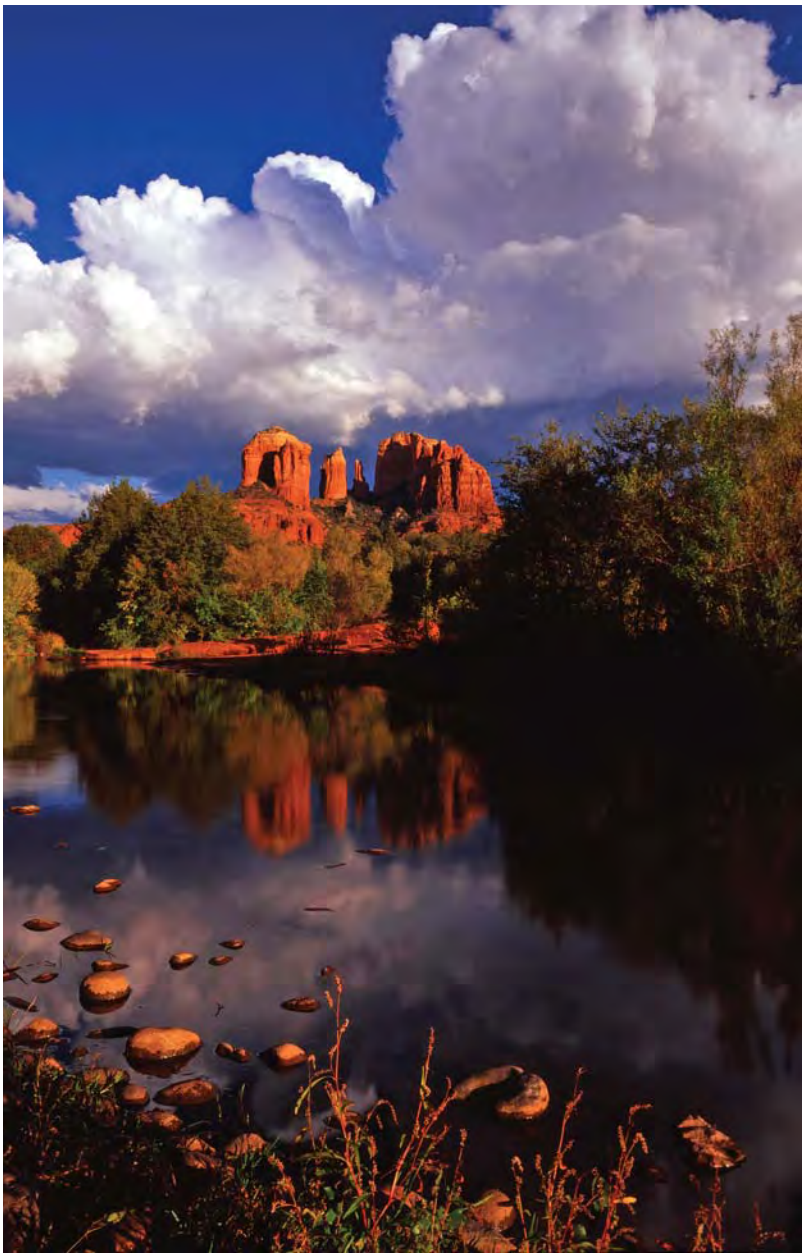
Figure 12
Change in Irrigated Acres in the Arkansas River Valley, 1997-2002
Source: Bureau of Economic Analysis, Regional Economic Information System



Another water transfer tool is alternative crops or water conservation measures. By reducing their consumptive use (e.g., by converting alfalfa to drought-tolerant grasses or adopting new irrigation methods), farmers can increase revenue by selling the water they save. Changes in consumptive use must be verified by the state engineer or water court prior to the transfer (see Case Study 2: Prior Appropriations Doctrine by State). As one example, the city of Aurora, Colorado, used a water conservation strategy during its second purchase from the Rocky Ford Ditch (see Case Study 3: Aurora). A potential risk to farmers is the high cost associated with increasing irrigation efficiency. For example, converting from flood to center-pivot irrigation includes a $568 per acre capital cost and $80 per acre annual cost.[54] While conservation can "free" water for other uses, high infrastructure costs make it unfeasible to implement conservation strategies during drought years alone.[55]

An additional water transfer strategy is called "purchase and lease back," where a municipality purchases land or its associated water rights and then leases them back to the land's user (such as a farmer or third party). The municipality gains access to some or all of the water in the future. As one example, the city of Parker, Colorado, purchased land from farmers in Logan County, Colorado, and leases back the purchased land. Ideally, all of the water in this area will not be consumed by Parker, keeping the land in production in between rotational fallowing.[56] However, the usual practice is complete consumption by the city when necessary. Often a transition period is allowed before additional land and water sales, as the rural agricultural economy is ultimately replaced.[57] Therefore, many lease-back programs represent interim stages prior to the permanent dry-up of agricultural lands.

Many of these strategies offer positive alternatives to permanent loss of agricultural land, which often has unexpected consequences for growing urban areas. For example, near



Phoenix, Arizona, the open space buffer created by surrounding farms reduces the urban heat island effect and mitigates the city's higher surface temperatures.[58] Rotational crop management arrangements could help address micro-climate issues by keeping most farms in production every year and alternating the amount of fallow land. For farm operators, benefits of fallowing include rotational crop management payments that may then be invested in potential improvements to field irrigation systems and improvements (e.g., laser-leveling) that will increase future water conservation.[59]

Conclusions

Despite the increasing trend toward agriculture to urban water transfers, supplying clean water to the Rockies' growing population remains an urgent problem. As previously discussed, the number of irrigated acres in the Rockies decreased (6 percent) between 1997 and 2002. While most water use in the Rockies Region is devoted to irrigation (87.2 percent in 2000) and adequate water exists for urban transfers, agricultural land is declining faster than anticipated.[60] In Colorado, the Statewide Water Supply Initiative (SWSI) estimated that while the state's population may grow by 65 percent between 2000 and 2030 (1.7 percent per year), 185,000 to 428,000 irrigated acres could be lost by 2030 due to water transfer projects, urbanization of irrigated lands, and other agriculture water losses (adjusted for some potential increase in irrigated acres if new water supplies are developed).[61] The 2002 Census of Agriculture estimate for irrigated land out of production (470,000 acres in 2002) does provide some context, but this estimate is based on a drought year, so some portion of this fallow land will likely return to production.[62] The decline in irrigated land raises new concerns about the economic vitality of rural areas and the cultural heritage lost. Are we trading rural agricultural lands under cultivation for urban water uses that have higher market value? Can small farms thrive through equitable water transfers and the development of more efficient irrigation techniques? Conservation and creative water sharing methods can potentially benefit the Rockies' people, land, and environment, but the demands of a growing population will likely create new tensions.

We end this review of agriculture versusHigher urban water uses in the Rockies as we started, by reflecting upon the concept of "sustainability." Helpful perspectives are provided in a Western Governors' Association's report on "water needs and strategies for a sustainable future":

> *While water resources are available for growth in the aggregate, they are essentially fully "appropriated" under regimes that have vested private property rights in water right holders. New uses to accommodate growth must largely rely on water obtained from changes to existing uses of surface and ground water, with limited opportunities to develop new supplies. In many instances, this will result in the reallocation of water to "higher valued uses" with accompanying third party impacts that must be considered, such as adverse consequences for rural communities and the environment.*[63]

This common theme of water sustainability increasingly permeates analysis of water in the Rockies. Limited in supply and often spatially separated from "higher value users," water has and will continue to be a fundamental challenge for the Rockies. How this limited, variable and potentially shrinking supply is managed in the face of myriad challenges ranging from climate change to rapid urban growth will largely determine not only the sustainability but also the "livability" of the Rockies so valued by millions of residents and visitors alike.

Case Study 1: Water Banking and Transfers in Idaho

The Idaho Water Supply Bank is one of the longest tenured water banks in the Rockies. Since 1930 the bank has served as a water exchange market, allowing for the temporary exchange of water rights between users.[1] The bank is involved in transactions of natural flow rights (e.g., the rights to surface water from a stream) and water storage rights (e.g., in reservoirs or aquifers). The price of the water is primarily based on where the water is going to be used. In the case of stored water, the price is determined by rental pool committees that operate the four rental pools of the Idaho Water Supply Bank.[2] Ten percent of the bank's revenue goes to the Idaho Department of Water Resources and the rest goes to the person holding the right.

Over the past five years, water banking activity in Idaho has increased for several reasons, mostly relating to drought, population growth, and a change in economic priorities regarding water allocations. On April 30, 1993, the state government amended a moratorium on new consumptive use to include the Boise River Basin and the East Snake River Plain and tributaries (it already included the Snake River Basin).[3] This regulation was continued by former Governor Dirk Kempthorne (now U.S. Secretary of the Interior), in Executive Order 2004-02 in relation to the East Snake River Plain Aquifer.[4] This halt to new consumptive use hampered certain industries, especially Idaho's fast-growing dairy industry. New industries have had to either establish a non-consumptive use (such as water left in the stream for fishing or recreation), mitigate for their impacts by providing other sources of water, acquire new rights (i.e., by transfers from other uses), or purchase rights from a municipal water provider that has extra water.[5] The moratoriums, combined with the drought and the decline in agricultural profitability, have prompted the recent increases in water transfers.

The Idaho Water Supply Bank facilitates temporary water rights transfers. As in other states, a transfer through the Idaho Water Supply Bank can take several years; however, the bank allows for purchasers of the water right to use that water during the processing time.[6] Developers and industrial dairies are using water banking to temporarily secure rights while they complete the transfer of new rights. As other areas of the West explore water banking as a means of alleviating water allocation problems, Idaho's water bank will serve as a good model due to its long tenure and relative success.

Case Study 2:

Summary of the Prior Appropriation Doctrine and Its Implications on Water Transfers

History:

The Prior Appropriation Doctrine of water law evolved during the mining boom of the 19th century.[1] Miners who needed water for their operations struck a claim to water just as they would to a mine site.[2] This doctrine contrasts with Riparian Doctrine, by which the owner of property adjacent to a waterway has the right to reasonable use of the water.[3] In many ways, however, the riparian doctrine is unsuitable for the arid and semi-arid West because it allows water use only on adjacent lands, meaning that only those lands could receive the irrigation water necessary to grow crops.

The Prior Appropriation Doctrine responded to the need to divert water farther from surface sources and to concerns that streamside owners would monopolize water use.[4] Because Prior Appropriation allows for the diversion of water from a river or stream to non-adjacent lands, vast areas of Western lands could receive critical water supplies. There are four components to a water right within the Prior Appropriation Doctrine: the intent to appropriate, capability of diversion and control, beneficial use without waste, and priority.[5]

As Hobbs notes, "A water right is a property right that arises solely by the act of placing water, theretofore un-appropriated, to the appropriator's beneficial purpose."[6] This evolved to include the intent to appropriate: the essential difference between a conditional water right and an absolute right. An absolute right is one that is actually put to use, while a conditional right is one that will later be put to beneficial use.[7] Holders of conditional rights have to prove due diligence or progress in placing the water under beneficial use. This rule is designed to prevent hoarding of water rights over many years for the purpose of speculation. The only exception to the rule is cities (via the Great and Growing Cities Doctrine), which can keep the water right in anticipation of future growth (but still have to prove diligence every six years). Once the right has been appropriated and diverted, it must be used beneficially, which is in a sense the most important part of the doctrine. Whether or not a water right is recognized depends on whether it is being beneficially used.[7] Beneficial use is generally defined as use "without waste," but the definition of beneficial use is constantly changing across the Rockies Region, and current definitions vary by state. For example, some states (New Mexico is one example) do not recognize an in-stream flow as a beneficial use unless it is for a purpose such as recreation.

The priority date or seniority of a water right largely determines its value. Once water is put to beneficial use, it is generally recognized as senior to future uses. Conditional water rights similarly rely on a priority date. Conditional rights receive the date of the original intent or plan to appropriate water. The relative priority of many agricultural water rights drives today's market in water transfers.

Implications for Water Transfers:

The most important part of the water rights transfer is arguably the no-injury/non-impairment clause. Water rights are usufructuary, meaning that there is the right to use the water beneficially, but the water itself is a public resource. When a water right is transferred, only the beneficial historic consumptive use is transferred, and downstream users must be protected from injury. Downstream junior users have the right to the river as it existed when they appropriated their right.[9] Water transfers, especially those out of a basin, can have serious impacts on downstream users and communities including the loss of property tax base, degraded water quality, and loss of jobs. States take various impacts into account, but the most common and the basis for no-injury is the change in stream flow.[10] The legal implications of water transfers in many cases require serious litigation. In Colorado, for example, all transfers are decided in water courts.[11] Colorado is the only state in the Rockies to use water courts to adjudicate all transfers. (See Matrix: Prior Appropriation Doctrine-Key Differences Between States)

Prior Appropriation Doctrine – Key Differences Between States

State	Water Transfer Application Agency[12]	In-Stream Flow Rights details[13]	"Public Interest or Welfare"[14]	Basin of Origin Protection for Out-of-Basin Transfers[15]	Basis for Protesting Transfers[16]
Arizona	Department of Water Resources	1941, public government or public interest groups	language in statutes, but no specific definition	No-injury, non-enlargement of water right	Anyone, preference given to water rights holders
Colorado	Water courts	1973, CWCB[17]	Not defined clearly	No-injury, non-enlargement	Anyone
Idaho	Department of Water Resources	1974, IDWR[ii]	12 concerns must be addressed [iii]	Arizona plus consistency with public interest	Anyone, preference given to water rights holders
Montana	Department of Natural Resources	1969, MDNR or private transfer	Might apply in reasonable use cases	No-injury, beneficial use	Downstream water rights
Nevada	Division of Water Resources	1988, public or private	Yes, case by case (state engineer)	No-injury, public interest	Anyone, preference given to water rights holders
New Mexico	State engineer	1998, public or private[iv]	Yes, both surface and groundwater	No-injury, conservation interests, public interest	Anyone, preference given to water rights holders
Utah	Division of Water Rights	1986, Division of Wildlife Resources	1989 Supreme Court ruling [v]	Same as Idaho	Anyone, preference given to water rights holders
Wyoming	Board of Control[vi]	1986, state[vii]	Case by case	Non-enlargement, no-injury	Anyone, preference given to water rights holders

[i] The public interest and welfare definitions vary from state to state. Some are defined by statute, some are case by case, etc. This is different from the Public Trust Doctrine, which could play a larger role in future water decisions.
[ii] The only way a private entity can hold an in-stream flow right is temporarily through Idaho's Water Bank System.
[iii] Statutory public interest concerns include: local economic impacts, impacts on recreation, fish, and wildlife, and compliance with air, water, and hazardous substance rules.
[iv] In New Mexico in-stream flow rights are not considered beneficial except for specific purposes such as for recreation or wildlife habitat.
[v] Requires rejection with unreasonable detriment to recreation, environment, and public welfare.
[vi] Includes the state engineer and the superintendents of the four water districts
[vii] In Wyoming this is only for fisheries.

Case Study 3:
Aurora, Colorado: Water Transfers from Agriculture to Urban Uses

Background:

Aurora, Colorado, has long been involved in purchasing water from agricultural users. At the time of its founding in 1891, Aurora (then named Fletcher) relied on groundwater and the Denver Water Board for its water. However, the town soon experienced problems with the groundwater supply, and Denver placed restrictions on Aurora's growth as well as the amount of water it would supply. In response, Aurora began looking for new water supplies. Together with Colorado Springs, Aurora helped build the Homestake Reservoir (completed in 1967), located across the Continental Divide near Leadville, Colorado. The pipes from Homestake now carry billions of gallons of clear mountain water to Aurora's growing developments.[1] Aurora also began purchasing water rights from ranchers in Park County, a predominantly rural county to the west. These purchases were complex both legally and socially and had large impacts on the communities of Park County. In the 1980s Aurora went searching for additional water to the south in Colorado's Lower Arkansas Valley, where the city began to acquire water from agricultural users.

Issues:

In a water transfer, benefits and costs will accrue to both the buyer and the seller. However, especially when transferred water leaves the basin of origin, there will also be third-party effects and most of the positive aspects will affect the purchasing basin, and most negative aspects will affect the selling basin.[2] Many state laws protect the basins of origin to varying degrees; some laws even require compensation for lost tax values and reseeding of fallowed land. Despite such protections, many areas have experienced drastic economic and social changes. This is true for various areas in the Lower Arkansas River Valley, where municipalities including Aurora have purchased large amounts of water. In Crowley County a large proportion of agricultural water was transferred to Aurora and Colorado Springs in the 1970s and 1980s, resulting in major impacts on the ranching community. Like other parts of the Arkansas Valley, Crowley County has seen a drop in land value; land in the Arkansas Valley is worth much more with irrigation ($1,700/acre) than without ($300/acre).[3]

Aurora has made several efforts to lessen the impact of its agriculture to urban water transfers. It has been leasing water from the Rocky Ford/Highline Canal, allowing farmers to stay in production except when the city needs the water (usually during drought years when farming is difficult anyway). In the second transfer from the main Rocky Ford Canal, Aurora purchased 1.78 acre-feet of water per acre of land, gave back half an acre-foot to some farmers, and assisted with the installation of drip irrigation systems and crop changes. These conservation measures allowed farmers to improve their productivity and product quality while using less than one-third of the water they had used originally.[4] Farmers on approximately 1,000 of the 2,800 acres of purchased land have asked to participate in this program so they can continue crop production. Aurora also created a $1.5 million trust fund for the Rocky Ford School District to make up for reduced tax revenue.[5] In a sense this was a bonus to the school system because the state also makes up for a portion of the lost revenue. Finally, in compliance with state law, Aurora reseeded the dried up lands with native grasses to prevent weed development and dust.

Future Challenges:

Aurora, as part of its intergovernmental agreement with the Southeastern Water Conservancy District, an Arkansas River basin water agency, for the next 37 years (originally 40 years in the 2003 agreement), will not transfer any more water out of the Arkansas Valley than what is already being transferred. Aurora will have to look to other basins for its water, such as the South Platte basin that houses the city. Currently, Aurora is pursuing new agreements that will provide its residents with water while not unduly harming the farmers from whom they buy/lease the water.

Significance for the Rockies:

Historically, Aurora's agriculture to urban transfers of water rights have been controversial. Aurora has made major efforts to become a leader in the pursuit of creative agreements designed to benefit both parties involved in water transfers. Aurora is growing rapidly and will likely always face criticism for allowing such growth without having enough water of its own. How Aurora will address the needs of its residents and the needs of the farmers from whom they receive water will set an example across the Rocky Mountain region.

Case Study 4: Innovative Approaches to Conservation:

Background:

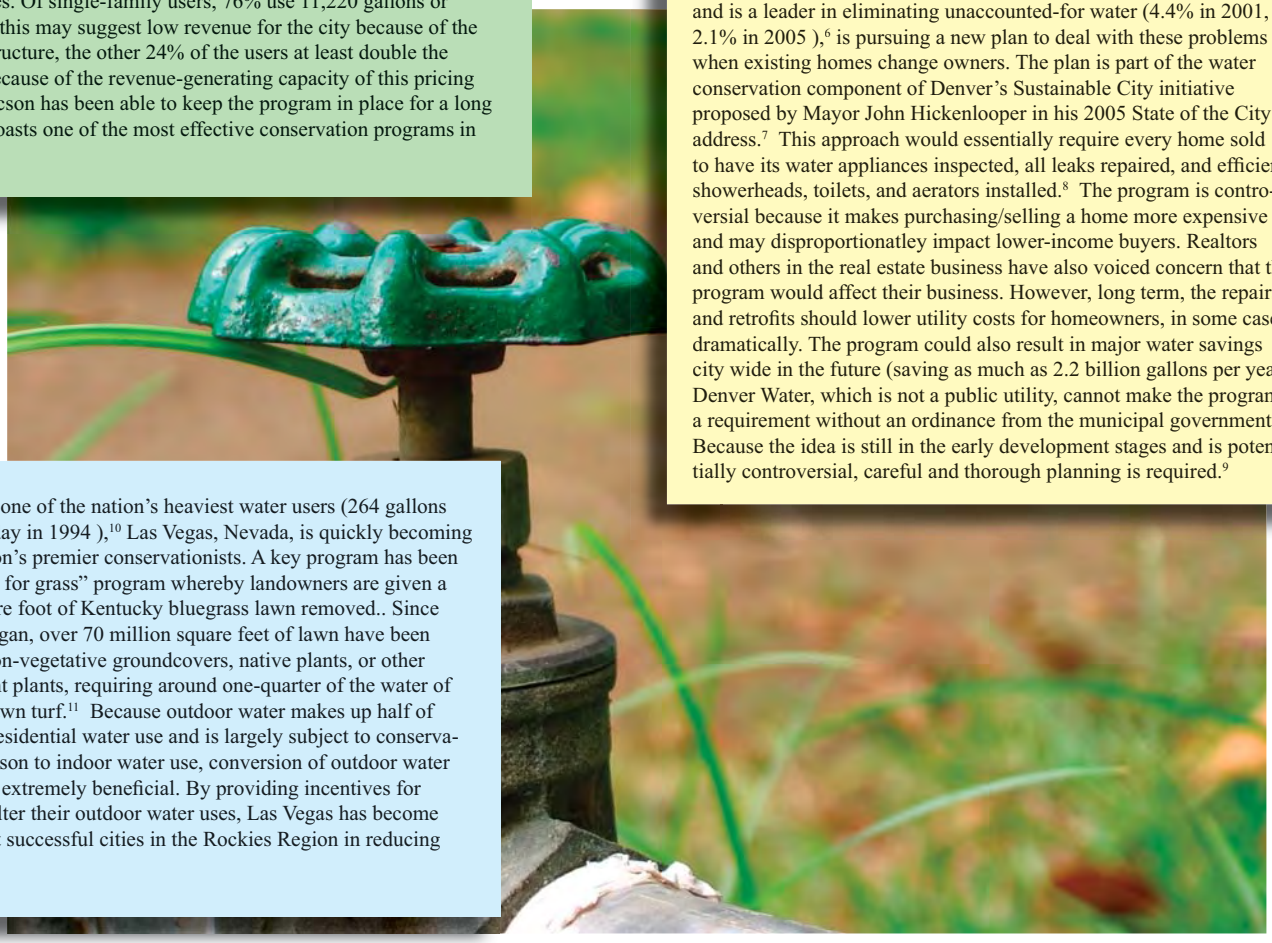
Conservation is an essential tool in the efficient use of water in the Rockies. Though sometimes controversial, especially the concept of conserving for growth, developing the conservation ethic is imperative, and many cities in the Rockies are experimenting with innovative approaches to promote conservation among their citizens. Examples include Tucson's aggressive water pricing structure, Denver's pending time-of-sale retrofit program, and Las Vegas' "cash for grass" program, outlined below.

Tucson:
Basic capitalist economics teaches that markets and prices are the best allocation tools. With water this may be true, but cities are often only allowed by law to price water to cover their costs. The law does, however, generally allow for increasing block rate structures as long as the low blocks are low enough to offset revenue from higher blocks.[1] In Tucson, single-family consumption of 11,220 gallons per month (g/m) is charged only $22.45, while the consumption of 22,440 g/m is charged $80.35; the water bills progressively increase from there, with 29,920 g/m equaling a $134.35 bill and 37,400 g/m equaling a $199.05 bill.[2] The city is currently increasing rates at 5% per year through 2011 to meet projected revenue needs.

Partly due to this rate structure, Tucson's single-family water use, which is the majority of the water use in the city, is one of the lowest in the Rockies. Of single-family users, 76% use 11,220 gallons or less.[3] While this may suggest low revenue for the city because of the block-rate structure, the other 24% of the users at least double the revenue.[4] Because of the revenue-generating capacity of this pricing structure, Tucson has been able to keep the program in place for a long period and boasts one of the most effective conservation programs in the Rockies.

Denver:
In every municipality, some water goes into the system and disappears, unregistered by the meters. This water is referred to as "unaccounted-for water" and is a large source of water waste in the Rockies. Western Resources Advocates, in their Smart Water Report, calculated that in the 13 Southwestern cities it surveyed, 118,732 acre-feet of water went unaccounted for in 2001, ranging from 1.3% (Mesa, AZ) to 12.3% (Albuquerque, NM) of all system deliveries.[5] Such water is lost through leaks in the delivery system, firefighting, pipeline flushing, and poorly functioning meters. Old fixtures and indoor leaks, while not contributing to unaccounted-for water, are also large wastes of water.

Denver Water, which pioneered xeriscape dry landscaping methods and is a leader in eliminating unaccounted-for water (4.4% in 2001, 2.1% in 2005),[6] is pursuing a new plan to deal with these problems when existing homes change owners. The plan is part of the water conservation component of Denver's Sustainable City initiative proposed by Mayor John Hickenlooper in his 2005 State of the City address.[7] This approach would essentially require every home sold to have its water appliances inspected, all leaks repaired, and efficient showerheads, toilets, and aerators installed.[8] The program is controversial because it makes purchasing/selling a home more expensive and may disproportionatley impact lower-income buyers. Realtors and others in the real estate business have also voiced concern that the program would affect their business. However, long term, the repairs and retrofits should lower utility costs for homeowners, in some cases dramatically. The program could also result in major water savings city wide in the future (saving as much as 2.2 billion gallons per year). Denver Water, which is not a public utility, cannot make the program a requirement without an ordinance from the municipal government. Because the idea is still in the early development stages and is potentially controversial, careful and thorough planning is required.[9]



Las Vegas:
Although once one of the nation's heaviest water users (264 gallons per capita per day in 1994),[10] Las Vegas, Nevada, is quickly becoming one of the nation's premier conservationists. A key program has been the city's "cash for grass" program whereby landowners are given a dollar per square foot of Kentucky bluegrass lawn removed.. Since the program began, over 70 million square feet of lawn have been converted to non-vegetative groundcovers, native plants, or other drought-tolerant plants, requiring around one-quarter of the water of conventional lawn turf.[11] Because outdoor water makes up half of single-family residential water use and is largely subject to conservation in comparison to indoor water use, conversion of outdoor water to other uses is extremely beneficial. By providing incentives for consumers to alter their outdoor water uses, Las Vegas has become one of the most successful cities in the Rockies Region in reducing outdoor usage.

Significance for the Rockies:
While some conservation programs are applicable region wide, others may not be. The city leaders of Denver, for example, might not want to reduce outdoor water use to the extent that Las Vegas has because Denver's water supplies are extremely variable and lawns can serve as a supply source during drought; that is, the city can enhance its available water supply by restricting outdoor use.[12] Las Vegas is guaranteed its Colorado River allotment, and it has a wastewater credit program which increases incentives for consumers to also conserve water used indoors, the least consumptive of water uses.[13] Time-of-sale retrofits have yet to be used on a wide scale, so their true effectiveness remains unknown. Finally, water rate structures such as Tucson's are increasingly being utilized across the Rockies. Conservation programs, while sometimes controversial, are also essential as populations grow in the dry Rockies Region. Despite differences in municipal characteristics, several cities have implemented distinct and successful programs that can serve as models for other municipalities and regions.

Facing Page Photo: Irrigation ditch that draws water from the Colorado River. © Ken Papelo, courtesy of the Rocky Mountain News

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[33]Todd Hartman, "Dividing the Waters Part 4," *Rocky Mountain News*, July 11, 2003: http://www.rockymountainnews.com/drmn/news/article/0,1299,DRMN_3_2100554,00.html.
[34]*Ibid.*
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[42]Jerd Smith, "The Browning of Green Colorado," Rocky Mountain News, July 29, 2006.
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[45]*Ibid*., p. 1063.
[46]Bureau of Economic Analysis Regional Economic Information System, 2004, cd-rom: RCN-0652.
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[51]Idaho Department of Water Resources, "Idaho Water Supply Banks", http://www.idwr.idaho.gov/waterboard/water%20bank/waterbank.htm.
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[53]"Agricultural Dry-Up Alternatives – Applicability."
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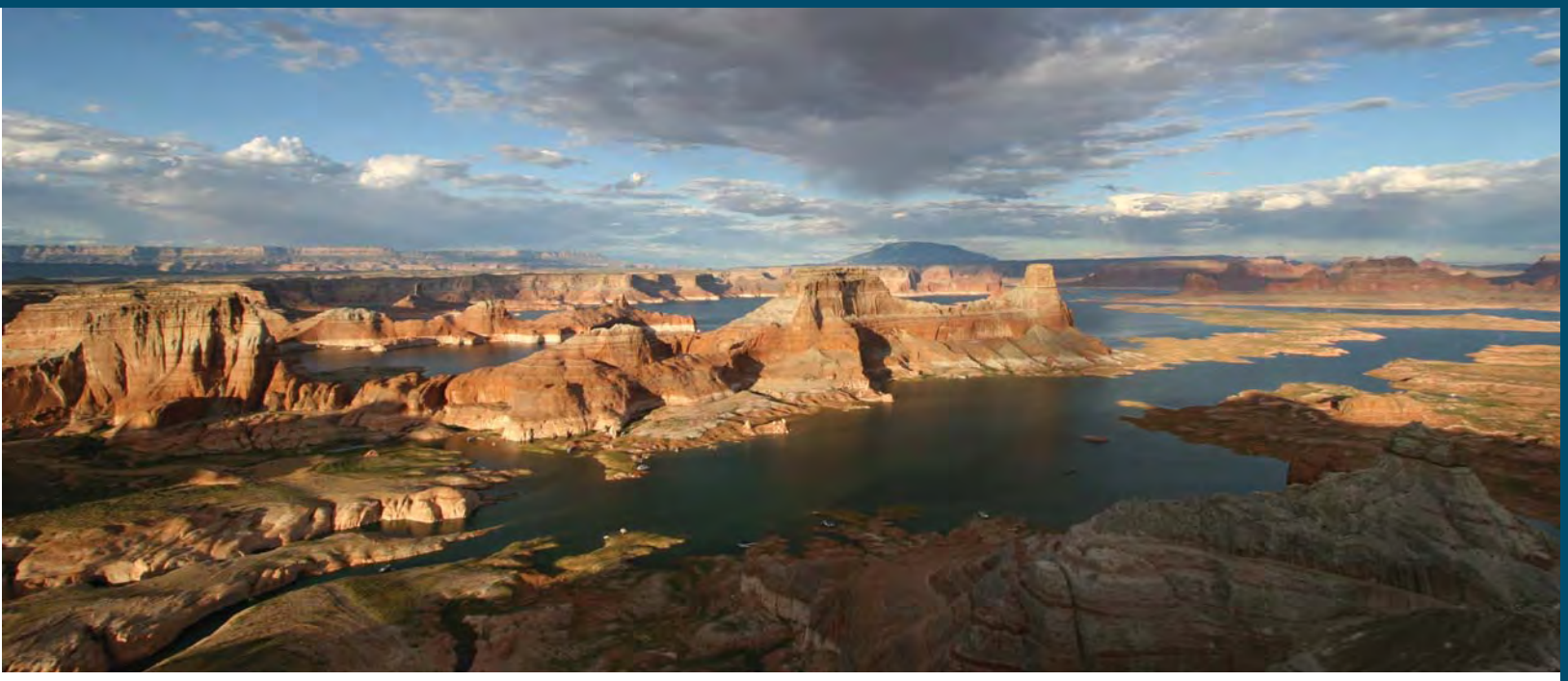
Photo: The Colorado River near Radium, Grand County, Colorado.



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[7]Aaron Clay, "Water Law in a Nutshell," Class Given at Western State College in Gunnison, 7/25–7/26/06.
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[10]Bonnie G. Colby, Mark A. McGinnis, Ken Rait, "Procedural Aspects of State Water Law: Transferring Water Rights in the Western States," Arizona Law Review, Volume 31 no 4 (1989): p. 710–711.
[9]*Ibid*, p. 705–706.
[10]Bonnie G. Colby, Mark A. McGinnis, Ken Rait. "Procedural Aspects of State Water Law: Transferring Water Rights in the Western States," Arizona Law Review, Volume 31 no. 4 (1989).
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[1]Western Resource Advocates, "Smart Water Report: A Comparative Study of Urban Water Use Efficiency across the Southwest," December 2003, p.77.
[2]Tucson Water, Council Adopts New Water Rate Schedule, http://www.tucsonaz.gov/water/newrates.htm, August 7, 2006.
[3]*Ibid.*
[4]*i.e.* one user pays $80 a month while three pay $20 a month resulting in $80 dollars from the first high user and $60 from the three low-volume users. This revenue disparity increases with each subsequent block making it very effective in punishing high use and rewarding conservation while still generating revenue.
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[11]Doug Bennett, Conservation Manager SNWA, Interview by Author, August 2, 2006.
[12]Chips Barry, Manager Denver Water, Speech at Alamosa Water Conservation Workshop, July 11, 2006.
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The Healthy Forests Restoration Act

By Phillip M. Kannan, guest contributor

Introduction

The United States Forest Service (Forest Service)[1] manages 193 million acres as national forests, national grasslands, and other lands collectively called the national forest system;[2] 35 million acres of this total are designated as wilderness. In this effort the Forest Service is subject to the control of both Congress and the president; however, in implementing the broad policies set by laws and executive directives, the Forest Service has broad discretion. The public, including for example environmental groups, logging companies, local governments, ATV manufacturers and owners, hikers, and skiers, can attempt to influence the discretionary decisions made at every level of the Forest Service. Since at least 1969 when the National Environmental Policy Act (NEPA) became law there have been administrative and judicial procedures available to anyone, including the groups mentioned in the previous sentence, who has been injured by a Forest Service decision to have it reviewed by an independent adjudicator to determine whether it is in compliance with the requirements established by laws and regulations.

In 1960 Congress enacted the Multiple Use Sustained Yield Act (MUSYA)[3] which requires that the national forests be used for "outdoor recreation, range, timber, watershed, and wildlife and fish purposes."[4] Congress was silent on the weights to be assigned to these uses; thus, the managers of national forests have broad discretion in doing so. Although this list of uses is alphabetical, presumably so as not to imply a ranking, the dominant use of national forests is for timber. The institutional culture of the Forest Service, established by its founder Gifford Pinchot, is reflected in Pinchot's famous characterization of the purpose of national forests as providing "the greatest good for the greatest number for the longest time." This effectively mandated that the dominant use of the forests would be growing trees as a crop.

It was taken as an axiom that forest fires are a threat to this crop. From this premise the Forest Service managers put in force what has been called the 10 a.m.. policy: all forest fires must be suppressed by 10 a.m.. of the day they were reported. The results of this policy were (1) fewer acres of national forest burned and (2) larger fuel loads in the forests. The Forest Service recognized the risk presented by these conditions; it ranked fire and fuel as the greatest threats to the health of national forests. In 1995 it adopted a policy that included mechanical thinning, prescribed fire, and selective fire suppression.[5]

The new policy did not prevent severe fire seasons in 2000 and 2002. President Bush decided to modify the policy with the goal of reducing the risk of severe forest fire even further. In August 2002 he adopted a policy called the Healthy Forests Initiative. This new policy has two components: (1) administrative and (2) legislative. Together, these mandates represent a dramatic change in the management of national forests, not merely a modified approach to fire protection.

The Administrative Component of the Healthy Forests Initiative

Because the administrative changes required no congressional approval, President Bush was able to initiate these changes almost immediately after announcing the new program. The administration put the following general policy in place: "HFI [Healthy Forests Initiative] focuses on reducing the risk of catastrophic fire by thinning dense undergrowth and brush in priority locations that are on a collaborative basis with selected federal, state, tribal, and local officials and communities. The initiative also provides for more timely responses to disease and insect infestations that threaten to devastate forests."[6] The emphasis was on mechanical removal rather than prescribed burning and the involvement of local officials. By December 12, 2003, 46 of these projects were underway by the Forest Service and 20 more were planned by the Bureau of Land Management.[7]

The most important element of the administrative component of the Healthy Forests Initiative is its effect on the National Environmental Policy Act (NEPA). This act requires every federal agency to prepare an environmental impact statement (EIS) for every proposed major federal action that will have a significant effect on the environment. Each agency has implemented this obligation through a triage system: actions are classified into one of three categories.[9] In the first category are those actions that normally require an EIS. In the second category are those agency actions that, because of their limited effect on the environment, the agency has determined do not require an EIS; these are called categorical exclusions.[10] The third category consists of those actions which do not clearly fit into either of the other two; for these actions the agency must prepare an environmental assessment (EA) to determine whether or not the action will have a significant impact on the environment.

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Agencies are required to provide a safety valve for categorical exclusions. The applicable regulation states: "[Agencies] … shall provide for extraordinary circumstances in which a normally excluded action may have a significant environmental effect."[11] Determining when extraordinary circumstances exist is almost completely within the discretion of the agency; challenges to an agency's decision that a particular action is not an extraordinary circumstance has almost no chance of success. The Court of Appeals for the Tenth Circuit summarized this legal principle as follows: "[Agencies] … are afforded a presumption of regularity … . This court grants "substantial deference" to the agency's interpretation of its own regulations. We may reject the agency's interpretation only when it is unreasonable, plainly erroneous, or inconsistent with the regulation's plain meaning." The challenger would have the burden of overcoming the presumption of regularity, and thus, have limited chances of forcing an agency to apply the extraordinary circumstances procedure.[13]

The Forest Service issued regulations adding new categorical exclusions. These include (1) harvest of live trees not to exceed 70 acres with no more than 1/2 mile of temporary road construction; (2) salvage of dead and/or dying trees not to exceed 250 acres with no more than 1/2 mile of temporary road construction; (3) commercial and non-commercial felling and removal of any trees necessary to control the spread of insects and disease on no more than 250 acres with no more than 1/2 mile of temporary road construction;[14] (4) hazardous fuels reduction activities; and (5) rehabilitation activities for lands and infrastructure impacted by fires or fire suppression.[15] These exemptions mean that neither the Forest Service decisionmaker nor the public will have the benefit of the scientific, economic, and other data that would be included in the environmental assessment or environmental impact statements for these categories.

The fuel reduction activities categorical exclusion applies to projects up to 4,500 acres for use of prescribed fire and 1,000 acres of mechanical control such as thinning. The rehabilitation categorical exclusion applies to projects of up to 4,200 acres.[16] Facts such as composition of the soil, the slope of the area to be logged, the proximity of the activity to surface water and to ground water, and other characteristics of the site are irrelevant to these exclusions.

The fact that the categorical exclusions set specific acreage limits and specific road length limits creates the opportunity for the Forest Service to apply mechanical control methods to large forests in 1,000-acre bites without either an environmental assessment or an EIS.[17] Moreover, even if none of the individual 1,000-acre projects has a significant impact on the environment, the combined or cumulative environmental effect of several of them can be significant. The fact that each is categorically excluded from the NEPA process, however, means that the cumulative impacts may never be analyzed. NEPA requires "all federal agencies to consider values of environmental preservation in their spheres of activities;"[18] that goal should be more explicit in the Healthy Forests Initiative.

In addition to these limits on NEPA, the administration adopted a process limiting the consultation requirements under section 7 of the Endangered Species Act (ESA). Under this provision of the ESA, agencies considering action that could affect an endangered or threatened species must prepare a biological assessment of the likely harm to the species and then consult with the Fish and Wildlife Service which can impose conditions on the proposed action, including prohibiting it, in order to protect the species. One commentator has characterized the new process as "allowing agencies carrying out fire management activities to avoid any consultations [under the ESA]."[19]

Other provisions in the Forest Service's regulations eliminate administrative appeals when a decision regarding a Healthy Forests Initiative project is made by the secretary or under secretary. Only a person or organization that submitted "substantive written or oral comments" can appeal decisions in such projects.[20]

The net result of these administrative policies is that fuel reduction activities, rehabilitation activities for lands and infrastructure impacted by fires or fire suppression, and the other categorical exclusions and other Healthy Forests Initiative projects will have little review by anyone outside the Forest Service. The public will have less data and less input regarding such activities that fall within a categorical exclusion. The Fish and Wildlife Service, designated by Congress as the protector of endangered and threatened species, will have less influence over the Forest Service in these activities. The Healthy Forests Initiative included one additional administrative policy which involves the Northwest Forest Plan of 1994 (NWFP). The NWFP established an ecosystems regime for managing 24.4 million acres of federal forests in the northwest that were the habitat of the northern spotted owl.[21] This plan set timber targets but required specific mitigation measures. The Forest Service and the Bureau of Land Management have failed to meet those measures; thus, the timber harvest has been below the targets. The Healthy Forests Initiative weakens the mitigation requirements of the NWFP and will thus make the harvest targets more likely.[22]

Picnic Rock Fire near Ft. Collins, Colorado - April, 2004

The Legislative Component of the Healthy Forests Initiative

The Healthy Forests Restoration Act of 2003 (HFRA) became law on December 3, 2003.[23] One of its primary purposes is to improve planning as a strategy to reduce personal injury and property damage from wildfires. This includes identifying at-risk communities and focusing programs at wildland-urban interfaces. Congress authorized $760 million annually for hazardous fuels reduction programs, 50 percent of which must be used on wildland-urban interface programs.

In forests that are not old growth stands the programs are to be implemented by focusing "largely on small diameter trees, thinning, strategic fuel breaks, and prescribed fire to modify fire behavior." In old growth stands the Forest Service is "to fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions … ."[25]

Challenges to hazardous fuels reduction programs are limited by HFRA. First, only a person that has exhausted the administrative review process established by the secretary of agriculture can seek judicial review.[26] Second, only issues that were raised in the administrative procedure can be reviewed in court.[27] Third, all judicial challenges must be in U.S. District courts for the district in which the project is to be carried out.[28] Fourth, if a court issues an injunction halting the project, it can last at most 60 days; however, it can be renewed.[29]

Like the administrative component discussed above, the HFRA weakens NEPA and the NEPA process. In the 35-year history of NEPA, the courts and federal agencies have developed an interpretation of this law to require that the EIS analyze a broad range of alternatives to the proposed action; the alternatives have been called the heart of the EIS. The breadth of this set of alternatives is controlled by what is called the rule of reason under which the agency must consider the reasonable and feasible alternatives.[30] HFRA changes this basic tool of environmental protection and reduces the understanding of both the public and the Forest Service managers of how the ends might be accomplished with less environmental harm. If the Forest Service decides a hazardous fuel reduction project is not in the categorical exclusion class and that an EIS must be prepared, the EIS will contain at most three alternatives: (1) the proposed project; (2) no action; and (3) an alternative proposed during the scoping process if it meets the purpose of the project.[31] If the project is within 1.5 miles of an at-risk community, no alternative need be analyzed.[32]

Conclusion

The objective of the Healthy Forests Initiative is to reduce the risk from wildfires to humans, private property, and national forests. These goals should be pursued; however, the means of achieving them should comply with NEPA and the Endangered Species Act. Some fuel reduction activities and rehabilitation projects may be emergencies; however, not all will be. For those that are, NEPA and the implementing regulations provide an exemption: "Where emergency circumstances make it necessary to take an action with significant environmental impact without observing the provisions of these regulations, the federal agency taking the action should consult with the Council about alternative arrangements. Agencies and the Council will limit such arrangements to actions necessary to control the immediate impacts of the emergency. Other actions remain subject to NEPA review."[33] This exemption has been used by other agencies and upheld by courts.[34] The Healthy Forests Initiative should reflect the fact that not all projects under it will be emergencies.

Policies should be developed that reduce new development of at-risk communities. A model for doing this is provided by Coastal Barrier Resources Act.[35] The purpose of this act is

> *"… to minimize the loss of human life, wasteful expenditure of federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts and along the shore areas of the Great Lakes by restricting future federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers … ."*[36]

To accomplish this purpose, except in very limited cases involving water-related projects, there can be no new expenditures or new financial assistance within the system of coastal areas defined by this law.[37]

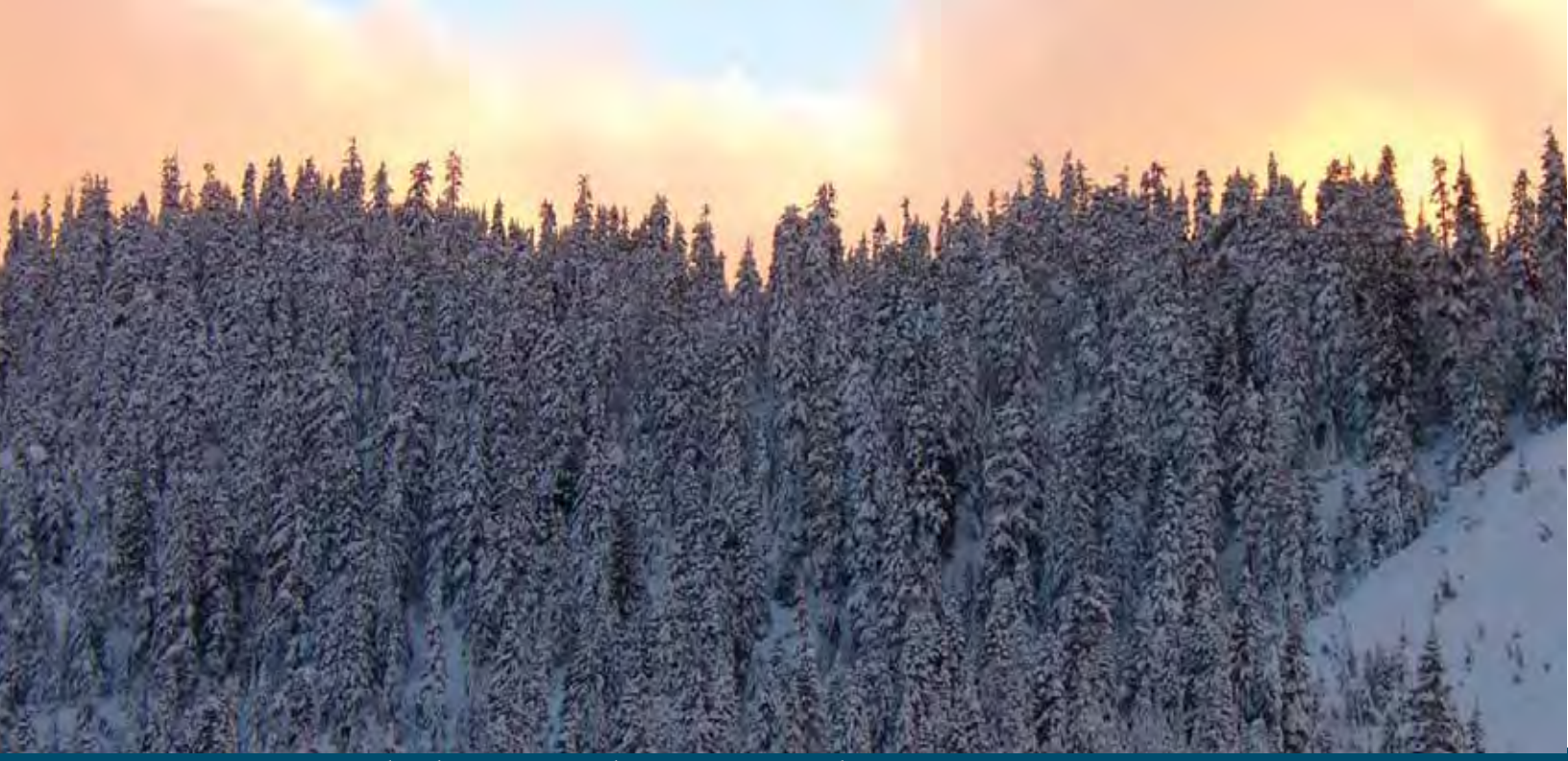
A similar approach was taken by Congress regarding the risks of building in floodplains: "Congress prohibited post-disaster federal support to those who could purchase flood insurance but who fail to do so, and it incorporated protection of the natural functions of floodplains into the program's rating system, reducing insurance premiums in communities with good floodplain management programs."[38]

By limiting federal expenditures and financial assistance that would encourage or support the development or expansion of at-risk communities, the risk from wildfires will be reduced. Such a program should be made a part of the Healthy Forests Initiative. This together with withdrawal of (1) the categorical exclusions, (2) the restrictions on appeals, (3) the restrictions on alternatives to be considered under NEPA, and (4) the limitations on the requirement that the Forest Service consult with the Fish and Wildlife Service under the Endangered Species Act would make the Healthy Forests Initiative a more balanced program.

Endnotes

[1]This brief article will consider only the role of the Forest Service, an agency within the Department of Agriculture, in the Healthy Forests Initiative. The Bureau of Land Management, an agency in the Department of Interior, has an analogous role to be carried out under laws and regulations pertaining to it.
[2]68 Fed. Reg. 33,582 (June 4, 2003).
[3]16 U.S.C. §§ 528-531 (2006).
[4]16 U.S.C. § 528 (2006).
[5]Jesse B. Davis, T*he Healthy Forests Initiative: Unhealthy Policy Choices in Forest and Fire Management*, 34 Environmental Law 1209, 1210 (2004).
[6]http://www.whitehouse.gov/infocus/healthyforests/restor-act-pg2.html (visited August 6, 2006).
[7]http://www.whitehouse.gov/infocus/healthyforests/restor-act-pg2.html (visited August 6, 2006).
[8]42 U.S.C. §§ 4321-4370f (2006).
[9]40 C.F.R. § 1501.4(a).
[10]Categorical exclusions are defined by the Council on Environmental Quality as "a category of actions which do not individually or cumulatively have a significant effect on the human environment and which have been found to have no such effect in procedures adopted by a federal agency in implementation of these regulations and for which, therefore, neither an environmental assessment nor an environmental impact statement is required." 40 C.F.R. § 1508.4. This regulation is binding on the Forest Service and all other federal agencies.
[11]40 C.F.R. § 1508.4.
[12]Utah Environmental Congress v. Bosworth, 443 F.3d 732, 740 (10th Cir. 2006).
[13]*See Id.* in which the challenger failed to force the Forest Service to apply its extraordinary circumstances procedure.
[14]68 Fed. Reg. 44598 (July 29, 2003) (for exemptions (1), (2), and (3)).
[15]68 Fed. Reg. 33814 (June 5, 2003) (for exemptions (4) and (5)).
[16]*Id.* (stating, "Hazardous fuels reduction activities using prescribed fire not to exceed 4,500 acres, and mechanical methods for crushing, piling, thinning, pruning, cutting, chipping, mulching, and mowing, not to exceed 1,000 acres. … Post-fire rehabilitation activities not to exceed 4,200 acres (such as tree planting, fence replacement, habitat restoration, heritage site restoration, repair of roads and trails, and repair of damage to minor facilities such as campgrounds) to repair or improve lands unlikely to recover to a management approved condition from wildland fire damage, or to repair or replace minor facilities damaged by fire").

The USDA Forest Service and the Department of the Interior have issued the categorical exclusions in their respective NEPA procedures. The categorical exclusions appear in Forest Service Handbook (FSH) 1909.15, Environmental Policy and Procedures, ID 1909.15-2003-1, and Department of the Interior Manual 516 DM, Chapter 2, Appendix 1, Departmental Categorical Exclusions. Reviewers who wish to view the entire chapter 30 of FSH 1909.15 may obtain a copy electronically from the USDA Forest Service directives page on the Web at http://www.fs.fed.us/im/directives/. Reviewers who wish to view the Department of the Interior Manual 516 DM may obtain a copy electronically from the Department of the Interior page at http://elips.doi.gov/table.cfm.
[17]A Healthy Forests Initiative project in the Fishlake National Forest in Utah called for timber thinning to treat beetle-infested trees of 123 acres and the construction of .75 mile of road reconstruction. However, the categorical exclusion that might be applied to this project would not fit because it was limited to .5 mile of temporary road construction. The Forest Service decided that "the .75 mile of road reconstruction will not be implemented as part of this decision." Utah Environmental Congress v. Bosworth, 443 F.3d 732, 738 n.4 (10th Cir. 2006).
[18]Calvert Cliffs Coordinating Committee v. United States Atomic Energy Commission, 449 F.2d 1109, 1111 (D.C. Cir. 1971).
[19]Jesse B. Davis, *The Healthy Forests Initiative: Unhealthy Policy Choices in Forest and Fire Management*, 34 Environmental Law 1209, 1212-1213 (2004).
[20]*See Id.* at 1220-1221 for detailed discussion of these limitations.
[21]*See* Bruce Babbitt, *Science: Opening the Next Chapter of Conservation History*, 267 Science 1954 (1995) for a discussion of NWFP.
[22]For a more detailed discussion see Jesse B. Davis, *The Healthy Forests Initiative: Unhealthy Policy Choices in Forest and Fire Management,* 34 Environmental Law *1209*, 1233-1234 (2004).
[23]Public Law 108-148, codified at 16 U.S.C. §§ 6501-6591.
[24]16 U.S.C. § 6512(f).
[25]16 U.S.C. § 6512(e).
[26]16 U.S.C. § 6515(c).
[27]*Id.*
[28]16 U.S.C. § 6516.
[29]I*d.*
[30]City of Carmel-by-the-Sea v. U.S. Dep't of Transp., 123 F.3d 1142, 1155 (9th Cir. 1997) (stating, "The EIS, however, need not consider an infinite range of alternatives, only reasonable or feasible ones.") and 40 C.F.R. § 1502.14(a)-(c).
[31]16 U.S.C. § 6514(c)(1) (2006).
[32]16 U.S.C. § 6514(d)(2) (2006).
[33]40 C.F.R. § 1506.11.
[34]*See, e.g.*, South Carolina v. O'Leary, 64 F.3d 892 (4th Cir. 1995).
[35]16 U.S.C. §§ 3501-3507 (2006).
[36]16 U.S.C. § 3501 (2006).
[37]*Id.* at § 3504.
[38]Robert V. Percival, Christopher H. Schroeder, Alan S. Miller and James P. Leape, Environmental regulation: Law, Science, and Policy (3rd ed. 2000). p. 764

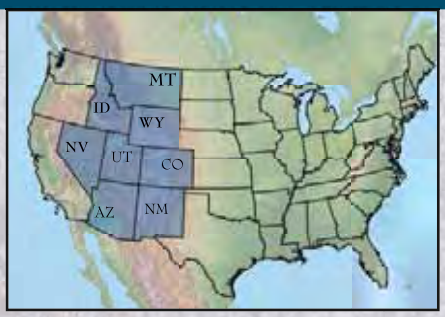


Forest Health in the Rockies:

Human Needs and Ecological Reality

By Carissa Look and Matthew Reuer, Ph.D

THE 2007 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD



Healthy forests embody the scenic beauty and environmental quality of the Rockies. From desert shrublands to lodgepole pine stands, forests cover much of the eight-state Rockies Region—68 percent by one estimate.[1] These forests provide critical wildlife habitat, protect watersheds, and sequester carbon dioxide. Forests also supply the region with economic resources, including recreational amenities and timber resources. Protecting these forests for future generations requires an integrated assessment of their health, ecosystem cycles, future climate change, urban growth patterns, and public policies. However, managing vast forested areas is costly, existing environmental regulations restrict development within forests, more people now live near our national forests, and public opposition has challenged some forest management techniques such as prescribed burns and salvage logging. This report examines how fire, insects and disease, and development have affected regional forest health and briefly discusses the history of land management in the Rockies.

Forest Health Defined

The text *Forest Health and Protection* defines healthy forests as those "that sustain their complexity while providing for human needs."[2] Ecosystem complexity can be described by basic qualities of the natural forest ecosystem (stand densities,[3] species composition, resource competition, and nutrient cycles) and disturbance factors such as the amount of disease or insect infestation in the forest and the current fire regime compared to its historical variability. Human needs include recreation, timber production, watershed protection, carbon sequestration, and minimal fire risk to life and property. Successful land management and development in the Rockies must balance both ecosystem and human needs to maintain healthy forests.

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Public Forest Managers in the Rockies

Future forest health in the Rockies Region is highly dependent on public land managers and their available resources. In the Rockies, approximately two-thirds of forests are publicly owned by the U.S. Forest Service, Bureau of Land Management, and Bureau of Indian Affairs.[4] As shown in Figure 1 and Table 1, total federal land ownership in the Rockies equals 58 percent and is dominated by the Bureau of Land Management (26 percent), U.S. Forest Service (19 percent), and Bureau of Indian Affairs (8 percent). Other federal agencies account for the remaining five percent, such as the U.S. Fish and Wildlife Service, the National Park Service, and the Department of Defense. Figure 2 presents the federal land ownership in each Rockies state, with Nevada reaching 88 percent public ownership. For comparison, public land ownership by census division is shown in Figure 3 and Table 2. Of all the U.S. census divisions, the Mountain Division is second only to the Pacific Division in federal land holdings (58 versus 74 percent, respectively), the latter dominated by BLM and U.S. Fish and Wildlife Service lands in Alaska. The average proportion of federal land ownership in the remaining seven census divisions equals 8 percent, suggesting that federal land management practices will have a stronger influence in the Western United States relative to the populous Eastern regions. This reinforces the perception of a Rockies "inland colony," where decisions made outside the region have a greater relative influence on land management and regional stakeholders than in other areas of the U.S.

Privately held forest lands are increasingly becoming part of the wildland–urban interface (WUI), where interspersed private development meets large tracts of public forest (see discussion below). The remainder of private forested lands is owned for multiple uses, including timber production, grazing, and conservation. Because federal agencies control the majority of forested lands in the Rockies, they will be the focus of this report. However, public land management practices can greatly influence nearby private forests, particularly with reagred to insect and disease infestation or fire risk.

Figure 1
Federal Land Ownership in the Rockies, 2005
Source: National Atlas of the United States

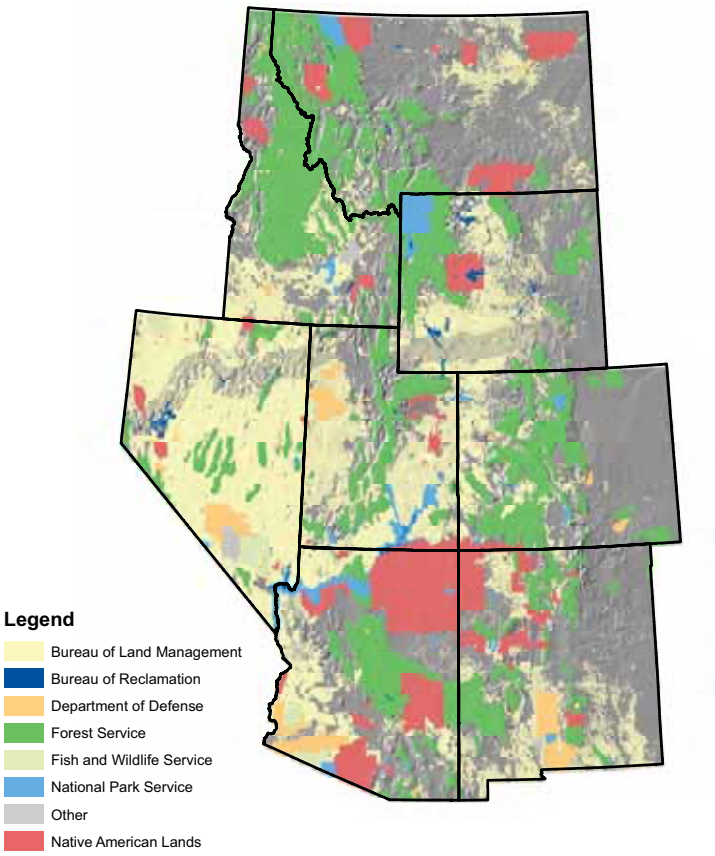


Table 1
Rockies Federal Land Ownership, Percent by State and Agency
Source: National Atlas of the United States

State	% Bureau of Land Management	%Bureau of Reclamation	%Department of Defense	%U.S. Forest Service	%U.S. Fish and Wildlife Service	%National Park Service	%Other	%Bureau of Indian Affairs	% of Total Land in Division
Arizona	17.2	0.2	3.9	16.2	2.2	3.4	0.0	27.3	70.4
Colorado	12.2	0.1	0.8	25.7	0.1	1.1	0.1	1.4	41.3
Idaho	21.8	0.2	0.4	40.4	0.2	0.9	1.2	3.3	68.5
Montana	8.1	0.1	0.3	19.9	1.1	1.3	0.1	8.9	39.8
Nevada	68.2	0.8	3.5	8.6	3.3	1.0	1.2	1.7	88.2
New Mexico	18.0	0.1	3.9	13.3	0.5	0.5	0.3	8.2	44.8
Utah	43.1	0.3	3.4	16.9	0.2	3.6	0.0	4.1	71.7
Wyoming	27.4	1.5	0.0	17.3	0.2	3.8	0.0	3.3	53.5
Rockies	25.8	0.4	2.0	19.1	1.0	1.9	0.3	7.8	58.4

Figure 2
Federal Land Ownership in the Rockies by State and Agency, 2005
Source: National Atlas of the United States

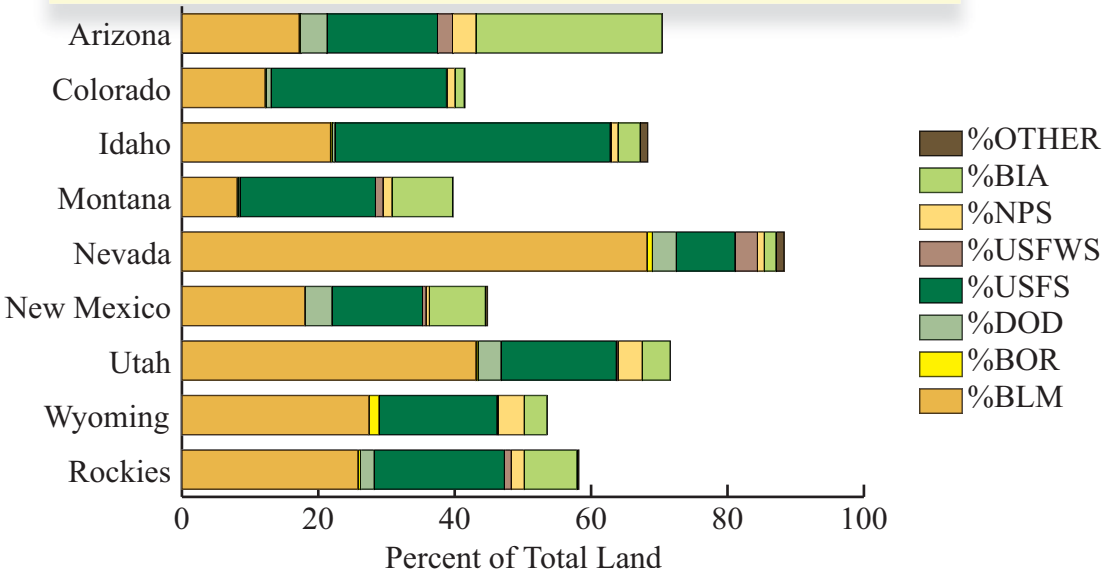


Figure 3
Federal Land Ownership by Agency and Census Division, 2005
Source: National Atlas of the United States

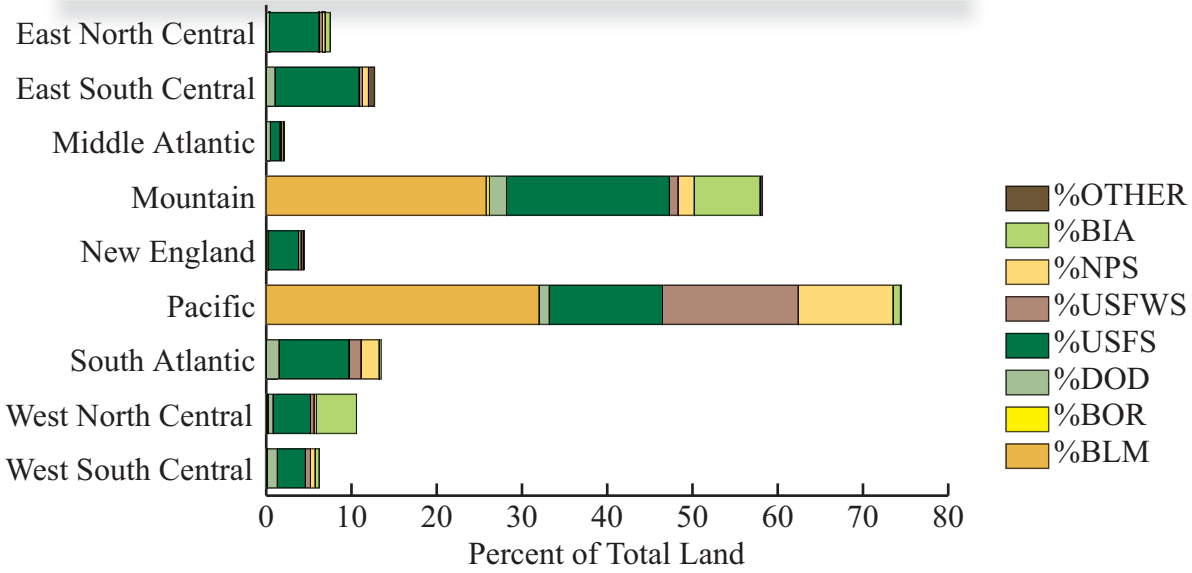


Table 2
Federal Land Ownership, Percent by Census Division and Agency
Source: Bureau of Economic Analysis, Regional Economic Information System

Census Division	% Bureau of Land Management	%Bureau of Reclamation	%Department of Defenses	%U.S. Forest Service	%U.S. Fish and Wildlife Service	%National Park Service	%Other	%Bureau of Indian Affairs	%of Total Land in Division
East North Central	0.0	0.0	0.4	5.8	0.4	0.3	0.0	0.6	7.4
East South Central	0.0	0.0	1.0	9.9	0.4	0.7	0.7	0.0	12.7
Middle Atlantic	0.0	0.0	0.5	1.1	0.2	0.2	0.0	0.1	2.2
Mountain	25.8	0.4	2.0	19.1	1.0	1.9	0.3	7.8	58.4
New England	0.0	0.0	0.2	3.6	0.3	0.2	0.0	0.1	4.4
Pacific	32.0	0.0	1.2	13.3	15.9	11.1	0.1	0.9	74.4
South Atlantic	0.0	0.0	1.5	8.2	1.4	2.1	0.2	0.1	13.4
West North Central	0.1	0.1	0.6	4.4	0.4	0.3	0.0	4.7	10.6
West South Central	0.1	0.0	1.2	3.3	0.6	0.5	0.0	0.5	6.2

Federal Land Managers and Legislation

The U.S. Forest Service was originally established as part of the Forest Reserve Act of 1891, which stated that "the President of the United States may, from time to time, set apart and reserve, in any State or Territory having public land bearing forests, in any part of the public lands wholly or in part covered with timber or undergrowth, whether of commercial value or not, as public reservations."[5] The associated Forest Service management goals were established in the Organic Act of 1897 with the aim of (1) improving and protecting the forest within the reservation; (2) securing adequate water flow; and (3) furnishing a continuous timber supply for the needs of U.S. citizens. However, the Organic Act does not authorize the inclusion of lands with valuable mineral deposits or agricultural fertility within the national forests.[6] Two primary resources shaped the Organic Act goals and the creation and management of the national forests between 1897 and 1960: water and timber.

With increased national interest in environmental protection and conservation in the 1960s, Congress responded with the Multiple Use Sustained Yield Act of 1960. The act states that the national forests shall be administered for multiple uses, including outdoor recreation, livestock grazing, timber sales, watershed protection, and wildlife management. Despite this multiple use strategy, the act does not affect the jurisdiction and responsibilities of individual states, stating that "nothing herein shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish on the national forests."[7] The 1960 act also does not change the management goals of the Organic Act (*i.e.*, the act supplements previous legislation). Most importantly, the Multiple Use Sustained Yield Act further requires that the relative values of the various resources be considered, not necessarily only the greatest dollar return or timber unit output.[8]

Minturn Ranger Station, Minturn, Colorado - June, 2006

Another protective measure for the national forests was provided by the Wilderness Act of 1964. "Wilderness areas" were to be secured as pristine forests where "the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain."[9] In these areas, no motorized equipment, permanent camps, or development are allowed.[10] This act also forbids mining, logging, and forest thinning within wilderness areas. Wilderness areas protected by the National Wilderness Preservation System increased from 9 million acres in 1964 to 105 million acres by 2005.

The National Forest Management Act of 1976 integrates the previous legislation and represents the primary statute governing forest management. The act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple use, sustained yield principles, and implement a resource management plan for each national forest unit. Therefore, continual assessment of forest health is central to the U.S. Forest Service land management practices.

Despite the trend towards multiple use and sustained yield practices in National Forest system legislation, the Supreme Court ruled in the 1978 court case, United States v. New Mexico, that at least before the enactment of the Multiple Use and Sustained Yield Act of 1960, National Forests could only be created "to insure favorable conditions of water flow and to furnish a continuous supply of timber".[11]

Thus, according to federal case law, all forests established before 1960 must have as their primary goal either the protection of timber resources or watersheds. They may have secondary goals that follow the Multiple Use and Sustained Yield Act of 1960. The case does not rule on the four national forests established after 1960.[12,13]

In 2003, President Bush signed the Healthy Forest Restoration Act

(HFRA) into law. This legislation contains a number of provisions meant to hasten the preparation and execution of hazardous fuels reduction projects to lessen the risk of uncontrolled wildfires. More importantly, the HFRA allows fuels reduction projects, including those that use private logging companies to thin dense stands, to be exempt from some of the National Environmental Protection Act requirements.[14] This allowance for private logging is a point of contention. Critics of the HFRA suggest the law caters to the logging industry as it is not subject to the National Environmental Policy Act (NEPA) process.[15] Supporters claim the NEPA process is too costly and time-consuming to effectively manage against catastrophic fires, and the law maintains considerable oversight to adequately balance environmental and logging interests.[16]

The Bureau of Land Management

The Bureau of Land Management (BLM) is primarily responsible for range management and minerals development, established by historical precedent through the Mineral Leasing Act of 1920 and the Taylor Grazing Act of 1920 (originally administered by the U.S. Grazing Service). However, the BLM also manages 55 million acres of forests within the Western United States, including 11 million acres of commercial forests. Although the BLM is within the U.S. Department of Interior, it has similar policies to the USDA Forest Service with regard to sustainable yield practices. Many issues, programs, and policies affect both agencies. For these reasons, BLM and Forest Service lands are discussed together in this paper.

The Bureau of Indian Affairs

Native American lands within the U.S. also contain 18 million forested acres, managed by the Bureau of Indian Affairs (BIA) under the Secretary of the Interior.[17] Tribes must develop forest management plans, and such plans covered 85 percent of tribal forested acres as of 2005.[18] These plans include comprehensive management guidelines for tribal forest resources, providing revenues through forests that meet multiple use objectives.[19] Tribes have also launched aggressive management programs to reduce forest density and to salvage stands damaged by fire, insects, and disease.[20] However, these initiatives are currently under-funded. As noted by an Intertribal Timber Council report, "there is considerable risk that efforts to combat forest health problems and institute sustainable management for all [Indian] forest resources will be overwhelmed by a combination of funding shortfalls, personnel shortages, and ecosystem-based problems (insects, disease, and fire)."[21]

Bureau of Land Management policies usually help guide Native American forest land management in collaboration with tribal agencies. As previously stated, BLM policies are often similar to those of the U.S. Forest Service when addressing forest health issues, including fire, development, and disease. However, each federal agency does have distinct challenges and mandates.

Forest Ecosystems and Fire

Forest fires represent a key challenge for federal land managers. How can fire's ecological services be balanced with human safety and economic interests in the Rockies? Fire's role in natural forest ecosystems is first discussed, followed by historical fire management practices in the Rockies and the region's current issues with fire management.

Fire is integral to the structure and health of forest ecosystems. Stand densities (the number of trees per area), species composition, median stand age, disease infestation, and natural succession all relate to fire conditions, notably the frequency and severity of fire events. Prior to the settling of the Rockies Region, fire served an important role in forest ecosystems,[22] removing saplings and providing space for larger, mature trees. Frequent, low-severity ground fires (known to foresters as a "nonlethal fire regime") were common in ponderosa pine forests, leaving mature trees with their fire-adapted bark and removing ground litter and saplings. These fire events, occurring every 5 to 30 years, decreased competition among ponderosas for light, nutrients, and water and returned critical nutrients to the soil.[23]

In other forest ecosystems, the fire return interval is 100 to 400 years. These infrequent, high-intensity fires kill most, if not all, trees in the burned area. Foresters refer to these events as stand-replacement fires, and they are common in lodgepole pine, Engelmann spruce, piñon pine–juniper, Douglas fir, and subalpine fir forests.[24] Although individual trees do not survive stand-replacement fires, the ecosystem as a whole benefits from these events. Lodgepoles, for example, have two types of cones: serotinous (fire-loving) and non-serotinous. Serotinous cones do not open unless they are disturbed, most often by fire, but occasionally by animals or warmer soil temperatures. Following a fire event, the disturbed area is reseeded by lodgepole's serotinous cones.

One dramatic example of a stand-replacement lodgepole fire occurred in Yellowstone National Park in 1988.[25] Yellowstone is dominated by lodgepole pine forests that regenerated following multiple severe fires in the early 1700s.[26] An unusually dry year, combined with multiple natural and human-caused fires, resulted in a fire that burned for four months and affected 793,000 acres (36 percent of the total park area).[27] Fifteen years later, the site of the fires now attracts tourists with its wildflowers and young, regenerating lodgepoles.[28]

Intermediate between stand-replacement fires and nonlethal fires are mixed-severity fire regimes, comprised of individual fire events of variable intensity. These fires result in a patchy distribution of fire mortality and highly diverse forest communities, including mixed conifer species, Douglas fir, lodgepole pine, ponderosa pine, and riparian species.[29] Generally, mixed-severity fires kill a greater proportion of fire-susceptible, shade-tolerant species (subalpine fir) and leave a greater proportion of the fire-resistant species (western larch, ponderosa pine, western white pine, and whitebark pine).[30] Historically, approximately 50 percent of forests in the northern Rocky Mountains were formed through mixed-severity regimes.[31]

These generalized fire-regime categories (nonlethal, stand-replacement, and mixed-severity) are also affected by climate factors and their variability. Among these factors, moisture and temperature play key roles in shaping forests and fire regimes. When determining fire susceptibility, forest managers must consider whether precipitation falls evenly throughout the year or in certain seasons or months. For example, cooler temperatures throughout the spring can cause slow, sustained snow melt, decreasing the risk of fire. However, the heavier vegetation growth encouraged by such steady spring moisture may provide extra fuel if drier conditions prevail in the fall. Global weather fluctuations also affect Western forests. For example, El Niño/La Niña cycles can impact southwestern ponderosa pine forests. El Niño tends to bring greater precipitation to the southwest from the eastern Pacific; as noted above, this precipitation promotes understory growth that inhibits fire but may also create more fuel under later dry conditions. In contrast, La Niña events have resulted in dry winters, droughts, dry understory vegetation, and consequently greater fire risk in the southwest. Therefore, the general fire categories must also account for climate variability and the resulting changes in vegetation conditions.

The U.S. Forest Service and Fire Suppression

Although early observers of American forests noted the importance of fire to forest ecosystems, the Forest Service was charged with protecting timber reserves, which meant protecting forests from fires. Two of the first priorities of the Forest Service were to establish a firefighting infrastructure and secure a firefighting budget. Despite this original intent, the Great Fire of 1910 (also known as "The Big Burn" and "The Big Blowup"), fueled by strong winds and dry forests, burned 3 million acres of forests in northeast Washington, northern Idaho, and western Montana in just two days, killing 86 people. The newly established U.S. Forest Service responded strongly to the disaster, viewing fire suppression as the ultimate measure of forest conservation. By 1935 firefighting technology had improved, and the Forest Service proclaimed that its firefighters would extinguish all spotted fires by 10:00 AM the next morning.[32]

Opposite page: regeneration after the Yellowstone fire

Fire suppression both reduces soil nutrient turnover and results in unnaturally high stand densities throughout the Rocky Mountain region.[33] The Coconino National Forest in northern Arizona, known for its ponderosa pine forests, now averages stand densities of 851 trees per acre; prior to settlement this area averaged 23 trees per acre.[34] Ponderosa pine stands in Colorado's Front Range have increased from 40 to 50 trees per acre to 200 to 400 trees per acre in the last 30 years.[35] Dense tree stands are especially susceptible to intense, stand-replacement fires as flames can readily jump from one tree to the next. When a forest finally ignites after years of fire suppression, the fire intensity significantly increases.

Higher fire intensity generally results in more acres burned per fire started, whether by lightening, human carelessness, or arson. In 1910, more than 1700 fires were responsible for burning 3.1 million acres in the northern Rocky Mountains (1824 acres/start). However, in 2000, 78 fire starts burned more than 350,000 acres in the Bitterroot Valley of western Montana (4487 acres/start).[36] In an extreme event, Colorado's Hayman fire of 2002 was ignited by a single arson event and burned 138,000 acres (see Case Study 1: Hayman Fire).[37]

Current Fire Conditions in the Rockies

Given decades of fire suppression, how can forests return to their natural state, prior to extensive human intervention? To address this question, one must first determine which areas have departed from their natural range of variability in vegetation characteristics, fuel composition, and fire frequency/severity. Colorado's Front Range alone contains approximately 800,000 forested acres in this category.[38]

The current condition of forests in the Rockies can be measured by the Fire Regime Condition Class (FRCC), which ranks the departure of a landscape from the natural fire regime (i.e., a regime

Case Study 1: The Hayman Fire

The Hayman Fire was started by former U.S. Forest Service worker Terry Barton on June 8, 2002 and burned more than 138,000 acres within 20 days. Dry air over Colorado combined with 15 to 30 mph winds and the topography of the South Platte River to create perfect conditions for this catastrophic blaze. Despite an aggressive initial response, including the use of air tankers, helicopters, fire engines, and ground crews, firefighters could not contain the fire. In areas downwind from the Hayman ignition point, uninterrupted stands of trees with low crowns, shrubs, and a thick layer of pine needles covering the forest floor helped fuel the fire and hindered firefighting efforts.

The Hayman Fire engulfed areas that had undergone previous fuels treatments, including prescribed burns, thinning, and wildfires. Temperature and wind conditions on June 9, however, caused an intense surface fire that even overtook these treated areas, breaching massive expanses of them. Exceptions included the Polhemus prescribed burn (2001) and the area of the Platte Springs wildfire (2002), which stopped the fire locally. Fire behavior was modified but not stopped by stand thinning that had been conducted at the Manitou Experimental Forest. Road density did not appear to affect fire severity in any part of the Hayman Fire. In some areas, similar burn extents had not been seen in centuries. For instance, the burn around the Cheesman Reservoir was unprecedented in the past 700 years.

After the fire, post-fire rehabilitation treatments included hillslope treatments such as mulching, contour-felling of logs, and seeding, as well as channel treatments such as installing straw-bale check dams. The success of these treatments has not yet been determined; however, researchers at the Rocky Mountain Research Station caution that certain types of rehabilitation efforts (such as salvage logging, seeding, and soil scarification associated with treatments) may remove or diminish critical structures for wildlife that were created by the fire.

The Hayman Fire was the most expensive in Colorado history. The total cost, including property loss, loans and grants from the Small Business Administration and FEMA awarded in response to the fire, damage to electrical transmission lines, wildlife losses, and fire suppression costs and forest rehabilitation efforts, rose to over $237.82 million. The Hayman Fire illustrates the effects of long-term fire exclusion in the Rockies and suggests the ineffectiveness of certain types of small-scale treatments in reestablishing the historical fire regime.

Sources:
Huspeni, Dennis. Jury Will Weigh Hayman Fire Sentence.The Colorado Springs Gazette. January 18, 2006.
Russell T. Graham. Hayman Fire Case Study: Summary. U.S. Forest Service 2003.

Site of the 2002 Hayman Fire, as of July 2006

unaltered by modern human mechanical intervention).[39] These natural fire regimes have been classified into five categories which rank the frequency and severity of fires, ranging from Regime I (0–35 year frequency, low to mixed severity) to Regime V (200+ year frequency, stand-replacement fires).[40]

Condition Class III represents a high departure from an ecosystem's natural state. Under this classification, grasslands and shrublands exhibit high rates of encroachment and establishment by woody shrubs, trees, or invasive species. Forests exhibit elevated stand densities, encroachment of shade-tolerant tree species, and loss of shade-intolerant tree species.[41] Figure 4 shows the FRCC areas for the Rockies Region.

Once high-risk areas are identified, the appropriate management techniques for that particular ecosystem must be applied. A recent study explored FRCCs in the Rockies and recommended the following strategies:[42]

•Fire exclusion has had little to no effect on fuels or community structure in forests characterized by stand-replacement fires (*e.g.*, lodgepole pines). Therefore, restorative treatments are inappropriate in these forests, and reducing stand-replacement fires through forest thinning would alter their ecological roles. However, restoration could address other aspects of these ecosystems, such as native understory diversity which has been altered by human land-use practices.

•A combination of thinning and prescribed burning may be useful in restoring mixed-severity fire regimes (where ecological and fire-history data are sufficiently available). However, further research is required to prescribe or discourage treatment, given limited scientific understanding of these complex ecosystems.[43]

•Restoration of landscapes characterized by low-severity fires is ecologically appropriate and desirable. Thinning and prescribed burns are recommended techniques to restore stand densities to their historical range (prior to fire exclusion, grazing, logging, and plantation establishment). Retention of mature trees, large snags

(standing dead trees), and downed logs is critical to restoring and maintaining ecological function in these ecosystems.[44]

The appropriate management technique is therefore strongly dependent on the ecosystem and how much human intervention has occurred. In many cases, little or no treatment is the best option.

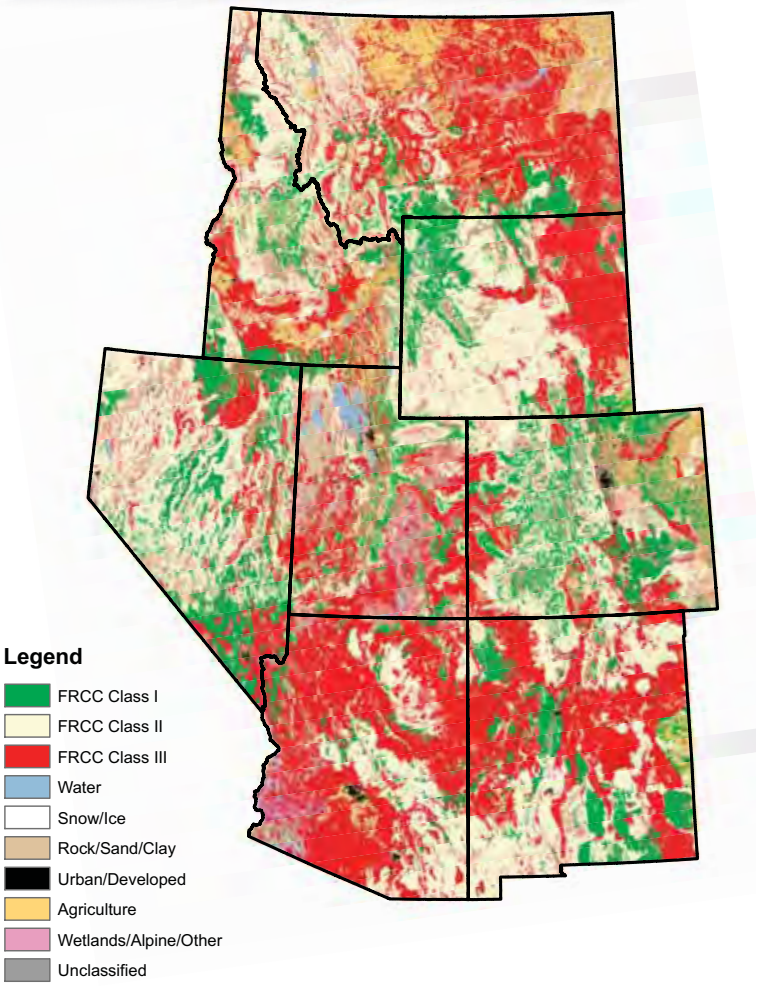
Insect and Disease Infestation in the Rockies

In addition to large forest fires, insect and disease infestations represent a second key factor affecting forest health. These infestations also exacerbate fire risk by killing mature overstory trees, providing readily burnable fuel for extensive canopy fires. Specific infestations affecting forest health in the Rockies Region include the mountain pine beetle, the piñon ips beetle, white pine blister rust, and heart-rot fungi. The extent of forest infestation in the Rockies is shown in Figure 5 and Tables 3 and 4, which rank the importance of these events in specific Rockies counties.[45] Counties are ranked according to the proportion of forests that are infested by disease and insects (Table 4) and the absolute acreage of diseased forests (Table 5); a 25 percent infestation level suggests which forests are likely to be greatly affected by a particular disease.

Mountain Pine Beetle

The mountain pine beetle, *Dendroctonus ponderosae*, attacks several pine species in the Rockies Region, particularly ponderosa, lodgepole, and limber pine. As of 2002, 4.1 million acres of forest were at risk from mountain pine beetle attacks in the United States, particularly in Colorado, Wyoming, Idaho, Montana, and Utah.[46]

Figure 4
Fire Regime Condition Class in the Rockies
Source: LANDFIRE Project, Wildland Fire Leadership Council



When mountain pine beetle infects its host tree, the tree releases sap to physically expel the beetle. However, trees that are stressed from drought, high stand densities, or large beetle populations cannot produce adequate sap to expel the invading beetles. Pioneer female beetles initiate the infestation, producing pheromones that then attract other beetles. After female beetles have invaded a tree, they construct vertical burrows in the phloem (vascular tissue that transports organic nutrients throughout the tree) in which they mate and deposit eggs. The beetle larvae develop inside the tree through the winter, feeding towards the bark until they emerge the following summer to invade other trees. The beetles in one infected lodgepole pine can infect four to seven new host trees the following summer.[47]

Pine beetles can introduce damaging bluestain fungus, *Ophiostoma minus*, to trees that they invade. Not all beetles carry the fungus, however, only two beetles are required to successfully infect a tree. The beetle's eggs carry the fungus that grows to fill the phloem and eventually the xylem (vascular tissue which transports water and inorganic ions up the tree). The result is nutrient and water loss and inadequate pitch to expel invading beetles. The tree eventually starves to death, its needles becoming red and dry.[48]

Recent mountain pine beetle outbreaks are likely enhanced by warmer temperatures and increased drought. Extreme cold is necessary to kill mountain pine beetle populations; winter air temperatures must drop to -40ºF for several hours or -30 to -35ºF for several weeks;[49] spring or fall cold spells can also stop the beetle

Figure 5
Forest Disease Risk in the Rockies
Source: Unpublished data generously provided by Frank Krist, Frank Sapio, and Borys Tkacz, U.S. Forest Service

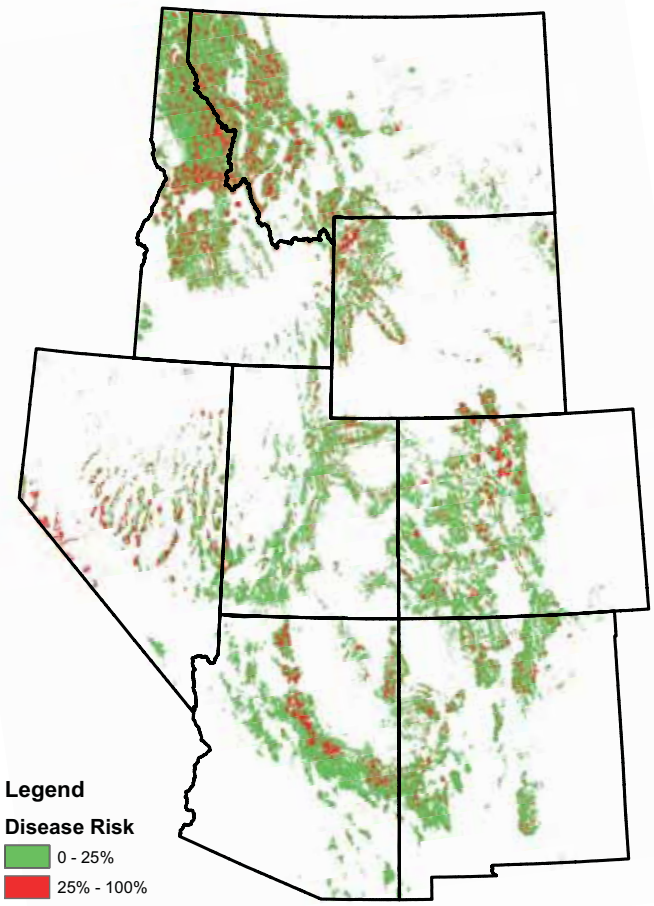


Table 3
Forest Disease Top Ten, Relative Acres by County
Source: Unpublished data generously provided by Frank Krist, Frank Sapio, and Borys Tkacz, U.S. Forest Service

County, State	%Diseased	Rank
Lyon, NV	81.9	1
Mineral, NV	66.5	2
Storey, NV	55.4	3
Esmeralda, NV	55.1	4
Douglas, NV	40.0	5
Carson City, NV	31.3	6
Churchill, NV	31.3	7
Nye, NV	29.0	8
Sheridan, WY	28.0	9
Lander, NV	26.0	10

Table 4
Forest Disease Top Ten, Absolute Acres by County
Source: Unpublished data generously provided by Frank Krist, Frank Sapio, and Borys Tkacz, U.S. Forest Service

County, State	Healthy Acres	Diseased Acres	Rank
Idaho, ID	2,3071,820	1,418,843	1
Coconino, AZ	9,736,496	994,528	2
Nye, NV	1,507,716	614,445	3
Flathead, MT	1,8321,596	530,418	4
Teton, WY	4,903,880	515,213	5
Sanders, MT	18,294,456	440,973	6
Shoshone, ID	18,281,844	440,745	7
Mineral, MT	18,286,349	437,917	8
Ravalli, MT	18,601,228	436,099	9
Missoula, MT	18,302,978	434,220	10

but must bring temperatures of around -25ºF.[50] The beetles' reproductive rate also increases with increased temperatures.[51] Most importantly, increased temperatures open previously unoccupied, healthy habitats to the mountain pine beetle at higher latitudes and altitudes, including lodgepole and jack pine ecosystems.[52]

Mountain pine beetle infestations may also increase fire risk.[53] The year following a beetle kill, the abundance of dead pine needles in the tree crown increases fire risk and the development of crown fires. After three to five years, however, the dead needles fall to the ground, reducing the canopy fire risk. Decades later, these dead, bare trees eventually fall to the ground, serving as fuels that promote high-temperature, stand-replacement wildfires. Such fires burn the forest floor, ladder fuels, and the newly regenerated canopy.[54] These intense fires can also sterilize the soil (*i.e.*, all nutrients and organic matter are burned out of the soil); the complete loss of vegetation increases the risk of soil erosion and the establishment of invasive species.

Natural controls on the mountain pine beetle population are presently not effective over large regions. The frigid temperatures needed to kill beetle larvae are unlikely given future climate predictions. Beetle predation by woodpeckers generally results in 20 percent beetle mortality, but 99 percent mortality is required to stop the infestation (other predators include checker beetles, ostomid beetles, and the fly *Dalla chapodidee*).[55] Although woodpecker populations have responded to the mountain pine beetle infestation, the beetle outlasts predators by overwhelming and satiating them. A third natural control on the mountain pine beetle population is food and habitat availability. Forest destruction caused by fires and by the beetles themselves may eventually limit the extent of beetle habitat. Given the scale of the mountain pine beetle epidemic, limited habitat may be the best available control on the exploding populations.

Human controls on the beetle population include pesticide spraying and forest thinning. Representatives John T. Salazar and Mark Udall of Colorado have introduced an act to amend the Healthy Forests Restoration Act. The act, called the Rocky Mountain Forest Insects Response Enhancement and Support Act, or the "Rocky Mountain FIRES Act," allows land managers in insect-infested areas to apply for fuels-treatment funding through the Community Wildfire Protection Plan. This act would also direct $25 million ($5 million over five years) to help communities develop a re-

quired Community Wildfire Protection Plan, funded by onshore oil and gas development royalties. Finally, the act would exclude projects within the Healthy Forests Restoration Act from the National Environmental Policy Act (NEPA), including proposed mountain pine beetle impact studies. This exclusion would limit, if not eliminate, obligations to conduct Environmental Impact Statements.[56] Opponents of this legislation argue that the current beetle infestation levels are not ecologically anomalous, do not increase the risk of crown fires, and do not warrant relaxed NEPA regulations.[57]

The Piñon Ips Beetle

The Piñon ips beetle, *Ips confusus*, is another important beetle in the Rockies. The ips beetle, also known as the pine engraver beetle, has killed piñon pine trees in over 60,000 square miles of piñon–juniper woodland in the Four Corners Region, and the total piñon mortality in this area is estimated to be 25 percent.[58] These beetles affect several other pine species as well, including lodgepole and ponderosa pines. Like the mountain pine beetle, ips beetle larvae feed on the tree phloem, just under the bark. However, the ips beetle eventually kills the infected tree by girdling it, not by a fungal infection.

The piñon ips beetle is endemic to the desert southwest, yet the current tree mortality level is unprecedented. Scientists hypothesize that recent extreme droughts and rising temperatures have resulted in weaker, stressed trees. High stand densities also promote the movement of ips beetles from one infected tree to its uninfected neighbors. Few solutions exist to reduce the severity of these outbreaks, although expensive chemical treatments ($10–$45 per tree) have been completed in high-value areas such as around park and forest visitor centers. Thinning also increases piñon pine vigor and the remaining, more vigorous trees can better pitch out beetles.[59]

Heart-Rot Fungus

The heart-rot fungus, *Phellinus tremulae*, infects the heartwood of aspen trees in the Rockies. The infection mechanism is not well understood, but the Forest Service hypothesizes the fungus reaches interior heartwood through dead branch stubs and fresh wounds.[60] The fungus will attack the tree's heartwood until it is entirely decomposed. This decomposition can benefit ecosystems by creating gaps in forest canopies that enhance succession and biodiversity, creating critical habitat for cavity-nesting birds and facilitating nutrient cycling.[61] Heart-rot fungus might also mitigate other insect infestations, as many cavity-nesting birds are insectivores. However, the heart-rot fungus greatly reduces, if not eliminates, the timber value of aspen.[62] In this case, forest managers must balance ecosystem health and timber production.

White Pine Blister Rust

White pine blister rust, *Cronartium ribicola*, is present in numerous areas throughout the Rockies, including Yellowstone National Park. An invasive fungus originating in Asia, white pine blister rust is likely the most destructive white pine disease in the United States. Hosts include whitebark pine, western white pine, limber pine, and southwestern white pine. The disease is exacerbated by extended cool, moist conditions during late summer and early fall. The ecological impacts are significant, as this disease threatens to eliminate white pine species in Western ecosystems.[63]

Population Growth and Fire Management

A third critical factor affecting forest health in the Rockies is recent development by humans, particularly the growth of urban areas near national forests and interspersed housing within forested areas. The high population growth in the Rockies reflects the abundant natural and recreational amenities of this region, but new residents may not be aware of the risks they pose to nearby forests.

One useful measure of human–forest interaction is the growing area of wildland–urban interface (WUI), defined as a wildland area within a half mile of housing with densities greater than 1 house per 40 acres.[64] This area is expected to double in the next 20 years. In Colorado's Front Range alone, there are 1.1 million WUI acres in which fire risk mitigation is necessary to protect human life, property, and other assets (*e.g.*, watersheds, wildlife habitats, and community infrastructure). Figure 7 shows the WUI areas of the Rockies Region.

Possible solutions to increased fire risk include buffer zones, prescribed burns, and forest thinning (see Case Study 2: Idaho Wildland Fire Use Fires). Buffer zones provide an effective solution to fire risk by removing fuels from areas of human life and property. Prescribed burns may reduce fire risk by eliminating ground and ladder fuels and restoring forests to their historical range of variability. However, prescribed burns are often inappropriate in the wildland–urban interface, as unforeseen wind conditions or fire

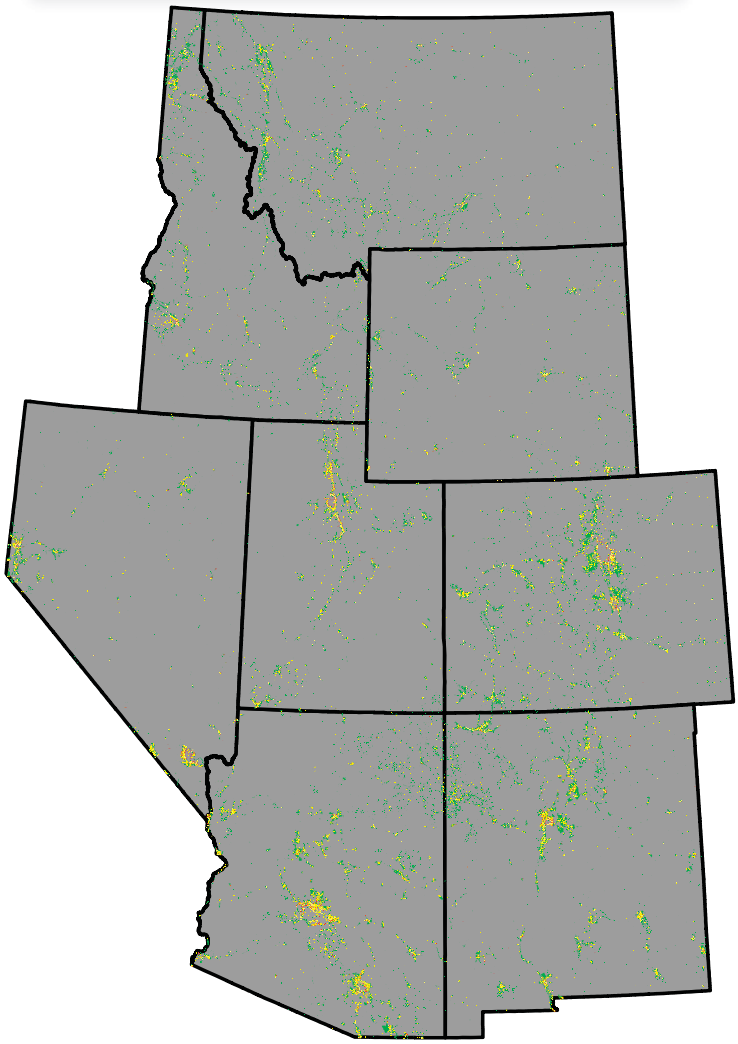
behavior can place lives and property at risk (see Case Study 3: Cerro-Grande Prescribed Fire and Wildfire).

Another solution actively pursued in WUI areas is forest thinning (see Case Study 4: Vail Valley Forest Health Project). Forest thinning projects can also target invasive species that are often associated with human development and can rapidly spread through burned areas.[65] According to the Front Range Fuels Treatment Partnership, "treatment plans should avoid the creation of sterile, park-like forests that have evenly-spaced trees and no shrubs or downed logs. Instead, treatments should achieve a complex mosaic of forest structures with patches of variable tree densities and ages that favor retention of the older trees."[66] By retaining part of the understory and the forest canopy, the introduction of invasive species can be minimized.

A concern of forest thinning is the fate of the small-diameter, low market value trees harvested from dense stands. One possible use of these timber products is as biomass fuel, providing energy for local schools and municipal buildings. For example, the city of Nederland, Colorado uses thinned trees to fire a 20 horsepower boiler, generating 5 million BTUs per hour to heat the Nederland Community Center.[67] Another use of small-diameter timber is niche market products such as timber flooring and furniture (see Case Study 5: North Slope Sustainable Wood, LLC).

The intersection of WUI areas and high fire risk is one regional measure of fire risk by county (that is, showing where people and fire risk coincide). We compared WUI areas (low, medium, and

Figure 7
The Wildland Urban Interface in the Rockies
Source: SILVIS Lab, Forest Ecology and Management System
University of Wisconsin-Madison



Case Study 2: Idaho Wildland Fire Use Fires

Wildland fire use is the practice of allowing naturally ignited fires in areas where fire is a major component of the ecosystem to burn. These fires are closely monitored and managed by the Forest Service. Traditionally, the Forest Service only allowed WFU in wilderness areas. However, Chuck Mark, the district ranger for the St. Joe Ranger District in the Idaho Panhandle National Forest, began a program utilizing WFU in Roadless areas in 2000.

The effects of wildfires in 1960 can still be seen in this area, where extensive brush fields cover areas where trees have not yet regrown. The intensity of these fires may have sterilized the soil, killing all trees as well as their seeds. These devastating effects made many in the public sector as well as the Forest Service reluctant to expand the use of WFU. However, Mark championed this program, arguing that the best way to help a landscape suffering from fire exclusion is to allow lightening-ignited fires to burn. Further, he contended that thinning programs will never be economically feasible because in many cases valuable timber has already been harvested.

Allowing naturally ignited fires to burn is a less expensive, yet more hazardous (if the fires get out of control), alternative to forest thinning. The WFU program attempts to return landscapes to their natural range of variability.If Mark's program is successful, it may be expanded throughout the Rockies Region to include other roadless areas and possibly national forests outside wildland–urban interface areas.

Sources:
Chuck Mark. District Ranger, St. Joe Ranger District, interview by author, 02 August 2006.
USDA Forest Service. "Wildland Fire Use" http://www.fs.fed.us/fire/fireuse/wildland_fire_use/use_index.html (2006).

Case Study 3: Cerro-Grande Prescribed Fire and Wildfire

The Cerro Grande Prescribed Fire was ignited as part of an approved plan on May 4, 2000 by fire personnel at Bandolier National Monument. Sporadic wind changes caused spotting (fires outside the fire perimeter caused by wind-carried burning branches or leaves) and "slopover" on the eastern fire line. Slopover occurs when fires spread outside the boundaries of a control line such as that created by a previous burn, firebreak, or line of fire personnel.

The fire was declared a wildfire at 1 PM on May 5. It was then contained for approximately 24 hours before a significant increase in winds from the west. The fire moved out of control to the east at the Santa Fe National Forest. At its most severe, the Cerro Grande Prescribed Fire produced spotting over a mile across fire lines in all directions. The fire began to move toward the towns of Los Alamos and White Rock, where 18,000 residents were evacuated. By May 10, the fire had destroyed 235 homes.

The Interagency Fire Investigation Team formed by Secretary of the Interior Bruce Babbitt concluded that federal personnel had failed to properly plan and implement the Cerro Grande Prescribed Fire. The investigators maintained that the Federal Wildland Fire Policy is sound yet depends on strict adherence to proper implementation by every agency involved. Although prescribed fires are a viable method of restoring landscapes to their historical fire regimes, public acceptance of this method is important. Prescribed fires that turn into wildfires have had harmful consequences not only in terms of property and costs, but in terms of public perception.

Source:
National Park Service"Cerro Grande Prescribed Fire Investigation Executive Summary." http://www.nps.gov/cerrogrande/executive_summary.htm (2000)

high interface and intermix areas) to the fire risk condition class III category. The number of acres for each WUI category was then determined, weighted according to each category, and assigned a final rank.[68] The result is shown in Table 5 for the top ten counties, as determined by our method. Seven Arizona counties ranked in the top ten (Maricopa, Pima, Pinal, Navajo, Coconino, Mohave, and Yavapai), with Clark (Nevada), Santa Fe (New Mexico), and El Paso (Colorado) counties also identified as high fire risk areas.

Legal and Scientific Debates: Roads and Salvage Logging

Solutions to regional forest health issues, such as fire, infestation, and development require a realistic assessment of existing resources, projected costs, and agreement on forest management plans among interested parties. However, agreement can be difficult to obtain, especially when mixing politics, science, and different visions for our national forests. Two key debates relate to road development in currently roadless areas and the practice of salvage logging.

The Roadless Rule

In 2001, the Roadless Area Conservation Rule was established to prohibit road construction and reconstruction in 59 million acres of inventoried National Forest areas. These areas were defined as undeveloped areas exceeding 5,000 acres. The "Roadless Rule" prohibited most timber harvests in inventoried roadless areas; exceptions included those areas that reduced fire risk, improved wildlife habitat for endangered, proposed (for listing as endangered), or sensitive species, and maintained or restored ecosystem composition and structure.[69]

Roadless areas present challenges to forest management. Transport of the heavy equipment required for forest thinning, including hydro-axes, bulldozers, and chippers, often requires an extensive road network, although small-scale thinning can be accomplished by work teams and pile burning. Without adequate thinning, many forest ecosystems may experience insect infestations or crown fires. However, many forest experts consider the current fire and disease regime part of a natural cycle, best left to nature rather than work teams. Environmental groups also argue that roads fragment wildlife habitat and cause soil erosion. One study has found that roads fragment forest ecosystems more than clearcutting by dissecting large, contiguous regions into smaller pieces and converting the forest interior into a series of edge habitats.[70]

In 2005, the Roadless Rule was repealed by the Bush administration, re-opening 59 million areas for road development. This

Table 5
Fire Risk Top Ten, Absolute Acres by County

County, State	Minimum	Medium	Maximum	Rank
Maricopa, AZ	130,694	81,295	12,161	1
Clark, NV	38,192	32,080	11,160	2
Pima, AZ	118,995	68,983	5,473	3
Pinal, AZ	49,804	24,822	2,631	4
Navajo, AZ	88,684	18,781	729	5
Santa Fe, NM	78,344	17,554	913	6
Coconino, AZ	70,852	16,342	1,106	7
Mohave, AZ	52,235	20,730	1,015	8
Yavapai, AZ	52,980	14,599	1,146	9
El Paso, CO	46,861	15,837	1,083	10

Case Study 4: Vail Valley Forest Health Project

The Vail Valley Forest Health Project (VVFH project) was created in response to the mountain pine beetle infestation outbreak in the Vail Valley of Eagle County, Colorado. The outbreak, which began in 1996, killed approximately 20,000 trees in the year 2000 alone, and the Forest Service has identified Eagle County as having the third highest level of mountain pine beetle infestation in Colorado. Fire suppression in the area over the past 60 years has created ideal conditions for the mountain pine beetle: evenly aged, dense lodgepole pine stands with decreasing aspen populations.

The VVFH project began in 2001 when the Forest Service entered into a participating agreement with the town of Vail. This agreement involves a $730,000 commitment by Vail to fund the Forest Health project. The town also agreed to provide technical assistance, fund salaries for town personnel assigned to prescribed burn activities, and monitor post-fire treatment response. A Final Environmental Impact Statement (FEIS) was issued in 2003, followed by a Record of Decision (ROD) in 2006. Forest Service personnel from the White River National Forest branch decided on a plan that will encompass 3,000 acres of national forest lands.

South of the I-70 corridor, about 700 acres of lodgepole pine will be thinned, chemically treated, salvaged, or patch cut. The remainder of the project will involve approximately 700 acres of aspen, which will be treated through patch cuts, perimeter treatments, and prescribed burning. North of the I-70 corridor, 1,600 acres of shrublands, grasslands, and aspen will be managed to return them to their historical range of variability (HRV). Mechanical vegetation treatments and prescribed burning will be used to vary stand age and density such that the potential intensity and severity of wildand fires in the wildland–urban interface will be reduced.

As of August 2006, the Forest Service had thinned 1,800 acres at a cost of $115,000. Cutting alone costs approximately $600 per acre, while piling and burning cut material that cannot be hauled away raises the cost to about $1,800 per acre. This case from the Vail Valley provides an example of community–Forest Service partnership that other municipalities and areas may want to follow in seeking ways to mitigate beetle infestations.

Sources:
USDA Forest Service, White River National Forest, Holy Cross Ranger District and Town of Vail. Participating Agreement. 2006.
USDA Forest Service, White River National Forest, Holy Cross Ranger District. Vail Valley Forest Health Project 2006.
Phil Bowden. Wildland Fuels Management Specialist Upper Colorado River Fire Management Unit USDA-FS/USDI-BLM, interview by author, 17 July 2006.
Cary Greene. Wildland Fuels Management Specialist Upper Colorado River Fire Management Unit USDA-FS/USDI-BLM, interview by author, 17 July 2006.

repeal addressed motorized access to the National Forests, citing inadequate public access to the roadless areas (i.e., no vehicles, no people). A limited rebuttal process does exist: proposed changes to specific roadless areas can be petitioned by state governors and filed with the Department of Agriculture. These petitions are not binding, and the Department of Agriculture can accept, modify, or reject them.[71]

The 2001 Roadless Rule was reinstated on September 20, 2006 by US Magistrate Judge Elizabeth Laporte of the United States District Court for the Northern District of California.[72] Laporte ruled that the Bush Administration violated the National Environmental Policy Act and the Endangered Species Act when it repealed the Roadless Area Conservation Rule.[73] Both New Mexico and Montana were co-plaintiffs in this four-state lawsuit to reinstate the 2001 Roadless Rule.[74] Following this ruling, the Chief of the Forest Service prohibited any "further management activities in inventoried roadless areas that would be prohibited by the 2001 Roadless Rule".[75]

Salvage Logging

Salvage logging, where dead trees are removed from a diseased or damaged area, is another issue currently under debate by politicians, scientists, and the public. Following a mountain pine beetle attack, trees can be harvested for approximately five years (mortality caused by the bluestain fungus does not affect a tree's structural integrity during this timeframe). After five years, however, the tree begins to "check": the wood is cracked by multiple freeze–thaw cycles and drying. Once cracked through the trunk, the tree is no longer valuable for timber.[76]

Widespread "beetle kill" in the Wildland Urban Interface, Vail, CO July, 2006

In response to the loss of harvestable timber caused by infestation and fire, Representative Greg Walden of Oregon has introduced the Salvage Logging Bill. The goal of the bill is to implement recovery treatments in response to catastrophic events, as determined by the Secretary of the Interior (BIA, BLM) and the Secretary of Agriculture (USFS). This includes the removal of dead and damaged trees and the implementation of reforestation treatments.[77]

The bill requires the Secretary of the Interior and the Secretary of Agriculture to develop a list of pre-approved management practices

by forest type that may be implemented as part of recovery projects. Because these pre-approved practices will be deemed emergency procedures, they must only consider the management practices and the "do-nothing" alternative when conducting an Environmental Impact Statement. Furthermore, the secretaries are permitted to use emergency procedures to circumvent the Endangered Species Act, excusing them from "incidental takings" of endangered species.[78]

In support of the bill, Mark Rey, Undersecretary of Agriculture for Natural Resources and Environment, argued that "in many cases, active management can restore a forest faster than letting nature take its course."[79] However, in August 2006, 500 scientists from academic and private institutions contested this view, asking Congress to defeat this legislation in favor of a more science-driven approach. They argue that:

> *Post-disturbance logging impedes regeneration of forest landscapes when it compacts soils, removes or destroys so-called biological legacies (such as soil organic material, seeds in the soil, large standing and downed trees) damages riparian corridors, introduces or spreads invasive species, causes erosion, delivers sediment to streams from logging roads and steep slopes, degrades water quality, and damages populations of many aquatic species.*[80]

A recent study also asserts that post-fire logging destroys much of whatever natural tree regeneration is occurring and generates significant short- to mid-term increases in fine and medium fuels (which may increase the re-burn potential).[81] The study also argues that post-fire logging taxes the public treasury, citing Oregon's Bis-

Case Study 5: North Slope Sustainable Wood, LLC

Fifteen years ago, Peter Stark bought 80 acres of forested land on the outskirts of Missoula, Montana, abutting the Rattlesnake Mountains. After taking a state-sponsored workshop that taught private landowners to develop a "forest stewardship plan," Stark realized that his forests were in poor shape. They had been clear-cut about 100 years ago and had grown back in a thick mat of Douglas fir and larch that had escaped much-needed thinning. Stand densities were over 830 trees per acre and despite being about a century old, most trees were only eight inches in diameter. The growth rings in the trees were so close together that it took a magnifying glass to see them.

Wishing to restore his forest, Stark enlisted the help of restoration forester Matt Arno. Matt Arno holds a degree in forestry and founded Montana-based Woodland Restoration, Inc., a timber company that harvests with the goal of restoring forest health. Although Arno occasionally worked on a break-even basis, accepting the thinned logs as payment, Stark's steeply graded land did not allow this. The two held off for years, searching for an economical use for Stark's timber. They found that use when Stark and his wife Amy decided to build a dance studio and office. The high price of flooring revealed a potential use for their thinned larch trees. Amy Stark's dance floor became the first floor created by North Slope Sustainable Wood, LLC.

The company produced 22,000 square feet of small-diameter timber flooring in 2002 alone and has been in business for four years. Private landowners hire Matt Arno to restore their forests; Arno then sells these logs to a sawmill where they are made into tongue-and-groove flooring. Stark buys these floorboards and installs them for his customers.

Stark's and Arno's flooring uses a previously difficult-to-market good (small-diameter timber). They anticipate that the revenue they generate will allow the forest service to save almost $400 per acre in treatment costs if they hire North Slope Sustainable Wood, LLC and Woodland Restoration, Inc. to perform forest treatments. They further estimate that over the next 15 years, if they are awarded a Woody Biomass Utilization Grant through the Healthy Forests Restoration Act, they will be able to restore approximately 22,000 acres of land (both public and private).

Although it is rare to come across business ventures that profitably use small-diameter timber harvested as part of forest restoration, this approach to forest treatment is well suited for wildland–urban interfaces because unlike prescribed burning it does not pose a threat to life and property.

Sources:
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Peter Stark. interview by author, 27 July 2006.

cuit Fire of 2002 as an example (post-fire logging operations exceeded revenue by $14 million). Therefore, salvage logging might not provide the best long-term, economically viable solution to forest management in the Rockies.

Conclusion

Healthy forests are an important challenge for the Rockies Region. Visitors and new residents flock to this area for clean air, recreational amenities, pure water, and scenic beauty provided by the national forests. Disease and fire cycles threaten not only these features but also human safety and property. The 1988 Yellowstone National Park fire showed that forests will regenerate and this process too can be both healthy for the forest and a draw for visitors. However, the immediate economic costs of devastated forests are potentially enormous to regional tourism, land developers, and natural ecosystems (*e.g.*, watersheds and soils). The debate for the next century will center on the "greatest good" provided by the national forests and the most appropriate management strategies. Most importantly, the people of the Rockies should provide a strong voice in this debate, as these decisions will affect the familiar, pristine corners of our backyard.

Endnotes

[1]Calculated from U.S. Forest Service Wildland Fire and Fuel Management data, http://www.fs.fed.us/fire/fuelman/. The forest area here includes the following ecosystems: desert shrub, other shrub, elm–ash–cottonwood, aspen–birch, western hardwoods, ponderosa pine, Douglas fir, larch, western white pine, lodgepole pine, western fir–spruce, pinon–juniper, and alpine tundra.
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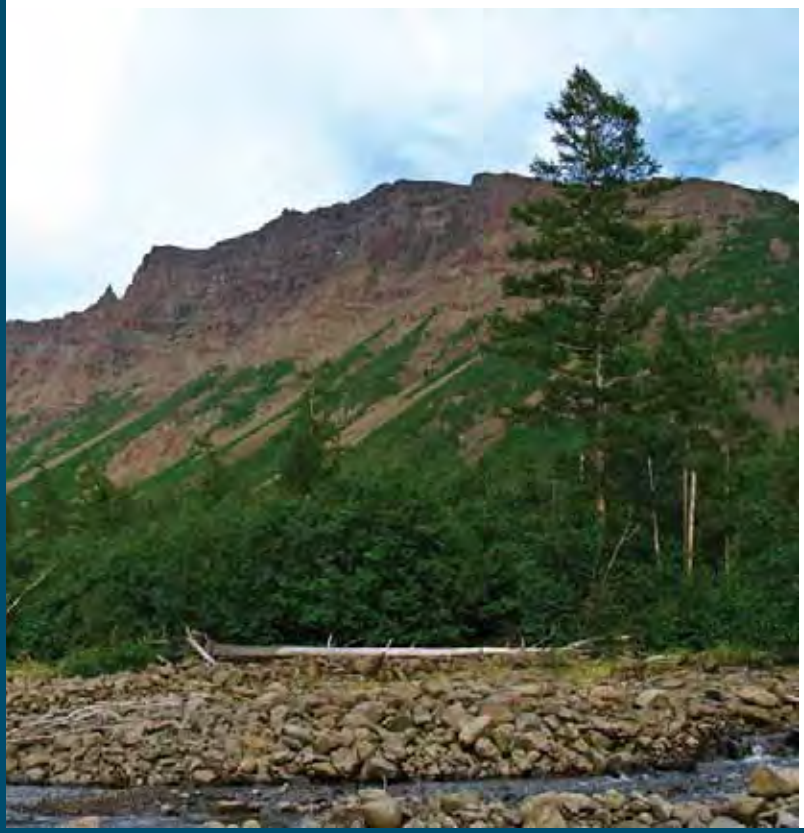
[5]26 Stat. 1103 (March 3, 1891) (repealed).
[6]36 Stat. 847 (June 25, 1910) (repealed).
[7]16 U.S.C. § 528–531.
[8]*Ibid.*
[9]16 U.S.C. § 1131 (c).
[10]16 U.S.C. § 1133 (c).



[11]U.S. v N.M., 438 U.S. 696, 708 (1978).
[12]U.S. v N.M., 438 U.S. 696, 715 (1978).
[13]National Forest Service "National Forest Lands-Annual Acreage (1891-2005)" http://www.fs.fed.us/land/staff/lar/LAR05/table21.htm
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[17]Second Indian Forest Management Assessment Team for the Intertribal Timber Council. *An Assessment of Indian Forests and Forest Management in the United States*, 2003 (accessed August 9, 2006). p. 5.
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[24]*Ibid.* p. 80–87.
[25]Merrill K. Kaufmann. *Emeritus Research Forest Ecologist U.S. Forest Service Rocky Mountain Research Station*. Interview by author, Fort Collins, Colorado, 10 July 2006.
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[32]*Ibid.*, p. 12–20.
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[55]Jeff Witcosky. *U.S. Forest Service Forest Health Management*. Interview by author, 8 August 2006.
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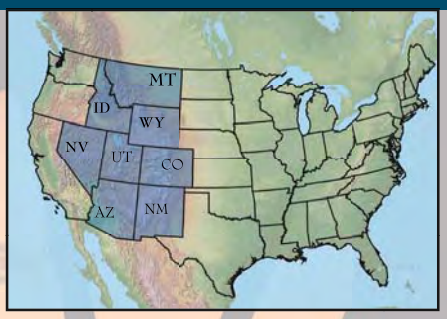
[58]Assistant Director, Renewable Resources and Planning, and Director, Office of Fire and Aviation. "Information Bulletin no. 2004-130 Pinon Ips Beetle Outbreak." U.S. Department of the Interior. http://www.blm.gov/nhp/efoia/wo/fy04/ib2004-130.htm.
[59]*Ibid.*
[60]USDA Forest Service, and State and Private Forestry Organizations. "Aspen Heart Rot." In *Forest Insect and Disease Management Guide*. 2004.
[61]*Ibid.*
[62]Phil Bowden. Wildland Fuels Management Specialist Upper Colorado River Fire Management Unit USDA-FS/USDI-BLM, interview by author, 17 July 2006.
[63]Frank Krist, Frank Sapio, and Borys Tkacz. *Draft Mapping Risk from Forest Insects and Diseases* 2006. p. 24. http://fhm.fs.fed.us/mtgs/wg/06/risk_map.pdf .
[64]Front Range Fuels Treatment Partnership Roundtable. *Living with Fire: Protecting Communities and Restoring Forests* 2006. p. 1–5.
[65]Molly Hunter. *Department of Forest Sciences Colorado State University*. Interview by author, 10 July 2006.
[66]Front Range Fuels Treatment Partnership Roundtable. *Living with Fire: Protecting Communities and Restoring Forests* 2006. p. 10.
[67]Toddi Steelman, Ginger Kunkel, and Devona Bell. "Community Responses to Wildland Fire Threats." NC State University Department of Forestry. http://www.ncsu.edu/project/wildfire/index.html (2006).
[68]The number of FRCC III acres for each WUI category was first assigned a Z-score, which normalizes each value according to the mean and standard deviation of the sample population. Each Z-score was then multiplied by a weight (low = 0.5, medium = 1.0, high = 2.0), and the sum calculated. Ranks were then assigned for each normalized, weighted sum.
[69]36 CFR § 294 (repealed).
[70]Rebecca A. Reed, Julia Johnson-Barnard, and William Baker. "Contribution of Roads to Forest Fragmentation in the Rocky Mountains." *Conservation Biology* 10, no. 4 (1996): 1098.
[71]36 CFR § 294.
[72]The Wilderness Society. "A Chronology of the Roadless Area Conservation Policy." http://www.wilderness.org/OurIssues/Roadless/chronology.cfm?TopLevel=Chronology (2007).
[73]*Ibid.*
[74]The Wilderness Society. "A Chronology of the Roadless Area Conservation Policy." http://www.wilderness.org/OurIssues/Roadless/chronology.cfm?TopLevel=Chronology (2006).
[75]The Wilderness Society. "A Chronology of the Roadless Area Conservation Policy." http://www.wilderness.org/OurIssues/Roadless/chronology.cfm?TopLevel=Chronology (2007).
[76]Cary Greene. Wildland Fuels Management Specialist Upper Colorado River Fire Management Unit USDA-FS/USDI-BLM. Interview by author, 17 July 2006.
[77]Greg Walden. *Forest Emergency Recovery and Research Act*. Vol. H. R. 4200 (2005).
[78]*Ibid.*
[79]Mike Soraghan, "Bill Pushes for Speedier Logging after Forest Fires." *Denver Post*, 8 August, 2006.
[80]Isabella A. Abbott, Margaret Adam, et al. Letter to Congress, 01 August 2006.
[81]Reed F. Noss, Jerry F. Franklin, William Baker, Tania Schoennagel, and Peter B. Moyle. "Ecological Science Relevant to Management Policies for Fire-Prone Forests of the Western United States: Executive Summary." p. 9.

Energy Development in the Rockies

Tempering the Boom, Avoiding the Bust

By Brian Hall and Chris Jackson

The 2007 Colorado College State of the Rockies Report Card



The 2005 Energy Policy Act calls for dramatically enhanced domestic exploration and resource development of fossil fuels, including oil, coal, and natural gas. For the Rockies Region, with its concentration of these natural resources, this plan is particularly important. New demands are being placed on oil and gas production, coal extraction, oil shale exploration, and energy transmission via power lines, pipelines, railways, and roads.

Many of these demands occur in rural regions, where communities are small and the infrastructure is limited. The sudden influx of workers, support services, and new infrastructure stresses these communities. They become "boom" towns, witnessing extraordinary spikes in employment and income, a large influx of newcomers, and the benefits and costs that have historically been associated with new economic development. City, town, and county governments may find such booms bittersweet: growing tax revenues coincide with greater demands for infrastructure and government services, often by workers who will only remain in the community temporarily. Local labor shortages can also occur as workers in other industries move to the energy sector for higher wages.

In addition to impacts on communities and regions, rapid energy development can also stress land and water resources. Oil and gas drilling impact the land, native ecosystems, wildlife habitat, and water quality. The extent of this impact is determined by the type of drilling activity (e.g., natural gas versus coalbed methane production), the concentration of that activity (e.g., directional drilling with multiple wells per pad), and the environmental practices of the drilling company. In addition, the quality and quantity of surface and ground water can change, often to the detriment of

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ranchers, recreational users, and municipalities. A patchwork of private versus public ownership further complicates the process of monitoring and accommodating (if not minimizing) these impacts on land, water, and wildlife.

This section of the *2007 State of the Rockies Report Card* evaluates the energy boom presently underway in the region. First, the primary forces of energy supply and demand are reviewed. Next is a discussion of the the federal energy leasing process, which strongly affects the location and pace of energy development in the Rockies. Finally, the socioeconomic costs and benefits of the energy boom are presented.

Energy Supply, Demand, and Infrastructure in the Rockies

To understand the costs and benefits of the current Rockies energy boom, it is important to first understand its origin. This section examines the current energy boom in terms of energy demand and supply, infrastructure statistics, the oil and gas leasing process, and the political climate.

Demand and Supply

Rising U.S. energy consumption has spurred oil and gas development in the West. In 2005, oil and gas accounted for 63% of total energy consumption in the U.S.[1] Figure 1 shows trends in oil and gas consumption over time and illustrates the rising demand for energy, a consequence of a growing population (note that total energy consumption per household actually fell from 138 million BTU in 1978 to 92 million BTU in 2001).[2] Domestic consumption of natural gas and oil has risen from 17 quadrillion BTUs in 1949 to 63 quadrillion BTUs in 2005.[3] To meet the growing demand, the U.S. has developed domestic natural resources and imports oil and gas from other countries. In 2005, domestic production satisfied 33% of total U.S. oil consumption and 83% of natural gas consumption.[4] With a growing population, U.S. energy demand will likely not diminish in the near future and will spur additional domestic production.

Domestic oil production has declined since peak production in 1970, associated with limited oil reserves, the economics of developing marginal wells, and development restrictions in environmentally sensitive areas (e.g., offshore areas and wildlife reserves). In 2005, the U.S. produced 5.1 million barrels of oil per day, down 47% since the 1970 peak.[5] Oil production in the Rockies has also declined, though not at the national rate. In 2005, the Rockies produced 557,000 barrels of oil per day, roughly 11% of national production (Figure 2).[6] Within the Rockies, New Mexico led in oil production in 2005, followed by Wyoming, Montana, Colorado, Arizona, Nevada, and Idaho (Figure 3).[7] The top three oil producing counties in the Rockies are Richland County, Montana (Williston Basin), Weld County, Colorado (Denver Basin), and Duchesne County, Utah (Uintah Basin). Figure 4 and Table 1 show the top ten oil producing counties in Rockies Region. Note that because of data availability, these figures exclude counties in the highly productive Permian Basin in southeastern New Mexico.

Figure 1
Total U.S. Energy Consumption by Source, 1949 to 2005
Source: Energy Information Administration, Annual Energy Review, 2005

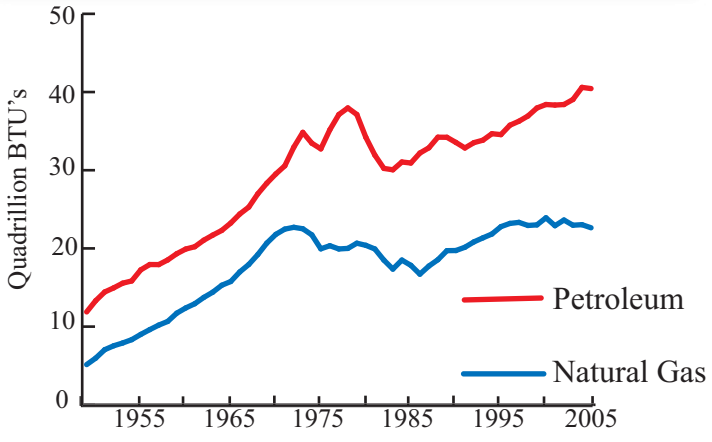


Figure 2
Oil Production by Census Region, 1981-2005
Source: Energy Information Administration

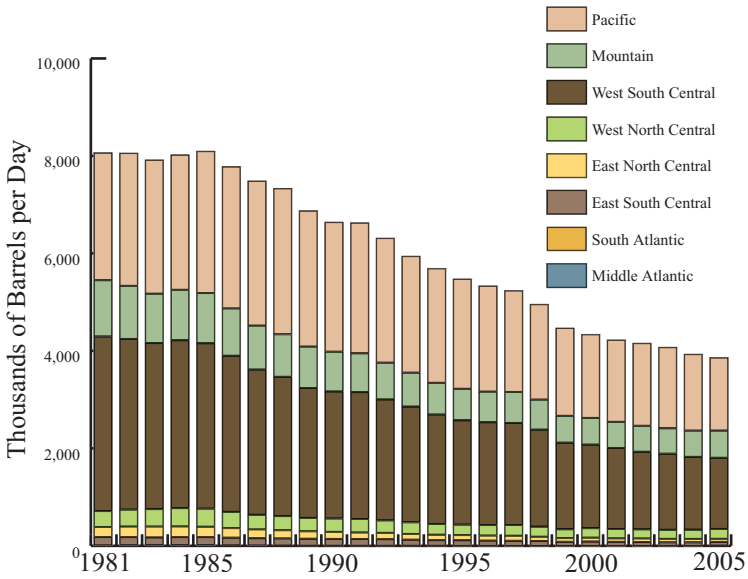


Figure 3
Rockies Oil Production by State, 1981-2005
Source: Energy Information Administration

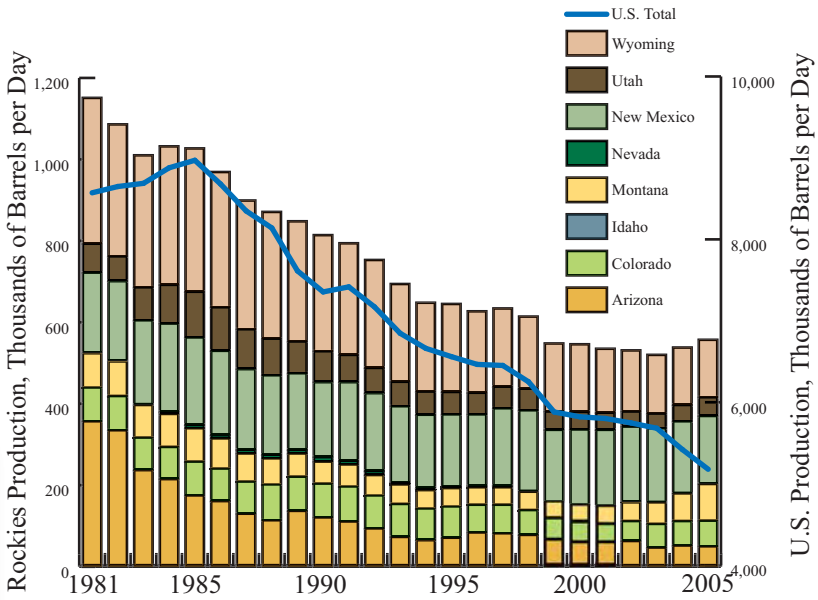
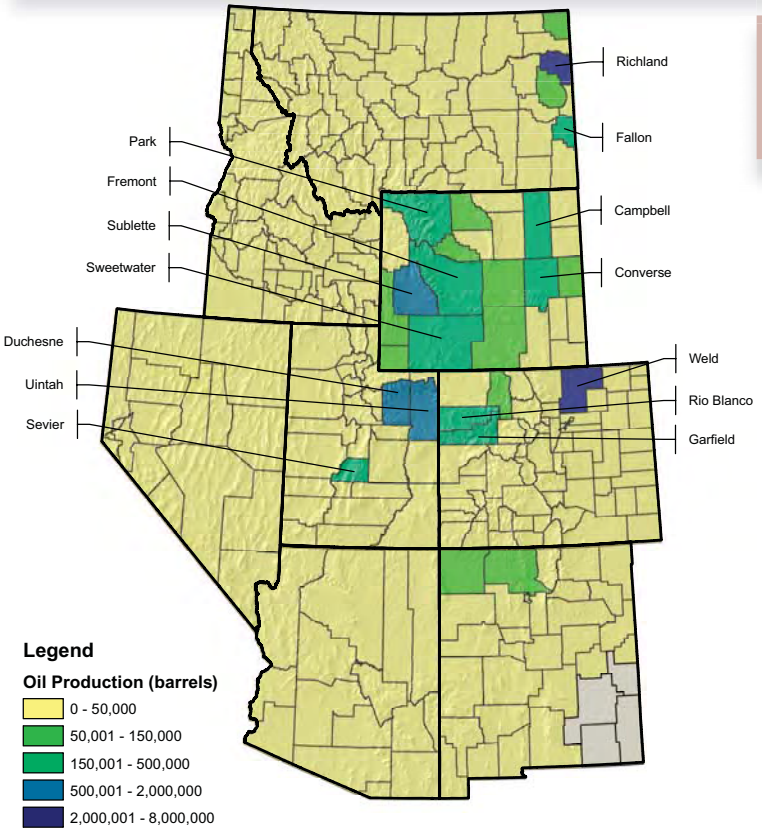


Figure 4
Top Oil Producing Counties in the Rockies, 2005
Includes data supplied by Petroleum Information/Dwights LLC; Copyright 2006 Petroleum Information/Dwights LLC. Special thanks to Carol Hudson of IHS Energy



Note: the Permian Basin counties are not included in this assessment (Chaves, Eddy, Lea, and Roosevelt Counties)

Table 1
Top Ten Oil Producing Counties in the Rockies, 2005
Includes data supplied by Petroleum Information/Dwights LLC; Copyright 2006 Petroleum Information/Dwights LLC. Special thanks to Carol Hudson of IHS Energy

County, State	Barrels, 2005 total
Richland, MT	7,103,079
Weld, CO	2,123,120
Duchesne, UT	1,325,697
Sublette, WY	1,044,792
Uintah, UT	907,118
Campbell, WY	447,144
Park, WY	445,416
Fallon, MT	423,027
Sevier, UT	343,529
Sweetwater, WY	314,565

Unlike oil production, domestic natural gas production is significantly increasing (Figure 5). In 2005, the Rockies states produced 5.6 trillion cubic feet (Tcf) of natural gas, accounting for 26% of total U.S. production.[8] The Rockies' share of total U.S. production has been steadily growing over the last 15 years (Figure 6). Returning to Figure 5, Wyoming led in natural gas production among Rockies states in 2004, followed by New Mexico, Colorado, Utah, Montana, Nevada, and Idaho.[9] The top three natural gas producing counties in the Rockies are Sublette County, Wyoming (Jonah Field in the Green River Basin), Garfield County, Colorado (Piceance Basin), and Uintah County, Utah (Uintah Basin). Figure 7 and Table 2 show the top 10 counties producing natural gas in the Rockies in 2005. These natural gas statistics clearly show the growing importance of Western states as a national energy supplier.

Energy Infrastructure in the Rockies

Examining the distribution of the oil and gas infrastructure illustrates the magnitude of the Rockies' energy boom and highlights the areas experiencing the most development activity. Figures 8 and 9 show the locations of oil and gas facilities and pipelines, and electric facilities and transmission lines, respectively. This web of energy conveyance is too often "out of sight – out of mind" to casual observers, but to the residents of an energy-rich region like the Rockies the impacts of energy development and transmission are significant.

Looking deeper into oil and natural gas facilities, well locations and production further reflect energy development in the West. Figure 10 shows the density of wells in the Rockies in 1995. Figure 11 depicts the historical oil and gas well locations in the West and the apparent peak in the energy development boom in the 1970s and early 1980s. Heightened energy activity is also demonstrated by the recent creation of new wells. Between 1999 and 2004, the number of producing natural gas wells in the Rockies grew 67%.[10] In 2004, the number of natural gas wells in the Rockies represented 21% of wells nationwide, up from 17% in 1999 and 11% in 1989.[11]

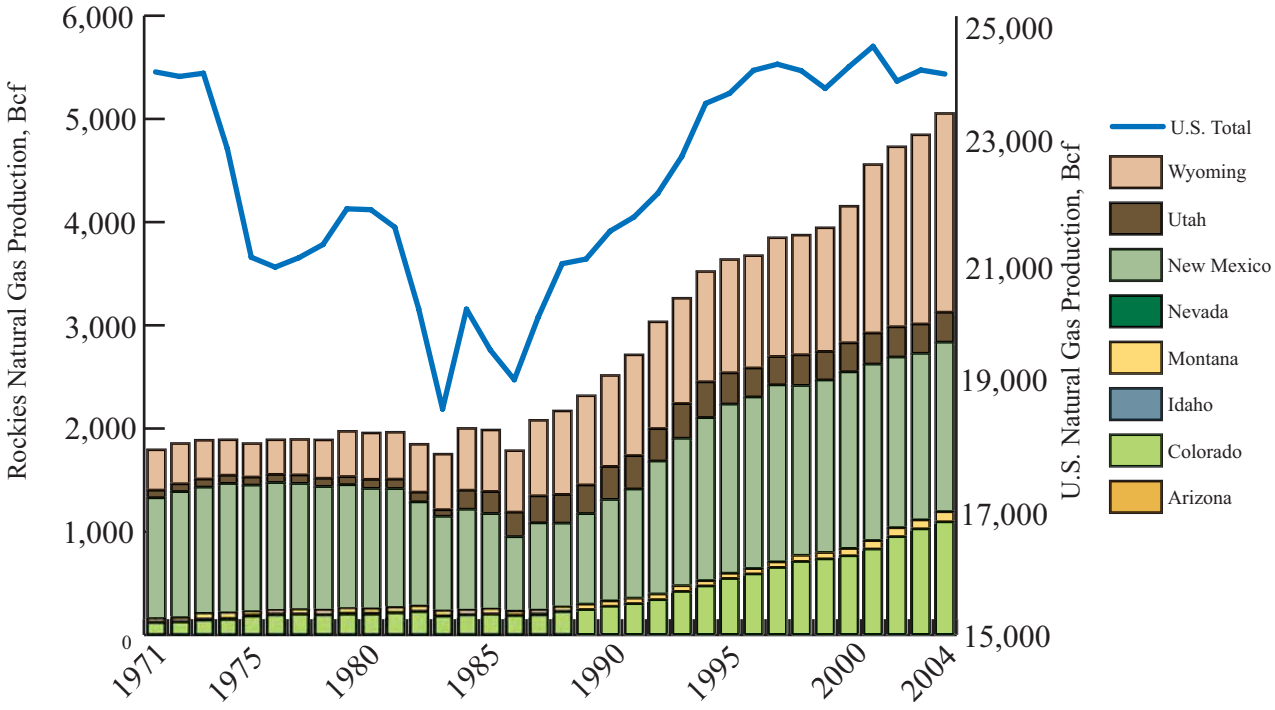
The Energy Information Administration (EIA) forecasts continued growth in the demand for oil and gas in the United States. According to the EIA's Annual Energy Outlook for 2007, consumption of oil and natural gas is slated to grow 15% by 2020 and almost 24% by 2030.[12] Incresaed domestic production will satisfy a large portion of growing domestic demand. The EIA predicts that natural gas production from the Rocky Mountain Region will grow faster than that in any other region of the contiguous U.S., growing by 2.7 trillion cubic feet annually by 2025 (Figure 12).[13] According to the EIA, the Rockies will be responsible for 38% of all domestic natural gas production in the lower 48 states by 2025.

The data and figures presented above regarding volume and infrastructure illustrate the magnitude and location of energy development in the West. It is clear that the West is and will continue to be a vital source of energy. The following section examines why this region is a prime location for energy development in the United States.

The Leasing Process and Federal Energy Policy

The federal government owns 58% of the eight-state Rockies Region.[14] The Bureau of Land Management (BLM) manages federal lands and minerals, including federal mineral rights on private lands. They directly oversee 258 million surface acres and 700 million acres of subsurface mineral rights.[15] Access to these federal lands for oil and gas production is obtained through energy

Figure 5
U.S and Rockies States Natural Gas Production, 1971-2004, Billions of Cubic Feet
Source: Energy Information Administration



leases, allowing private companies to develop the mineral rights for decades. The leasing process begins with a resource management plan (RMP), which determines the areas available for oil and gas leasing. The lease sales are done on a quarterly basis, and the BLM must post a notice 45 days prior to the sale. During this time, a public comment period can affect the leasing of particular tracts. The sale is conducted by a closed-bid system, with some promising tracts going for several thousand dollars per acre. If there are protests regarding a parcel, the sale is postponed until the state director issues a ruling.[16] The duration of a lease is 10 years, although the lease owner can appeal and ask that the lease be extended if they have been unable to develop the resource. If the well is producing, the lease lasts until production is complete.[17]

Current U.S. energy policy reflects a desire to increase domestic production, particularly in the West. High oil prices resulting from supply restrictions and price policies instituted by Middle Eastern oil-producing states and increasing global demand led to the 1970s oil crisis and associated boom in domestic production. Domestic exploration has continued to increase since the 1970s in response to concerns over dependence on foreign oil, political instability in oil-producing states, and increased energy demands from developing countries. Such concerns are reflected in the 2005 Energy Policy Act, which expedites the leasing process and eases regulations in Western states through the "western states pilot program."[18] This program establishes field offices in five Rockies states (Colorado, Montana, New Mexico, Utah, and Wyoming) to streamline the leasing and permitting process to handle the growing volume of permit requests. In her statement before the House Appropriations Subcommittee on Energy and Water Development on March 8, 2006, then Secretary of the Interior Gale Norton stated:

> *The BLM is experiencing a steady increase in the demand for drilling permits . . . To address this demand, BLM has taken steps to ensure that drilling permit applications are processed promptly, while at the same time ensuring that environmental protections are fully addressed. These measures, along with increased funding, have allowed BLM to make significant progress in acting on permit applications. In 2005, BLM processed 7,736 applications, nearly 4,000 more than it was able to process in 2000.*
>
> *Section 365 of the Energy Policy Act established a pilot program at seven BLM field offices that currently handle*

Figure 6
Rockies Natural Gas Production as a Share of U.S. Production.
Source: Energy Information Administration

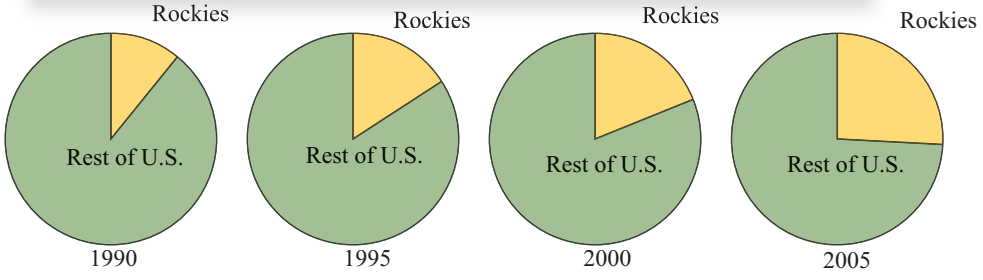
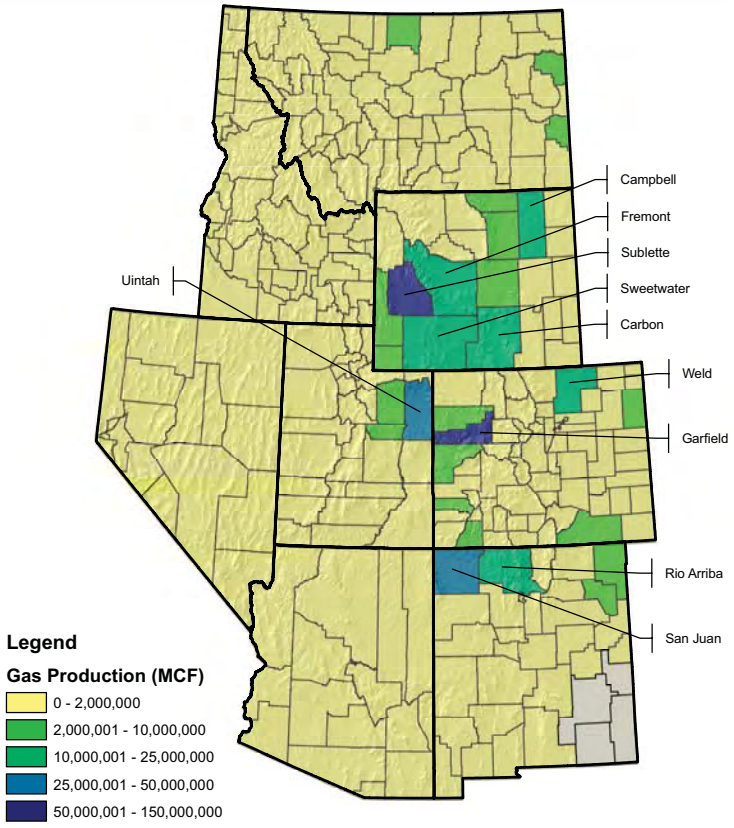


Figure 7
Rockies Gas Production by County, Thousands of Cubic Feet, 2005
Includes data supplied by Petroleum Information/Dwights LLC; Copyright 2006 Petroleum Information/Dwights LLC. Special thanks to Carol Hudson of IHS Energy



Note: the Permian Basin counties are not included in this assessment (Chaves, Eddy, Lea, and Roosevelt Counties)

70 percent of the drilling permit application workload. The pilot program is testing new management strategies designed to further improve the efficiency of processing permit applications. The Energy Policy Act provides enhanced funding for the pilot offices from oil and gas rental receipts. With more efficient processes and authorities and funding provided through Section 365, BLM currently anticipates processing 10,160 permits in 2006.[19]

The specific interest in the Rockies Region reflects both geology and politics. Currently, 11% of total proven oil reserves[20] and 31% of proven natural gas reserves are in the eight-state Rockies Region.[21] In addition to these resources, the Rockies states are also politically appealing, as federal land ownership eases the leasing and extraction processes. For example, natural gas development in Wyoming is assisted by the 53.5% total federal land ownership in that state. As noted by Duane Zavadil, the vice president for government and regulatory affairs of the Bill Barrett Corporation (an oil and gas exploration and development company operating in the Rockies Region), political power and energy consumption vary geographically:

There are fundamental reasons for supporting production growth in the West. Reserves here are relatively untapped, and many more heavily populated (and therefore politically influential) states are exporting the challenges posed by energy production to the Rockies. Florida and California collectively consume 15 percent of the nation's natural gas, yet they prohibit offshore exploration and severely limit other oil and gas activities.[22]

Table 2
Top 10 Natural Gas Producing Counties in the Rockies, Thousands of Cubic Feet, 2005
Includes data supplied by Petroleum Information/Dwights LLC; Copyright 2006 Petroleum Information/Dwights LLC. Special thanks to Carol Hudson of IHS Energy

County, State	Thousands of Cubic Feet
Sublette, WY	120,587,250
Garfield, CO	84,340,918
Uintah, UT	42,448,564
San Juan, NM	27,588,436
Campbell, WY	22,445,464
Sweetwater, WY	19,172,473
Weld, CO	17,832,472
Rio Arriba, NM	17,235,142
Fremont, WY	13,493,659
Carbon, WY	11,484,055

This quote supports the idea that the West is an "inland colony" of the U.S., where natural resources are extracted with little political opposition and then sent to larger markets to the east and west. The recipient regions seek to limit development of their own natural resources and avoid the ensuing environmental impacts. Federal policies promoting energy development have a disproportionate impact on the Rockies, where natural resources are abundant and the federal government retains control.

Federal policy must balance energy independence and the consequences of domestic production. Similarly, local governments must also weigh the costs and benefits of oil and gas development, lest a boom quickly turn to a bust.

Benefits of Oil and Gas Production

The benefits of energy production appear straightforward: increased tax revenues and economic vitality, including lower unem-

Figure 8
Rockies Oil and Gas Infrastructure, 2005
Source: Infrastructure data generously provided by PennWell Petroleum Group

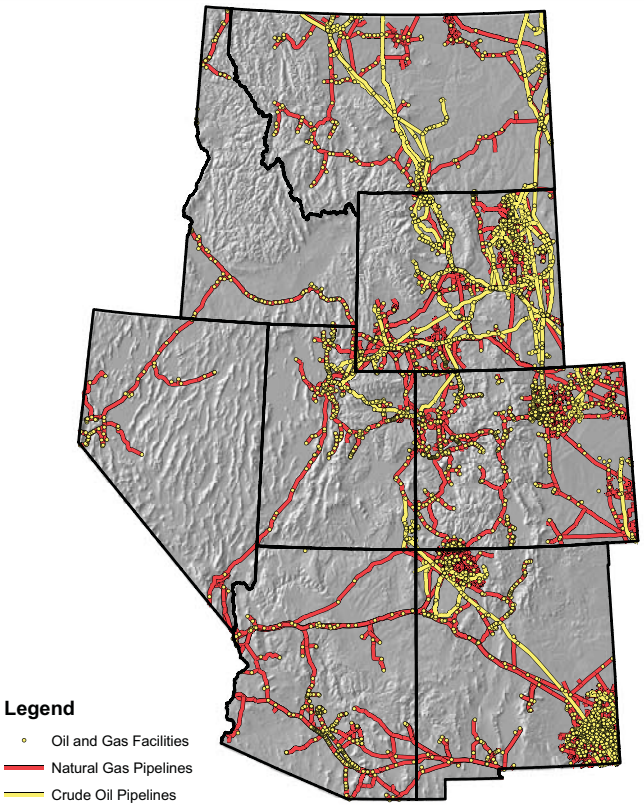
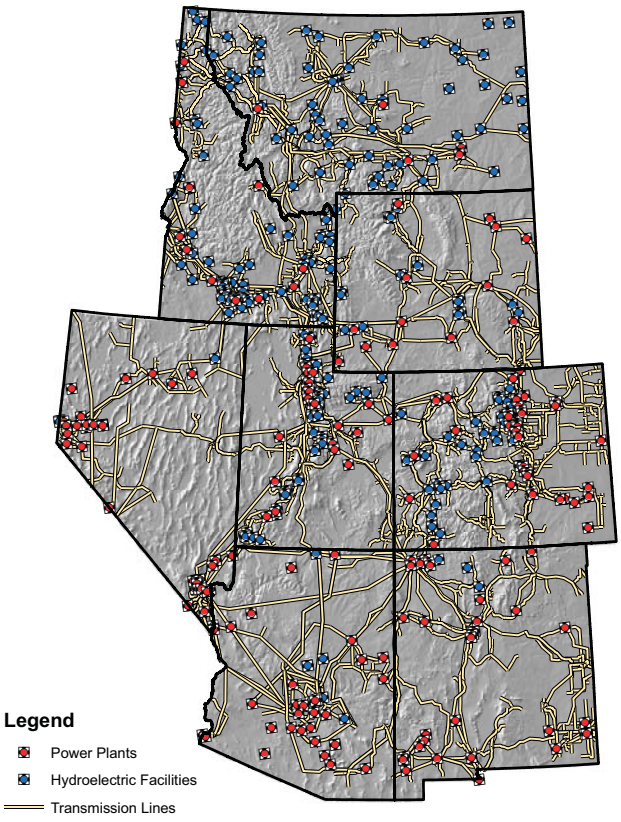


Figure 9
Rockies Electric Power Infrastructure, 2005
Source: Infrastructure data generously provided by PennWell Petroleum Group



ployment and rapid job growth. Development in the energy industry ripples through other economic sectors in what is known as the "local multiplier effect." Workers require housing, roads, groceries, entertainment, and other goods and services. This demand creates new jobs and local businesses, and increases wages across many industries, in addition to raising sales tax revenues. Energy development provides an economic windfall that can boost economic vitality in rural communities throughout the West.

Acquisition and Allocation of Lease and Tax Revenues

Increased revenue from federal royalties and lease rents, as well as state taxes, are other visible benefits of energy development. The mineral royalties collected by the federal government were established by the 1920 Mineral Leasing Act and equal 12.5% of the income generated from resource extraction on federal lands. Royalties are distributed according to the following formula: the state where the resource was extracted receives 50%, the Bureau of Reclamation receives 40%, and the U.S. Treasury receives 10%. The collection and distribution of royalty revenues is performed by the Minerals Management Service (MMS).[23] From October 1, 2005 to September 30, 2006, federal revenue from energy royalties reached $10.7 billion. Natural gas and oil royalties constituted 54% and 37% of total royalty revenues, respectively.[24]

Rental fees are assessed for the use of federal land. As previously stated, mineral leases are distributed by auction. Rents are paid by the leaseholder until the lease is in production. In addition, the successful bidder for a mineral lease pays a "bonus" fee to the federal government. Half of the rental revenues are allocated to the state where the land is located, while the other half returns to a restrict-

Figure 10
Rockies Oil and Gas Provinces, 1995 Well Density
Source: Infrastructure data generously provided by PennWell Petroleum Group

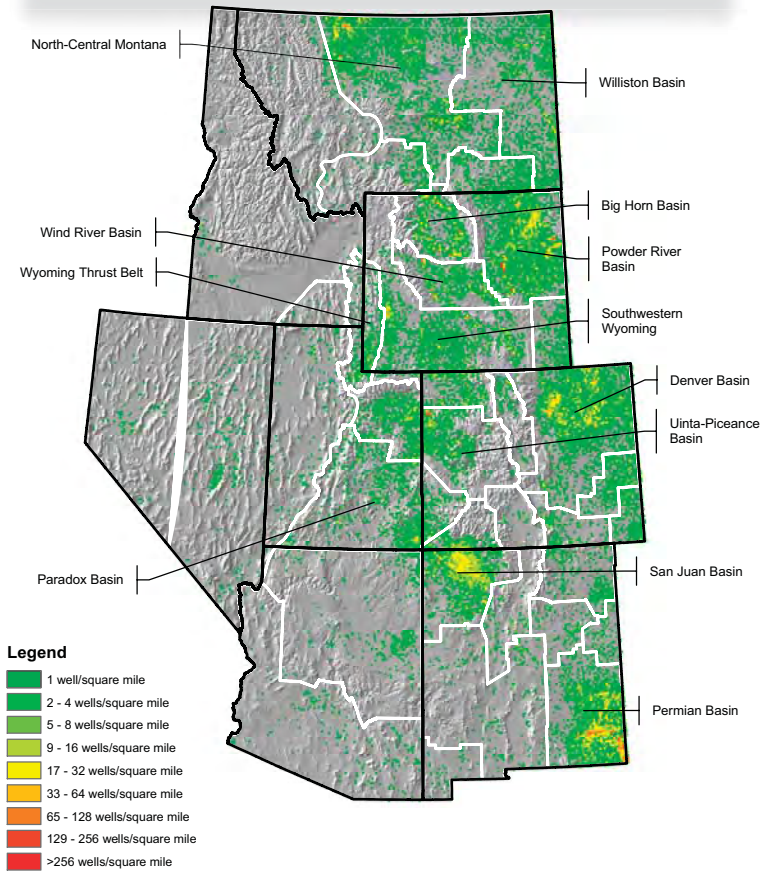
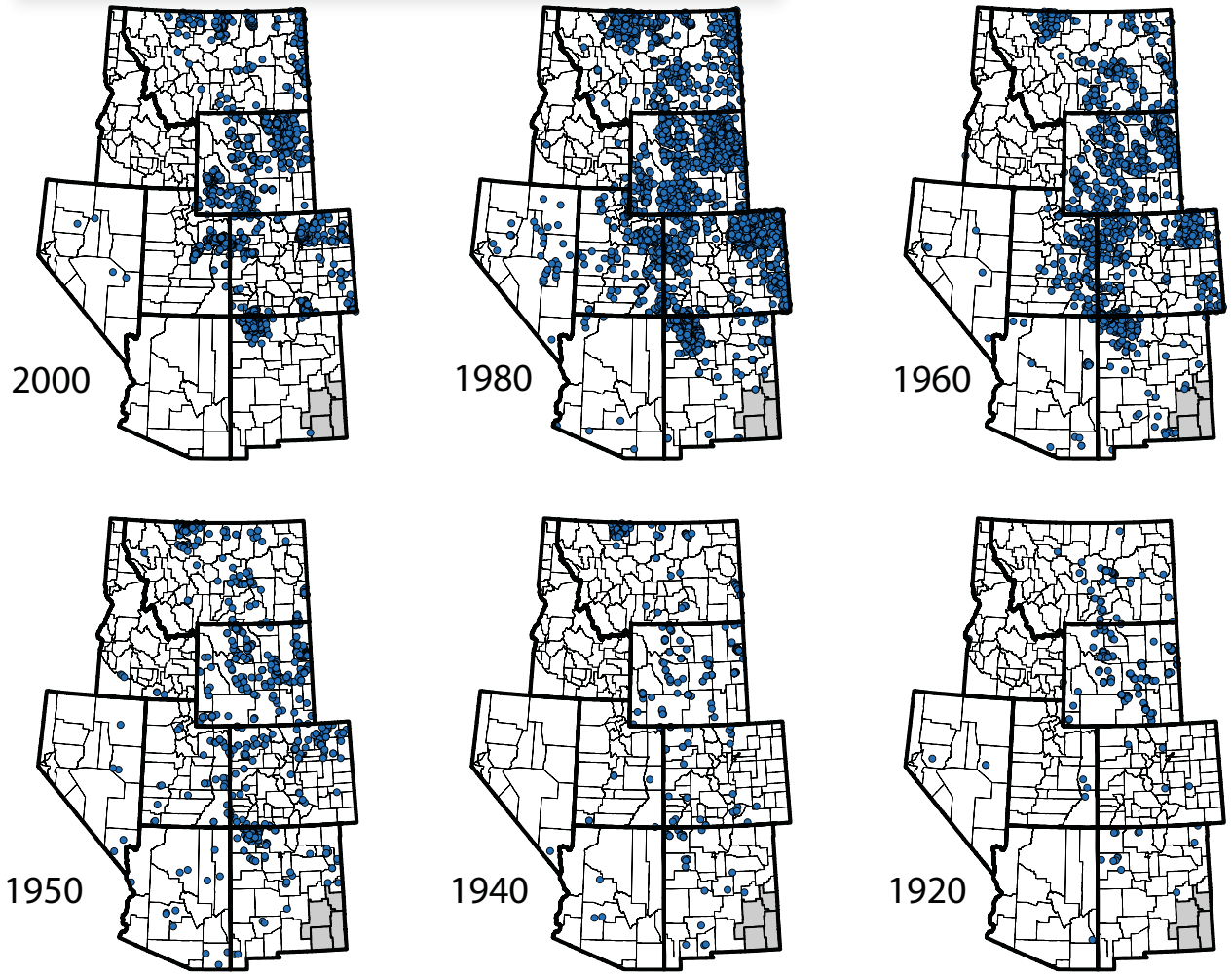
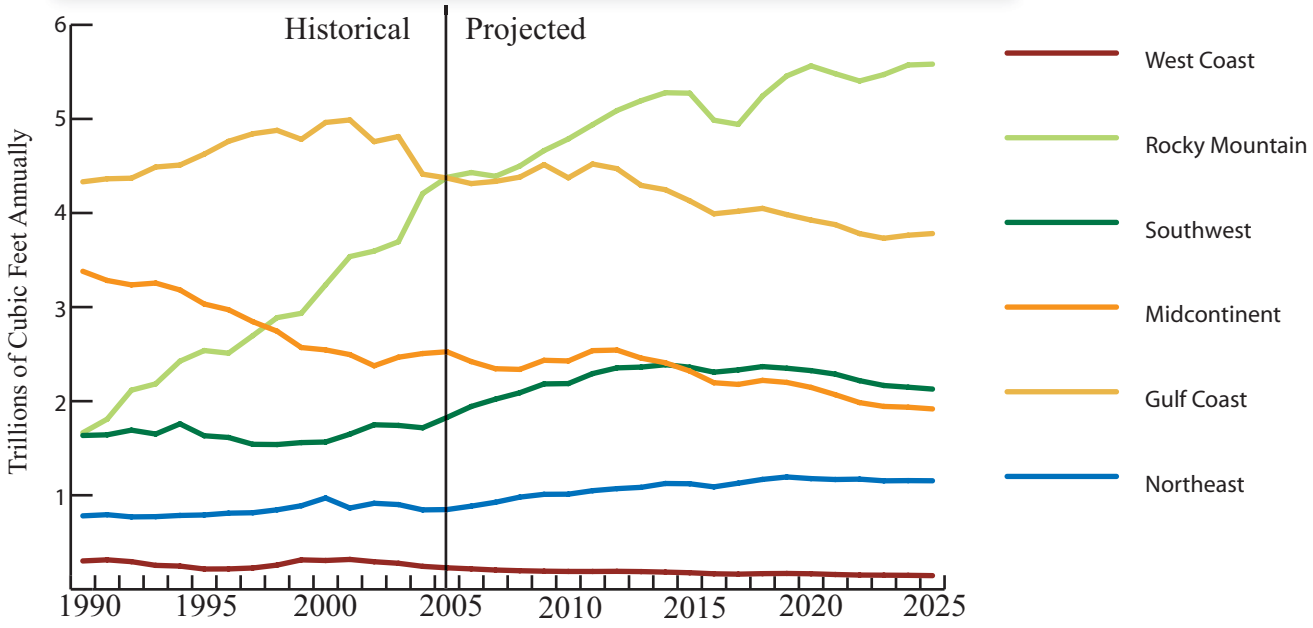


Figure 11
Historical Oil and Gas Locations in the Rockies
Source: Includes data supplied by Petroleum Information/Dwights LLC; Copyright 2006 Petroleum Information/Dwights LLC. Special thanks to Carol Hudson of IHS Energy



Note: the Permian Basin counties are not included in this assessment (Chaves, Eddy, Lea, and Roosevelt Counties)

Figure 12
Historical and Projected Natural Gas Production by Region, 1990-2025
Source: Energy Information Administration, 2003 Annual Energy Outlook



ed BLM fund. The director of the BLM can then choose to transfer the money in the fund, but only to other governmental agencies that are involved in the "coordination and processing of" oil and gas permits.[25] In 2005, revenues from rental fees, bonus fees, and other fees totaled over $1.8 billion.[26]

The MMS collected $12.5 billion in combined royalty and rent revenues from October 1, 2005 to September 30, 2006.[27] Of this, the government paid $2.2 billion to 34 states for their share of the federal revenues. Wyoming led the nation in royalty receipts with just over one billion dollars. Rockies states accounted for 91% of total receipts,[28] as expected from the large proportion of federal land and the active oil and gas development in the region.

States can also levy a severance tax separate from royalty and lease rental revenues. Severance taxes are assessments on corporate revenue generated from natural resource extraction, and these taxes can be applied to minerals whether the land is federally or privately owned. Revenues from a severance tax remain in the state.[29] States have the authority to allocate the funds wherever they see fit; most states allocate funds within the counties where the resource is produced. For example, Garfield County, Colorado, receives over 50% of its revenues from severance tax revenues.[30] State revenues from federal royalties and state severance taxes represent a large and tangible benefit to energy development for many remote, rural areas with limited tax revenues.

Costs of Oil and Gas Production

The costs of energy development are more difficult to identify and quantify. Boomtowns and the characteristic influx of people and money include a variety of socioeconomic disruptions, sometimes collectively referred to as the "boomtown syndrome" or "Gillette syndrome" (after the energy boomtown experience of Gillette, Wyoming). These include strains on the local infrastructure and workforce, increased in crime and drug use, health hazards, housing shortages, high housing costs, and economic vulnerability. Are these disruptions anecdotal or supported by socioeconomic data? Tables 3 and 4 show the top oil and gas producing counties and data on their violent crime, unemployment, median housing rent, and rent as a percentage of income. Although a few of these counties follow the predicted impacts of high crime and high housing costs, a significant correlation does not exist between energy development and these socioeconomic indicators. Therefore, the positive economic benefits likely outweigh any negative impacts on the local infrastructure or social fabric: hardworking people are providing new economic and social vitality to Western towns, a far less intriguing story than rampant drug use or violent criminals.

Table 3
Violent Crime, Unemployment, Median Rent, and Rent as a Percent of Income in the Top 10 Oil Producing Counties in the Rockies in 2005

County, State	Reported Violent Crimes (2004)	Unemployment (2005)	Median Rent-monthly Cost of a 1 bedroom apt. (2005)	Rent as Percent of Income (2000)
Richland, MT	not reported	3.4%	$398	20.1%
Fallon, MT	36	2.6%	$398	20.5%
Weld, CO	98	5.1%	$584	27.2%
Duchesne, UT	60	4.6%	$502	24%
Sublette, WY	31	1.8%	$477	22.5%
Uintah, UT	60	3.9%	$422	21.6%
Campbell, WY	25	2.6%	$474	18.4%
Park, WY	64	3.9%	$428	22%
Sevier, UT	46	4.3%	$494	24%
Sweetwater, WY	61	3%	$434	19.2%
Rockies Region County Average	44	4.8%	$505	23.6%

Table 4
Violent Crime, Unemployment, Median Rent, and Rent as a Percent of Income in the Top 10 Natural Gas Producing Counties in the Rockies in 2005

County, State	Reported Violent Crimes (2004)	Unemployment (2005)	Median Rent-monthly Cost of a 1 bedroom apt. (2005)	Rent as Percent of Income (2000)
Sublette, WY	31	1.8%	$477	22.5%
Garfield, CO	19	3.7%	$716	25.8%
Uintah, UT	60	3.9%	$422	21.6%
San Juan, NM	111	5.5%	$466	22.8%
Campbell, WY	25	2.6%	$474	18.4%
Sweetwater, WY	61	3%	$434	19.2%
Weld, CO	98	5.1%	$584	27.2%
Rio Arriba, NM	not reported	6.1%	$430	22%
Fremont, WY	51	4.7%	$381	21.8%
Carbon, WY	19	4%	$364	19.4%
Rockies Region County Average	44	4.8%	$505	23.6%

However, one must also consider specific case studies to gain a clearer understanding of energy development in the West. The following is a more detailed examination of the socioeconomic impacts observed in Western energy boomtowns.

Demand on a Limited Infrastructure and Workforce

Small communities are often unprepared to accommodate the rapid population increase associated with an energy boom. Detention

facilities need more cells, health care facilities need more beds, schools need more classrooms and teachers, and roads need more lanes. For example, in Pinedale, Wyoming, the school has seen a 10–12 percent increase in enrollment over the last few years, which has been difficult for the small school district to absorb.[31] Vehicle traffic is another easily identified impact of energy booms. Traffic causes long delays on outdated roads and highways built to service low volumes of ranch or farm traffic. In addition, large vehicles and constant traffic create noise, congestion, and pollution. Sublette County, Wyoming, has had a 60% increase in traffic on nearly all roads since 1995, with truck traffic showing large increases since 1995. On one road, the daily average of trucks rose from an average of 150 a day during 1995 to nearly 650 in 2005.[32]

Low unemployment is typically viewed as a positive economic indicator. But in boomtowns, it is often a sign of a strained workforce. The unemployment rate in Sublette County, Wyoming, reached 1.8% in 2005. Garfield County, Colorado, also fell below the eight-state mean (4.8%) at 3.7% unemployment in 2005.[33] Oil and gas companies offer wages above traditional levels and thus draw workers away from jobs in the local school system, retail businesses, and law enforcement. As a result, the local school district in Pinedale has the highest base salary in the state ($41,500)[34] and the sheriff's office has increased their base salary 20% in the last year.[35] In Sublette County, a police department of 52 people has had 38 people leave since January 2004, many drawn to better-paying jobs in the energy industry. Deputies regularly put in over 20 hours of overtime every week to compensate for worker shortages.[36]

Housing

A large influx of workers can also overwhelm local housing supplies in rural areas. In Garfield County, Colorado, the rental unit vacancy rate dropped from 1.5 percent in 2005 to 0% in 2006, resulting in waiting lists.[37] Energy companies, desperate to house workers, have built camps of portable trailer housing. RVs and campers pepper the landscape, parked wherever space can be found. It is not uncommon for campers to park in the equipment parking area (or staging area) in the small towns experiencing a boom. Such improvised housing is officially known as "non-traditional" housing. In these small communities, non-traditional housing simply means campers parked wherever a spot can be found, often creating strain between newcomers and long-time residents.

Potential Increases in Crime and Drug Presence

An increased population generally brings increased crime proportional to the change in population. As shown above, higher violent crime rates do not correlate with increased energy production in Rockies counties. Researchers studying past energy booms have predominantly shown that the impacts of an energy boom on crime are unclear.[38] Possible impacts include higher per capita crimes against property[39] or reduced per capita crimes against people.[40] The energy industry heavily relies on transient workers, and past research has shown these populations to be associated with higher crime rates.[41] Regardless, the increased population results in higher absolute crime within a county, further straining limited local law enforcement.

Even more difficult to prove conclusively is the correlation between energy production and local drug use. Much speculation exists regarding rampant drug use, and some believe that drilling crews may rely on methamphetamines to work 12 hour shifts for seven to 14 days in a row. However, methamphetamine use is becoming more prevalent in rural regions as a whole, so it is difficult to say what specific impact the drilling industry has on drug use.[42] While the industry does conduct drug tests, the results are not pub-

lic knowledge and a curtain of uncertainty remains over drug use by energy workers.

Economic Vulnerability and Overbuilding

A healthy economy is diverse and insulated from price fluctuations in any one sector. In contrast, the economic fate of an energy boomtown is linked to the performance of a single commodity in national and global markets. A drop in the price of oil or gas below its economic development point can rapidly drain money from a community. As drilling operations shut down, jobs and tax revenues evaporate. Often, financial problems experienced during a bust are exacerbated by overbuilding, which occurs when a community rushes to accommodate infrastructural needs such as roads, schools, and hotels. After a bust, personnel and money leave, but the buildings remain, saddling communities with maintenance costs and debt.[43] This scenario occurred throughout the West when the price of oil dropped below $30 a barrel in May 1982, marking the end of the 1970s oil boom.[44]

The Center for the American West in Boulder suggests that the current energy boom will not necessarily go bust like the previous one. Their report "What Every Westerner Should Know About Energy" suggests that communities are increasingly skeptical of energy hype and instead diversify their economies through increased energy revenues, adding retail and service industries as well as oil and gas wells.[45] Energy prices may fluctuate and resources may be exhausted, but through diversification rural communities are better insulated from the capital flight experienced after previous energy booms.

Environmental Impacts

Oil and gas development has both direct and indirect environmental impacts. Direct impacts are those associated with infrastructure such as access roads, drilling pads, pumping stations, storage facilities, and pipelines.[46] The placement of these facilities causes habitat fragmentation, destruction of vegetation, and soil degradation.[47]

The most notable indirect impacts are air and water pollution. Noxious emissions from drill rigs, vehicles, and other energy facilities degrade air quality around drill sites.[48] As energy development encroaches on residential areas, air quality also becomes a greater human health concern. Of particular concern are the significant hydrogen sulfide emissions from natural gas wells.[49]

In the drilling process, hydraulic fracturing threatens water quality. Hydraulic fracturing is the process by which fluids (gelling agents, foaming agents, and acids) are pumped down a bore hole to break up the gas-rich rock layers and expedite the flow of natural gas.[50] Of particular concern is drilling near watersheds, where seepage from the hydraulic fracturing process may contaminate rivers and municipal water sources. Responding to health and environmental concerns associated with the process, some oil and gas companies have offered to switch to "green fracing,"[51] which utilizes non-toxic substances such as citrus oil in the slurry pumped underground.

Direct and indirect environmental impacts, such as infrastructure buildup, noxious emissions, and water contamination, can be difficult to measure and quantify and therefore difficult to weigh against the positive impacts of energy development in the West. Yet these impacts must still be considered when exploring the effects of oil and gas development on Western communities.

Conclusion

The West is in the midst of an energy boom driven by high demand and prices, as well as federal policy that encourages development of Western resources. This is not a new story for the region; it is disturbingly reminiscent of the boom and bust during the 1970s and 1980s. Will history repeat itself in the Rockies?

The federal government plays a key role in determining the magnitude of the next energy boom and bust cycle. As the largest minerals owner in the West and the controller of oil and gas lease permits, the government is in the best position to regulate energy development and temper the pace of resource extraction. The 2005 Energy Policy Act focuses on expediting energy development in the West. Perhaps the West is considered a "sacrifice zone" to be exploited until oil dependence can be eased with the advent of renewable energy sources.

As long as land continues to be leased for resource extraction, local governments and corporations must mitigate the socioeconomic strains and alleviate the "boomtown syndrome." At this level, citizens and corporations are already taking proactive measures. For example, energy companies have adjusted truck schedules and stringently enforced speed limits to accommodate community traffic. New technology allows for directional drilling, a technique that concentrates wells and limits their proximity to local homes. These two examples reflect many positive changes since the last energy boom and bust. Communities and corporations must continue to work together to manage the socioeconomic and environmental impacts of energy development as well as prepare for the bust that history has shown is inevitable.

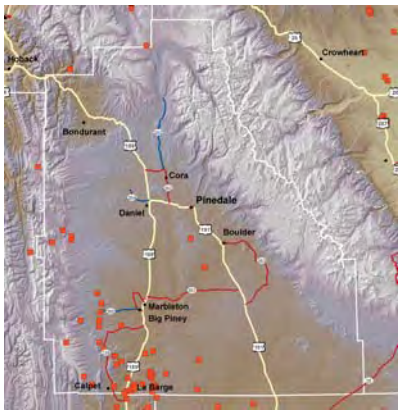
Endnotes

Case Study: Sublette County, WY

A Detailed Profile of an Energy Boomtown

Sublette County Well Placement

1940



1980

Region-wide analysis of the towns and counties impacted by the recent energy boom is hindered by the lack of uniform, all-inclusive, and up-to-date data sets. Occasionally, however, comprehensive data are available for individual counties. Such is the case for Sublette County, Wyoming.[1] Sublette County is in the unique position of having a countywide socioeconomic analyst, Jeffrey Jaquet, to study the impact of the energy boom. With Jacquet's help, we can examine detailed statistics in conjunction with personal interviews to provide a more accurate depiction of the economic windfalls and socioeconomic disruptions of the West's energy boom.

Energy operations in Sublette County draw from the Pinedale anticline and Jonah natural gas fields, which are the fourth and sixth largest producing fields in the nation, respectively.[2] The volume of energy development in the region has jumped significantly in the past five years, growing from 25 rigs in 2001 to a high of 55 rigs in 2006.[3] Concurrently, the population of Sublette County grew by 17 percent from 2000 to 2005. In comparison, neighboring Sweetwater County grew by only 1.3 percent,[4] and Wyoming as a whole has grown less than 1 percent since 2000.[5]

The largest town within the area of Sublette County drilling operations is Pinedale, with a population of 1,412.[6] Energy development and the related population influx are an economic boon to the community but have also strained the infrastructure and social fabric of Pinedale. Examples of such pressures include workforce shortages in non-energy-related industries, a lack of affordable housing, increased crime and drug use, and high traffic volumes on inadequate roads.

Tax Revenue

Sublette County energy operations have generated a windfall in tax revenue for the county and its municipalities. In 2006 alone, over $52 million in sales and use tax revenues were generated by Sublette County. Of that total, over $16 million was returned to Sublette County and local municipalities. Of the $47.5 million collected in sales tax, 51 percent was generated by the mining industry, as was nearly half of the $4.3 million in use tax revenue.[7] Sublette County has the lowest sales and use tax rate allowed by Wyoming state law. With a tax rate of 4 percent, Sublette is one of three counties in the state using the lowest possible rate.[8] Even with such a low tax rate and small population, Sublette County ranked sixth among Wyoming counties in terms of tax revenue generation.[9]

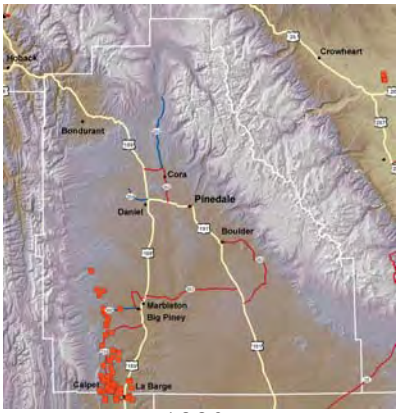
Labor and Wages

In November 2006, the unemployment rate in Sublette County hit an all-time low of 1.5 percent.[10] The energy boom in the area has simultaneously increased the need for public service jobs to accommodate the growing population, as well as drawn people away from those positions. Local schools, law enforcement, and other public service sectors struggle to attract new employees when energy companies offer much higher wages.

In the gas field, new workers with no prior experience or education generally start as roustabouts, earning an average of $36,585/yr plus overtime, which generally brings the average up to $53,000/yr. However, because of the high turnover rates and shortage of workers in the gas field there are generally plenty of opportunities for an unskilled and uneducated worker to be promoted. With just a few years of experience, a worker can rise from roustabout to driller ($60,000/yr plus

Table 5
Sublette County Sales Tax Revenue, 2001-2006
Source: Wyoming Department of Revenue
Prepared by: Jeffrey Jacquet, Sublette County Socioeconomic Analyst

Fiscal Year	Gross Tax Revenue	Total Amount of Sales	Revenue Returned			
			Sales	Use	Lodging	Total
2001	$15,520,968	$388,024,200	$3,961,059	$331,950	$8,858	$4,301,867
2002	$21,059,374	$526,484,350	$5,520,576	$280,411	$103,064	$5,904,051
2003	$21,082,473	$527,061,825	$5,675,004	$436,263	$122,471	$6,233,738
2004	$28,291,190	$707,279,750	$7,649,411	$561,690	$140,500	$8,351,601
2005	$37,580,227	$939,505,675	$10,632,904	$838,716	$164,990	$11,636,610
2006	$52,568,766	$1,314,219,150	$14,711,510	$1,333,922	$233,125	$16,278,557



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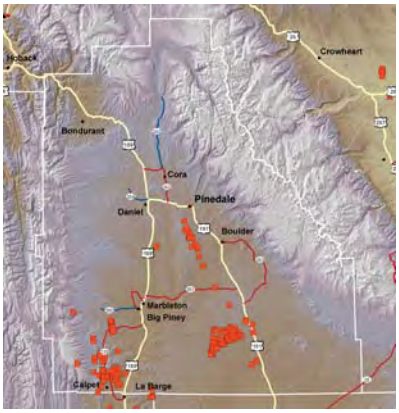

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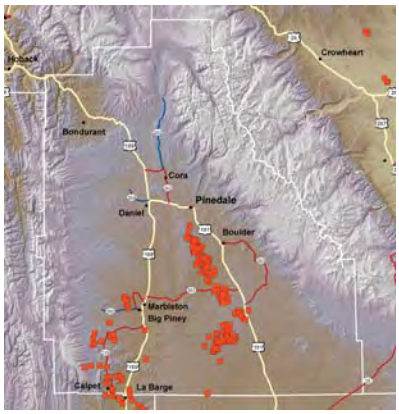


2005

overtime) and then to tool pusher, earning $91,000/yr plus overtime pay in Sublette County.[11]

To compete with high wages offered by energy companies, other businesses must raise wages to retain a sufficient staff. As a result, the local school district in Pinedale has the highest base salary in the state ($41,500),[12] and the Sheriff's office increased their base salary by 20 percent in 2006.[13] The average minimum wage for non-skilled, non-labor-intensive jobs was $9/hr in July 2006.[14] Statewide, the starting wage for the same sector of jobs ranged from $5.88/hr to $6.50/hr.[15] Wage increases are particularly difficult for residents with fixed incomes, whose wages do not rise with the rising cost of living. With an estimated workforce shortage of 1,500–2,000 workers in the natural gas industry, wages are bound to keep increasing and competition for the short supply of workers will only become more intense.[16]

Rising housing prices further contribute to the labor shortage. The Sublette County Assessor's office estimates that the average sales price of a single-family home has risen from $126,000 in 2000 to $249,000 in 2005.[17] When surveyed,

local Realtors reported a lack of homes under $150,000.[18] Sublette County Sheriff Wayne "Bardy" Bardin elaborated that "we lose people or have very few people apply for jobs because of housing prices. Both parents have to work in order to live here so we have a definite lack of child care. Since January 2004, 38 people from my 52-person staff have left my department."[19] Not only does the housing crunch make it difficult to attract teachers and police officers, it also deters workers in the gas fields from relocating to Pinedale. Depending on the affordability of housing, one study of the tastes and preferences of gas field workers estimates between 300 and 1500 would prefer to become permanent residents of Sublette County.[20]

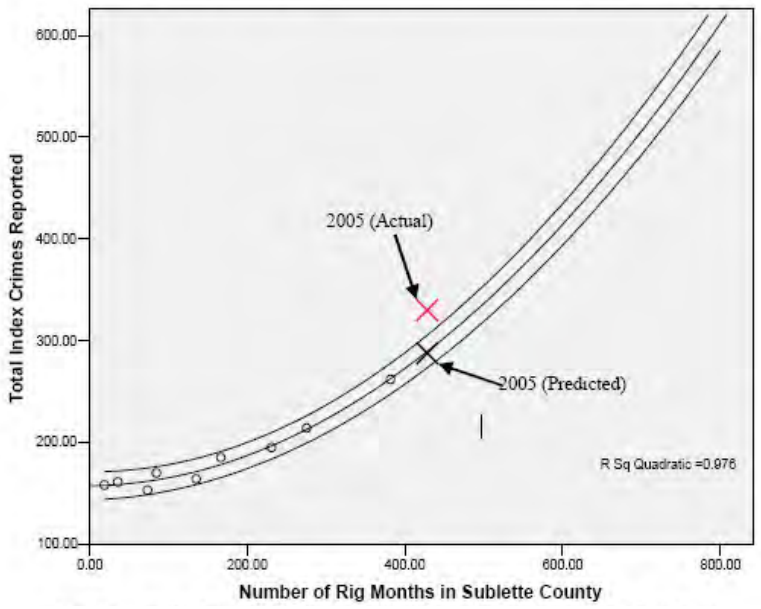
Brett Kingsbury, chairman of the local school board, also expressed difficulties in recruiting staff: "As we grow, it gets difficult to attract young kids to come teach. Housing is expensive, the temperatures can hit 40 below, and there are 10 men for every 1 woman."[21] The October 2006 student count showed a 9.6 percent (74 students) increase in the local school district.[22] Funding is available to expand school facilities, but teachers remain in short supply.

Crime and Drug Use

Assessing crime and its relationship to energy development is difficult. Arrest data are an imperfect indicator of actual crime rates, and it is hard to correlate fluctuations in arrests to energy-specific growth as opposed to growth in general. Despite these obstacles, it is useful to explore the statistics and research associated with crime and drug use, specifically in Sublette County where more in-depth studies have been conducted.

Pinedale and the Sublette County region have seen a rise in non-violent crime but not in violent crimes. This is illustrated by figure 13, created by Mr. Jacquet. The figure shows several years and the increase of crime correlated to rig-operation months. The number of drilling rigs present is the best way to estimate how many workers there are in the county.[23] The number of drilling rig months per year is the aggregate number of months spent by drilling rigs in Sublette County. The graph illustrates the predicted amount of crime for the amount of rig months in 2005 and shows that the actual increase in crime was much steeper than initially expected.[24] From 2002 to 2004, the number of arrests increased by 75 percent while the resident population of the county increased by only 7 percent. In 2004 there was one arrest for every 15 people, and Jacquet's regression model predicts that by 2008 one arrest will be made for every eight residents.[26] According to Jacquet, "part of this severe increase may be accounted for by a disproportionate increase in residents in their mid-twenties or younger, as younger populations typically commit a great amount of crime." He also suggests that the

Figure 13
Rig-Based Trend of Reported Index Crimes 1996-2004
Sources: Wyoming Unified Crime Reporting, 1996-2004; Drilling Records Inc., 1996-2004
Prepared by: Jeffrey Jacquet, Sublette County Socioeconomic Analyst



increase may reflect the increased non-resident population which includes workers who live in campers and worker camps.[27]

Crime and drug use are recognized as undesirable factors associated with development, but actually quantifying the magnitude of each factor is difficult. Most drug use data are confidential or hard to piece together, and the actual increase is not necessarily represented by the number of reported arrests made.[28] Nevertheless, in 1995 110 arrests were made, and by 2004 that number had increased by 270 percent to 439 arrests. Since 1995, the number of arrests per officer also more than doubled.[29] As stated by Jeffrey Jacquet, "while caution must be exercised when analyzing percentage changes of the small numbers associated with rural areas, the changes still appear to be substantial."[30] Jacquet also stated that tracking arrest data does not track overall crime. That is, if a crime is committed but no one is arrested for it then no arrest will be reported. Also, arrest data only record the most serious crime for which a person is being arrested. If a person has committed a murder and also possessed illegal drugs, the murder but not the drug possession are recorded.[31] Arrests per officer in Sublette County rose from 7.93 in 1995 to 19.09 in 2004. This number also accounts for an increase of staff from 15 officers in 1995 to 23 officers in 2004. The number of arrests per officer in 2004 is likely underestimated, as the Sheriff's office has had some officers serving abroad as national reservists.[32] In contrast, arrests per officer for the State of Wyoming have decreased 6.37 percent over the same time period.[33]

Table 6
Median Housing Prices, Sublette County
Source: Teton Board of Realtors Multilisting Service
Provided by: Jeffrey Jacquet, Sublette County Socioeconomic Analyst

Year, Month	sales	median price
2004	11	$150,000
February	1	$139,500
March	7	$169,000
April	12	$180,000
May	10	$180,000
June	12	$195,000
July	14	$182,450
August	11	$293,000
September	11	$220,000
October	19	$165,000
November	15	$200,000
December	9	$165,000
2005	8	$195,000
February	9	$240,000
March	11	$172,000
April	12	$265,000
May	12	$195,000
June	15	$170,000
July	12	$185,000
August	15	$175,000
September	19	$215,000
October	7	$158,000
November	15	$205,000
December	21	$226,500
2006	5	$288,000
February	9	$190,000
March	14	$285,100
April	11	$330,000
May	20	$260,000
June	17	$325,000
July	26	$256,000
August	14	$231,000
September	14	$258,000
October	14	$232,500
November	9	$238,000

Traffic

With growth in energy development comes growth in the traffic volume. Roads built to carry small levels of ranching or tourist traffic are now being used heavily by the natural gas industry. Sublette County has seen a 60 percent increase in traffic on nearly all roads since 1995, with truck and semi-tractor trailer traffic showing large increases. On one road, the daily average of trucks and semis rose from roughly 150 a day during 1995 to nearly 650 in 2005.[34] Both of these numbers outpace the population increase of the county over the same period of time. Increased traffic on small rural roads is not just an inconvenience, it is a safety hazard. Many roads were not built to handle two-way travel of large trucks, and roads to energy facilities can cut through residential areas. Most often, the expensive burden of expanding the road infrastructure falls on the county or local municipality.

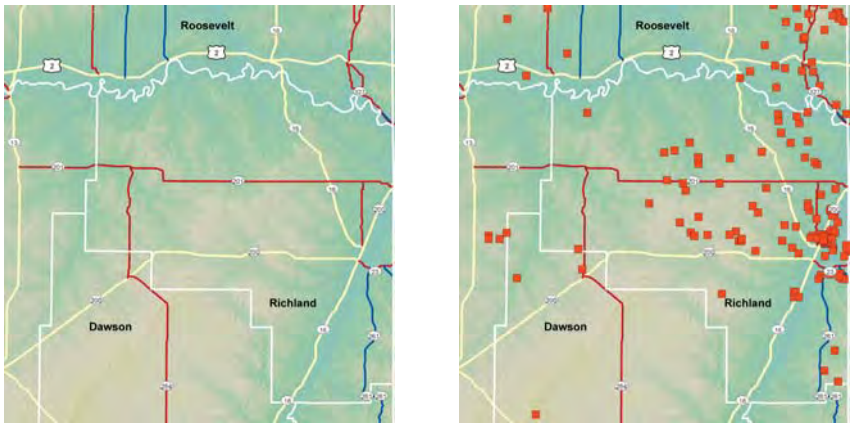
Conclusion

The region as a whole is seeking to learn from other areas in the Rockies that are experiencing similar problems. Sublette County has found a "sister county" in Colorado's Garfield County, and some experts in the community also plan to visit Farmington, New Mexico, to examine their mitigation of energy project impacts. Local citizens are beginning to "think regionally," an important first step in cooperating with others to find solutions to common problems.[35] The assistant to the Mayor of Pinedale, Laurie Latta, said the region needs to work together and focus: "we have not focused on planning; we have been reactive." Jacquet notes that "there needs to be more consensus and planning in the communities, but Pinedale could come out of this boom running."

Case Study: Richland County, MT

Oil Wealth to Mitigate Oil Impacts

Richland County Well Placement



1940 1980

In six years, Richland County, Montana has gone from being a relatively insignificant supplier of oil to the largest oil-producing county in the Rockies Region. In 1999, Richland County produced 52,000 barrels, a number the surged to 7.1 million barrels in 2005.[1] The major oil companies had previously explored the area but had not drilled into the same lucrative layers chosen by the future "wildcat" producer. After a test well was drilled in May 2000, the producer and nearby competitors quickly realized that large amounts of oil still remained in the area.[2]

Recent energy development has brought economic prosperity to the area. The schools are well-funded, business is booming, and the unemployment rate is low. The local paper publishes a twice-yearly section on oil while the town of Sidney and Richland County hold an "Oil Appreciation Day" at the local fairgrounds.[3]

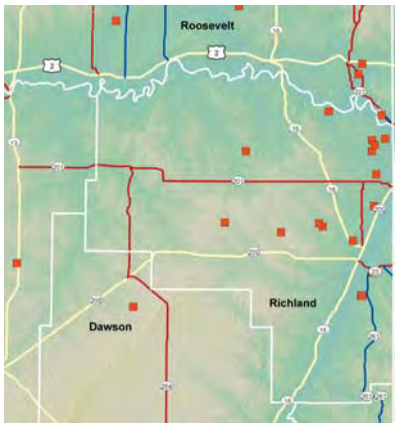
However, not all the recent change is positive. As in other energy boomtowns in the Rockies, affordable housing is limited. As noted by Richland County Commissioner Mark Rehbein, "there are currently no homes on the market in the $150,000 to $200,000 range"; high traffic volume is also harming the area's "gravel roads designed for farm equipment, not heavy oil trucks"; and there is a severe labor shortage with "every local business [having] a 'help wanted' sign in the window."[4]

The local emergency medical service has been hit particularly hard by the labor shortage. Recruiting new emergency medical technicians (EMTs) has been difficult because it is an all-volunteer force. With the increased pace of life that the boom has created few people have the time or the desire to even join the force. According to Josh King, Director of Richland County Emergency Medical Services, "our call load has increased. For example, a couple years ago we averaged one call every other day, and yesterday alone we had six calls." The oil boom has given the local economy an immense boost but at the same time has challenged locals in many ways.

Energy development not only affects the infrastructure and workforce, but also the social fabric of the community. The Richland County Coalition Against Domestic Violence provides care and assistance to victims of domestic violence and their families. According to Director Helen Schmitt, out of 187 total cases in the past year, 20 involved people who were in Richland County specifically because of the oil industry.[5] While oil impact funds are readily dispersed to local governments, as a private nonprofit, the CADV cannot easily acquire such funding. However, thanks to donations by some church congregations and other community members, the center has remained able to care for victims of domestic violence.[6]

Often, citizens of boomtowns accuse local officials of being reactive in their policies, rather than anticipating the externalities of energy development. County Commissioner Mark Rehbein explains the difficulty of being proactive at the outset of the current energy boom: "the way the revenue system is structured, we didn't receive any funds until two years after the boom really started." Since the funds started pouring in, however, the county has worked hard to stay ahead of the energy development. As Rehbein notes, "we're now spending money to improve roads where we predict the energy development is going in the future, not just catching up to where the development is now."[7]

The town of Sidney and Richland County as a whole have received "oil impact funding." The recently passed House Bill 758 established the oil impact fund to redistribute state income from the energy boom to the counties and municipalities hit hardest by the boom. Two-thirds of the funding goes straight to the towns, and the remaining third goes to county coffers.[8] In one fiscal quarter alone, Richland County and Sidney received over $79,000 and $137,000, respectively, in oil impact funds. These funds add to the over $7.5 million that the county claims annually in severance tax receipts.[9] The county spent most of their oil impact funds on improving roads in three unincorporated towns, as well as on new law enforcement facilities (the court system has been overwhelmed in the past several years), and new fair grounds.[10] Sidney has also spent their impact funds on law enforcement and road repair, but additionally built a water slide and improved the local school. The school expansion alone cost between $3 and $4 million and included a new science wing. The school improvements would not have been possible without the added funding from the energy boom.



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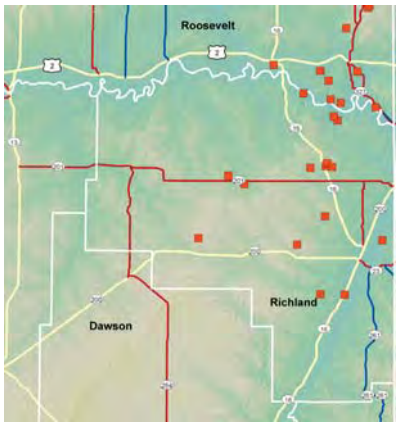

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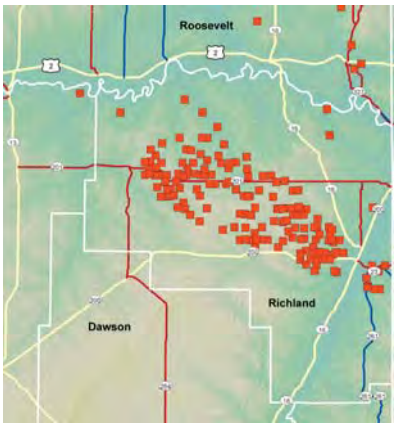


2005

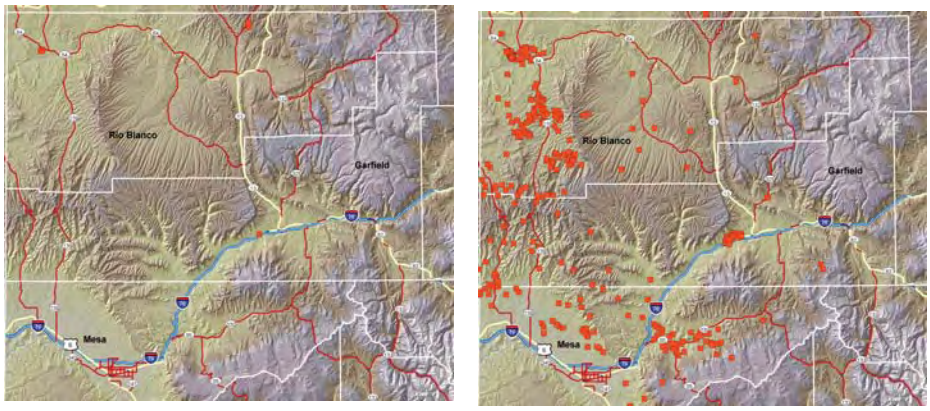
School funding in Montana is based on school enrollment, which has been declining in Sidney. The community had repeatedly tried to raise money through bonds and mill levy requests, but had not been able to raise sufficient funds.[11] It was not until the oil money came in that they were able to make the upgrades. Commissioner Rehbein reiterates that "all these community improvements have been possible through the energy boom, and never at the expense of increased taxes on local residents."[12]

Local officials and residents are also confident that they are proceeding with caution and have learned from the previous bust. The Richland County economy is more diversified than during the boom in the early 1980s (for example, Anheuser-Busch recently installed a large facility in the area).13 Many community members, including local EMT director Josh King, agree that their local government is spending the new funds wisely.14 The pace at which the energy boom came to Richland County initially made it difficult for local officials to mitigate its impacts. It appears, however, that with enough money and thoughtful planning, many of the negative side effects of the energy boom can be tempered.

Case Study: The Grand Valley, CO

Corporate and Community Cooperation

Garfield County Well Placement

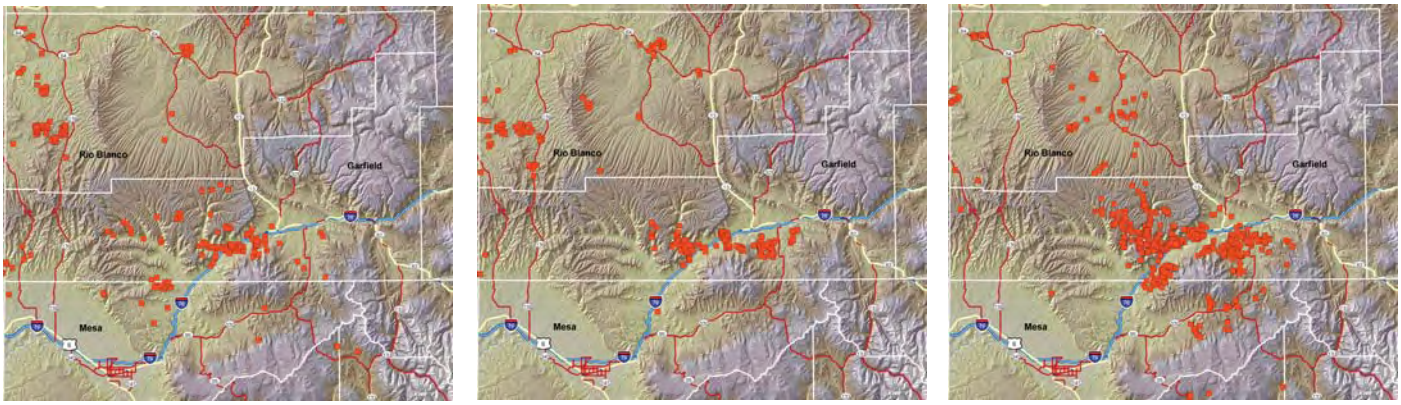


1940 1980

Rapid energy development is a familiar story to the citizens of the Grand Valley in western Colorado. In the late 1970s and early 1980s the region enjoyed the economic impacts of heavy energy investment, led most notably by Exxon's oil shale projects. Eventually, the oil shale development proved unprofitable, and Exxon closed it doors on "Black Monday"—May 3, 1982. Hundreds lost their jobs, and local municipalities were left in economic disarray.[1]

Now, energy development, spurred by high natural gas prices and a renewed interest in oil shale, has returned to Garfield and Mesa counties. Residents who recall the previous energy bust are skeptical of the current boom and fear another economic collapse. Further marring the relationship between energy companies and local citizens are complications with the "split estate." The split estate refers to the separation of surface rights and subsurface mineral rights. It is common for a surface owner to not know who owns the minerals beneath their land, and it can be a shock to learn of plans to extract those minerals. Residents who do not own the mineral rights beneath their land may find natural gas facilities and access roads encroaching on their homes. Current laws attempt to mitigate potential disagreements between surface rights and mineral rights owners. Sub-surface owners must make a "good faith effort" to come to an agreement with the surface owner regarding details of a potential development. However, if no agreement is reached, the mineral rights owner can still proceed by posting a bond with the Bureau of Land Management that is theoretically large enough to cover the costs of plugging the well and reclaiming and restoring the impacted lands.[2] The process of "bonding on" ensures that the mineral rights owner has the upper hand in a dispute.[3]

Despite the contentious relationship between energy companies and residents of the Grand Valley, there are examples of cooperation. EnCana Oil and Gas (USA) has drilling rights to more than 1.2 million acres in Colorado; the company has roughly 2,500 wells in the area[4] and plans to drill 250 more in 2007.[5] EnCana has a mixed history of community relations. In 2004, they were fined for a faulty well that allowed natural gas to seep into a nearby creek.[6] Since then, due in large part to the community uproar over the leak, EnCana has sought to improve community relations and make some concessions to local community members. Examples include painting oil and gas collection tanks colors that match the landscape, burying pipelines underground, and readjusting trucking schedules to avoid school bus pickup and drop-off times.[7] To dampen noise from rigs working near residences, EnCana sometimes builds temporary walls around the rigs and focuses lights on the rig downward to lessen light pollution.[8] The company has also helped Garfield County School District 16 retrofit their buildings with energy efficient upgrades and has donated money to Colorado Mountain Col-



1990 2000 2005

lege to help build a technology and training center in Rifle, Colorado.[9] EnCana has reclaimed 129 acres of sage grouse habitat by replanting mountain shrubs and also halted drilling during mating season. A new method of drilling, called micro-drilling or coiled tube drilling, could offer a way to diminish some of the impacts. The coiled tube rigs are smaller, with the largest taking about 12 semi-trailers to move as opposed to 20 or 30 semi-trailer loads for the conventional drilling rig. Coiled tube rigs are also quieter, reduce the amount of time needed to drill a well, and have cut costs by 38 percent according to tests run by the National Energy Technology Laboratory.[10]

Even though EnCana has made some changes and appears poised to make more, many residents are still frustrated by the traffic, noise, and odors. The Colorado Oil and Gas Conservation Commission, which is in charge of inspecting the wells and ensuring that regulations are being met, currently has only nine inspectors for the 30,000 wells it oversees.[11,12] With over 3,300 wells for each inspector, it is easy to understand why some local residents are concerned that regulations may not be enforced.

The Grand Valley Citizens Alliance (GVCA) was formed in 1997 with the goal of representing local residents and pushing energy companies to adopt best industry practices. Recently, the GVCA helped draft a planning document to encourage responsible energy development. One of the local drilling companies, Antero Resources Corporation, has taken a leadership role in the region and was involved in writing the plan. GVCA member Peggy Utesch stated, "I'm not aware of any other communities that have done this."[13]

The Grand Valley of western Colorado has had a long history with the energy industry, with no end in sight. According to Andrew McGregor, the Director of Community Development for Glenwood Springs, "the boom-bust cycle will keep repeating itself as long as there is something in the ground worth taking."[14] For the citizens of the Grand Valley, the best practice efforts of local energy companies and the work of citizens groups like the Grand Valley Citizens Alliance provide hope for more thoughtful booms and fewer unexpected busts.

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Case Study: Richland County

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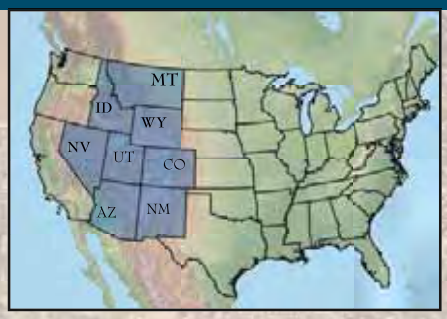
The Growing Rockies:

New People, New Communities, New Urbanism

By Julianne Kellogg and Chris Jackson

The 2007 Colorado College State of the Rockies Report Card



The eight-state Rocky Mountain West is a region in transition. Rapid population growth, perhaps above all else, fuels change in the Rockies. The steady influx of people from all over the country, as well as foreign-born residents, contributes to the strength of the economy and social fabric of the Rockies Region. However, these new residents also increase pressure on the Rockies' infrastructure and natural amenities. Included in the changes sparked by the current population explosion are major modifications to the size and character of our metropolitan centers.

In 2005 the Colorado College State of the Rockies Project presented an analysis of urban sprawl in the eight-state Rocky Mountain West. Large and small metropolitan statistical areas were graded on a sprawl index that measured housing unit density.[1] The analysis spurred discussion on the effects of sprawl in the Rockies' metropolitan centers. A survey of recent articles on Headwaters News and NewWest.net show that the debate is still active.[2]

This year, the Colorado College State of the Rockies Project returns to the theme of urban growth patterns in the Rockies. The goal of this piece, as with the 2005 article, is not to resolve the debate between planned and unplanned growth; rather, we aim to elevate the level of dialog by looking at growth patterns rather than sprawl. In this section of the *State of the Rockies Report Card*, we provide detailed statistics on population growth and demographics and expand on the "urban dynamic" debate by taking a closer look at three development trends emerging in the Rockies: smart growth and "new urbanism," retirement communities, and gated communities.

Although only one of these development schemes—new urbanism—is a direct response to sprawl, all three types involve themes

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familiar to State of the Rockies readers and citizens of the Rockies: land use patterns, equity, the regional economy, and the environment. Regardless of whether you have weighed in on the debate between sprawl and planned development, the following statistics and case studies provide a more detailed portrait of growth in the Rockies.

National, Regional, and Municipal Growth

The population of the United States officially hit 300 million on October 17, 2006, just 39 years after reaching 200 million.[3] Between 2000 and 2005, the U.S. population grew 2 percent.[4] Most of this growth occurred in the nation's major cities; 79 percent of the population resides in urban areas, up from 64.3 percent in 1950 and 39.8 percent in 1900.[5] The Rockies Region shows similar growth trends to the United States as a whole, but at a greater magnitude. From 2000 to 2005, the Rockies grew 9%–4.5 times the national rate.[6] Figure 1 shows the region's population growth by state since 1900. Contrary to the perception that it is mostly rural, the population of the Rockies is actually more urbanized than the U.S. as a whole. In 2000, 83 percent of Rockies residents lived in an urban area, up from 55 percent in 1950 and 32 percent in 1900.[7]

A closer look at metropolitan statistical areas (MSAs) in the Rockies yields similarly eye-opening growth trends. Figure 2 shows the Rocky Mountain region's MSAs and their county components. Figures 3 and 4 show 2006 population estimates and 2011 growth projections for Rockies MSA's and counties. Compared to urban growth nationwide, Western cities are booming.

While Western cities are clearly growing, the reasons for this growth are not as well understood. A Brookings Institution study published in May 2001 examined urban growth throughout the 1990s and extrapolated the common characteristics of the nation's fast-growing cities.[8] It is difficult to determine causality with some of the following indicators of metropolitan growth. That is, do cities attract new residents because they have a higher mean family income, or do some cities have a higher mean family income because they are growing? Therefore, it is important to keep in mind that these are characteristics that fast growing cities have in common, but they are not necessarily the reason for their growth.

Figure 1
Rockies Population by State 1900-2005
Source: U.S. Census Bureau

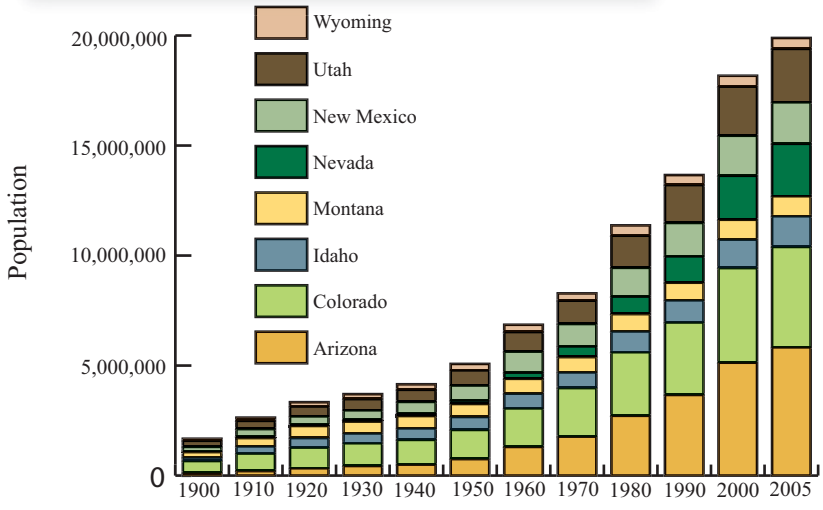
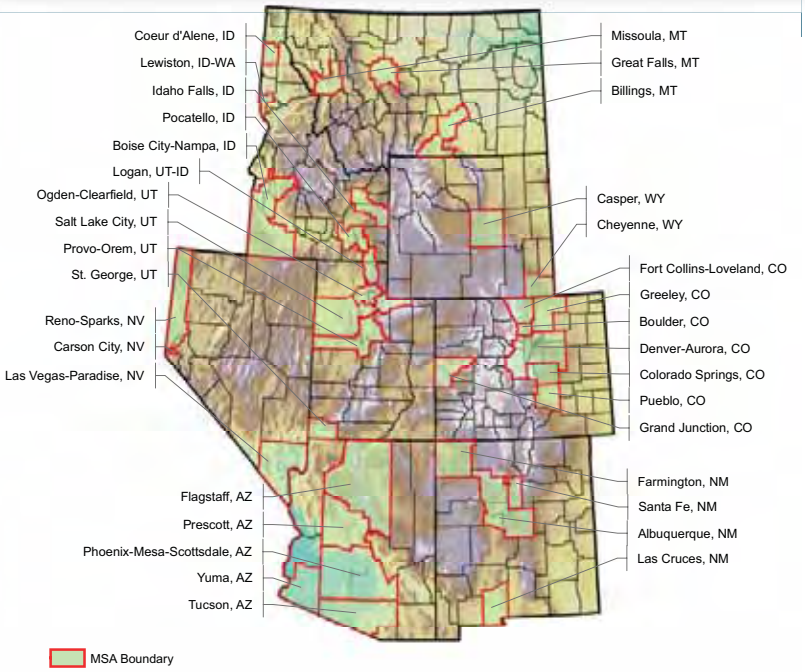


Figure 2
Rockies Metropolitan Statistical Areas and their County Components
Source: U.S. Census Bureau



Nonetheless, these traits are a valuable means of exploring where future Rockies growth may occur. The Brookings study lists the following metropolitan growth indicators:

-Western location: cities in the West (including the west coast) grew 19.5% from 1990 to 2000, considerably higher than the 8.7% median growth rate for cities nationwide.
-High rate of human capital: Human capital is typically measured by educational attainment rates. Cities with high rates of educational attainment grew faster than those with low rates.
-Median income: Income is another measure of human capital. The Brookings study found that cities with median household income greater than $30,000 grew by 18.9%, while cities with median household income less than $20,000 grew only 0.3%
-Service Industry: Cities with high levels of employment in services, wholesale and retail trade, or finance, insurance, and real estate grew, while cities that relied on manufacturing shrank.
-Car-centric: Cities where 65% or more of the population commuted alone to work grew by over 12%, while cities with fewer commuters grew less than 2%. This trend may reflect the age of a city rather than the effect of mass transit. Cities with an older building stock tend to decline, and older cities tend to have more mass transit options and fewer commuters.
-High immigrant population: Cities with larger foreign-born populations grew the fastest from 1990–2000.

City rating guides may also provide insight as to why some cities are attractive. The Places Rated Almanac and Cities Ranked & Rated guides judge metropolitan areas based on numerous criteria including cost of living, economy and jobs,

Facing page photo: Salt Lake City

Figure 3
2006 Population Estimates of Rockies Counties
Source: Geolytics, 2006 Estimates and 2011 Projections Professional

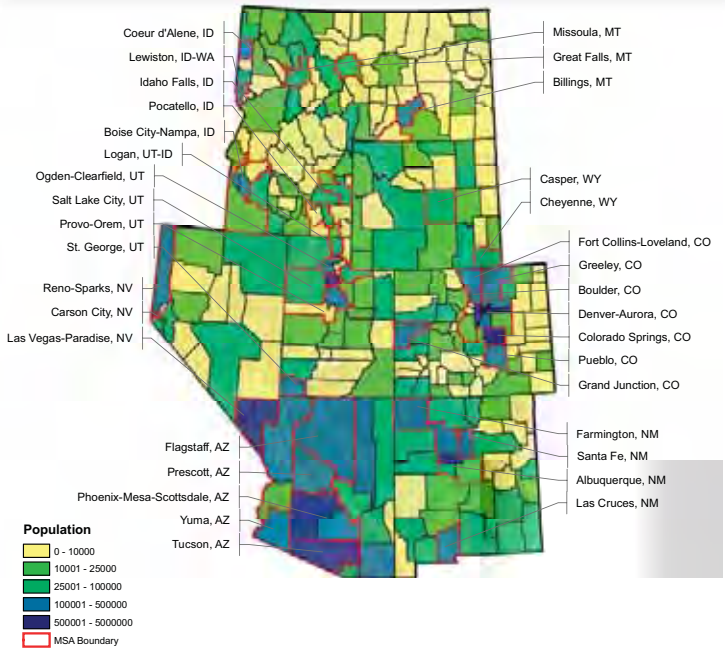
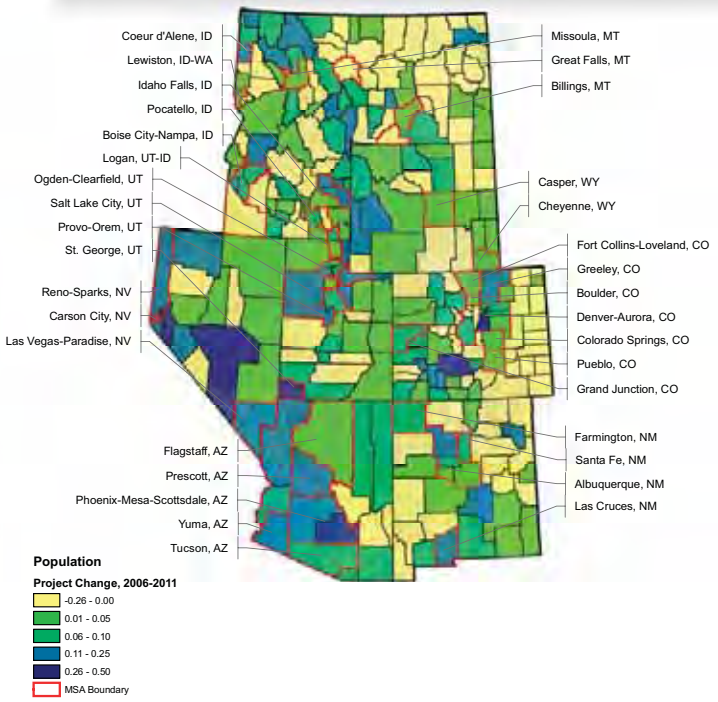


Figure 4
2011 Population Projected Percent Change
for Rockies Counties
Source: Geolytics, 2006 Estimates and 2011 Projections Professional

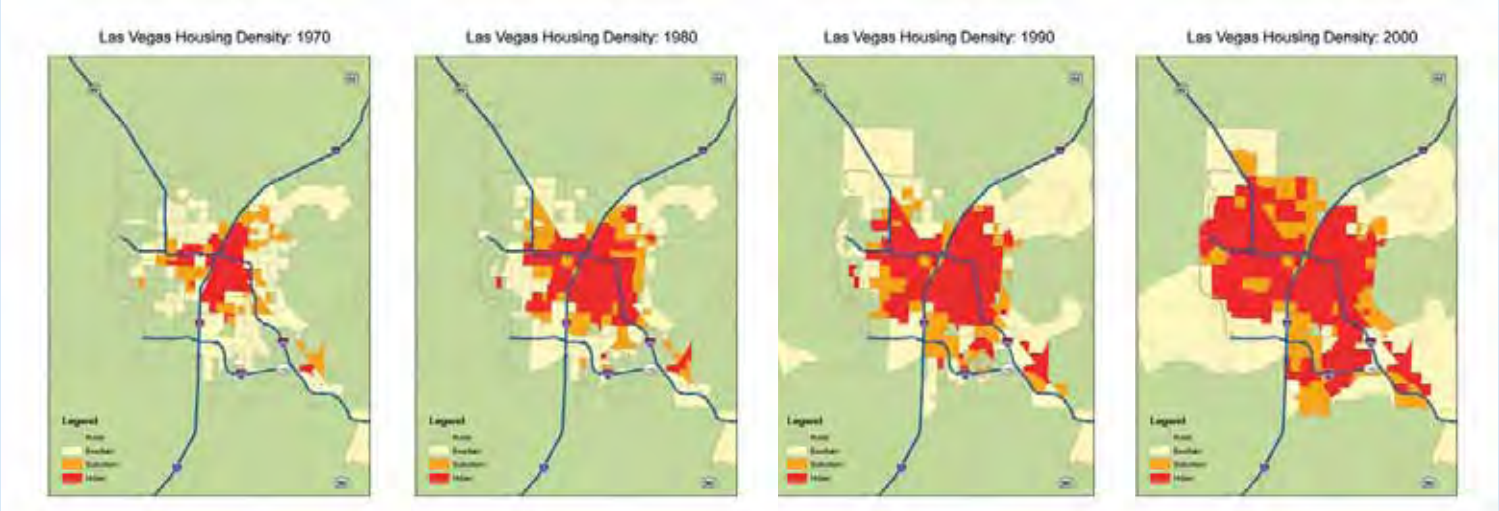


climate, education, health and healthcare, crime, transportation, leisure, arts and culture, quality of life, crime, and recreation. Western MSAs appear sporadically in the guides' top 30 lists, but the only categories where Western cities consistently earn high ranks are for economy and projected job growth. The Places Rated Almanac places Phoenix–Mesa and Las Vegas first and second, and Salt Lake City–Ogden, Denver, Tucson, and Boise within the top 30.[9] In Cities Ranked and Rated eight Western MSAs rank in the top 30 cities for high household income growth and nine Western MSAs are in the top 30 for projected job growth.[10]

Growth in the actual building stock of Western cities is perhaps even more pertinent to this discussion than population growth. A 2004 Brookings Institution report examined the likely increase in demand for residential units that will result from projected population growth to 2030.[11] Their results show major changes in store for the Rockies. Of the top ten states where residential construction is projected to grow the most, six are in the Rockies, with Nevada, Arizona, and Utah ranking first, second, and third, respectively (Table 1). On the city level, three MSAs in the Rockies are on the top ten list: Las Vegas (ranked #1), Phoenix (ranked #3), and Salt Lake City (ranked #8)(Table 2).[12]

These statistics demonstrate that metropolitan growth is on the way, but what form will this growth take? The following sections take a closer look at three possibilities: new urbanism projects, retirement communities, and gated communities.

The Growing Rockies: Las Vegas



The Growing Rockies: Phoenix

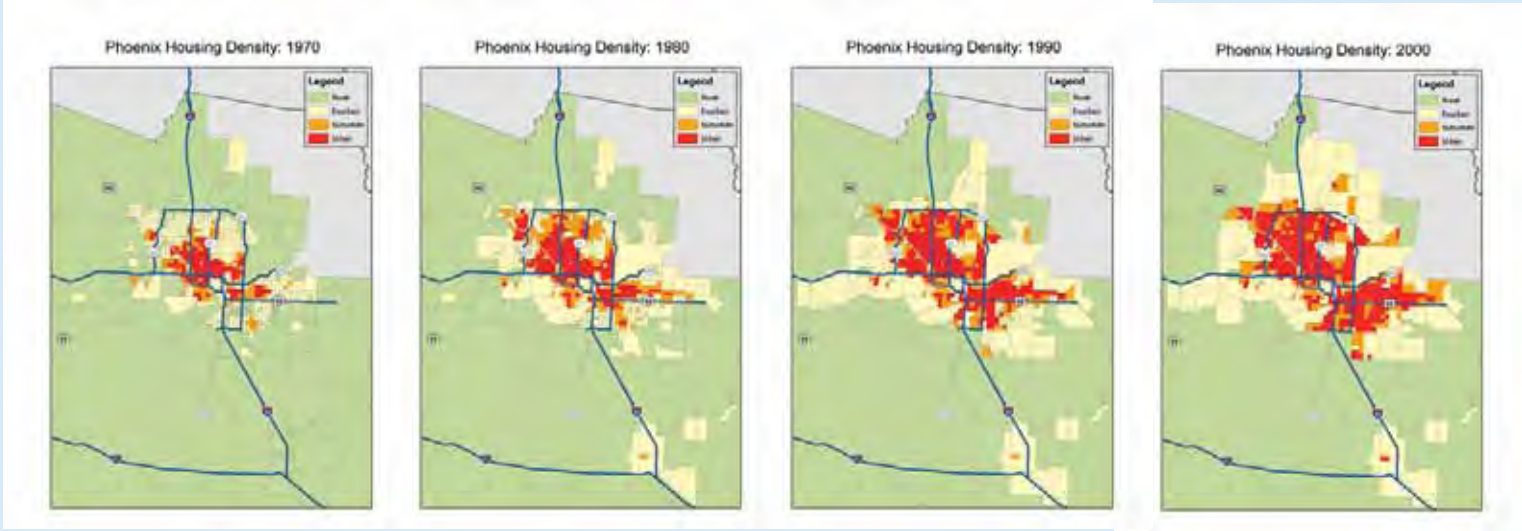


Table 1
Predicted Growth in Residential Housing Units in Rockies' States
Source: Arthur C. Nelson, "Toward a New Metropolis", 2004

State	National Rank	Rockies Rank	Percent New Housing Units, 2030
Nevada	1	1	57.9%
Arizona	2	2	54.0%
Utah	3	3	53.0%
Idaho	5	4	47.7%
Colorado	6	5	47.4%
New Mexico	8	6	45.5%
Montana	20	7	40.4%
Wyoming	34	8	34.4%

Table 2
Predicted Growth in Residential Housing Units Among Selected Rockies' MSAs
Source: Arthur C. Nelson, "Toward a New Metropolis", 2004

MSA	National Ranks	Rockies Rank	Percent New Housing Units, 2030
Las Vegas	1	1	60.3%
Phoenix	3	2	55.3%
Salt Lake City	8	3	50.5%
Tucson	12	4	49.0%
Denver	17	5	46.6%

Smart Growth and New Urbanism

To those that abhor urban sprawl, the alternative lies in "smart growth." Smart growth refers to municipal policies that promote "livability" or "place making." Specifically, it is meant to encourage walkability, compact design, mixed land use, and environmental stewardship. Frequently cited examples of smart growth polices are financing high-density development, rewriting zoning laws to allow for high density, and creating urban planning committees.[13]

The design movement of new urbanism embodies smart growth policies. Where smart growth describes the policy tools, new urbanism describes the architectural design tools that promote livability. There are several different design styles that embody smart growth ideals, such as nontraditional design and transit-oriented development, and although these terms are not completely interchangeable, for the sake of consistency and clarity we will use the term new urbanism to encompass all of them.

New urbanism was set in motion by architects Andres Duany, Elizabeth Plater-Zyberk, and Peter Calthorpe. By focusing on strengthening the sense of "community" within neighborhoods, new urbanism provides an alternative to the generic and redundant nature of traditional American suburbs with their cookie-cutter housing developments, malls, and office parks. A development following new urbanism principles promotes face-to-face interaction among a diverse set of neighbors by reducing exclusionary practices and private space and maximizing public space and facilities. The effort that goes into "place making" separates new urbanism from traditional-style real estate development. New urbanism is labeled a neotraditional design movement in that it seeks to create an atmosphere of cities before the automobile explosion in the 1940s. It reflects a desire to return to a time when towns had unique character that contributed to their social vibrancy and increased quality of life.

The Congress for the New Urbanism is an organization comprised of architects, city governments, environmentalists, businesses, transit agencies, and other citizens that subscribe to the tenants of the new urbanist design movement. The first two paragraphs of their "Charter for the New Urbanism" describe the general thrust of their motivation:

Community Profile: Stapleton, CO

The Stapleton redevelopment, located on the old site of the Stapleton International Airport in Denver, is the nation's largest urban infill project.[1] The project has garnered national and international attention as a large-scale new urbanism project that could "change the pattern of sprawl that has scarred so many of the nation's cities."[2]

The Plan

In 1995, Stapleton International Airport closed and the Stapleton Development Foundation produced the development plan for the Stapleton infill. The development plan, call the "Green Book," outlines the guiding principles of the project. These principles coincide with the "Charter of the New Urbanism," a document produced by the Congress for the New Urbanism and meant to lay down the fundamental ideals of the new urbanism movement. Specifically, both the Charter for the New Urbanism and Stapleton's Green Book focus on cultural and economic diversity, walkability and mass-transit, and environmental stewardship. For example, the Green Book dictates that 20 percent of the rental units and 10 percent of the for-sale units must be classified as affordable housing to encourage diversity. Individual neighborhoods within the Stapleton redevelopment are to be built around schools and multi-use community facilities that act as the hub of the neighborhood. In addition to the environmental benefits of promoting walkability, the plan calls for an energy and water conscious infrastructure. Stapleton also boasts more than 1,100 acres of parks, trails, and open space, increasing the total amount of open space in the Denver area by 25 percent.[3]

Implementation

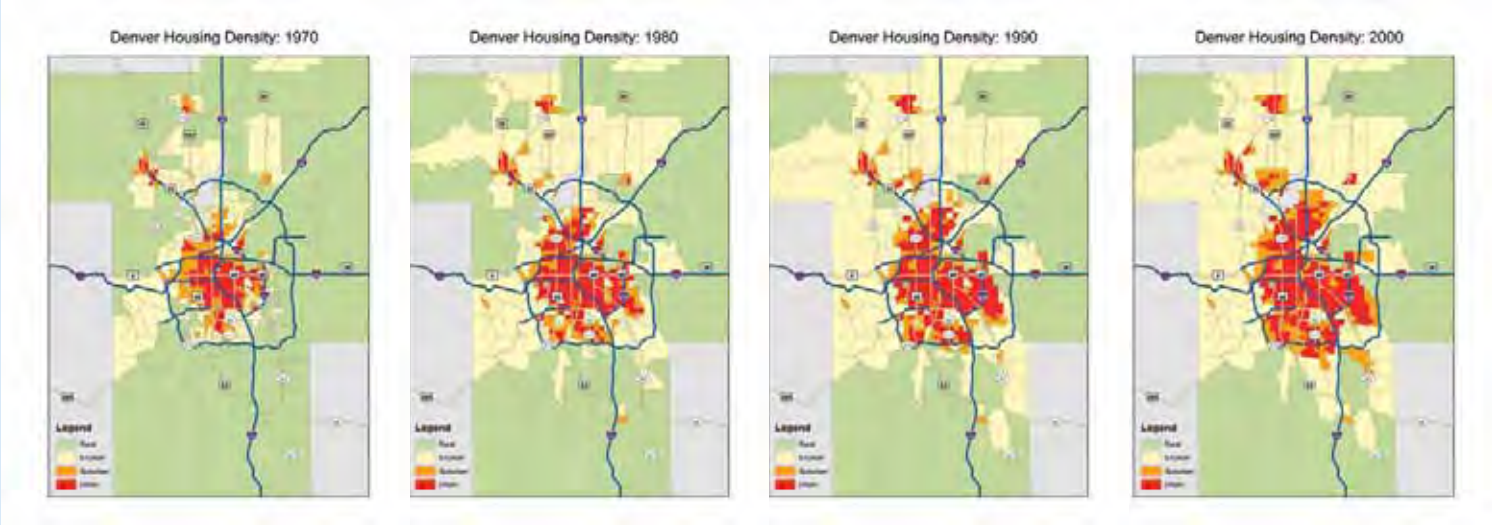
In 1999, Forest City Development was hired to implement the plan laid out in the Green Book. Construction of the site began in 2001; as of year-end 2005, the Stapleton Redevelopment Area had 6,100 residents, 2,300 homes, 13,300 employees, and 6.4 million square feet of non-residential space. This represents just over 20 percent of the project's estimated residential build out and over 33 percent of the non-residential build out.[4] At the same time, construction of the infrastructure was 40 percent complete, at a cost of nearly $330 million.[5]

With one notable exception, Forest City Development has succeeded in translating their new urbanism design principles into reality at Stapleton. The exception is the Quebec Square shopping center which includes a Wal-Mart, Home Depot, and Sam's Club. These big box stores seem contrary to the ideals of new urbanism and were never mentioned in the Green Book.[6] But Tom Gleason, the project's vice president for public relations, explains this was a necessary financial boost. And even these stores are set on a standard street grid with sidewalks and trees to encourage pedestrian traffic.[7] According to Hank Baker, a senior vice president at Forest City Stapleton, "Quebec Square, which opened in 2002, brings in $8 million annually in property and sales taxes, nearly seven times the amount from the project's first 1,000 homes."[8]

A report published on September 20, 2006, says that since the redevelopment began in 1996, Stapleton has generated $5.7 billion in fiscal impact to the Metro-Denver area, with an estimated total $36.3 billion impact through build out. In addition, the Stapleton redevelopment has been credited with spurring economic activity in surrounding neighborhoods, as businesses are rushing in to improve run-down areas around Stapleton and capitalize on the appeal of the trendy new neighborhood.[9]

Stapleton has received additional praise for being a part of the national Energy Star program promoting energy efficient housing. The project also has a "sustainability director," advising on energy conserving materials and techniques along with saving water in new construction.[10] Will Coyne, the land-use advocate for Environment Colorado, has praised Stapleton as "one of the best examples of 'smart growth' in the Denver region."[11] To date, Stapleton has won ten national and international awards for categories ranging from "urban enrichment" to environmental sustainability, quality land use, and civic–corporate cooperation.

The Growing Rockies: Denver



Aerial photo of the Stapleton redevelopment, courtesy of ForestCity Development Inc.

> *The Congress for the New Urbanism views disinvestment in central cities, the spread of placeless sprawl, increasing separation by race and income, environmental deterioration, loss of agricultural lands and wilderness, and the erosion of society's built heritage as one interrelated community-building challenge.*
>
> *We stand for the restoration of existing urban centers and towns within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, the conservation of natural environment, and the preservation of our built legacy.*[14]

Also included in the "Charter for the New Urbanism" are more specific design elements that encourage "livable" communities. Livable communities are rich in racial and economic diversity, promote walkability and offer mass transit alternatives, are densely populated, and incorporate mixed land use that puts commercial, residential, and recreational space all in close proximity.

Livable communities are not just about improving the quality of life for their residents. According to Bruce Katz at the Brookings Institution, high-density and mixed use are economically beneficial. Katz argues that the healthiest municipal economies are a product of service industries driven by human capital, and the most talented workers are attracted to cities with vibrant city centers and a high quality of life.[15] Further, densely populated labor forces that live in close proximity to their jobs are shown to be more productive, as indicated by increased patent activity.[16]

The new urbanism movement is becoming more well known throughout the United States, but not everyone is on board. Critics of new urbanism and smart growth either doubt the effectiveness of top-down policies or question the need to halt urban sprawl at all. Many new urbanism projects that promised mixed-use, livable communities are struggling to fulfill their vision. Some new urbanist communities have had to accept large commercial enterprises such as a chain hotel or "big box" store to prop up the economy of the development.[17] This is antithetical to the new urbanist value of small, unique establishments. Some Rockies citizens have voiced their frustration on newspaper websites, feeling betrayed by the new urbanist hype. In response to an article about a struggling new urbanism Project in New Mexico, one resident of the community wrote, "'New Urbanism' is nothing more than a marketing buzzword that goes next to pretty pictures of people strolling through a leafy marketplace. Developers cannot create a village. Only people can." Another writes: "'New Urbanism' is a fresh and shiny new name for purposes of marketing, but it's the same old sprawl."[18]

Other critics point out desirable effects of sprawl. According to the Colorado Springs Gazette, low-density housing means, "hard-working people don't have to be wealthy to claim a piece of the American Dream."[19] An article from the Property and Environment Research Center (PERC) notes that "sprawl has one major thing going for it: people like it."[20] Many interpret sprawl as the free market successfully addressing people's tastes and preferences, in this case, for low-density, suburban housing.

New urbanism is a relatively new trend in urban development and has yet to prove itself as the answer to worries about urban and suburban growth in the Rockies. But as more people move into the region, increasing numbers of municipalities are encouraging smart growth and new urbanism projects. Western cities will serve as testing grounds for various policy and design combinations to improve the quality of life in the West.

Retirement Communities

Census figures from the 2005 American Community Survey show an increase in the percent of the national population aged 65 and over. The elderly (65+) population in the U.S. grew from 31.2 million in 1990 to 34.8 million in 2005.[21] This increase is not simply a function of population growth in general, but also of the "graying" of the population, with 65+ year olds rising from 4.1 percent of the total population in 1900 to 12.1 percent in 2005.[22] The U.S. Census Bureau predicts a major jump in the proportion of elderly beginning in 2011 as the baby boomers turn 65, with the older population reaching 72 million, or 19.6 percent of the total population, by 2030.[23]

Of the nine census divisions, the South Atlantic Division has the largest elderly population (Figure 5), but the Mountain Division, composed of the same eight states as the State of the Rockies Project study region, experienced the highest proportionate growth in elderly population from 1990 to 2005 at 45.4 percent (Table 3).[24] Within the Rockies states, Nevada showed the highest growth in elderly population at 109.7 percent, which was also the highest growth rate in the nation.[25] The highest actual 65+ population in the Rockies, however, was in Arizona, at 735,397 elderly residents in 2005 (Figure 6).[26] The Phoenix–Mesa–Scottsdale MSA has both the highest elderly population of any MSA in the West and had the highest growth in the 65+ population from 2000 to 2005.[27] Table 4 shows the 65+ population and growth among the Western MSA's.

Population size and growth are not the only important attributes of this demographic trend. The specific characteristics of the elderly population are also in transition. As a whole, the elderly are now more educated, wealthier, and healthier than previous generations. The median income for the 65+ population has increased from $12,882 in 1967 to $28,722 (inflation adjusted to 2005 dollars).[28] In addition, advances in medicine mean that the elderly are living longer and are more physically active.[29] The relative health and wealth of today's elderly population, compared to past generations, may explain the decline in nursing home residency (down 2.1 percent between 1990 and 2000) as well as contribute to the popularity of the Rockies as a location for retirement.[30] The agreeable climate and open spaces appeal to an active population.[31]

Master-planned, age-restricted housing is gaining a larger share of the housing market for the elderly demographic. According to the American Housing Survey, a regular report on housing statistics conducted by the Census Bureau and Department of Housing and Urban Development, the number of households in age-restricted communities increased by 639,000 between 2001 and 2005.[32] As of 2005, 7 percent of households age 55 or older lived in age-restricted communities.[33] The share is much higher in Western MSAs; the 2002 American Housing Survey profile of Phoenix showed that 96,000 households age 55 or higher were in age-restricted communities—25 percent of all households age 55 and over.[34]

Master-planned retirement communities are a relatively new trend

Figure 6
Growth in 65+ Population from 2000 to 2005
Source: U.S. Census, American Community Survey

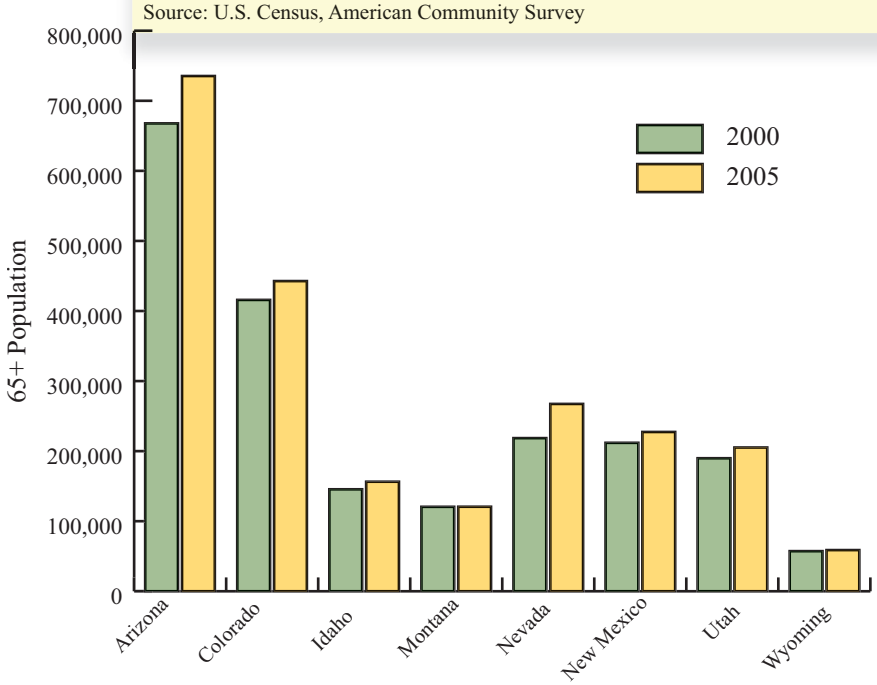


Figure 5
Growth in 65+ Population from 2000 to 2005
Source: U.S. Census, American Community Survey

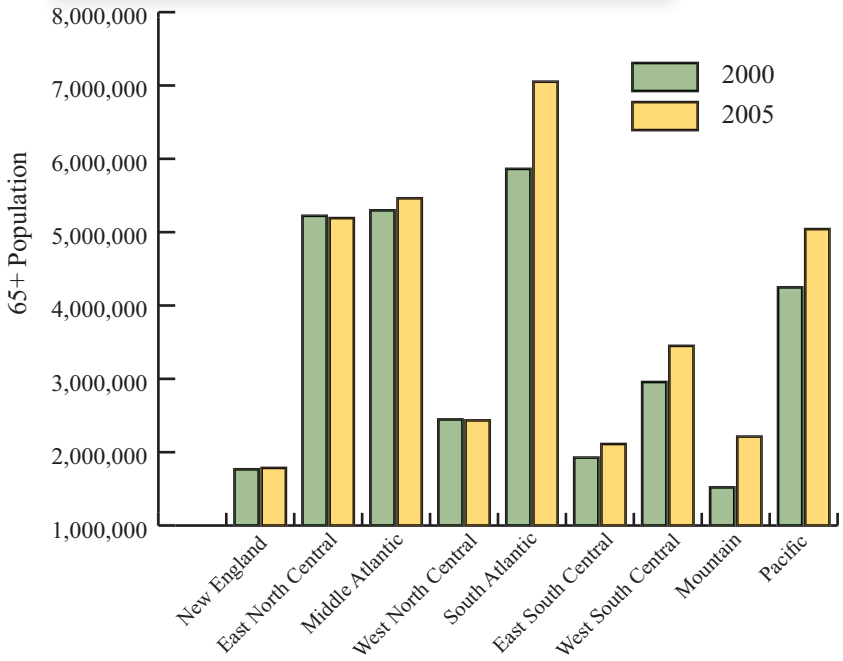


Table 3
Growth in 65+ Population from 2000 to 2005
Source: U.S. Census, American Community Survey

Census Division	Percent Change
New England	1.0%
Middle Atlantic	-0.6%
East North Central	3.1%
West North Central	-0.5%
South Atlantic	20.3%
East South Central	9.6%
West South Central	16.6%
Mountain	45.4%
Pacific	18.7%

Table 4
Growth in 65+ Population from 2000 to 2005
Source: U.S. Census, American Community Survey

MSA	65+ population 2000	65+ Population 2005	Actual Change	Percent Change
St. George	15,343	19,410	4,067	27%
Las Vegas-Paradise	146,899	179,150	32,251	22%
Reno-Sparks	36,243	43,485	7,242	20%
Santa Fe	13,903	16,304	2,401	17%
Coeur d'Alene	13,345	15,605	2,260	17%
Yuma	26,456	30,821	4,365	16%
Farmington	10,326	12,000	1,674	16%
Provo-Orem	24,312	28,230	3,918	16%
Las Cruces	18,512	21,276	2,764	15%
Prescott	36,816	42,133	5,317	14%
Flagstaff	8,143	9,184	1,041	13%
Boise City-Nampa	46,161	51,554	5,393	12%
Greeley	16,240	18,042	1,802	11%
Idaho Falls	10,173	11,298	1,125	11%
Colorado Springs	46,327	51,302	4,975	11%
Fort Collins-Loveland	24,037	26,606	2,569	11%
Phoenix-Mesa-Scottsdale	388,150	423,082	34,932	9%
Grand Junction	17,642	19,014	1,372	8%
Tucson	119,487	128,456	8,969	8%
Albuquerque	82,068	88,116	6,048	7%
Denver-Aurora	194,064	206,835	12,771	7%
Ogden-Clearfield	38,440	40,504	2,064	5%
Cheyenne	9,351	9,779	428	5%
Salt Lake City	77,101	80,396	3,295	4%
Boulder	22,670	23,477	807	4%
Pocatello	8,445	8,733	288	3%
Missoula	9,585	9,829	244	3%
Logan	7,860	7,922	62	1%
Pueblo	21,456	21,210	-246	-1%
Great Falls	11,248	11,081	-167	-1%
Casper	8,424	8,203	-221	-3%
Billings	18,851	18,266	-585	-3%

Community Profile: Sun Lakes, AZ

Characteristics of the Development

Sun Lakes is a "resort-style active adult community" located in the southern outskirts of Phoenix. Encompassing roughly 3,500 acres and home to approximately 16,200 residents,[1] the community is restricted to those 55 and older (although a limited number of units can be sold to those 40 and older). In 2000, the median resident age of Sun Lakes was 69.[2] The development features 14 different models of homes, accommodating a variety of needs and income levels.[3]

Sun Lakes caters to the "active adult" demographic, boasting 45 holes of golf, 16 tennis courts, stocked fishing lakes, swimming pools, a health club, and a softball field. In addition, the community has three pharmacies within the development, a health center with several doctors and specialists on site, and more extensive health facilities within 5 miles in metropolitan Phoenix. The close proximity to Phoenix also allows Sun Lakes residents access to arts and leisure centers, fine dining, and other amenities of a large city. Sun Lakes is a good model of the type of high-quality retirement communities springing up throughout the West.[4]

Ed Robson and the Development of Sun Lakes

Development mogul Edward J. Robson started Sun Lakes in 1972. Previously, Robson worked as Director of Corporate Sales for the Del Webb Corporation, a development company similarly marketing to the "active retiree." The Sun Lakes development is the centerpiece in his prolific development career. The initial concept billed the once-remote development as a low-budget alternative to luxury retirement communities, and the business model has evolved with the market. Sun Lakes began with several double-wide trailers, but now features homes for a wide range of incomes, many selling for $300,000+ and a small portion for over $1 million. In 2005, Sun Lakes "sold its last new home and closed models for good after 33 years and 11,000 sales."[5]

The aging of America is fast fueling a wide variety of new community responses. Often the results are housing developments "gated" and restricted by age, while informal self-selection leads to most residents having similar backgrounds and interests. Conscious efforts to infuse diversity through a range of housing types and costs, from apartments to condominiums, garden homes, and single "family" residences, help mitigate what otherwise might be highly restrictive communities within the Rockies urban and suburban areas. Ed Robson has been a pioneer in the Rockies, designing and building housing complexes that fit the rapidly changing demographics of the Rockies Region.

in development in the United States. Prior to 1950, retirement communities did not exist; the compact, mixed-use layout of older cities meant that the elderly could live comfortably with limited mobility.[35] In the post-WWII era of expanding cities, however, the elderly have often found themselves stranded. Whereas groceries, pharmacies, and other daily needs were at one time in walking distance, for many they now can only by accessed by car—a means of conveyance not every elderly person can utilize.[36] Often the only choice left for seniors is a retirement community or assisted living center.

Occasionally there arise unplanned communities comprised mainly of retired and elderly people. These are called "naturally occurring retirement communities" (NORCs). A NORC is an area, often in sections of older cities, where the majority of residents is increasingly elderly.[37] Mixed-use and pedestrian-friendly designs allow residents to easily transition from an auto-dependent lifestyle to a retirement lifestyle. Originally the NORC may have been diverse in age, but as the residents aged and remained in their homes, other older individuals found the area appealing. NORCs, however, occur with less frequency since the decentralization of cities began after WWII.[38]

Today, master-planned retirement communities offer an alternative housing option that reflects the need for functional and appealing retirement amenities. Developers target the new elderly demographic by shedding the stale "shuffleboard" image and marketing an active and engaging way of life, complete with golf courses, sports leagues, academic courses, social groups, comfortable climate, and access to the outdoors.

Retirement communities are an attractive housing alternative for the elderly population, but are they suitable for everyone? A 2005 Association for the Advancement of Retired Persons (AARP) study outlines several criteria for measuring how "livable" a community is for the elderly. The master-planned retirement communities now prevalent in the West satisfy most of the requirements. Most retirement communities provide a means for seniors to be engaged both physically and mentally and offer a sense of community and security.[39] They also make for pedestrian friendly communities and have health facilities in close proximity. A 2002 report from the National Older Adult Housing Survey showed that senior citizens in age-restricted communities benefit from more accommodating housing features (e.g., first floor bedrooms) and a higher prevalence of community amenities and activities than their counterparts in mixed-age communities.[40] The specialized design of retirement communities is an obvious advantage over mixed-age communities.

Age-restricted developments, however, fall short of the ideal elderly housing situation in two ways. First, they are not always affordable. While some developments offer several models to accommodate a variety of income levels, the population influx in the West in particular is driving up housing values—an especially difficult challenge for older populations who often rely on fixed incomes. Second, a 2005 AARP survey shows that 74 percent of people over 50 wish to stay in their current residence.[41] Age-restricted communities are by definition a place that one cannot have grown up in and are often depicted as "destination" accommodations, requiring a significant move. In a letter put before the Senate Committee on Health, Education, Labor, and Pensions, the AARP voiced the challenge America faces "to create livable communities, with appropriate and affordable housing, adequate options for mobility,

and the community feature and services that can facilitate personal independence and continued engagement in civic and social life."[42] Master-planned retirement communities satisfy many of these characteristics, but are not fit for or available to everyone.

Gated Communities

The American Housing Survey (AHS) refers to gated communities as "secured" communities and defines them as "residential communities in which public access by nonresidents is restricted, usually by physical boundaries, such as gates, walls, and fences, or through private security."[43]

The American Housing Survey provides the most comprehensive statistics about gated communities in the United States. National-level surveys are conducted every other year; the most up-to-date statistics are for 2005. The national survey also provides statistics broken out for the Northeast, Midwest, South, and West census regions. The West Region includes the eight-state Rockies study region, plus California, Oregon, Washington, Alaska, and Hawaii. In addition to national and regional data, the AHS provides detailed housing profiles for select MSAs throughout the country. Since 2000, the AHS has produced surveys for two MSAs in the eight-state region—Phoenix in 2002 and Denver in 2005.

Table 4
Number of Secured Communities by Region and Selected Rockies MSAs
Source: American Housing Survey

	Total units with access secured with walls or fences (thousands)	Percent of Total Units with access secured with walls or fences
Area		
National (2005)	6925	6.30%
Northeast	526	2.50%
Midwest	441	1.80%
South	3117	7.80%
West	2841	11.90%
Phoenix (2002)	202	17.30%
Denver (2005)	62	7.20%

Community Profile: Yellowstone Club, MT

The Yellowstone Club is the epitome of a luxury gated community in the Rockies. Located on 13,400 acres near the northwest border of Yellowstone National Park, at completion the development will accommodate no more than 864 residential properties. As of February 2007, the club had 250 members, each paying upwards of $3 million in membership fees and building costs to be a part of the development.[1] Recently, Forbes declared one of the homes in the Yellowstone Club to be the most expensive house in the world—worth $155 million.

Amenities are the selling point for the Yellowstone Club. The development claims to be the only private ski and golf resort in the world, and also features premier fishing waters. Membership is by invitation only, and so far Bill Gates, Jack Kemp, and Dan Quayle are among the select few who have accepted.[2]

Construction of the Yellowstone Club has not been without protest. Joining the typical critics of gated communities as a whole are environmentalists who cite a multitude of violations. Opponents argue the development's transgressions include dumping dredge material into a protected wetlands and polluting streams that feed the Gallatin River. For disrupting the wetlands, Yellowstone Club developer Tim Blixseth paid $1.8 million in fines, the highest penalty ever assessed for an environmental transgression. Blixseth did not admit guilt, but opted to pay the fine rather than endure drawn-out litigation.[3]

Nonetheless, the Yellowstone Club is an economic boon to the area. The development directly employs 500 workers and 1,000 subcontractors, enough that the Yellowstone Club purchased a nearby motel to house workers in light of a housing shortage.[4] Developer Blixseth estimates that the development injects $200 million into the economy annually.[5]

Gated communities have different meanings throughout the Rockies. In urban and suburban areas they offer residents added security and camaraderie among those of similar age, background, and interests. In rural resort areas, the "gates" stand more for exclusivity and "separation" of the haves from the have-nots. Prestige, pampering, and world-class recreation opportunities often sell to high-wealth individuals and families. The resulting regional injection of jobs and income can come at the price of resentment by those the gates "lock out."

Table 4 shows the AHS data for the number of housing units with "community access secured with walls or fences." The data show the West has the highest number of housing units in gated communities as a percent of total housing units. The West and the South are associated with an area commonly referred to as the "Sunbelt," a popular location for gated retirement communities.[44] The percentage of units in gated communities in the Phoenix MSA is well above the national average, while Denver closely reflects the national average. Although far from comprehensive, the AHS data are the best available statistics for analysis of national and regional trends regarding gated communities.

It is a common perception that gated communities are the bastions of the wealthy and white. But a detailed look at the AHS data shows that these developments are also popular among the middle-class and minorities. An analysis of the 2001 national AHS data by Sanchez and Lang showed two distinct patterns. The first was the familiar trend of wealthy, white homeowners, living in access-controlled communities (requiring a special entry system such as an entry code, key card, or security guard approval).[45] The second pattern, however, was a stark contrast. Sanchez and Lang observed a large instance of units occupied by middle-income minorities who rented rather than owned their houses and lived in gated communities that did not necessarily have the rigorous access controls of the more up-scale developments.[46] Sanchez and Lang conclude by remarking that the desire for the security of gated communities pervades many social classes, not just the wealthy.[47]

Gated communities are appealing for many reasons. They provide a feeling of security, the comfort of racial and economic homogeneity, and the satisfaction of exclusivity.[48] However residents must be willing to adhere to strict building codes and social guidelines for the privilege of home in a "privatopia."[49] Depending on the development, homeowners' associations can control everything from the color of houses to the number of guests allowed in residences and what home furnishings can be visible through windows.[50] Residents tolerate intrusive policies to maintain social order as well as protect the value of their property.[51] Strict building maintenance regulations ensure that the physical deterioration of a neighbor's property will not affect the value of an adjacent property. Gated communities reflect the desire for a utopian enclave.

Gated communities draw considerable criticism from sociologists and the excluded population. Common arguments claim such developments catalyze segregation and perpetuate social conflict and class divisiveness.[52] In the book Behind the Gates: Life, Security and the Pursuit of Happiness in Fortress America, Setha Low sums up the position stating, "gated residential communities intensify social segregation, racism, and exclusionary land use practices."[53] Exacerbating the problem is communities' ability to fund and regulate themselves. In Suburban Nation: The Rise of Sprawl and the Decline of the American Dream, Duany et al. explain, "the people in gated communities are the ones consistently voting down necessary taxes. Not one penny more to support the inner city, schools, parks, or even for the maintenance of the public realm at large. Meanwhile, these people often pay hundreds, sometimes thousands of dollars a month to their homeowners' association to maintain their personal archipelago. The rest of the world is expected to take care of itself."[54] Gated communities are thus insulated from problems affecting their surroundings and further alienate those not living within their walls.

A similar dissatisfaction with gated communities, especially the ultra-exclusive developments, is echoed throughout the Rockies. Natural amenities make the West an attractive location for high-end developments, including several on the Forbes list of the most expensive gated communities.[55] A 2002 article in High Country News explains that residents of one particular luxury gated development in Montana isolate themselves from the community at large—they don't shop at local establishments or participate in community functions or meetings.[56] The developers and residents of the gated community defend themselves explaining that they donate to local non-profits and provide added financial benefits through increased property taxes and jobs for local contractors and service workers to maintain the golf course and country club.[57] Experts in the field of urbanism, however, contend that gated communities are usually economically and racially homogenous. The lack of diversity in such developments promulgates intolerance and complacency toward issues outside the community.[58]

As gated communities gain popularity in the West, more citizens and municipalities will grapple with the pros and cons of these developments. Are the increased financial benefits worth the potential for social strife?

Conclusion

The Rockies' population is growing at an alarming rate-9 percent from 2000 to 2005, nearly 4.5 times the national growth rate. Examining how the growing population in housing itself, namely new urbanism projects, retirement communities, and gated communities, illuminates specific characterisitics of the current population boom. The population influx and the associated housing trends change not only the physical size and composition of the region's urban centers, but also the character and "livability" of the West. Understanding the intricacies of these dynamic changes will help us to better anticipate the future of this region in transition.

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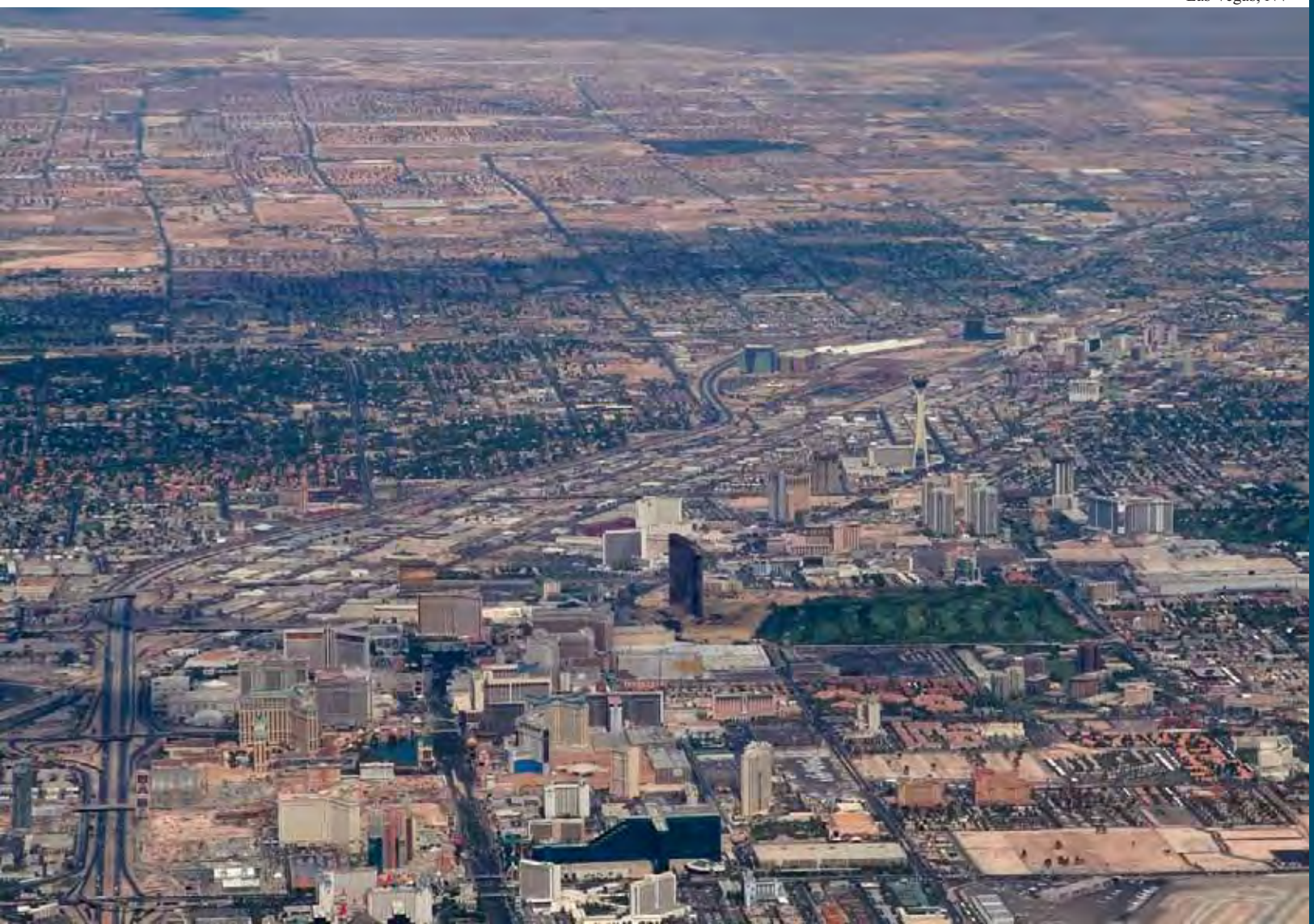
Las Vegas, NV

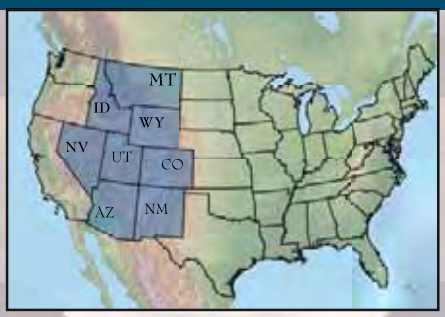


Feeding From the Federal Trough

Patterns of Federal Government Expenditures Around the Rockies

By Pablo Navarro

THE 2007 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD



April is "tax time" and we all either look forward to a refund for overpayment or dread having to find the funds to pay the rest of what we owe the IRS. Out the other side of Washington DC come federal expenditures and obligations that are "spent" in cities, counties and states around the nation. We here in the Rockies, like elsewhere, strive through federal programs and our representatives to obtain a "share," arguing among other ways that after all we sent the funds "east" in the first place. Do we receive back our "fair" share? Are we envious of other counties around the Rockies that receive "more"? Is there something slightly off for we rugged, fiercely independent "westerners" to be playing the federal funds game in the first place? Answering some of these questions is made difficult by lack of data on the "revenue sent to Washington DC" by counties. Easier to decipher are the actual federal expenditures and obligations made around the Rockies, we know partly because our esteemed elected representatives are always instantly informed and pass along to their constituents any federal monies coming to their jurisdiction. What we explore here briefly are patterns of federal expenditures around the Rockies, shared with our readers to help fuel a healthy debate about the role of the federal government "out west."

In 2004, the United States government committed $2.2 trillion in direct payments and obligated funding to states, counties, municipalities, corporations, and individuals throughout the U.S. Examples of these outlays and contingent liabilities include:

- retirement and disabilities payments ($667 billion)
- procurement contracts (($340 billion)
- salaries and wages for federal employees ($226 billion).

About the author: Pablo Navarro is a 2006-2007 student researcher for the Colorado College State of the Rockies Project

Which parts of the U.S. benefited the most from federal expenditures in 2004? We know some counties were net "donors," providing more in taxes than they received in federal expenditures and others were net recipients, benefiting from tax dollars generated in other areas. This section of the *2007 State of the Rockies Report Card* examines which states and counties in the West received the most in federal funding.

The Data

The "2004 Consolidated Federal Funds Report", an analysis generated by the U.S. Census Bureau, provides county level data on federal expenditures by agency. Using these data, (adjusted to spread state level federal expenditures among counties proportionately by population) we provide the top ten recipients of federal funding from selected agencies for Rockies counties based on both total dollars and dollars per capita. Occasionally, we hold a magnifying glass to county expenditures, and show in greater detail where the money went. Through this section of the Report Card, we illustrate which Rockies Counties are apparently most effective at "feeding from the federal trough."

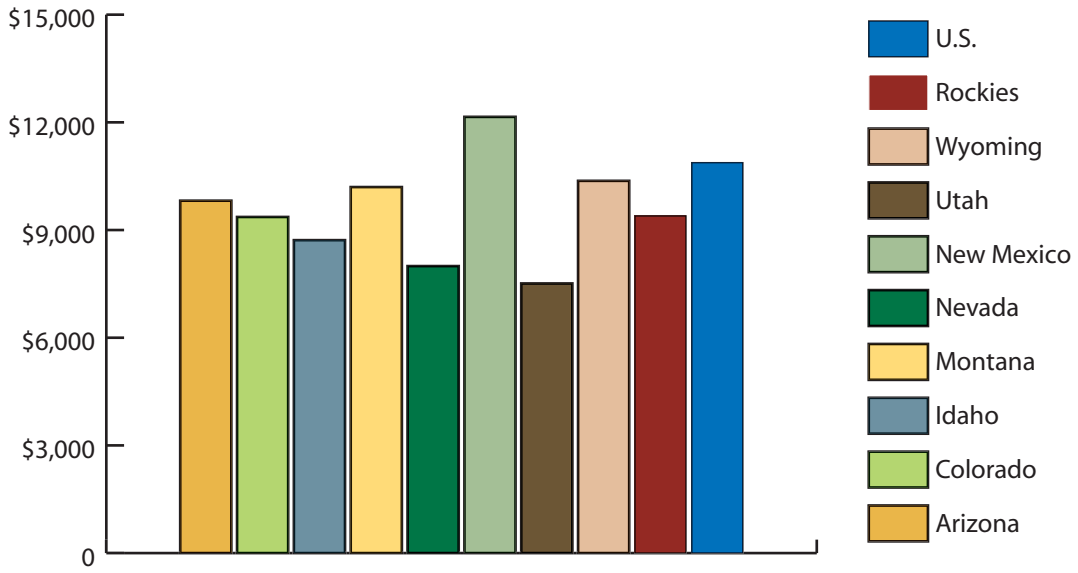
Total Expenditures by Agency by State

	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming	Rockies Region
Agency									
Executive Office of the President	$255,894	$725,000	$0	$0	$0	$0	$0	$0	$980,894
Agriculture Dept.	$1,632,019,298	$2,308,624,781	$1,360,923,649	$1,632,067,370	$341,869,611	$858,577,687	$820,998,020	$331,356,706	$9,286,437,122
Commerce Dept	$21,325,520	$194,901,162	$19,285,325	$11,400,002	$15,884,590	$17,508,293	$12,609,851	$6,490,602	$299,405,345
Interior Dept	$743,404,156	$907,491,214	$234,568,052	$290,833,024	$408,498,159	$895,058,527	$322,298,581	$813,773,514	$4,615,925,227
Justice Dept.	$483,471,926	$297,272,247	$69,765,435	$65,273,929	$125,268,292	$138,425,170	$93,091,314	$38,873,039	$1,311,441,352
Labor Dept.	$578,479,056	$706,880,510	$226,951,805	$136,489,543	$383,353,790	$247,347,128	$309,180,565	$70,810,264	$2,659,492,661
State Dept.	$22,197,178	$22,638,829	$3,063,183	$3,094,965	$5,387,139	$7,774,424	$3,344,109	$1,064,188	$68,564,015
Treasury Dept	$783,478,486	$562,610,103	$262,193,417	$143,767,808	$301,528,990	$372,003,738	$504,756,802	$84,377,559	$3,014,716,903
Transportation Dept	$945,705,712	$915,291,916	$287,110,360	$397,229,864	$364,426,958	$397,441,876	$413,489,844	$288,733,699	$4,009,430,229
Homeland Secuirty Dept	$5,223,446,568	$2,813,613,451	$969,740,421	$451,415,981	$3,118,701,075	$1,491,541,681	$474,552,477	$306,438,181	$14,849,449,835
Health and Human Services Dept	$9,828,919,534	$5,775,882,398	$1,867,532,458	$1,773,997,711	$2,475,764,527	$4,044,075,084	$2,721,254,299	$777,359,669	$29,264,785,680
Housing and Urban Development Dept.	$4,322,596,247	$6,743,849,607	$785,255,689	$431,803,788	$1,739,069,824	$1,106,017,774	$2,809,642,353	$215,277,271	$18,153,512,553
Energy Dept.	$90,900,887	$1,114,896,079	$899,697,636	$34,834,650	$964,227,395	$4,500,101,567	$21,880,480	$12,491,000	$7,639,029,694
Education Dept.	$4,548,766,568	$1,946,718,671	$651,587,187	$540,309,797	$464,046,482	$953,402,763	$864,196,056	$261,555,095	$10,230,582,619
Total Ex-Branch non-military	$29,224,907,030	$24,311,395,968	$7,637,674,617	$5,912,518,432	$10,708,026,832	$15,029,275,712	$9,371,294,751	$3,208,600,787	$105,403,694,129
Navy	$2,654,058,759	$364,360,893	$90,930,061	$44,098,024	$331,271,708	$165,943,593	$195,560,160	$19,162,508	$3,865,385,706
Army	$3,827,152,869	$1,821,330,686	$249,470,811	$247,228,099	$334,313,658	$781,454,315	$745,571,406	$59,160,726	$8,065,682,570
Veterans Affairs Dept.	$2,760,856,331	$2,202,625,686	$562,494,436	$310,072,596	$1,337,727,583	$974,372,680	$733,118,071	$211,019,609	$9,092,286,992
Air Force	$2,452,516,540	$3,373,807,022	$379,021,359	$325,607,950	$888,156,290	$1,368,340,453	$2,219,676,384	$279,587,205	$11,286,713,203
Defense Dept. (except Branches)	$2,173,043,424	$596,337,587	$16,258,677	$24,964,453	$37,658,526	$114,333,162	$137,777,263	$53,946,101	$3,154,319,193
Total Ex-Branch Military	$13,867,605,123	$8,358,461,874	$1,298,175,344	$951,971,122	$2,929,127,765	$3,404,444,203	$4,031,703,284	$622,876,149	$35,464,364,864
Postal Service	$1,050,705,682	$1,178,681,292	$237,661,043	$219,685,326	$423,383,540	$341,140,679	$429,110,296	$109,683,590	$3,990,051,448
General Services Administration	$136,500,985	$294,044,134	$20,956,978	$25,186,706	$29,594,131	$39,542,382	$74,247,195	$7,531,809	$627,604,320
FEMA	$0	$0	$0	$0	$0	$0	$0	$0	$0
EPA	$54,712,768	$158,142,018	$51,545,193	$39,279,690	$44,734,618	$49,315,820	$34,473,860	$22,005,047	$454,209,014
Small Businesses Administration	$467,506,120	$550,116,340	$111,411,103	$81,020,326	$168,711,940	$67,012,887	$328,973,300	$37,866,887	$1,812,618,903
NASA	$166,940,761	$303,914,252	$6,095,426	$18,210,004	$7,259,471	$127,431,296	$25,022,454	$2,783,414	$657,657,078
Total Other + Legislative and Judicial Expenditures	$13,259,610,036	$10,422,286,125	$3,226,610,499	$2,587,540,002	$5,015,877,543	$4,692,799,875	$4,782,194,826	$1,414,907,311	$45,401,826,217
Grand Total Federal Expenditures	$56,352,122,189	$43,092,143,967	$12,162,460,460	$9,452,029,556	$18,653,032,140	$23,126,519,790	$18,185,192,861	$5,246,384,247	$186,269,885,210

Per Capita Expenditures by Agency by State

	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming	Rockies Region
Agency									
Executive Office of the President	$0	$0	$0	$0	$0	$0	$0	$0	$0
Agriculture Dept.	$284	$502	$975	$1,761	$147	$451	$339	$655	$468
Commerce Dept	$4	$42	$14	$12	$7	$9	$5	$13	$15
Interior Dept	$130	$197	$168	$314	$175	$470	$133	$1,609	$233
Justice Dept.	$84	$65	$50	$70	$54	$73	$38	$77	$66
Labor Dept.	$101	$154	$163	$147	$164	$130	$128	$140	$134
State Dept.	$4	$5	$2	$3	$2	$4	$1	$2	$3
Treasury Dept	$136	$122	$188	$155	$129	$195	$209	$167	$152
Transportation Dept	$165	$199	$206	$429	$156	$209	$171	$571	$202
Homeland Secuirty Dept	$910	$611	$695	$487	$1,337	$784	$196	$606	$749
Health and Human Services Dept	$1,712	$1,255	$1,339	$1,914	$1,061	$2,125	$1,124	$1,537	$1,476
Housing and Urban Development Dept.	$753	$1,465	$563	$466	$745	$581	$1,161	$426	$916
Energy Dept.	$16	$242	$645	$38	$413	$2,365	$9	$25	$385
Education Dept.	$792	$423	$467	$583	$199	$501	$357	$517	$516
Total Ex-Branch non-military	$5,092	$5,283	$5,474	$6,379	$4,590	$7,898	$3,871	$6,343	$5,316
Navy	$462	$79	$65	$48	$142	$87	$81	$38	$195
Army	$667	$396	$179	$267	$143	$411	$308	$117	$407
Veterans Affairs Dept.	$481	$479	$403	$335	$573	$512	$303	$417	$459
Air Force	$427	$733	$272	$351	$381	$719	$917	$553	$569
Defense Dept. (except Branches)	$379	$130	$12	$27	$16	$60	$57	$107	$159
Total Ex-Branch Military	$2,416	$1,816	$930	$1,027	$1,256	$1,789	$1,666	$1,231	$1,789
Postal Service	$183	$256	$170	$237	$181	$179	$177	$217	$201
General Services Administration	$24	$64	$15	$27	$13	$21	$31	$15	$32
FEMA	$0	$0	$0	$0	$0	$0	$0	$0	$0
EPA	$10	$34	$37	$42	$19	$26	$14	$43	$23
Small Businesses Administration	$81	$120	$80	$87	$72	$35	$136	$75	$91
NASA	$29	$66	$4	$20	$3	$67	$10	$6	$33
Total Other + Legislative and Judicial Expenditures	$2,310	$2,265	$2,313	$2,792	$2,150	$2,466	$1,976	$2,797	$2,290
Grand Total Federal Expenditures	$9,818	$9,364	$8,718	$10,197	$7,996	$12,153	$7,512	$10,371	$9,395

Per Capita Expenditures for all agencies by State, Rockies Region, and U.S., 2004



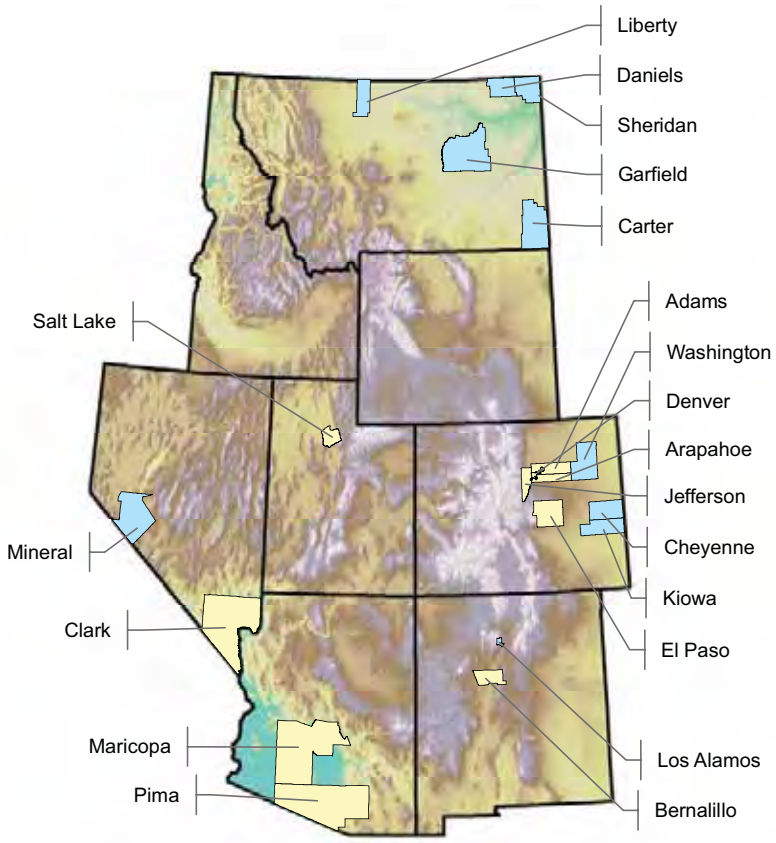
Highest Total Expenditures, All Agencies

Total Expenditures

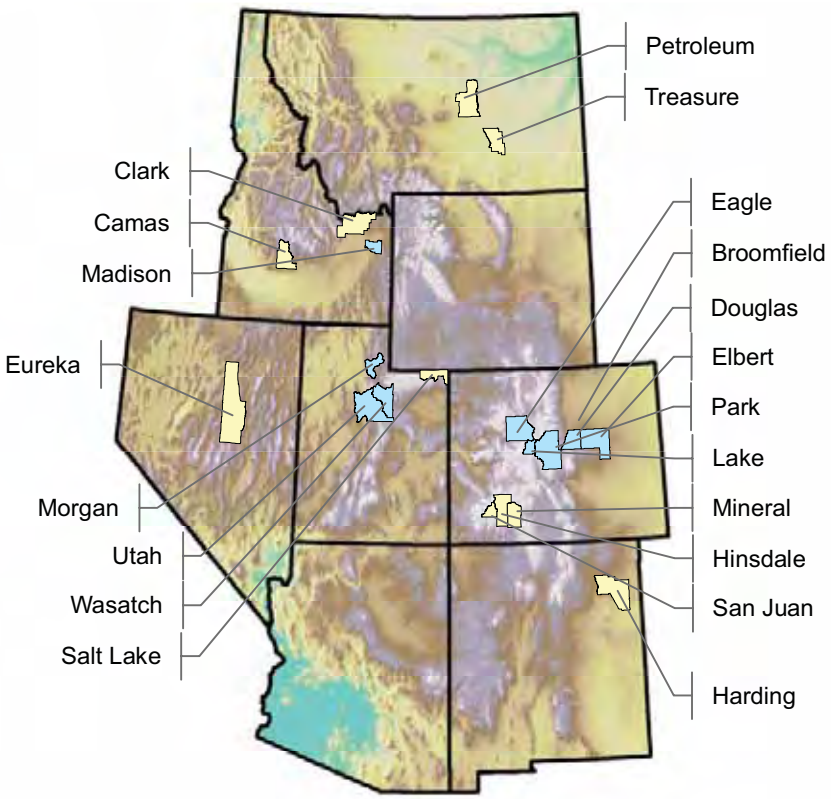
County, State, Rank	Total Expenditures
Maricopa, AZ (1)	$31,600,899,160
Clark, NV (2)	$12,533,970,088
Pima, AZ (3)	$11,332,647,528
Bernalillo, NM (4)	$9,008,628,644
Denver, CO (5)	$7,958,086,210
El Paso, CO (6)	$7,328,591,755
Salt Lake, UT (7)	$6,966,670,784
Jefferson, CO (8)	$4,649,737,547
Arapahoe, CO (9)	$4,237,049,387
Adams, CO (10)	$3,326,720,873

Per Capita Expenditures

Coutny, State, Rank	Per Capita Expenditures
Los Alamos, NM (1)	$108,569
Cheyenne, CO (2)	$53,137
Kiowa, CO (3)	$43,271
Garfield, MT (4)	$33,760
Carter, MT (5)	$30,172
Daniels, MT (6)	$27,570
Liberty, MT (7)	$26,773
Washington, CO (8)	$23,367
Mineral, NV (9)	$22,989
Sheridan, MT (10)	$22,804



Lowest Total Expenditures, All Agencies



Total Expenditures

Coutny, State, Rank	Total Expenditures
San Juan, CO (1)	$3,157,209
Camas, ID (2)	$7,911,144
Mineral, CO (3)	$8,174,298
Petroleum, MT (4)	$8,530,041
Harding, NM (5)	$9,287,503
Hinsdale, CO (6)	$9,776,285
Treasure, MT (7)	$9,810,767
Eureka, NV (8)	$10,861,834
Daggett, UT (9)	$11,298,437
Clark, ID (10)	$11,973,480

Per Capita Expenditures

Coutny, State, Rank	Per Capita Expenditures
Broomfield, CO (1)	$2,845
Douglas, CO (2)	$3,930
Eagle, CO (3)	$3,990
Elbert, CO (4)	$4,104
Wasatch, UT (5)	$4,194
Lake, CO (6)	$4,291
Morgan, UT (7)	$4,545
Madison, ID (8)	$4,571
Utah, UT (9)	$4,573
Park, CO (10)	$4,622

Labor Department

Total Expenditures

County, State, Rank	Total Expenditure
Maricopa, AZ (1)	$374,312,066
Clark, NV (2)	$226,158,411
Denver, CO (3)	$198,535,666
Salt Lake, UT (4)	$151,664,945
Bernalillo, NM (5)	$113,945,585
Ada, ID (6)	$96,562,608
Pima, AZ (7)	$74,688,516
El Paso, CO (8)	$71,700,185
Jefferson, CO (9)	$71,530,810
Carson City, NV (10)	$65,845,128

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Carson City, NV (1)	$1,177
Lewis and Clark, MT (2)	$797
Apache, AZ (3)	$458
Denver, CO (4)	$357
Laramie, WY (5)	$331
Lake, MT (6)	$301
Ada, ID (7)	$290
Pueblo, CO (8)	$225
Daggett, UT (9)	$225
Shoshone, ID (10)	$222

The United States Department of Labor is responsible for occupational safety, wage and hour standards, unemployment insurance benefits, re-employment services, and some economic statistics. The Department's purpose is "to foster, promote and develop the welfare of working people, to improve their working conditions, and to enhance their opportunities for profitable employment." Its five largest programs in terms of expenditures for 2004 were:

- •Unemployment Compensation Benefit Payments
- •Pension Plan Termination Insurance
- •Federal Employees Compensation
- •Unemployment Insurance
- •Procurement Contracts

The largest single Labor Department expenditure in Carson City County, Nevada in 2004 was for "Unemployment Insurance." This alone totaled $25,129,120, which is approximately 38% of total labor department expenditures in the county.

Health and Human Services

The United States Department of Health and Human Services (HHS), is a Cabinet department of the United States government with the goal of protecting the health of all Americans and providing essential human services. Among the operating divisions of the HHS department are the Centers for Disease Control (CDC) and the Food and Drug Administration (FDA). In 2004, the 5 largest HHS expenditures were:

- •Medical Assistance Program
- •Medicare-Hospital Insurance
- •Medicare-Supplementary Medical Insurance
- •Temporary Assistance for Needy Families
- •Procurement Contracts

Total Expenditures

County, State, Rank	Total Expenditure
Maricopa, AZ (1)	$5,165,732,810
Pima, AZ (2)	$1,828,649,215
Denver, CO (3)	$1,816,772,063
Clark, NV (4)	$1,579,067,833
Salt Lake, UT (5)	$1,328,306,818
Bernalillo, NM (6)	$1,114,938,245
El Paso, CO (7)	$483,710,985
Apache, AZ (8)	$462,347,452
Washoe, NV (9)	$451,784,743
Jefferson, CO (10)	$428,863,380

Apache County's largest source of funding from the Health and Human Services Department was for the Medical Assistance Program, a health care initiative to assist low-income individuals and families. In 2000, the median family income in Apache county was $26,315 (the U.S. median family income in 2000 was $50,046), and 33.5 percent of its families lived below poverty level (compared to 9.2 percent nationwide). These statistics indicate why Apache, County was eligible for $280,294,466 from the Medical Assistance Program.

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Apache, AZ (1)	$6,716
Guadalupe, NM (2)	$6,170
Mora, NM (3)	$5,721
Costilla, CO (4)	$4,970
San Miguel, NM (5)	$4,876
Roosevelt, MT (6)	$4,406
Lewis, ID (7)	$4,395
McKinley, NM (8)	$4,153
San Juan, UT (9)	$6,716
Blaine, MT (10)	$4,125

Department of Agriculture

Total Expenditures

County, State, Rank	Total Expenditure
Maricopa, AZ (1)	$635,863,076
Adams, CO (2)	$270,845,976
Pima, AZ (3)	$262,576,229
Pinal, AZ (4)	$195,568,816
Duchesne, UT (5)	$178,746,492
Clark, NV (6)	$162,185,469
Larimer, CO (7)	$157,656,074
Denver, (8)	$156,396,899
Salt Lake, UT (9)	$156,223,902
Bernalillo, NM (10)	$151,099,467

Per Capita Expenditures

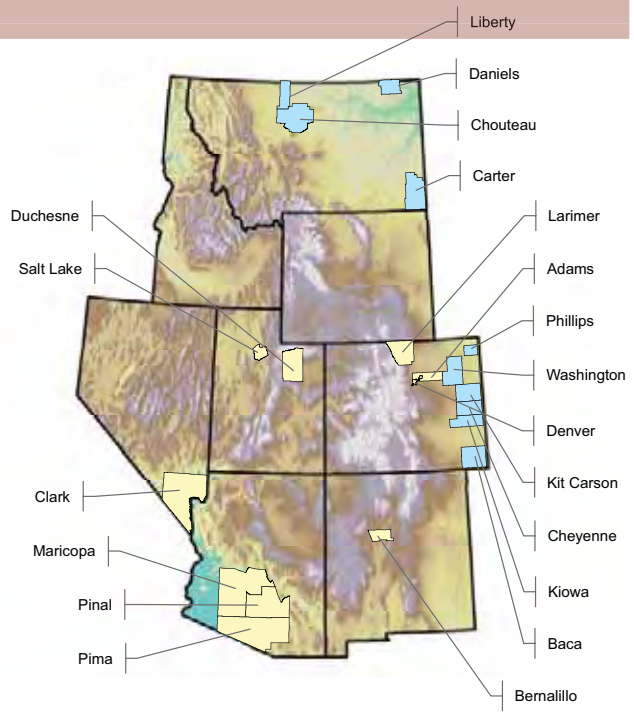
County, State, Rank	Per Capita Expenditure
Kiowa, CO (1)	$36,116
Cheyenne, CO (2)	$30,595
Daniels, MT (3)	$18,776
Liberty, MT (4)	$18,457
Washington, CO (5)	$17,498
Kit Carson, CO (6)	$17,083
Carter, MT (7)	$16,566
Chouteau, MT (8)	$16,439
Phillips, CO (9)	$15,159
Baca, CO (10)	$14,009

The United States Department of Agriculture oversees development and execution of policies related to farming, agriculture, and food. It serves the needs of farmers and ranchers, promotes agricultural trade and production, works to assure food safety, protect natural resources, foster rural communities and end hunger. In 2004, the DOA's five largest expenditures were:

- Crop Insurance
- Food Stamps
- National School Lunch Program
- Payment for Contract Commodities Production
- Salaries and Wages

Among the Agriculture Department's expenditures in Maricopa county in 2004 was over $284 million for food stamps and over $77 million for the National School Lunch Program

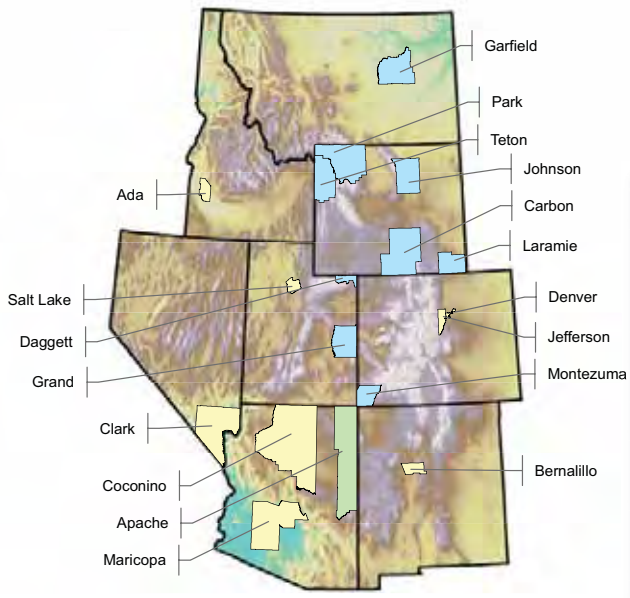
In 2004, Kit Carson County received over $33 million in crop insurance payments; over $5.5 million in Crop Disaster Program payments to compensate for crop losses due to adverse weather; and over $6 million in payments from the Conservation Preserve Program, which provides economic incentive for farmers to convert cropland vulnerable to erosion into long term vegetative cover.



Department of the Interior

The United States Department of the Interior (DOI) manages a federally owned land. Its operating units include: the National Park Service, the Fish and Wildlife Service, Bureau of Indian Affairs, the Bureau of Land Management, The U.S. Geological Survey, and the Bureau of Reclamation. In 2004, the DOI's five largest expenditures were:

- Procurement Contracts
- Salaries and Wages
- Shared revenues with states (includes mineral leasing act)
- Payments to the Territories
- Sport Fish Restoration



Total Expenditures

County, State, Rank	Total Expenditure
Jefferson, CO (1)	$427,930,192
Bernalillo, NM (2)	$311,810,073
Clark, NV (3)	$270,474,154
Laramie, WY (4)	$195,493,109
Maricopa, AZ (5)	$150,667,294
Apache, AZ (6)	$140,696,431
Denver, CO (7)	$131,226,902
Ada, ID (8)	$120,630,011
Coconino, AZ (9)	$108,183,639
Salt Lake, UT (10)	$107,100,606

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Garfield, MT (1)	$3,117
Daggett, UT (2)	$3,101
Montezuma, CO (3)	$2,895
Park, WY (4)	$2,733
Laramie, WY (5)	$2,299
Teton, WY (6)	$2,202
Apache, AZ (7)	$2,044
Carbon, WY (8)	$2,021
Grand, UT (9)	$1,955
Johnson, WY (10)	$1,703

By far the largest single Interior Department expenditure in Laramie County, Wyoming in 2004 was for the "Abandoned Mine Reclamation Program." Expenditures for this program alone totaled $73,341,588; money for this program is raised through a tax on coal production, and then redistributed by the Department of the Interior with the goal of environmental restoration of abandoned coal mines.

Department of Energy

Total Expenditures

County, State, Rank	Total Expenditure
Bernalillo , NM (1)	$2,419,785,698
Los Alamos, NM (2)	$1,889,512,301
Clark, NV (3)	$940,375,538
Jefferson, CO (4)	$929,609,173
Bonneville, ID (5)	$879,826,377
Eddy, NM (6)	$151,145,629
Maricopa, AZ (7)	$69,194,407
Arapahoe, CO (8)	$63,825,032
Boulder, CO (9)	$48,089,472
Santa Fe, NM (10)	$31,356,178

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Los Alamos, NM (1)	$100,757
Bonneville, ID (2)	$9,804
Bernalillo, NM (3)	$4,083
Eddy, NM (4)	$2,925
Butte, ID (5)	$2,046
Jefferson, CO (6)	$1,765
Clark, NV (7)	$570
Silver Bow, MT (8)	$484
Esmeralda, NV (9)	$346
Santa Fe, NM (10)	$225

The United States Department of Energy (DOE) is responsible for energy policy and nuclear safety. It oversees the nation's nuclear weapons program, nuclear reactor production for the Navy, energy conservation, energy-related research, radioactive waste disposal, and domestic energy production. Its five largest programs in terms of expenditures in 2004 were:

- •Procurement Contracts
- •Salaries and Wages
- •Office of Science Financial Assistance Program
- •Fossil Energy Research and Development
- •Weatherization Assistance for Low Income Persons

Listed under the DOE's expenditures for Los Alamos county is over $1.8 billion for "Procurement Contracts." This expenditure represents over 99% of the total DOE expenditure in the county, and is undoubtedly for the Los Alamos Nuclear Laboratory of Manhattan Project notoriety. Today, management of the lab is contracted out to Los Alamos National Security, LLC.

Executive Branch - Military Expenditures

Expenditures in this category include the Department of Veterans Affairs, the Navy, the Army, the Air Force, and other Department of Defense related programs.

Total Expenditures

County, State, Rank	Total Expenditure
Maricopa, AZ (1)	$7,336,302,478
Pima, AZ (2)	$4,520,429,195
El Paso, CO (3)	$4,348,009,299
Clark, NV (4)	$2,057,502,608
Davis, UT (5)	$1,727,719,460
Bernalillo, NM (6)	$1,712,617,637
Denver, CO (7)	$1,141,825,752
Cochise, AZ (8)	$1,018,569,878
Arapahoe, CO (9)	$974,446,539
Salt Lake, UT (10)	$952,512,317

El Paso County is home to several military bases including Schriever, Falcon, Peterson, and Cheyenne Mountain Air Force Bases, the Air Force Academy, and Fort Carson. The strong military presence in this region explains the considerable amount of funds it receives from the Department of Defense. During 2004, the DOD spent $2.66 million on all research programs combined and $1.9 billion in salaries and other payments to employees and military personnel, as well as $605 million in retirement and disabilities payments.

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Cheyenne, CO (1)	$16,194
Elmore, ID (2)	$12,529
Esmeralda, NV (3)	$11,479
Mineral , NV (4)	$10,179
Cochise, AZ (5)	$8,223
El Paso, CO (6)	$7,780
Davis, UT (7)	$7,674
Storey, NV (8)	$6,978
Churchill, NV (9)	$6,812
Otero, NM (10)	$6,095

Department of Commerce

Total Expenditures

County, State, Rank	Total Expenditure
Boulder, CO (1)	$156,805,949
Denver , CO (2)	$13,780,595
Ada, ID (3)	$11,355,769
Bernalillo, NM (4)	$11,163,645
Clark, NV (5)	$10,459,902
Larimer, CO (6)	$9,985,930
Salt Lake, UT (7)	$9,297,659
Maricopa, AZ (8)	$8,428,384
Pima, AZ (9)	$7,744,312
Jefferson, CO (10)	$5,866,402

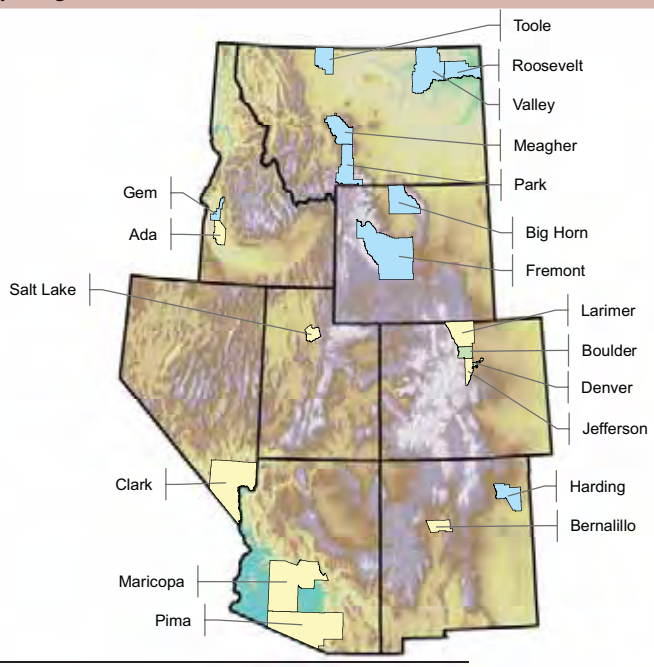
The mission of the Department of Commerce is to "promote job creation and improved living standards for all Americans by creating an infrastructure that promotes economic growth, technological competitiveness, and sustainable development." Among its duties are gathering economic and demographic data for business and government decision-making, issuing patents and trademarks, and helping to set industrial standards. Its five largest expenditures in 2004 were:

- •Salaries and Wages
- •Procurement Contracts
- •Grants for Public Works and Economic Development Facilities
- •Coastal Zone Management Administration Awards
- •Advanced Technology Programs

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Boulder, CO (1)	$561
Harding, NM (2)	$517
Valley, MT (3)	$196
Meagher, MT (4)	$157
Gem, ID (5)	$126
Roosvelt, MT (6)	$114
Big Horn, WY (7)	$111
Toole, MT (8)	$97
Fremont, WY (9)	$78
Park, MT (10)	$57

Department of Commerce expenditures in Boulder County are associated with the multitude of National Oceanic and Atmospheric Administration (NOAA) facilities located there, such as the Earth System Research Lab (ESRL), the Office of Ocianic and Atmospheric Research.



Department of Justice

The United States Department of Justice (DOJ) is a Cabinet department designed to enforce the law and ensure fair and impartial administration of justice for all Americans. The DOJ is administered by the United States Attorney General, one of the original members of the cabinet. Its law enforcement and corrections agencies include: The Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), Drug Enforcement Administration (DEA), Federal Bureau of Investigation (FBI), Federal Bureau of Prisons (BOP) and the United States Marshals Service (USMS). In 2004, its five largest expenditures were:

- •Salaries and Wages
- •Procurement Contracts
- •State Domestic Preparedness Equipment Support Program
- •Urban Areas Security Initiative
- •Public Safety Partnership and Community Policing Grants

Total Expenditures

County, State, Rank	Total Expenditure
Maricopa, AZ (1)	$219,145,463
Gila, AZ (2)	$127,279,114
Jefferson, CO (3)	$98,044,661
Salt Lake, UT (4)	$78,403,148
Fremont, CO (5)	$64,639,608
Ada, ID (6)	$54,030,089
Carson City, NV (7)	$52,160,842
Clark, NV (8)	$46,558,293
Arapahoe, CO (9)	$45,973,460
Bernalillo, NM (10)	$43,444,411

Per Capita Expenditures

County, State, Rank	Per Capita Expenditure
Gila, AZ (1)	$2,481
Fremont, CO (2)	$1,363
Socorro, NM (3)	$1,109
Carson City, NV (4)	$933
Lewis and Clark, MT (5)	$566
Laramie, WY (6)	$387
Graham, AZ (7)	$360
Santa Fe, NM (8)	$300
Roosevelt, MT (9)	$247
Mineral , NV (10)	$219

Department of Education

The United States Department of Education (ED) is a Cabinet-level department of the United States government. It is the smallest cabinet-level department, with about 5,000 employees. Its five largest programs in terms of expenditures in 2004 were:

- Federal Family Education Loans
- Federal Direct Student Loans
- Federal Pell Grant Program
- Special Education-Grants to States
- Title I Grants to Local Educational Agencies

Total Expenditures

County, State, Rank	Total Expenditures
Maricopa, AZ (1)	$2,754,974,397
Pima, AZ (2)	$623,166,833
Denver, CO (3)	$523,614,606
Salt Lake, UT (4)	$388,869,870
Bernalillo, NM (5)	$322,586,994
Clark, NV (6)	$293,619,713
Coconino, AZ (7)	$290,358,573
Boulder, CO (8)	$218,226,248
Ada, ID (9)	$218,185,927
Larimer, CO (10)	$191,413,169

Per Capita Expenditures

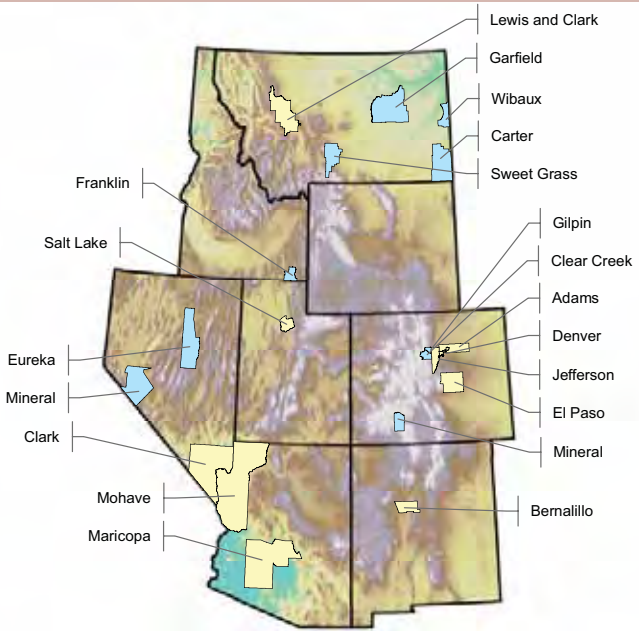
County, State, Rank	Per Capita Expenditures
Latah, ID (1)	$3,556
Coconino, AZ (2)	$2,367
Apache, AZ (3)	$1,713
Bannock, ID (4)	$1,687
Blaine, MT (5)	$1,581
Roosevelt, MT (6)	$1,493
Lewis and Clark, MT (7)	$1,459
Carson City, NV (8)	$1,403
Gallatin, MT (9)	$1,394
Glacier, MT (10)	$1,356

In 2004, over $28 million in Education Department funds went to Coconino County in the form of "impact aid." Impact aid is funding for school districts that are financially burdened by federal activities. Often, the funding goes to schools on Indian reservations.

Department of Transportation

The United States Department of Transportation (DOT) has a mission to "Serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future." Construction and maintenance of highway and transit networks has traditionally been the responsibility of the DOT. Its five largest programs in terms of expenditures in 2004 were:

- Highway Planning and Construction
- Salaries and Wages
- Dot Miscellaneous Grant Awards
- Procurement Contracts
- Federal Transit Formula Grants



Total Expenditures

County, State, Rank	Total Expenditures
Maricopa, AZ (1)	$583,340,434
Salt Lake, UT (2)	$253,779,995
Denver, CO (3)	$239,193,983
Clark, NV (4)	$230,267,613
Bernalillo, NM (5)	$146,059,835
Adams, CO (6)	$105,231,271
El Paso, CO (7)	$92,175,867
Lewis and Clark, MT (8)	$88,142,144
Mohave, AZ (9)	$72,705,176
Jefferson, CO (10)	$49,748,861

Per Capita Expenditures

County, State, Rank	Per Capita Expenditures
Garfield, MT (1)	$13,628
Carter, MT (2)	$8,200
Wibaux, MT (3)	$6,678
Sweet Grass, MT (4)	$3,480
Clear Creek, CO (5)	$2,679
Mineral, CO (6)	$2,633
Eureka, NV (7)	$2,552
Gilpin, CO (8)	$1,950
Franklin, ID (9)	$1,836
Guadalupe, NM (10)	$1,763

Department of Homeland Security

The Department of Homeland Security (DHS) is charged with prevention, detection, response, and recovery from acts of terrorism, and natural disasters. Its largest programs in terms of expenditures for 2004 were:

- Flood Insurance
- Salaries and Wages
- Procurement Contracts
- Disaster Assistance

Total Expenditures

County, State, Rank	Total Expenditures
Maricopa, AZ (1)	$3,187,376,192
Clark, NV (2)	$1,767,164,243
Pima, AZ (3)	$794,717,766
Boulder, CO (4)	$562,156,659
Washoe, NV (5)	$522,658,101
Ada, ID (6)	$400,655,071
Nye, NV (7)	$394,544,812
Valencia, NM (8)	$361,084,084
Jefferson, CO (9)	$310,097,812
Bernalillo, NM (10)	$274,190,532

Per Capita Expenditures

County, State, Rank	Per Capita Expenditures
San Miguel, CO (1)	$11,352
Nye, NV (2)	$10,469
Blaine, ID (3)	$7,064
Hinsdale, CO (4)	$6,543
Storey, NV (5)	$6,240
Teton, WY (6)	$5,441
Valencia, NM (7)	$5,266
Ouray, CO (8)	$4,371
La Plata, CO (9)	$3,639
Douglas, NV (10)	$3,005

The majority of the Homeland Security expenditures in Teton County ($101.1 million out of $103.3 million) was for flood insurance obligations concentrated around the Jackson Hole area.

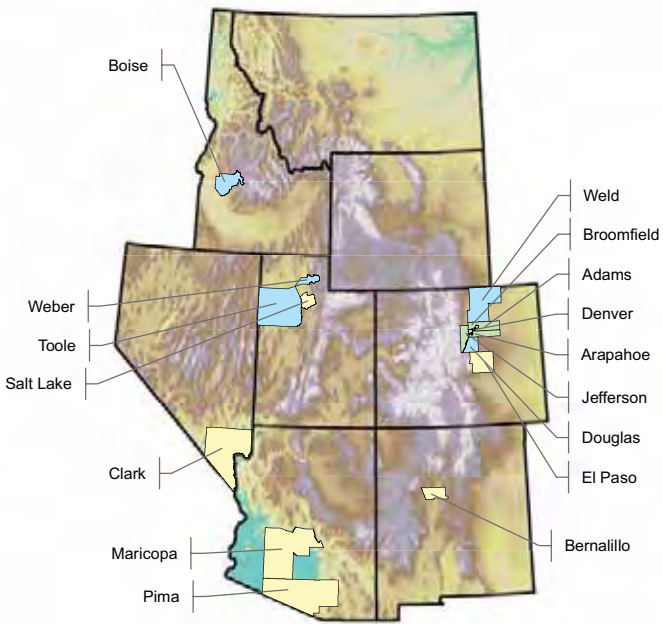
Department of Housing and Urban Development

The Department of Housing and Urban Development (HUD) was founded in 1965 to develop and execute policy on housing and cities. It has largely scaled back its urban development function and now focuses primarily on housing. Its five largest programs in terms of expenditures in 2004 were:

- Mortgage Insurance Homes
- Section 8 Housing Choice Vouchers
- Mortgage Insurance Purchase of Units in Condominiums
- Public and Indian Housing
- Community Development

Total Expenditures

County, State, Rank	Total Expenditures
Maricopa, AZ (1)	$3,138,914,927
Clark, NV (2)	$1,361,705,657
Salt Lake, UT (3)	$1,294,276,290
Denver, CO (4)	$1,274,559,280
Arapahoe, CO (5)	$1,160,174,411
Adams, CO (6)	$1,142,774,392
Jefferson, CO (7)	$745,511,082
Bernalillo, NM (8)	$653,944,985
El Paso, CO (9)	$568,853,453
Pima, AZ (10)	$542,076,726



Citizens of Denver County received more than $962 million in mortgage insurance of several forms in 2004. One of the programs available from HUD is the reverse mortgage program where individuals over the age of 62 can get a home equity loan without the need to repay as long as they live in the house.

Per Capita Expenditures

County, State, Rank	Per Capita Expenditures
Adams, CO (1)	$2,945
Boise, ID (2)	$2,711
Denver, CO (3)	$2,292
Arapahoe, CO (4)	$2,221
Douglas, CO (5)	$1,732
Weld, CO (6)	$1,666
Toole, UT (7)	$1,538
Broomfield, CO (8)	$1,474
Jefferson, CO (9)	$1,416
Weber, UT (10)	$1,399

Methods

General Statistics Used

Mean & Median: For a set of data, the mean and median were both used to approximate the value that will be most similar to all data in the set. The mean is the average of the dataset. The median is the middle value of the dataset, if all values are put in order. Depending on the values in the dataset, one method may have been deemed more appropriate than the other.

Standard Deviation: The standard deviation is a measure of the dispersion of a dataset, or how spread out or tightly centered the data is, and was used as part of the method for comparing and combining different sets of data as detailed in the Indicator Rankings method above.

Deriving Broadband Holdings Companies by County

The FCC reports holdings companies by zip code. To convert to the county level, the figures for each zip code within a county were averaged. For any given zip code, the FCC uses an "*" to denote 1-3 holdings companies. To find county averages, a "*" was assumed to be 2 companies.

Determining Federal Expenditures by County

Data from the 2004 Consolodated Federal Fund Report were condensed by agency code. State undistributed funds for each agency were divided among counties based on 2004 county population as a share of total state population.

Forest Health Fire Risk Ranking

Analysis began with isolating areas of Fire Regime Condition Class 3 (FRCC 3). This corresponds to areas most departed from the historical range of variability. The FRCC 3 areas were intersected with Wildland Urban Interface Categories, using the sum of Interface + Intermix WUI areas (minimum, medium, and maximum). The sum of WUI + FRCC for each county by WUI value was then calculated. Finally, the Z-scores and weights for each county based on the WUI value were calculated. The Z-Score for a county and for a given variable is equal to the value of the variable for that unit minus the mean value of the variable for all counties all divided by the standard deviation of the variable for the group.

$Z = (X - X_{mean})/S_x$, where Z is the Z-Score, X is the value of a variable for a geographic unit, X_{mean} is the mean value of the variable for all units in the group, and S_x is the standard deviation of the variable for all units in the group.

County Groups: Metro, Micro, and Rural

The State of the Rockies uses the rural-urban continuum codes developed by the Economic Research Service at the U.S. Department of Agriculture in 2003 based on their metropolitan-nonmetropolitan status and size of their metropolitan or urban populations. Beginning in June 2003, the Office of Management and Budget (OMB) has instructed the Census Bureau to track "micropolitan" areas as well as metropolitan areas. Micropolitan statistical areas must have an urban cluster of at least 10,000 people but fewer than 50,000 people. The designation includes the county where the urban cluster is, plus adjacent counties linked by commuting ties. For more information http://www.census.gov/population/www/estimates/metrodef.html and http://www.ers.usda.gov/briefing/rurality/RuralUrbCon/.

Note: Because it was so recently created, and most data sets do not yet include it, Broomfield County, Colorado is not included in our analyses.

State of the Rockies County Label	Code	Census/ USDA Label	Definition	Number of Counties in the Rockies
Metro	1	Metro	County in metro area with 1 million population or more	12
Metro	2	Metro	County in metro area of 250,000 to 1 million population	24
Metro	3	Metro	County in metro area of fewer than 250,000 population	25
Micro	4	Non Metro	Nonmetro county with urban population of 20,000 or more, adjacent to a metro area	14
Micro	5	Non Metro	Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area	14
Micro	6	Non Metro	Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area	38
Micro	7	Non Metro	Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area	72
Rural	8	Non Metro	Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area	25
Rural	9	Non Metro	Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area	56

Additional Acknowledgements

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Cover photo by Stephen G. Weaver. Photo contributions for this report, unless otherwise noted, were made by the Colorado College State of the Rockies staff and the Colorado College Office of External Relations. Other photos came from a contract with Shutterstock.com.

State of the Rockies Contributors

Tom Cronin is a political scientist and a business and leadership consultant. He currently serves as the Mc Hugh Professor of American Institutions and Leadership at Colorado College, president of CRC, Inc., serves as director of Cascade Natural Gas Corporation, and on several other civic, educational and editorial boards. He is past president of Whitman College where he served from 1993 to 2005, a former president of the Presidency Research Group, a former president of the Western Political Science Association and a former Executive Committee member of the American Political Science Association. Cronin has won prizes for his scholarship, teaching and civic leadership. He is the author or co-author of more than 150 scholarly or public affairs essays and ten books. He has lectured at over 300 colleges and universities in the U.S. and in two-dozen nations abroad. He has served as White House Fellow scholar-in-residence at the Brookings Institution, the Hoover Institution, the Aspen Institute and the Center for the Study of Democratic Institutions.

Jon Goldstein will receive a B.A. in International Political Economy in May, 2007 from Colorado College where he is research assistant to Professor Tom Cronin. He attended the Universidad de Costa Rica in San Jose during 2005. Last year, he was a lead field organizer in suburban St. Louis on behalf of U.S. Senator Claire McCaskill and other party nominees and directed the Democratic Senatorial Campaign Committee's election day Get-Out-The-Vote (GOTV) operation. In 2004, he coordinated El Paso County volunteers for U.S. Senator Ken Salazar and served as GOTV transportation coordinator. Goldstein is a native of Washington, D.C., and a graduate of St. Albans School.

Brian Hall is a 2006/07 student researcher for the Colorado College State of the Rockies Project. He is a 2004 Boettcher Scholar and will graduate in May 2008 with a B.A. degree in economics. Brian was raised in rural Nebraska and graduated from high school in Westcliffe, Colorado. He has served as an intern in Congressman Joel Hefley's district office and worked at several farms and ranches. He is very interested in political discussions regarding energy and water. Brian also enjoys playing sports, writing music, and spending time with his family.

Walter E. Hecox is professor of economics, director of the Slade Sustainable Development Workshop, and project director for the State of the Rockies Project at Colorado College, Colorado Springs, Colorado. Walt received his B.A. degree from Colorado College in 1964 and an M.A. (1967) and Ph.D. (1970) from Syracuse University, Syracuse, New York. He teaches courses in ecological economics, and sustainable development. He has conducted research and taken leave to work for the World Bank, U.S. Agency for International Development, U.S. Department of Energy, and Colorado Department of Natural Resources. He is author of *Charting the Colorado Plateau: an Economic and Demographic Exploration* **(The Grand Canyon Trust, 1996), co-author of** *Beyond the Boundaries: the Human and Natural Communities of the Greater Grand Canyon* **(Grand Canyon Trust, 1997), and co-editor of the** *Colorado College State of the Rockies Report Cards***.**

Chris Jackson is 2006/07 program coordinator for the Colorado College State of the Rockies Project. This is his second year with the State of the Rockies Project, having spent last summer as a researcher. Chris' work for the 2006 Report Card focused on innovative resource management techniques in the Rockies. He graduated cum laude from Colorado College in May 2006 with a B.A. degree in International Political Economics. Growing up in the mountains of Eagle County, Colorado, Chris gained a particular interest in exploring ways to maintain the unique character of the Rockies Region.

Cory Jackson is corporate counsel for the Tri County Telephone Association in Basin, Wyoming. He received a B.A. in Economics from Colorado College in 2002, and a J.D. from the University of Colorado School of Law in 2005. Cory's work in telecommunications policy involves advocacy before the Wyoming Legislature, U.S. Congress, and Federal Communications Commission. He is an avid backcountry enthusiast and spends his free time exploring the peaks of the Gore and Absaroka Ranges near his homes in Avon, Colorado and Cody, Wyoming.

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Carissa Look is a 2006/07 summer researcher for the State of the Rockies Project. She is an Environmental Science major and French minor at the Colorado College and will graduate in June of 2007. Carissa studied ecology and conservation in Madagascar in the fall of 2005 and plans to write her thesis, entitled "Medicinal Plants and Sustainable Development in Madagascar," using the research she conducted while abroad. Carissa is from Martha's Vineyard, Massachusetts, and enjoys swimming, hiking, cooking, camping, and traveling in her spare time.

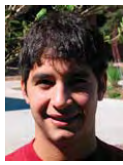
Phillip M. Kannan is distinguished lecturer and legal-scholar-in-residence, Colorado College. His education includes a B.S. (1961) and M.A. (1963) in mathematics at the University of North Carolina, Chapel Hill, N. Carolina; and a JD degree (1974) from the University of Tennessee College of Law, Knoxville, Tennessee. He has practiced law for over 30 years as the general counsel for nonprofit and public corporations and has published many articles in the fields of administrative and environmental law. Since 1997 he has taught a variety of courses at Colorado College in the Environmental Science and Southwest Studies programs and the Master of Arts in Teaching Program, focusing on environmental policy nationally, internationally, and in the Southwest.

Julianne Kellogg is a 2006/07 student researcher for the Colorado College State of the Rockies Project. As a sophomore graduating in 2009, Julianne will continue to cultivate her knowledge and skills through the Environmental Science major. Julianne was first driven to major in Environmental Science by her experience as a volunteer research assistant in the Canyonlands National Park in Utah. Outside of hands-on research, Julianne is interested in environmental activism. Hoping to bridge the gap between environmentalism and markets, she and two other CC students have founded the CC Buying Back the Earth Project. A native of Massachusetts, Julianne grew up hiking and backpacking in the mountains of New England, developing a lifetime hobby and passion for preserving the natural world.

Robert Loevy has been professor of Political Science at Colorado College since 1968. He received his A.B. from Williams College in 1957 and his Ph.D. from Johns Hopkins University in 1963. During the 1963-1964 academic year, Loevy served as an American Political Science Association Congressional Fellow in the office of United States Senator Thomas H. Kuchel, of California, the Republican floor manager in the Senate for the civil rights bill that later became the Civil Rights Act of 1964. Loevy is the author of several books, including: *To End All Segregation: The Politics of the Passage of the Civil Rights Act of 1964,* and he is the editor of *The Civil Rights Act of 1964: The Passage of the Law that Ended Racial Segregation.* He also wrote *The Flawed Path to the Presidency 1992: Unfairness and Inequality in the Presidential Selection Process*, and, with Thomas Cronin, *Colorado Politics and Government: Governing the Centennial State.* Loevy also is the co-author of a high school civics text, *American Government: We Are One.*

Tyler McMahon is a 2006/07 student researcher for the Colorado College State of the Rockies Project. He is currently a senior economics major at Colorado College graduating in May 2007. His interests are in the field of environmental economics, particularly in resource use and its impacts on both the environment and poverty. The interest in resource use and poverty came from his semester in Nepal, where he observed drastic differences in access to resources, particularly water, between people of different castes, and saw how this affected their livelihoods and also the environment. Next year, Tyler will be studying water supply issues in Kathmandu, Nepal on a Fulbright Student Grant. Tyler grew up in Fairplay, Colorado and is an avid cyclist.

Pablo Navarro is a 2006/07 student researcher for the State of the Rockies Project. He will graduate from Colorado College in May 2008 with a degree in Mathematical Economics. Upon graduation from Karl C. Parrish School in Barranquilla, Colombia, Pablo received the prestigious Ecopetrol award. At Colorado College he has worked as a Junior Research Fellow with Professor Andrew Price-Smith on a project on Health and Global Affairs and with Professor Daniel Johnson on a project focusing on innovation and economic development in the U.S. His main interest is international economic development and regional integration, particularly in the area of the Americas. Summer, 2007, Pablo will be conducting research in Brazil on the Family Fund, a conditional cash transfer program.



Matthew K. Reuer serves as the technical liaison for the State of the Rockies Project, overseeing tasks including data assimilation, GIS analysis, and logistics management. He received his doctorate degree from MIT in 2002 and was a Harry Hess postdoctoral research fellow at Princeton University from 2002 to 2004, focusing on global carbon cycle research. Matt's scientific interests in this region include the environmental chemistry of western rivers and watersheds and global change impacts on alpine biogeochemical cycles. He is also highly interested in western development issues and the creation of innovative energy policies in the Rocky Mountain West.

Stephen G. Weaver is an award-winning photographer with over 30 years experience making images of the natural world and serves as technical director for the Colorado College geology department. Educated as a geologist, Steve combines his scientific knowledge with his photographic abilities to produce stunning images that illustrate the structure and composition of the earth and its natural systems. As an undergraduate geology student, he first visited the Rocky Mountains, where he fell in love with the mountain environment and the grand landscapes of the West. Steve currently photographs throughout North America with a major emphasis on mountain and desert environments. His use of a 4x5 large format view camera allows him to capture images with amazing clarity and depth.

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The 2007 Colorado College State of the Rockies Report Card

Every year, the *State of the Rockies Report Card* measures economic, demographic, social, and environmental conditions throughout the eight-state Rockies Region to track trends on the most critical issues this rapidly changing region faces. Highlights of this year's Report Card are:

State of the Rockies Reports

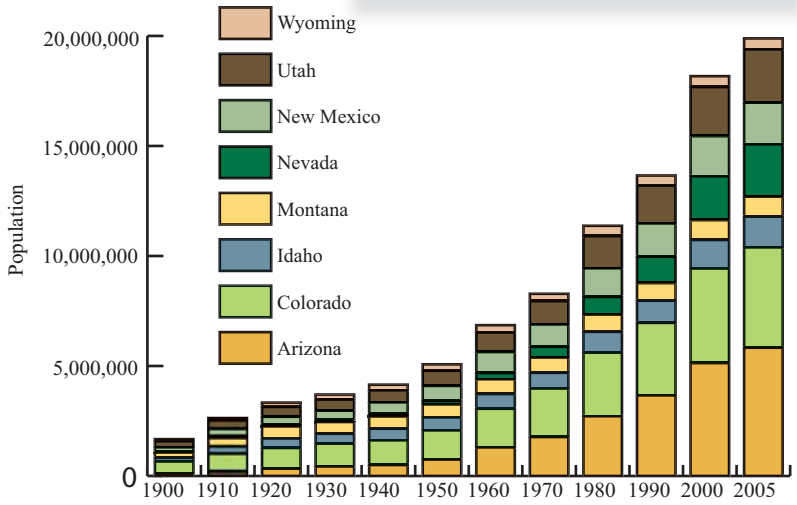
- "Rockies Baseline: Vital Signs for a Region in Transition"
- "Water Sustainability in the Rockies: Agriculture to Urban Water Transfers and Implications for Future Water Use"
- "Forest Health in the Rockies: Human Needs and Ecological Reality"
- "Energy Development in the Rockies: Tempering the Boom, Avoiding the Bust"
- "The Growing Rockies: New People, New Communities, New Urbanism"
- "Feeding from the Federal Trough: Patterns of Federal Government Expenditures Around the Rockies"

Guest Contributions

- *Challenge Essay* - "Democrats and Their Rocky Mountain High (Hopes): A Close Look at Party Voting Patterns in the Eight-State Rocky Mountain West" by Robert D. Loevy, Thomas E. Cronin, and Jonathan M. Goldstein
- *Challenge Essay* - "How the West is Wired: Broadband Connectivity in the West" by D. Corwin Jackson
- *Faculty Overview* - "The Healthy Forests Restoration Act" by Phillip M. Kannan

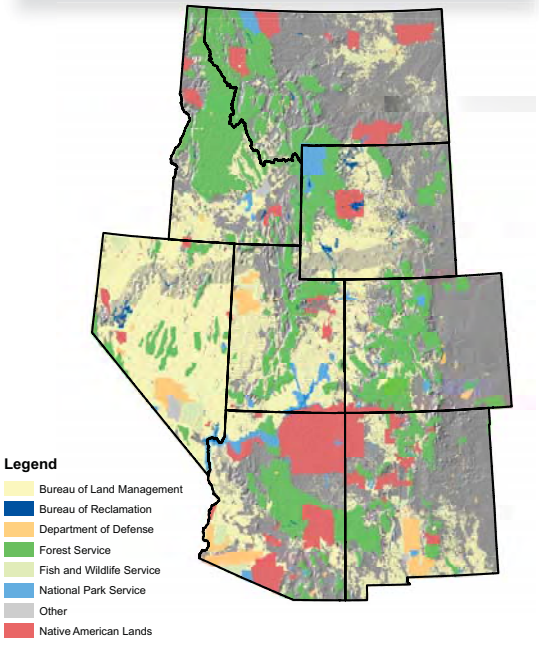
The Growing Rockies

Rockies Population by State 1900-2005
Sources: U.S. Census Bureau



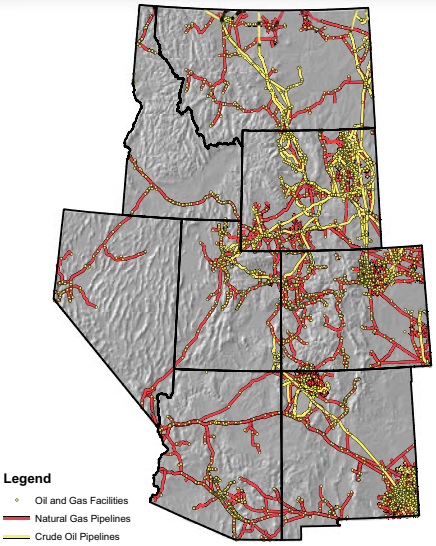
Forest Health

Federal Land Ownership in the Rockies, 2005
Source: National Atlas of the United States



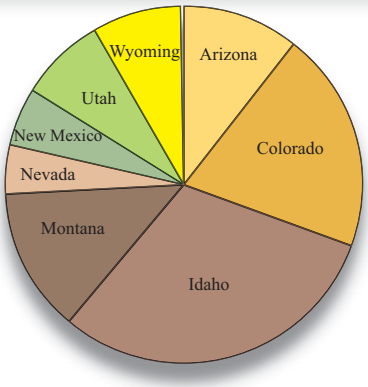
Energy Development

Rockies Oil and Gas Infrastructure, 2005
Source: Inrastructure data generously provided by PennWell Petroleum Group



Water Sustainability

Share of Rockies Water Withdrawals by State, 2000
Source: U.S. Geological Survey



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