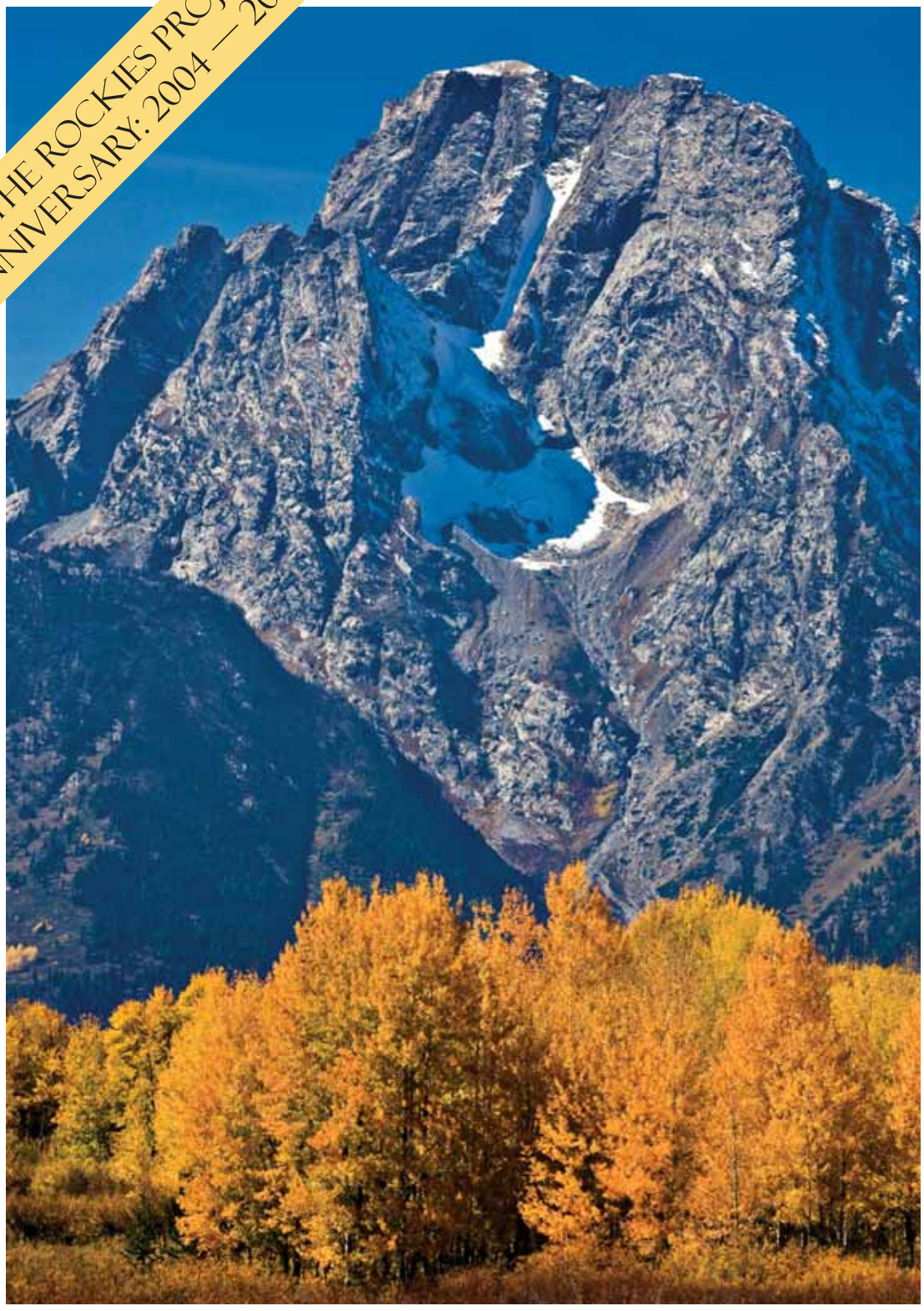
STATE OF THE ROCKIES PROJECT
FIFTH ANNIVERSARY: 2004 — 2008



The 2008

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

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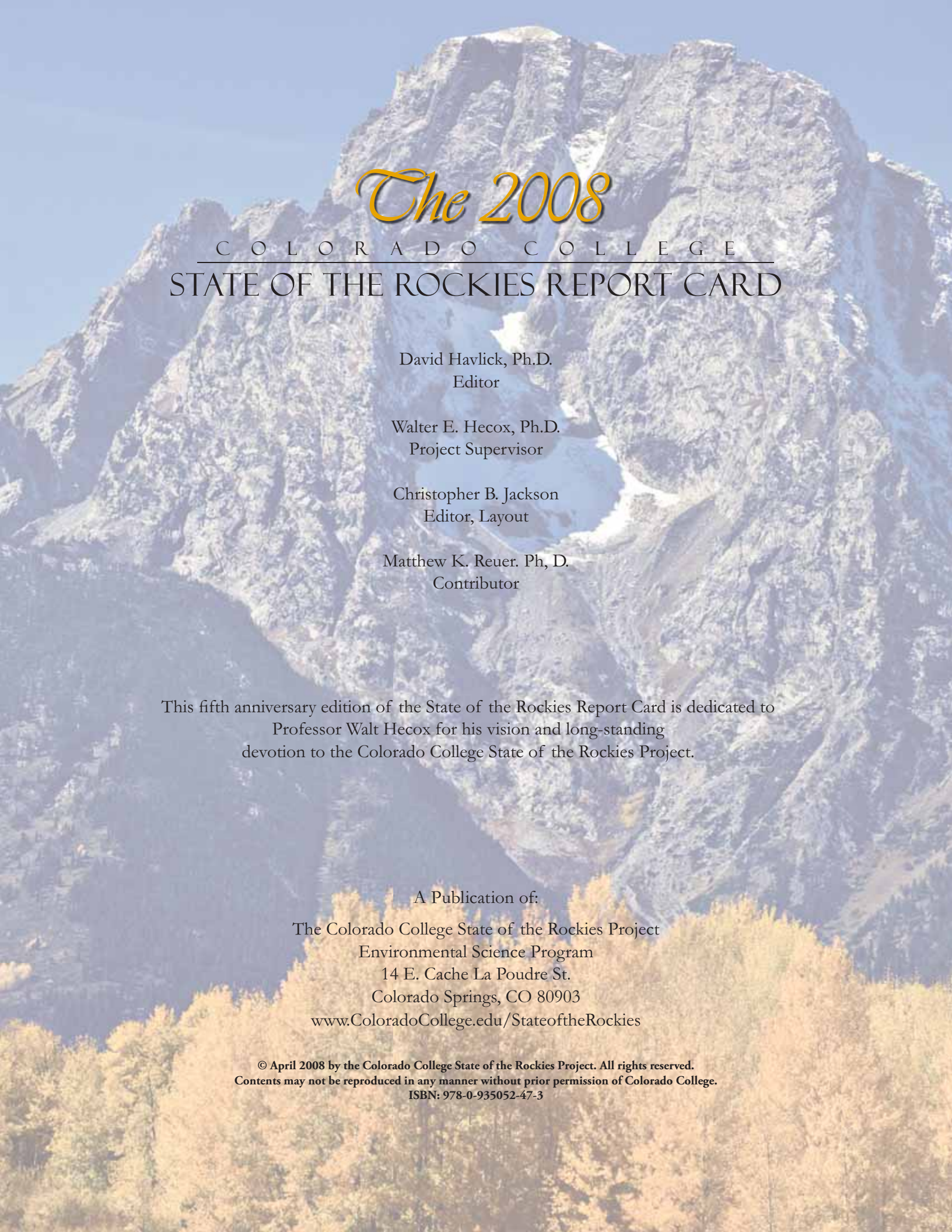

The 2008

COLORADO COLLEGE

STATE OF THE ROCKIES REPORT CARD

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This fifth anniversary edition of the State of the Rockies Report Card is dedicated to Professor Walt Hecox for his vision and long-standing devotion to the Colorado College State of the Rockies Project.

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Cottonwood Basin, Sangre de Cristo Wilderness, Colorado

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The Colorado College State of the Rockies Project

Research, Report, Engage!

An Introduction from the President

On behalf of Colorado College, I am proud to introduce the *2008 State of the Rockies Report Card*. This is the fifth annual signature report on the magnificent and challenged eight-state region we call the Rockies.

The critical research topics for the *2008 Report Card* include immigration, affordable housing, renewable energy resources, river restoration and restoration economies, and wildlands.

Our 2007-2008 project again emphasizes contributions from undergraduate student research. Five Colorado College student researchers dedicated their summer to investigating the issues presented in this year's report. Their research included a two-week field trip through Colorado, Wyoming, and Montana to meet with and interview experts on the respective topics, examine how these issues emerge on the ground, and to participate in the Sopris Foundation's 2007 conference, "New Practices for Growing Communities of the Intermountain West," held in Missoula, Montana.

This year Colorado College also extended State of the Rockies outreach by holding a fall wilderness/wildlands speaker series that brought in five experts with varying perspectives on wilderness, from advocacy to ecology to environmental history, and by hosting various presentations of Rockies research, among other efforts.

The 2008 State of the Rockies Conference will be held at Colorado College April 6-8, 2008 and will feature:

•State of the Rockies kickoff festivities including: Regional film screenings, photo contest judging, and a local foods celebration

•Keynote address by former U.S. Secretary of the Interior Gale Norton

•Community workshops focusing on practical, place-based applications of the topics featured in the 2008 Report Card, including: restoration of the Fountain Creek watershed in Colorado, participation in travel management planning on national forests, connecting CC to immigrant communities in southern Colorado, and exploring affordable housing in El Paso County, Colorado, and residential-scale approaches to renewable energy.

I invite you to delve into this rich report which – for those of us who care deeply about the Rockies – should serve to provoke, stimulate, and even disturb. I hope you will join us on campus for the conference in April.

Richard F. Celeste
President, Colorado College

Editors' Preface

The 2008 Colorado College State of the Rockies Report Card

By David Havlick and Chris Jackson

Connecting to the Rockies

When most of Americans think of "the Rockies," they likely think of the mountains that stretch from New Mexico to Montana. To many, the Rockies region is best known for its environmental amenities – not just mountains, but rivers, redrock canyons, forests, open lands, scenic vistas. The *2008 Report Card* attends to a number of these features, yet also pushes into social dimensions that seem increasingly to capture the spotlight in the eight states included in this report: the role of immigrants, the challenge of affordable housing, the need to restore degraded landscapes, the continuing controversies over wildland protection, and the prospect of creating a long-term regional renewable energy boom.

It is sometimes tempting to view the Rockies as an area dominated by nature, but even the most natural events are also often deeply integrated with social processes. The steady winds that push across Wyoming occur naturally, of course, but they become an energy resource when we apply human structures and desires to them. Each of the principal chapters in this year's *Report Card* highlights, whether implicitly or explicitly, the interplay of natural and social processes. Encouraging new insights and making new connections are, in fact, very much at the heart of this report and the broader State of the Rockies Project.

This fifth annual *State of the Rockies Report Card* comes only as a result of a number of important connections made by the student researchers and writers who produced the chapters that follow. As with previous years, the ten-week summer research period was rigorous and fruitful. Integral to our research process is an extensive field trip that immerses the student research team in their topics and brings them face-to-face with regional experts. This year, the State of the Rockies researchers traveled 2,500 miles over eight days for meetings in Colorado, Wyoming, and Montana. Once the academic year starts again, our researchers juggle full-time student life with part-time State of the Rockies work to edit their section, respond to external reviews, give presentations, and help plan guest speakers and the annual State of the Rockies Conference. The State of the Rockies research process is demanding, and the resulting components of the *State of the Rockies Report Card* demonstrate the capability of the Colorado College State of the Rockies Research Team.

As you read through this year's *Report Card*, we encourage you not only to appreciate the fine student research and writing that these chapters feature, but also to challenge yourself to think through the connections between places and people that we may too often and too easily overlook. After all, even the Rocky Mountains, the bedrock range that serves as our unifying regional axis, starts well south of the border and continues north to the arctic. Imagine that.

Wasatch-Cache National Forest, Utah

© Tom Dugan

About the authors: David Havlick is assistant professor of geography and environmental studies at the University of Colorado – Colorado Springs and editor of the 2008 State of the Rockies Report Card; Chris Jackson (Colorado College, '06) is the program coordinator for the Colorado College State of the Rockies Project.

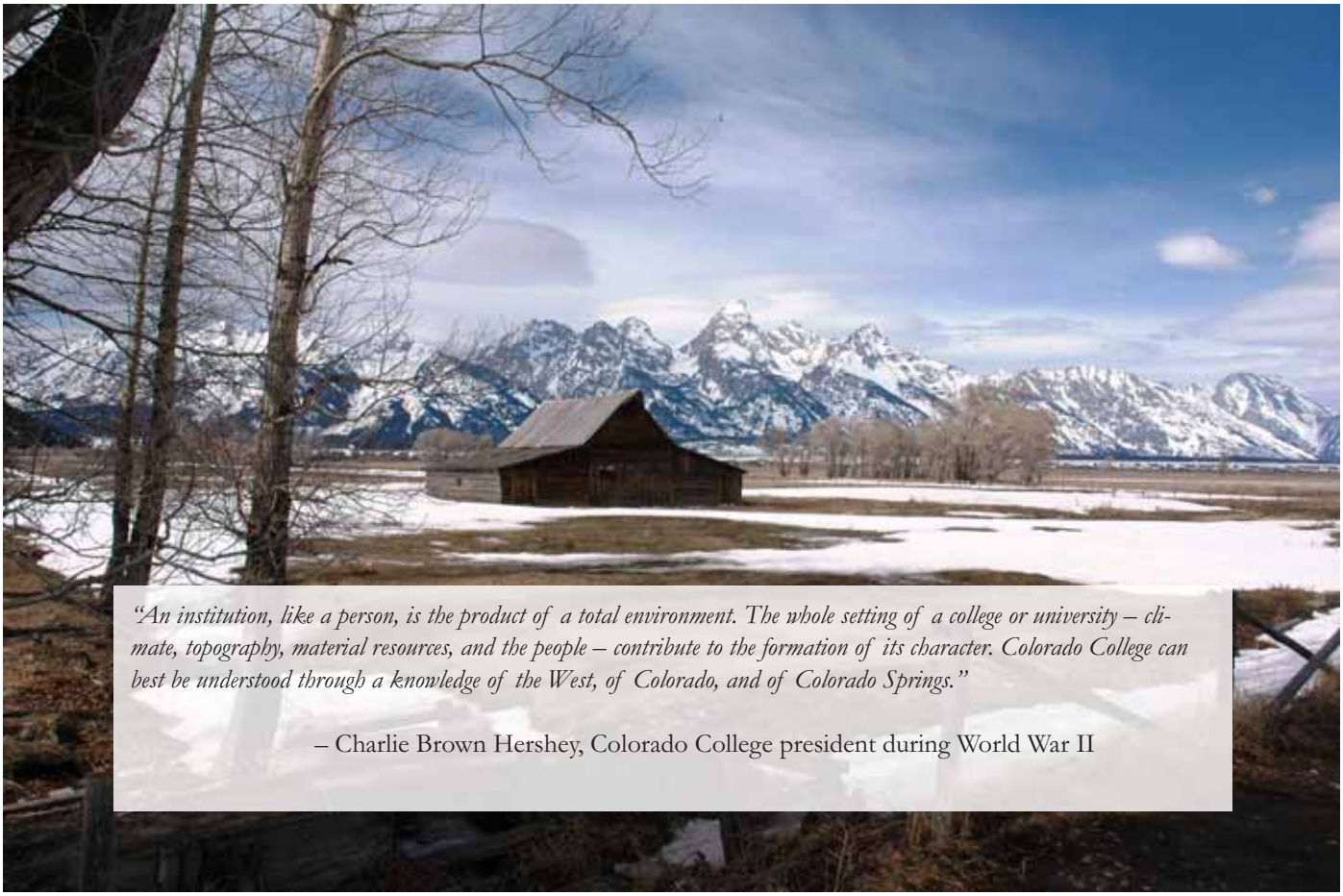
The 2008 Colorado College State of the Rockies Report Card

By Walter E. Hecox

Colorado College today, as for the past 133 years, is strongly defined by location and events of the 1800s. Pikes Peak abruptly rises out of the high plains that extend from the Mississippi and Missouri rivers towards the west. Peaking at 14,000 feet, this eastern-most sentinel of the Rocky Mountain chain first attracted early explorers and was later 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 "Pikes 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 Old Colorado City and fell in love with the view of Pikes Peak and red rock formations now called the Garden of the Gods. An entrepreneur and adventurer, Palmer 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 the 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 Pikes 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 Colorado College summer program, and on a trip up Pikes Peak was inspired to write her famous "America the Beautiful" poem. Her poem helped celebrate the magnificent vistas and grandeur of Pikes Peak and the surrounding region, and provided bragging rights for Colorado College 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



"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

© Ryan Schumacher

Moulton Barn, Jackson Hole, Wyoming

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

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Great Sand Dunes National Prak and Preserve

the travails of a struggling 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 U.S. 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 fieldwork offered by a variety of disciplines. Students can thoroughly explore the Rockies through the block plan.

The State of the Rockies Project

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•**Research:** Offering opportunities for collaborative student–faculty research partnerships

•**Report**: Publishing an annual Colorado College *State of the Rockies Report Card*

•**Engage:** Convening a companion State of the Rockies Conference and other sessions.

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 among our students, graduates, and the broader regional community.

Rockies Baseline

Vital Signs for a Region in Transition

By Chris Jackson

THE 2008 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

Every year, the Colorado College *State of the Rockies Report Card* presents the "Rockies Baseline," showing key economic and demographic "vital signs." These statistics are compared at the state, regional, and national level, thus distilling similarities and uniquenesses between the Rockies and the U.S. as a whole. Further, many statistics are provided for both 2006 and 2000, showing changes and potential trends.

This year's Rockies Baseline tells a familiar story. The West is growing: population increased 15 percent since 2000, compared to 6 percent nationally. The West is diverse: 28 percent of the population speak a language other than English; as a percent of total population, there are four times as many Native Americans in the Rockies than the U.S.; and 22 percent of the population identifies itself as either Hispanic or Latino. The West is thriving economically: between 2000 and 2006, jobs in all occupations grew 18 percent — twice the national pace. These statistics, and the others shown in the Rockies Baseline, depict a region that is an exciting place to be, and with its own unique challenges.

The trends and statistics depicted in the Rockies Baseline not only serve as a snapshot, but also a glimpse at the curves in the road ahead for this rapidly changing region.

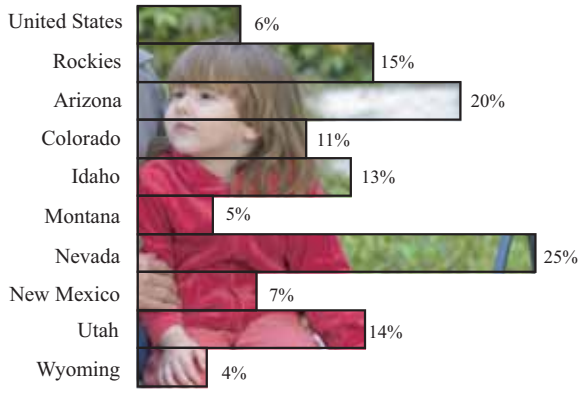
All data, unless otherwise noted, comes from the 2000 Census and the 2006 American Community Survey, both of which were conducted by the U.S. Census Bureau. The data are available at www.census.gov/.

About the author: Chris Jackson (Colorado College, '06) is co-editor of the State of the Rockies Report Card, and program coordinator for the Colorado College State of the Rockies Project.

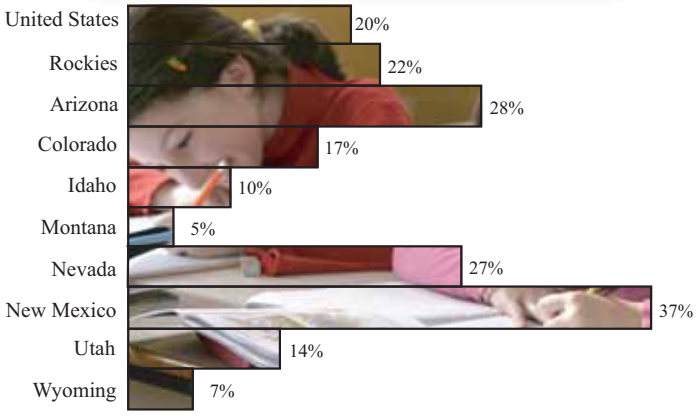
Population & Age, 2006

	Population	Population growth since 2000	Percentage of Population age 0-19	Percentage of Population age 65+	Median Age
United States	299,398,485	6%	28%	12%	36
Rockies	20,845,987	15%	29%	11%	34
-Arizona	6,166,318	20%	29%	13%	35
-Colorado	4,753,377	11%	27%	10%	35
-Idaho	1,466,465	13%	30%	12%	34
-Montana	944,632	5%	26%	14%	40
-Nevada	2,495,529	25%	28%	11%	36
-New Mexico	1,954,599	7%	29%	12%	35
-Utah	2,550,063	14%	34%	9%	28
-Wyoming	515,004	4%	26%	12%	38

Population Growth, 2000 to 2006



Percentage of Population Who Speak a Language Other than English at Home, 2006



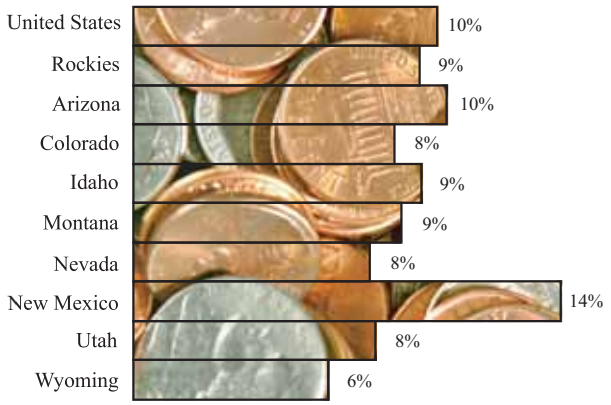
Language, 2000 and 2006

Percentage of population age 5 and Older Who Speak the Following Language at Home	English Only, 2006	Language other than English, 2006	Language other than English 2000
United States	80%	20%	18%
Rockies	78%	22%	20%
-Arizona	72%	28%	26%
-Colorado	83%	17%	15%
-Idaho	90%	10%	9%
-Montana	95%	5%	5%
-Nevada	73%	27%	23%
-New Mexico	63%	37%	37%
-Utah	86%	14%	13%
-Wyoming	93%	7%	6%

Poverty, 2000 and 2006

Percentage of the Following Groups Whose Income in the Past 12 Months is Below the Poverty Level	All Families, 2006	All Families, 2000	All People, 2006	All People, 2000
United States	10%	9%	13%	12%
Rockies	9%	9%	13%	12%
-Arizona	10%	10%	14%	14%
-Colorado	8%	6%	12%	9%
-Idaho	9%	8%	13%	11%
-Montana	9%	10%	14%	14%
-Nevada	8%	8%	10%	10%
-New Mexico	14%	15%	19%	18%
-Utah	8%	6%	11%	9%
-Wyoming	6%	8%	9%	11%

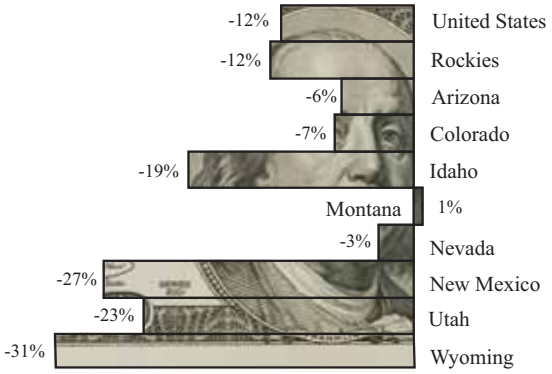
Families in Poverty, 2006
As a Percentage of All Families



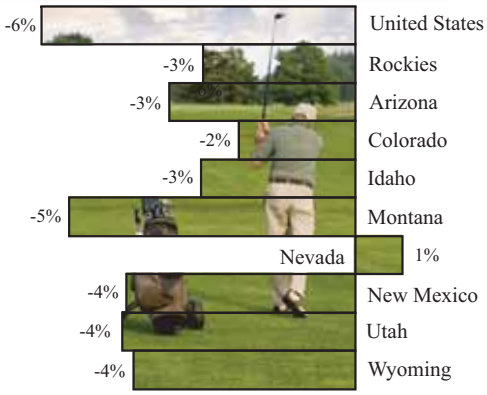
Housing Units, 2006

	Occupied Housing Units	Owner-occupied Units as a Percentage of Occupied Housing Units	Renter-occupied Units as a Percentage of Occupied Housing Units	Average Number of Residents in Owner-occupied Units	Average Number of Residents in Renter-occupied Units
United States	111,617,402	67%	33%	3	2
Rockies	7,676,916	69%	31%	3	3
-Arizona	2,224,992	68%	32%	3	3
-Colorado	1,846,988	69%	31%	3	2
-Idaho	548,555	71%	29%	3	2
-Montana	372,190	70%	30%	3	2
-Nevada	936,828	62%	38%	3	3
-New Mexico	726,033	70%	30%	3	2
-Utah	814,028	72%	28%	3	3
-Wyoming	207,302	70%	30%	3	2

Change in
Mean Cash Public Assistance Income, 2000 to 2006



Change in
Mean Retirement Income, 2000 to 2006



Household Income by Type, 2006

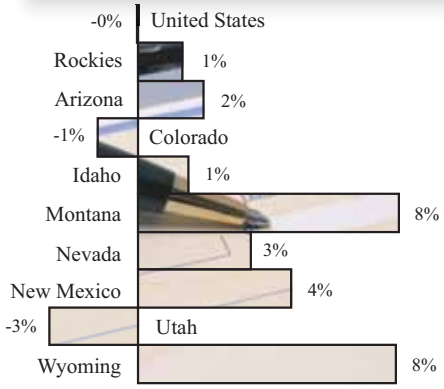
	Mean Earnings, 2006	Mean Earnings, Change Since 2000	Mean Social Security Income, 2006	Mean Social Security Income, Change Since 2000	Mean Retirement Income, 2006	Mean Retirement Income, Change Since 2000	Mean Supplemental Security Income, 2006	Mean Supplemental Security Income, Change Since 2000	Mean Cash Public Assistance Income, 2006	Mean Cash Public Assistance Income, Change Since 2000
United States	$66,733	1%	$13,877	5%	$19,141	-6%	$7,388	-0%	$3,139	-12%
Rockies	$62,921	2%	$14,024	5%	$20,612	-3%	$7,514	1%	$2,640	-12%
-Arizona	$64,600	5%	$14,582	4%	$20,612	-3%	$7,766	2%	$2,848	-6%
-Colorado	$68,383	-1%	$13,593	6%	$22,138	-2%	$7,238	-2%	$2,637	-7%
-Idaho	$53,540	-1%	$14,027	6%	$17,939	-3%	$7,829	10%	$1,718	-19%
-Montana	$49,849	6%	$13,658	5%	$16,761	-5%	$6,403	-11%	$2,872	1%
-Nevada	$67,897	5%	$14,025	5%	$22,019	1%	$8,411	5%	$3,188	-3%
-New Mexico	$52,963	3%	$12,759	3%	$20,767	-4%	$6,623	-3%	$2,456	-27%
-Utah	$62,001	-4%	$14,668	6%	$19,792	-4%	$8,043	4%	$2,580	-23%
-Wyoming	$57,955	9%	$13,854	4%	$18,251	-4%	$7,753	1%	$1,936	-31%

Income, 2006

	Median Household Income, 2006	Median Household Income, Change Since 2000	Mean Household Income, 2006	Median Family Income, 2006	Median Family Income, Change since 2000	Mean Family Income, 2006	Per Capita Income, 2006	Per Capita Income, Change since 2000
United States	$48,451	-1%	$65,527	$58,526	-0%	$76,130	$25,267	0%
Rockies	$48,312	-1%	$63,464	$57,302	1%	$72,744	$24,183	1%
-Arizona	$47,265	-0%	$64,021	$55,709	2%	$72,974	$24,110	2%
-Colorado	$52,015	-6%	$69,334	$64,614	-1%	$81,751	$27,750	-1%
-Idaho	$42,865	-2%	$54,659	$51,640	1%	$62,624	$21,000	1%
-Montana	$40,627	5%	$51,213	$51,006	8%	$61,110	$21,067	5%
-Nevada	$52,998	2%	$68,277	$61,466	3%	$76,213	$26,340	2%
-New Mexico	$40,629	2%	$54,273	$48,199	4%	$62,581	$20,913	4%
-Utah	$51,309	-4%	$63,807	$58,141	-3%	$70,802	$21,016	-1%
-Wyoming	$47,423	7%	$59,583	$57,505	8%	$68,918	$24,544	10%

Median Family Income, 2006

Change in Median Family Income, 2000 to 2006



Families, 2006

	Family Households as a Percentage of all Households	Non-family Households as a Percentage of all Households	Average Family Size in Number of People	Average Family Size, Change since 2000
United States	67%	33%	3.2	2%
Rockies	67%	33%	3.2	2%
-Arizona	66%	34%	3.3	5%
-Colorado	65%	35%	3.1	1%
-Idaho	70%	30%	3.1	-2%
-Montana	65%	35%	3.1	2%
-Nevada	65%	35%	3.2	2%
-New Mexico	66%	34%	3.3	3%
-Utah	76%	24%	3.6	-0%
-Wyoming	66%	34%	2.9	-2%

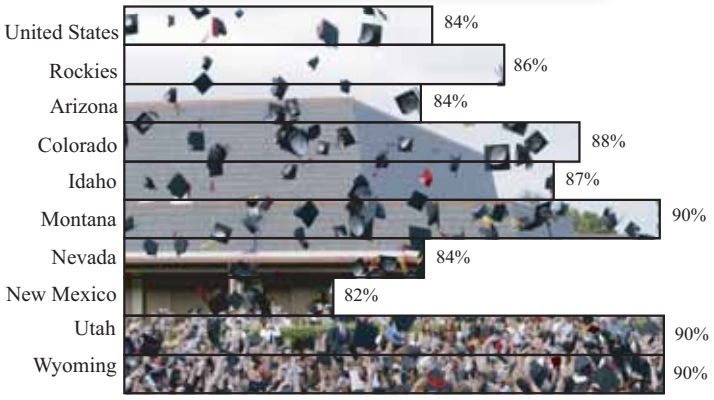
2006 Foreign Born Population, Citizenship Status, and Year of Entry

	Total population, 2006	Percent of population that is Foreign born	Percent of foreign born that are naturalized U.S. citizens	Percent of foreign born that are not U.S. citizens	Percent of foreign born that entered 2000 or later	Percent of foreign born that entered before 2000
United States	299,398,485	13%	42%	58%	25%	75%
Rockies	20,845,987	12%	31%	69%	30%	70%
-Arizona	6,166,318	15%	29%	71%	31%	69%
-Colorado	4,753,377	10%	31%	69%	30%	70%
-Idaho	1,466,465	6%	33%	67%	27%	73%
-Montana	944,632	2%	51%	49%	27%	73%
-Nevada	2,495,529	19%	36%	64%	28%	72%
-New Mexico	1,954,599	10%	29%	71%	29%	71%
-Utah	2,550,063	8%	29%	71%	31%	69%
-Wyoming	515,004	3%	38%	62%	34%	66%

Educational Attainment, 2000 and 2006

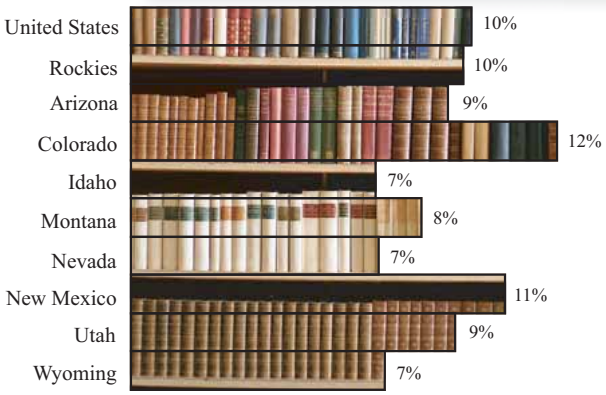
Percentage of Population 25 and Older Who at least	Earned High School, Diploma (or Equivalency) 2006	Earned High School Diploma (or Equivalency) 2000	Bachelor's Degree, 2006	Bachelor's Degree, 2000	Graduate or Professional Degree, 2006	Graduate or Professional Degree, 2000
United States	84%	80%	27%	24%	10%	9%
Rockies	86%	84%	27%	25%	10%	9%
-Arizona	84%	81%	26%	24%	9%	8%
-Colorado	88%	87%	34%	33%	12%	11%
-Idaho	87%	85%	23%	22%	7%	7%
-Montana	90%	87%	27%	24%	8%	7%
-Nevada	84%	81%	21%	18%	7%	6%
-New Mexico	82%	79%	25%	24%	11%	10%
-Utah	90%	88%	29%	26%	9%	8%
-Wyoming	90%	88%	23%	22%	7%	7%

Percentage of Population 25 and Older Who at Least
Graduated High School, 2006



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

Percentage of Population 25 and Older with at Least a
Graduate or Professional Degree, 2006

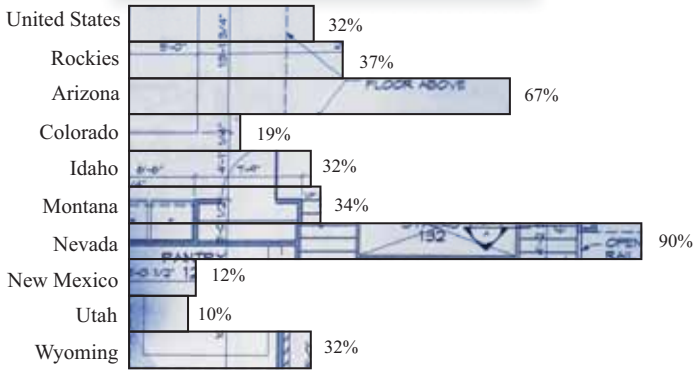


Home Values & Costs, 2006

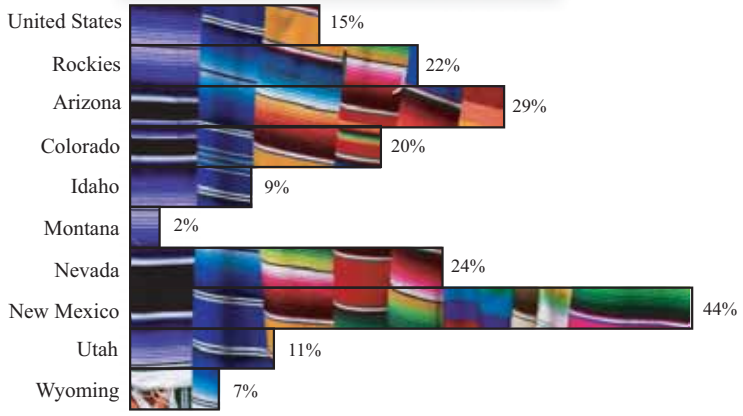
	Median Home Value, 2006	Median Home Value, Change since 2000	Median Monthly Costs for Housing Units Without Mortgage	Median Monthly Costs for Housing Units With Mortgage	Median Rent, 2006	Median Rent, Change since 2000
United States	$185,200	32%	$399	$1,402	$763	8%
Rockies	$216,300	37%	$334	$1,362	$744	4%
-Arizona	$236,500	67%	$321	$1,359	$762	5%
-Colorado	$232,900	19%	$376	$1,534	$780	-1%
-Idaho	$163,900	32%	$309	$1,099	$623	3%
-Montana	$155,500	34%	$344	$1,108	$571	9%
-Nevada	$315,200	90%	$401	$1,617	$917	12%
-New Mexico	$141,200	12%	$283	$1,076	$617	5%
-Utah	$188,500	10%	$336	$1,294	$697	-0%
-Wyoming	$148,900	32%	$326	$1,059	$601	18%

Median Home Value, 2006

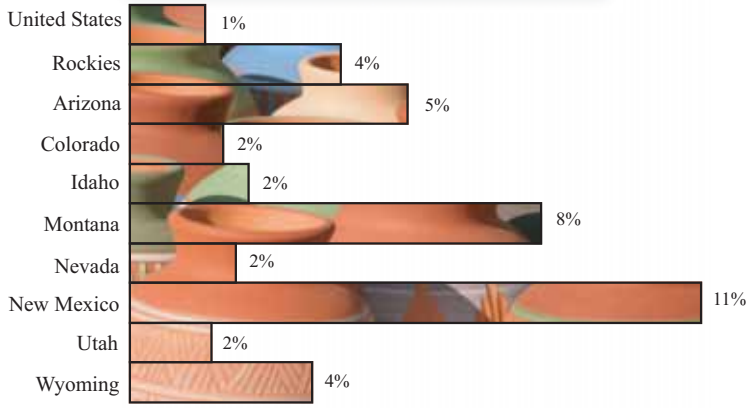
Change in Median Home Value, 2000 to 2006



Percentage of Population Who Identify as Hispanic or Latino, 2006



Percentage of Population Who Identify as American Indian or Alaska Native, 2006



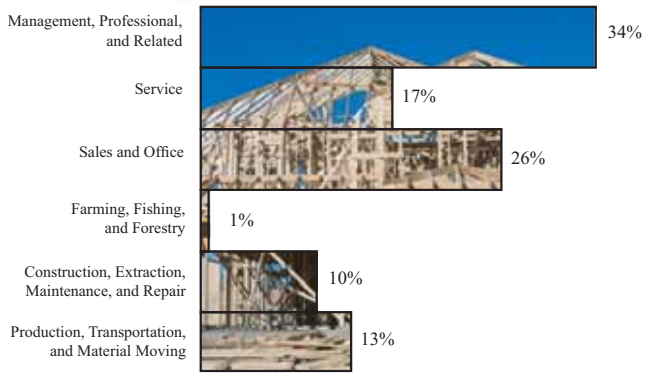
Race & Ethnicity, 2006

Percentage of Population Who Identifies as the Following	American Indian and Alaska Native	Black or African American	White	Hispanic or Latino (any race)
United States	1%	13%	76%	15%
Rockies	4%	4%	83%	22%
-Arizona	5%	4%	79%	29%
-Colorado	2%	5%	85%	20%
-Idaho	2%	1%	95%	9%
-Montana	8%	1%	92%	2%
-Nevada	2%	8%	76%	24%
-New Mexico	11%	3%	71%	44%
-Utah	2%	1%	91%	11%
-Wyoming	4%	1%	94%	7%

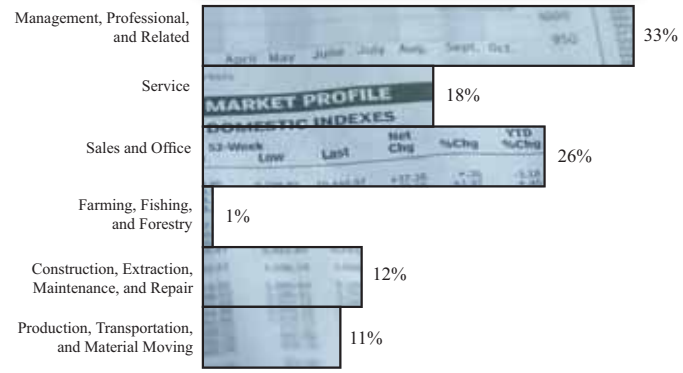
Employment by Occupation, 2006

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%	17%	26%	1%	10%	13%	141,501,434
Rockies	33%	18%	26%	1%	12%	11%	9,972,726
-Arizona	33%	17%	27%	1%	12%	10%	2,792,806
-Colorado	37%	16%	26%	1%	11%	10%	2,432,651
-Idaho	31%	16%	25%	3%	13%	12%	690,638
-Montana	33%	18%	23%	2%	13%	10%	467,475
-Nevada	27%	24%	25%	0%	14%	10%	1,224,523
-New Mexico	34%	18%	25%	1%	12%	10%	875,545
-Utah	32%	15%	28%	0%	11%	13%	1,216,420
-Wyoming	30%	17%	22%	1%	15%	14%	272,668

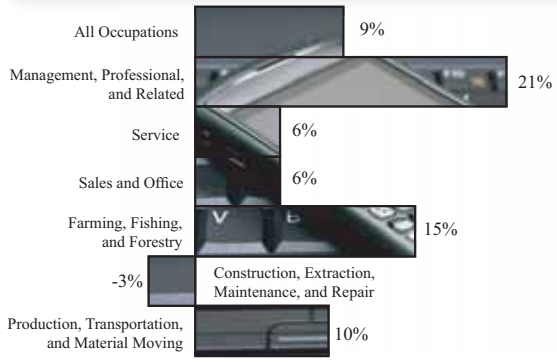
The United States
Employment by Occupation, 2006



The Rockies Region
Employment by Occupation, 2006



The United States
Employment Growth by Occupation, 2000 to 2006



The Rockies Region
Employment Growth by Occupation, 2000 to 2006

Employment Growth by Occupation, 2000 and 2006

	Management, Professional and Related	Service	Sales	Farming	Construction	Production	All Occupations
United States	10%	21%	6%	6%	15%	-3%	9%
Rockies	17%	27%	13%	3%	30%	9%	18%
-Arizona	25%	33%	20%	2%	40%	14%	25%
-Colorado	9%	28%	4%	2%	15%	2%	10%
-Idaho	15%	16%	13%	20%	39%	1%	15%
-Montana	11%	14%	1%	-6%	36%	-1%	10%
-Nevada	35%	30%	21%	27%	56%	23%	31%
-New Mexico	15%	24%	10%	4%	23%	5%	15%
-Utah	16%	24%	15%	-19%	19%	12%	16%
-Wyoming	14%	15%	3%	-20%	17%	27%	13%

Employment by Industry, 2006

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, Accommodation, and Food Services	Other Services (except public administration)	Public Administration	Total Employed Civilian Population 16 and Older
United States	2%	8%	12%	3%	11%	5%	2%	7%	10%	21%	9%	5%	5%	141,501,434
Rockies	3%	10%	7%	3%	12%	5%	2%	7%	11%	18%	11%	5%	5%	9,972,726
-Arizona	1%	11%	8%	3%	12%	5%	2%	9%	11%	18%	10%	5%	5%	2,792,806
-Colorado	2%	10%	7%	3%	11%	5%	4%	8%	12%	18%	10%	5%	5%	2,432,651
-Idaho	6%	11%	11%	3%	12%	4%	2%	6%	9%	19%	8%	4%	5%	690,638
-Montana	8%	10%	5%	3%	12%	5%	2%	5%	7%	22%	10%	5%	6%	467,475
-Nevada	2%	12%	5%	3%	10%	5%	2%	7%	10%	13%	23%	4%	4%	1,224,523
-New Mexico	4%	10%	5%	2%	12%	5%	2%	5%	11%	22%	10%	5%	7%	875,545
-Utah	2%	9%	11%	3%	12%	5%	3%	8%	11%	19%	8%	4%	5%	1,216,420
-Wyoming	11%	8%	5%	3%	12%	7%	2%	4%	6%	22%	10%	5%	6%	272,668

Employment Growth by Industry, 2000 to 2006

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, Accommodation, and Food Services	Other Services (except public administration)	Public Administration	All Industries
United States	7%	27%	-11%	4%	7%	6%	-12%	15%	19%	14%	19%	8%	7%	9%
Rockies	12%	43%	-3%	8%	13%	16%	-11%	28%	30%	19%	19%	17%	14%	18%
-Arizona	9%	62%	-4%	15%	23%	27%	-11%	38%	35%	24%	25%	26%	19%	25%
-Colorado	10%	22%	-12%	-1%	7%	5%	-18%	19%	17%	15%	19%	17%	13%	10%
-Idaho	12%	52%	-3%	-3%	10%	11%	2%	41%	31%	16%	10%	1%	7%	15%
-Montana	7%	49%	-9%	10%	-0%	-2%	-2%	6%	21%	10%	9%	7%	16%	10%
-Nevada	26%	72%	23%	38%	20%	20%	5%	41%	53%	37%	16%	26%	25%	31%
-New Mexico	6%	38%	-6%	-0%	9%	11%	-1%	12%	38%	17%	22%	8%	-1%	15%
-Utah	18%	21%	5%	3%	11%	24%	-11%	29%	32%	17%	20%	17%	17%	16%
-Wyoming	21%	6%	20%	25%	11%	14%	-15%	-2%	19%	14%	23%	6%	6%	13%

Immigration in the Rockies

Inmigración en Los Rockies
L'immigration dans les Montagnes Rocheuses
Pansamantalang pandarayuhan sa Rockies
Иммиграция в регионе Скалистых гор
Einwanderung in den Rockies
移民到落基山脉

By Simon Cataldo

THE 2008 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

Key Findings

•The immigrant population in the Rockies region today is approximately 11 percent; in 1900, immigrants represented more than 18 percent of the region's population.

•The growth of the Rockies' immigrant population is significantly outpacing the United States as a whole: from 2000-2005 the regional immigrant population rose 27 percent versus 16 percent nationwide.

•6 of 8 Rockies states rank in the highest percentage (40-54 percent) of foreign born residents who are unauthorized.

•About two thirds of immigrants in the Rockies are Hispanic, but over 60 percent of Hispanics in the region are not immigrants. In fact, there is not a single state in the Rockies where immigrant Hispanics outnumber native Hispanics.

•Poor immigrants use fewer public services than poor American citizens, even though immigrants are far less likely to have health insurance.

About the author: Simon Cataldo (Colorado College class of 2008) is a student researcher for the 2007/08 State of the Rockies Project.

Our ancestors ... possessed a right, which nature has given to all men, of departing from the country in which chance, not choice has placed them.
- Thomas Jefferson[1]

Unless the stream of these people can be turned away from their country to other countries, they will soon outnumber us so that we will not be able to save our language or our government.
- Benjamin Franklin[2]

Introduction

During the first decades of the twentieth century a wave of European immigrants rolled across the Atlantic Ocean. The newcomers hailed from diverse ethnic backgrounds: Italians, Jews, French, Irish, and Russians alike converged on the eastern shores of the United States for the first time in a unique social experiment. In an attempt to describe this new phenomenon, a catchy but inaccurate term was coined; the United States became the world's "melting pot."

America's immigrant experience, both from the perspective of immigrants and receiving communities, tells us that the "melting pot" expression scarcely describes the result of an influx of foreigners. William Timken, the current U.S. Ambassador to Germany, characterized the immigrant society with more insight during a speech in Berlin in 2006. He cited fears that the influx of Germans to Philadelphia in the late eighteenth century threatened to "Germanize" the city. This did not turn out to be the case, but neither were the immigrant Germans "Anglified." "Immigrant integration," Timken declared, "means that both newcomers and residents change."[3]

To re-phrase: America does not only change immigrants, immigrants change America too. Resistance to change is part of the human condition, a challenge Americans have dealt with throughout the nation's history. America's struggle to integrate immigrants and new ethnic minorities has borne some of the most colossal successes and horrendous atrocities in U.S. history.

Immigrants have played an essential role in the evolution of the nation's economy, demography, and culture. Nevertheless, immigration has also historically been the nexus for a heated debate across the United States. The arrival of the foreign-born in large numbers generates strong sentiments regarding national identity, social justice, economic opportunity, and education. Today's foreign-born share of the population is approaching levels of the 1930s, both in the Rockies region and the country as a whole. As a result, immigration has once again arrived at the forefront of national, regional, and local politics.

The turn of the twenty-first century marked a new era of immigration to the United States, distinguished by a redistribution away from the "Big Six" settlement states of California, New York, Texas, Florida, Illinois, and New Jersey. Today Colorado, Nevada, Utah, and even Idaho have become major "destination states," especially for unauthorized migrants, joining Arizona and New Mexico.[4] The growth of the Rocky Mountain West's foreign-born population significantly outpaces the United States as a whole.

This rapid influx of immigrants into the Rockies region introduces a unique challenge of integration to both the receiving communities and new immigrants. Compared to native workers, foreign-born members of the workforce are typically low-skilled and have low-incomes. In many key indicators of well-being, foreign-born children and families in the Rockies region fare far worse than the general U.S. foreign-born population. The gap is exaggerated for non-citizens and those who speak Spanish.

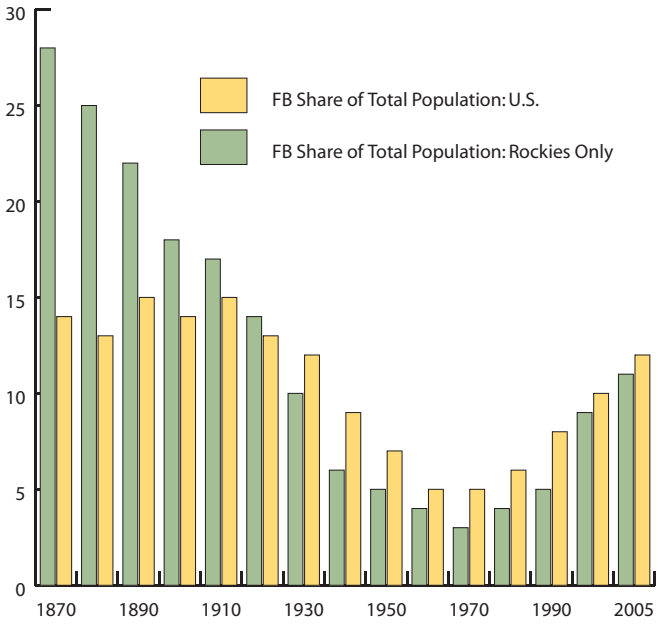
Uncertainty regarding immigrants' whereabouts, role in the economy, and legal status has promoted confusion amongst natives and immigrants of the Rockies, leading many to point fingers at immigration for a bevy of social and fiscal problems. This chapter of the *2008 State of the Rockies Report Card* will explore the issues of immigrant labor and immigrant integration as they pertain specifically to the eight-state Rocky Mountain West, working from a quantitative and spatial viewpoint on this highly emotional topic.

Today's Trends in a Historical Context

The beginning of the twenty-first century marks a unique period in immigration patterns for the Rocky Mountain West. While the number of immigrants residing in the Rockies region has never been greater, the foreign-born share of the Rockies region's population today pales in comparison to that of the beginning of the last century. (See Figure 1.)

Border crossing at Algodones, Mexico

Figure 1
Foreign-Born Share of Total Rockies and U.S. Population, 1970 to 2005
Source: Historical Statistics of the United States Millenial Edition Online, 2000 Decennial Census, American Community Survey



In 1900 nearly 20 percent of people in the region hailed from afar. This percentage decreased steadily until the mid-1970s, when a new immigration surge commenced. Today the rate of increase of the foreign-born share of the population continues to climb. As the demography and origin of the Rockies region's population changes, it is easy for long-time residents to forget the historical context of the region's immigrant past.

One hundred years ago, the Rocky Mountain West had a significantly higher percentage of immigrants than the United States (approximately 20 percent and 14 percent, respectively). Between 2000 and 2005 immigrants arrived to the eight-state region twice as fast as the country as a whole.[6] Even as a rapidly growing region in terms of general population, the Rockies' immigrant population grew three times faster than the total region's population between 2000 and 2005.[7] (Figure 2)

However, at mid-century, the foreign-born share of the Rockies region's population dipped below that of the nation, and has yet to catch up. Immigrants' share of the total population in the Rockies region today is only 11 percent compared to 12.4 percent for entire country.[8]

Characteristics of the Foreign-born: Unauthorized Migrants

Legal status rests at the center of the immigration debate. The concept of a foreigner entering the United States illegally and without documentation irks many U.S. citizens. Perhaps generating even stronger anti-illegal immigrant sentiments are the perceptions that these residents use public services to which they are not entitled and that they take jobs from Americans. This feeling has become prevalent enough that in 2007 a

Terminology

Hispanic: Derived from the Latin word for Spain, "Hispanic" refers to any Spanish speaker from either hemisphere. Thus, "Hispanic" defines neither race nor ethnicity. Some consider the word to be offensive because of its Anglo roots. This chapter will use "Hispanic" when necessary to be consistent with U.S. Census Bureau terminology.

Latino: Refers to a person from Latin America, or whose ancestors are from Latin America. "Latino" describes U.S. Spanish-speaking immigrants more acutely than "Hispanic," because most are from Latin America. Like "Hispanic," "Latino" refers to no specific race. Unlike "Hispanic," "Latino" carries an ethnic connotation. "Latino" refers to males and "Latina" to women.

Limited English Proficient (LEP): Limited English Proficient (LEP) is the term used by the federal government, most states and local school districts to identify those students who have insufficient English to succeed in English-only classrooms.[5] These students may also be called English Language Learners (ELL).

Foreign Born: The U.S. Census Bureau counts a "Foreign Born" as anyone who

A) is a citizen by naturalization OR

B) is NOT a citizen of the United States.

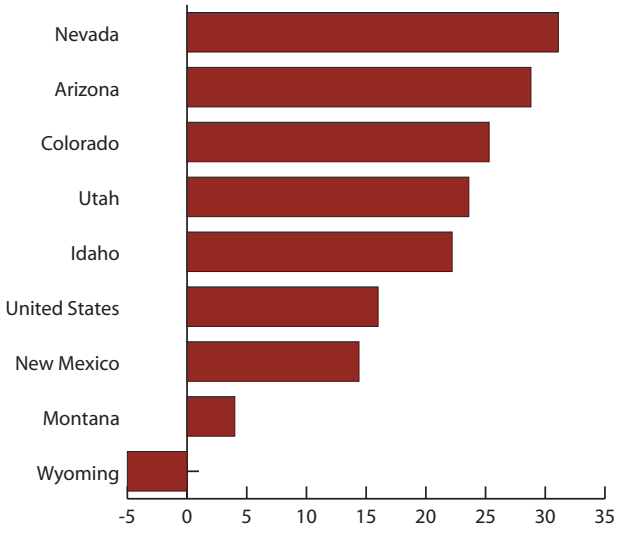
Naturalized Citizen: A naturalized citizen was born into foreign citizenship, but has legally become a citizen of the United States with all the benefits of a native citizen except the right to become Vice President or President.

Non-Citizen: Includes anyone who is residing in the U.S., but is not a naturalized citizen. Non-citizens include Legal Permanent Residents (Green Card holders), Temporary Legal Residents (temporary work or leisure visa holders), Refugee Asylees, and Unauthorized Migrants.

Unauthorized Migrant: Any person residing in the United States without legal authorization. Also referred to as Undocumented Immigrant or Illegal Immigrant. "Unauthorized Migrant" is the most accurate term because some people have forged documentation and many actually emigrate back to their home country.

Immigrant Family: In this chapter, the term "immigrant family" refers to a family in which one of the heads of the household is an immigrant. Therefore, U.S.-born children and spouses are often members of an "immigrant family."

Figure 2
Percent Change in Rockies Immigrant Population by Rockies State and United States, 2000-2005
Source: U.S. Census Bureau, American Community Survey



Colorado congressman, Tom Tancredo, staked a Presidential campaign on it:

> *"As President, I will secure our borders so illegal aliens do not come, and I will eliminate benefits and job prospects so they do not stay."*[9]

On the opposite end of the spectrum, many Americans value the labor and cultural infusions immigrants – legal or not – bring to their communities. Across the Rockies region unauthorized migrants occupy a large portion of the workforce within individual businesses and entire industries. Local governments and citizen groups are scrambling to integrate the rapidly growing number of immigrant families into the larger community, but the fear, confusion, and anonymity of unauthorized migrants hinders these efforts.

Politicians in Washington, D.C., thrust the issue to new heights on the national stage in July 2007 when a national immigration reform bill, which proposed a path to citizenship for the estimated 13 million unauthorized migrants currently residing in the U.S., was voted down in the Senate. President George W. Bush and several notable Republican legislators supported the bill, which also would have required measures to improve border security.

Twelve million people currently live in the United States without full subjection to or benefit from the nation's laws, taxes, and regulations. Regardless of political inclination, there is a consensus that this status quo is not acceptable. In the Rockies, the political climate is particularly volatile in regard to illegal immigrants. This may be explained by its geographical location (Arizona and New Mexico occupy a large section of the U.S.-Mexico border), as well as the drastic change in foreign-born population during the last thirty years, highlighted by a relatively rapid influx of immigrants over the last five years. (See Figures 1 and 2.)

But the Rocky Mountain West is experiencing immigration in another unique way as well. According to the most widely accepted estimates of the unauthorized migrant population by Jeffrey Passel of the Pew Hispanic Center in Washington, D.C., all Rockies states except Montana and Wyoming rank among those with the highest percentage of foreign-born residents who are unauthorized. (See Table 1.) Only eleven of the remaining states are within this category. Nevada and New Mexico are among the "Very Highest" states, with more than 48 percent of immigrants unauthorized. It appears that in the Rockies region, a significantly higher percentage of the foreign-born are unauthorized than in the country as a whole (Figure 3).

The effects of unauthorized status are severe on the personal, family, community, state, and national level. Unauthorized migrants often live in the shadows of society, fearing deportation. An inability to speak English and cultural confusion contribute to ignorance regarding legal rights, access to services, and other critical information. In families with one or more unauthorized migrants, the disadvantages of illegal status affect those who are legal. This effect is especially felt by children of immigrant parents who are born into U.S. citizenship within the nation's borders.[10] For instance, an unauthorized parent might keep his child home from school when a rumor of a raid circulates, or prevent his child from receiving services she is entitled to as a citizen.

The Difficulty of Counting Unauthorized Migrants in the U.S.

Determining the number of unauthorized migrants residing in any geographic location, from the local to the national level, is extremely difficult in large part because those without legal status are hesitant to complete

U.S. – Canada border crossing

Figure 3
Estimated Unauthorized Population as a Percentage of the Foreign-Born Population, 2005
Source: Passel (2005), Pew Hispanic Center

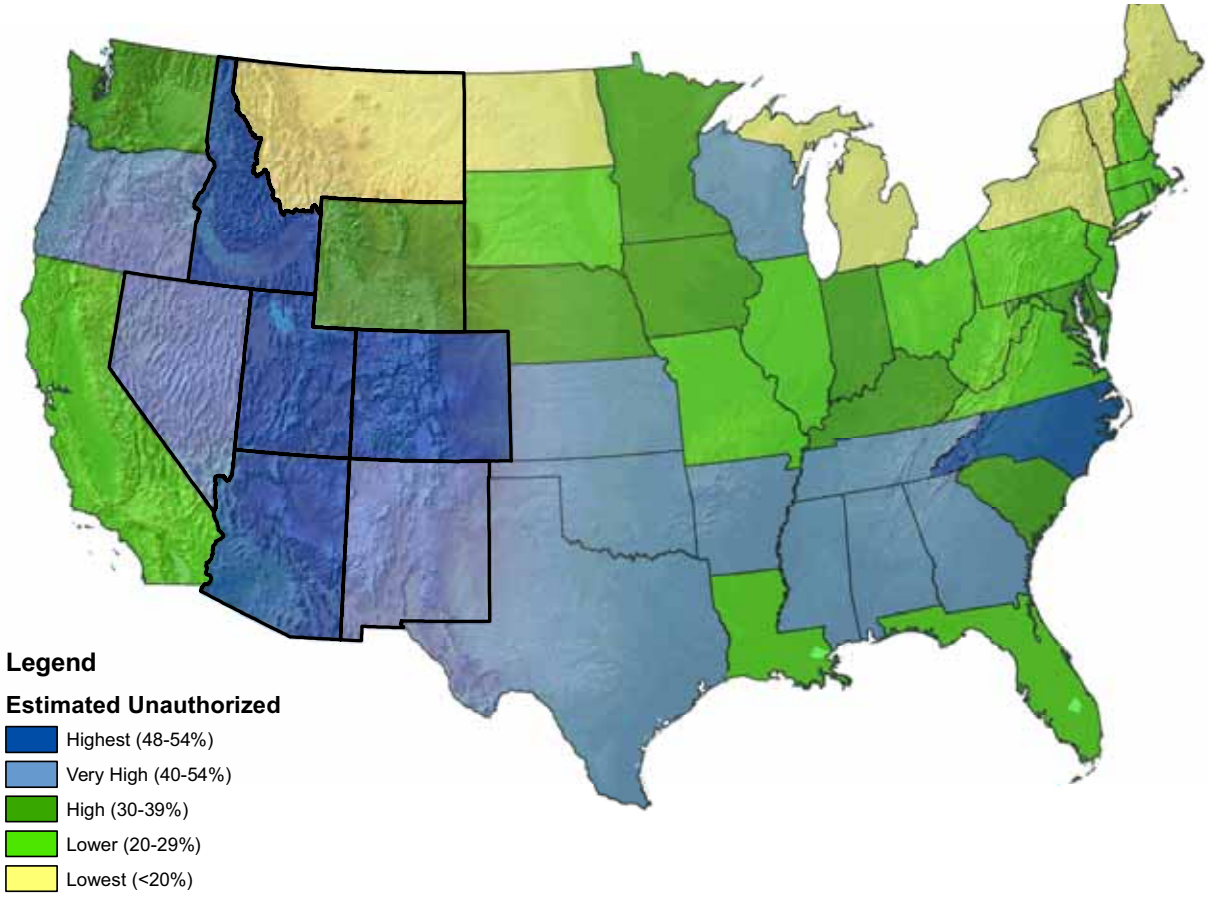


Table 1
Estimated Unauthorized Migrant Populations by State and U.S. Rankings, Thousands
Source: Jeffrey Passel's estimates based on 2005 CPS data

	Rank	Lower	Upper
U.S.		10,700	11,500
AZ	5	400	450
CO	12	225	275
NV	15	150	200
UT	23	75	100
NM	28	50	75
ID	38	25	45
WY	44-51	NA	10
MT	44-51	NA	10

any surveys or census forms. A breakdown of foreign-born residents into citizens and non–citizens is more attainable, but note that only a fraction of non–citizens are unauthorized. The Pew Hispanic Center's Passel estimated that in 2004 only 29 percent of foreign-borns resided illegally in the country. The remaining foreign-born residents included Legal Permanent Resident Aliens (29 percent), Naturalized Citizens (32 percent), Temporary Legal Residents (i.e. those with temporary student or work visas–3 percent), and Refugee Arrivals (7 percent). The citizen/non-citizen breakdown is nonetheless useful because it demonstrates a startling gap in many well-being and financial indicators. In 2005:

- 66 percent of immigrants in the Rockies region lacked citizenship
- A tenth of Nevadans in 2005 were not citizens of the United States.
- Nearly a fifth (18 percent) of people living in Arizona in 2005 lacked citizenship.
- In Idaho, the non-citizen immigrant population grew by nearly 250 percent from 1990 to 2005, outpacing the growth of naturalized immigrants in the state by more than a factor of 2. In both Colorado and Utah, non-citizen immigrant populations grew by over 330 percent during that time.

It is likely the above statistics are under-exaggerated, given the inherent under-counting of unauthorized migrants.[11]

Why Don't Immigrants Just Become Legal?

The barriers to acquiring legal entry to or naturalization in the United States are substantial. After the 2005 acceptances for U.S. naturalization applications, there remained a 552,940-person backlog. Low-skilled foreign workers find themselves out of luck, even when an employee is willing to sponsor them. Currently there is a limit of 66,000 H2B visas (for non-agricultural, low-skill labor) per fiscal year in the United States. Allotments of these have been known to run out in March or April, long before the cycle begins again on October 1. In 2007, the visa quota was filled on March 23.[12]

The Changing Face of Immigrants: Origin of the Foreign-Born

An understanding of the basic characteristics of the immigrant population in the Rockies region is an essential step towards addressing the immigration issue. For example, the Hispanic origin and native country of an immigrant may be correlated with his or her wage, primary language, and likelihood to have attained a certain level of education or occupation skill.

The majority of today's immigrants are Hispanic. In 2005, 53 percent of the U.S. foreign-born population hailed from Latin America, up from 44 percent in 1990. Each year, since at least 1986, Mexico has been the top source country of immigrants to the United States.[13] Meanwhile, Europe and Canada's share has declined significantly (see Figure 4). Only a quarter of the immigrants admitted to the United States during the 1950s originated in the Western Hemisphere, not including Canada, while more than 60 percent of the immigrants admitted to the United States during the decade originated in Europe or Canada. In the 1990s, those numbers were 47 percent and 17 percent, respectively. By 2005, Europeans composed only 11 percent of the foreign-born population, down from 23 percent fifteen years earlier.[14]

Although the birthplace of immigrants varies from community to community, in general Latin Americans dominate the foreign-born population in the Rocky Mountain West. More than 66 percent of the Rockies region's foreign-born population is Latin American (Figure 5). Fifty-eight percent of immigrants in the region were born in Mexico, compared to only thirty percent in the nation as a whole.[15]

In turn, Hispanics and Latinos represent the majority of immigrants in the Rockies–more so in the region than in the United States. This trend is magnified in Arizona and Wyoming, where more than 70 percent of the immigrant populations are Hispanic/Latino (Figure 6).

This being said, it is important to note that while most immigrants in the Rockies are Hispanic, *most Hispanics in the region and the country are not immigrants*. The Rocky Mountain West has a long and rich native-born Latino heritage that can be confused with the new immigrant population. It is statistically inaccurate for Hispanics to serve as a proxy for immigrants. In truth, there is no state in the Rockies where immigrant Hispanics outnumber native Hispanics. Of the Rockies region states with high immigrant populations, this trend is especially strong in New Mexico, where only 11 percent of Hispanics are foreign-born.

Today's immigrants represent a very different ethnic mix than the immigrant peaks of the early and mid-twentieth

Figure 4
Change in Immigrant Country of Origin, Rockies, 1990-2005
Source: U.S. Census Bureau, American Community Survey

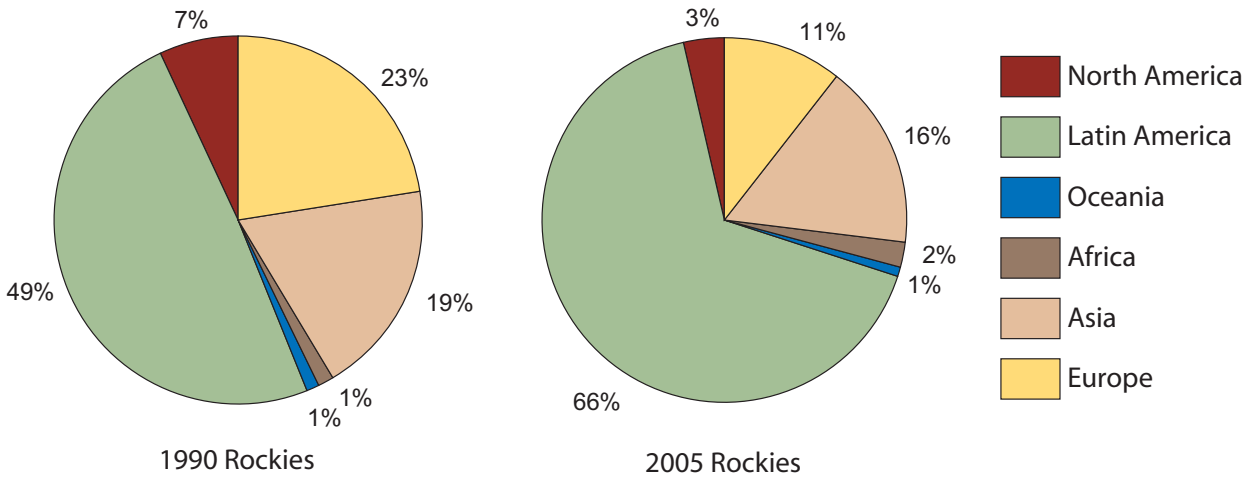


Figure 5
Percent of Immigrant Population that is Hispanic, 2006
Source: Calculated from 2006 Current Population Survey

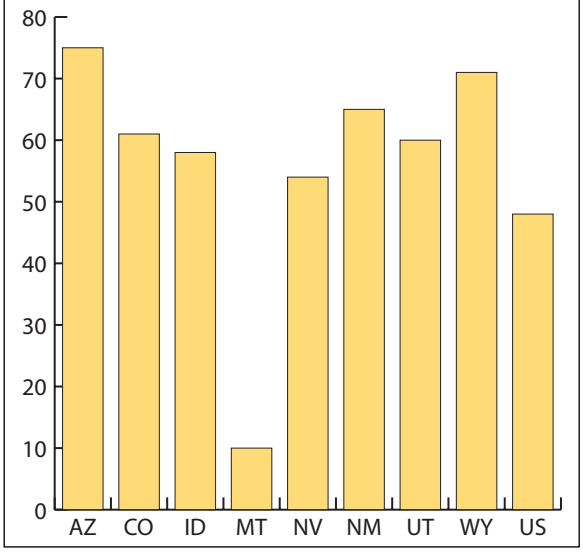
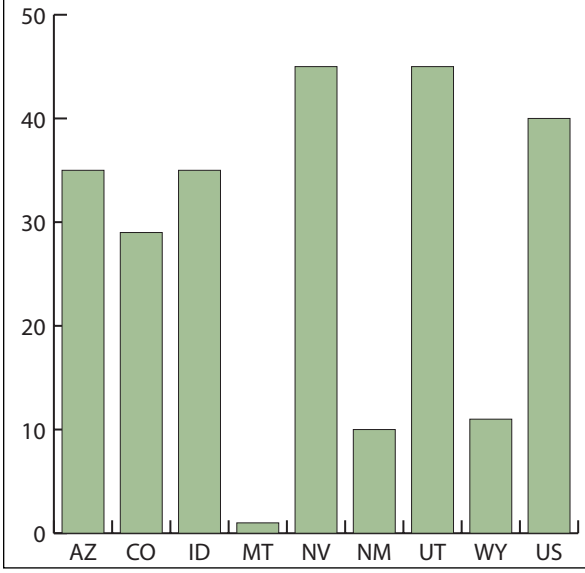


Figure 6
Percent of Hispanic Population that is Foreign Born, 2006
Source: Calculated from 2006 Current Population Survey

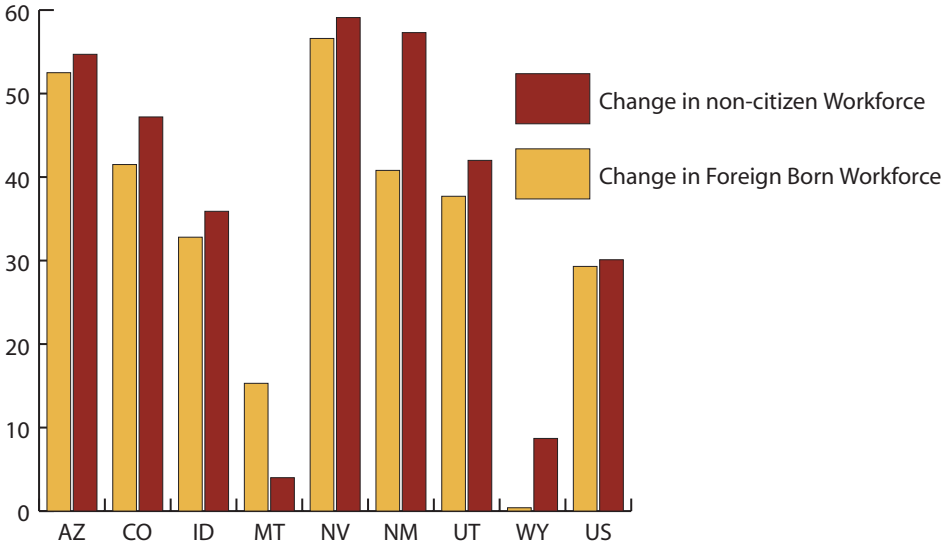


century, with most of the foreign-born population native to the Western Hemisphere south of the U.S. However, immigrants to the United States have historically been considered ethnically and racially different from the majority of those already living here. For example, Italians were not considered to be "white" during the peak of Italian immigration to America in the twentieth century. Now Italian-Americans, along with other ethnic groups of European descent, are counted as "white" on the U.S. Census. Americans must ask themselves, "How does ethnic origin and skin color change our attitude towards and treatment of immigrants?" and "How is an influx of Latin Americans affecting our perceptions of native U.S. Hispanics?" One might even ask, "Are most of the perceived differences between immigrants and natives real or imaginary?"

The Immigrant Workforce of the Rockies

Immigrants comprise a growing share of the workforce in the Rockies region. From 1995 to 2006, the foreign-born workforce in the region grew by nearly 300 percent. That increase represented a rise in the share of the total workforce from 10 to 15 percent.[16] During the first five years of this century, the foreign-born and non-citizen workforces grew considerably faster in most Rockies region states than in the nation as whole. As Figure 7 shows, non-citizen workforce accounts for almost all of this growth in most states in the Rockies. This immigrant portion of the nation's and region's workforce has grown to the point that its economic impact is felt throughout all strata of the economy.

Figure 7
Percent Change in Rockies Foreign-Born and Non-Citizen Workforce, 2000-2005
Source: Migration Policy Institute Tabulations of U.S. Census Bureau Data (Decennial Census and ACS)



Extensive research has been done by several economists exploring the intricacies of immigrant labor's economic impact in the United States.[17] These studies have yielded contrasting results, particularly in regards to the effect on job availability and wages for less-skilled

native workers.[18] Judging by immigrant workers' substantial contribution to the growth of the U.S. and Rockies region's workforce, it is likely that immigrants play an integral role in the net economic growth of the country and the region. According to Edward Lazear, Chairman of the White House Council of Economic Advisors for the Bush administration, "Our review [in 2007] of economic research finds immigrants not only help fuel the Nation's economic growth, but also have an overall positive effect on the income of native-born workers."[19]

A comprehensive economic impact study released in July 2007 by Judith Gans of the University of Arizona reported that in 2004 Arizona's immigrant population had a net positive fiscal impact of approximately $942 million.[20]

A 2001 report by the Committee for Economic Development (CED) raises significant doubts concerning the nation's ability to continue on a path of economic growth without immigrant labor. The results of the CED's study make it clear that the U.S. will depend on newcomers for an increase in the workforce in the near future. According to the CED, in the 1950s and 1960s, immigrants "made no net contribution" to the U.S. working age population, but between 1996 and 2005 immigrants accounted for one-third of that growth. If current trends continue, they will account for more than half of the net growth from 2006 to 2015, and all of the net growth in the working age population between 2016 and 2035.[21]

Still, the debate revolves around immigrants' "taking" of Americans' jobs and the potential impact of losing immigrant laborers. Around the Rockies region, even as some elected officials rail against immigrants for undercutting natives' jobs, many community members and business owners claim that their local economies and industries rely heavily on immigrant labor, and that losing them would have a devastating economic impact (see Case Study: ICE raids).

Key Findings from the Judith Gans Report:
Total State Tax Revenue Attributable to Immigrant Workers: $2.3 Billion ($862.1 million for naturalized citizens and $1.5 billion for non-citizens)

Fiscal Cost of Immigrants (including education, health care and law enforcement): $1.4 billion

Economic Output of naturalized citizen (immigrant) workers: $14.8 billion (4 percent of total)

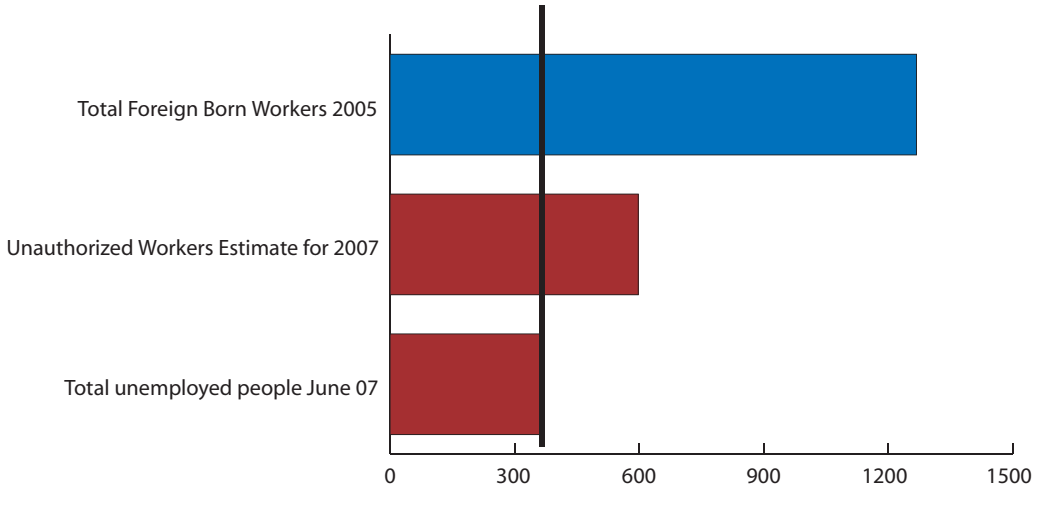
Economic Output of non-citizens: $28.9 billion (8 percent of total)

An analysis of the foreign-born workforce of the Rocky Mountain West challenges the notion that if immigrants were to leave the workforce, native workers could even fill the void. The number of immigrant workers in 2005 far exceeded the total number of people looking for work in June of 2007. Most of this gap is due to the non-citizen workforce, although citizen immigrants alone also outnumber the unemployed population. A size estimate of the unauthorized migrant workforce in 2007 (see data section on page 32) suggests that unemployed persons could not replace even the region's illegal workers, as those laborers outnumber the unemployed population by nearly a factor of two (Figure 8).

A *Denver Post* editorial in July 2007 highlighted this point with respect to agricultural workers. Colorado farmers claimed that they, "can't find enough workers, immigrant or native, even offering $400 a day."[22]

One approach to explore the job "taking" issue is an analysis of the education level of immigrants relative to that of natives. According to Gans' analysis, when natives and immigrants have similar skill-sets and abilities, it leads to job competition and wage decreases. When immigrants and natives have a stratified education distribution, they fill different roles in both

Figure 8
Comparison of Immigrant Workers to Number of Unemployed in the Rockies (Thousands of Workers)
Source: Computed from Bureau of Labor Statistics and Passell (2005), see methodology for estimate of unauthorized workers.



Case Study: The ICE raids at the Swift meatpacking plant in Greeley, Colorado

Background:
Many unauthorized migrants harbor a keen fear of immigration raids and deportation. Rumors of immigration enforcement, often unfounded, spread quickly and paralyze communities. Such fear is not merely paranoia, however, given the drastic consequences of deportation on the individual, family, and community.

The effects of immigration raids, made clear by the events in Greeley, are far-reaching. Swift and Company is the third-largest processor of fresh beef and pork in the U.S., with $9 billion in annual sales. The economic impact of Swift beyond the company itself is substantial. For instance, Swift's livestock purchases total more than $900 million, mostly from local sources. When processing at Swift stops, so do sales to the company from local livestock producers.

On December 12, 2006, Immigration and Customs Enforcement (ICE) agents raided the Swift meatpacking plant in Greeley, as well as five other Swift plants around the country. "Operation Wagon Train" resulted in the arrest and detention of 1,282 Swift employees nationwide, 261 of them in Greeley. Many of these workers were ultimately deported to their home countries, primarily Mexico and Guatemala.

Perspectives: Swift and Company
Companies must straddle the line between respecting civil rights and complying with documentation requirements. In 2001, the U.S. Department of Justice sued Swift for $2.5 million for discrimination, "for going too far in determining applicant eligibility" of employees. Swift settled the case for less than $200,000 with no admission of wrongdoing.

Since 1997, Swift has used the federal government's online verification program, "Basic Pilot," to check the legal status of its workers. Although Swift claims that "a company cannot legally and practically do more than we have done to ensure a legal workforce," the ICE opened an investigation of Swift and its hiring practices prior to its enforcement action. No criminal charges have been levied against Swift in connection with its hiring practices following the raids.

The company says that it tried repeatedly to work with ICE to apprehend and remove "all potential illegal workers and criminals in order to minimize disruption to the company, communities, and livestock producers." ICE rejected these efforts and ended the investigation with a very public enforcement action. Swift contends that politics and public relations played a part in the manner in which ICE carried out the raids. Swift did not return to full employment until May of 2007 and reports that, overall, it suffered a $53 million loss as a result of the 2006 raids.

The company would like to see comprehensive immigration reform in order to better integrate immigrant labor, which it deems integral to the nation's economy. Swift Vice President of Investor Relations and Public Communications, Sean McHugh is doubtful that native workers are willing and able to fill the void: "Every year Swift hires 5,000 employees, with two times the minimum wage and full benefits, so why don't Americans come to work here?...The low-tech and high tech industry needs immigrant labor, period…The inescapable conclusion is that [immigration] policy is broken."

Perspectives: Greeley Hispanic immigrant workers
In the aftermath of the raids, Roberto and Emanuel felt that the Latino community in Greeley lacked a strong, cohesive voice. In addition, immigrant support from within the Latino community and the broader Greeley community was and still is insufficient despite valiant efforts by the Catholic church and local organizers. Rallies in Denver in support of immigrant workers following the raids gave them hope, but they became disappointed when no concrete improvements came.

Roberto tells the story of his cousins, Jorge and Martha who both worked at Swift full-time for the ten years they lived in Greeley. The couple had been living and working in the country illegally, as well as paying off their decade-old mortgage on the home where they and their two young children lived.

When ICE apprehended and deported Jorge and Martha to their native Mexico, they lost their mortgage and all of their possessions. Their 10-year-old son and 4-year-old daughter learned of their parents' arrest when a relative picked them up from school. All four are now living in Mexico, trying to save enough money to return to the United States.

Conclusion:
Immigration raids are a delicate issue. Raids carry the potential for acute and broad negative impacts, which must be balanced with ICE's obligation to enforce immigration regulations passed down by state and national lawmakers. Greeley exemplifies a trend which the Rockies can expect to see more of if the unauthorized migrant community continues to grow within the region's current political climate.

On July 10, 2007, just days after the State of the Rockies team visited Greeley, ICE again raided the Swift meatpacking plant there. The raid resulted in the arrest of 19 employees.


State of the Rockies Researchers meet immigrant laborers in Greeley, Colorado

[1]Shandley, Jack. Testimony on "Problems in the Current Employment Verification and Workforce Enforcement System" before the House Subcommittee on Immigration, Citizenship, Refugees, Border Security, and International Law of the Committee on the Judiciary United States Congress. Washington D.C. 24 April 2007. Page 3.
[2]Shandley, 4.
[3]Interview with Sean McHugh. 11 July 2007.
[4]Pseudonyms used; conversation conducted in Spanish with translation provided by Pablo Navarro.

the general economy and specific industries, leading to a complementary skill set which benefits the workforce as a whole.[23] For example, a single ski resort needs to employ a wide array of workers, from accountants and lawyers to dishwashers and janitors. An immigrant with a 9th grade education does not compete with the lawyer for his job, or the high school educated citizen for a managerial job.

A breakdown of educational attainment levels by origin in the Rockies region (Figure 9) confirms that, in fact, the region enjoys this complementary workforce effect between immigrants and natives:

- 30 percent of foreign-born adults over age 25 in the Rockies region have less than a 9th grade education, while this is true for only about 2 percent of natives.
- More than half of immigrant adults lack a high school degree, while just over 10 percent of natives do not have a high school diploma.

The issue of foreign-born laborers transcends the legalization debate because a large portion of foreign-born workers are either citizens or have temporary visas. However, many workers who obtain temporary visas "overstay" because of the price of renewal is prohibitive. The H2A and H2B seasonal worker visas, which allow an immigrant to work in the U.S. for up to a year (but normally only 6 months), require the individual to return to his or her home country and reapply without guarantee of renewal. The total duration of stay for these visa holders cannot amount to more than three years.[24] The cost of the trip to a worker's native country and the risk of rejection, incentivize temporary workers to remain in the country illegally when their visas expire.[25] Further complicating the temporary visa issue is its seasonal nature. The immigrant workforce of the Rockies is highly concentrated in the service industry, which needs year-round employees.

Construction companies are also strong employers of foreign-born workers in the Rockies region. One third of construction workers in Nevada are foreigners from countries within the Americas, second highest in the nation. Thirty-one percent of Arizona's construction workers are foreigners from the Americas, and New Mexico's and Colorado's shares are both over twenty percent.[26]

When analyzing workforce statistics for the foreign-born, especially non-citizens, one must keep in mind inherent under-counting; illegal workers often go unreported in statistical surveys. Available data shows a large discrepancy in the industry breakdown of citizen and non-citizen foreign-born workers. Non-citizen workers are more prevalent in the Rockies region than foreign-born citizens, as most of the region's foreign-born work-

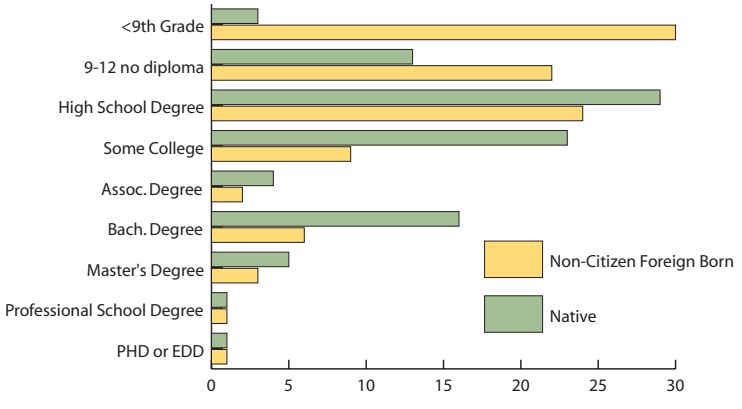
force in all states except Montana lacks citizenship.

The discrepancy in citizenship of workers is most notable in construction. Five percent of citizen immigrant workers are in the construction trade, while more than twenty percent of non-citizen workers are in construction. The service industry is the top employer for both groups, drawing 26 and 29 percent of citizen and non-citizen foreign-born laborers, respectively. (See Figure 10.) Presumably, these industries, two of the Rockies region's strongest, would be among those hit hardest by a crackdown on immigrant labor in the region.

Immigrants also occupy a large portion of the workforce in several other, smaller industries. (See Table 2.) For example, 40 percent of the more than 16,000 workers in the plastics and rubber products industry of the Rockies (mostly in Colorado, Utah, and Arizona) are immigrants, and virtually all of them non-citizens; 43 percent of machinery manufacturers in the region are foreign-born.

Immigrant workers in the Rockies region earn less than the U.S.-born workforce on average. Both male and female foreign-born workers earn significantly less than

Figure 9
Educational Attainment for Non-Citizen Foreign Born and Native Populations, 2006
Source: Calculated from 2006 Current Population Survey



native workers, enough to make them considerably more likely to live in poverty. Colorado has the second highest difference between median earnings of native and foreign-born male workers in the country. Nevada, Arizona, and Utah rank forth, fifth, and seventh, respectively. New Mexico's foreign-born population ranks second in the nation in poverty rate and Arizona's is sixth.[27]

Thus, the influx of immigrant labor is accompanied by a population of people who earn less and often live in poverty. This, compounded by limited English ability, complicates the integration of new immigrant families into communities across the Rocky Mountain West.

The Well-Being and Integration of Immigrants in Communities of the Rockies Region

Integration of the recent, burgeoning foreign-born population and their families into the general community is an active process, not a passive one. Cultural differences and authorization status issues contribute to communication deficiencies, which can breed fear and contempt. Efforts to integrate new immigrant populations require a significant amount of political will, patience, social activism, communication, and in some cases, reallocation of public funds. The desire and subsequent success of communities in the Rockies region to do this varies greatly, largely due to local politics and availability of funding for support services. (See Case Study: Jackson, Wyoming).

New Mexico's foreign born population ranks second in the nation in poverty rate and Arizona's is sixth.

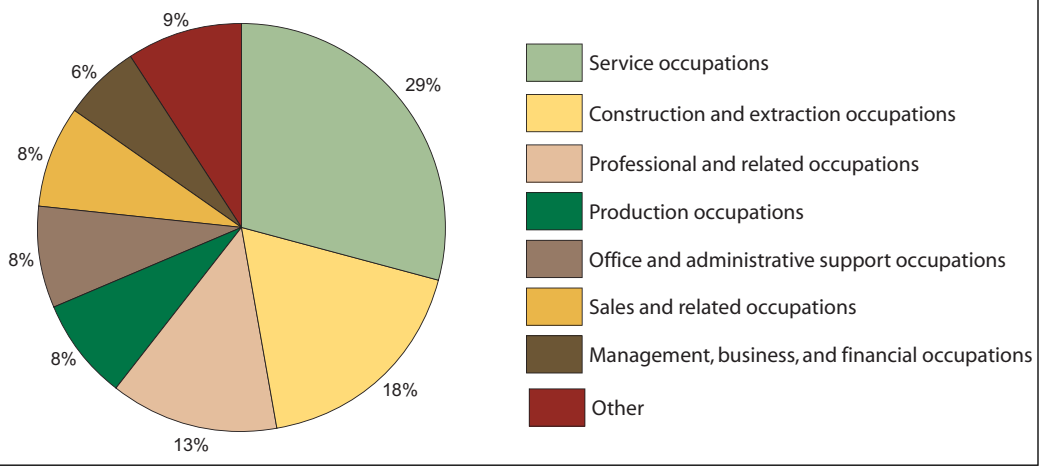
The forces that shape immigrant integration operate on several levels (Table 3). On the macro-level, national laws lay out basic civil rights and federal funding directed towards immigrants. Federal immigration policy also determines entrance standards to the United States and the number of people allowed entry each year. Such policies carry significant weight in terms of the origin, occupational skill, and family connectedness of new arrivals. On the federal level, immigrant integration is not prioritized as it is in countries such as the Netherlands and Canada, which have Offices for Immigrant and Refugee Integration.[28]

The failure of the federal government to pass comprehensive immigration reform has burdened the states to deal with immigration individually. From January to June of 2007, state legislatures enacted 171 new immigration-related laws, double the number from the same period in 2006; 44 of these laws were enacted by the eight Rocky Mountain states.[29]

States wield considerable influence in documentation and enforcement policies, which can affect integration of unauthorized migrants or any immigrant with English language difficulties. States also make funding decisions with profound effects on their immigrant populations.

For those communities seeking some semblance of equality between immigrants and the general population, data shows that there is a long way to go in the Rockies. In particular, children in immigrant families (immigrant children or native ones with immigrant parents) are suffering. Many of those represented in the following KIDS COUNT statistics from the Annie E. Casey Foundation project are U.S. citizens by birth, yet clearly the negative implications of being an immigrant in the Rockies region are being imposed upon them. In 2004, an estimated 67 percent of children with an unauthorized parent were themselves U.S. citizens.[30] As previously mentioned, anyone born within the borders of the United States is automatically a legal citizen, regardless of the authorization status of the parents. Therefore, future immigration enforcement policies are unlikely to eliminate most of these children from the population. In other words, they are here to stay.

Figure 10
Employment by Industry, Foreign Born Population, 2006
Source: Bureau of Labor Statistics



In line with the poverty trends of the general immigrant population, children in immigrant families are far more likely to live in poverty than their native peers (see Figure 11).

Topics in Integration: Public Education

Education is a hot topic in communities with large or growing immigrant populations. Rising enrollment of immigrant children in

Case Study: Jackson, Wyoming and the Latino Services Network

Background:
Teton County, Wyoming is one of a number of communities in the Rockies with a strong, service-driven economy thanks to beautiful natural surroundings and an internationally-renowned ski resort. The nature of the county's economy, specifically in Jackson, requires a low-skilled workforce to maintain and service the town's many tourist facilities.

In the early to mid-1990s Latino immigrants, mostly Mexican men, began to arrive in Teton County to work in the agriculture and employment sectors. Slowly their wives followed suit and in time the immigrant couples had children. Latino immigrants were a new phenomenon for the residents of Jackson. As Manuel Lopez, a Jackson restaurant owner and native Cuban recounts, "I think there may have been two or three Hispanics in Jackson when I arrived in 1973."[1]

Like many communities in the Rockies, the Latino population grew rapidly. Jackson's Latino immigrant population has grown by a factor of four since 1990, to 2,700 residents in 2006.[2] From 2001 to 2007, the Latino share of total school enrollment in Teton County climbed from 6 percent to 19 percent.

Teton County's Action:
As the Latino population expanded, the Jackson community realized it had to respond. Most citizens recognized that immigrants played an essential role in the town's economy (and still do today), but also saw that immigrants' low-income, English language deficiencies, and cultural differences required support from the town as a whole.

In 2000, focus groups at the Teton County Library spurred a coordinated effort to improve collaboration and information dissemination between both service providers and engaged community members. Their efforts have thus far resulted in what today is called the Latino Services Network (LSN), composed of more than 25 local agencies, including medical translation services, Headstart Programs, and the police department. The LSN's main purpose is to improve information sharing between entities that serve the Teton County's Latino community in order to reduce duplication of services and make more efficient use of human and financial resources. The benefits reach not only Latinos, but the community's support network overall.

The Teton County Library has led the way in Jackson's efforts towards the integration of the Latino immigrant community. The library has a full-time Latino Services Supervisor, as well as a Spanish Computer Class Instructor and a College Preparation Program Coordinator specifically for designed for Latino high school students. Also piloting Jackson's integration initiatives are "study circle" conversations, supported by both public entities and private businesses, which address residents' concerns and ideas regarding the Latino community.

State of the Rockies Researchers meet with the Latino Services Network in Jackson, Wyoming.

Continuing Challenges:
Despite intensive human and financial resource investments in Teton County's Latino immigrant community, several difficulties persist. For instance, the LSN has struggled to increase involvement from Latinos themselves, as many of the adults who work multiple jobs are not inclined to devote time to volunteering. This, in part, limits the LSN's ability to diffuse the fear of raids which continues to permeate the immigrant population. Fear of deportation is becoming more legitimate, as some say the state highway patrol increasingly stops Latino motorists and requests documentation.

On the economic level, Jackson struggles to obtain enough temporary work visas year round; there is still a shortage of labor in the town. In addition to the seasonal nature of the H2B visa (whereas many low-skilled jobs in Jackson require year round workers), the visas obligate workers to return to their native country for renewal. Anecdotal evidence suggests that employers pressure workers to "overstay." This, compounded by the severe financial implications of a home-and-back trip without guarantee of renewal, cause some immigrant workers in Jackson to remain in the country illegally. Members of the LSN estimate that about half of the town's foreign born workers are currently authorized.

The Bottom Line:
Teton County's immigrant experience is common throughout the Rocky Mountain West, as Latino immigrant communities emerge to provide labor for booming service economies. Jackson's response shows how one town can impact the integration of the immigrants, using human resources, innovative practices, political will, and some public funds. In Jackson, community leaders have determined that the effort and fiscal expenditures committed to the Latino community are outweighed by the newcomers' cultural and economic contributions.

[1]Rice, Lucille. "Taking Root: Valley Reaps Benefits from Successful Immigrant Businesses". *Planet Jackson Hole*. 4-10 July 2007.
[2]GCIR toolkit
[3]Valencia, Gina, et al. "A Changing Community: Diversity and Immigration in Teton County" July 2007

Table 2
Non-Citizen and Immigrant Composition for Selected Industries in the Rockies, 2006
Source: 2006 Current Population Survey

	Non-citizens		All Immigrants	
Industry	Share of Industry's Workforce	Number in Industry's Workforce	Share of Total Workforce	Number in Industry's Workforce
Plastics and rubber products	40.4%	16,629	40.4%	16,629
Furniture and fixtures manufacturing	32.3%	12,080	36.8%	13,779
Textile, apparel, and leather manufacturing	30.7%	6,372	38.2%	7,922
Food manufacturing	26.5%	27,265	34.5%	35,442
Private households	24.2%	17,468	31.2%	22,507
Management of companies and enterprises	23.6%	544	23.6%	544
Beverage and tobacco products	23.0%	4,448	23.0%	4,448
Wood products	22.9%	6,924	22.9%	6,924
Waste management and remediation services	22.7%	6,522	22.7%	6,522
Construction	21.5%	234,030	25.8%	280,896
Accommodation	18.6%	48,053	32.7%	84,443
Agricultural	18.6%	32,930	22.2%	39,311
Food services and drinking places	18.0%	121,530	24.0%	162,231

schools, or children of immigrants, often means that classrooms find themselves full of students who speak little or no English. In 2000, nearly a fifth of all children in U.S. schools had an immigrant parent.[31] For schools with already exhausted resources and other students with special needs (especially in low-income districts), an influx of immigrant children creates considerable hardship in the absence of additional support. Understandably, parents of native children in such school systems are deeply concerned that limited school resources are being diverted to absorb growing numbers of Limited English Proficiency (LEP), immigrant students.

In 1982, the U.S. Supreme Court ruled on the case Plyler v. Doe that public schools could not deny an education to immigrant students or those with immigrant parents, regardless of legal status.[32] Thus all immigrant children in the United States are legally entitled to attend school without suffering from discrimination.

Immigrant school children in the Rockies region are at a socio-economic disadvantage because, compared to natives, many of their parents do not have a high school degree (See Figure 12). In addition, about a third live in linguistically isolated households.[33]

Schools' approach to English language acquisition for ELLs has become as much a political issue as it is an academic one. "English Only" advocates, led by the groups U.S. English and Pro-English, vehemently defend English immersion techniques as the best way to teach English, adding that the use of a native language in the classroom only prolongs English acquisition.[34] Others argue that a bilingual approach not only is a more effective way for students to quickly learn English, but also helps preserve cultural heritage and can be used to teach native children a second language.[35]

Language curricula in schools reflect this wide philosophical spectrum, as they vary greatly in their allowance for (or encouragement of) native language use in the classroom. (See box, p. 18).

In the Rockies region as a whole, the language issue cannot be correctly characterized as an "immigrant problem." The rich Chicano and Native American past in the Rocky Mountain West coincide with longtime resident popula-

Table 3
Immigrant Integration Policy Framework

Geographic Level	Examples of Role in Immigrant Integration
Federal Government	•Civil Rights of Immigrants
	•Eligibility of Immigrants for Federally Funded Public Services (i.e. welfare, health care)
	•Entrance Standards for Prospective Immigrants
	•Number of People Allowed Entry
State Government	•Documentation required to receive services
	•Immigration Enforcement
	•State Funding Directed Towards Immigrants
	•Eligibility of Immigrants to receive State-Funded Public Services
Local Government/ School District/ and Community Initiatives	•Immigration Enforcement
	•General Community Integration Initiatives
	•Language and Cultural Resource Initiatives
	•English Language Acquisition Methodology in Schools

Figure 11
Percent of Children in Native and Immigrant Families in Poverty, 2005
Source: Kids Count Statistics Calculated From 2005 ACS Data

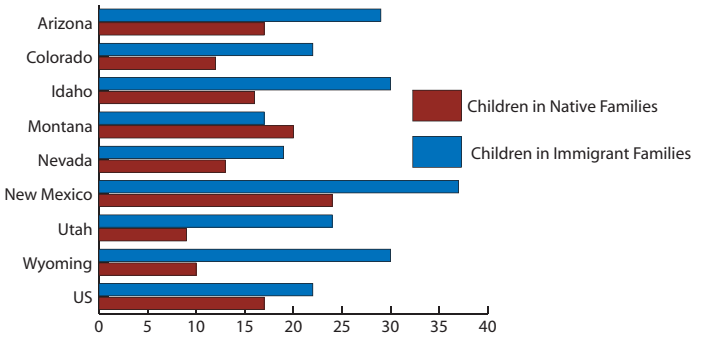
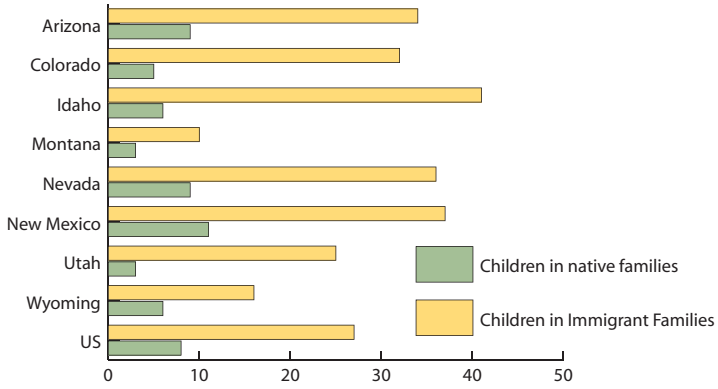


Figure 12
Percent of Children in Native and Immigrant Families Whose Parents Have Less Than a High School Degree, 2005
Source: Kids Count Statistics Calculated From 2005 ACS Data



tions whose primary language is not English. Children who are raised speaking Spanish or another language at home are also likely to be labeled as LEP in school. Because there is no federal mandate to ask students or their parents country-of-origin information, most states do not tabulate how many immigrant students are in their school systems. Therefore it is not clear how many LEP students are also immigrants.

Colorado is one state that does ask students if they were born in the United States. Colorado Student Assessment Program (CSAP) results for 2006 reported that in grades 3 through 10, the number of non-English proficient and limited English proficient students outnumbered the number of immigrant students by a factor of seven (about 35,000 to 5,000).[37] While many immigrant parents are unlikely to divulge the birthplace of their children because of the current political climate, the CSAP statistics suggest that a strong majority of LEP students are not immigrants in some districts.[38] In New Mexico, anecdotal evidence suggests that more than 80 percent of the state's LEP students are native born to native parents.[39] Even if the LEP challenge is not a new one, it is certainly growing in magnitude and immigrant students are responsible for part of this growth.

Across the nation, LEP students comprise a growing share of the total student population. From 1995 to 2005, the number of LEP students grew by 56 percent compared to only 2.6 percent growth of the general student population.[40] This trend is also evident in the Rockies, although some of the eight states have LEP growth rates far higher than the national average. Colorado's LEP enrollment grew by 237 percent from 1995 to 2005, compared to 11 percent growth for the general enrollment. Idaho's rose 97 percent compared to 3.1 percent for the entire student population. Utah's enrollment grew by 163 percent for LEP students and 18 percent total. On the other end of the spectrum, Wyoming's LEP population declined by 16 percent, while the state's total enrollment more than doubled.

Topics in Integration: Immigrants' Access to Public Services and Health Care

The low income and high poverty rates of new immigrant working families in the Rockies region creates a dire need for a safety net in the form of public services. In addition to non-citizens' inability to vote, work in many government jobs, or run for political office,[41] the average non-citizen occupies a starkly different socio-economic stratum than the general populace. Immigrants' use of public services, such as Temporary Assistance for Needy Families (TANF), Food Stamps, and health care, is a key point among those who generally argue for immigration reduction and anti-illegal immigrant policies.[42] In this view, immigrants strain the American tax base and providing services to the poor serves to attract immigrants who become dependent on public assistance. Given the socio-economic condition of immigrants in the Rocky Mountain West, it might be expected that foreign-born residents are creating a disproportionate drain on public services.

However, the data shows that in the Rockies, poor immigrants, both citizens and non-citizens, use drastically less public assistance money than poor natives in several categories (Figures 13 and 14).

In 2000, nearly a fifth of all children in U.S. schools had an immigrant parent

The U.S. Congress fundamentally changed immigrants' access to public services in 1996 when it passed the controversial Personal Responsibility and Work Opportunity and Reconciliation Act (PRWORA). Before PRWORA, most legal immigrants were eligible to receive the same Medicaid, State Children's Health Insurance Program

(SCHIP), food stamps, Welfare, and social security income benefits as U.S. citizens.[43] The law prohibited most authorized, non-citizen immigrants from receiving these services within the first five years of their residency in the United States, regardless of legal status. These restrictions raised concerns regarding civil rights and public health, as legal immigrants still pay taxes and are subject to much the same civic presence as native U.S. citizens, including service in the military.[44] In response to PRWORA, many states immediately attempted to fill the gap left in federal aid by offering state-funded health care and public assistance to those specifically left out in the new policy framework.

As a whole, the state governments of the Rockies region have been among the least generous in providing health and assistance services to recent, legal immigrants in the wake of PRWORA. This raises serious doubts about the legitimacy of the alleged services "magnet" for poor immigrants, as the Rockies region's foreign-born population growth appears unhindered by a relative hardship in attaining basic services.[45]

As shown by Figure 15, just three of the eight Rocky Mountain states are among the twenty-two which fund coverage for immigrants ineligible for federal Medicaid and State Children's Health Insurance Program. However, these provisions are extremely limited with the exception of New Mexico. Colorado only extends state-funded health care to pregnant women, while only certain battered or paroled immigrants qualify in Wyoming, for a maximum of one year.

As of 2005, none of the eight Rockies region states counted among those in the U.S. which had replaced nutritional assistance to immigrants not eligible for the federally-funded Food Stamp Program.[46] Only New Mexico, Utah, and Wyoming offered Temporary Assistance for Needy Families to such immigrants, provided they met

Selected Approaches to Limited English Proficiency Students[36]:

Dual Language Program/Dual Immersion:
Also known as two-way immersion or two-way bilingual education, these programs are designed to serve both language minority and language majority students concurrently. Two language groups are put together and instruction is delivered through both languages. The goals of the program are for both groups to become biliterate, succeed academically, and develop cross-cultural understanding.

Transitional Bilingual Education (TBE):
TBE is an instructional program in which subjects are taught through two languages–English and the native language of the English language learners–and English is taught as a second language. The primary purpose of these programs is to facilitate the LEP students' transition to an all-English instructional environment while receiving academic subject instruction in the native language to the extent necessary. Transitional bilingual education programs vary in the amount of native language instruction provided and the duration of the program.

English as a Second Language:
English as a Second Language (ESL) is an educational approach in which English language learners are instructed in the use of the English language. Their instruction is based on a special curriculum that typically involves little or no use of the native language, focuses on language (as opposed to content) and is usually taught during specific school periods. For the rest of the school day, students may be placed in mainstream classrooms, an immersion program, or a bilingual education program.

Structured Immersion:
In this program, language minority students receive all subject matter instruction in their second language. The teacher uses a simplified form of the second language. Students may use their native language in class; however, the teacher uses only the second language. The goal is to help minority language students acquire proficiency in English while at the same time achieving in content areas.

Figure 13
Food Stamp Payments to Households Below Low Income Level by Citizenship and Nativity, Rockies, 2006
Source: 2006 Current Population Survey

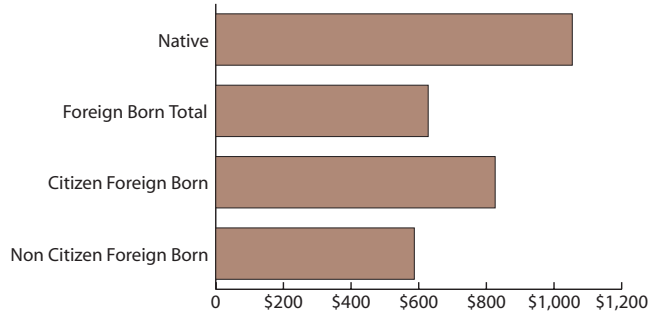
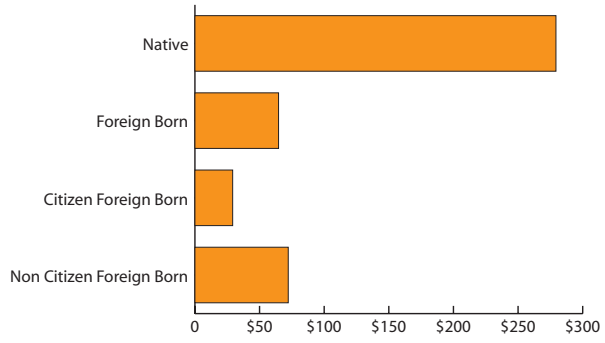


Figure 14
Food Public Assistance to Households Below Low Income Level by Citizenship and Nativity, Rockies, 2006
Source: 2006 Current Population Survey



one of several qualifications.[47]

In 2006, Colorado and Arizona were two of only three states (the other being Georgia) that took measures to reduce immigrants' access to public services. Proposition 200 in Arizona and HB1023 in Colorado did not change who could receive services or what services one could receive, but instead increased the documentation requirements necessary for receipt of services.[48]

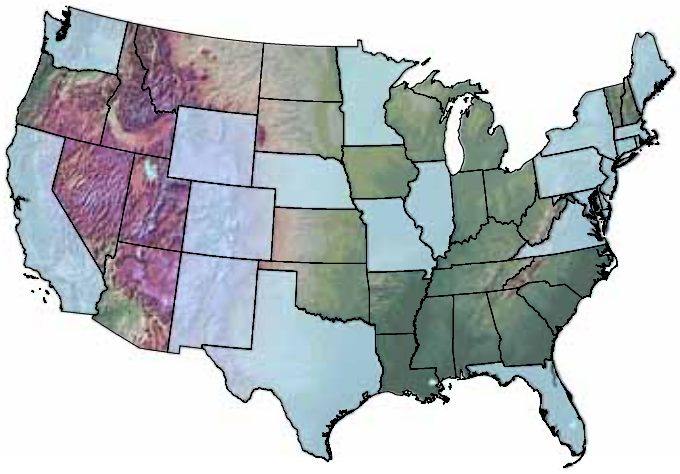
It is unlikely that immigrants' low use of services is due solely to eligibility requirements. Additional barriers exist for poor immigrants eligible to receive public services. These include confusion caused by limited English proficiency, fear of becoming a "public charge,"[49] and requests for sensitive information not pertinent to the receiving individual, such as legal status documentation or Social Security numbers.

Immigrants in the Rockies region, given their low rate of English proficiency, are vulnerable to be perplexed by the complicated matrix of eligibility rules on the federal and state level. Two-thirds of foreign-born residents in the region speak English less than "very well" according to tabulations from the 2005 American Community Survey. In the absence of adequate and easily accessible translation services, poor immigrants miss out on services they are legally entitled to receive. In particular, parents may not understand the potential for their children to receive benefits that the parents themselves cannot, such as SCHIP, or all the benefits of citizenship if the child is U.S.-born.[50]

Health insurance is perhaps the most crucial component of the government's safety net. Most Americans today are keenly aware of a health insurance crisis, but the issue is even more pertinent to U.S. immigrants. Analysis of Current Population Survey data from 2006 shows that immigrants' health coverage in the Rockies region is at critically low levels (Figure 15).

The uninsured gap exists for two primary reasons: for poor people, the gap is mostly due to immigrants' comparatively low receipt of government-provided health care and Medicaid

Figure 15
States Providing Coverage for Immigrants Who are Ineligible for Medicaid or SCHIP, May 2004
Source: Fremstad and Cox (2004)



Blue Indicates States With Some Form of Coverage

(see figures 16 and 17). Employer-based insurance is a second big contributor to the Rockies region's health insurance gap. While 60 percent of U.S. natives receive employer-based health insurance, only 40 percent of immigrants do.[51] This gap comes partly because immigrants in the Rockies hold low wage jobs that are less likely to offer health insurance.

Nationally, Latino immigrants are nearly 40 percent less likely to be offered health insurance at work than white U.S. citizen workers.[52] The temporary nature of many immigrants' jobs and their higher likelihood to work for labor contractors also likely contributes to lower employer-provided insurance rates for immigrants.[53]

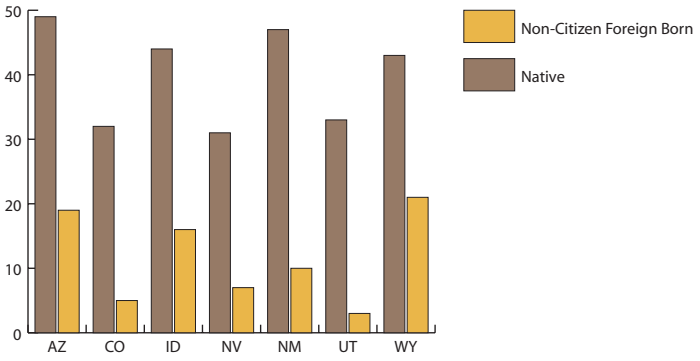
Uninsured immigrants cost states financially, because when immigrants lack preventative care and basic health coverage they must rely on health services provided at the state and community level, which are likely to go uncompensated by the federal government. These include state and county "safety net clinics" for reduced-price health care, and charitable organizations such as churches. A common concern is the cost of emergency room care for unauthorized migrants and immigrants in general.[54] Yet the framework of health care provided to immigrants, especially by government, clearly funnels recent immigrants (non-citizens) towards waiting until a health emergency to seek medical assistance.

Despite the high cost of emergency room services, a recent study showed that total expenditures, public and private, on natives far outweighed that of the average immigrant, $2,546 to $1,139.[55] The Rocky Mountain states could further reduce these costs by strengthening insurance programs for immigrants as a way to prevent reliance upon emergency care.

Conclusion

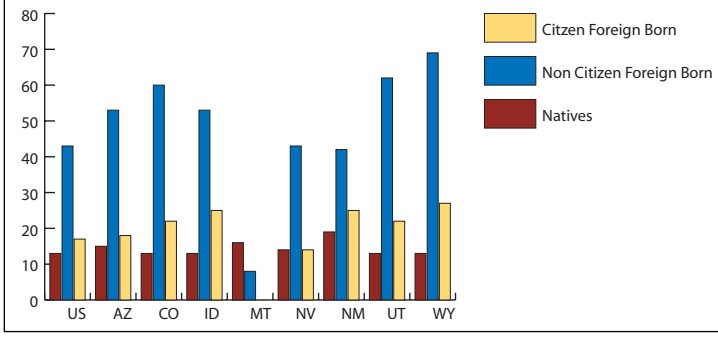
The Rocky Mountain West is confronted by an extraordinary challenge as foreigners move to the region at a record pace. The well-being indices of new immigrants show that they are operating at a severe socio-economic disadvantage in the Rockies, the effects of which could cascade to the population as a whole. Language, cultural differences, and widespread misinformation are all formidable barriers to the seamless and healthy integration of a new demographic. It is essential that the inhabitants of the Rockies, regardless of origin or political inclination, find a common ground upon which they can work towards goals that encompass the diverse needs of all of the region's people. Individuals, communities, and local and state governments must work hard to ensure that today's immigrants find the American West to be the land of opportunity that has greeted people from around the world for over two centuries, including the ancestors of many of those who live here today.

Figure 16
Percent of People Below 200 Percent of the Poverty Line who Receive Medicaid, Natives and Non-Citizen Immigrants, 2006
Source: 2006 Current Population Survey



(Data Not Available for Montana)

Figure 17
Percent of the Population Without Health Insurance by Citizenship and Nativity Status, 2006
Source: 2006 Current Population Survey



A Note About the Data:

Current Population Survey:
The Current Population Survey (CPS) is a monthly survey of about 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics. The CPS is the primary source of information on the labor force characteristics of the U.S. population. The sample is scientifically selected to represent the civilian non-institutional population. Respondents are interviewed to obtain information about the employment status of each member of the household 15 years of age and older. However, published data focus on those ages 16 and over.
Source: U.S. Census Bureau. http://www.census.gov/cps/ Accessed 2.2.2008

American Community Survey:
The American Community Survey (ACS) is a nationwide survey designed to provide communities a fresh look at how they are changing. It is a critical element in the Census Bureau's reengineered 2010 census plan. The ACS collects information such as age, race, income, commute time to work, home value, veteran status, and other important data from U.S. households. As with the official decennial census, information about individuals will remain confidential.

The ACS collects and produces population and housing information every year instead of every ten years. About three million households are surveyed each year, from across every county in the nation.

The ACS began in 1996 and has expanded each subsequent year. Data from the 2006 ACS are available for geographic areas with a population of 65,000 or more, including 783 counties, 436 congressional districts, 621 metropolitan and micropolitan statistical areas, all 50 states, and the District of Columbia.
Source: U.S. Census Bureau. http://factfinder.census.gov/ Accessed 2.2.2008

Decennial Census:
Most Census data are available for many levels of geography, including states, counties, cities and towns, ZIP codes, census tracts and blocks, and much more.
A limited number of questions were asked of every person and housing unit in the United States. Information is available on Age, Hispanic or Latino origin, Household Relationship, Sex, Race, and Housing Characteristics
Source: U.S. Census Bureau. http://factfinder.census.gov Accessed 2.2.2008

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[They found that wages of native workers declined by 3 percent between 1980 and 2000, and by 9 percent among the least educated workers, due to immigration. In contrast, Ottaviano and Peri) Ottaviano, Gianmarco I. P., and Giovanni Peri. 2006. "Rethinking the Effects of Immigration on Wages." NBER Working Paper no. 12497. Cambridge, MA: National Bureau of Economic Research.)
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Renewable Energy in the Rockies

Responsibly Using the Resources of the West

By Elizabeth Kolbe

Key Findings

•The Rockies region is home to world-class wind, solar, and geothermal energy resources.

•Five of eight Rockies states are among the top 15 windiest in the country.

•More than 97 percent of Wyoming's electricity supply currently comes from coal.

•86 percent of Idaho's electricity currently comes from hydropower.

•Energy usage in the Rockies is 9 percent lower than the U.S. average and consumers' monthly bill is 17 percent lower than the national average.

About the author: Elizabeth Kolbe (Colorado College class of 2008) is a student researcher for the 2007/08 State of the Rockies Project.

Introduction

The demand for energy in the United States has never been higher. As the population of the United States passes 300 million, American energy consumption continues to climb with cell phones, TVs, personal computers, and 1.86 children per family leaving the lights on late to finish reading Harry Potter.[1] However, political instability in energy-producing nations, rising energy costs, and increasing concern about climate change have prompted Americans to seek energy that is clean, cheap, and domestically produced. The drive to meet these terms has sparked public, economic, and governmental interest in renewable energy. The Rockies states are already major energy producers, home to some of the largest coal beds in the world and the nation's only natural gas fields with increasing production projections.[2] However, the Rockies are also capable of becoming a world-class production region for renewable energy.

The eight-state region is home to world-class wind, solar and geothermal resources, along with local hot spots for biomass potential. These resources qualify as renewable because they are essentially inexhaustible: they naturally replenish themselves as we use them. Occasionally "clean coal" and nuclear power are listed as renewable energy sources, but they will not be included as such in this report because coal and uranium are not replenishable on a timescale useful to humans. This report does consider hydroelectric power a renewable resource; nevertheless, most of the large rivers in the West have already been developed and there is little potential for expansion. As such, hydro's role in the energy mix of the Rockies will likely remain stable and will not be discussed further.[3]

Each person drawn to renewable energy is attracted by something different. For some, the promise of making money in a growing market is reason enough to act. But for the average person, supporting renewable energy may come with extra financial costs. So why do it? Why support a movement that until recently seemed to have trouble breathing in America's free market system?

National security has been on the minds of Americans and the tongues of politicians since 9/11/2001. As relationships with oil-rich nations remain tenuous, it is only sensible to end our dependence on that which has become unreliable. By fully understanding the wealth of our resources, we can formulate an energy policy to free our livelihood from the need to protect oil and gas interests overseas. Renewable energy can also mean energy independence for the individual. Living "off the grid" can empower individuals and local economies by freeing them from centralized infrastructure. This is especially true in the Rockies where people look to renewables to maintain their autonomy.

Still others see renewables as a way to make the world a better place. By implementing clean renewables, we directly combat global climate change (for more on climate change in the Rockies, see the *2006 State of the Rockies Report Card*). Whether or not humans are perpetuating climate change is no longer debatable. What is important is what we can do to slow the change of the Earth's climate. We emit a lot of greenhouse gases —somewhere on the order of 1.6 gigatons (3.5 trillion pounds) of carbon per year.[4] But according to a report by the American Solar Energy Society (ASES), coauthored by scientists at the National Renewable Energy Laboratories, the Massachusetts Institute of Technology, and the Rocky Mountain Institute, increased energy efficiency and the development of renewable energy resources can make large reductions in emissions. Although the authors of the ASES report remind the readers that uncertainties were present within their research, they were confident enough to say:

> The results strongly suggest, however, that energy efficiency and renewable energy technologies have the potential to provide most, if not all, of the U.S. carbon emissions reductions that will be needed to help limit the atmospheric concentration of carbon dioxide to 450 to 500 ppm.[5]

The authors assert that the concentration of CO2 noted in the quotation are the levels we must reach to maintain some semblance of the current biological, economic, and social order.

Lastly, we have a responsibility to our land and to our posterity. The Rockies region has a history of extraction, often devastating ecosystems and scarring the land (see section on Surface Water and Restoration in the *2008 State of the Rockies Report Card*). Renewable energy provides the Rockies a way to utilize our natural resources without causing harm to our environment. By maintaining a healthy environment and becoming ener-

Gas station, southeastern Utah © Charlie Kenyon

gy independent we set an example for the future, providing generations to come with the beauty, resources, and opportunities that our ancestors have given us. Many people who dedicate their lives to renewables do it on moral grounds – they will not stand for environmental destruction any longer.

This chapter outlines current electrical generation and consumption trends, and the role of renewable energy in our current system. It also discusses the potentials of each renewable resource in the Rockies and the role governments and utilities play in moving our society toward a sustainable future.

Current Production – Trends

Between 1990 and 2006, electricity production grew from 3,185 to 4,250 terrawatt hours (see Figure 1).[6] This addition of 1,065 megawatt hours (MWh, equivalent to one million watts) represents a one-third increase in generation over 16 years. Consumption was not the only thing to increase. In nearly the same time period electricity rates increased just over one cent per kilowatt hour (KWh). (See Figure 2).[7] One cent may not seem significant, but the average U.S. home uses 938 KWh of electricity per month, so the heightened rates increase the average home's electricity bill by roughly $10 per month.

Mix Over Time

The power generation mix of the U.S. has been relatively constant since 1960. As generation capacity has increased, coal and natural gas have maintained their respective, and large, holds on the industry. The only changes in the generation mix over time occur with the entrance of nuclear power into the market. This occurred when hydro reached the limits of its capacity and the petroleum industry exited electrical generation to produce more auto fuel. Around 1990, renewables began to penetrate the industry, but even today are only a minute player in electrical generation.[8] (See Table 1.)

Figure 1
U.S. Electrical Production, Terawatt Hours, 1990-2006
Source: Energy Information Administration

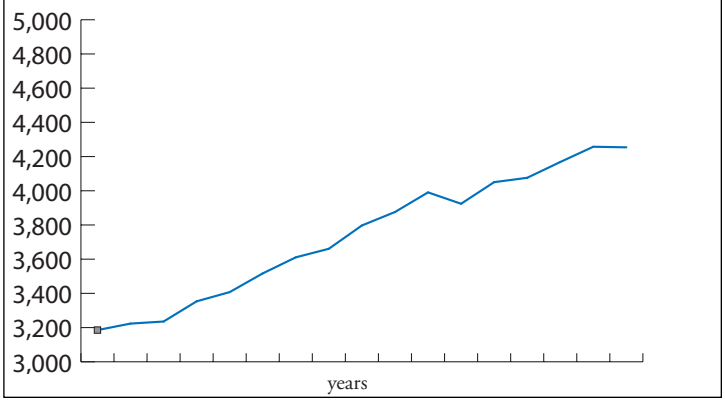
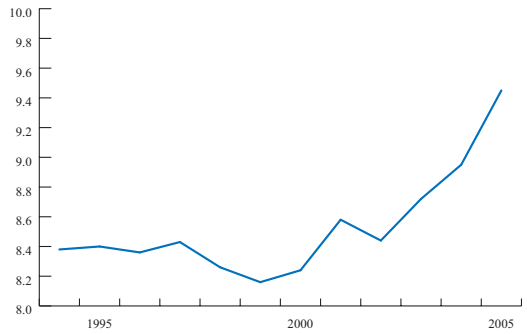


Figure 2
U.S. Residential Electricity Prices,
Cents per Kilowatt Hour, 1994-2005
Source: Energy Information Administration



The Rockies region has seen coal-powered electricity skyrocket since 1960, decreasing the region's reliance on hydro, natural gas, and petroleum as electricity sources. As a group, renewable resources came to the Rockies markets later than the rest of the country. Geothermal accounted for just over 1,000 MWh of power by 1969, and wind brought only 2,000 MWh by 1989.[29] By comparison, a single, modern wind turbine can produce 4,000 MWh of power. Geothermal energy finally accounted for 1.5 percent of electricity in the Rockies starting in 1995.[10] (See Table 2.)

At the state level within the Rockies, some startling statistics emerge. Wyoming burns the highest percentage of coal, which fuels upwards of 97 percent of the state's electricity. Arizona does not reach the national average in coal consumption, but reaches well over the average in nuclear and natural gas. Idaho is the anomaly of the region. The state generates 86 percent of its power from hydroelectric sources, and nearly 1.5 percent from biomass.[11] Also important to note are the states' exports and imports of energy. The net imports and exports show how self-reliant a state can be for its energy needs. States whose power companies have to buy energy off the grid do so at a higher price, so self-sufficiency for power providers is economically attractive. As of 2004, only two of the Rockies states, Montana and Wyoming, were net exporters of electricity.[12]

Average Monthly Consumption and Costs

The Rockies states have relatively inexpensive energy, but we need to use it more wisely. The region finishes in the middle of the scale in per-household energy consumption for U.S. states. Although below the national average consumption of 938 KWh per month, the Rockies ranked fifth out of ten regions in 2005 at 852 KWh of energy consumed per household every month (Figure 3).[13] Simple steps can be taken to decrease energy use in the home. Many utilities offer energy-saving tips on

Table 1
U.S. Energy Generation Mix, 2005
Source: US Department of Energy, and Union of Concerned Scientists

Energy Source	Megawatt Hours	Percent of Total
Coal	2,013,178,838	50%
Hydroelectric Conventional	269,586,532	7%
Natural Gas	757,974,331	19%
Nuclear	781,986,365	19%
Other	4,748,646	0%
Other Gases	16,316,773	0%
Other Renewables	94,932,377	2%
Petroleum	122,521,953	3%

Table 2
Rockies Energy Generation Mix, 2005
Source: US Department of Energy, and Union of Concerned Scientists

Energy Source	Megawatt Hours	Percent of Total
Coal	221,279,564	63%
Hydroelectric Conventional	29,415,041	8%
Natural Gas	66,823,944	19%
Nuclear	25,807,446	7%
Other	125,589	0%
Other Gases	391,254	0%
Other Renewables	4,497,939	1%
Petroleum	614,863	0%

their websites, and some even sponsor conservation and efficiency workshops. A few ideas include switching to compact fluorescent lightbulbs, turning down water heaters, unplugging seldom-used appliances, and taking advantage of the West's arid climate to line-dry clothes.

Energy usage in the Rockies is nine percent less than the U.S. average rate, and, the Rockies consumer's monthly bill is 17 percent lower than the national average (Figure 4).[14] The gap between these percentages is created by the average cost (rate) of energy; rates in the Rockies are eight percent lower than the national average (see Figure 5). Looking at the region state-by-state, some interesting observations can be made (see Figures 6, 7, and 8).

Nevada and Arizona, the highest energy users after Idaho, pull up the regional average for monthly bills considerably, as they each average more than $90 per month. Given the two states' high prices and high consumption, this is not surprising. Nevada has the highest energy price rate and Arizona has the fourth highest rate in the region. In addition, they are the third and second largest consumers of energy in the region, respectively.[15] Homeowners and city planners in these states, as well as around the nation, should be asking themselves where they can reduce energy consumption. Undoubtedly, air conditioning is a major contributor to high energy use in these states. Instituting building codes with design standards aimed at reducing cooling needs would be a good first step for planners. Homeowners may look to simpler measures, such as installing ceiling fans and improving insulation and ventilation.

New Mexico residents are the most efficient users of energy. New Mexicans have the lowest average monthly consumption of any Rockies state, so despite paying the second-highest rates, they have the second lowest average monthly bill.[16]

Current Renewables Production

In the past five to ten years renewable resources have been increasingly utilized for electricity production. Utility companies are now implementing large wind farms, photovoltaic, geothermal, and concentrated solar facilities around the region. This trend comes, in part, from the utilities' effort to meet their Renewable Portfolio Standards (RPS), which identify the percentage of energy generated in the state that will be produced from renewable sources by a certain year. Wind is currently the leading installed renewable source in the Rockies

Figure 3
Monthly Household Residential Electrical Consumption in the U.S. by Census Division, 2005
Source: Energy Information Administration

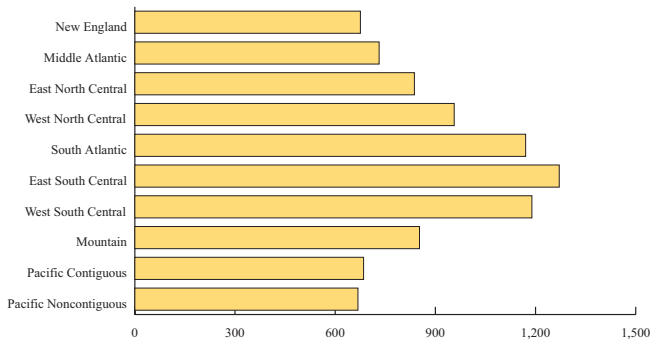


Figure 4
Electricity Consumption in Rockies States, all Sectors, MWh/yr, 2005
Source: Energy Information Administration

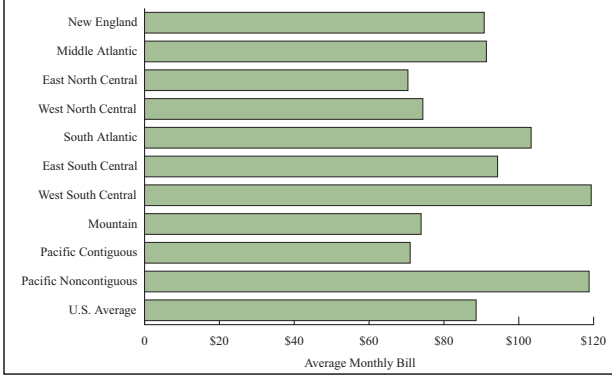


Figure 5
Average Monthly Residential Electricity Rate by Census Division, Cents per Kilowatt Hour, 2005
Source: Energy Information Administration

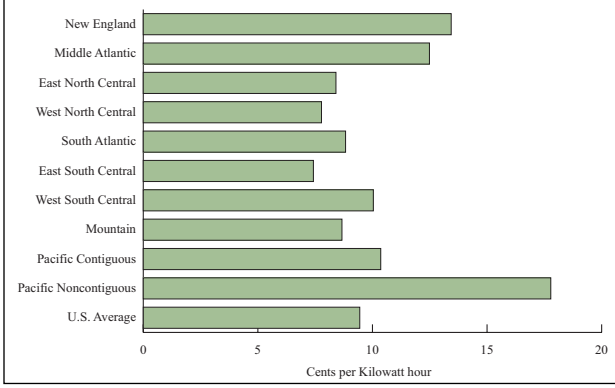


Figure 6
Average Monthly Residential Electricity Bill by Rockies State, 2005
Source: Energy Information Administration

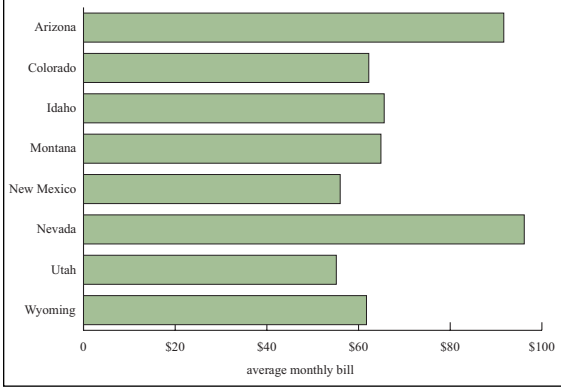


Figure 7
Average Monthly Residential Electricity Rate by Rockies State, Cents per Kilowatt Hour, 2005
Source: Energy Information Administration

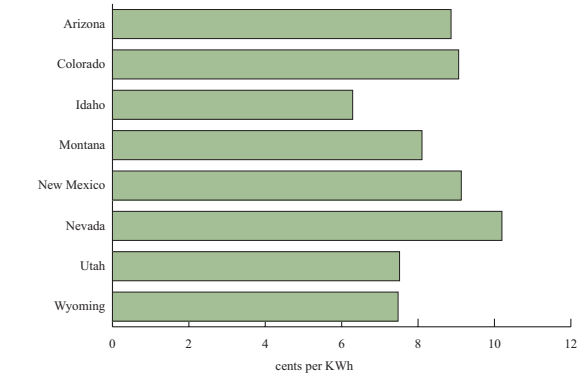
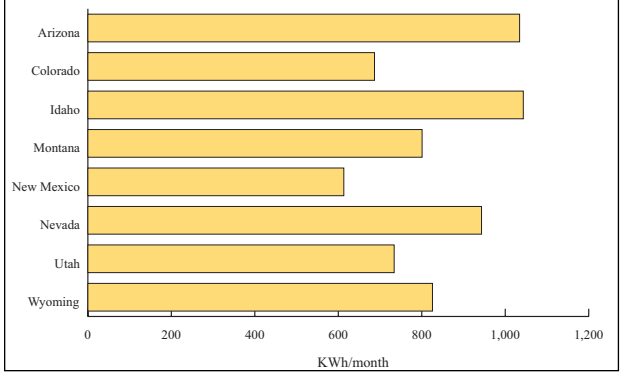


Figure 8
Monthly Household Residential Electrical Consumption in the Rockies by State, 2005
Source: Energy Information Administration



with 1,372 MW online, an electrical supply roughly equivalent to four or five coal-fired power plants.[17] Solar appears to have only a marginal contribution to date; however, many private solar systems are off-grid and while these are very important to the renewables movement, they are not included in this calculation. Home solar that is grid-tied can theoretically sell energy back to the system via net metering. This practice is financially important to the homeowner, but the amount of energy put into the grid is miniscule. A state-by-state breakdown of renewable energy generation can be seen in Table 3. The Rockies states are beginning down the renewables path, but have a long journey ahead of them.

Renewables Potential: Wind Resources

Wind power is usually broken into classes 1 through 7, where higher numbers indicate better wind. Generally, areas with class 3 wind or higher are good options for development (see Figure 9). The Dakotas are known for their consistent winds, but five of the eight Rockies states are among the top 15 windiest in the country.[18]

Magnifying the scale to the Rockies, it becomes apparent that the tops of mountains are often very windy but infeasible to develop because of limited access to roads and power lines (Figure 10). Nevertheless, the plains of Colorado, Wyoming, Montana, and eastern New Mexico are excellent places to install wind turbines. The top ten windiest counties, all registering in a wind power class between 4 (good) and 5 (excellent), lie along the front range of northern Montana and the plains of Wyoming.[19] The Rockies has ample class 3 wind resources; current facilities use just 0.3 percent of the region's wind potential.[20]

Solar Energy Resources

Based on the region's solar resources, it is in the best interest of Western states to aggressively develop solar energy. Figure 11: Annual Solar Resources of the Conterminous United States, shows annual solar energy resources across the country. The Rockies are highly distinguished; seven of the eight states register as superior solar resources, between 5,000 and greater than 6,000 kilowatt hours per square meter per day (KWh/m^2/day). (See Figure 12.)

Among the Rockies states, Arizona, New Mexico, and

Table 3
Installed Rewable Capacity by Rockies State (MW)
Source: Renewable Energy Atlas of the West, 2006

Resource Type	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Wind	0.1	366.0	75.0	146	0.0	496.0	1.0	288.0
Solar (PV)	11.8	8.2	0.1	0.1	15.1	0.1	0.0	0.1
Solar (Thermal)	0.1	No data	0.0	0.0	64.0	0.0	0.0	0.0
Geothermal	0.0	0.0	0.0	0.0	346.0	0.0	39.3	0.0
Biomass	5.3	6.1	119.6	16.1	1.0	2.2	4.0	0.0
Total	17.3	380.3	194.7	162.08	426.1	498.3	44.3	288.1

Montana hold the greatest resources, each receiving the equivalent of over 100 million MWh/yr from the sun, nearly the equivalent amount of energy used by all three states combined in 2005.[21,22] Yuma and La Paz Counties of Arizona, and Luna County of New Mexico, are the top three sunniest counties in the Rockies. Residents of these counties would benefit from solar generation for their homes, and should urge electrical providers to utilize solar on a larger scale.

Solar energy development, however, should not be limited to the areas with the highest exposure. Compared with the rest of the country and most of western Europe, where solar is widely used, nearly the entirety of the Rockies receive superior sunshine (See Case Study: German Solar). The region's neglect of prime solar resources is striking when contrasted with other countries that pour research and capital into the development of relatively less lucrative renewable opportunities.

Currently, the solar energy market is dominated by photovoltaics (PV). PV systems are able to capture diffuse sunlight and convert it to electricity. These work best when installed facing south, but rotational axes can be installed in a variety of ways, usually on rooftops. Building integrated designs with PV cells, glass, or shingles is becoming more popular, especially in Germany, Japan, and Spain. In these countries, an emphasis is placed not only on the importance of renewable energy, but also on the aesthetics and beauty of the building. In the Rockies, this sort of energy is just starting to make its way into the market. It does not come easily, however. The Energy Company Xcel's solar financial rewards are lower for building integrated solar than rewards for conventional solar, and the technology is more expensive to purchase.

Another attractive quality of solar energy in the Rockies is that it can be easily implemented on the home, commercial, and utility scale. While solar fields installed by power companies can provide energy for thousands,

Figure 9
Wind Resources of the Conterminous United States
Source: National Renewable Energy Laboratory, US Department of Energy, 1987

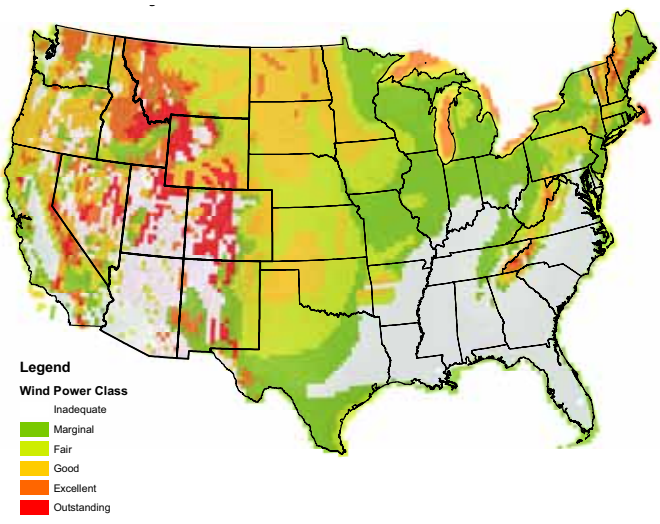


Figure 10
Wind Power Resource Potential in the Rockies (50 meter wind)
Source: TrueWind Solutions, provided by NREL

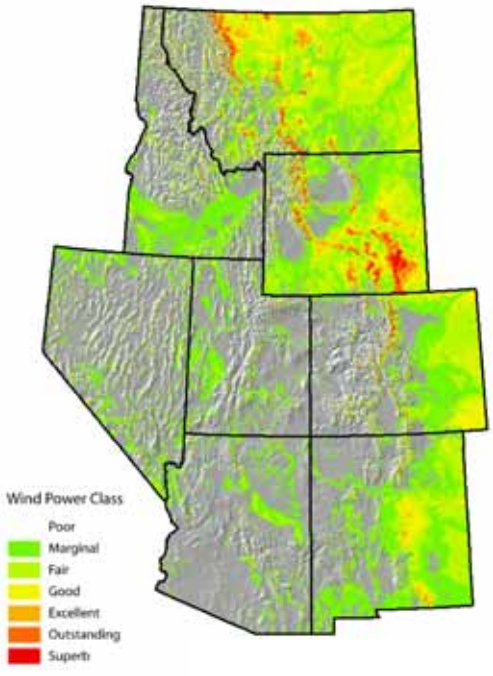


Figure 11
Annual Solar Energy Resources of the Conterminous United States (KWh/m^2/day), Flat Panel Irradiance, South-Facing, Latitude Tilt
Source: Perez et al. (2002), Provided by NREL

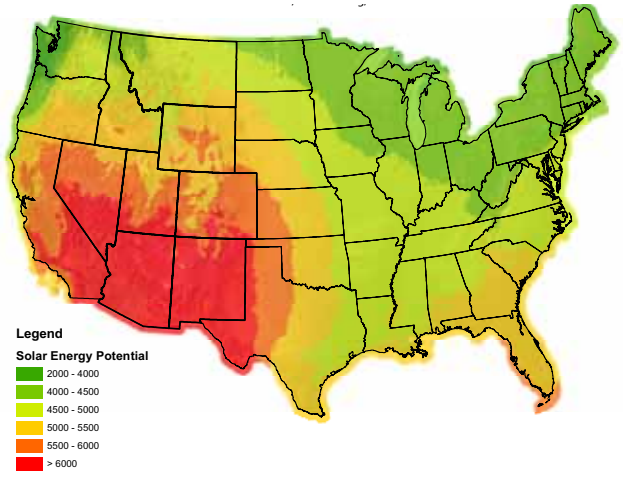
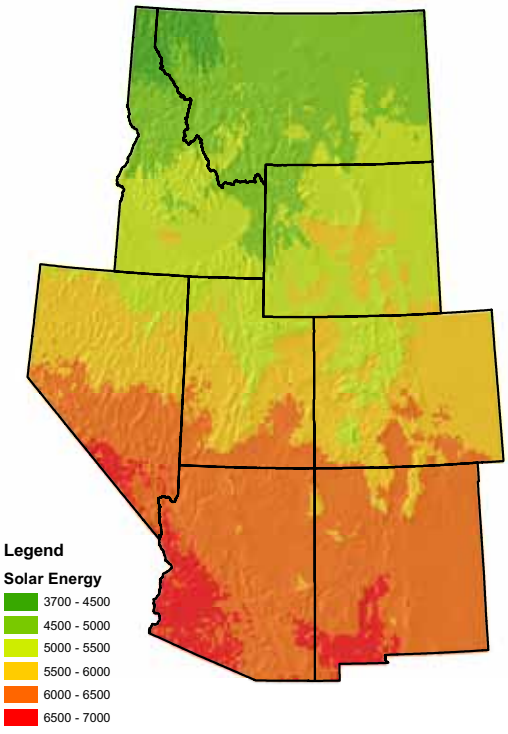


Figure 12
Annual Solar Energy Resources of the Rockies (KWh/m^2/day), Flat Panel Irradiance, South-Facing, Latitude Tilt
Source: Perez et al. (2002), Provided by NREL



individual solar installations provide clean, renewable energy regulated solely by the home or business owner with the option of selling power back to the grid.

On the Horizon

Concentrated Solar Power, or CSP, is beginning to move into the U.S. market. Although still utilizing the sun, CSP works very differently than PV. CSP uses direct sunlight, mirrors, and a central collector to generate heat, and consequently, power. CSP holds a spatial advantage over PV: CSP uses five acres of land per megawatt of power produced, while PV, at best, requires 7.4 acres per megawatt.[23, 24]

The most common and cost-effective type of CSP is the parabolic trough, which is composed largely of concrete, steel, aluminum, and mirrors. Not including storage, the cost of building a CSP facility is $3.20-3.50 per watt.[25] The parabola is designed so that wherever the sun's rays hit, the light will be reflected directly onto a pipe filled with liquid. When the liquid is heated by the sunlight, it generates steam to move a turbine. This method of power generation is essentially the same mechanical technique as used by gas and coal-fired power plants, the only difference being that the energy to create the steam comes from the sun rather than a non-renewable resource. CSP can also be achieved with dishes or towers, but these methods are not yet proven on the market and, therefore, not as attractive to investors. Also, because CSP needs very direct sunlight, not all areas suitable for PV are suitable for CSP. Yet the best areas for PV are generally good places for CSP; counties with high solar resources should look into CSP development.

the U.S., CSP is most famously used in Boulder City, NV, at Nevada Solar One, which has a capacity of 64 MW. It is the third largest CSP facility in the world and generates enough power to cover the needs of more than 15,000 average households.[26] (See Case Study: Nevada Solar One.)

Biomass Resources

Biomass resources should not be confused with biofuel resources. The biomass resources in this section consist of crop residues (corn stalks), forest residues (trees from thinning), animal waste (methane digesters and water treatment plants), and landfill gas. The distillation process for ethanol and other *biofuels* is very different than the combustion process for electricity utilized by these resources. This section focuses on electricity generation with biomass and not biofuels. Biomass can be very effective when operating locally and diversely; there are dozens of ways to utilize biomass. In addition, most biomass not used for energy is thrown into landfills or released, uncombusted, into the atmosphere. Therefore, biomass energy is often a cost-effective and environmentally-responsible option. Figure 13: Annual Biomass Resources of the Conterminous United States, shows the biomass resources of the country broken down by state and county. Compared to the Midwest, the Rockies seem quite deficient in their quantity of biomass re-

Case Study: German Solar Comparison

The United States has the resources to be a world leader in solar power, but currently Germany is driving the market. Germany's sunshine, in the best places, is 33 percent less intense than Colorado's sun, yet the country installed 750 megawatts (MW) of solar power across 100,000 roof tops in 2006.[52,53] These numbers follow 600 MW of solar installations in 2004 and 750 MW of solar installations in 2005.[54] In all, Germany has installed 2,500 MW of solar energy.[55]

In the U.S., photovoltaics are tagged as too expensive. Germany sidesteps this problem by implementing "feed-in rates." Feed-in rates are the rate the utility company pays the owner of the solar system for the power that goes into the grid. The U.S.'s practice of net-metering is similar, but not as thorough. Net-metering only pays solar owners for the net power they generate; feed-in rates pay for all the power produced, even if it is used on-site. Plus, German feed-in rates are higher than American net metering. Jim Welch, President of Sun Electric Systems, sees feed-in rates as the best way to make solar competitive. It is simple, efficient, and easy to execute.

Solar Church, Germany
Implements vertical panel configuration
Photo Courtesy of Bella Energy

In Germany, normal solar collectors receive around 61 cents/kWh produced and building integrated solar receives 85 cents/kWh produced.[56] Essentially, Germany is paying a premium for ingenuity and architectural verve. As architects and engineers work together, new more efficient technology is often created. This serves as a potential driver to make solar more economically competitive, while at the same time making homes and buildings aesthetically pleasing and less susceptible to the vagaries of overcommitted centralized grids.

Illuminiertes Building, Germany
Uses architecturally integrated solar design
Photo courtesy of Bella Energy

sources. Small scale and localized biomass, however, is often very rewarding.

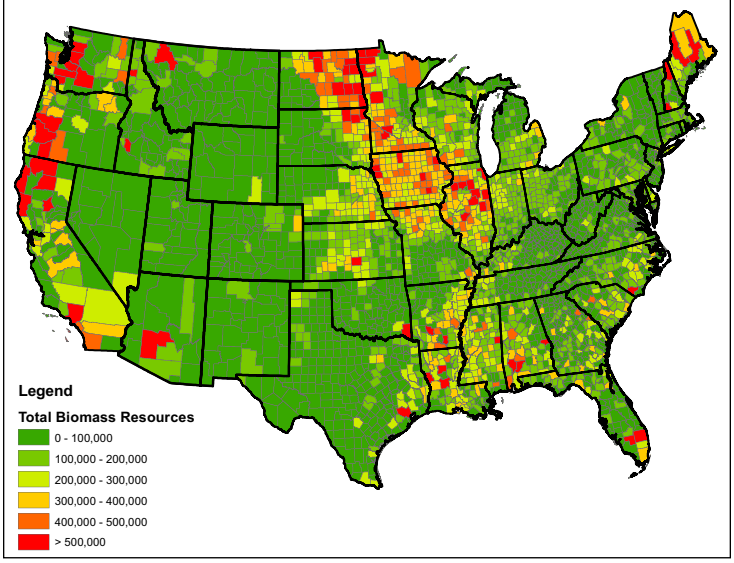
Maricopa County, Arizona, where Phoenix is located, stands out as a biomass hotspot (see Figure 14). This may seem peculiar given that Phoenix does not support much agriculture, but the beauty of biomass is its diversity and adaptability. The dense populations of Maricopa County generate waste that can be transformed to energy through landfill gas, wastewater gas, and urban wood residues. Other areas such as Las Vegas in Clark County, Nevada, boast similar resources from their waste.

Unlike Maricopa and Clark Counties, the top three counties in Idaho and Montana rely on residues from the timber milling industry for their biomass resources. Yuma County, Colorado, which is fifth best overall, benefits mainly from crop residues. On the national scale, and even on the regional scale, biomass does not appear to be a priority in the Rockies. On the local and municipal scale, however, the impacts of utilizing biomass should not be overlooked.

Geothermal Resources

Geothermal hot spots are normally caused by specific geologic features or seismic activity, but more generally geothermal heat resources are created by radioactive decay of elements in the Earth. A quick glance at Figure 15: Geothermal Resources of the Contiguous United States, shows that similar to solar resources, the Rockies stand out for geothermal resources. These resources represent huge assets to the region. The nature of geothermal power is intrinsically different than that of wind and solar. The latter sources are not constant: wind can stop blowing and the sun does not always shine. Conversely, geothermal is capable of handling large base loads of power needing a consistent, reliable supply. Figure 16: Rockies Geothermal Resources by County, illustrates the Rockies' geothermal resource potentials on the state and county level. With all of its resources, the Rockies are far behind in installed geothermal energy. The national capacity of geothermal facilities is 3,000 MW.[27] In the Rockies, geothermal electricity generation is most widely used in Nevada. Yet the state only has a capacity of 346 MW of geothermal power; a little less than one

Figure 13
Annual Biomass Resources of the Conterminous United States (tonnes per year)
Source: National Renewable Energy Laboratory, US Department of Energy



coal-fired power plant in Pueblo, Colorado.[28]

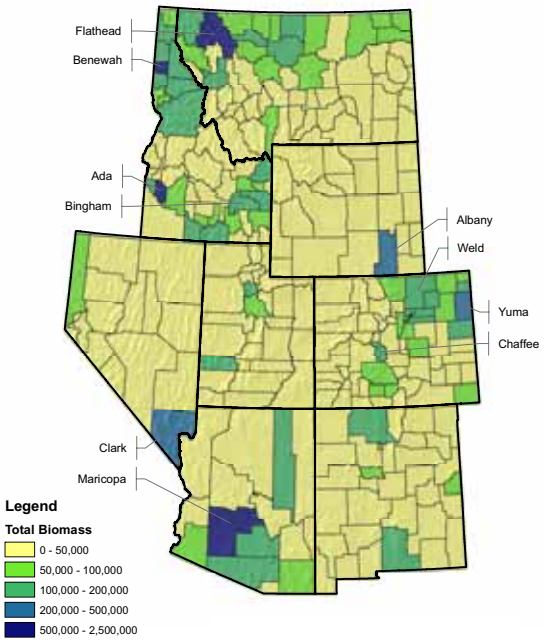
While Nevada is currently the leader in developing geothermal energy in the Rocky Mountain West, other parts of the region provide more geothermal resources. Counties in Montana and Wyoming hold the greatest opportunity, yet portions of these counties lie within the boundaries of Yellowstone National Park and therefore will probably never be developed. This renders counties in the rest of the top ten, located around southern Idaho and northern Utah, very desirable for geothermal energy facilities.

Geothermal resources can be captured at the utility scale, but also at the residential scale. For utilities, geothermal energy is used to heat water to create steam that spins a turbine to generate power. Geothermal heat pumps, used in homes and businesses, are efficient in most parts of the United States because a direct geothermal heat source is not needed. Heat pumps take advantage of the stable temperatures underground to regulate the temperature of the building. To achieve this, pipes filled with a water-based fluid are coiled underground. The earth-insulated fluid is warmer in the winter and cooler in the summer, resulting in more comfortable living environments throughout the year. Curt Robinson, Executive Director of the Geothermal Resources Council, notes, "Ground source heat pumps are the Volkswagon of geothermal, bringing it to one's home, just like solar panels."[29]

Purchase example:

A homeowner in Iowa installed an Econar, a closed-loop geothermal system. The slinky system was composed of 3200 feet of ¾ inch plastic pipe buried 8-9 feet deep. The quote for the project was $13,350, and after the addition of an air filter came to $13,650. Alliant Energy provided a $2,285 rebate on the project. The couple expects to save 46 percent on their total utility bill. With an average yearly bill of $3,180, the cost of the heat pump will be repaid within eight years.[30]

Figure 14
Cumulative Biomass Resources by Rockies County, 2005 (tonnes per year)
Source: National Biomass Assessment, NREL



Demand Side Management

One way utilities currently try to deal with peak demand issues is through Demand Side Management (DSM), which are programs that encourages energy conservation. DSM is especially sensitive to conserving energy during peak usage times. For example, turning down your air conditioner and not using the clothes dryer in the afternoon can greatly lessen the stress on utilities during peak hours. By lowering and normalizing the volume of energy needed, utilities, and therefore consumers, save money (see Figure 17).[32]

Conservation

Americans take pride in being visionary. However, we have traditionally focused our vision on the variety of ways in which we can have more of what we want. We define progress as more houses, more jobs, and more technology. Growth and development require changes and adaptations that consume energy. Looking ahead, we need to redirect our vision to answer the question of how we can use less—how we can conserve.

No new form of energy, or mix of energy, makes us more secure than not needing the energy in the first place. In

all of our technologically progressive projections for the future, we have focused on meeting demand—not modifying our demand to accommodate our resources and infrastructure. Energy independence must mean more than weaning ourselves from foreign fossil fuels. It should also mean taking the system out of the clutches of a sprawling grid and infrastructure that races to keep up with growing consumption. By doing this, we could not only save money in our homes on our energy bills, but keep from investing millions of dollars towards the construction of unneeded power plants and infrastructure. Needing less can be far more liberating—and contribute more to our national security—than having more.

Intermittence

Although both wind and solar can make excellent additions to the energy grid, the variability in wind resources and sunshine prevents turbines and PV from supplying large base loads of power as reliably as coal-fired power plants. This "intermittence" is an ongoing problem for wind and solar energy. Turbines in most windy places will produce power some 70 percent of the year.[33] Unfortunately, the American expectation to receive unlimited power at *all* times renders 70 percent an underachievement.

This shortcoming should not cause wind and solar to be marginalized. Recent studies suggest that intermittence will have a far less negative impact on the grid than previously thought. Ron Lehr, former Chairman and Commissioner of the Colorado Public Utilities Commission, points out that Danish, German, Spanish, Irish, and English power system engineers are dealing with a much higher percentage of wind on their grids than the United States, without many storage concerns.[34] EnerNex's Wind Integration Study stated, "Many of the earlier concerns and issues related to the possible impacts of large wind generation facilities on the transmission grid have been shown to be exaggerated or unfounded by a growing body of research, studies, and empirical understanding gained from the installation and operation of over 6,000 MW of wind generation in the United States."[35] Among these studies is one performed for Xcel Energy, Colorado's largest energy provider. In 2010, it plans to install 1,500 MW of wind power to an area of Minnesota that only uses 10,000 MW of electricity, substituting 15 percent of power use to an "intermittent" resource.[36]

Intermittence has become exclusively associated with renewable energy. It seems people have forgotten what the failings of other types of energy could mean for the reliability of the grid. What would happen if foreign oil and natural gas imports were to cease? If we cannot safely store nuclear waste, what effect will that have on our national security? How secure are coal supply lines that stretch across the country? The intermittence of renewable energy is no reason not to push forward with its development; it simply emphasizes the need for diversity in energy generation. Just as our reliance on oil as the sole fuel of our automobiles causes environmental and political problems, a complete reliance on a single electrical power resource creates energy vulnerability. Energy is critically important to our national security and renewable, domestically-produced energy must be a top priority.

Figure 15
Geothermal Resources of the Contiguous United States (MW/m^2)
Source: SMU Geothermal Laboratory

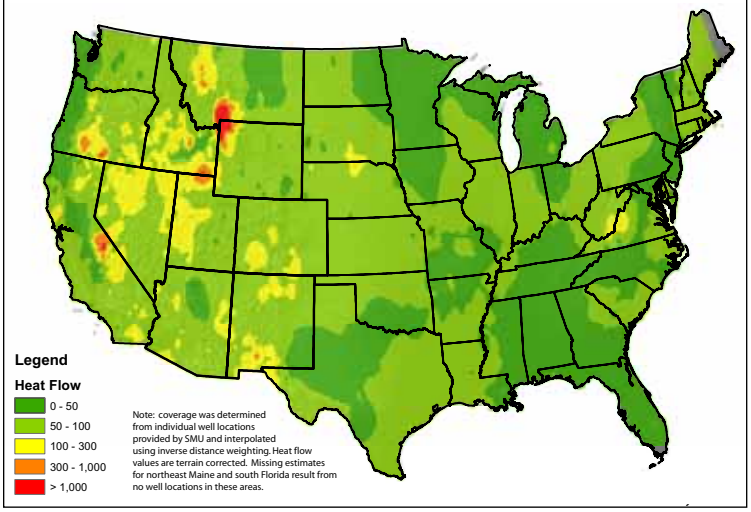


Figure 16
Geothermal Resources in the Rockies by County (MW/m^2)
Source: Calculated from SMU Geothermal Laboratory statistics

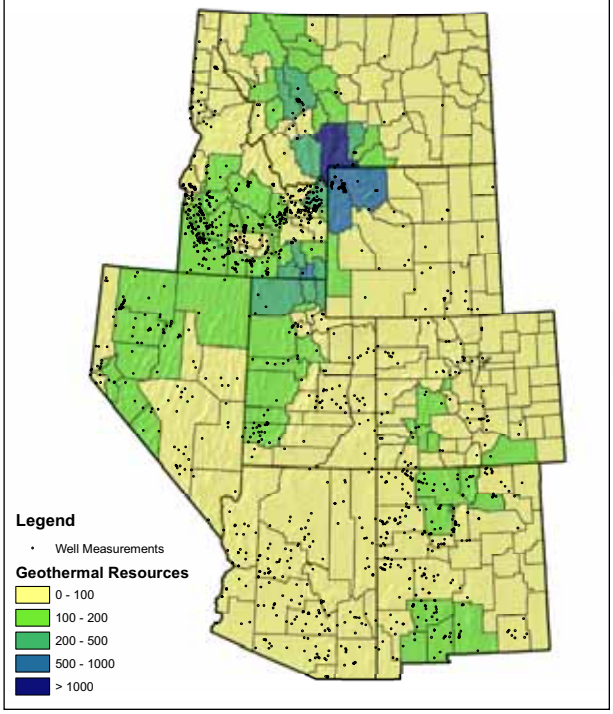
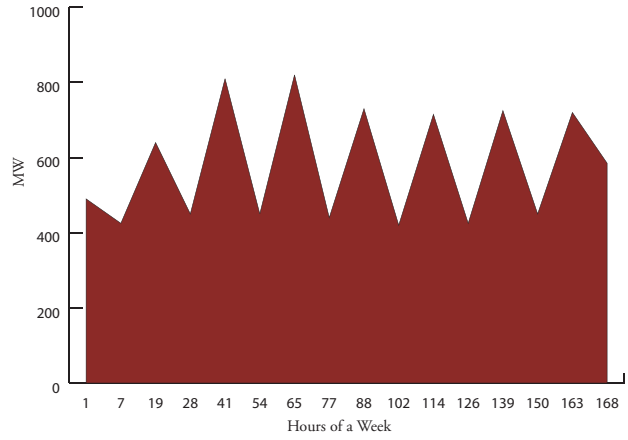


Figure 17
Hypothetical Utility Load Shape, MW, Peak Summer Week
Source: Estimated from Colorado Springs Utilities Data



Transmission

The transmission of electricity accounts for a huge effort by the energy industry, both geographically and financially. Three weakly interconnected grids cover the United States: the Western, Eastern, and Texas grids. For electricity to flow efficiently throughout the region, the grid must be updated to accommodate increased generation. Transmission lines are expensive. A common assumption about renewable resources is that they are far away from existing transmission lines and will require billions of dollars in new infrastructure; however, plenty of wind is available close to existing transmission lines.

As the region's infrastructure ages, policy makers are preparing for updates. In March of 2006, the Western Governors' Association's (WGA) Clean and Diversified Energy Initiative published a report of recommendations for updating what is becoming a heavily strained Western grid; they suggested eight major expansions. One example is the Frontier Line: stretching from California through Nevada and Utah to Wyoming, it is estimated to cost $3 billion.[37]

Currently, less than ten percent of the cost of electricity goes towards transmission.[38] With expensive infrastructure updates looming ahead, the WGA outlined several principles that should accompany the planning process.[39] To summarize, planners must be *proactive*, recognizing the needs of the future instead of building to suit what we currently have. The planning process must be *open* for public participation, recognizing needs of the many parties involved. The data used in making decisions must be *transparent*, and planning should be *comprehensive*, including demand and supply side management, as well as integration of new technologies [emphases in original].[40]

Also included in the recommendations was an emphasis on the importance of connecting to renewable energy resource sites in order to meet state Renewable Portfolio Standards. The WGA put priority on connecting to small generators (under 20 MW), for the timely cooperation of the federal government in the permitting process, and for the planning process to be region-encompassing.[41] In the past, individual utilities built lines when necessary. The WGA is calling for a regional plan for the future, creating an involved, comprehensive process to ensure stability for our electrical grids. Proponents of renewable energy should use this opportunity to ensure a place for renewables now and in the future.

Case Study: Nevada Solar One

The hot sun of Nevada is easy enough to notice, but when concentrated to 71 times its strength it produces temperatures up to 750 °F. These extreme temperatures are created by facilities like Nevada Solar One, the largest Concentrated Solar Power (CSP) facility in the world built within the last 16 years. Covering 400 acres, the facility uses 760 parabolic cylinder concentrators and 18,240 solar receivers.[51] The generation capacity of 64 megawatts will likely produce 130,000 MWh annually – enough to power more than 15,000 homes.

Beyond power production, the facility powers the economy. During the 16-month, $250 million construction that ended in June of 2007, 400 construction jobs were created along with 28 permanent jobs. Acciona Solar Energy, the developer, is a subsidiary of Spain's Acciona Energy, a company that is no stranger to the renewables business. Acciona is the largest supplier of wind energy in the world, having installed 4,500 megawatts across 169 wind farms in ten countries. They are also very active in solar, biomass, and biofuels production worldwide.

Nevada Solar One represents solar power operating on a utility-sized scale. CSP's efficient use of land and sun, cheap construction materials, and substantial energy capacity make it palatable for investors, consumers, and utilities alike. If other companies can follow the lead of Acciona, CSP can be an important contributor to the Rockies region's energy

Western Governors

In addition to their transmission report described above, the Western Governors' Association drafted a resolution in June 2006 entitled "Clean and Diversified Energy for the West." The resolution sets goals for the region's energy future, advocates several policies, and identifies ways clean and diversified energy would help the West. Although the WGA resolution identifies fossil fuels as the largest energy producer now and for the future, renewable energy, conservation, and efficiency play a large role in the policy recommendations. The major goals of the resolution include:

- Additional development of 30,000 MW of clean energy by 2015 (75 percent of current production if generating at capacity at all times) from renewable energies, "clean coal" technologies, and advanced natural gas technologies.
- A 20 percent increase in energy efficiency in western states by 2020.
- An ability to meet the transmission needs of the West for the next 25 years.
- Better position the western energy system to respond to new environmental challenges, including potential limitations on emissions.[42]

The Western Governors also include a section listing federal policies they would like to see implemented. Among these are increased tax incentives for renewables, increased national efficiency standards, adequate funding for technology research, and federal support of the transmission goals outlined in their Transmission Report (see Transmission Section, above).[43]

State Renewable Portfolio Standards

As an initial step, five of the eight Rockies states have adopted Renewable Portfolio Standards (RPS), which prescribe the percentage of energy generated in the state that will be produced from renewable sources by a certain year (See Table 4: Rockies Renewable Energy Portfolios by State).

Many of these standards have incremental percentage goals building up to the final target level. Colorado, for example, after passing Amendment 37 requiring 10 percent renewables by 2015, passed HB07-1281, requiring utilities to achieve 20 percent renewables by 2020, while meeting several deadlines along the way.

RPS target percentages, reporting, and enforcement vary greatly from state to state. For example, in Colorado, the Public Utilities Commission can only regulate Xcel Energy and Aquila, the publicly owned utilities. Municipal utilities, such as Colorado Springs Utilities and Fort Collins Utilities, are managed by their city councils, which are responsible for ensuring that they comply with standards. Furthermore, the Rural Electric Cooperatives, formed during the New Deal under Franklin Roosevelt, are not regulated. The RPS applies to them as well, but there is no enforcement.[44]

Many utilities initially developed Integrated Resource Plans to help them meet their RPS. An Integrated Resource Plan is defined as "a formal process by which utilities analyze the costs, benefits, and risks of *all* resources available to them—both supply-side and demand-side—with the ultimate goal of identifying a portfolio of resources that meets their future needs at lowest cost and/or risk."[45]

Utility incentives provided by the federal and state governments, utilities, municipalities, and non-profits are very effective in making renewable energy and conservation measures attractive and affordable to homeowners and businesses. Yet imperfect information often dissociates consumers from accessing what is available.

Social Movements, Signs of Change

Solar Energy International (SEI) is a non-profit educational organization based out of Carbondale, Colorado. Founded in 1991, it began by offering 12 classes each year that introduced about 250 people annually to renewable energy.[46] During the rest of the 1990s, interest in renewables and SEI's workshops steadily increased. After 2000, class and workshop enrollment began to sharply rise. In 2006, SEI offered 52 hands-on workshops and seven online courses, attracting 1,800 participants. Since 1991 more than 4,800 people have participated in SEI's Renewable Energy Education Programs.[47]

Table 4
Renewable Energy Portofolios by State
Source: US Department of Energy, and Union of Concerned Scientists

State	Percentage	Year	Organization Administering RPS
AZ	15	2025	Arizona Corporation Commission
CO	20	2020	Colorado Public Utilities Commission
MT	15	2015	Montana Public Service Commission
NM	20	2020	New Mexico Public Regulatory Commission
NV	20	2015	Public Utilities Commission of Nevada
WY	x	x	x
ID	x	x	x
UT	x	x	x

Note: Wyoming, Idaho, and Utah have not yet adopted renewable portfolio standards

"This is a national trend, not just a Colorado trend," noted Johnny Weiss, Executive Director of SEI. Indeed, by running workshops in many states and offering online classes, SEI has helped people from all 50 states and 66 countries learn about renewable energy.[48]

Economics is always a factor. If people can save money with renewables the choice is easy. Currently, however, most progressive renewables represent a financial net loss. This does not seem to deter Weiss's participants. Weiss added, "People who have installed solar on their homes in the past decade have done it for environmental and personal reasons…Renewables are seen as positive and constructive; they're a personal statement."[49] For some, investing in renewable energy generation may also reflect a desire to gain energy independence at the household level. In the case of a Hutterite community in Martinsdale, Montana, the incentive is economic gain, preservation of their autonomy, and the desire to implement the latest, and best technology (See Case Study: Martinsdale, MT, Hutterite Colony).

The Rights of Our Posterity

In his essay, "Law of the Land," author David Orr calls for an amendment to the U.S. Constitution that would declare access to a healthy environment as a universal and timeless right. Part of his claim is that posterity has been greatly ignored by today's society. Orr's proclamation sounds bold, but it may also be reasonable: the State of Montana's constitution already guarantees its citizens a fundamental right to a clean and healthful environment – a provision that was affirmed in a 1999 state Supreme Court decision.[50]

In thinking about energy, we must look to the future. As humans, how can we defend an energy system that deprives our great-grandchildren the opportunity to experience the world the way we, and those before us, have known it?

The Rocky Mountain West's abundance of renewable resources is eclipsed only by its wealth of natural beauty: Yellowstone National Park, the Grand Canyon, the Sonoran Desert, Arches National Monument, the San Juan Mountains, the Gallatin River, to name a few. We need to focus our energy toward conservation and renewables to give future generations a chance not only to live, but to live well.

Huts with Solar Panels, Bear Basin Ranch, Westcliffe, Colorado
© Natalie Baumann

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Case Study: Martinsdale, MT, Hutterite Colony

From the outside, the Hutterite colony near Martinsdale, Montana, doesn't seem especially progresssive. Sustained by farming, community members home-school their children only through ninth grade, attend church services nearly every day, and maintain gender roles from the 1920s. However, on a tour with the colony's financial director, Peter Wipf, it became clear that this Hutterite community was in some ways revolutionary.
We met Wipf at the base of the colony's Qualified Facility Hook-up wind farm. The system, new in 2006, is composed of 19 third-generation turbines from California. Despite their limited schooling, Hutterite boys are extremely proficient in mechanical operations. In two days, eight Hutterite men erected 11 of the turbines. The larger turbines took a bit longer, but all the work was done by the Hutterites. On the larger, 250-kilowatt machines, some of the blade technology is overseen by Montana Wind Works, on this day in the form of a high school biology teacher named Lewis Gunn.

Gunn sees his work with turbines as a hobby. His neighbor taught him how to work with turbines and he has been part of the wind company ever since. Gunn seemed to understand the importance of hands-on learning. Within five minutes of our meeting, he offered me his climbing harness and I was at the top of the turbine. I was covered in grease, but ecstatic to be looking across Montana from over a hundred feet in the air. For those who say wind turbines ruin the view, I would argue they are looking at the turbine from the wrong vantage point. Montana never looked better.

Wipf wanted to show us around the colony a bit more before taking us to the colony's off-grid turbine. While we walked, he answered our questions about agriculture, religion, technology, and Hutterite society. We learned that Hutterites are very musical; they perform a capella very often, and even though it isn't allowed, they sometimes play instruments. The colony is bilingual. To each other, they speak their traditional German dialect, but everyone spoke perfect English with us. Their religious philosophy is based mainly on two chapters of the Bible, Acts 1 and 2. Acts 2:45 says, "And (the Apostles) sold their possessions and goods, and parted them to all [men], as every man had need." The Hutterites live in accordance with this. Everyone works on the colony, but no one earns a salary. Money that is made by the colony is handled by the elder leaders.

Despite this communal approach, the Hutterites are very capitalistic in their endeavors. Wipf pointed out how important it was for the colony to keep on the cutting edge of technology. Without technology, they would not be able to compete in agricultural markets. The colony grows barley, wheat, yellow peas, and a variety of other crops. They are also a top producer of dairy cows, and their dairy products are sold to the regional dairy Meadow Gold. In fact, they are so proficient with agriculture, they are 90 percent self-sufficient for food. They only buy what they cannot produce as cheaply – namely beef.

We reached the colony's off-grid turbine. With a capacity of 65 kilowatts, the turbines often cover the needs of the entire colony. Wipf explained that because the Hutterites do all the electrical and mechanical work, the cost of the turbine was paid off in about a year and a half. The turbine was installed in December of 2003, and was the first of its kind in Montana's Wheaton County.

In addition to wind energy, the Hutterites have developed a heat-recapture system for their dairy and kitchen refrigeration units. The system is one of Wipf's proudest accomplishments, and the colony is in the beginning stages of acquiring a patent. In the colony building, where the women cook three meals a day, the excess heat is used for pre-heating water and heating buildings. In the dairy barn, the pre-warmed water is fed to the cows. This is doubly efficient for the colony. Because the cows do not have to use energy to warm the water, they require less calories, and subsequently, less feed.

After all they have accomplished, the Hutterites, true to their ethic, are not finished with their work in renewables. They plan to install two additional 150 kW turbines on the colony to sell power back to the grid. Also pending is a 75 megawatt wind farm development on their land by Horizon Wind Energy. The Hutterites, of course, will be doing all the mechanical, electrical, and installation work for these projects. When I asked Wipf how he got into wind, he said, "I've always been dreaming about wind."

Grading Renewable Energy Potential

Historically considered an inland energy colony of the United States, the eight-state Rocky Mountain West has for decades been exploited for its fossil fuel resources. With national interest turning toward renewable energy alternatives, what opportunities are available for counties in the region? This "Grading the Rockies" section of the *2008 State of the Rockies Report Card* examines the potential to develop wind, solar, geothermal, and biomass resources available in each of the 281 Rockies counties. The grades provided in this study only consider renewable potential, it does not account for the necessary infrastructure to store and deliver each county's collected renewable energy. Since the current infrastructure was built mostly to accommodate fossil fuel production, including this would not necessarily depict a particular county's ability to develop renewable energy. This analysis highlights which counties, when supplemented with the necessary labor and infrastructure, are best poised to take advantage of a renewable energy boom.

Methodology

Grades for geothermal potential were derived from geothermal heat flow data provided by the Southern Methodist University geothermal lab: http://www.smu.edu/geothermal/heatflow/heatflow.htm. Geothermal potential is measured by heat flow per unit area (mW/m^2).

The potential for biomass energy is calculated from a National Renewable Energy Lab (NREL) analysis that considers the following biomass sources: crop residues, forest residues, primary mill residues, secondary mill residues, urban wood waste, methane emissions from landfills, methane emissions from manure management, methane emissions from wastewater treatment plants, and dedicated energy crops. A more detailed description of these sources is located at: http://www.nrel.gov/gis/biomass.html.

Wind data is provided also by NREL. Wind resources for a given grid space are measured on a scale of one to seven, seven being the greatest resource potential. Wind speed is measured at 10 meters and 50 meters above ground to account for frictional effects on wind speed. A detailed table of this scale is provided below.

Classes of wind power density at 10 m and 50 m(a)				
Wind Power	10 m (33 ft)		50 m (164 ft)	
Class	Wind Power Density (W/m 2)	Speed (b) m/s (mph)	Wind Power Density (W/m 2)	Speed (b) m/s (mph)
1	0	0	0	
2	100	4.4 (9.8)	200	5.6 (12.5)
3	150	5.1 (11.5)	300	6.4 (14.3)
4	200	5.6 (12.5)	400	7.0 (15.7)
5	250	6.0 (13.4)	500	7.5 (16.8)
6	300	6.4 (14.3)	600	8.0 (17.9)
7	400	7.0 (15.7)	800	8.8 (19.7)
	1000	9.4 (21.1)	2000	11.9 (26.6)

Solar grades are also determined from data provided by NREL. These data show monthly average solar resources that can be collected by a flat plate collector and are described here: http://www.nrel.gov/gis/solar.html.

Solar Array at Nellis Air Force Base near Las Vegas, Nevada © David Amster-Olszewski

		Biomass		Solar		Wind		Geothermal	
State	County	Tonnes/year	Grade	Solar Energy Resource Potential (million MWh/year)	Grade	Mean Power Class	Grade	HF (mW/m2)	Grade
Arizona	Apache	20439.6	C+	58021.0	A	2.4	D	87.0	A
	Cochise	51675.3	B	27794.1	A	2.9	C-	81.7	A
	Coconino	33678.8	B-	65370.0	A	2.7	D+	53.2	A
	Gila	9831.8	C-	11421.7	B+	2.5	D	81.8	B
	Graham	22162.3	C+	17856.0	A-	2.8	C-	83.8	A-
	Greenlee	3002.9	D	2065.7	D	2.6	D	87.8	D
	La Paz	20234.7	C+	5387.7	C	2.2	D	83.3	C-
	Maricopa	515608.3	A	25857.3	A	2.7	D+	80.6	A
	Mohave	21141.5	C+	26193.2	A	2.5	D	89.7	A
	Navajo	155277.3	A	52835.0	A	2.4	D	71.6	A
	Pima	131454.6	A	39865.0	A	2.5	D	86.4	A
	Pinal	150765.0	A	26294.2	A	2.7	D+	76.7	A
	Santa Cruz	6785.3	D+	3684.6	D+	2.6	D	90.5	D
	Yavapai	26410.7	C+	22604.6	A	2.3	D	87.8	A
	Yuma	89560.3	A-	6455.0	C+	2.3	D	75.1	C-
Colorado	Adams	110052.4	A-	6334.6	C+	2.0	D	78.0	C
	Alamosa	72614.8	B+	3244.1	D+	3.5	A-	89.4	D
	Arapahoe	122320.7	A-	4311.5	C-	2.2	D	79.6	D+
	Archuleta	1512.7	D	2855.4	D	3.1	C+	87.7	D
	Baca	61942.3	B	8835.7	B-	3.1	C+	74.1	C+
	Bent	6073.7	D	8465.3	B-	2.7	D+	84.7	C+
	Boulder	42731.4	B-	1951.6	D	3.8	A	79.8	D
	Broomfield			180.1	D	2.0	D	76.1	D
	Chaffee	183509.1	A	827.7	D	3.6	A-		
	Cheyenne	22884.2	C+	9787.8	B	3.3	B+	74.9	B-
	Clear Creek	4226.7	D	520.7	D	3.7	A	82.0	D
	Conejos	10110.4	C-	2926.3	D+	3.1	C+	96.7	D
	Costilla	18689.9	C+	7050.2	C+	3.5	B+	94.9	C+
	Crowley	1150.2	D	4504.4	C-	1.8	D	92.2	C-
	Custer	1350.3	D	2506.3	D	3.5	B+	75.1	D
	Delta	9277.2	C-	2757.7	D	2.3	D	94.1	D
	Denver	68399.7	B+	800.9	D	1.7	D	78.4	D
	Dolores	3441.9	D	2121.4	D	2.7	C-	98.9	D
	Douglas	57510.8	B	3212.2	D+	2.3	D	78.6	D
	Eagle	6641.3	D+	1805.7	D	3.2	B	97.4	D
	Elbert	9012.2	C-	10249.4	B	2.5	D	86.5	B
	El Paso	95023.2	A-	9850.4	B	3.1	C+	89.0	B
	Fremont	7267.6	D+	4675.0	C-	3.0	C	78.3	D+
	Garfield	14840.1	C	5806.8	C	2.8	C-	70.2	C-
	Gilpin	493.0	D	295.9	D	3.7	A-		
	Grand	2995.5	D	2909.1	D+	3.3	B+	88.8	D
	Gunnison	3839.6	D	2855.8	D	3.2	B	106.3	D+
	Hinsdale	667.8	D	107.0	D	3.5	B+		
	Huerfano	3390.9	D	7079.6	C+	3.5	A-	97.1	C+
	Jackson	3009.5	D	3312.5	D+	3.4	B+	82.4	D
	Jefferson	68267.2	B+	3086.5	D+	3.2	B-	74.3	D
	Kiowa	6630.2	D+	9902.2	B	2.8	C-	81.2	B-
	Kit Carson	126771.4	A-	11753.4	B+	3.6	A-	69.1	B-
	Lake	1289.6	D	463.4	D	3.7	A-	106.1	D
	La Plata	6611.9	D+	5478.3	C	3.3	B	95.3	C
	Larimer	56382.0	B	5592.9	C	3.7	A-	79.2	C
Colorado (continued)	Las Animas	7576.6	D+	23165.2	A	2.9	C	103.2	A
	Lincoln	28329.6	C+	14358.2	B+	3.2	B	88.1	A-
	Logan	71773.7	B+	9781.4	B	3.4	B+	58.7	C+
	Mesa	38035.1	B-	4934.6	C	2.2	D	65.5	D+
	Mineral	2541.5	D			3.2	B-		
	Moffat	4336.0	D	10963.7	B	2.6	D	65.6	B-
	Montezuma	7980.2	D+	6580.6	C+	2.7	D+	77.6	C
	Montrose	21186.3	C+	3577.1	D+	2.2	D	117.1	C-
	Morgan	112868.4	A-	6978.1	C+	1.7	D	65.5	C
	Otero	12898.9	C	4818.6	C-	2.0	D	91.6	C-
	Ouray	6713.1	D+	1343.6	D	3.4	B+	133.3	D
	Park	2621.2	D	5222.9	C	3.5	B+	89.4	C
	Phillips	112099.3	A-	3595.6	D+	3.6	A-	65.0	D
	Pitkin	8084.9	C-	635.5	D	3.5	B+	91.4	D
	Prowers	29703.2	C+	9073.0	B-	3.1	C+	73.9	C+
	Pueblo	32650.6	C+	12170.3	B+	2.5	D	99.9	A-
	Rio Blanco	1746.7	D	4295.4	C-	2.5	D	65.6	D
	Rio Grande	70528.3	B+	1958.1	D	3.1	C+	93.9	D
	Routt	10374.0	C-	6551.7	C+	3.1	C+	86.1	C+
	Saguache	65416.8	B+	5214.4	C	3.3	B	88.8	C-
	San Juan	148.6	D	63.3	D	3.4	B+		
	San Miguel	2451.0	D	2522.7	D	3.3	B	108.1	D
	Sedgwick	73259.4	B+	2880.4	D	3.1	C+	68.8	D
	Summit	9187.4	C-	34.9	D	3.5	B+		
	Teller	3392.7	D	1578.4	D	3.1	C+	77.1	D
	Washington	85778.1	B+	13645.4	B+	3.0	C	63.9	B
	Weld	199644.2	A	14957.2	A-	3.1	C+	78.5	A-
	Yuma	368711.2	A	12630.0	B+	3.1	B-	66.2	B
Idaho	Ada	2232695.4	A	2748.8	D	2.2	D	151.4	C
	Adams	18085.6	C+	1905.9	D	3.0	C+	105.0	D
	Bannock	37809.2	B-	3935.6	C-	3.0	C	240.6	B+
	Bear Lake	5045.8	D	2847.8	D	2.7	D+	266.1	B
	Benewah	2336686.7	A	2729.2	D	2.6	D	75.1	D
	Bingham	171240.3	A	7752.9	C+	2.3	D	96.0	B
	Blaine	16908.1	C+	3012.4	D+	3.1	C+	69.0	D
	Boise	41622.4	B-	1282.1	D	2.8	C-	163.3	D
	Bonner	113172.7	A-	3941.5	C-	3.2	B	65.3	D+
	Bonneville	142871.3	A	4348.5	C-	2.7	D+	75.6	D+
	Boundary	61802.9	B	1639.7	D	3.2	B	80.5	D
	Butte	12879.5	C	1446.9	D	3.2	B	294.4	C
	Camas	3388.0	D	1858.6	D	2.6	D	170.0	D+
	Canyon	101941.0	A-	2870.0	D	1.8	D	103.3	D+
	Caribou	61065.4	B	4834.1	C	2.5	D	117.9	C+
	Cassia	125828.7	A-	5962.4	C+	3.0	C+	135.3	B
	Clark	10405.8	C-	2848.1	D	3.0	C	57.7	D
	Clearwater	143244.1	A	5355.0	C	2.9	C	73.3	C
	Custer	5661.9	D	1506.4	D	3.2	B-	111.4	D
	Elmore	59789.0	B	3159.8	D+	2.6	D	105.9	D+
	Franklin	12262.7	C	2028.0	D	2.6	D	912.2	A
	Fremont	110776.4	A-	3473.7	D+	3.0	C+	162.5	C+
	Gem	8748.4	C-	1727.5	D	2.2	D	132.1	D

State	County	biomass		solar		Wind		Geothermal	
		Tonnes/year	Grade	Solar Energy Resource Potential (million MWh/year)	Grade	Mean Power Class	Grade	HF (mW/m2)	Grade
Idaho (continued)	Gooding	35110.7	B-	1785.5	D	2.1	D	63.0	D
	Idaho	129653.4	A	6065.3	C+	2.9	C-	58.8	C-
	Jefferson	68193.1	B+	2709.6	D	1.7	D	47.0	D
	Jerome	72579.5	B+	1991.4	D	1.4	D	75.5	D
	Kootenai	117221.0	A-	3686.3	D+	2.9	C	70.1	D+
	Latah	163494.7	A	3903.1	C-	2.3	D	66.3	D+
	Lemhi	2785.2	D	1995.0	D	3.1	C+	76.3	D
	Lewis	84042.4	B+	2125.4	D	1.9	D	65.1	D
	Lincoln	15202.4	C	1589.8	D	1.4	D	51.1	D
	Madison	67928.7	B+	1824.6	D	2.1	D	82.9	D
	Minidoka	75219.5	B+	1949.1	D	1.2	D	65.4	D
	Nez Perce	98736.5	A-	3723.2	D+	2.3	D	68.4	D+
	Oneida	11977.5	C	2482.5	D	2.5	D	777.3	A
	Owyhee	30962.3	C+	8059.9	B-	2.6	D	104.1	B
	Payette	19299.3	C+	1497.7	D	1.6	D	87.4	D
	Power	84803.8	B+	4820.7	C-	2.8	C-	125.1	C+
	Shoshone	125016.0	A-	2305.0	D	3.2	B-	85.6	D
	Teton	33517.7	C+	1371.5	D	3.0	C	91.4	D
	Twin Falls	132186.4	A	4914.9	C	2.2	D	92.3	C
	Valley	34249.4	B-	2214.9	D	2.7	D+	122.7	D+
	Washington	13859.8	C	4372.7	C-	2.6	D	77.5	C-
Montana	Beaverhead	8742.7	C-	10337.2	B	3.3	B+	72.8	B
	Big Horn	34950.7	B-	23305.2	A	3.1	B-	53.8	A-
	Blaine	57206.1	B	15504.9	A-	4.0	A	38.8	B-
	Broadwater	20770.8	C+	3580.1	D+	3.1	B-	100.5	C-
	Carbon	12033.9	C	5702.3	C	3.7	A-	80.2	C
	Carter	6144.2	D+	11501.7	B+	3.3	B+	61.7	B-
	Cascade	80628.5	B+	10684.0	B	3.5	A-	93.5	A-
	Chouteau	130622.7	A	17191.0	A-	3.8	A	67.4	A-
	Custer	10228.6	C-	15442.8	A-	2.7	D+	52.2	B+
	Daniels	68166.2	B+	6206.1	C+	3.0	C+	52.8	C-
	Dawson	44744.3	B	10802.1	B	3.1	C+	55.1	C+
	Deer Lodge	7963.7	D+	1769.1	D	3.6	A-	87.5	D
	Fallon	5206.9	D	6960.4	C+	3.2	B-	58.0	C
	Fergus	70315.7	B+	16114.2	A-	3.4	B+	55.0	B+
	Flathead	2074657.0	A	4754.2	C-	3.6	A-	84.0	C
	Gallatin	63750.6	B	5838.6	C	3.3	B	1078.2	A
	Garfield	12849.8	C	16860.5	A-	3.1	C+	46.7	B
	Glacier	67786.4	B+	10874.4	B	4.2	A	151.4	A
	Golden Valley	2473.6	D	5239.4	C	3.6	A-	53.8	D+
	Granite	32451.8	C+	2539.5	D	3.2	B-	148.0	C-
	Hill	104413.9	A-	12613.0	B+	4.1	A	58.6	B
	Jefferson	10482.7	C	3388.8	D+	3.2	B-	84.7	D+
	Judith Basin	26459.8	C+	6392.6	C+	3.7	A	71.5	C
	Lake	48772.2	B	5547.8	C	3.5	B+	90.3	C+
	Lewis and Clark	44058.7	B	8275.5	B-	3.6	A-	181.3	A
	Liberty	58351.1	B	6373.6	C+	4.6	A	60.2	C
	Lincoln	106337.3	A-	1972.5	D	3.2	B-	79.5	D
	McCone	47644.1	B	10539.0	B	3.2	B-	51.6	C+
	Madison	12994.0	C	8492.9	B-	3.5	A-	101.9	B+
	Meagher	27394.2	C+	6548.9	C+	3.4	B+	103.6	B-
	Mineral	13931.4	C	477.1	D	3.4	B+		

State	County	Biomass		Solar		Wind		Geothermal	
		Tonnes/year	Grade	Solar Energy Resource Potential (million MWh/year)	Grade	Mean Power Class	Grade	HF (mW/m2)	Grade
Montana (continued)	Missoula	130588.9	A	4263.2	C-	3.2	B	110.1	C+
	Musselshell	13688.8	C	7904.6	C+	2.4	D	47.9	C-
	Park	11368.0	C	5350.2	C	3.5	A-	1102.5	A
	Petroleum	2082.0	D	4526.5	C-	2.6	D	46.1	D
	Phillips	34636.7	B-	13109.9	B+	3.1	C+	38.0	C+
	Pondera	100079.6	A-	6664.6	C+	4.1	A	89.3	C+
	Powder River	11320.5	C	11053.2	B	2.3	D	57.9	B-
	Powell	46013.8	B	5246.1	C	3.3	B	231.5	A-
	Prairie	6282.3	D+	5056.2	C	2.9	C	50.9	D+
	Ravalli	27113.6	C+	2487.6	D	3.3	B+	84.0	D
	Richland	49972.9	B	9343.3	B-	2.8	C-	55.1	C+
	Roosevelt	96006.8	A-	10468.0	B	2.3	D	54.5	C+
	Rosebud	27073.2	C+	21844.0	A	2.7	D+	49.0	A-
	Sanders	56110.6	B	5138.9	C	3.3	B+	82.9	C
	Sheridan	86734.3	A-	7130.9	C+	2.7	D+	56.0	C
	Silver Bow	5780.2	D	1569.4	D	3.3	B	83.8	D
	Stillwater	7807.1	D+	6970.3	C+	3.7	A-	112.0	B
	Sweet Grass	6973.2	D+	6561.5	C+	3.9	A	256.1	A
	Teton	78218.6	B+	8682.8	B-	4.0	A	160.2	A-
	Toole	81653.0	B+	8740.1	B-	4.4	A	51.5	C
	Treasure	11068.2	C	4637.4	C-	2.4	D	49.1	D
	Valley	81720.1	B+	13967.6	B+	2.9	C	47.1	B-
	Wheatland	8843.4	C-	6227.1	C+	3.6	A-	65.7	C
	Wibaux	7767.1	D+	3963.4	C-	3.2	B-	56.0	D
	Yellowstone	45635.6	B	11866.5	B+	2.3	D	49.2	C+
New Mexico	Bernalillo	95002.8	A-	5661.7	C	2.6	D	78.2	C-
	Catron	2154.8	D	12617.9	B+	2.4	D	82.8	B+
	Chaves	10427.4	C	22608.2	A	3.0	C	51.6	B+
	Cibola	7940.0	D+	18106.4	A-	2.8	C-	86.4	A-
	Colfax	13141.1	C	20948.2	A	3.1	C+	94.5	A
	Curry	67909.8	B+	8159.2	B-	2.5	D	68.3	C
	De Baca	390.8	D	13105.0	B+	3.2	B-	60.3	B-
	Dona Ana	37193.9	B-	5850.2	C	3.0	C+	170.3	B
	Eddy	13449.5	C	9915.1	B	3.8	A	43.6	C-
	Grant	3532.8	D	11918.7	B+	2.5	D	96.4	B+
	Guadalupe	607.9	D	17170.9	A-	3.7	A	69.0	B+
	Harding	119.6	D	11166.1	B	2.8	C-	72.6	B-
	Hidalgo	5424.1	D	11479.1	B+	2.9	C	90.2	B
	Lea	23852.9	C+	21616.6	A	2.2	D	45.3	B
	Lincoln	2546.8	D	16391.2	A-	3.1	B-	71.1	B+
	Los Alamos	1906.3	D	33.0	D	2.5	D		
	Luna	8015.5	D+	10414.6	B	2.8	C-	179.9	A-
	McKinley	9125.8	C-	27058.6	A	2.3	D	77.2	A
	Mora	2222.9	D	10120.1	B	3.3	B	104.7	B+
	Otero	110881.4	A-	11445.5	B+	2.8	C-	93.9	B+
	Quay	8419.7	C-	16804.8	A-	3.5	A-	72.4	A-
	Rio Arriba	104887.7	A-	14758.5	A-	2.6	D	87.2	A-
	Roosevelt	43794.8	B-	13954.6	B+	2.8	C-	49.7	C+
	Sandoval	13805.7	C	12521.3	B+	2.5	D	105.2	A-
	San Juan	35488.4	B-	23003.6	A	2.3	D	72.3	A-
	San Miguel	7701.3	D+	23656.5	A	2.9	C	76.4	A-
	Santa Fe	14055.1	C	8215.4	B-	2.9	C-	70.2	C

		Biomass		Solar		Wind		Geothermal	
State	County	Tonnes/year	Grade	Solar Energy Resource Potential (million MWh/year)	Grade	Mean Power Class	Grade	HF (mW/m2)	Grade
New Mexico (continued)	Sierra	1484.2	D	8544.4	B-	2.8	C-	106.5	B-
	Socorro	5570.3	D	16572.3	A-	2.7	D+	80.1	A-
	Taos	4485.3	D	5799.9	C	3.3	B+	103.7	C+
	Torrance	3070.1	D	17805.0	A-	3.3	B	61.0	B+
	Union	29674.7	C+	20823.9	A-	2.7	D+	68.9	A-
	Valencia	8626.2	C-	6009.5	C+	2.6	D	87.3	C
Nevada	Churchill	2814.3	D	4655.9	C-	2.7	D+	86.6	C-
	Clark	217348.2	A	5183.7	C	2.9	C	87.2	C-
	Douglas	10471.3	C	1270.3	D	3.3	B+	81.8	D
	Elko	10454.4	C	23228.5	A	3.0	C	106.1	A
	Esmeralda	203.5	D	1168.2	D	2.9	C	113.7	D
	Eureka	313.9	D	4407.5	C-	2.8	C-	97.6	C-
	Humboldt	6487.2	D+	8600.1	B-	3.0	C+	120.0	B+
	Lander	787.7	D	4152.0	C-	2.8	C-	124.8	C
	Lincoln	574.4	D	845.1	D	2.6	D	66.7	D
	Lyon	4893.6	D	3470.7	D+	2.7	D+	96.0	D+
	Mineral	679.7	D	2895.4	D	3.0	C	143.9	C-
	Nye	4454.7	D	2660.6	D	2.9	C	75.5	D
	Pershing	1063.9	D	7983.9	C+	2.8	C-	124.0	B+
	Storey	489.6	D	1389.8	D	2.1	D	120.1	D
	Washoe	59426.8	B	9830.1	B	2.9	C	94.8	B+
	White Pine	1279.5	D	2154.8	D	3.1	C+	99.6	D
	Carson City	16125.5	C	198.6	D	3.0	C+	90.3	D
Utah	Beaver	115701.1	A-	3069.2	D+	2.9	C	126.5	D+
	Box Elder	40581.4	B-	22401.5	A	3.1	C+	226.0	A
	Cache	28806.4	C+	2063.2	D	2.8	C-	608.1	A-
	Carbon	2997.8	D	3815.5	D+	2.7	D+	66.7	D
	Daggett	398.5	D	663.4	D	2.7	D+	59.1	D
	Davis	41226.4	B-	2839.2	D	2.8	C-	90.8	D
	Duchesne	4111.7	D	9401.5	B	2.9	C-	65.9	C+
	Emery	2557.1	D	4025.8	C-	2.8	C-	63.4	D
	Garfield	3028.5	D	2328.5	D	2.7	D+	74.5	D
	Grand	1203.6	D	5406.0	C	2.7	D+	60.4	D+
	Iron	6102.2	D+	7793.4	C+	2.4	D	103.8	B-
	Juab	1359.3	D	4892.1	C	2.7	D+	112.2	C
	Kane	2769.0	D	2784.9	D	2.7	D+	95.0	D
	Millard	10270.3	C-	8405.8	B-	2.9	C	109.9	B
	Morgan	1831.8	D	1866.8	D	2.6	D	70.6	D
	Piute	1247.4	D	827.8	D	3.2	B-	70.7	D
	Rich	845.6	D	3270.1	D+	2.6	D	173.2	C+
	Salt Lake	130324.6	A	2900.9	D	2.9	C	87.7	D
	San Juan	8456.9	C-	17282.3	A-	2.6	D	66.3	B+
	Sanpete	5518.1	D	3914.5	C-	3.1	C+	90.8	D+
	Sevier	8437.1	C-	1876.5	D	3.0	C	76.8	D
	Summit	7954.6	D+	4634.7	C-	2.9	C	63.0	D+
	Tooele	6333.5	D+	7944.5	C+	2.6	D	99.7	B-
	Uintah	12955.2	C	9013.9	B-	2.5	D	57.3	C
	Utah	62335.5	B	5760.7	C	2.9	C	105.8	C+
	Wasatch	3079.5	D	2338.4	D	2.5	D	84.7	D
	Washington	14711.7	C	3254.2	D+	2.9	C	85.0	D
	Wayne	1553.7	D	1311.1	D	2.6	D		
	Weber	29996.1	C+	1679.5	D	2.9	C	109.5	D

		Biomass		Solar		Wind		Geothermal	
State	County	Tonnes/year	Grade	Solar Energy Resource Potential (million MWh/year)	Grade	Mean Power Class	Grade	HF (mW/m2)	Grade
Wyoming	Albany	263639.5	A	16003.2	A-	4.5	A	48.6	B-
	Big Horn	13838.1	C	3476.4	D+	3.2	B-	60.4	D
	Campbell	4800.2	D	18998.7	A-	3.0	C	56.9	A-
	Carbon	7049.9	D+	18516.4	A-	4.1	A	55.4	B+
	Converse	1572.9	D	15260.6	A-	4.5	A	59.1	B+
	Crook	21724.1	C+	11991.4	B+	2.2	D	67.2	B
	Fremont	8257.9	C-	21147.0	A	3.9	A	64.3	A-
	Goshen	36965.7	B-	11397.6	B+	3.8	A	58.4	C+
	Hot Springs	1005.6	D	6087.4	C+	3.5	A-	68.2	C-
	Johnson	2741.2	D	14483.0	A-	3.5	A-	59.4	B
	Laramie	39334.6	B-	13813.8	B+	4.6	A	57.2	B-
	Lincoln	8565.2	C-	4996.2	C	3.0	C+	108.4	C+
	Natrona	9048.1	C-	15577.8	A-	4.1	A	60.8	B+
	Niobrara	1239.6	D	12545.3	B+	3.3	B	70.2	B+
	Park	22456.3	C+	7276.4	C+	3.7	A-	76.2	C+
	Platte	5519.4	D	10113.2	B	4.2	A	50.6	C
	Sheridan	7259.1	D+	9108.0	B-	3.3	B	57.8	C+
	Sublette	1282.2	D	5442.4	C	3.5	B+	73.1	C-
	Sweetwater	4623.6	D	15619.9	A-	3.2	B	58.6	B+
	Teton	10408.1	C-	470.6	D	3.3	B	89.8	D
	Uinta	2429.2	D	6362.8	C+	2.7	D	66.6	C
	Washakie	13785.7	C	3810.9	D+	3.0	C+	65.6	D
	Weston	4143.7	D	5047.0	C	2.7	D+	64.0	D+

Blank cells indicate instances where data are unavailable

Restoring Rivers in the West

Environmental Benefit, Economic Opportunity

By Lucy Emerson-Bell

THE 2008 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

Key Findings

•Resource extraction in the Rockies has left a legacy of environmental degradation that can be turned into opportunities to revitalize communities.

•Approximately 40 percent of surface waters in the western U.S. are contaminated from acid-mine drainage.

•Thousands of miles of low-use forest roads in the Rockies provide no access benefits while damaging water quality and fisheries.

•Many of the region's dams have met or exceeded their planned lifespans and should be evaluated for breaching or removal.

•Decommissioning abandoned mines, low-use forest roads, and obsolete dams can contribute to a growing "restoration economy" throughout the Rockies.

About the author: Lucy Emerson-Bell (Colorado College Class of 2008) is a student researcher for the 2007/08 State of the Rockies Project.

Restoration work is not fixing beautiful machinery, replacing stolen parts… welding and rewriting. It is accepting an abandoned responsibility. It is a humble and often joyful mending of biological ties, with a hope clearly recognized, that working from this foundation we might, too, begin to mend human society. [1]

–Barry Lopez

Introduction

The resource-rich Rockies region has a history of extraction that in places has left a legacy of environmental degradation. The mining boom of the nineteenth and twentieth centuries contributed to the settlement of the Rockies, but also to the contamination of its land and water. Abandoned mines continue to contaminate surface water through acid-mine drainage. The logging industry created many jobs but left forests stripped bare. Roads built to access isolated areas with valuable resources still remain, although a majority are no longer used. Instead, their presence leads to erosion and landslides causing sedimentation and the degradation of surface waters. Dams built to reduce floods and provide energy have transformed majestic rivers into enormous bathtubs, triggering dramatic hydrological change and severely impacting fisheries. Infrastructure once built to accommodate extraction under the ideals of Manifest Destiny is now aging.

Though troubling in many respects, this legacy of resource management policies over the last century can also provide opportunities for a new era of environmental restoration. As environmental historian Dan Flores comments, "If…management of Western resources was the great conservation theme of the late nineteenth century, and preservation of select pieces of the West that of the twentieth, then restoration may well be that of the twenty-first."[2]

Although restoration of a diverse number of ecosystems in the Rockies may be warranted, the West's surface waters have faced particular degradation as they have been contaminated by heavy metals, fragmented and thermally altered by dams, and compositionally transformed by roads and sedimentation. Water is the lifeblood of this dry region and maintaining water quality is of particular importance for the arid, rapidly-growing Rockies. Meeting water demands for this growing region will require restoring riparian ecosystems. According to the United States Geological Survey (USGS), "the definition of water availability has been expanded to include sustaining riparian ecosystems and individual endangered species, which are disproportionately represented in the Western States."[3] Ensuring clean and available water sources will be a limiting factor and key challenge for the long-term success of this region.

The *2007 State of the Rockies Report Card* provides research on agriculture to urban water transfers. To ensure water sustainability for future use that report noted that "water must be provided to natural hydrologic and ecological systems."[4] In a region where water is a scarce resource, every drop is accounted for. What is not always accounted for are the consequences negligence or overuse have had on riparian ecosystems. This section of the *2008 State of the Rockies Report Card* investigates the quality of surface water region-wide. Specifically, this chapter examines threats to riparian ecosystems and the sustainable supply of clean water. We address the possibilities for and benefits from a restoration industry through job creation, increased recreation, and tourism.

Water quality in the Rockies is of particular importance since this region contains the headwaters and drainage systems of many of the United States' major rivers. (See Figure 1.) The conditions of the rivers in this region have national and even international impacts. New Mexico, for example, feeds the headwaters of three major systems: the San Juan and Gila Rivers flow into the Colorado, the Canadian River contributes to the Mississippi, and much of the Rio Grande-Pecos basins drain the interior of the state.[5]

In 2002, metals were the number one impairment of surface waters in the Rockies, sediment came second, and thermal impairments were the third most com-

Figure 1
Rockies Contributions to National Watersheds
Source: National Atlas of the United States, USGS

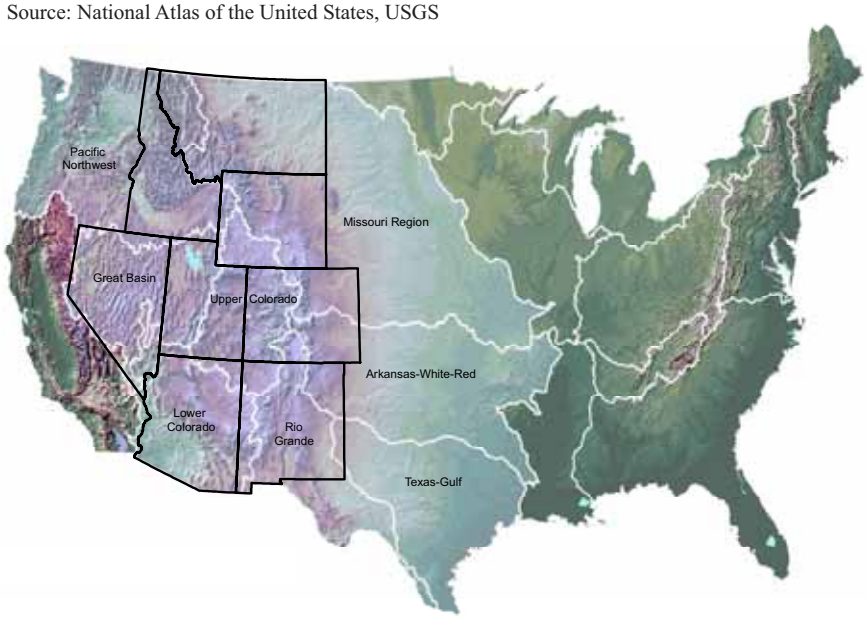
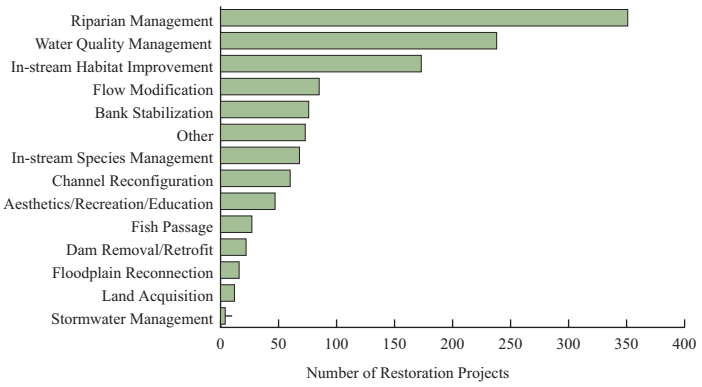


Figure 2
Number of River Restoration Projects in the Rockies by Project Intent, 2006
Source: Calculated from National River Restoration Science Synthesis Statistics



mon.[6] While impairments cannot always be directly attributed to one specific source, across the West most metal impairments (other than mercury) have been caused from existing or abandoned mine sites. Sediment impairments can be derived from multiple sources such as from agriculture and grazing practices, but the abundance of abandoned logging roads contributes directly to the sedimentation of surface waters.[7] Dams also contribute to the problem as sediment accumulates upstream of an impoundment.[8] Additionally, dams are one of many sources that cause thermal impairments as they alter river temperature by forming shallow, warm pools, or deep, cold pools of water.[9] This report focuses on mines, dams, and roads due to their abundance in the Rocky Mountain West and the scale of environmental impacts they have on surface waters.

Failing dams and abandoned mines and roads are becoming an economic liability due to costly maintenance, threats to human health, and contamination of municipal water sources. Restoration to improve watersheds can be costly, but a growing restoration industry could turn this liability into an asset. The economic motives of the Old West may have caused environmental damage, but restoration projects intended to treat what came before have the opportunity to create jobs directly, as well as encourage the economy of a New West by generating an amenities-based economy including family-wage, high-skill jobs, and increased tourism and recreation. In its Restoration Economy Policy Resolution, the Western Governors' Association states that, "the Restoration Economy of the West is emerging as an important component of the region's recent economic growth through activities that provide high-paying jobs throughout the restoration cycle."[10]

River restoration, in particular, is becomming a profitable business.[11] Restored riparian ecosystems benefit the local economy by providing employment and improving fishing and water-based recreation. Restored ecosystems also continue to generate benefits, since intact ecosystems offer an idealized image of the West, attracting tourists to the region and providing business opportunities. In addition, they can benefit communities because healthy rivers can increase property values. According to the Western Governors' Association, "Large intact and functioning ecosystems, healthy fish and wildlife populations, and abundant public access to natural landscapes are a significant contributing factor to the West's economic and in-migration boom."[12] Rivers connect humans to their natural surroundings. In many places, healthy rivers are culturally significant. As geographer William Graf notes, "Free-flowing rivers are broadly attractive to modern American society that attaches numerous positive social values to natural river landscapes."[13]

Scope of Restoration

Environmental restoration projects vary in magnitude and design. Examples of river restoration include channel engineering, removal of heavy metals, habitat improvement, and bank stabilization. The ultimate goal of river restoration should be to improve surface waters that "no longer perform essential ecological and social futions such as mitigating floods, providing clean drinking

Figure 3
Impaired Watersheds in the Rockies, TMDL Listings from State Reports
Source: TMDL listings from individual state 303(d) reports were compiled from the most recent year available: Arizona (2004), Colorado (2006), Idaho (2002), Montana (2006), Nevada (2004), New Mexico (2006), Utah (2006), and Wyoming (2006).

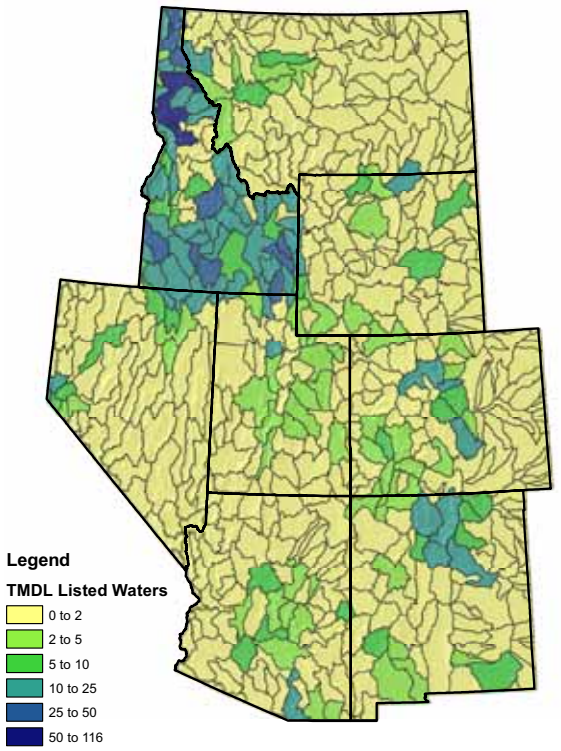
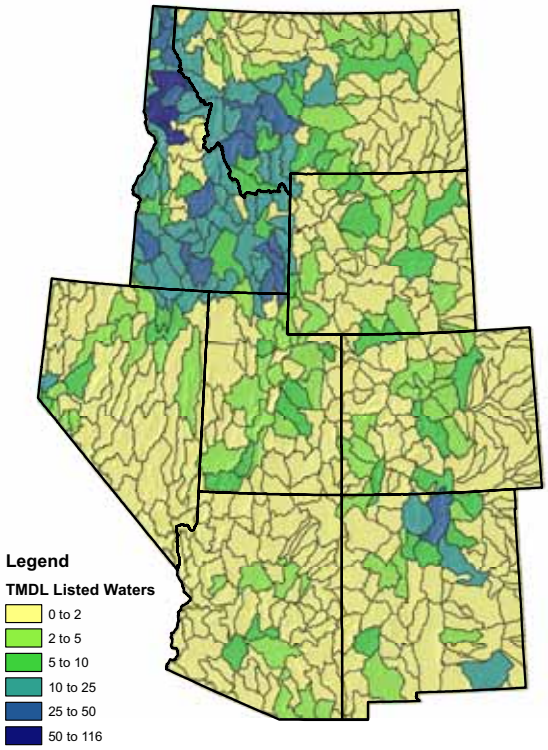


Figure 4
Impaired Watersheds in the Rockies, TMDL Listings from EPA Reports
Source: US EPA TMDL Project, 1998-2004



water…and supporting fisheries and wildlife."[14] Some projects integrate human uses, such as removing a dam and establishing a whitewater park, while others constrain human uses, such as restricting development along streambanks. There are currently more than 37,000 river restoration projects occurring nationally, costing more than $1 billion annually.[15] These include projects by federal agencies, non-governmental groups, and citizen volunteers, and range in scope from entire wetlands to minor streams.[16] Nearly one thousand of these projects are taking place in the Rockies, primarily for riparian management—including revegetation of riparian zones or removal of exotic species.[17] (See Figure 2.)

Legislation and Impediments to Restoration

Legal protection of rivers first reached prominence with the passage of the Wild and Scenic Rivers Act in 1968. The Act declares that "selected rivers of the Nation…shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." Today this law protects nearly 11,000 miles of rivers from dams.

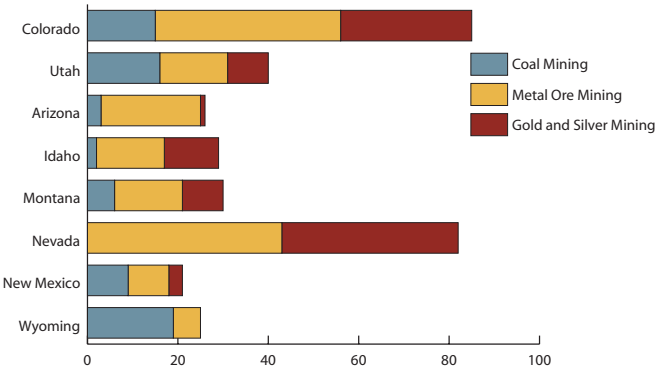
The Clean Water Act (CWA) was passed in 1972 with the purpose "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[19] Despite progress attained under this Act, the need for river restoration remains high: more than one-third of rivers in the United States are listed by the U.S. Environmental Protection Agency (EPA) as impaired or polluted.[20] Under the CWA, surface waters are protected from excessive levels of point-source pollution based on their designated use, but the act also creates liability issues which may scare away restoration projects. Some rivers are simply so polluted that full remediation is nearly impossible. Although the CWA succeeded in improving water quality from 1971 levels, the Act has failed more recently in guaranteeing quality water. Rivers are so polluted that if they continue in their current state, by 2016 U.S. rivers will be as dirty as they were in the mid-1970s.[21] While a complete assessment of surface waters is required under the Clean Water Act, since it was amended in 1977, only about one-third of the nation's surface waters have been assessed.[22] According to the EPA, in 2002 only 17 percent of the waters in the Rockies had been assessed, but each state's water quality department claims to have inventoried a higher percentage since then.[23]

Inconsistencies in Regulation

Rivers transcend state boundaries, but laws regulating their conditions vary with state lines. According to section 303(d) of the Clean Water Act, each state is required to establish standards for each designated use of the surface water, whether it is allocated for drinking water or for boating. If a waterbody does not meet the standards, it is designated "impaired." The state water quality department then sets a Total Maximum Daily Load (TMDL) standard to limit the concentration of effluent discharged into the impaired water body. Impaired surface waters and known sources of impairment are published every two years by each state's 303(d) lists. From data compiled by each state's water quality department websites, only seven percent of the rivers in the Rockies region are impaired, which is significantly lower than the nation's total. However, by the EPA's count, the average number of impaired waterbodies in the Rockies region in 2004 was 37 percent (see Figure 3 and Figure 4 for comparison).

Since regulations vary by state, the assessment procedures are not systematic and many states lack qualified data collectors.[26] In addition, the actual health of the nation's rivers is exceedingly difficult to gauge, since impairment data only reflects the relatively small percentage that have been assessed. As the EPA water quality website states, "It is not appropriate to use the information in this database to make statements about national trends in water quality. The methods states use to monitor and assess their waters and report their findings vary from state to state and even over time. Many states target their limited monitoring resources to waters they suspect are impaired and, therefore, assess only a

Figure 5
Number of Coal, Metal Ore, and Gold and Silver Mining Establishments by Rockies State, 2002
Source: 2002 Economic Census of Mining



small percentage of their waters."[27] It is therefore extremely challenging to accurately portray the conditions of surface waters. In addition, of all river restoration projects nationwide, only ten percent have any form of assessment or monitoring.[28] Restoration may be needed to improve watersheds, but in order to avoid wasting money, time, and effort, pre- and post-monitoring programs are essential.[29] How can we ensure the quality of America's surface waters if many are not adequately assessed or monitored? Perhaps, with the arrival of the twenty-first century, a new page should be turned for the protection of surface waters. We may need new policies to update and promote monitoring, assessment, and restoration standards.

Ancillary Legislation

To improve surface waters, laws must reflect new priorities to encourage better management practices and contemporary values. Recent legislation has allocated funding for watersheds in certain states and in national forests to deliver more stringent standards than those of the Clean Water Act. On December 26, 2007, Congress allocated $39 million for road removal projects in national forests, including land in the Rockies, specifically to restore storm-damaged watersheds and fisheries.[30]

Another type of legislation that promotes river restoration is the Conservation Reserve Enhancement Program. Through this legislation, the Department of Agriculture's Farm Service Agency pays farmers to engage in conservation projects such as planting riparian buffers and native species on their land and removing invasive species already in place.[31, 32] Since the 1990s the Bureau of Land Management (BLM) has inventoried over 8,000 abandoned hardrock mines, which they prioritize for the most environmentally-damaged watersheds. The BLM is currently working with states to clean up roughly a dozen BLM abandoned mines annually. The agency receives about $10 million annually from federal and congressional appropriations.[33]

Each state may decide to implement more stringent standards than those stated by the CWA. In 2000, the Lake Tahoe Restoration Act authorized $300 million over a decade to fund erosion control, wetlands restoration, and forest health projects of the lake and its tributaries in order to preserve the clarity and quality of the lake described by Mark Twain as offering "the fairest picture the whole Earth affords." Algal growth from increased development and additional anthropogenic influences has severely decreased water clarity and quality since the 1960s.[34]

One piece of legislation that could encourage restoration is a "Good Samaritan" Act. This would allow environmental groups, counties, or other entities to obtain a permit to remediate surface waters with limited liability. The Western Governors' Association and other nonprofit organizations promote this approach and some, such as Trout Unlimited, already do remediation as "Good Samaritans" with the hope that charges will not be pressed. However, other organizations believe that a Good Samaritan Act could provide loopholes for mining companies to remine waste under the guise of remediation while exacerbating conditions instead of improving them.[35]

Mining

Metal mining is the leading source of toxic pollution in the United States. The hard-rock mining industry alone released 3.5 billion pounds of toxic pollution in 1998, about half of all toxic pollution released that year in the U.S.[36] Hard-rock mining requires the extraction of certain metals, minerals, and ore from the earth. The environmental impacts of mining are especially significant to the Rockies region. Historian Patricia Limerick, Director of the Center of the American West, observes, "No other industry changed the West as rapidly and as profoundly as did the gold and silver rushes of the nineteenth century."[37]

Figure 6
Total Number of Mines per Rockies State by Production Status, 2005
Source: USGS

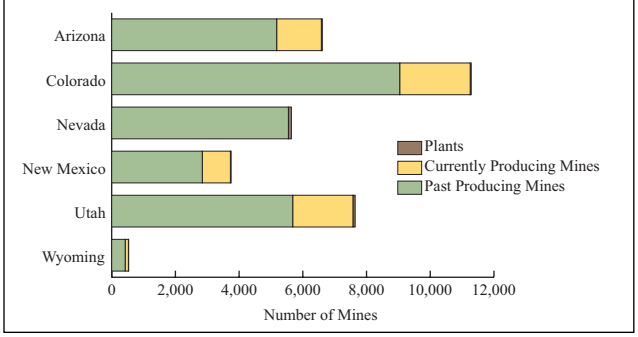
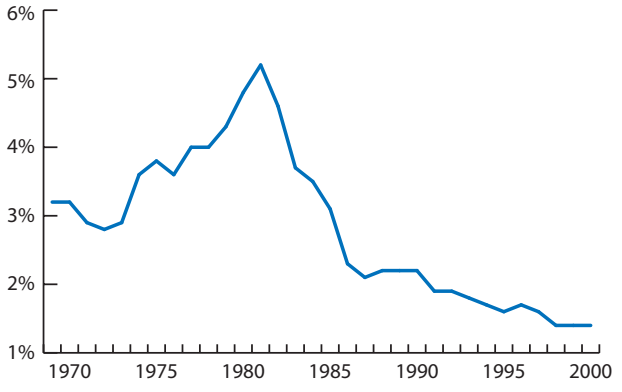


Figure 7
Personal Income Derived from Mining as a Percent of All Personal Income, 1969-2000
Source: US Department of Labor, Bureau of Labor Statistics



The EPA states that mines are "one of the largest sources of water pollution in the (West)."[38] Today many Rockies states continue to lead the nation in the production of certain minerals, including copper, gold, silver, and molybdenum through hard-rock mining. (See Figure 5.) The combination of mining operations of today and abandoned mines from the past continue to threaten the fragile ecosystems and degrade the water quality of the West.

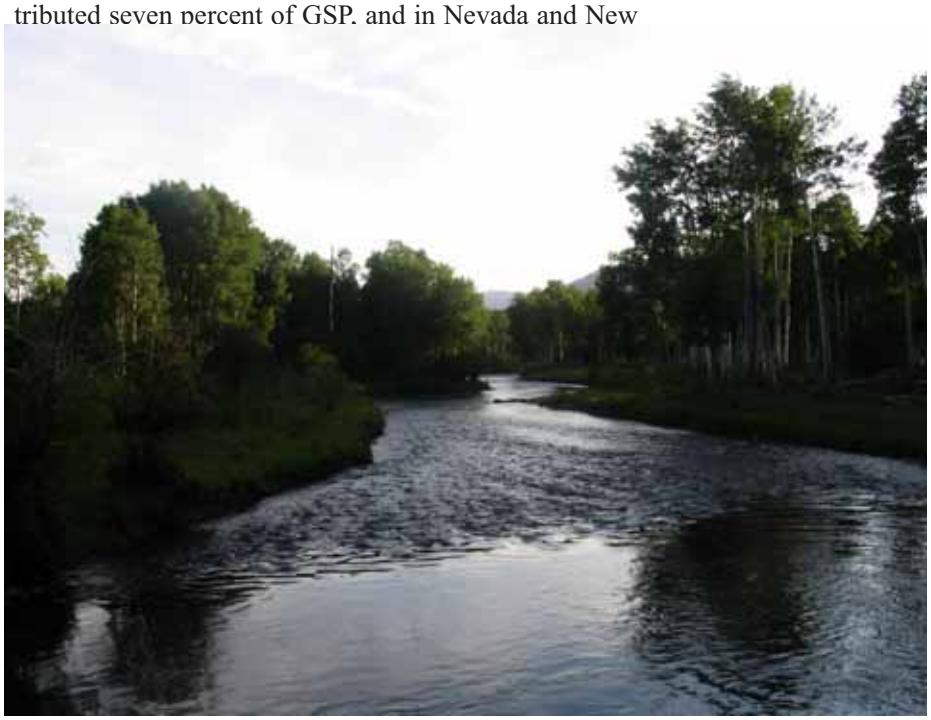
The mining industry in the Rockies is now a fraction of what it once was. About 75 percent of the total mines in the Rockies are past producers or non-operational.[39] (See Figure 6.) In addition, income from mining now contributes a smaller percent to personal income in the Rockies than it has in the past.[40] (See Figure 7.) That said, the Gross State Product (GSP) from mining in states with less diverse economies has still been reasonably high in recent decades. As of 1992, mining in Montana contributed seven percent of GSP, and in Nevada and New Mexico it made up nine percent of the total.[41]

Current and past producing mines are heavily concentrated in this region. (See Figure 8.) Presently, approximately 350 million acres of land in the Rocky Mountain West are open to mining.[42] Since 1964, close to 300,000 acres of land in the Rockies have been privatized or patented for mines.[43] According to the U.S. Geological Survey, in 2005 there were 2,212 producing mines in Colorado, more than any other Rocky Mountain state, but this number is only a fifth of the total number of current and past-producing mines in Colorado.[44] (See Figure 6.)

Abandoned for Use but Continuous Abuse

Abandoned mines significantly threaten water quality, especially when no party is held accountable for environmental degradation. The EPA estimates that there are 500,000 abandoned hard-rock mines in the West.[45] Many abandoned hard-rock mine sites are so severely polluted and dangerous that by 2003, 87 were listed on the Superfund National Priorities List.[46] The EPA has an Abandoned Mine Land program to work with federal land management agencies, mine owners, and communities to organize voluntary cleanup and remediation of land and water surrounding watersheds contaminated from mining.[47]

Mine cleanup is expensive; the estimated remediation costs for all the abandoned and inactive mines nationally ranges from $32 to $72 billion.[48] In Colorado the annual value of mining, excluding oil and gas, is just over $1 million; meanwhile, Colorado's Inactive Mine Reclamation Program spent more than $18 million on abandoned mine remediation in 2002 alone.[49] The numbers vary, but it has been estimated that about 16,000 miles – or 40 percent – of the surface waters in the Western United States are contaminated by metals from acid-mine drainage.[50]

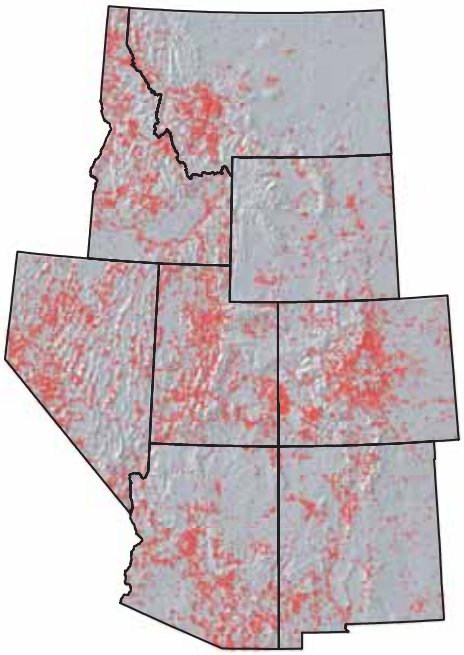


Lake Creek, Snake River Ranch, Wyoming © Turner Resor

Acid Mine Drainage

Acid mine drainage is caused by hardrock metal mining when metals oxidize in sulfide ore to form sulfuric acid. The sulfuric acid dissolves metals within the rock, catalyzing heavy metals and other contaminants. This yellowish-orange leachate can then enter surface waters and percolate into groundwater. The presence of heavy metals in water may render it unfit for drinking, destroy aquatic habitat, or kill organisms upon exposure. Abandoned mines can continue to pollute

Figure 8
Past and Current Mining in the Rockies, Metallic and Non-Metallic Mining Operations (Past Producers, Current Producers, and Processing Plants)
Source: Mineral Resource Data System, USGS, 2005



even when no longer operational. Acid drainage develops gradually and can form anywhere sulfides are exposed to air and water such as in waste rock piles, mine tailings, open pit mines, or underground tunnels.[51] Acid mine drainage affects surface water and associated ecosystems throughout the Rockies.[52] (See Figure 8).

Open Pit Mines

Open pit mines are created when the surface is excavated to extract ore. They are the predominant means for extracting gold and copper. The mines can fill with groundwater, which oxidizes and becomes toxic, and may contaminate shallow wells and groundwater, threatening wildlife. Decades of copper mining created a mile-wide toxic lake in Butte, Montana's Berkeley Pit, one of the oldest and largest open pit mines in the U.S. In 1995, a flock of 342 migrating snow geese landed on the waters of the Berkeley Pit and quickly died from exposure to acid-mine drainage and heavy metals.[53]

Riparian and Watershed Effects

Acid mine drainage and toxic loading of heavy metals can decimate native fish populations, aquatic insects, and vegetation.[54] Toxic metals released from mining operations can also be re-dissolved in the water column, posing a continual threat to water quality. Toxic chemicals used to remove a target metal, such as cyanide for the extraction of gold and copper from ore, can also lead to contamination problems.[56]

Polluted watersheds not only affect wildlife, but they can jeopardize municipal water sources from both surface and ground water. The USGS estimates that in 2000, 79 percent of the nation's 408 billion gallons of water used per day was derived from surface water while the remainder came from groundwater.[57] The threat to water quality is of particular importance in the Rockies, with its rich history of mining operations and a climate where water scarcity is typical. Mining below the water table can pollute critical shallow aquifers as surface materials infiltrate and flow into groundwater. The West's national forests are the single largest provider of municipal water for some 66 million people in 33 western states, but also contain nearly 7,600 abandoned mines that present a severe threat to sustainable water sources.[58] Remediation of abandoned mines in the national forests therefore is crucial for municipal water sources and for supporting the natural quality of these lands.

Mining operations can reduce both the quality and the quantity of water. For example, water is extracted to prevent open pit mines from filling with water. One study found that mines in Nevada withdrew more than 580 billion gallons of water from 1986 to 2000 — more than enough to supply New York City's tap water for a year.[59] With the help of mining, groundwater levels in Nevada have dropped about 1,500 feet during the past decade.[60]

Figure 9
Major Dams, Primary Uses, and Normal Reservoir Storage Capacity in the Rockies (acre-feet)
Sour

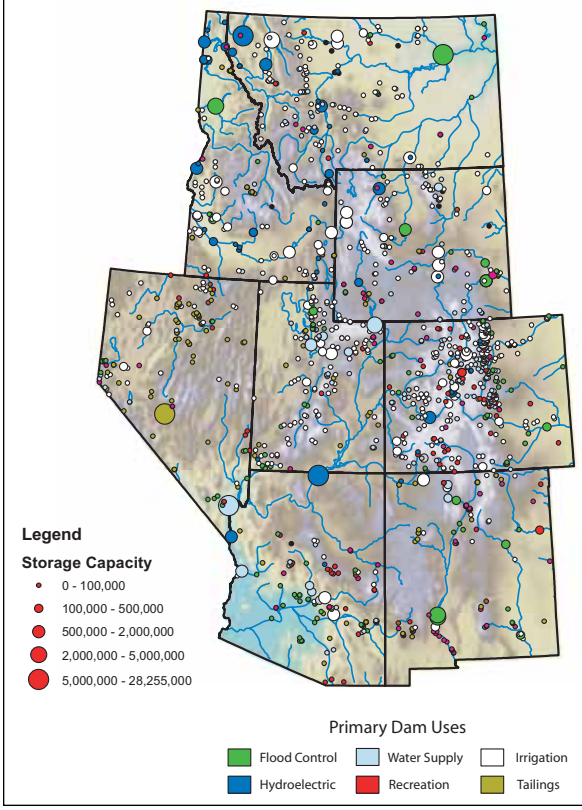


Figure 10
Major Dams and Normal Reservoir Storage Capacity in the Rockies (acre-feet)
Source: National Atlas of the United States

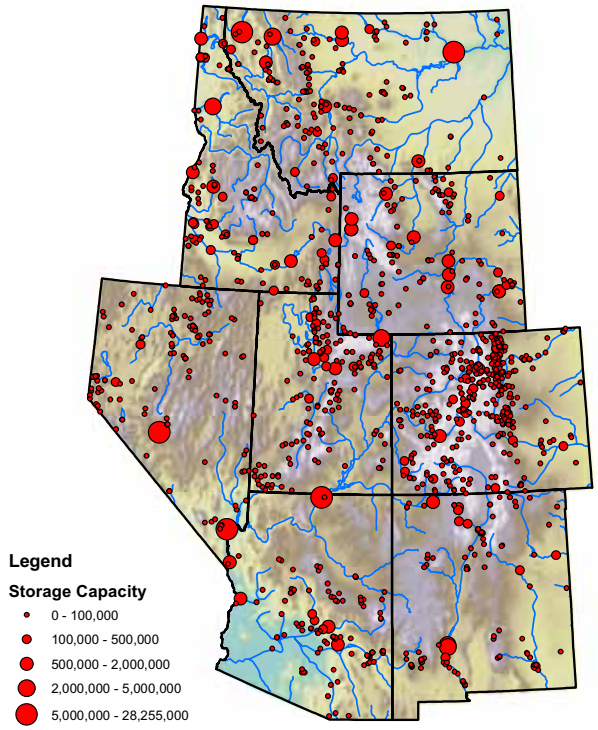
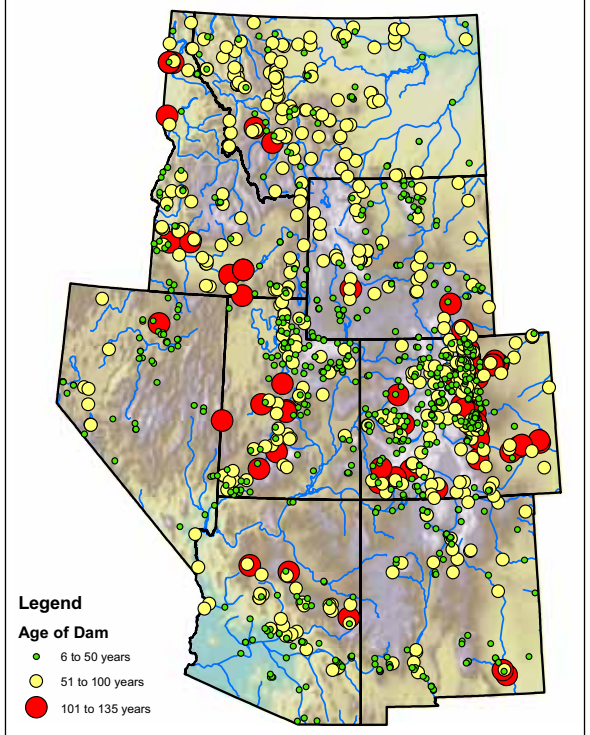


Figure 11
Age of Dams in the Rockies
Source: National Atlas of the United States



Dams – Historical and Current Status

Dams can serve important purposes for hydropower, irrigation, water storage, or flood control, but many dams nationwide are obsolete or no longer function as planned. Those that no longer benefit society but threaten ecosystems should be considered prime candidates for removal. Nationally, dams supply 269,000 megawatt hours of energy, about seven percent of total electrical generation in the U.S. in 2005.[61] They provide water for irrigation to transform dry land into productive farms and help prevent flooding. Dams store water for arid metropolitan areas, such as Phoenix and Las Vegas, allowing these cities to persist in an arid region. In the Rockies, 40 percent of all dams are used for irrigation. Although only five percent of the dams in the Rockies are used for hydroelectric power, these dams have massive storage capacity in the reservoirs they create, holding 25 percent of the total water stored by dams in the region (see Figure 9 and 10 for purpose and storage capacity). Many dams no longer serve their intended purposes and may be suitable candidates for breaching or removal.

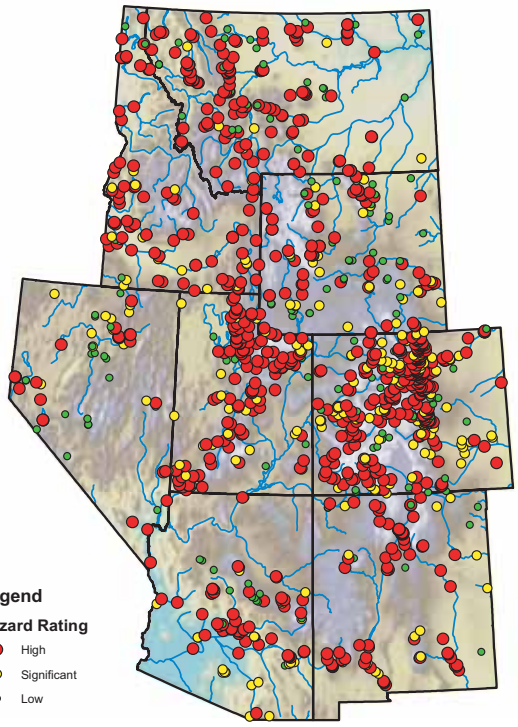
Scale of Dams

The National Inventory of Dams has counted 79,000 dams nationwide. Of these, 8,100 are considered "major" dams—50 feet or taller, with a normal storage capacity of 5,000 acre-feet or more and a maximum storage capacity of at least 25,000 acre-feet.[62] With 1,300 dams, the Rockies region contains more major dams than any other census division in the country (See Figure 10). The majority of dams in the Rockies region were built in the 1960s, following an early peak in 1905 (Figure 11). Even though the great dam-building era has passed, the dams that still stand continue to impact the environment. The size of the dam and its age can indicate its potential lifespan and hazard—aging dams are more inclined to failure and can present substantial risks. From an engineering perspective, most small and medium size dams will only last about 50 years, while the lifespan of large dams is controlled by the rate of sedimentation in their reservoirs and typically last longer.[63] (See Figure 12 for relative dam hazard).

Large Dams and Their Large Environmental Impacts

Dams with large storage capacities create unnatural reservoirs where a river once flowed. This drastically changes the flow, temperature, and evaporation rates of the river. The ratio of reservoir storage capacity to mean annual runoff is an informative measure of the potential hydrologic impact of dams. In the U.S., the highest ratio of storage capacity to mean annual runoff occurs in the Rockies, the Great Plains, and the Southwest.[64] In the Rockies, large dams can store three to four times the mean annual runoff. Due to this enormous reservoir capacity, water from the region may be exported elsewhere, while damaged riparian ecosystems remain in the region. As William Graf remarks, "The plains,

Figure 12
Dam Hazard Ratings in the Rockies
Source: National Atlas of the United States, National Inventory of Dams



mountains, and southwestern areas export water…while retaining the environmental costs. The environmental costs of dams in the form of disrupted downstream hydrologic and biotic systems are likely to be greater in these regions than elsewhere."[65]

Waterways in the Rockies flow through both mountains and deserts, therefore, a range of riparian ecosystems face disruption from dams. Dams are a major threat to many fish populations, mainly by restricting migratory routes, but also by altering temperature, destroying habitat, and reducing water quality and quantity. Dams restrict downstream flow and natural flooding events, which are crucial processes for removing salt and debris, rebuilding the river banks, and the generation of fertile sediment. With altered flow regimes, invasive species can dominate.

Hazards

The National Inventory of Dams classifies major dams by hazards they pose to the environment, to human life, and to the economy from failure or misoperation. A failure can occur with old, disintegrating dams or in a flooding event. In the event of failure, "high" hazard dams are classified as likely to cause human and economic casualties.[66] The Rockies contain 18 percent of the nation's "high" hazard dams, more than any other region. Thirty percent of the region's high hazard dams are in Colorado.[67] (See Figure 12.) Many of the region's dams are considered high hazard due to their large storage capacity. (See Figure 10.)

Dam hazards are more than a theoretical concern and dam failures can lead to significant destruction. When Idaho's Teton Dam collapsed in 1976, it wiped out several towns and killed 14 people.[68] Many dams nationwide appear to be in danger of failing. The American Society of Civil Engineers graded the condition of the dams in the United States and assigned an overall grade of a "D" in their 2001 Report Card.[69] It could cost almost $10 billion over the next decade to repair the deteriorating dams nationwide. In some instances, complete removal is a less expensive option than repair.

Economic Revival through Healthy Rivers

The West has become a destination for those inclined towards the outdoors, open space, and scenic views. Resource extraction has not proved to be a long-term economic solution in many mountain towns, but in many cases restoration programs could provide a more durable route to economic vitality. University of Montana economist Thomas Power projects that closing and cleaning up mines can reinvigorate local economies by attracting residents drawn to natural amenities, including clean, healthy ecosystems.[70] River restoration projects have the ability to improve struggling economies by stimulating a recreation industry and can create economic incentives that spur community involvement and encourage citizens to protect rivers for future use.

A study conducted by John Loomis of Colorado State University determined the economic benefits of river recreation in southwestern Wyoming and southeastern

Case Study: Mike Horse Dam

Mike Horse Dam is a 500-foot-long tailings dam straddling the Blackfoot River near its headwaters along the Continental Divide in Montana. It was built in the 1940s from metal-laced mine tailings to contain toxic mining waste and for decades has leaked acid-filled wastewater into the river.[1] Made famous by Norman Maclean's story, "A River Runs Through It," the Blackfoot River is an important water source for irrigation, ranching, and for recreation, but the dam provides no hydropower and the reservoir it holds does not supply drinking water.

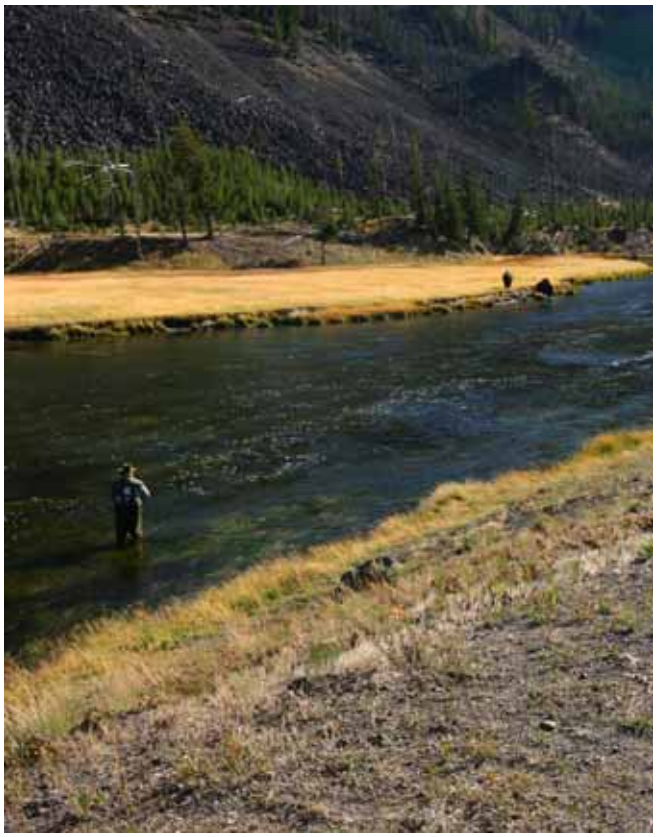
In 1975 a flood breached the Mike Horse dam, releasing 100,000 tons of toxic tailings into Mike Horse Creek and ten miles down the Blackfoot River. The mining corporation ASARCO rebuilt the dam shortly thereafter.[2] Mike Horse Dam is now a Superfund site and contains two million cubic yards of contaminated material. Populations of cutthroat, brown, and brook trout were decimated after the dam failed, and more than a decade later the number of cutthroat trout one year and older was still 25 percent below that of pre-flood levels. A study conducted sixteen years after the breach found significant cadmium contamination in stone flies and brown trout located more than 46 miles downstream from the dam.[3]

Millions of dollars worth of restoration efforts conducted by Trout Unlimited and other groups along the Blackfoot have cleaned the stream banks and increased the native trout populations. These efforts have helped mend more than 350 stream miles and the Blackfoot River fishery is showing improvement.[4] However, a Forest Service report indicates that a repeat of the 1975 dam failure is not just possible, but likely.[5] The Forest Service manages the land below the impoundment and determined that the dam has been eroding from within for about 15 to 20 years.[6]

Watershed and fisheries groups now advocate the removal of Mike Horse Dam, a project estimated to cost tens of millions of dollars.[7] They need only look downstream to the confluence of the Blackfoot and Clark Fork Rivers to get a sense of what such a task might entail—the aging Milltown Dam is currently being removed, and along with it, some 2.6 million cubic yards of contaminated river sediments.

[1]The Clark Fork Coalition website. http://www.clarkfork.org/programs/mike_horse_mine.html. See also: Schnitzer, Russ and Rob Roberts, "Settled, Mined & Left Behind." Report from Trout Unlimited's Public Land Initiative: 14. Viewed online July 14, 2007.
[2]The Clark Fork Coalition website. http://www.clarkfork.org/programs/mike_horse_mine.html
[3]Schnitzer, Russ and Rob Roberts: 14.
[4]Schnitzer, Russ and Rob Roberts: 14.
[5] Mike Horse Dam: A Threat to The Blackfoot, A Threat To Our Communities. Produced by the Clark Fork Coalition. Viewed online at http://www.clarkfork.org/programs/mike_horse_mine.html
[6] Clark Fork Coalition: Programs, Watershed Cleanup and Restoration http://www.clarkfork.org/programs/mike_horse_mine.html
[7]Moore, Michael. "Group presses for Mike Horse Dam removal." *The Missoulian*. http://www.missoulian.com/articles/2005/06/11/news/top/news01.txt

Idaho: fishing and boating on the Upper Snake River creates 1,460 jobs and provides $46 million in income. Dr. Loomis's study found that if river conditions improved so anglers could catch twice as many fish, the total number of jobs would nearly double, providing $77 million in total income and creating incentives for improving the natural riparian habitat.[71] The fishing industry in the Rockies currently contributes $4.5 billion to the regional economy.[72] River restoration can reestablish natural hydrology and temperature, reduce sedimentation, and decrease concentrations of heavy metals, thus improving fish populations (See Case Study: Mike Horse Dam).



Whitewater Parks

Where dam removal occurs, river restoration projects can also boost the economy by constructing whitewater parks on stretches of free-flowing river formerly covered by reservoirs. There are currently about 35 whitewater parks nationwide, and 25 of these are located in the Rockies.[73] The Colorado River Outfitters Association reports that in 2006 rafting in Colorado contributed a net benefit of $139 million.[74] Whitewater parks can also stimulate suffering fish populations by reintroducing

Case Study: The Arkansas River, Pueblo, Colorado

A 12-foot diversion dam was modified on the Arkansas River in order to develop an $800,000 white water park, the Arkansas River Legacy Whitewater Park. The dam on the Arkansas remains and serves its original purpose, but eight structures were added to support whitewater recreation and enhance fish habitat. The whitewater park engineers made the rapids passable for fish and have found that the structures aerate the river, thus improving conditions for aquatic species.[1] In addition, nearly a mile of riverbank was restored. The City of Pueblo now hosts a major whitewater festival and benefits from recreation-related tourism the whitewater park attracts.[2] According to Shane Sigle, a park designer, the whitewater park in Pueblo is the best restoration project of its kind in which a dam was altered, and in-stream habitat improved, and the river has demonstrated signs of recovery.[3]

Approximately ninety miles upstream on the Arkansas River, Salida, Colorado, also features a whitewater park, and water-based recreation has become a $55 million business.[4] In the summer of 2000, more than 300,000 people took commercial raft trips down the Arkansas River (which features many miles of natural whitewater in addition to the constructed parks).

[1]Recreation, Engineering and Planning website. http://www.wwparks.com/projects.html
[2]Recreation Engineering and Planning. http://www.wwparks.com/dam_projects.html
[3]Shane Sigle, designer at Recreation Engineering and Planning, Interview, June 20, 2007.
[4]Sherry Devlin. "Two Rivers proposal would return Milltown Dam to its free-flowing state," *The Missoulian.* February 22, 2001.

rapids that aerate the water and increase transportation of fine particles. Deep pools formed beneath whitewater park rapids provide protection and habitat for juvenile and adult fish, particularly beneficial to certain salmonid species that are imperiled in the Rockies region[75] (See Case Study: The Arkansas River).

Criteria for Dam Removal

With the dam-building era winding down and the impacts of dams more keenly realized than ever before, a number of dams now face removal. According to Rebecca Wodder, President of American Rivers, "Every study has shown that dam removal is the best — and probably only — way to restore the salmon. Dam removal is far less costly than other salmon recovery alternatives such as severe new restrictions on logging, farming and fishing."[76] Although dam removal can cause initial shocks to ecosystems, in the long run it provides a more viable solution than alternatives, such as installing fish ladders or bussing loads of anadromous fish around a dam. Repair is another option for some aging dams, but removal ought to be considered for dams that are obsolete or particularly harmful environmentally, as well as older, smaller dams more inclined toward disintegration. For many smaller dams, sediment build-up compromises their integrity so decommissioning and removal makes sense.[77] The Federal Energy Regulatory Commission (FERC) requires licenses for hydroelectric dams, which are valid for 30- to 50-year periods, then evaluated for re-licensing. FERC evaluates renewals based on criteria such as the integrity and productivity of the dam and the extent of environmental impact. Though removal of even obsolete dams can be contentious, the FERC re-licenseing process creates an opportunity to reassess the merits of keeping aging dams in place.

Forest Roads

An estimated 523,000 miles of roads fragment America's national forests.[78] (See Figure 13.) Built for resource extraction, recreation, or transportation, a majority of the roads in the national forests are abandoned or receive little to no use. The Forest Service is the largest road management agency in the world, but can only afford to maintain about 20 percent of its roads.[79] Forest Service inventories are often incomplete, lacking information needed to assess road use and environmental impacts[80] (See Figure 13 for reference to "unknown roads").

Since 1988 the Forest Service has removed or decommissioned approximately 10,000 miles of road, but it estimates that 100,000 to 186,000 miles of roads are unnecessary and eventually could be decommissioned as well.[81] Both road maintenance and road removal can be expensive; removal of small roads averages $7,500 per mile,[82] medium-sized roads can cost from $40,000 to $70,000, and major roads can cost from $100,000 to $250,000 per mile.[83] The Forest Service has prioritized

road removal and maintenance based on roads' use and environmental impact. "Single purpose roads" are the main focus of decommissioning, but smaller, decrepit roads are also candidates for removal. (See Figure 13.)

Effect of Roads on Water Quality

The presence of roads can produce a range of impacts on riparian ecosystems and water quality. On a broad scale, roads cause landslides that pollute aquatic habitat and municipal water sources with sediment runoff. In addition, they can alter the overall hydrology in a watershed, change groundwater availability, change timing of peak flows, and redirect water flows.[84] Roads have been found to increase the frequency, timing, and magnitude of disturbances, such as landslides and debris flows to aquatic habitat by 30 to 300 times the natural rate, depending upon terrain.[85] Erosion occurs due to the presence of roads when water that would otherwise be absorbed in the ground is concentrated, causing magnified runoff into surface waters.[86] Several studies of roads in the Pacific Northwest found that untreated roads can produce four times the amount of erosion than that produced by recontoured roads, where stream crossings or

Case Study: Clearwater National Forest, Clearwater River Basin, Idaho

The Clearwater National Forest covers some 1.8 million acres in north-central Idaho. Criss-crossing the forest are about 6,000 miles of road, mostly built between 1950 and the 1970s. Many of these roads are so-called "jammer" roads, built by the timber industry for use during brief periods of intensive logging. These low-volume roads now receive little maintenance and many are failing, in poor condition, or impossible to drive. In 1995 and 1996, a series of heavy rains caused severe landslides across the forest. Subsequent assessments determined that 60 percent of these slides were triggered by overgrown, abandoned roads. However, on ten kilometers of road that had been recontoured and removed prior to the floods, no landslides occurred.

In response to these events, the Clearwater National Forest and Nez Perce Tribe have been working together on an intense road removal program to reduce road concentrations in the watershed. In addition to decreasing the risk of landslides, the program is designed to protect salmon and trout species by decreasing road-related sedimentation. The project started by mapping the roads in the forest and prioritizing them based on use and relative environmental impact. Roads classified as "high priority" were in areas of high road density and located near stretches of river that were important fish habitat. The agencies then began removing unnecessary roads that were prone to failure. On average, the program reclaims about 40 miles of roads per year.

The Clearwater National Forest and Nez Perce Road Removal Project has been heralded as a model road removal project. Not only has it been successful in gaining community support—in part by hiring locals to conduct the road removal work—the partners have also demonstrated success in reducing landslides and lowering sediment risks. Post-removal monitoring has also found increased wildlife and more native vegetation on treated roads. Future challenges include funding and finding the labor necessary to physically remove or decommission the roads.

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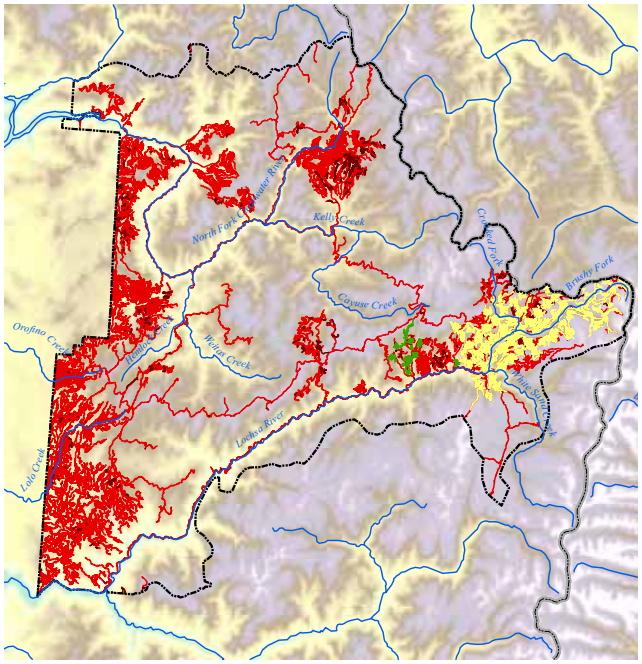
Road Removal in the Clearwater National Forest, Montana

© Tim Brown, courtesy of Wildlands CPR

Figure 13
Rivers, Creeks, and Roads in the Clearwater National Forest, Idaho
Source: Nez Perce Tribe, 2007



road cuts have been returned to a more natural condition.[87] In Idaho, 94 percent of the streams considered water-quality impaired are located in roaded areas. Because roads create a dramatic impact on riparian habitat and fisheries, many road removal projects focus directly on river and watershed restoration.[88] (See Case Study: Clearwater National Forest.)

Cost-Benefits of Removal

Studies have found that roadless areas are crucial for maintaining intact fish habitat. A report published by Trout Unlimited found that 74 percent of current steelhead trout habitat is located in roadless areas. As Scott Stouder of Trout Unlimited notes, "The best habitat for fish and wildlife is in roadless areas. It's pretty simple."[89] Removing unused or abandoned roads can reduce threats to the riparian ecosystem and restore ecosystem services such as water purification and flood control. This is substantially cheaper than building a municipal filtration facility to treat water and could save the Forest Service millions of dollars by reducing the frequency and intensity of landslides. In some cases, the cost of removing sediment from surface waters can be significantly greater than the cost of preventing erosion. According to a report published by the nonprofit organization Wildlands CPR, "Removing roads, which stops soil-erosion and sedimentation, is more cost-efficient than repairing damaged waterways, restoring habitat, and recovering threatened and endangered species."[90]

Old, low-volume roads are a symbol of aging extractive industries, which continue to haunt the ecosystems of the West. Nevertheless, they present new opportunities for restoration of the environment and of rural economies. Road removal projects require skilled labor and long-term employment of local workers, including workers displaced from the original road construction projects or from the timber industry. Reports estimate that 14.5 direct jobs are created, plus additional jobs created in the community, for every $1 million spent on road removal or restoration.[91] If a national forest road removal program treated 9,300 miles of road annually, in two decades the Forest Service could rid itself of all 186,000 miles of road it identified for decommissioning. Such a plan would cost approximately $93 million annually — at an average cost of $10,000 per mile of road removed — but would also generate more than 3,000 living-wage jobs that would go primarily to rural communities that have suffered from recent declines in extraction-based economies.[92]

Conclusion

The Rockies region was settled in large part through policies designed to develop its natural resources. The Homestead Act, the 1872 Mining Act, and other early laws promoted the land for its many uses to attract settlers. Since land essentially cost nothing, it was often treated as if it had no value. In some cases, this attitude and some laws, such as the General Mining Act of 1872, still exist today.

Rivers are the life of the dry Rocky Mountain West. By refocusing the attention of resource management in the Rockies to emphasize restoration – particularly of the region's precious waterways – we may find that the legacy of mining, damming, and road-building can translate into the economic boom of the future. Only this time, the boom could benefit the environment rather than leave it in need of repair.

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Stormy Gulch, San Juan Range, Colorado © Ryan Schumacher

The 2008 Colorado College State of the Rockies Report Card

By Bethanie Walder

Boom and bust economic cycles are a well known feature in the Rocky Mountain West, triggered by intense periods of logging, mining, and other forms of resource extraction from public and private lands. Investing in and developing a robust, dynamic restoration sector of the economy ("restoration economy" for short) provides an opportunity to move beyond boom and bust cycles and to help stabilize rural, resource-dependent economies. A comprehensive restoration economy includes both the restoration of watersheds and the uplands that feed them, as well as the revitalization of the built environment in local communities. Investment in restoration is not intended to replace existing economic opportunities, but will add to these in the West.

The restoration economy includes many different components, beginning with an assessment of the current health of the natural and built environment. Once that is determined, practitioners can identify opportunities and techniques for restoring those environments to a more healthful and resilient condition. Restoration requires skilled workers who can be trained through university, union, or other programs. Universities across the region can also help monitor restoration efforts and develop new restoration technologies. In addition, a complex restoration economy will be adaptive, changing in response to monitoring results and ensuring that restored areas are maintained over the long-term.

A restoration economy includes components such as road removal, dam removal, forest thinning, mine reclamation, brownfields cleanup/redevelopment, and more. Many of the jobs created through a diverse, comprehensive restoration economy will be high-wage, high-skill jobs. Some of the restoration jobs, like those requiring heavy equipment and earth-moving machines, will be suitable only to local contractors, making a component of these jobs truly local in nature. This is another key element to reduce boom and bust economic cycles.

Road removal provides one excellent example of the potential for restoration to be a true component of economic growth in the Rockies and beyond. In 2000, the U.S. Forest Service published a long-term transportation policy that called for removing up to 186,000 miles of roads from their overall system (380,000 miles) over a 20-40 year time period. Wildlands CPR, a nonprofit organization that promotes road removal, commissioned an economic report to assess the potential benefits of such a road removal program. This report found that more than 3000 jobs could be created, per year throughout the economy, if the agency invested approximately $90 million/year in road removal. But the work would not stop in 20 years—once the agency gets their road system down to a manageable number, they should be able to better maintain their remaining roads, providing a number of permanent jobs in rural communities.

Montana Conservation Corps revegetating removed road © Adam Switalski, courtesy of Wildlands CPR

Removing those roads would have other economic benefits besides just providing immediate jobs to high-wage, high-skill workers. Road reclamation is one of the key steps for restoring clean drinking water for approximately 60 million Americans who depend

Ripped Road on the Centennial Demonstration Forest of Northern Arizona University © Adam Switalski, courtesy of Wildlands CPR

on national forest watersheds for their water in nearly 3,400 communities. The City of Seattle, for example, has chosen to invest in road removal in their watershed to ensure that they do not have to build a multi-million dollar water filtration plant and then maintain and run that plant in perpetuity. Their $6 million investment in restoration work over the next 20 years will save many more millions of taxpayer dollars over the long run.

With the prospect of increasingly frequent and severe storms in coming years, communities along the Pacific Coast and into the interior West face an urgent need to deal with their undermaintained, aging, and failing forest road systems. The longer these roads remain on the land, the more damage they will cause in future storms – damage that can cost hundreds of millions of dollars. But we cannot build a restoration economy unless public agencies and private industry invest in such work and create the infrastructure to support such work. While road reclamation funding has been scarce for years, there is growing interest in this effort. In December 2007, Congress appropriated $39.4 million to decommission roads and address critical maintenance needs to protect clean water and fisheries, mostly in storm-damaged national forests.

When lands and watersheds are restored, their economic value is also increased for the commensurate amenities-based economy. Growing numbers of people are moving to western landscapes to take advantage of recreational opportunities like fishing, hiking, hunting and bird-watching. The restoration economy is just one piece of a much broader and greener national economic vision for the United States. It deserves our attention and our investment.

About the author: Bethanie Walder is Executive Director of Wildlands CPR in Missoula, MT.

Affordable Housing in the Rockies

Housing a Region in Transition

By Wiley Rogers

THE 2008 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

Key Findings

•In Santa Fe, New Mexico, just 20 percent of all homes are affordable to a median income household.

•A minimum wage worker must work at least 3 jobs in Colorado to afford an average apartment.

•Approximately 158,000 individuals in the Rockies work at or below minimum wage.

•Rockies states receive less federal funding for housing programs than any other region.

•Energy-efficient affordable housing can help stabilize communities and decrease pressure on other public services.

About the author: Wiley Rogers (Colorado College class of 2008) is a student researcher for the 2007/08 State of the Rockies Project.

Introduction

The eight-state Rockies region offers breathtaking scenery, intact ecosystems, and a growing amenities-based economy. From 2000 to 2005, the Rockies region experienced a population growth rate 4.5 times the national average.[1] Although growth and the region's appeal have stimulated the regional economy, they have also taken a serious toll on housing availability and affordability, creating an affordability crisis in many Rockies communities.

Communities in the Rockies suffer as policemen, teachers, bank clerks, street cleaners, cappuccino makers — members of the working class — are pushed out, unable to afford housing in their own communities. Currently the average minimum-wage earner must work at least two full-time jobs to afford a two-bedroom apartment in the Rockies. Protecting the vibrancy and social health of Rockies region communities means providing adequate housing for the residents that support these communities. Expected population growth in the near future highlights the importance for communities not only to address the current problem, but to plan ahead.

Housing is the single largest expenditure for Americans. Nationwide, 55.5 million low-income households must pay more than 30 percent of their disposable income on housing costs, exceeding the "affordable level" defined by the U.S. Department of Housing and Urban Development (HUD).[2] A disproportionate number of these households are minorities concentrated in impoverished urban centers where poorly funded services leave little opportunity for upward mobility and homeownership. People in unaffordable housing situations often are unable to afford nutritious food or health care, putting a greater strain on public health systems.[3] The Rockies region does not have the affordable housing needs of mega-cities such as New York, Chicago, and Los Angeles, but with diminishing funding sources for low-income households many, Rockies communities now consider housing affordability a serious and growing problem.

The Rockies region boasts large metropolitan areas, rural agricultural lands, American Indian Reservations, booming oil frontiers, and ritzy resorts. With such socio-economic diversity, each regional housing market is unique and requires an individual set of policy measures to satisfy affordable housing needs. With that said, this report presents general findings from the Rockies with the understanding that regional situations may differ greatly; some areas are currently handling their affordability needs and others are approaching complete crisis. This report addresses several region-wide topics: the severity of the Rockies housing affordability problem, national and regional trends responsible for this problem, barriers and innovative solutions to improve affordability, and several case studies to illuminate local efforts to assure livability and affordability. To better tell the Rockies' story, this report profiles three community types that are struggling to house their inhabitants affordably: resorts, rural communities, and urban areas.

Resorts

In most Rockies resort communities there simply are not enough affordable housing units, forcing locals to commute hours to work while second-homes sit vacant; in these areas affordable housing is a crisis. Second, third, or even fourth-home owners flooding Rocky Mountain resort towns transform small, inexpensive communities surrounding resort destinations into towns resembling Gucci-fringed Aspen and faux-cowboy Jackson Hole. Finding affordable housing for locals and service workers in these communities is difficult when the median house price is far from affordable, given their annual income.

Rural Communities

A town's capacity to provide affordable housing in rural areas is greatly influenced by the local socio-economic climate. In rural areas, housing stock is generally much older, necessitating larger repair costs for families that often have lower incomes than city dwellers. Fortunate-

New Housing in Park City, Utah

ly, land prices in rural areas are much cheaper than in hot amenities-based markets, and this makes financing for housing construction more affordable. Nevertheless, many homes in rural areas carry significant health risks: in Arizona, nearly 59 percent of all households — rural and urban — are living at risk of lead-based paint.[4]

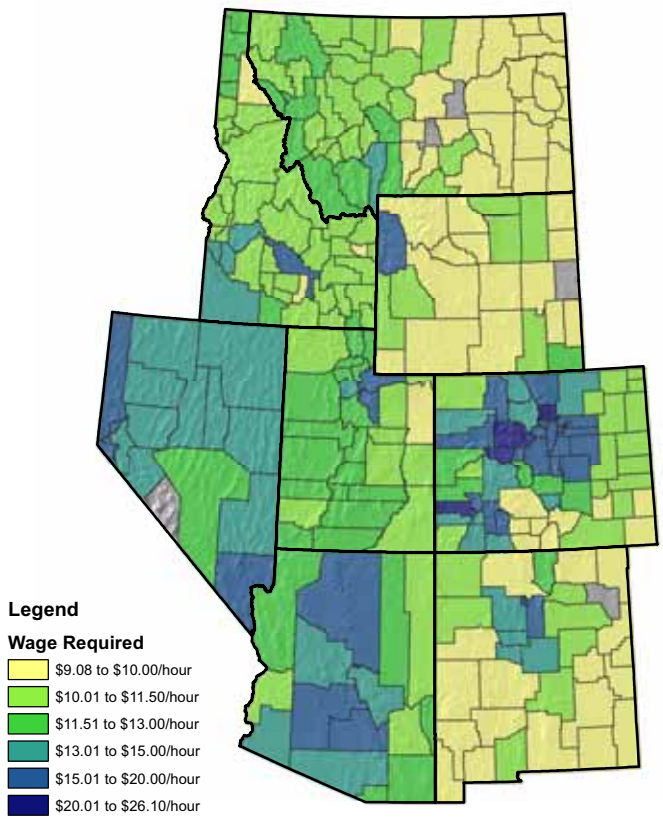
Urban Areas

Urban areas in the Rockies struggle to provide affordable housing near job centers and along transit lines. Living downtown can be expensive, especially as parts of cities gentrify and push low-income households to other less "trendy" neighborhoods. Denver is currently a more affordable city than many of the region's other urban areas; in Denver approximately 65 percent of homes are affordable to households, that make the area median income (AMI). In Santa Fe only 20 percent of homes are affordable to the same demographic.[5] Smaller urban areas, such as Boise, Bozeman, and Santa Fe are rapidly gentrifying. In many of these smaller cities, finding affordable housing is becoming increasingly difficult.

A Closer Look at the Rockies Affordability Problem: The Rental Market

Can low-income households afford rent in the Rockies? Finding affordable rental housing is the last step in line for many households on the brink of homelessness. Figure 1 highlights the wage needed to afford a median two-bedroom rental in the Rocky Mountain West.[6] In many Rockies communities, individuals must work multiple jobs to afford local rents. Working a 60-hour week seriously detracts from parents' ability to spend quality time with their children, attend higher institutions of learning, or save money to eventually purchase their own house.

Figure 1
Wage Required to Afford Two Bedroom Rental, Fair Market Rent, 2006
Source: National Low Income Housing Coalition



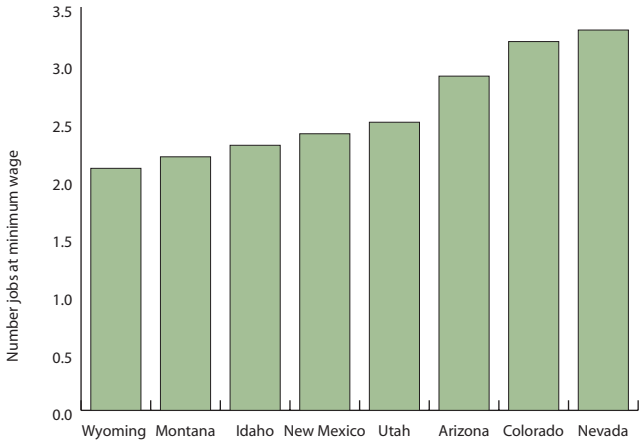
[MINIMUM WAGE LABORERS] MUST WORK AT LEAST 120 HOURS EACH WEEK IN COLORADO AND NEVADA TO AFFORD LOCAL FAIR MARKET RATES.

Renting a typical apartment in the Rockies with a minimum wage salary is nearly impossible. Yet the U.S. Department of Labor's Current Population Index estimates that 158,000 individuals in the Rockies work at or below minimum wage.[7] Without some form of subsidized rental housing, minimum wage laborers primarily employed by the food and service industries must work 80 hours per week to afford an average-priced rental. As shown in Figure 2 individuals must work at least 120 hours each week in Colorado and Nevada to afford local fair market rates. Considering that a week only contains 168 hours, without assistance from non-profit organizations and affordable housing subsidies, these workers face the prospect of having less than seven hours per day to eat, sleep, commute, shop for groceries, or spend with their families. Even with federal minimum wage increases, renting in the Rockies will still be grossly unaffordable to minimum-wage workers.

Extremely low-income households renting residential units are shut out of homeownership because they lack the financial capital and knowledge needed to purchase a home. Nationally, 23 percent of these renters experience severe cost burdens, paying more than 30 percent of their annual income on monthly rent and utilities.[8] These households with less disposable income struggle with fluctuating rental prices while putting a greater strain on other public services. Affordable housing problems increase in elderly households, often constrained by fixed incomes. Kathi Williams, Director of Colorado's Division of Housing, contends that the aging population of baby boomers migrating to Colorado will greatly burden already-stressed health care and transportation systems. She sees the lack of affordable assisted-living rental units for the many retirees that are not financially secure as a major concern, not only for the Division of Housing, but for all public services that will be burdened in the near future.[9] Her concerns are based, in part, on changing demographics: the Rockies region is the fastest growing destination for people age 65 and higher.

Critics claim that housing assistance is too costly for the taxpayer and encourages public-service dependence, yet

Figure 2
Number of Minimum Wage Jobs Needed to Afford Median Rent, Fair Market Rent, 2006
Source: National Low Income Housing Coalition



housing officials point out that with affordable housing one either pays up front to provide adequate housing, or pays even more money down the road in other public services.[10] A unique plan in Denver confronts homelessness by providing subsidized rental units for homeless men and women, costing the state government $14,512 annually per individual. The city calculates that this approach has saved Denver $25,488 of taxpayer money per assisted person that would have been spent in hospital bills, soup kitchens, homeless shelters, and police enforcement.[11] The price of housing Denver's homeless will likely decrease over time as these adequately-housed citizens find employment opportunities.

Buying a House in the Rockies

Although the U.S. has one of the highest home ownership rates in the world, roughly a third of U.S. households still rent residential units instead of owning their own home.[12] Encouraging renters to make their first home purchase has been integral to U.S. housing policy, but it takes more than encouragement for many living in Rockies job centers. Housing markets in the region vary widely from highly affordable rural communities to counties with the highest median incomes in the nation.

Table 1 shows the percentage of homes that households making the median income can afford in select Rockies metropolitan areas. Nationally, cities on the West Coast are the least affordable, closely followed by the Rockies. Within the region, affordability varies: metropolitan areas in Nevada and Utah are far less affordable than in Colorado and Montana. In Pueblo, Colorado, more than three-fourths of houses land in affordable- to medium-income levels, whereas in Las Vegas less than one-fifth of houses are affordable.[13]

The benefits of home ownership are numerous. In 2004, the median personal wealth of a U.S. homeowner was $184,560, whereas the median wealth of a renter was $4,050, with minority renters lower still at $2,600.[14] Accessible first-buyer homes allow families asylum from fluctuating rental markets in addition to increasing general wealth and borrowing ability. Home equity investments provide the benefit of shelter as well as income generation through refinancing; income effects generated by home equity are felt faster and stronger than stock market investments in the consumer goods market.[15] More fundamentally, home ownership provides the roots for successful permanent communities. Assisting low-income families in their first home purchase greatly benefits those families, their community, and the U.S. economy.

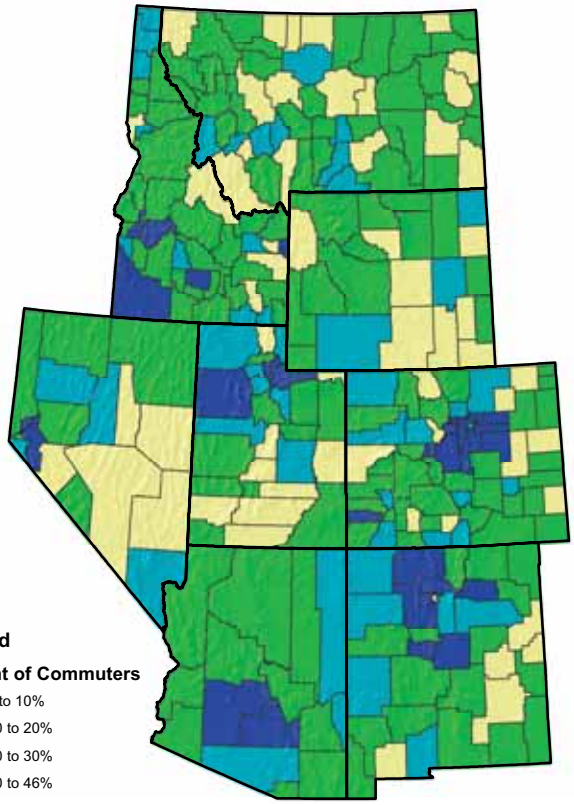
Commute Until You Qualify

Suburban sprawl now carpets portions of the Rocky Mountain West. Rows of single-family homes stan miles from job centers, luring families willing to sacri-

Table 1
Share of Homes Affordable for Median Income by Select Rockies MSA, Quarter 1, 2007
Source: National Association of Home Builders, Wells Fargo Opportunity Index

MSA	Share of Homes
Pueblo, CO	76.3%
Colorado Springs, CO	68.5%
Denver-Aurora, CO	64.5%
Greeley, CO	63.2%
Fort Collins-Loveland, CO	61.5%
Pocatello, ID	59.7%
Great Falls, MT	57.0%
Ogden-Clearfield, UT	53.9%
Boulder, CO	53.7%
Albuquerque, NM MSA	45.4%
Yuma, AZ	42.8%
Tucson, AZ	33.4%
Salt Lake City, UT	31.6%
Boise City-Nampa, ID	30.6%
Phoenix-Mesa-Scottsdale, AZ	30.0%
Provo-Orem, UT	29.3%
Prescott, AZ	28.1%
Flagstaff, AZ	23.2%
Reno-Sparks, NV	21.2%
Carson City, NV	20.0%
Santa Fe, NM	19.5%
St. George, UT	19.3%
Las Vegas-Paradise, NV	18.9%

Figure 3
Percent of Workers 16+ Commuting 30 to 59 minutes to Work
Source: Geolytics, Inc. Business Demographics 2005



fice a lengthy commute for more affordable living. As shown in Figure 3, a high percentage of workers are commuting 30 to 59 minutes to work around large metropolitan areas in the Rockies.[16] Rarely are commuting costs included in affordable housing equations, but driving two hours back and forth from work is very costly for families and has created major congestion problems that strain state transportation systems, especially along the I-70 and I-25 corridors in Colorado and I-15 in Utah.

The personal and societal costs of auto-dependent, low-density neighborhoods located miles from job centers are immense. Low-income families already spend a disproportionate part of their income on housing costs — a daily commute lowers productivity and quality of life, and has detrimental environmental and financial impacts on the individual and the community. After housing and utilities, transportation costs are the third largest expense for U.S. households.[17] These costs have prompted Fannie Mae to offer Location Efficient Mortgages that reward low-income families who choose to live a quarter mile from a bus line and own one less automobile.

In the inner city, the situation is quite different. Poverty is concentrated in neighborhoods far from service-industry opportunities in the growing suburbs. Low-income households rely heavily on public transportation, but as cities such as Denver plan new public transportation routes, affordable housing advocates struggle to secure nearby residential lots. Land values near transit lines tend to escalate so homeowners located on future light-rail blueprints often become land speculators waiting for their property values to skyrocket.[18] Greater cooperation between city transportation planners and affordable housing advocates can and should assure low-income housing along transportation routes. For example, the state of Nevada awards points to projects applying for Low-Income Housing Tax Credits if project sites are located in transit-oriented areas.[19]

As mentioned earlier, the search for a lawn, garage, and single-family detached house rests near the core of the "American Dream." Unfortunately this dream has been a nightmare for the Rockies region, taking the form of poorly planned, sprawling developments that spread across Colorado's Front Range, Phoenix's suburbs, and Utah's Wasatch front. Devoid of vibrant community and isolated from employment opportunities, shopping, and school, inhabitants of these new "Dream Homes" are utterly dependent on gasoline. The Rockies can grow more intelligently by modifying the "American Dream" to provide adequate housing without sacrificing the landscapes responsible for this region's great success. But like more affluent home-buyers, low-income families want the traditional "American Dream" House. The challenge will be to change development patterns and make denser urban communities more attractive to Rockies residents.

The U.S. Housing Market

To understand the current housing situation in the Rockies, it is necessary to examine recent patterns in the national housing market. From 2004 to 2005 the U.S. housing market boomed. Record-breaking single-family home sales and housing starts propelled the U.S. economy. The housing boom was mainly fueled by low interest rates set by the U.S. Federal Reserve that stimulated monetary lending, enabling banks and other financial institutions to offer inexpensive long-term loans. The development of new financial vehicles such as collateral debt obligations and subprime mortgage products further accel-

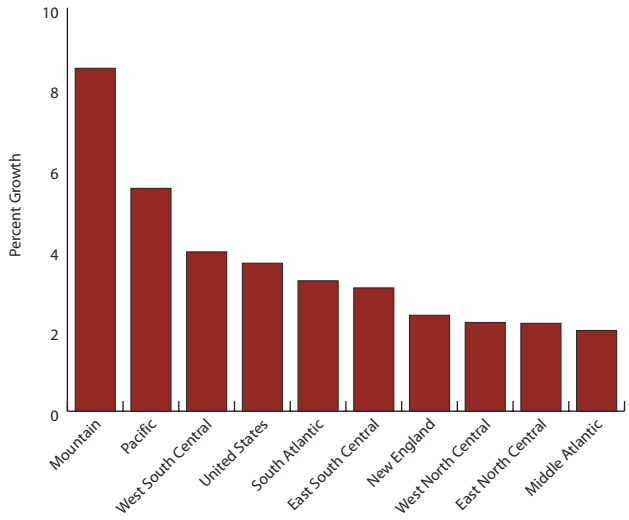
erated the housing market. As demand for single-family homes soared, the value of existing homes appreciated across the country. Investors speculated on future housing value. Many first-time buyers bought homes and even individuals with poor credit lines that originally would not have qualified for long-term lending were offered sub-prime mortgages and other unusual mortgage packages.

In 2006, the housing market began to waver as home sales plummeted by 10 percent, housing starts dropped by 13 percent, and appreciation rates flattened across the country.[20] To make matters worse, sub-prime mortgage lenders targeting low-income home-buyers with poor credit lines experienced huge losses as households were forced to default on their mortgages. In 2006, Denver ranked fifth among the 100 largest U.S. cities for housing foreclosures.[21] The housing industry accounts for one-fifth of the U.S.'s total Gross Domestic Product and the collapse of lending institutions such as American Home Mortgage, the tenth largest lender in the United States, has prompted stock losses and concerns about a more sustained economic slump.[22]

Today's slowing housing market has both positive and negative effects on affordable housing supply and affordability. As housing price inflation levels off, low to moderate home-buyers benefit from price cuts and greater housing options. But for the poorest households, housing prices are still appreciating at an unaffordable pace. According to the Arizona State Housing Division, Arizona has seen a decrease in residential housing starts, but single-family home prices are not dropping substantially enough to solve the affordable housing crunch. Phoenix, notorious for suburban sprawl and housing growth, experienced a 29 percent drop in new housing permits in 2006.[23] As lenders lose billions from housing foreclosures, the credit market tightens and households with poor credit lines or low incomes have difficulty finding willing lenders. To make matters worse, multi-family rental prices have increased as families forced to foreclose search for affordable apartments.

Some of the fastest growing housing markets in the country were in the Rockies region. As the U.S. housing market slows and the Rockies region reflects on five years of growth, it is an important time to assess current and future affordable housing needs. Once-booming cities in Nevada and Arizona now sit on vacant inventories; developers attempting to liquidate stock are offering ever more creative incentive packages to prospective buyers. Although housing prices seem more affordable, price-sensitive low-income households still cannot afford these empty homes. This snapshot of the national housing market serves as a key backdrop for housing trends unique to the Rockies.

Figure 4
Projected Population Growth by Census Division and the U.S., 2007-2012
Source: Geolytics, Inc. Estimates and Projections, 2007 and 2012



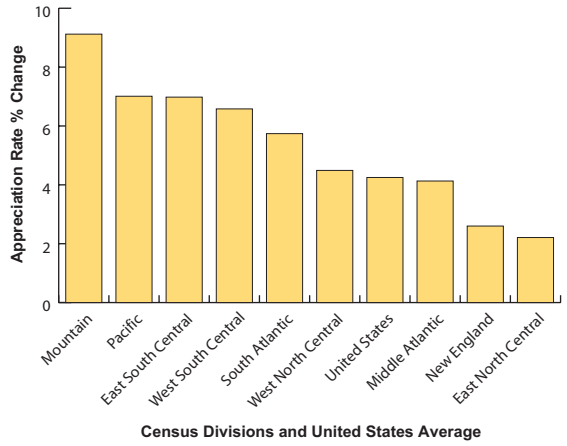
Troubling Rockies Housing Trends: The Next California?

The Rockies will likely continue to be the fastest growing region in the nation. As shown in Figure 4, population forecasts to 2012 indicate that the Rocky Mountain West will grow at a rate more than double the national average.[24] Growth is mainly concentrated in metropolitan areas with compelling job opportunities. As of 2000, 83 percent of the population in the Rockies already lived in urban areas.[25] Although rural areas suffer affordable housing shortages, the majority of extremely low-income housing needs are concentrated in dense urban areas.

People are migrating to the Rockies. Many of these newcomers move from expensive housing markets on the West Coast. Simply ask a Coloradan about their Californian neighbors and you will likely elicit complaints of housing prices, crime rates, and the general "Californication" of the community. In some respect, locals' complaints about the growing California Diaspora are legitimate; more than 5 million native-born Californians have migrated away from the state looking for more affordable living in job growth centers.[26] Population growth in the Rockies is making it increasingly difficult to provide affordable housing.

Housing future generations is only a fraction of the problem. Foreign-born immigrants play a major role in recent housing growth and are projected to account for two-thirds of projected housing growth in 2005 to 2015.[27] (See Immigration chapter in this volume). Individuals migrating to the Rockies greatly increase housing demand. Although housing supply in large metro-

Figure 5
Percent House Price Appreciation
by Census Division, 2006
Source: Office of Federal Housing Enterprise Oversight



politan areas can generally keep up, these single family tract homes are still too expensive for many local first-time home-buyers and low-income families.

Housing Prices in the Rockies Region

The availability and affordability of residential units is inextricably tied to the health of the housing market. Fluctuations in regional housing markets have a direct effect on the supply and demand of both subsidized rental and owner-owned units. Although the national housing market has slowed significantly, the Rockies market continues to grow. As Figure 5 shows, home-value appreciation rates in the Rockies region are higher compared to other census divisions, even after a major decrease from the first quarter of 2006 to the second quarter of 2007.[28] Such states as Idaho, Montana, Wyoming, and Utah maintain the highest appreciation rates in the nation, while most metropolitan housing markets in the Rockies are experiencing slowdowns in housing growth.

Many smaller mountain communities in the Rockies region seem unaffected by the national housing slump. Provo-Orem, Utah, the second-fastest appreciating market in the country at 20 percent, seems to have dodged slumping prices.[29] The situation in Jackson Hole, Wyoming, is quite similar. As one Jackson broker put it; "Our real estate market is essentially quite bullet-proof!"[30]

Rapidly appreciating markets affect affordable housing in several ways. The most costly aspect of affordable housing supply is often land price, which is more expensive in areas of high appreciation. Because land prices have increased rapidly around metropolitan areas and popular resort communities, affordable housing developers face much higher building costs. In Flagstaff, Arizona, a study conducted by Economic and Planning Systems Inc. found that land prices, rather than expensive second homes, were the cause of the affordability crunch. According to the *Arizona Daily Sun*, Flagstaff's lot prices are some of the most expensive in the state. Commonly amounting to 35 percent of a new home's price, residential lots are rarely sold for less than $100,000.[31] There is a common misconception that the Rockies possess an infinite supply of cheap land. Although land remains inexpensive in some rural areas, population growth mainly surrounds economic centers where jobs can be found. As smaller housing markets in the Rockies appreciate and second home growth explodes, land that originally was worth very little turns to gold.

A Lagging Median Income Growth

Regardless of appreciation patterns, family income growth has not kept up with housing prices in the Rockies. Although family median incomes increased steadily from 2004 to 2007 by an average of 1 percent per year, the median house jumped 7 percent in price from 2006 to 2007.[32] In Nevada, median income increased 3.5 percent from 2000 to 2004, whereas the median house price increased by 20 percent in the same period.[33] Figure 6 depicts the overwhelming disparity between income growth and housing prices in select Rocky Mountain metropolitan areas from 2004 to 2007. Housing price and income imbalance leads to situations where families are cost burdened — paying too much for housing each month.

Given the impact of population growth, housing supply, real estate appreciation, and the mismatch between income and housing prices, is the Rockies region adequately prepared for future affordable housing demand?

Figure 6
Change in Median Income vs. Change in Median House Price, Select Rockies MSAs 2004-2007
Source: National Association of Home Builders, Wells Fargo Opportunity Index

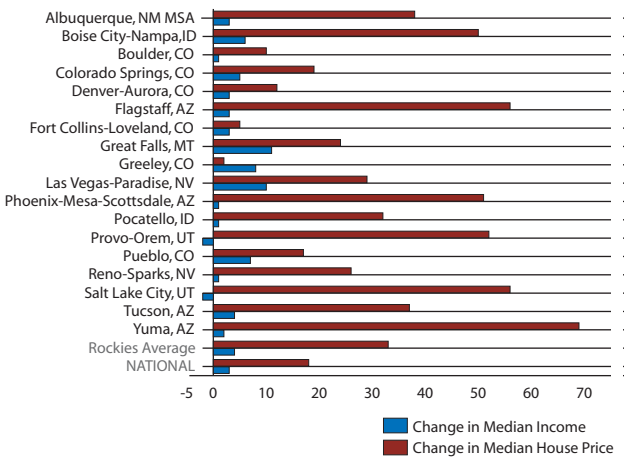


Figure 7
Total HUD Subsidized Housing Units Per Capita Below Poverty Level, 2000
Source: Department of Housing and Urban Development, U.S. Census Bureau

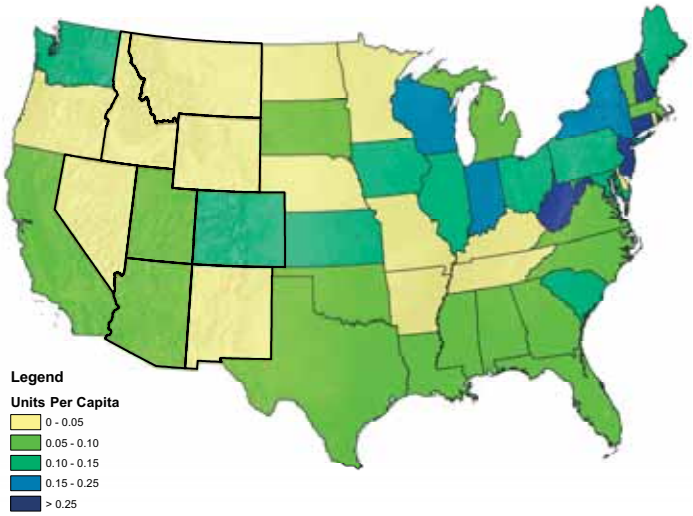
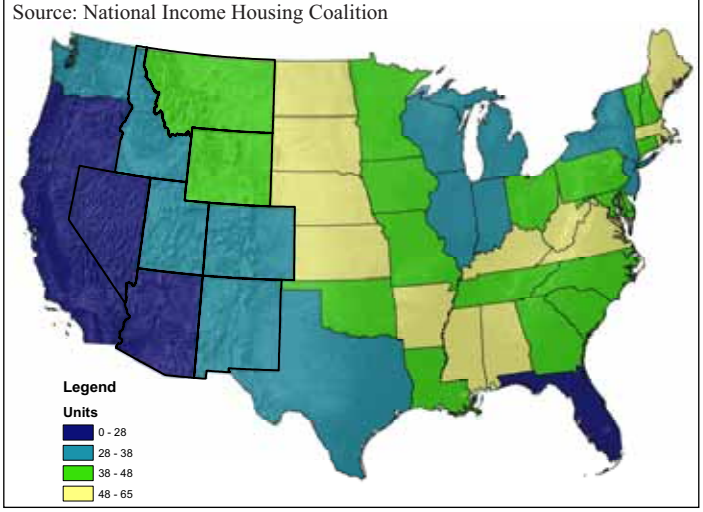


Figure 8
Units Affordable and Available for Every 100 Extrememly Low-Income Renter Households, 2005
Source: National Income Housing Coalition



Preparing for projected growth is a proactive process: by building affordable housing units today, communities ease the demand of tomorrow. Unfortunately, as depicted in Figure 7, the region as a whole has fewer federally-funded housing units per capita below the poverty level than any other region in the U.S.[34] In slacking markets, income assistance programs and housing choice vouchers (HCVs) are often more cost effective than actually building low-income units. Unfortunately, HCVs do not reach all families in need. According to a study produced by the National Low-Income Housing Coalition, nearly 5 million qualified households do not receive federal subsidies.[35]

A housing gap analysis conducted by the National Low-Income Housing Coalition illustrates the number of affordable and available rental units for every one hundred extremely low-income renter households (Figure 8). In both Arizona and Nevada, less than 28 units per 100 extremely low-income households are affordable and available. Other Rockies states are also experiencing a drastic rental shortage for the neediest demographic.

Barriers to Affordable Housing in the Rockies

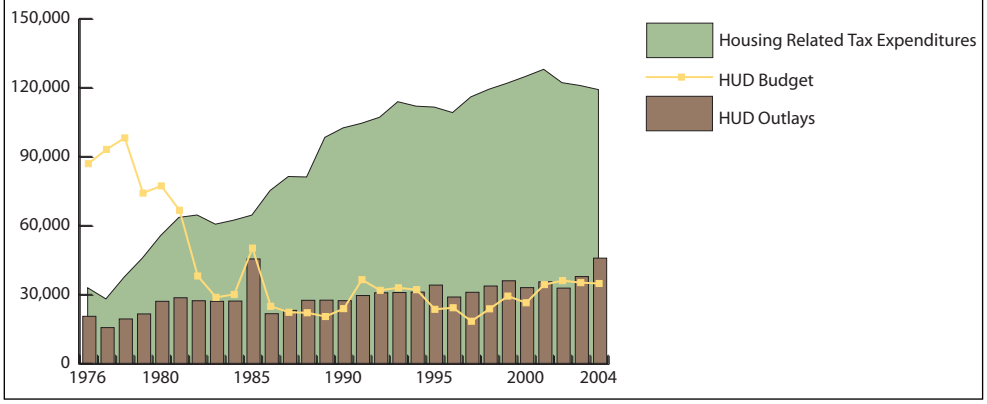
Nationwide, 90 million U.S. residents are still living in unaffordable or inadequate housing, either paying more than 30 percent of their income on housing costs or inhabiting poorly-maintained units. It is clear, given the numerous subsidies and programs that fall short of housing the neediest Americans, that the free market is simply incapable of providing enough clean, well-built, affordable housing. Without public money aiding low-income households and housing developments, many more individuals would be without shelter. Ensuring housing affordability protects some of our most important service sectors. The benefits here are numerous and important: housing our workforce of service industry employees, teachers, and policemen supports our nation's social health, secures a stable workforce, reduces crime rates, and generates personal wealth that boosts local economies. Without shelter it is extremely difficult to "pull yourself up by your bootstraps," especially here, as land in the Rockies is scarce and costly. As Justin Marks, the lead economist at the Colorado Division of Housing said, "You can't pull up your bootstraps, if you have no boots."[36]

Housing is a basic necessity of life. Recognizing that market forces fail to address low-income housing needs, the next section of this report addresses policy challenges and the mix of innovative tools that encourage healthy affordable living, especially those policies that on the federal, state, and local levels benefit the Rocky Mountain poor. We avoid wide-sweeping Rockies policy suggestions here, and instead highlight a fraction of the affordable housing barriers and innovative policy tools that could be utilized by Rocky Mountain communities. Each housing market is unique, so policy measures that would greatly assist residents of Denver cannot necessarily be applied to Missoula, Montana.

Lack of Federal Funding

Federal money for housing assistance is dwindling. The Rocky Mountain region receives federal funding in many different forms, including block grants, homeless assistance programs, and vouchers for cost burdened families. Since 1976 when the Reagan administration reformed U.S. housing policy into a tax incentive-based program, affordable housing advocates have waged a constant struggle to prevent housing assistance budget cuts. As shown by Figure 9, HUD's budget authority for housing assistance dropped by nearly $28.1 billion be-

Figure 9
HUD Budget History, 1975 to 2004
Source: National Low Income Housing Coalition "Changing Priorities" Report



tween 1976 and 2002.[37] In 1976, HUD was able to fund 435,362 low-income housing units nationwide. Had this budget trend continued, more than 14 million U.S. low-income families would be living in publicly funded housing today; instead, major budget cuts allowed for a meager 8,493 new subsidized housing commitments in 1996.[38]

Federal efforts to increase homeownership through tax-incentives take precedence over HUD-oriented housing support. Homeowner deductions such as the mortgage interest deduction encourage home-ownership in the U.S., but fall short in assisting low-income households that do not have sufficient taxable earnings to allow for a mortgage interest deduction. This deduction is more helpful to families with expensive mortgages.[39] Housing tax expenditures that specifically target low-income populations only amount to 3 percent of the total $127 billion in housing-related tax expenditures.[40]

President George W. Bush's 2008 congressional budget request does not paint an optimistic picture for affordable housing. Despite increasing demand for affordable housing, Bush's proposed budget of $35.2 billion cuts HUD funding by 8 percent.[41] HUD budget cuts have immediate effects: in Phoenix, Arizona, more than 13,000 people are waiting to move into public housing units. Despite the long waitlist, as of July 1, 2007, nearly 250 public housing units stood vacant because HUD budget cuts forced Phoenix to lay off 30 percent of its housing staff responsible for processing public housing applications.[42] As Federal budgets decrease, some state governments are organizing independent funding sources to satisfy affordable housing needs.

Inadequate Funding for the Rocky Mountain States

States receive a variety of federal funds to subsidize affordable housing and rental unit supply. These block grants allow state Divisions of Housing and other participating entities flexible annual funds to build low-income apartments, distribute household vouchers, provide housing for HIV patients, and generally increase the stability of Rockies neighborhoods. A study conducted by the Colorado Division of Housing illustrates, in Tables 2 and 3, the proportion of per capita funding in the Rockies compared with the rest of the country.

The Community Development Block Grant (CDBG) established by the Housing and Community Development Act of 1974 is an important funding source for housing authorities to subsidize the production of affordable housing units. Participating local governments with populations over 50,000 receive CDBG money to develop stable urban communities.[43] These funds are designed to benefit households making below 70 percent area medium income (AMI), the rest can be used to prepare for natural disasters or improve blighted areas.[44] As Table 2 shows, five Rockies states are among the ten worst funded nationally (table includes Washington D.C.).

The Federal HOME block grant program created in 1990, has helped produce approximately 744,000 low-income units in the United States. Unlike CDBG grants, which can be used for a number of community improvements, HOME funds are specifically for housing assis-

Table 2
States Receiving the Least Community Development Block Grant Funding, 2006. Rockies States Highlighted
Source: Colorado Division of Housing

Rank	State	Per capita
40	Georgia	$9.1
41	Delaware	$8.6
42	Oklahoma	$8.6
43	Idaho	$8.6
44	Tennessee	$8.5
45	Nevada	$8.5
46	Utah	$8.4
47	Wyoming	$8.3
48	North Carolina	$8.3
49	Colorado	$8.3
50	Virginia	$8.2
51	Alaska	$7.2

Table Includes Washington D.C.

Table 3
States Receiving the Least HOME Funding, 2006, Rockies States Highlighted
Source: Colorado Division of Housing

Rank	State	Per capita
40	Idaho	$4.6
41	Indiana	$4.5
42	Georgia	$4.4
43	Colorado	$4.4
44	North Carolina	$4.4
45	South Carolina	$4.3
46	Florida	$4.3
47	Maryland	$4.3
48	Virginia	$4.2
49	Minnesota	$4.2
50	Arizona	$4.1
51	Utah	$3.5

Table Includes Washington D.C.

tance. The office of Community Planning and Development, a part of HUD, issues these Block Grants of which 60 percent goes directly to participating jurisdictions with affordable housing plans and the remaining 40 percent is utilized by state Divisions of Housing. Rockies states rank poorly in HOME budget allocations. As shown in Table 3, four of the eight states rank in the bottom category for HOME dollars per capita, with Arizona and Utah placing last.[45]

The Rockies region faces the highest appreciation rates and population growth rates in the country, but still receives a disproportionately smaller share of federal tax dollars for affordable housing. Federal representatives should recognize the growing affordability crisis in the Rocky Mountain West and allocate funding towards Community Development Block Grants (CDBG) and HOME grants.

Building low-income housing is risky and irksome for developers who make larger profits selling market-rate homes. To encourage commercially-developed affordable housing, the Internal Revenue Service offers low-income housing tax credits (LIHTCs) for projects that include low-income rental units.[46] States have the power to allocate these LIHTCs to competing developments. Figure 10 depicts the distribution of LIHTCs in the Rocky Mountain region since 1987. Typically, metropolitan areas tend to receive more tax credits than less populated rural zones.[47] Unfortunately, LIHTC projects are still not affordable for many extremely low-income families. Half the households living in LIHTC rental units still on average pay more than 30 percent of their monthly income on housing costs.[48] Increasing the pool of low-income tax credits available to states would encourage greater affordable housing supply.

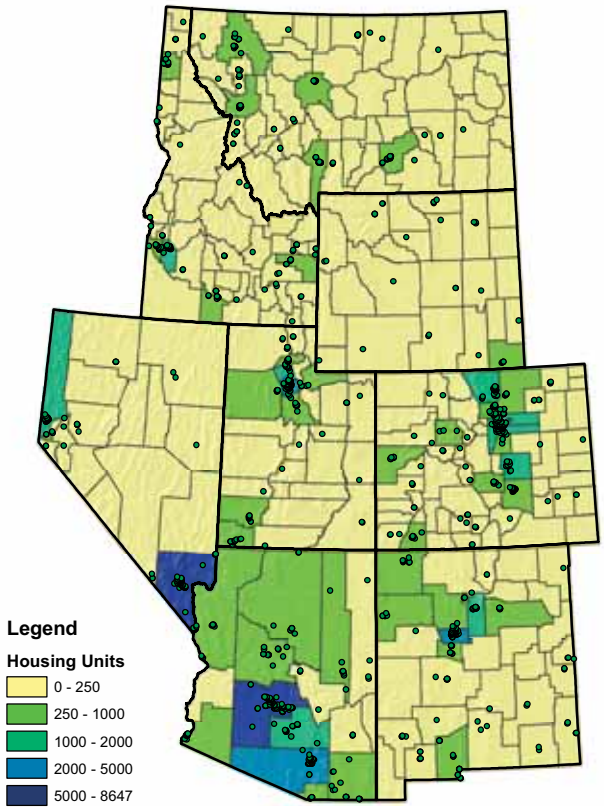
Regional Barriers

Often the strongest barriers to affordable housing are not-in-my-back-yard (NIMBY) regulations that actively exclude low-income housing developments. Residents often claim that low-income housing developments bring poor families into neighborhoods, decrease property values, and increase crime rates. This NIMBY attitude prompts exclusionary zoning regulations such as density and minimum unit size standards, which favor large expensive home developments over small affordable units. Many communities do not realize that low-income housing can be seamlessly integrated and that in the modern affordable housing market it is often difficult to distinguish subsidized units from market rate units.

Affordable Housing Built Right

Modern-day affordable housing should not have to translate into poorly designed, unhealthy homes. All homes ought to be intelligently designed to conserve energy and building materials, support a healthy indoor living environment, and require fewer maintenance costs. Low-income populations already bear a disproportionate share of housing-related health problems and environmental degradation; erecting slapdash housing units is not a sustainable long-term solution. Thoughtfully-built, resource-efficient techniques can be incorporated into affordable housing developments, not just in high-end neighborhoods. By incorporating design principles that are both cost-efficient and improve the lives of the poor and their surrounding community, the

Figure 10
Cumulative Low Income Housing Units by Rockies County, 1987-2004, Low Income Housing Tax Credit, And Locations of Units
Source: Housing and Urban Development, Low Income Housing Tax Credit Database



Rocky Mountain region can grow more intelligently in future years.

Conventional housing development costs only consider the design and building process of residential home construction. Because of this short-term economic outlook, design elements that could reduce total costs in the lifetime of the building are overlooked. Life-cycle costing provides an innovative solution, incorporating the full lifespan of a building into the development cost structure. Under this model, both owners and low-income renters benefit from annual utility savings by implementing resource-efficient building materials. A series of four resource-efficient affordable development case studies compiled by James Goldstein at the Tellus Institute, a non-profit research and policy organization dedicated to sustainability, found that the net conventional cost of "greening" developments ranged from 1 percent higher to 18 percent higher. After examining the net cost of "greening" these developments using the life-cycle costing structure, additional costs ranged from 4 percent higher to 34 percent lower. The two most successful projects provided fifteen and fifty resource-efficient affordable units, saving 23 percent and 34 percent respectively in lifetime building costs.[49]

Building healthy homes should be a priority. On average, U.S. citizens spend up to 90 percent of their day inside.[50] Designing indoor environments with non-toxic building materials benefits general family health, increases worker productivity, and eases the strain on the healthcare system. Many affordable homes are built with toxic materials. Conventional paints emit volatile organic compounds (VOCs) into the indoor atmosphere, which can cause headaches, muscle weakness, and nausea. These paints and lacquers contain toxic organic compounds that can irritate eyes, induce headaches, cause cancer in animals, and lead to serious long-term health problems.[51] Designs that utilize low-VOC paints and protect homes from mold and moisture are much safer for any household.

Resource Efficient Affordable Homes

Low-income households pay more for utility costs each month than for health care and education combined.[52] Conserving electricity, water, and natural gas reduces utility costs for low-income families while encouraging greater resource independence. Heating a home during the winter is increasingly expensive. As shown in Figure 11, the price of U.S. natural gas for residential usage more than doubled from 1996 to 2006. Utilities costs can constitute 25 percent of a low-income household's expenses after rental payments.[53] The use of energy-efficient appliances can reduce monthly bills and ease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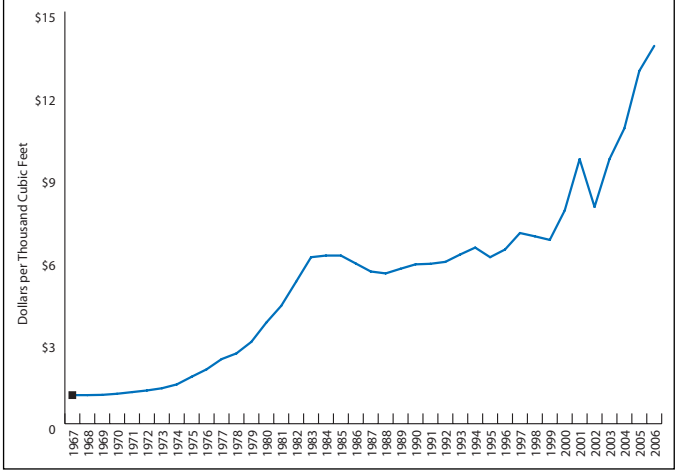
Kasi Carter, Colorado College class of 2011, working on a Habitat for Humanity Project in Santa Fe, New Mexico.

Figure 11
Price of Residential Natural Gas in the United States, 1967-2006
Source: Energy Information Administration



housing burden costs. Replacing older appliances with new EnergyStar models, for example, commonly saves consumers $80 or more per year in utilities costs while reducing a home's impact on the environment.[54]

Nationally, the residential housing market plays a major role in energy consumption, using 60 percent of all electricity and 35 percent of all primary energy. Nearly one-third of greenhouse gases in the U.S. are generated by homes.[55] According to the 2007 U.S. Department of Energy's Annual Energy Outlook, electricity consumption in homes is projected to increase by more than 30 percent from 2005 to 2030.[56]

Conclusion

The Rocky Mountain Region faces continued population growth in the next decade. An aging demographic coupled with an influx of immigrants working low-wage service jobs will strain a number of public systems. Without sufficient affordable housing, families will have to make sacrifices, either by living in run-down apartments or paying an exorbitant portion of their monthly income on housing. It is unlikely that the housing market will equitably allocate resources to poor households. Thus, public policy that shapes and frames the housing market will be important as the region grows.

Although federal programs support many in need, more funding is required to secure the stability and vibrancy of our region's neighborhoods. Local programs are playing an increasingly large role in this respect, but this burden can be too heavy in many Rocky Mountain communities already struggling with rampant population growth and rising housing costs. Local governments are integral to developing innovative regional policy in support of affordable housing. Often, the most effective affordable housing policy occurs on the local level. Although federal and state workforce housing assistance provides the bulk of subsidies, addressing low-income housing needs is seen by many as a community's responsibility. As broader funding sources evaporate, communities concerned with maintaining a stable workforce are beginning to take charge. For example, much can be accomplished by reforming NIMBY building regulations to encourage affordable housing supply and provide income assistance programs for those households still unable to afford rental units. (See Case Study: Policy Matrix for a list of useful local policies, page 80).

As good neighbors, as concerned citizens, and as educated taxpayers, we must understand that without adequate shelter, the cost for family stability, public services, and decency of life is heavy. Despite periodic downturns in the housing market, the Rockies region is positioned for long-term growth. If used well, these pauses in growth will grant communities the opportunity to address their own affordable housing needs and consider the critical question: are we designing growth, or is growth designing us?

Managing for truly effective affordable housing can be difficult because it requires the patience and cooperation of many different actors such as non-profits, local trust funds, for-profit developers, HUD agents, city councils, community members, and private donors. Fortunately, many of these players recognized and learned from the social and economic inefficiencies of the "public housing era."


Telluride, Colorado

Building affordably does not mean building foolishly. Mixed-income developments, such as Colorado's Elitch community offer a holistic and diverse approach to affordable housing, veering wildly away from "project" style poverty concentration, and actually improving the economic well-being of the surrounding neighborhood (see Case Study: Highlands Garden Village). States and localities are beginning to offer incentives for energy-efficient affordable housing designs.

State and regional affordable housing trust funds provide reliable revenue streams for state's affordable housing needs. Trust funds create a pool of money to build new affordable units, rehabilitate aging homes, offer low-interest rate loans, provide home-buyer education classes, and fund many other affordable housing projects (see Case Study: Santa Fe Housing Trust). Figure 12 illustrates states with affordable housing trust funds.[57] Arizona's state housing trust fund created in 1988 is particularly interesting: rather than creating unpopular new taxes, 55 percent of the trust fund revenue comes from small sources like abandoned bank accounts and unclaimed properties.[58]

To the region's credit, many Rockies communities are actively creating affordable housing trust funds, down-payment assistance funds, and inclusionary zoning regulations, thereby displaying leadership in how to keep low-income households from getting pushed aside. But more federal, state and community support is needed to assist workers and families who can now scarcely afford to live in the Rockies.

Case Study: Highlands Garden Village

Background:
Highlands Garden Village (HGV) is an innovative 26-acre infill redevelopment in Denver, CO, designed by Perry Rose & Jonathan Rose Companies on the former site of Elitch Gardens, an amusement park site closed since the late 1980s. The revitalization of the unused site with mixed residential zoning, office space, a new school, and multiple community gathering points, has benefited the whole neighborhood, which is becoming one of Denver's most desirable communities. The project also served as a pedestrian connection to burgeoning retail hotspots that had been disconnected by the blighted amusement park. HGV was highly lauded; receiving the American Public Health Association's Healthy Community Design Award, EPA's Overall Excellence in Smart Growth and Clean Air Excellence Awards, and Denver University's Burns School Residential Project of the Year.

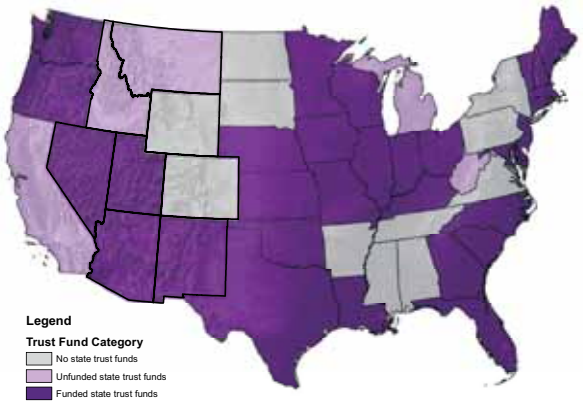
A community garden at Highlands Garden Village, Denver, Colorado

Relevance to Type of Project:
Highlands Garden Village is an excellent example of thoughtful urban affordable housing design. Utilizing Low-Income Tax Credits to subsidize affordable rental apartments for families, individuals, and senior assisted-living, HGV effectively integrates a diversity of income levels. Designing a community that, on a single block, has high-end town homes and low-income housing developments, and with high aesthetic standards, eliminates the not-in-my-backyard (NIMBY) stigma that prevents many affordable housing developments from taking shape. In addition, Highlands Garden Village is resource efficient; green measures include: recycling 30 tons of concrete from the former site, installing energy-efficient appliances in all multi-family buildings, planting buffalo grass and other plants that require less water, and building single family homes to exceed the Energy-Star program's standard requirements. Highlands Garden Village represents a holistic approach to community, providing job opportunities on site, connecting residents to the Denver transit system, and maintaining the spirit and uniqueness of a former amusement park.

Current/future Challenges:
Highlands Garden Village is currently trying to spur commercial development within the community. A health food store with affordable organic and non-organic options will provide on-site jobs for local residents. Increasing local job opportunities will help create a stronger and self-sustaining community.

What is Significant for the Rockies?:
The Rockies desperately needs thoughtful infill developments like HGV that provide affordable housing along transit lines serving metropolitan areas and occupational hubs.

Figure 12
State Housing Trust Funds in the United States
Source: Housing Trust Fund Project, Center for Community Change



Case Study: Santa Fe Community Housing Trust

Background:
The Santa Fe Community Housing Trust is a successful regional model for community members to protect the social fabric of their neighborhoods. Founded in 1991, the Santa Fe Community Housing Trust (SFCHT) is a non-profit organization working to protect Santa Fe residents from gentrification and promote low-income homeownership. The trust was conceived through the collaboration of citizen groups and illustrates what can happen when community members care about the people in their neighborhood. The Housing Trust has administered over 3,000 home-ownership classes for local first-time home buyers; out of 1,000 home owners who received this training, none has been foreclosed on a loan.[1] In addition to homeowner education, the Housing Trust works with local businesses and land owners to acquire vacant and unused lots. During its sixteen year history, the housing trust has built 350 low-income residential units for Santa Fe families who without assistance, would have been driven out of Santa Fe by exorbitant housing costs.[2]

Relevance to Type of Project:
The Trust acts as an agent for the Santa Fe's Inclusionary Zoning Policy, organizing for-profit developers to build affordable housing units. Additionally, the housing trust acts as a land trust, buying parcels of land in areas with anticipated affordable housing needs in the future. In the Rockies region, high land prices often make new housing very expensive. By partnering with local banks that recognize credit value in the housing trusts homeownership course graduates, SFCHT facilitates low-interest loans for poor families. The Santa Fe Community Housing Trust is a multi-faceted, grassroots-based concept that has grown into a very important affordable housing resource in the Santa Fe area. There are more than 15 community land trusts in the Rockies region, providing a similar holistic approach to regional affordable housing support.

Relevance to the Rockies:
Many communities in the Rockies struggle to address their regional affordable housing needs. Creating a community land trust that can also act as a housing trust fund, enables a community to address both affordable housing supply shortages and demand. Community trusts are yet another funding resource, especially important in the Rockies where land prices are expensive in many needy areas. Because low-income housing tax credits do not cover the cost of land acquisition, some affordable housing developments cannot afford to build in the heart of the community. Land Trusts and housing trust funds are an important grassroots tool that communities can use to protect their socioeconomic integrity and diversity.

[1]"The Santa Fe Community's Housing Trust Report to the Community: 2003-2004." 2004, available at: http://www.santafecommunityhousingtrust.com/
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Case Study: Policy Matrix

Policy Strategies	Policy Tool	Ideal For	Benefits	Example in the Rockies
Land Regulations	Density Bonuses	All	·Higher Density ·More Affordable Units ·Live near Work ·Reduces Sprawl	Developers building affordable housing units in Denver receive a 10% density bonus, with the exception of planned unit developments, special zoning districts and non-residential zoning districts.[1]
	Encourage density and low-income projects on transit routes	Urban	·Public transit access for low-income families ·Lower transportation costs ·Higher density	When allocating Low-Income Housing Tax Credits, the State of Nevada gives priority points to affordable housing units located on transit lines.[2]
Zoning	Infill Development	Urban/ Resort	·Revitalizes blighted or unused lots ·Can promote a vibrant urban community ·Reduces Sprawl ·Decreases transportation costs	Phoenix, Arizona, charges impact fees for improving municipal services. Certain types of infill developments are not required to pay these fees.[3]
	Allow Accessory Dwelling Units	All	·Increases available rental units on the market ·Allows private homes to offer low-income housing ·Gives low-income households more rental options	The city of Bozeman, Montana, relaxed zoning requirements to allow accessory dwelling units.
	Zone for Multifamily or mobile homes	Resort/ Rural	·Allows dense low-income housing ·Less expensive for developers ·Less expensive for households	Idaho's state building codes prohibit local governments from banning manufactured housing in single-family neighborhoods with the exception of historic districts.[4]
Administrative Strategies	Allow fee waiving for affordable projects	All	·Waiving impact fees decreases the cost of building affordable housing ·Encourages non-profit and for-profit developers to build more affordable units	Salt Lake City waives all impact fees for rental housing for those earning 60 percent of the area median income and homeowner housing for low-income households earning less than 80 percent of the area median income.[5]
	Establish a One-Stop Permitting System	All	·Saves time and money for affordable housing projects ·Decreases bureaucratic woes associated with affordable housing	Colorado Springs expedites permit reviewing for affordable housing projects. The city's affordable housing program manager reviews all low-income projects, saving affordable housing developers approximately four weeks.[6]
	Property Tax Exemptions for Affordable Projects	All	·Decreases the cost of affordable housing ·Decreases the income expenses to low-income families	The State of Arizona allows qualifying elderly residents to defer property taxes or receive property tax credits depending on their age and annual income.[7]
Market Regulations	Inclusionary zoning	Resort Hot Urban Markets	·Forces developers to provide affordable housing ·Increases the supply of low-income housing ·Cash-in-lieu payments can be directed to housing trust funds or other low-income projects	Aspen/Pitkin County, CO, has one of the most stringent inclusionary zoning policies. Developers are required to provide 60% inclusionary zoning.[8]
	Commercial/Industrial Linkage	Resort	·Requires commercial and industrial employers to provide affordable housing for their employees	The town of Basalt, CO, requires that new developments must provide 20 percent of their associated work force with affordable housing.[9]
	Real-estate Transfer Tax	Resort	·Generates money for local affordable housing projects	The State of Nevada charges $2.25 - $2.55 per $500 of consideration depending on the population of the specific county. These funds can be used for a number of community projects.[10]
Financing Tools	Down-payment Assistance	All Especially Rural	·Assists low-income families without lacking liquid assets in buying a home ·Promotes home ownership	Most state housing finance authorities provide down-payment assistance for first time homebuyers.
	Low-interest loans	Rural All Especially rural	·Lowers monthly mortgage payments for low-income home owners ·Can help families rehabilitate aging homes	Most state housing finance authorities provide low-interest affordable loans for first time homebuyers.
	Home-buyers education	All	·Reduces the risk involved in buying a house for both the household and mortgage lender	Most state housing finance authorities provide home-buyers education for first time homebuyers.
Other Tools	Create a Community Land Trust	All	·Protects valuable land in communities for future affordable housing projects	The Sawmill Community land trust in Albuquerque has reclaimed 27 acres to provide affordable housing in downtown Albuquerque.[11]
	Create a community housing trust fund	All	·Community funded affordable housing resource ·Can provide low-interest loans, home-buyers education classes, actual housing units, foreclosure protection, etc.	There are many examples of community land trusts. See Santa Fe Housing Trust Case Study.
	Enact a Living Wage	All	·Often there is a decent supply of vacant housing units, but households just don't make enough to afford them.	

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Grading the Rockies: Affordable Housing

The Rockies is a region in transition. High housing appreciation rates and a large population influx combine to make finding affordable housing a particular challenge in the Rockies. In addition, the region receives proportionally less federal funding for affordable housing compared to other regions in the nation. Increasing rates of immigration and the recent sub-prime lending crisis will further exacerbate the shortage of affordable rental units. Affordable housing is crucial to maintaining healthy communities and economies, particularly in resort communities, which depend on a large working class to support the service industry. This section of the *2008 State of the Rockies Report Card* grades every Rockies county on housing affordability.

This study shows where peer counties exist and can thus promote opportunities for counties to share effective strategies and increase available affordable housing. While greater funding from Washington, D.C., could help the region's communities, county governments are not powerless. Local entities often understand their needs best, and tools exist such as inclusionary zoning, transfer taxes, and housing trust funds to empower counties to improve their housing situation.

Methodology

Working from data compiled by the National Low Income Housing Coalition, available at www.nlihc.org, we determined affordability as the difference between the fair market rent for a two-bedroom housing unit and the rental rate that is affordable at the county renter median household income. These data are collected by the Census Bureau and the Department of Housing and Urban Development. Renter median household income is multiplied by 0.3, as HUD suggests rent exceeding 30 percent of income is unaffordable. This calculation excludes non-renter median income, asrenters rather than owners who are most squeezed by unaffordable housing. This also excludes the median of second homeowners who tend to be insulated from limited affordable housing and whose incomes may skew the data. Before counties were graded, they were sorted into one of three categories: metropolitan, micropolitan, and rural. The challenges of providing affordable housing in a city are different than those in a rural or resort community, thus it is important to compare each county only to its peers. County categories were derived from the USDA urban-rural continuum codes; see *2008 State of the Rockies Report Card* Methodology section.

The analysis provided here is not a perfect "affordable housing gap" analysis. It does not provide an actual figure of how many people are without affordable housing; rather, it provides a metric for determining what level of income one would need to afford housing in a given community. It addresses the supply side of the issue, not demand, which is contingent on antiquated census data.

Las Vegas, Nevada

State	County	Geographical Designation	Two bedroom FMR	Rent affordable at renter median income	Difference	Grade
Arizona	Apache	Micropolitan	$522	$755	$233	A-
	Cochise	Micropolitan	$617	$709	$92	C+
	Coconino	Metropolitan	$939	$806	-$133	D
	Gila	Micropolitan	$713	$630	-$83	D
	Graham	Micropolitan	$582	$562	-$20	D
	Greenlee	Micropolitan	$615	$1,219	$604	A
	La Paz	Micropolitan	$592	$644	$52	C-
	Maricopa	Metropolitan	$782	$884	$102	B-
	Mohave	Micropolitan	$676	$732	$56	C
	Navajo	Micropolitan	$610	$623	$13	D+
	Pima	Metropolitan	$772	$698	-$74	D
	Pinal	Metropolitan	$782	$718	-$64	D
	Santa Cruz	Micropolitan	$645	$603	-$42	D
	Yavapai	Metropolitan	$744	$728	-$16	D
	Yuma	Metropolitan	$695	$695	-$0	D+
Colorado	Adams	Metropolitan	$909	$932	$23	D+
	Alamosa	Micropolitan	$519	$499	-$20	D
	Arapahoe	Metropolitan	$909	$991	$82	C+
	Archuleta	Micropolitan	$746	$745	-$1	D
	Baca	Rural	$519	$596	$77	C+
	Bent	Micropolitan	$534	$600	$66	C
	Boulder	Metropolitan	$1,041	$965	-$76	D
	Chaffee	Micropolitan	$646	$683	$37	C-
	Cheyenne	Rural	$534	$711	$177	A-
	Clear Creek	Metropolitan	$909	$894	-$15	D
	Conejos	Rural	$519	$451	-$68	D
	Costilla	Rural	$519	$403	-$116	D
	Crowley	Rural	$534	$637	$103	C+
	Custer	Rural	$691	$750	$59	C
	Delta	Micropolitan	$594	$638	$44	C-
	Denver	Metropolitan	$909	$815	-$94	D
	Dolores	Rural	$686	$722	$36	C-
	Douglas	Metropolitan	$909	$1,418	$509	A
	Eagle	Micropolitan	$1,283	$1,392	$109	B-
	El Paso	Metropolitan	$785	$897	$112	B-
	Elbert	Metropolitan	$909	$1,022	$113	B
	Fremont	Micropolitan	$615	$656	$41	C-
	Garfield	Micropolitan	$808	$956	$148	B
	Gilpin	Metropolitan	$909	$1,044	$135	B+
	Grand	Rural	$729	$1,062	$333	A
	Gunnison	Micropolitan	$741	$693	-$48	D
	Hinsdale	Rural	$963	$760	-$203	D
	Huerfano	Micropolitan	$519	$553	$34	D+
	Jackson	Rural	$720	$810	$90	C+
	Jefferson	Metropolitan	$909	$1,041	$132	B+
	Kiowa	Rural	$534	$597	$63	C
	Kit Carson	Micropolitan	$534	$685	$151	B+
	La Plata	Micropolitan	$772	$743	-$29	D
	Lake	Micropolitan	$963	$820	-$143	D
	Larimer	Metropolitan	$802	$852	$50	C-
	Las Animas	Micropolitan	$558	$507	-$51	D
	Lincoln	Rural	$534	$795	$261	A
	Logan	Micropolitan	$553	$630	$77	C
	Mesa	Metropolitan	$602	$654	$52	C-

State	County	Geographical Designation	Two bedroom FMR	Rent affordable at renter median income	Difference	Grade
Colorado (Continued)	Mineral	Rural	$963	$800	-$163	D
	Moffat	Micropolitan	$557	$769	$212	A-
	Montezuma	Micropolitan	$597	$607	$10	D
	Montrose	Micropolitan	$647	$683	$36	D+
	Morgan	Micropolitan	$580	$706	$126	B-
	Otero	Micropolitan	$519	$507	-$12	D
	Ouray	Rural	$963	$898	-$65	D
	Park	Metropolitan	$909	$1,111	$202	A-
	Phillips	Rural	$534	$745	$211	A-
	Pitkin	Micropolitan	$1,357	$1,319	-$38	D
	Prowers	Micropolitan	$519	$608	$89	C+
	Pueblo	Metropolitan	$652	$568	-$84	D
	Rio Blanco	Rural	$720	$740	$20	C-
	Rio Grande	Micropolitan	$519	$592	$73	C
	Routt	Micropolitan	$1,002	$1,165	$163	B+
	Saguache	Rural	$519	$523	$4	D
	San Juan	Rural	$686	$423	-$263	D
	San Miguel	Rural	$1,042	$1,062	$20	C-
	Sedgwick	Rural	$534	$631	$97	C+
	Summit	Micropolitan	$1,124	$1,243	$119	B-
	Teller	Metropolitan	$893	$1,193	$300	A
	Washington	Rural	$534	$707	$173	A-
	Weld	Metropolitan	$690	$718	$28	D+
	Yuma	Micropolitan	$534	$671	$137	B
Idaho	Ada	Metropolitan	$695	$795	$100	B-
	Adams	Rural	$556	$594	$38	C-
	Bannock	Metropolitan	$545	$581	$36	C-
	Bear Lake	Micropolitan	$534	$647	$113	B-
	Benewah	Micropolitan	$623	$610	-$13	D
	Bingham	Micropolitan	$521	$605	$84	C
	Blaine	Micropolitan	$850	$951	$101	C+
	Boise	Metropolitan	$695	$753	$58	C
	Bonner	Micropolitan	$634	$598	-$36	D
	Bonneville	Metropolitan	$568	$643	$75	C+
	Boundary	Micropolitan	$623	$652	$29	D+
	Butte	Rural	$551	$449	-$102	D
	Camas	Rural	$589	$731	$142	B+
	Canyon	Metropolitan	$695	$691	-$4	D
	Caribou	Micropolitan	$534	$717	$183	A-
	Cassia	Micropolitan	$589	$618	$29	D+
	Clark	Rural	$551	$747	$196	A-
	Clearwater	Micropolitan	$553	$609	$56	C
	Custer	Rural	$551	$626	$75	C+
	Elmore	Micropolitan	$562	$801	$239	A-
	Franklin	Metropolitan	$615	$799	$184	A-
	Fremont	Micropolitan	$551	$670	$119	B-
	Gem	Metropolitan	$586	$605	$19	D+
	Gooding	Micropolitan	$589	$748	$159	B+
	Idaho	Micropolitan	$594	$554	-$40	D
	Jefferson	Metropolitan	$568	$696	$128	B+
	Jerome	Micropolitan	$589	$711	$122	B-
	Kootenai	Metropolitan	$646	$706	$60	C
	Latah	Micropolitan	$546	$530	-$16	D
	Lemhi	Micropolitan	$551	$533	-$18	D

State	County	Geographical Designation	Two bedroom FMR	Rent affordable at renter median income	Difference	Grade
Idaho (continued)	Lewis	Rural	$553	$566	$13	D+
	Lincoln	Rural	$589	$720	$131	B
	Madison	Micropolitan	$519	$607	$88	C+
	Minidoka	Micropolitan	$519	$643	$124	B-
	Nez Perce	Metropolitan	$570	$613	$43	C-
	Oneida	Rural	$534	$521	-$13	D
	Owyhee	Metropolitan	$695	$652	-$43	D
	Payette	Micropolitan	$558	$661	$103	C+
	Power	Metropolitan	$545	$657	$112	B
	Shoshone	Micropolitan	$519	$556	$37	C-
	Teton	Rural	$551	$1,062	$511	A
	Twin Falls	Micropolitan	$599	$674	$75	C
	Valley	Rural	$556	$806	$250	A-
	Washington	Micropolitan	$556	$703	$147	B
Montana	Beaverhead	Micropolitan	$658	$556	-$102	D
	Big Horn	Micropolitan	$519	$694	$175	A-
	Blaine	Rural	$526	$560	$34	C-
	Broadwater	Rural	$558	$729	$171	B+
	Carbon	Metropolitan	$598	$750	$152	B+
	Carter	Rural	$519	$591	$72	C
	Cascade	Metropolitan	$550	$623	$73	C
	Chouteau	Rural	$526	$646	$120	B
	Custer	Micropolitan	$519	$563	$44	C-
	Daniels	Rural	$519	$523	$4	D
	Dawson	Micropolitan	$519	$522	$3	D
	Deer Lodge	Micropolitan	$558	$448	-$110	D
	Fallon	Rural	$519	$635	$116	B-
	Fergus	Micropolitan	$519	$592	$73	C
	Flathead	Micropolitan	$599	$660	$61	C
	Gallatin	Micropolitan	$680	$773	$93	C+
	Garfield	Rural	$519	$630	$111	B-
	Glacier	Micropolitan	$526	$555	$29	D+
	Golden Valley	Rural	$519	$522	$3	D
	Granite	Rural	$558	$567	$9	D+
	Hill	Micropolitan	$519	$516	-$3	D
	Jefferson	Rural	$558	$625	$67	C
	Judith Basin	Rural	$526	$666	$140	B+
	Lake	Micropolitan	$556	$519	-$37	D
	Lewis and Clark	Micropolitan	$591	$673	$82	C
	Liberty	Rural	$526	$622	$96	C+
	Lincoln	Micropolitan	$571	$427	-$144	D
	Madison	Rural	$658	$666	$8	D+
	McCone	Rural	$519	$610	$91	C+
	Meagher	Rural	$658	$607	-$51	D
	Mineral	Rural	$653	$532	-$121	D
	Missoula	Metropolitan	$668	$610	-$58	D
	Musselshell	Rural	$519	$525	$6	D+
	Park	Micropolitan	$627	$648	$21	D+
	Petroleum	Rural	$519	$504	-$15	D
	Phillips	Rural	$519	$528	$9	D+
	Pondera	Micropolitan	$526	$620	$94	C+
	Powder River	Rural	$519	$676	$157	B+
	Powell	Micropolitan	$558	$721	$163	B+

State	County	Geographical Designation	Two bedroom FMR	Rent affordable at renter median income	Difference	Grade
Montana (continued)	Ravalli	Micropolitan	$611	$655	$44	C-
	Richland	Micropolitan	$519	$653	$134	B
	Roosevelt	Micropolitan	$519	$459	-$60	D
	Rosebud	Rural	$519	$678	$159	B+
	Sanders	Rural	$571	$561	-$10	D
	Sheridan	Rural	$519	$521	$2	D
	Silver Bow	Micropolitan	$522	$496	-$26	D
	Stillwater	Rural	$519	$920	$401	A
	Sweet Grass	Rural	$519	$734	$215	A-
	Teton	Rural	$526	$584	$58	C
	Toole	Micropolitan	$526	$626	$100	C+
	Treasure	Rural	$519	$477	-$42	D
	Valley	Micropolitan	$519	$573	$54	C-
	Wheatland	Rural	$519	$584	$65	C
	Wibaux	Rural	$519	$497	-$22	D
	Yellowstone	Metropolitan	$598	$641	$43	C-
New Mexico	Bernalillo	Metropolitan	$746	$711	-$35	D
	Catron	Rural	$472	$485	$13	D+
	Chaves	Micropolitan	$482	$569	$87	C+
	Cibola	Micropolitan	$472	$612	$140	B
	Colfax	Micropolitan	$502	$668	$166	B+
	Curry	Micropolitan	$472	$615	$143	B
	De Baca	Rural	$472	$510	$38	C-
	Dona Ana	Metropolitan	$521	$510	-$11	D
	Eddy	Micropolitan	$472	$563	$91	C+
	Grant	Micropolitan	$497	$494	-$3	D
	Guadalupe	Micropolitan	$556	$498	-$58	D
	Harding	Rural	$472	$474	$2	D
	Hidalgo	Micropolitan	$472	$444	-$28	D
	Lea	Micropolitan	$472	$537	$65	C
	Lincoln	Micropolitan	$562	$586	$24	D+
	Los Alamos	Micropolitan	$898	$1,327	$429	A
	Luna	Micropolitan	$472	$383	-$89	D
	McKinley	Micropolitan	$575	$617	$42	C-
	Mora	Rural	$556	$367	-$189	D
	Otero	Micropolitan	$472	$733	$261	A-
	Quay	Micropolitan	$472	$470	-$2	D
	Rio Arriba	Micropolitan	$506	$566	$60	C
	Roosevelt	Micropolitan	$472	$521	$49	C-
	San Juan	Metropolitan	$571	$664	$93	C+
	San Miguel	Micropolitan	$524	$441	-$83	D
	Sandoval	Metropolitan	$746	$908	$162	A-
	Santa Fe	Metropolitan	$872	$796	-$76	D
	Sierra	Micropolitan	$472	$390	-$82	D
	Socorro	Micropolitan	$472	$453	-$19	D
	Taos	Micropolitan	$673	$537	-$136	D
	Torrance	Metropolitan	$746	$531	-$215	D
	Union	Rural	$472	$491	$19	D+
	Valencia	Metropolitan	$746	$605	-$141	D
Nevada	Carson City	Metropolitan	$794	$870	$76	C+
	Churchill	Micropolitan	$743	$887	$144	B
	Clark	Metropolitan	$891	$907	$16	D+
	Douglas	Micropolitan	$923	$1,011	$88	C+

State	County	Geographical Designation	Two bedroom FMR	Rent affordable at renter median income	Difference	Grade
Nevada (continued)	Elko	Micropolitan	$750	$920	$170	B+
	Esmeralda	Rural	$682	$807	$125	B
	Eureka	Rural	$682	$796	$114	B-
	Humboldt	Micropolitan	$717	$901	$184	A-
	Lander	Micropolitan	$682	$831	$149	B+
	Lincoln	Rural	$682	$403	-$279	D
	Lyon	Micropolitan	$722	$901	$179	A-
	Mineral	Micropolitan	$682	$721	$39	C-
	Nye	Micropolitan	$653	$806	$153	B+
	Pershing	Rural	$682	$846	$164	B+
	Storey	Metropolitan	$911	$975	$64	C
	Washoe	Metropolitan	$911	$890	-$21	D
	White Pine	Micropolitan	$682	$754	$72	C
Utah	Beaver	Rural	$612	$692	$80	C+
	Box Elder	Micropolitan	$598	$784	$186	A-
	Cache	Metropolitan	$615	$705	$90	C+
	Carbon	Micropolitan	$535	$548	$13	D
	Daggett	Rural	$555	$693	$138	B
	Davis	Metropolitan	$639	$908	$269	A
	Duchesne	Micropolitan	$555	$589	$34	D+
	Emery	Rural	$555	$604	$49	C
	Garfield	Rural	$612	$721	$109	B-
	Grand	Micropolitan	$558	$571	$13	D+
	Iron	Micropolitan	$555	$621	$66	C
	Juab	Metropolitan	$675	$747	$72	C
	Kane	Micropolitan	$612	$757	$145	B
	Millard	Micropolitan	$612	$612	-$0	D
	Morgan	Metropolitan	$639	$901	$262	A
	Piute	Rural	$612	$426	-$186	D
	Rich	Rural	$618	$681	$63	C
	Salt Lake	Metropolitan	$714	$855	$141	B+
	San Juan	Micropolitan	$555	$737	$182	A-
	Sanpete	Micropolitan	$612	$623	$11	D
	Sevier	Micropolitan	$612	$631	$19	D+
	Summit	Metropolitan	$1,018	$1,142	$124	B
	Tooele	Metropolitan	$652	$846	$194	A-
	Uintah	Micropolitan	$519	$624	$105	C+
	Utah	Metropolitan	$675	$789	$114	B
	Wasatch	Micropolitan	$796	$985	$189	A-
	Washington	Metropolitan	$650	$748	$98	C+
	Wayne	Rural	$612	$736	$124	B
	Weber	Metropolitan	$639	$710	$71	C
Wyoming	Albany	Micropolitan	$595	$541	-$54	D
	Big Horn	Rural	$512	$695	$183	A-
	Campbell	Micropolitan	$550	$990	$440	A
	Carbon	Micropolitan	$512	$797	$285	A
	Converse	Micropolitan	$512	$621	$109	C+
	Crook	Rural	$512	$841	$329	A
	Fremont	Micropolitan	$512	$680	$168	B+
	Goshen	Micropolitan	$512	$624	$112	B-
	Hot Springs	Micropolitan	$512	$627	$115	B-
	Johnson	Micropolitan	$522	$876	$354	A
	Laramie	Metropolitan	$633	$810	$177	A-

State	County	Geographical Designation	Two bedroom FMR	Rent affordable at renter median income	Difference	Grade
Wyoming (continued)	Lincoln	Micropolitan	$540	$973	$433	A
	Natrona	Metropolitan	$512	$716	$716	A
	Niobrara	Rural	$512	$649	$137	B
	Park	Micropolitan	$514	$776	$262	A
	Platte	Micropolitan	$512	$792	$280	A
	Sheridan	Micropolitan	$541	$695	$154	B+
	Sublette	Rural	$551	$968	$417	A
	Sweetwater	Micropolitan	$512	$874	$362	A
	Teton	Micropolitan	$978	$1,320	$342	A
	Uinta	Micropolitan	$512	$918	$406	A
	Washakie	Micropolitan	$512	$661	$149	B+
	Weston	Micropolitan	$512	$653	$141	B

Wilderness and Extractive Industries

An Economic Transition in the Rockies

By Brandon Goldstein

Key Findings

•With regional population growth, the share of public land per person in the Rockies is steadily decreasing

•Over 60 percent of public land and almost half of all designated Wilderness within the contiguous United States is in the Rockies region.

•In 2005, natural resource extraction accounted for 3 percent of total GDP in the Rockies; the services industry made up 75 percent of total GDP.

•"New West" economies based upon cultural services have emerged from "Old West" economies that relied on natural resource extraction.

•National forests, Wilderness areas, and national parks collectively draw over 600 million visitors every year.

•Recreation benefits from Roadless and Wilderness areas are estimated to be worth $1.2 billion annually, and tourism generates billions more for local economies.

About the author: Brandon Goldstein (Colorado College class of 2008) is a student researcher for the 2007/08 State of the Rockies Project.

Introduction

The federal government manages more than 750 million acres within the United States as national parks, national forests, and other lands.[1] Many of these areas are largely undisturbed, relatively undeveloped tracts of land; in many cases these lands hold great public appeal and significant quantities of natural resources. More than 107 million acres of Wilderness are protected within the National Wilderness Preservation System, the majority of which is located in the western United States and Alaska. Still, there are many wilderness-quality lands that have not been set aside under this system.[2] At least 58 million acres of these wildlands exist in the eight-state Rockies Region, and a considerable portion of this land has an uncertain future that could result in either development or preservation.[3]

The fate of these public lands depends on political, social, and economic developments in the Rockies. Nowhere in the country is the management of wildlands more contentious than in the Rocky Mountain West. The Rockies is the nation's fastest-growing region, experiencing continuous pressure to increase recreational, ecological, and extractive uses of its remaining wildlands.

This section of the *2008 State of the Rockies Report Card* examines the societal and cultural significance of these open spaces and considers the potential for development and protection for Wilderness and wildlands across the region.

The Philosophy of Wilderness

American society's relationship with open spaces and wildlands has evolved considerably over the last several hundred years. Historically, land was considered a resource to be used solely for the benefit of humankind. The Louisiana Purchase in 1803 and the Gold Rush in the 1840s are representative of the "Manifest Destiny" ideal by which people occupied and profited from the undeveloped lands in the West.

Prior to the passage of the Homestead Act of 1862, the Federal Government was unsure how to manage the expansive tracts of land it held within the public domain. Many groups lobbied Congress for the "free distribution of such lands."[4] The passage of the Homestead Act encouraged droves of people to travel West so that they could try to gain ownership and live off the land. The Act was designed to send people west to cultivate the soil and to improve it for future use; in addition, it seemed to promise a stable income for many of the nation's poor. However, this promise fell through.

Between 1862 and 1904, the General Land Office distributed the rights to about 500 million acres. Homesteaders could rarely afford to develop a working farm or ranch. These ranchers, farmers and other laborers acquired only 80 million acres, about 16 percent of the total.[5]

The federal government often assisted industrial development directly, through land grants to railroad companies and other corporations.[6] Private industry jumped at the opportunity and profited immensely from the extraction, degradation, and fragmentation of Western wildlands.

Leading up to and during this time of federal land giveaways, the first explicit philosophies concerning wild and open lands began to emerge. Among the first to articulate the issue was Henry David Thoreau. In *Walden*, he expressed innovative concepts suggesting that undeveloped lands had inherent value beyond their economic potential. He advocated the conservation of natural areas to ensure that they would remain in their pure and natural states.

It took considerably longer, however, for public voices to sound calling for the protection of wild and open spaces. One of the first true champions of conserving public lands was the twenty-sixth President of the United States, Theodore Roosevelt. With help from his friend, the renowned naturalist John Muir, he established some of the nation's early national parks, several wildlife refuges, and hundreds of millions of acres of national forests.[7]

Grand Canyon, Arizona © Krista Pearson

In the beginning of the twentieth century, while working for the Forest Service, Aldo Leopold emerged as America's first wilderness advocate. He developed opinions that were critical of practices employed to manage forests and wildlands. In the 1920s, he became dedicated to preserving wilderness areas, associating wilderness with the availability of wild game and outdoor recreation activities. He hoped that the solace of the wild and the value of the land could be discovered without the destructive practices that were primarily used in the "exploration" of natural areas.[8]

At about the same time, Bob Marshall surfaced as another key champion of wild areas. He recognized characteristics of wilderness that were valuable to humanity. To him, wilderness areas allowed for an escape from the distractions of civilization. He considered the inherent value of wild places too great to ignore when he said, "What small financial loss ultimately results from the establishment of wilderness areas must be accepted as a fair price to pay for their inaccessible preciousness."[9] This insight reveals Marshall's ability to recognize the importance of the environment even without the modern understanding of ecosystem services.[10]

More recently, studies of the human relationship with wilderness have progressed further. Deep Ecology is a fairly recent philosophy that considers humankind as simply one component of the Earth's systems. It promotes the idea that ecosystems and wildlife have intrinsic value and should be preserved. This rejects the classic duality expressed by an anthropocentric view which claims that nature and its processes are separate from humanity, and therefore exist solely for our use. Furthermore, deep ecology recognizes that the "business as usual" policy of land management must stop because industrial and extractive practices degrade the natural systems that support all forms of life.[11]

The open spaces of the Rocky Mountain West have enormous potential to serve multiple uses and other interests of human society. In addition to the extractive industries (i.e. oil/gas drilling, mining, and timber,) there are several alternatives for cultural benefit. The most common features of wildlands highlighted by wilderness advocates are the opportunities for outdoor recreation. Various recreational activities attract people to wildlands, including fishing, camping, hunting, and even driving ATVs. Millions of user days are tallied each year by people who recreate outdoors to experience something that appears to be largely absent from their daily lives: wild nature.

What is Wilderness?

Wildlands within the public domain exist under a wide variety of classifications. The agencies with the most significant holdings of federal land are the Bureau of Land Management (BLM), U.S. Forest Service (USFS), National Park Service (NPS), and U.S. Fish and Wildlife Service (FWS). Each of these agencies manages land designated as Wilderness areas.

The term "Wilderness" no longer describes any wild area within the public domain; wilderness is wild ter-

Gore Range, Colorado © P. Zion Klos

rain where *Wilderness* (note the capital W) is protected land administered by the National Wilderness Preservation System under the terms of the Wilderness Act of 1964. The Wilderness System now contains more than 107 million acres in 702 areas.[12] As expansive as this may seem, Wilderness makes up less than 14 percent of public lands in the United States and less than five percent of total land area. Within the Rockies, just over seven percent of public land is designated as Wilderness; these 22,670,100 acres account for slightly more than four percent of all land in the eight Rockies states (See Figures 1 and 2 and Table 1.)[13]

Critics contend Wilderness areas exclude certain groups of people.[14] It is commonly thought to allow access only to hikers and thus, considerably limiting recreation options within its boundaries. In reality, many recreational opportunities are still allowed in Wilderness areas, including hiking, camping, horse packing, hunting, and fishing; nevertheless, activities that use motor vehicles, motorized equipment, or mechanical transport (i.e. bicycles, snowmobiles, motorboats, trucks, etc.) *are* expressly prohibited, as well as any supporting infrastructure such as roads and buildings.[15] Under the terms of the Wilderness Act, "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain."[16] The effects of human actions within Wilderness areas are to be "substantially unnoticeable" next to those caused by the "forces of nature."[17]

Even so, a wide array of human activities is permitted within Wilderness areas. Vehicles can be permitted if deemed necessary to control disease, insects, or fire. Prospecting and mining was allowed in Wilderness areas until December 31, 1983, and mines can still be established in Wilderness areas provided that a valid claim existed before that date.[18] Grazing rights for livestock are also permitted as long as the use was established prior to September 3, 1964, and is approved by the Secretary of Agriculture.[19]

Many of these activities can negatively impact local ecosystems. Mining operations, for example, alter and fragment landscapes, and mining sites seriously detract from visitors' Wilderness experiences. Livestock, especially cattle, trample the ground, which compacts the soil and increases surface water flow.[20] The amplified

Figure 1
National Wilderness Preservation System of the Conterminous United States and Census Divisions
Source: National Atlas of the United States, USDA Forest Service

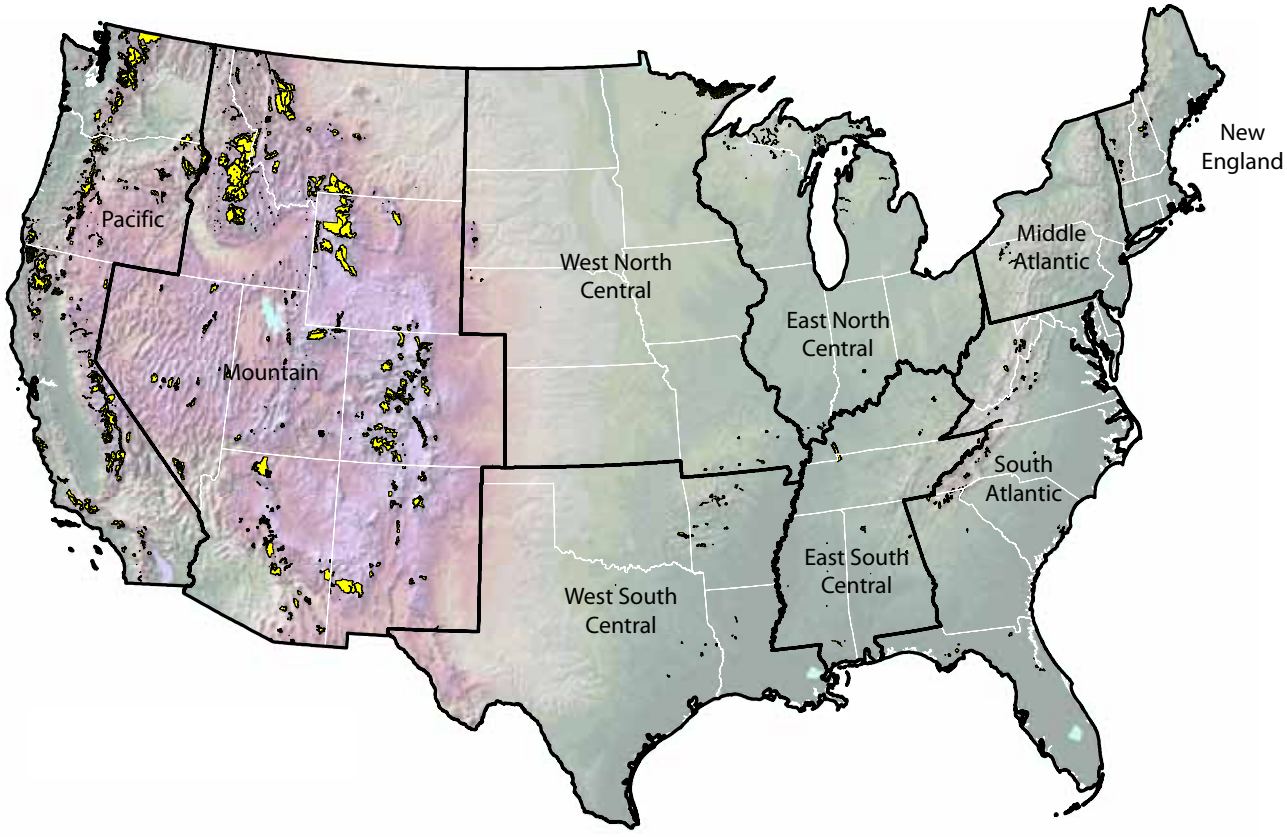


Figure 2
National Wilderness Preservation System in the Rockies
Source: National Atlas of the United States, USGS

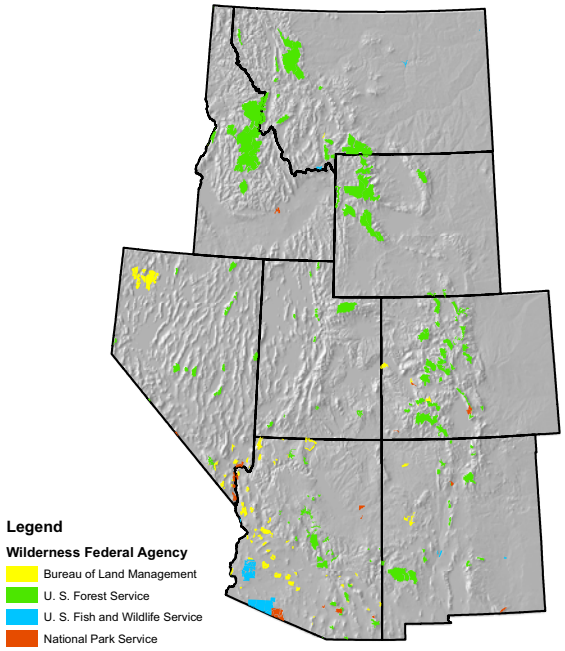


Table 1
National Wilderness Preservation System of the Rockies, 2005
Source: Data Calculated from National Atlas of the United States

State	Bureau of Land Management	U.S. Forest Service	Fish and Wildlife Service	National Park Service	Total
Arizona	1,412,309	1,349,373	1,337,994	447,884	4,547,560
Colorado	139,290	3,120,946	2,222	99,692	3,362,150
Idaho	1	3,870,986	0	46,031	3,917,018
Montana	11,928	3,258,541	56,625	0	3,327,094
New Mexico	145,756	1,394,736	42,734	56,212	1,639,437
Nevada	998,701	847,576	0	224,374	2,070,652
Utah	31,804	753,752	0	0	785,555
Wyoming	0	3,020,634	0	0	3,020,634

runoff can increase sediment deposition in streams and rivers, polluting natural freshwater systems and damaging critical riparian zones.[21]

Public Lands in the United States

The use of federal lands has been contentious for as long as they have existed. Public and private voices call for using these lands in a variety of ways. Some seek to develop, others to preserve. Conflicts emerge as each land use demands a different management strategy or portion of the land.

Over the past two centuries, the United States has seen a 1,600 percent increase in population density, from 4.4 people per square mile in 1790 to nearly 78 people per square mile in 2000. (See Figure 3.) The ratio of population to federal land has increased even more dramatically: from 13 people for every square mile of federal land in 1790 to almost 284 people per square mile in 2000 (Figures 3 and 4). This is largely due to increases in population density. Population in this period grew more than 7,000 percent compared to only a 300 percent increase in federal land area.[22]

The change in public domain as a portion of total U.S. land also reveals the growing scarcity of federal land. In 1850, public land made up 63 percent of total land area; by 1955, that had dropped to less than 18 percent (Figure 5). The West is stereotypically viewed as synonymous with open spaces and an expansive frontier. The Rockies region embodies this idea, with rugged mountains and wide vistas. According to National Atlas Data from 2005, the Rockies contains more than 62 percent of all public land in the lower 48 states. On the whole, 59 percent of the region is owned by the federal government (Table 2).[23] However, what were once vast stretches of wilderness are increasingly shrinking due to exurban development, resource extraction, and some recreational activities.

Public Land in the Rockies

The Rockies region is the fastest growing in the country, with over 14 percent population growth from 2000 to 2006.[24] The rapidly increasing population translates to higher demand for all the resources that public lands provide. This section will compare recent trends in population and public land area in the Rockies region.

The share of public land per person in the Rockies is now changing rapidly as population increases. From 1999 to 2006, the share of public lands per capita decreased almost 18 percent from 15 acres per person in 1999 to 12 in 2006 (Figures 6 and 7). Nevada and Arizona, the two fastest growing states in the nation, experienced decreases of more than 20 percent.[25]

The relatively stable public land figures combined with rapid population growth works to erode the frontier image of the Rocky Mountain West. High population densities increase the demand for natural resources, like water, oil, and natural gas. Greater numbers of hikers and campers cause noticeable impacts from increased use on roads, trails, and campsites. In addition, the chance of encountering other individuals in the backcountry rises. Each of these factors can detract from the wilderness experience.

Figure 3
People per Square Mile of Land and Square Mile of Public Domain in the United States, 1790-2000
Source: Historical Statistics of the United States Millenial Edition Online

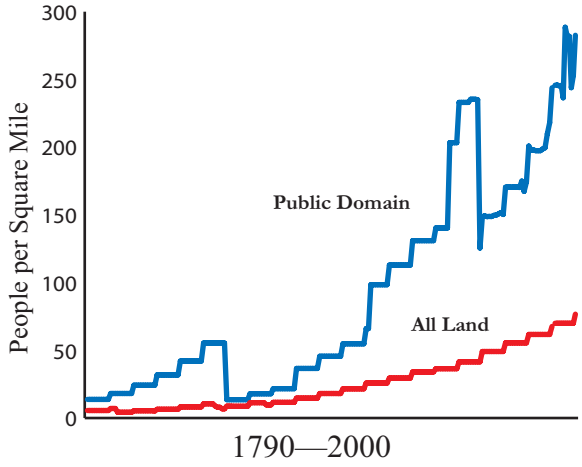
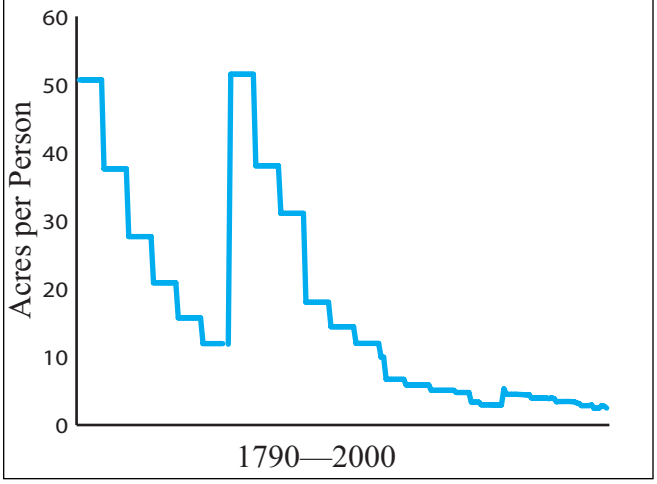


Figure 4
Acres of Public Domain per Person, 1790-2000
Source: Historical Statistics of the United States Millenial Edition Online



The quantity of public land is not the only factor for consideration. More important, in fact, is its quality. Areas that become more populated apply increasing pressure to a variety of systems. Increasing demand on fresh water removes more water from rivers, reservoirs, and lakes. Higher power demands quickly translate to the need for more power generation facilities. The increased density of backcountry roads and trails considerably affects the landscape. There are also more subtle effects that occur: sediments are deposited into rivers and watersheds, and the risk of human-caused forest fires increases.

This report does not imply that these problems will worsen in the Rockies region with the quickly enlarging population. It simply acknowledges that without proper preparation and attention to these risks, our natural systems may show signs of increasing degradation.

Current Trends

The Old West economy consisted largely of agricultural and extractive industries. This section of the report will focus mainly on natural resource extraction, since agriculture does not affect the designation of Wilderness to nearly the same extent — at least insofar as Wilderness areas continue to be found primarily in high elevation areas largely unsuited for agriculture. Since the early nineteenth century, harvesting timber and mining for precious metals, oil, and gas has been common in the Rockies. These industries created thousands of jobs as well as support infrastructure. Employees were needed not only for the mining and logging processes; towns like Leadville, Colorado, and Butte, Montana, emerged almost exclusively to support miners. They offered amenities like housing, saloons, and mercantiles catering to workers. Other workers were employed to build and maintain roads connecting remote mining and timber sites to civilization.

The economy emerging in the Rockies today is evolving from the extractive trends of yesterday. Faced with a "choice of an 'old' economy built on resource extraction or a 'new' economy built on clean environments, natural amenities, and renewable nature services," more voices in the western United States have come to support the latter.[26] This movement has been labeled the "New West" economy, in contrast to the Old West economy. A significant part of the New West economy is based upon the service industry. The supporting industries of the Old West economy have become the basis for the new emerging Western economies: food, health, technology, legal, entertainment, technical, financial, transportation, administrative, and recreation services have come to dominate the markets of the New West. Economic em-

Figure 5
Public Domain as a Percent of Total Land in the United States, 1790-2000
Source: National Atlas of the United States

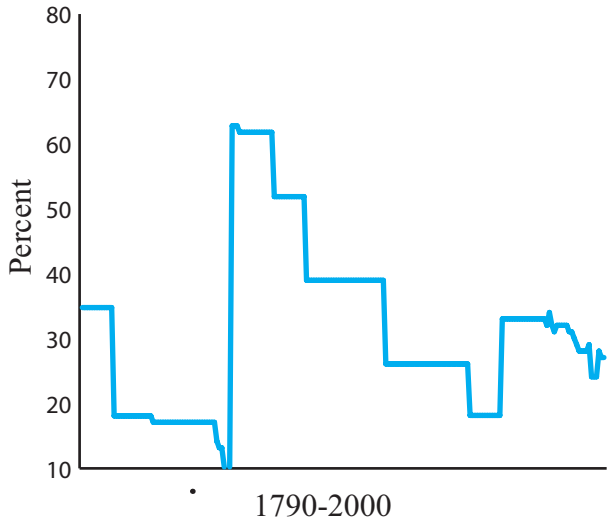
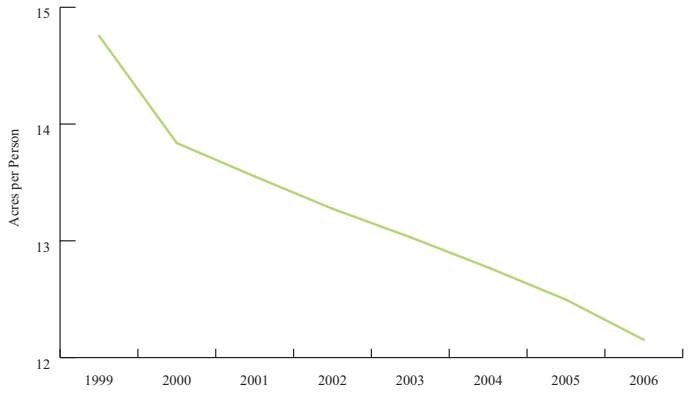


Table 2
Percent Federal Ownership by U.S. Census Division, 2006
Source: USGS National Atlas GIS layer

Census Division	Sum Federal	Total Land	Percent Federal
Pacific	363,390,363	583,474,860	62%
Mountain	323,560,545	552,717,515	59%
West North Central	32,651,988	331,413,519	10%
West South Central	14,431,935	278,480,765	5%
East North Central	11,657,106	158,780,796	7%
East South Central	9,550,621	116,378,077	8%
South Atlantic	19,978,956	173,791,573	12%
Middle Atlantic	1,376,565	64,955,478	2%
New England	1,835,717	41,977,356	4%

Figure 6
Acres of Public Land per Person in the Rockies, 1999-2006
Source: US Census Bureau, PILT



phasis has shifted to services that enhance the quality of life while protecting the environment.

Economic trends illustrate this point well. From 1939 to 2001, the number of trade and services employees in the Rockies region rocketed from 281,000 to more than 4.7 million (Figure 8). During the same years, the number of employees in the mining industry only increased from 77,500 to 84,500 (Figure 8). Since 1939, there have been momentous changes within the mining industry. If we assume that mining equipment has changed little from 1997 to 2001, employee numbers can actually tell us something about the size and relative importance of the mining industry. In that five-year period, the number of mining employees in the Rockies dropped almost 8 percent from 91,800 to 84,500 (Figure 8).[27] Examining total employment, the extractive industries' share of the economy is insignificant. In 2005, three percent of the total employed Rockies population worked in agriculture, forestry, fishing, hunting, and mining, whereas 75 percent of the population worked in the service industry.[28] Measured in terms of GDP, mining in the Rockies grew by about 25 percent from 1997 to 2006, but it still accounts for just five percent of the region's GDP, compared to nearly 65 percent for the service sector (Figure 9).[29]

The value of open lands can also be evaluated by analyzing recreation trends. Comprehensive and matching data is lacking across all agencies, so this report analyzes recreational visits for the National Park Service and the Forest Service. Recreation on public lands, especially in our national parks and forests, has become more and more popular. In 1960, there were about 79 million visitors to all areas under the jurisdiction of the National Park Service. It quickly grew and stabilized at about 270 million visitors since 1990. Overall, national parks experienced 245 percent growth in visitor numbers between 1960 and 2005. Between 1960 and 1996, the number of visitors to national forests grew 269 percent from almost 93 million to more than 341 million (Figure 10).

The Wilderness Act, passed in 1964, coincides with the beginning of the boom in outdoor recreation. In 1965, there were almost 3 million recreational visits to all Wilderness areas. In 1994, there were approximately 17 million (Table 3). From this increase, it can be inferred that keeping areas off-limits to machines and vehicles has considerably increased the worth of wild areas to some recreational users.

Lifestyle choices and recreational activities highlight how people value the environment. According to Joe Kerkvliet, "Economists have learned that people value the environment in many ways. Yes, we value extracted oil and gas and we pay directly for it. Westerners also value the healthy lifestyles supported by clean air and water, abundant wildlife, and wide open spaces."[30]

Figure 7
Acres of Public Land in the Rockies, 1999-2006
Source: PILT

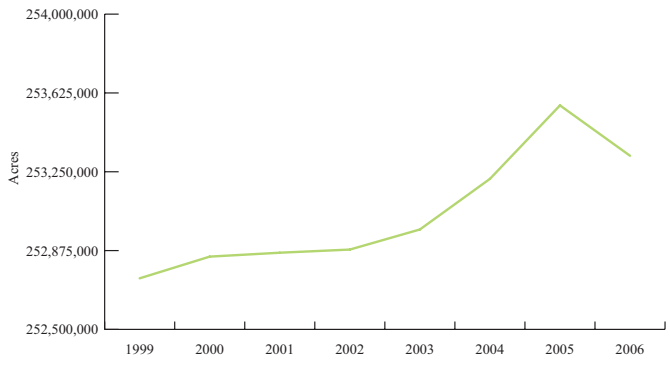
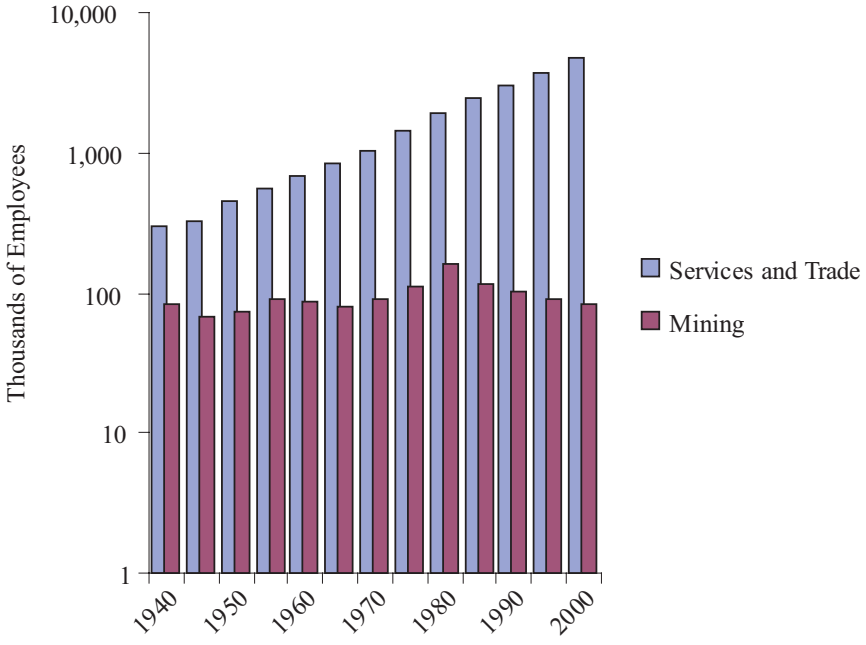


Figure 8
Employment in Services and Trade and Mining Industries, 1940-2000
Source: Bureau of Labor Statistics



Note Data for Service Employees in Utah is unavailable until 1982
Data is not seasonally adjusted

Many move to the West because of its natural character and environmental amenities. The economic prosperity in the Rockies region is due largely to the rapid influx of people immigrating here from other regions. They are coming west to be closer to wildlands, not only to recreate in but to live near the environmental amenities these places provide.[31]

The Controversy Over Wildlands

Only a small portion of public lands are actually Wilderness. Less than 14 percent of public land in the United States is designated as Wilderness. Within the continental U.S., about half of these Wilderness acres are in the Rockies region.[32] There are many other lands with Wilderness-quality characteristics, but they lack much of the protection given to formal Wilderness. These exist most prominently as roadless areas within national forests, but are also included in some national parks, BLM lands, and national wildlife refuges. As the most politically-visible, unprotected wildlands, roadless areas managed by the U.S. Forest Service have by far stirred the most controversy.

The debate centers upon whether these lands should be protected as Wilderness or opened up to development. The Forest Service tracks Inventoried Roadless Areas (IRAs) under three categories. Road construction and maintenance is permitted on 70 percent of IRAs and the rest are off-limits to these activities. Some roadless areas are also recommended for Wilderness designation (Figure 11, and Table 4).[33]

Political intentions for roadless areas have differed between recent administrations, sparking a battle over how these lands will finally be designated. In 2001, as one of his last acts as President, Bill Clinton implemented the Roadless Area Conservation Rule ("Roadless Rule"). The plan was to protect 58 million acres of land from road-building and most logging within nearly all national forests, while continuing to allow a wide array of recreational activities. Accused of being "11th-hour" and underhanded by some critics, this action was actually the culmination of about twenty years of study and more than 600 public meetings.[34] When it came time to solicit public opinion, the Forest Service held a 69-day period for public comment, 30 percent longer than required.[35] This opportunity produced 1.7 million public comments, 95 percent of which favored maintaining these areas without roads.[36]

Shortly after George W. Bush took office, he made it a priority to repeal the Roadless Rule. President Bush claimed that the policy would improperly restrict access to national forest lands.[37] In July 2003, U.S. District

Figure 9
GDP Derived From Select Services and Trade and Mining Industries in the Rockies, 1940-2000, millions of dollars
Source: Bureau of Economic Analysis, U.S. Department of Commerce

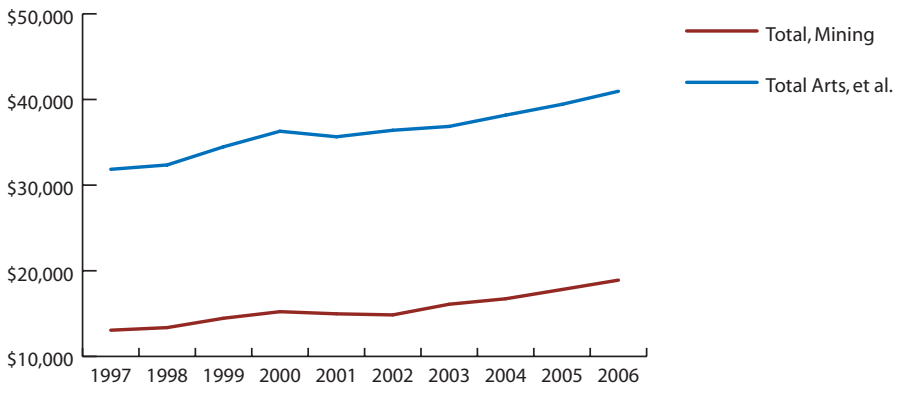


Figure 10
Annual Number of Visitors to U.S. Forest Service and National Park Service Land, 1960-2005
Source: US Statistical Abstract 2000 Section 7: Parks Recreation and Travel

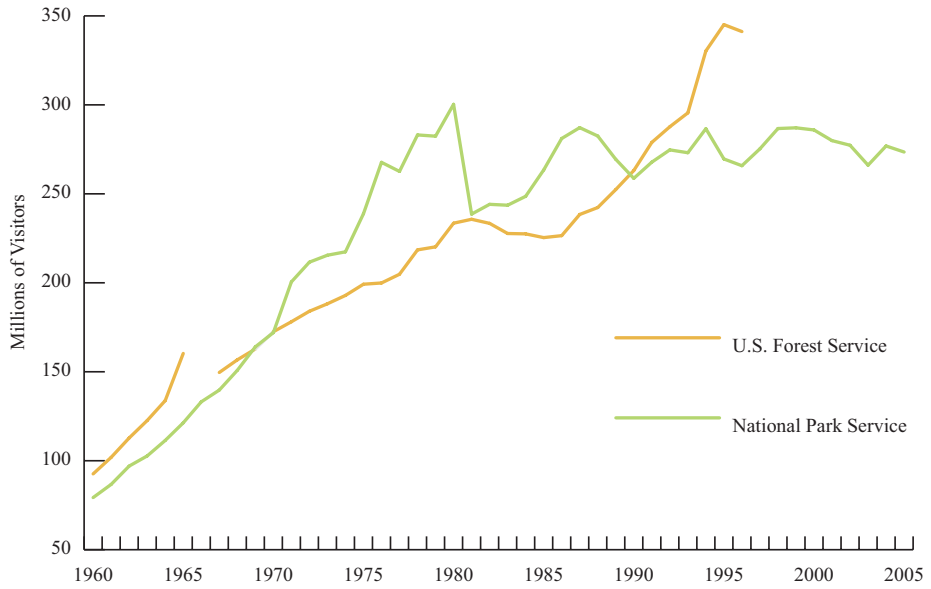


Table 3
Wilderness Recreation Visits, 1965-1994
Source: US Statistical Abstract 2000 Section 7: Parks Recreation and Travel

Year	Recreation Use (Thousands)	Average Annual Percent Change
1965	2,952	—
1972	5,246	11%
1979	8,843	11%
1989	14,801	7%
1994	16,988	3%

Court Judge Clarence Brimmer blocked the implementation of the rule Clinton initiated, claiming that it violated the National Environmental Policy Act (NEPA) and Wilderness Act.[38] Before the case could go to further legal review,[39] the Roadless Rule was repealed in 2005 when the Bush administration replaced it with a process that required state governors to petition the Forest Service for roadless protection in their states.[40] Under the new process, the federal government retained the authority to deny any requested protections.[41]

In September 2006, United States Magistrate Judge Elizabeth Laporte ruled against Judge Brimmer's 2003 decision, and the Roadless Rule was reinstated to the Clinton policy that applied to all national forests within the continental United States.[42] After six years of legal wrangling, the fate of national forest roadless areas remains uncertain. Many of these lands sit vulnerable to extractive uses and motorized recreation. Public opinion may still sway political interests, but one key question lingers: How much wilderness is enough?

Open Land: What is it Good For?

In addressing these issues of quantity and quality, one must consider all possible land uses and resources that wildlands produce. Historically, resource extraction has been the predominant use type. Timber, minerals, and more recently, oil and gas, have brought considerable income and employment to regions that were otherwise economically isolated. Recreation and services that rely on wildlands have recently become much more significant parts of our economy. They have now surpassed resource extraction industries in terms of employment and GDP. (See Figure 9.)

Resource extraction, although waning in magnitude, is still significant to the Rockies economy. As discussed above, these industries contribute billions of dollars every year and provide thousands of jobs. The economic benefits we reap from these resources should not be dismissed. One study estimated that in existing wells and drilling fields in the United States there is the equivalent of 14.6 years worth of economically recoverable oil and 21.4 years of gas based on 2001 U.S. consumption.[43] Of undiscovered oil and gas on federal lands, the study estimates 384 days and 1.7 years' worth respectively.[44]

The timber industry, although waning like many other natural resource industries, is still a critical part of some economies in the Rockies region. In 1998, almost 56,000 jobs were supported by forestry throughout the United States. The industry's aggregate effects on the economy totaled about $290.7 million that year alone.[45] A number of areas in the Rocky Mountain states still rely on these revenues and provide raw materials for a variety of forest products.

Without proper management, however, extractive industries have the potential to critically damage the quality of western ecosystems. Logging can degrade the aesthetic value of wildlands, reduce habitat integrity, and increase rates of erosion. Sustainable timber harvesting has therefore become a major goal of many groups working with logging companies. Oil and gas drilling scars and fragments landscapes, as it requires not only rigs for extraction, but roads to transport necessary materials and the resources themselves. In addition, the financial infusion provided to communities generally

Case Study: The Roan Plateau, Colorado

The fate of the Roan Plateau has become a highly visible battle between environmentalists, local communities, and conservation groups against the federal government. A 9,000-foot-high plateau in Western Colorado, the Roan is capped by 73,602 acres of federal land.[1] The plateau is surrounded by gas drilling within the Piceance Basin and is the next area on the Colorado Oil and Gas Association's wishlist for lands to be leased by the Bureau of Land Management (BLM).

According to one wilderness advocate, the Roan Plateau "rises 3,500 feet above the Colorado River Valley and includes some of the last wild tracts of public land in the region."[2] One of four areas in Colorado noted for its tremendous biodiversity, it is the only one that has not yet been protected. In 1999, a coalition of local groups and elected officials proposed to the BLM that four areas in the Roan Plateau be protected as Wilderness. The BLM confirmed that three of the four have considerable wilderness-quality characteristics. In addition, the region has become a prime location for hunting, fishing, and other types of outdoor recreation.[3] These activities in the Roan bring in an estimated $5 million every year.[4]

The land on the Roan Plateau was transferred to the BLM from the Department of Energy in 1997. Afterwards, the agency began forming resource management plans (RMPs) for the area. The fight has been for the BLM to acknowledge the ecological and recreational importance of the area, and to manage it with the goal of preserving the environmental quality and integrity of the plateau.[5]

Despite these conservationist efforts, in 2004 the BLM proposed an RMP that would open up land to be leased on top of the Roan Plateau. In May of 2007, Colorado Representatives Mark Udall and John Salazar requested a year-long moratorium on oil and gas production on the Roan.[6] Within one month, the BLM began leasing public lands atop the plateau for development. The final plan was created and implemented at the last minute, making it unavailable for public review or comment. This directly contradicts the draft plan and environmental impact statement (EIS) from the BLM itself, which called for public opinion to be gauged and recommendations to be formed. The Wilderness Society claims that the new plan actively disregarded public opinion on this matter, despite seven years of public comment that "overwhelmingly opposed drilling the public lands on top of the Plateau."[7]

The BLM asserts that it is compelled to lease all public lands on the Roan to oil and gas companies without delay. In 2002 the "BLM itself acknowledged that there was no such requirement included in the Transfer Act, legislation that turned these lands over to the BLM … in 1997."[8] Further, Congress passed these lands to the BLM with the intention of having the land administered by terms set by the state of Colorado, and did not expect the drilling of the entire Plateau.[9]

Oddly enough, the BLM's own draft plan found no need to actually drill on the Roan. Projections made by the federal government indicated that 91 percent of all available oil resources were accessible without drilling into the Plateau.[10] Furthermore, 86 percent of the gas could be recovered without drilling anywhere on the top of the Plateau.[11] Groups such as The Wilderness Society also dispute the BLM's figures for recoverable gas from the Roan.[12] With gas drilling now slated to move forward in selected areas atop the plateau, this case illustrates how vulnerable—and how contested—unprotected wildlands in the Rockies remain.

Workover Rig, Rangely, Colorado © Russell Clarke

Case Study Notes

[1]Judith Kohler. July 31, 2007. Congressmen Solicit Feedback On Roan Plateau Management Plan. February 14, 2007. Associated Press. http://www.saveroanplateau.org/press.htm

[2]Too Wild Too Drill: Roan Plateau, Colorado. June 25, 2007. The Wilderness Society. http://www.wilderness.org/WhereWeWork/Colorado/TWTD-Roan.cfm

[3]The Wilderness Society, 2007.

[4]Steven K. Paulson. June 15, 2007. Two Colorado Congressmen Call For Delay In Drilling On Roan Plateau. May 15, 2007. Associated Press. http://www.saveroanplateau.org/press.htm

[5]Campaign Disappointed in BLM Decision to Immediately Lease Roan Plateau's Public Lands. June 14, 2007. The Wilderness Society. June 8, 2007. http://www.wilderness.org/NewsRoom/Release/20070608.cfm

[6]Steven K. Paulson. June 15, 2007. Two Colorado Congressmen Call For Delay In Drilling On Roan Plateau. May 15, 2007. Associated Press. http://www.saveroanplateau.org/press.htm

[7]Campaign Disappointed in BLM Decision to Immediately Lease Roan Plateau's Public Lands. June 14, 2007. The Wilderness Society. June 8, 2007. http://www.wilderness.org/NewsRoom/Release/20070608.cfm

[8]Campaign Disappointed in BLM Decision to Immediately Lease Roan Plateau's Public Lands. June 14, 2007. The Wilderness Society. June 8, 2007. http://www.wilderness.org/NewsRoom/Release/20070608.cfm

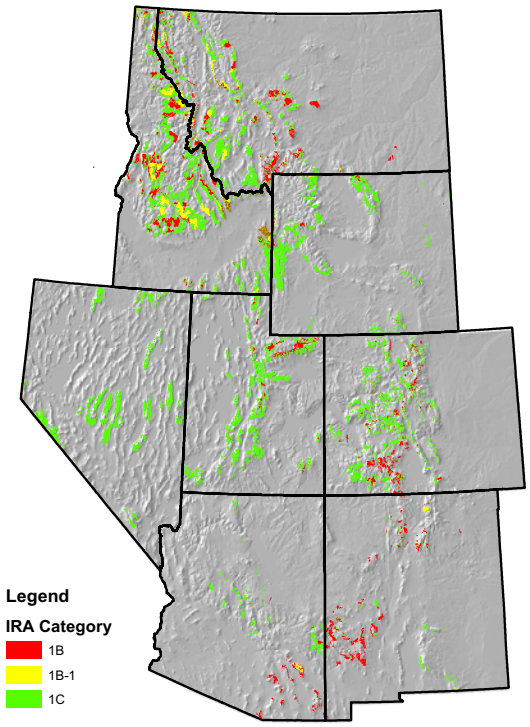
[9]The Wilderness Society, 2007.

[10]86% Of Plateau's Natural Gas Available Without Drilling Top: Citizens Renew Push For Even-Handed Roan Plateau Plan. July 31, 2007. Citizens' Campaign to Save Roan Plateau. February 24, 2004. www.saveroanplateau.org/press.htm

[11]No Need to Drill the Top. July 31, 2007. Save Roan Plateau Fact Sheet-The Roan Plan by the Numbers. December 28, 2004. http://www.saveroanplateau.org/background.htm

[12]Analysis Shows Interior Department Overstated Roan Plateau's Gas Potential by More Than 3,000%. July 31, 2007. The Wilderness Society. October 27, 2004. http://www.saveroanplateau.org/press.htm; see also A GIS Analysis of Economically Recoverable Gas and Oil Underneath the Roan Plateau, Colorado. July 31, 2007. The Wilderness Society. October 26, 2007. http://www.wilderness.org/NewsRoom/Release/20041027.cfm.

Figure 11
Inventoried Roadless Areas in the Rockies
Source: USDA Forest Service Geospatial Service and Technology Center, 2003



Category Definitions
1B: IRAs where road construction and reconstruction is prohibited
1B-1: IRAs that are recommended for wilderness designation in the forest plan and where road construction and reconstruction is prohibited
1C: IRAs where road construction and reconstruction is not prohibited

Table 4
Inventoried Roadless Areas in the Rockies by State
Source: USDA Forest Service Geospatial Service and Technology Center, 2003

State	1B IRA	1B-1 IRA	1C IRA	Sum
Arizona	534,057	61,135	698,574	1,293,767
Colorado	924,838	10,774	3,522,117	4,457,730
Idaho	2,544,624	1,619,674	5,939,295	10,103,593
Montana	1,882,819	1,012,440	3,925,530	6,820,789
New Mexico	1,098,812	65,779	382,772	1,547,363
Nevada	16,868	401	3,203,617	3,220,886
Utah	448,435	14,630	3,651,834	4,114,898
Wyoming	160,675	18,134	3,111,634	3,290,443

only assists economies in the short-term, so it is questionable whether drilling in wild areas is worth the ecological backlash.

The BLM, which issues most permits for drilling on federal land, claims that it performs thorough assessments of effects on wildlife habitat (see Case Study: Roan Plateau). A former BLM scientist spoke against this view in a 2007 report: "The habitat used to be treated as a valuable resource. Now the BLM biologist acts as a support person to get permits processed, period."[46] Opponents of the Roadless Rule cited, among other reasons, the loss of mineral, oil, and gas development opportunities as reasons to keep areas open to future road building. According to Wilderness supporters, in Montana, North Dakota, Wyoming, Utah, Colorado, and New Mexico, of all lands with good potential for oil and gas recovery, roadless areas made up less than 4 percent. The total resources from drilling there would provide only 63 to 79 days worth of gas, and 21 to 24 days worth of oil. The relative value of these lands to oil and gas developers is paltry — the most valuable resources have already been surveyed and tapped.[47]

Economic studies of wilderness attempt to analyze all economic benefits that human society receives from these environments. This section of the report presents calculations offered by respected scientists and economists to quantify the extent to which humans benefit from wilderness.

The importance of unimpaired wildlands is disputed by some economists since valuations of ecosystem services are difficult to quantify. Healthy ecosystems purify our air and water, sequester carbon, control erosion, and stabilize the climate, among other things.[48] One paper approximated the total global value of ecosystem services to be at least $33 trillion annually.[49] In the United States alone, it is estimated that the value of temperate and boreal forests is worth about $63.6 billion every year.[50] A study at Colorado State University (CSU) found that approximately $1.5 billion generated from environmental benefits each year from the preservation of 42 million acres of national forest roadless areas.[51]

Recreation, tourism, and their supporting industries also contribute to economic growth. Like agriculture and mining, tourism is now shaping the development of western economies. According to a 2001 survey, hunters and anglers in Arizona, Idaho, Montana, New Mexico, Wyoming, and Utah contributed more than $3 billion to the economy in spending.[52] Hundreds of millions of dollars are generated each year from licensing, taxes, and other items related to hunting and fishing.[53] The study performed at CSU concluded that just under $600 million in recreation benefits were generated each year by the 42 million acres of roadless areas mentioned

Sand Dunes, Colorado © Nicole Gautier

above.[54] Recreation in designated Wilderness generated an additional $600 million every year in economic benefits.[55]

Even property value is positively influenced by open spaces and wildlands. People increasingly want to live in areas that are relatively undeveloped, especially if there is wilderness close by. In addition to a productive business atmosphere, people look for factors that will directly improve quality of life.[56] The effect this has on land prices is a good indicator of the enormous demand to live in these areas. According to Spencer Philips, "The per-acre price of residential land in towns that have some wilderness acreage is almost 19 percent higher than in towns that contain no wilderness."[57] Furthermore, in a city/town without any nearby Wilderness, property values would increase by about $4,000 per acre if some Wilderness acreage were added in the area.[58]

Some studies of wildlands economics seek to account for an array of socioeconomic factors. In 2004, two Colorado College researchers evaluated social and economic factors in 113 rural counties in the Western U.S., 50 of which had designated Wilderness within their boundaries. The percentage of counties managed as Wilderness, or by the BLM, USFS, and NPS was compared to income, employment, and population growth. Each additional percent of federal land within a county correlated with between 0.23 percent and 0.42 percent more growth for each of these factors. The most significant growth occurred in counties not adjacent to metropolitan counties.[59] These data indicate the significance of open spaces and wildlands to the economies and the social welfare of the West.

Issues/Obstacles

The benefits of wilderness are likely to be more significant, or at least stable, if the environmental quality of these wild areas is high. If wildlands are left intact, they will be able to effectively perform the full array of ecological services. In addition, they will be increasingly attractive to recreational users; nevertheless, there are a number of issues that may prevent effective gains in wilderness quality.

One of the fundamental characteristics of wildlands is solitude. There is an element of remoteness that makes undeveloped areas feel wilder; it is this appeal that draws millions of backpackers, hikers, and other recreational users into the wilderness every year. A good measure of isolation is proximity to roads. The farthest accessible distance from a road in the Rockies region is in northern

Woodland Park, Colorado © Will Chambers

Figure 12
Distance to Roads in the Rockies
Source: Watts et. al. (2007)

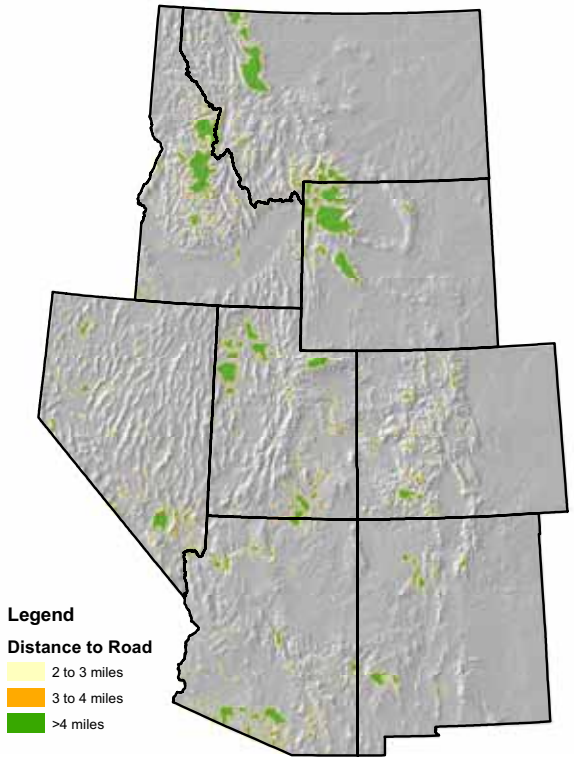
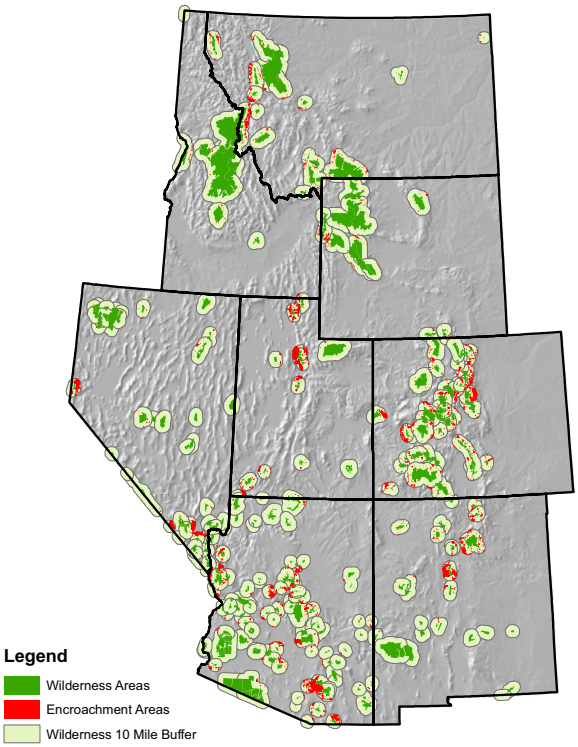


Figure 13
Wilderness Encroachment in the Rockies, 10-Mile Buffer
Source: USDA Forest Service (Roadless Area Conservation), Radeloff et al. (2005)



Wyoming, at just over twenty miles.[60] In Colorado, the maximum possible distance to a road is slightly more than ten miles. On average, however, land in the Rockies region is only 0.4 miles from a road (Figure 12).[61]

Biological diversity is another important indicator of wildness. Higher levels of biodiversity in a region tends to match with greater ecosystem health; environmental stressors and random events will have less effect on robust ecosystems. Habitat destruction is currently the largest threat to biodiversity and healthy ecosystems. Other harmful human activities include the spread of non-native species, pollution, exploitation of resources, and habitat fragmentation.[62] The threats, however, are not diminishing. The population in the Rockies region is projected to grow to about 30 million by 2025, almost a 50 percent increase from 2000.[63] The increased demand for land and resources will likely only exacerbate current environmental problems and resource demands.

Habitat destruction and fragmentation are considerably affected by development, like roads. Wilderness can be encroached upon by dwellings as well. The boundaries of many towns in the Rockies extend up to Wilderness land (Figure 13). Houses are built in the middle of forests and on the sides of mountains so that the inhabitants can feel closer to the wild, or farther from civilization. Such development only adds to the destruction and division of wildlands.

Protecting habitat for sensitive species is crucial in protecting biodiversity. The "Spine of the Continent Project" has identified lands from Mexico up to Yukon Territory that qualify as core, linkage, and transition wildlife networks (Figure 14).[64] In doing so, the project has identified considerable quantities of land upon which a number of species rely.

Even with the identification of critical areas, protection depends upon adequate and appropriate management strategies. Wilderness managers currently face several key challenges. The demographics of user trends have changed significantly over the past few years. The number of overnight users is down while the number of day users is up; day users do not get as far into areas, so Wilderness peripheries experience serious impacts.[65] ATV use is becoming more popular in many public lands, and illegal use within Wilderness areas is also increasing. ATVs create unplanned roads that cut into these critical wildlands. Also, as discussed above, development continues to encroach upon wild areas, increasing the "islandification of wilderness."[66]

These problems are heightened by different management approaches from the various governing agencies and dependable monitoring techniques are still being created to assess the outcomes of management. As such, the extent to which public agencies are accomplishing their goals is unclear. Understanding the values of wilder-

Case Study: The Swan Valley, Montana

The Swan Valley in northwestern Montana is a site where public-private collaboration has protected key wild lands. In 2003, the Trust for Public Land (TPL) worked with Plum Creek Timber Company, Flathead National Forest, and local communities to transfer almost 1,700 acres into public ownership as national forest. Senators Conrad Burns (R) and Max Baucus (D) of Montana assisted the project by securing financial support from the federal Land and Water Conservation Fund.[1]

Just over three years later, an additional 1,761 acres were protected through the joint efforts of TPL, Bonneville Power Administration (BPA), and the Plum Creek Timber Company. Funding was provided through an agreement between BPA, the Montana Department of Fish, Wildlife, and Parks, and the Confederated Salish and Kootenai Tribes. TPL, working with the State and the local tribes, designed the projects to conserve valuable wildlife habitat in the valley.[2]

Ecologically, protecting the Swan Valley has been very significant. With lands located between several Wilderness areas, the projects were designed to include critical elements of the local ecosystem: wildlife core habitat, habitat linkage areas, and watersheds have been protected as part of this widespread effort.[3] The plan also includes habitat for federally-protected species such as grizzly bear (see Swan Valley Grizzly Movement Map below) bull trout, and water howellia—all native to Montana. The lakes, rivers, and streams provide critical spawning and rearing habitat for the trout. The protected land in the Swan Valley provides grizzlies with a corridor between the Bob Marshall Complex and the more isolated Mission Mountain Wilderness Areas.[4]

The ecosystem-wide conservation effort required years of constant communication amongst private entities and several other groups, like the Swan Valley Coalition, Friends of the Wild Swan, the Swan Ecosystem Center, and Northwest Connections. They have developed a long-term and comprehensive plan to sustainably utilize forest resources and protect the recreational and environmental assets in the Swan Valley. Since 1999, almost 7,200 acres have been incorporated into the Flathead National Forest, largely through the Land and Water Conservation Fund. Another 7,200 acres make up a conservation easement in Plum Creek forestlands, part of the Swan River State Forest.[5]

Through the energy and resources dedicated by TPL, Plum Creek Timber, and other groups, a larger contiguous landscape has been protected. Critical core and linkage habitat for a variety of species has been conserved and recreational opportunities have been protected. These efforts have made the environmental, social, and economic welfare of the region more secure.

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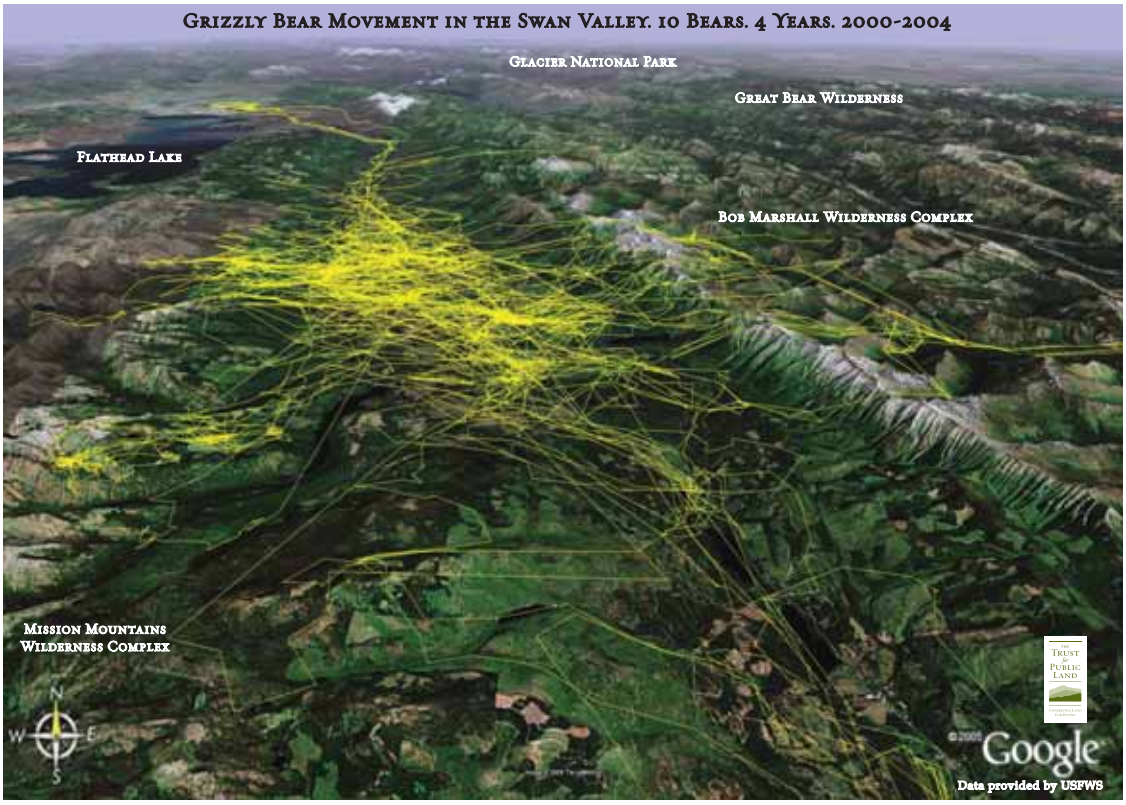


Map generously provided by the Trust for Public Land

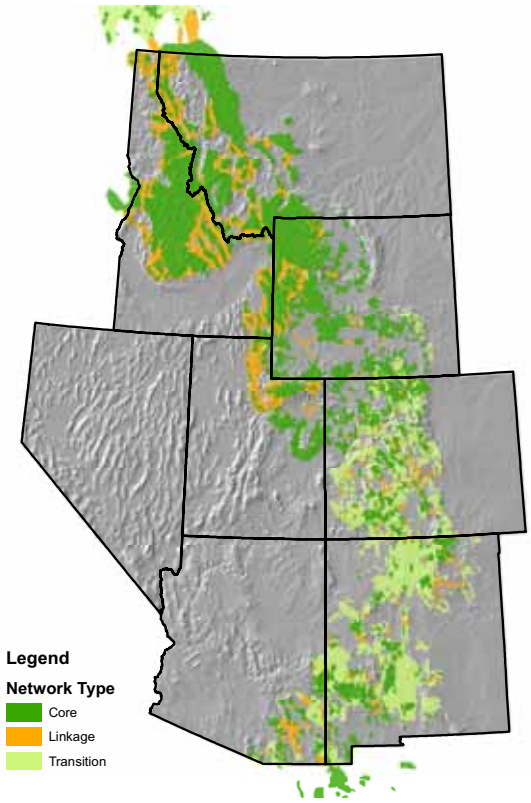
ness and its contribution to surrounding communities in the Rocky Mountain West is important for both the management agencies and the public.[67]

In the end, much of the administrative action ought to be determined by public opinion. After all, these are public lands. This leads to the final and most prevalent issue: lack of adequate public knowledge. People must be educated on the issues; they should research and evaluate facts. The defense of public lands should not be a partisan issue; it should seek to maintain the ecosystem services provided by our environment and protect wildlands for the enjoyment of hikers, anglers, hunters, and other recreational users from all backgrounds. Collaboration between public and private groups is also needed in many areas (see Case Study: Swan Valley). The benefits that these lands provide make them well worth sparing from development.

Conclusion

The Rocky Mountain West contains some of the largest and most ecologically significant and intact tracts of public lands in the U.S. Dating to the nineteenth century, development and natural resource extraction characterized the Old West economy. More recently, changing trends have shifted the focus to recreation and enjoyment in a service-based market, aptly dubbed the New West economy. This brings attention to the quality of our public lands, especially Wilderness. In an effort to correctly manage what wild areas we do have left, the first step is protection. Limiting additional encroachment and fragmentation must be the basis on which human civilization develops further in the Rockies region. The wildlands that exist provide invaluable recreational, economic, and environmental services to millions of Americans. A long-term and fully comprehensive approach to protecting these places can defend the interests that the Rockies region has in them.

Figure 14
A Wildlands Network Design for the Continental Divide Spine
Source: American Wildlands, Yellowstone to Yukon Conservation Initiative, Wild Utah Project, Grand Canyon Wildlands Council, Southern Rockies Ecosystem Project, Wildlands Project



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Maroon Bells Wilderness, Colorado © Ryan Schumacher

Grading Wilderness

The historical, cultural, and aesthetic character of the West is often described as "wild." Westerners identify with open spaces and wildlands not only for their beauty, opportunities for recreation, and economic resources, but as a fundamental part of the region's distinctiveness. How can we measure the wild qualities of a region? Many associate the trait with a feeling, not a unit of measurement. Gregory Aplet of The Wilderness Society defines wilderness as those tracts of land that are the most "natural" and "free."[1] That is, where the ecosystem is least disturbed from an historical baseline and outside of direct human impacts or control. Common indicators of wildness include solitude, remoteness, and the extent to which the land is "untrammeled" by humans. This section of the *2008 State of the Rockies Report Card* works from these terms to grade counties based on how "wild" they are.

Methodology

Previous studies suggest that the most "wild" lands are those that are undeveloped, remote, and secluded, and use a variety of indicators to measure these qualities. This study uses federal land designations to quantify naturalness, average distance to roads for remoteness, and population density as a proxy for solitude.

Population density is calculated from 2007 county population estimates provided by Geolytics Inc. and the U.S. Census Bureau. Designated Wilderness Areas and Inventoried Roadless Areas (IRAs) are calculated from National Atlas of the United States and the USDA Forest Service Geospatial and Technology Center. Subcategories of IRAs are defined as follows:

1B: Inventoried Roadless Areas where road construction and reconstruction is prohibited.

1B-1: Inventoried Roadless Areas that are recommended for wilderness designation in the for est plan and where road construction and reconstruction is prohibited.

1C: Inventoried Roadless Areas where road construction and reconstruction is not prohibited.

Public land per county is calculated from Payment in Lieu of Taxes (PILT) data provided by the Department of the Interior. Road density data is provided by Raymond Watts and the US Geological Survey.[2]

After tabulating the data, each variable was weighted based on the degree to which each variable represents the characteristics of wildness outlined above. Lower weights will have a smaller impact on the final rankings.

VARIABLE	WEIGHT
Population Density: acres per person	0.4
Percent of county that is designated Wilderness	0.4
Percent of county that is Roadless: 1B	0.4
Percent of county that is Roadless: 1B-1	0.38
Percent of county that is Roadless: 1C	0.36
Average distance to roads	0.4
Percent of county that is public land, minus Wilderness	0.1

Before grading, Rockies counties were sorted by population and geography as either "metropolitan," "micropolitan," or "rural" as explained in the methodology section of the *2008 State of the Rockies Report Card*. We assume a rural area will be more remote, less developed, and provide more solitude than an urban area. Thus, we only compare like geographies for purposes of grading wildness. The weighted figures were then converted to z-scores and counties were ranked and graded.

There are several limitations to this study. Using federal land designations to measure naturalness is a good measure of federal protection, but does not include unprotected wildlands. In other words, an area need not be protected by the federal government to be wild. A more comprehensive study could include actual land cover data, as well as indicators of biodiversity to demonstrate the degree to which a particular area is departed from the historical norm. Population density also does not tell the whole story in terms of solitude. An area known for being "wild," especially a well-known Wilderness area, may draw more outdoor enthusiasts, thus diminishing the likelihood that a visitor would experience the same degree of solitude.

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State	County	County Type	Grade	Mean Distance to Road by County (miles)	Public Land other than Designated Wilderness, Percent of County	Designated Wilderness as a Percent of Total County Land	Percent of County that is IRA: 1B	Percent of County that is IRA: 1C	Percent of County that is IRA: 1B-1	Population density, acres per person
Arizona	Apache	Micropolitan	D	0.3	8.6%	0.7%	0.1%	0.1%	0.0%	0.2
	Cochise	Micropolitan	C-	0.6	18.8%	3.8%	4.4%	0.0%	0.0%	0.0
	Coconino	Metropolitan	C+	0.6	37.0%	2.7%	0.0%	0.6%	0.0%	0.2
	Gila	Micropolitan	C	0.7	49.6%	8.3%	0.0%	2.7%	0.0%	0.1
	Graham	Micropolitan	C+	0.7	33.1%	4.4%	3.7%	2.2%	2.1%	0.1
	Greenlee	Micropolitan	A-	1.2	75.7%	1.0%	6.5%	23.7%	0.0%	0.2
	La Paz	Micropolitan	C+	0.7	52.5%	10.8%	0.0%	0.0%	0.0%	0.2
	Maricopa	Metropolitan	C+	0.5	33.5%	8.1%	0.0%	2.1%	0.0%	0.0
	Mohave	Micropolitan	C	0.7	63.6%	7.0%	0.0%	0.0%	0.0%	0.1
	Navajo	Micropolitan	D	0.4	9.1%	0.3%	0.0%	0.0%	0.0%	0.1
	Pima	Metropolitan	A-	2.1	13.6%	13.6%	2.5%	0.0%	0.0%	0.0
	Pinal	Metropolitan	C-	0.4	14.5%	3.7%	1.3%	0.0%	0.0%	0.0
	Santa Cruz	Micropolitan	C-	0.4	50.6%	3.6%	4.7%	0.0%	0.0%	0.0
	Yavapai	Metropolitan	C+	0.5	42.9%	6.9%	0.0%	4.4%	0.0%	0.0
	Yuma	Metropolitan	B+	0.9	18.5%	25.8%	0.0%	0.0%	0.0%	0.0
Colorado	Adams	Metropolitan	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0
	Alamosa	Micropolitan	D	0.3	7.8%	7.3%	0.2%	1.1%	0.0%	0.0
	Arapahoe	Metropolitan	D	0.3	0.9%	0.0%	0.0%	0.0%	0.0%	0.0
	Archuleta	Micropolitan	B+	0.7	42.6%	8.0%	9.5%	20.1%	0.0%	0.1
	Baca	Rural	D	0.2	12.6%	0.0%	0.0%	0.0%	0.0%	0.6
	Bent	Micropolitan	D	0.3	2.2%	0.0%	0.0%	0.0%	0.0%	0.3
	Boulder	Metropolitan	B-	0.6	27.3%	7.0%	8.5%	1.8%	0.2%	0.0
	Broomfield	Metropolitan	D	0.1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0
	Chaffee	Micropolitan	A-	0.7	64.7%	14.2%	4.2%	35.2%	0.0%	0.1
	Cheyenne	Rural	D	0.3	0.0%	0.0%	0.0%	0.0%	0.0%	1.0
	Clear Creek	Metropolitan	A	0.5	47.5%	19.9%	27.2%	36.2%	0.2%	0.0
	Conejos	Rural	B-	0.6	48.8%	11.6%	10.9%	2.3%	0.0%	0.1
	Costilla	Rural	D	0.3	0.1%	0.0%	0.1%	4.3%	0.0%	0.4
	Crowley	Rural	D	0.3	0.8%	0.0%	0.0%	0.0%	0.0%	0.1
	Custer	Rural	C+	0.4	27.5%	9.3%	1.4%	13.2%	0.1%	0.2
	Delta	Micropolitan	C+	0.4	53.9%	1.2%	2.6%	29.2%	0.0%	0.0
	Denver	Metropolitan	D	0.1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0
	Dolores	Rural	B	0.4	58.7%	3.1%	0.0%	42.1%	0.0%	0.6
	Douglas	Metropolitan	C-	0.3	27.0%	0.0%	1.3%	12.1%	0.0%	0.0
	Eagle	Micropolitan	B	0.6	63.5%	14.9%	0.3%	25.6%	0.0%	0.0
	Elbert	Metropolitan	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.1
	El Paso	Metropolitan	D	0.4	7.7%	0.0%	0.0%	2.9%	0.0%	0.0
	Fremont	Micropolitan	D+	0.5	43.0%	3.3%	0.0%	5.5%	0.1%	0.0
	Garfield	Micropolitan	C	0.5	53.8%	9.0%	0.5%	8.8%	0.0%	0.1
	Gilpin	Metropolitan	A-	0.3	34.3%	9.3%	27.1%	0.0%	0.0%	0.0
	Grand	Rural	B-	0.6	60.5%	6.5%	7.5%	19.5%	0.2%	0.1
	Gunnison	Micropolitan	A-	0.8	58.7%	19.9%	2.4%	30.8%	0.0%	0.2
	Hinsdale	Rural	A	2.0	47.6%	46.5%	24.9%	13.2%	0.0%	1.5
	Huerfano	Micropolitan	C	0.4	17.0%	3.4%	2.2%	7.3%	0.0%	0.2
	Jackson	Rural	B+	0.5	39.7%	10.0%	3.7%	17.3%	0.0%	1.2
	Jefferson	Metropolitan	D+	0.3	18.3%	2.8%	0.8%	5.0%	0.0%	0.0
	Kiowa	Rural	D+	0.3	0.8%	0.0%	0.0%	0.0%	0.0%	1.3
	Kit Carson	Micropolitan	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.3
	Lake	Micropolitan	A-	0.6	44.6%	32.1%	19.1%	21.1%	0.4%	0.0
	La Plata	Micropolitan	B+	1.1	35.7%	4.5%	5.6%	21.2%	0.0%	0.2
	Larimer	Metropolitan	B-	0.8	37.5%	10.5%	2.3%	6.8%	0.3%	0.0
	Las Animas	Micropolitan	D+	0.3	10.2%	0.0%	0.7%	0.5%	0.0%	0.3
Colorado (continued)	Lincoln	Rural	D	0.2	0.1%	0.0%	0.0%	0.0%	0.0%	0.5
	Logan	Micropolitan	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.1
	Mesa	Metropolitan	B	1.0	69.4%	3.3%	0.3%	19.8%	0.0%	0.0
	Mineral	Rural	A	1.5	61.4%	31.9%	27.9%	17.8%	0.0%	0.9
	Moffat	Micropolitan	C	0.4	55.0%	0.0%	0.0%	4.2%	0.0%	0.4
	Montezuma	Micropolitan	C-	0.4	35.5%	0.7%	0.0%	15.2%	0.0%	0.1
	Montrose	Micropolitan	D+	0.3	66.3%	1.7%	2.1%	4.1%	0.0%	0.1
	Morgan	Micropolitan	D	0.2	0.4%	0.0%	0.0%	0.0%	0.0%	0.0
	Otero	Micropolitan	D	0.2	22.3%	0.0%	0.0%	0.0%	0.0%	0.1
	Ouray	Rural	C	0.5	34.3%	11.6%	0.7%	5.6%	0.0%	0.1
	Park	Metropolitan	B	0.5	39.2%	11.2%	1.5%	9.6%	0.1%	0.1
	Phillips	Rural	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.1
	Pitkin	Micropolitan	A	1.1	47.7%	43.2%	1.1%	37.8%	0.0%	0.1
	Prowers	Micropolitan	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.1
	Pueblo	Metropolitan	D	0.3	3.9%	0.3%	0.2%	1.2%	0.0%	0.0
	Rio Blanco	Rural	C	0.5	69.3%	3.4%	0.1%	9.0%	0.0%	0.5
	Rio Grande	Micropolitan	B+	0.4	56.6%	0.8%	20.9%	11.6%	0.0%	0.1
	Routt	Micropolitan	B-	0.6	36.4%	7.5%	0.6%	20.9%	0.0%	0.1
	Saguache	Rural	B-	0.6	59.5%	6.6%	6.4%	12.2%	0.0%	0.4
	San Juan	Rural	A	1.7	66.5%	19.9%	22.4%	94.3%	0.0%	0.7
	San Miguel	Rural	C-	0.3	55.5%	3.9%	0.3%	9.0%	0.0%	0.2
	Sedgwick	Rural	D	0.2	0.1%	0.0%	0.0%	0.0%	0.0%	0.2
	Summit	Micropolitan	A-	0.9	54.3%	25.2%	6.8%	41.2%	0.0%	0.0
	Teller	Metropolitan	C-	0.3	45.3%	0.0%	0.0%	7.5%	0.0%	0.0
	Washington	Rural	D	0.2	0.1%	0.0%	0.0%	0.0%	0.0%	0.6
	Weld	Metropolitan	D	0.4	7.7%	0.0%	0.0%	0.0%	0.0%	0.0
	Yuma	Micropolitan	D	0.2	0.5%	0.0%	0.0%	0.0%	0.0%	0.2
Idaho	Ada	Metropolitan	D+	0.7	43.2%	0.0%	0.0%	0.0%	0.0%	0.0
	Adams	Rural	B	0.5	59.7%	2.1%	26.0%	8.1%	0.0%	0.4
	Bannock	Metropolitan	C+	0.4	29.1%	0.0%	0.4%	23.6%	0.0%	0.0
	Bear Lake	Micropolitan	B	0.4	42.9%	0.0%	0.1%	41.7%	2.3%	0.2
	Benewah	Micropolitan	D	0.2	9.1%	0.0%	0.0%	0.0%	0.0%	0.1
	Bingham	Micropolitan	D	0.3	22.1%	0.0%	0.0%	0.0%	0.0%	0.0
	Blaine	Micropolitan	A	0.7	76.2%	1.6%	12.1%	26.5%	19.4%	0.1
	Boise	Metropolitan	A	0.9	67.0%	5.5%	0.5%	20.0%	15.9%	0.2
	Bonner	Micropolitan	C+	0.5	37.0%	0.0%	5.2%	11.1%	2.8%	0.0
	Bonneville	Metropolitan	A	0.8	50.3%	0.0%	18.2%	17.9%	5.4%	0.0
	Boundary	Micropolitan	B+	0.5	58.1%	0.0%	10.2%	14.3%	5.2%	0.1
	Butte	Rural	B	0.6	60.3%	2.2%	1.7%	26.4%	2.3%	0.8
	Camas	Rural	A-	0.8	64.5%	0.0%	34.9%	36.6%	0.0%	1.0
	Canyon	Metropolitan	D	0.2	5.0%	0.0%	0.0%	0.0%	0.0%	0.0
	Caribou	Micropolitan	B	0.4	38.7%	0.0%	0.1%	38.4%	0.0%	0.3
	Cassia	Micropolitan	C-	0.3	55.4%	0.0%	1.5%	9.2%	0.0%	0.1
	Clark	Rural	A-	0.4	62.3%	0.0%	7.9%	17.0%	6.1%	1.9
	Clearwater	Micropolitan	A	0.7	52.6%	0.0%	9.0%	23.7%	18.7%	0.3
	Custer	Rural	A	1.1	81.3%	11.6%	7.5%	40.4%	17.7%	1.2
	Elmore	Micropolitan	A-	0.7	64.0%	4.3%	18.1%	14.0%	3.9%	0.1
	Franklin	Metropolitan	A-	0.3	32.6%	0.0%	0.0%	37.4%	7.1%	0.1
	Fremont	Micropolitan	C	0.3	58.8%	0.0%	3.1%	1.2%	4.3%	0.2
	Gem	Metropolitan	C	0.5	36.9%	0.0%	5.3%	2.9%	0.0%	0.0
	Gooding	Micropolitan	D	0.4	53.6%	0.0%	0.0%	0.0%	0.0%	0.1
	Idaho	Micropolitan	A	2.7	43.7%	39.4%	11.4%	15.6%	3.4%	0.5

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Idaho (continued)	Jefferson	Metropolitan	D	0.2	26.8%	0.0%	0.0%	0.0%	0.0%	0.0
	Jerome	Micropolitan	D	0.2	25.0%	0.0%	0.0%	0.0%	0.0%	0.0
	Kootenai	Metropolitan	D	0.2	28.6%	0.0%	0.0%	4.9%	0.0%	0.0
	Latah	Micropolitan	D	0.2	14.3%	0.0%	0.0%	0.0%	0.0%	0.0
	Lemhi	Micropolitan	A	1.1	74.8%	15.8%	15.0%	34.9%	6.6%	0.6
	Lewis	Rural	D	0.2	2.6%	0.0%	0.0%	0.0%	0.0%	0.1
	Lincoln	Rural	D	0.3	76.0%	0.0%	0.0%	0.0%	0.0%	0.3
	Madison	Micropolitan	B	0.3	20.9%	0.0%	23.6%	2.0%	0.0%	0.0
	Minidoka	Micropolitan	D	0.5	36.7%	0.0%	0.0%	0.0%	0.0%	0.0
	Nez Perce	Metropolitan	D	0.3	6.4%	0.0%	0.0%	0.0%	0.0%	0.0
	Oneida	Rural	D+	0.3	53.1%	0.0%	0.0%	14.6%	0.0%	0.3
	Owyhee	Metropolitan	A	0.6	73.8%	0.0%	0.0%	0.2%	0.0%	0.7
	Payette	Micropolitan	D	0.6	24.9%	0.0%	0.0%	0.0%	0.0%	0.0
	Power	Metropolitan	C	0.3	31.8%	0.0%	0.2%	1.9%	0.0%	0.2
	Shoshone	Micropolitan	A	0.5	72.6%	0.0%	10.5%	23.1%	18.9%	0.2
	Teton	Rural	A	0.4	33.6%	0.0%	57.8%	6.7%	21.8%	0.1
	Twin Falls	Micropolitan	D	0.2	51.7%	0.0%	0.6%	1.9%	0.0%	0.0
	Valley	Rural	A	2.5	55.9%	29.8%	16.0%	20.7%	12.3%	0.4
	Washington	Micropolitan	C	0.8	36.0%	0.0%	2.5%	2.3%	0.0%	0.1
Montana	Beaverhead	Micropolitan	A-	0.7	56.0%	1.4%	4.5%	29.8%	6.3%	0.7
	Big Horn	Micropolitan	D+	0.3	1.3%	0.0%	0.0%	0.0%	0.0%	0.4
	Blaine	Rural	D	0.4	16.6%	0.0%	0.0%	0.0%	0.0%	0.7
	Broadwater	Rural	C	0.3	35.5%	0.0%	6.4%	12.9%	1.1%	0.3
	Carbon	Metropolitan	A-	0.8	31.7%	11.7%	0.2%	11.7%	2.2%	0.2
	Carter	Rural	C+	0.3	27.7%	0.0%	0.0%	0.0%	0.0%	2.6
	Cascade	Metropolitan	C+	0.4	12.4%	0.0%	11.3%	4.9%	0.0%	0.0
	Chouteau	Rural	D	0.3	6.1%	0.0%	0.0%	1.6%	0.0%	0.7
	Custer	Micropolitan	D+	0.3	13.7%	0.0%	0.0%	0.0%	0.0%	0.3
	Daniels	Rural	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.8
	Dawson	Micropolitan	D	0.3	4.2%	0.0%	0.0%	0.0%	0.0%	0.3
	Deer Lodge	Micropolitan	B-	0.8	34.1%	10.9%	0.0%	14.9%	1.2%	0.1
	Fallon	Rural	D	0.3	11.2%	0.0%	0.0%	0.0%	0.0%	0.6
	Fergus	Micropolitan	C	0.3	17.4%	0.0%	3.4%	0.1%	0.0%	0.4
	Flathead	Micropolitan	A-	2.1	54.1%	18.4%	2.4%	12.6%	3.0%	0.1
	Gallatin	Micropolitan	B+	0.8	35.9%	5.9%	18.9%	3.0%	2.6%	0.0
	Garfield	Rural	B	0.3	26.3%	0.0%	0.0%	0.0%	0.0%	4.2
	Glacier	Micropolitan	C-	0.8	20.7%	0.0%	0.0%	3.0%	0.0%	0.2
	Golden Valley	Rural	C-	0.2	4.2%	0.0%	12.3%	0.4%	0.0%	1.0
	Granite	Rural	A-	0.8	57.7%	5.7%	8.3%	23.9%	5.3%	0.6
	Hill	Micropolitan	D	0.2	2.6%	0.0%	0.0%	0.0%	0.0%	0.2
	Jefferson	Rural	C	0.5	52.2%	0.0%	4.2%	13.0%	1.6%	0.1
	Judith Basin	Rural	C+	0.4	25.8%	0.0%	8.6%	16.6%	0.0%	0.9
	Lake	Micropolitan	B-	0.5	13.6%	1.2%	0.0%	13.3%	7.8%	0.1
	Lewis and Clark	Micropolitan	A-	2.0	28.2%	20.3%	3.4%	14.9%	5.0%	0.1
	Liberty	Rural	D	0.2	3.6%	0.0%	0.0%	0.0%	0.0%	0.7
	Lincoln	Micropolitan	B+	0.4	72.2%	2.1%	9.3%	10.3%	5.9%	0.2
	McCone	Rural	D+	0.3	5.7%	10.3%	0.0%	0.0%	0.0%	0.4
	Madison	Rural	B+	0.8	45.6%	0.0%	2.3%	21.5%	1.9%	2.0
	Meagher	Rural	C+	0.4	31.5%	0.0%	8.1%	16.4%	0.6%	1.2
	Mineral	Rural	A	0.6	82.0%	0.0%	9.0%	30.5%	26.0%	0.3
	Missoula	Metropolitan	A-	0.6	34.9%	8.1%	2.7%	5.2%	11.8%	0.0
	Musselshell	Rural	D	0.2	7.3%	0.0%	0.0%	0.0%	0.0%	0.4
	Park	Micropolitan	A	1.7	24.8%	27.7%	18.1%	4.5%	0.0%	0.2

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Montana (continued)	Petroleum	Rural	B-	0.3	31.3%	0.0%	0.0%	0.0%	0.0%	3.9
	Phillips	Rural	C-	0.3	40.6%	0.6%	0.0%	0.0%	0.0%	1.3
	Pondera	Micropolitan	C+	0.5	9.7%	0.6%	5.1%	5.9%	0.5%	0.3
	Powder River	Rural	C	0.3	28.2%	0.0%	0.5%	0.0%	0.0%	2.1
	Powell	Micropolitan	A	2.4	30.3%	18.7%	2.6%	13.8%	5.3%	0.3
	Prairie	Rural	C-	0.3	38.5%	0.0%	0.0%	0.0%	0.0%	1.7
	Ravalli	Micropolitan	A	1.2	54.6%	18.0%	18.8%	17.0%	5.6%	0.1
	Richland	Micropolitan	D	0.2	4.0%	0.0%	0.0%	0.0%	0.0%	0.2
	Roosevelt	Micropolitan	D	0.2	0.3%	0.0%	0.0%	0.0%	0.0%	0.2
	Rosebud	Rural	D	0.3	10.1%	0.0%	0.9%	0.0%	0.0%	0.6
	Sanders	Rural	B-	0.5	49.1%	2.1%	9.0%	18.4%	4.0%	0.2
	Sheridan	Rural	D	0.2	-0.1%	0.2%	0.0%	0.0%	0.0%	0.5
	Silver Bow	Micropolitan	C-	0.4	50.8%	0.0%	0.2%	18.4%	0.0%	0.0
	Stillwater	Rural	C	0.7	5.5%	11.0%	0.0%	3.2%	0.0%	0.2
	Sweet Grass	Rural	C+	0.6	17.4%	7.9%	11.4%	5.6%	0.0%	0.5
	Teton	Rural	C+	0.7	11.6%	7.8%	3.2%	3.9%	0.7%	0.4
	Toole	Micropolitan	D+	0.2	3.7%	0.0%	0.0%	0.0%	0.0%	0.4
	Treasure	Rural	D+	0.3	0.1%	0.0%	0.0%	0.0%	0.0%	1.6
	Valley	Micropolitan	C+	0.3	34.7%	0.0%	0.0%	0.0%	0.0%	0.7
	Wheatland	Rural	D+	0.3	7.2%	0.0%	0.2%	10.2%	0.0%	0.7
	Wibaux	Rural	D	0.3	4.7%	0.0%	0.0%	0.0%	0.0%	1.0
	Yellowstone	Metropolitan	D	0.2	4.6%	0.0%	0.0%	0.0%	0.0%	0.0
Nevada	Churchill	Micropolitan	C	0.8	66.7%	0.0%	0.0%	0.0%	0.0%	0.2
	Clark	Metropolitan	B+	1.3	82.8%	9.8%	0.0%	1.9%	0.0%	0.0
	Douglas	Micropolitan	C+	1.4	54.4%	0.0%	1.1%	9.3%	0.0%	0.0
	Elko	Micropolitan	C+	0.5	69.6%	2.2%	0.0%	3.8%	0.0%	0.4
	Esmeralda	Rural	A-	0.7	97.0%	0.9%	0.5%	0.9%	0.0%	4.7
	Eureka	Rural	B+	0.6	80.6%	0.0%	0.0%	4.9%	0.0%	3.1
	Humboldt	Micropolitan	B	0.7	70.0%	10.3%	0.0%	3.4%	0.0%	0.5
	Lander	Micropolitan	A-	0.7	94.4%	0.0%	0.0%	8.1%	0.0%	1.0
	Lincoln	Rural	B+	1.0	94.2%	0.0%	0.0%	1.1%	0.0%	2.3
	Lyon	Micropolitan	C-	0.4	67.3%	0.0%	0.0%	16.6%	0.0%	0.0
	Mineral	Micropolitan	B+	0.6	79.5%	0.0%	0.2%	10.5%	0.0%	0.8
	Nye	Micropolitan	B-	0.7	70.1%	3.3%	0.0%	11.2%	0.0%	0.4
	Pershing	Rural	C	0.5	75.0%	0.4%	0.0%	0.0%	0.0%	1.0
	Storey	Metropolitan	D	0.3	8.6%	0.0%	0.0%	0.0%	0.0%	0.1
	Washoe	Metropolitan	C	0.7	66.0%	3.9%	0.0%	0.6%	0.0%	0.0
	White Pine	Micropolitan	B+	0.5	91.2%	1.8%	0.0%	10.6%	0.0%	0.9
	Carson City	Metropolitan	D	0.3	48.5%	0.0%	0.0%	0.0%	0.0%	0.0
New Mexico	Bernalillo	Metropolitan	C-	0.7	8.8%	3.5%	0.0%	0.0%	0.0%	0.0
	Catron	Rural	B+	0.7	54.0%	8.0%	8.8%	1.8%	0.0%	2.1
	Chaves	Micropolitan	D	0.3	31.0%	0.3%	0.0%	0.0%	0.0%	0.1
	Cibola	Micropolitan	D+	0.4	23.6%	3.6%	0.0%	0.2%	0.0%	0.2
	Colfax	Micropolitan	D	0.3	3.1%	0.0%	0.0%	0.0%	0.0%	0.3
	Curry	Micropolitan	D	0.2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0
	DeBaca	Rural	D+	0.2	3.0%	0.0%	0.0%	0.0%	0.0%	1.2
	Dona Ana	Metropolitan	D+	0.5	48.6%	0.0%	0.0%	0.0%	0.0%	0.0
	Eddy	Micropolitan	D	0.2	57.6%	1.2%	0.0%	0.6%	0.8%	0.1
	Grant	Micropolitan	B	0.9	34.2%	12.3%	10.4%	0.1%	0.0%	0.1
	Guadalupe	Micropolitan	C+	0.3	3.3%	0.0%	0.0%	0.0%	0.0%	0.7
	Harding	Rural	C+	0.3	5.2%	0.0%	0.5%	0.0%	0.0%	3.0
	Hidalgo	Micropolitan	B-	0.5	37.4%	0.0%	2.1%	0.0%	0.0%	0.7
	Lea	Micropolitan	D	0.2	15.1%	0.0%	0.0%	0.0%	0.0%	0.1

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New Mexico (continued)	Lincoln	Micropolitan	D+	0.3	27.3%	2.6%	0.0%	1.6%	0.0%	0.2
	Los Alamos	Micropolitan	B+	0.5	47.5%	4.7%	18.4%	15.5%	0.0%	0.0
	Luna	Micropolitan	D	0.4	39.3%	0.0%	0.0%	0.0%	0.0%	0.1
	McKinley	Micropolitan	D	0.3	12.1%	0.0%	0.7%	0.0%	0.0%	0.1
	Mora	Rural	C-	0.5	4.2%	5.2%	1.8%	0.2%	0.2%	0.4
	Otero	Micropolitan	D	0.4	35.2%	0.0%	0.0%	2.4%	0.0%	0.1
	Quay	Micropolitan	D	0.2	0.1%	0.0%	0.0%	0.0%	0.0%	0.3
	Rio Arriba	Micropolitan	C-	0.3	50.1%	3.6%	2.6%	1.2%	0.0%	0.1
	Roosevelt	Micropolitan	D	0.2	0.7%	0.0%	0.0%	0.0%	0.0%	0.1
	Sandoval	Metropolitan	B-	1.6	40.0%	1.6%	1.8%	0.9%	0.0%	0.0
	San Juan	Metropolitan	D+	0.3	23.1%	1.2%	0.0%	0.0%	0.0%	0.0
	San Miguel	Micropolitan	D	0.3	11.2%	1.9%	1.8%	0.3%	0.0%	0.2
	Santa Fe	Metropolitan	C	0.4	20.7%	5.3%	4.4%	1.0%	0.0%	0.0
	Sierra	Micropolitan	B	0.6	43.0%	4.9%	8.8%	0.7%	0.0%	0.3
	Socorro	Micropolitan	C+	0.4	34.5%	2.2%	3.0%	1.5%	0.0%	0.4
	Taos	Micropolitan	C	0.4	50.3%	3.5%	1.4%	0.5%	3.1%	0.1
	Torrance	Metropolitan	C	0.3	6.1%	1.4%	0.0%	0.0%	0.0%	0.2
	Union	Rural	D	0.2	2.4%	0.0%	0.0%	0.0%	0.0%	1.0
	Valencia	Metropolitan	D	0.3	4.4%	0.9%	0.0%	0.0%	0.0%	0.0
Utah	Beaver	Rural	C-	0.4	77.4%	0.0%	0.2%	7.0%	0.0%	0.4
	Box Elder	Micropolitan	C	1.4	27.7%	0.3%	0.0%	2.5%	0.0%	0.1
	Cache	Metropolitan	B	0.4	28.7%	7.1%	2.0%	25.6%	1.9%	0.0
	Carbon	Micropolitan	D+	0.5	45.9%	0.0%	1.8%	3.1%	0.0%	0.1
	Daggett	Rural	A-	0.6	78.0%	0.0%	39.6%	25.2%	0.0%	0.7
	Davis	Metropolitan	B	2.1	8.8%	0.0%	0.1%	8.3%	0.0%	0.0
	Duchesne	Micropolitan	A-	1.1	29.8%	13.2%	13.3%	14.9%	0.0%	0.2
	Emery	Rural	C	0.8	79.0%	0.0%	0.7%	5.7%	0.0%	0.4
	Garfield	Rural	B	0.9	77.6%	0.7%	0.1%	15.6%	0.0%	1.2
	Grand	Micropolitan	C+	0.8	72.7%	0.2%	0.0%	1.3%	0.0%	0.4
	Iron	Micropolitan	D+	0.4	58.3%	0.4%	0.0%	5.9%	0.0%	0.1
	Juab	Metropolitan	B+	0.5	68.9%	0.9%	0.0%	7.2%	0.0%	0.4
	Kane	Micropolitan	B+	1.2	86.7%	0.8%	0.0%	1.1%	0.0%	0.7
	Millard	Micropolitan	B-	0.5	77.1%	0.0%	0.0%	6.3%	0.0%	0.6
	Morgan	Metropolitan	C-	0.4	4.1%	0.0%	0.0%	6.7%	0.0%	0.1
	Piute	Rural	B+	0.4	72.4%	0.0%	0.6%	50.1%	0.0%	0.6
	Rich	Rural	D+	0.3	31.7%	0.0%	0.0%	10.5%	0.0%	0.5
	Salt Lake	Metropolitan	C	0.4	12.8%	6.1%	3.4%	2.4%	0.0%	0.0
	San Juan	Micropolitan	B	0.9	59.0%	1.2%	0.4%	2.8%	0.0%	0.6
	Sanpete	Micropolitan	C+	0.3	51.8%	0.0%	3.3%	30.7%	0.0%	0.1
	Sevier	Micropolitan	B-	0.5	77.9%	0.0%	0.0%	41.5%	0.0%	0.1
	Summit	Metropolitan	A	0.9	31.2%	12.3%	19.9%	16.2%	0.0%	0.1
	Tooele	Metropolitan	B+	2.0	43.4%	0.5%	0.0%	1.6%	0.0%	0.1
	Uintah	Micropolitan	C	0.5	63.6%	0.0%	5.5%	7.2%	0.0%	0.2
	Utah	Metropolitan	B+	1.0	47.0%	3.0%	1.4%	37.4%	0.0%	0.0
	Wasatch	Micropolitan	B	0.3	59.2%	0.0%	0.7%	48.8%	0.0%	0.1
	Washington	Metropolitan	B-	0.6	70.2%	3.7%	0.1%	16.2%	0.0%	0.0
	Wayne	Rural	B	1.0	84.1%	0.0%	0.0%	15.8%	0.0%	1.0
	Weber	Metropolitan	C+	1.2	16.3%	0.0%	4.0%	9.4%	0.0%	0.0
Wyoming	Albany	Micropolitan	D	0.3	24.5%	0.1%	0.2%	5.0%	0.0%	0.1
	Big Horn	Rural	C+	0.4	71.8%	4.5%	0.3%	17.7%	0.0%	0.3
	Campbell	Micropolitan	D	0.2	11.9%	0.0%	0.0%	0.6%	0.0%	0.1
	Carbon	Micropolitan	C+	0.3	51.9%	1.7%	0.0%	3.9%	0.0%	0.5
	Converse	Micropolitan	C-	0.2	14.8%	0.0%	0.1%	4.4%	0.0%	0.3

State	County	County Type	Grade	Mean Distance to Roads by County	Public Land other than Designated Wilderness, Percent of County	Designated Wilderness as a Percent of Total County Land	Percent of County that is IRA: 1B	Percent of County that is IRA: 1C	Percent of County that is IRA: 1B-1	Population density, acres per person
Wyoming (continued)	Crook	Rural	D	0.2	18.2%	0.0%	0.1%	1.1%	0.0%	0.5
	Fremont	Micropolitan	B-	0.9	44.9%	8.9%	0.5%	9.0%	0.0%	0.3
	Goshen	Micropolitan	D	0.2	1.9%	0.0%	0.0%	0.0%	0.0%	0.2
	Hot Springs	Micropolitan	C	0.4	42.7%	1.7%	0.0%	3.9%	0.0%	0.4
	Johnson	Micropolitan	B-	0.4	27.0%	4.1%	0.0%	8.9%	0.0%	0.5
	Laramie	Metropolitan	D	0.3	0.6%	0.0%	0.0%	0.0%	0.0%	0.0
	Lincoln	Micropolitan	B+	0.5	74.6%	0.0%	2.0%	36.7%	2.5%	0.2
	Natrona	Metropolitan	D+	0.3	43.1%	0.0%	0.0%	0.2%	0.0%	0.1
	Niobrara	Rural	D	0.2	7.4%	0.0%	0.0%	0.0%	0.0%	1.1
	Park	Micropolitan	A	3.1	58.0%	22.5%	0.7%	11.8%	0.4%	0.3
	Platte	Micropolitan	D	0.2	7.9%	0.0%	0.0%	0.0%	0.0%	0.2
	Sheridan	Micropolitan	C	0.3	27.1%	0.3%	1.7%	23.9%	0.0%	0.1
	Sublette	Rural	A-	1.0	62.1%	14.8%	0.0%	22.7%	0.0%	0.7
	Sweetwater	Micropolitan	C-	0.3	68.7%	0.0%	0.0%	0.4%	0.0%	0.3
	Teton	Micropolitan	A	3.5	71.4%	26.0%	3.2%	23.1%	2.4%	0.2
	Uinta	Micropolitan	D	0.2	42.5%	0.0%	0.0%	0.1%	0.0%	0.1
	Washakie	Micropolitan	C-	0.3	66.8%	0.0%	0.0%	7.7%	0.0%	0.3
	Weston	Micropolitan	D+	0.2	19.9%	0.0%	0.0%	0.3%	0.0%	0.4



Employment Trends and Competitive Advantage in the Rockies

A Mix/Share Analysis

By John MacKinnon and Pablo Navarro

The 2007 Colorado College State of the Rockies Report Card

Key Findings

•Total employment growth in the Rockies from 1990-2000 was 36 percent, compared to 12 percent nationally.

•Nearly 65 percent of all jobs created in the Rockies from 1990-2000 were due to a regional competitive advantage.

•The Rockies region holds a competitive advantage for all occupational categories analyzed except healthcare support.

•Construction and extraction occupations held the strongest competitive advantage in the region, with computer and mathematical occupations second.

•Las Vegas, Nevada held the greatest overall competitive advantage of any metropolitan area in the region.

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Introduction

"No region in the world is better positioned than we are to understand and profit from the increasingly important role of livability as a key contributor to sustained prosperity. For a decade and a half, this region has been the fastest growing in the nation, not only in terms of population, but also in economic terms such as income growth."[1]

The Rocky Mountains are experiencing an economic boom that is likely to continue. As a result of this economic expansion, the Rocky Mountain region has enjoyed more jobs and greater material wealth for its residents.

In examining the employment trends concurrent with this economic boom, some key questions arise: Which specific occupations are driving employment growth in the Rockies? Which locales have been successful at adding the creative and high tech jobs influential in attaining competitive advantage? Is the Rocky Mountain region adding high wage jobs to keep pace with the increase in low wage jobs? What percentage of employment growth is due to an influx of immigrants working in low skill occupations? To what degree is competitive advantage affecting employment change in the Rockies? Finally, how can competitive advantage influence economic policy in the Rocky Mountain region?

Our Approach: Mix-Share Analysis

To examine these questions, we conduct a mix-share analysis. Mix-share analysis illustrates how well a region's occupational sectors are performing in relation to a larger benchmark area—such as the 8-state Rocky Mountain region, or the United States as a whole—by systematically examining three mutually exclusive components of employment change. Through this breakdown, mix-share analysis provides a dynamic account of total regional employment change that is attributable to the growth of a benchmark economy (*growth effect*[2]), a mix of occupations that are growing faster or slower than national averages (*occupational mix effect*[3]), and the competitive nature of local occupational sectors employing workers (*regional effect*[4]).[5]

Growth effect addresses the idea that some of a region's employment growth is due to the overall employment growth of its benchmark area. For example, if total employment in the United States grew by 5 percent from 1950-1960, then employment in the Rocky Mountains should have also grown by 5 percent over this period.

Occupational mix effect is similar to growth effect, but instead of looking at total employment growth it observes growth rates for specific occupations. For instance, if management occupations in the United States grew by 4 percent in excess of total employment growth from 1950-60, management occupations in the Rocky Mountains should have also grown by 4 percent in excess of total employment growth for this period.

Regional effect refers to employment growth that is the product of the neither growth effect, nor the occupational mix effect. Rather, these jobs are the result of region-specific qualities that promote economic competitiveness. Jobs added by the regional effect demonstrate that a region's economy out-performed that of its benchmark. In these instances, we say that a region possesses "competitive advantage."

In this mix-share analysis, we investigate how these three factors influence total employment, specific occupations, and what we define as "cross-occupational super categories." We first observe the performance of the Rocky Mountain region in relation to the United States as a whole, then assess the performance of Metropolitan Statistical Areas (MSAs) in relation to the Rocky Mountain region (see Figure 1).[6] Following our mix-share analysis, we measure competitive advantage based on our regional effect calculations.[7]

Figure 1
Metropolitan Statistical Areas of the Rocky Mountain Region, 1999
Source: U.S. Office of Management and Budget

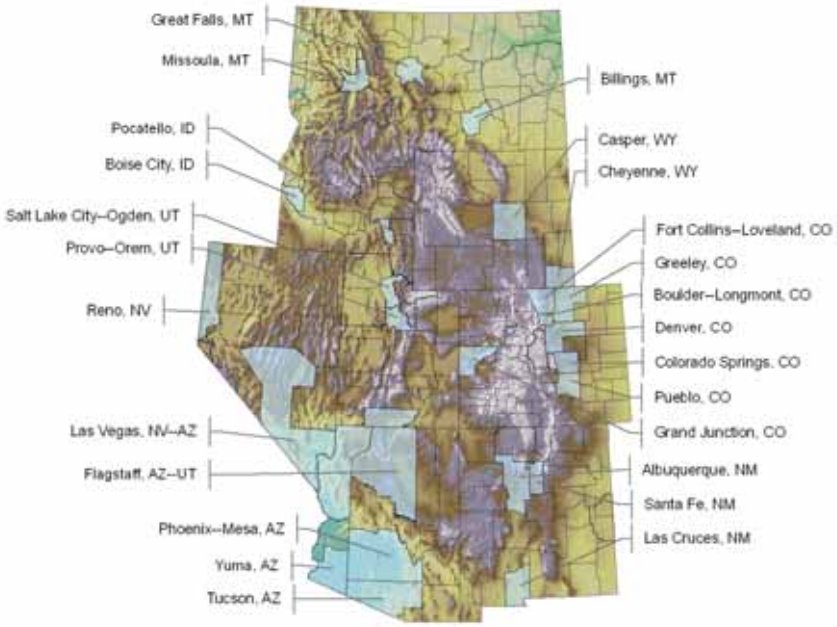


Table 1
Cross-Occupational Super Categories and Components
Source: Current Population Survey June 2007, Bureau of Labor Statistics

Occupation	% of Immigrants employed June 2007	Median Income, 2006	High-Income Super Category	Low-Income Super Category	Creative Super Category	Immigrant Super Category	High-Tech Super Category
Management	8.2%	70,880	X		X		
Business and Financial Operations	11.5%	50,165	X				
Computer and Mathematical	14.5%	61,713	X		X		X
Architecture and Engineering	7.2%	60,701	X		X		X
Life, Physical, and Social Science	10.7%	47,640			X		X
Community and Social Services	6.4%	34,658					
Legal	4.6%	61,755	X				
Education, Training, and Library	6.0%	36,294			X		
Arts, Design, Entertainment, Sports, and Media	7.4%	35,231			X		
Healthcare Practitioners and Technical	7.0%	51,288	X				X
Healthcare Support	10.7%	23,122		X			
Protective Service	1.8%	32,029					
Food Preparation and Serving Related	25.6%	16,308		X		X	
Building and Grounds Cleaning and Maintenance	42.6%	20,264		X		X	
Personal Care and Service	13.4%	18,783		X			
Sales and Related	10.4%	23,392		X			
Office and Administrative Support	7.8%	27,094					
Farming, Fishing, and Forestry	40.8%	18,495		X		X	
Construction and Extraction	33.8%	33,677				X	
Installation, Maintenance, and Repair	13.4%	36,577					
Production	20.5%	26,399					
Transportation and Material Moving	15.8%	25,643					
All Occupations	14.6%	32,603					

Competitive Advantage

Competitive advantage—a term that applies to both industries and geographic areas—refers to the ability of a market participant to attain superior economic performance, despite the profit-reducing forces of market competition. At the root of competitive advantage sits the "value chain," or the activities a company or region undertakes to create a valuable product.[8] For example, a company undergoes activities that add value to raw materials, and a region can take steps to make itself more attractive to businesses. When such an entity either produces value more efficiently than its competitors, or differentiates its products so it is able to demand high prices, the entity gains competitive advantage.[9] It may be thought of as the result of "superior productivity, either in terms of lower costs than rivals or the ability to offer products with superior value that justify premium price."[10] That is, the competitive advantage of a region or city stems from its capacity to offer a productive (low-cost) environment for economic activity, or its attributes—such as recreational and entertainment opportunities—that make it otherwise attractive to businesses and workers.

Perhaps the most widely recognized factor in establishing competitive advantage is the "cluster effect." The cluster effect occurs when "clusters" of related companies and institutions facilitate productivity and thus promote competitive advantage. The competition and cooperation brought by clusters increases productivity, spurs innovation, and prompts the development of new business. Clusters increase productivity by allowing companies to "operate more productively in sourcing inputs; accessing information, technology, and needed institutions; coordinating with related companies; and measuring and motivating improvement."[11] In addition, concentrated innovation within a cluster may further spur productivity by reducing the inputs required for production. Finally, cluster activity leads to the development of new industry niches, which in turn strengthens and expands a cluster.[12]

Some of the Rocky Mountain region's competitive advantage is attributable to its abundance of natural amenities. Prior research indicates that the Rockies' wealth of natural amenities may be a commanding force in drawing qualified human capital to the area. Indeed, natural amenities including recreational opportunities, natural scenery, and environmental quality are fundamental to the desirable outdoor lifestyle that, in turn, builds an attractive atmosphere for businesses and qualified workers alike.[13]

Creating Cross-Occupational Super Categories

To answer our questions regarding trends in creativity, technology, income, and work force composition, we constructed five cross-occupational "super categories": Creative, High-Tech, High-Income, Low-Income, and Immigrant. Each super category combines data from the specific occupations that drive these respective trends (See Table 1). Occupational data is classified under the U.S. Bureau of Labor Statistics Standard Occupational Classification system (SOC).[14]

Mix-Share Analysis Results: The Rockies and the U.S. 1990-2000
(See Appendix 1)

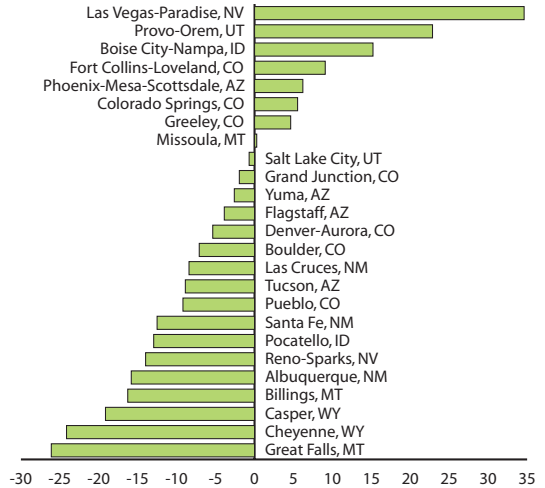
The Rocky Mountain region has experienced more rapid GDP growth than the U.S. as a whole for most of the past two decades.[15] Not surprisingly, our analysis indicates that from 1990-2000 the Rocky Mountain region greatly surpassed the U.S. in employment growth as well. Total employment growth for this period in the Rockies was 36 percent, as compared to 12 percent for the U.S. as a whole.

Illustrating the forces of competitive advantage at work, nearly 65 percent of all jobs created in the Rockies during this period were due to the regional effect, and the Rocky Mountain region maintained a competitive advantage measure of 23 percent. Though the Rocky Mountain region endured a -17 percent competitive advantage in healthcare support occupations, its competitive success prevailed across all remaining occupational sectors. With positive competitive advantages in 21 of 22 occupational categories, employment growth in the Rocky Mountain region out-performed the U.S. for practically all occupations. The Rockies held strong competitive advantages in occupational categories such as construction and extraction occupations (62 percent), computer and mathematical occupations (48 percent) and personal care and service occupations (39 percent). Though all cross-occupational super categories held significant competitive advantages over this period, the immigrant occupations super category (34 percent) and the creative occupations super category (25 percent) displayed the highest competitive advantages. Competitive advantage for all occupations in all Rockies MSAs is shown in Figure 2.

Change in the Rockies: 1990 - 2000
(See Appendix 2)

From 1990-2000, employment trends varied among Rocky Mountain MSAs. MSAs often exhibited high degrees of specialization in some occupational categories, and lower proficiencies in others. For example, in Boulder, Colorado, specific occupations where a competitive advantage existed include computer and mathematical occupations (173 percent) and—likely due to the presence of the University of Colorado-Boulder campus—life, physical, and social science occupations (95 percent). Conversely, occupations at a competitive disadvantage in Boulder include community and social service occupations (-65 percent) and installation, maintenance, and repair occupations (-58 percent). Among cross-occupational super categories, Boulder experienced positive competitive advantage in the high-income super category (8 percent), the creative super category (24 percent) and the high-tech super category (18 percent). Boulder's performance in the low-income super category and the immigrant occupations super category yielded competitive (dis)advantages of -5.6 percent, and -5.0 percent, respectively.

Figure 2
Competitive Advantage, All Occupations, All Rockies MSAs, 1990-2000
Source: Calculations Made From Census Bureau Data



A Closer Look at Cross-Occupational Super Categories: Creative Super Category[16]

The Creative super category allows us to observe employment trends among creative occupations. A creative work force implies innovative potential among human capital. As innovative potential leads to competitive advantage,[17] promoting creative occupation growth may be an effective economic development strategy.

Our analysis of the Creative super category, summarized in Table 2, indicates that Provo-Orem, Utah (51 percent) held the greatest competitive advantage in creative occupations from 1990-2000, while Casper, Wyoming (-46 percent) maintained the greatest competitive disadvantage.

Although Provo-Orem did not display competitive advantage in all occupational categories that comprise the Creative super category, its strong competitive advantage in select occupational categories more than offset its competitive disadvantage in others. From 1990-2000, Provo-Orem experienced high competitive advantages in computer and mathematical occupations; education, training, and library occupations; and arts, design, entertainment, sports, and media occupations. Not surprisingly, creative occupations in Provo-Orem grew by 52 percent between 1990-2000.

By contrast, Casper, Wyoming, endured negative competitive advantage in all creative occupations during this time period. Its lowest competitive advantage within

the Creative super category was in computer and mathematical occupations at nearly 200 percent. Overall, Casper lost approximately one half of its creative employment in 1990.

Table 2
Top 5 and Bottom 5 MSAs:
Creative Super Category
Source: Calculations Made From Census Bureau Data

Top 5 MSA's for Creative Occupations		Bottom 5 MSA's for Creative Occupations	
Rocky Mountain MSA	Competitive Advantage Measure	Rocky Mountain MSA	Competitive Advantage Measure
Provo-Orem, UT	51.0%	Billings, MT	-31.0%
Fort Collins-Loveland, CO	29.1%	Pueblo, CO	-38.9%
Las Vegas-Paradise, NV	27.2%	Cheyenne, WY	-39.8%
Boulder, CO	24.4%	Great Falls, MT	-44.9%
Flagstaff, AZ	23.0%	Casper, WY	-45.6%

High-Tech Super Category

The High-Tech super category assesses the aptitude of an MSA's workforce to adapt and use new technologies. Incorporating new technologies is essential in both staying current with changing economies, and in boosting innovative capacity. Our mix-share analysis of the High-Tech super category from 1990-2000 found that Boise City-Nampa, Idaho, led with a competitive advantage, and Casper, Wyoming, had the greatest competitive disadvantage. The results of our mix-share analysis for the High Tech super category are displayed in Table 3.

Table 3
Top 5 and Bottom 5 MSAs:
High Tech Super Category
Source: Calculations Made From Census Bureau Data

Top 5 MSA's for High-tech Occupations		Bottom 5 MSA's for High-tech Occupations	
Rocky Mountain MSA	Competitive Advantage Measure	Rocky Mountain MSA	Competitive Advantage Measure
Boise City-Nampa, ID	41.1%	Yuma, AZ	-21.1%
Colorado Springs, CO	32.5%	Great Falls, MT	-30.3%
Fort Collins-Loveland, CO	26.9%	Cheyenne, WY	-31.1%
Provo-Orem, UT	17.6%	Las Cruces, NM	-38.6%
Boulder, CO	17.5%	Casper, WY	-39.6%

High-Income Super Category

High-income occupations often require high degrees of education, specialization, and an experienced work force. The presence of jobs requiring such qualities is indicative of a highly developed economy, and is therefore an important tool in assessing the economic profile of a region or MSA. Table 4 highlights our High Income super category analysis, with Provo-Orem, Utah, holding the highest competitive advantage, and Casper, Wyoming, again with the greatest competitive disadvantage. These high-income competitive advantage estimates are, again, largely affected by competitive advantages within the computer and mathematical occupations category.

Table 4
Top 5 and Bottom 5 MSAs:
High Income Super Category
Source: Calculations Made From Census Bureau Data

Top 5 MSA's for High-Income Occupations		Bottom 5 MSA's for High-Income Occupations	
Rocky Mountain MSA	Competitive Advantage Measure	Rocky Mountain MSA	Competitive Advantage Measure
Provo-Orem, UT	26.4%	Pocatello, ID	-28.8%
Las Vegas-Paradise, NV	26.2%	Great Falls, MT	-30.3%
Boise City-Nampa, ID	24.9%	Yuma, AZ	-35.4%
Colorado Springs, CO	18.1%	Las Cruces, NM	-41.6%
Fort Collins-Loveland, CO	13.6%	Casper, WY	-42.1%

Low-Income Super Category

In the Low-Income super category, Las Vegas-Paradise, Nevada/Arizona, held the highest competitive advantage, while Cheyenne, Wyoming, held the lowest competitive disadvantage. The results of our analysis for the low-income super category are listed in Table 5.

Table 5
Top 5 and Bottom 5 MSAs:
Low Income Super Category
Source: Calculations Made From Census Bureau Data

Top 5 MSA's for Low-Income Occupations		Bottom 5 MSA's for Low-income Occupations	
Rocky Mountain MSA	Competitive Advantage Measure	Rocky Mountian MSA	Competitive Advantage Measure
Las Vegas-Paradise, NV	38.0%	Tucson, AZ	-13.5%
Provo-Orem, UT	18.8%	Billings, MT	-16.0%
Boise City-Nampa, ID	13.3%	Reno-Sparks, NV	-17.1%
Missoula, MT	8.6%	Great Falls, MT	-29.8%
Fort Collins-Loveland, CO	7.9%	Cheyenne, WY	-33.4%

Immigrant Occupations Super Category

Finally, we turn to competitive advantages in the Immigrant Occupations super category (Table 5). In occupational categories that employ high levels of immigrants, Las Vegas-Paradise, Nevada/Arizona, held the highest competitive advantage, while Great Falls, Montana, held the lowest competitive advantage. Though it is difficult

to assess the reasons for competitive advantage in this super category, one possibility is that immigrants may gravitate toward economies that are experiencing rapid growth. Because the occupations included in this super category are often indicators of high economic growth, a competitive advantage in immigrant occupations may be due to rapidly growing local economies.[18] It should be noted that the two most competitive MSAs in the Immigrant Occupations super category—Las Vegas-Paradise, NV and Provo-Orem, UT—were also the two most competitive MSAs for total employment growth.[19]

Table 5
Top 5 and Bottom 5 MSAs:
Immigrant Occupations Super Category
Source: Calculations Made From Census Bureau Data

Top 5 MSA's for Immigrant Occupations		Bottom 5 MSA's for Immigrant Occupations	
Rocky Mountain MSA	Competitive Advantage Measure	Rocky Mountain MSA	Competitive Advantage Measure
Las Vegas-Paradise, NV	41.7%	Pocatello, ID	-25.1%
Provo-Orem, UT	17.1%	Reno-Sparks, NV	-27.3%
Santa Fe, NM	14.3%	Cheyenne, WY	-29.8%
Fort Collins-Loveland, CO	13.7%	Billings, MT	-34.3%
Boise City-Nampa, ID	9.3%	Great Falls, MT	-40.4%

Revisiting Competitive Advantage

Though we are able to establish the existence of competitive advantage for total employment, specific occupations, and cross-occupational super categories, the precise underlying causes of competitive advantage remain less clear. Many factors, including proximity to markets, urban and social amenities that attract or keep workers, and support from transport and communications infrastructure all play a part. As we mentioned earlier, a city or region can utilize innovation and industry clusters as ways to attain the superior productivity that brings about competitive advantage. Innovation can increase productivity by allowing industries to break away from old production restraints and reduce needed inputs. In addition, horizontally and vertically-linked industry clusters can promote competitive advantage by reducing costs, facilitating both competition and cooperation among cluster members, increasing innovation, and creating new business niches.[20]

Some also point to the Rocky Mountain region's natural amenities as an attracting force for new people and companies seeking a unique quality of life.[21] "Footloose" individuals with high levels of education and skills/training are capable of first choosing where they will live, then seeking employment later. Likewise, companies that are in the service and light-manufacturing sectors may choose a location first, and seek out a compatible workforce second.

Furthermore, the Rockies' natural amenities are a source of "sustainable" competitive advantage, meaning competitors have difficulty reproducing its value-adding processes.[22] In other words, there is no way for the Midwest or other regions to reproduce all the amenities, and therefore the competitive advantage, provided by the Rocky Mountains. However, a Rocky Mountain location can also be a disadvantage for some industries. With large distances between major cities raising shipping costs, businesses that depend on shipping such as restaurants, retailers, and manufacturers may have difficulty attaining high levels of productivity in the Rockies. Supporting this, our analysis indicates that most Rocky Mountain MSAs had low or negative competitive advantages in production occupations.[23]

Nonetheless, the overall competitive advantages the Rockies displayed throughout the past two decades offer evidence of the region's superior economic potential. In recognition of this potential and how it relates to our economic future, our final question arises: how can competitive advantage influence economic policy in the Rocky Mountain region?

Creating Competitive Advantage Through Policy: Cluster Development
(See Appendix 3)

Because competitive advantage leads to superior economic growth, cities and regions may benefit by adopting policies to promote and sustain it. To foster advanced, innovative, and competitive economies, some areas have embraced the cluster effect as an integral part of their economic policy.

In the early 1990s, the state of Arizona examined the role of clusters in its economy and adopted a cluster development strategy under the Arizona Strategic Plan for Economic Development (ASPED). In its analysis, Arizona identified 11 industry clusters—some of which were not previously recognized as autonomous indus-

tries—and took steps to assist these clusters though economic policy. While the results of Arizona's cluster policy are mixed, some industries have experienced significant growth. For instance, Arizona's diverse and previously unidentified cluster among optics producers has expanded dramatically since its inception. According to one optics industry leader, three years spent on cluster activities and networking cost his company $50,000, but resulted in more than $700,000 in new business for a small company.[24]

A key element of Arizona's cluster development policy has been encouraging communication between clusters and government. Because formal approaches to cluster development are relatively new, difficulties arise in implementing these policies. To address the challenge of identifying and meeting cluster needs and to gain a better understanding of cluster dynamics, Arizona has worked to facilitate collaboration between policy makers and industry advisory groups: a dialogue that has proven fundamental in Arizona's cluster development strategy. This communication between clusters and government has led to strong support of economic development legislation in the state and has aided policy makers in effectively designing cluster-promoting legislation.[25]

The industry benefits of cluster promotion under ASPED are most apparent within previously unidentified clusters. Similar to the optics cluster, Arizona's environmental technology and software industries were not recognized before the 1990s. Since their emergence as clusters, these industries have received backing from both policy makers and influential economic development organizations including the state's two largest public universities and the Arizona World Trade Center.[26]

Natural Amenities and Competitive Advantage

Competitive advantage can serve as a metric for assessing the economic performance of a region or city. In observing competitive advantage, a locale can evaluate its strengths and weaknesses, and make informed decisions on how to progress economically. When choosing a course of economic action, however, an area must be cognizant that promoting competitive advantage in one industry may reduce competitive advantage in another.

As noted above, competitive advantage may be derived from an area's attributes that workers and businesses find attractive. The Rocky Mountain region's natural amenities are analogous to what economist Michael Porter calls a "[product] with superior value that justifies premium price."[27] By allowing ready access to the aesthetic and recreational benefits that these amenities provide, features such as the Rocky Mountains effectively compensate workers and businesses for the price of relocating to them. Furthermore, the desirable lifestyles supported by the Rockies' natural amenities aid in retaining qualified workers who already call the Rockies home.

Given the importance of natural amenities in attracting and maintaining qualified workers, it is economically beneficial to examine the extent to which any economic activity may compromise them. For example, some raise the idea that the establishment of extraction industries in the Rockies may detract from the value of its natural amenities.[28] With a competitive advantage of 62 percent in construction and extraction occupations between 1990 and 2000,[29] the Rocky Mountain region is in a strong position to capitalize on its natural resources. However, before pursuing this competitive advantage, the region must make important decisions regarding how it will develop these resources. While extraction provides economic benefits of increased tax revenue and job growth, the effects of developing an extraction-based economy may decrease the value of natural amenities, and thereby impede the Rocky Mountain region's ability to draw and sustain a skilled, highly educated workforce.

Therefore, although the Rocky Mountain region may be poised to realize significant economic gains, pursuing competitive advantage in one industry may offset competitive advantage in another. This principle is particularly applicable with regard to the region's natural amenities. Because natural amenities are a key element in driving competitive advantage in the Rockies, the region must carefully consider how any economic activity affects them.

Conclusions

Our analysis shows a mixed picture for the Rocky Mountain economy. While some MSAs are moving toward economic compositions that rely on the more advanced occupations of the High-Tech, Creative, and High-Income super categories, others are seeing expansion in their less advanced, lower-income sectors. The economic segmentation that has resulted from this dis-

proportionate occupational growth may or may not continue as competitive advantages either shift or remain in place.

Additionally, our analysis indicates, to some extent, how the high immigration of recent decades has impacted employment in the Rocky Mountains. A competitive advantage in the Immigrant Occupations Super Category may be the product of rapid economic growth within an area, geographic location, or other factors. Reasons that explain growth in immigrant occupations may be solidified by further research.

Much of the economic strength that arises from competitive advantage can be achieved and maintained through policy. In order to improve economic competitiveness, some governments have geared their economic development policy toward the promotion of cluster-based economies. Prior research shows that clusters are an effective way to achieve the productivity increases that lead to competitive advantage.[30] However, cities and regions should take care in deciding where to pursue competitive advantage. While the economic prosperity that competitive advantage represents is generally considered beneficial, the pursuit of competitive advantage in one industry may cause a locale to forfeit its competitive advantage in others. Policy makers must therefore account for these costs and benefits in designing economic policy, specifically with respect to the effect of economic activity on natural amenities. Because of the importance of these natural amenities in creating and sustaining competitive advantage in the Rockies, policy makers must carefully consider them in their decisions.

Endnotes and Citations

[1]Daniel Kemmis, "Cities in the New West: Urban planning will best determine how the region will grow," *Heawaters News*, 27 October 2007.
[2]We calculate *Growth Effect* with the equation: *Growth Effect* $i = e_i^t * R_a$ —where e equals sub-regional employment, and R equals the overall benchmark growth rate. i is a subscript denoting specific occupational category, and a is a subscript denoting aggregate benchmark employment. t is a superscript denoting the first year of the observation period.
[3]We express *Occupational Mix Effect* with the equation: *Occupational Mix Effect* $i = (ri - Ra) * e_i^t$ — where r equals the specific occupational growth rate. All other variables, subscripts, and superscripts used in this equation are the same as those delineated in the equation used to express *Growth Effect*.
[4]We express *Regional Effect* with the equation: *Regional Effect = Aggregate Employment Change – Growth Effect - Occupational Mix Effect.*
[5]Avrom Bendavid-Val, *Regional and Local Economic Analysis for Practitioners*, 4th ed. (New York: Prager Publishers, 1991), 67-73.
[6]Our study uses 1990 and 2000 Census occupation data in addition to 1999 and 2004 Occupational Employment Statistics (OES) data. The data is provided at the MSA level. An MSA is composed of one or more counties, and is usually referred to by the name of the city, or cities, it encompasses. For example, the MSA containing El Paso County is referred to as the Colorado Springs metro area. MSAs considered in this study are those defined according to the 1999 Office of Management and Budget (OMB) guidelines. For 1990-2000, we collapsed county data to create the MSAs based on 1999 OMB definitions. For more information on the criteria the Census Bureau uses to define MSAs, visit http://www.census.gov/population/www/estimates/metrodef.html.
[7]We measure competitive advantage by dividing the number of jobs added due to the regional effect by the number of jobs that existed at the beginning of the period. It is important to note that even with positive employment growth a region or MSA may still exhibit a negative competitive advantage—a competitive disadvantage. This phenomenon occurs when a region or MSA's *actual* job growth falls short of the job growth that it should have experienced as a result of the growth effect and the occupational mix effect. This illustrates the fact that jobs gained by regions and MSAs with positive competitive advantage are essentially jobs lost by comparable regions and MSAs with competitive disadvantage. Note that competitive advantage estimates produced through mix-share analysis have several limitations. First, the presence of competitive advantage in one period does not necessarily assure competitive in succeeding periods. Additionally, mix-share analysis does not address the underlying causes of employment trends: mix share analysis only considers one variable (for our purposes, this is employment) and therefore does not establish causal relationships. One implication of this shortcoming is that, while it may seem, in a superficial sense, that *all* competitive advantage is beneficial, the driving forces behind competitive advantage may indicate the contrary. For example, a low or negative competitive advantage estimate produced by our methodology could represent an increase in labor productivity, or a shift away from unproductive industry— occurrences that should actually increase competitive advantage.
[8]Michael E. Porter and Victor E. Millar, "How Information Gives You Competitive Advantage," *Harvard Business Review* 63 (1983): 149-160.
[9]Ibid.
[10]Michael E. Porter and Claas van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship," J*ournal of Economic Perspectives* 9 (1995): 97-118.
[11]Michael E. Porter, "Clusters and the New Economics of Competition," *Harvard Business Review* 76 (1998): 77-90.
[12]Ibid.
[13]Walter E. Hecox and F. Patrick Holmes, The Colorado Plateau Economy: Shifting Patterns and Regional Disparities, The Colorado Plateau II (Tucson: University of Arizona Press, 2005), 13-23.
[14]Bureau of Labor Statistics, "Standard Occupational Classification (SOC) System," 16 February 2007, <http://www.bls.gov/soc/> (6 March 2008).
[15]Kemmis, "Cities in the New West," 1.
[16]Todd Gabe, "Growth of Creative Occupations in US Metropolitan Areas: A Shift-Share Analysis." *Growth and Change* 37, no. 3 (2006): 396-415.
[17]Richard Florida, *The Rise of the Creative Class*, (New York: Basic Books, 2002).
[18]There may or may not be an actual causal relationship between a competitive advantage in immigrant occupations and high economic growth.
[19]See Appendix
[20]Porter, "Clusters and the New Economics of Competition," 4.
[21]Hecox and Holmes, *The Colorado Plateau Economy*, 4.
[22]Porter, "How Information Gives you Competitive Advantage," 3.
[23]Authors' Calculations, see appendix
[24]Mary Jo Waits, "The Added Value of the Industry Cluster Approach to Economic Analysis, Strategy, Development, and Service Delivery." Economic Development Quarterly 14, no. 1 (2000): 35-50.
[25]Ibid.
[26]Ibid.
[27]Porter, "Clusters and the New Economics of Competition," 4.
[28]Todd Hartman, "Drilling operations reshape landscape" *Rocky Mountain News* 10 December, 2005.
[29]Authors' calculations
[30]Porter, "Clusters and the New Economics of Competition," 4.

Appendix 1
Occupational Shift Share Analysis, 1990-2000
Rockies Region
Benchmark Region: United States
Source: Calculations Made From Census Bureau Data

Occupation	Change in Employment 1990-2000	% Change in Employment 1990-2000	Occupational Growth Rates- US Benchmark 1990-2000	Rockies Growth Effect 1990-2000	Rockies Growth Effect as a % of Total Job Change 1990-2000	Rockies Occupational Mix Effect 1990-2000	Rockies Occupational Mix Effect as a % of Total Job Change 1990-2000	Rockies Regional Effect 1990-2000	Rockies Regional Effect as a % of Total Job Change 1990-2000	Competitive Advantage Measure in %
11-0000 Management Occupations	263,746	49.8%	24.2%	64,304	24.4%	64,076	24.3%	135,366	51.3%	25.6%
13-0000 Business and Financial Operations Occupations	111,502	46.7%	25.2%	28,968	26.0%	31,195	28.0%	51,339	46.0%	21.5%
15-0000 Computer and Mathematical Occupations	133,287	161.0%	113.4%	10,046	7.5%	83,781	62.9%	39,460	29.6%	47.7%
17-0000 Architecture and Engineering Occupations	29,056	17.5%	-10.6%	20,108	69.2%	-37,656	-129.6%	46,605	160.4%	28.1%
19-0000 Life, Physical, and Social Science Occupations	15,919	23.7%	-0.4%	8,156	51.2%	-8,405	-52.8%	16,168	101.6%	24.1%
21-0000 Community and Social Services Occupations	37,829	50.5%	43.4%	9,085	24.0%	23,400	61.9%	5,344	14.1%	7.1%
23-0000 Legal Occupations	25,275	43.3%	33.6%	7,085	28.0%	12,531	49.6%	5,659	22.4%	9.7%
25-0000 Education, Training, and Library Occupations	148,392	47.7%	29.1%	37,735	25.4%	52,582	35.4%	58,074	39.1%	18.7%
27-0000 Arts, Design, Entertainment, Sports, and Media Occupations	45,058	37.5%	13.3%	14,596	32.4%	1,449	3.2%	29,013	64.4%	24.1%
29-0000 Healthcare Practitioners and Technical Occupations	80,629	31.7%	30.1%	30,872	38.3%	45,781	56.8%	3,977	4.9%	1.6%
31-0000 Healthcare Support Occupations	4,496	3.4%	20.8%	16,269	361.9%	11,544	256.8%	-23,318	-518.7%	-17.4%
33-0000 Protective Service Occupations	60,433	52.8%	23.9%	13,891	23.0%	13,505	22.3%	33,037	54.7%	28.9%
35-0000 Food Preparation and Serving Related Occupations	133,746	38.7%	13.6%	41,947	31.4%	4,893	3.7%	86,906	65.0%	25.1%
37-0000 Building and Grounds Cleaning and Maintenance Occupations	36,866	13.9%	0.4%	32,210	87.4%	-31,225	-84.7%	35,881	97.3%	13.5%
39-0000 Personal Care and Service Occupations	124,548	77.2%	38.4%	19,578	15.7%	42,359	34.0%	62,610	50.3%	38.8%
41-0000 Sales and Related Occupations	220,971	28.4%	4.1%	94,453	42.7%	-62,822	-28.4%	189,341	85.7%	24.3%
43-0000 Office and Administrative Support Occupations	298,106	29.4%	2.5%	123,192	41.3%	-97,769	-32.8%	272,683	91.5%	26.9%
45-0000 Farming, Fishing, and Forestry Occupations	399	0.6%	-8.9%	8,650	2168.6%	-15,009	-3762.8%	6,758	1694.2%	9.5%
47-0000 Construction and Extraction Occupations	241,031	69.6%	7.2%	42,059	17.4%	-17,071	-7.1%	216,043	89.6%	62.3%
49-0000 Installation, Maintenance, and Repair Occupations	119,907	54.3%	21.0%	26,806	22.4%	19,615	16.4%	73,487	61.3%	33.3%
51-0000 Production Occupations	5,289	1.1%	-7.1%	58,454	1105.2%	-92,427	-1747.5%	39,262	742.3%	8.2%
53-0000 Transportation and Material Moving Occupations	96,718	25.8%	10.5%	45,521	47.1%	-6,044	-6.2%	57,241	59.2%	15.3%
All Occupations	2,233,202	35.9%	12.1%	753,984	33.8%	38,285	1.7%	1,440,933	64.5%	23.2%
High Income Super Category	643,496	48.4%	27.1%	161,383	25.1%	199,482	31.0%	282,631	43.9%	21.3%
Low Income Super Category	521,025	29.7%	9.1%	213,107	40.9%	-53,391	-10.2%	361,310	69.3%	20.6%
Creative Super Category	635,457	49.8%	24.3%	154,946	24.4%	155,825	24.5%	324,686	51.1%	25.4%
Immigrant Super Category	412,042	40.1%	6.6%	124,866	30.3%	-57,124	-13.9%	344,300	83.6%	33.5%
High Tech Super Category	258,891	45.4%	26.8%	69,182	26.7%	83,484	32.2%	106,225	41.0%	18.6%

Appendix 2
Occupational Shift Share Analysis, 1990-2000
Boulder, Colorado
Benchmark Region: Rockies

Source: Calculations Made From Census Bureau Data

Occupation	Change in Employment 1990-2000	% Change in Employment 1990-2000	Occupational Growth Rates- Rockies Benchmark 1990-2000	Boulder Growth Effect 1990-2000	Boulder Growth Effect as a % of Total Job Change 1990-2000	Boulder Occupational Mix Effect 1990-2000	Boulder Occupational Mix Effect as a % of Total Job Change 1990-2000	Boulder Regional Effect 1990-2000	Boulder Regional Effect as a % of Total Job Change 1990-2000	Competitive Advantage Measure in %
11-0000 Management Occupations	8,540	70.0%	49.8%	4,387	51.4%	1,688	19.8%	2,466	28.9%	20.2%
13-0000 Business and Financial Operations Occupations	2,365	39.8%	46.7%	2,135	90.3%	640	27.0%	-409	-17.3%	-6.9%
15-0000 Computer and Mathematical Occupations	9,110	333.9%	161.0%	981	10.8%	3,413	37.5%	4,716	51.8%	172.8%
17-0000 Architecture and Engineering Occupations	1,984	36.3%	17.5%	1,964	99.0%	-1,006	-50.7%	1,026	51.7%	18.8%
19-0000 Life, Physical, and Social Science Occupations	2,627	118.9%	23.7%	794	30.2%	-271	-10.3%	2,104	80.1%	95.2%
21-0000 Community and Social Services Occupations	-331	-14.2%	50.5%	834	-252.3%	339	-102.4%	-1,504	454.7%	-64.8%
23-0000 Legal Occupations	563	30.2%	43.3%	670	118.9%	137	24.3%	-244	-43.3%	-13.1%
25-0000 Education, Training, and Library Occupations	2,464	25.8%	47.7%	3,431	139.2%	1,124	45.6%	-2,091	-84.9%	-21.9%
27-0000 Arts, Design, Entertainment, Sports, and Media Occupations	1,941	51.1%	37.5%	1,365	70.3%	58	3.0%	518	26.7%	13.6%
29-0000 Healthcare Practitioners and Technical Occupations	-2,016	-24.6%	31.7%	2,946	-146.1%	-348	17.3%	-4,615	228.9%	-56.3%
31-0000 Healthcare Support Occupations	-121	-5.6%	3.4%	771	-636.8%	-699	577.4%	-193	159.4%	-9.0%
33-0000 Protective Service Occupations	344	26.2%	52.8%	472	137.3%	221	64.4%	-350	-101.6%	-26.6%
35-0000 Food Preparation and Serving Related Occupations	2,659	52.5%	38.7%	1,822	68.5%	139	5.2%	698	26.2%	13.8%
37-0000 Building and Grounds Cleaning and Maintenance Occupations	479	13.6%	13.9%	1,271	265.3%	-780	-162.8%	-12	-2.5%	-0.3%
39-0000 Personal Care and Service Occupations	1,786	73.2%	77.2%	877	49.1%	1,007	56.4%	-98	-5.5%	-4.0%
41-0000 Sales and Related Occupations	2,371	15.8%	28.4%	5,396	227.5%	-1,134	-47.8%	-1,891	-79.7%	-12.6%
43-0000 Office and Administrative Support Occupations	1,841	9.6%	29.4%	6,904	375.0%	-1,263	-68.6%	-3,800	-206.4%	-19.8%
45-0000 Farming, Fishing, and Forestry Occupations	-259	-49.8%	0.6%	187	-72.1%	-184	71.0%	-262	101.1%	-50.4%
47-0000 Construction and Extraction Occupations	2,046	41.5%	69.6%	1,774	86.7%	1,658	81.0%	-1,386	-67.7%	-28.1%
49-0000 Installation, Maintenance, and Repair Occupations	-113	-3.4%	54.3%	1,184	-1044.3%	604	-532.9%	-1,901	1677.2%	-57.7%
51-0000 Production Occupations	-717	-8.5%	1.1%	3,031	-422.6%	-2,938	409.7%	-810	112.9%	-9.6%
53-0000 Transportation and Material Moving Occupations	324	7.4%	25.8%	1,575	486.9%	-445	-137.6%	-807	-249.3%	-18.4%
All Occupations	37,886	30.4%	35.9%	44,771	118.2%	1,959	5.2%	-8,844	-23.3%	-7.1%
High Income Super Category	20,546	56.5%	48.4%	13,083	63.7%	4,530	22.0%	2,933	14.3%	8.1%
Low Income Super Category	6,915	24.1%	29.7%	10,324	149.3%	-1,802	-26.1%	-1,607	-23.2%	-5.6%
Creative Super Category	26,666	74.2%	49.8%	12,921	48.5%	4,970	18.6%	8,775	32.9%	24.4%
Immigrant Super Category	4,925	35.0%	40.1%	5,054	102.6%	577	11.7%	-706	-14.3%	-5.0%
High Tech Super Category	11,704	62.9%	45.4%	6,685	57.1%	1,761	15.0%	3,258	27.8%	17.5%

Appendix 3

Competitive Measure in Percent by SOC and Cross-Occupational Super Category, 1990-2000

Source: Calculations Made From Census Bureau Data

SOC or Cross-Occupational Category	Management occupations	Business and financial operations occupations	Computer and mathematical occupations	Architecture and engineering occupations	Life, physical, and social science occupations	Community and social services occupations	Legal occupations	Education, training, and library occupations	Arts, design, entertainment, sports, and media occupations	Healthcare practitioners and technical occupations	Healthcare support occupations	Protective service occupations
Rocky Mountain MSA												
Flagstaff, AZ	34.3%	-20.8%	-160.2%	-49.2%	120.5%	62.4%	-23.0%	78.7%	-1.5%	10.5%	-27.1%	-30.1%
Phoenix-Mesa-Scottsdale, AZ	5.2%	18.1%	49.1%	23.9%	-46.2%	-4.3%	13.2%	-12.3%	4.2%	5.1%	5.7%	6.4%
Tucson, AZ	-15.8%	-21.0%	-54.5%	12.5%	18.7%	5.0%	-21.5%	-10.6%	-10.0%	4.7%	9.5%	0.7%
Yuma, AZ	-50.5%	-32.2%	-180.3%	-21.4%	-58.2%	78.2%	-23.7%	84.0%	-24.9%	40.5%	-10.1%	10.4%
Boulder, CO	20.2%	-6.9%	172.8%	18.8%	95.2%	-64.8%	-13.1%	-21.9%	13.6%	-56.3%	-9.0%	-26.6%
Colorado Springs, CO	6.1%	-3.5%	261.4%	22.3%	-59.9%	17.4%	-31.2%	-14.7%	8.4%	-10.6%	9.1%	2.2%
Denver-Aurora, CO	-1.4%	16.3%	134.7%	5.5%	-6.7%	-27.8%	33.1%	-39.0%	-6.9%	-20.9%	-12.1%	-11.0%
Fort Collins-Loveland, CO	29.1%	-3.4%	59.8%	45.5%	88.5%	-17.5%	-80.8%	3.5%	14.6%	-12.6%	9.1%	-1.7%
Grand Junction, CO	-6.1%	-13.7%	-156.9%	-12.6%	-3.8%	46.4%	-22.7%	-5.3%	-49.7%	44.8%	73.6%	-23.7%
Greeley, CO	-2.7%	17.6%	24.3%	-3.1%	-10.4%	53.9%	-46.8%	39.1%	4.4%	9.3%	41.2%	0.1%
Pueblo, CO	-18.8%	-8.0%	-171.3%	-43.1%	-75.7%	64.3%	-35.4%	-13.6%	-59.0%	78.7%	36.6%	4.2%
Boise City-Nampa, ID	2.1%	33.8%	51.7%	78.5%	-8.1%	35.6%	22.2%	17.2%	14.7%	25.0%	47.8%	7.0%
Pocatello, ID	-33.4%	-32.6%	-145.6%	-15.8%	12.9%	5.9%	-50.3%	44.4%	-55.4%	16.9%	18.3%	14.0%
Billings, MT	-30.3%	-34.6%	-135.4%	-23.0%	-2.9%	62.4%	18.6%	-12.7%	-37.4%	44.9%	14.6%	-20.8%
Great Falls, MT	-35.7%	-28.0%	-209.2%	-51.4%	-48.6%	4.8%	-10.0%	-13.0%	-47.9%	45.5%	0.1%	-3.2%
Missoula, MT	-10.2%	-9.5%	-125.8%	-58.4%	74.2%	49.6%	10.3%	9.8%	22.4%	11.6%	-14.4%	-39.6%
Albuquerque, NM	-19.5%	-10.5%	-66.9%	12.1%	2.3%	-29.8%	3.0%	-29.9%	-22.4%	-7.3%	2.0%	-7.4%
Las Cruces, NM	-34.6%	-40.4%	-138.2%	-18.4%	5.2%	19.4%	-71.7%	54.8%	-50.3%	-30.9%	14.9%	-1.0%
Santa Fe, NM	-6.5%	0.5%	-75.4%	0.7%	191.9%	-50.8%	41.1%	-43.2%	35.1%	-42.3%	-10.8%	-13.2%
Las Vegas-Paradise, NV	29.9%	12.0%	-61.4%	-7.3%	-29.5%	4.7%	102.5%	36.5%	133.8%	67.5%	-48.5%	16.1%
Reno-Sparks, NV	-15.2%	-20.2%	-114.8%	-26.7%	-1.4%	-30.3%	18.4%	-15.8%	14.9%	21.0%	-49.4%	-34.5%
Provo-Orem, UT	45.5%	29.3%	227.7%	-35.9%	-6.2%	-2.7%	-51.3%	75.6%	35.5%	-8.2%	33.7%	16.7%
Salt Lake City, UT	-10.6%	13.5%	23.0%	-7.7%	-9.8%	-19.0%	-0.2%	-12.4%	-7.2%	-7.5%	18.1%	-3.1%
Casper, WY	-36.5%	-58.6%	-195.4%	-28.5%	-40.0%	14.5%	-43.1%	-28.6%	-55.8%	2.8%	37.3%	-46.2%
Cheyenne, WY	-29.2%	-24.9%	-129.1%	-28.3%	-13.2%	-8.8%	42.0%	-41.3%	-52.0%	-6.0%	-4.4%	-26.0%

	Food preparation and serving related occupations	Building and grounds cleaning and maintenance occupations	Personal care and service occupations	Sales and related occupations	Office and administrative support occupations	Farming, fishing, and forestry occupations	Construction and extraction occupations	Installation, maintenance, and repair occupations	Production occupations	Transportation and material moving occupations	All Occupations	High Income	Low Income	Creative	Immigrant	High Tech
	25.6%	10.9%	-29.4%	-16.7%	-7.3%	23.2%	-25.1%	-27.4%	-10.5%	-27.0%	-3.9%	-8.3%	-4.1%	23.0%	6.1%	-18.3%
	3.4%	29.6%	1.4%	4.6%	6.4%	-12.7%	-2.8%	9.0%	6.4%	11.1%	6.2%	13.0%	7.3%	3.6%	8.9%	11.1%
	-8.8%	2.8%	-25.7%	-21.0%	1.7%	-61.0%	-15.6%	3.5%	-8.3%	-14.4%	-8.9%	-11.4%	-13.5%	-10.6%	-9.2%	0.0%
	-8.1%	-22.0%	-45.0%	6.0%	-4.5%	150.6%	-26.9%	33.7%	-11.0%	2.2%	-2.6%	-35.4%	5.6%	-24.7%	2.6%	-21.1%
	13.8%	-0.3%	-4.0%	-12.6%	-19.8%	-50.4%	-28.1%	-57.7%	-9.6%	-18.4%	-7.1%	8.1%	-5.6%	24.4%	-5.0%	17.5%
	-5.4%	-6.9%	-5.8%	-2.4%	7.3%	-55.3%	7.1%	7.2%	13.8%	13.8%	5.5%	18.1%	-2.9%	16.9%	-1.5%	32.5%
	-16.4%	-8.7%	-7.6%	-6.9%	-14.0%	-50.9%	8.5%	8.3%	-7.7%	7.2%	-5.4%	9.1%	-9.2%	-1.4%	-3.8%	11.4%
	5.8%	11.2%	-14.0%	11.1%	-1.8%	7.8%	21.7%	-24.2%	17.7%	16.5%	9.1%	13.6%	7.9%	29.1%	13.7%	26.9%
	2.5%	-4.0%	-35.0%	-12.3%	12.3%	6.7%	8.2%	-17.1%	-10.0%	10.8%	-2.0%	-8.5%	-3.1%	-20.6%	3.3%	-6.5%
	0.4%	-24.5%	-29.9%	3.7%	3.2%	1.9%	10.0%	-1.4%	11.5%	7.5%	4.6%	2.6%	-4.7%	8.2%	-5.6%	5.6%
	-12.7%	-25.5%	-63.4%	-0.7%	-3.3%	-27.7%	2.8%	-8.6%	-12.4%	-9.0%	-9.2%	-10.9%	-10.2%	-38.9%	-11.0%	-10.9%
	24.1%	-1.5%	19.2%	8.4%	7.8%	18.7%	3.0%	12.7%	26.1%	3.7%	15.2%	24.9%	13.3%	19.0%	9.3%	41.1%
	-7.7%	-2.0%	-28.7%	-12.9%	-2.0%	-6.5%	-64.9%	14.3%	-0.8%	-30.6%	-13.0%	-28.8%	-8.8%	-18.0%	-25.1%	-16.7%
	-15.0%	-38.8%	-31.2%	-11.9%	-18.3%	-18.7%	-53.8%	-0.7%	1.6%	-1.1%	-16.3%	-21.0%	-16.0%	-31.0%	-34.3%	-6.5%
	-33.7%	-42.8%	-53.8%	-25.0%	-12.9%	-16.9%	-44.7%	-24.6%	-23.5%	-22.4%	-26.1%	-30.3%	-29.8%	-44.9%	-40.4%	-30.3%
	24.7%	-5.7%	7.2%	7.9%	6.1%	28.0%	-16.5%	34.1%	-11.6%	-7.4%	0.3%	-18.9%	8.6%	-11.0%	3.2%	-21.0%
	1.9%	-2.8%	-25.0%	-16.5%	-14.9%	-51.8%	-39.8%	-18.9%	-12.8%	-17.0%	-15.8%	-13.1%	-10.5%	-20.0%	-13.6%	-9.1%
	10.3%	11.7%	-11.9%	-4.0%	-8.4%	19.8%	-13.7%	7.3%	-10.0%	2.1%	-8.4%	-41.6%	2.6%	-16.2%	1.6%	-38.6%
	12.3%	22.5%	-7.5%	-18.4%	-21.0%	-40.8%	11.4%	-45.2%	-22.6%	-36.9%	-12.5%	-14.9%	-5.6%	-3.9%	14.3%	-6.7%
	36.7%	42.3%	124.6%	32.0%	44.4%	-47.7%	59.7%	18.5%	1.6%	42.4%	34.6%	26.2%	38.0%	27.2%	41.7%	15.5%
	-31.4%	-15.2%	23.8%	-15.5%	-13.4%	-38.9%	-30.5%	-4.7%	5.7%	4.5%	-14.0%	-15.6%	-17.1%	-19.6%	-27.3%	-15.3%
	1.4%	17.7%	-11.1%	34.5%	20.6%	-36.8%	40.1%	2.1%	6.4%	13.5%	22.9%	26.4%	18.8%	51.0%	17.1%	17.6%
	-12.0%	16.0%	-1.5%	2.2%	2.8%	-41.6%	-19.8%	-6.4%	11.7%	6.1%	-0.7%	-2.4%	2.1%	-8.0%	-5.1%	-3.2%
	-10.5%	25.2%	-45.1%	-8.2%	-18.7%	-41.8%	-21.3%	29.5%	-8.3%	-22.8%	-19.1%	-42.1%	-4.8%	-45.6%	-4.9%	-39.6%
	-38.2%	-31.0%	-55.1%	-35.3%	-21.2%	-3.9%	-25.0%	12.9%	0.0%	-4.3%	-24.1%	-26.9%	-33.4%	-39.8%	-29.8%	-31.1%

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.

Indicator Rankings

For a given indicator, counties are ranked according to the following methodology:

Each county is assigned a Z-Score for each variable that makes up the indicator in order to normalize and compare numerically different variables. 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.

After each county is assigned a Z-Score for each variable that makes up the indicator, each county is assigned an overall Z-Score by averaging the county's different Z-Scores. Sometimes different Z-Scores are given different weight as indicated in that section of the *Report Card*. Then, each unit is ranked in order of its overall Z-Score for the indicator.

Indicator Grades

After the units are ranked for the indicator as outlined above, the following percentage distribution is applied to assign grades to each geographic unit:

Percentile Earning Grade	% of Counties Earning Grade	Letter Grade Earned
100% to 93%	8%	A
92% to 85%	8%	A-
84% to 77%	8%	B+
76% to 70%	7%	B
69% to 64%	6%	B-
63% to 54%	10%	C+
53% to 44%	10%	C
43% to 36%	8%	C-
35% to 28%	8%	D+
27% to 0%	7%	D

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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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.

Simon Cataldo is a student researcher for the 2008 State of the Rockies Project. A native of Concord, Massachusetts, Simon has also lived in Ecuador and Bolivia, where he studied language, cultural studies and development issues. Curiosity about the dynamic set of challenges and rewards facing the Rockies region as it moves towards integrating newcomers inspired Simon to focus on immigration for his summer research. After graduating with a degree in Environmental Science in May of 2008, Simon will join Teach for America as a high school Earth Science teacher at Frederick Douglass Academy in Harlem, New York City.

Lucy Emerson-Bell is a student researcher for the 2008 State of the Rockies Project. Originally from Cambridge, MA she has roots in Colorado and has fallen in love with the West. She will be graduating from Colorado College in May 2008 with a B.S. in biology focusing on plant ecology. While at Colorado College she has been involved with environmental activism, tutoring, snowboarding and yoga. After graduation she plans on interning in government and working for the Democratic National Convention followed by a year of travel.

Brandon Goldstein is a student researcher for the 2008 State of the Rockies Project. He will graduate in May, 2008 with a major in mathematical economics. Growing up in Montana, Brandon has gained considerable interest in social and environmental issues throughout the Rocky Mountain States. His senior thesis research will focus on the evaluation of environmental systems through regression analysis. As an intern for the State of the Rockies project, he is pursuing his interest in the field of environmental economics.

David Havlick is an assistant professor of geography and environmental studies at the University of Colorado-Colorado Springs, and faculty editor of the 2007/2008 State of the Rockies Project. He graduated from Dartmouth College with a degree in English, earned an M.S. in environmental studies from the University of Montana, and a Ph.D. in geography at the University of North Carolina at Chapel Hill (2006). His publications include *No Place Distant: Roads and Motorized Recreation on America's Public Lands* (Island Press, 2002); and articles in *Ethics, Place & Environment, High Country News, Walking, Adventure Cyclist, Conservation in Practice, Science*, and other periodicals. He was the founding president of Wild Rockies Field Institute, where he taught for more than a decade as a field instructor, and has worked for other organizations including Predator Conservation Alliance, Wildlands CPR, and the Forest History Society

Walter E. Hecox is professor of economics and environmental science, 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 2007/08 program coordinator for the Colorado College State of the Rockies Project. This is his third year with the State of the Rockies Project, and second year as the program coordinator when he also served as co-editor of the 2007 and 2008 Report Cards. 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.

Elizabeth Kolbe is a student researcher for the 2008 State of the Rockies Project. She is currently an environmental science major at CC with a focus on renewable energy and sustainable design. Since leaving Grinnell, Iowa, she has also developed an interest in the state's agricultural economy, its relationship to ethanol, and the effects of the corn subsidy on farmers and markets. Aside from academics, Liz was a two-year captain of the CC women's basketball team enjoys the outdoors, reading, and cooking. After graduation, she will take over as program coordinator for the State of the Rockies Project and prepare to attend graduate school for environmental studies.

John MacKinnon is a 2008 Project Researcher for the Colorado College State of the Rockies Project. He graduated from Colorado College in August 2006 with a BA in economics. During his time at CC, John has focused primarily on macroeconomic issues, and wrote a thesis concerning the potential monetary and social effects of Medicare Part D. After college, John took steps to integrate his lifelong passion for the outdoors into his career, and was elected to the board of directors of the watershed conservation group, Animas Riverkeeper. John plans to further his career in environmental conservation by beginning law school in the Fall of 2008.

Pablo Navarro is a student researcher for the 2008 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, Pablo has worked as a research assistant for the Economics and Political Science departments. He recently finished a research paper analyzing the effects of Brazilian tax cuts on government revenues and the shadow economy. His main interest is equitable wealth creation through business development, particularly in Latin America. After graduation, Pablo will be working in Chicago as a Transfer Pricing Consultant with Ernst & Young.

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; in addition he co-edited the 2007 Report Card. 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.

Wiley Rogers is a student researcher for the 2008 State of the Rockies Project. He is currently a senior at Colorado College completing his self designed major Ecological Economics, which is an interdisciplinary approach to Environmental Science combining Mathematics, Environmental Science and Economics courses. After spending summer 2006 attending a perma-culture design course taught in interior Brazil and during the fall researching tourist demographics with Costa Rica's National Park system, Wiley is excited to be investigating Rockies topics closer to home. After graduating in May of 2008, Wiley plans on joining a sustainable construction firm on the West Coast, then road biking to Curitiba, Brazil.

Bethanie Walder is Executive Director of Wildlands CPR, a national conservation organization that works to promote balance, save money and create jobs by restoring unneeded forest roads to their natural state and by limiting off-road vehicle use. She has a B.A. in Political Science from Duke University and an M.S. in Environmental Studies from the University of Montana.

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.

Colorado College State of the Rockies Project

Students Researching, Reporting, and Engaging:

The Colorado College State of the Rockies Report Card, published annually since 2004, is the culmination of research and writing by a team of Colorado College student researchers. Each year a new team of students studies critical issues affecting the Rockies region of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.

Colorado College, a liberal arts college of national distinction, is indelibly linked to the Rockies. Through its Block Plan, students take one course at a time, and explore the Rockies and Southwest as classes embark in extended field study. Their sense of "place" runs deep, as they ford streams and explore acequias to study the cultural, environmental, and economic issues of water; as they camp in the Rocky Mountains to understand its geology; as they visit the West's oil fields to learn about energy concerns, and hike through forests to experience the biology of pest-ridden trees and changing owl populations. CC encourages a spirit of intellectual adventure, critical thinking, and hands-on learning, where education and life intertwine.

The Colorado College State of the Rockies Project dovetails perfectly with that philosophy, providing research opportunities for CC students and a means for the college to "give back" to the region in a meaningful way. The Report Card fosters a sense of citizenship for Colorado College graduates and the broader regional community.

Research
During summer field work, the student researchers pack into a van and cover thousands of miles of the Rocky Mountain West as they study the landscape, interview stakeholders, and challenge assumptions. Back on campus, they mine data, crunch numbers, and analyze information.

Report
Working collaboratively with faculty, the student researchers write their reports, create charts and graphics, and work with editors to fine-tune each Report Card section. Their reports are subjected to external review before final publication.

Engage
Through a companion lecture series on campus, the naming of a Champion of the Rockies, and the annual State of the Rockies Conference, citizens and experts meet to discuss the future of our region.

Each Report Card has great impact: Media coverage of Report Cards has reached millions of readers, and the 2006 report section on climate change was included in a brief presented to the U.S. Supreme Court. Government leaders, scientists, ranchers, environmentalists, sociologists, journalists, and concerned citizens refer to the Colorado College State of the Rockies Report Card to understand the most pressing issues affecting the growing Rockies region.

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