



Rockies Sprawl



Merriam-Webster's Collegiate Dictionary defines "sprawl" as a verb, transitive, "to cause to spread out carelessly or awkwardly." For some, sprawl is a term used to express aesthetic distaste over excessive growth around population centers. For others, the term refers to everything from density, to land-use, to pedestrian orientation. Sprawl conjures up images of low-density residential housing, car dependent cultures, freeway off-ramp office parks, and big-box stores eroding our farms, forests, and open spaces. Academics have coined catchphrases for the multi-dimen-

Index

sions of sprawl, the slurbs and zoomburbs, exopolises, and edge cities. They have discovered megacounties and freeway districts, and countless acronyms like LULU – locally unwanted land use, BANANA – build absolutely nothing anywhere near, NOPE – not on planet earth, and the ever-prevalent NIMBY – not in my backyard.¹ Even regions take on whole new names like "Ft. Greeland" here in Colorado, referring to the Ft. Collins, Loveland and Greeley urban/suburban agglomeration. Those of us who study sprawl find ourselves so entrenched with our subject matter that we are increasingly becoming like the subject itself: our expansive new vocabulary verges on becoming awkward and our ongoing attempts to orient ourselves in the rapidly transforming landscape have become rather disoriented.

Here in the Rocky Mountains, where population growth has exploded at three times the national average, many citizens are losing grasp of their civic destinies in their immediate backyard as a result of sprawl. "Twice I have bought a house on the edge of town, hoping to enjoy the desert for a long time," history professor at the University of Nevada Las Vegas Hal Rothman said. "Each time I found myself downtown."²

Aridity, topography, land ownership and stewardship, all contribute to a unique growth dynamic in the Rockies. All around the country, researchers conduct statistical analyses of the spatial characteristics of growth, planners and landscape architects use visual tools to qualitatively measure citizens' preferences for various growth outcomes, and aerial photography is used to show our human footprint from above. The Rockies Project's approach to understanding the growth dynamics in the Rocky Mountains will rely on each of these approaches. How successful we "citizens of the Rockies" are in reacting to the pressures of growth in the coming decades will depend largely upon our ability to collectively respond to one salient question: What is the proper

relationship between the natural and built environment here in the Rockies?

What Causes Sprawl?

The highly charged political debate over growth management policy has divided the public understanding of the causes and consequences of sprawl.

Anti-sprawl activists maintain that sprawl emerges from a prevalent dichotomy between private benefits and public costs. Sprawl, they insist, is born of a disproportionate political alliance; one in which bankers and real-estate interests, developers and contractors, utility managers, and public officials all stand to benefit from increased development. The emerging political economy of growth has allegiances with supermarket and fast-food chains, local retailers, the automobile industry, and federal housing and transportation subsidies. Citizen voices and perspectives are increasingly diminished in this setting and only recently have concerns about open space, scenic vistas, wildlife habitat, and recreational opportunities been considered as important contributors to the quality of our lives.³

Others view sprawl as the expression of our free-market demand for low-density neighborhood lifestyles. They insist that the "enthusiastic suburbanization" of the landscape is in fact the result of demand for the suburban product.⁴ Moreover this faction believes that growth management activists misdiagnose our transportation problems and unwisely push to limit housing choices, thereby increasing housing costs. A low-density neighborhood is where, according to the *Colorado Springs Gazette*, "hard-working people don't have to be wealthy to claim a piece of the American Dream."⁵

Through these lenses one perspective sees sprawl as affliction, harmful to the environment and community; while the other sees dispersed development as advantageous, with homeownership providing the vehicle for financial security and thus local economic prosperity.



Equally contested and debated between the disparate perspectives are the consequences of low-density development. Traffic congestion, diminishing air and water quality, racial and economic segregation, loss of prime agricultural lands and natural habitats, and flourishing local government fiscal crises are all consequences some attribute to sprawl.

An often-cited solution to these consequences is "Smart

Growth.” The American Planning Association defines Smart Growth as:

“the planning, design, development and revitalization of communities to promote a sense of place, the preservation of natural and cultural resources, and the equitable distribution of the costs and benefits of development. Smart Growth enhances ecological integrity over the short and long term and improves quality of life by expanding the range of transportation, employment, and housing choices in the region in a fiscally responsible manner.”⁶

Smart Growth is an oxymoron to opponents, who view compact developments as innately limiting our choices. Attempts to block sprawl in Whitefish, Montana, left one resident upset about the consequences. “Slam the door on these parcels,” Dave Skinner said, “and the people who are moving here anyway will just jump over to the next-closest lands. So we get higher land prices, less school money for the children, less affordable housing, longer commutes, and a randomly fragmented landscape.”⁷ For Skinner, the problems of sprawl are clear, but the solution is inadequate.

When Mayor Martin Chavez of Albuquerque, New Mexico, opened a forum called “Density, Variety and Choice” he said, “the two things Portland [Oregon] residents hate the most are density and sprawl,” and then he aptly noted “and I think therein lies the dilemma.”⁸

Measuring Sprawl in the Metropolitan Rockies

Past studies of sprawl commonly cite the following general characteristics:

- scattered or leapfrog development,
- commercial strip development,
- uniform low-density development, or single-use development (with different land uses segregated from one another, as in bedroom communities.)⁹

However, utilizing the methodology of national studies of sprawl may be insufficient. The distinctive urban dynamic here in the Rocky Mountains reflects aspects of the region’s unique topography, aridity, and land ownership patterns, making comparison with urban areas in other parts of the country unsuitable. Moreover, the region’s propensity towards low-density lifestyles that value owning access to the region’s scenic open space amenities creates a problem of exurban or rural sprawl. Metropolitan areas of the Rockies are a distinguishing study in contrasts, where urban areas abut working landscapes, public lands, and exurban ranchettes. There exists a clear need for an index of sprawl that represents these characteristic traits of the metropolitan Rockies.

There are several steps in the analysis used by the Colorado College Rockies Project in analyzing sprawl.

Principally, an analysis of density at varying geographies

both within and around urban areas is the way we have opted to measure sprawl here in the Rockies. Most studies have looked at the ratio of the total population of the urban area relative to the land area of the metropolitan region. A better surrogate for analyzing sprawl as a condition of land-use change uses residential housing unit densities per acre of developable land, or land that has no barriers to being developed at urban densities.¹⁰

Data from the 2000 Census has been used in a geographic information system (GIS) to calculate residential housing unit density (acres per housing unit) at the Census Block level, the most refined geography for data available. Areas like cemeteries, schools, federal lands, state lands, and Native American reservation lands were then removed from the analysis to obtain an estimate for private land that can be developed. Spatial data from the Bureau of Land Management’s Gap Analysis program was used to identify privately owned census blocks.¹¹

Second, each block was classified according to a schematic developed by Dave Theobald of the Natural Resource Ecology Laboratory at Colorado State University:¹²

- Urban – Less than one acre per housing unit
- Suburban – 1 to 1.75 acres per housing unit
- Exurban – 1.75 to 40 acres per housing unit
- Rural – Greater than 40 acres per housing unit
- No Housing Units

This classification scheme allows for identification of different aspects of residential development and visualization of the spatial extent of development with a map. **Figure 1** illustrates these development patterns for the greater Boise region in Idaho.

Finally, a set of five metrics was developed to measure sprawl in the metropolitan areas of the Rockies.

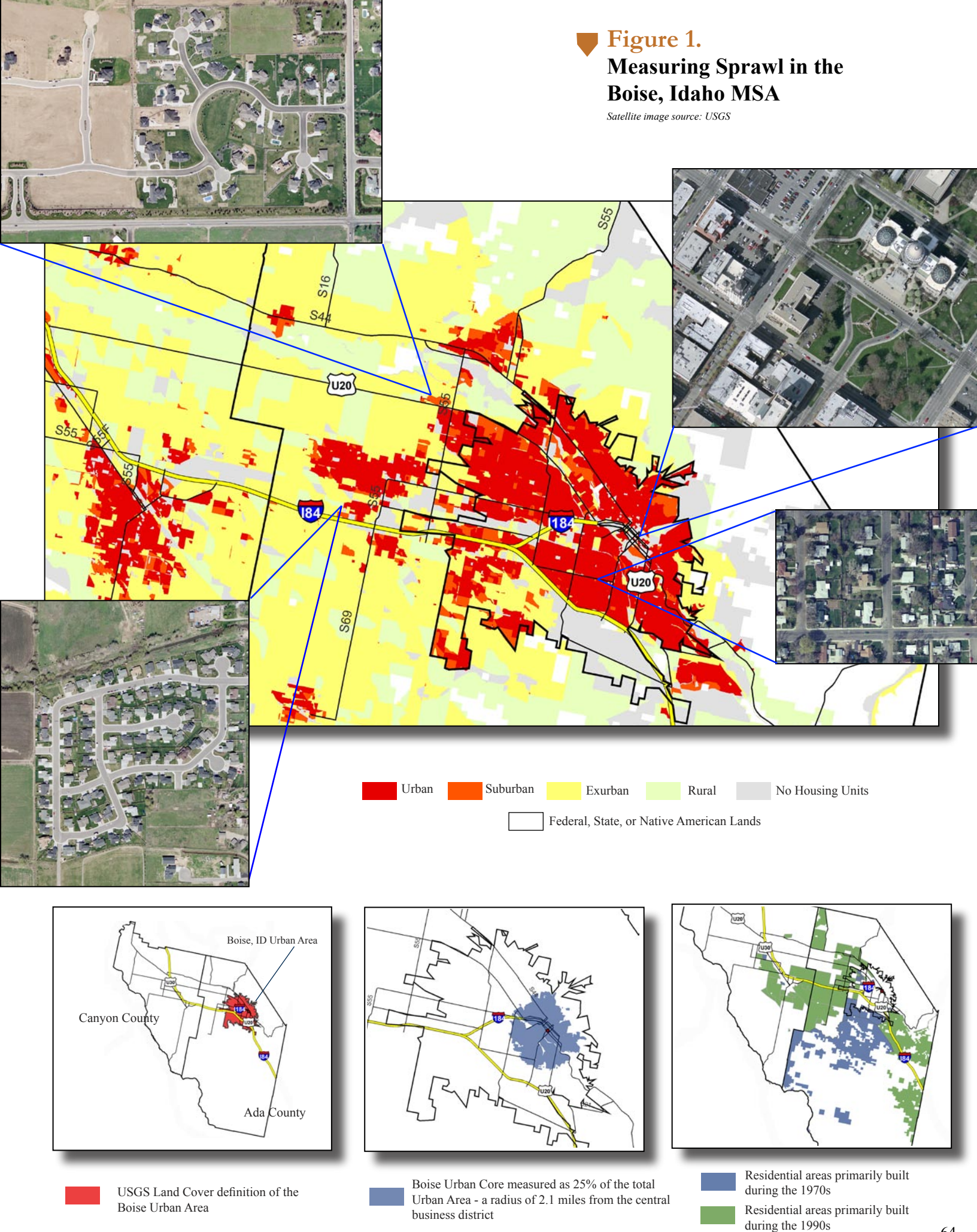
Density of the Urban Area – utilizing the most recent National Land Cover dataset developed by USGS, an urban boundary of each city was used to delineate one geography for density calculations. Utilizing a land-cover dataset rather than a political boundary allows for inclusion of many “cities” that constitute an urban area. Moreover, it is an accurate representation of the urban extent of a city that is independent of current political annexations.

Density of the Urban Core – a compact, concentrated downtown is an indicator of the efficiency of a city. More centralized downtowns are more likely to have more efficient infrastructure and more vibrant and vital business and social characteristics. Such city centers provide a lively, compact area where leaders in business, communications, the arts, and government can interact. This area is defined as ¼ of the urban area with a center point of the central business district.

Density of Areas of Residential Housing Boom – Sprawl affects areas beyond the urban boundaries in profound ways. We opted to look at areas of residential housing boom where more than half of the homes in the area were built during the 1990s. This data is available at the block-level, a

Figure 1.
Measuring Sprawl in the
Boise, Idaho MSA

Satellite image source: USGS



slightly larger geography than the census block level, and so block-groups were identified so that densities of the blocks contained therein could be explored more carefully. Block-groups in any of the counties making up the Metropolitan Statistical Area were included if they had more than half of their housing units built during the 1990s. This methodology explores the way in which areas with strong commuting ties to an urban area are being affected. It also acts as an indicator of recent development impacts.

The Expansion Estimate – Using a similar methodology to the Housing Boom metric, the expansion estimate identifies census block-groups that had more than half of their homes built during the 1970s and uses the previously identified separate set of block-groups that had more than half of their homes built during the 1990s. By comparing the average distance from the Central Business District of areas that were primarily developed during the 1970s to the average distance from the CBD to areas that were built mostly in the 1990s, we can estimate the degree of expansion during the past three decades or so. The percent growth in this distance over this three decade time period was used to normalize the data for comparison purposes. This metric is essential for measuring sprawl as a process of development, rather than taking a more static approach as in the other metrics.

Acres of Exurban Development per Capita – The final metric calculates the acres of low-density exurban developments (1.75 – 40 acres per housing unit) per capita. This metric acts as the exurban “footprint” of the metropolitan area.

The geography for each of these areas is also depicted in **Figure 1** for the Boise, ID Metropolitan Statistical Area (MSA). Admittedly, our sprawl index falls victim to the most common misconception of sprawl; that sprawl is virtually synonymous with low-density residential development. Difficulty in finding variables to evaluate the relative degree of mixed land uses in an urban region for every metropolitan area in the eight Rocky Mountain states prevented inclusion of a set of mixed-use metrics. Residential densities are, however, more likely than non-residential uses to be sound indicators of sprawl according to past studies. The notion that agglomeration economies and land-use restrictions are more likely to concentrate non-residential uses adds validity to these insights.¹³

Rating Sprawl in the Metropolitan Rockies

Our sprawl index has been calculated from each metric described above, using the Z-score approach found in the Methods section. Calculations were performed for each Metropolitan Statistical Area in the Rocky Mountains, as defined by the Office of Management and Budget at the time of the 2000 Census (See **Table 1**). These definitions include all counties that contain a major urban area and those adjacent counties that are deemed highly associated with the urban area through commuting trends. Metropolitan areas were separated into two groups, MSAs with a population of greater than 50,000 people, and MSAs with less than 50,000 people. Finally, the Sprawl index was normalized to a scale of 100 for both smaller and larger metropolitan areas. Scores higher than 100 can be considered more sprawling than the regional norm and scores lower than 100 are less sprawling. The results of the Sprawl Index can be found in **Tables 2 and 3**. It should be noted that the sprawl index is a relative, rather than absolute score, and that indexes between larger metropolitan areas and smaller ones in the

Table 1.
Metropolitan Statistical Areas of the Rockies (2000)

Albuquerque, NM MSA Bernalillo County Sandoval County Valencia County	Great Falls, MT MSA Cascade County
Billings, MT MSA Yellowstone County	Las Cruces, NM MSA Dona Ana County
Boise City, ID MSA Ada County Canyon County	Las Vegas, NV-AZ MSA Mohave County, AZ Clark County, NV Nye County, NV
Casper, WY MSA Natrona County	Missoula, MT MSA Missoula County
Cheyenne, WY MSA Laramie County	Phoenix-Mesa, AZ MSA Maricopa County Pinal County
Colorado Springs, CO MSA El Paso County	Pocatello, ID MSA Bannock County
Denver-Boulder-Greeley, CO CMSA Boulder County Denver, CO PMSA Adams County Arapahoe County Denver County Douglas County Jefferson County Greeley, CO PMSA Weld County	Provo-Orem, UT MSA Utah County
Flagstaff, AZ-UT MSA Coconino County, AZ Kane County, UT	Pueblo, CO MSA Pueblo County
Fort Collins-Loveland, CO MSA Larimer County	Reno, NV MSA Washoe County
Grand Junction, CO MSA Mesa County	Salt Lake City-Ogden, UT MSA Davis County Salt Lake County Weber County
	Santa Fe, NM MSA Los Alamos County Santa Fe County
	Tucson, AZ MSA Pima County
	Yuma, AZ MSA Yuma County



 **Table 2. Sprawl Index for the Largest Metro Areas of the Rockies**

MSA	Average Distance of New Homes Built in the '70s from the CBD (miles)	Average Distance of New Homes Built in the '90s from the CBD (miles)	Residential Housing Boom Density (Areas Primarily Built in the 1990s)	Density of the Urban Area	Density of the Urban Core	Acres of Exurban Development per-capita (Exurban Footprint)	Vehicle Miles Driven per-capita 2000	Average Utilities Expenditure per-capita for the Central City (\$)	Average Total Expenditure per-capita for the Central City (\$)	Sprawl Index
PROVO-OREM, UT	11.81	12.64	3.42	0.50	0.34	0.21	17.95	\$215	\$739	13
LAS VEGAS, NV	9.92	16.87	1.84	0.75	0.64	0.14	18.62	\$264	\$3,595	53
RENO, NV	5.87	8.97	2.20	0.91	0.57	0.10	20.14	\$0	\$989	58
BOISE, ID	7.71	10.49	3.28	0.76	0.42	0.51	18.35	\$32	\$2,720	64
PHOENIX, AZ	12.27	18.50	1.76	0.93	0.77	0.15	19.86	\$651	\$3,196	71
DENVER, CO	0.75	1.18	2.19	1.08	0.49	0.26	21.56	\$319	\$4,725	74
SALT LAKE CITY, UT	5.68	12.71	1.87	0.78	0.75	0.15	18.75	\$339	\$3,545	83
TUCSON, AZ	9.23	13.94	2.70	0.80	0.70	0.63	19.98	\$325	\$3,061	93
COLORADO SPRINGS, CO	4.31	13.18	2.61	1.01	0.80	0.46	18.77	\$1,136	\$3,621	160
ALBUQUERQUE, NM	8.13	12.80	3.14	1.17	1.22	0.38	21.23	\$380	\$3,168	161
PUEBLO, CO	5.13	5.16	6.56	1.20	0.59	0.74	21.06	\$172	\$789	162

 **Table 3. Sprawl Index for Smaller Metro Areas of the Rockies**

MSA	Average Distance of New Homes Built in the '70s from the CBD (miles)	Average Distance of New Homes Built in the '90s from the CBD (miles)	Residential Housing Boom Density (Areas Primarily Built in the 1990s)	Density of the Urban Area	Density of the Urban Core	Acres of Exurban Development per-capita (Exurban Footprint)	Vehicle Miles Driven per-capita 2000	Average Utilities Expenditure per-capita for the Central City (\$)	Average Total Expenditure per-capita for the Central City (\$)	Sprawl Index
GREAT FALLS, MT	5.22	0.00	0.00	0.62	0.44	0.42	15.68	\$60	\$606	8
MISSOULA, MT	10.36	3.46	3.78	0.58	0.44	0.51	20.59	\$0	\$595	29
CHEYENNE, WY	4.09	3.86	1.80	0.69	0.50	0.43	25.71	\$222	\$3,976	38
CASPER, WY	6.78	0.00	0.00	0.75	0.84	0.35	20.97	\$125	\$998	55
YUMA, AZ	5.53	9.41	1.40	0.83	0.52	0.36	18.89	\$126	\$1,246	68
BILLINGS, MT	2.36	3.46	0.80	1.00	0.71	0.69	16.13	\$91	\$2,802	103
POCATELLO, ID	3.72	3.54	2.05	1.14	0.92	0.41	20.71	\$87	\$650	114
SANTA FE, NM	11.84	8.32	4.39	0.96	0.70	1.02	25.47	\$312	\$2,065	132
FLAGSTAFF, AZ	24.74	35.31	4.34	0.66	0.61	1.47	53.47	\$119	\$995	157
GRAND JUNCTION, CO	2.25	4.35	2.15	1.43	0.85	0.64	20.23	\$101	\$1,364	176

Note: all data provided is from the U.S. Census Bureau for 2000 except the Vehicle Miles Driven per-capita figures, which are from the U.S. Department of Transportation's Federal Highway Administration, and the annual expenditure per-capita figures, which come from the Census Bureau from 1997. All density data is shown as acres per housing unit unless otherwise noted.

Governance of Expanding Urban Areas

Grappling with growth and change increasingly requires unique intergovernmental collaborations. In the greater Denver area, columnists have noted that the “United Nations-like” assemblage of governments, comprised of 42 towns and cities and 9 counties, continually fails to reach consensus on important growth issues.¹⁴ The division between counties, which tend to support growth for the property tax revenue it brings, and cities, which tend to curtail growth because of the added infrastructure costs, generally

marks the divergence. Although the city-county growth management dynamic is not always this black and white in the Rockies, similar episodic and ad-hoc decision-making is widespread.

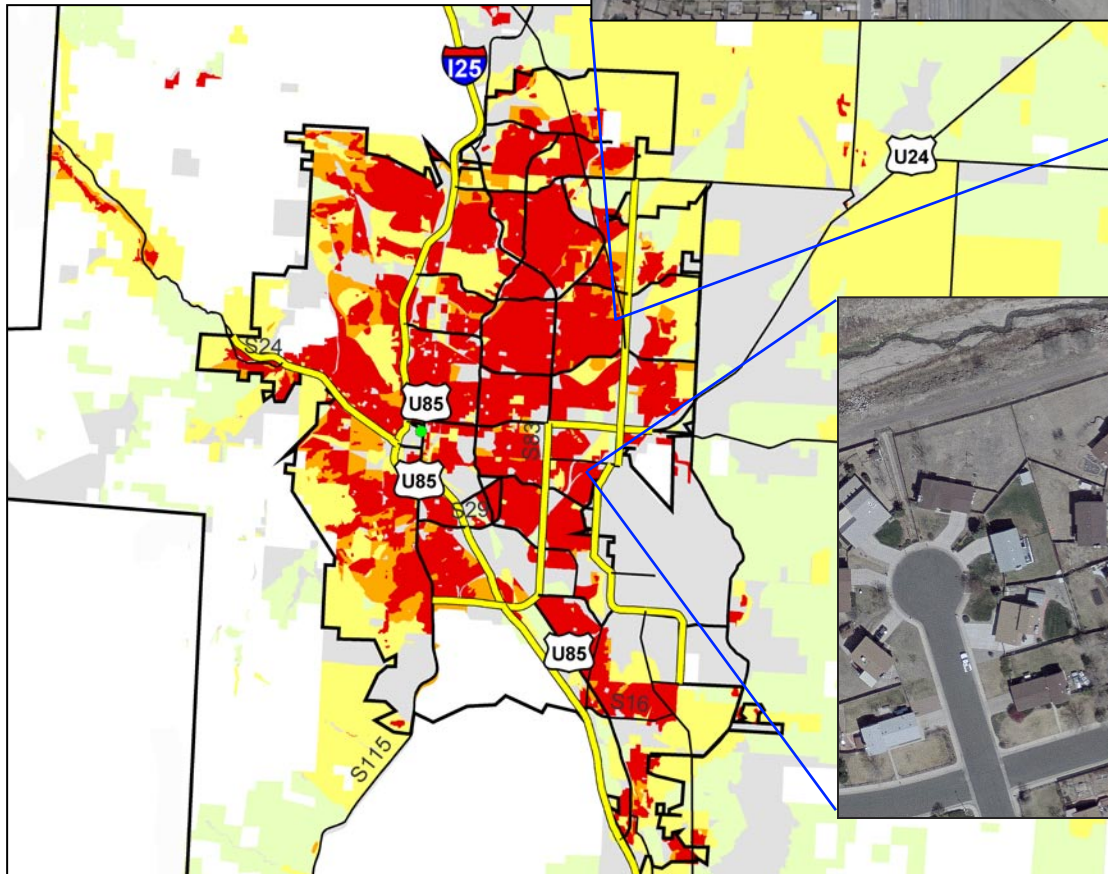
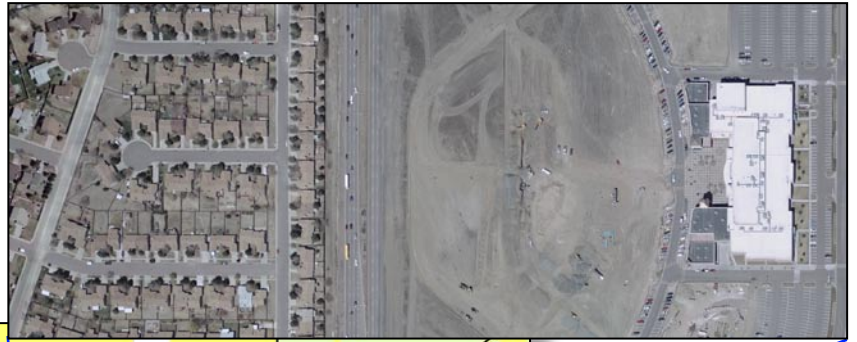
In Missoula, Montana, the choice of whether to sprawl or infill has reached a fulcrum. The city council of the late 1990s saw infill development as a way to create more housing supply to meet the demand and keep prices closer to an affordable level for Missoula residents (note that the average distance of new home construction from the CBD dropped from 10.36 miles in the 1970s to 3.46 miles in the 1990s – **Table 3**). Now, permits to build infill housing on lots within city boundaries are largely being denied for evading the Montana Subdivision and Platting Act, as city

Figure 2. Sprawl in the Colorado Springs, Colorado MSA

Satellite image source: USGS

Big-Box

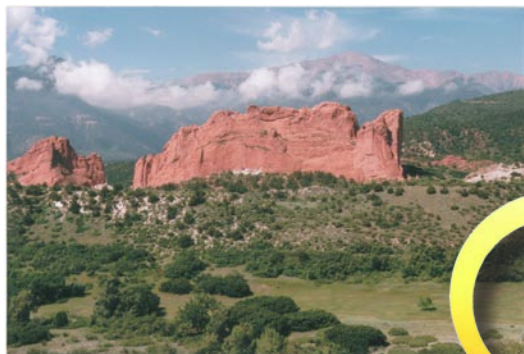
A big-box store and stripmall begin construction near the eastern edge of Colorado Springs



■ Urban
 ■ Suburban
 ■ Exurban
 ■ Rural
 ■ No Housing Units
 Federal, State, or Native American Lands

A deteriorating scenic viewshed

This progression shows an overview of a construction site that threatens the view of the scenic Garden of the Gods Park. The aerial photos depict us looking down upon the view corridor of the first photograph.



The Costs and Consequences of Sprawl

council members feel that cheap housing is deteriorating the downtown quality of life.¹⁵

In Albuquerque, the Rio Rancho county subdivision has seen housing upstarts skyrocket. Jim Folkman of the Home Builders Association of Central New Mexico says this is because “it takes longer to get through the development process in Albuquerque.”¹⁶ As Mayor Chavez noted, “All too often, in the name of planned growth and infill, we penalize people wanting to grow on the perimeter...we’re getting the opposite of the intent – we’re getting regional sprawl.”¹⁷

In Santa Fe and Cheyenne, “checkerboard annexation” has created a “jigsaw jurisdiction” and outdated planning has left the cities and counties struggling to keep pace.¹⁸

In Pueblo, Colorado, the Pueblo West area (spawned from the same developer who brought the London Bridge to Lake Havasu City) has grown at nearly three times the rate of the neighboring central city. The new area is young and considerably more affluent than Pueblo, yet their tax burden is noticeably lower. Nearly half of Pueblo School District 70 is comprised of Pueblo West children, yet the new area does not want to incorporate or become a separate school district.¹⁹

While the idea of reconciling this piecemeal governance of our urban areas is appealing to many, others resist the temptation to give the county more control over land-use decisions. Too often, we object to city-county partnerships because we think they will result in non-disputed decisions to expand, rather than conflict resolution and clear decisions about vital issues like transportation planning, air quality, solid-waste disposal, and workforce development. In order to move beyond this stalemate, we need to think like one editorial writer from the *Albuquerque Journal*: “No community can control its own destiny, growth-wise. We’re all in this together. We all need to cooperate through real, regional institutions that have real power.”²⁰

Ever since the landmark publication of the “Costs of Sprawl” in 1974 and then the “Costs of Sprawl Revisited”²¹ more recently, concern over whether low-density development increases community expenditures for vital services like water, sewer, fire, police, and school services has led the debate over sprawl-related issues. But does it cost more to sprawl in the Rockies? Does sprawl seem to be associated with rental and housing affordability, vehicle dependence, socio-economic turmoil, and other commonly cited consequences?

To test these theories, we have developed a correlation matrix containing over 20 variables, to see if our measure of sprawl (low density, expanding residential developments) is associated with some of the most commonly cited consequences of sprawl (for more information on correlation measures please *see the Methods section*). Most basically, correlations measure degrees of “association” between variables but not necessarily causation. A summary list of variables is included in **Table 4**.

Table 4. Variables tested using Pearson’s Correlation Coefficients against the Sprawl Index:

- Home owner vacancy rate
- Rental vacancy rate
- % of Population that is foreign born
- % of Population comprised of ethnic minorities
- Method of commuting to work (drove alone, walked, used public transit)
- Average commute time
- Income distribution
- Poverty levels
- Housing and rental affordability
- Vehicle miles driven
- Average life expectancy
- Self-rated health status
- Per-capita incidences of major depression
- Recent drug use
- Expenditures per-capita for police and fire protection
- Utilities expenditures per-capita



Table 5 shows the significant results of these correlations for the larger Metropolitan Statistical Areas. The correlation between expenditures per-capita of residents of the Central City for Utilities was strong and statistically significant, indicating that utility expenditures of central municipalities tend to increase on a per-capita basis as sprawl increases. County-level expenditures for secondary and elementary schools per-capita displayed a similar relationship with our expansion variable, but no significant relationship with our sprawl index. Strong relationships exist with the Sprawl Index and method of travel to work, indicating that sprawling areas are more associated with vehicle dependence, while more people tend to use mass transit in less sprawling areas. Two other noteworthy findings indicate that as sprawl increases in larger metro regions of the Rockies, rental costs tend to skyrocket and incidences of major depression per-capita also tend to increase. Has sprawl got you down lately?

Table 6 shows the significant results of the correlations for the smaller MSAs in the Rockies. County expenditures per capita for elementary and secondary schools are associated with higher levels of sprawl as are longer commutes. No additional data was associated with the sprawl measurements in the smaller metropolitan areas. Associations may be less strong because growth dynamics are not as consistent between these MSAs. Contrasting growth in Great Falls, MT where population has declined over the past three decades, with growth in Santa Fe, NM over that same period reveals this discrepancy.

Rural Sprawl

While this section of the 2005 Report Card looked to evaluate sprawl in the metropolitan Rockies, the issue of rural sprawl and the proliferation of the 35-acre ranchette may be the most serious land-use problem facing the region. As the market demand for large-lot second, third, and in some instances, fourth homes steadily increases, the quality and size of farm and ranchland in the Rockies has simultaneously declined. Due attention to this issue will surely be a part of future State of the Rockies Report Cards.



Table 5. Significant Correlations for Larger MSAs

	Large Metropolitan Sprawl Index	Large Metropolitan Expansion Estimate
Central city utility expenditures per-capita (1997)	0.559	-
County expenditures for elementary and secondary schools per-capita (average of 1992, 1997, and 2001)	-0.208	0.545
Percent of people who drove alone to work	0.612	-
Percent of people who used public-transit to get to work	-0.522	-
Percent of renters whose rent costs were more than 25% of income	0.661	-
Incidences of major depression per capita	0.515	-

Table 6. Significant Correlations for Smaller MSAs

	Large Metropolitan Sprawl Index
Average commute time to work	0.559
County expenditures for elementary and secondary schools per-capita (average of 1992, 1997, and 2001)	-0.208

Conclusions

What do we make of this analysis and our findings? Growth and development are a reflection of us, the citizens of the west, and our connections to our surroundings. Whether our urban patterns will ultimately be a reflection of our passivity or a triumph of our collaboration is still to be determined.

In Arizona, a developer is being sued for “moonscaping the desert,” blading state trust lands, killing bighorn sheep, and destroying Hohokam archaeological sites.²² In and around Denver, communities are “desperate for downtowns” scouring out vibrant areas that evoke Old West origins out of the carcass of empty shopping malls.²³

What will be our legacy? As Wayne Lemmon points out in his essay “The Anti Sprawl Mantra” for the *Planning Commissioners Journal*, regardless of your perspective on sprawl and growth in general, “Which land is consumed, and which land is left in ‘natural’ or rural state can be a matter of conscious policy rather than market forces.”²⁴

If we can take Lemmon’s advice to heart, maybe we can act together as citizens of the Rockies to take the next step by generating an empathy for our built environment similar to what many hold for our natural surroundings.

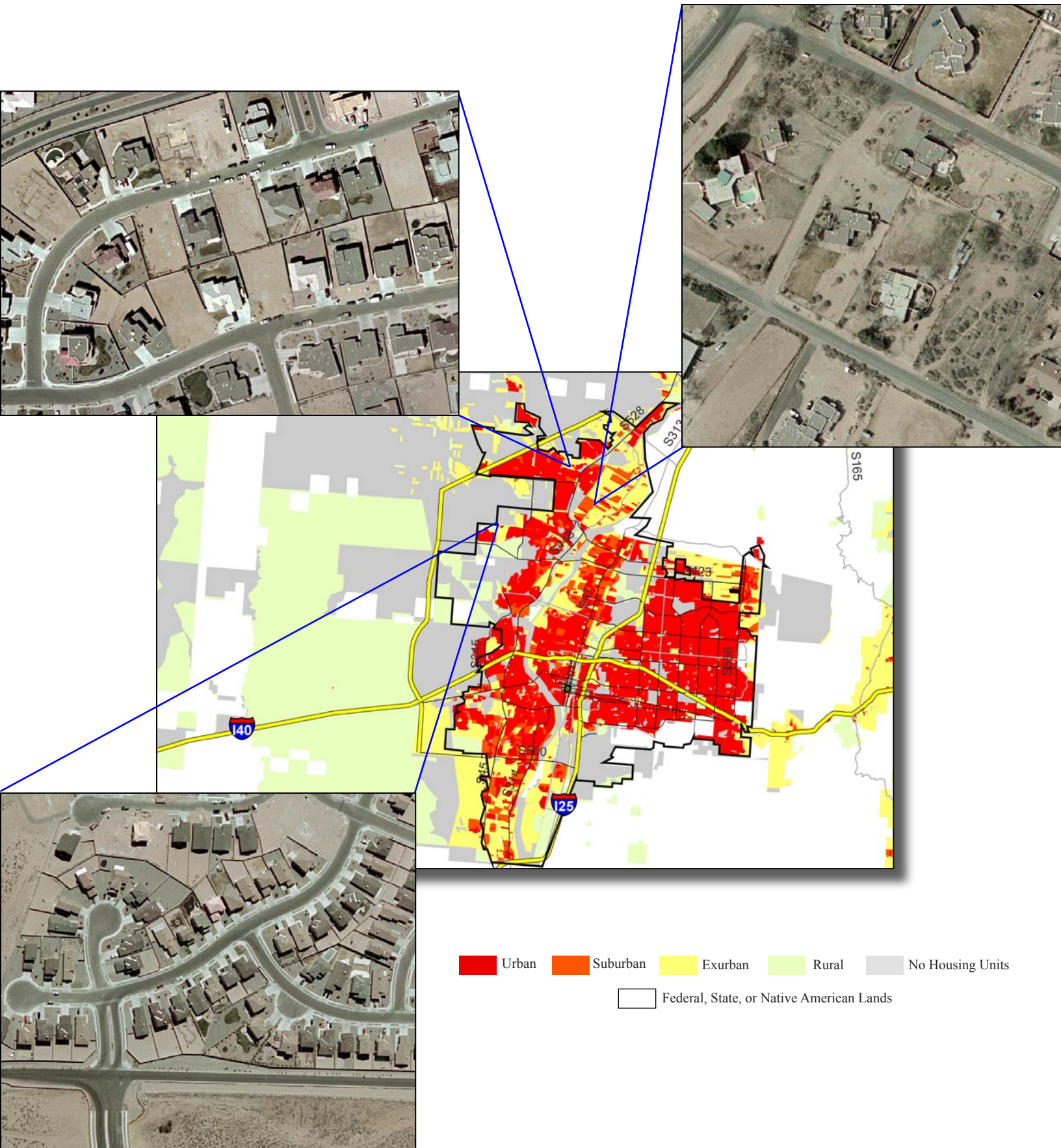


Figure 3. Sprawl in the Albuquerque, New Mexico MSA
 Satellite image source: USGS