TELLURIDE FOUNDATION

ALTERNATIVE FUTURES FOR THE TELLURIDE REGION, COLORADO

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The authors of the study are solely responsible for any errors or omissions in the study and for its conduct and conclusions.

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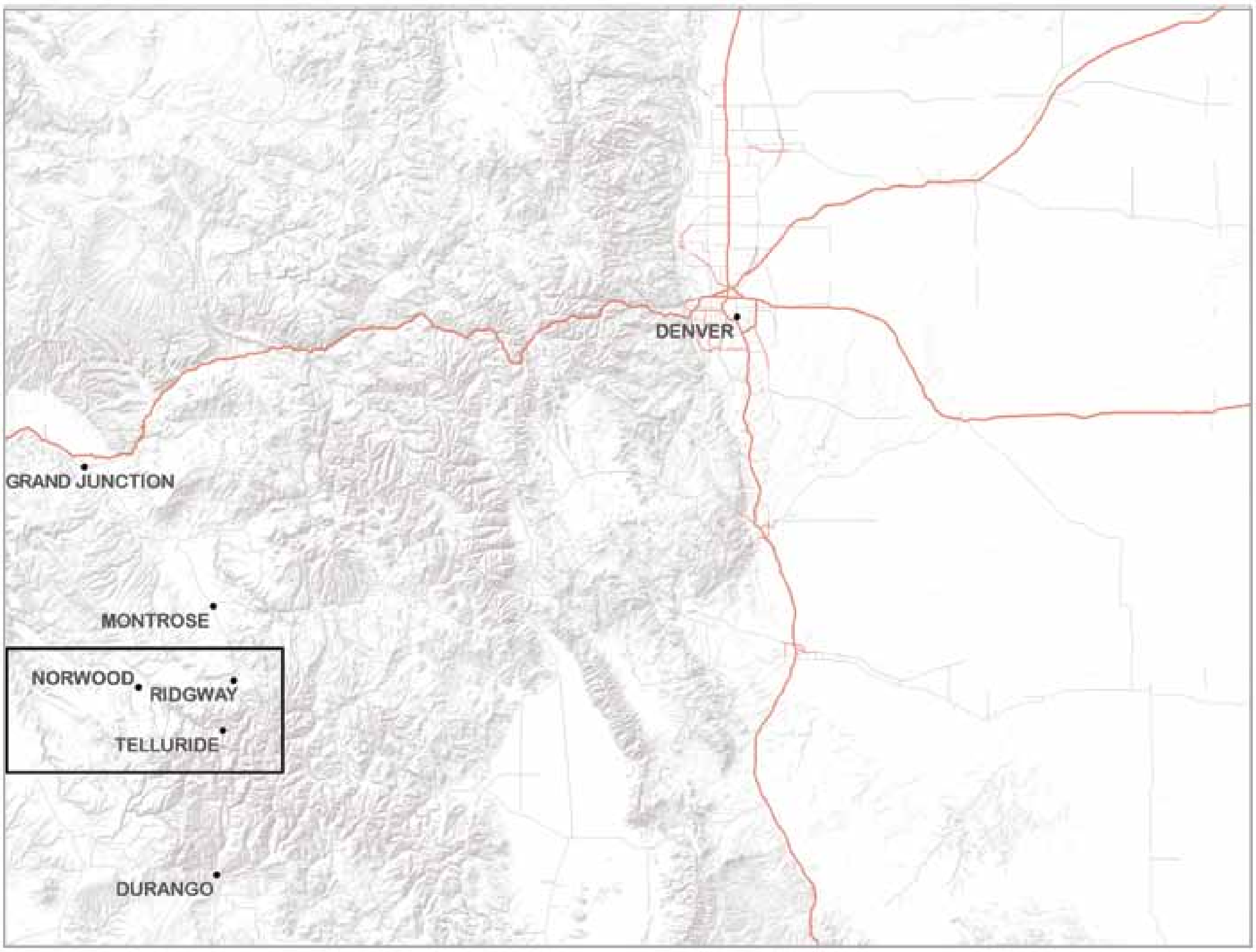

FIGURE 1, THE TELLURIDE REGION IN SOUTHWEST COLORADO

EXECUTIVE SUMMARY

Alternative Futures for the Region of Telluride Colorado forecasts and assesses future development patterns for San Miguel County and parts of Montrose and Ouray Counties in Colorado. Nine alternatives based on different combinations of assumed population growth and public policies are spatially simulated in a 20 year projection. The alternatives are assessed and compared for their demographic, traffic, visual preference, and ecologic consequences.

Section 1 is an introduction to the Telluride region.

Section 2 describes the framework for alternative futures studies within which this research has been organized and carried out.

Section 3 describes the assumptions and constraints which guide this study.

Section 4 presents the data categories by which the Telluride region is represented for the purposes of this study.

Section 5 describes processes which occur in the study region. These include demographic, economic, traffic, visual preference and selected habitat functions and their interrelationships.

Section 6 describes the current evaluation of the study region in terms of the above-mentioned processes.

Section 7 describes how the Telluride region might change as a function of demand for new development resulting from population growth, and the public policies which can attract or constrain that development. Nine alternatives are simulated for projected conditions 20 years in the future. They are based on two different population forecasts, combined with a range of possible public policies, including current regulations and zoning, and additional policies that add visual and ecologic constraints, increase allowable housing densities, provide subsidized housing and/or include extensive mineral extraction.

Section 8 accesses the impacts of the nine alternative futures on the processes incorporated into the research and compares the outcomes.

Section 9 presents the conclusions derived from this study.

In the high growth scenario, under existing regulations and zoning, the great majority of the region's private developable land will be built upon within the next 20 years. Under the assumptions of the low growth scenario under existing regulations, within about 40 years all private developable land in the region will be built upon.

Telluride and Mountain Village are reaching the limits of their developable land, and as a result are exporting demand for housing to other parts of the region. As the region continues to develop, more people will demand more services, especially the many more people who are living in unincorporated parts of the Counties.

The consequences of scarcity of developable land are today being felt as increasing land values cascade through the region. The alternative futures show that land values will continue to rise in Ridgway and Norwood, causing displacement of full-time residents who find themselves priced out of these towns. When Norwood and Ridgway become too expensive, many full time residents will move into more remote and unincorporated parts of the region. Increased commuting distances and travel times will bring about personal hardship and financial costs for workers. Loss of full time residents will have social consequences in the region's communities. Costs incurred by local government to provide infrastructure and public services to sprawling low density development will rise disproportionately.

Without significant intervention, the use of private vehicles in the region will continue to grow causing greatly increased traffic congestion. The traffic problem in Telluride and throughout the region cannot be solved if traffic continues to be composed chiefly of private vehicles. Therefore, it is essential that the Telluride region design and implement an affordable, frequent and efficient public transportation system to serve both residents and visitors. Local rezoning decisions, particularly for residential development, should take into account access to public transport.

The ecological, economic and social effects of future natural resource extraction will be felt primarily in the western part of the study region, where mineral resources are located. Oil, gas and uranium exploitation may benefit the nation, the mining companies and their employees, and would provide substantial economic benefit to the towns of Nucla and Naturita. However, exploitation of these resources will have a harmful effect on the ecology and visual landscape quality of the western part of the study area.

Maintaining the character of the Telluride region over the next 20 years will be a challenge. It is highly likely that the visual landscape will change dramatically unless there is a major change in the regulation of development. Today's landscape is perceived as isolated urbanized areas separated by beautiful natural landscapes. It will be transformed to a more generally built-up landscape. There will be few if any views that do not contain houses. This will be especially apparent in the views from the region's public roads. This will alter the current perception of the Telluride region as one of exceptional natural landscapes punctuated by small attractive towns. This in turn may impact negatively on the region's economic future.

Finally, and most importantly, the critical issues facing the Telluride region must be recognized as regional in nature. Location of new housing, transportation, the provision of services and protection of the environment are at their core regional issues. Furthermore, actions to deal with these issues must be carried out over periods of time that are much longer than the electoral cycle. While the various towns and counties have legal rights and responsibilities, the most important issues are long-term and regional. Because of its outstanding natural attractiveness, its reliance on potentially fickle tourism, and its vulnerability to poorly coordinated development decisions, the potential risks to the Telluride region are particularly acute. If the Telluride region is to succeed in managing itself efficiently and effectively, it must establish ways to coordinate planning and policy decisions across the many jurisdictions in the region.

This study demonstrates that the pressures which have been building over recent decades will continue to increase, with serious and potentially harmful impacts. At the same time, the window of opportunity to influence the future is closing as the private land supply continues toward "buildout". There are significant needs and consequent actions which should be taken immediately.

There is a clear need for greater technical cooperation among the region's towns and counties. There is inadequate coordination in the ways by which data are defined, collected and maintained by the various jurisdictions and there are no shared data management technologies. Without these it is and will continue to be extremely difficult to understand what is actually happening in the Telluride Region.

There is an obvious need to increase greatly the regional coordination of planning efforts among the towns and counties, and also to coordinate with the several public agencies which control large amounts of land in the Telluride Region. This applies especially to regional issues such as planning for public transportation and new roads, visual management and ecological policies, and other issues not included in this study such as water supply, sewage treatment and the organization of services such as health care. The critical need for improved coordination will require new, innovative and publicly acceptable institutions for making coordinated decisions. The implementation of regional planning policies will require political, legal and financial mechanisms which go beyond the current ways of "getting things done" in the Telluride Region.

INTRODUCTION

Twenty years ago, in Park City, Aspen or Vail, nobody imagined the magnitude, scale or speed of development and its resulting impacts. The Telluride region is on the cusp of a similar stage of development and resulting impacts. Issues include not just residential and commercial growth, but also regional economic instability, future extensive oil and gas development, uranium mining and milling start-up, conversion of ranch and agricultural lands, water rights and usage, changing workforce demographics, to mention a few. Coupled with the fact that Telluride and Mountain Village will be effectively built out in the next decade, the protection and enhancement of the economy, ecology and community will require thoughtful, fact-based and far-sighted decisions. The future quality of life of the region will result from the regional-scale interaction of complex dynamics.

The report on the study of alternative futures for the Telluride region of Colorado is the culmination of 2 years of research and public involvement. The Telluride Foundation funded this project through a Special Initiative grant and private donations in order to better inform its long range grant making strategy. The principal objectives of this study are to understand and model regional scale economic, ecological and community interactions and to assist the Telluride Foundation and regional community leaders in decision making that might affect the future of the region.

The Telluride Foundation funded the research team from the Graduate School of Design at Harvard University (Harvard) and the Massachusetts Institute of Technology (MIT) to conduct this Alternative Futures study. The study uses advanced geographic information systems (GIS) computer modeling to project the 20 year economic, ecological and community impacts of various near term decision scenarios. To reach this objective, the research team developed a set of scenarios based on current conditions and reasonable assumptions for the region, and assessed their impact on future development, and traffic, visual, ecological and other consequences. The results constitute a synthesis of the best available regional data and knowledge of existing land use, development and conservation options, and reasonable projections of their likely impacts across jurisdictional boundaries in San Miguel, Ouray and west Montrose Counties.

This effort was not intended as a master planning or visionary process but rather a data driven forecasting study using computer modeling techniques based on historic data and trends. We hope this study will become a tool that local and regional governments and regional governmental entities can use in their planning efforts. The data base from this project will ultimately be held by San Miguel County within their GIS Department and will be available for governments, government agencies and researchers to utilize.

This study was made possible by the hard work, experience, and wisdom of the research team members, and the valuable input of many local individuals and organizations, and we thank them for this effort.

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The Telluride Foundation is a 501(c) 3 community foundation located in the southwest corner of Colorado. The Foundation's mission – to preserve and enrich the quality of life of the residents, visitors and workforce of the Telluride region - is supported by its outcome oriented focus on supporting charitable organizations, offering donors easy and effective ways to give, convening groups around community issues, and building resources to meet future needs. Through the leadership and stewardship of its Board of Directors, the Foundation conducts three principal activities; grant making, capacity building programs and operating initiatives to address emerging and underserved issues.

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The Region of Study

The Telluride region is located in southwestern Colorado and is shown in figure 1. The Study Area is contained within a rectangle measuring 85 miles east to west and 40 miles north to south (figure 2). It is intended to include the area that is most directly influenced by the towns of Telluride and Mountain Village. The study area includes ten important settlements: in Montrose County, Naturita and Nucla; in Ouray County, Ouray and Ridgway; and in San Miguel County, Mountain Village, Norwood, Ophir, Placerville, Sawpit and Telluride. The area is famous for outstanding mountain scenery. Skiing is a major attraction, with the region's average 300 inches of snowfall providing for a November to April season. Towns such as Telluride and Ouray are surrounded by snow capped peaks reaching 13,000 feet. Views of Mount Wilson (alt.14,248) are highly prized. Mount Sneffels (alt. 14,150) is the highest in Ouray County. Both mountains are within designated wilderness areas.

The Bureau of Land Management and the USDA Forest service manage large tracts of land in the Telluride region. Parts of the Uncompahgre National Forest are within the area, along with Ridgway State Park and three Nature Conservancy reserves. The San Miguel River, a tributary of the Dolores River, drains the study area. Rising in the San Juan Mountains southeast of Telluride, it flows generally northwest. In its 90 mile length, it drops over 7,000 feet. In the western part of the study area, the towns of Nucla and Naturita occupy a high plain at the base of the Uncompahgre Plateau, approached by broad expanses of dry ranchland. The Telluride airport, one of two general aviation airports in the study area, offers scheduled air services in the winter skiing season. Most visitors come to the study area via Montrose Regional Airport, operated by Montrose County and a 66 mile drive from Telluride.

FIGURE 2, THE STUDY AREA

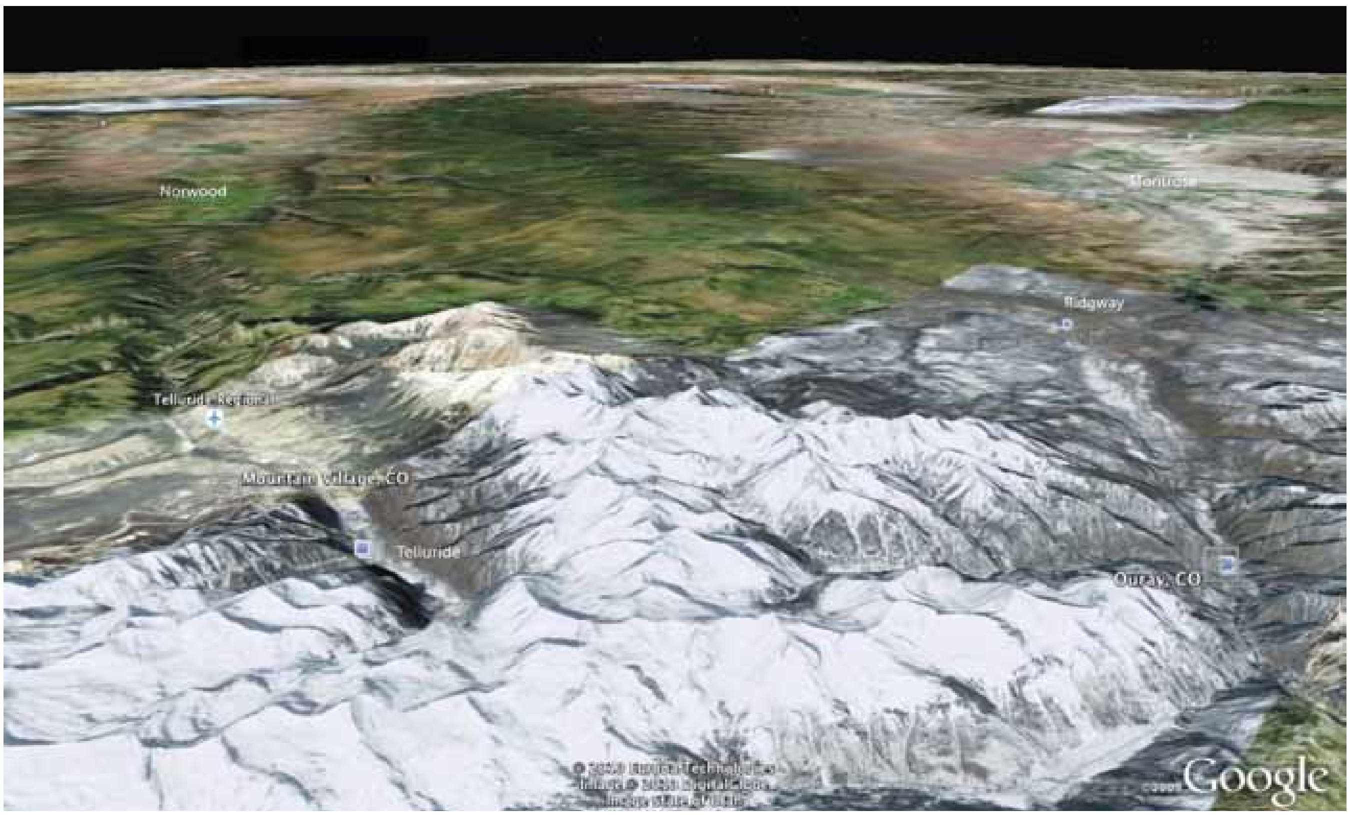


FIGURE 3, TELLURIDE REGION SOURCE: GOOGLE EARTH, 2009

Native Americans of the Ute tribal group were the original occupants of the Telluride region. Adoption of the horse allowed them to range over large areas, including the valley floor below Telluride for summer camping grounds. Mining and timber extraction were the initial reasons for European occupation. By the 1870s, miners were staking claims throughout the region. In 1872, the Ute chief, Ouray, signed a treaty allowing European settlement of the ore rich San Juan Mountains. The treaty was broken by the US government, and the Utes were forced out of Colorado by 1881. Mining expanded rapidly, its demands stripping the mountains of timber and attracting the construction of narrow gauge railroads. The Rio Grande and Southern Railroad began operating between Ridgway and Placerville in 1890, with a spur line from Vance Junction into Telluride. The Denver Rio Grande Railroad reached Ouray in 1888. The region boomed, with cheaper transport supporting mining, timbering and livestock businesses. Disputes between mine owners and labor resulted in violence and industrial disruption. From 1939, the various mining interests began consolidating into the Idarado Mining Company. In 1978, Idarado closed Telluride's Pandora mine. The mountains above Telluride are said to be riddled with over 350 miles of old mine tunnels. In 1953, the rail line between Ouray and Ridgway was abandoned, and the line from Ridgway to Montrose was abandoned in 1972.

In 1877, Ouray County, (County Seat, Ouray), was created from San Juan County. In 1883, Montrose County, (County Seat, Montrose), was formed from Gunnison County, and San Miguel County, (County Seat, Telluride) was separated from Ouray County.

Ouray

FIGURE 4, OURAY SOURCE: GOOGLE EARTH, 2009

Ouray (2006 est. pop. 896, el. 7792ft.), was incorporated in 1876 and became an important shipping point for ores and a commercial hub. With its largely intact center of 19th century buildings, outstanding scenery and hot springs, Ouray has maintained itself chiefly as a tourist destination, promoting itself as the Switzerland of America.

THE TELLURIDE REGION

Ridgway

FIGURE 5, RIDGWAY SOURCE: GOOGLE EARTH, 2009

Ridgway (2006 est. pop. 749, el. 7047ft.), incorporated in 1891, and formerly Dallas Junction, was renamed in honor of Robert M. Ridgway, an important railway developer. In 1890, the new town was projected as a center for smelters and industry. It was an important rail facility until closure of the line in 1972. By 1910 it had a fine brick schoolhouse. Nearby are the Orvis Hot Springs, an important site for the Ute people, now a recreational site, and popular Ridgway State Park on the Ridgway reservoir. It is surrounded by beautiful ranching country, including the 22,000 acre Ralph Lauren Ranch. Ranching and tourism have been the basis of Ridgway's economy since the decline of mining. The character of the area has appealed to filmmakers. In 2007 the 60 acre Dennis Weaver Memorial Park nature reserve on the Uncompaghre River was dedicated. The old depot survives, relocated and much altered. The Ridgway Railroad Museum includes a display on the RGS Motors "Galloping Goose" which was used for regional passenger transport in the later days of the rail line.

Naturita and Nucla

FIGURE 6, NATURITA AND NUCLA SOURCE: GOOGLE EARTH, 2009

Naturita , in western Montrose County, (2006 est. pop. 659, el.9524ft.) began as a single cabin in 1881 on the San Miguel River. It developed as a center for cattle drives, and as a stopping off point for freight wagons taking copper ore to the railroad in Placerville. About 1880, uranium ore was discovered 10 miles northwest of Naturita, resulting in the eventual development of the now demolished mining town of Uravan. Two miles northwest of Naturita is the uranium mill site. First operated in 1939, it produced uranium-vanadium sludge and processed ore from Uravan. It continued to operate until 1963, and the site remained active in various forms until 1979. In 1996, the site consisted of the 53 acre mill site and another 85 contaminated acres. Cleanup continued from 1994 to 1998. The DOE is responsible for long term monitoring of the site.

Nucla (2006 est. pop. 733, el. 5,787ft.), incorporated 1915, began as an agricultural colony of the Colorado Cooperative Company. In 1894, construction began of a 17 mile long irrigation channel to bring water from the San Miguel Canyon to the promising farmlands of the Tabequache plateau. Completed in 1904, the channel supported the new town of Nucla, located on a rocky hill and intended to be the nucleus of a large agricultural area. Two miles southwest of the town, the Nucla-Hopkins Airfield (AIB), operated by Montrose County, with a 4,600 foot asphalt runway offers general aviation facilities.

Telluride

FIGURE 7, TELLURIDE SOURCE: GOOGLE EARTH, 2009

Telluride, in San Miguel County, (2006 est. pop. 2,267 el. 8,796ft.) is the main town of the region. It is located in the bottom of a well watered canyon at the headwaters of the San Miguel River. First platted as Columbia in 1885, the settlement was renamed Telluride by the Post Office. Tellurium ore, often associated with gold and silver ores, was not found at Telluride, but the town name survives. It was incorporated in 1887. Arrival of the railway in 1890 caused the busy mining town of Telluride to boom as the mines in the mountains above yielded their ores. Additionally, the town saw the first successful commercial use of alternating current, a milestone in the history of technology, and became the first town in the world to be electrified with alternating current. The population reached 5,000, and attracted Butch Cassidy who robbed the bank in 1889. Working conditions were harsh, and from 1896, the miners began to unionize. Labor unrest eventually resulted in the strike of 1903-04, ending with the miners defeat. Mining never resumed with the intensity of the early years. By the 1960s, the population had dwindled to less than 600.

The town began to revive with the introduction of skiing in the 1970s. Joe Zoline opened the Telluride ski area in 1972, with five chair lifts and a day lodge up on the mountain. In 1978, the operators of the ski area envisioned a much improved development, now realized as Mountain Village, a separate town reached by gondola from Telluride. The mining boom left Telluride with a fine collection of 19th century buildings, recognized in 1964 as a National Historic Landmark District. Today it is the scene of a lively arts community and many festivals. After a long effort, the city succeeded in purchasing the 570 acre flood plain parcel along the approach road to Telluride in 2009 commonly known as the Valley Floor, committing it to permanent open space.

Norwood

FIGURE 8, NORWOOD SOURCE: GOOGLE EARTH, 2009

Norwood (2006 est. pop. 355, el. 7011ft.) was incorporated in 1903. It is located 33 miles west of Telluride on top of Wright's Mesa, and has a long history of ranching. The mesa has spectacular views of high alpine country. In the 1930s Norwood organized the Community Hospital of Norwood, a ten room house where for a subscription of $1, residents could receive treatment. This was the ancestor of the present day Uncompahgre Medical Center, a Community Health Center.

Placerville and Sawpit

FIGURE 9, PLACERVILLE AND SAWPIT SOURCE: GOOGLE EARTH, 2009

Placerville (el. 7,316ft.) is an unincorporated settlement in San Miguel County located at the confluence of Leopard Creek and the San Miguel River. Founded as a mining camp, it became the railhead of the Rio Grande and Southern Railway in 1890. Named for early gold placer mines, Placerville is near vanadium bearing limestone, and by 1919 was producing ferro-vanadium in large quantities at two ore mills. Mining related activity continued until the 1950s. It also was a center of sheep and cattle ranching, and until closure of the railway, a shipping point for livestock.

Sawpit (2006 est. pop. 23, el. 7,559ft.) was incorporated in 1896. Formerly related to local timber operations, Sawpit is the third smallest incorporated town in Colorado.

THE TELLURIDE REGION
Mountain Village

FIGURE 10, MOUNTAIN VILLAGE SOURCE: GOOGLE EARTH, 2009

Mountain Village (2006 est. pop.765, el. 9,524 ft.) was incorporated in 1995. It began in 1982 when the design of a Planned Unit Development (PUD) was approved by San Miguel County. In November 1996, the gondola serving Mountain Village from Telluride in the valley below began operation. The twelve minute ride provides free public transportation for both the public and for skiers. Mountain Village includes a village center with hotels, restaurants and shops and an extensive area of large single family homes, interspersed with ski runs and a golf course. Most homes are in part time occupation. There are 2,000 acres of skiing terrain ranging in elevation from 12,750ft. to 8,750 ft., with 115 trails and one 4.6 mile long run.

The Telluride region has now become a world famous skiing and resort destination. With its stunning setting, Telluride has in the last decade been experiencing a major real estate boom. With this success comes a new set of challenges, including finding suitable places to house an expanding population within a very high price real estate market. Telluride is by its nature geographically constrained and environmentally fragile, so accommodating change while maintaining the quality of life and character of the region will not be simple. Like many resort areas, the Telluride region experiences heavy winter use and a second tourism season in the summer, but seeks to further diversify its economy to mitigate seasonal downturns. Providing adequate social services for both residents and nonresident employees is difficult. For example, the nearest major hospital is 65 miles away and in a different county. Meanwhile, many employees are being forced by high housing costs to live further and further from work, a situation which if allowed to continue will place great social strains on the communities of the region, as well as the regional transportation system.

THE TELLURIDE REGION

Challenges Facing the Telluride Region

While its fortunes have waxed and waned, the Telluride region has historically been able to maintain its economic and ecological base without extensive coordination among its neighboring towns and counties. However, this era is rapidly coming to an end. For example, at current population growth rates, Telluride and Mountain Village will be effectively “built out” in the next decade or so. The challenges that the Telluride region will face over the next several decades include economic, social and environmental issues: the demand for real estate and associated population growth are reshaping the social structure of the region in addition to threatening the highly valuable landscape.

The principal challenges include:

Rising property values continue to force many long-time residents to move to the periphery or completely out of the area, altering the character of the region.

If the demand for second homes and retirement homes in the greater region continue to increase, there will be pressure on labor and housing markets that will raise costs and further exacerbate the social challenges facing Telluride, particularly on the full-time residents of Telluride.

The visual quality of the region, which is so vitally important to the economic competitiveness of the region, is at risk of degradation with further development.
A decrease in year-round residents may harm the economic vibrancy of the commercial areas.

Increasing traffic on tightly constrained roads is likely to contribute to a decline in the quality of life.

The ecology of the region is threatened by climate change and a possible increase in the susceptibility to catastrophic fire.

Providing government services for growing populations in outlying areas will be difficult.

A possible surge in natural resource extraction could produce substantial social and environmental impacts in the region

The most important changes in the region will be instigated by outside forces and are subject to a high level of uncertainty, complicating a planning process that is already highly complex.

While these and other potential problems are inherently regional issues, the cross-regional institutional structures for addressing these problems are underfunded.

The only long-term solution is a regional solution. The value in this study will be to look at these issues across jurisdictions, in an integrated manner and across longer time horizons.

The protection and enhancement of the Telluride region’s economic, ecological and cultural assets in the future will require decisive actions and policies. Leaders of the region will need to carefully consider regulatory policies and infrastructure decisions and assess the implications of various alternatives upon Telluride and its neighbors. The objective of this project is to provide regional leaders and the public with a comprehensive tool for assessing future landscape planning policy decisions.

The study develops a set of scenarios leading to alternative futures for the region, and assesses their demographic, socioeconomic, traffic, visual, ecological and other consequences. The results constitute a synthesis of the best available knowledge of key land use, development and conservation policy options, and a set of predictions of their likely impacts. This work was done in close collaboration with the Telluride Foundation, with the explicit goal of building local capacity to conduct future work based on the results of this study. It was a semi public effort, in which many regional stakeholders and experts worked with the research team in joint fact finding. Interviews and discussions with relevant groups and individuals played a critical role in the study, both to help determine the types and extent of the conservation and development strategies to be studied, and to help define the economic, visual, and ecological assessment models.

2. THE FRAMEWORK FOR ALTERNATIVE FUTURES STUDIES

The Telluride region study was based on the framework for "Alternative Futures Studies" developed by Carl Steinitz (1990). It is shown in Figure 11. The framework consists of six questions which are asked several times during the course of a study. In designing a study of alternative futures for an area, the answers – the models, their styles and levels of abstraction – are particular to the case study. Some modeling approaches can be general, but data and model parameters are local to the place and time of the study, as are the issues and options whose consequences are being studied.

Designing the methodology for a study of alternative futures involves decisions that are especially complex, and which are most often based on experience and judgment. Some overarching questions, which apply to any planning-related study, include:

Who should participate and how? local residents and/or outside experts?

What is the purpose? public action, and/or scientific advancement?

What are the tradeoffs between faster results and action and possibly better research but later decisions?

Will the study "product" be a single effort or a continuing decision support process?

How much time, money, and basic research are needed? What is the appropriate cost?

The following is partly quoted from Chapter 3. The Framework for Alternative Futures Studies, in Steinitz, Carl, H. Arias, S. Bassett, M. Flaxman, T. Goode, T. Maddock, D. Mouat, R. Peiser, and A. Shearer. 2003., Alternative Futures for Changing Landscapes: The Upper San Pedro River Basin in Arizona and Sonora, Island Press, Washington, D.C. 2003

Over the course of the study, each of the six questions and its several subsidiary questions are asked three times: first, from 1 to 6 to define the context and scope of the work (the WHY?); second, from 6 to 1 to identify the methods of study (the HOW? questions), and third, from 1 to 6 to implement the study method (the WHAT,WHERE and WHEN? questions).

This is not a linear process, but one which has several iteration 'loops" and feedback possibilities. It does, however, follow an organized sequence of questions. A clear framework around which tasks can be identified and linked is essential in a large and collaborative effort.

The objective of the first iteration is to understand the context and scope of the study. The study process begins with a broad survey of the setting and major issues of concern. The six questions framework is used from top to bottom. Existing descriptions and representations of the region are examined and a general knowledge of how the landscape works is developed. Areas of concern, existing plans and policy interventions and their potential impacts, and decision making processes and criteria are investigated.

1. How should the landscape be described in content, space and time? This question is answered by representation models, the data upon which the study relies.
Where is the study area?
What is its history?
What is its physical, economic, and social geography?

2. How does the landscape operate? What are the functional and structural relationships among its elements? This question is answered by process models which provide information for the several analyses which are the content of the study.
What are the area's major natural and social processes?
How are they linked to each other?

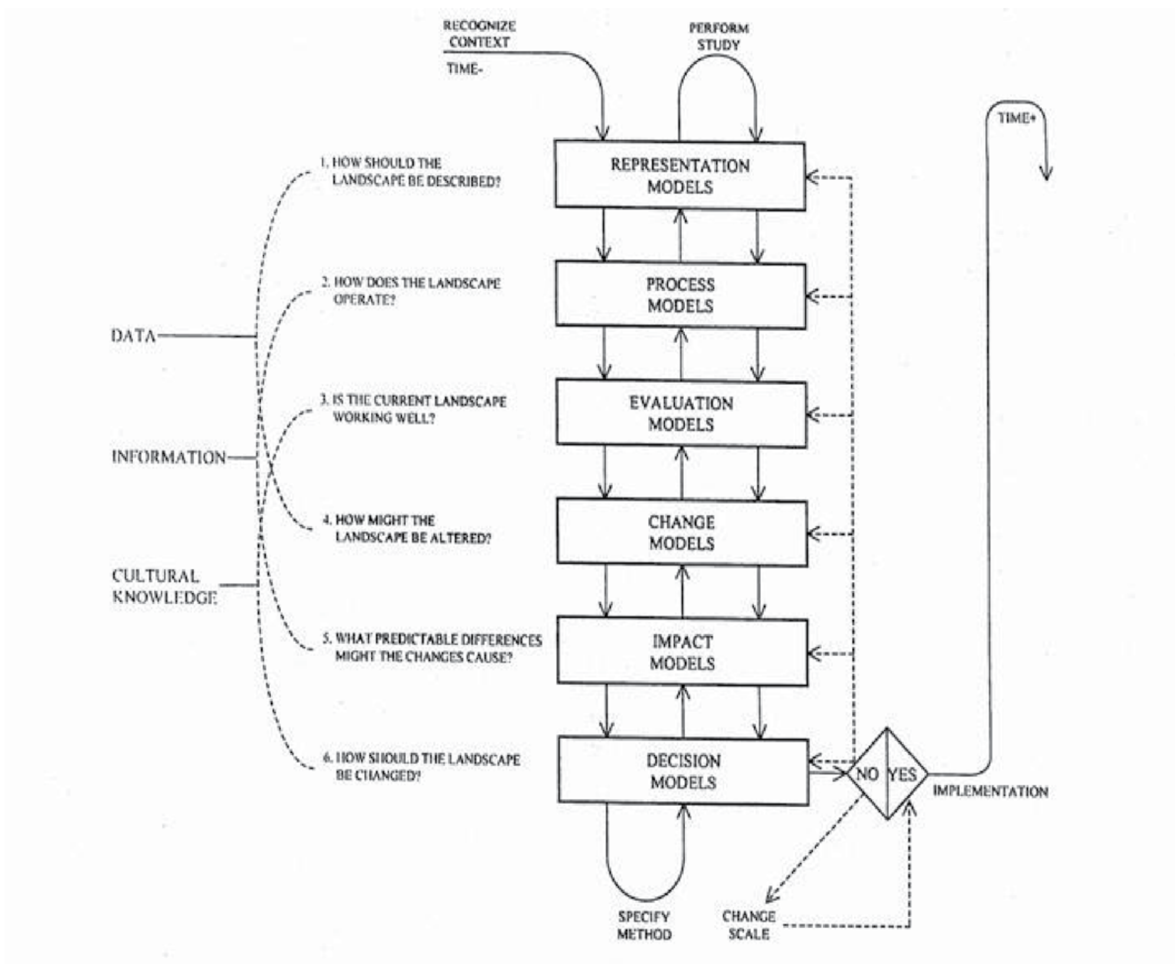


FIGURE 11, FRAMEWORK FOR ALTERNATIVE FUTURES STUDIES

3. Is the current landscape working well? This question is answered by evaluation models, which are dependent upon cultural knowledge of the decision making stakeholders.
Is the area seen as attractive? why? why not?
Are there current environmental "problems" in the area?

4. How might the landscape be altered ? By what policies and actions, where and when? This question is answered by the change models which will be tested in this

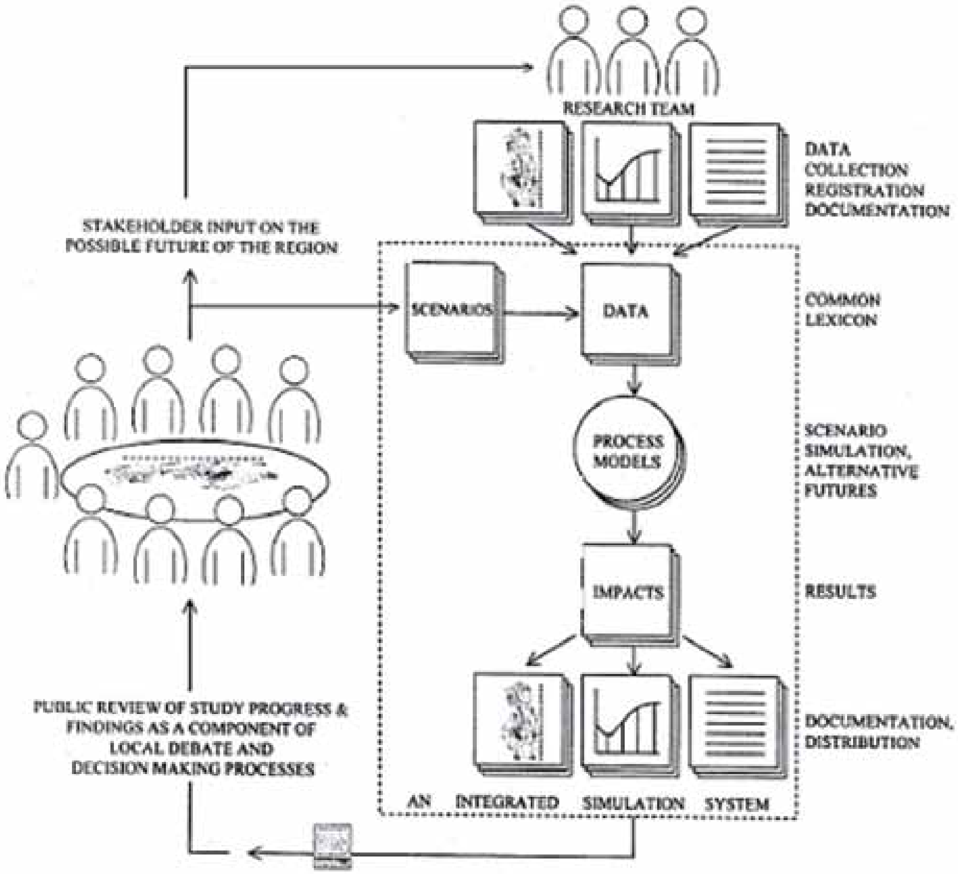


FIGURE 12, THE STUDY PROCESS

research. They are also data, as assumed for the future.
What major changes are foreseen for the region?
Are they related to growth or decline?
Are the pressures for change from inside or outside?

5. What difference might the changes cause? This question is answered by impact models, which are information produced by the process models under changed conditions.
Are foreseen changes seen as beneficial or harmful?
Are they seen as serious? Irreversible?

6. How should the landscape be changed? This question is answered by decision models which, like the evaluation models, are dependent upon the cultural knowledge of the decision making responsibility is theirs.

Who are the major stakeholders? Are they public or private? Are "positions" known? Are they in conflict?

The aim of the second iteration is to define the methods of the study. In this stage, the framework is used from bottom to top. Basic to developing the methodology is an understanding of how public and private decisions to change the landscape are made. The issues and the criteria defining acceptable impacts that decision makers and their constituents apply are investigated. Ways of identifying planning and policy choices that may influence future change are identified. Existing landscape conditions must be understood and considered. Structural and functional landscape processes are studied and models are specified. Once the processes are understood, and data needs identified, requirements for data acquisition and appropriate means of representation can be identified.

6. Decision:
   What do the decision makers need to know?
   What are their bases of evaluation?
   Are they scientific evaluations? Cultural norms? Legal standards?
   Are there issues of public communication? of visualization?

5. Impact:
   Which impacts, how much, where, when, and to whom are seen as "good" vs. "bad"?

4. Change:
   Who defines the scenarios for change? how?
   Which scenarios are selected? towards which time horizon? at what scale(s)?
   Which issues are beyond the capabilities of the research models?
   Are the outcomes simulated, or are they normtive allocations?

3. Evaluation:
   What are the measures of evaluation? in ecology? in development economics? in politics?

2. Process:
   Which models should be included?
   How complex should the models be?

1. Representation:
   Which data are needed?
   for which geography? at what spatial scale? at which classification?
   for which times? from which sources? In which mode of representation? at which cost?

The third iteration implements the methods and carries out the study. In this third stage, the framework is again used from top to bottom.

1. Representation,
2. Process,
3. Evaluation,
4. Change,
5. Impact,
6. Decision.

Data are gathered and represented in a format useful for study purposes. Process models are implemented, and evaluate the existing landscape as a baseline from which to assess impacts of change, a number of Alternative Futures are simulated, and their impacts assessed. Decision makers can then better understand the likely future impacts of their choices.

Decision making is the responsibility of the region's stakeholders, from the individual citizen to the highest levels of government. In order to make decisions, questions must be asked and answered, and options for choice must be framed and deliberated. Figure 12 shows the relationship between the research team and the stakeholders. This study is shaped to respond to the issues and choices posed by the stakeholders. The Alternative Futures and the results of the assessments of their impacts are presented for stakeholder review and the many decision processes which must precede any major action.

The stakeholder working group shown on the left was convened by the Telluride Foundation. The research team activities are represented on the right.

At the extreme, two decision choices present themselves: "no" and "yes." A "no" implies a backward feedback loop in the framework and the need to alter a prior level. All six levels can be the focus of feedback; "more data," "a better model" and "redesign of the proposed changes" are frequently applied feedback strategies.

A contingent "yes" decision (still a "no") may also trigger a shift in the scale or size or timing of the study. In a scale shift, the study will again proceed through the six levels of the framework but the several types of model will be different. It will then continue until it achieves a positive ("yes") decision. A "yes" decision implies implementation, and (one assumes) a forward-in-time change to new representation models.

When repeated and linked over scale and time, the framework may be the organizing basis of a very complex study. Regardless of complexity, the same questions are posed again and again. However, the models, their methods, and their answers vary according to the scale and context in which they are used.

While the framework and its set of questions and models looks orderly and sequential, it is frequently not so in application. The line through any study is not a smooth path. It has false starts, dead ends, and serendipitous discoveries, but it does pass through the questions and models of the framework as described herein before decisions can be made.

3. ALTERNATIVE FUTURES FOR THE TELLURIDE REGION

For the Telluride region study, we used the general methodological framework for alternative futures studies that is described above, and which has been applied successfully both nationally and internationally. The central task was to forecast land use patterns based on different sets of assumptions regarding the types and amounts of pressures facing the Telluride region over the next twenty years under different development and conservation priorities, projects and policies. This framework is well-suited for carrying out a rapid yet comprehensive assessment of the major landscape planning options, incorporating the most important ecological, visual and economic impacts. Rather than seeking to create a single vision for the future of the region, the study models the range of choices that decision-makers face today in order to better understand the implications of each of possible future paths. This framework builds upon and uses the values and knowledge of the stakeholders, making it a useful means for fostering dialog and instigating change.

The research team visited the region eight times, and we have gotten to know it reasonably well. We have had excellent cooperation from the region's public agencies and from the 20 to 30 people who have met with us regularly, and we have formally interviewed more than 100 people during the course of the study. The study was designed with considerable local and regional advice and consultation, and this was especially the case related to its initial assumptions and constraints and the selection of the scenarios to be tested.

Assumptions and Constraints

There are several very important assumptions that guided the design of the study.

We assume that the entire study area is a single region irrespective of political boundaries. In Colorado, counties have great political power, as do towns, and they normally act independently of each other. We have ignored these boundaries in order to study the Telluride region as a single functional unit. The study is conducted over the whole region; however, the results of the study are also reported on the basis of counties, towns and other sub-areas.

The study uses individual parcels of private property as the unit that is subject to development in the alternative futures. These are shown in Figure 13. We assume that all legally developable parcels which are at present undeveloped are available for future development. Obviously, that is not always true. Some landowners choose to not develop land regardless of the underlying attractiveness of the land and its value for development. At the parcel scale, there are inaccuracies in any projections that we make because we cannot predict these decisions taken by the owners of individual parcels. However, in the aggregate, the models are representative of the future pattern of development. The study was designed to model regional scale processes to achieve aggregate levels of results.

The study is based upon imperfect data, and data that have been combined from several different sources to create a single thematic map. We have drawn upon data from the State of Colorado on population demographics and transportation, we have data from the counties and towns in the region, and we have private data. The inconsistencies in data are substantial. For example, the several towns and counties differ in the ways that they define land uses and in their implementation of property value assessments. One of the challenges of this study was to integrate data from diverse sources into a single classification system. The data quality that we have achieved does not prevent us from drawing useful conclusions.

And finally, something that all modelers understand: all models are wrong but they may nonetheless be very useful.

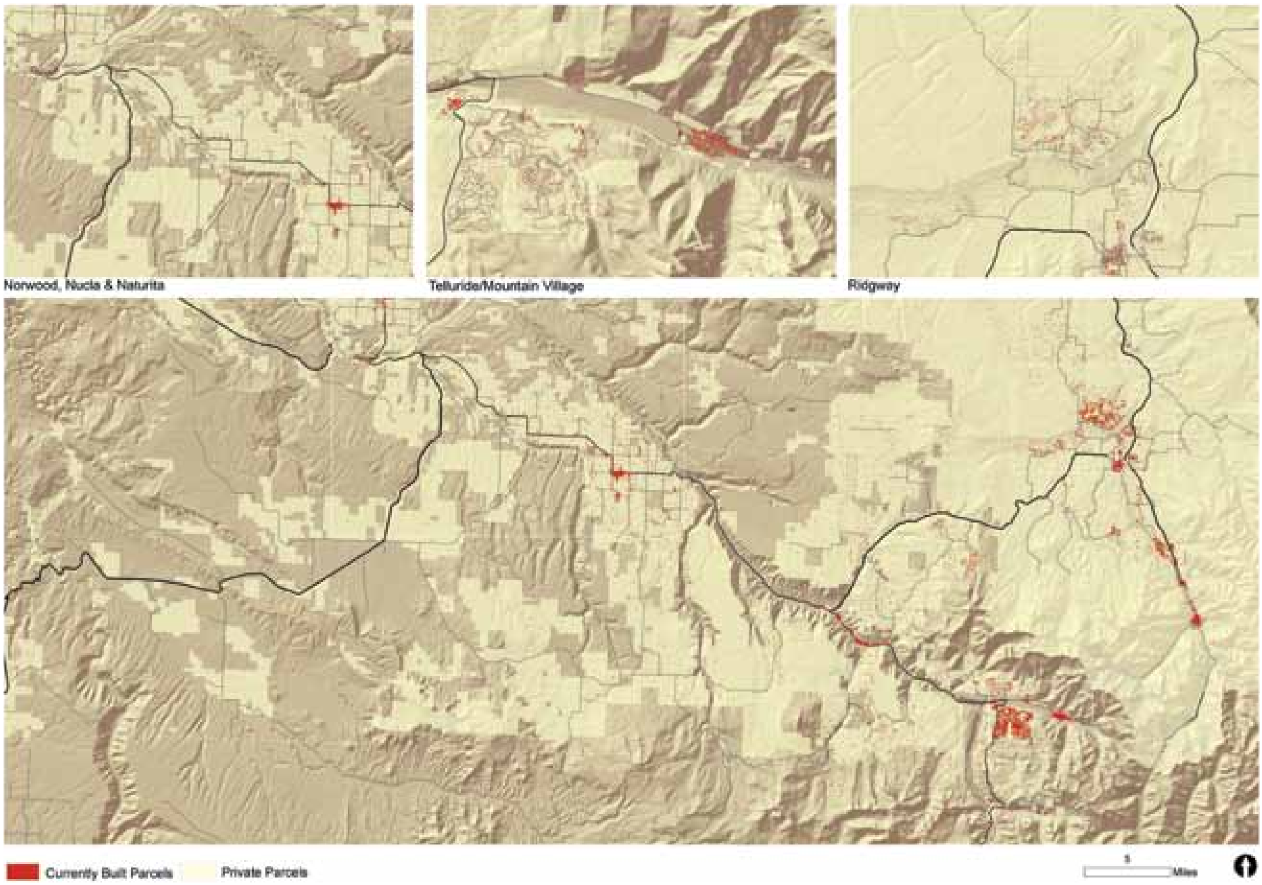


FIGURE 13, PRIVATE PARCELS OF DEVELOPABLE LAND

The most important process-related issues which we included in the study are:

- The Telluride region will develop more.
- Housing patterns will change and the consequent demographics of the region will change.
- These will have a profound effect on transportation and transportation will have an effect on the housing patterns.
- The region's highly valued visual qualities will also be impacted, as will the region's wildlife habitat and ecology.

There are four other concerns in the region that were very much on peoples' minds, but which we decided not to include in the study.

First is climate change. We were advised that the consequences of climate change over a twenty year time period cannot be reliably modeled. We are well aware of this year's early snow melt, but we do not know if it is an extreme event in a normal pattern of distribution that will stay relatively stable, or the first example of a new pattern of early snow melt. We decided that attempting to model the impact of climate change was not where we should spend our limited time and resources.

Second is forest ecology, and as a particular concern, forest fires. Fires can have major regional consequences. However we have concluded that existing expert studies and models are far better than anything we could produce given the constraints of time and money. Regional experts in the Forest Service and the Bureau of Land Management are able to model forest ecology and evaluate fire risk. The patterns of development in our alternative futures can be evaluated by these agencies for their impacts on forest ecology, and exposure to fire risk.

The third is energy use and air pollution. Although these are very important, they are extremely difficult to model. The element of energy use which is most subject to change as a result of our study is road traffic, and we are incorporating models of traffic on major roads. In some of our scenarios we have assumed a continually increasing reliance on road transport, and in some an increasing demand for public transport.

The fourth, and most contentious, is water quantity and quality. The early snow melt has implications for late season water shortages. The municipalities are responsible for the management of water resources, and some are studying it while some have consultants who are modeling hydrologic processes. One of the main inputs to water quantity and quality models is the estimation of demand. We hope that our work will be used to inform the several water studies being undertaken in the region, but we have not included water as a component in this study.

4. REPRESENTATION - HOW IS THE TELLURIDE REGION DESCRIBED?

To represent the processes at work in this study area, a computer based Geographic Information System (GIS) was organized to coordinate spatially explicit and publicly available data on the region. Consisting of approximately 100 map layers, this database integrates information across political and jurisdictional boundaries. It contains information on physical, hydrological, climatic and ecological characteristics of the area. It also contains socioeconomic data, including census demographics and digital property parcels information. Where exact comparable data are not available in digital format across the full study area, a variety of GIS techniques were used to estimate current conditions based on nationally and regionally available datasets.

A standard format of maps has been adopted for representing the Telluride region. The entire study area is presented below. The three inset maps are blow ups of the Norwood, Naturita, Nucla zone, the Telluride-Mountain Village zone and the Ridgway zone . These three present the major development areas at a closer scale but with the same information as on the regional map.

Figure 14 presents the 2008 land cover of the Telluride region, presented in 12 categories. The red areas are locations of existing development and the white areas represent the more mountainous parts of the region which are also above tree line.

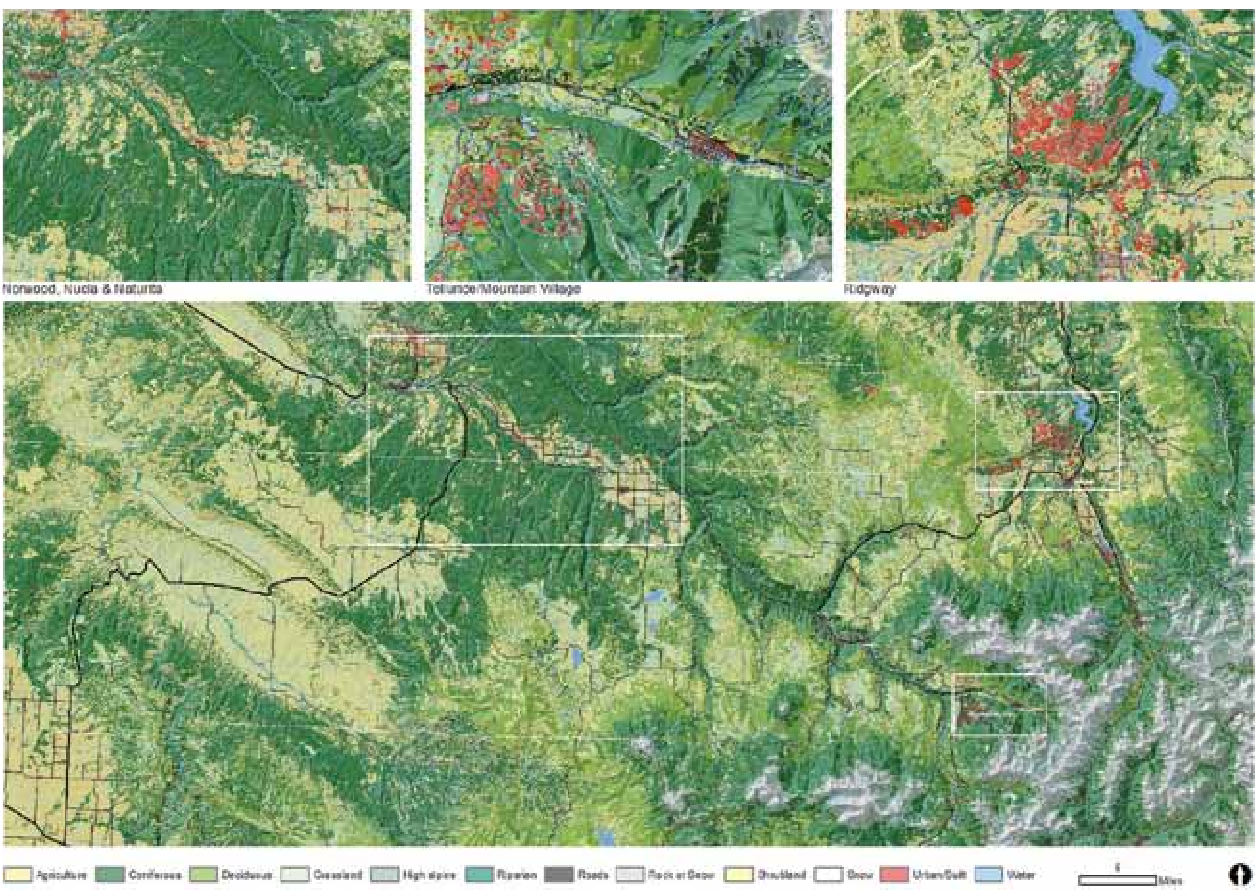


FIGURE 14, LAND USE/LAND COVER, 2008

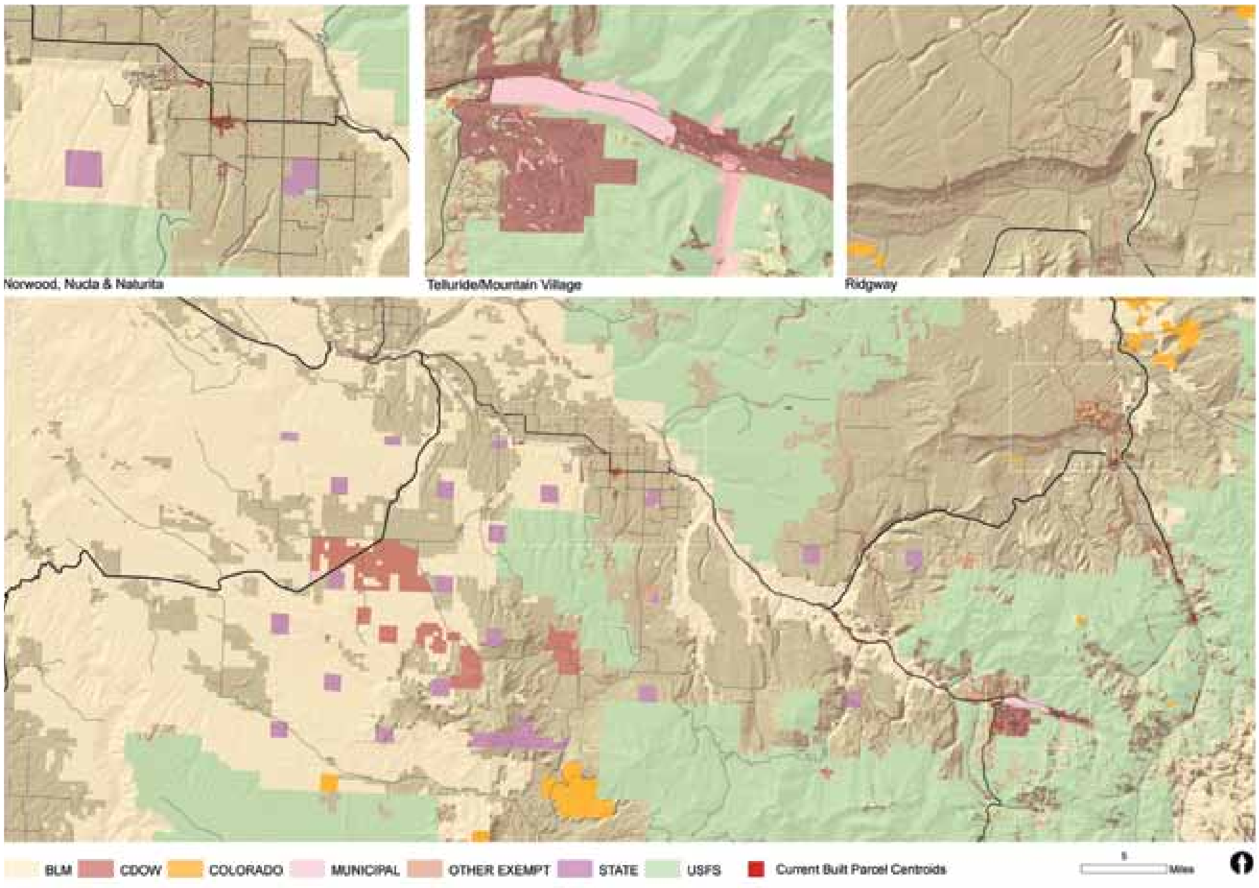


FIGURE 15, PUBLIC LANDS

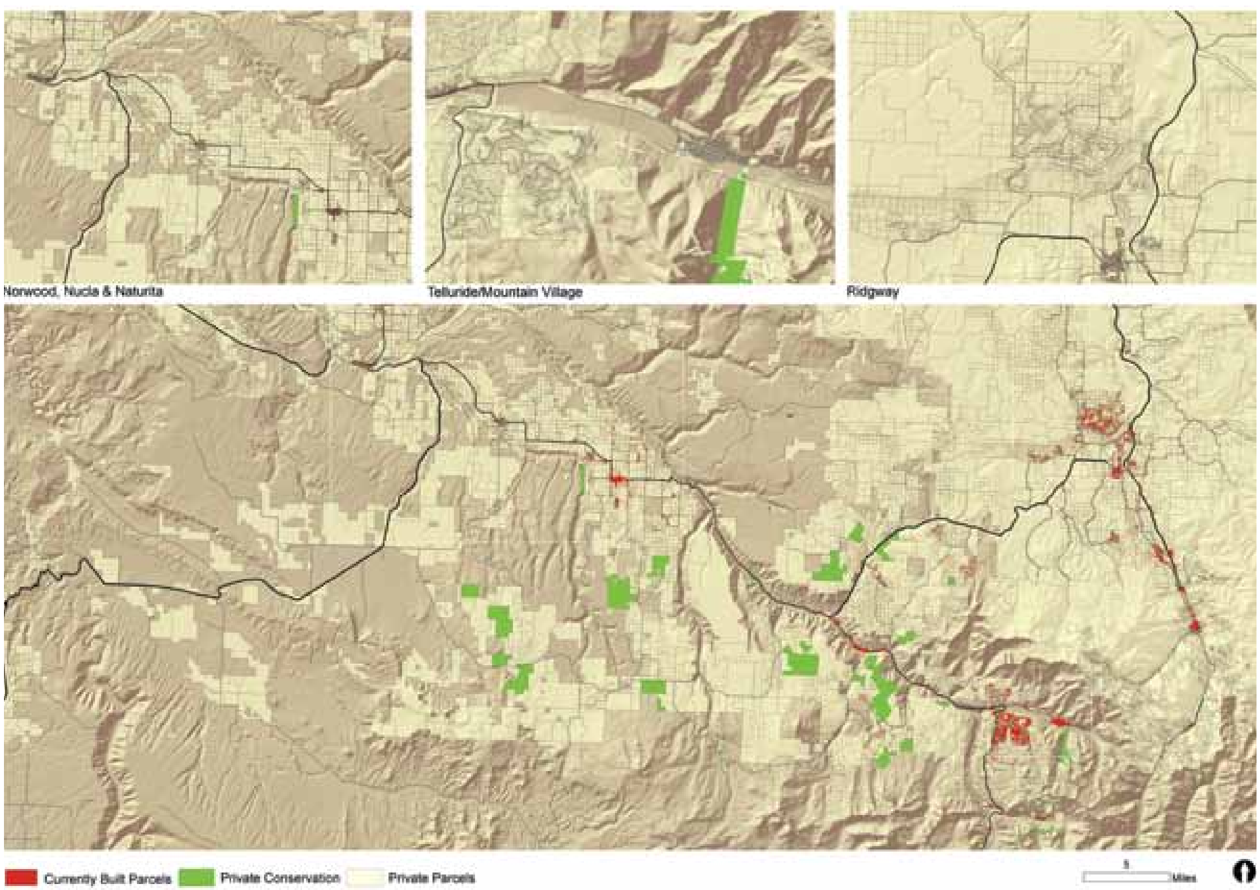


FIGURE 16, PRIVATE LANDS

Figure 15 shows the various categories of public lands in the study region the most significant of which are managed by the USDA Forest Service and the Bureau of Land Management.

One of the central assumptions of this study is that all future residential development will occur on private property. Figure 16 shows the parts of the study area which are privately owned in yellow. The already built areas are shown in red. In addition to the current housing stock in the region of about 10,000 housing units, there are approximately another 12,000 parcels that might be developed under current zoning laws. There is adequate supply of privately owned and developable land to more than double the current housing stock. The regional economy is described by overall economic output and employment divided into the sectors in which this economic activity takes place. As shown in table 1, the largest employers in the economy are the retail, service and construction sectors. Mining and agriculture, historically major parts of the economy, now occupy a relatively small part of the regional output. Together, industry, mining and agriculture account for just over 5% of the jobs in San Miguel and Ouray Counties. The expenditures by second home owners and tourists along with construction, which is driven in large part by the development of second homes, are estimated to be responsible for more than half of the jobs in the area, approximately 56% in San Miguel County and 49% in Ouray County.

	San Miguel County		Ouray County	
Sector	Jobs	% of total	Jobs	% of total
Agriculture	105	1.3%	103	3.6%
Mining	131	1.6%	3	0.1%
Construction	1299	16.2%	534	18.6%
Manufacturing	178	2.2%	48	1.7%
Wholesale trade	33	0.4%	26	0.9%
Retail Trade	535	6.7%	270	9.4%
Transportation and warehousing	55	0.7%	13	0.5%
Information	146	1.8%	36	1.3%
Finance activities	131	1.6%	81	2.8%
Real estate	727	9.1%	136	4.7%
Professional and business services	491	6.1%	285	9.9%
Administrative and support services	262	3.3%	62	2.2%
Education	92	1.2%	Withheld	-
Health Services	233	2.9%	93	3.2%
Arts	1099	13.7%	75	2.6%
Accommodation and food	1135	14.2%	528	18.4%
Other services	494	6.2%	174	6.1%
Government	839	10.5%	373	13.0%
Estimated Total Jobs	7998	100.0%	2868	100.0%

Table 1, EMPLOYMENT, SAN MIGUEL AND OURAY COUNTIES, 2007

Another key descriptor of the economy is the cost of living, including the price of housing. Figure 17 shows median home value reported by census block groups with the more valuable homes shown in darker red and the least represented in darker blue.

The social aspects are described by the size and the character of the various communities in the study region and socioeconomic profile of their residents. Data from the United States census and from the Colorado census have been integrated into the database for this study. The reporting units are large and few but they provide important insights into the demographic and economic variation within the study area.

Figure 18 shows the percent occupancy of the housing in the study area, with the red colors representing more full-time occupancy and the light tan to darker blue showing more seasonal use.

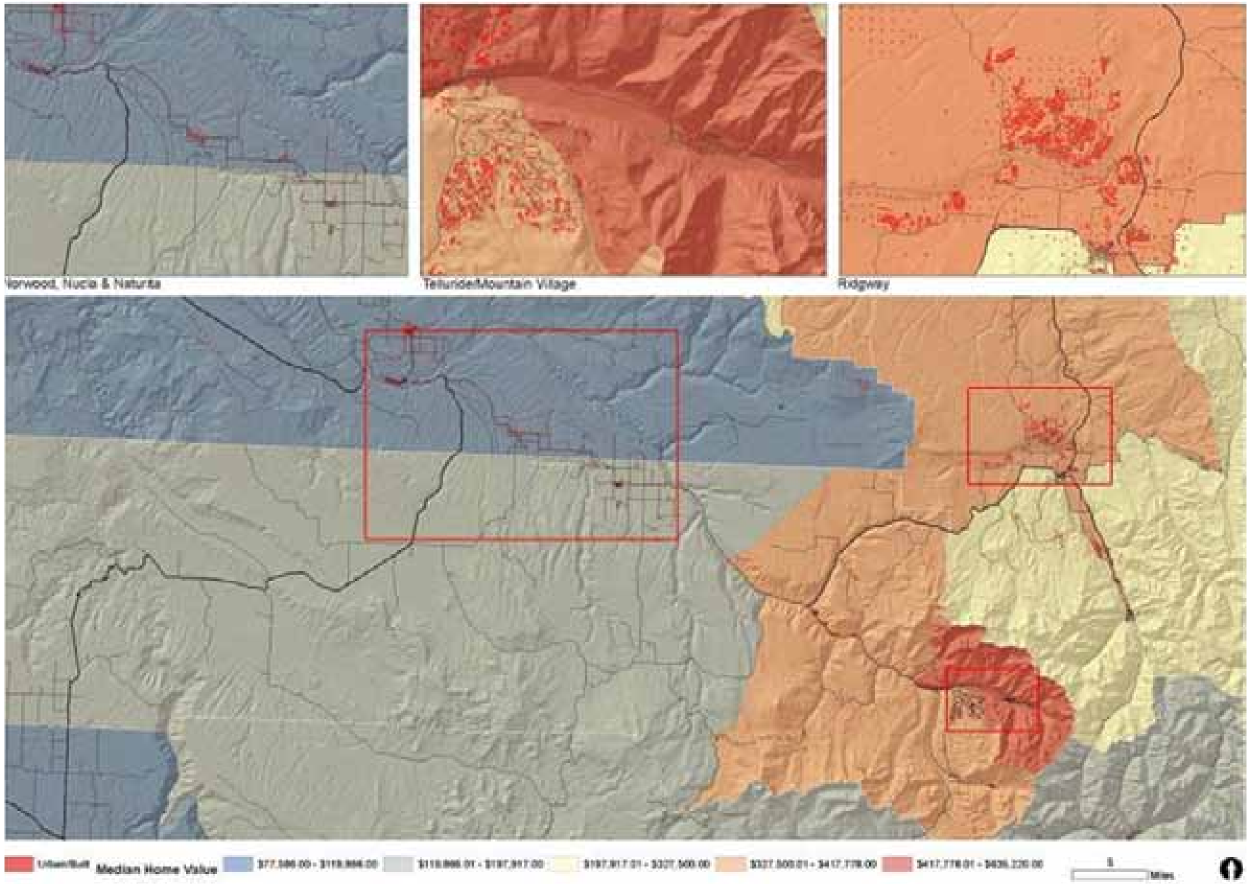


FIGURE 17, MEDIAN HOME VALUE

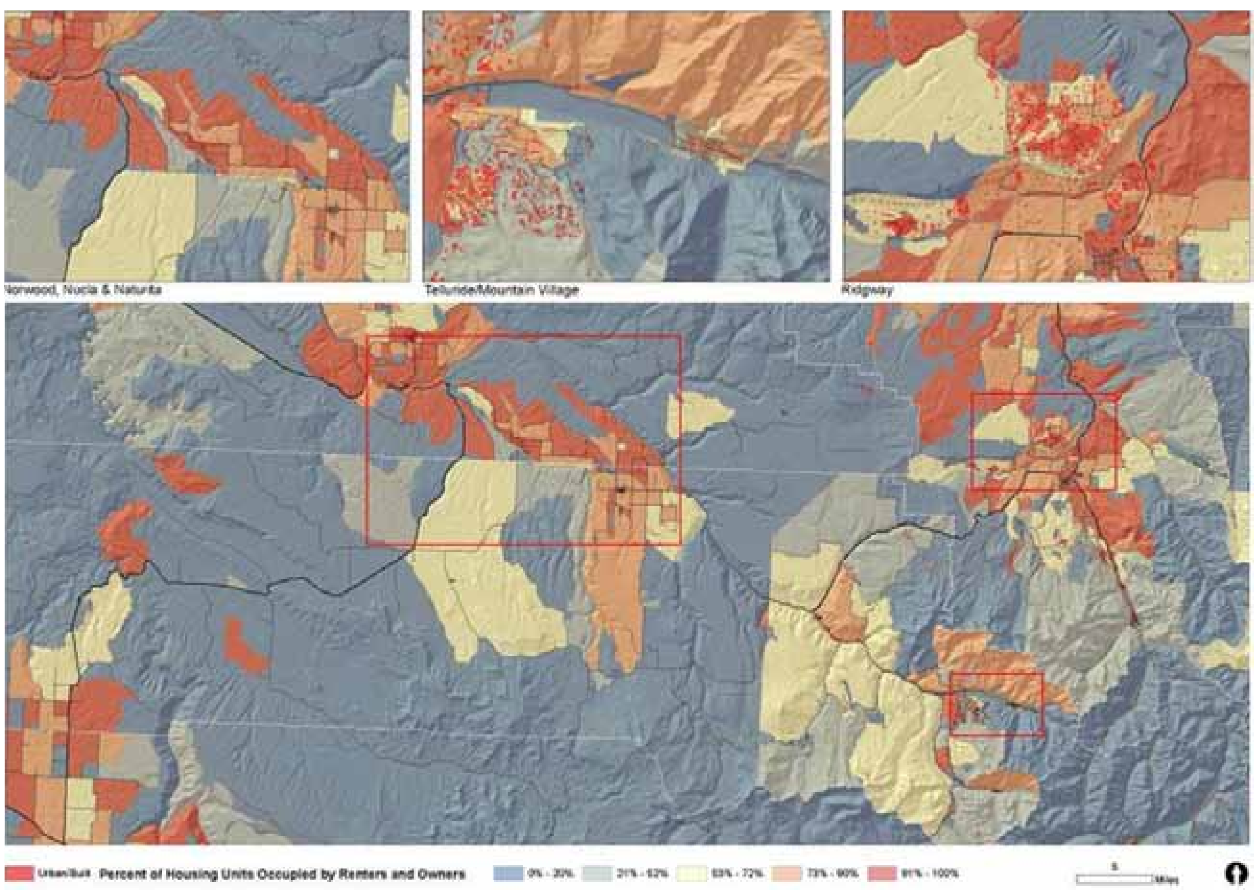


FIGURE 18, PERCENT OCCUPANCY

5. PROCESS - HOW DOES THE TELLURIDE REGION FUNCTION?

This question is answered by process models that provide information for the assessments in this study. Process models include economics, demographics, visual quality, transportation, and terrestrial ecology. Just as issues facing the region are interrelated, the computer models developed for the analysis of these processes are interlinked as shown in figure 19.

FIGURE 19, SKI-RELATED COMMERCE, MOUNTAIN VILLAGE

While protecting, enhancing and marketing these assets are essential elements in the success of this economic strategy, the money that drives economic growth (mainly from tourists and second home owners) comes from outside the region. These exogenous forces help to generate jobs that in turn translate into regional housing needs for the workforce. These exogenous demands also contribute to rising land and housing prices which can result in the displacement of portions of the population that have been ‘priced out’ of the area.


FIGURE 20, AGRICULTURE AND RANCHING

Surveys were conducted to determine the structure of the local real estate markets and their relationship to various amenities. These were synthesized into a set of spatial development attractiveness models, one for each major submarket, which were then used to evaluate every location in the study area relative to its attractiveness to that market. This in turn guided the process of allocation of new development. Each resulting alternative future was then assessed for its demographic, traffic, visual and

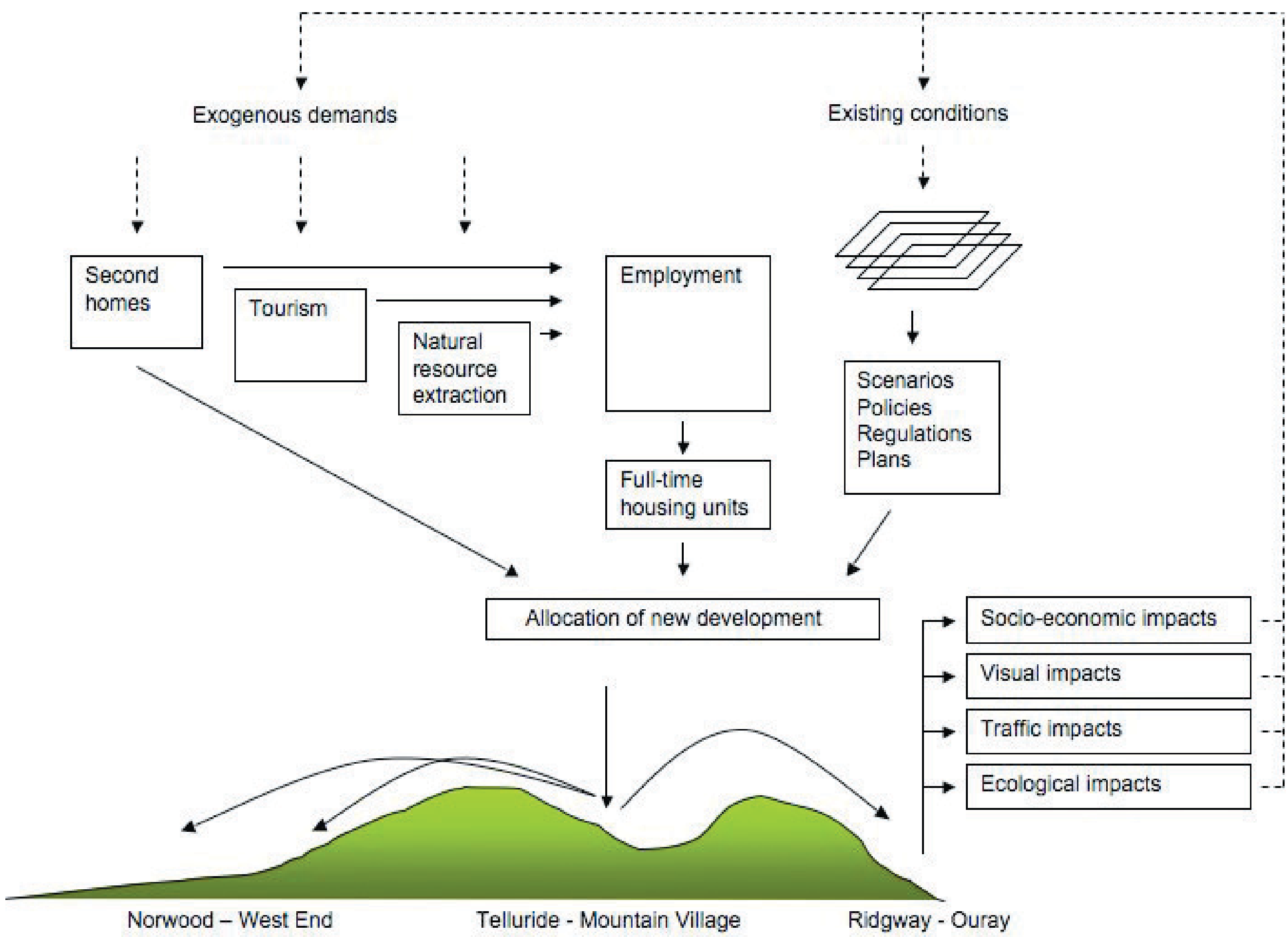


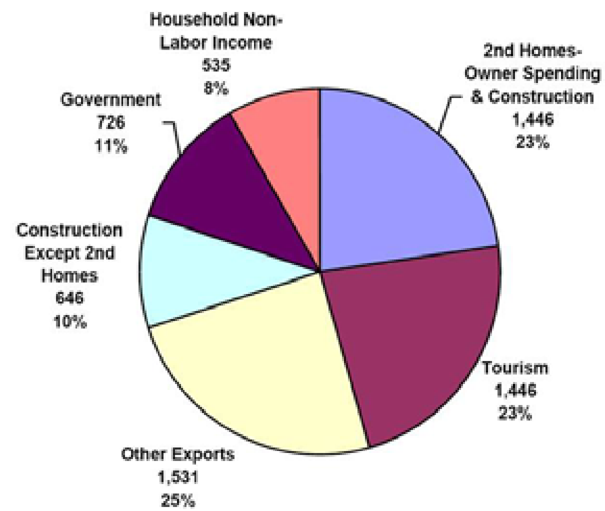
FIGURE 21, STUDY OVERVIEW

6. EVALUATION - IS THE TELLURIDE REGION WORKING WELL?

This question is answered by evaluation models, which apply value judgments to information. These value judgments are derived from interviews and meetings with stakeholders and experts and by analytical models. Interviews and consultations were conducted separately for each of the model areas. The resulting value judgments were mapped and presented to a broader working group for discussion and revision.

Economic and social measures are especially sensitive to value judgments. The economic performance of the area, if measured by job creation and output, has been strong. These jobs have been driven primarily by tourism and construction in recent years (figures 20, 21). An associated trend has been the steep rise in land prices. This has been good for landowners but generally bad for employees that do not already own a home in the area. These exogenous forces also contribute to rising housing prices and rents, which can result in the displacement of portions of the population that have been 'priced out' of the area.

The increasing proportion of second homes in Telluride/Mountain Village and Ridgway/Ouray impacts the character of these places. The ratio of second homes to housing for full-time residents is a useful measure of the social changes occurring in these communities, serving as an indicator for many complex processes. Although there is no "typical" second home or full-time household, in aggregate, these households have markedly different characteristics. Second home owners spend less time in the region and therefore have less demand for government services for heath care, schools, water and energy. Property values tend to be higher for second home owners who thus generate higher property taxes and higher real estate transfer tax (RETT) receipts.



SOURCE: LLOYD LEVY CONSULTING 2006

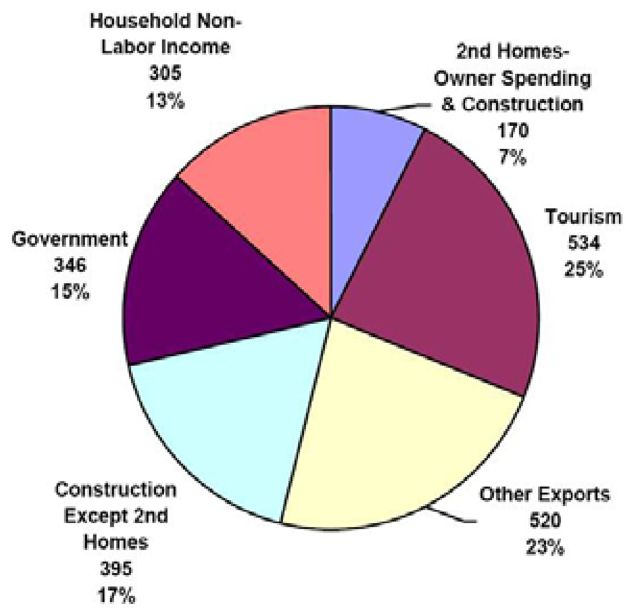
FIGURE 22, JOBS BY SECTOR, OURAY COUNTY

Full time residents have a year round demand for government services, year round demand for water and energy. They create year round traffic but are likely to have a greater willingness to ride on public transportation. They have children in schools, they require health care, and they have a full time presence in the civic life of a community. While innumerable intangible elements contribute to the vitality and character of the region's towns and communities, the size of the community and proportion of full-time residents are useful indicators.

The values that landowners place on land can be inferred from the decisions that they have taken to develop land. The allocation of new houses into the study area relies on an assessment of the attractiveness of each of the potential parcels in the eyes of potential homeowners and residents. Those seeking second homes and full time residences have different preferences for housing types and locations. Potential residents also vary in their ability and willingness to pay for housing.

Several factors contribute to land value in the Telluride region and attractiveness for development. These include proximity to recreation areas, particularly skiing, proximity to commercial centers, access to roads and transport, access to work, views from the house, open space, historical attributes, and the social and cultural characteristics of the area. For this study, we used GIS tools and statistical analysis to estimate a housing attractiveness model based on prior development and housing values in the region. This model in turn guides the sequence of development in the study. The statistical analysis was carried out of existing development patterns for the study region to assess the impact of different factors on housing location choice. The analysis incorporated distance to roads, stores, jobs, commercial centers, and recreation for each location as well as the quality of views.

The statistical analysis produced parameters that describe the relative weight that each of these factors plays in the regional allocation of individual development decisions. We applied this strategy to modeling two separate sub-markets, one for full-time residents and one for second-home owners. For full time residents, attractiveness is mainly a function of proximity to roads, markets and employment. They would like a nice view and land for their children to run around on, but travel efficiency is most important. For second homeowners, attractiveness is a function of proximity to Telluride and Mountain Village, their recreation assets and the high visual qualities in the mountains area.



SOURCE: LLOYD LEVY CONSULTING 2006

FIGURE 23, JOBS BY SECTOR, SAN MIGUEL COUNTY

The attractiveness models are based on development decisions taken across a range of different property values. Although the resulting attractiveness gradients will be correlated with land prices, particularly for second homes, they are not strictly tied to land prices. The full-time resident model depicts attractiveness across a wider range of prices.

EVALUATION

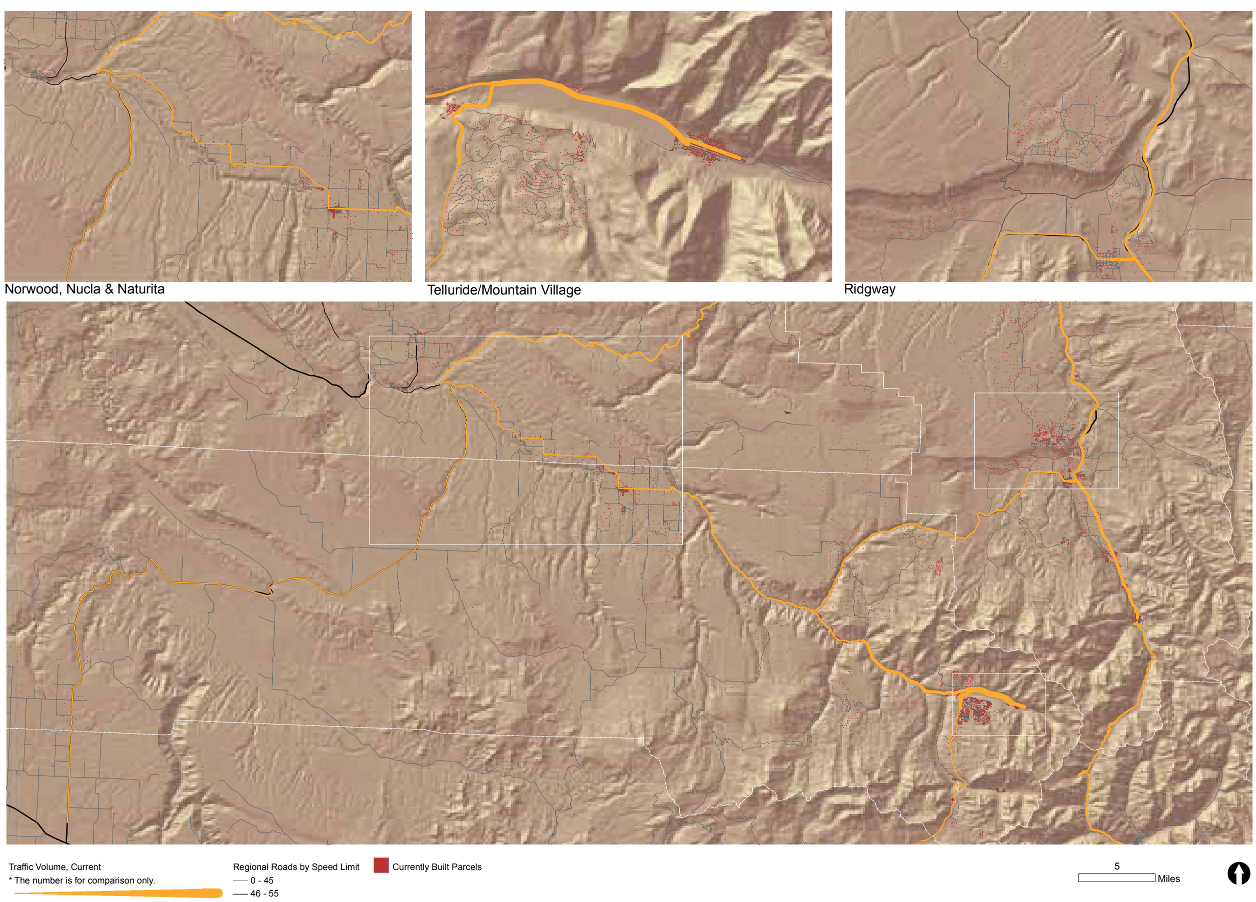
Traffic

Figure 22 shows regional traffic according to the 2006 Colorado Department of Transportation (CDOT) trip survey. An important limitation is that this survey considered only work-related trips and annually averaged traffic. Because of lack of survey data, it was not possible to estimate tourism-related traffic, or the seasonal variance of traffic volume.

Figure 23 shows the driving time from all parts of the study region to Telluride/Mountain Village, and figure 24 shows driving time to the nearest year-round maintained road. These are important determinants of residential attractiveness.

Drive times were estimated based on the existing road network's posted speed limits, using terrain slope and a GIS "cost distance" model. These estimates do not consider traffic, inclement weather, or road curvature. For off-road areas, time estimates were based on the assumption that residential service roads with a typical traffic speed of 15 miles per hour could be created, including culverts and bridges.

The advantages of having close access to a road which is maintained year-round (figure 24) and also being close to the recreational and employment of Telluride/Mountain Village (figure 23) are substantial but they are offset in part by traffic congestion on the narrow and heavily used road leading to Telluride/Mountain Village and the need to find parking there. As the region develops further this already difficult situation will be exacerbated.



SOURCE, 2006 COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) TRIP SURVEY.

FIGURE 24, REGIONAL TRAFFIC

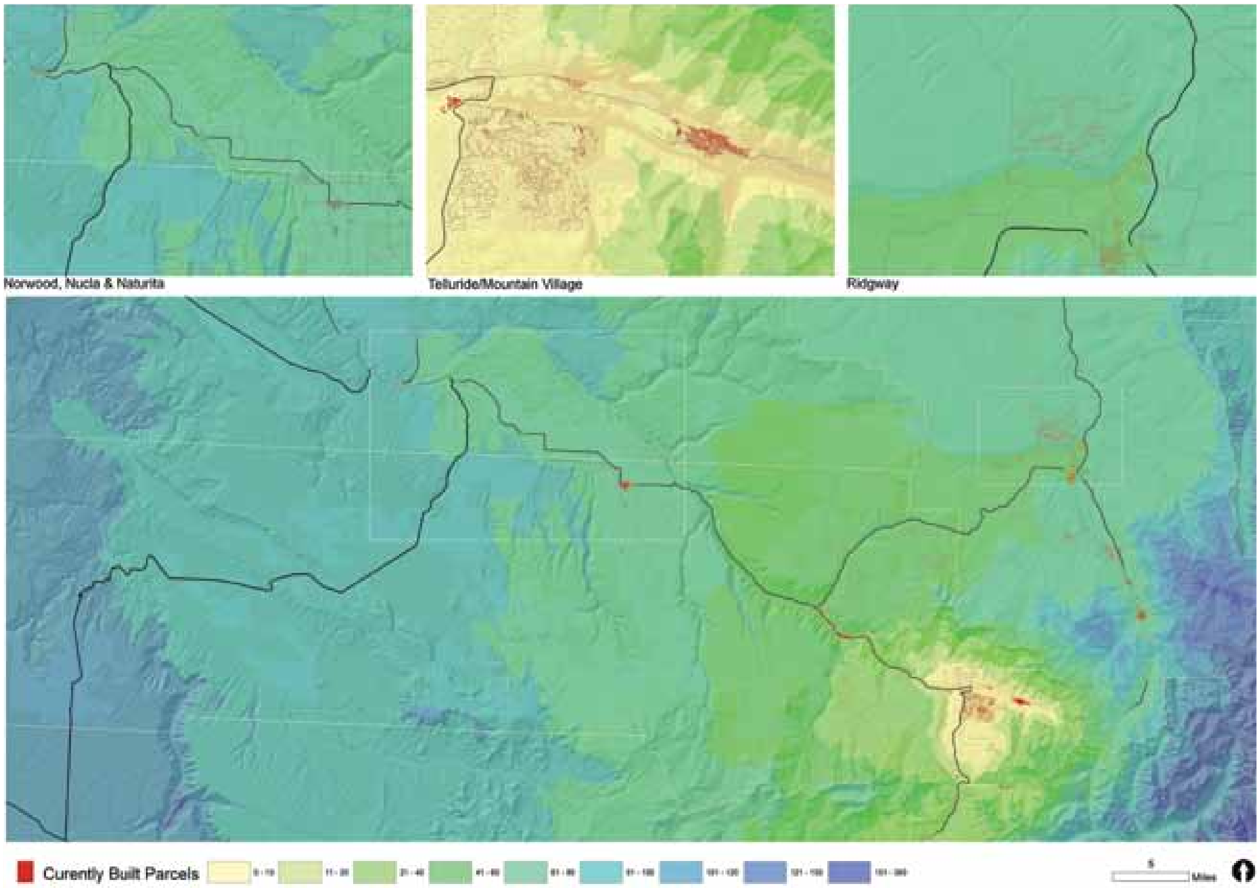


FIGURE 25, TIME TO TELLURIDE AND MOUNTAIN VILLAGE

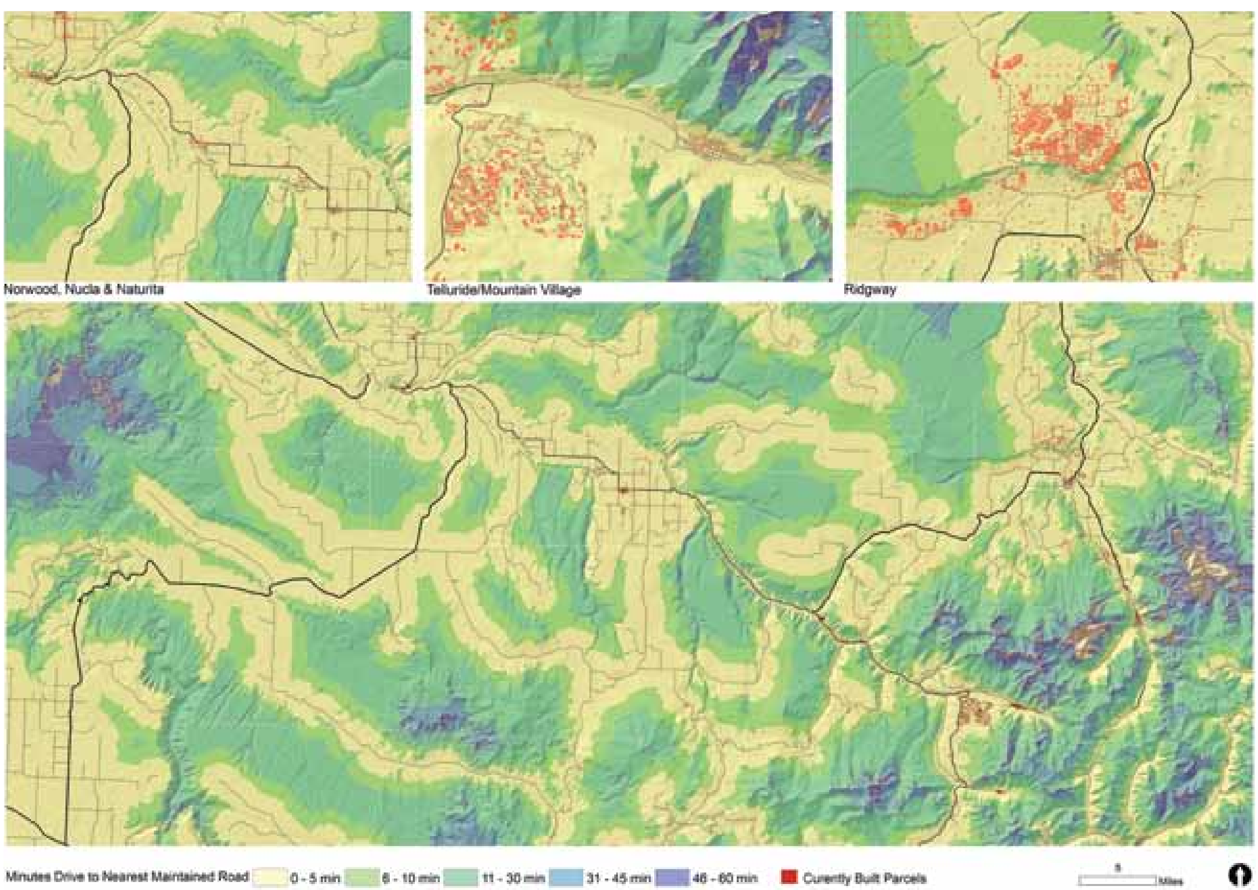


FIGURE 26, DRIVING TIME TO NEAREST YEAR-ROUND ROAD

EVALUATION

Visual Preference

FIGURE 27, A SELECTION OF ADVERTISING COV ERS

The economy of the region has been fueled in recent years by tourism and the development of second-homes. As with many other leisure-based economies, the Telluride region thrives by marketing its natural amenities and finding ways to monetize access to these amenities, for example, by providing tourism services and through the development and sale of second homes. We have studied how the Telluride region presents itself commercially by analyzing the region's real estate advertising over a six month period. About 90% of the images represent different versions of the views shown in figure 198 demonstrating the importance to the regional economy of visual amenities and access to recreation.

When we began the study, one of the things that everybody described as important was the visual qualities of the area. People think that the Telluride region is a beautiful area and they value it. A recent Telluride Visitors Center survey found that over 96 percent of visitors rated the scenic beauty of the region as paramount to enjoying their trip to Telluride. As a result, we initiated a study of visual preferences, of both residents and tourists.

We took about 1,000 photographs as we drove the entire study area over several days, and in two seasons. We selected 80 photographs that represented all the types of land use and land cover in the data base. At least 8 of the selected photographs were taken in every town in the region and some are from remote areas. Each photo was then assessed and encoded for a set of factors that might explain visual preference for the view.

FIGURE 28, THE VISUAL PREFERENCE INTERVIEW

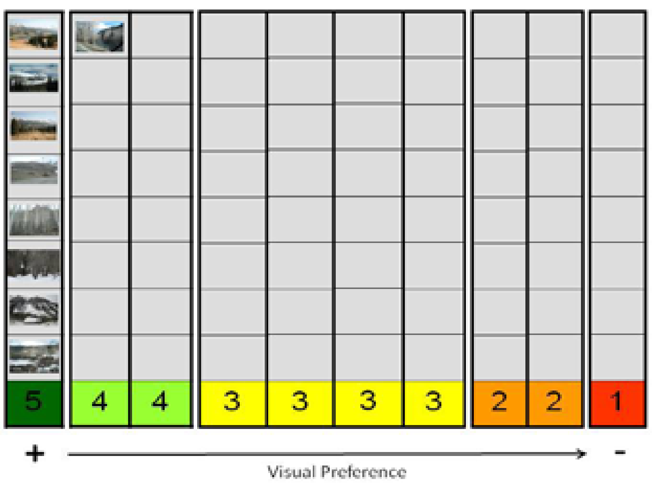


FIGURE 29, SCORING THE VISUAL PREFERENCE INTERVIEW

We asked people to evaluate their relative preferences for the views in these photos in a free process. As shown in each interviewee received a randomly ordered set of the 80 photographs, and was asked to place them on a table in any way it felt comfortable, but eventually in a normally distributed set of piles, with 8 pictures being the most preferred (scored as a 5), 16 pictures the next preferred, 32 in the middle, 16 less preferred, and 8 least preferred (scored as a 1). 101 people were interviewed, in all parts of the study region. The sample consisted of 80 residents and 21 tourists, 44 men and 59 women, 35 younger persons and 66 older. Each interview took about 15 minutes, and the 1 to 5 preference results were encoded for each photo and interview.

FIGURE 30, PHOTOGRAPHS RANKED 1 TO 40

Figure 27 shows are the forty most preferred photographs in rank order from upper left to lower right, and their mean scores. They have several things in common: mountain views, “naturalness” and “history”.

FIGURE 31, PHOTOGRAPHS RANKED 41 TO 80

Figure 28 shows the 40 least preferred photos. Many of these views show new development. Mountain Village is not highly preferred visually and the commercial strip development in Ridgway is among the least preferred parts of the study region.

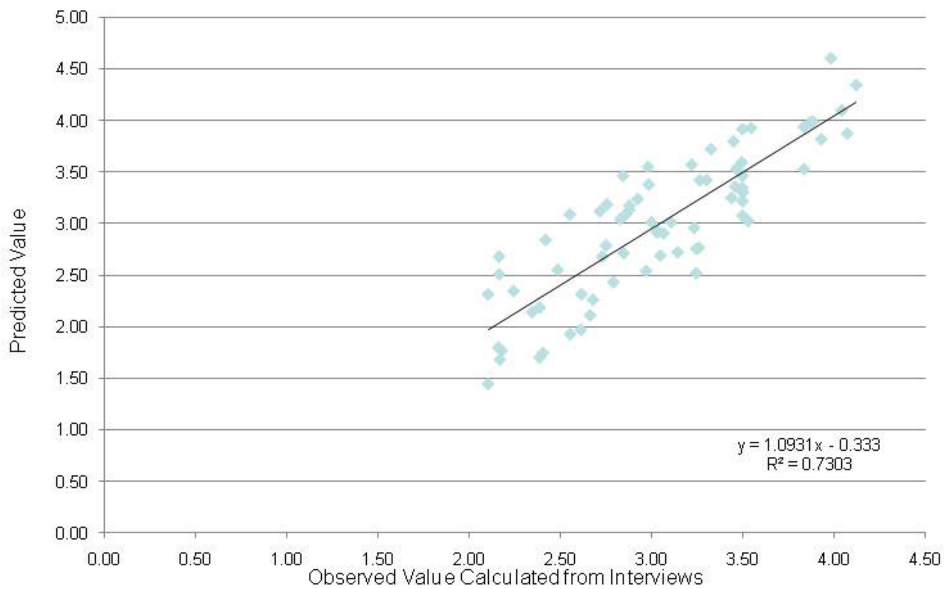


FIGURE 32, THE VISUAL PREFERENCE MODEL, PREDICTABILITY

The analysis of the factors which best explain the interview results was made by regression analysis. The resulting model (figure 29) has a very high predictability, with an R2 of 0.73. These are the main factors which explain visual preference in order of importance: mountain views, historic character of the landscape, the idea of naturalness (no development), water views, canyon views, distant views, and a strong negative preference on new development. From later discussion with interviewees, the negative associations seem less be a function of architectural design, but rather are related to the visible presence of these kinds of new development. This is especially significant in the public views from the major transportation corridors in the region.

	MEN	WOMEN	TOURIST	RESIDENTS	YOUNG
MEN					
WOMEN	0.9619				
TOURIST	0.8994	0.9120			
RESIDENTS	0.9869	0.9900	0.8898		
YOUNG	0.9554	0.9634	0.9131	0.9640	
OLDER	0.9824	0.9859	0.8976	0.9933	0.9355

Table 2, VISUAL PREFERENCE MODEL, SUBSAMPLE AGREEMENT

Not only is there a general agreement on this predictive visual preference model, but when tested, we found almost uniform and very strong correlation among the different subsamples. This is shown in table 2.

EVALUATION

Spatial Modeling of Visual Preference

Once the statistical modeling of regional visual preferences was established, we created two spatial models. The first of these estimates visual preferences under current conditions as seen from every location within the region. The second computes visual impact as seen from any location based on the scenario-based changes allocated in the alternative futures.

Baseline visual preference modeling was structured using the explanatory factors from the statistical model. Mountain views, views of water, historic buildings and predominantly natural landscapes were strongly positive features. We first generated view sample location points along major roads and tourist routes. At each point, we independently computed viewsheds in major compass directions. Thus we examined the characteristics of views north, south, east, and west in pie shaped wedges outward from the sample points.

Within each viewshed, we computed what was visible from that location and its distance to the sample view point. For example, we computed the visibility and distance of high mountain peaks from each sample point in each major compass direction. We also measured potential distance of view and horizontal openness of each view. All increasing measured factors were positive, with the exception of the number of visible houses and other buildings.

The model considers the attenuation of impact with distance. The model recognizes three categories of distance: foreground, middle-ground and background. Because view distances in this area are relatively large, we used 0-300m as foreground, 300m - 3000m as middle-ground, and greater than 3000m as background. While the 3km distance is higher than typical in other visual studies, public policy debates and lawsuits about the visual impacts of housing development in Ridgway were prompted by building on a bluff approximately 3 kilometers from the main highway. Therefore we felt it appropriate to consider development at the distance as potentially causing a noticeable negative impact.

When multiple occurrences of a feature were found in the same view, they were scored in a system of diminishing returns system. The principle was that the first of a kind of object seen was more important than repetitions of the same type. For example, seeing one high mountain peak was of great visual significance, seeing 2-5 was better by one category and seeing 6 or more peaks better by two categories. Similarly, seeing a single house in a landscape which had previously been completely undeveloped was a strong negative influence on visual preference, but the presence of 2-5 houses was treated as one category more negative. This form of weighting appears to be appropriate based on the visual preference survey results.

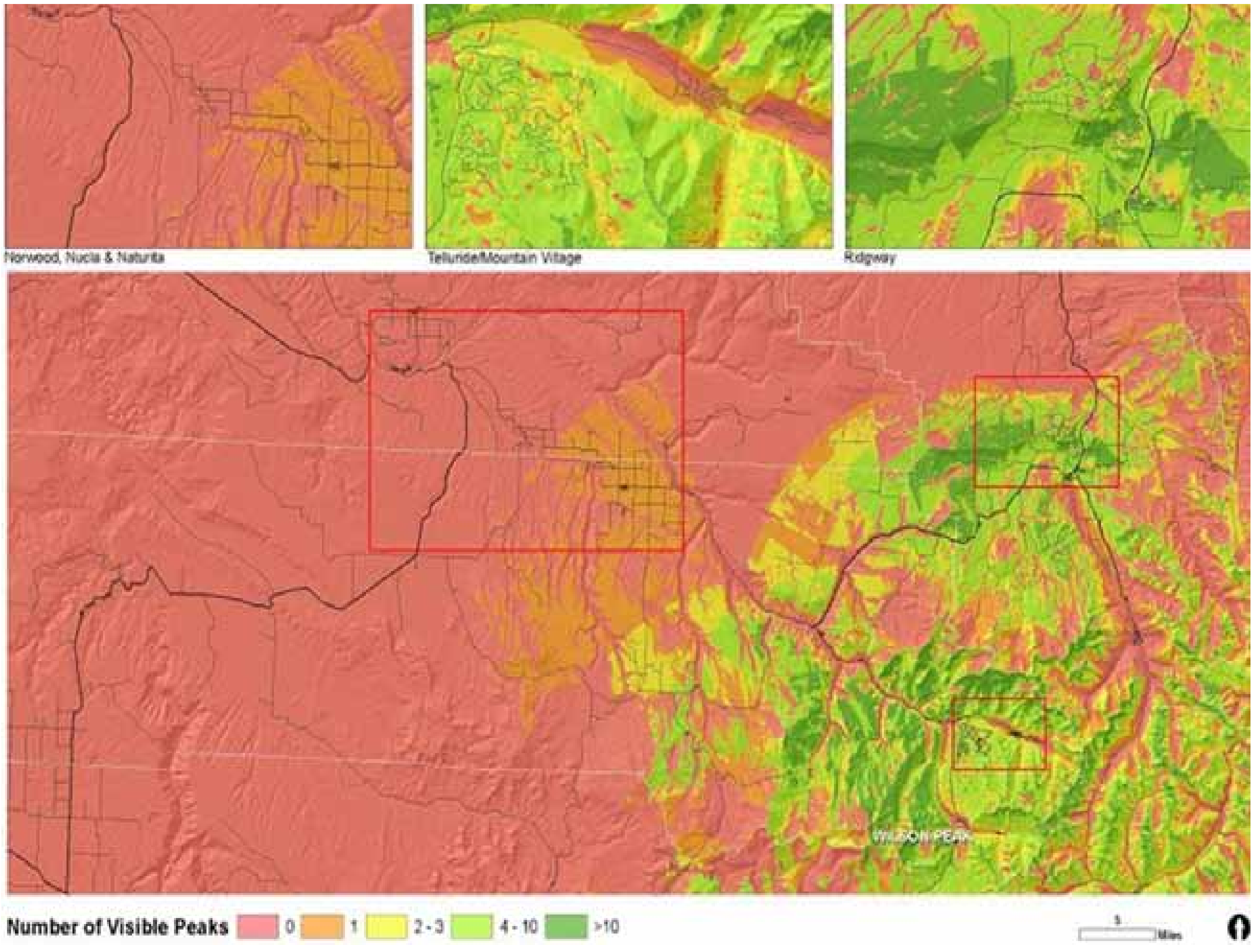


FIGURE 33, MOUNTAIN VIEWS

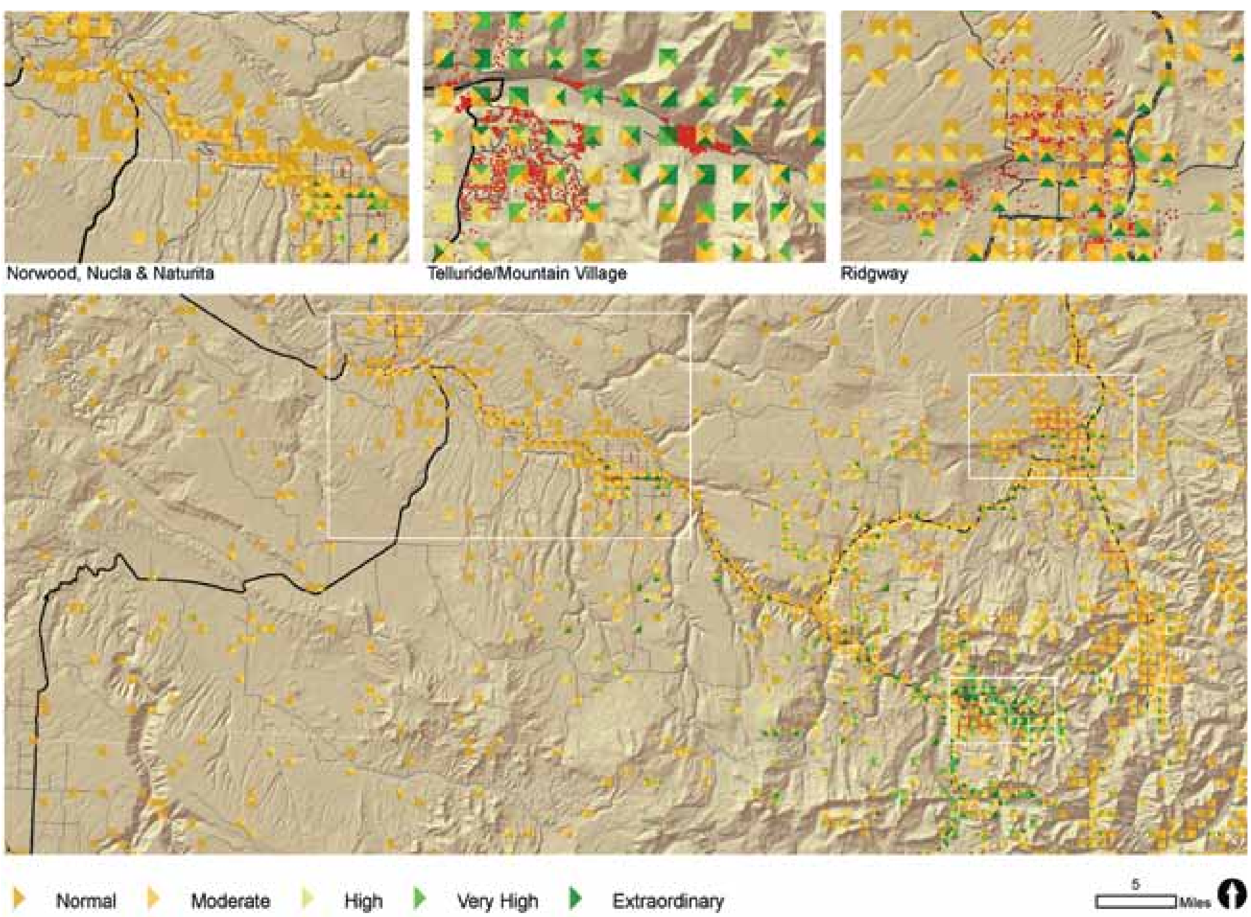


FIGURE 34, DIRECTIONAL COMPUTATION OF VISUAL PREFERENCES

When assessing the impacts of new development on visual preference, two important assumptions were made. It was assumed that the current visual preferences as surveyed would be stable to 2030. In addition, only new allocated development was considered. The 2030 impacts do not consider possible “natural changes” due to fire, climate change, etc.

The visual preference impact model is based on the model of existing conditions which assesses new development with diminishing impact for greater numbers and greater distance from the viewpoint. For each scenario, we computed the number of new houses potentially visible within each view. We then weighted the impact using two separate schemes. For overall visual impact modeling, we considered the view from any location in the study area, public or private. This method is comprehensive. For example, it includes the impacts on the future views of existing houses. However, the public view of the region is significantly different than private views. Since tourism is a very large part of the local economy, we made a second visual impact model which was designed to focus on the public perception of the landscape. In daily experience, this is dominated by views from public areas, and specifically as seen from major tourist routes.

Figure 32 is the summary map of visual preference as seen from all points in the study region. It is based upon the interviews of regional residents and tourists. A way to think about it might be—if you were parachuted blindfolded into anywhere in this region and removed the blindfold, we believe that the model could predict what you would tell us regarding your preference for the view. This map is very important when assessing where persons seeking second homes may want to build their homes.

The Telluride region has a reputation as a beautiful area. The views that people see while driving on the major public roads are of special importance in shaping this “image”. It is of special importance to the Telluride region because the economy is so dependent upon tourists and second home residents. Figure 33 shows the visual preference evaluations as seen from the major public roads of the study area. These are assessed within the viewsheds of the road-views, which are the areas potentially seen from these roads.


VERY HIGH VISUAL PREFERENCE SCORE


HIGH VISUAL PREFERENCE SCORE


MODERATE VISUAL PREFERENCE SCORE


LOW VISUAL PREFERENCE SCORE

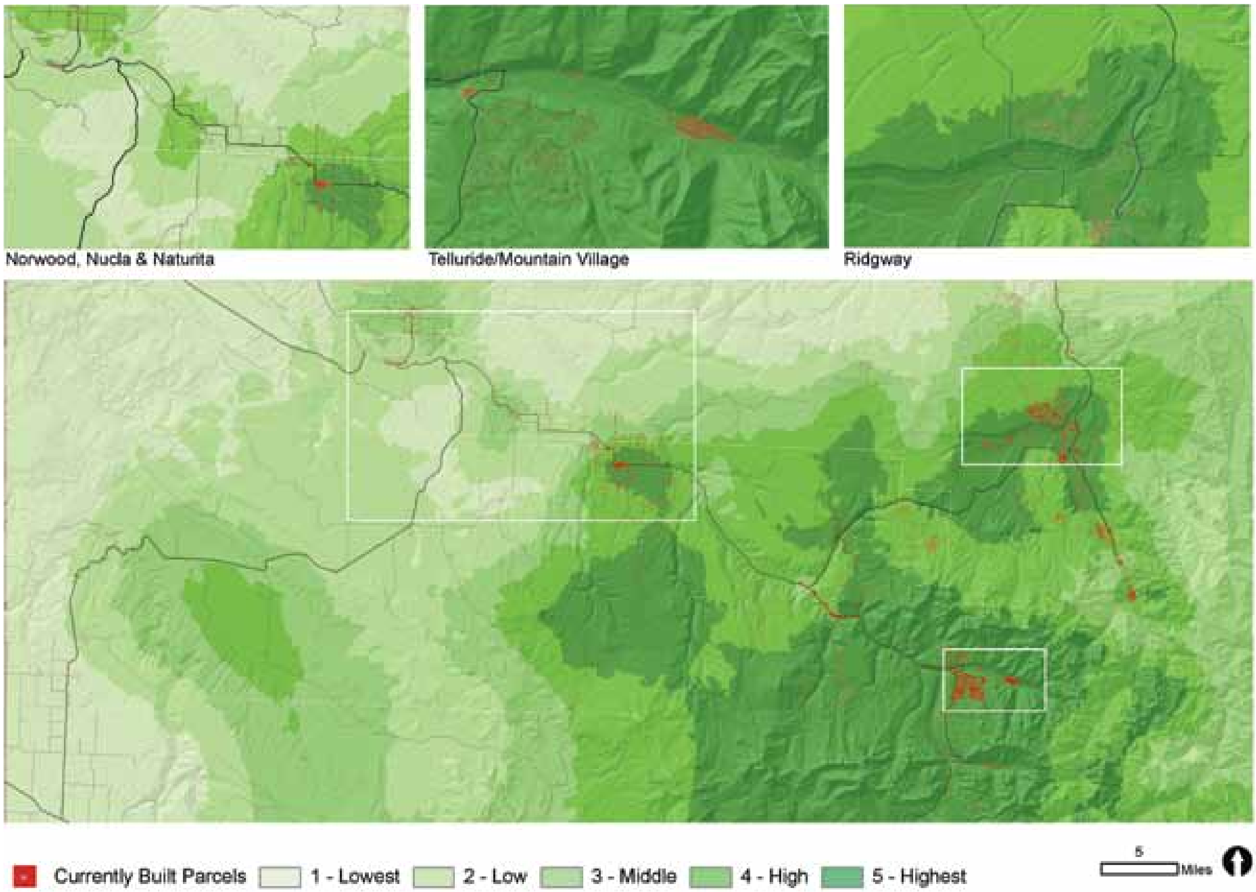


FIGURE 35, VISUAL PREFERENCE FROM WITHIN THE STUDY REGION

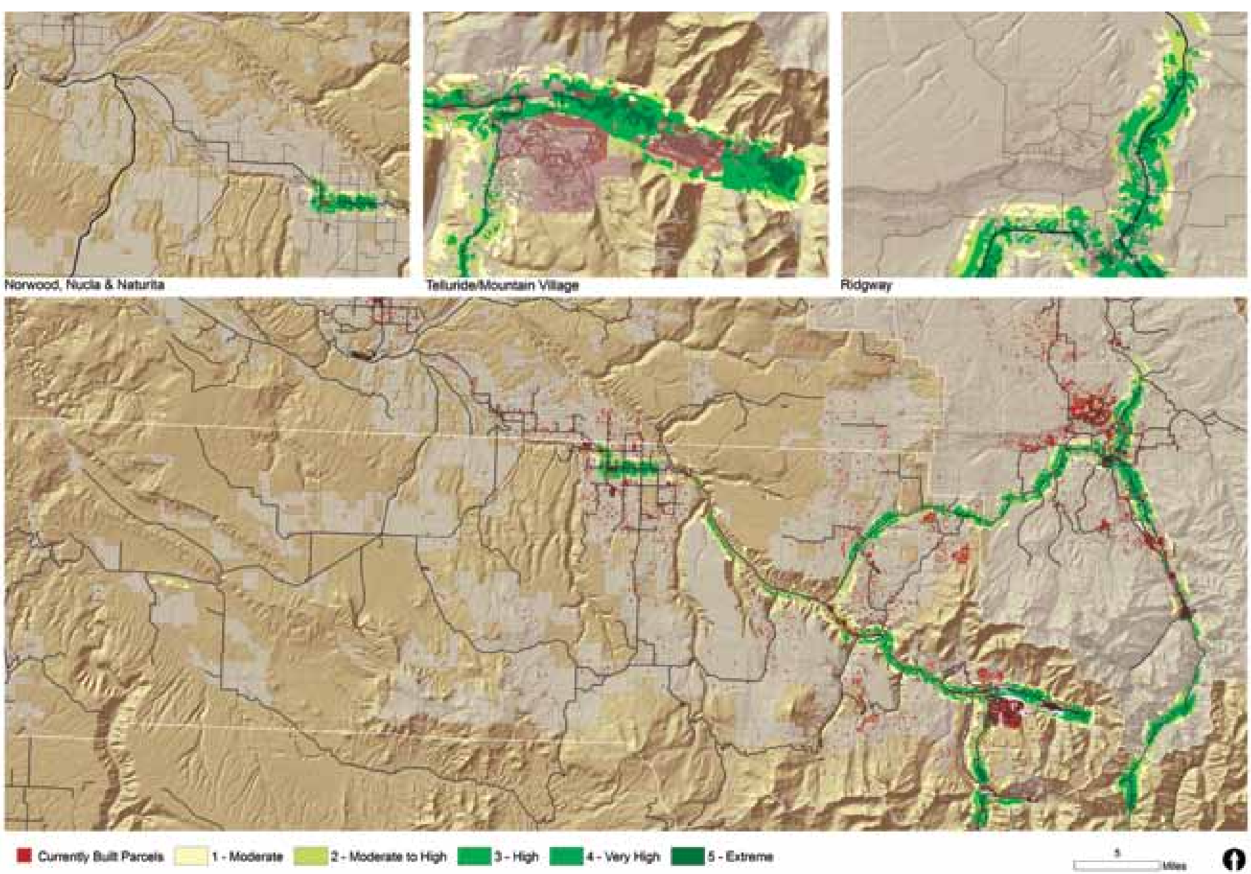


FIGURE 36, VISUAL PREFERENCE IN VIEWS FROM MAJOR PUBLIC ROADS

EVALUATION

Ecology

Three indicator species were chosen to represent broad scale ecological requirements and sensitivities of species in the region across a variety of habitat types: the bald eagle, the bighorn sheep, and the Gunnison sage-grouse (Centrocercus minimus). Since there are hundreds of species in the area, any small set of species should be considered indicative of likely impacts, but not definitive. For example, no aquatic species were represented in our modeling (due to lack of appropriate data). Nonetheless, habitats of these species constitute an appropriate starting point for conservation planning. For example, sage habitats in the U.S. have declined by approximately 50% from historic levels, and sage-grouse populations have tracked that decline. Although most remaining sage ecosystems occur on public lands, less than 3% of them are currently protected as federal reserves or national parks, and there are significant pressures for uses of these lands which are not currently compatible with sage-grouse. Thus conservation of some of the remaining sage habitat is San Miguel county has an importance beyond that of single species preservation. Similarly, bald eagle and bighorn sheep populations are indicative of the broader health of the region's ecosystems.

All ecological models were based on potential habitat maps provided by the San Miguel County GIS department or the Southwest Regional Gap Analysis Program. For each species, a similar method was used. First, we reviewed existing models and the scientific literature for studies documenting effects of human settlement pattern, roads or natural resources extraction activities on the species. For each type of activity, we developed a "fall-off" curve for impacts. In general, the presence of new development on existing habitat was considered to destroy the habitat, and known buffer distances from various disturbance types were used. For example, the Gunnison sage-grouse is extremely sensitive to noise, and has demonstrated reduction in populations up to three kilometers from oil and gas well sites.

RIPARIAN ZONE VEGETATION

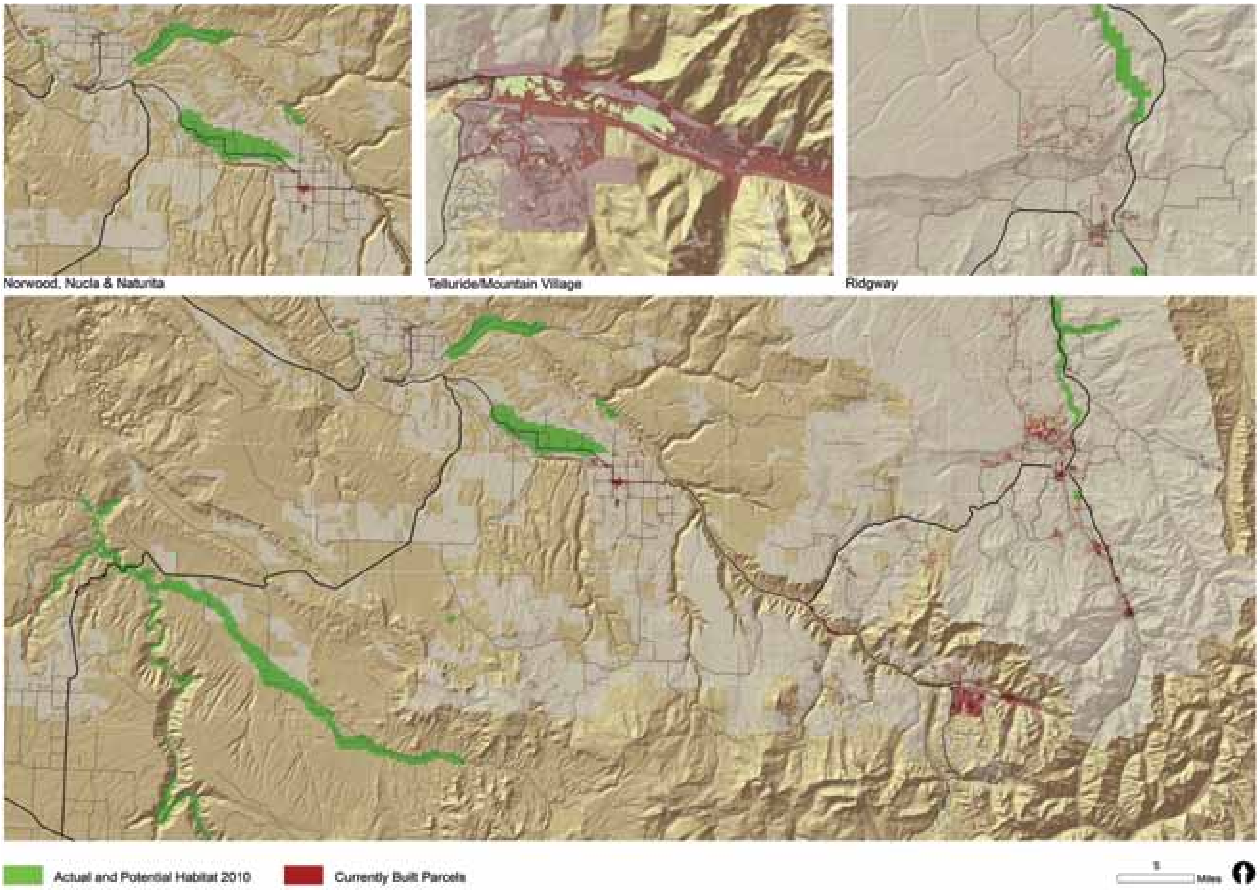


FIGURE 37, POTENTIAL NESTING HABITAT, BALD EAGLE

Bald Eagle

Bald Eagles (Haliaeetus leucocephalus) select areas with low human disturbance, suitable forest structure, and abundant prey (Fraser et al 1985). They prefer large "superdominant" trees with broad branches for perching. Fish are a major source of prey, and nest sites are typically near rivers or water bodies with a surface area of greater than 30 hectares (USFWS). Eagles normally forage within 1 mile (1.5km) of nest sites. In winter, eagles require ice-free waters (ibid.) Sensitivity to human disturbance varies by season, and is highest in nesting season. Human presence within 0.3 miles (500m) of a nest site is known to cause disturbance and typical management guidelines prohibit activities such as logging, land clearing, development or construction within a radius of 1 mile (1.6 km) of nest sites (USFWS 1987).

The bald eagle nesting habitat model was based on GIS habitat map data provided by San Miguel County. Because existing habitat maps include both nesting and foraging areas, we considered any new form of disturbance within 0.3 miles (500m) to be unsuitable habitat. This distance may understate impacts for habitat areas with nest sites close to their edges, but most defined habitat near water appeared to be centered around water bodies, so this appears to be a reasonable choice.

MAP BALD EAGLE

SOURCE: ANDREW NICHOLSON. "NORTHERN BALD EAGLE." 27 JULY 2007. ONLINE IMAGE. FLICKR. 14 DECEMBER 2009

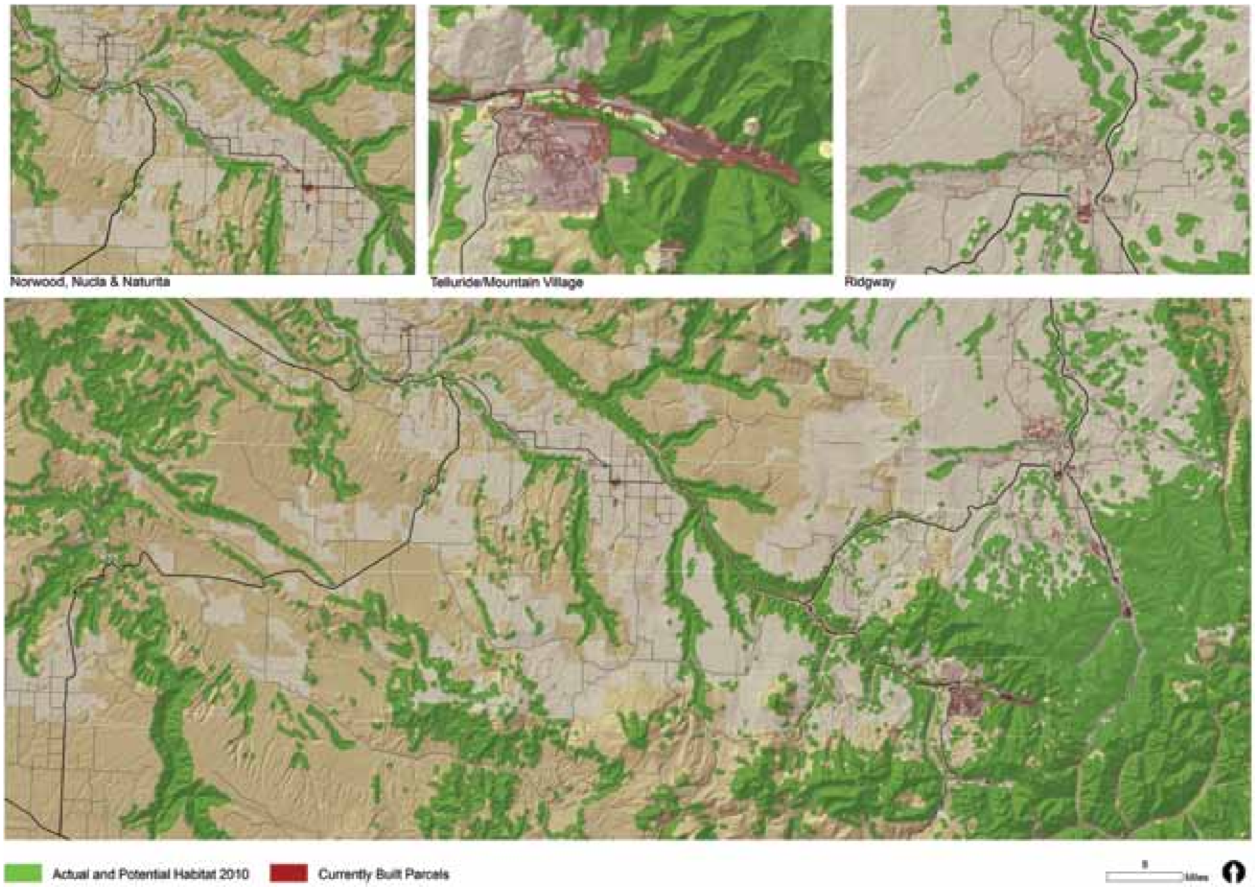


FIGURE 38, POTENTIAL HABITAT, BIGHORN SHEEP

Bighorn Sheep

Based on a GIS habitat map provided by San Miguel County and a review of the literature, we developed a model of bighorn sheep habitat impacts. Bighorn sheep habitat was modeled as function of vegetation, topography and distance to water. This species requires access to perennial water, but routinely travels a rather large distance to obtain it (up to 2 miles or 3.2km). In our study area, this requirement was met in most places. However, this species also requires vegetative cover within 0.2 miles (300m) of steep slopes. This functions as "escape habitat" and is the dominant constraint on populations in the study region. According to the GIS model created by the Southwest Regional Gap Analysis Program, Bighorn sheep are adversely affected by roads and human settlement within 150m. Therefore, our model considered as impacted all existing habitat within 490 feet (150m) of new development.

BIGHORN SHEEP

STRANGES ONES. "BIGHORN SHEEP." 28 JUNE 2007. ONLINE IMAGE. FLICKR. 14 DECEMBER 2009.

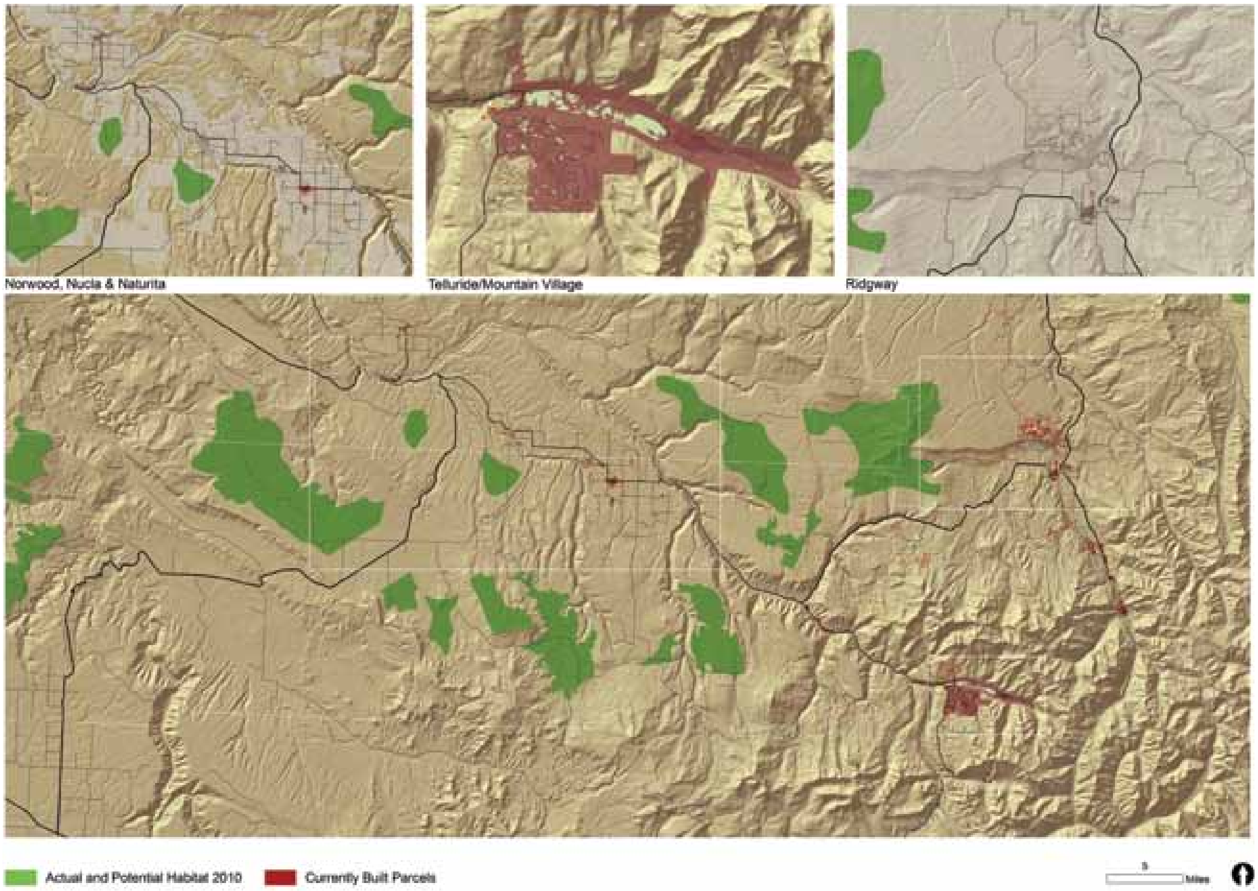


FIGURE 39, POTENTIAL HABITAT, SAGE-GROUSE

Gunnison Sage-grouse

The Gunnison sage-grouse occurs in eight isolated populations, with the largest (>3,000 individuals) occurring in the Gunnison Basin, and others in Montrose, Mesa, San Miguel and western Dolores counties (Young et al 2000). The breeding population is estimated to be less than 5,000 range wide (ibid). The species has been listed as a "species of special concern" by the Colorado Division of Wildlife and has been petitioned to be listed on the Federal Endangered Species list.

A GIS coverage of surveyed sage-grouse habitat was obtained from San Miguel County. This identified active lek sites (breeding habitat), active and potential habitat. Information on the sensitivity of GSG to disturbance was based on the Colorado State GAP analysis program habitat suitability model, and on a review of the literature. Particular attention was given to the topic of sage-grouse sensitivity to disturbance from oil and gas activities. According to Braun et al., sage-grouse exhibit significant disturbance effects from typical oils and gas operation sites. Holleran (2005) quantified these effects relative to distance to drilling rigs, main haul roads and producing wells in the Powder River Basin. His work found annual population changes of 51% on leks 0.6 miles (1km) or less from these activities, and 25% loss per year in the range of 0.6-1.2 miles (1-2km). Statistically significant effects over time were found out to about 2 miles (3 km). Acoustic studies (Patricelli et al) indicate that the primary physical mechanism of disturbance is noise, and that traffic noise from roads is significant to this species.


GUNNISON SAGE-GROUSE

SIGMA EYE. "SAGE GROUSE FEMALE." 12 APRIL 2009. ONLINE IMAGE. FLICKR. 14 DECEMBER 2009.

Because we do not have access to a calibrated noise model of the area, we simulated the falloff of noise with distance based on empirical measures of distance decay of traffic noise from studies on human disturbance. Human sensitivity to noise depends on the frequency of the sound, and it is not clear if this response spectrum is shared by GSG. Also, topography plays a major role in sound dispersion, and this is particularly true in this study area. For this reason, we used cost-distance weighting by terrain slope and trees as an approximation of sound absorbance from terrain and vegetation. In order to calibrate the distance decay, we examined cost-distance values in several locations in the study area in which sage-grouse populations persist and are closer than 1.8 miles (3 km) from a busy road. All such circumstances involve roads in canyons, with sage-grouse populations on the mesas above. We also measured cost-distance values for populations on flat planes near roads. The result was an empirical measure for the study area of sage-grouse sensitivity to terrain and vegetation-attentuated distance from roads.

Impacts were calculated for each scenario by buffering any new proposed oil or gas well, road or house by the cost distance function determined above. A simple binary threshold was used for all cases, and no distinction was made between lek sites, surveyed or unsurveyed habitat. In addition, the model did not consider potential mitigation measures, or the importance of the level or type of road traffic. Impact areas were simply those locations in which normal development of a particular type would be likely to cause some demonstrable impact on sage-grouse populations.

PIPELINES, ROADS AND WELL PAD IN THE CENTRAL PICEANCE BASIN (OUTSIDE STUDY AREA) COLORADO DIVISION OF WILDLIFE

PIPELINES, ROADS AND WELL PAD IN THE CENTRAL PICEANCE BASIN (OUTSIDE THE STUDY AREA). COLORADO DIVISION OF WILDLIFE

EVALUATION

Attractiveness for Development

The attractiveness of developable parcels, as described earlier, is driven by access to jobs, commercial centers, recreational amenities and visual quality. For full-time residents, the distances from each parcel to roads, jobs and commerce determine which parcels will be given priority in the development sequence. The allocation of second homes is divided into two submarkets. The first submarket is driven solely by the distance to the recreational opportunities and amenities in Ouray and Telluride-Mountain Village. The second submarket is guided both by distance to Telluride-Mountain Village and visual quality, which, when compared to other second home submarket, draws homeowners onto the mesas and other parcels with exceptional views.

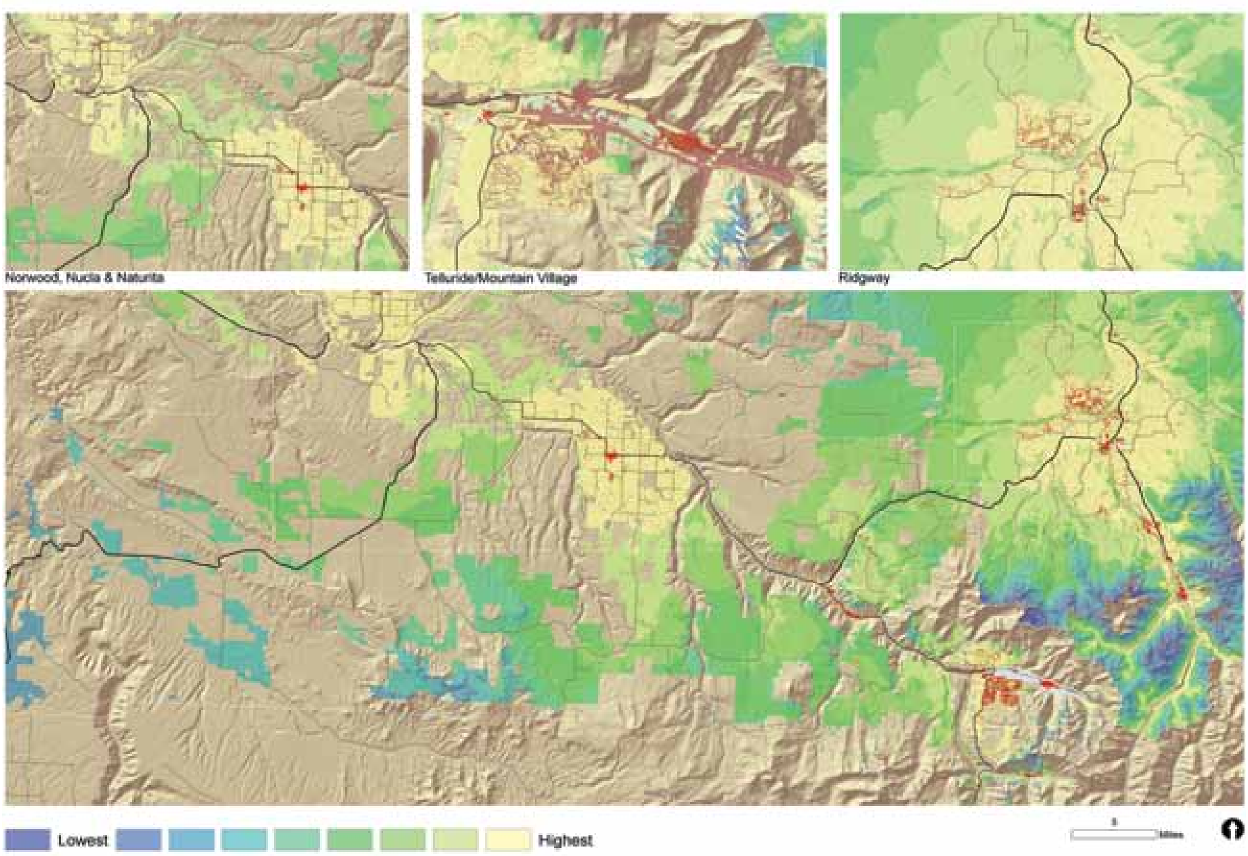


FIGURE 40, ATTRACTIVENESS FOR FULL TIME RESIDENT HOME DEVELOPMENT

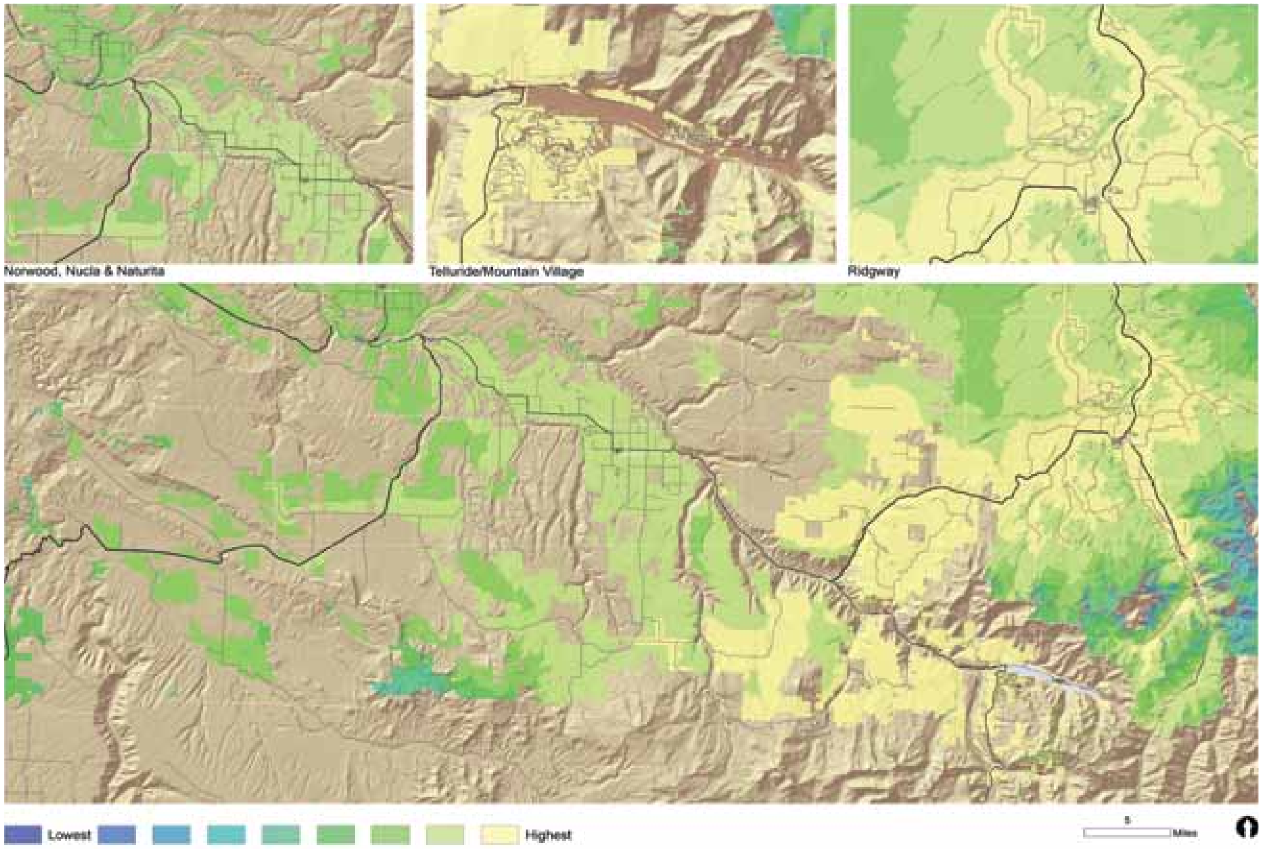


FIGURE 41, ATTRACTIVENESS FOR SECOND HOME DEVELOPMENT, SUBMARKET ATTRACTED TO VIEWS

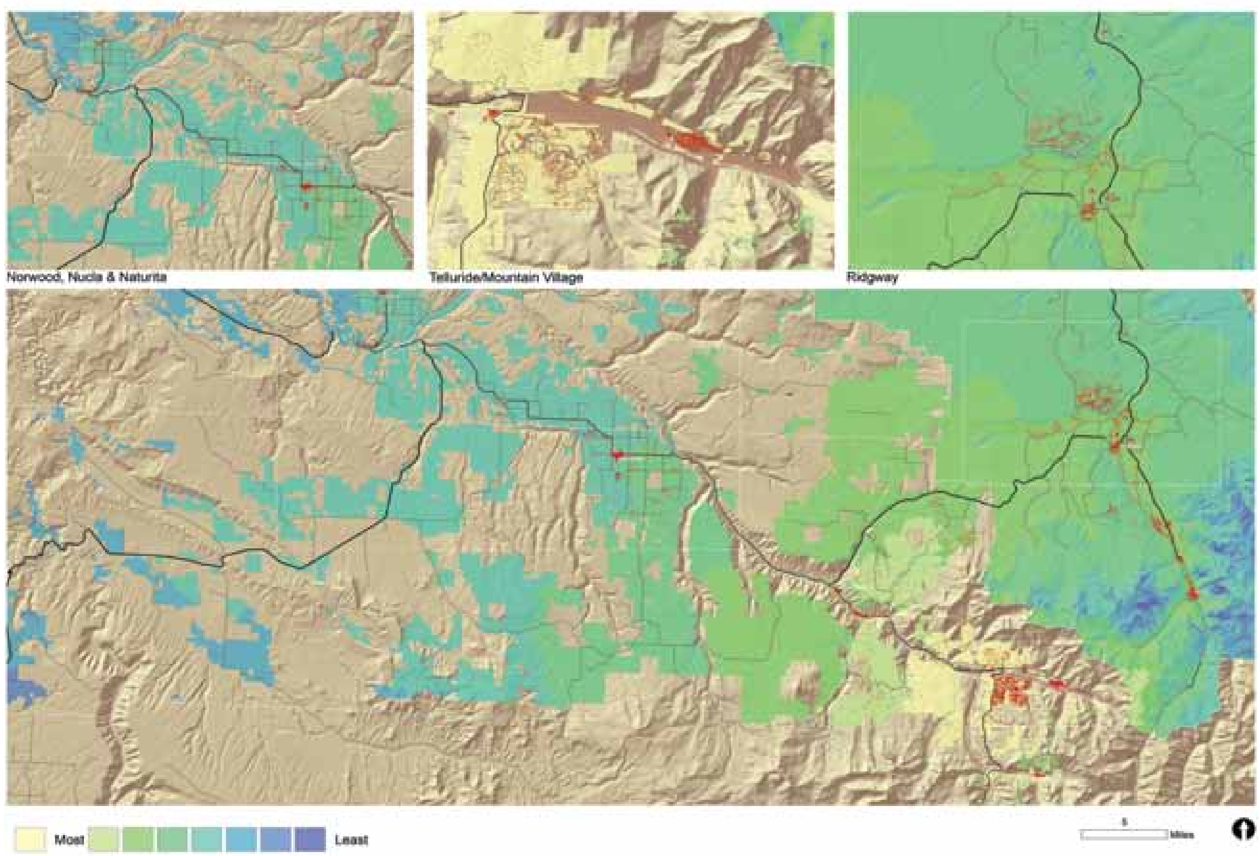


FIGURE 42, ATTRACTIVENESS FOR SECOND HOME DEVELOPMENT, SUBMARKET ATTRACTED TO RECREATION

7. CHANGE - HOW MIGHT THE TELLURIDE REGION BE CHANGED?

The Allocation of Development

Because the future is uncertain, it is desirable to consider a set of alternative futures that encompass a spectrum of possibilities. Therefore, this study examined several alternative policy scenarios and the resulting range of Alternative Futures that the region might experience. The set of scenarios were developed jointly in consultation with a group of stakeholders convened by the Telluride Foundation.

Unlike typical planning methods, we maintain a purposeful distinction between policies and plans (a "scenario"), and the response of the private market to such regulations (an "Alternative Future"). For this reason, we use a development allocation model to predict the spatial locations of redevelopment and growth based on a simulation of how market demand will operate in response to a particular scenario. This allows for the consideration of the development over time and processes such as "spillover development" which frequently results from uncoordinated single-jurisdictional planning.

There are several major strategic alternatives facing Telluride and its surrounding region. Some of these represent policy choices under community control. Others represent the actions of external parties which are not under local control, but nonetheless may have significant consequences to the community. These key assumptions, in combinations, form the basis of alternative future scenarios:

Scenarios can reflect stability or growth in the resort activities and second home real estate markets, and consequent seasonal and permanent populations. In particular, scenarios would have to consider policies and market factors affecting the residential location of employees working in these areas and their transit choices.

Scenarios can be based on variations in land management policies, including land use regulations such as zoning. This can and usually should include consideration of different sets of policies or actions occurring within adjacent jurisdictions and by the U.S. Government.

Scenarios can reflect inter-jurisdictional cooperation, or lack thereof, in the location and sharing of regional services and infrastructure. This would likely include changes to the transportation and social services sectors.

Scenarios can include possible future events of high consequence. For example, there is significant potential of major gas development occurring in the western parts of San Miguel and Montrose Counties. Even though this is highly uncertain, it could potentially cause major social, economic, ecological and visual changes. In prior studies, we have found it useful to include at least one such major potential system shock within the scenario set considered, not as a prediction, but because it serves to test the robustness of existing policy mechanisms.

Scenarios are described as a set of policy options and spatial location choices. For example, a particular scenario might start by assuming a 50% increase in overall housing demand over twenty years, with policies maintaining current zoning in one location and changing it in another. In all cases, these scenarios are mapped, and these maps would form the basis for a simulation of possible alternative futures. A number of scenarios are defined for this study based on different combinations of policy choices and exogenous economic forces.

The principal sources of future economic and demographic growth in the Telluride region are tourism spending and the demand for high end housing, primarily in the form of second homes. Natural resource extraction may also play a significant role in the economic future of the western portion of the study area. The expenditures by tourists, seasonal residents and the natural resource industries contribute to the creation of new jobs and thereby drive the growth in full-time residents.

Increased tourism expenditures, the construction and sale of second homes and natural resource extraction are treated in this study as exogenous inputs. Treating these demands as exogenous is not only convenient for the modeling process but based on the economic structure of the region. Although choices made within the region will impact the demand for tourism and second homes, acting to either increase or decrease the demand, this demand will be strongly influenced by national- and global-level economic conditions and the relative value of the Telluride region compared to other comparable destinations. The levels of demand for tourism and second homes will be shaped by decisions made by actors outside of the study region over which local residents and leaders have no control. Similarly, the demand for future development

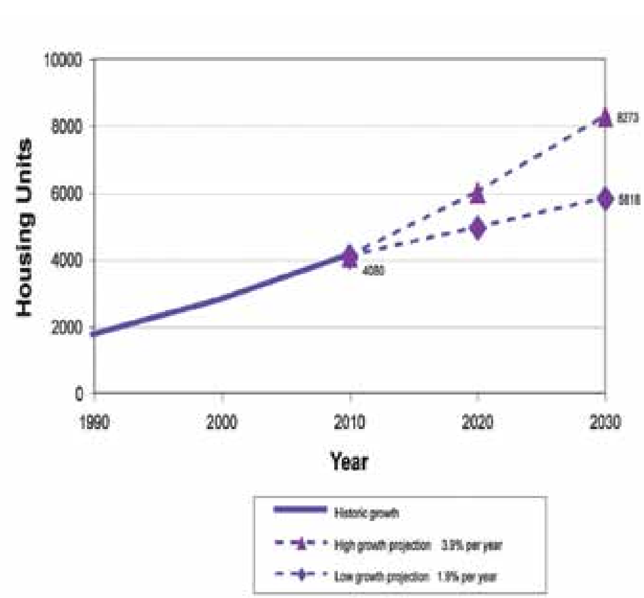


FIGURE 43, SECOND HOMES GROWTH TRAJECTORY

of natural gas and uranium will be driven in large part by the prices of these commodities as determined by global markets.

As a basis for subsequent analysis, we define low growth and high growth trajectories for the second home and tourism markets (figure 40). The low growth trajectory is based on an average annual growth rate of second homes of 1.8% over the next two decades. In the high growth trajectory, the growth of second homes averages 3.6% per year. Neither trajectory is a straight-line projection of past growth rates into the future. In fact, both projections are

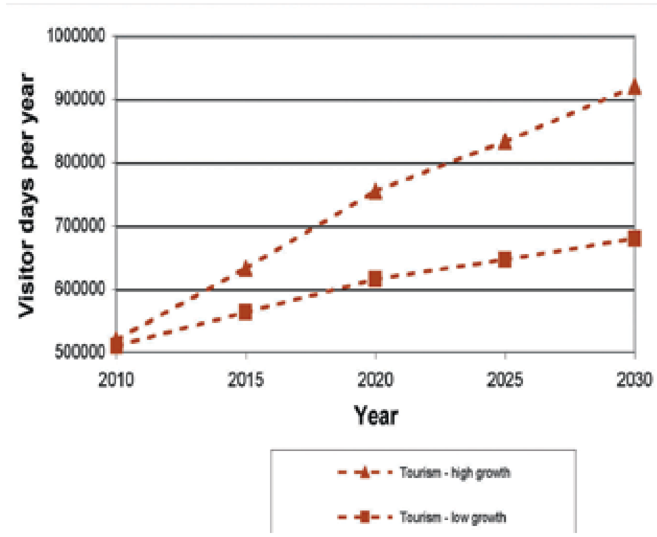


FIGURE 44, TOURISM GROWTH TRAJECTORY

lower than the growth rates in second homes in the study area over the past decade and a half, which has averaged 5.0% from the period of 1990 to 2006.

Tourism is projected to grow 1.4% annually in the low growth trajectory and 2.8% in the high growth trajectory (figure 41). Although comparable tourism visitation figures are not available, we believe that these growth rates are lower than historic rates. From 1992 to 2006, the annual growth rate of skier visits has averaged 3.5%. For the natural resource extraction industries, we bracket the future development prospects with two alternatives: no new natural resource development and development of all of the existing leases.

The economic activity generated by tourism, second homes and natural resource extraction are then used as a basis for estimating the growth in full-time residents for the region. We employed the IMPLAN model, a standard regional input-output model, to estimate the relationship between these different factors. Input-output models estimate the impacts of economic changes, for example, higher expenditures in certain sectors of the economy. Three types of impacts are estimated. The direct impacts include the demand for intermediate goods such as material inputs and labor. Indirect impacts are comprised of the additional spending by sectors that experience higher demand as a result of the change. Induced impacts reflect the increased spending by employees. Once these three impacts are estimated and totaled, the input-output model is able to assess the impact of the change in terms

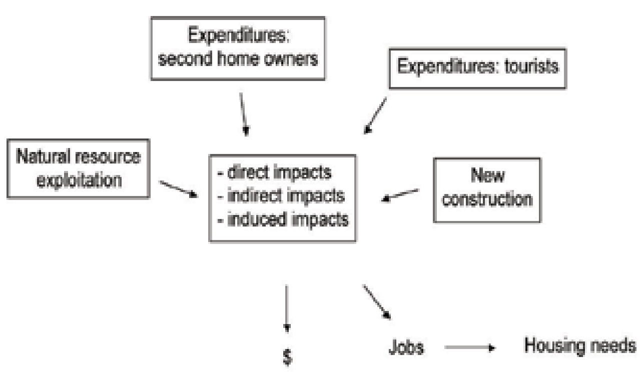


FIGURE 45, ECONOMIC MODELING

of higher economic output and increased employment. For this study, we focus on the employment impacts. The growth of tourism and higher demand for second homes in the in Telluride region stimulate the construction, recreation and retail sectors, which are the largest employers in the region. The sum of these impacts in the low growth scenario translates into further employment growth of approximately 1.0% per year, or approximately 105 jobs in the first year. The higher growth scenario produces employment growth of 2.1% per year, or an additional 225 jobs in the first year.

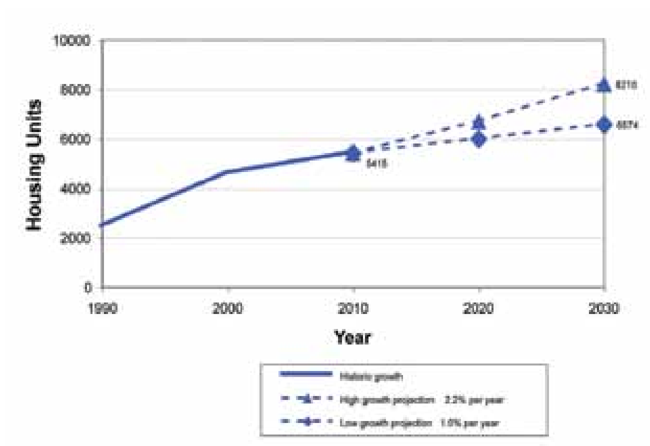


FIGURE 46, FULL TIME RESIDENT HOME GROWTH TRAJECTORY

Drawing on parameters from previous studies of the Telluride region, we projected new housing needs based on the number of additional jobs that are created in each of the growth trajectories, and shown in figure 43. An average household includes 1.6 employees, each of whom holds an average of 1.2 jobs, which corresponds to approximately 1.9 jobs per household. These jobs would be filled by a combination of full-time and seasonal workers. To calculate the associated housing needs we do not distinguish between year-round and seasonal workers, or between owner-occupied housing and renters. In all of these cases, workers need housing. To assess the impact of new housing on the future landscape, the pertinent question is where they live and how far they travel to work. The projections for growth in full-time housing range from approximately 1,000 new units in the low growth scenario to almost 3,000 new units in the high growth scenario.

The corresponding population growth estimates are 2,550 and 6,150 over the next two decades, counting only full-time residents, which would bring the current population of approximately 14,000 residents to 16,550 and 20,150 under the low and high growth trajectories respectively.

The new development projections reflect a continuation of the trend towards a higher proportion of second homes

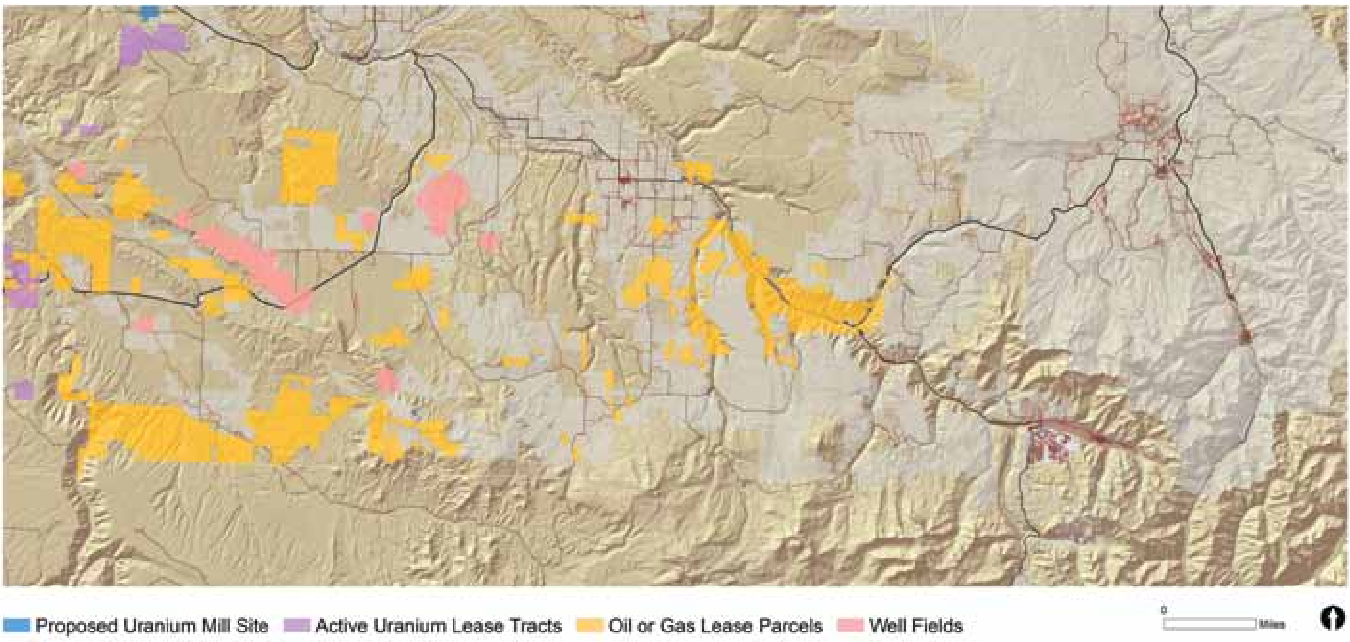


FIGURE 47, MINERAL EXTRACTION LEASES

to full-time residents in the region, with the number of second homes exceeding full-time resident units in the high growth trajectory.

There are several independent points of reference for these projections. The population growth estimates derived for this study are somewhat smaller that the projections of the State of Colorado, which forecasts average annual population growth of 1.95% for Ouray County and 2.35% for San Miguel County over the next two decades.

Another point of comparison is historic rates of employment growth in the region. The number of jobs in the study area grew at an annual rate of over 6% from 1990 to 2005, although job growth slowed from 2000 to 2005, increasing at an average rate of 1.2% in San Miguel County and 2.6% in Ouray County.

Using housing growth as a point of comparison, from the period of 1990 to 2006, an average of 290 housing units were added each year, compared to the projections used for this study of an average annual increase in housing units of 145 and 350 per year in the lower and higher growth trajectories.

While the study area can accommodate such growth in population, the more difficult questions center on the impact on housing markets, dislocation of current residents and distribution of new housing in the region, and on the social, cultural and environmental impacts of a growing population.

The expansion of natural resource extraction in western San Miguel and Montrose countries is an additional potential source of increased economic activity. If developed, the natural resource sector would create new jobs and result in a significant change in land use patterns, both in affected areas and in the construction of access roads. The future of drilling and mining activities in the area is highly sensitive to the fluctuations in resource prices. There is a long history of natural gas extraction and uranium mining and milling in the region, but the level of activity has fluctuated greatly depending on market demands and national policies. In recent years, there has been a great deal of exploratory activity, with both natural gas and uranium finds. Expectations for the future expansion of natural gas drilling in the region have been supported by the discovery of large reserves of Gothic shale gas. The Yellow Jacket prospect in the Paradox basin has proven large reserves, with five wells currently in production.

	Existing regulations	Proactive policy set	Existing regulations + high density	Proactive policy set + high density
Existing land use and zoning laws	X	X	X	X
Public land	X	X	X	X
Private and local conservation	X	X	X	X
Water and wetlands	X	X	X	X
Road right-of-way buffers	X	X	X	X
Terrain slope constraint	X	X	X	X
Protection of most preferred views from main roads		X		X
Enhanced riparian and wetland buffers		X		X
Restrictions on mineral extraction on public lands		X		X
Enhanced protection of historic landscapes		X		X
Higher density zoning in urban areas			X	X

TABLE 3, SCENARIO REGULATORY POLICY SETS

The future of the region will be shaped not only by exogenous forces but also policy choices. The exogenous forces are subject to public policies under the control of county and municipal governments. For example, each town has alternative regulations for defining developable areas, including zoning regulations and allowable densities. Affordable housing policies, particularly in the case of Telluride and Mountain Village, are additional policy levers that will help to shape the future of the region.

Those persons seeking places to build are subject to a wide range of municipal, county and state policies. We have generated four sets of policies for the scenarios which guide future development by defining where development may and may not take place and the allowable densities of development (table 3).

The first policy set assumes that the current regulations in the region are applied and that all private lands are available for development except areas protected by current laws and regulations. The current policies are the current local zoning laws, the restriction on public land, private and local conservation areas, water and wetlands, road rights of way and buffers that are legally required for power lines and other infrastructure, and terrain slope constraints. Figure 45 shows the current development constraints based on existing regulations.

After consultation in our local meetings, we created a second "proactive" policy set that enhances protection for high cultural, historical or visually valued areas by restricting development in these areas (figure 46). We added protection of the most preferred views from main

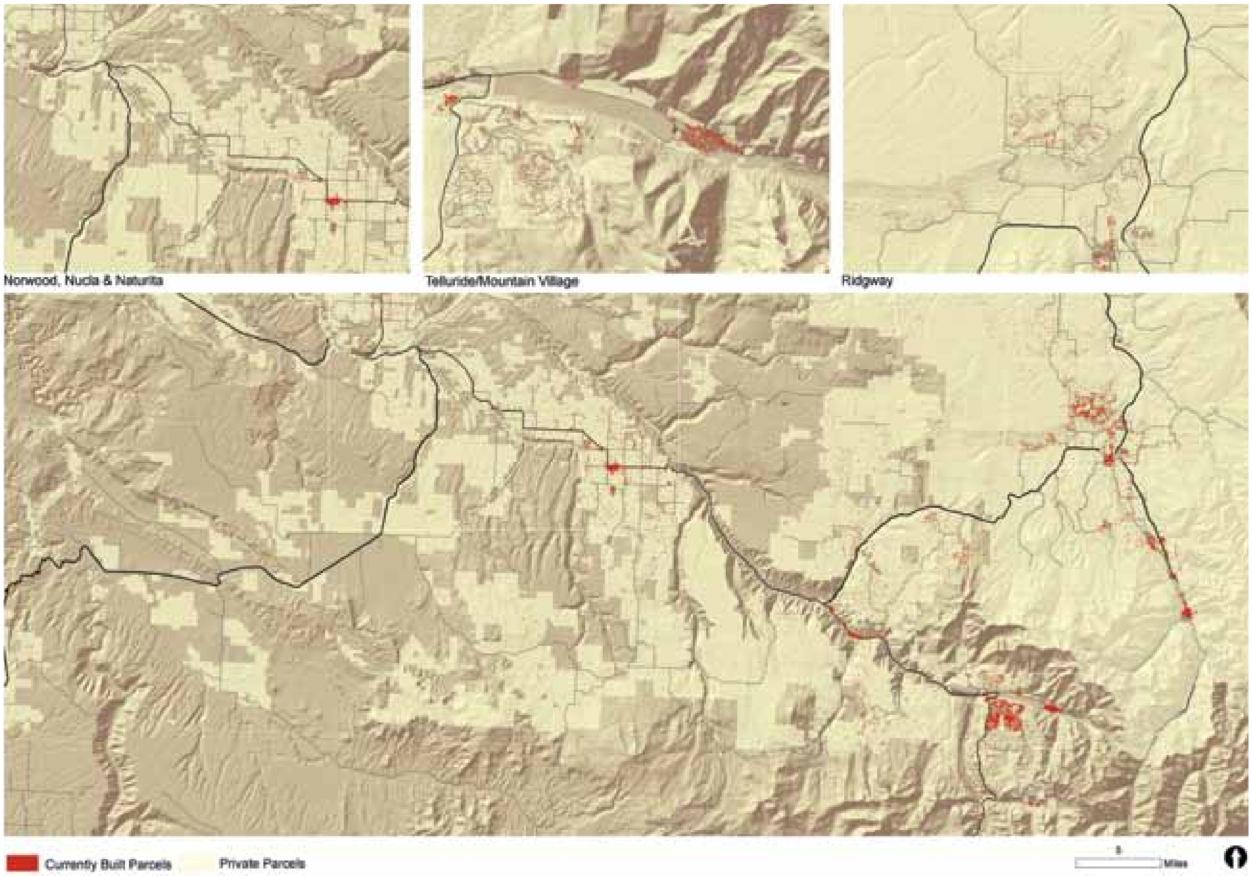


FIGURE 48, CURRENT DEVELOPMENT CONSTRAINTS

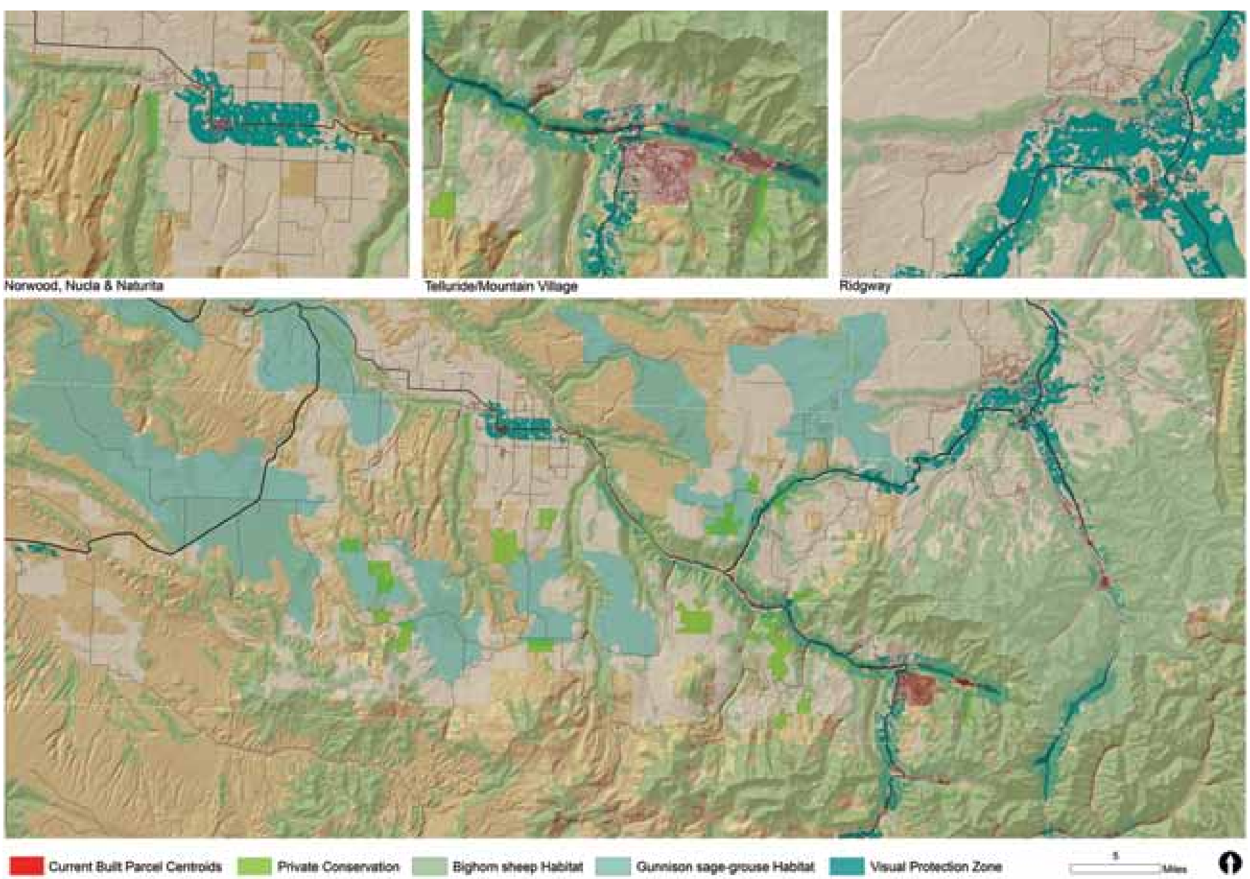


FIGURE 49, PROACTIVE DEVELOPMENT CONSTRAINTS roads, increased the riparian and wetland buffers (increasing it not from a distance standpoint but based on riparian vegetation), restricted mineral extraction on public lands, and enhanced protection of significant historic landscapes. We are speculating on the tightening of these constraints, and realize that this is very politically complicated, but we are representing a set of ideas that has been publically discussed in the meetings we have had.

A third land use policy option allows for higher density development in existing subdivisions and urban areas, increasing density by 50% in those developable parcels that are between 1 and 5 acres. These parcels lie within or are in close proximity to the existing urban areas. This differs from the previous two land policy options which are generated using current density regulations.

The fourth land use policy combines the proactive policy set with higher allowable densities.

Another policy option that we take into consideration in producing scenarios is housing policy. Our many conversations and meetings in the region suggest that there is substantial agreement that offering affordable housing to the region's workforce is one of the region's most important challenges. In the majority of the scenarios, we assume that future investments in subsidized housing will approximate current levels, thereby adding 30 new subsidized units each year. We also evaluate the impact of adding 50% more subsidized housing units or 45 units per year. Neither of these alternatives represents an attempt to match subsidized housing with regional housing needs. Rather, these two levels of public investment in housing are based on numbers that appear to be politically viable based on past decisions.

Because each of these scenario components may vary independently, there is the possibility of generating a great number of combinatorial scenarios. The report presents nine, all of which resulted from community discussions in which it was decided to test the region's sensitivity to the widest ranges of "reasonable" assumptions and policies. These scenarios are shown in table 4.

Scenario number one is based on the low growth projection and current regulations. The second scenario is constructed using low growth and the proactive set of regulations. The third scenario is simulated under low growth, proactive policies, and the addition of higher density development to lessen impacts on the landscape and to make it more efficient for public transport.

The fourth scenario is based on the high growth projection and existing regulations. The fifth is the high growth and proactive policies scenario.

The sixth scenario is based on low growth, existing regulations and higher densities. The seventh is based on high growth, existing regulations and higher densities.

The eighth is made based on high growth, existing regulations, and increased subsidized housing.

Scenario nine is based on high growth, existing regulations and mineral extraction to the full extent of currently leased lands.

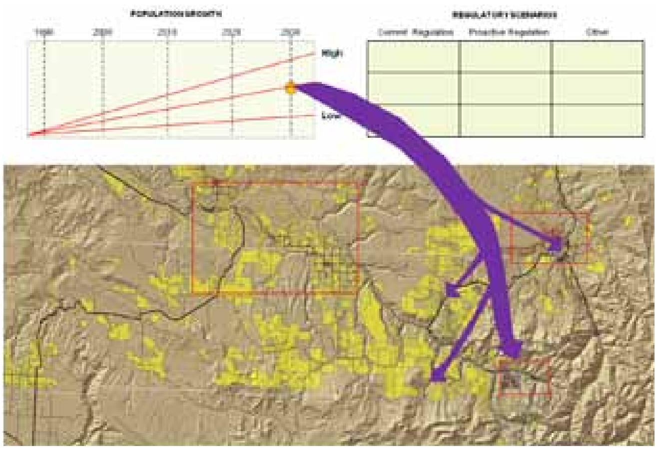
A resurgence in Uranium mining in the region would follow construction of the Piñon Ridge Mill, located approximately 12 miles west of Naturita in the Paradox Valley. If developed as planned, the mill would process 50 tons a day from underground mines along the western slope of Colorado and employ approximately 100 people. Uranium mine sites would be developed on existing identified lease sites. The scenario also includes the development of the 464 wells in the region which have measured oil or gas from initial potential tests. Approximately 300 of these wells are located west of Norwood, and south of Nucla and Naturita. These are relatively widely scattered, although these are 7 larger well fields in this area.

At this stage we have the map of legally developable parcels, the constraints based on the policy sets, the attractiveness for second and full time home locations, the demand for second and full time homes, and we have determined the level of subsidized housing and set the level of mineral extraction for each of the scenarios.

VIEW OF MOUNT WILSON RANGE

		Land use policy					New Housing Units		
Scenario	Economic trajectory	Current regulations	Proactive	Higher density	High subsidized housing	Mineral extraction	Second homes	Full-time residences	Subsidized housing
1	Low growth	x					1738	1159	600
2	Low growth		x				1738	1159	600
3	Low growth		x	x			1738	1159	600
4	High growth	x					4193	2795	600
5	High growth		x				4193	2795	600
6	High growth			x			4193	2795	600
7	High growth		x	x			4193	2795	600
8	High growth	x			x		4193	2795	900
9	High growth	x				x	4193	3295	600

TABLE 4, NINE SCENARIOS FOR FUTURE CHANGE



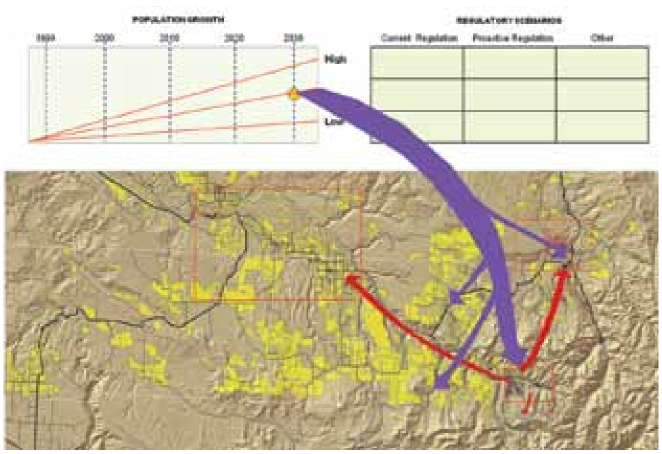
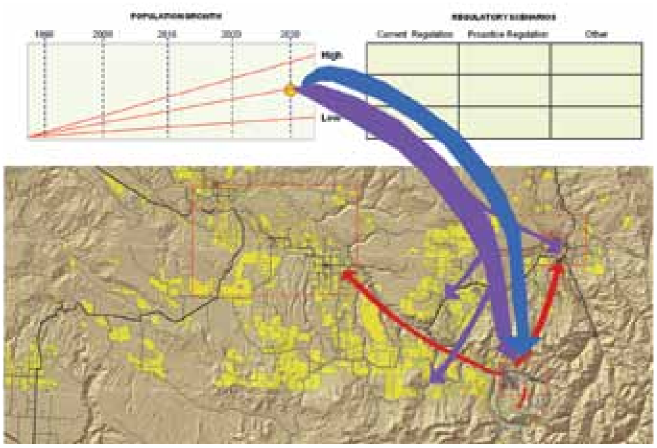


FIGURE 50, THE ALLOCATION OF FUTURE CHANGE

The simulation of future change follows a series of allocations based on the parameters of each scenario with the allocation sequence following policy choices and private market responses. Its major stages are shown in figures 47 and 48. The first stage identifies the developable private land parcels based on the policy constraints. The next stage sets the overall level of housing demand. The second step determines the amount of housing permitted in Telluride and Mountain Village. The scenarios based on current density assumptions permit a total of 950 new units in these two towns. The higher density scenario provides space for 1,500 units. The third stage of the allocation sequence is to allot subsidized housing units in Telluride and Mountain Village to the chosen level in the scenario. The modeling sequence assumes that Telluride and Mountain Village are built out before second home demand spreads to other areas. (Although a significant proportion of future land owners may prefer to reside in other areas over Telluride and Mountain Village, this simplified assumption does not impact the results, as these towns will be largely built out over 20 years in any realistic scenario.) In the next steps in the process, second home demand fills in the remaining allowable housing development in Telluride and Mountain Village, followed by any excess demand being allocated to the locations most attractive for second homes. Finally, full-time residents are allocated to the remaining locations that they find most attractive.

This modeling algorithm assumes that there is no net loss of housing units for full-time residents in Telluride and Mountain Village, which in all likelihood underestimates the potential for second home owners to displace existing residents there. (Modeling this highly complex process would be highly speculative at best, requiring predictions



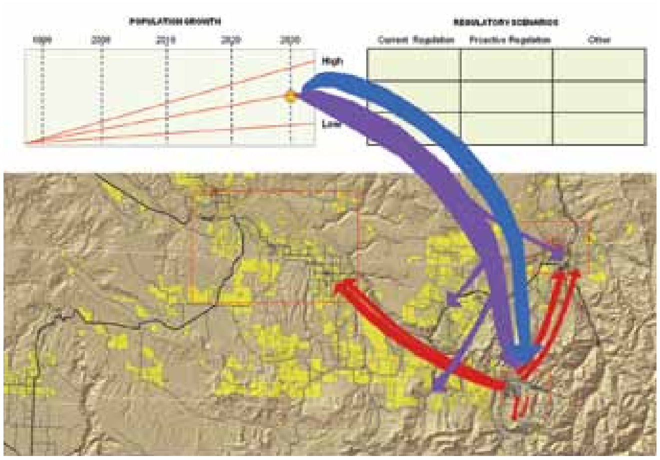


FIGURE 51, THE ALLOCATION OF FUTURE CHANGE

of future land prices in these areas and price thresholds at which households will elect to sell their property and move out.)

The allocation of housing follows a sequence that reflects willingness to pay, with second home owners choosing first from the most desirable properties. Full-time residents then select from the remaining available properties. Depending on the level of demand and the supply of available land as dictated by policy choices, there may be insufficient housing sites in the most attractive areas for both second home owners and full-time residents. This is particularly likely in the Telluride and Mountain Village area where most the jobs are located. In this situation, existing residents are induced or forced to move to less desirable locations farther from their workplace, following a process of gentrification-dislocation that has been happening in the region for more than a decade.

Policy makers in the region have been attempting to hold back this gentrification process by building subsidized housing for residents of the region. Unfortunately, the creation of subsidized housing has not kept pace with the displacement induced by the demand for high end housing.

The net result of this modeling will allocate the future distribution of the different types of households. This will be the principal factor in creating the alternative futures for the Telluride region. In the figures that map the new pattern of development, red represents existing development, the new second homes are in purple and the new year round residences are blue. Each dot is a new house and its immediate area, which has been expanded to increase legibility on the map.

CHANGE

Low Growth Scenarios

Figure 49 shows alternative future #1, based on the low growth scenario and the region's existing regulations. There is little new development outside the existing urbanized areas. After 'filling' Telluride and Mountain Village with second homes, it develops Ridgway in a mixture of second and full time homes, and Norwood predominantly for full time residents. A mix of second homes and full-time residents and second homes are developed in the view lots north of Ridgway and a small number of houses (less than two dozen) are developed on the mesas.

Figure 50 depicts alternative future #2. It is based on the low growth scenario, with additional proactive policies. These policies, which protect environmentally valuable and sensitive areas, induce a significant displacement of growth away from viewshed corridors, approximately one quarter of the new houses allocated. However, this relocation does not significantly alter the general distribution of housing across the study area.

Figure 51, alternative future #3, is the result of the low growth scenario with proactive policies along with higher residential density in urban areas. This is the alternative that uses the least land for new development as higher density in urban areas and adjacent areas, particularly Telluride and Mountain Village, are able to absorb a majority of the new housing demands. This results in a significant reduction in sprawl, for example, in the areas surrounding Ridgway and Norwood.

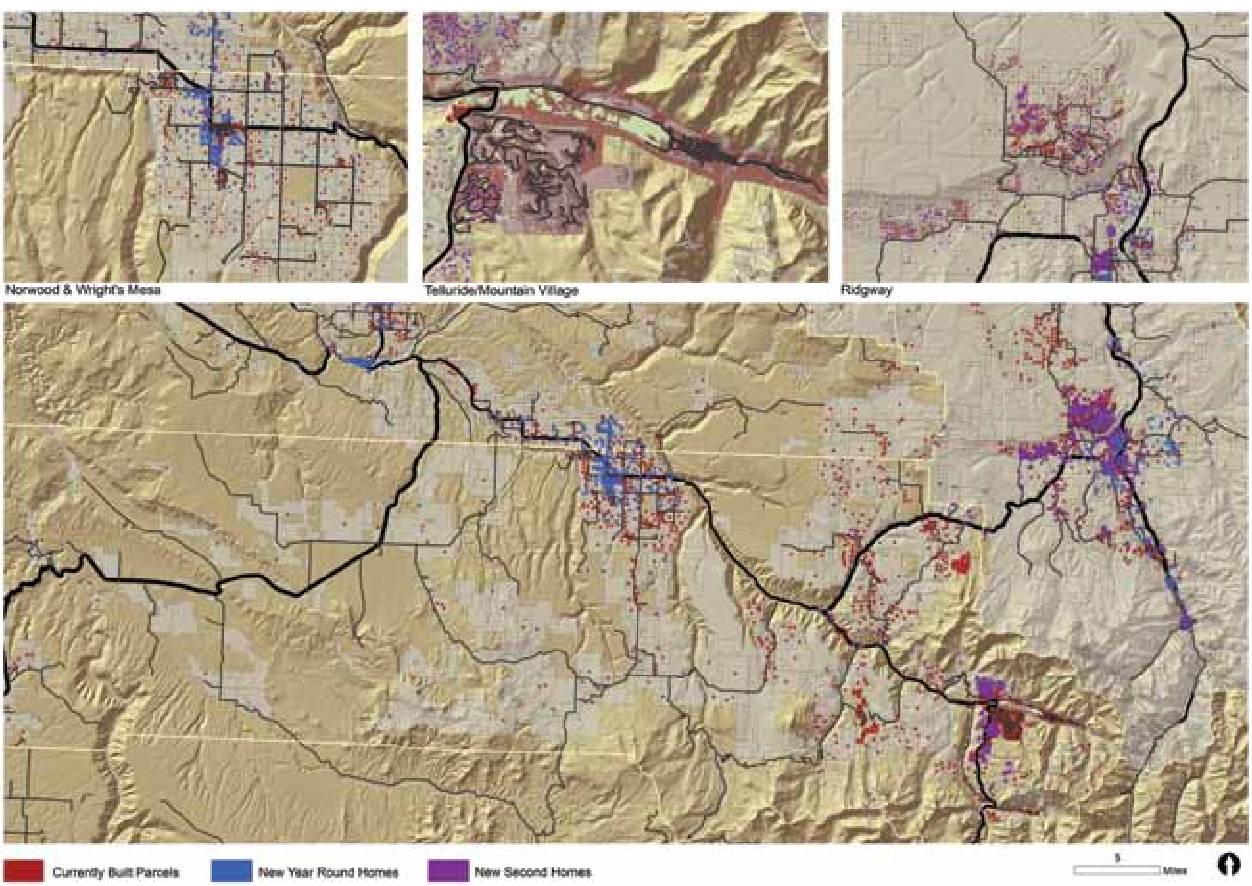


FIGURE 52, ALTERNATIVE FUTURE #1, 2030
LOW GROWTH, EXISTING REGULATIONS

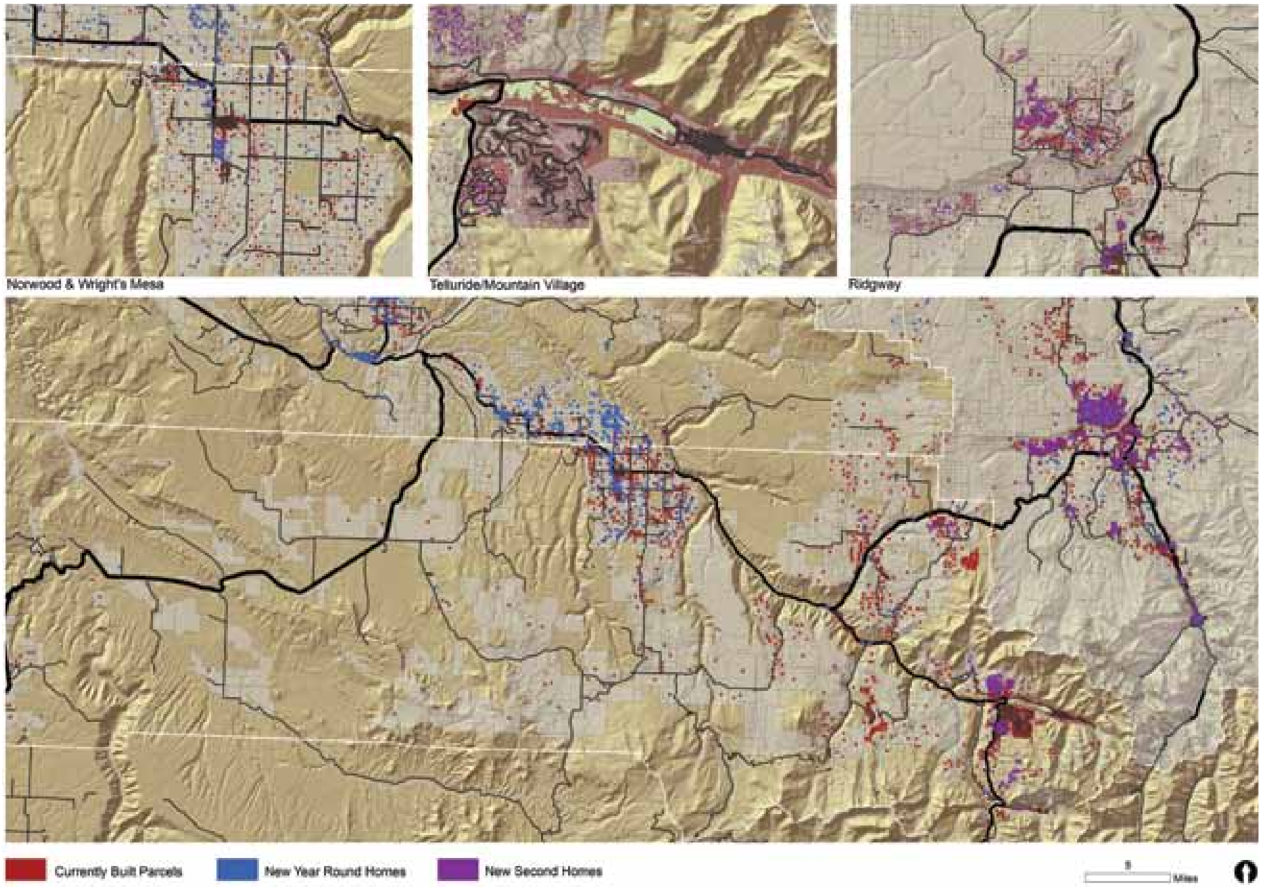


FIGURE 53, ALTERNATIVE FUTURE #2, 2030
LOW GROWTH, PROACTIVE REGULATIONS

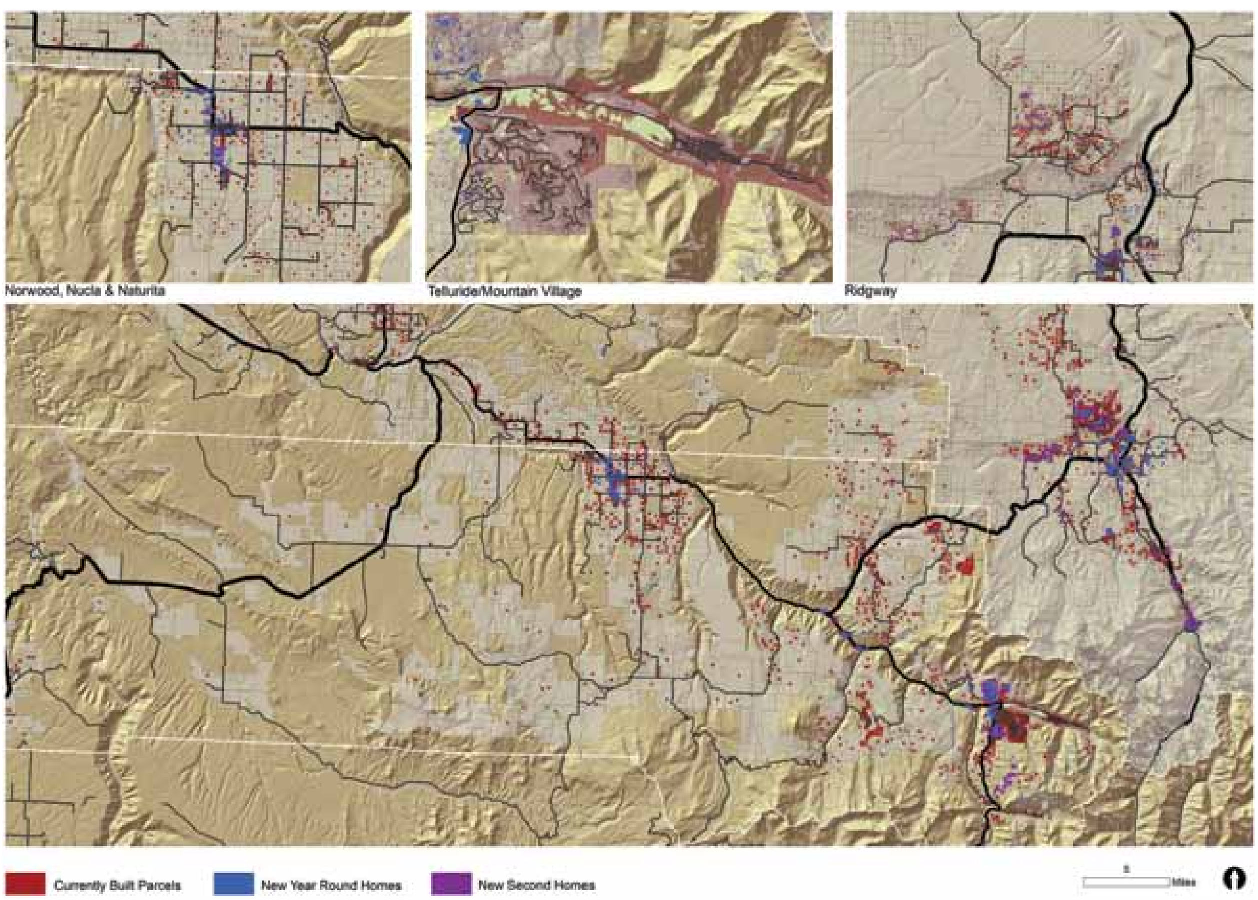


FIGURE 54, ALTERNATIVE FUTURE #3, 2030
LOW GROWTH, PROACTIVE REGULATIONS, HIGHER DENSITY

CHANGE

High Growth Scenarios

Figure 52 shows alternative #4, based on the high growth scenario and existing regulations. Norwood and Ridgway experience major development, as do the mesa areas and the areas between Ridgway and Montrose. All areas easily accessible to the major entry roads to Telluride experience significant development and change. As in all the other high growth scenarios, this produces a more socially segregated housing pattern, with second homes concentrated in Telluride/Mountain village and Ridgway-Ouray, and with more of the full time residents in Norwood and outlying areas as well as on the mesas. More than 800 new houses are developed on the mesas, three quarters of which are second homes.

Figure 53 shows alternative #5, based on high growth and proactive policies. While it protects many environmentally sensitive areas and some of the most preferred public road views, it also pushes some of the people further out onto the mesas and other more remote areas. It is the most sprawling development pattern and receives approximately 20% more development on the mesas than high growth without proactive policies. Under this scenario, the demand for housing exceeds the number of available parcels. The consequence will be the displacement of approximately 2,000 present and future full-time households out of the study area, while all of the new housing in Norwood and Ridgway is taken up by second-home owners leaving fewer options for new year-round residents.

Figure 54 is the result of the high growth, existing regulations scenario #6, which allows higher densities in urban and adjacent areas. The higher density provisions considerably reduce sprawl as Norwood, Nucla, Naturita and Ridgway all more than double in size under this scenario.

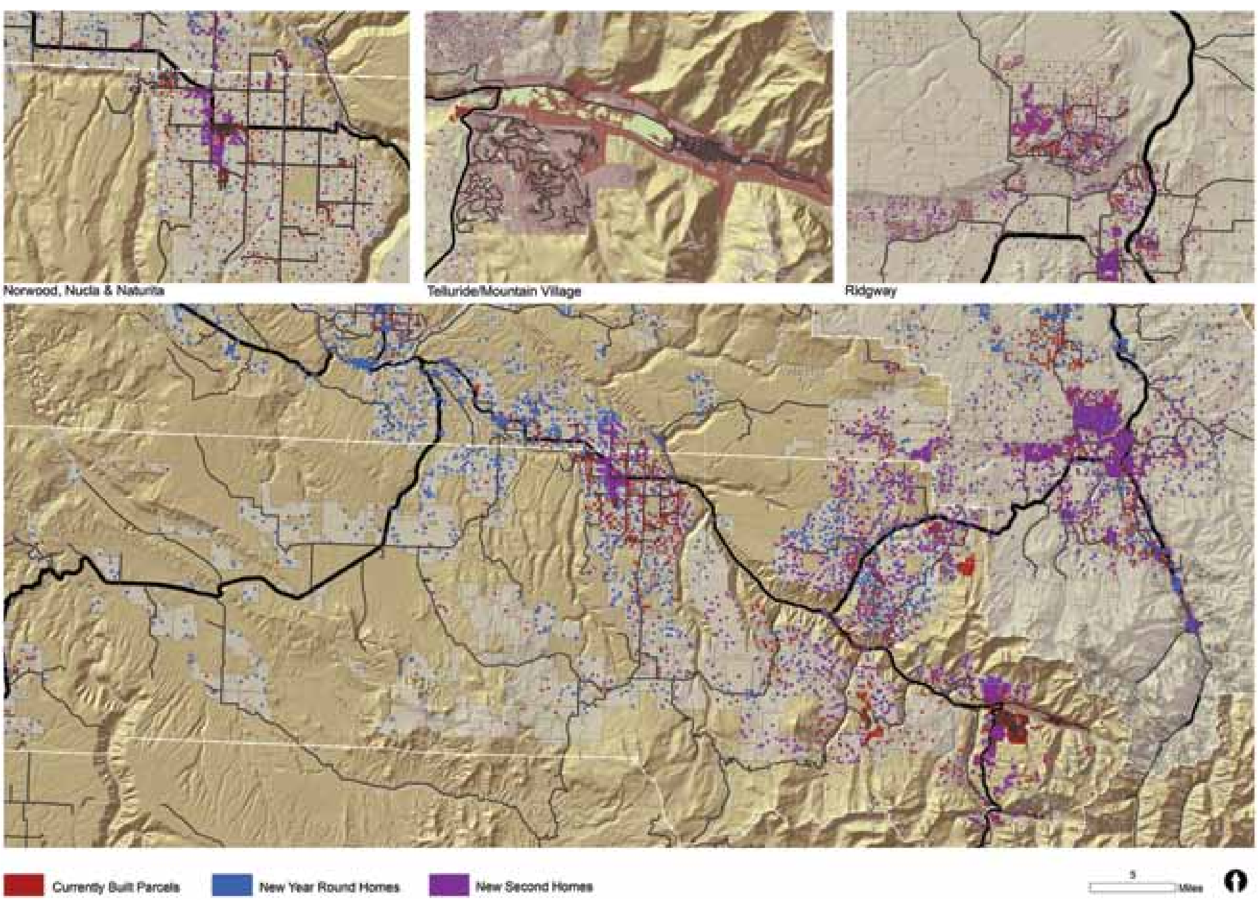


FIGURE 55, ALTERNATIVE FUTURE #4, 2030
HIGH GROWTH, EXISTING REGULATIONS

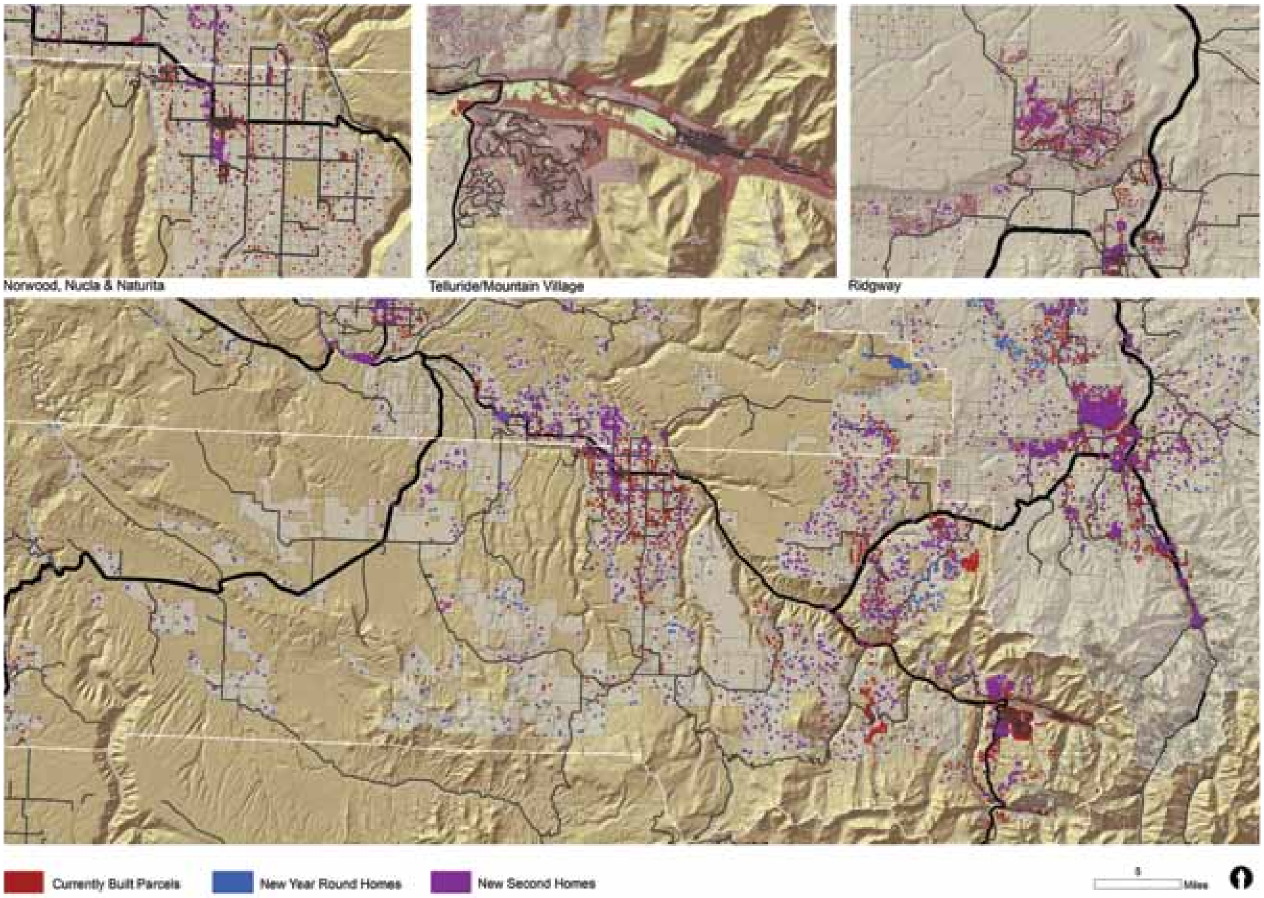


FIGURE 56, ALTERNATIVE FUTURE #5, 2030
HIGH GROWTH, PROACTIVE REGULATIONS

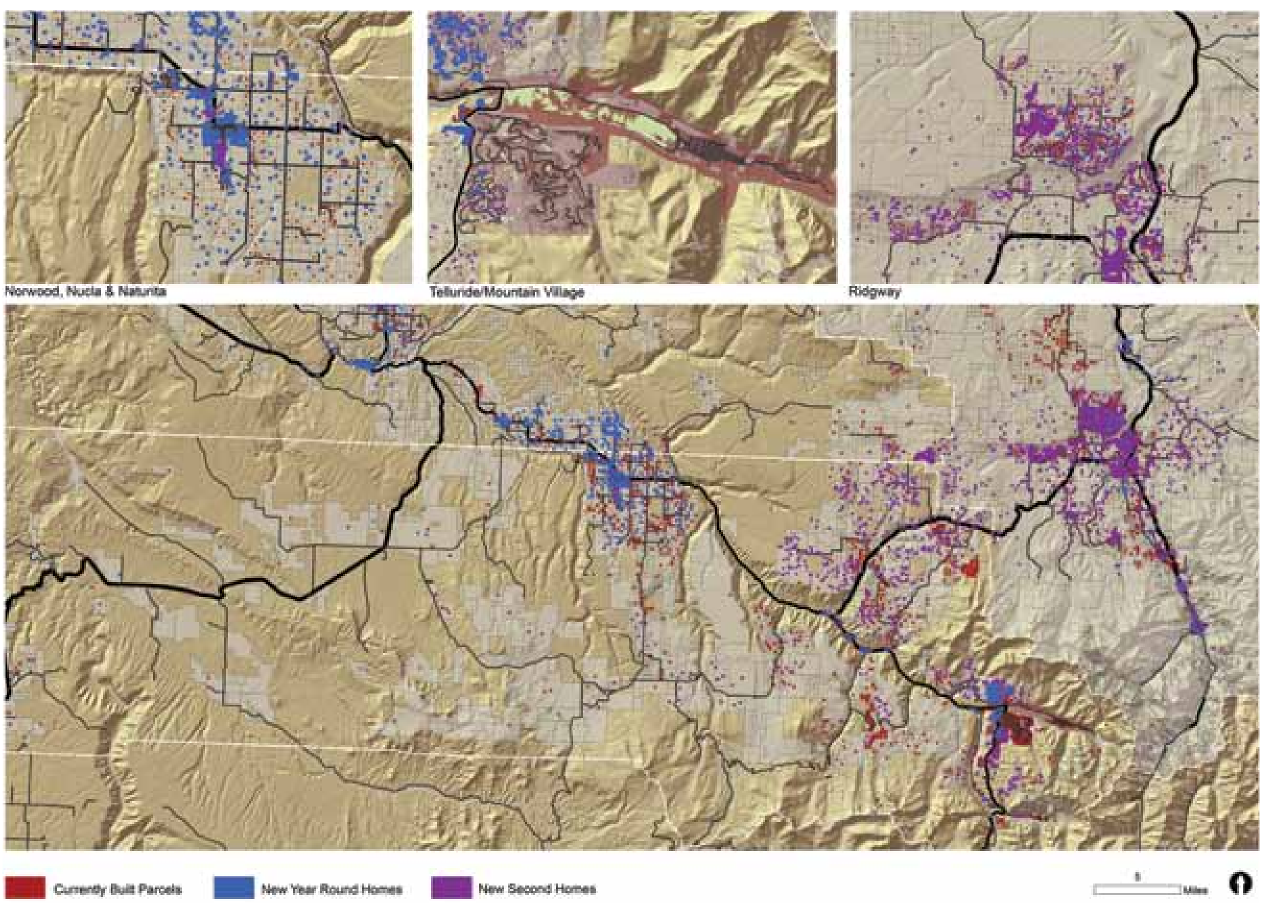


FIGURE 57, ALTERNATIVE FUTURE #6, 2030
HIGH GROWTH, EXISTING REGULATIONS, HIGHER DENSITY

This creates a concentrated pattern that would be amenable to the development of an efficient public transport network.

Figure 55 is the alternative with high growth, the proactive policies and higher density development in urban areas. Alternative #7 is somewhat more compact than the other high growth scenarios and maintains more of the development in the Ridgway-Telluride-Norwood corridors. This greatly reduces development on the mesas, which receive half of the new development compared to the base high growth scenario.

Alternative #8, shown in figure 56, is based on the high growth scenario with existing regulations and the amount of subsidized housing which was forecast. The additional 300 units of subsidized housing has a negligible impact on the overall pattern of new housing, which is very similar to the base high growth alternative (#5).

Figure 57 shows alternative #9, based on high growth with extensive oil, gas and mineral activity as allowed by the existing mining leases. Its added development mainly impacts the western parts of the region near Naturita and Nucla. The high growth rate pushes new development into the areas where natural resource extraction is likely, suggesting a possible conflict over appropriate land uses.

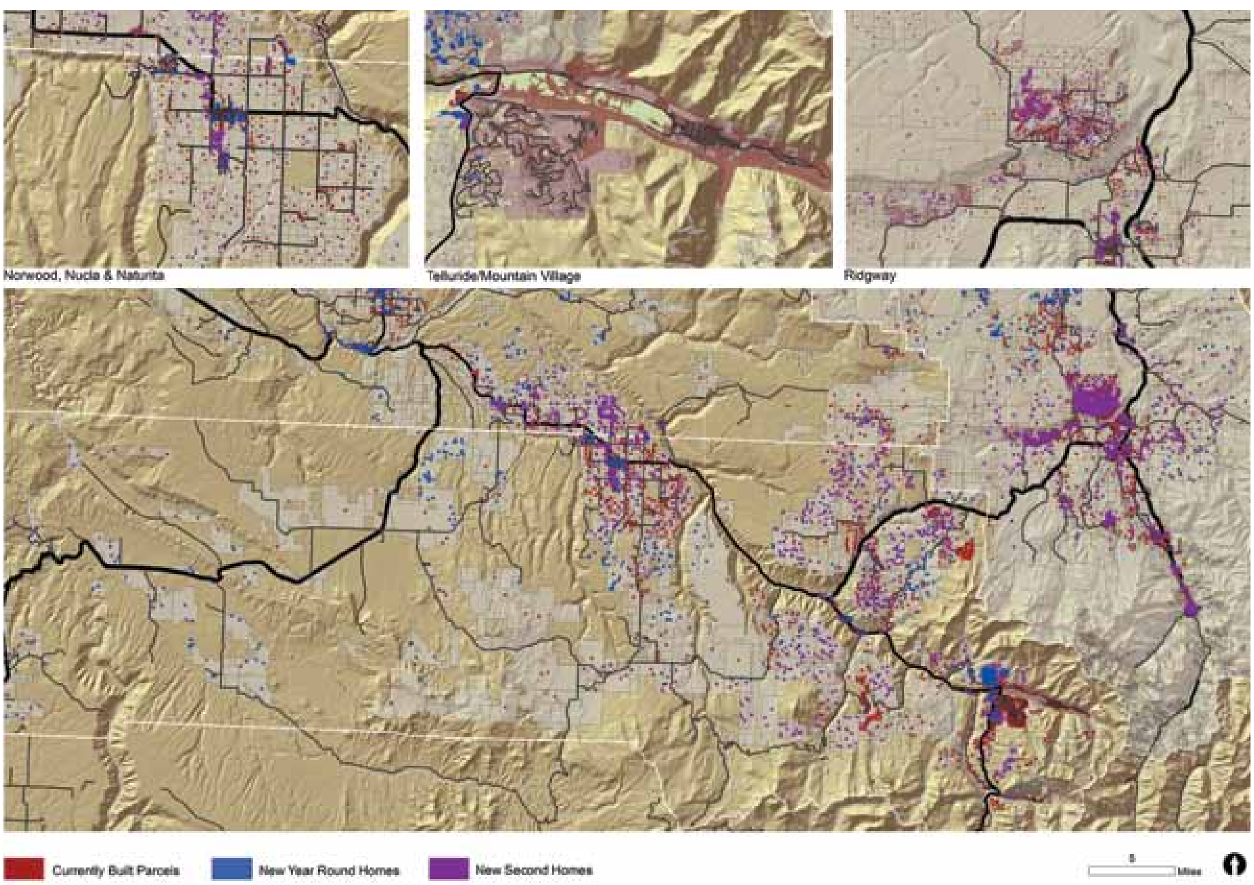


FIGURE 58, ALTERNATIVE FUTURE #7, 2030
HIGH GROWTH, PROACTIVE REGULATIONS, HIGHER DENSITY

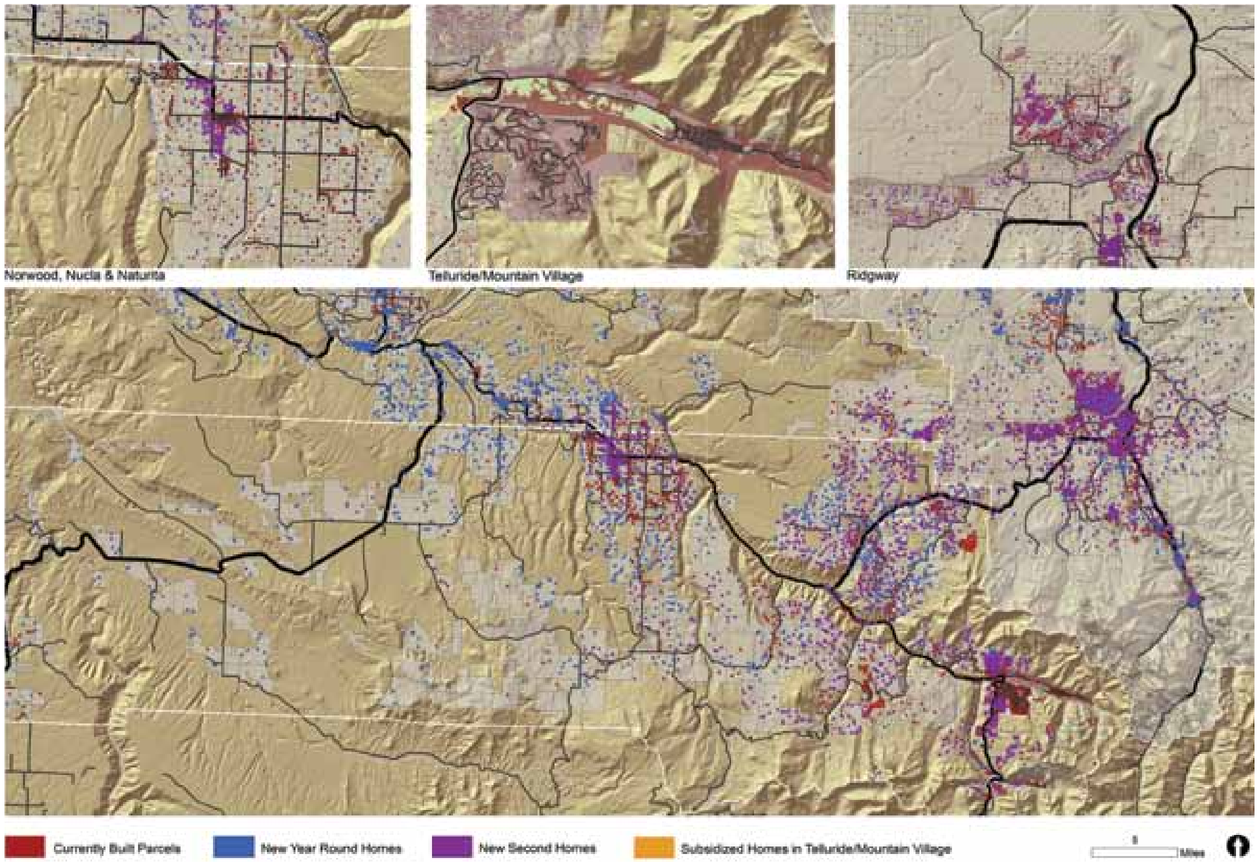


FIGURE 59, ALTERNATIVE FUTURE #8, 2030
HIGH GROWTH, EXISTING REGULATIONS, SUBSIDIZED HOUSING

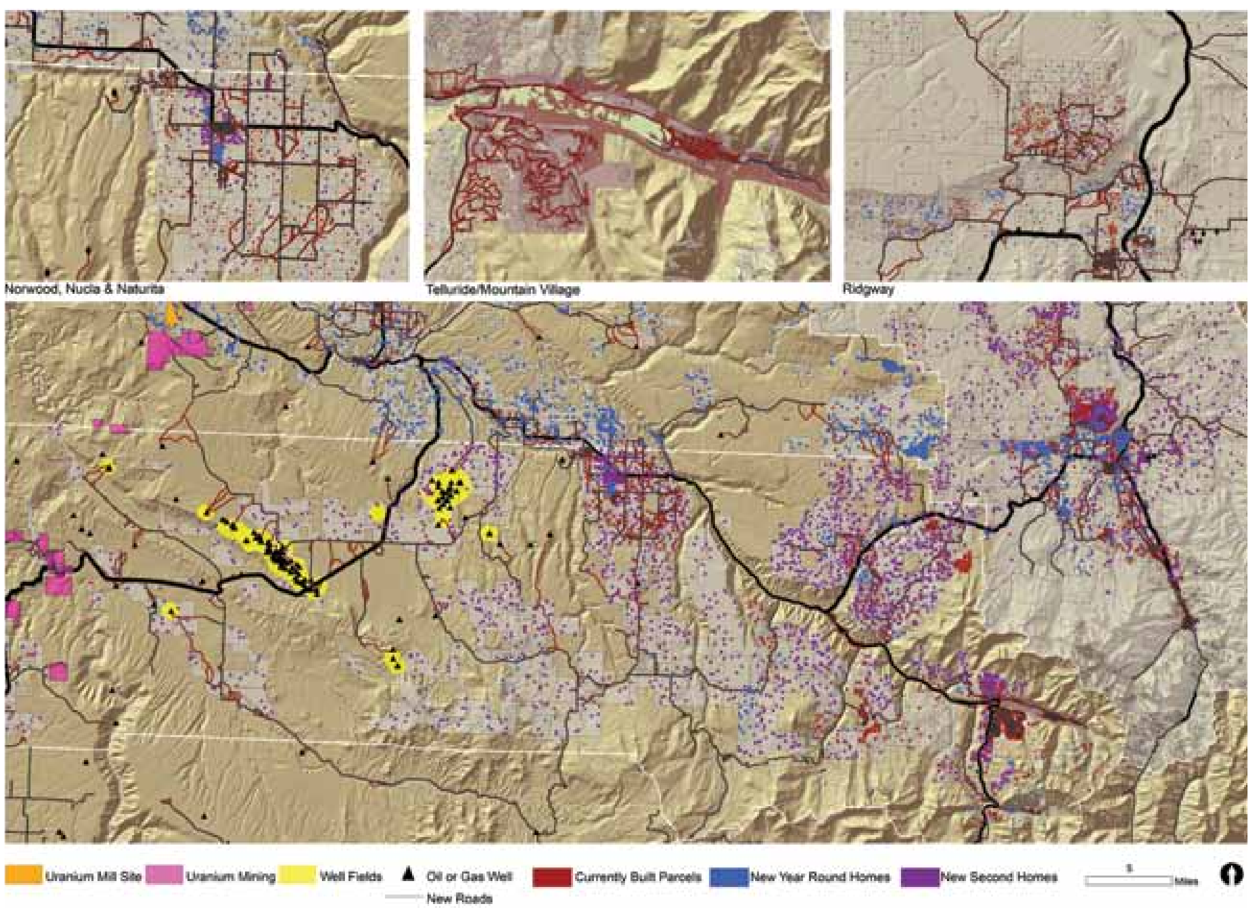


FIGURE 60, ALTERNATIVE FUTURE #9, 2030
HIGH GROWTH, EXISTING REGULATIONS, MINERAL EXTRACTION

8. IMPACT - WHAT DIFFERENCES MIGHT THE CHANGES CAUSE?

Housing and Population

The differences in the development patterns between 2010 and 2030 among the nine alternative futures will be shaped by the development forecasts in the low growth and high growth scenarios, variations in development attractiveness across the region and the differences in public policies. Telluride and Mountain Village are built out in all of the scenarios. The other sub-regions show considerable variation both in the amount of new development and in the composition of new housing units among seasonal and year-round residents.

Second homes and year-round homes are consistently allocated first to the region's existing urban areas: Telluride/Mountain Village, Ridgway and Norwood. In the high growth scenarios, second homes (and some year-round homes) proliferate in unincorporated areas, including the mesas between Ridgway and Placerville along Colorado State Highway 62 and the mesas along State Highway 145 between Telluride and Norwood.

As expected, second home development along Highway 145 decreases with distance from Telluride; conversely, year-round homes increase as one approaches Norwood. This illustrates the attractiveness priorities for visual amenities and proximity to tourist and recreational areas for second home owners, and the more affordable land which will attract full time residents.

Year-round homes consistently orient along the major road alignments in the unincorporated areas and cluster in and around the towns of Norwood, Nucla and Naturita. Under all scenarios, there will be substantial increases in the number of full-time residents in the West End.

Urban areas, including Ridgway and Norwood, will feature significant second home growth in the high growth scenarios, displacing year-round homes with important implications for the character and economic composition of these towns. In the low growth scenario, our model predicts a majority of new residents in Norwood will be full time residents. In the high growth scenario, however, the majority of new entrants in Norwood are second home owners. Ridgway shows a similar pattern, except with a higher proportion of new units going to second-home owners in all scenarios because of acute competition for buildable land, high quality views, and accessibility to local amenities.

Low Growth - Existing Regulations

The low growth with existing regulations alternative future adds approximately 3,300 new housing units to the almost 10,000 units currently in the study area (figure 58). Slightly more than half of the new development is projected to be second homes. The population of full-time residents would increase by 3,500, adding to the estimated 2010 population of more than 12,000.

Following the recent historic trend, second-home owners would be drawn to Telluride and Mountain Village, which would accommodate approximately half of the demand. Further second home development would occur in Ridgway and on the mesas south of Norwood and north of Ridgway. Almost half of new full-time residents end up in the west, with the balance occupying the areas around Ridgway and available subsidized housing in the Telluride vicinity. Although there is a mix of year-round and seasonal development in the largest population centers, the trend is towards social segregation, with second-home owners accounting for approximately two-thirds of new Ridgway residents and most all new development on the mesas in addition to the new second homes in Telluride and Mountain Village. Approximately three-quarters of the new housing units in Norwood are occupied by full-time residents. In the low growth scenario, a majority of the new growth is concentrated in existing urban areas along with moderate new development in unincorporated areas.

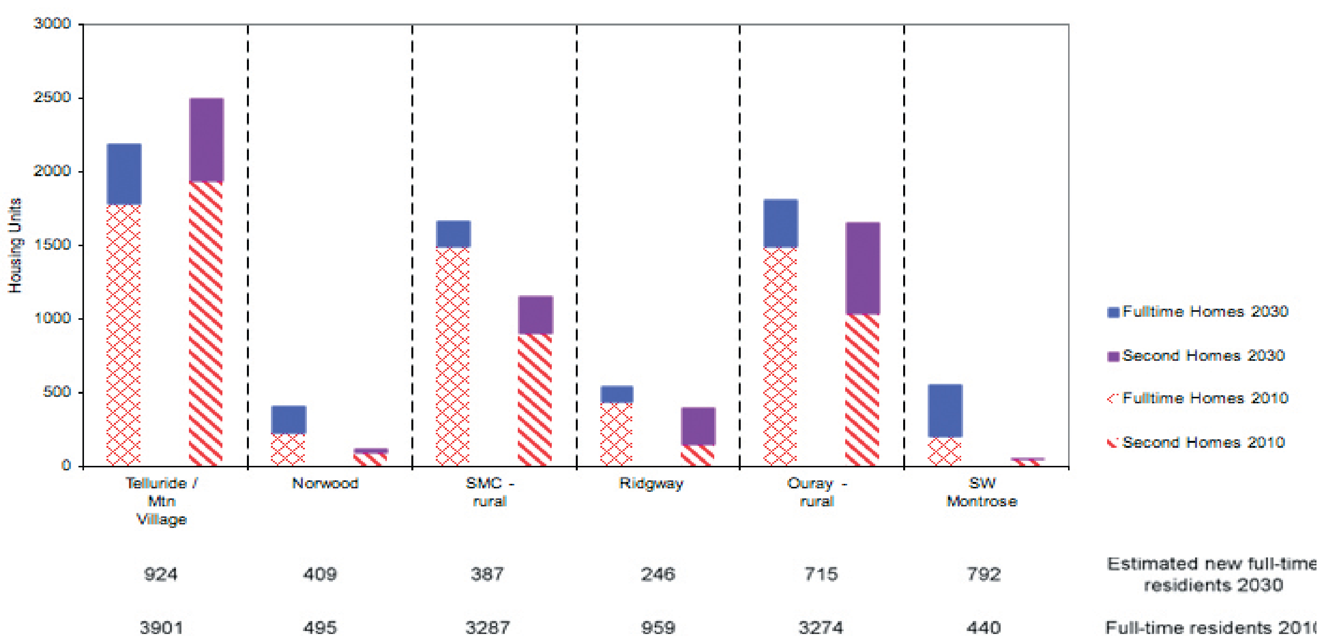
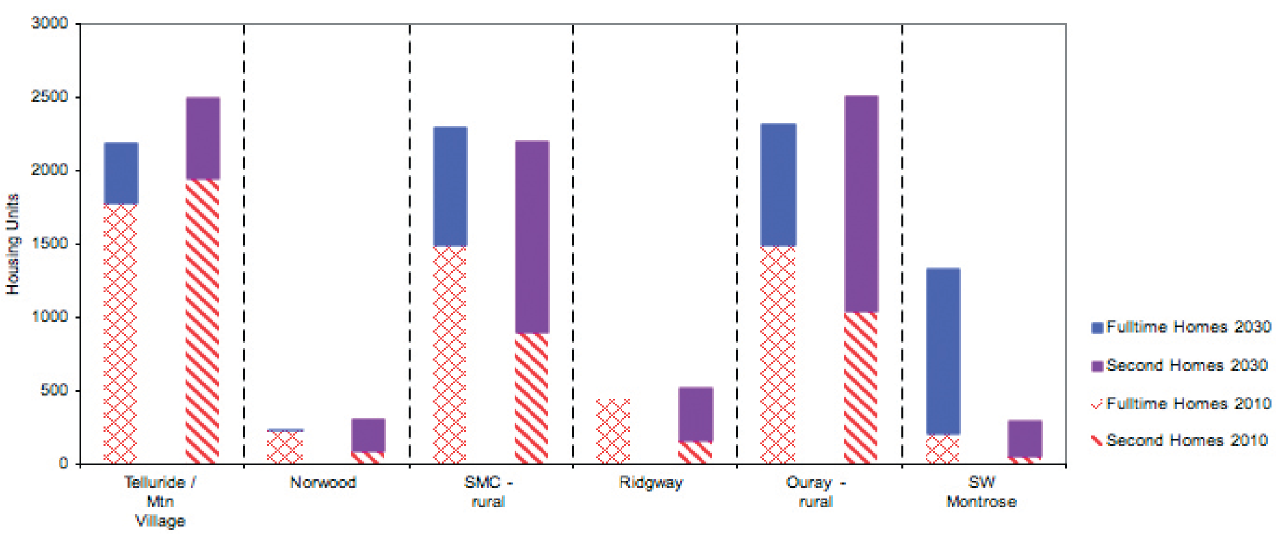


FIGURE 61, LOW GROWTH, EXISTING REGULATIONS, HOUSING ALLOCATION

High Growth - Existing Regulations

As shown in figure 59, the high growth with existing regulations alternative adds roughly 7,400 new units, a majority of which are seasonal homes. The population of year-round residents would increase by about 50% in this scenario with 7,000 new full-time residents. Compared to the low growth alternative, there is stronger social segregation in this alternative as full-time residents are pushed farther out into the periphery. New houses in both Ridgway and Norwood are predominantly second-home owners. There is much higher development on the mesas, which is also primarily comprised of second-home owners. The amount of housing in the west end is much higher in this alternative, serving as home for many of the full-time residents that would work in Telluride and Mountain Village. The overall pattern of development is characterized by greater sprawl and is strongly shaped by access to the regional road system.



	Telluride / Mtn Village	Norwood	SMC - rural	Ridgway	Ouray - rural	SW Montrose
Estimated new full-time residents 2030	924	24	1773	13	1846	2493
Full-time residents 2010	3901	495	3287	959	3274	440

FIGURE 62, HIGH GROWTH , EXISTING REGULATIONS, HOUSING ALLOCATION

Regional Variations in Development

We summarize and describe the housing and population projections in six geographic areas shown in figure 60: the towns of Telluride and Mountain village, Norwood and Ridgway, the southwestern portion of Montrose County, and the unincorporated areas of San Miguel and Ouray counties. As can be seen in table 5, the sub-regional impact of future development varies under the different alternative futures. The development trajectories show a substantial increase in the number of houses across the region, with much of the growth occurring outside of Telluride and Mountain Village; a doubling of the housing stock over the next twenty years is a possible outcome for any of the other communities in the study area.

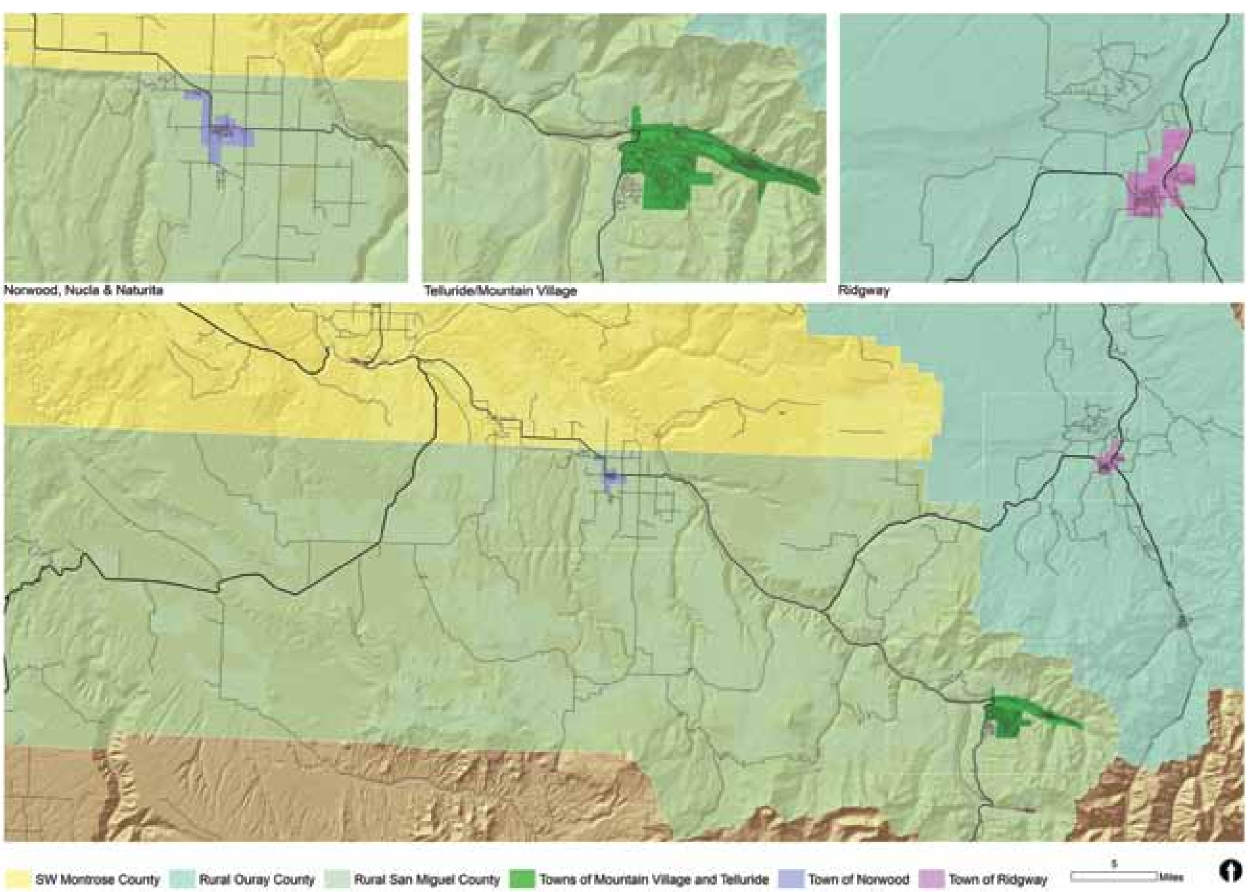


FIGURE 63, IMPACT ZONES

The growing population of full-time residents is distributed across the region in a related but separate process (table 6). The displacement of year-round residents by more affluent second-home owners will influence the ultimate distribution of households in the region. Policies that increase land scarcity, including the proactive set of policies modeled in this study, will push working families farther from the most attractive communities, highlighting the likely trade-offs between policies designed to protect natural amenities and those intended, to further the social and economic well-being of the regions workforce. This is demonstrated in alternative future 5, which predicts that new development in Ridgway and Norwood will be taken up by second-home owners. Allowing higher density in existing urbanized areas, as simulated in alternative futures 3, 6 and 7, helps to reduce the displacement of full-time residents. The lower growth scenarios are able to more easily accommodate a majority of new second-home owners and year-round residents within the existing communities.

		Telluride/ Mountain Village	Ridgway	Norwood	Rural San Miguel County	Rural Ouray County	SW Montrose
	Estimated housing units 2010	3711	585	312	2391	2521	250
Scenario							
1	Low growth, existing regulations	4697	943	535	2830	3464	618
2	Low growth, proactive policies	4697	730	435	2561	2848	828
3	Low growth, proactive policies, higher density	5190	781	596	3262	3029	306
4	High growth, existing regulations	4697	966	540	4508	4837	1630
5	High growth, proactive policies	4697	733	436	3734	4333	1247
6	High growth, higher density	5190	1047	895	4686	4364	996
7	High growth, proactive policies, higher density	5190	816	790	4805	4452	1114
8	High growth, higher subsidized housing	4697	966	540	4508	4837	1630
9	High growth, natural resource extraction	4697	967	551	4638	4893	1726

TABLE 5, TOTAL HOUSING UNITS 2030

		Telluride/ Mountain Village	Ridgway	Norwood	Rural San Miguel County	Rural Ouray County	SW Montrose
	Estimated population 2010	3901	959	495	3287	3274	440
Scenario							
1	Low growth, existing regulations	4825	1206	904	3674	3989	1232
2	Low growth, proactive policies	4825	968	684	3788	4946	1698
3	Low growth, proactive policies, higher density	4825	1247	832	4756	3619	550
4	High growth, existing regulations	4825	972	519	5060	5119	2933
5	High growth, proactive policies	4825	959	495	3861	3826	1067
6	High growth, higher density	4825	988	1575	6347	3824	1870
7	High growth, proactive policies, higher density	4825	977	1239	6543	4268	1553
8	High growth, higher subsidized housing	5287	972	519	5060	5119	2933
9	High growth, natural resource extraction	4825	972	521	5368	5247	3142

TABLE 6, FULL-TIME RESIDENT POPULATION 2030

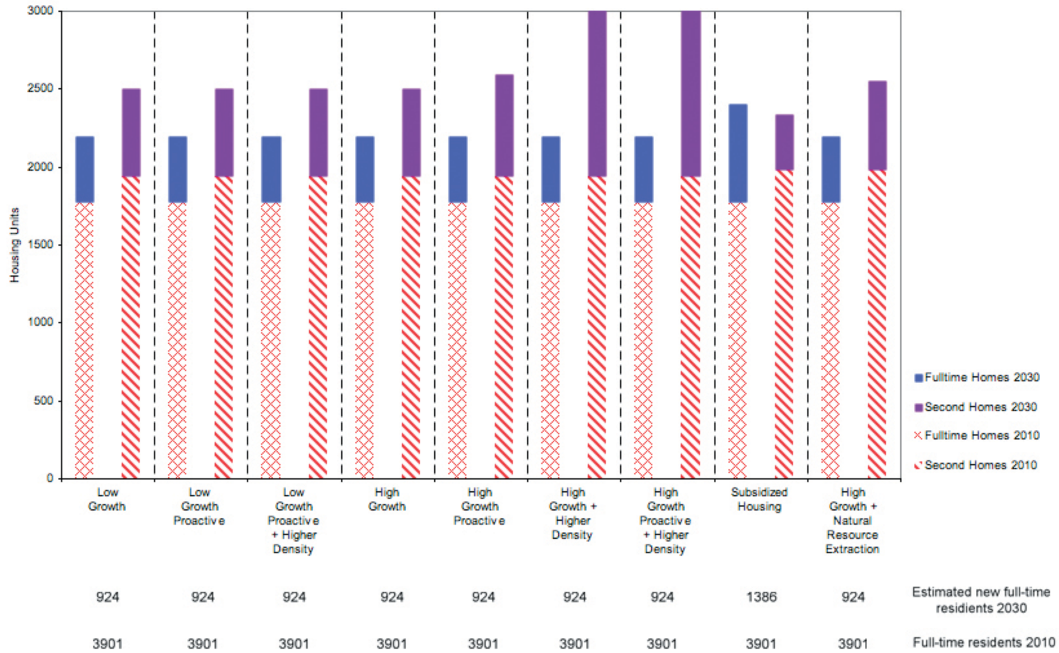


FIGURE 64, HOUSING ALLOCATIONS BY SCENARIO, TELLURIDE / MOUNTAIN VILLAGE

Telluride and Mountain Village are fully built out in all of the alternatives, adding just under 1000 new housing units in the base scenarios to almost 1500 when higher density is permitted (figure 61). The future mix of seasonal to full-time residents is highly influenced by subsidized housing policies. Of all the regions, Telluride and Mountain Village is the most tightly constrained and thereby shows the least variation in outcomes.

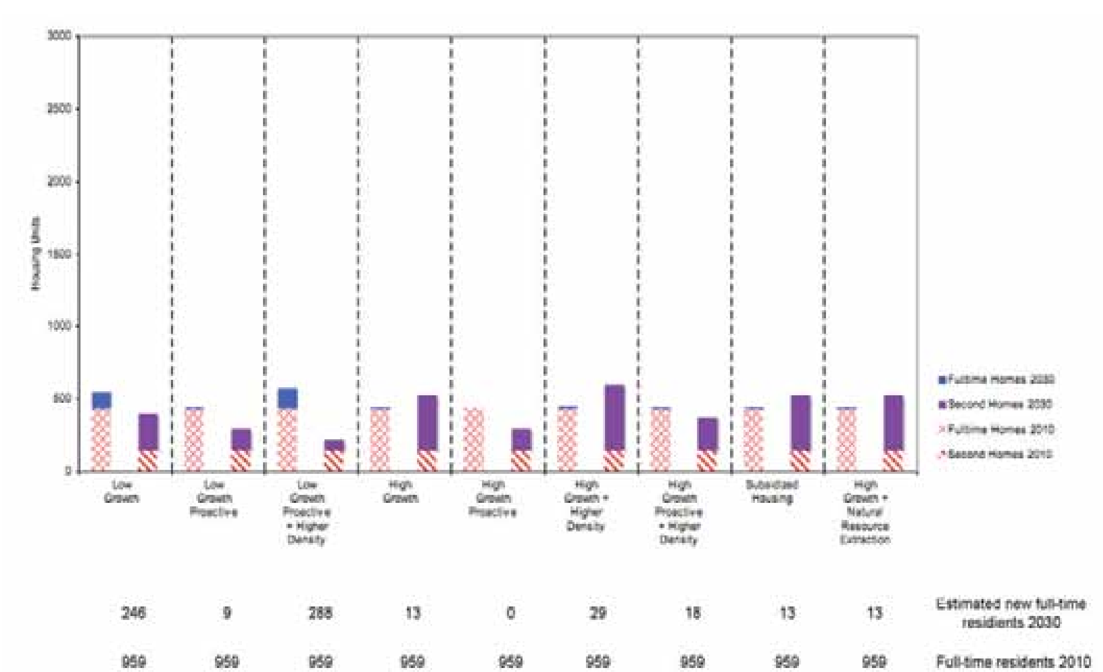


FIGURE 65, HOUSING ALLOCATIONS BY SCENARIO, RIDGWAY

As seen in figure 62, future development in Ridgway ranges from 150 new housing units to over 400. The low growth scenarios projects an increase in both full-time residents and second-home owners in Ridgway. In the high growth alternatives, a great majority of new development is for second homes, suggesting a substantial shift in the social composition of Ridgway. Future development in Ridgway is also sensitive to proactive policies, which tend to reduce the availability of land and channel more second-home owners into the urban center. The higher density policy increases the number of full-time residents in the low growth scenario, but has less of an impact with higher growth.

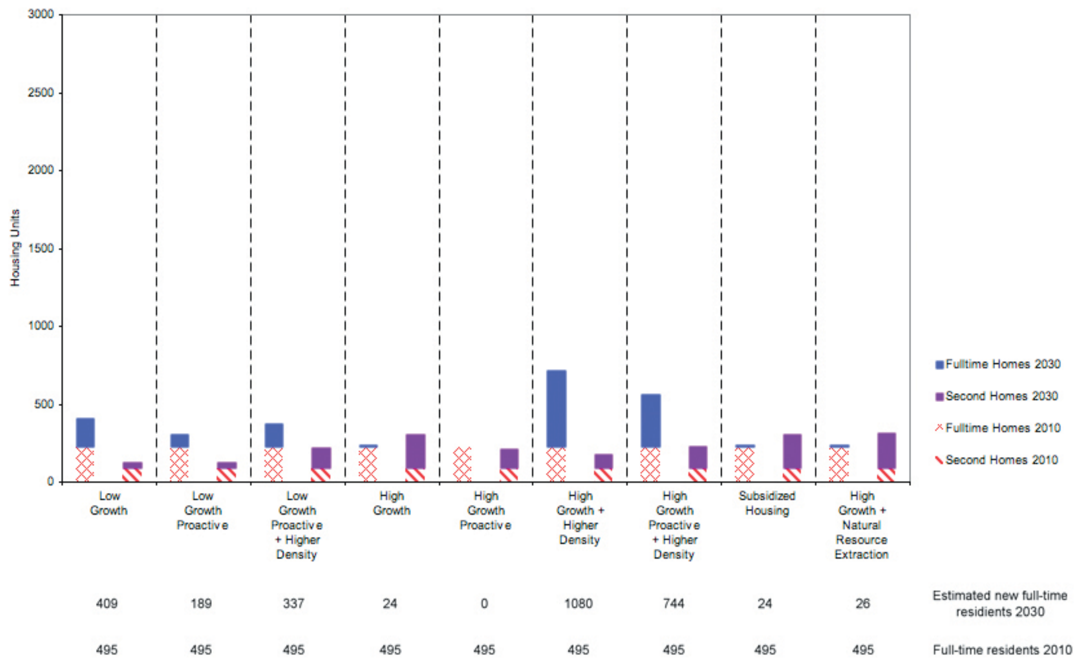


FIGURE 66, HOUSING ALLOCATIONS BY SCENARIO, NORWOOD

The town of Norwood is projected to add from between 100 to 300 new housing units over the next two decades (figure 63). The future character and composition of the town are likely to be strongly influenced by the economic forces of the greater region. In the low growth alternatives, full-time residents will occupy a majority of the new homes. In the high growth scenarios, however, second homes will comprise a majority of the new homes. This growth displaces first homeowners south into agricultural and rural residential areas of Wright's Mesa and northwest along the road corridor towards Nucla and Naturita. The high growth scenarios predict that the town of Norwood itself may have a smaller increase in full-time population compared to the lower growth scenarios due to displacement by second home owners.

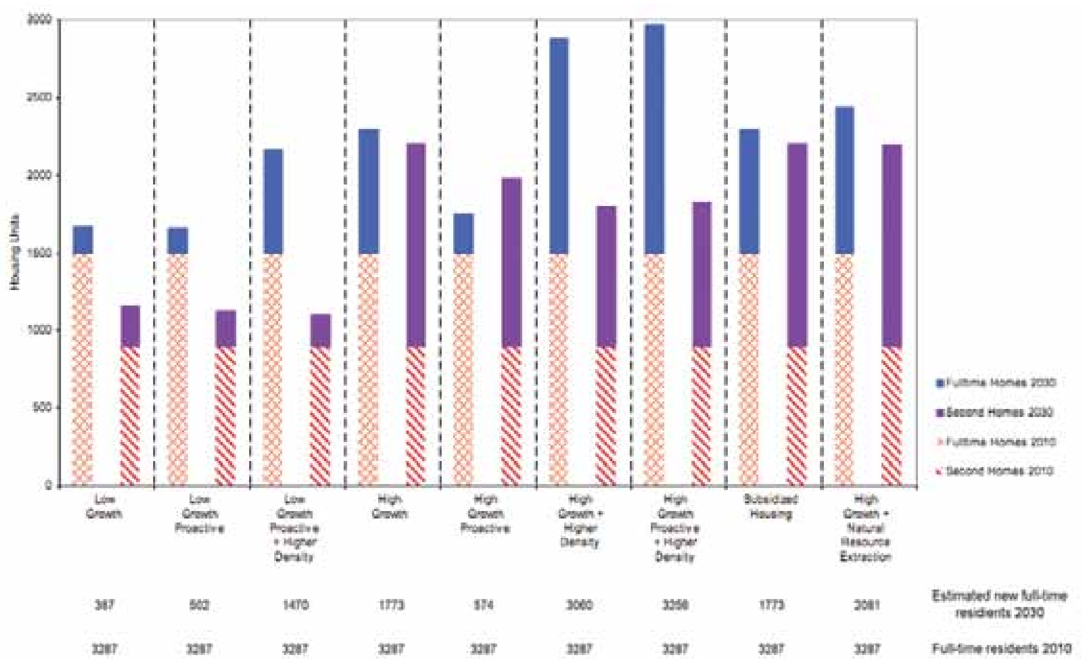


FIGURE 67, HOUSING ALLOCATIONS BY SCENARIO, RURAL SAN MIGUEL COUNTY

The development of rural and unincorporated areas of San Miguel County varies considerably over the different alternatives (figure 64). Second homes comprise approximately 60-70% of the new development in these areas for almost all of the alternatives, driven by development on the mesas. Allowing higher density development in areas contiguous to existing urban areas draws more full-time residents to these areas. The pattern of growth reliably follows the transportation network, with full-time residents seeking out locations close to employment not already occupied by second-home owners.

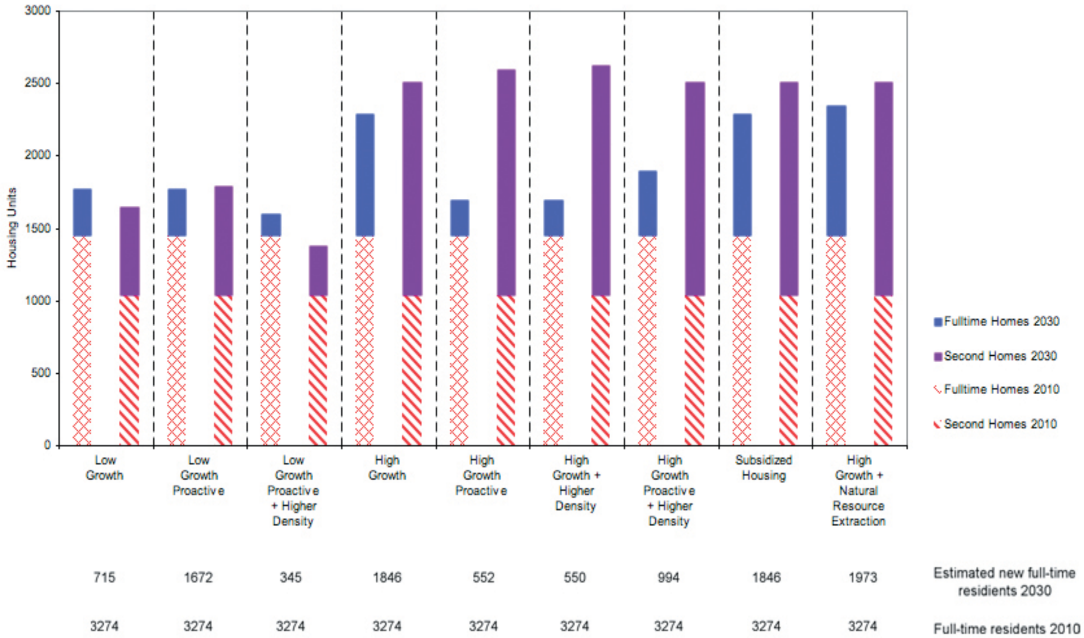


FIGURE 68, HOUSING ALLOCATIONS BY SCENARIO, RURAL OURAY COUNTY

As with the other unincorporated regions, the alternatives vary substantially for Ouray County, with as little as 300 new housing units in the low growth alternative to well over 2000 (figure 65). The new development in this region includes a mix of year-round and second homes in all alternatives, although generally more second homes. There are three areas of major growth projected: along Highway 62 west, Highway 550 south, and on Log Hill, north of Ridgway. The proactive constraints act to block much of the development that would otherwise occur on Highway 550 north of Ridgway.

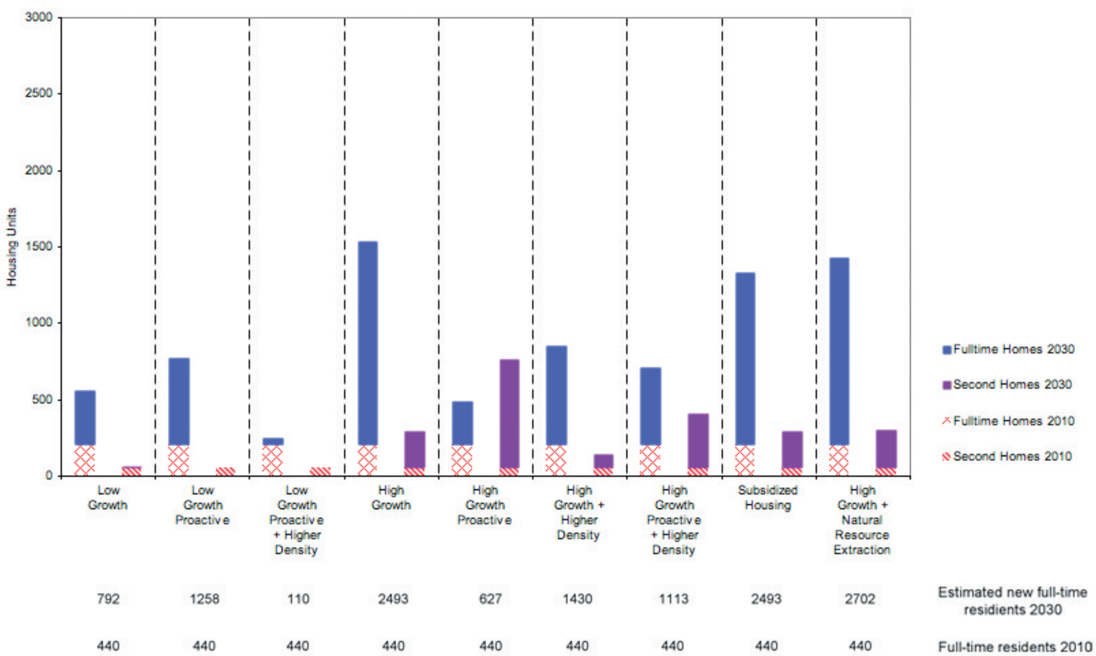


FIGURE 69, HOUSING ALLOCATIONS, SW MONTROSE COUNTY

The amount of future development varies substantially under the different alternatives, from as little as 50 new housing units to almost 1500 in the high growth alternative with proactive policies (figure 66). This large variation is primarily the residual impact of land and housing policies in other parts of the region. In those alternatives in which the other areas can absorb new housing demands, the modeling predicts little change in southwest Montrose County. In those alternatives that displace full-time residents from areas closer to the regional job centers, the southwestern portion of Montrose County is more heavily populated with full-time residents looking for an affordable option. The natural resource alternative increases growth in the western portions of the study area by providing an independent source of jobs.

IMPACT

Traffic

TRAFFIC ENTERING RIDGWAY, SUMMER 2009

Traffic volume simulations were conducted in ArcGIS, and were calibrated against the 2006 Colorado Department of Transportation (CDOT) trip survey. An important limitation is that this survey considered only work-related trips and annually averaged traffic. Because of lack of survey data, it was not possible to estimate tourism-related traffic, or seasonality of traffic volume.

Our model allocated trips from transportation analysis zone (TAZ) centroids to other TAZ centroids based on historic populations and rates of travel. In this area, TAZ zones corresponded almost exactly to towns. The one exception were the towns of Ridgway and Ouray, which in CDOT surveys was considered only as a single TAZ unit. For our work, we split the traffic in this zone proportionally based on relative populations. We assumed a linear relationship between existing patterns and future patterns in which the only variable was new population. We did not consider road improvement projects, new roads other than residential feeders, or congestion effects.

For traffic outside of the study area, we assumed that neighboring towns would grown at the same proportional rate as the nearest town inside the study area. For example, under "High Growth" scenarios, the city of Montrose (outside of the study area) was assumed to grown at the same rate as Ridgway. While this assumption is reasonable, the dynamics of other towns and cities in the region are affected by numerous forces not considered in this study. In particular, Montrose may well grow significantly faster than Ridgway, which would lead to a higher increase in traffic than forecast here.

Table 7 shows the growth in traffic in the study area which can be expected by 2030 for each of the nine alternative futures. All alternative futures assume that the travel patterns and typical trip frequencies that occur in 2010 will be maintained throughout this future period. The number of trips will change in accordance with the number of new residential units. The growth in traffic is a function of population growth, but it is also influenced to a lesser extent by the distribution of low-density rural development which requires longer trips. The low growth scenarios produce about a 20% increase in traffic volumes. The high-growth scenarios will produce a two thirds increase in mean traffic volumes.

Scenario	Traffic	Percent over current
Current	1,043	0%
Low Growth, existing regulations	1,263	21%
High Growth, existing regulations	1,732	66%
Low Growth, Proactive	1,271	22%
High Growth, Proactive	1,730	66%
High Growth, Natural Resource Extraction	1,695	63%

Table 7, Projected Mean Daily Traffic

For much of the study area, where traffic volumes are low, a two thirds increase might be acceptable. However, increases in traffic will be substantially greater on the main and now heavily traveled highways linking Ridgway and Norwood to Telluride and Mountain Village.

The most significant traffic problems will be felt on the entry roads to Telluride and Mountain Village. These problems already exist in the region and will significantly worsen. All alternative futures assume continued patterns of predominantly private vehicle use until 2030. Table 8 shows the demand for access to Telluride and Mountain Village in the nine alternatives simulated in this study. Traffic problems are caused by the influx of new people who are drawn to the employment opportunities and recreational amenities of Telluride/Mountain Village. In the low growth scenarios there will be an increase of about 135% in traffic seeking entry into the Telluride area. In the high-growth scenarios the growth of traffic will be about 200% over current levels. Most of the traffic is generated by trips to work and for shopping, services or recreation.

Scenario	Traffic	Percent over current
Current	3,885	100%
Low Growth, existing regulations	5,229	135%
High Growth, existing regulations	7,773	200%
Low Growth, Proactive	5,345	138%
High Growth, Proactive	7,873	203%
High Growth, Natural Resource Extraction	7,517	193%

Table 8, Projected Mean Daily Traffic, Telluride Spur

The existing physical infrastructure of Telluride and Mountain Village cannot accommodate this increased traffic demand. The traffic problem is complicated by the limited available land and the demanding topography, making any expansion of roads and parking facilities very expensive. It is clear that if Telluride and Mountain Village are to retain their central positions as generators of the region's economy, reliance on private vehicles is insupportable. An efficient, frequent, and affordable public transportation system must be designed and implemented.

It is also possible that the forecast demand for vehicular access to Telluride/Mountain Village cannot be satisfied. Chronic congestion and parking problems will blight Telluride's attractiveness. Businesses and services will be forced to look to areas of easier access and lower costs such as Ridgway and Norwell, or along the region's major roads.

Figure 67 shows the pattern of increase in traffic forecast in alternative future 1, low growth under existing regulations. Figure 68 shows the increase of traffic caused by the high-growth scenario under existing regulations. Both illustrate the dramatic growth in traffic on the roads between Ridgway and Norwood, resulting from people's desire to travel to Telluride and Mountain Village. There will also be significant traffic increases on the road between Ridgway and Ouray.

THE OPEN ROAD, RURAL SAN MIGUEL COUNTY

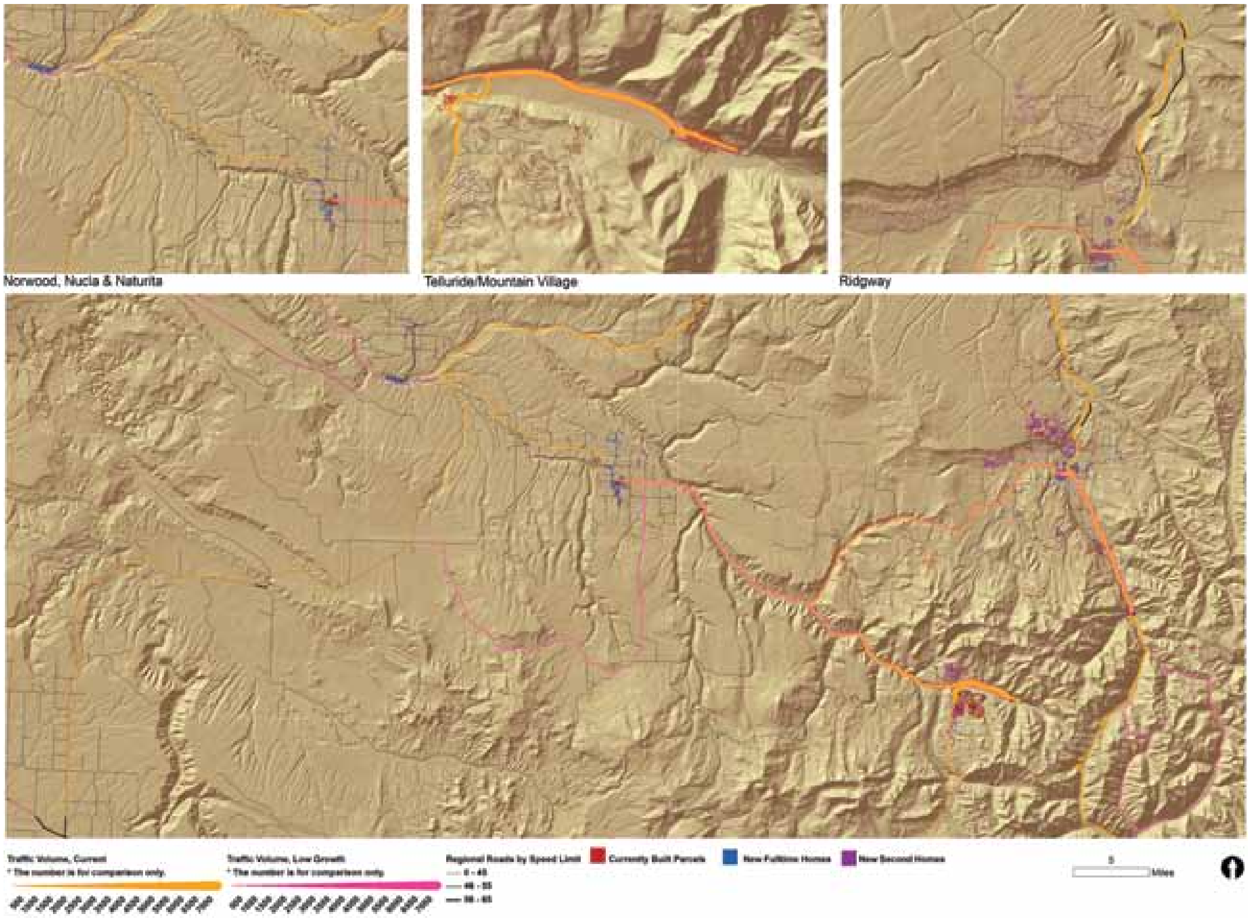


FIGURE 70, TRAFFIC IMPACTS, ALTERNATIVE FUTURE #1, 2030 : LOW GROWTH, EXISTING REGULATIONS

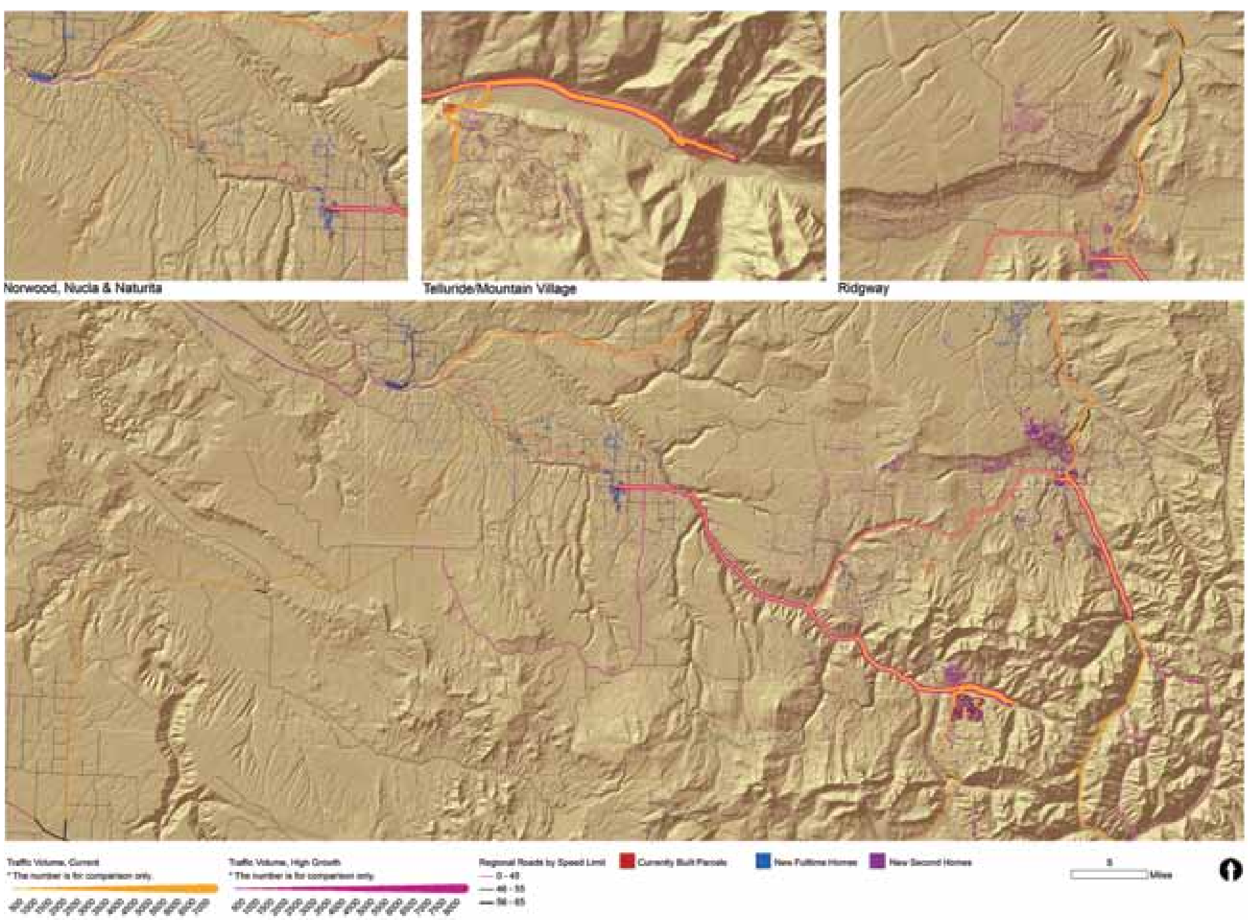


FIGURE 71, TRAFFIC IMPACTS, ALTERNATIVE FUTURE #4, 2030 : HIGH GROWTH, EXISTING REGULATIONS

IMPACT
Visual Impacts

When assessing the impacts of new development on visual preference, two important assumptions were made. It was assumed that the current visual preferences as surveyed would be stable to 2030. In addition, only new allocated development was considered. The 2030 impacts do not consider possible “natural changes” due to fire, climate change, etc.

The visual preference impact model is based on the model of existing conditions, which assesses new development with diminishing impact for greater numbers and greater distance from the viewpoint. For each scenario, we computed the number of new houses potentially visible within each view. We then weighted the impact using two separate schemes. For overall visual impact modeling, we considered the view from any location in the study area, public or private. This method is comprehensive. For example, it includes the impacts on the future views of existing houses. However, the public view of the region is significantly different than private views. Since tourism is a very large part of the local economy, we made a second visual impact model which was designed to focus on the public perception of the landscape. In daily experience, this is dominated by views from public areas, and specifically as seen from major tourist routes.

Once the statistical modeling of regional visual preferences was established, we created two spatial models. The first of these estimates visual preferences under current conditions for every location within the region.

HIGHWAY SIGNAGE IN RIDGWAY

Baseline visual preference modeling was structured using the explanatory factors from the statistical model. We first generated view sample location points along major roads and tourist routes. At each point, we independently computed viewsheds in major compass directions. Thus we examined the characteristics of views north, south, east and west in pie shaped wedges outward from the sample points. Within each viewshed, we computed what was visible from that location and its distance to the sample view point. For example, we computed the visibility and distance of high mountain peaks from each sample point in each major compass direction. We also measured view depth and openness for each view.

All measured factors were positive, with the exception of the number of houses visible. The presence of feature type in the view received a score proportional to its contribution to visual preference in the statistical model built from the photo survey. For example, views of water were strong positives, as were historic housing and landscapes.

When multiple occurrences of a feature were found in the same view, they were scored with a diminishing returns system. The principle was that the first of a kind of object seen was more important than repetitions of the same. For example, seeing one high mountain peak was of great visual significance, seeing 2-5 was better by one category and seeing 5 or more peaks better by two categories. Similarly, seeing a single house in a landscape, which had previously been completely undeveloped, was a strong negative influence on visual preference, but the presence of 2-5 houses was treated as comparable. This form of weighting appears to be appropriate based on visual survey results.

A second issue treated by the model is the attenuation of impact with distance. The model recognized three categories of distance: foreground, middle-ground and background. Because view distances and sensitivities in this area are relatively large, we used 0-300m as fore-

MOUNTAIN VIEWS NEAR OPHIR

ground, 300m - 3000m as middle-ground, and greater than 3000m as background. While the 3km distance is higher than typical in other visual studies, public policy debates and lawsuits about the visual impacts of housing development in Ridgway were prompted by building on a bluff approximately 3m from the main highway. Therefore we felt it appropriate to consider development at that distance as potentially causing a noticeable impact.

For each scenario, we computed the number of new houses potentially visible within each view. We then weighted the impact using two separate schemes. For overall visual impact modeling, we considered the view "from" any location in the study area, public or private. This method is comprehensive. For example, it includes the impacts on the views of existing houses. However, the public view of the region is significantly different than private views. Since tourism is a very large part of the local economy, we made a second visual impact model which was designed to focus on the public perception of the landscape. In daily experience, this is dominated by views from public areas, and specifically from major tourist routes.

While the approach used here was significantly more elaborate and detailed than that used in prior visual assessment studies, several limitations are nonetheless important to consider. First, GIS visibility analysis does not consider visual contrast and context. It is possible to build new houses into natural vegetation and topography with materials which blend very well into the surrounding landscape. This kind of "camouflage" effect is important, and is the basis for many visual quality standard codes, including those currently in effect in Mountain Village. Because GIS modeling is technically unable to consider these effects, it can be considered as modeling a typical to worst-case form of development. The second limitation is related, and it is that our scenarios did not specify the physical form of potential developments. Actual visual quality to a specific building or building pattern varies depending on design. In this region, "historic" building architecture, even when applied to new construction, rated highly in our visual survey. Therefore, a number of design-based approaches and planning standards, which are important to visual quality management in the area, were not considered in this modeling.

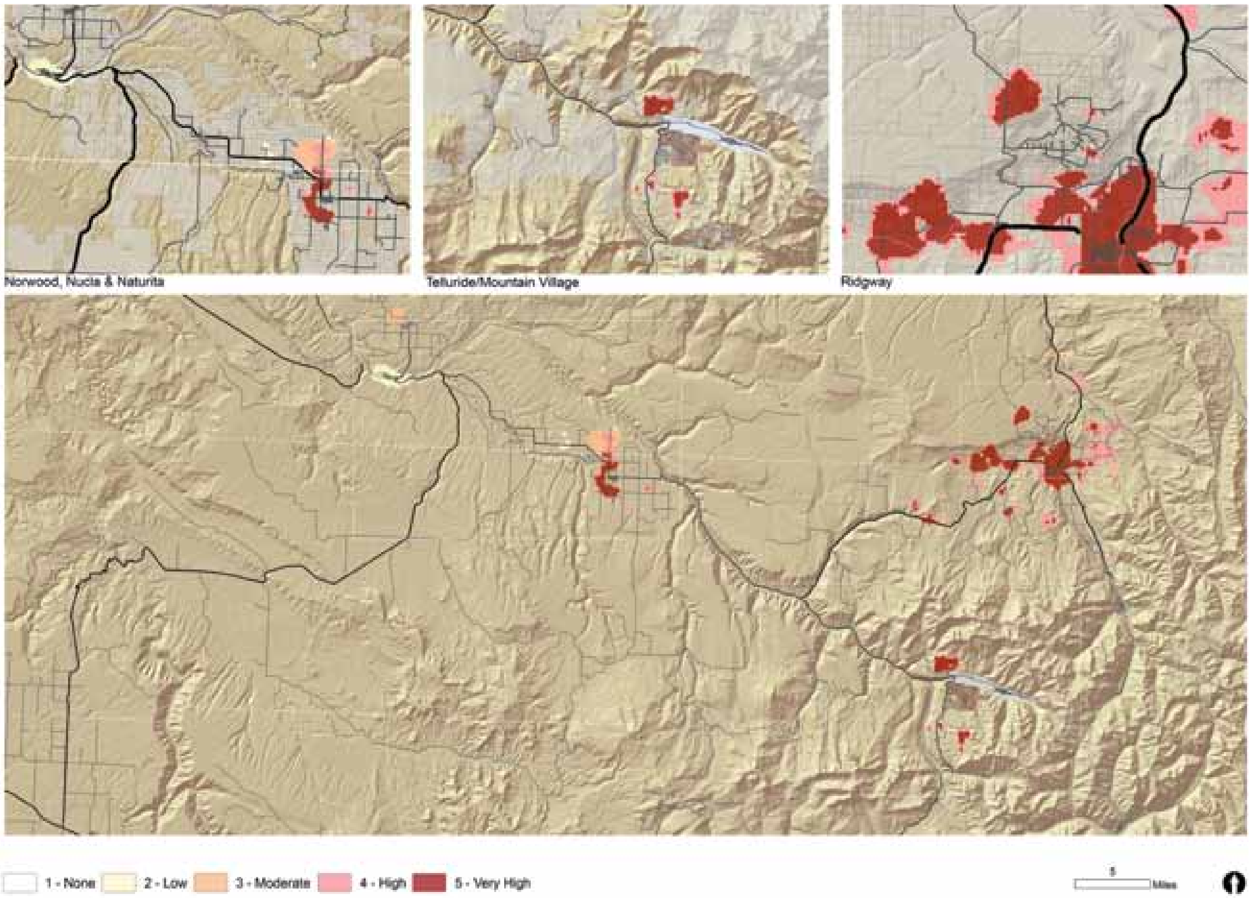


FIGURE 72, VISUAL PREFERENCE IMPACTS, ALTERNATIVE FUTURE #1, 2030
LOW GROWTH, EXISTING REGULATIONS

Figure 69, the low growth scenario under existing regulations, shows that there will be substantial visual change in Ridgway, Norwood, and on several of the mesas. Telluride itself will not change visually to a great extent because it does not accommodate very much new development in this scenario. The most significant changes will occur in Ridgway, and they will be visible and not visually preferred. The area where the greatest visual decline will occur is also one of the most important parts of the Telluride region for tourists. The main intersection in Ridgway is a critical point for people who are driving the highly scenic loop road around the San Juan Mountains. For people driving to Telluride and Mountain Village from Montrose, the Ridgway area is the visual entrance to the Telluride region. It is very important that the image presented in Ridgway is predominantly a highly preferred landscape. If not managed, a less preferred visual sequence of sprawling development is the likely future.

The visual changes seen in the low growth alternative future under existing regulations are greatly exacerbated in the alternative based on the high-growth scenario under existing regulations, figure 70. The main growth areas in Ridgway, Norwood and on the mesas are all substantially developed. There will be more new development on the entry road into Telluride. The visually undesirable changes in Ridgway, which were not preferred even under low growth, will be very much more extensive. This important tourist area will be seen as part of a sprawling pattern of development extending 5 miles toward Ouray and 10 miles toward Telluride. It will present a much less preferred image at the visual entry point for the Telluride region.

Figure 71 shows the visual preference of the scenario based on high-growth, with proactive regulations that conserve highly preferred views from major roads, and a policy of higher density development within existing developed areas. Figure 71 shows that proactive regulations can help maintain the present high visual preferences for views from the major roads in Ridgway, even though more new housing will be visible. The same result occurs in other parts of the region. However, there is a consequence of conserving otherwise developable and highly attractive land for visual reasons. The demand for new homes cannot be accommodated near the existing development, and many more new homes are pushed into rural parts of San Miguel County, especially on the mesas and outer areas near Norwood. While highly preferred public views have been maintained as much as possible, the preference for private views will decline substantially as sprawling low density development increases on the mesas. Unobstructed and natural mountain views will be very rare. Most historic ranching landscapes will be severely damaged.

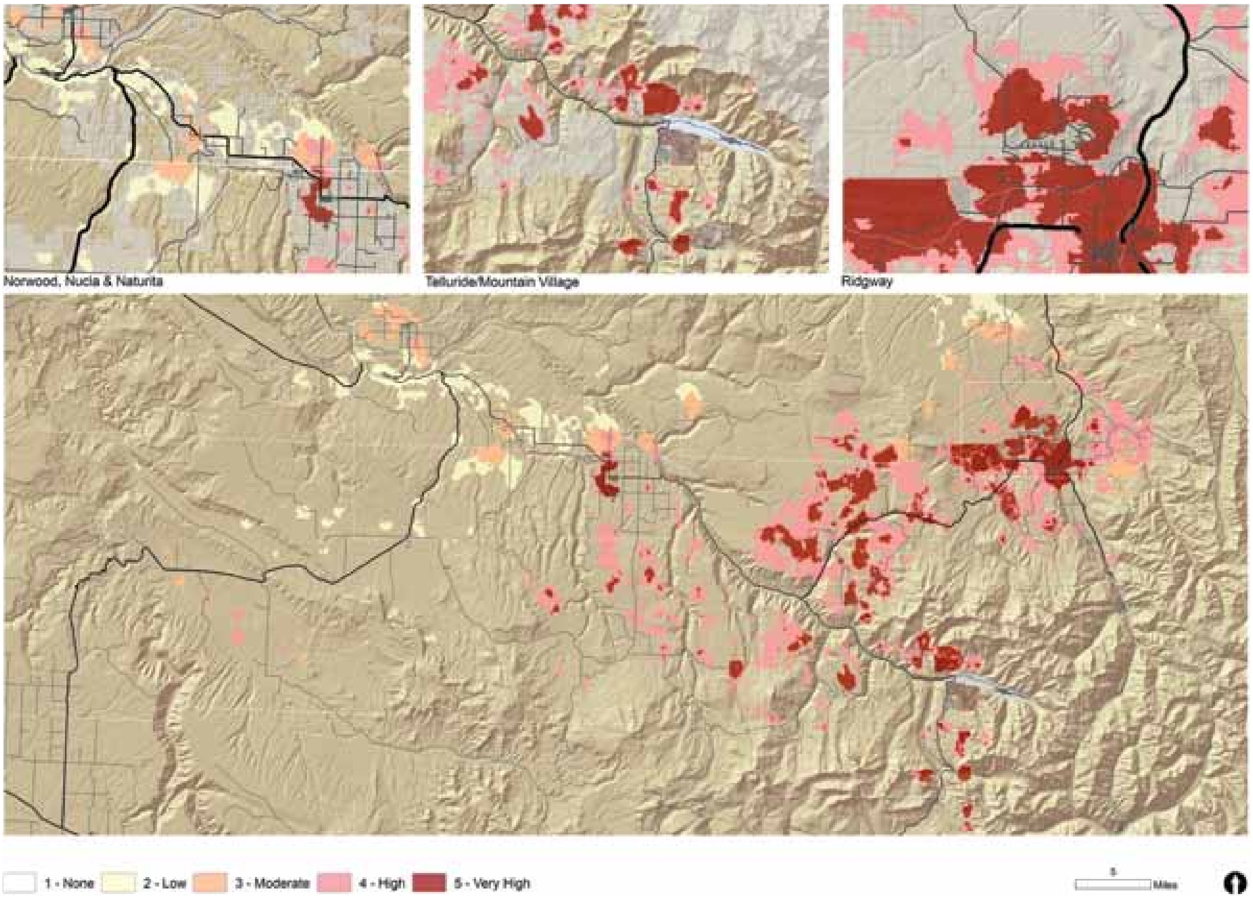


FIGURE 73, VISUAL PREFERENCE IMPACTS, ALTERNATIVE FUTURE #4, 2030
HIGH GROWTH, EXISTING REGULATIONS

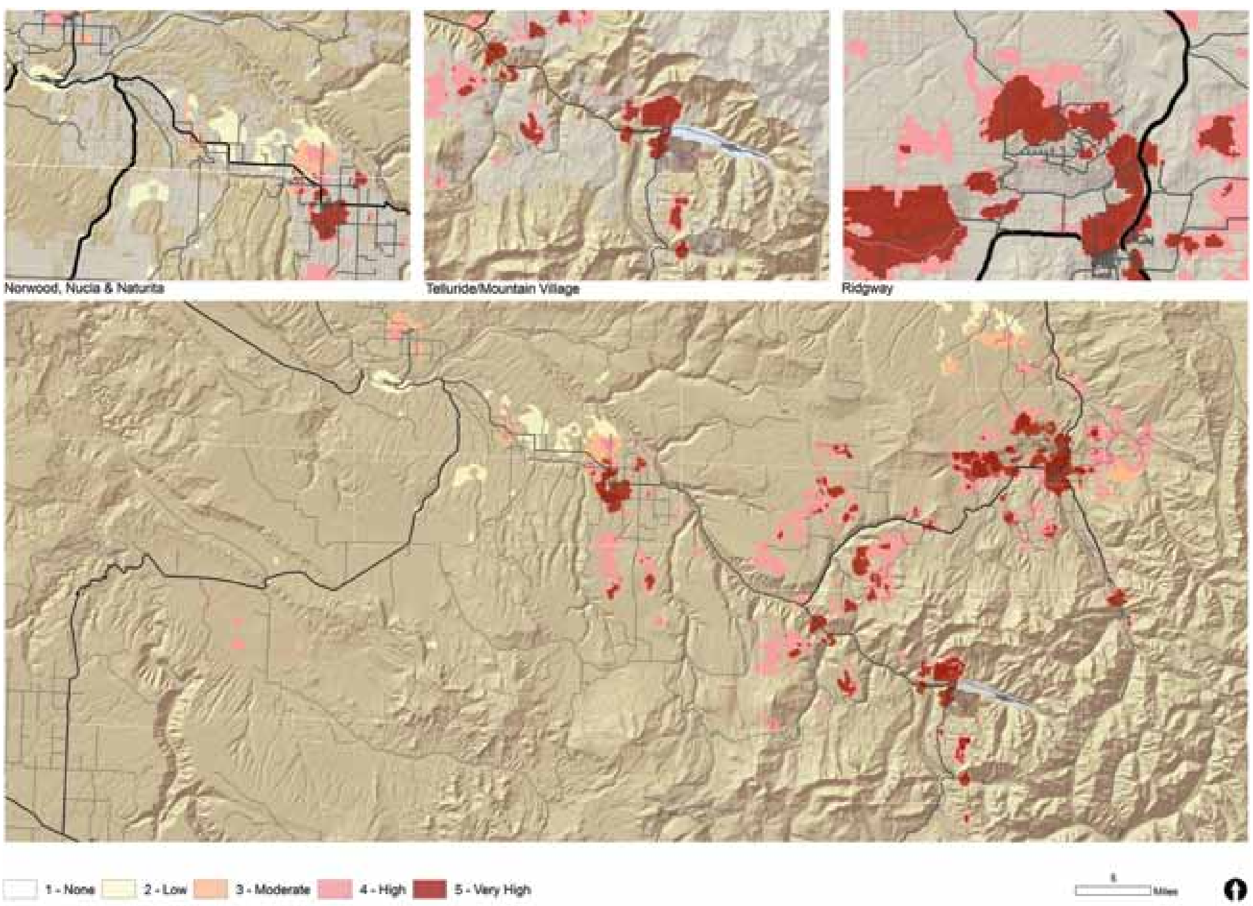


FIGURE 74, VISUAL PREFERENCE IMPACTS, ALTERNATIVE FUTURE #6, 2030
HIGH GROWTH, PROACTIVE REGULATIONS, HIGHER DENSITY

Publicly-Perceived Visual Preference

Publicly-perceived visual impact was assessed using the same factors and weights as the general model, but exclusively from the perspective of major tourism route views. We created sample points every kilometer along roads shown in regional tourism brochures. Views were assessed in each compass direction for each of these sample points before and after the development included in a scenario. Impacts were computed based on visual preference under current conditions, and the visual prominence of scenario changes as seen from the roads themselves. The highest impact was putting a large amount of housing development in the foreground of a previously undeveloped view of highest visual preference.

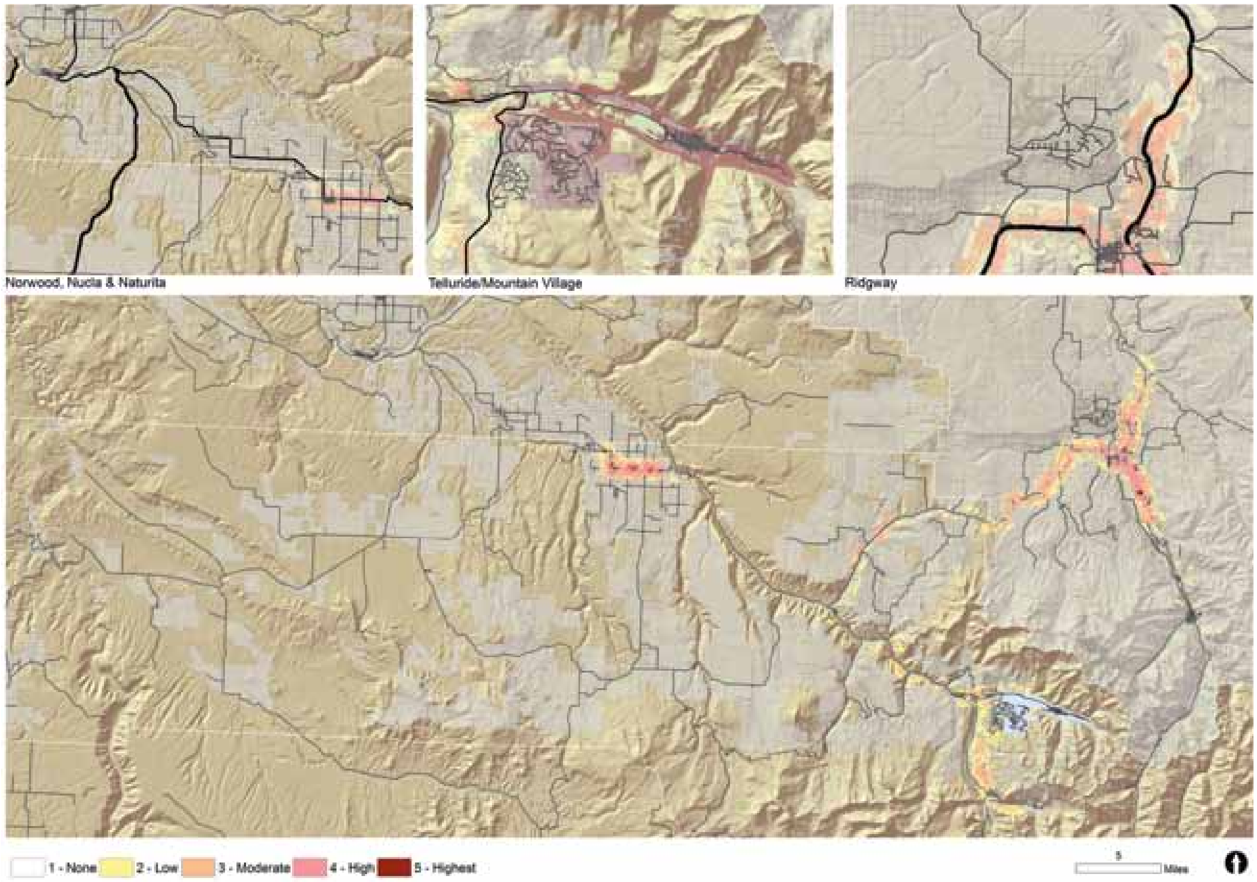


FIGURE 75, VISUAL PREFERENCE IMPACTS IN VIEWS FROM MAJOR PUBLIC ROADS, ALTERNATIVE FUTURE #4, HIGH GROWTH, EXISTING REGULATIONS

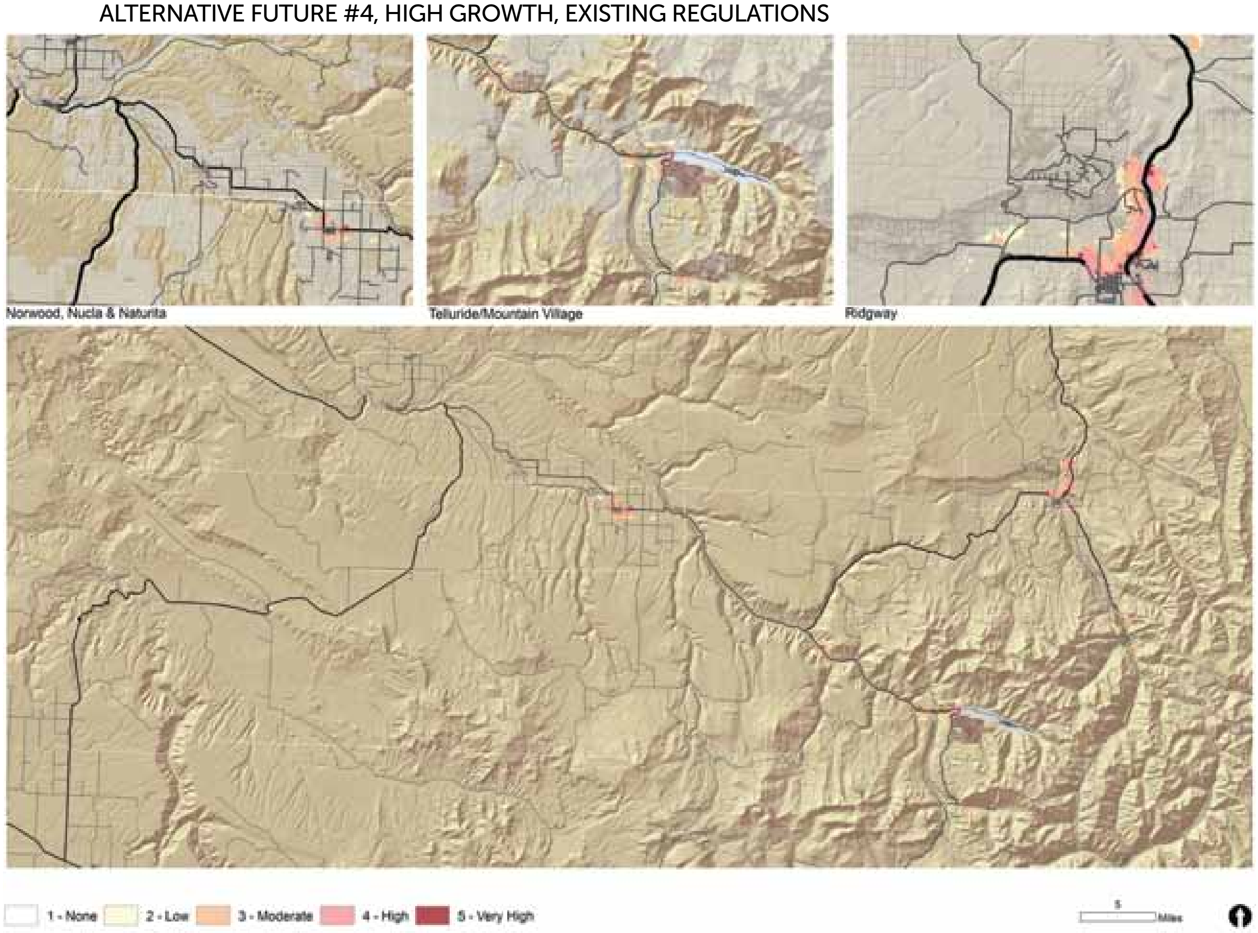


FIGURE 76, VISUAL PREFERENCE IMPACTS IN VIEWS FROM MAJOR PUBLIC ROADS, ALTERNATIVE FUTURE #6, HIGH GROWTH, PROACTIVE REGULATIONS, HIGHER DENSITY

IMPACT
Ecology

Models of potential species habitat were constructed for several species known to be of conservation significance in the region and for which regional base data were available. These included the bald eagle, bighorn sheep, and sage-grouse.

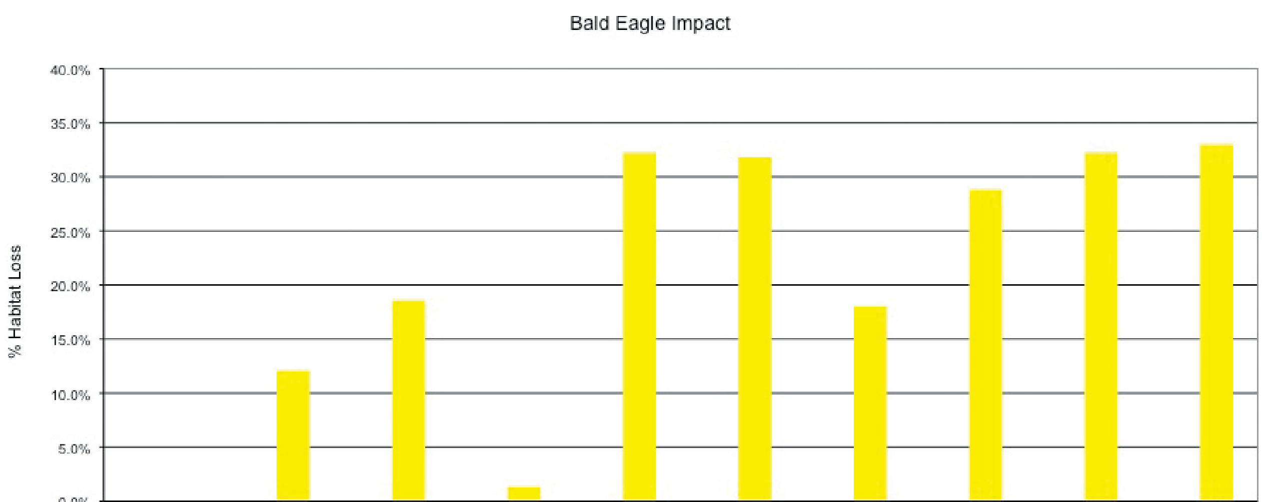
Ecological impacts were calculated for each scenario based on new building and road centroids. In the Natural Resources Extraction scenario, disturbance from gas and uranium mining activities was also considered. As with the current building data, no attempt was made to estimate the site of individual buildings within parcels. We made the assumption that every building was built at the center of a lot. While this is likely wrong for many parcels, particular large ones with complex terrain and water features, it is a reasonable estimate in aggregate.

The disturbed area around new or changed land uses was estimated using species-specific buffer distances around those uses. These ranged from 150m for bighorn sheep to 500m for bald eagles. In the case of the sage-grouse, densities of greater than one household per 160 acres were considered to be incompatible with species persistence, a method identical to that used in the State of Colorado's habitat conservation plan for the species.

One of the major sources of ecological impacts are the access roads to new developments. In a region of this size, it is not feasible to manually design each such potential road. Therefore, driveways and access roads were simulated algorithmically using a least-cost-path to the centroid of new development. Road alignments were projected to run along a minimum slope gradient and along parcel borders with a penalty for crossing perennial streams. This results in a road network that is a reasonable for the intended purpose, although lacking many details of actual road alignments such as minimum curvatures and "cut and fill" of terrain.

Bald Eagle

Figure 76 shows the impacts on potential bald eagle nesting habitat caused by the high growth scenario under existing regulations. Loss of nesting habitat is caused by the encroachment of development and its surrounding areas of disturbance. The pattern of nesting habitat decline is related to the distribution of new development throughout the study area. The most significant cumulative impact is in Ridgway, where the expansion of new homes in the landscape will destroy the large patch of eagle habitat which currently exists. The nesting habitat areas along the entry road into Telluride will also be significantly impacted in this scenario.



	Current (1,111ac)	Low Growth	Low Growth Proactive	Low Growth Proactive, Higher Density	High Growth	High Growth Proactive	High Growth Higher Density	High Growth Proactive, Higher Density	High Growth Subsidized	High Growth Natural Resouce Extraction
Acres Loss		134	206	15	358	354	200	320	358	366
% Habitat loss	0	12%	19%	1%	32%	32%	18%	29%	32%	33%

FIGURE 77, POTENTIAL BALD EAGLE NESTING HABITAT, IMPACT BY SCENARIO

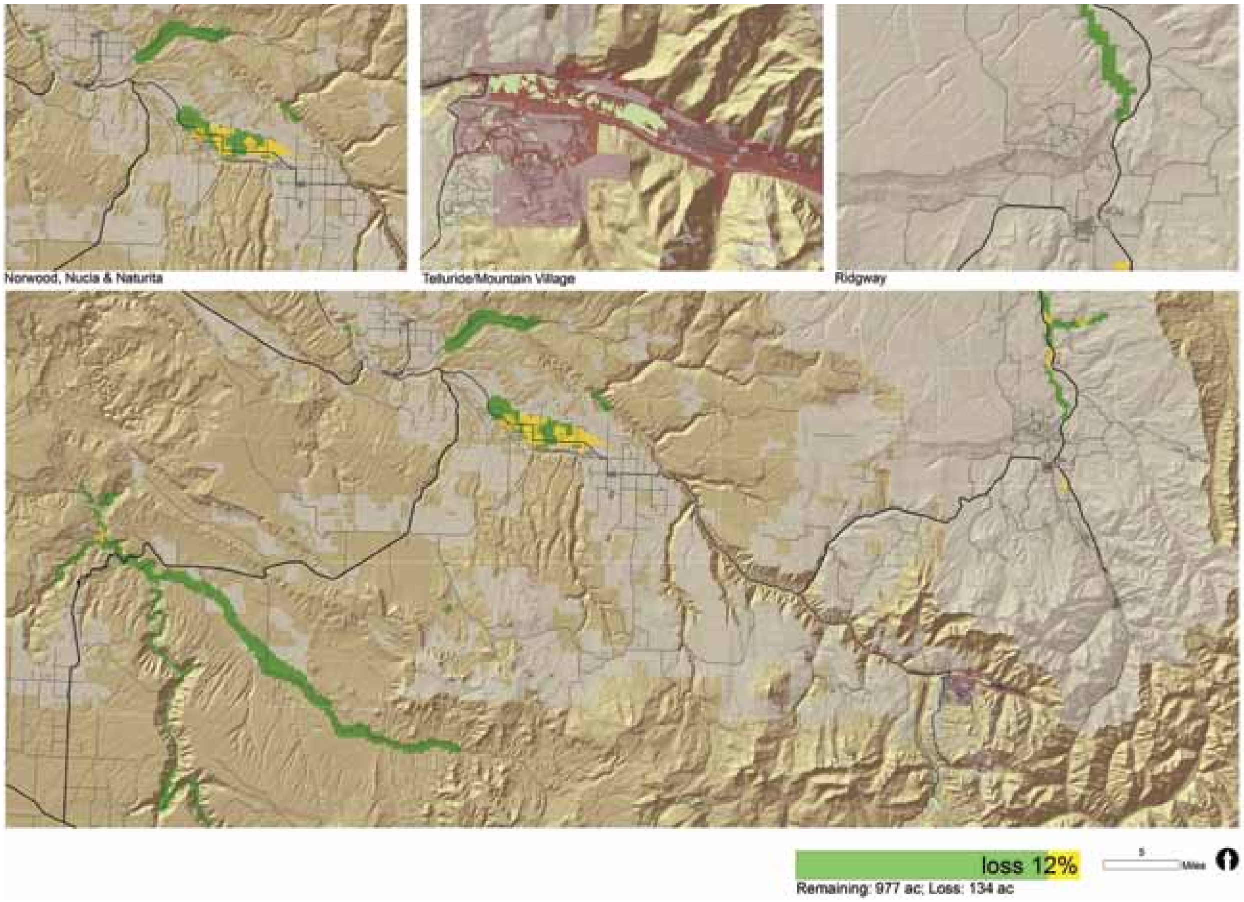


FIGURE 78, BALD EAGLE, IMPACTS ON POTENTIAL NESTING HABITAT, ALTERNATIVE FUTURE #1, 2030 LOW GROWTH, EXISTING REGULATIONS

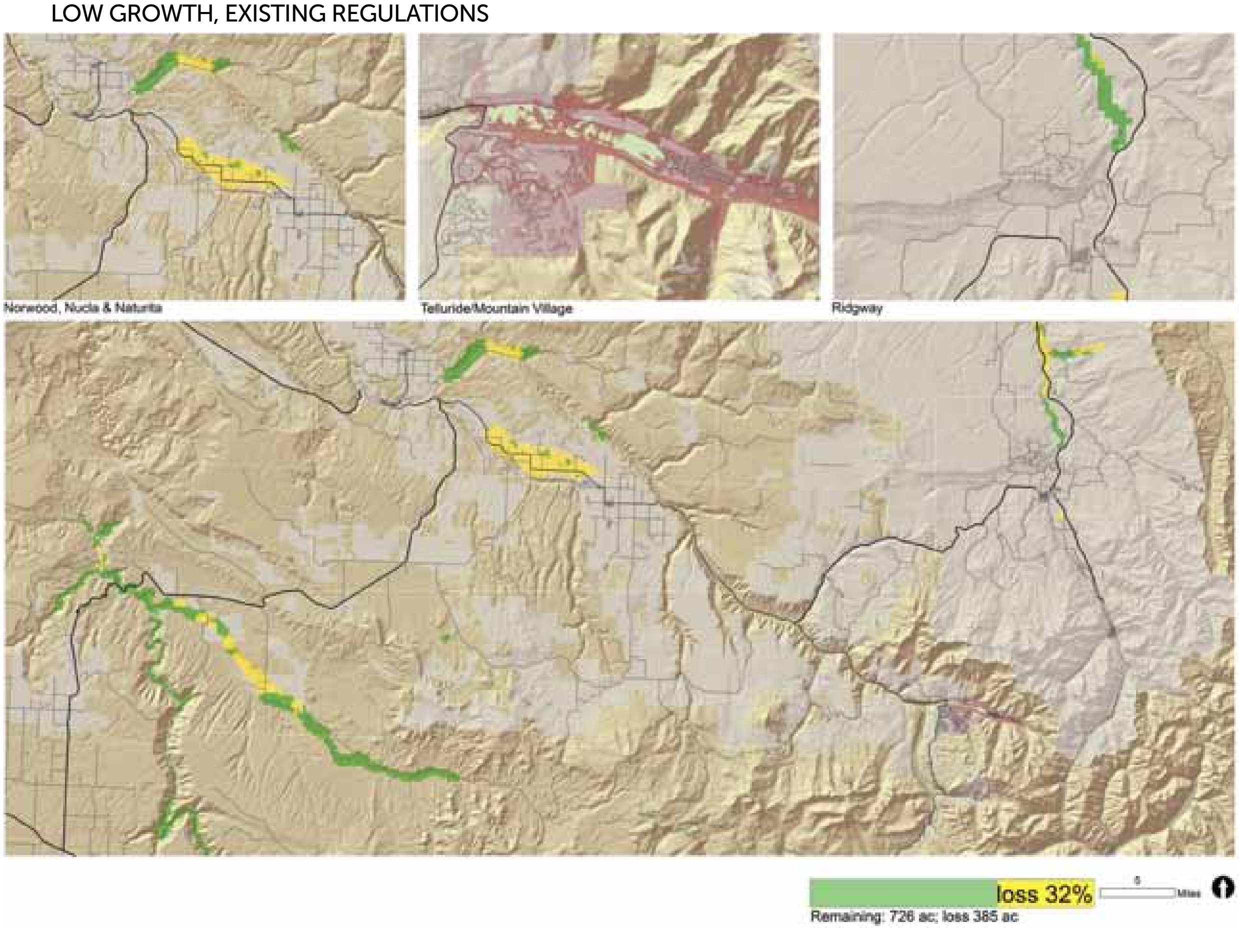


FIGURE 79, BALD EAGLE, IMPACTS ON POTENTIAL NESTING HABITAT, ALTERNATIVE FUTURE #4, 2030 HIGH GROWTH, EXISTING REGULATIONS

Bighorn Sheep

Figures 78 and 79 show the pattern of retained and lost big horn sheep habitat in the low and high-growth alternative future under existing regulations. As expected, the impact of development is greatest in the relatively level parts of the sheep habitat within the study area where it is easiest to develop. It is important to note that although the habitat area is reduced, the continuity of habitat in the mountains and canyons of the study area has generally been maintained.

Impacts overall are relatively minor, ranging from 2% of existing habitat in the low growth scenario to about 4% under the high growth scenario. The ecology of steep mountain areas is significantly less affected by direct human development impacts than other areas, although of course still sensitive to management practices on these lands. For example, the bighorn are sensitive to domestic sheep grazing - an activity which, although no longer prevalent, still occurs in this region.

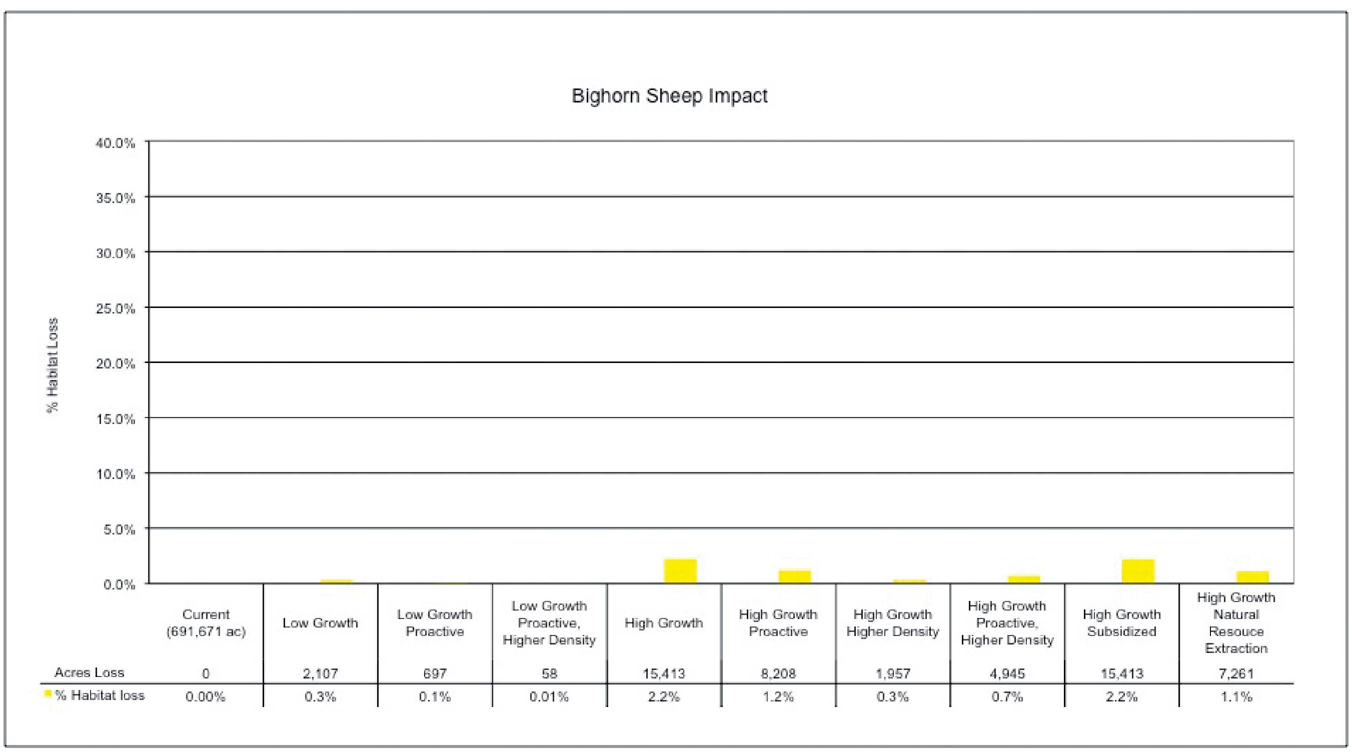


FIGURE 80, BIGHORN SHEEP, IMPACT BY SCENARIO

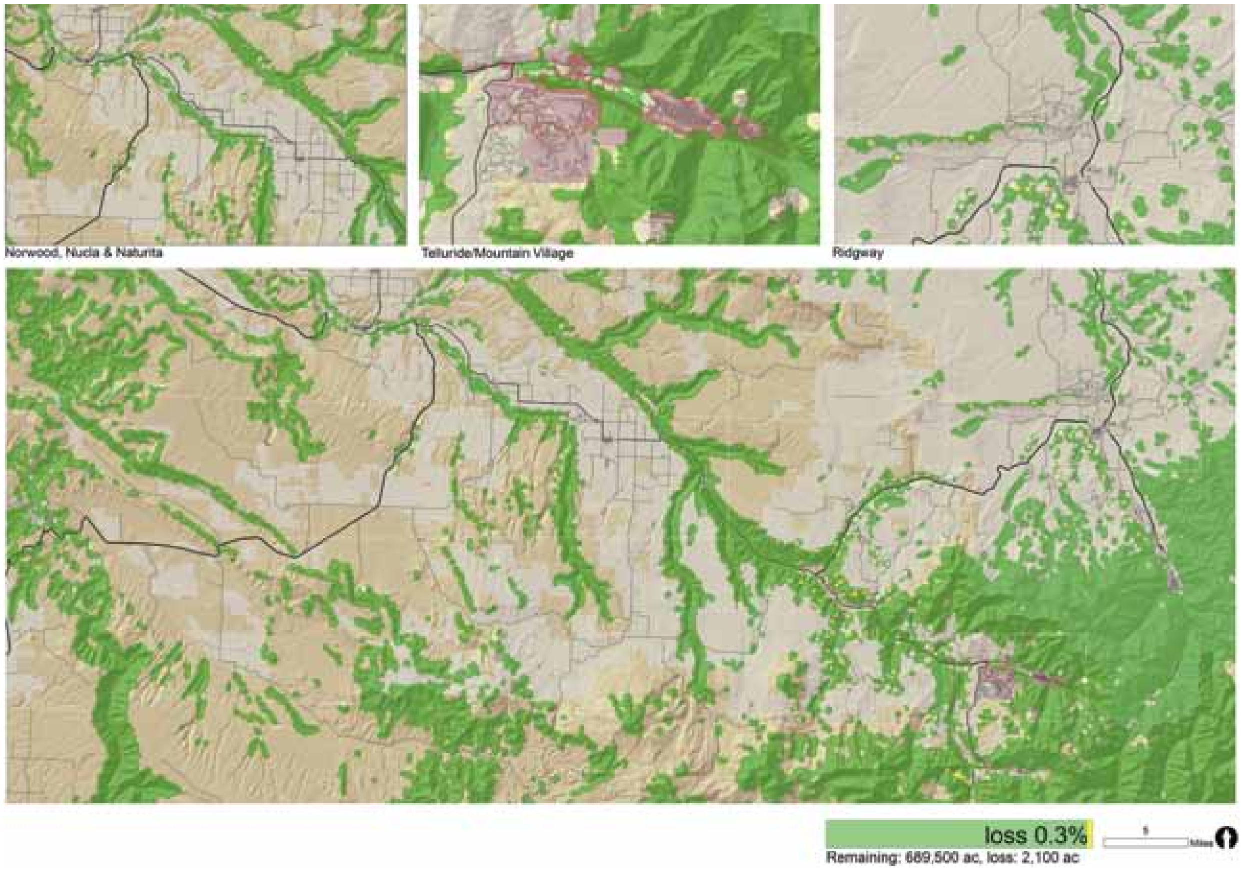


FIGURE 81, BIGHORN SHEEP, IMPACTS ON POTENTIAL HABITAT, ALTERNATIVE FUTURE #1, 2030
LOW GROWTH, EXISTING REGULATIONS

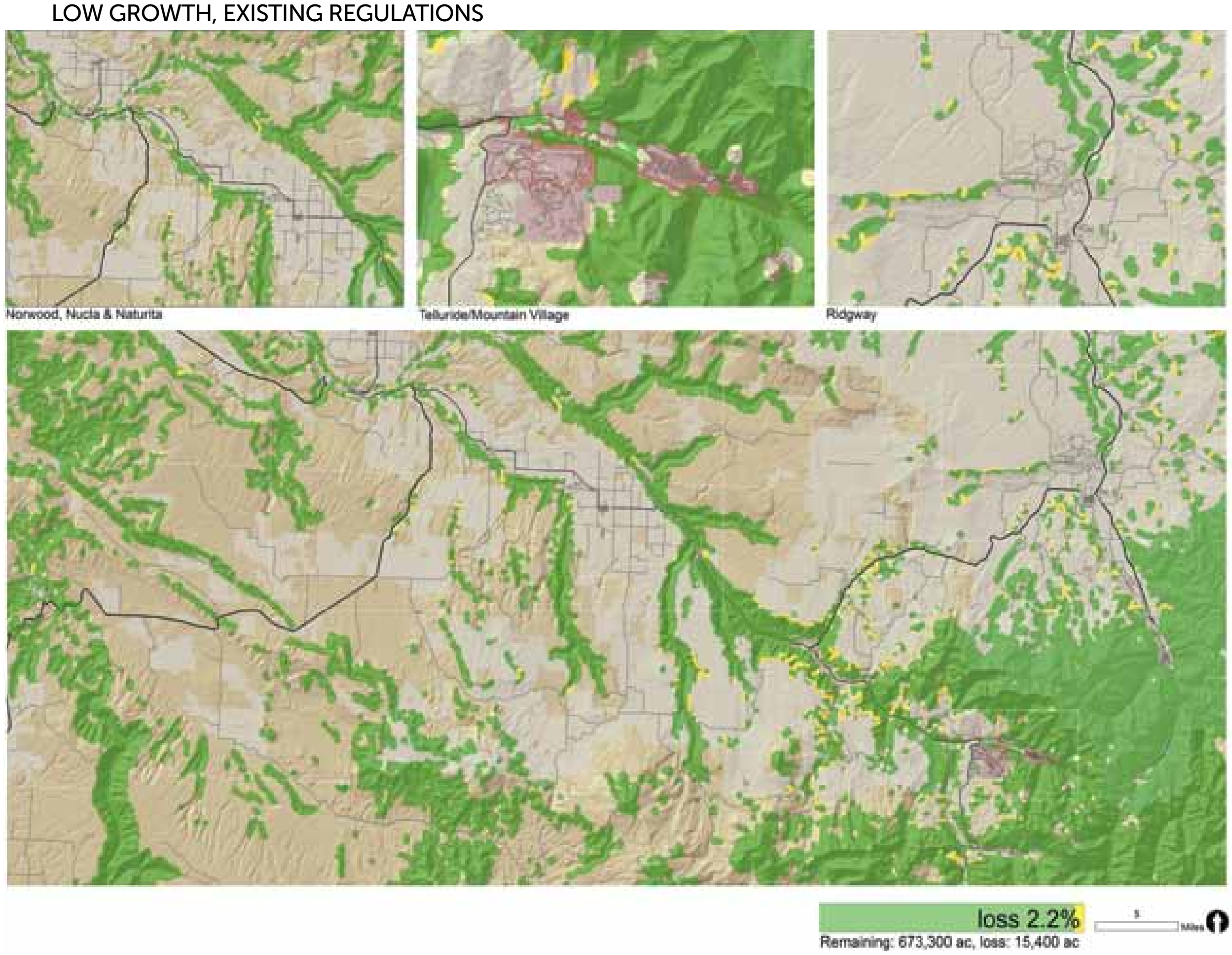
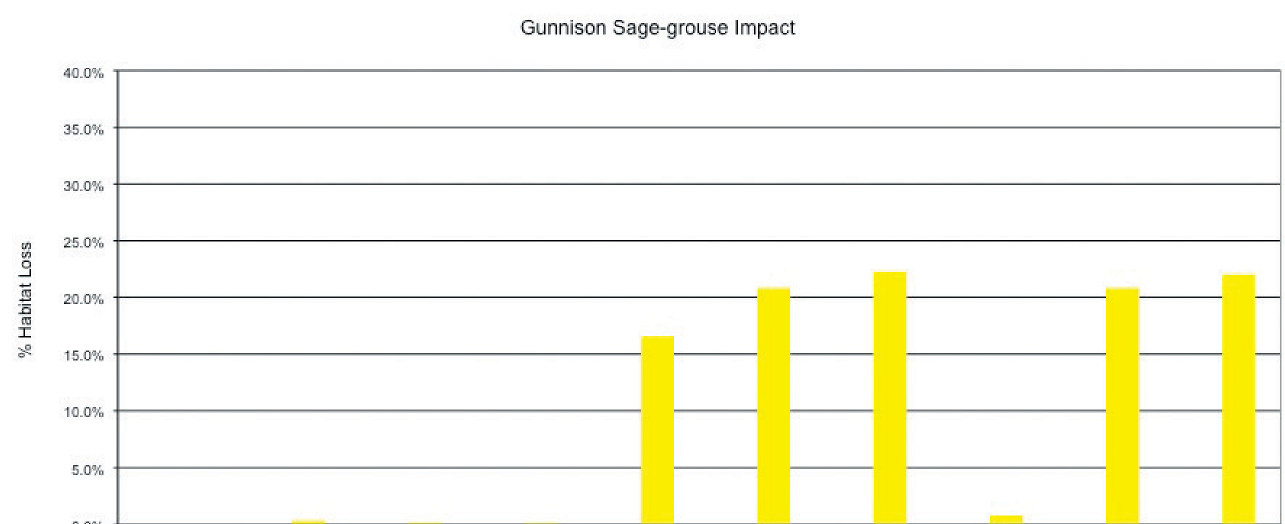


FIGURE 82, BIGHORN SHEEP, IMPACTS ON POTENTIAL HABITAT, ALTERNATIVE FUTURE #4, 2030
HIGH GROWTH, EXISTING REGULATIONS

Gunnison Sage-Grouse

The Gunnison sage-grouse is a species very sensitive to disturbance. This sensitivity leads to significant potential habitat loss,, even under low growth scenarios. The sage-grouse occupies flat, developable land, and so is impacted by the development of the mesas. Because the Gunnison sage-grouse is a candidate for endangered species listing, any loss of observed habitat must be considered very serious.

Figure 81 shows the impact on sage-grouse habitat caused by Scenario 1, the low growth alternative under existing regulations. About a quarter of the potential habitat is at risk, much of it on the mesa west of Ridgway.



	Current (206,347ac)	Low Growth	Low Growth Proactive	Low Growth Proactive, Higher Density	High Growth	High Growth Proactive	High Growth Higher Density	High Growth Proactive, Higher Density	High Growth Subsidized	High Growth Natural Resouce Extraction
Acres Loss		733	324	271	34,239	43,013	46,008	1,612	43,013	45,511
% Habitat loss	0.0%	0.4%	0.2%	0.1%	16.6%	20.8%	22.3%	0.8%	20.8%	22.1%

FIGURE 83, SAGE GROUSE, IMPACT BY SCENARIO

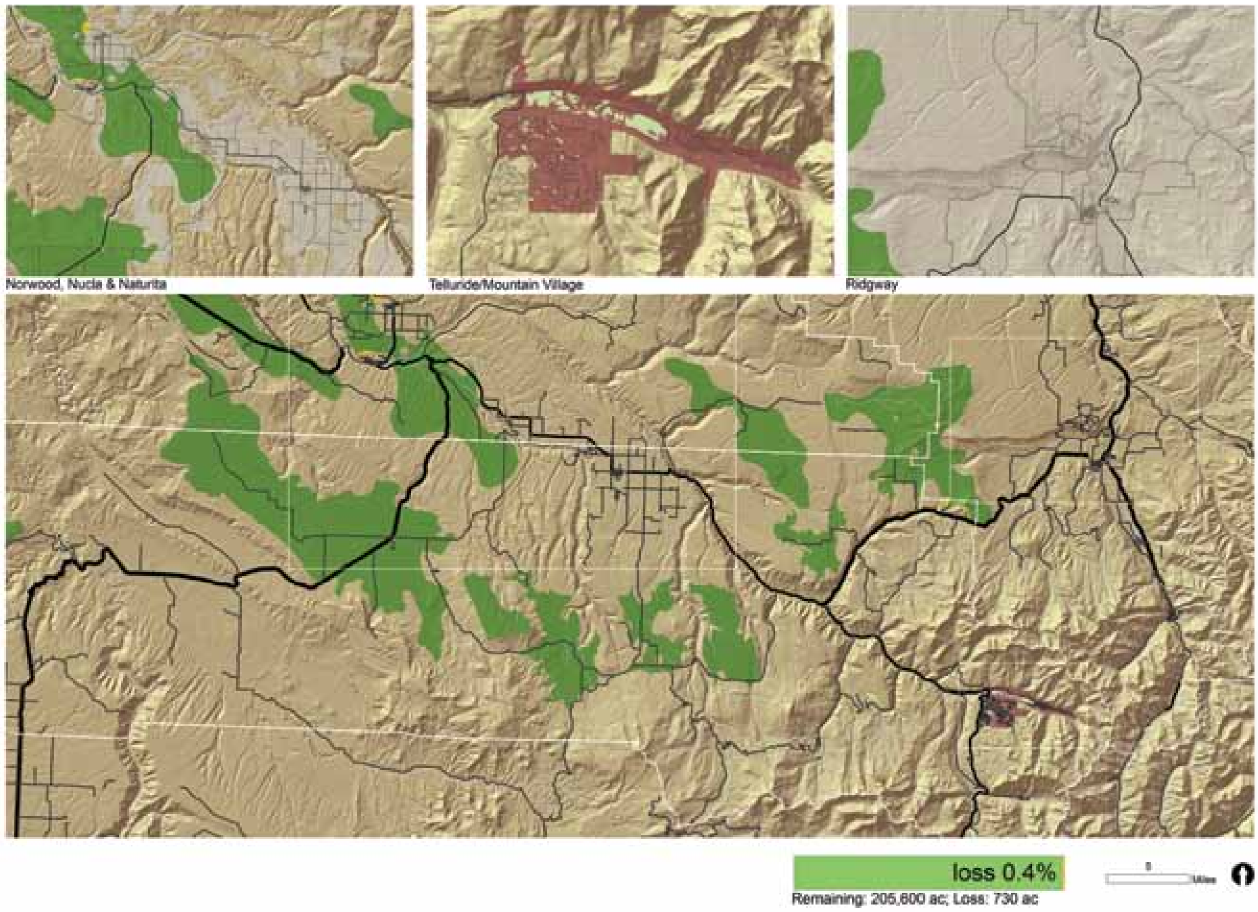


FIGURE 84, SAGE GROUSE, IMPACTS ON POTENTIAL HABITAT, ALTERNATIVE FUTURE #1, 2030
LOW GROWTH, EXISTING REGULATIONS

Figure 82 shows the impact of the high growth alternative under existing regulations. About 40% of the region's sage-grouse habitat will have been lost by 2030. However the single largest sage-grouse habitat area is maintained.

The impact on sage-grouse habitat caused by Scenario 82 high-growth of development under existing regulations, with exploitation of all current mineral extraction lease areas, is shown in figure 83. Impact occurs mainly in the western part of the study area. Loss of habitat occurs both on private land and on public land which has been leased for mineral extraction activities. Much of the impact occurs because of the road construction which is required to service areas of mineral extraction. One of the main extraction areas will destroy much of the single largest area of Gunnison sage-grouse habitat in the study area.

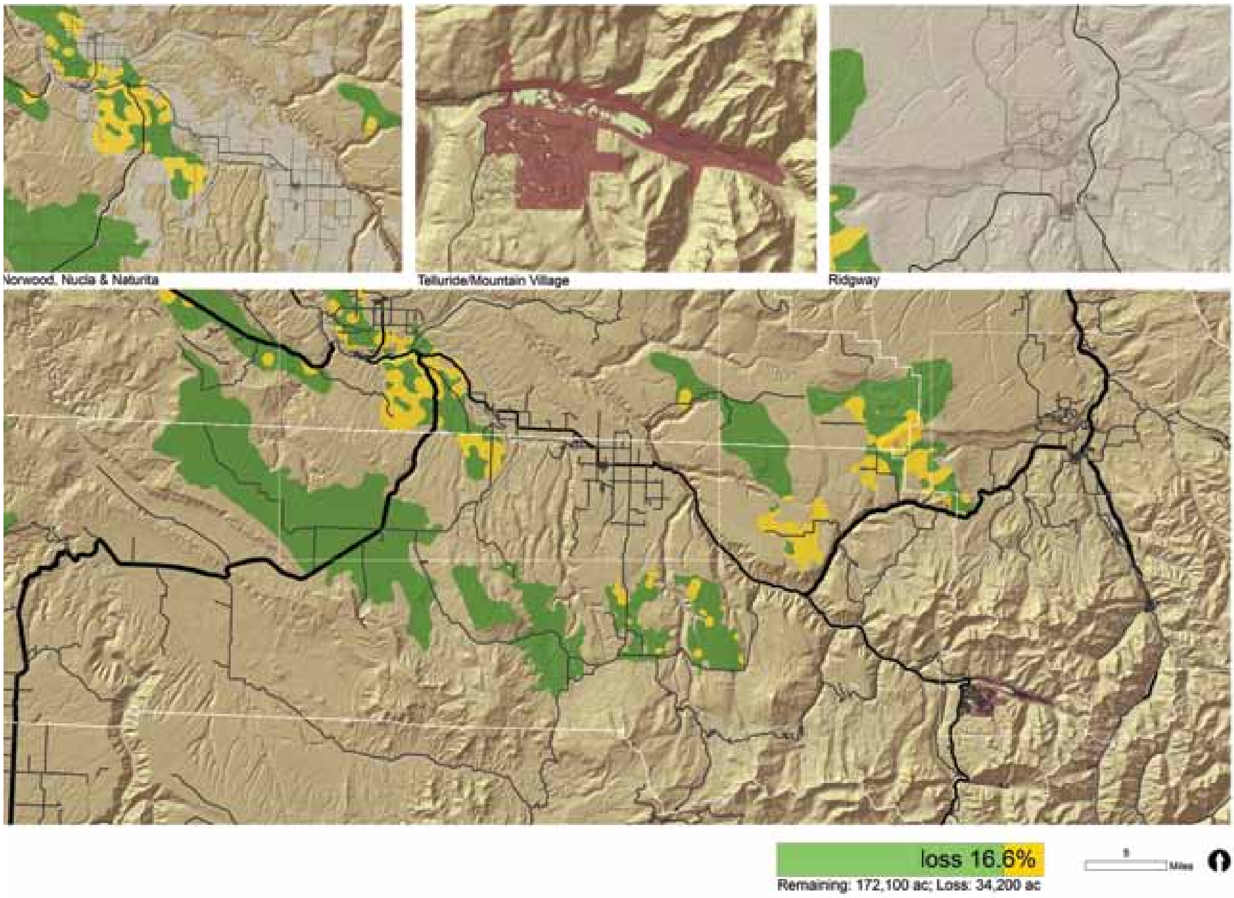


FIGURE 85, SAGE GROUSE, IMPACTS ON POTENTIAL HABITAT, ALTERNATIVE FUTURE #4, 2030
HIGH GROWTH, EXISTING REGULATIONS

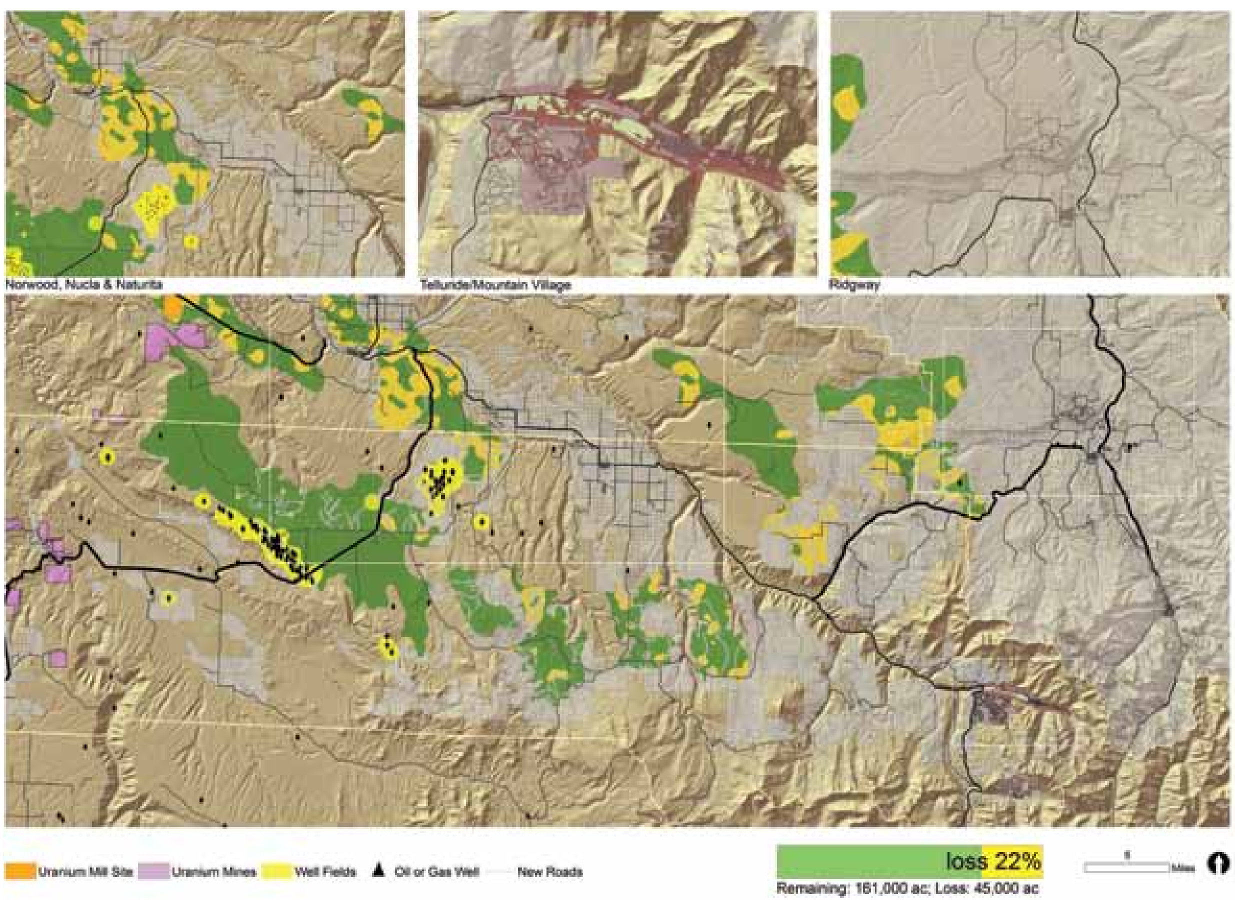


FIGURE 86, SAGE GROUSE, IMPACTS ON POTENTIAL HABITAT, ALTERNATIVE FUTURE #9, 2030
HIGH GROWTH, EXISTING REGULATIONS, MINERAL EXTRACTION

9. DECISION - HOW SHOULD THE TELLURIDE REGION BE CHANGED?
Conclusions

It is the purpose of this study to draw together existing information about the Telluride region, and organize it into a useful tool for evaluating the likely outcomes of a range of scenarios that could influence the future of the region in various ways. This study can be used to inform the decision making process, by helping stakeholders to have a shared understanding of regional issues, and to help them choose policies more likely to yield desired outcomes. These decisions must be made by the region's stakeholders. It is they who will be most directly affected by these decisions, and who have the political power to implement them.

There are about 8,000 privately-owned developable parcels of land that have not yet been developed in the study area. We estimate that 3,000 to 7,000 of these parcels will be developed in the next twenty years. In the high growth scenario, under existing regulations, the great majority of the region's private developable land will be built upon. Under the assumptions of the low growth scenario under existing regulations, within about 40 years, all private developable land in the region will be built upon.

The consequences of the scarcity of developable land are already being felt as increases in land value cascade through the region. In the future, as developable land becomes increasingly scarce, this process is likely to intensify. Land values will continue to rise in Ridgway and Norwood, causing increasing displacement of full-time residents who find themselves priced out of these towns. When Norwood and Ridgway become too expensive, many full time residents will move into more remote and unincorporated parts of the region. Increased commuting distances and travel times will bring about personal hardship and financial costs for workers. Loss of full time residents will have social consequences for the region's communities. Because of more widely spread development, major economic and technical problems will affect the area. Costs borne by the towns and counties to provide infrastructure and public services for the sprawling low density development will rise disproportionately.

There is considerable flexibility to expand or contract the pattern of future development through the adjustment of zoning regulations across the region. Sprawling development may be discouraged by using a combination of tighter proactive constraints, and allowing increased housing densities in selected areas, supported by provision of affordable public transportation.

Telluride and Mountain Village are reaching the limits of their developable land, and as a result are exporting demand for housing to other parts of the region. As the region continues to develop, more people will demand more services. Land uses other than residential will compete for the available land, especially in Telluride. Privately owned developable land is valuable for private houses, or for subsidized housing for employees. It is also valuable as sites for public and private services that will be needed in the future such as increased parking, commercial and public services. These demands will add to the already present pressure on Telluride's full time residents to move away to less expensive areas.

Without significant intervention, the use of private vehicles in the region will continue to grow, causing significantly increased traffic congestion. Because of the region's demanding topography, it is extremely difficult and costly to increase capacity on the major roads. This is particularly true of the roads entering Telluride and Mountain Village.

Parking will become increasingly difficult, especially in Telluride, where parking, public services and subsidized housing compete for the same limited land. The traffic problem in Telluride and throughout the region cannot be solved if traffic continues to be composed chiefly of private vehicles. Therefore, it is essential that the Telluride region design and implement an affordable, frequent and efficient public transportation system for both residents and visitors. Local rezoning decisions, particularly for residential development, should take into account access to public transport.

The ecological, economic and social effects of any future natural resource extraction will be felt primarily in the western areas of the region, where these resources are located. Oil, gas and uranium exploitation may benefit the nation, the mining companies and their employees, and would provide substantial economic benefit to the towns of Nucla and Naturita. However, development of these resources will have a profoundly harmful effect on the quality and the character of the landscape of the western portion of the study area. Management of the visual quality of this part of the region is particularly challenging because of the easily disrupted long views across open ranch lands.

Maintaining the character of the Telluride region will be a challenge. It is highly likely that the visual landscape will change dramatically unless there is a major change in the regulation of development. The present landscape presents the image of isolated urbanized areas separated by beautiful natural landscapes. It will be transformed to a more generally urbanized landscape. There will be few if any views that do not contain houses. This will be especially apparent in the views from the region's public roads. This will alter the perception of the Telluride region as one of exceptional natural landscapes punctuated by small attractive towns. This in turn may impact negatively the region's economic future.

Finally, and most importantly, the critical issues facing the Telluride region must be recognized as regional in nature. Distribution of new housing, transportation, the provision of services and protection of the environment are at their core regional issues. Furthermore, actions to deal with these issues must be carried out over periods of time that are much longer than the electoral cycle. While the various towns and counties have legal rights and responsibilities, the most important issues are long-term and regional. Because of its outstanding natural attractiveness, its reliance on potentially fickle tourism, and its vulnerability to dam¬age by poorly coordinated development decisions, the potential risks to the Telluride region are particularly acute.

This study demonstrates that the pressures which have been building over recent decades will continue to increase, with serious and potentially harmful impacts. At the same time, the window of opportunity to influence the future is closing as the private land supply continues toward "buildout". There are significant needs and consequent actions which should be taken immediately.

There is a clear need for greater technical cooperation among the region's towns and counties. There is inadequate coordination in the ways by which data are defined, collected and maintained by the various jurisdictions and there are no shared data management technologies. Without these it is and will continue to be extremely difficult to understand what is actually happening in the Telluride Region.

There are several major regional-scale policy issues facing the Telluride region which have been identified in this study:

• planning, providing and paying for regional public transport centered on Telluride and Mountain Village;

• adopting a regionally coordinated approach to the challenge of workforce housing;

• identifying opportunities for higher density development as a complement to and in coordination with regional transportation and workforce housing planning;

• establishing visual management policies, especially in viewsheds seen from main tourist routes;

• establishing stronger environment-derived development constraints particularly to protect Gunnison sage grouse and riparian vegetation zones;

• managing the conflicts between mineral extraction and environmental quality and natural habitats.

There are other issues which derive from those considered in this study such as planning for, providing and financing water, sewer, education, public health and safety, and other public services in the counties as population increases and development sprawls.

These issues will require an effective process for inter-jurisdictional planning, decision making and implementation, which will require much greater coordination and cooperation among the different towns and counties and also with the several public agencies which control large amounts of land in the Telluride Region. The critical need for improved coordination will require new, innovative and publicly acceptable ways making coordinated decisions. The implementation of regional planning policies will require political, legal and financial mechanisms which go beyond the current ways of "getting things done" in the Telluride Region. Unless the Telluride region adopts an effective regional approach, it will be in serious difficulty within the next 20 years. We hope that the people of the Telluride region are successful in establishing a coordinated regional strategy for the greater benefit of them¬selves and their environment.

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Colorado Department of Transportation for Colorado roads and traffic data

Colorado State Demography Office for population, population projects, housing and employment data

U S Environmental Protection Agency for the national hydrological dataset "plus"

The Nature Conservancy for ecological prioritization

U S Census for population data

U S Geological Survey , for land cover and elevation data

THE RESEARCH TEAM

Michael Flaxman is Assistant Professor in the Urban Information Systems Group of MIT's Department of Planning. He has practiced GIS-based planning in 14 countries, including one year as a Fulbright fellow in Canada. Dr. Flaxman previously served as Industry Manager for Design at Environmental Systems Research Incorporated (ESRI), the world's largest maker of geographic information systems (GIS). At ESRI, he was a manager of the design team responsible for the "geodesign initiative" - a framework for spatial decision support. Prior to joining ESRI, Dr. Flaxman was a Lecturer in Landscape Planning at Harvard's Graduate School of Design. He received his Doctorate in Design from Harvard in 2001, and holds a Masters in Community and Regional Planning from the University of Oregon, and a Bachelor's in Biology from Reed College.

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