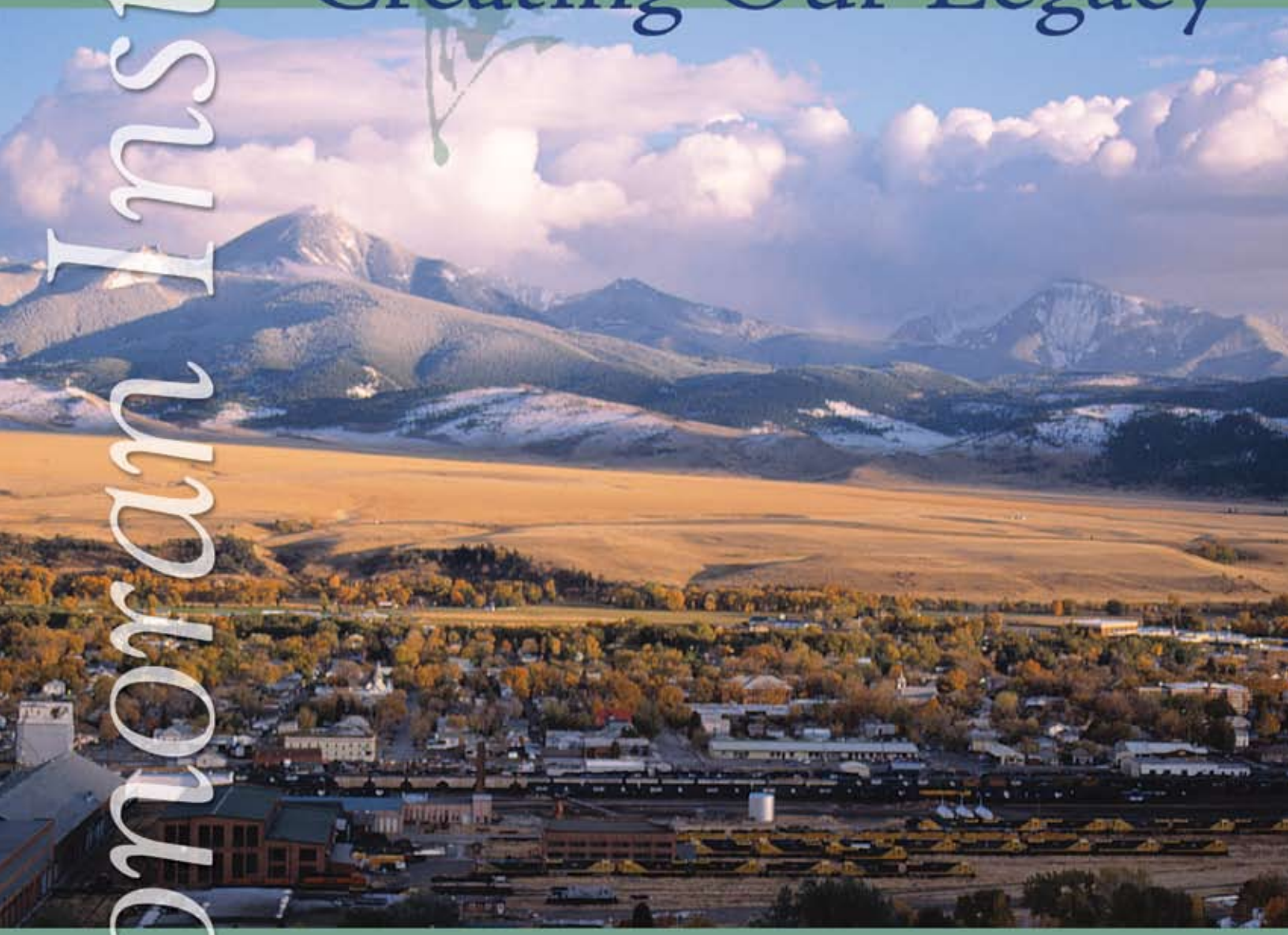
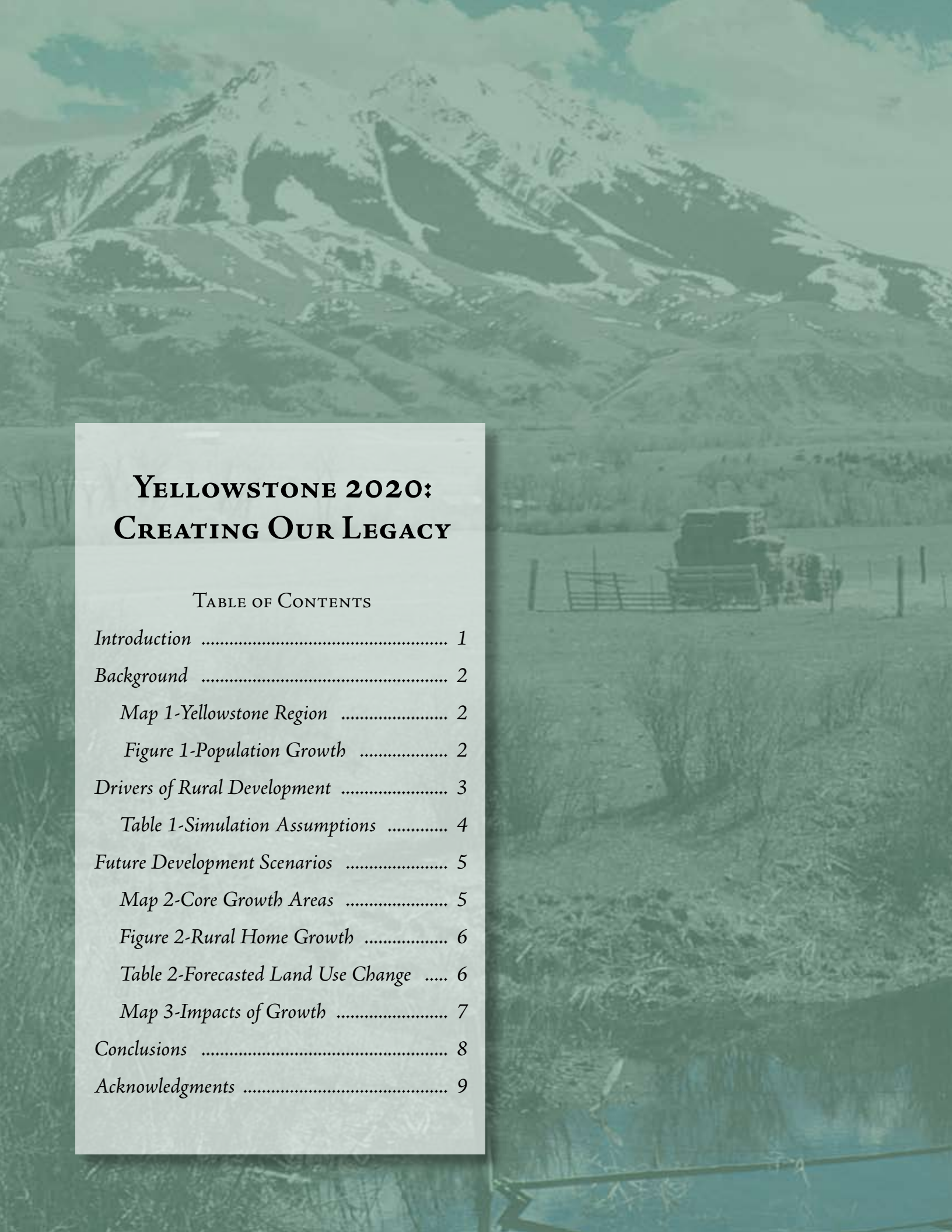
Sonoran Institute

Yellowstone 2020: Creating Our Legacy



In Partnership With
The Landscape Biodiversity Lab At Montana State University



Yellowstone 2020: Creating Our Legacy

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INTRODUCTION

The American West is growing rapidly. Incredible landscapes, friendly communities, and abundant recreational opportunities draw thousands of new residents every year. In fact, population growth rates of western American states far outpace the national average. More significantly, the rate of land development is growing much faster than the population. We're building bigger homes on bigger lots, and using more land than ever before.

The Yellowstone region (the lands in the 20 counties surrounding Yellowstone National Park), is experiencing these trends. Since 1970, population growth in the Yellowstone region has been occuring faster than in 78 percent of counties in the United States. Land consumption–the amount of land developed for new housing–grew by a staggering 350 percent. From valley to valley, the landscape is being transformed from farms, ranches, and natural areas to subdivisions and paved roads.

Because it is such a wonderful place to live, we know that the West will continue to grow. The question we must ask is: what sort of growth will we have and where will it occur?

Before we can successfully plan for growth, we should understand how we got where we are. This report starts by describing factors that influence the location of growth. Then, using past trends and patterns, we project where growth will occur in the future – if we continue with current land use policies. We pose alternative growth scenarios to illustrate how the actions taken now by landowners, county commissioners, planners, and citizens will affect the future of our communities.

Land use policies put in to practice now will determine what our communities, natural areas, and economies will be far into the future. With effective planning, our legacy for the Yellowstone region can be vibrant communities, prosperous economies and open spaces.

This report is a shorter, popularized version of a comprehensive analysis done at Montana State University in collaboration with the Sonoran Institute. The study was done by Patricia Gude under the advisement of Dr. Andrew Hansen, Dr. Ray Rasker, and Dr. Bruce Maxwell. A full description of the study can be found at: www.montana.edu/etd/available/hernandez_04.html. For additional information on the full report, contact patty@sonoran.org.

BACKGROUND

WHAT IS SMART GROWTH?

Smart growth strengthens economies, communities, and the environment.

Smart growth:

- *Uses land and existing infrastructure like roads, schools, fire, and police services efficiently;*
- *Protects clean air and water by preserving farmland and natural areas;*
- *Provides a variety of travel options for safer streets and reduced traffic;*
- *Creates more choices in home size and price;*
- *Revives and creates traditional neighborhoods that sustain community bonds.*

The results and recommendations of this report focus on the 20 counties of Idaho, Montana, and Wyoming that make up the Yellowstone area (see Map 1). However, these findings can be applied to any region of the West experiencing rapid growth where wide open spaces and friendly communities are absorbing new migrants.

The Yellowstone region is 36 million acres, of which 32 percent is privately owned. **With roughly 370,000 permanent residents in 2000, (approximately 20 people per square mile of private land), the region has a small but rapidly expanding population.** Demographers believe that this rapid migration will continue in areas like Yellowstone that are rich in natural amenities, and that this growth will far outpace the national average.

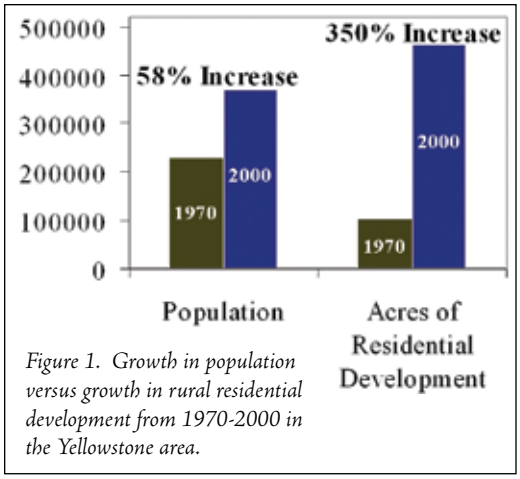


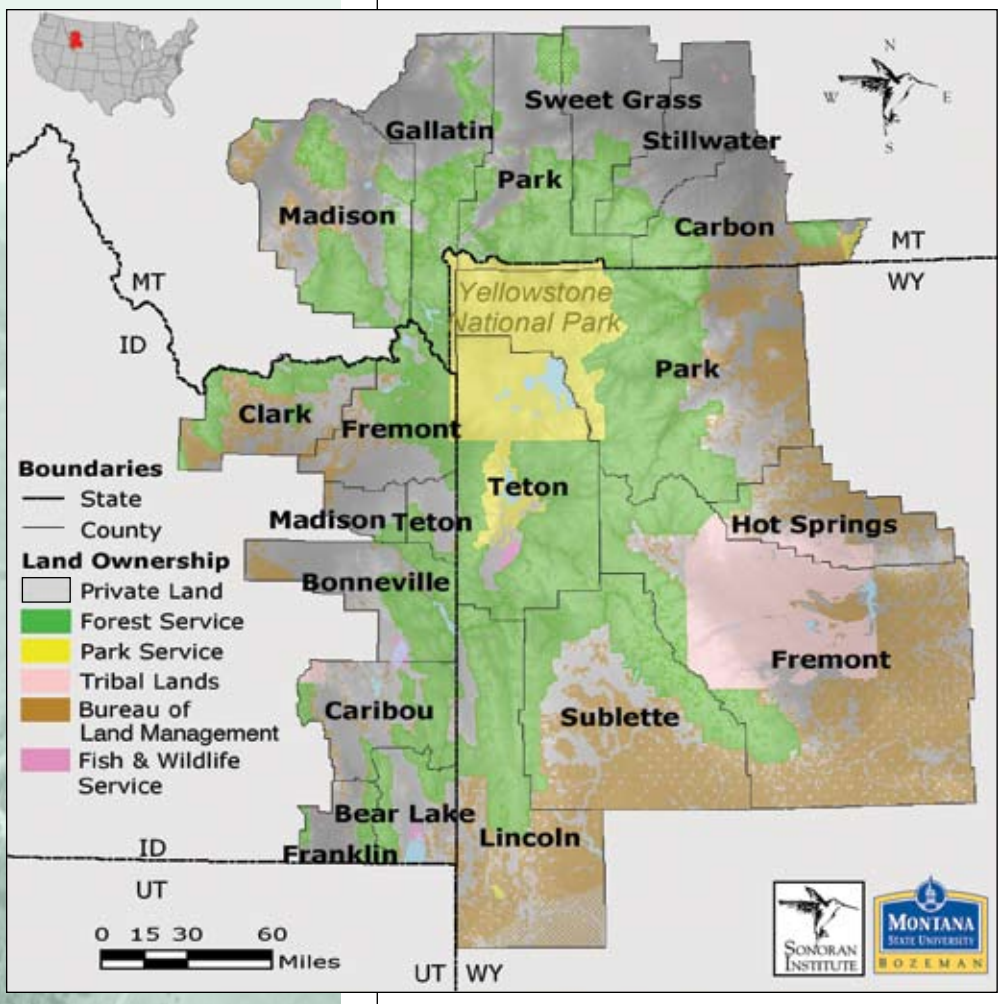
Figure 1. Growth in population versus growth in rural residential development from 1970-2000 in the Yellowstone area.

From 1970 to 2000, the Yellowstone region experienced a 62 percent increase in population, while the amount of land developed in rural areas grew by 350 percent (see Figure 1).

A little known but important fact is that ecologically sensitive areas in the Yellowstone region, like elk winter range and riparian areas along streams, are often concentrated on private lands because public lands are generally higher in elevation with less productive soils. Today, most of the private lands are still natural areas, but residential development is fragmenting the region by converting farms and ranches into large-lot subdivisions. The footprint of residential development is increasing much faster than the rate of population growth, as large-lot rural subdivision continues to be the preferred mode of development.

From 1970 to 2000, the Yellowstone region experienced a 62 percent increase in population, while the amount of land developed in rural areas grew by 350 percent.

Map 1. The Yellowstone Region



In this study, we identified factors driving current development, such as transportation infrastructure, services, and natural amenities. We also identified lands most likely to be developed, including highly productive agricultural lands and riparian wildlife habitat. We then created a computer simulation model to predict the impact of various "smart growth" strategies, assuming different rates of population growth.

Specifically, this report addresses the following questions:

What drove rural development in the past?

What scenarios of rural growth patterns are likely to occur in the future?

What effect will today's planning efforts have on the landscapes of the future?

DRIVERS OF RURAL DEVELOPMENT

In this study, we gathered data on rural homes from county tax assessor records and used modern statistical methods to identify the drivers of recent growth patterns. We found that many factors influence the location of growth, including: agricultural suitability, transportation infrastructure, services, natural amenities, and nearby existing development.

Five major trends in rural development appear:

1 **Rural homes are concentrated near water and on highly productive soils.** This trend reflects early settlement patterns and transportation routes established when people needed to be self sufficient in growing food and accessing water. The aesthetic and recreational value of rivers and lakeshores has also driven this pattern; people want to live near sources of water.

2 **Development of remote home sites encourages conversion of nearby natural areas.** This occurs because new homes built in remote locations lead to the construction of roads, schools, and utility lines, all of which encourage growth. Isolated subdivisions are soon accompanied by development along their borders; growth begets more growth once the infrastructure is in place.

3 **Natural amenities, such as rivers, sweeping vistas, and protected public lands attract growth.** Natural amenities are strongly related to growth in rural housing. The areas experiencing higher

CONSEQUENCES FOR WILDLIFE, FARMS, AND RANCHES

Recent growth patterns have negative consequences for wildlife and working agricultural lands. New development bordering the national parks and adjacent public lands poses a barrier to migrating wildlife. Pronghorn antelope, moose, elk, and mule deer that migrate to winter ranges on private lands are especially vulnerable. Occupied grizzly bear habitat, songbird hotspots, and riparian areas have been disproportionately impacted by rural development. In fact, most habitats are likely to undergo substantial conversion (between 10% and 40%) to rural development by 2020.

CONSEQUENCES FOR LOCAL GOVERNMENT BUDGETS AND TAXES:

Rural residential development increases demands for new schools, fire stations, roads, sewer, and utility lines. Often costing more in services than is generated in property taxes, rural residential development can be a net drain on local government budgets. In the Yellowstone region, most new rural growth is low density, dispersed development that costs more for services like fire and police than compact development located near existing communities, services, and infrastructure.

levels of rural home construction tend to be in warmer and wetter regions, and have more direct access to national parks and forested areas. Recent increases in retiree and vacation homes have intensified this pattern.

4 **High amenity towns are more likely to attract nearby rural development.** Not all towns are likely to attract rural residential development. We found that towns near national park entrances were more likely to experience home construction in nearby rural lands, as were towns characterized by a highly educated population and a large proportion of employment in the professional services, like engineering, accounting, real estate, finance, and architecture. Such towns include Rexburg, Driggs, and Victor in Idaho; Bozeman, Ennis, and West Yellowstone in Montana; and Pinedale and Jackson in Wyoming.

5 **The strongest driver of growth is the location of transportation infrastructure and services.** The most influential drivers of rural home construction are transportation infrastructure and service related factors, including road density, travel time from airports, and travel time from hospitals. These factors play a complex role in promoting growth. For example, rural home construction increases the demand for new roadways and expanded capacity along existing roads. These new and improved roads induce additional traffic by encouraging new development along them. This new development in turn creates an even greater demand for new roads.

The current pattern of rural development reflects all of the factors we have mentioned, as well as the "legacy" of previous growth patterns. The Gallatin Valley in Montana is an excellent example. The rural areas surrounding Bozeman were developed within the rich agricultural lands of the Gallatin Valley. The railroad and improved highways encouraged further development, and resulting population growth led to the construction of an airport, increasing a key form of accessibility for new rural homeowners. Growth in tourism led to the expansion of the airport. Easier access to larger population centers via air travel in turn made it possible for high-tech businesses and higher wage professional services, such as finance, engineering, architecture, and management consulting to locate in the area. Owners of many of these businesses migrated to the Gallatin Valley because of its abundant natural amenities, including hiking, fishing, and scenic mountains, and its connection to larger markets via the airport. Growth has become a self-perpetuating force as businesses move in to capitalize on the needs of residents or cater to clients outside the immediate area by utilizing the transportation infrastructure, internet, and other technologies.

SIMULATION ASSUMPTIONS

Scenario	Rate of Rural Home Construction	Smart Growth Factors	Driving Factors
STATUS QUO	Same as 1990s	Existing zoning and conservation easements	Factors that drove growth in 1990s
LOW GROWTH	Lower probability limit	Existing zoning and conservation easements	Factors that drove growth in 1990s
BOOM	Upper probability limit	Existing zoning and conservation easements	Factors that drove growth in 1990s, plus information provided by Yellowstone planners on future gains in transportation and housing
SMART GROWTH	Same as 1990s	Hypothetical zoning and conservation easements	Factors that drove growth in 1990s

Table 1. The future growth scenarios used different assumptions of growth rates, limiting, and driving factors.

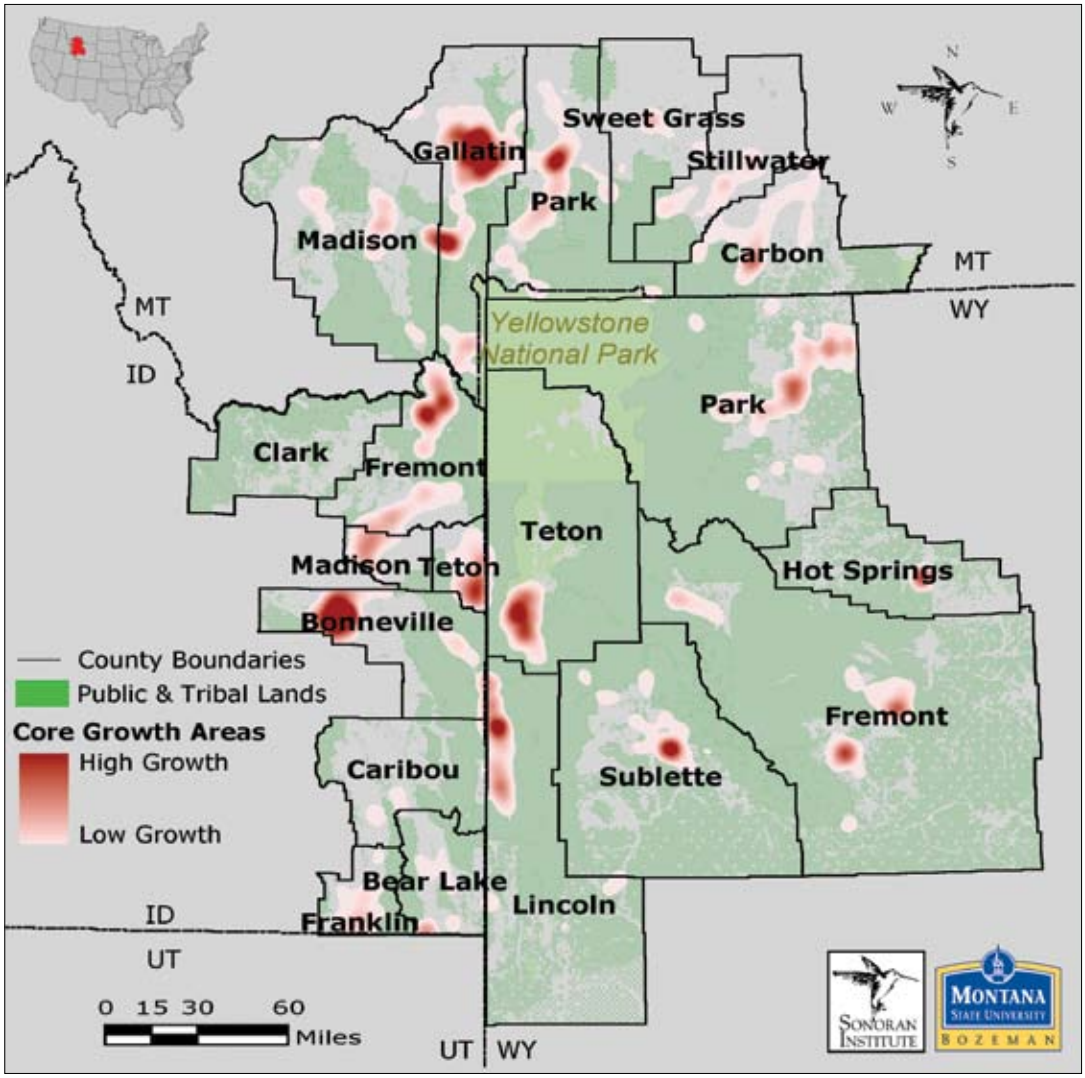
FUTURE DEVELOPMENT SCENARIOS

After identifying the drivers of growth, we created a simulation of future rural development using computer mapping software. This simulation is based on 1990s growth rates and the expert opinions of regional land use planners and zoning administrators, who provided information regarding future changes that might spur growth, including the construction of roads, airport expansions, and the building of new subdivisions. In all, we created four alternative scenarios for the year 2020: a status quo scenario; a low growth scenario; a boom scenario; and a smart growth scenario (see Table 1).

From the alternative future scenarios, we learned that:

1 Under all of the scenarios, rural areas will face major land use changes by the year 2020.

In all scenarios, forecasted homes were concentrated near towns and public lands mainly in the northern and western portions of the study area (see Map 2). Development was forecasted to occur most densely in the Gallatin Valley, the area surrounding Idaho Falls, the Island Park area, Jackson Hole, southern Teton Valley, the Rexburg area, northern Star Valley, northern Paradise



Map 2. Red highlight areas that were forecasted to experience high growth in all four future scenarios in the Greater Yellowstone.

INSIDE THE SMART GROWTH SCENARIO

In the smart growth scenario, growth occurs at the same rate as in the status quo scenario. The difference is in the location of forecasted homes. In the smart growth scenario, we incorporated hypothetical smart growth policies, such as conservation easements, incentives, and zoning that would guide growth toward existing towns. These policies were used to guide development away from one quarter of the Yellowstone region's most valuable natural areas, farms, and ranches.

To determine which natural areas, farms, and ranches should be conserved, we graded lands on four measures: irreplaceability, connectivity to other habitats, biodiversity, and riparian habitat. In the smart growth scenario, 8% of private lands (1 million acres) were put into conservation easements, 25% (3 million acres) were zoned for agricultural use, and incentives were used to guide growth toward existing towns.

SIMULATING FUTURE DEVELOPMENT

A statistical technique known as generalized linear modeling was used to identify the combination of factors that best described growth in rural housing during the 1990s. The resulting equation was used to forecast rural housing densities per square mile of private land for 2010 and 2020. The simulation was designed so that both growth-inducing and growth-management factors could be manipulated in order to generate maps of alternative future scenarios. For example, growth-inducing factors, such as future road additions, were drawn on maps by Yellowstone area planners, and incorporated into the boom scenario. Smart growth factors, such as incentives to cluster growth near towns, were incorporated into the smart growth scenario. Such modifications affected forecasted housing densities, and were used to generate the four alternative scenarios. Technical reports available at www.sonoran.org contain full documentation on how the simulation works.

Valley, and the area surrounding Cody, Wyoming.

The scenarios differed in the amount of growth projected and the location of future homes. The increase in rural homes ranged from 28 percent in the low growth scenario, to 82 percent in the status quo scenario, to 234 percent in the boom scenario (see Figure 2).

In the status quo scenario, 15 percent of agricultural lands and 8 percent of natural areas were developed by 2020 (see Table 2). Farms and ranches are more vulnerable because they are accessible by roads, whereas isolated natural areas are more likely to remain undeveloped until a road is built. In the boom scenario, 36 percent of agricultural lands and 24 percent of natural areas were developed by 2020.

At the rate of development forecasted in the boom scenario, all natural areas on private lands in the region would be converted to development within roughly 40 years. In comparison, the policies in the smart growth scenario protect 99 percent of agricultural areas and 97 percent of natural areas without restricting the amount of development.

2 The majority of current land use policies will be largely ineffective at limiting unplanned, costly growth.

While counties are working toward good land use plans, we found that existing land use policies had little or no effect on the patterns of forecasted growth. For example, in 16 of the 20 counties, existing zoning districts affected fewer than 10 percent of forecasted homes. In rare cases, such as Clark County, Idaho, restrictive zoning districts had only minor impacts because growth was forecasted to occur slowly and not exceed the zoning regulations. However, in most counties, zoning was ineffective because it put few limits on high growth areas. For example, the rapid rural growth forecasted in Lincoln County, Wyoming never exceeded the current zoning regulations. This is because the rural zoning within Lincoln County is exceptionally permissive, allowing for housing densities of 320 to 1280 homes per square mile.

3 Without growth management coordination between cities and counties at a regional scale, the patchwork of local policies will merely shift unplanned growth from one place to the next.

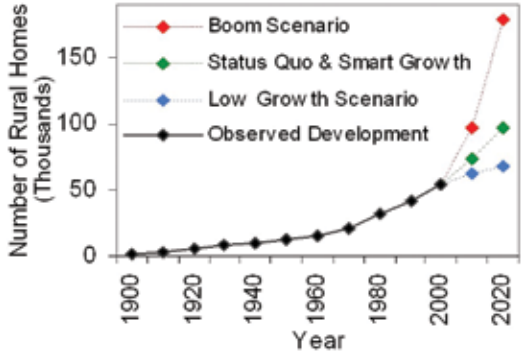


Figure 2. The total number of forecasted rural homes per future scenario.

Forecasted Land Use Change In the Private Lands of the Yellowstone Area (2000 - 2020)

SCENARIO	LOSS OF AGRICULTURAL LANDS	LOSS OF NATURAL AREAS
Low Growth	5%	5%
Status Quo	15%	8%
Boom	36%	24%
Smart growth	1%	3%

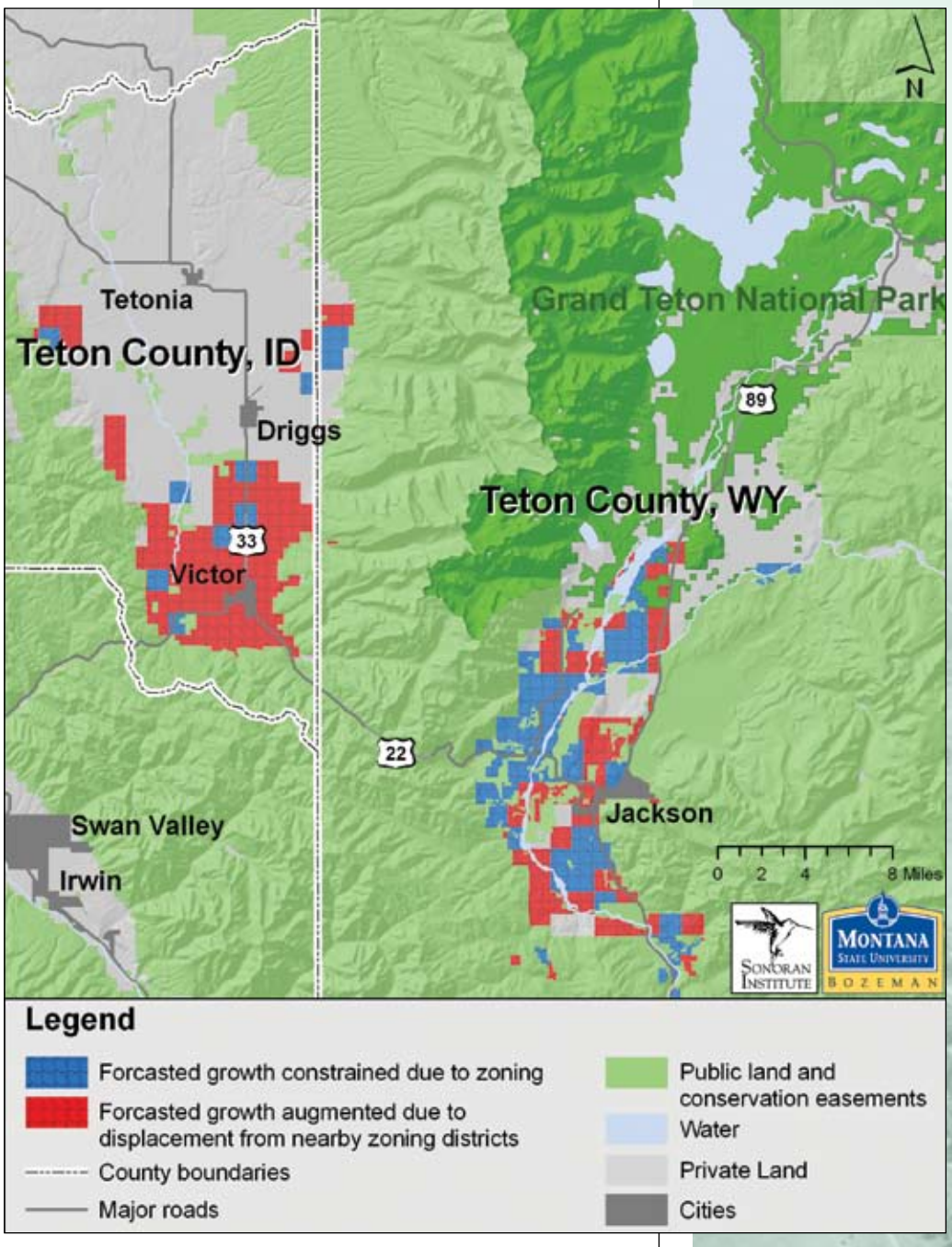
Table 2. The percent of private agricultural and natural lands converted to rural residential development is compared between the four alternative future scenarios.

We learned that a patchwork of local land use policies leads to unintended growth patterns. Teton County, Wyoming and Teton County, Idaho are clear examples of how land use policies in one county can have major effects on growth patterns in neighboring counties. Aggressive growth management efforts in the Jackson Hole area resulted in a forecasted "spill-over" of rural homes into the southern portion of Idaho's Teton Valley (see Map 3). To avoid this situation, there must be regional cooperation among counties in developing smart growth plans.

At the rate of development forecasted in the boom scenario, all natural areas on private lands in the region would be converted to development within roughly 40 years.

4 There is no silver bullet. A combination of land use policies and incentives is needed to successfully balance future growth, fiscal well-being, and environmental quality.

We used the smart growth scenario to evaluate land use policies. The goal was to identify policies that could preserve one quarter of the ecologically sensitive private lands in the Yellowstone region as natural areas, farms, and ranches. This was achieved without limiting future growth in housing by providing incentives that guided growth toward existing towns, and strategically locating conservation easements and zoning districts. As a result of these hypothetical policies, losses of natural areas and working agricultural lands were minimized in the smart growth scenario (see Table 2).



Map 3. The impacts of growth management can extend into neighboring counties, as shown by the "spill-over" from Jackson Hole into Idaho's Southern Teton Valley.

CONCLUSIONS

More information on the study summarized in this report will soon be available in the following peer-reviewed journal articles:

Gude, P.H., Hansen, A.J., Rasker, R., Maxwell, B. In Press. Rates and drivers of rural residential development in the Greater Yellowstone. Landscape and Urban Planning.

Hansen, A.J., Knight, R.L., Marzluff, J., Powell, S., Brown, K., Gude, P.H., Jones, K.L. In Press. Effects of exurban development on biodiversity: patterns, mechanisms, research needs. Ecological Applications.

Gude, P.H., Hansen, A.J., Rasker, R., Maxwell, B. In Review. Biodiversity consequences of alternative future land use scenarios in Greater Yellowstone. Ecological Applications.

KEY FINDINGS

Future migration and development may forever change western lands. The questions to be asked are: What sort of growth will we have? Where will it occur? The answers will greatly impact the landscapes, communities, and local economies in the West.

Through our case study of the Yellowstone region, we learned that:

1 **Sprawling development, especially "leap frog" subdivisions constructed away from existing development, encourages further development of nearby natural areas.** This occurs because the infrastructure and services that accompany "leap frog" subdivisions facilitate further development of nearby land.

2 **Existing land use policies in most of the region are largely ineffective at limiting unplanned growth.** While some counties have made progress in drafting good management plans, less success has been enjoyed in the actual implementation of these plans and policies.

3 **Policies in one county have major spillover impacts on growth patterns in neighboring counties.** Good land use standards and implementation in one local area are by themselves insufficient to prevent and in some cases encourage unwanted development patterns in adjacent areas.

KEY RECOMMENDATIONS

We also identified necessary steps in planning for growth. We learned that well-planned local policies can preserve agricultural lands, wildlife, air and water quality, and the stability of local economies without limiting growth.

The following three tactics will be critical:

1 **A combination of land use policies, including conservation easements, regulations, and incentives are needed to successfully balance future growth, fiscal well-being, and environmental quality.**

2 **Beyond writing good land use plans and ordinances, the region needs to adopt policies to implement its best laid plans and enforce its regulations.**

3 **For smart growth policies to be truly effective, regional coordination among cities and counties is imperative.**

There is a high potential for undirected growth in many areas of the West because of rapid migration rates and unrestricted land use policies. However, effective growth management can be accomplished with regional collaboration, provision of incentives to encourage future growth near towns, and more extensive and strategic use of zoning and conservation easements.

We can take action now to reduce unplanned growth in the long run. Rather than be victims of change, we can plan for it, shape it, and emerge as a region known for its vibrant communities, prosperous economies and open spaces. With effective planning, this can be our legacy for the Yellowstone region.

ACKNOWLEDGMENTS

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healthy landscapes • vibrant economies • livable communities

A nonprofit organization established in 1990, the Sonoran Institute brings diverse people together to accomplish shared conservation goals.

The Sonoran Institute works with communities to conserve and restore important natural landscapes in Western North America, including the wildlife and cultural values of these lands. The lasting benefits of the Sonoran Institute's work are healthy landscapes and vibrant, livable communities that embrace conservation as an integral element of their quality of life and economic vitality.

Through our approach, the Sonoran Institute contributes to a day when:

Healthy landscapes, including native plants and wildlife, diverse habitat, open spaces, clear air and water, extend from northern Mexico to Western Canada;

People embrace stewardship as a fundamental value by caring for their communities, economies and natural landscapes;

Resilient economies support strong communities, diverse opportunities for residents, productive working landscapes, and stewardship of the natural world.

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The Landscape Biodiversity Lab studies how people use the land and how, in turn, people influence wildlife and ecosystems.

Plants and animals are spread across landscapes based on natural factors like climate, food availability, and habitat type. The use of land by people is a product both of human factors like economics, but also ecological factors like climate. Consequently, the locations of farms, rural homes, and cities sometimes occur in the places most important to native wildlife.

The Landscape Biodiversity Lab studies how natural factors and human land use influence the distribution of species and changes in their population sizes. The Lab's research is aimed at understanding these complex interactions to help land managers and citizens make informed decisions about natural resource issues.

The Lab's studies make use of a unique combination of approaches in this work, including field studies, satellite data analysis, statistics, and spatial modeling. Together, these approaches help us address questions across large complex landscapes.

The Landscape Biodiversity Lab's findings from the Yellowstone region have lead to studies across the Pacific and Inland Northwest, the Yellowstone to Yukon region, Mexico, China, Kenya, and several other countries around the world. These studies are helping decision makers and natural resource managers implement science-based policies and management strategies

Landscape Biodiversity Lab

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