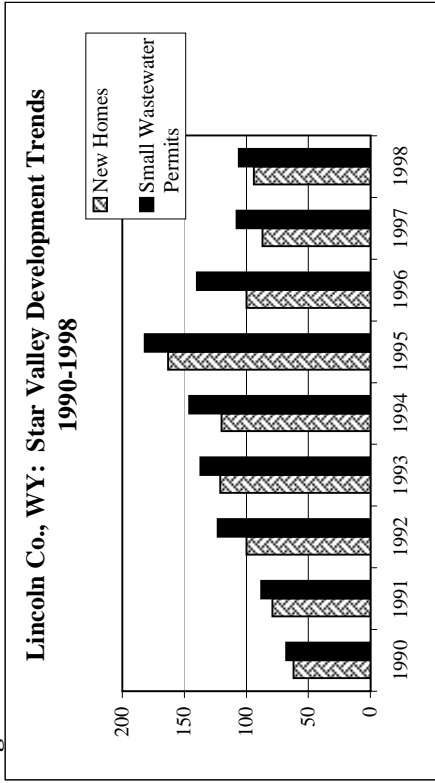
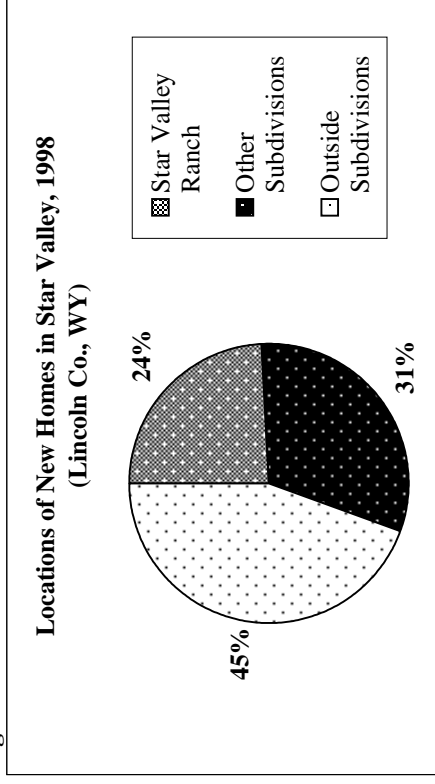


Figure 22a



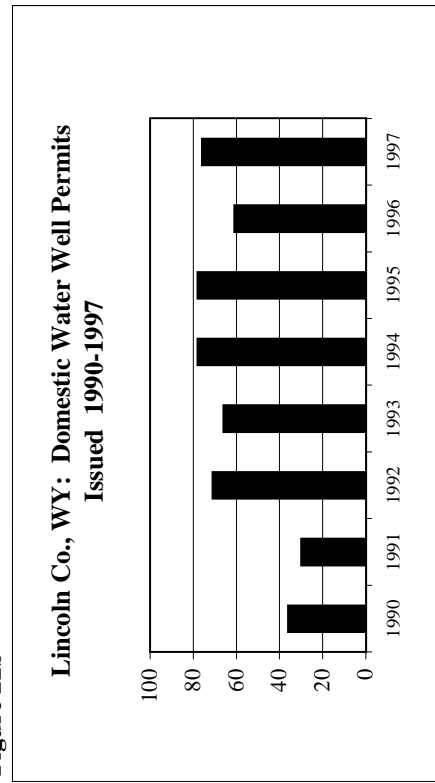
Source: Lincoln County Office of Planning and Development, Afton, WY

Figure 22c



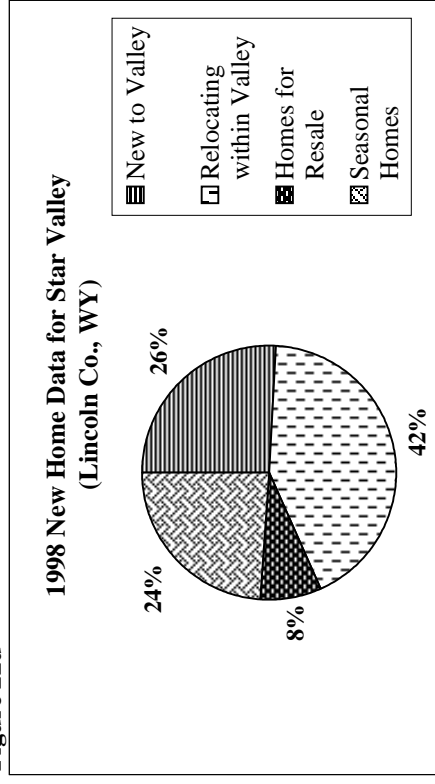
Source: Lincoln County Office of Planning and Development, Afton, WY

Figure 22b



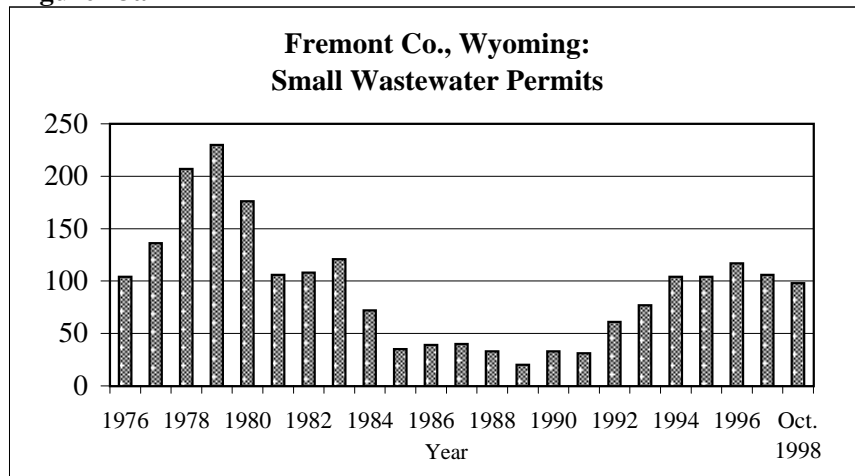
Source: Wyoming State Engineer's Office, Ground Water Division, Cheyenne, WY

Figure 22d



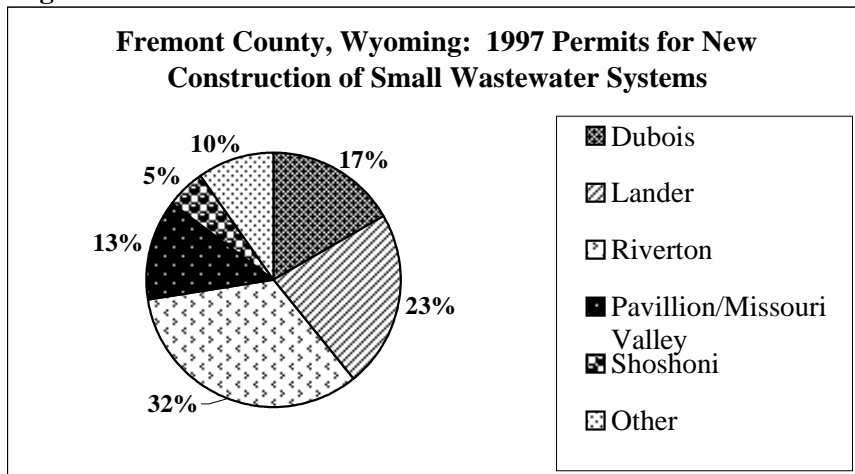
Source: Lincoln County Office of Planning and Development, Afton, WY

Figure 23a



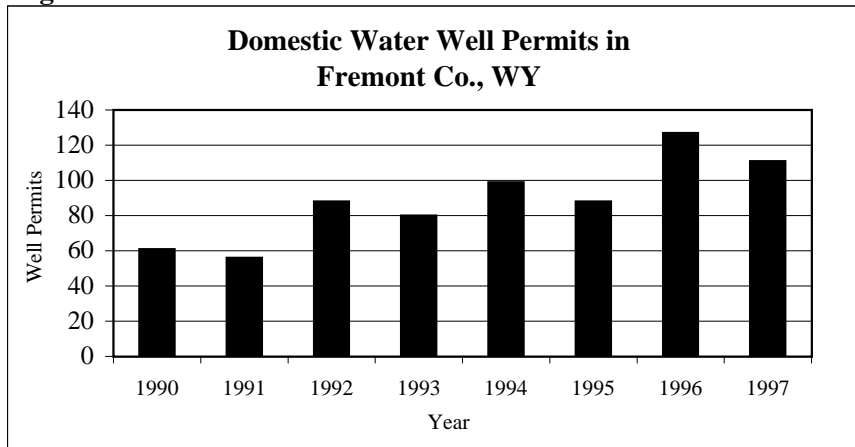
Source: Fremont County Planning Department, Lander, Wyoming

Figure 23b



Source: Fremont County Planning Department, Lander, Wyoming

Figure 23c



Source: Wyoming State Engineer's Office, Ground Water Division

Park County

The Park County Planning and Zoning Department has analyzed trends both in the amount and location of development over the last 20 years through Bureau of Census statistics, tax assessor data, permits for new housing units (land use certificates), and subdivision lot numbers. The number of subdivision lots created peaked in 1983, at 545 (Figure 24a). The number of lots declined thereafter, and then peaked again in 1996 at just over 100. However, permits for new housing units were much higher in the 1990s than in the previous two decades (Figure 24b). This suggests that many lots created or bought in the 1980s are just now being built upon. This is corroborated by data on the building status of subdivision lots as of 1997 (Figure 24c), as the majority of subdivision lots (59%) remain vacant.

Beginning in the late 1980s, broad trends in Park County well data (Figure 24d) mirror broad trends in the county's data for new housing unit permits: in general, there was an increase in this period from the prior decade. However, from 1989 – 1994, numbers for wells are greater than permits for new housing units, from 1995 – 1996 there were more housing units permits issued than wells drilled, and for 1997 the wells slightly greater again than new housing permits. This suggests well data may not be a precise indicator of development numbers. Furthermore, well data likely underestimate rural residential development, as the Assistant Planner at Park County noted that “many homes both in and out of subdivisions are on Northwest Rural Water (a local rural water provider), and, therefore, have no wells.” (Martin, pers. comm., 1998). As of April 1999, Northwest Rural Water serviced 925 homes in Park County (Northwest Rural Water, pers. comm., 1999).

Sublette County

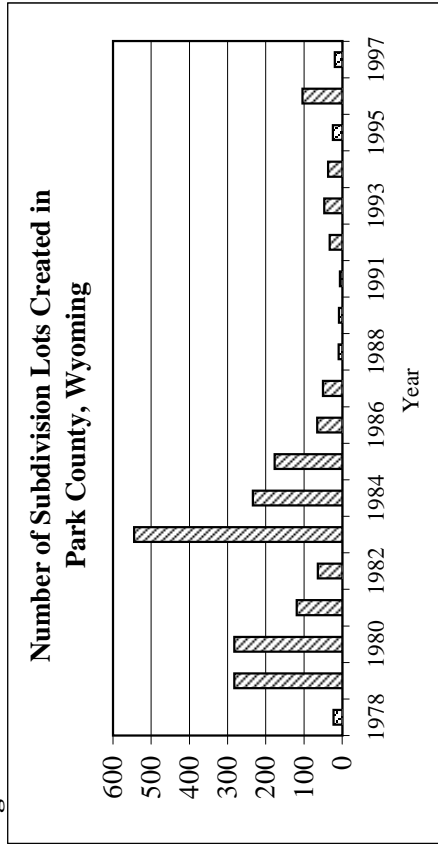
Broad trends in Sublette County Planning and Zoning Office data on the number of residential permits allocated for houses, mobile homes, septic systems, and water wells follow trends in Wyoming domestic water well permit data from approximately 1990-1997 (Figures 25a-b). Sublette County Planning and Zoning data show a maximum number of permits allocated for sewer systems and water wells in 1994, and houses in 1995. The number of domestic water well permits also peaked in 1995.⁹

While both county and well permit data sets indicate that 1994-1995 were peak building years in Sublette county, there are some discrepancies in the numbers of residential units these indicators represent. According to the Wyoming State Engineer's Office data, 95 water well permits were allocated in 1995, however, according to county data, 67 permits were issued for water wells. The cause of this discrepancy is not known, as the original source for both numbers is the Wyoming State Engineers Office. In 1995, 82 (in total) houses and mobile homes were permitted, and 93 septic systems approved. In 1997, the number of permits issued for housing, sewer, and water construction were on the rise.

Subdivision lots and acres peaked in 1978 at levels significantly greater than 1998 levels (Figure 25c). Over 3000 acres were subdivided in 1978, compared to just over 1000 in 1996. According to the Sublette County planner, roughly ½ of the lands subdivided in the 1970s are still available for development.

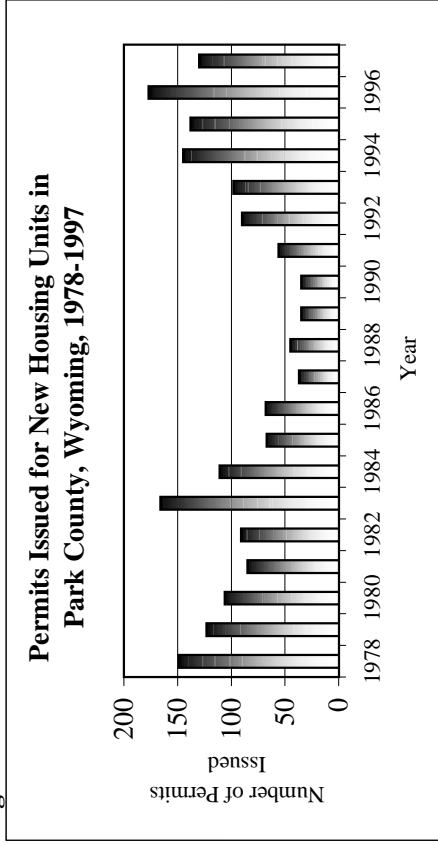
⁹ Note that in the Sublette County Planning and Zoning data, the lines representing sewer and well permits do not necessarily overlap with housing permits; often, this is because landowners obtain permits for installing sewer and wells prior to beginning construction.

Figure 24a



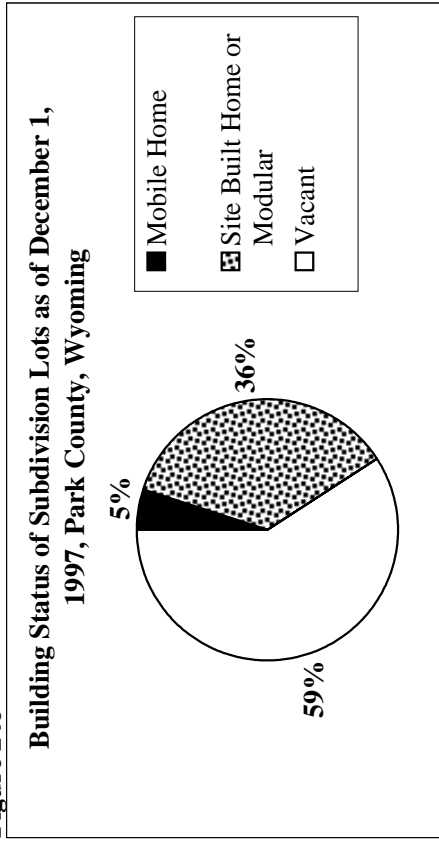
Source: Park County Planning and Zoning Department, Cody, Wyoming

Figure 24b



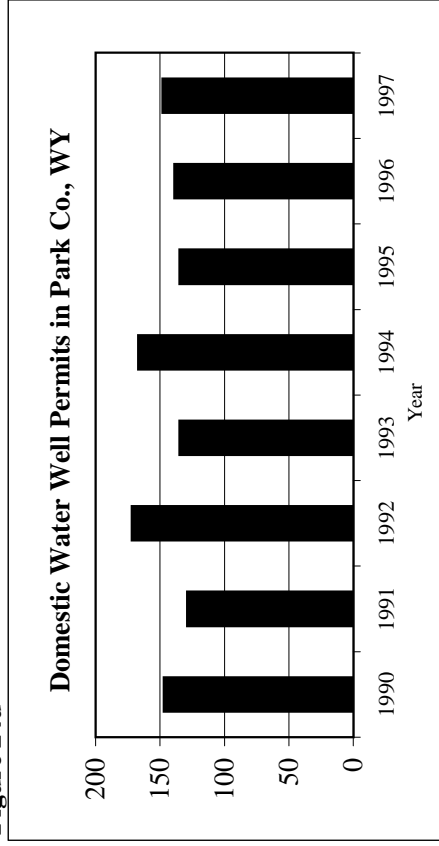
Source: Park County Planning and Zoning Department, Cody, Wyoming

Figure 24c



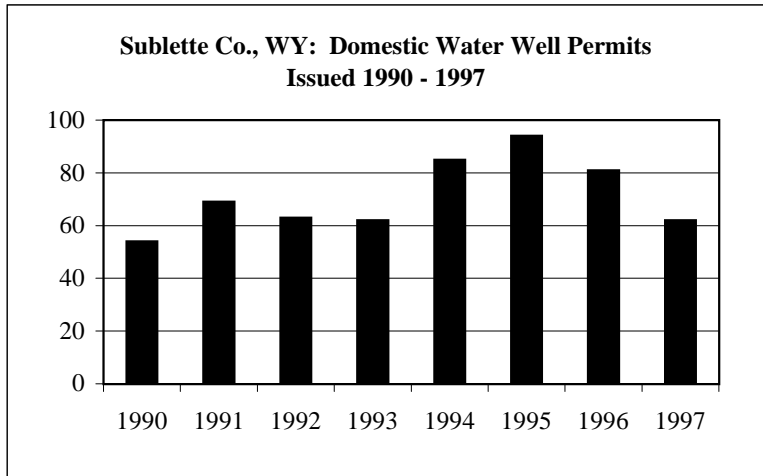
Source: Park County Planning and Zoning Department, Cody, Wyoming

Figure 24d



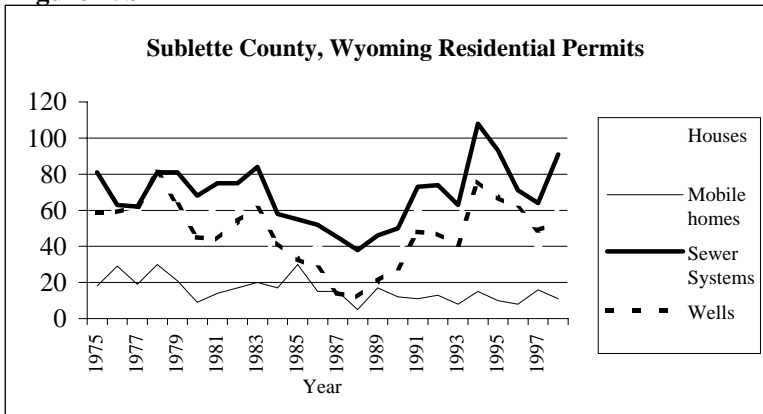
Source: Wyoming State Engineer's Office, Ground Water Division

Figure 25a



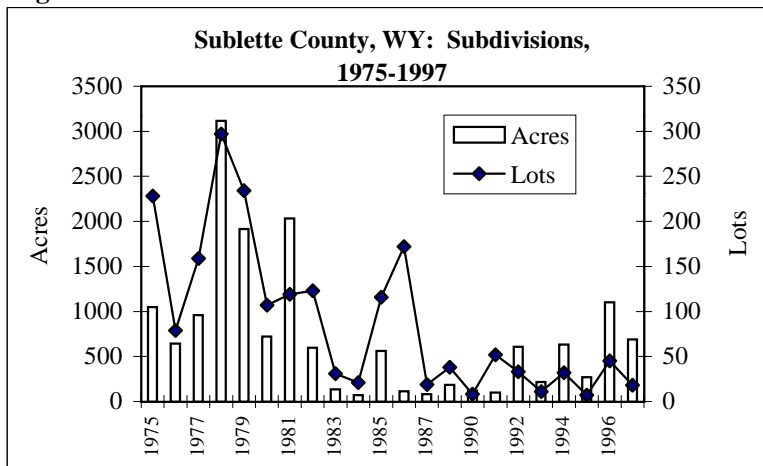
Source: Wyoming State Engineer's Office, Ground Water Division, Cheyenne, WY

Figure 25b



Source: Sublette County Planning and Zoning Office, Pinedale, WY

Figure 25c



Source: Sublette County Planning and Zoning Office, Pinedale, WY

Teton County

Building permits were available from Teton County to compare with well permit data. The number of residential unit building permits issued in Teton County was nearly twice as high in the 1990s than in the previous two decades (Figure 26a). Applications for building permits peaked in 1990 (202 building permits issued), and again in 1998 (228), levels unrivaled in earlier years. Building permit data do not correlate with the water well permit data for Teton County (Figure 26b). Well data underestimated the amount of residential housing development. Teton County's senior planner corroborated that well water permit data alone do not reflect development trends in Teton County (DeGroh, pers. comm., 1998).

Cumulative Trends in Wyoming Counties

Cumulative graphs for Fremont County show that between 1975 and 1996 over 2000 new permits were issued for small wastewater systems (Figure 27). Cumulative graphs for Park County show similarly that just under 2000 permits were issued for new housing units in the county between 1978 and 1997 (Figure 28a), corresponding with the just over 2000 new subdivision lots created during this time period (Figure 28b).

Cumulative graphs for development trends in Sublette County illustrate that nearly 16,000 acres were subdivided between 1975 and 1997, and nearly 2000 new lots created (Figure 29a). Between 1975 and 1998, approximately 1250 new permits were issued for houses, 370 for mobile homes, 1650 for sewer systems, and 1150 for water wells (Figure 29b). The discrepancy between acres subdivided, lots created, and construction permits issued may be partially due to large lot sizes. The discrepancy may also indicate of the amount of development that has been approved, but not yet constructed.

Cumulative data for Teton County show that over 2700 building permits were issued between 1978 and 1998 (Figure 30). The annual totals show that the majority of these permits were issued in the 1990s. In contrast, Wyoming State Engineer's Office data show just under 800 water well permits issued in this time period. In Lincoln County, over 1000 new homes were built between 1990 and 1998 in Star Valley (Figure 31). State data indicate that just under 600 water well permits were issued between 1990 and 1997. Again, it appears that well permits underestimate the actual level of development.

Summary of Findings

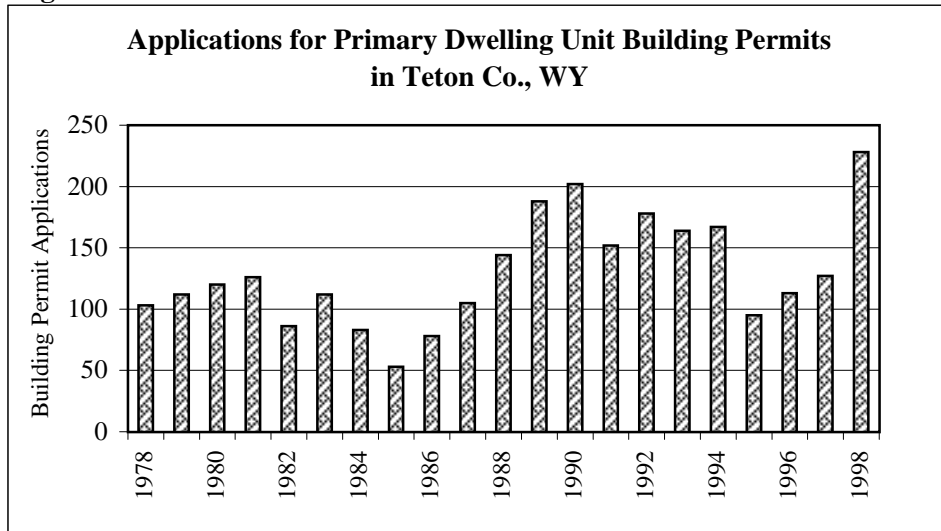
It is difficult to draw definitive conclusions regarding where the fastest, and greatest, growth is occurring due to the different mechanisms by which each county tracks residential development. One way to assess the rate of growth is to look at the percent increase¹⁰ (Appendix 4) in the various residential development parameters from 1990 to the year of most current data.

According to the septic permit data for Idaho counties, Clark County had the greatest rate of increase in permits issued for the 1990s (550%), followed by Teton County (360%), Jefferson and Madison Counties (just over 200%), and Bonneville and Fremont Counties (between 150 and 200%). Bear Lake County had the greatest rate of increase in the 1990s in terms of acres developed (225%) and building permits issued for homes and cabins (321%).

According to Montana well log data, Madison and Carbon counties had the greatest % increase in wells logged during the 1990s, at just under 100%. The % increase for the wells logged in the other Montana GYE counties was just under (or just over for Park County) 80%. Beaverhead County showed a 779% in subdivisions approved. Gallatin County experienced a 523% increase in acres subdivided. In

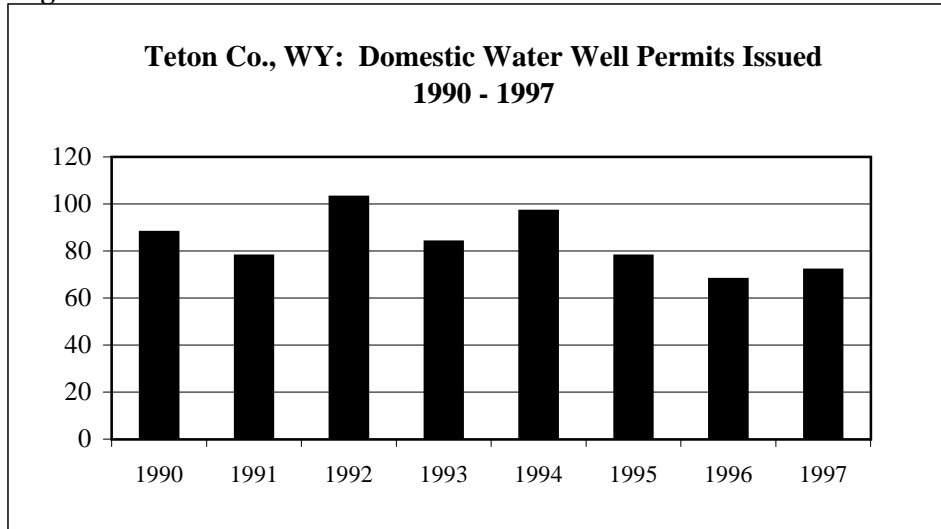
¹⁰ Percent increase for each county was calculated from cumulative totals tallied between 1990 and 1997.

Figure 26a



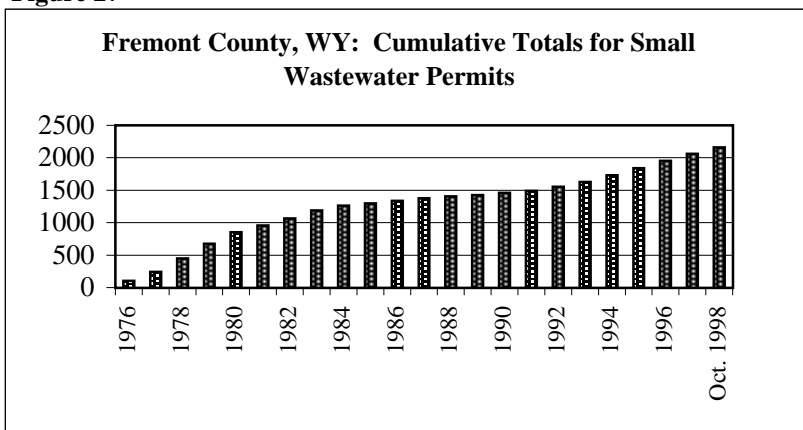
Source: Teton County Planning Department, Jackson, WY

Figure 26b



Source: Wyoming State Engineer's Office, Ground Water Division

Figure 27



Source: Fremont County Planning, Lander, Wyoming

Figure 28a

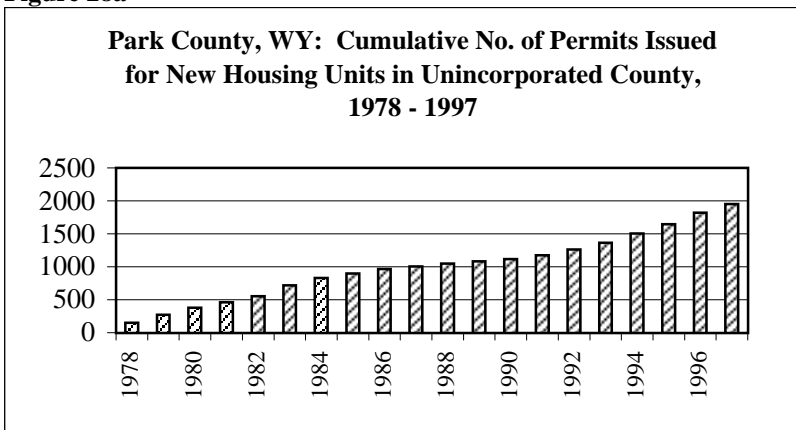
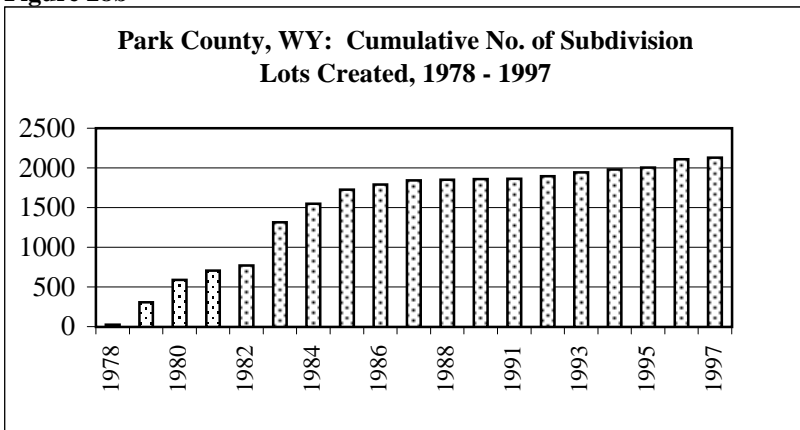
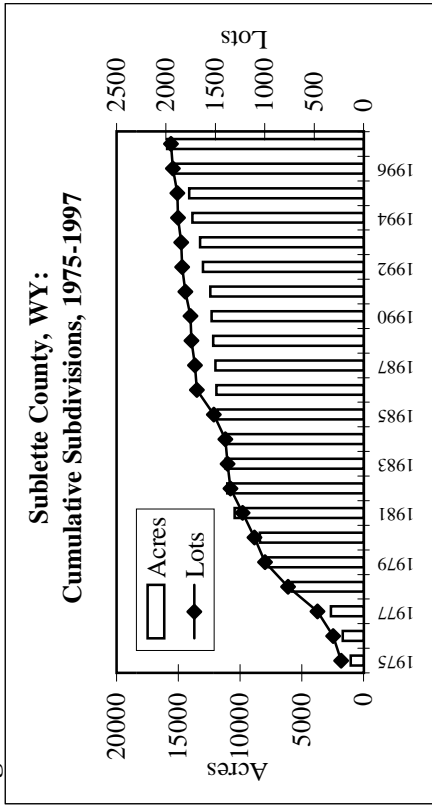


Figure 28b



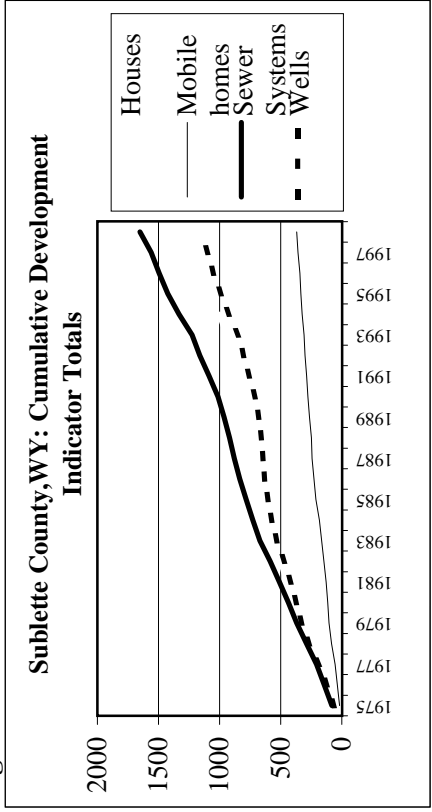
Source: Park County Planning and Zoning Department, Cody, Wyoming

Figure 29a



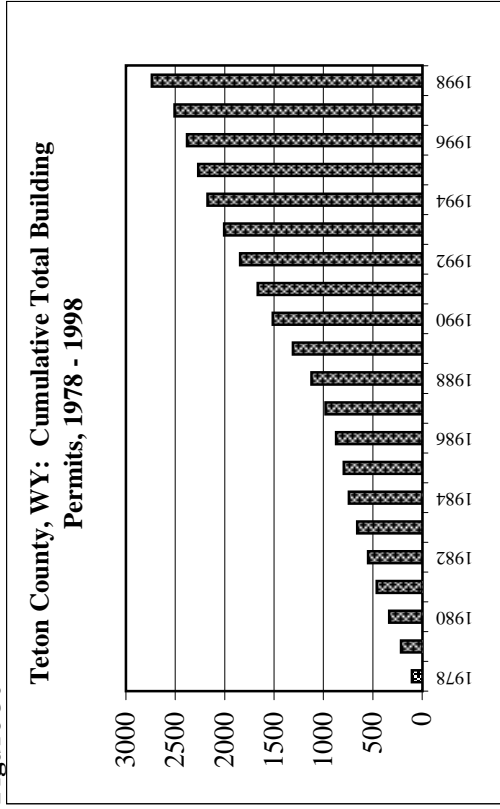
Source: Sublette County Planning and Zoning Office, Pinedale, WY

Figure 29b



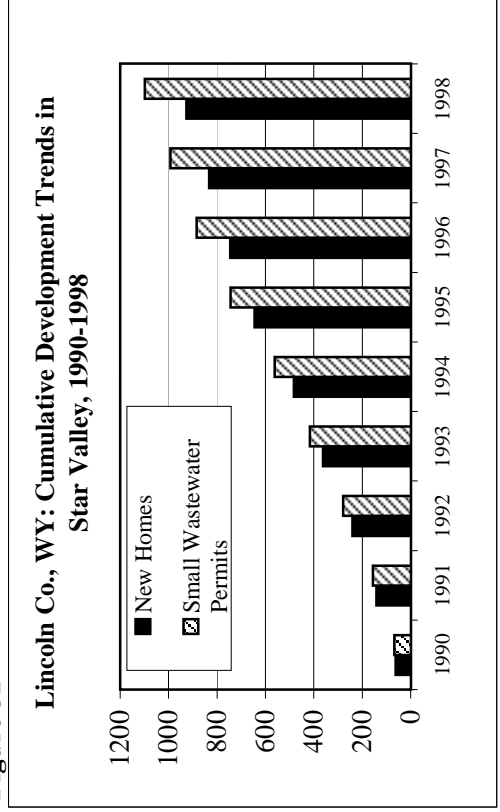
Source: Sublette County Planning and Zoning Office, Pinedale, WY

Figure 30



Source: Teton County Planning Department, Jackson, WY

Figure 31



Source: Lincoln County Office of Planning and Development, Alton, WY

terms of major and minor subdivisions approved by the Montana DEQ in Montana GYE counties, Madison county had the greatest increase (2325%), followed by Gallatin County (1558%).

According to well permits in Wyoming, Lincoln and Sublette Counties had the greatest rate of increase (350%), followed by Park and Teton Counties (just under 300%), and Fremont at just over 200%. Lincoln County had a 1394% increase in new homes in Star Valley during the 1990s.

While these percentages appear extraordinary (and, in some cases are), it is important to note that they can be a misleading indicator of overall development. For example, in Bear Lake County, Idaho, building permits for homes and cabins increased from 14 in 1990 to 59 in 1998. Nonetheless, the above analysis does indicate a trend of rapid growth in these counties.

For the majority of GYE counties, the 1990s represent the decade of the greatest development levels.¹¹ Looking at cumulative development trends for the 1990s in the GYE counties offers a better indication of the relative residential development levels, and where the most rapid development is occurring.

In Idaho between 1990 and 1998, Bonneville County had the greatest numbers of septic permits issued (1706), followed by Jefferson (1357) and Fremont (1248), Teton (1063), Madison (745), and Clark (78). According to U.S. Bureau of Census data (see below), Teton County, of all of the GYE counties, has experienced the greatest percent population increase from 1990-1998, at nearly 60%. Fremont, Bear Lake, and Teton Counties all had approximately similar acreages subdivided in the 1990s. Fremont County subdivided 4768 acres between 1990-96, Bear Lake County 4436 acres between 1991-97, and Teton County 4203 acres from 1990-1997.

In Montana, Gallatin County logged the greatest number of new wells (approximately 2400) between 1990-96, nearly 3 times more than Park County, with the next highest. The Montana DEQ data corroborates this, showing that over 3 times as many subdivisions were approved in Gallatin County between 1990-97 than in Carbon, Park, and Madison Counties. Gallatin County, too, had the greatest population increase (26.8%) of the Montana GYE counties between 1990-98. However, information on acres divided in these counties offers a different perspective. While approximately 9270 acres were subdivided in Gallatin County between 1993-98, 16,584 acres were subdivided in Madison County between 1994-1998.

Park County, Wyoming, had the greatest number of well permits issued from 1990-97 (1172), followed by Fremont (710), Teton (668), Sublette (570), and Lincoln (496). However, in terms of new housing and septic permits (assuming a 1:1 correlation between the two) for Lincoln, Park, Teton, and Fremont Counties, Teton County had the greatest amount of new development in the 1990s, with 1426 new housing building permits issued between 1990-98. Lincoln, Fremont, and Park had between 700 and over 900 permits issued during approximately the same time period. While comparable data were not available for Sublette County, 3,735 acres were subdivided in the county from 1990-97. According to census data, Teton (26.8%) and Sublette (18.5%) had the greatest population increase between 1990-1998.

¹¹ The exceptions to this are Fremont, Park, and Sublette Counties in Wyoming, which experienced higher development levels in the late 1970s and early 1980s; Fremont and Bear Lake Counties, Idaho, which experienced greater lot divisions in the mid 1970s and mid 1980s, although the *acreage* subdivided in these counties was significantly greater in the 1990s; and Stillwater County, Montana, which had more land divided by COS in the 1980s than 1990s, although land being divided by subdivision has been greater in the 1990s.

The other trend common to several GYE counties is that a significant amount of land that has already been divided, or otherwise approved for development, has not yet been built upon. Thus, what appears to be “open space” in these counties is actually not. A significant portion of subdivided land in the following counties remains vacant: Bear Lake and Fremont Counties, Idaho, Gallatin and Madison Counties, Montana, and Lincoln, Park, and Sublette Counties, Wyoming. Note that because information was not readily available, it was not possible to discern the extent of this trend in all of the GYE counties.

Other GYE Residential Development Patterns: Location of New Homes

The above discussion has focused on *when* development has occurred. However, from a critical habitat perspective, *where* development is occurring in the ecosystem is even more pertinent.

More Rural Development

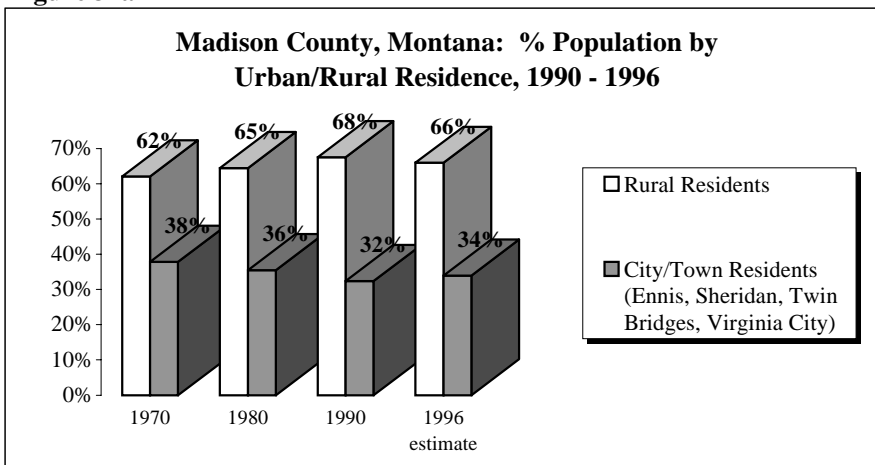
Nearly all of the data gathered for this report (unless specified otherwise) refer to rural, unincorporated county areas. Thus, these data indicate that for many of the counties discussed above, the character of rural county areas is being rapidly altered by development at rates unprecedented in previous decades. In addition, several planning agencies have quantified the relative proportions of new development in rural versus municipal county areas, and their results follow.

Analyses conducted by several planning agencies indicate that more people are moving to rural areas of the county than incorporated municipalities. A Montana EQC report (1996) stated that “One of the most noticeable changes in land use in Montana is the increase in residential lands, notably new developments in the rural outskirts of urban areas. Many of these developments involved the subdivision of large tracts of agricultural or range land into smaller residential developments” (MT EQC 1996:6). The MT EQC found that Madison and Gallatin counties had among the highest average acreages of rural residences by county. Data gathered by the Madison County planning department also show that the percentage of residents living in rural areas is increasing, while those living in incorporated municipalities is declining (Figure 32a): in 1996, 66% of the county’s population was living in rural areas, and only 34% in urban parts of the county (Madison County 1998).

Data gathered by the Gallatin County Planning Department provides more evidence that an increasing percentage of development is occurring in rural areas: “new tracts tend to be large, dispersed, and removed from population centers” (Gallatin County Planning Dept. 1998:1). In a recent planning report, the county concluded that, “Sites slated for new residential development or commercial development tend to be large and dispersed, rather than compact and integrated into existing towns. . . [between 1993 and 1998] the largest fractions of new tracts created (45%) and the total area divided (57%) represent lands outside the boundaries of the planning donuts” (Gallatin County Planning Dept. 1998:8-9).

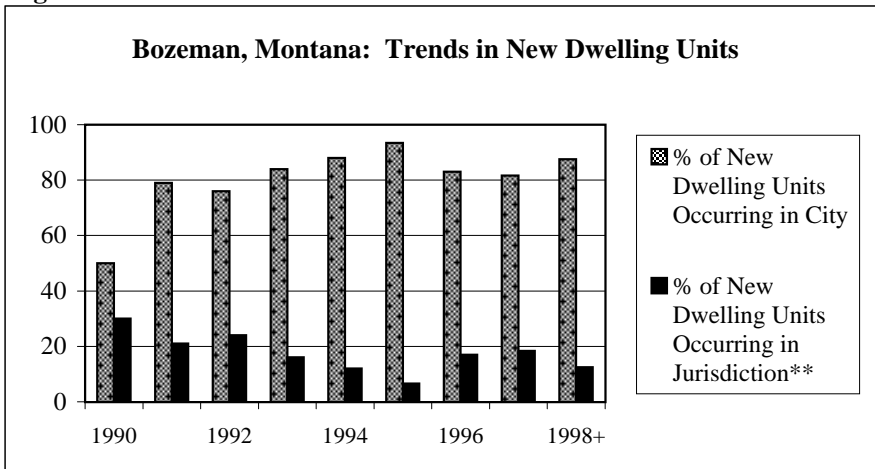
The Bozeman City Planning Office in Gallatin County, Montana has found that the percentage of *new* development within the 3-mile wide planning donut increased between 1995 and 1997 from 6.6% to 18.4%. As of August 1998, this percentage was 12.5% (Figure 32b). Between 1990 and 1996, the percent population residing in urban county portions decreased from approximately 38% to 34%, while the population percentage living in rural county areas increased from approximately 62% to 66%. The planner for Beaverhead County, Montana, also noted that the majority of new residential development is occurring in unincorporated county areas (Hartz, pers. comm., 6/8/99).

Figure 32a



Source: U.S. Bureau of the Census in Madison County Planning Department Development Trend Data

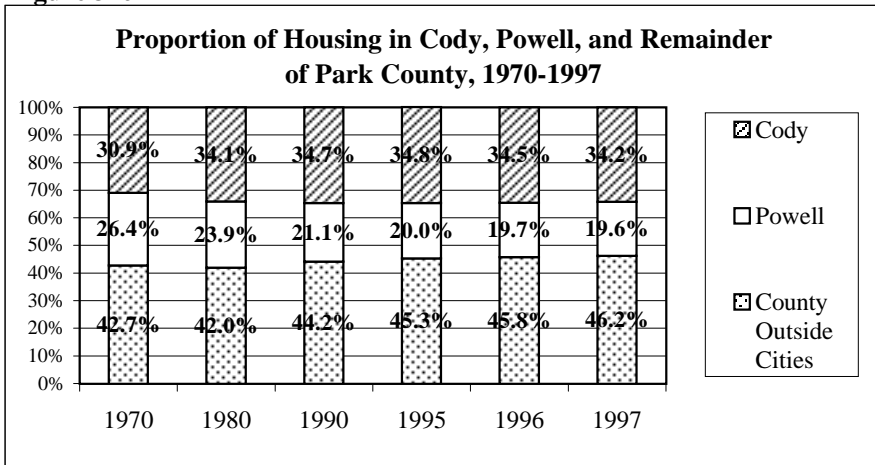
Figure 32b



Source: Bozeman City Planning Office, Bozeman, MT

**Housing units occurring +through August

Figure 32c



Source: Park County Planning and Zoning Department, Cody, Wyoming

Similar trends have been found in Wyoming. In Teton County, 60% of new development has been in unincorporated county areas, and 40% in incorporated towns; this ratio has been fairly constant over the last decade, and is projected to remain so (Degroh, pers. comm., 1999). The Lincoln County Office of Planning and Development has also found the majority of development occurring in unincorporated county areas (Woodward, pers. comm., 1999). Park County Planning and Zoning found also that between 1970 and 1997 the percentage of housing built outside city limits increased (Figure 32c). Beaverhead and Carbon County (Montana) planners acknowledged similar trends in their counties.

U.S. Bureau of Census data on urban and rural population growth between 1970 and 1996 also demonstrates preferential rural development in GYE counties, especially in the last 2 decades.¹² Data from the 1970-90 decennial censuses were compared with results from the most recent U.S. Bureau of census population estimates. To equalize these numbers, cumulative annual growth rates were calculated (hereafter referred to as annual growth rate).¹³

The last decade has seen a complete reversal in urban/rural growth patterns in the majority of Wyoming and Idaho GYE counties. Between 1970 and 1990, growth in urban areas of WY and ID GYE counties (with urban areas) predominated. However, in the 1990s, this trend reversed itself: the majority of growth in these counties occurred in rural areas. In the Idaho GYE counties, the annual rural growth rate was 5 times greater between 1990 and 1996 than in the 1980s. While the annual urban growth rate has been higher in Montana GYE counties between 1970-1996, the rural growth rate has been steadily rising since the 1970 census (see also footnote below regarding annexation of property to cities in Gallatin County).

¹² For the decennial census (1970, 1980, 1990 used in this study), the U.S. Bureau of the Census analyzes growth at the county level according to urban and rural areas. "Urban," as applies to the GYE states, is defined as "places of 2,500 or more persons incorporated as cities, villages, boroughs, and towns, but excluding the rural portions of extended cities" or "census designated places of 2,500 or more persons." Rural is defined as "territory, population, and housing units not classified as urban." In between the decennial census, the U.S. Census Bureau publishes estimates of population growth based on birth, death, and migration rates. Estimates of population growth, however, are not tabulated by "urban" versus "rural" area; rather, results are given by county and incorporated cities or towns. Therefore, to assess growth in urban and rural areas from 1990-96 for this study, urban areas were defined according to the U.S. Census definition used for the decennial census. All cities listed with population numbers greater than or equal to 2,500 were counted as "urban", and the remainder included in "rural" county areas. Using U.S. Census definitions for urban and rural has the following limitations:

- (1) Growth in towns that don't qualify as "urban" is included with "rural" populations - even if these "rural" populations are in clustered settled developments - potentially resulting in an overestimation of the amount of growth in areas away from centralized service areas.
- (2) What counted as urban in the 1990 census may not have in 1970 or 1980. Thus, what was "rural" growth in previous decades now counts as urban even though growth may have been predominantly in a relatively centralized area.
- (3) Annexations: Gallatin County, MT, has grown from 32,000 to over 50,000 since 1970. It can be argued that much of this growth has occurred, and is occurring, in formerly rural areas, e.g., former agricultural lands. However, Bozeman, the largest city in Gallatin, has annexed 1747 acres between 1988 and 1998 to the city. New growth in this annexed area will only show up as "urban" growth by census definition. This may give the appearance that urban areas have experienced tremendous growth, when in fact much of this growth has occurred in rural, outlying areas.
- (4) "Census designated places (CDP)" - urban (as defined by U.S. Census, e.g., with greater than 2,500 people) areas with census-designated boundaries which don't correspond to city or county boundaries. The only GYE county with a CDP is Bingham County, Idaho. One-half of this CDP in Bingham county and the other half is in Bannock county. Therefore, the portion in Bingham is technically rural, as it contains less than 2,500 people. However, the whole CDP is actually designated "urban." Therefore, for the 1970-90 censuses, rural population numbers in Bingham County will be overestimated, as some of this "rural" population in Bingham is actually in an urban CDP. CDPs are not included in the 1991-96 population estimates. This is not a concern, as indicated above, for most of the GYE counties. However, since state-wide urban/rural populations from the decennial censuses were compared to the 1991-96 estimates, it should be noted that state-wide rural population numbers for the 1991-96 time period may be slightly overestimated, and state-wide urban populations slightly underestimated.

¹³ Data originally obtained from U.S. Bureau of the Census, reports 1990 CPH-2-14, -28, and -52; and PC80-1-A14, -A28, and -A52. Calculations were performed jointly by the author and by Jonathan Schechter of Summit Management Consulting in Jackson, Wyoming (see Appendix 3 for contact information).

In Wyoming, the most rapid rise in rural growth occurred between 1980 and 1996. This disproportionate increase in annual rural growth rate has been most apparent in the following Wyoming GYE counties:

Teton: A nearly 40-fold increase in annual rural growth rate from the 1970s to the 1990s.

Lincoln: A 7-fold increase in annual rural growth from the 1970s to 1990s, with the greatest increase in the 1990s.

Sublette: A 4-fold increase in annual rural growth from 1980s to 1990s.

Park: A greater than 3-fold increase in the annual rural growth rate from the 1980s to the 1990s.

In Idaho's GYE counties, similar trends are apparent:

Teton: Teton has experienced the greatest rise in rural annual growth rate of all the Idaho GYE counties – with a greater than 5-fold increase (from 1.7% to 6.9%) from the 1980s to the 1990s.

Bonneville: The annual rural growth rate grew nearly 5-fold between the 1980s and 1990s.

Bear Lake, Caribou, Clark, Fremont, and Jefferson counties have all seen a greater than 2-fold rise in the annual rural growth rate between the 1980s and 1990s.

While Montana's GYE counties have shown a consistently greater proportion of urban over rural growth, the cumulative annual growth rate in rural county areas has been steadily increasing since 1970. Beaverhead, Carbon, and Madison counties have all experienced a greater than 2-fold rise in the rural annual growth rate between the 1980s and 1990s. In Gallatin County, even with the annexation of city property (see footnote), the cumulative annual growth rate has increased from the 1980s to the 1990s to 1.8% as of 1996.

Preferential Development in Riparian Corridors

Subdivision maps provide critical information on where rural development is occurring on the landscape. While few counties have the resources with which to produce maps, the maps that are available show growth concentrating around riparian corridors (Figure 33). Other research supports this finding. A study performed by the Jackson Hole Conservation Alliance found that “the most sought after properties are often in the most ecologically sensitive areas, in particular near Jackson Hole's major waterways.” Of the 15,000 acres comprising the Snake River corridor, 9000 acres of these lands have already been platted for development, or are otherwise undevelopable (Jackson Hole Conservation Alliance 1992).

Research conducted at Montana State University (MSU) found that homes in southern Gallatin County, Montana were disproportionately abundant within 2 km of aspen-cottonwood-willow habitat – i.e. riparian areas. One of the most important implications is that native wildlife and plant species are concentrated in riparian corridors, which comprise a relatively small proportion of the landscape. Research overwhelmingly indicates that riparian corridors are significant landscape components in maintaining regional biodiversity (Naiman et al. 1993). These “biological hotspots” are the same areas where humans prefer to build their homes – in riparian zones. Already, the MSU researchers have found that there may be important negative feedbacks to native species. For example, evidence suggests that bird reproductive levels are negatively associated with residential home density. (Hansen, pers. comm., 1999)