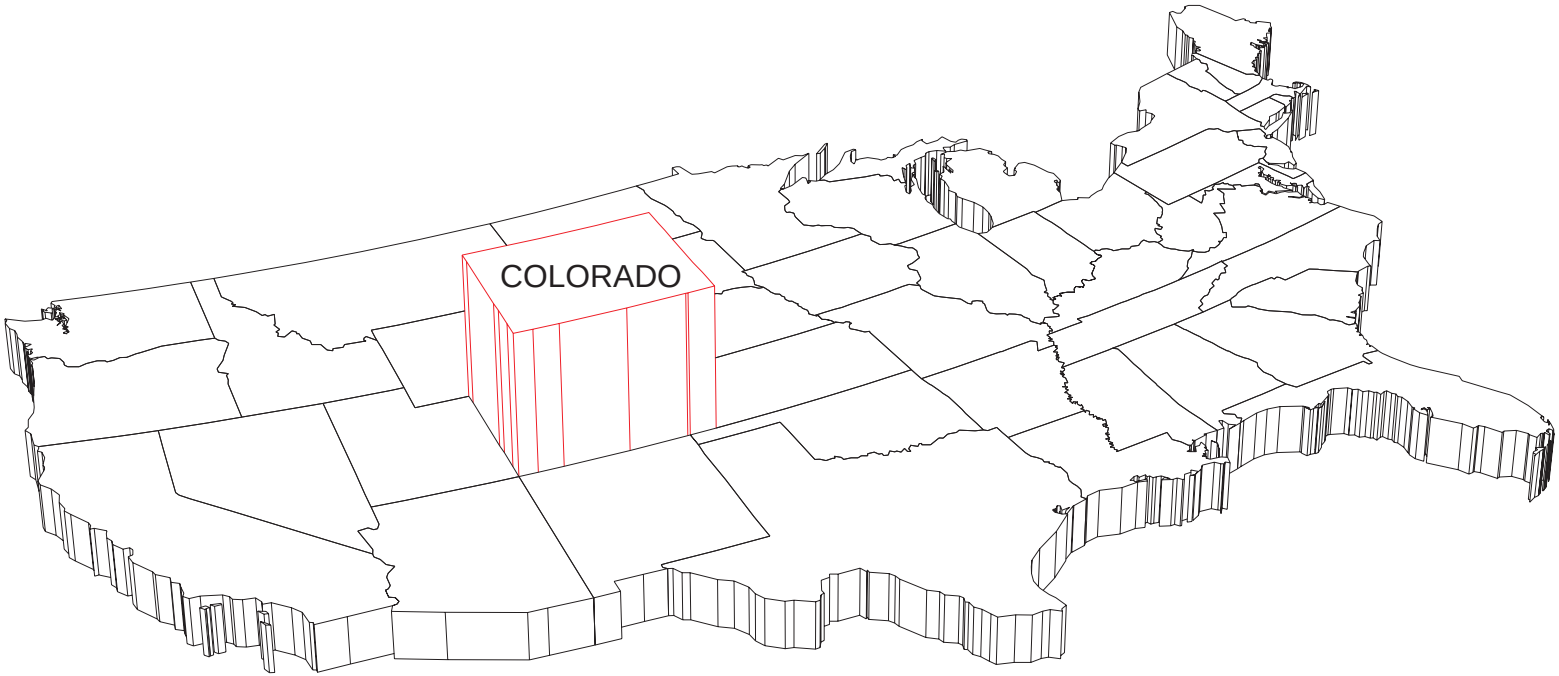
ATLAS OF COLORADO
A TEACHING RESOURCE



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2003 Edition

PREFACE

It is rare to receive something that is truly free, but that is precisely the case with the 2003 edition of ***ATLAS OF COLORADO: A TEACHING RESOURCE***. All that you owe us, all that we ask, is that you use it and if you like it, tell your friends. Whether you are teaching Geography, History, Social Studies, Current Events, or some other subject dealing with Colorado, we believe you will find the maps, photos, tables, and suggested activities useful.

The ***ATLAS*** represents years of work. More importantly, the two editions (1999 and 2003) reflect the authors' career-long commitment to the discipline of Geography and to geographic education. We live in a fascinating State at a dynamic time, and it is incumbent upon those of us charged with teaching about Colorado to do so in varied and imaginative ways. In this regard we hope that you find this edition of the ***ATLAS*** not merely a reference tool but a source of topics, concepts, and questions that provoke you and your students to further investigation.

The ongoing ***ATLAS OF COLORADO*** project would not be possible without the cooperation and assistance of numerous individuals and organizations. First and foremost, we express our appreciation to members of the Department of Geography at the University of Northern Colorado for sustaining an atmosphere where geographic education is valued as part of the varied context of professional Geography. To the greater university community we extend thanks for resources and facilities that make the ***ATLAS*** possible. Faculty and staff at Michener Library rendered patient assistance to many inquiries and searches for information. Special thanks go to: Rosanna Slingerland for work on many of the choropleth and dot maps; Ethan Jimenez and Lisa Kolm for their efforts to format the photographs; and to Max Beavers for the development of the template used throughout the ***ATLAS***. Likewise, we thank Sandy Winkler, departmental administrative assistant, for proofreading and correcting the text materials.

A gratis copy of the original (1999) edition of the ***ATLAS*** was sent to each school district in Colorado. That was only possible through the generous funding from the Colorado Geography Education Fund and the National Geographic Society Education Fund, that funding attained through the endorsement and encouragement of the Colorado Geographic Alliance. In particular, we are indebted to Dr. David Cole for guiding the project proposal to the proper agencies and speaking on its behalf.

Our goal is that the ***ATLAS OF COLORADO: A TEACHING RESOURCE (2003)*** be an ongoing reality, freely available to Colorado educators. To accomplish this the new edition is available on the Internet and the materials are ***not*** copyrighted so that they can be reproduced and shared. If you used the 1999 edition, you will find that we have changed some of the formatting and have included some new content in the present volume. We welcome your questions, suggestions, and corrections regarding the ***ATLAS OF COLORADO: A TEACHING RESOURCE (2003).***

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Colorado Model Content Standards for Geography

In 1995, a task force of teachers, administrators, and consultants developed six Model Content Standards for the teaching of geography in the state of Colorado. While this Atlas is not specifically designed to systematically address each and every Model Content Standard, that document was a guide in the development of this resource for teachers. The authors strongly urge anyone using this Atlas in a classroom situation to likewise apply those Standards. To facilitate such a linkage a the Table of Contents (below) matches Maps and Graphs to specific elements of the six Standards. In some cases the utility of a Map or Graph and its match to a particular Standard or Standards is quickly evident. In other instances the Atlas text, i.e., "READING THE MAPS" or "QUESTIONS TO THINK ABOUT" provide ideas for introducing and investigating the Standards. This document is available on the Web at http://geography.unco.edu/coga/.

ATLAS OF COLORADO

PO 44	Population 25 and Over with High School Degree and Above 2000	4.1, 4.2, 4.4, 6.2
PO 45	Population 25 and Over with Bachelor's Degree or Above 2000	4.1, 4.2, 4.4, 6.2
PO 48	Pupil to Teacher Ratio	
PO 49	Dropout Rate for Grades 7th thru 12th, 2001-02	
PO 52	Median Family Income 1999	4.1, 4.2, 4.4
PO 53	Families Below the Poverty Level 1999	4.1, 4.2, 6.2
PO 54	Employment in Agriculture, Forestry, Fishing and Hunting 2000	4.2, 4.3, 4.4
PO 55	Employment in Manufacturing 2000	4.2, 4.3, 4.4
PO 56	Rural Non-Farm Population 2000	1.3, 4.1, 4.4
PO 57	Rural Farm Population 2000	1.3, 4.1, 4.4
PO 58	Total Rural Population 2000	1.3, 4.1, 4.4
PO 59	Urban and Rural Share of the Population	1.3, 4.1, 4.4, 5.3
AG 3	Rural Land Use 1997	3.2, 5.1, 5.3
AG 6	Tenant Operated Farms 1997	4.1, 4.3
AG 7	Value of Agricultural Products Sold 1997	4.3
AG 10	Average Size of Agricultural Holding 1997	4.4
AG 11	Change in Average Farm Size, 1949 to 1997	4.4, 4.5, 6.1, 6.2
AG 12	Irrigated Land1997	3.2, 5.1, 5.3
AG 13	Area in Cropland 1997	3.2
AG 14	Cropland Harvested Change: 1949-1997	4.5, 6.1, 6.2
AG 15	Wheat Production 2001	4.3
AG 16	Cropland in Wheat 1997	4.3
AG 17	Corn for Grain 2001	4.3
AG 18	Silage Production 2001	4.3
AG 20	Dry Edible Beans 2001	4.3
AG 21	Sugar Beets 2001	4.3
AG 23	Potatoes 2001	4.3
AG 24	Cattle and Calves 2001	4.3
AG 27	Dairy Farms 1997	4.3
AG 28	Milk Cows 1997	4.3
AG 29	Hogs and Pigs 1997	4.3
AG 30	Sheep and Lambs 1997	4.3

CHAPTER*/ PHOTOGRAPH PAGE

PH 15	Pawnee Buttes
PH 16	Wyoming Basin
PH 17	Plains Vegetation
PH 18	Tornado Watch
PH 19	South Platte River
PH 20	Colorado River
PH 21	Hail
PH 22	Horsetooth Reservoir
PH 23	Raton Mesa
PH 24	Spanish Peaks
PH 25	Wolf Creek Pass
PH 26	South Park
PH 27	Rocky Mountain National Park
PH 29	Royal Gorge
PH 30	San Juan Mountains

PH 31	Sawatch Range
PH 32	Grand Mesa
PH 33	Great Sand Dunes
PH 34	Black Canyon
PH 35	Colorado National Monument
PH 36	Dinosaur National Monument
INF 21	Denver Light Rail
INF 22	Denver International Airport
INF 23	Glenwood Canyon
INF 24	Interstate Highway 70
INF 25	Vail Pass
INF 26	Motels
INF 27	Western Slope Winery
INF 28	Black Hawk
INF 29	Bonny Reservoir
INF 30	Hayden Power Plant
PO 61	Mesa Verde
PO 62	Bent's Old Fort
PO 63	Pelts and Hides
PO 64	Sand Creek
PO 65	Fort Garland
PO 66	Church at Conejos
PO 67	Leadville
PO 68	Land Development
PO 69	Vail Ski Slopes
PO 70	Vail Valley Development
PO 71	Ranch Directories
PO 72	Denver Metro Area
PO 73	Douglas County
AG 32	Wheat Equipment
AG 33	Wheat Harvest
AG 34	Grain Elevator
AG 35	Barley Storage
AG 36	Corn Harvest
AG 37	Center Pivot Landscape
AG 38	Center Pivot Irrigation
AG 39	Artesian Well
AG 40	Concrete Ditch
AG 41	Irrigation Tubing
AG 42	Mellon Irrigation
AG 43	Potato Storage
AG 44	San Luis Valley Crops
AG 45	Poultry Feedlot
AG 46	Cattle Feedlot
AG 47	Cattle Grazing
AG 48	Vineyard, Pallisade, Colorado

*AG = Agriculture Chapter
INF = Infrastructure Chapter
INT= Introduction Chapter
PH = Physical Landscape Chapter
PO = Population Chapter

**COLORADO MODEL CONTENT STANDARDS FOR GEOGRAPHY. This document is available on the Web at http://www.cde.state.co.us

ATLAS MAPS AND THE MAPPING PROCESS

Maps in this atlas were created using personal computer mapping routines developed by 1) Golden Graphics, Golden, Colorado; and 2) ESRI of Redlands, California. The final maps were then brought into *CorelDraw*, displayed in a common template and exported as *Adobe Acrobat* files. As is the case with all such computer programs, there are many advantages and a few disadvantages. Positive characteristics include the ability to deal with large data bases with relative ease, elimination of several steps in data collection (e.g., can be downloaded directly from CD ROM), immediate display of generated maps, and generally less time required for map design. However, because of the types of maps created and limitations of the computer programs, there can be misinterpretation of certain map patterns. Several of those possibilities are outlined in the following summary of particular map types.

Generating Isarithmic Lines and Surfaces Using *ArcView Spatial Analyst* and *Surfer* Software Packages

ArcView (versions 3.2a and 8.2) *Spatial Analyst* was used to plot isarithmic lines from X and Y coordinates and Z values. This routine generated the maps of Elevation, Precipitation and Temperature. In this procedure it is necessary for the program to infer values between the known point values, a process that may lead to errors of line placement owing to the program's inability to consider other influences or variables (topography, for example

A positive property of the *Surfer* package is the ability to create statistical surfaces from isarithmic maps. The three-dimensional map of Colorado Topography was generated from more than 200 data points. The resulting map is a useful perspective of how the state's topography would appear when viewed from space while looking from the southwest. Once again, the computer program cannot recreate specific small parts of the landscape but offers a good overview of that landscape.

Thematic Maps Using *Mapviewer* and *ArcView GIS*

Thematic maps are those that illustrate specific statistical data about a topic or theme. In this project thematic maps show characteristics of population, agriculture, etc. ArcView and MapViewer both allow for the creation of choropleth, dot, proportional symbol and prism maps. All except prism are found here.

Choropleth Maps

Choropleth maps are generated from data based on an areal unit, often a county or state. Each data unit is shaded or colored according to its value. Great care must be taken in interpreting these maps since the value is averaged over the entire area of the collection unit. This particular symbolization process is appropriate only for areal averaged data, and not for total values. Therefore, population density, yield per acre and average family income are appropriate while total population, total yield and total income are not.

Determination of class limits that best illustrate the data set is of extreme importance in choropleth mapping. *Mapviewer* and *ArcView* provide several options for determination of class intervals. "Equal number" simply ranks the data and then places the same number of observations in each class interval. This method can lead to misinterpretation of the pattern if closely related observations (values) are placed in different intervals. The equal number method is acceptable for data that are continuous and equally spaced.

A second possibility for class limits is "equal interval," where each interval is the same width or range of values. This method can also be used where the data are continuous, but may cause confusion in non-continuous distributions where the possibility exists for a class interval with no observations.

The decision was made to use a statistical process to determine class limits for this project.

"Jenks" is the classing routine used. Named for the cartographer who developed it, Jenks groups data to minimize the variation within class limits and maximize it between classes. It is the classing routine used for each choropleth map in this atlas.

A final cautionary note here about class limits in *Mapviewer*. The program assumes all distributions are continuous, when in fact few are. Therefore, only the upper limit or lower limit is entered, with the program determining the other, once again assuming a continuous distribution. Great care has been taken to ensure that counties are shown in the correct classes.

Dot Maps

One of the simplest methods to show the character of a distribution is by using dots. After a dot value has been determined, dots are placed on the map as close as possible to the actual location. Determination of the dot value and placement are important in this method of thematic mapping. The dots should just begin to coalesce where the distribution has its greatest intensity. However, because the areal units (counties) may be large and the program cannot determine the actual location, *ArcView* places the dots randomly within counties.

Proportional Symbols

Total values of a distribution can be represented on a map by a symbol (such as a circle). This particular mapping method is also appropriate for illustrating component parts of a single distribution. For example, circle size can show the total harvested acres in each county, while circle segments represent the proportion or percentage of harvested acres in each of several crops, e.g., wheat, corn, beans, etc. Several of these are included in the atlas.

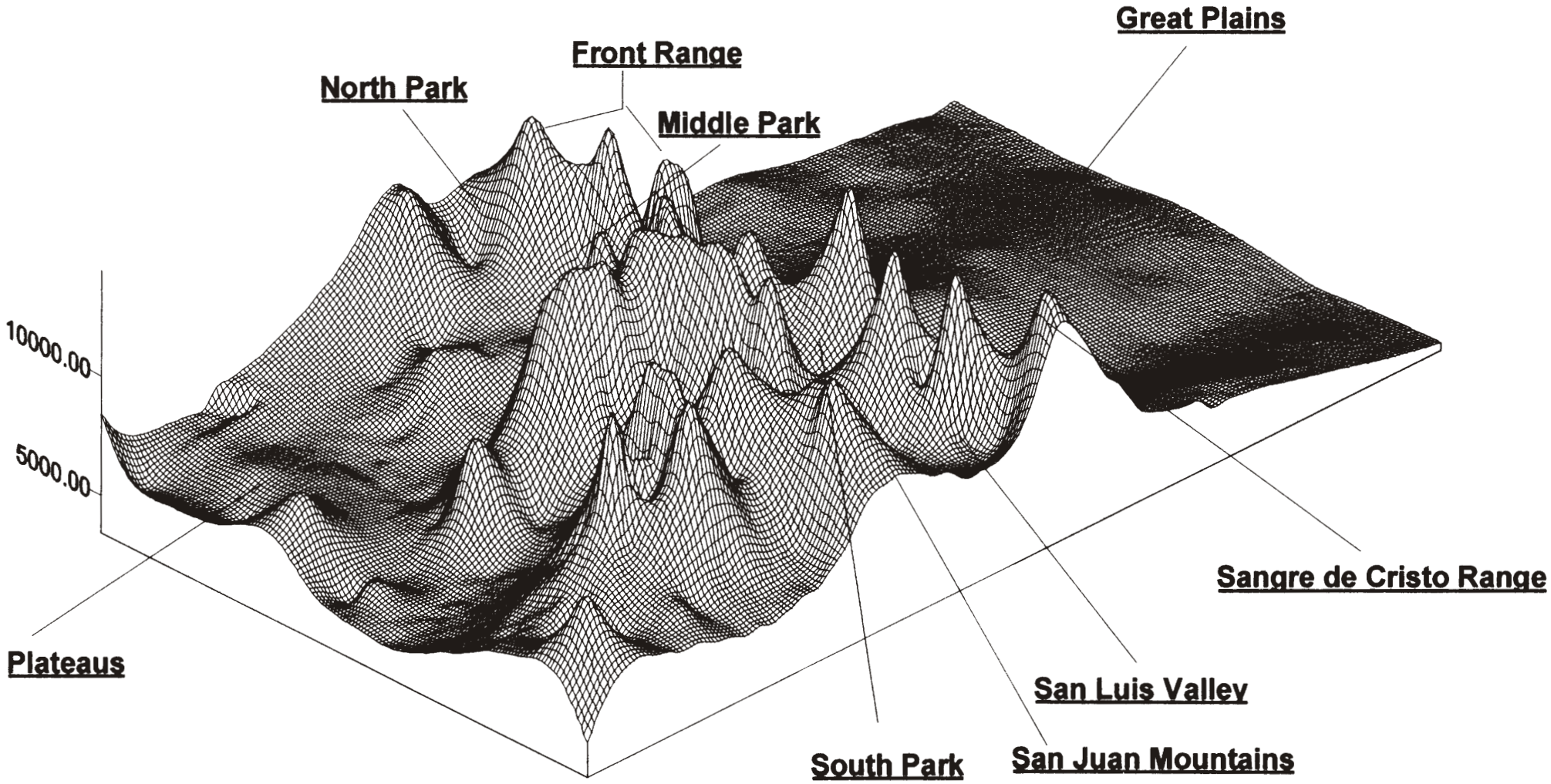
Base Maps and Orientation

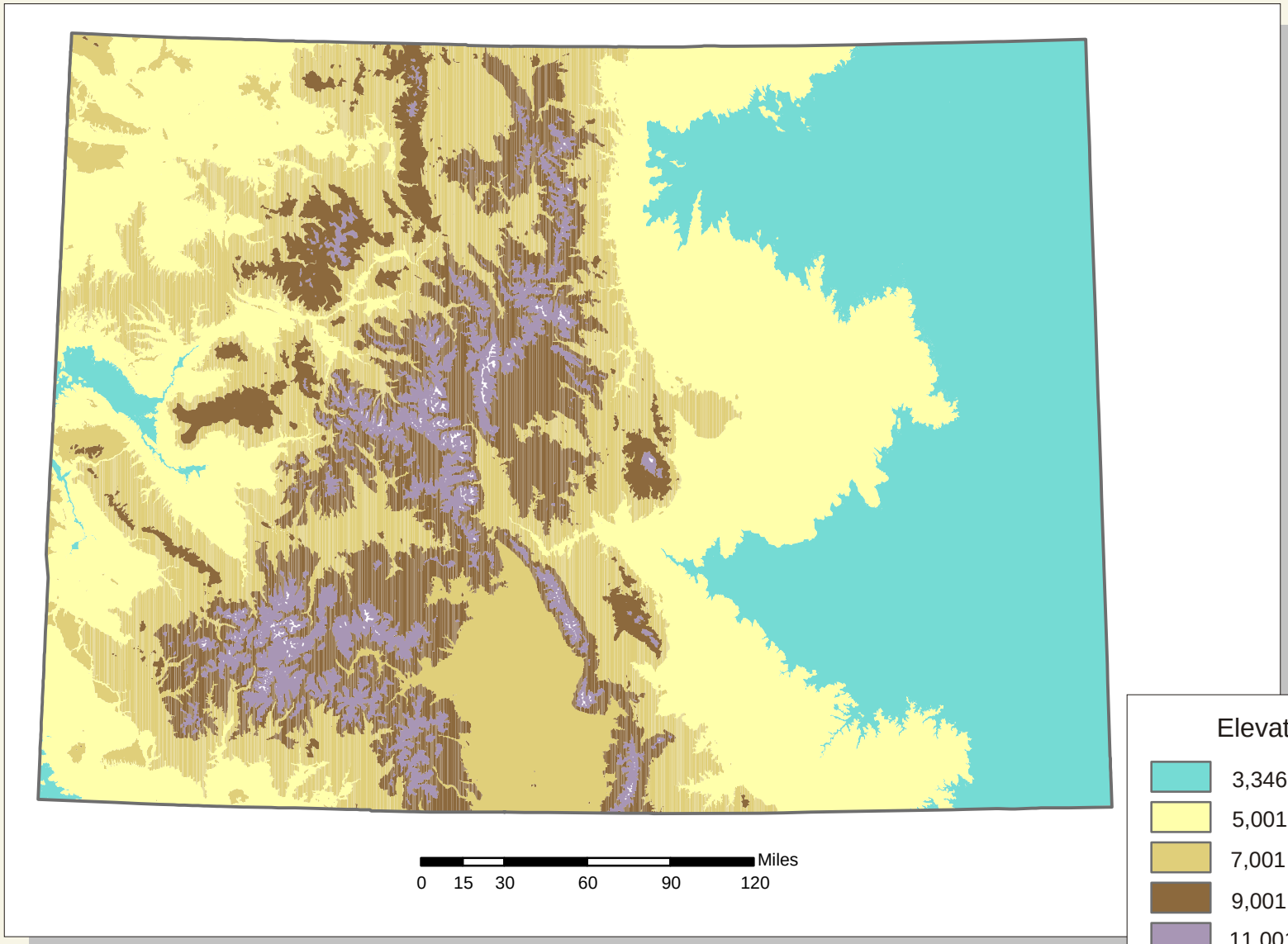
Two base maps are used in this atlas, and their orientation is altered slightly for the sake of convenience. The base on which several of the isoline maps was constructed is a longitude/latitude projection that treats spherical coordinates as if they are a cartesian (rectangular) system in which all coordinate lines are straight and intersect at right angles. This was done because of the difficulty of changing the rectangular outline with the Surfer program. A small amount of areal distortion results from the cartesian map projection but should not detract from accurate interpretation of the patterns presented.

The base map for all other thematic maps is an Albers Equal Area projection that portrays areas in their true proportion. Parallels are unequally spaced arcs of concentric circles, and meridians are equally spaced radii that intersect the parallels at right angles, the same as the grid on a globe.

Orientation of each of the base maps has been changed so that it is more aligned with the page. In reality, the western boundary of Colorado should be shifted slightly northward, or the eastern boundary a similar distance southward. The change in orientation makes a map that is more pleasing; this change is commonly done in publications of all kinds.

COLORADO TOPOGRAPHY




Miles
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Elevation Zones
3,346 to 5,000 ft.
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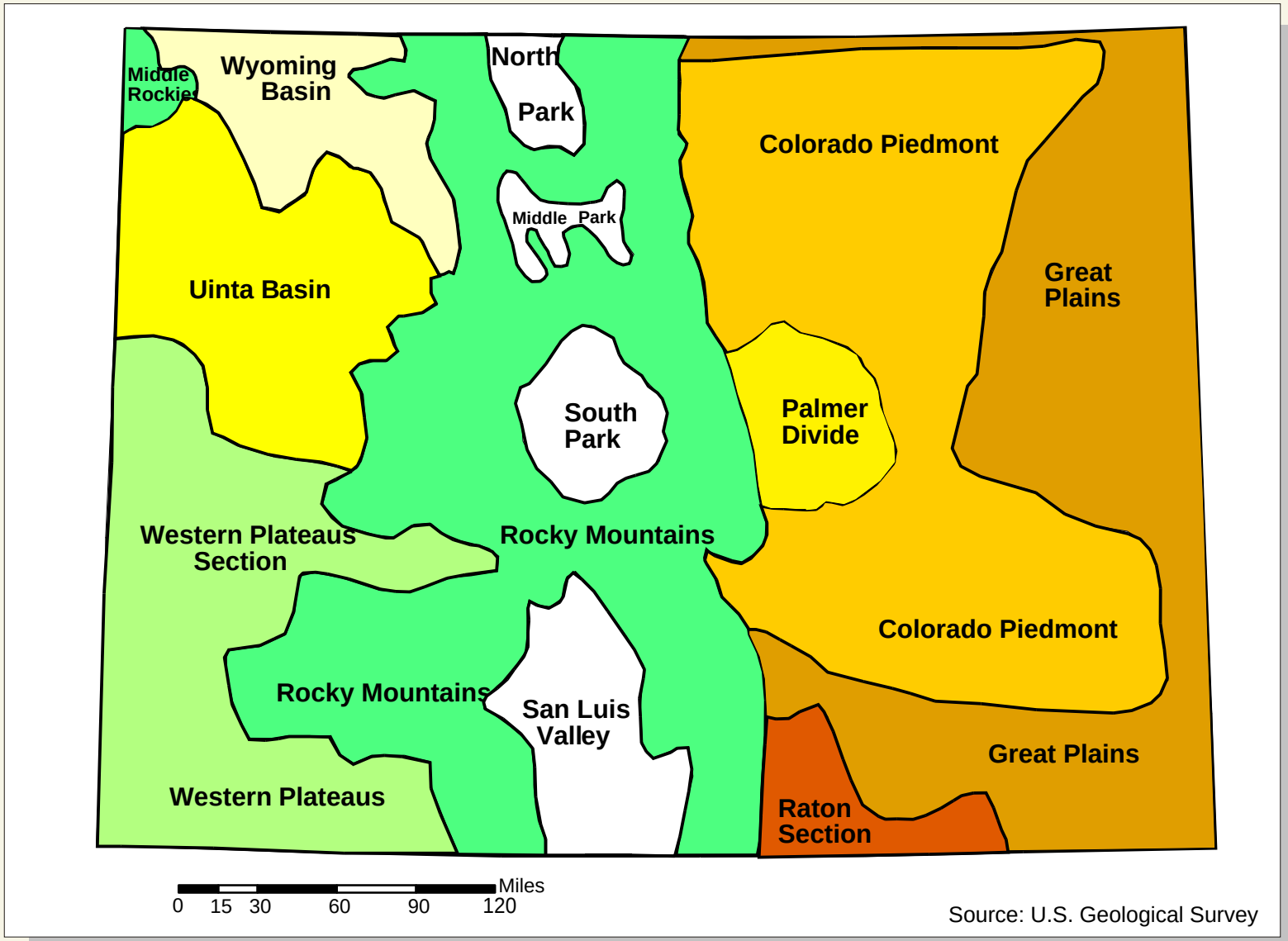
ELEVATION



LANDFORM REGIONS

TOPOGRAPHY-LANDFORM REGIONS-ELEVATION

Cartographers have always been challenged to depict the Earth's varied surface features on a flat sheet of paper. While representing areas of plains would seem comparatively easy, it is when one considers the numerous hills, valleys, gorges, plateaus, and mountains that constitute Earth's topography, and especially Colorado, that the problem comes a bit more into focus.

The three maps titled Colorado Topography, Landform Regions, and Elevation represent three ways to depict the surface features of Colorado.

READING THE MAPS

The simplest depiction of the physical geography of the state is to label the major landform features and group them into regions. Notice that eight distinct terms are used to classify the nature of Colorado's surface: mountain, plain, valley, park, plateau, basin, piedmont, and divide. One region, the Raton Section, is not given a descriptive label, in part owing to the highly varied nature of the land surface there.

By using these landform labels and keying them to particular colors, it is possible to show that significant portions of Colorado share certain types of surface features. For example, the southwestern corner of the state, all the area in light green, is primarily a region of plateau landforms. These are flat surfaces, often elevated, which have experienced considerable erosion from water and wind [PH 17, PH 32, PO 55]. Obviously, valleys exist within this plateau region, but they are not labeled on this map. The reason is that a regional map cannot show all the details of the "real world," but it must generalize. This means that it is only possible to show for each landform region that feature which is most common in that location.

The dominant landform of central Colorado is shown in dark green and labeled Rocky Mountains [PH 24, PH 25, PH 27, PH 28]. Here again the information must be generalized so that only the most common features are represented, in this case the mountains and several large parks or valleys, shown in white [PH 23, PH 30, A 29]. Other landforms exist within this region of mountains and parks or valleys, including limited areas of plains and plateaus. However, the latter are the exception and not the rule and thus cannot be shown on this generalized map of landform regions.

A second way to depict surface features is with a map showing elevation. A series of lines, called contour lines or isolines, are used to give an indication of differences in elevation from place to place. At first it may appear quite complicated and even confusing. But notice that each line connects or runs through points of equal elevation. For example, the line at the right of the map (extreme eastern Colorado) is labeled 4000, which means that at any point along this line the elevation is 4000 feet above sea level. Move your view to the west and the next line is labeled 5000. As indicated (Contour Interval = 1000) each isoline is either 1000 feet higher or 1000 feet lower than the line next to it.

Where lines are far apart, as in eastern or northwestern Colorado, one must travel a considerable distance across the state's surface to experience either an increase or decrease of elevation of 1000 feet [PH 12, PH 14, A 24]. In contrast, in the mountainous central portion of the state the lines are bunched closely together. This means that by traveling only a short distance it is possible to climb or descend a 1000 feet in elevation, or more [PH 21, PH 24, PH 28]. Here the appropriate terms are "climb" or "descend" because the topography consists of mountains and valleys and local relief (differences in elevation) can be very great even within a small area. Notice that the locations with closely bunched lines correspond with the regions of dark green on the previous map, that is, the Rocky Mountains. Also located within the mountain landform region are several parks and a large valley. Find these and examine the nature of the contour lines in these places.

Understanding this map and being able to "see" the high and low spots in the topography requires practice. It may be necessary to find a line with an elevation label and count carefully from that point in order to know the precise elevation of other lines. Even then it may not be clear at first if the elevation is increasing or decreasing. What may help is to look at the next map -- Colorado Topography.

Here the cartographer has used a technique that appears to spread a "net" over the peaks and valleys, the plateaus and plains of the state. The map is still on a flat sheet of paper but now the surface appears to be three-dimensional. It also helps that some of the surface features are named, e.g., Great Plains, Sangre de Cristo Range, etc.

Looking at the three maps side-by-side, it should be easier to "see" the differences in elevation and surface features. Notice that elevation changes so gradually in the landform regions labeled Great Plains and Colorado Piedmont that the map of topography shows little variation in this region. By contrast, in the mountainous regions the isolines are close together and the map of topography shows mountains and valleys in close proximity.

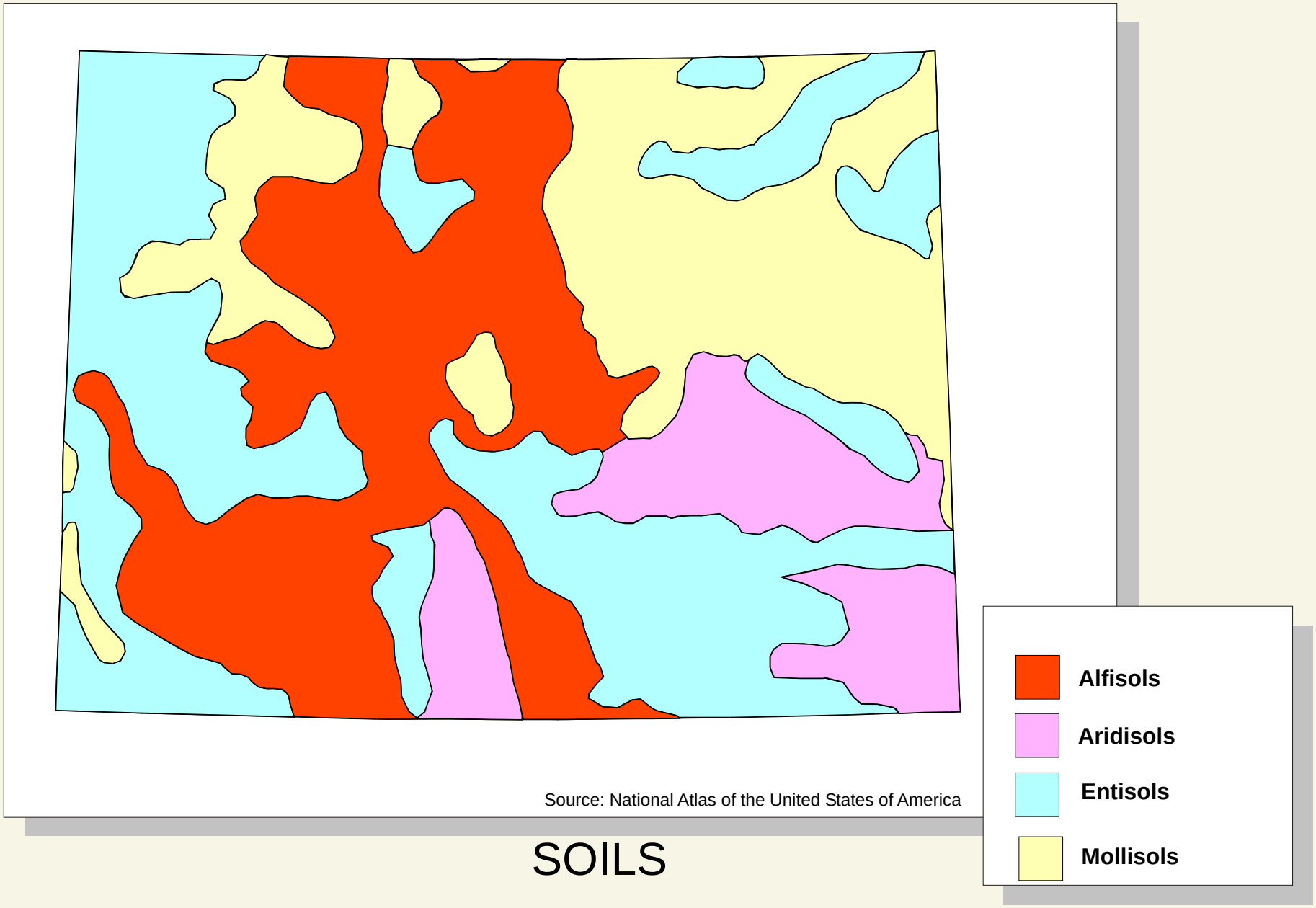
Most people are more attracted to the topography map than to the other two and feel that it gives them a better understanding of what Colorado is really like. Why, then, include the elevation map at all? First of all, the topography map is much more difficult to draw. Very few people can construct such a map by hand, and then it would require a great amount of time. This particular map was drawn by CAD (Computer Assisted Drafting), but not everyone has the software program needed to create this map. And even this program requires that the elevations of many locations be fed into the computer before the drawing can occur. But there are two other problems with this map that are important to understand. In order for peaks and valleys to be clearly seen it is necessary to exaggerate the actual differences in elevations. So what is depicted on this map is not exactly what one would see if traveling through these regions. Also, in a mountainous region like Colorado this form of topography map hides some places behind the higher elevations. Notice in this map that you cannot see much of the eastern slope of the Front Range and only a tiny bit of the Palmer Divide (visible between two of the peaks). These are important regions of Colorado and should not be omitted on any map. However, if the topography map was rotated so the viewer would seem to be looking westward from some part of the Piedmont (which is something the computer mapping program can do!), then much of western Colorado would be blocked from view by the high mountains of the Front Range.

QUESTIONS TO THINK ABOUT

What is the best method to show the Earth's very "unsmooth" surface on a flat, smooth piece of paper? There is probably not a single most correct answer to this question. It depends upon the cartographer's purpose and what the map reader is supposed to learn.

However, the nature of the Earth's surface, and of Colorado's, is very important. Many things are strongly influenced by the nature of the local topography. For example, would you rather go skiing on the surface of the Great Plains, the Western Plateaus, or the Rocky Mountains? Would it be easier to build a road or a railroad through the Great Plains, the Western Plateaus, or the Rocky Mountains? How many other ways can you think of that Colorado's topography or the nature of its land surface affect the way we occupy and use this portion of the planet? It may be useful to compare these maps of topography to others showing Population, Transportation, Climate, Farming, etc.

By living, working, and playing upon the land surface of Colorado, humans also impact this physical environment. As you travel about, is it possible to identify ways in which landforms, elevation, or topography are being changed? If so, do you believe these changes are direct and intentional, or indirect and unintentional? Would it be possible to map such changes?


Alfisols
Aridisols
Entisols
Mollisols
Source: National Atlas of the United States of America

SOILS

SOILS

Soil is generally considered to be that uppermost layer of the Earth's surface occupied by living organisms, that is plants and animals. On a worldwide basis the average soil depth is only about 6 inches, but varies greatly from place to place. The soil found at any specific place on the Earth's surface is the result of basically five factors. These include 1) parent material; 2) climate; 3) topography; 4) soil biology; and, 5) time.

Parent material is the source of the tiny rock fragments that make up the soil. Through a process called weathering, parent material is broken into smaller and smaller particles. These may either come from the underlying bedrock or may be materials transported from other places by wind, water or ice.

Temperature and moisture are the most important climatic factors in soil formation. Generally, the warmer and wetter a climate is the more rapidly parent material is broken down into soil. Conversely, in cooler and drier locations soils evolve more slowly.

Topography is also an important factor in soil formation. As a general rule of thumb, soils develop to greater depths on flat land than on hillsides or mountain slopes. On sloping topography erosion can carry away soil from the land surface faster than weathering converts parent material into new soil. On level or gentle surfaces, such as valley bottoms or plateaus, soils tend to accumulate.

Soils consist mainly of mineral matter (small fragments of parent material), air, and water, plus a very small portion of organic matter. But the organic material, made up of living and dead plants and animals, is of extreme importance to soil fertility. Decomposed and decomposing organic matter is called humus and it plays an important but complicated part in maintaining soil fertility. Often on cultivated land, the natural humus content is supplemented by applications of manure.

The final factor in soil formation is the period of time the various processes have acted upon parent material and interacted. For example, it is common practice to refer to soils as immature or mature, depending upon the length of time they have been in the process of formation. Finally, since soil formation is such a slow process soils are generally considered a nonrenewable resource; when they are damaged or destroyed it is not feasible to await development of a new soil.

Soil Classification

The most common soil classification system is based on a soil's properties. This produces 10 or 11 Soil Orders and many sub-orders. As one would expect in a place of such varied elevations, topography, and climate, Colorado exhibits a complex pattern of soils. The generalized distribution of the four most extensive soil orders is illustrated on the accompanying map.

Alfisols

Alfisols are mature soils that develop under a variety of environmental conditions. The name is derived from two abbreviations, "Al" for aluminum, and "f" for Fe, the symbol for iron, common elements in this soil order. In Colorado they are found mostly in upland areas of uneven terrain and colder climates where their usefulness is frequently limited by shallow depth, varied topography, and short growing seasons. Even a quick glance at the map suggests that Alfisols can be associated with the Rocky Mountains and some of the more rugged portions of the western Colorado plateau country.

Aridisols

These are the soils of dryer lands and generally associated with desert and semidesert climates, thus the prefix "arid." As the map reveals, Aridisols are concentrated in southern and southeastern Colorado. The south central region of Aridisols is in the San Luis Valley, one of the driest locations in the state. The remaining two areas are in locations of limited precipitation and high average temperatures, a combination of environmental factors that keep soil moisture low. In their natural state Aridisols are generally unproductive due to this lack of moisture. Where irrigated, however, these soils can be quite productive, as in the San Luis Valley where they support a variety of crops including vegetables and small grains. [A 29], [A 34]

Entisols

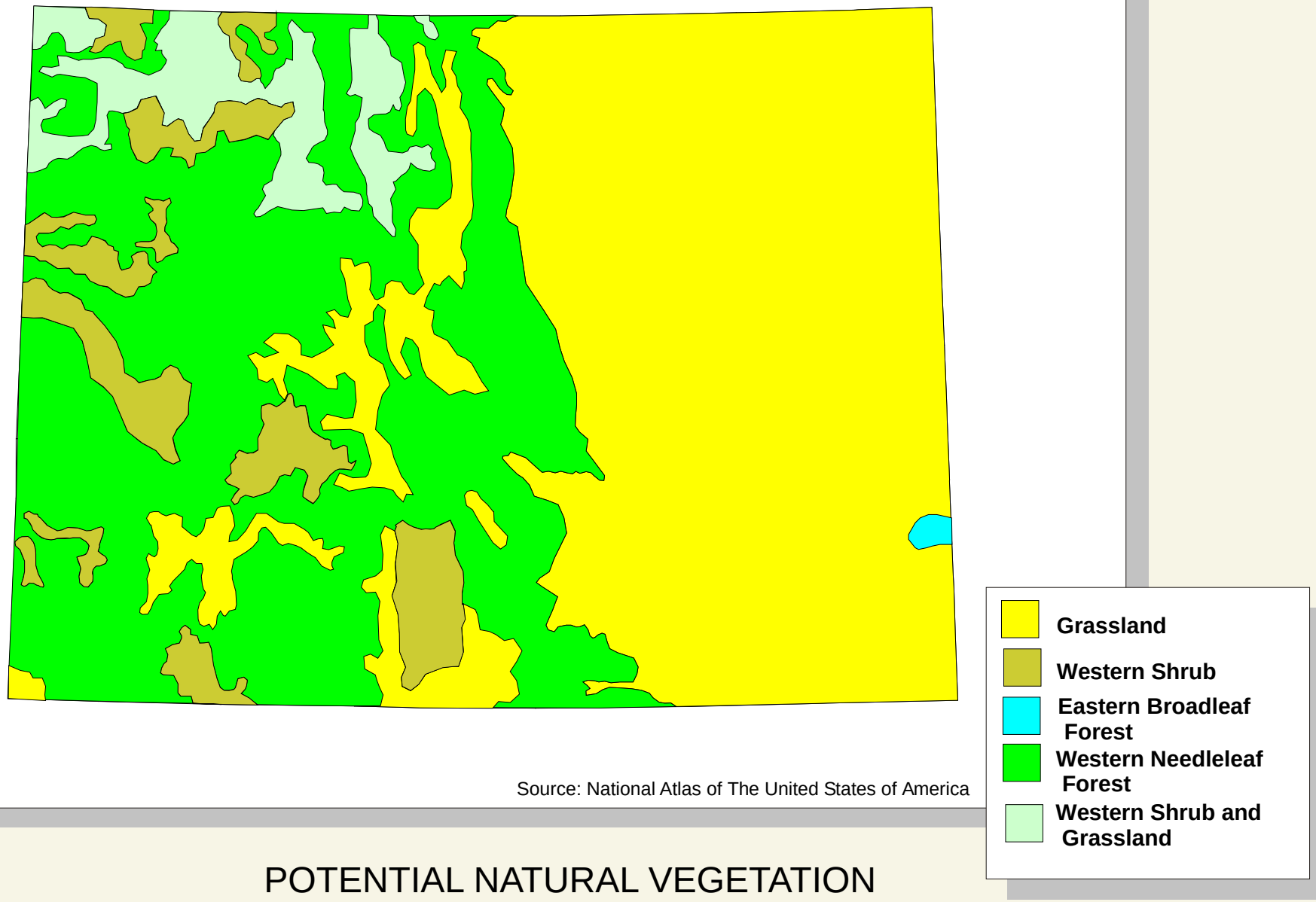
Entisols are immature or underdeveloped soils owing to their recent origin (the "Ent" prefix is merely the last three letters of recent). They may also be associated with dryer climates.

The most extensive deposits of Entisols in Colorado occur in river valley as a result of alluvial (water deposited) material. Note that several of these soil regions have an elongated shape. Most notable are the South Platte and Arkansas in eastern Colorado, the Colorado River and its tributaries in the west, and the Rio Grande along the western margin of the San Luis Valley. Smaller regions of Entisols occur in mountain valleys such as North Park and remnant basins of now seasonal streams. Where irrigated this soil order tends to be very productive. [A 26] [A 32]

Mollisols

Mollisols are found in regions where neither arid nor humid conditions characterize the climate, but where environmental conditions support the growth of grasses. These are soils that generally have a rich humus content owing to the decay of extensive grass roots systems. On a world wide basis Mollisols are probably the most productive of all soil orders because of their high organic content and relative ease of cultivation.

Large areas of northeast Colorado are in this soil order, with a smaller region in the northwest. Where irrigation water is adequate these soils are highly productive. But even where plant growth is dependent upon natural precipitation more drought resistant crops such as wheat, barley, and sunflowers are grown. [PH 14] [A 37] [A 23]



Source: National Atlas of The United States of America

POTENTIAL NATURAL VEGETATION

POTENTIAL VEGETATION

Vegetation is the mosaic or pattern of plant communities evident upon the landscape. Mapping vegetation is, however, a difficult task. On the one hand the variety and distribution of plant communities found in Colorado's complex range of environments cannot be comprehensively portrayed at the map scale used in this atlas. The second problem and perhaps the greater one is the impact of human actions upon vegetation. Some plant communities have been largely, if not completely, eradicated. At the same time, exotic plant species are intentionally introduced (new crops), as well as unintentionally (unwanted species we collectively term "weeds").

In response to this latter problem, the concept of potential natural vegetation is applied to the mapping of plant communities. Potential natural vegetation is defined as the vegetation that would currently exist assuming the following: the effects of earlier human impacts on plants are acknowledged; human influence is removed from the scene; plant communities establish their distributions on the basis of natural competition (succession) under conditions of constant climate. Stated most simply, potential natural vegetation would be "plants growing where they grow best without interference from humans."

The distribution of vegetation is of interest to geographers, and should be to everyone, for three reasons: it is the most visual component of the landscape; it is usually an indicator of other environmental conditions, e.g., precipitation, temperatures, air movement, soils; it usually has a significant impact on human activities.

Five major plant associations are found in the Colorado; the vegetation typical to each is listed below.

Grassland [PH 14] [I 28] [PO 58] [A 37] [PO 65]
- fescue-mountain muhly prairie
- gramma-buffalo grass
- sandsage-bluestem prairie

Broadleaf Forest
- northern floodplain forest

Western Forest [PH 25] [PH22]
- western spruce-fir forest
- pine-douglas fir forest
- spruce-fir-douglas fir forest
- southwestern spruce-fir forest
- juniper-pinyon woodland

Shrub and Grassland [PH 23] [PH 17] [A 29]
- mountain mahogany-oak scrub
- great basin sagebrush
- saltbush-greasewood
- sagebrush steppe

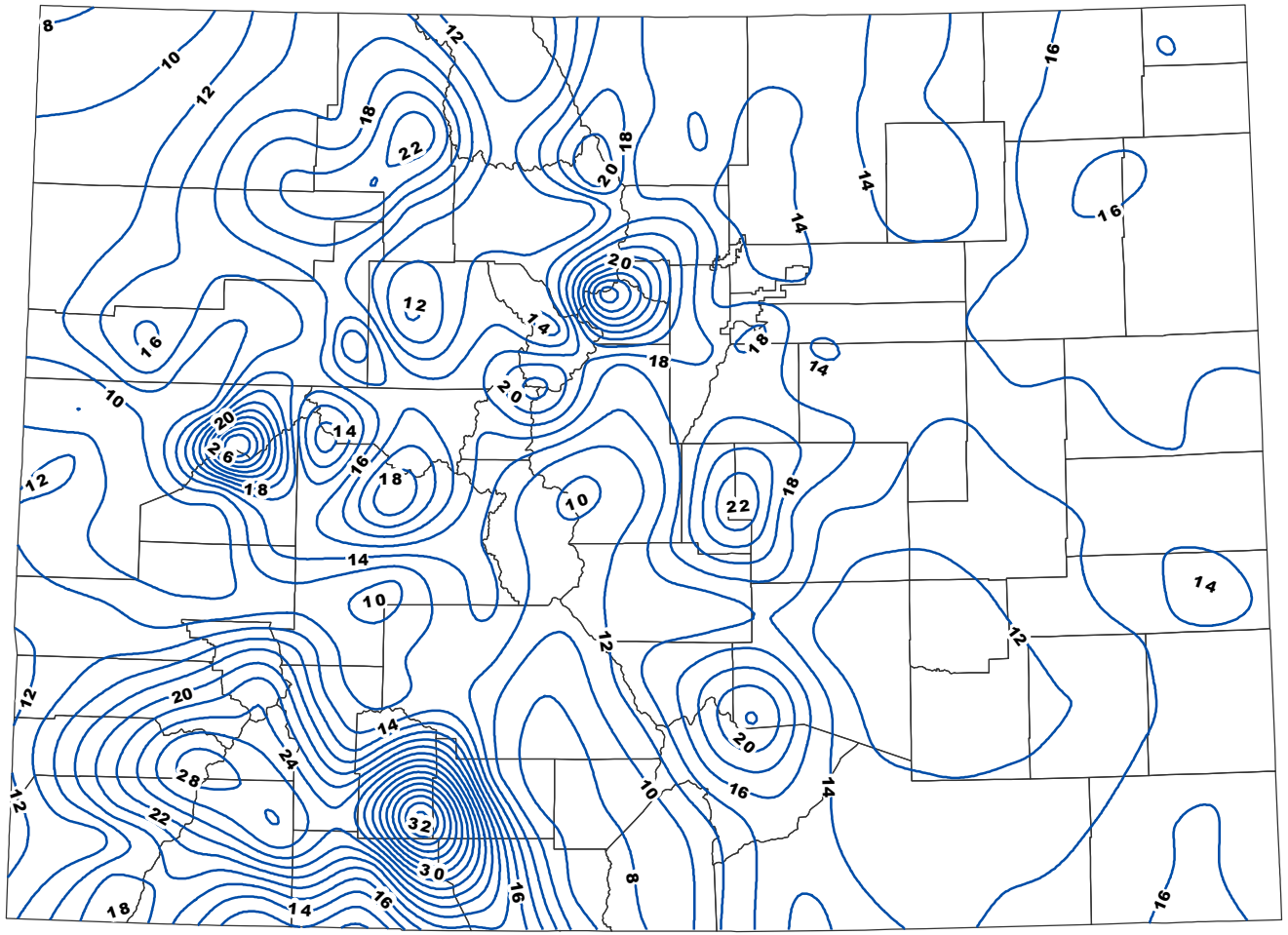
Western Shrub [PH 13]
- Mountain mahogany-oak scrub
- great basin sagebrush
- saltbush-greasewood

QUESTIONS TO THINK ABOUT

In terms of the variety of vegetation, how can eastern Colorado be so different from the rest of the state? Remember, the map depicts "potential natural vegetation," so that differences in plant communities is primarily owing to natural environmental conditions, not current human activity. Are there any other maps of natural conditions in which eastern Colorado appears to be quite uniform and at the same time quite different from the remainder of the state? Are the patterns on the maps of vegetation and elevation at all similar?

Do you live in eastern Colorado, or have you traveled along the South Platte or Arkansas River valleys? Is that region of the state all grass, as the map suggests? Can you find trees there? The answer is Yes!, there are trees in this natural grassland. But where did they come from and how do you think they got there?

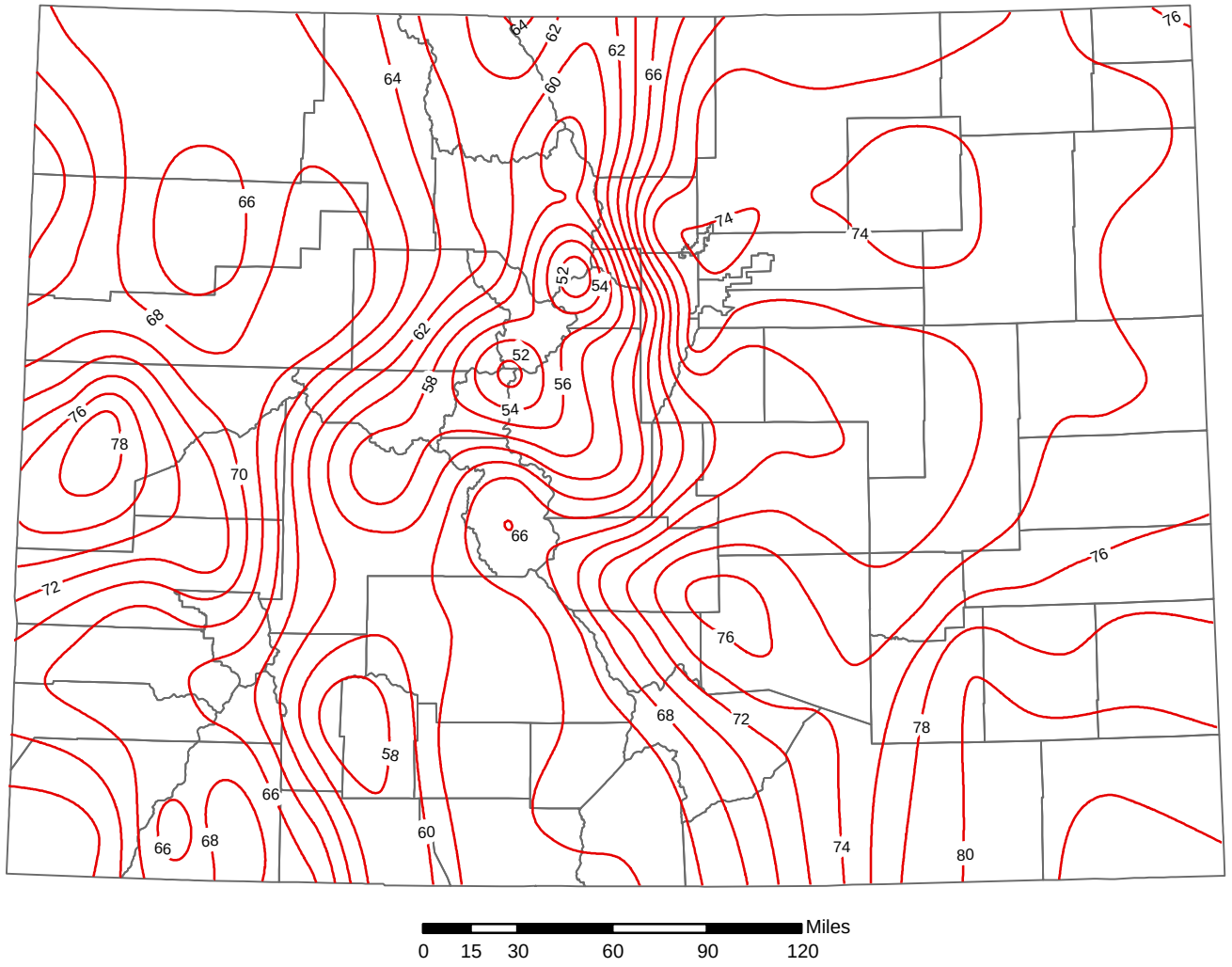
How different would a map of "actual" vegetation be from this map of potential natural vegetation? Plot your school or home location on the map of potential natural vegetation. Take a brief field trip outside to observe, record, and identify the different plants you encounter, especially those occurring repeatedly (do not ignore lawns, gardens, and crops!). Do your observations fit what the map indicates is the vegetation type in your location? How can you explain differences? Remember the caution given in the first paragraph of this section about the difficulties of mapping vegetation.



Source: Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days,1961-1990, Colorado

Interval = 2 Inches

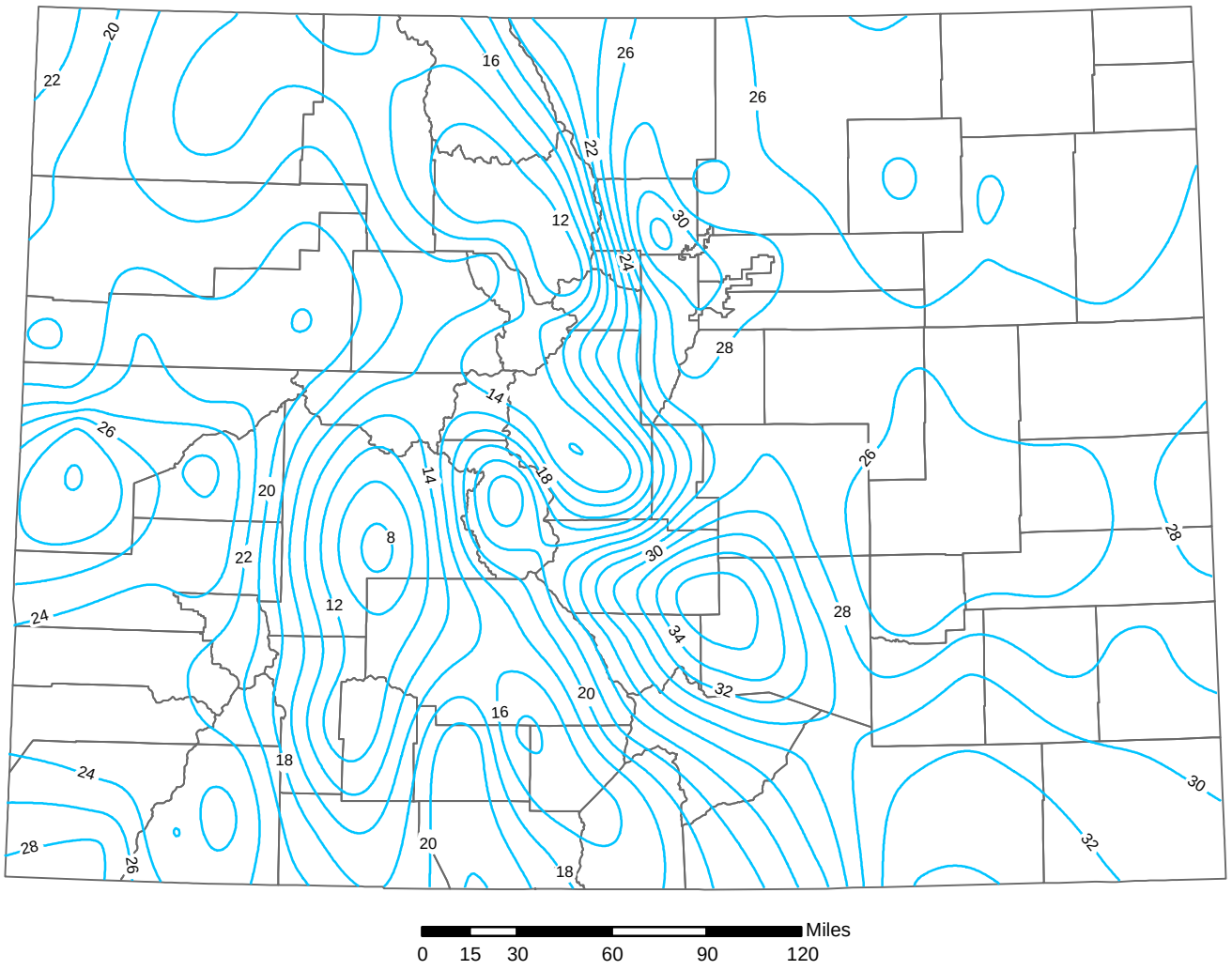
Average Annual Precipitation



Source: Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1961-90, COLORADO

Interval = 2 Degrees F.

Average July Temperature



Source: Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1961-90, COLORADO

Interval = 2 Degrees F.

Average January Temperature

Pawnee Buttes

Eastern Colorado is a region of plains, broad river valleys, and rolling uplands. The origin of these landforms is essentially depositional, primarily water and wind-borne materials originating in regions to the west and northwest. Occasionally, the gentle topography is broken by erosional remnants such as the Pawnee Buttes where a more resistant layer protects somewhat the underlying soft materials from the forces of erosion. These buttes provide a layered geologic history of this portion of eastern Colorado.

Wyoming Basin

The flat to rolling topography of the Wyoming Basin extends into northwestern Colorado. This elevated basin is dry, with a typical vegetative covering of bunch grasses and sagebrush. Sheep are more numerous than cattle in this environment. Large deposits of oil, coal, and oil shale underlie much of this region.

Plains Vegetation

Though historically referred to as a desert, the plains of eastern Colorado actually lie in a zone of steppe, an environment of low-growing grasses and other drought-resistant or xerophytic vegetation. The yucca plant is known by a variety of names, including Spanish bayonet for its pointed, blade-like leaves, or soapweed, since pioneers made a form of soap from its roots and found its leaves handy for scouring cooking utensils. Unfortunately, extensive areas of yucca indicate overgrazing.

Tornado Watch

Owing to a variety of factors -- continental location, proximity to the Rocky Mountains, elevation, latitude -- the weather in eastern Colorado is subject to frequent and sometimes radical change. An early summer storm cell is cause for concern. Such a system may produce violent thunder showers, damaging hail, or even a tornado. Annually, eastern Colorado produces a substantial number of reported funnel clouds and/or tornados, though these are fewer and smaller than the occurrences in Texas, Kansas, or Oklahoma.

South Platte River

For most of the year, the South Platte River makes its way between low, Cottonwood-covered banks as it crosses the plains of eastern Colorado. Only during late spring and early summer runoff is there a notable increase in volume and occasional flooding. Hydrologists speculate that prior to modern settlement, the South Platte in eastern Colorado ceased flowing most years during late summer and fall. Seasonal fluctuations are now reduced owing to storage and diversion of water from Colorado's western slope; downstream states such as Nebraska are by law assured a continuous flow.

Colorado River

Near the point where it leaves the state, the Colorado River flows between flat-topped formations of red sandstone. This river, once called the Grand River, has the greatest volume of any river in the state and its water is used by residents as far away as Arizona, southern California, and Mexico. Over-use is a significant environmental problem.

Hail

Each summer, thunderstorms develop over eastern Colorado with thunderheads (cumulonimbus clouds) that may reach 60,000 feet in elevation. These hail stones destroyed crops, punctured roofs, and damaged vehicles. They were produced when strong vertical air currents in the towering storm carried ice particles up and down, repeatedly adding layers of ice until the stones could no longer remain suspended in the atmosphere.

Horsetooth Reservoir

Beds of horizontal sediments were lifted and tilted by the intrusion of igneous materials into what are now the Front Range mountains. Erosion has removed softer strata leaving elongated valleys between ridges (hogbacks) of harder sediments. Horsetooth Reservoir is impounded within one of these erosional valleys.

Raton Mesa

The horizontal flow of molten rock created this elevated mesa (table) near Colorado's southern border. Within the Raton Section are many other evidences of volcanic activity, including small necks or plugs and cinder cones.

Spanish Peaks

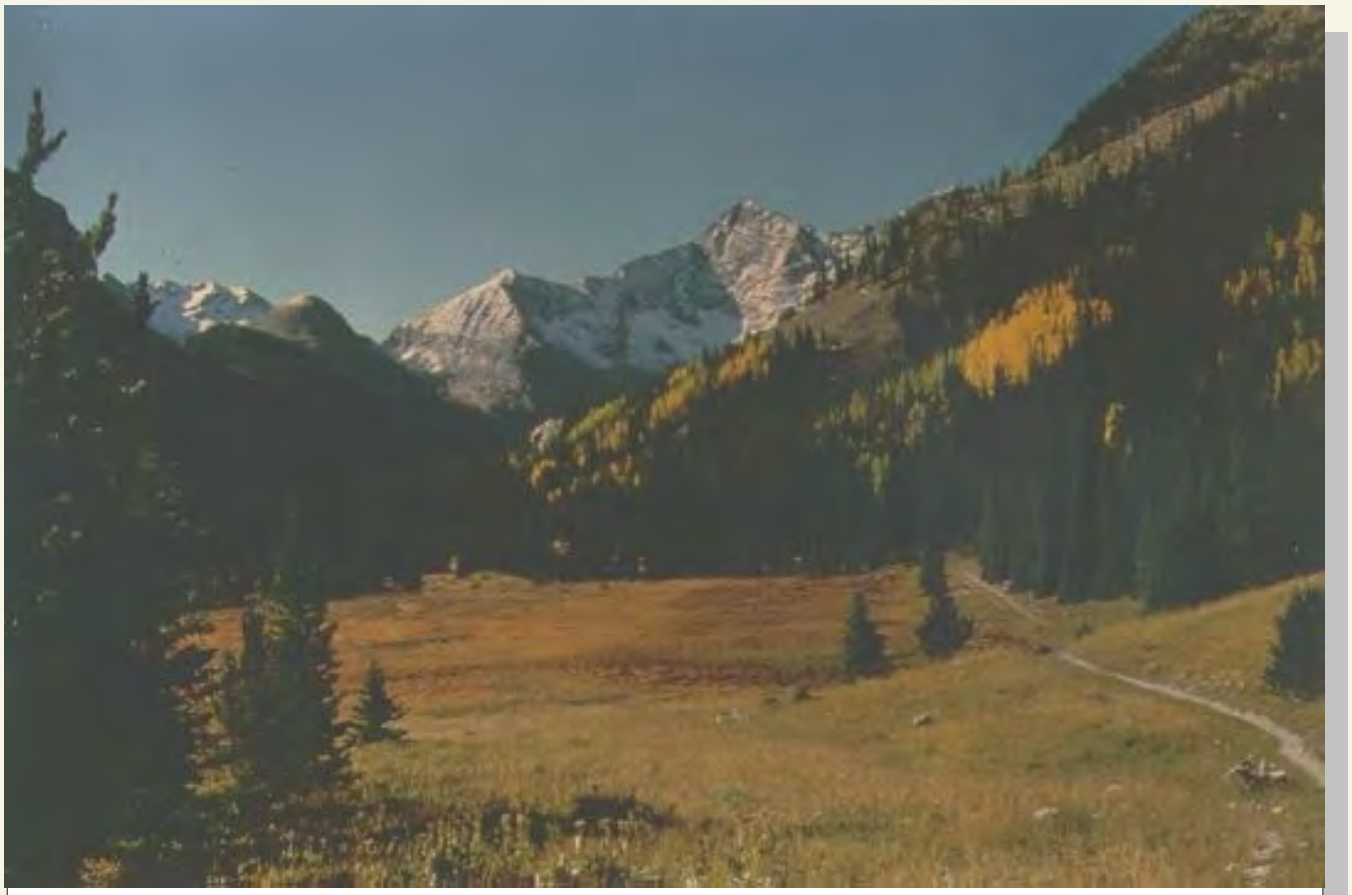
These two large mountains were created as masses of volcanic magma intruded or pushed upward nto the overlying sediments. Erosion has stripped away much of the softer sedimentary material revealing the harder volcanic rock as well as numerous wall-like dikes radiating outward from each peak, much like the spokes of a wagon wheel.

Wolf Creek Pass

This location in the San Juan Mountains of southwestern Colorado is one of the wettest places in the state. The mountains intercept moisture bearing winds, force them to rise, and the result is precipitation, often in the form of snow. In a single winter season, nearby Wolf Creek Pass has received as much as 400 inches of snow.

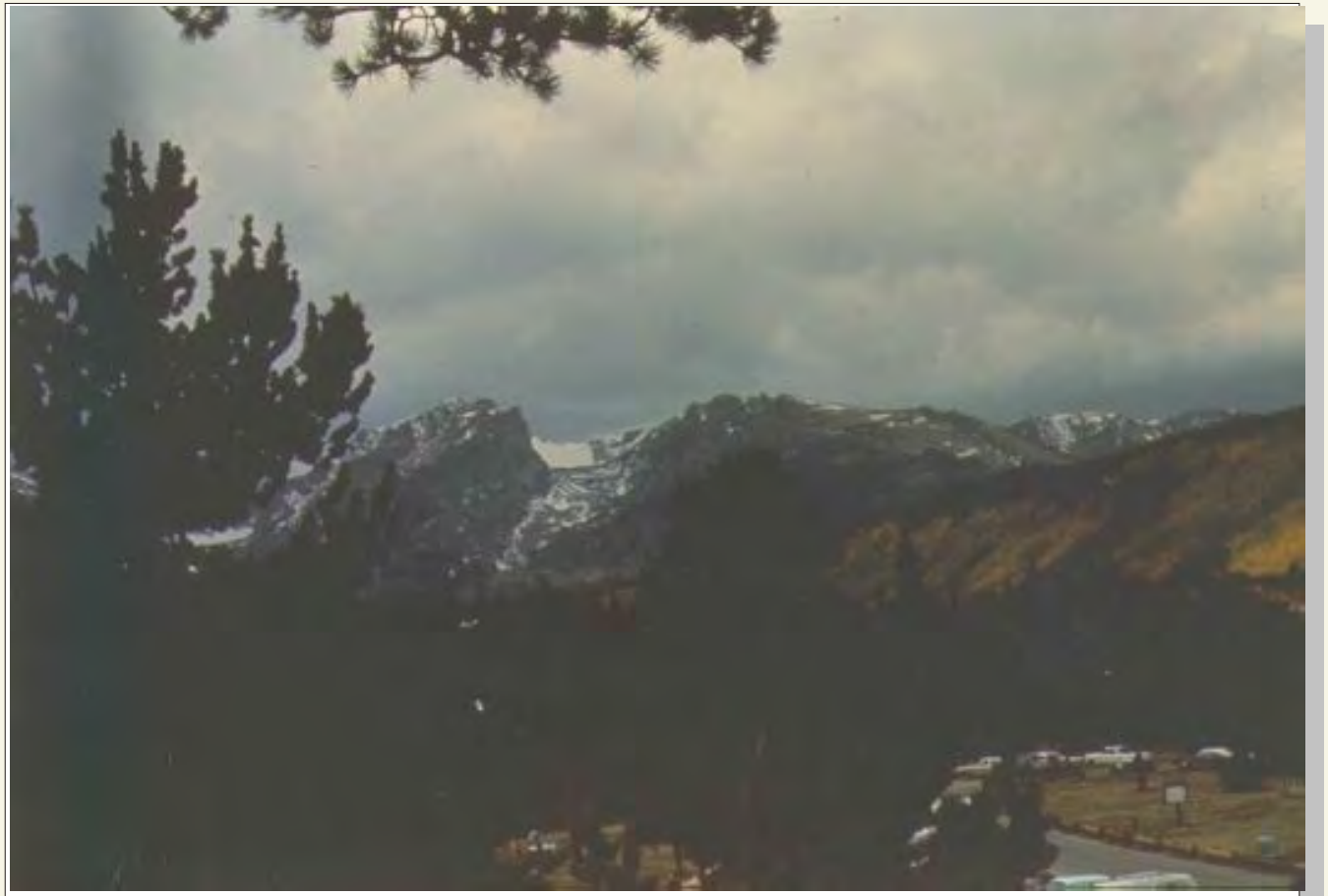
South Park

Located within the mountains of Colorado are several large flat-floored basins commonly referred to as "parks." South Park, measuring approximately twenty-four by forty-eight miles, appears to be a grassy and virtually treeless plain. However, the basin's average elevation is 8,800 feet. The headwaters of the South Platte River arise in this basin.



Blanca Peak

Part of the Sangre de Cristo range, Blanca Peak (14,345 feet) takes its name from the light colored granite that forms the summit. As the fourth highest mountain in Colorado, Blanca Peak is also covered with snow much of the year. The entire range was created as a portion of the Earth's crust was heaved upward along a zone of faults or fractures.



Rocky Mountain National Park

Higher elevations of the Front Range receive abundant snow most years. Note the U-shaped valley carved by ice. Many glacial landforms exist in the Park, including moraines, horns, tarns, and even small ice fields.

Royal Gorge

The Royal Gorge Bridge spans a 1,200-foot-deep canyon carved by the Arkansas River. As the river erodes downward the surrounding land surface has been uplifted, accelerating the work of the river. The suspension bridge is the world's highest, hanging 1,053 feet above the river, yet its function is as tourist attraction, not transportation link. Owing to the narrowness of the gorge, the single railroad track that runs beside the river is in places suspended from the rock wall.

San Juan Mountains

These mountains are heavily eroded remnants of huge volcanoes that spewed molten rock and ash over present-day southwestern Colorado. Despite the action of water, wind, and ice, more than a dozen peaks in the San Juans exceed 14,000 feet. Vulcanism produced valuable deposits of gold and silver, the basis of several "rushes" and resulting boom towns.

Sawatch Range

Located in south central Colorado, the Sawatch Range contains the state's highest elevation (Mt. Elbert, 14,433 feet) and many of its "Fourteeners," peaks that exceed 14,000 feet. Because of their height, snow remains upon many of the peaks most, if not the entire year.

Grand Mesa

Western Colorado is dominated by plateaus and mesas. The Grand Mesa's surface is composed of thick layers of lava, called basalt. This material once accumulated in valleys where it cooled and hardened. Erosion removed the softer materials surrounding the lava and left the mesa standing high above the intervening landscape.

Great Sand Dunes

Prevailing southwesterly winds moving across the desert floor of Colorado's largest intermontane basin, the San Luis Valley, pick up fine soil particles. As the winds reach the Sange de Cristo mountains they lose velocity and deposit their load near the western foot of that range. The result is Great Sand Dunes National Monument, approximately forty square miles of dunes some of which rise over 700 feet above the valley floor.

Black Canyon

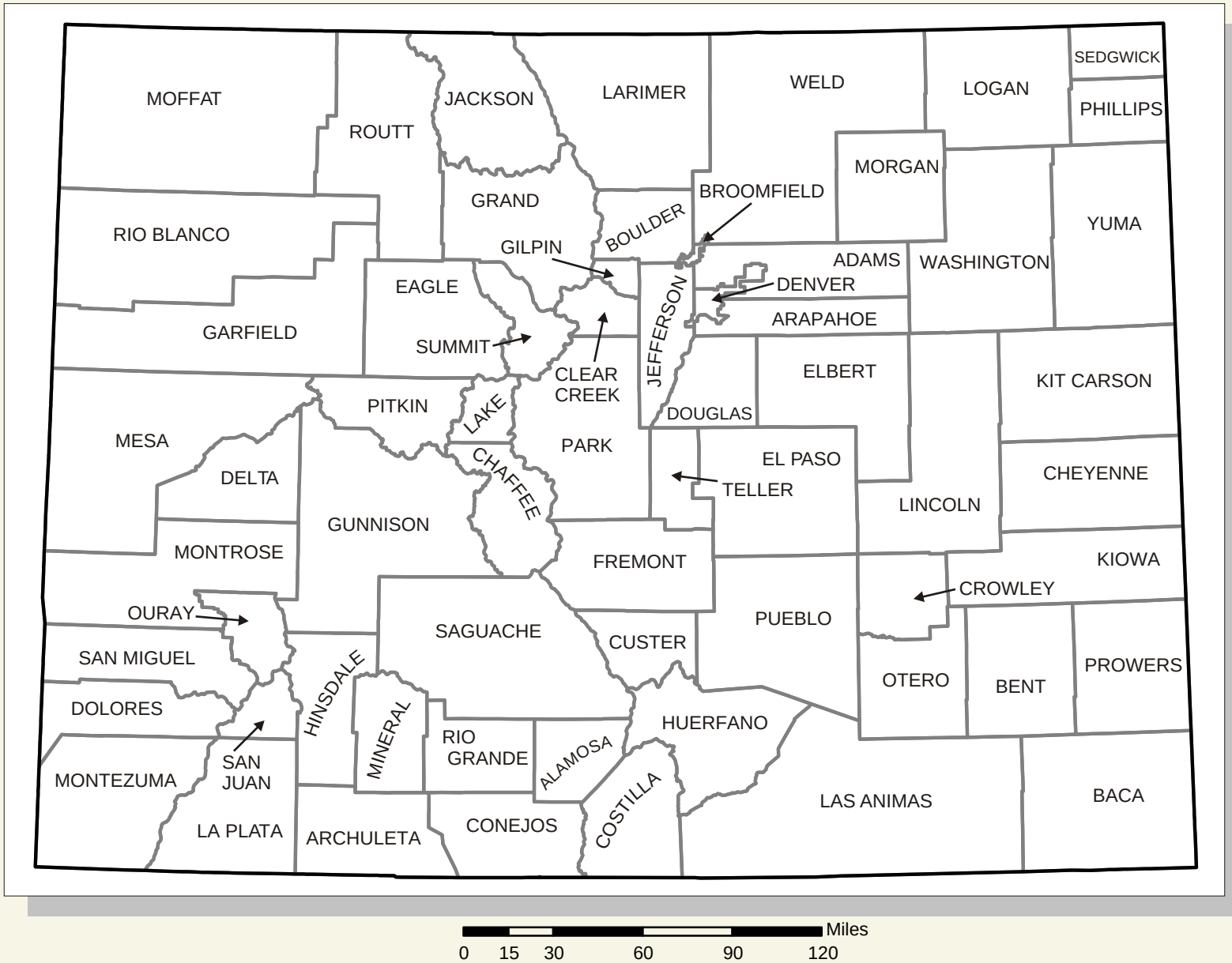
With nearly vertical walls, some more than 2,000 feet tall, the Black Canyon of the Gunnison River is among the most spectacular landscapes in Colorado. Initially, the river cut downward through softer volcanic materials. Once its course was established the river has continued to erode the very hard Precambrian materials through which it now flows. At places, the river nearly disappears beneath jumbles of boulders, making this a challenging run for kayakers.

Colorado National Monument

Spires of reddish Wingate sandstone, some more than 300 feet tall, characterize the Colorado National Monument. Thin layers of harder caprock, light brown in color, protect the underlying and more easily eroded sandstone. In the distance the Colorado River flows through the Grand Valley near western Colorado's largest city, Grand Junction. Notice rock climbers atop this spire.

Dinosaur National Monument

The old and largely sedimentary materials of the Uinta Mountains contain numerous fossils, including those of large dinosaurs. After paleontologists began excavating the fossils, an area extending from northwestern Colorado into eastern Utah was designated a National Monument. Not only did this help protect the fossil beds against unauthorized digging, it also stimulated tourism. In fact, the nearby small town of Artesia, Colorado, changed its name to Dinosaur, Colorado.



Colorado Counties

COLORADO'S COUNTIES

READING THE MAPS

The first impression created by the map of Colorado Counties is of a large box filled with smaller geometric figures -- squares, rectangles, quadrangles, and so forth. In fact, nearly one-half (29) of the counties have purely geometric, i.e., straight line boundaries. Many of the remaining thirty-five have borders that are partially or even primarily straight lines. Not one of Colorado's sixty-four counties has purely "natural" boundaries, though counties such as Jackson, Summit, Chaffee, Ouray, San Juan, and Huerfano come closest.

Geometric boundaries, as opposed to "natural" ones, have a history of being superimposed upon the Earth's surface with little regard for the nature and distribution of pre-existing physical and cultural landscape features. In contrast, natural boundaries may follow rivers, mountain ranges, edges of plateaus, or other visible physical features. .

The most consistently "geometric" part of Colorado is in the eastern Plains. Secondary concentrations of straight line boundaries occur in the northwestern Plateau region and the San Luis Valley. A greater frequency of natural county boundaries is evident in a band extending north/south through the center of the state.

QUESTIONS TO THINK ABOUT

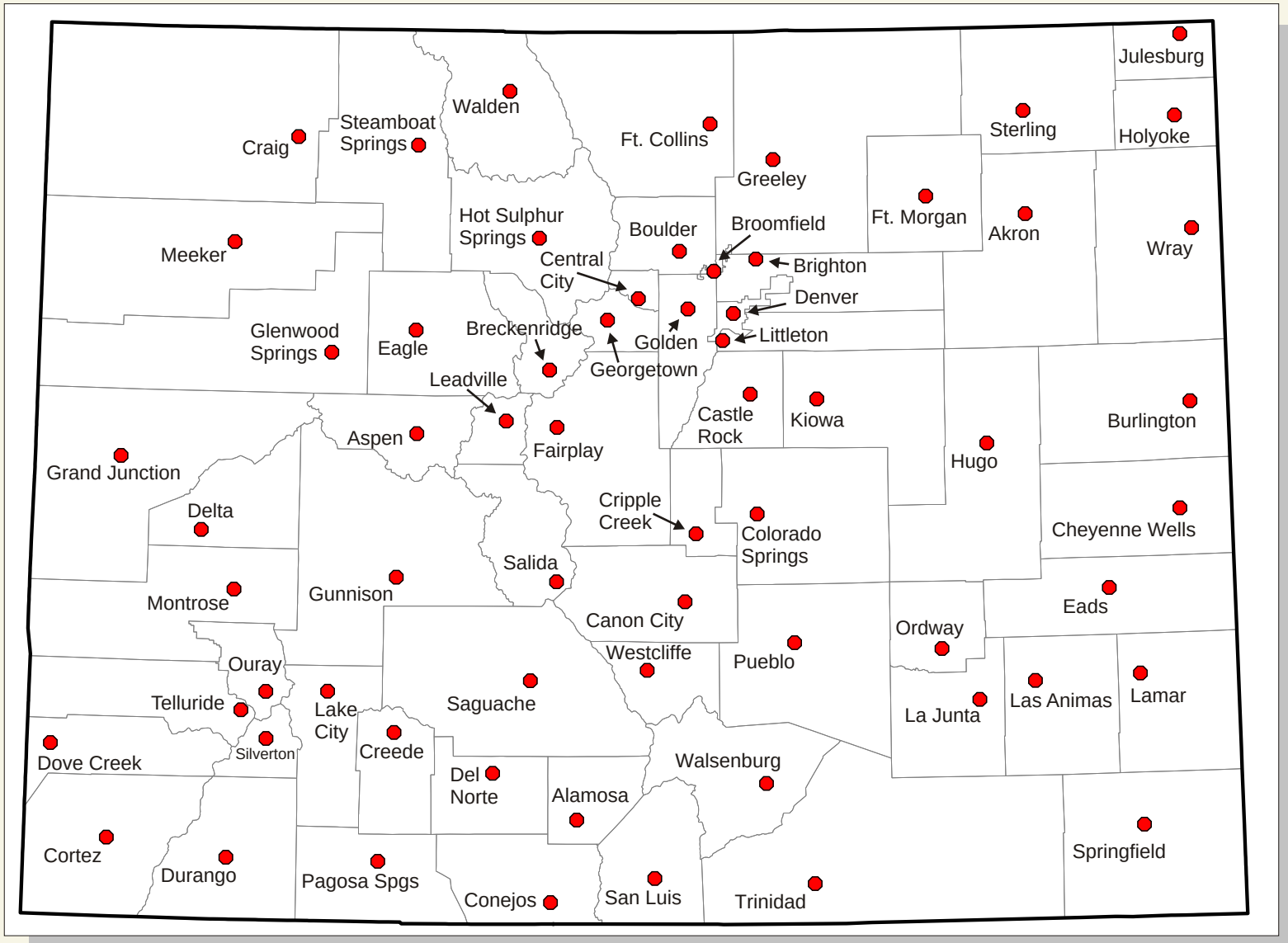
What spatial associations or correlations can be made between types of county boundaries, e.g., geometric or natural, and their location or clustering within Colorado?

Clearly, there is an association between topography and the nature of boundaries. What is it? Compare the county boundaries of Colorado with those of some other state, preferably from the eastern United States (Kentucky, West Virginia, or Georgia provide instructive comparisons).

Another way to look at and think about counties is in relationship to their size. Colorado has several very large counties, such as Las Animas, Weld, Moffat, Mesa, and Huerfano (the five largest), as well as some quite small ones, e.g. Gilpin, Denver, Clear Creek, and Lake. Do the largest counties have anything in common other than size? Do they have large or small populations? Are population densities high or low?

What about the Colorado counties with the smallest land areas? Gilpin, Denver, Clear Creek, and Lake have already been mentioned. But Colorado’s newest county, Broomfield, is the smallest of all at only 33.6 square miles. Why did the residents of the suburb of Broomfield desire their own county, approved in 2001? Do the smaller counties share common origins or traits? Do you think more counties will be formed in the future?

A third way to regionalize or group Colorado's counties is by name. Names usually reflect something about the people who chose them; this can include their history (Lincoln), national origin (La Plata), or original inhabitants (Cheyenne, Kiowa). Some names tell about the local physical geography (Mesa, Mineral, Summit, Costilla). By mapping the counties that belong to a particular category you will identify different regions within the state that may share other characteristics as well.



COUNTY SEATS

COUNTY SEATS

READING THE MAP

Each Colorado county has a town or city designated the County Seat. This is where government offices are located and where the county's elected officials normally carry out their duties, for example, the judges and their courts. Official records are also maintained at the County Seat.

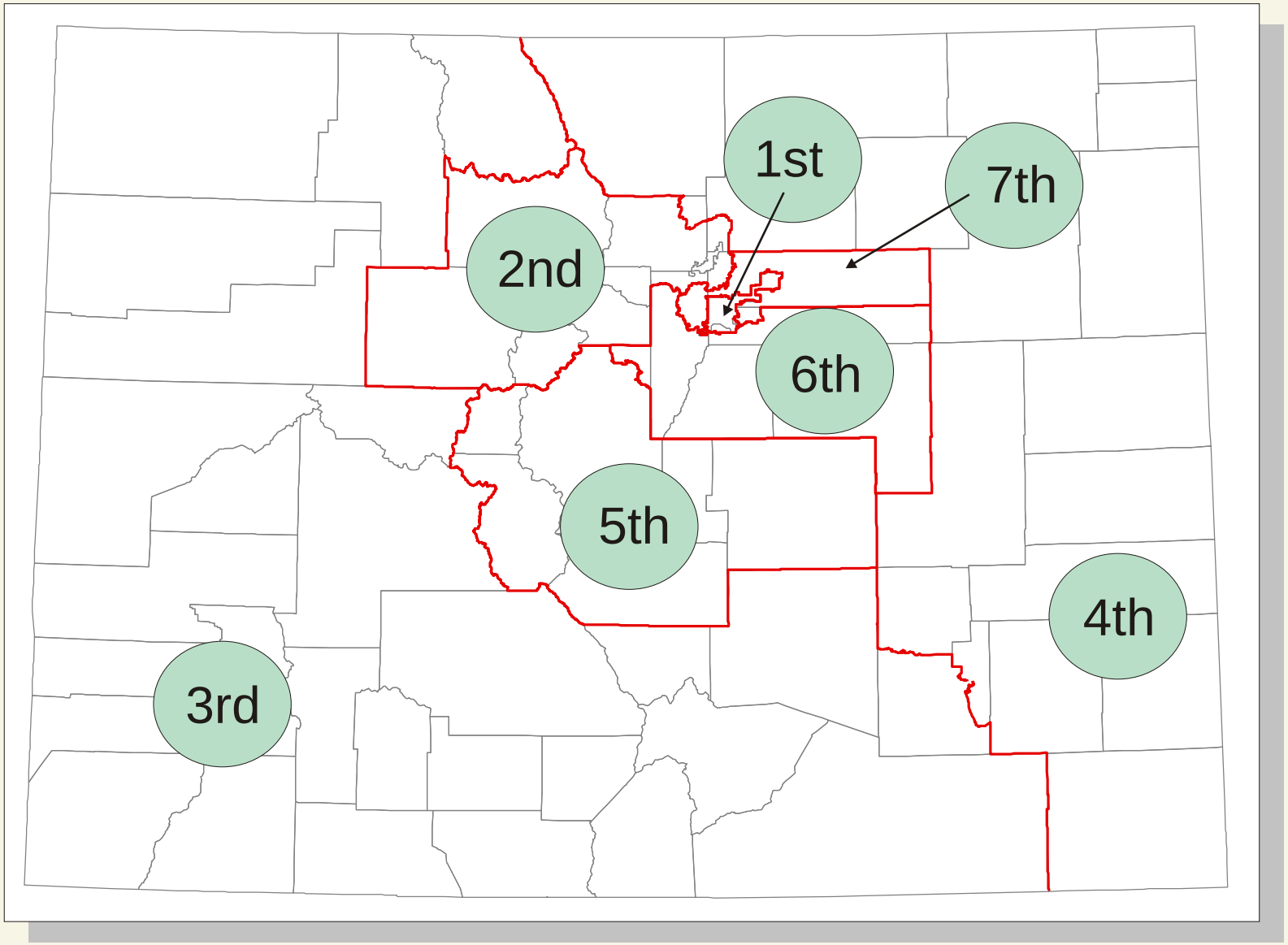
The present County Seat in each county has not always had that function. Some counties have switched their Seats several times and for various reasons. In some cases, it was the desire to have the seat of government more centrally located or at least more accessible to a majority of the people. Some country seats were originally mining "boom towns," but when the mines were worked out the population dwindled and eventually citizens voted to move the County Seat function to a larger, more important town. At times, towns people in various counties even tried various "extra-legal" means to move the County Seat from some other town to their own, including moving the official records and even the building that housed such documents. Virtually all efforts to move or maintain a County Seat were prompted by the belief that such a governmental function increased the permanence of a town and provided some employment. For a fascinating map and account of such activities, see Colorado Historical Atlas, by Noel, Mahoney, and Stevens.

QUESTIONS TO THINK ABOUT

Are county names related to County Seat names? If the name of the county has a Native American origin (e.g. Arapahoe), is the County Seat name from the same or related origin? Look for name pairing of Spanish/Spanish (Costilla-San Luis), Anglo/Anglo (Weld-Greeley), and any others you can find. If you identify the counties with a particular pairing (e.g., Hispanic), do they tend to be clustered in one part of the state? If they are, it probably means that the people who first settled that region had considerable influence or power then. Do they still have influence or power in that part of Colorado? How might you find out? Check the names of county officials such as commissioners, the sheriff, the coroner, etc., for clues.

Is there any pattern of placement of County Seats within counties? For example, do they tend to be closer to the geographic center of the county or near its edge? Is County Seat location related to transportation? How many are located on federal or interstate highways?

Does Colorado have too many counties or not enough? Could some counties be combined so citizens could share the expense of law enforcement, road repair, education and other social services? One Colorado governor suggested this idea to residents of Colorado's San Luis Valley in the counties of Saguache, Mineral, Costilla, Alamosa, Rio Grande, and Conejos. They rejected the governor's idea. Why do you think they felt that way? In contrast, Colorado has a new county (Broomfield).



FEDERAL CONGRESSIONAL DISTRICTS 2002

FEDERAL CONGRESSIONAL DISTRICTS

The U.S. Constitution provides that each of the fifty states will be represented by two Senators and a number of Representatives proportional to each state's population. Since the membership of the U.S. House of Representatives is fixed at 435, with each new census it is necessary to recalculate the number of representatives apportioned to each of the states. States that lose population or are growing slowly may have their number of representatives reduced (e.g., based on the 1960 census, Iowa was accorded seven U.S. Representatives; based on the 2000 census, that number is now five). In contrast, Colorado has experienced rapid population growth for several decades. As a consequence, the state gained an additional representative after the 1970 census, and another based on the census of 2000, bringing the total to seven.

Each U.S. Congressional Representative has a "home district." Such districts are really geographic regions, although they may be temporary ones. It is the responsibility of Colorado state government to identify and establish these districts in a fashion that provides an essentially equal number of residents in each district, with districts being as compact as possible, while using existing county boundaries whenever possible.

READING THE MAP

It is immediately apparent that Colorado's seven Congressional Districts in 2002 varied tremendously in area. The Third and Fourth Congressional Districts cover well over one-half of the surface area of the entire state. In contrast, District One based on Denver County is comparatively tiny. This variation in physical size is necessary to provide each of the districts with essentially equal population.

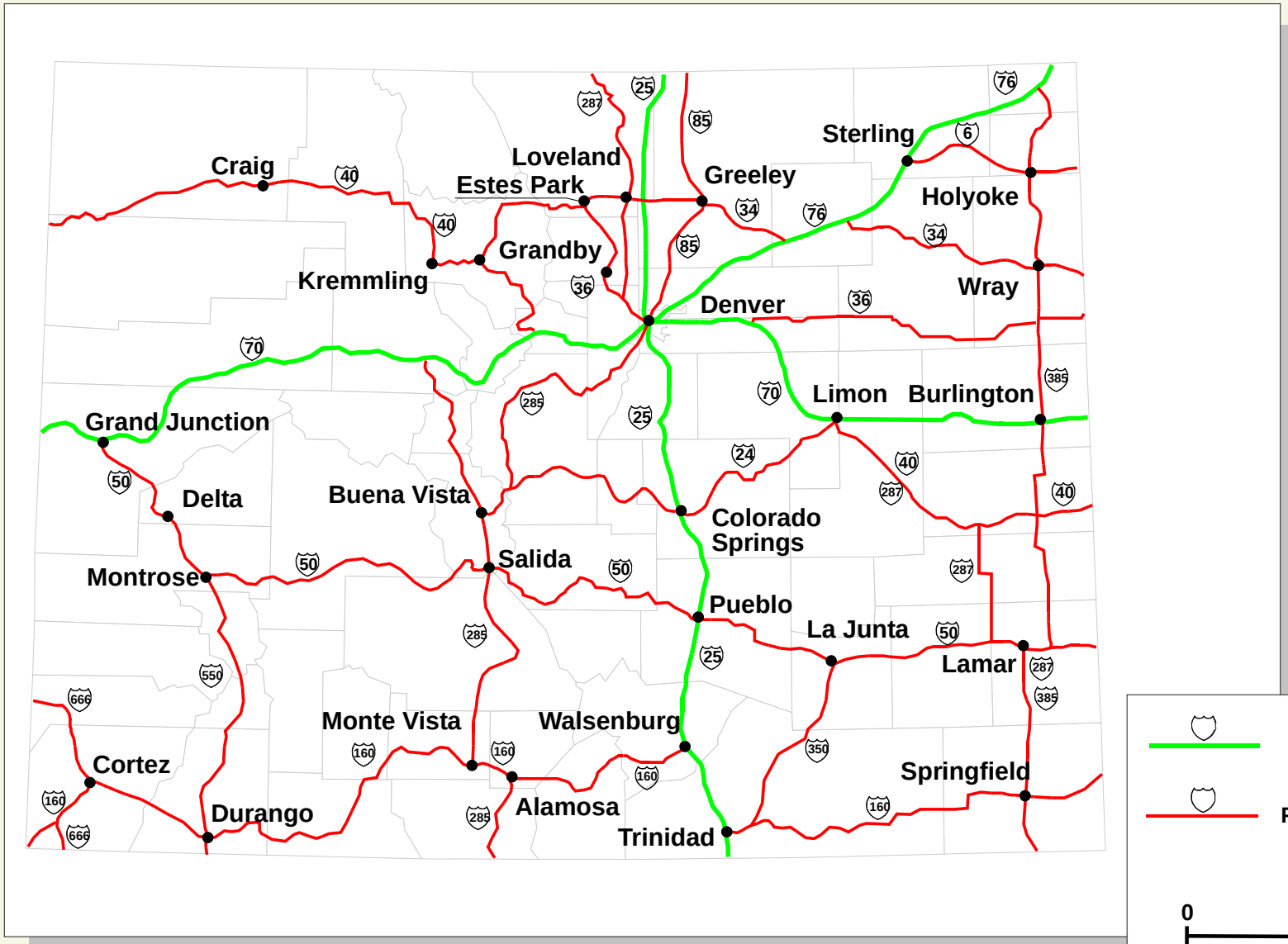
Check the map to see where the boundaries of Congressional Districts depart or vary from county boundaries. This is most commonly done to more nearly equalize the districts' populations. The district boundaries in the heavily populated Denver Metro Region are very complex and frequently combine parts of different counties. Another example is in Otero County where it was necessary to "equalize" population between Districts Three and Four. If Colorado continues to gain population it will be necessary in the future to redraw district boundaries (often termed "Redistricting") to assure equality of population. It may also be necessary to add yet another Congressional District.

QUESTIONS TO THINK ABOUT

Politicians like to "mess with maps." While the process is officially termed "redistricting" or "reapportionment," there is another term. It is called gerrymandering. When population change makes it necessary to redraw Congressional District boundaries, it is in the interest of the different political parties to use the change to their political advantage. Moving a county, or part of a county, out of one Congressional District and into another can change the relative voting strength of a political party relative to its opponent. For this reason, the Colorado party in power (the one with a majority of state senators and representatives) always attempts to make district changes in a way that will benefit that party.

In 2003, Colorado Congressional District boundaries were redrawn amidst great controversy. The new map (http:www.state.co.us/gov_dir/reap/reapp_index.htm) is quite different from the 2002 version in the Atlas. Compare the two maps noting where the greatest boundaries changes occur. Which districts changed most? Which changed least? Did your family "change districts?" How might this impact your family?

Understand that the latest Congressional District map (2003) is being challenged in court. Some charge that the changes are unfair and the map should be redrawn once again. Are you beginning to understand how "political geography" and "political maps" change over time?



INTERSTATE AND FEDERAL HIGHWAYS, PLACES

INTERSTATE AND FEDERAL HIGHWAYS, PLACES

READING THE MAP

Of Colorado's 85,000 miles of highway, the roads shown are demonstrably the most important and most intensively traveled. The total length of Interstate (1,170 miles) and federal highways (7,100 miles) is slightly more than 10 percent, by length, of all highways, yet these account for about 60 percent of the state's annual vehicle-miles.

East of the Rocky Mountains, the density of the highway network is greater than any other region of the state. Dramatic population growth along the Front Range during the 1990s severely strained the states existing road network. Highways are also comparatively straighter, owing to more level or gentle terrain, and north-south travelers are better served. West of Interstate Highway 25 (I-25), topographic constraints affect the number and direction of highways. River valleys facilitate several east-west routes but major north-south roads are few since they must run counter to physical obstacles, namely mountains and plateaus.

There is a spatial relationship between highways and cities or towns. But what is that relationship? Observe that cities and towns tend to occur where two or more highways cross or converge. The most obvious example is Denver,* where several important and heavily traveled routes meet. This is the only place in Colorado served by more than one Interstate highway.

*The map scale did not permit Denver's suburbs to be shown but they are included in the statistics and analysis.

QUESTIONS TO THINK ABOUT

Does Colorado have any large or important cities that are not located one of the Interstate or federal highways shown on this map? What is the largest city or town in Colorado not on one of these two types of highway? (See Table below) Likewise, are there any counties in Colorado that do not have either an Interstate or Federal highway passing through them? Does this suggest anything about these counties?

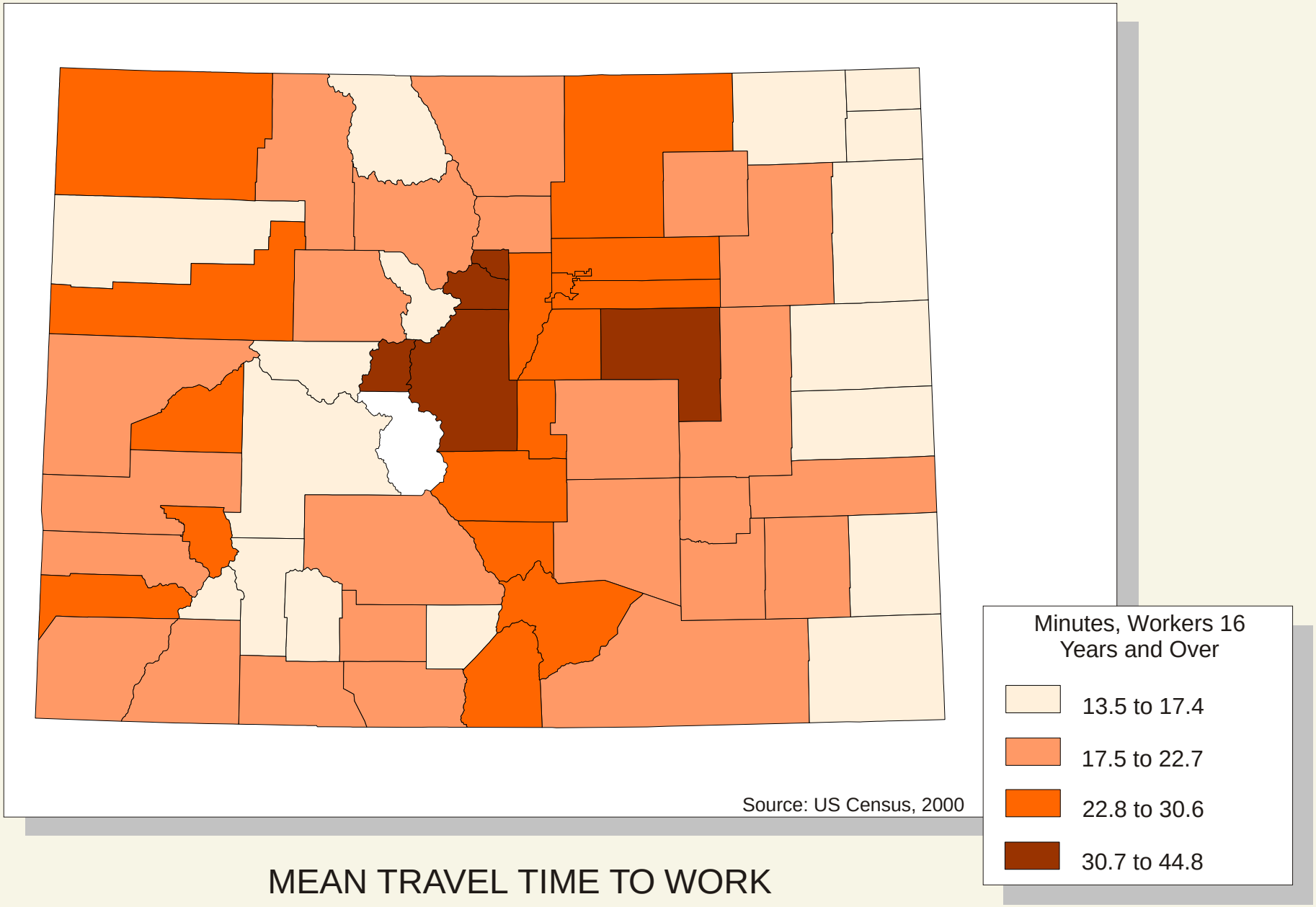
Roll a piece of paper into a short tube with an opening about the size of a 25 cent piece (quarter). Use this tube as a microscope and move it above the surface of the map. The area visible within the tube is approximately fifty miles across. Can you find places with more than one Interstate Highway visible inside your field of view? Where? How many? What are those places like in terms of their physical, population, or economic geography?

Are there locations on the map with a combination of two or more highways, either Interstate or Federal? Where are these and how would you describe the local geography? Finally, can you find any locations on the map where no highway appears within the circle of your view? What do you know or what can you learn about these places? Do you live in one of them? Would you want to?

Colorado's 20 Largest Municipalities
(July 2001 Estimates)

Denver	560,365	Greeley	80,806
Colorado Springs	369,853	Longmont	74,675
Aurora	283,650	Loveland	53,345
Lakewood	143,976	Grand Junction	44,782
Fort Collins	122,521	Broomfield	40,621
Pueblo	103,030	Littleton	40,503
Westminister	102,905	Northglenn	32,834
Arvada	102,470	Wheat Ridge	32,661
Centennial	102,457	Englewood	32,393
Boulder	94,680		
Thornton	88,434		

Source: Colorado State Demographer's Office.



MEAN TRAVEL TIME TO WORK

MEAN TRAVEL TIME TO WORK

Analyzing and understanding patterns of Work Travel is a somewhat complicated process. First, several factors can account for the time required for people to get from their residence to their place of employment. Most important are the distance separating the two locations, the physical geography (e.g., topography, weather conditions) through which the route passes, the type and condition of roads, and the nature and volume of traffic encountered.

READING THE MAP

The two most evident patterns are these. One, the shortest amount of time spent getting to work is in rural counties, an especially large grouping of these is evident in extreme eastern Colorado. A second group of counties in the west-central part of the state is similarly characterized by short travel times. Several conditions link all these counties. Population densities are low and there are no large cities; likewise, population growth is below the state's average. With two exceptions (Summit and Pitkin) the counties are rural and agricultural. Most of the residents of the two regions work at or near their place of residence, which is likely a ranch, farm, or business establishment in a small town.

A second but less obvious travel pattern characterizes individuals in the two classes of most time consuming work travel, i.e., between twenty-two and forty-four minutes. With few exceptions, the distance commuters are in the Front Range region and most are linked to either the Denver Metro area or Colorado Springs, the state's two largest urban centers and sources of jobs. Linked closely to the two urban sites are counties such as Adams, Arapahoe, Jefferson, Douglas, and Teller that average between twenty-two and thirty minutes, though travel times would probably be longer except for access to Interstate 25.

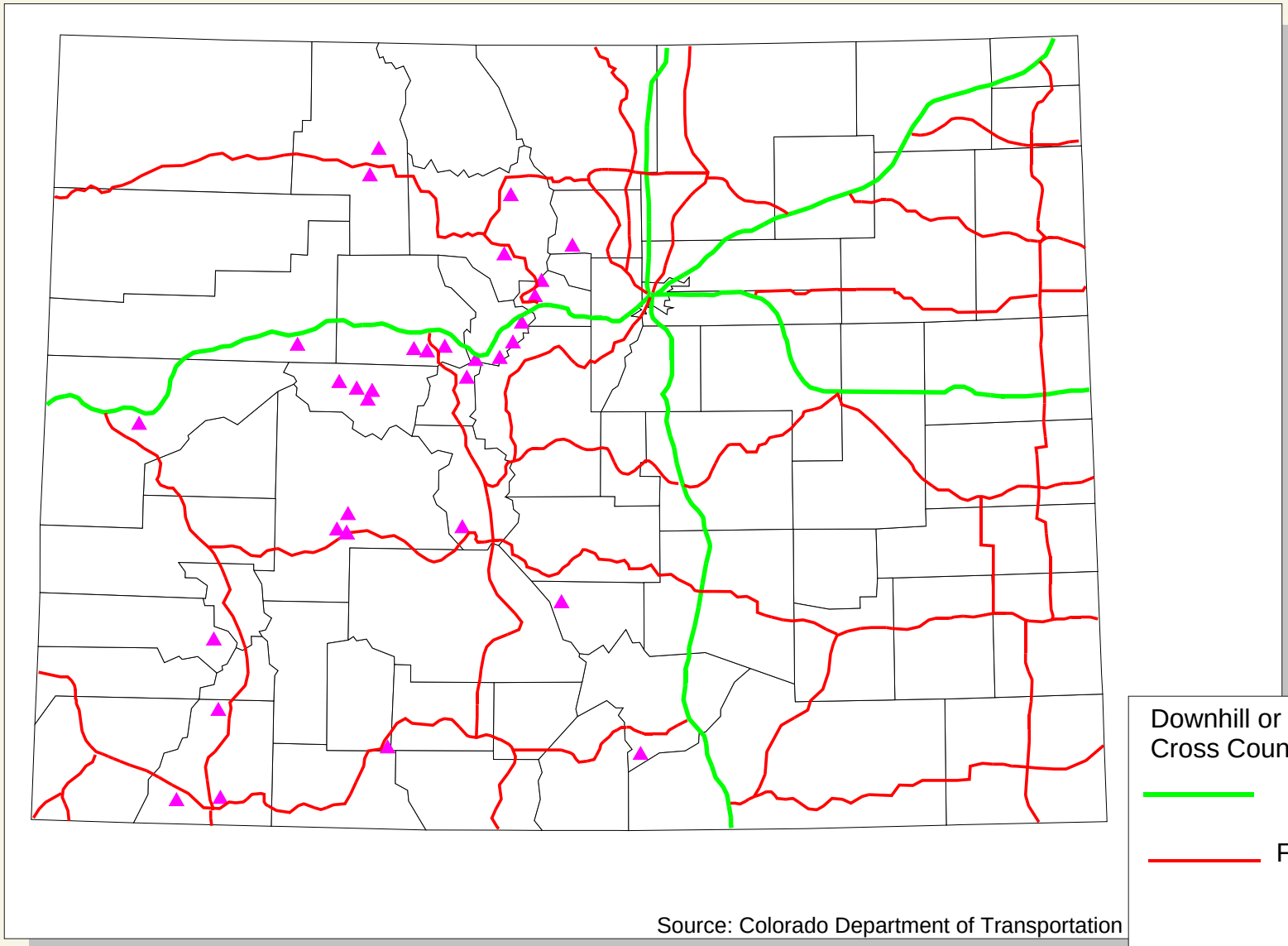
Colorado's longest commutes appear to originate both east and west of Denver and Colorado Springs. Elbert County may be experiencing spill over from the phenomenal residential growth in adjacent Douglas County, yet the former county has few local sources of employment and no physical connection to Interstate 25. The four county block of long commuters to the west involve a more complex situation. The allure of mountain living is clearly a factor, yet it offers limited local employment and residents are forced to seek work elsewhere. A growing volume of traffic, compounded by the nature of the roads and weather, also contribute to an average commute of between thirty and almost forty-five minutes.

QUESTIONS TO THINK ABOUT

As we move across the landscape there is a general awareness of differences between places. The rural/urban boundary is usually rather distinct, as is that between mountains and plains. However, the change that distinguishes many regions, one from another, is often a gradual transition and it is only after we are well into the new regions that the new reality is apparent. With this in mind, look again at the map.

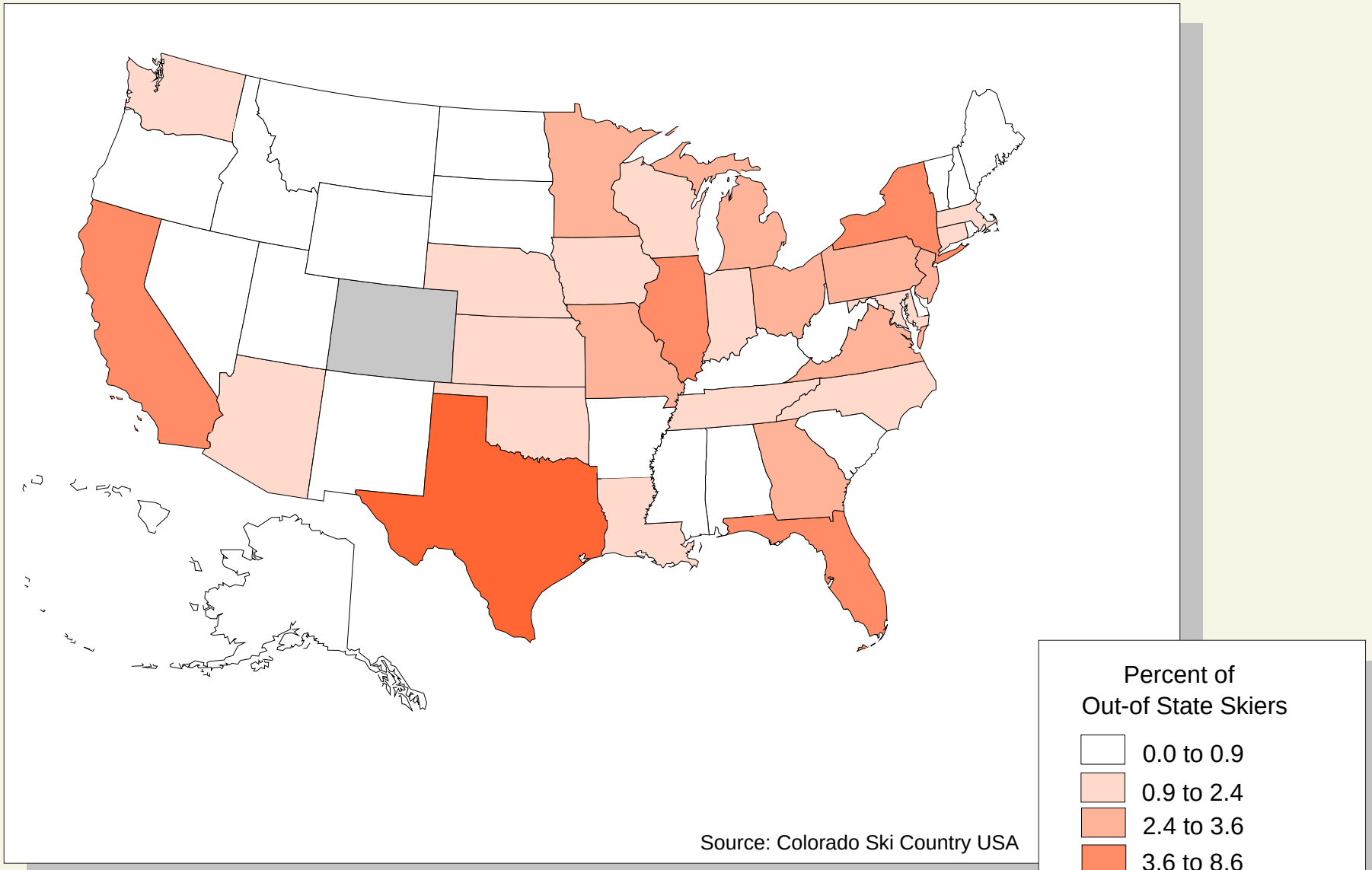
In most cases the colors (class intervals of travel time) occur in progression, e.g., dark red, red, orange, yellow, as you move from county to county. This indicates a transition as opposed to an abrupt change. But that is not always the case. Notice that Park County and Chaffee County are adjacent (their borders touch) but the two counties are at extreme opposites regarding how long it takes their residents to get to work. How do you explain this? And why does Jackson County have a lower travel time than any of the three counties with which it shares boundaries? Did you notice that Denver County, now Colorado's third smallest in area, has travel times in the next to highest class? How would you attempt to explain this apparent inconsistency?

Increasingly, we are a nation of commuters and Colorado is very near the national average for travel time to work. It is a number that will probably grow as population growth occurs. That reality has serious implications for our physical environment, including air quality and plant and animal life. Proposals to replace private or individual travel to work with some sort of public transportation system are being implemented on a limited basis, with more extensive plans under review. Using the MEAN TRAVEL TIME TO WORK map, where would you propose to build public systems to reduce private travel time?



Source: Colorado Department of Transportation

SKI AREAS



OUT-OF-STATE SKIER VISITS, 1993-94

SKI AREAS

A geography of skiing would seem to depend first and foremost on the distribution of two things, snow and mountainous topography. Both can be found widely distributed over central and southwestern Colorado. But skiing is also dependent upon a third variable, a supply of skiers.

READING THE MAP

Approximately one-half of Colorado's ski areas, and most of its larger and better known ski resorts, are clustered in a five county region west of the Denver metropolitan area [I 10]. This location is not the snowiest part of the state nor does it possess the most spectacular topography. To be sure, the snow is usually adequate and the slopes sufficiently challenging. But what the geography of this part of the state does offer in unrivaled abundance is accessibility to a large metropolitan center with a resident pool of avid and potential skiers, plus air connections to the remainder of the nation and points abroad.

Notice that with few exceptions, all of the state's ski areas are on or near either a Federal or Interstate highway. With their superior design and maintenance, these routes offer more reliable travel during the snowy months of the ski season [I 6, I 23], though traffic congestion is sometimes a problem [I 8]. Proximity to Interstate 70 west of Denver can be especially important for out-of-state skiers who fly to Denver's International Airport and reach their destination by car or bus.

An apparent exception to the concentration of ski areas near major highways is the cluster of ski destinations in Pitkin County, in and near Aspen, Colorado. Congestion and driving conditions on the secondary highway leading from Interstate 70 to Aspen is a concern to those who must travel it frequently during snow season. Proposals have even been aired for a light rail connection along this route. On the other hand, Aspen is an internationally renown resort for the affluent, many of whom arrive and depart by private aircraft. Increased accessibility would, for some members of this "jet set," reduce the exclusivity and attractiveness of this locale. A similar attitude prevails among some who favor the Telluride ski area in San Miguel County.

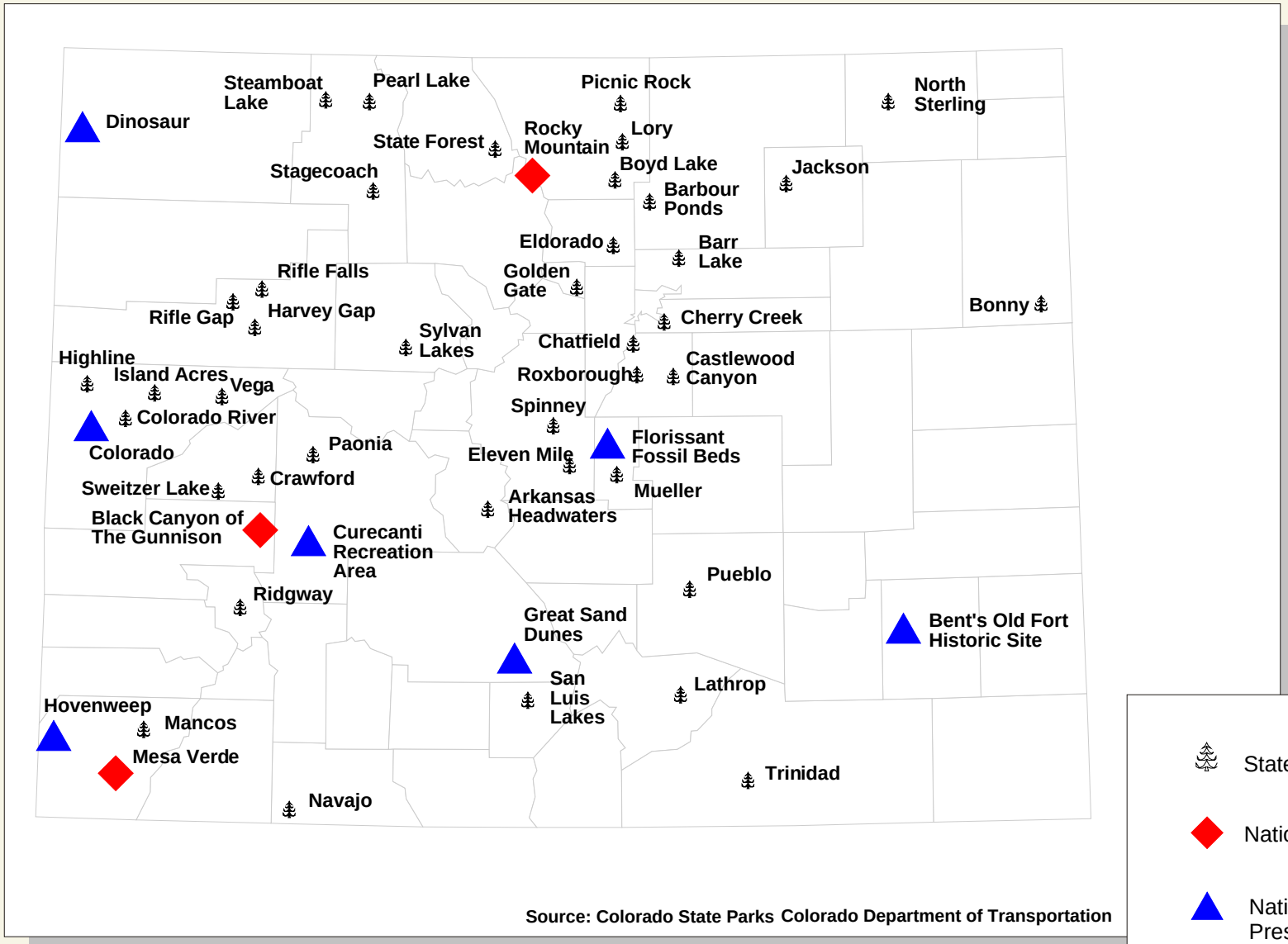
QUESTIONS TO THINK ABOUT

In 1997, Arapahoe Basin Ski Area announced plans to develop year-round skiing. Even in the "snowiest" years this would require at least two months of artificial snow making, and in some years perhaps twice that amount, to provide acceptable skiing. This suggests that owners and operators of major ski resorts consider large-scale snow making a viable option. In turn, this suggests that future ski resorts might be built at locations somewhat or largely independent of natural snow conditions. How do you think the recent (2000-2002) drought affected Arapahoe Ski area’s plans?

Assume that you want to build a new ski resort in Colorado using primarily or exclusively machine-made snow. Where would you place this resort if:

a. You wanted to maximize access (and your profits!) for Colorado day-skiers;
b. You wanted to attract more skiers from California;
c. You wanted to attract more skiers from Texas.

In each case, indicate where you would establish the resort, what other facilities would be needed to support the ski area, and why? Finally, what might be the impact on existing ski areas? What might be the environmental impact of such a year-round ski resort on local vegetation, animal life, and water supply?



STATE PARKS & NATIONAL PARKS AND MONUMENTS

NATIONAL PARKS AND MONUMENTS, STATE PARKS NATIONAL HISTORIC SITES

Approximately 42 percent (about 43,000 square miles) of Colorado's land area is publicly owned. Of this, the State of Colorado controls about 3 million acres, but the great majority, 24 million acres (38,000 square miles) are administered by a host of federal agencies. Among the agencies are the Department of Energy, Defense Department, Bureau of Reclamation, and Bureau of Indian Affairs. However, the largest areas of public land are those controlled by the Forest Service and Bureau of Land Management and administered as national forests and parks, recreation areas, monuments, and extensive lands leased for livestock grazing. On a smaller scale, the State of Colorado administers public lands for many of these same purposes.

Rocky Mountain and Mesa Verde National Parks

Rocky Mountain National Park (PH 26)

Rocky Mountain National Park (RMNP) covers over 400 square miles of the front range of the Southern Rocky Mountains. The Park contains some of the most scenic and spectacular landscapes found in the U.S. Within the Park are 76 named peaks with elevations of 12,000 feet or more, with 14,255 foot Long's Peak the highest. Glacial landforms are found throughout the Park and five active glaciers (Andrews, Rowe, Sprague, Taylor, Tyndall) occupy high valleys (cirques).

A great variety of plant and animal life thrives in RMNP. Bighorn sheep, elk and deer are common sights, while coyotes, black bears, mountain lions, and bobcats are present but seldom seen by visitors. Large numbers of visitors are attracted each fall to witness the color change of the aspen tree leaves to a bright yellow. On some weekends the traffic through the park is bumper-to-bumper. (P1, P2)

Mesa Verde National Park (PO 55)

Located in southwest Colorado near Cortez, Mesa Verde is one of the nation's major archeological areas. Translated as "green table," the name Mesa Verde describes the flat topped local topography and its juniper and pinon pine forest cover. The Park covers about 80 square miles and the mesa top is generally 1800 to 2000 feet above the bordering valleys.

This part of the Colorado Plateau surface is cut by scores of steep-sided canyons along whose walls are found some of the world's largest and best preserved cliff dwellings. Thus far relatively few of the ruins have been extensively excavated, though the more accessible ones can be reached by auto or on ranger-led hiking tours.

About 1300 years ago, people living in the present Four Corners area picked Mesa Verde for their new home. For a time they lived and prospered on the mesa and in its canyons, but near the end of the 13th century the site was abandoned. When they departed, the builders of Mesa Verde left their villages and many of their personal possessions virtually intact. Today artifacts of this historic settlement are preserved in the Park. Among the most accessible of the excavated cliff dwellings are Spruce Tree House and Step House.

Dinosaur and Great Sand Dunes National Monuments, Bent's Old Fort Historic Site

Dinosaur National Monument (PH 34)

Dinosaur National Monument straddles the Colorado-Utah border on the big bend of the Green River. In a single sandstone cliff is preserved one of the world's greatest concentrations of fossilized dinosaur bones, including those of Brontosaurs, Allosaurs, and other species from the age of the giant reptiles. Initially, the remains of many specimens, an estimated 350 tons, were mined from the site and shipped to the Carnegie Institute in Pittsburg. Eventually conservation became the watchword and today the emphasis is upon study of the remains on site, although several skeletons are exhibited in the Denver Museum of Natural History

Among the exceptional landscape features of Dinosaur National Monument are the deep, narrow gorges cut by the Green River. These red-tinted sheer sandstone canyons are bordered by cliffs rising from 1,000 to 3,000 feet above the river. A notable is Lodore canyon, described and mapped first by John Wesley Powell, a one-armed Civil War veteran who led an exploration of the Green River by boat in 1879.

Great Sand Dunes National Monument (PH 21)

The 38,000 acre Great Sand Dunes National Monument is in the San Luis Valley about 40 miles northeast of Alamosa. The Monument consists of over 50 square miles of dune sand deposited in the past 15,000 years by westerly winds blowing across the dry valley floor. As the velocity of the wind slows upon contact with the Sangre de Cristo Range the sand settles out on the valley floor. Some of the dunes are 700 feet high and because of the variable wind patterns all are in a continual state of change. Local legends maintain that wagon trains, herds of sheep, and shepherds vanished in the dunes and that strange web-footed horses roam the dune's inner reaches. What does vanish within the sands is a local stream, Medano Creek, and among the stranger creatures are the giant sand treader camel cricket that uses shovel-shaped hind feet to dig burrows and a beetle that sprays a stinking liquid to fend off predators.

Bent's Old Fort Historic Site (PO 56)

Bent's Old Fort is located on the north side of the Arkansas River about 15 miles west of La Junta. The fort, completed in 1833, was an important stop on the Santa Fe Trail and a place where hunters, traders, Native Americans and others gathered to barter and celebrate. At one time or another visitors to the fort included Kit Carson, John C. Fremont, Colonel Henry Dodge, and General Stephen Kearny, important figures in the exploration and settling of present-day Colorado.

The fort was built by the Bent brothers, Charles, Robert, George and William, and their partner Ceran St. Vrain. All were instrumental in the early development of trade in the West. The original fort was 180 feet long, 135 feet wide and built of adobe by Mexican workmen brought from Taos. The adobe walls were 15 feet high and 4 feet thick. After a series of events that drastically reduced profits from trading, the fort was intentionally destroyed by William Bent in 1852.

Bent's Old Fort was designated a National Historic Site in 1959 and is rebuilt to its approximate 1830's appearance. The contemporary fort is a "living museum" where guides in period dress lead tours through the restored blacksmith's shop, living quarters, recreation room, and warehouse, and visitors can see live demonstrations of some of the skills and crafts common there 150 years ago.

Colorado State Parks

Between 1937 and 1957, several attempts were made to establish a Colorado state park and recreation authority, but owing to lack of resources all proved unsuccessful. Finally, in 1957, Colorado's governor was authorized to create a Parks and Recreation Department. The first unit in the system was acquired when the state signed a twenty-five year lease with the U.S. Army Corps of Engineers for Cherry Creek Reservoir. In 1960, the first land was purchased specifically for park development, land now part of Golden Gate Canyon State Park. By 1997 the system included more than 40 recreation sites.

Bonny State Park (I 28)

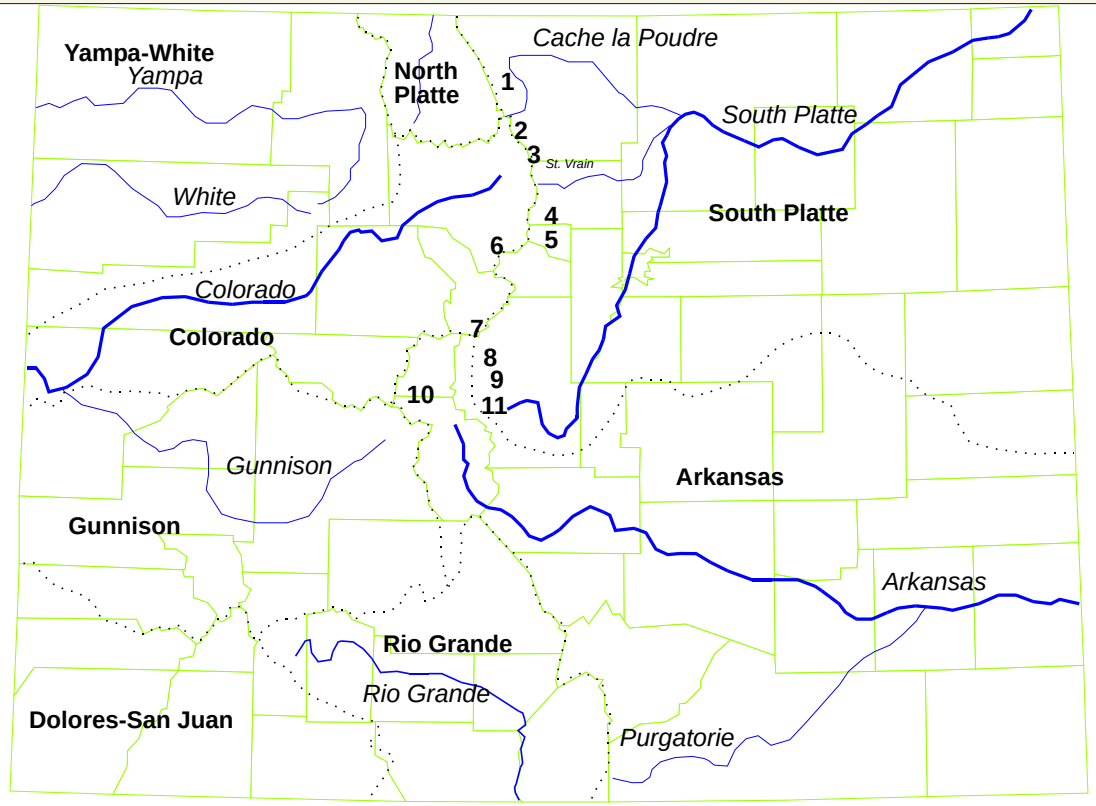
Bonny State Park and Bonny Reservoir are located on the South Fork of the Republican River not far from the Colorado-Kansas state line. Situated in the Great Plains, the park has been subjected to alternating periods of drought and above normal precipitation common to the region. For example, in the spring of 1935 a unique set of weather conditions developed and on May 31 a fierce rain storm produced 24 inches of rain in 45 minutes. Towns and farms were devastated and there was loss of life. In an attempt to mitigate future problems the U.S. Bureau of Reclamation selected this site for a flood control dam and reservoir, completing the project in 1951.

A unique feature of Bonny State Park is the Bonny Prairie Natural Area. Here the primary soil is a fine grained, wind deposited material called loess, also found in adjacent areas of Kansas and Nebraska. The plants and animals native to the loess prairie environment have been largely destroyed across the region but in the Bonny Prairie Natural Area many have been reintroduced. Visitors may hike a trail providing interpretive stations that explain the geography, history, plant and animal life of the region.

QUESTIONS TO THINK ABOUT

Some Colorado counties have neither State Parks, National Parks, nor Monuments. Do you think this is because such counties lack attractive scenery, are too remote, or have too few residents? Plot these counties on a map and study their location.

Some counties have more than one type of park or monument. If you highlighted such counties on the map what kind of pattern do you see? One county has an example of each - - a national park, a state park, and a national monument. Which county is it? Where is it? And why is so much happening there?



DIVERSIONS THAT EXCEED 8,000 ACRE FEET PER YEAR

1. **Laramie to Cache la Poudre**
2. **Colorado to Cache la Poudre**
3. **Colorado to Big Thompson**
4. **Fraser to S. Boulder Creek**
5. **Blue to N. Frk. South Platte**
6. **Williams Fork to W. Clear Creek**
7. **Blue to Middle Fork South Platte**
8. **Eagle to Arkansas/South Platte**
9. **Frying Pan to Lake Fork - Ark.**
10. **Roaring Fork to Lake Cr. - Ark.**
11. **Eagle to South Platte**

MAJOR TRANSMOUNTAIN DIVERSIONS

MAJOR TRANSMOUNTAIN DIVERSIONS

When national legislation was approved creating the Territory of Colorado, and subsequently, the State of Colorado, there was apparently little concern over the fact that the Continental Divide essentially split in two the land area of the new state. It would not be long, however, before this topographic partition became the focal point of an issue pitting Colorado's western residents against those of the east. The issue was water.

The Continental Divide separates the state into two regions: a western sector drained by streams that flow to the Pacific and an eastern slope drained into the Atlantic via the Gulf of Mexico. Thus defined, the two regions are quite different in these aspects:

A. Approximately 63 percent of Colorado's land area is east of the Continental Divide;
B. An estimated 69 percent of the state's natural precipitation falls on land west of the Continental Divide;
C. As much as 90 percent of Colorado's resident population lives east of the Continental Divide.

This uneven distribution of water and population, or some would consider it a "separation of people from water," is at the root of a long-standing regionalism in Colorado pitting the "Western Slope" against the "Front Range."

READING THE MAP

Most of the mountains east of the Continental Divide, and all the eastern plains of Colorado are drained by two river systems, the Platte and the Arkansas. The Platte drainage includes both the North Platte which arises in North Park and exits into Wyoming, and the larger South Platte which drains most of the northeastern quarter of the state. The Arkansas River and its tributaries carry water from a slightly smaller drainage in southeastern Colorado.

South central Colorado is drained southward by the Rio Grande. Much of the collection area is in the San Luis Valley and eastern portions of the San Juan mountains, plus the western slope of the Sangre de Cristo. Water from all three systems -- Platte, Arkansas, and Rio Grande -- flows into the Gulf of Mexico and the greater Atlantic basin.

Essentially all of Colorado west of the Continental Divide is drained by the Colorado River system. The map indicates other basins, namely the Yampa-White, Gunnison, and Dolores-San Juan, but all streams from these basins eventually join the Colorado River system before it reaches the Pacific Ocean via the Gulf of California.

The Colorado River system is far and away the largest in the state measured by volume of water. In a typical year (if such exists!), the annual flow of the entire system is approximately 10.5 million acre feet (AF). The combined flow of the Platte, Arkansas, and Rio Grande systems is on the order of 5 million acre feet (AF).

As early as the 1880s proposals advocated the transfer of water between drainage basins, with the first operational diversion carrying water from a tributary of the North Platte into the Cache la Poudre River (number 1 on the map). By 1894, water from the headwaters of the Colorado River was flowing into the South Platte basin, again via the Cache la Poudre. This was the first diversion that truly brought water from one side of the Continental Divide to the other, that is, from the western slope to the eastern.

In the 1990s, twenty-four ditches and tunnels carry water across or through the Continental Divide. All originate in the Colorado River system and augment either the Platte, Arkansas, or Rio Grande systems. The largest by volume is the Colorado-Big Thompson (CBT) project, which annually diverts an average of 220,000 AF to eastern slope users. Initially, most of this water was for agricultural purposes; but over the more than fifty years of operation, CBT water has been shifted increasingly to municipal and industrial uses.

QUESTIONS TO THINK ABOUT

Do you know where your water supply comes from? It may be ground water from local wells. But in significant areas of Colorado, the water you use may be transferred from a considerable distance. Water that naturally would have flowed to Utah, Arizona, California, Mexico, and finally to the Pacific Ocean now keeps the lawn in front of your house green or your family's car clean. Your community's demand for water, and willingness to pay for it, literally denies water to the Pacific Ocean and sends it to the Atlantic.

After you have determined the source of the water you use, think about what differences that water makes to the area in which you live. Does it change the appearance of the landscape around you? Does it make a difference in the jobs that are locally available? Does it affect the number of people who can live where you do? What would happen if less water was available?

If you live in a part of eastern Colorado that receives diversion water, what is the source of that water and how is it used locally? Try to imagine your area or neighborhood without benefit of diversion water. Ask your parents to do the same.

If you live in a part of western Colorado from which water is obtained for the eastern slope, identify any changes this produces in your area or neighborhood. By having water diverted, has there been a change in the appearance or the economy of your part of Colorado? Ask your parents to respond to these questions.

If you live on the east side of Colorado's Continental Divide, try to contact a class in a school on the west side (and vice versa). Invite them to discuss the subject of water and water use in the state from their geographic perspective. An E-mail conference could shed light on how we think about and use the limited water resources of Colorado. A topic for discussion might be the traditional axiom, "In Colorado, water runs uphill toward money."

The proposed “Big Straw” project would take the State of Colorado’s unused Colorado River water near the Colorado/Utah border and through a very elaborate system of aqueducts, pumping stations, and other facilities ship the water to the east side of the Continental Divide. This project would be very expensive, but could help lessen water shortages during drought years. Do you think the “Big Straw” project is a good idea? Do you think the record-setting 2002 drought might influence opinion on the project? Information on the project can be found at state/local newspaper, state government, and non-governmental organization websites.

Denver Light Rail

While the population of Denver proper has essentially stabilized, the growth of surrounding commuting suburbs continues to be vigorous. One result can be seen in the "brown cloud" that frequently hangs over the metropolitan area, much of which comes from vehicles operating in this high basin at the foot of the mountains. Responding to poor air quality and the need for commuting, is the construction of limited light rail. Supporters urge such a service for all the Front Range region.

Denver International Airport

Colorado can now claim one of the newest and largest airports in the World. Despite much controversy concerning its $4 billion cost and location, in 1995 the state inaugurated DIA amidst wheat fields 20 miles east of Denver. Touted as state-of-the-art and an all-weather airport, DIA's modernistic terminal resembles a cluster of high tech tipis. Today, the area around the airport is rapidly being developed.

Glenwood Canyon

Glenwood Canyon is a fifteen mile long gorge carved by the Colorado River. For years this challenging bottleneck confronted drivers with two-lane traffic and a thirty mile per hour speed limit. Proposals to widen the highway were resisted by those concerned with preserving the rugged beauty and natural habitat of the canyon. In 1992, engineers finally managed a four-lane linkup through Glenwood Canyon by the use of tunnels, plus elevated and two-tiered lanes.

Interstate Highway 70

I-70 is Colorado's premier east-west highway. East coast tourists, Kansas farmers, long-haul truckers, West coast refugees, and a significant portion of Coloradans depend upon this route. At certain times and under certain conditions, especially ski-season weekends, I-70 is the scene of delays and backups. Even so, traffic demand on this critical highway continues to grow. Proposals to deal with the delays include: a light rail or monorail system from Denver to Eagle County and the addition of more lanes for vehicular traffic.

Vail Pass

Snow is a mixed blessing in Colorado. Much of the state's agriculture depends upon irrigation water that comes from snowmelt. Likewise, skiing, snowmobiling, and snow boarding are the basis for the lucrative winter sports industry. However, when winter storms descend upon the highways crossing the Rockies they pose a serious problem to truckers, business travelers, and even those bound for or returning from high country recreation.

Motels

To the uninitiated, the seemingly endless fields of wheat and pastures of native grass convey a feeling of monotony. Many travelers comment that "there is nothing of interest to be seen!" However, in the small towns consistently bypassed by the interstate highway system there is much local "color." Motels in the region advertise and prepare for the annual influx of pheasant hunters, and as the sign suggests, if you lack the skill to shoot one, you can buy one (or more) to take home.

Western Slope Winery

The creation of Colorado wines is not new, but the industry has experienced significant growth in recent years. Some of the land, farming experience, and labor formerly devoted to other fruit crops have facilitated development of local wineries. The product nicely compliments Colorado's expanding resort and recreation economy.

Black Hawk

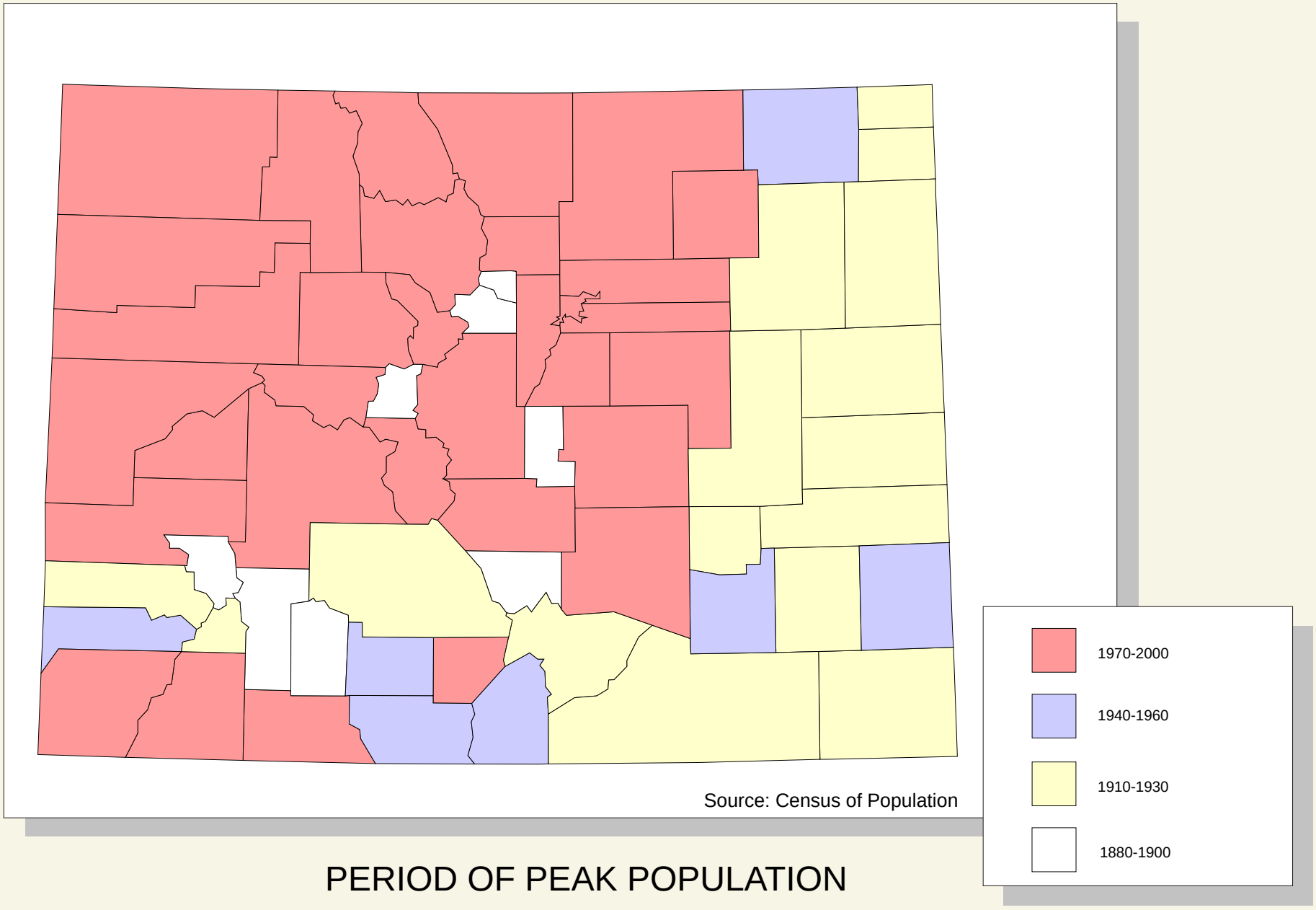
The boomtowns of Black Hawk and Central City were part of the region that produced Colorado's Initial Gold Rush of 1859. Rich placer mining was followed by the general digging up of the mountain sides, as today's huge tailings piles attest. The boom past, the towns' economies suffered as there was little else to support significant population. In recent years legalized gaming has arrived and with it a new boom in casino construction to accommodate increased tourism.

Bonny Reservoir

In 1951, the U.S. Bureau of Reclamation completed a dam on the South Fork of the Republican River for the purposes of flood control and irrigation. Today, the reservoir is the focal point of Bonny State Park, a multiple use facility that includes water sports, fishing, hunting, camping, and bird watching. The park also protects a limited acreage of native "loess prairie," a grassland ecosystem otherwise destroyed by farming and grazing on this part of the Great Plains.

Hayden Power Plant

Relative to other economic activities, mining in Colorado has declined in importance. Much of what remains is either for construction materials, such as sand and gravel, or for energy sources. The thermal electric plant at Hayden burns locally mined coal to produce power for a regional grid extending beyond the state's boundaries. Studies have identified the plant as a source of emissions causing acid rain affecting downwind forests.



Source: Census of Population

PERIOD OF PEAK POPULATION

PERIOD OF PEAK POPULATION

READING THE MAP

Even a quick glance at the map reveals two major multi-county regions, one in eastern Colorado (yellow) that had its greatest population between 1910-1930, and an even larger one (rose) of recent peak population covering much of northern and western Colorado. In contrast, the southwestern counties display a lack of commonality in their population history.

It is also possible to read the map in a chronological context, that is, by the four indicated time periods. Line graphs are provided (immediately following) that depict the nature of population change in four counties, one from each of the time periods presented in the map and discussed below. Using these graphs in conjunction with the map will aid in understanding the state's population history.

1880-1900

While the eight counties (white) with peak populations during this time are spatially scattered, it is possible to relate most or all of them to common geographic and economic factors. If this map of Peak Population is compared to a map of Landform Regions, it is evident that all these counties are in mountainous parts of the state.

In 1900, Teller County had the third largest population in Colorado (29,002), despite being formed just the previous year (1899). Nearly a century later (1990), Teller County had a population of 12,408, or about 43 percent of its Peak Population. By 2000 the population had rebounded to 20,555.

QUESTIONS TO THINK ABOUT

What can bring large numbers of people to mountainous locations? What would have brought them to these eight Colorado counties between 1880-1900? Why did these counties fail to grow or even to retain their early populations? Why have adjacent counties grown when these eight have not? Is there some unique resource in these counties? Does their location or accessibility help answer any of these questions?

1910-1930

Between 1910-1930, most eastern Colorado counties recorded their highest population totals. Only Logan and Prowers Counties deviate from this broad, consistent pattern. Since all the counties in question are in the High Plains and Piedmont Landform Regions, a logical association is that population growth had something to do with farming and ranching. Likewise, agriculture-based Saguache County in the San Luis Valley had its largest number of residents during this period.

A few words of caution are in order. Some of the counties that peaked between 1910-1930 have never had many residents. Thus an increase or decrease of only a few hundred persons could change their period of peak population. Unfortunately, a map such as this is discrete, meaning that it is frozen in time. Looking just at the map we have little idea of what may have happened since the peak of population was reached.

QUESTIONS TO THINK ABOUT

What events or conditions could cause population growth in rural communities with farm and/or ranch-based economies? What impacts do land prices, crop prices, government programs, and weather have on farming and farm populations? A hint, think about conditions just before and during the Dust Bowl years.

1940-1960

There is little evidence of a pattern or regional association for the period 1940-1960. This was an era when the state's overall population grew by the slowest rate in its history. The counties that peaked at this time are scattered both spatially and environmentally, that is, they are not concentrated in plains, mountains, or plateaus, but occur in all three.

Closer examination reveals counties with small base populations (less than 10,000 in 1960) in which growth and decline have been a matter of minimal change. Prowers County peaked in 1950 with a population that was only about 100 residents greater than in 1930; Logan County's largest population, in 1960, was just 400 more than resided there in 1930. The historic population patterns in each county suggest that they differ little from adjacent counties in eastern Colorado.

QUESTIONS TO THINK ABOUT

Decisions about the design of a choropleth map are often mathematical, and may even be arbitrary. In the present case, for example, the use of uniform twenty year time periods is based on the census interval and the desire to depict as much of Colorado's statehood as possible, i.e., 1880 to 1990. Clearly, such decisions make a great difference in the appearance of the map and the nature of regional patterns. What would happen if maps were created for 1880-1910, 1920-1950, and 1960-2000, or some other sets of dates?

1980-2000

Colorado's population has grown at rates considerably above the national average in recent decades. One-half (32) of the state's counties have attained their greatest ever population since 1980.

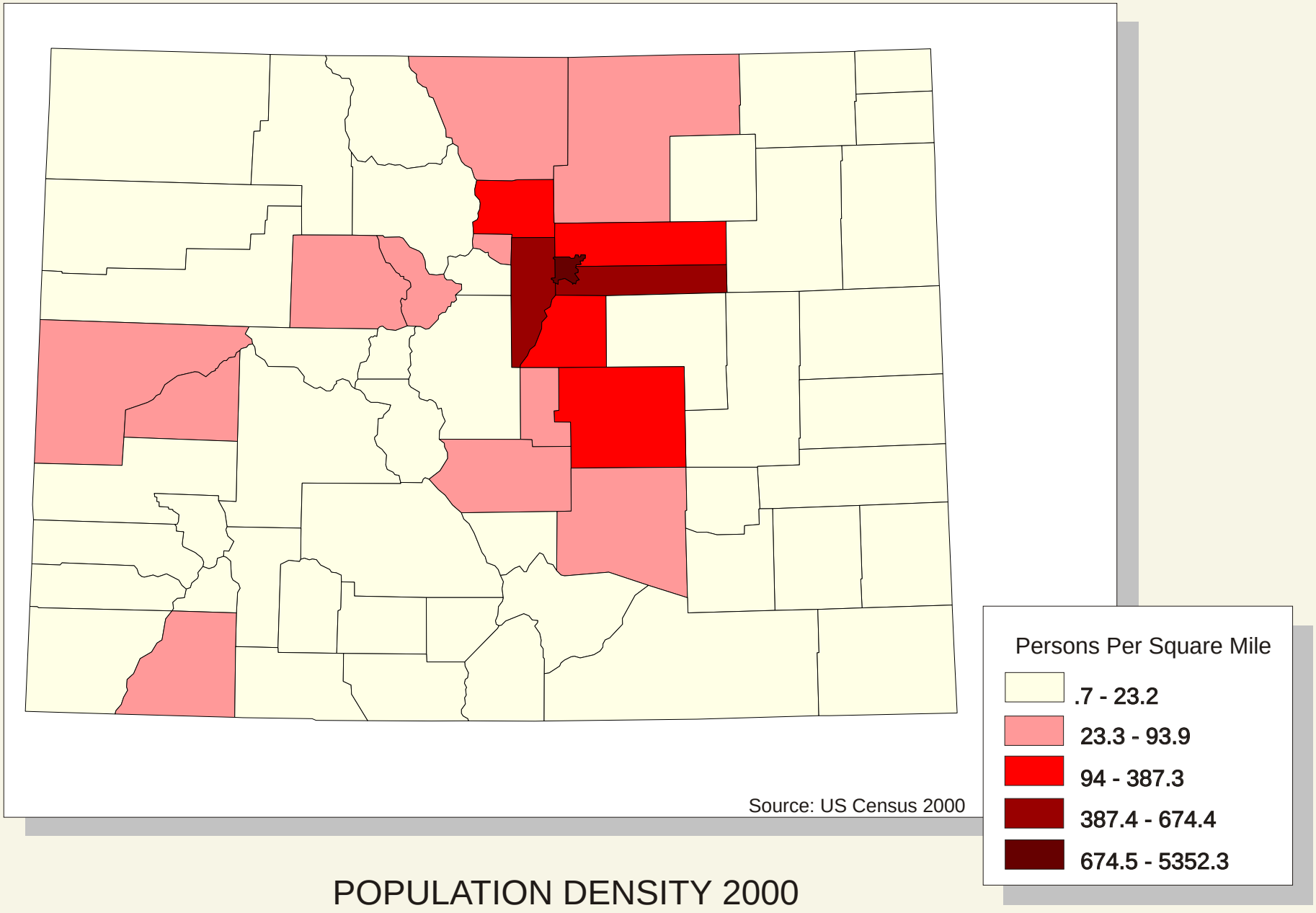
The counties characterized by this relatively recent growth occur in all parts of the state except the far eastern plains. Could any single variable adequately explain simultaneous growth in places as varied as Alamosa and Jackson Counties (high mountain valleys), Moffat and Montrose Counties (western plateau), Pitkin and Park Counties (mountains), or Denver and Douglas Counties (Front Range)?

It may be useful to find out what is causing growth. Is it so-called "natural growth" in which the birth rate greatly exceeds the death rate? Or is it migration into these counties? Can it possibly be both?

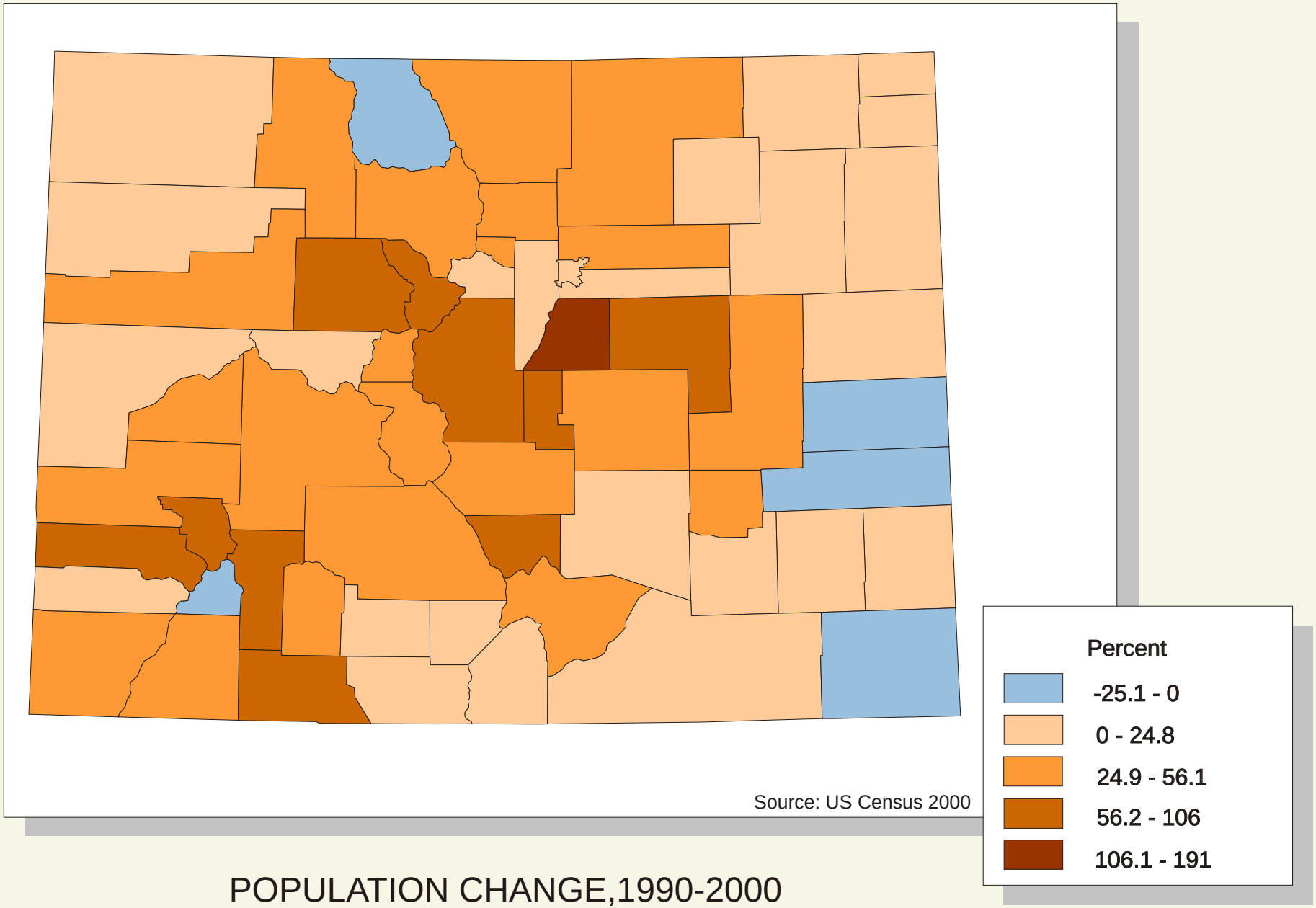
QUESTIONS TO THINK ABOUT

In Colorado, people between 24-29 years of age have the highest birth rates. Are there locations or counties where this age group might prefer to live? This same age group (24-29) is relatively mobile and willing to move. Why might they relocate to certain counties or groups of counties? The most common reason is economic, that is, to get jobs or better jobs. Others move to enjoy recreation or the environment. Are there counties where a person might find both employment and an attractive physical environment? Is it possible to relate any of these things with counties having current peak populations?

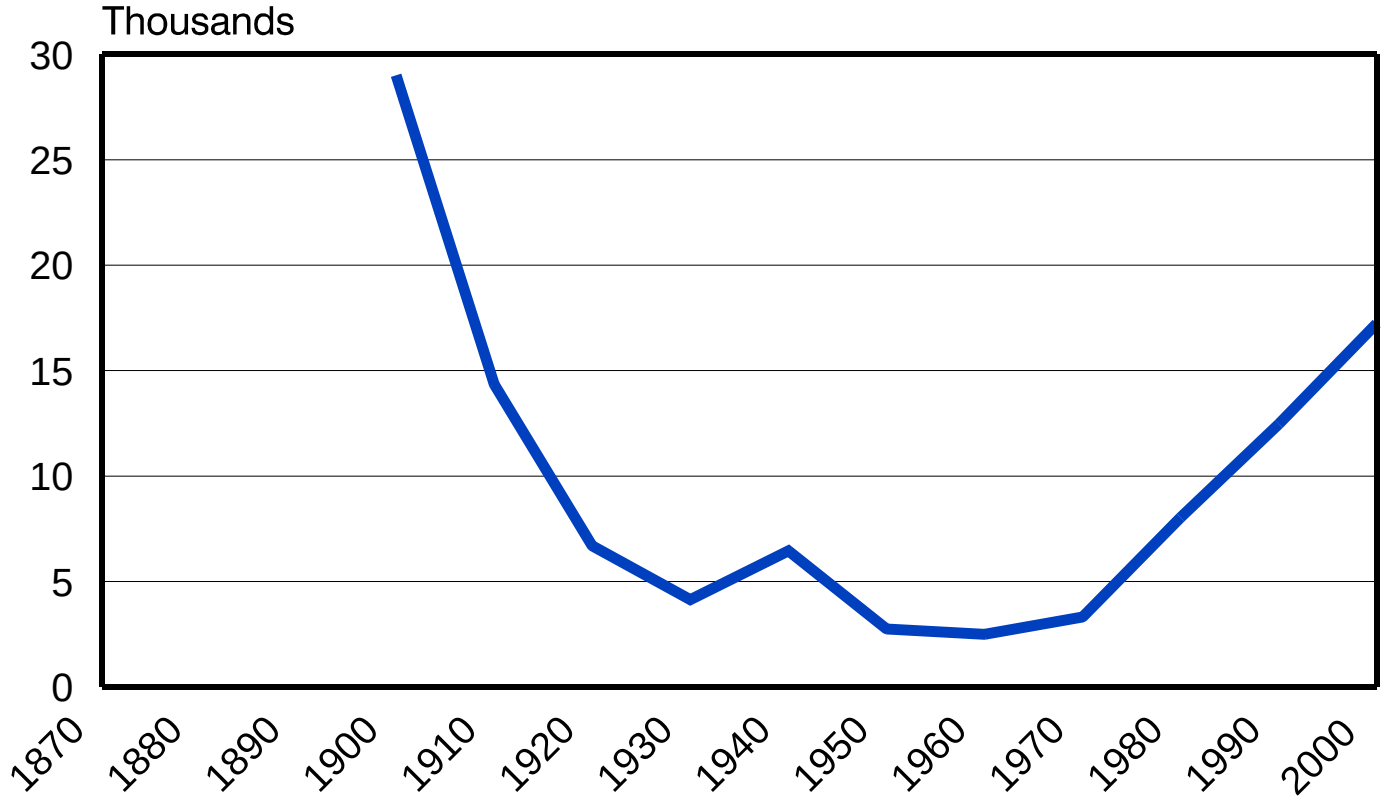
Population estimates for Colorado's counties for the period 1990-2000 suggest few changes in the pattern of peak population. With one exception, the counties in the 1880-1900, 1910-1930, and 1940-1960 periods have not changed regarding the era of their greatest population. The exception is Clear Creek County which in 2000 had its largest ever population. What might account for this population's notable growth? Meanwhile, all of the 32 counties whose population peaked between 1980-2000 continued to grow, some very rapidly. Is it possible that some of these counties might experience a population decline in the future? If so, what might cause a loss of residents?



POPULATION DENSITY 2000

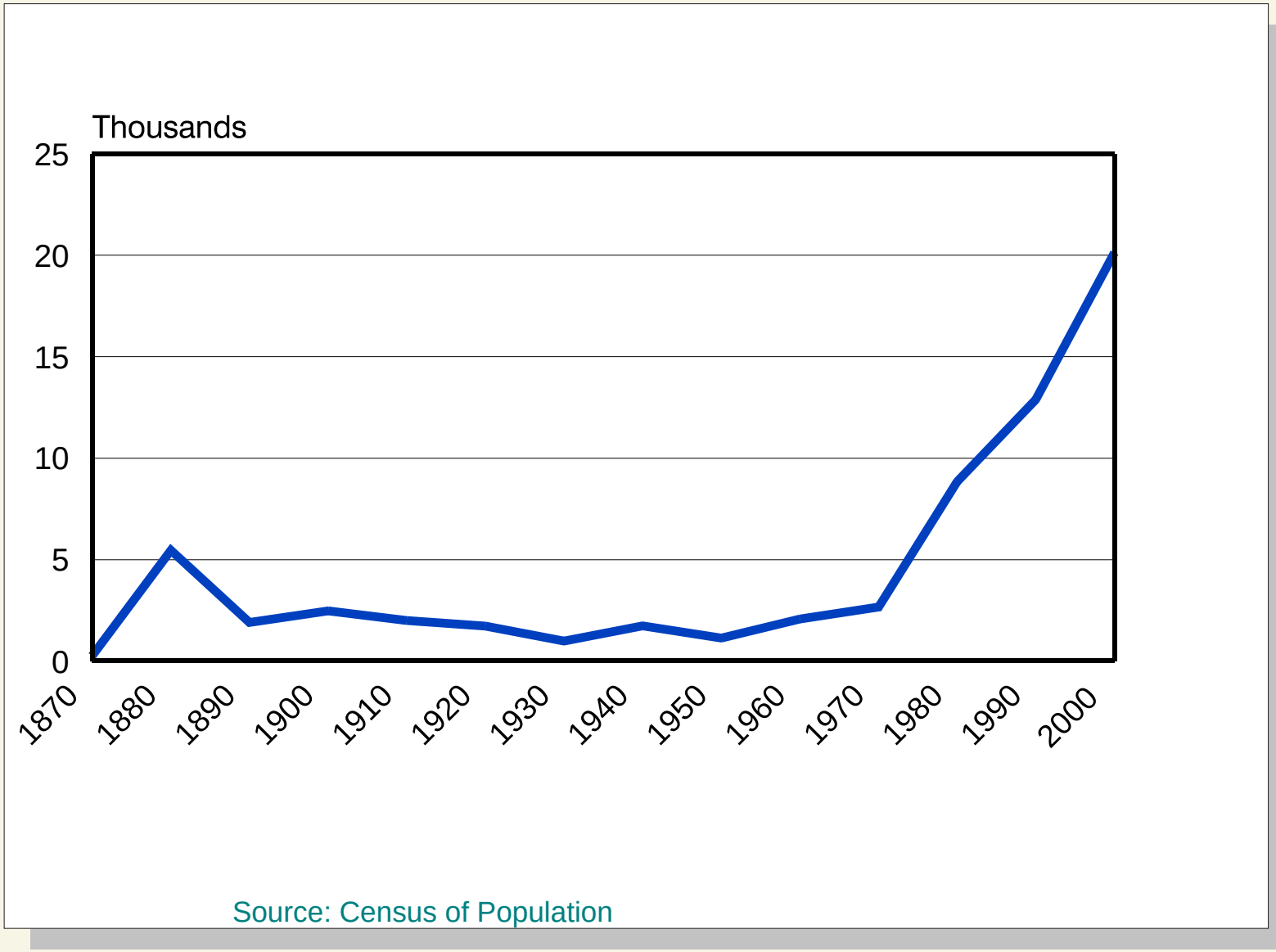


POPULATION CHANGE,1990-2000



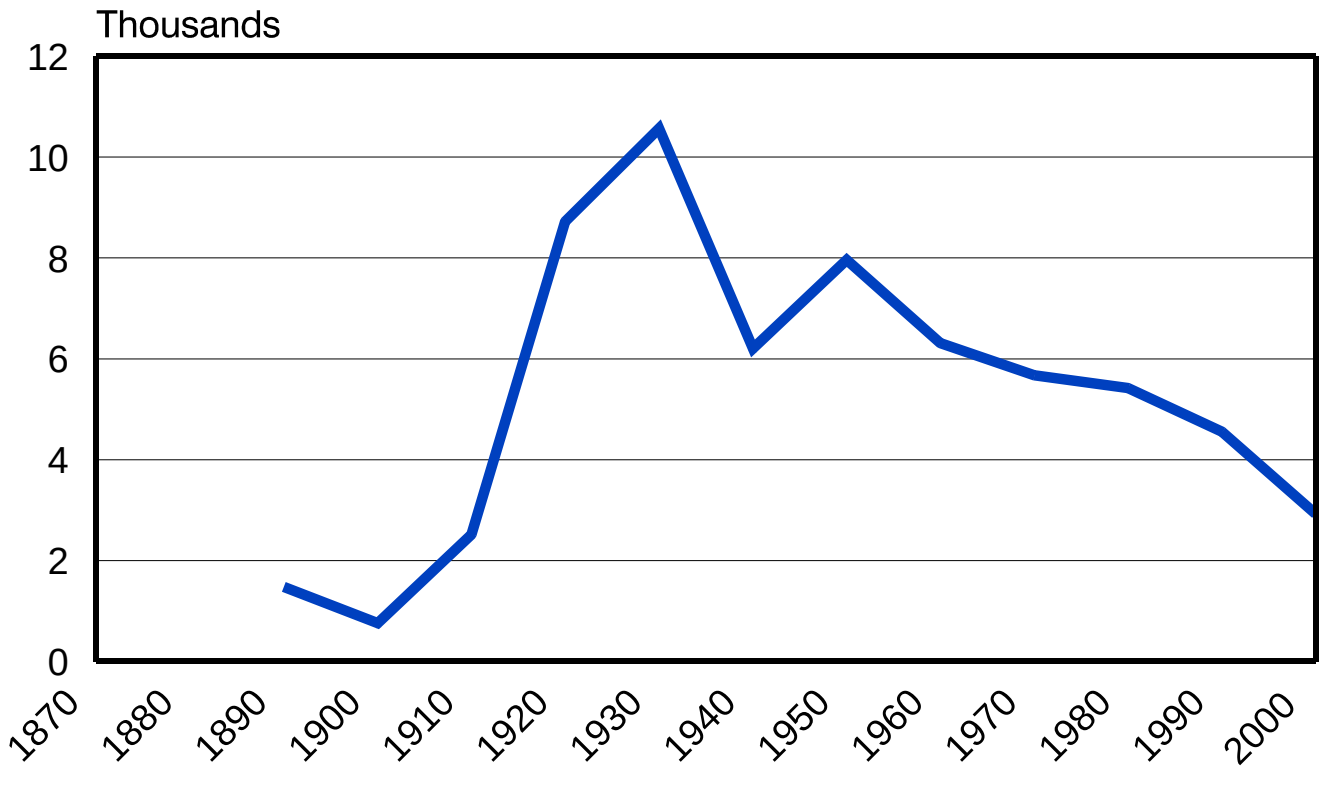
Source: Census of Population

TELLER COUNTY: POPULATION CHANGE



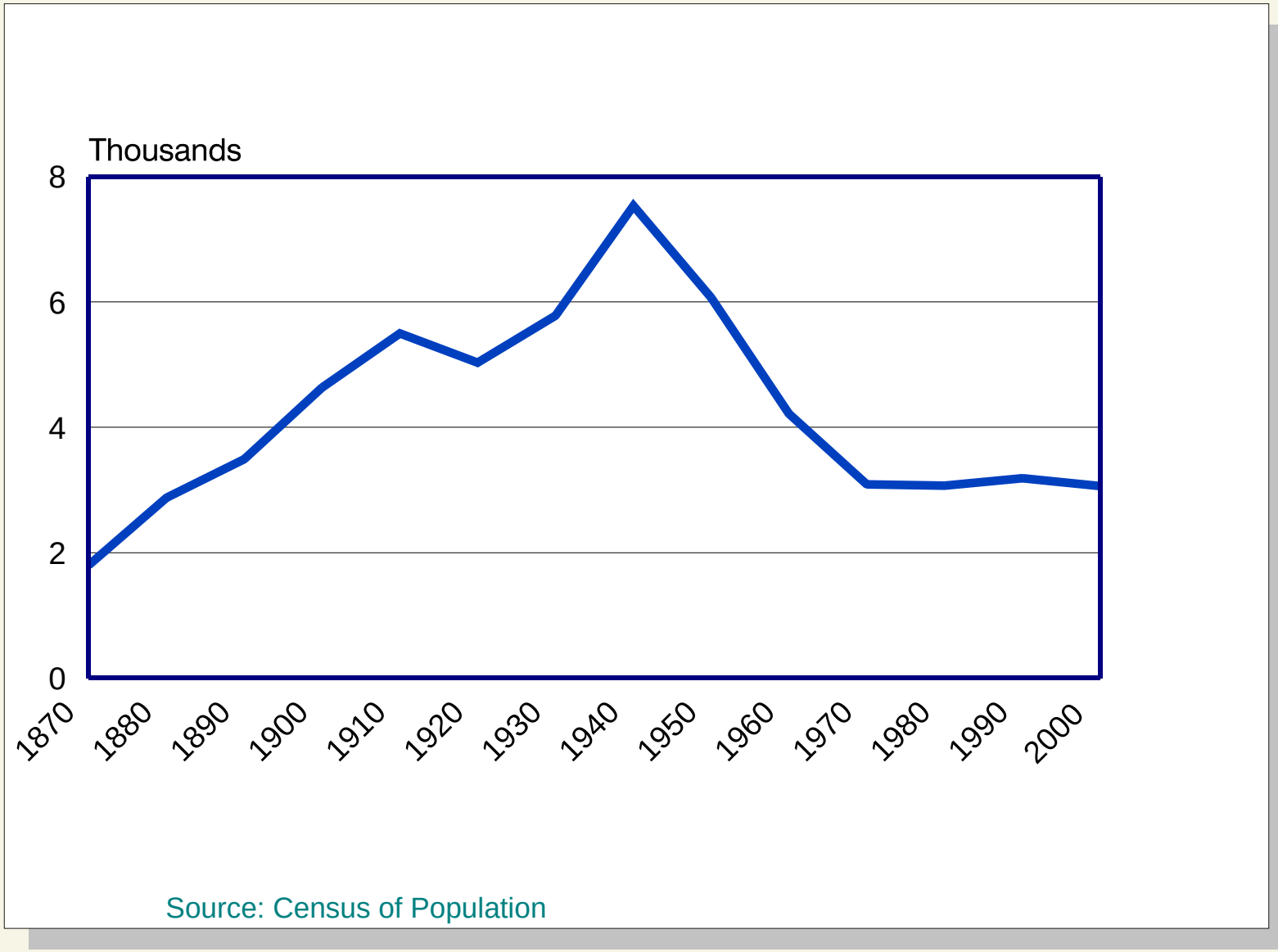
Source: Census of Population

SUMMIT COUNTY: POPULATION CHANGE



Source: Census of Population

BACA COUNTY: POPULATION CHANGE



Source: Census of Population

COSTILLA COUNTY: POPULATION CHANGE

POPULATION CHANGE, 1980-2000

READING THE MAPS

During the decade 1980-1990, Colorado recorded a 14 percent population increase, the lowest rate for the state since the Great Depression decade of 1930-1940. However, even this rate of growth was well above the national average and exceeded that of all but thirteen states. The decade of the 1990s, however, saw a dramatic increase in the state's population. Over one million people were added to the state's population (a 30% increase for the decade)

Population change 1990 to 2000

The map clearly indicates that population growth occurred across Colorado during the 1990s. Only five counties experienced population decline during this period. At least two patterns of occurrence or regions are apparent. Counties with the heaviest loss or only moderate growth are mostly on or near the state's border, that is, in outlying areas remote from Colorado's Front Range, urban-centered population core. A second identifiable pattern is the almost continuous region of stagnation or loss in the eastern plains of the state. A possible third pattern includes the two mountain counties (Jackson and San Juan), which saw a population decline.

One functional association is this: all five of the counties losing population had an overwhelming majority of their residents living in rural areas (see map, URBAN AND RURAL SHARE OF THE POPULATION 2000).

Losses of population were primarily a result of differential migration, that is, more people moved out of these counties than moved in. Colorado, however, had twelve counties with crude death rates exceeding crude birth rates: Baca, Bent, Costilla, Delta, Fremont, Huerfano, Jackson, Kiowa, Las Animas, Lincoln, San Juan, and Sedgewick. Colorado participated in the rural-to-urban migration that occurred in many rural counties throughout the United States between 1980-2000, in large part owing to a weak rural economy.

The pattern of county population growth seems less clearly regional during the 1990s. While the more urban and more densely settled Front Range region grew rapidly, individual counties within it ranged from Pueblo County's 15 percent and Denver's 18.6 percent population gains, to Douglas County where growth topped 191 percent. After decades of in-migration and growth, Denver County became, for all purposes, totally urban. As in cities throughout the United States, a portion of the urban residents responded by migrating to the suburbs, some of which are in adjacent counties, such as Douglas. Thus, every Colorado county proximate to Denver County grew at a greater rate than Denver during the 1990s.

Douglas County was Colorado's fastest growing county during the decades of the 1980s and 1990s, being identified at times as the fastest or second-fastest growing county in the entire United States. Geography, and specifically location, is the reason. Douglas County is sandwiched between Denver County and El Paso County, which respectively contain Colorado's largest and second largest cities, Denver and Colorado Springs. Commuters from each have been drawn to the rolling and lightly forested former farm and ranch lands of Douglas County, many of which are rapidly being converted into multi-acre tracts or "ranchettes." Teller County, adjacent to Douglas County and proximate to the city of Colorado Springs, recorded the second most rapid growth among Colorado counties. Again, an increasing willingness to commute, in this case from home sites in the Rocky Mountains, best explains Teller County's rapid growth. Recent legalization of limited stakes gambling in the town of Cripple Creek is also a contributing factor. A cautionary note is in order: Douglas and Teller counties have small population bases (see County Population Data table in the appendix). Consequently, a modest total increase in population translates to a large percentage growth rate. This is one weakness of measuring population change using only percent change, whether for growth or decline. However, any rapid change of whatever magnitude can bring with it difficult adjustments, especially for counties with small populations and perhaps limited economic and social resources.

That has been the case in two other Colorado counties with rapid growth during the previous decade. In 1990, the adjacent counties of Eagle and Summit had a combined population of nearly 35,000 persons. By 2000, that total had grown to over 65,000, an increase of nearly 86 percent. This growth is primarily attributable to recreation, initially skiing, and various economic opportunities linked to recreational activities. Notice on the maps of EMPLOYMENT that both counties have low levels of primary and manufacturing employment, suggesting that it is the service sector that is most important.

Population Change 1990 to 2000

This map bears out much of the changes that were set in motion during the 1980s. In fact, the most striking part of the population change 1990 to 2000 map is how SIMILIAR it is to the map showing POPULATION CHANGE FROM 1990 to 2000. Douglas County continues to lead the state in population growth with extreme southwestern and central mountain counties also experiencing considerable growth. Additional growth along the northern Front Range is also evident.

QUESTIONS TO THINK ABOUT

Any and all change in population is the result of the interplay of just three variables: birth, death, and migration. With this thought in mind can you explain the patterns on the MAP OF POPULATION CHANGE (1990-2000) by comparing this map to maps showing other population components? For example, does there appear to be any spatial association between counties with heavy population loss and patterns on the map of CRUDE BIRTH RATE or CRUDE DEATH RATE? Or, compare the CBR and CDR for rapidly growing Douglas County with the CBR and CDR for Baca or Sedgwick Counties. What about your home county?

Since an important component of population change is migration, you may want to compare the map POPULATION CHANGE FROM 1990 to 2000 with some of the following maps: POPULATION THAT LIVED IN A DIFFERENT STATE 1995, URBAN AND RURAL SHARE OF THE POPULATION 2000, POPULATION 17 YEARS OF AGE AND YOUNGER 2000, and POPULATION 65 YEARS OF AGE AND OLDER 2000. Remember, different age groups have different propensities to migrate and thus migration alters the average age or age structure of a county's population, which in turn will affect things like crude birth rates and crude death rates.

What happens if you plot the ten Colorado counties with the highest percentage population growth, and then compare that map with one showing the ten Colorado counties that had the greatest population increase (actual number of new residents) between 1990-2000? Do you expect these maps to reveal similar patterns?

LOOKING AHEAD

The 2000 census show some interesting developments in Colorado's population. For example:

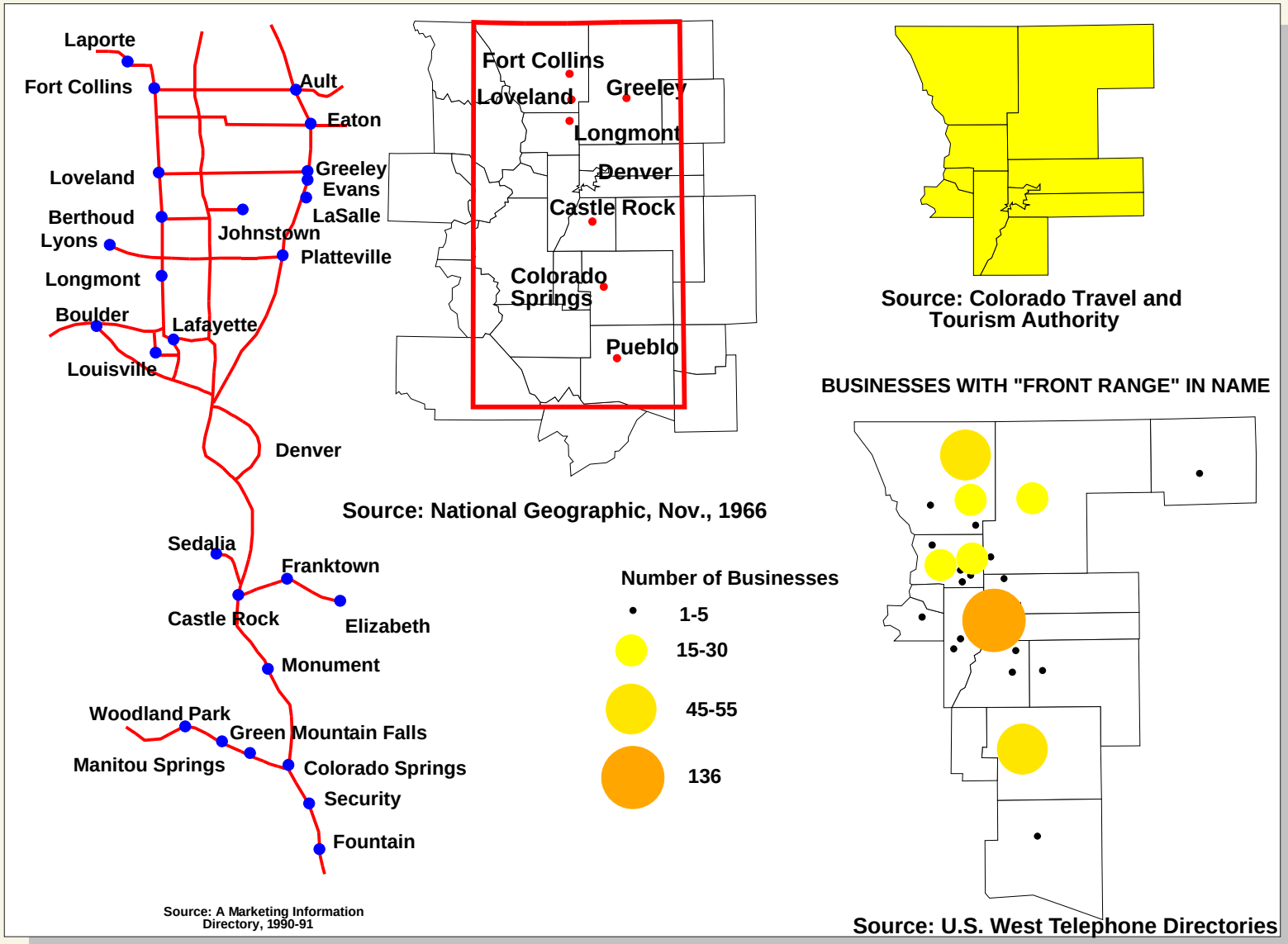
A. Between 1980-1990, 27 of Colorado's 63 counties lost population. But between 1990-2000 only five counties – Jackson, San Juan, Cheyenne, Kiowa, and Baca - experienced a decline in population.

B. Between 1980-1990, 6 Colorado counties grew by more than 40 percent. However, between 1990-2000, the growth in 16 counties exceeded 40 percent (29 counties above 30%)!!

C. Douglas County grew by 140 percent between 1980-1990, and by 191 percent between 1990-2000. However, in the earlier ten year period the county grew by 35,000 persons, but by 115,000 in the latter ten year span.

D. Between 1980-1990, most of the rapidly growing counties were either in the Front Range region or directly connected to it by major transportation systems, e.g., I-70. Since 1990, several counties in southwestern Colorado and far from the Front Range have recorded high rates of growth, e.g., San Miguel, Ouray, Hinsdale, and Archuleta.

E. Many rural counties whose populations either declined or were essentially stagnant during the 1980s are growing during the 1990s, some modestly, but some rapidly.



PERCEPTIONS OF THE FRONT RANGE REGION

THE FRONT RANGE REGION

Geographers create spatial generalizations termed regions. By this means the Earth's surface is divided into smaller and more internally similar units, i.e., regions, for purposes of analysis. It is easier, for example, to study and understand a country than a continent, or at a different scale, a single Colorado county than the entire state since the smaller area of a county usually contains less physical and cultural diversity than the more extensive state.

Geographers typically recognize and use three types of regions. Formal regions exhibit a uniform distribution of some selected variable, e.g., the Rio Grande drainage basin is uniformly characterized by streams that drain into the Rio Grande system, or the State of Colorado with a uniform set of state laws, tax rates, etc. Most formal regions tend to be relatively permanent and have comparatively precise boundaries.

A second type of region is termed a functional or nodal region. In this instance the areal extent of the region is determined by an activity. For example, the locations encompassing the majority of subscribers to a particular Denver-based newspaper is such a region, with Denver as the node from which the activity extends outward. Functional regions have less precise and permanent boundaries than formal ones, and these may in fact change with fluctuations in the economy and population, or in the present example, competition from other news providers.

The third type of region is termed perceptual or vernacular. In some ways it is the most common, though the least helpful to actual geographic understanding. Perceptual or vernacular regions are a form of geographic shorthand. When we use vernacular regional references, such as "The South" or "The West," it is an attempt to convey a host of geographic or place-based traits with the use of a single label. The variability of the region and its presumed boundaries are functions of the process of individual perception: ask ten persons to define "The Western Slope" and you will likely receive ten more or less distinct responses.

READING THE MAPS

One of Colorado's perceptual or vernacular regions is popularly called the "Front Range." This is not to be confused with the front range of the southern Rocky Mountains, which can be defined and delimited as a formal physical region [page PH 3]. Rather, in everyday conversation, in the newspaper, or on the radio, the term Front Range Region is the common reference to a portion of Colorado extending an unspecified distance east of the Rocky Mountains and with a north-south extent variously described as Denver-to-Colorado Springs or even Fort Collins-to-Pueblo.

The maps [page PO 13] represent four views of the "Front Range Region" as interpreted by four quite distinct institutions or groups.

Map 1 is essentially a map of route ways and destinations. There is no effort to identify a boundary that might suggest the region's limits or separate it from another region. The important variable in this map is movement, or potential movement, as befits an organization intent upon marketing its products or helping other businesses to market theirs. The indefiniteness of the region can be seen in the several roads that extend beyond towns but end in empty space.

Map 2, from National Geographic, is both arbitrary and mechanical. It suggests a general "study area" within whose boundaries some type of geographic research will be carried out, as was the case. That this well-known publication chose to devote time to this portion of Colorado, in itself, suggests that there is a regional identity and uniqueness associated with this portion of the state. However, the map as rendered conveys little information.

Map 3 is an aggregation of Colorado counties reflecting the interest of the state in the promotion of Front Range tourism. By no means do the member counties have the same type or intensity of tourism sites, nor tourist traffic. However, by delimiting this entity it is supposedly possible to more effectively administer and promote regional tourism. Note that the map contains no actual tourism sites nor advertising, but is a matter of administration.

Map 4 represents the use of a regional label for the purpose of identity and advertising. Hundreds of Colorado businesses have chosen to include the term Front Range in their name since its imagery is generally considered positive, and thus memorable. Most of the businesses have little in common, e.g.,

Front Range Plumbers, Front Range Counselors, Front Range Eggs, other than sharing a broad regional location and label.

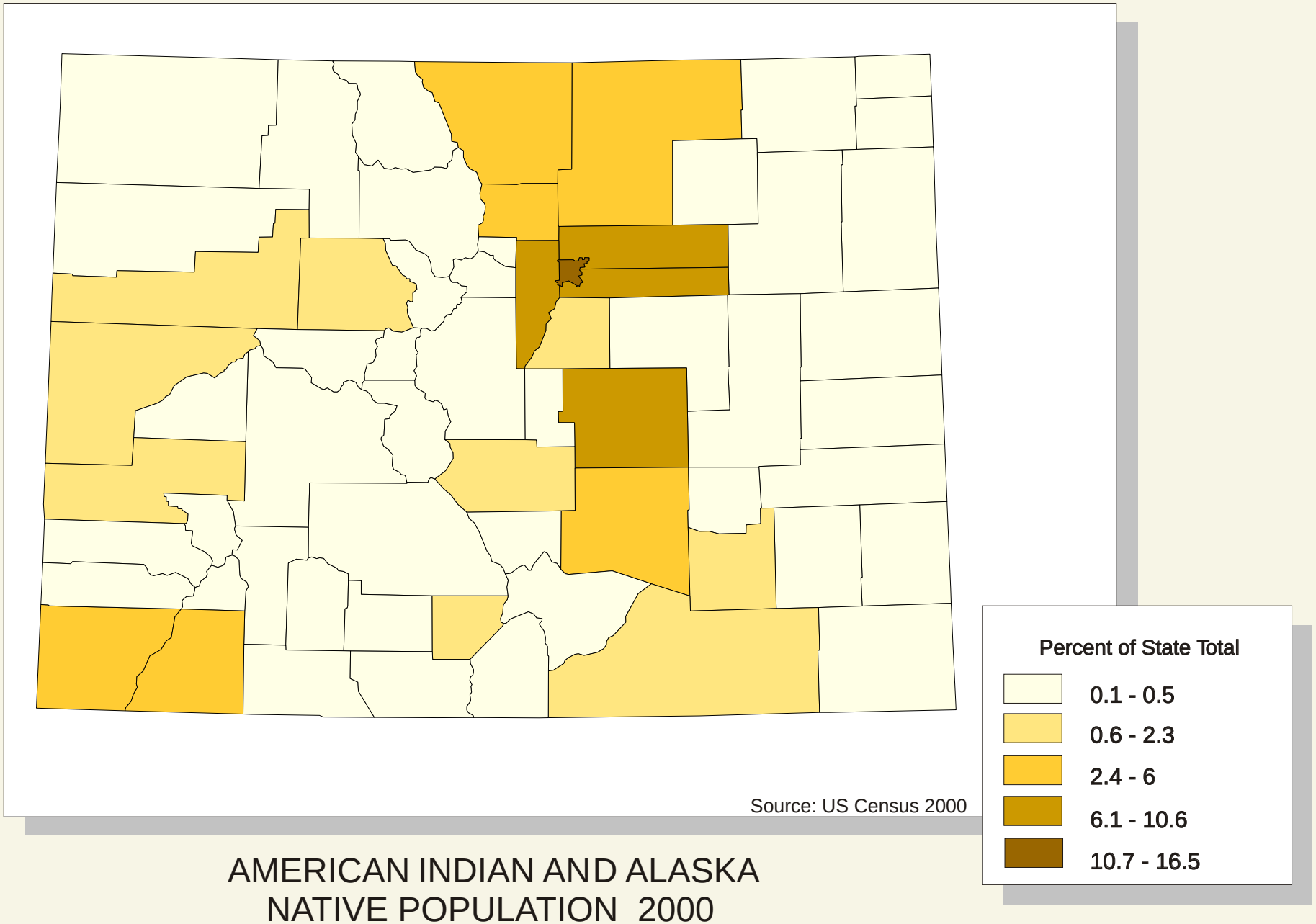
However, repeated use of the phrase works its way into the public consciousness and becomes a handy geographic identity. For example, when asked the common question, "Where are you from?" the reply Front Range is a useful reference that falls somewhere between a response that is too general, e.g., Colorado, or so specific, e.g., your hometown, that may only draw a blank stare. To Colorado residents, at least, the term Front Range also conveys additional information about the physical and cultural nature of that region.

QUESTIONS TO THINK ABOUT

Do you use the phrase "Front Range" in your conversation? Have you seen it in the newspaper or on television? If so, collect examples and use them to draw the "Front Range" on a map of the state. Now, explain why you put its boundaries where you did. What is found within those boundaries that gives geographic character to that location, that sets it apart from the rest of Colorado?

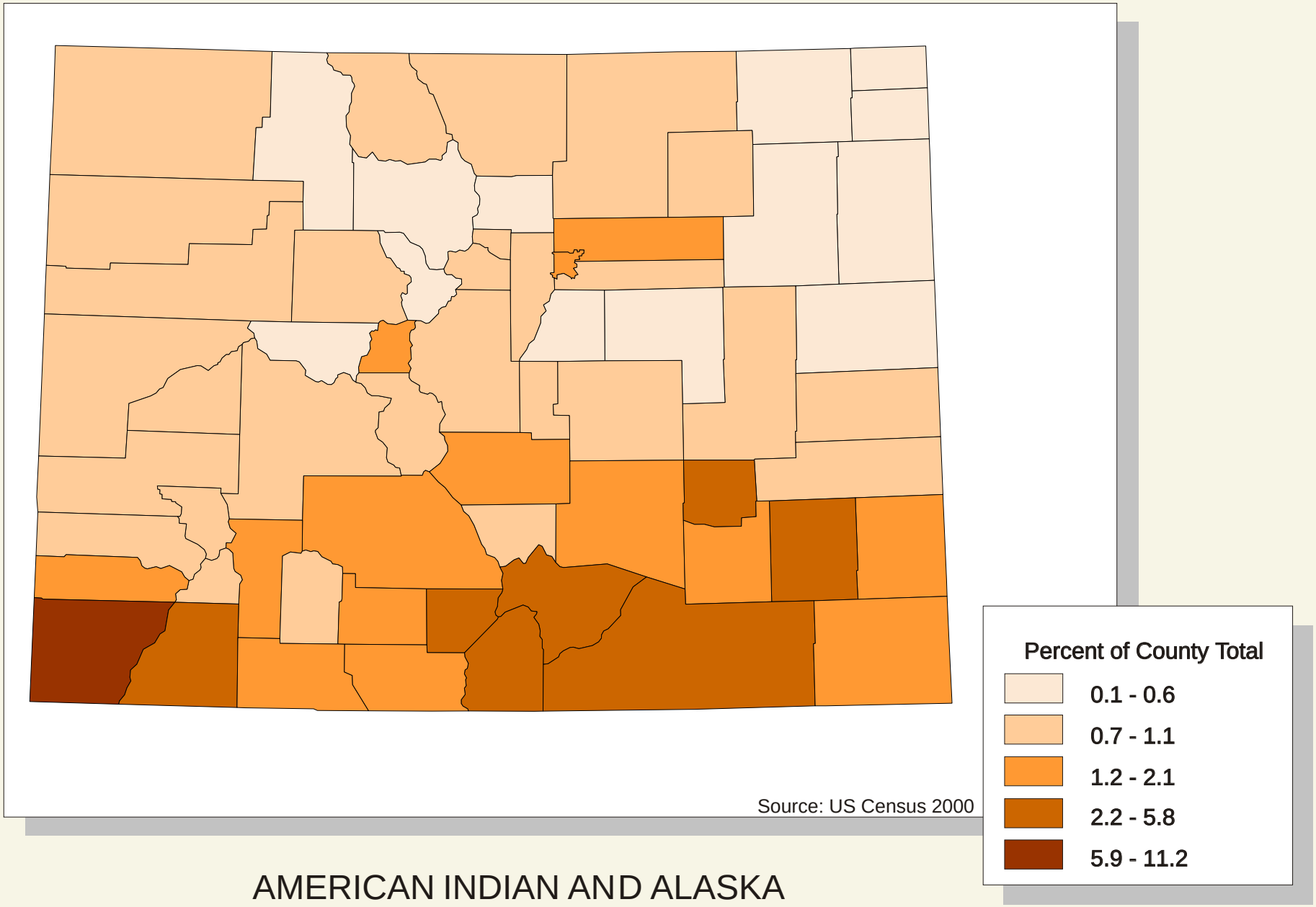
Can you think of other perceptual or vernacular regions in Colorado? Remember, many seem to have directional or locational labels. In Colorado, this includes the "Western Slope" or "Southern Colorado." Some such regions are identified with unique political or cultural characteristics, e.g., the "Four Corners Region" or the "Denver Suburbs."

Some perceptual regions may be only locally known. We may regionalize parts of a town as the "Old Section" or "east of the tracks," or as identified with a particular street gang. Can you identify any local perceptual regions, or what we often call "areas?" If you can, try to draw boundaries for one of these on a map. Next, ask several individuals in your classroom, including your teacher, to draw their ideas of boundaries for that same region on separate maps. Compare the maps and discuss similarities and differences in the boundaries, and most importantly, why different members of your class might have different perceptions of the same area (region). Do age, gender, location of residence, experience, or other variables influence how you think about places?

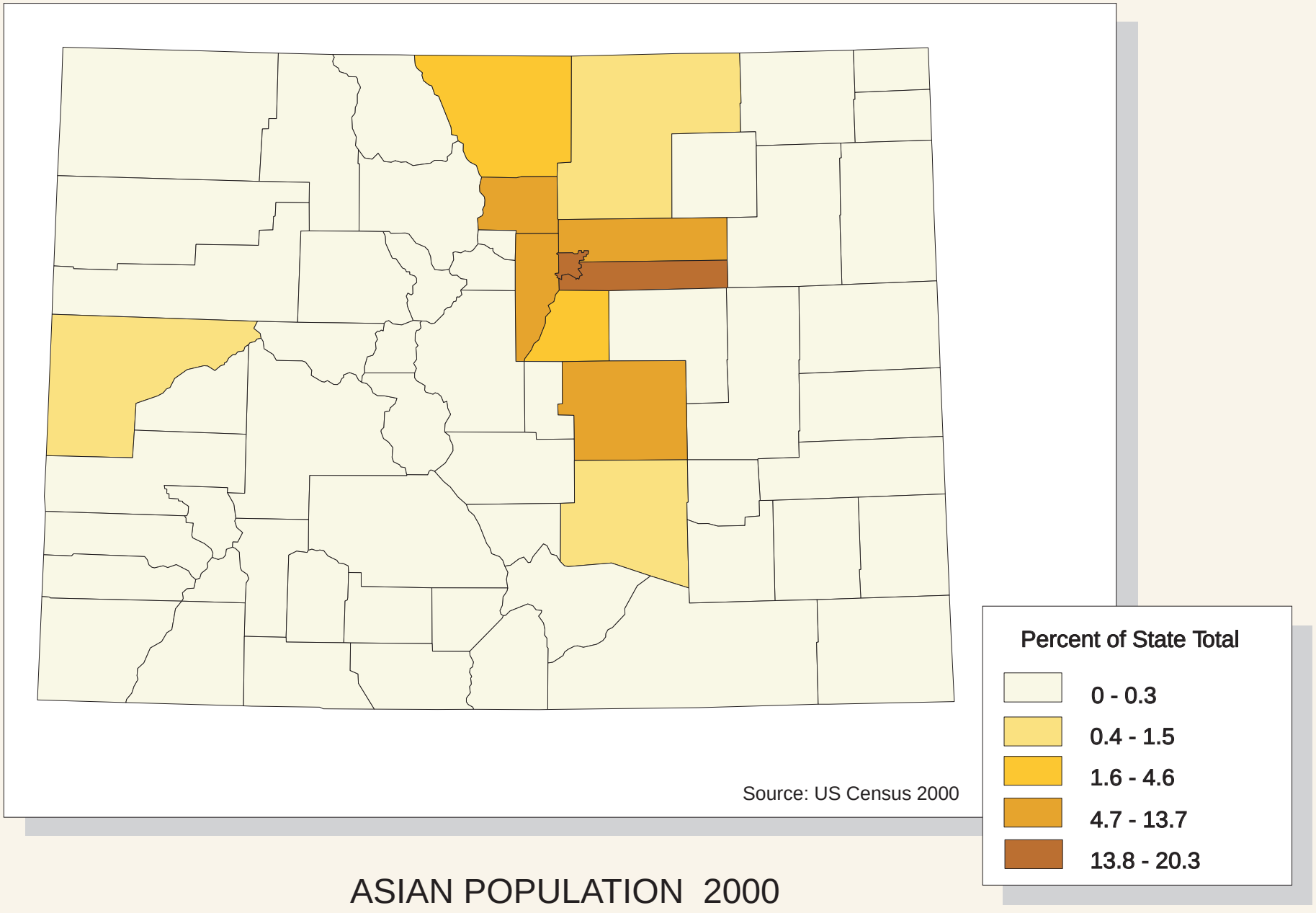


Source: US Census 2000

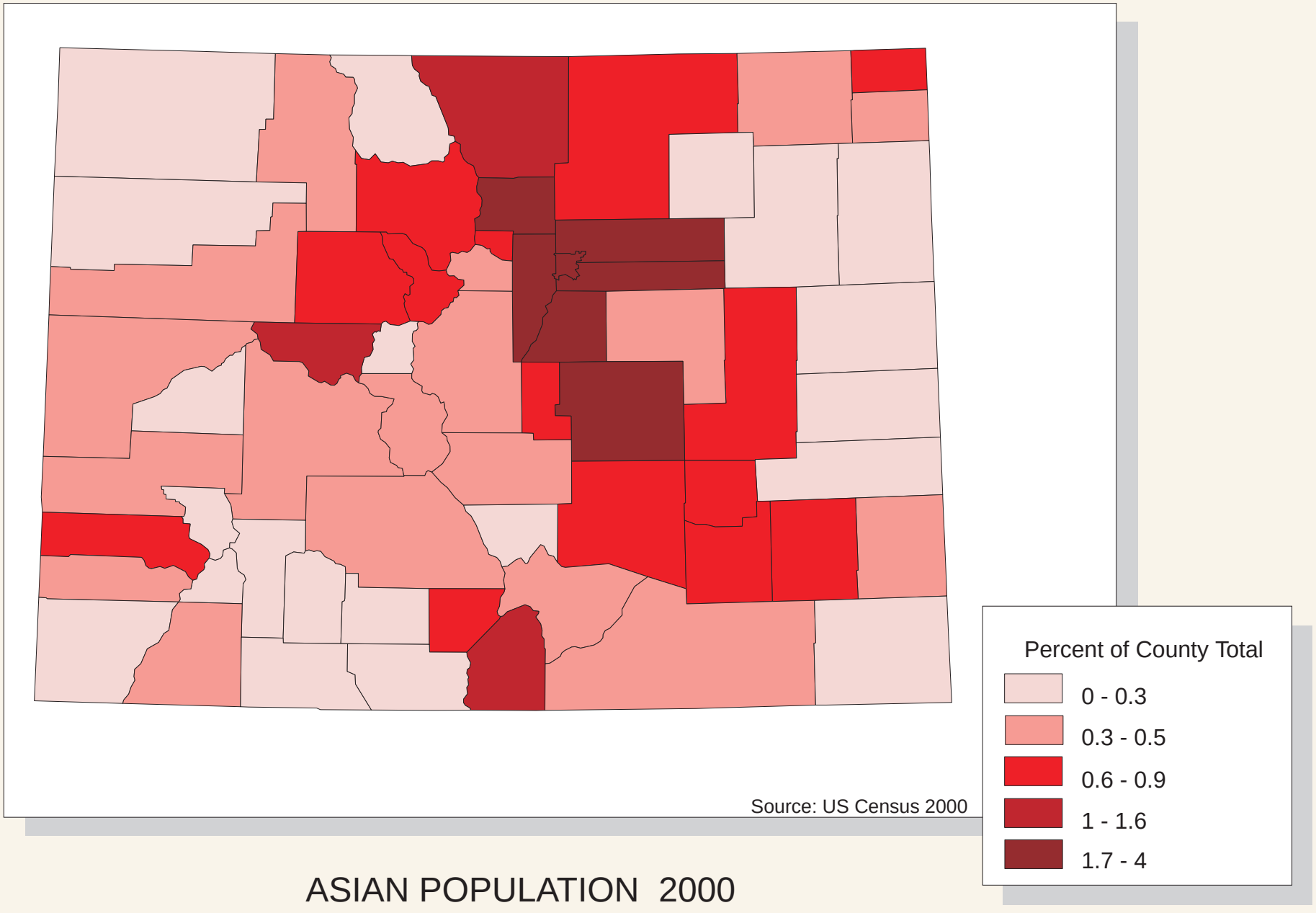
AMERICAN INDIAN AND ALASKA NATIVE POPULATION 2000



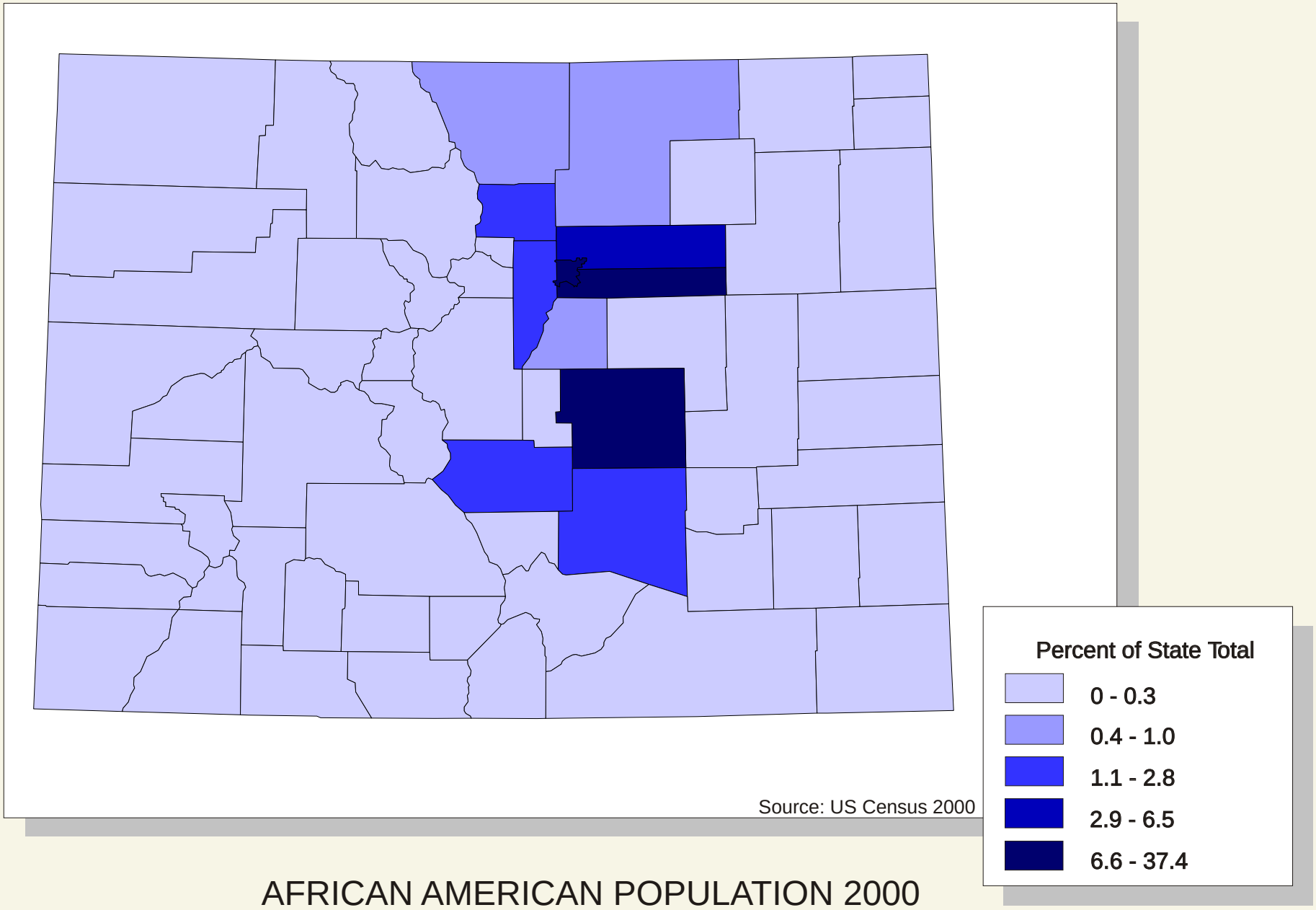
AMERICAN INDIAN AND ALASKA NATIVE POPULATION 2000



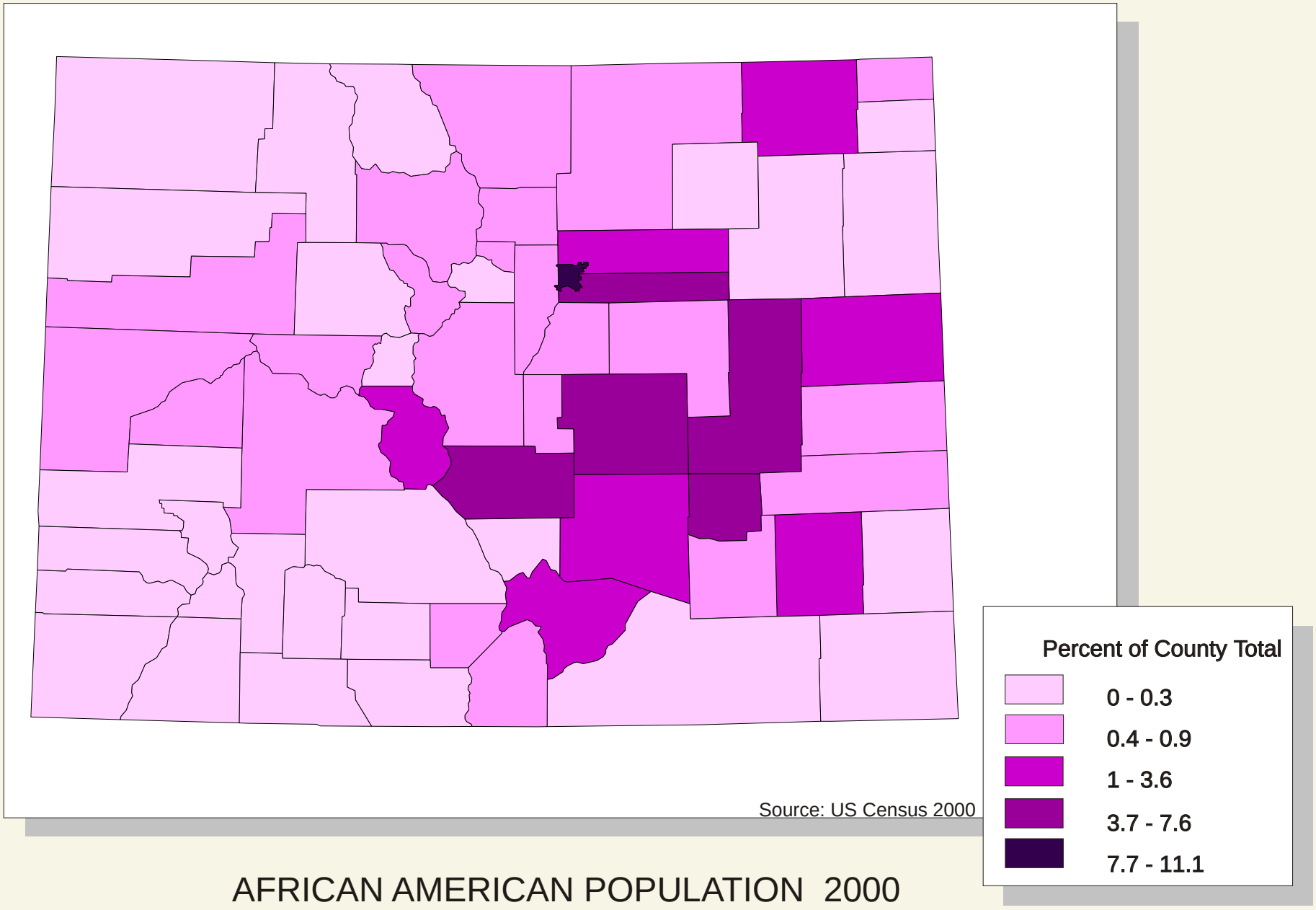
ASIAN POPULATION 2000



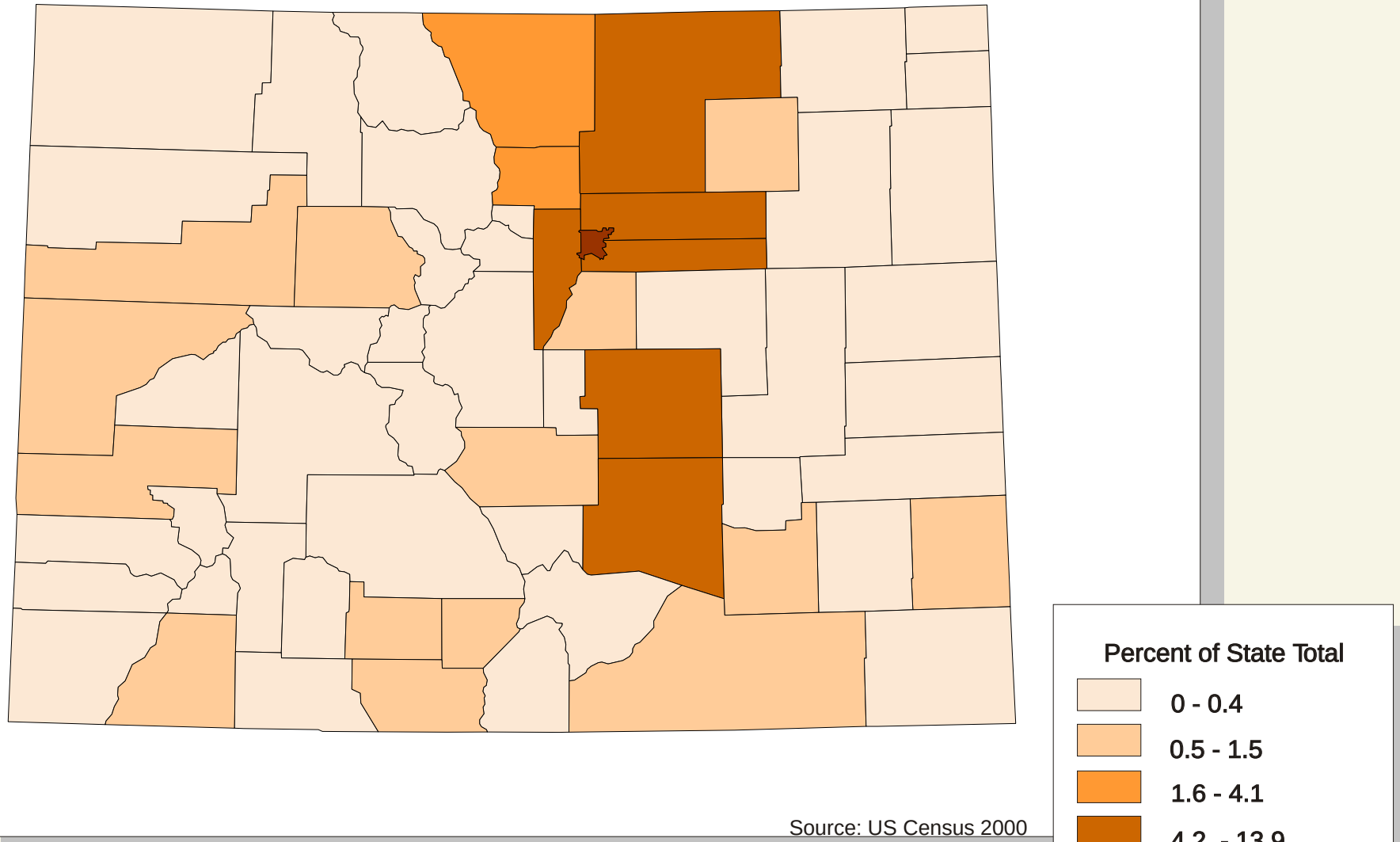
ASIAN POPULATION 2000



AFRICAN AMERICAN POPULATION 2000

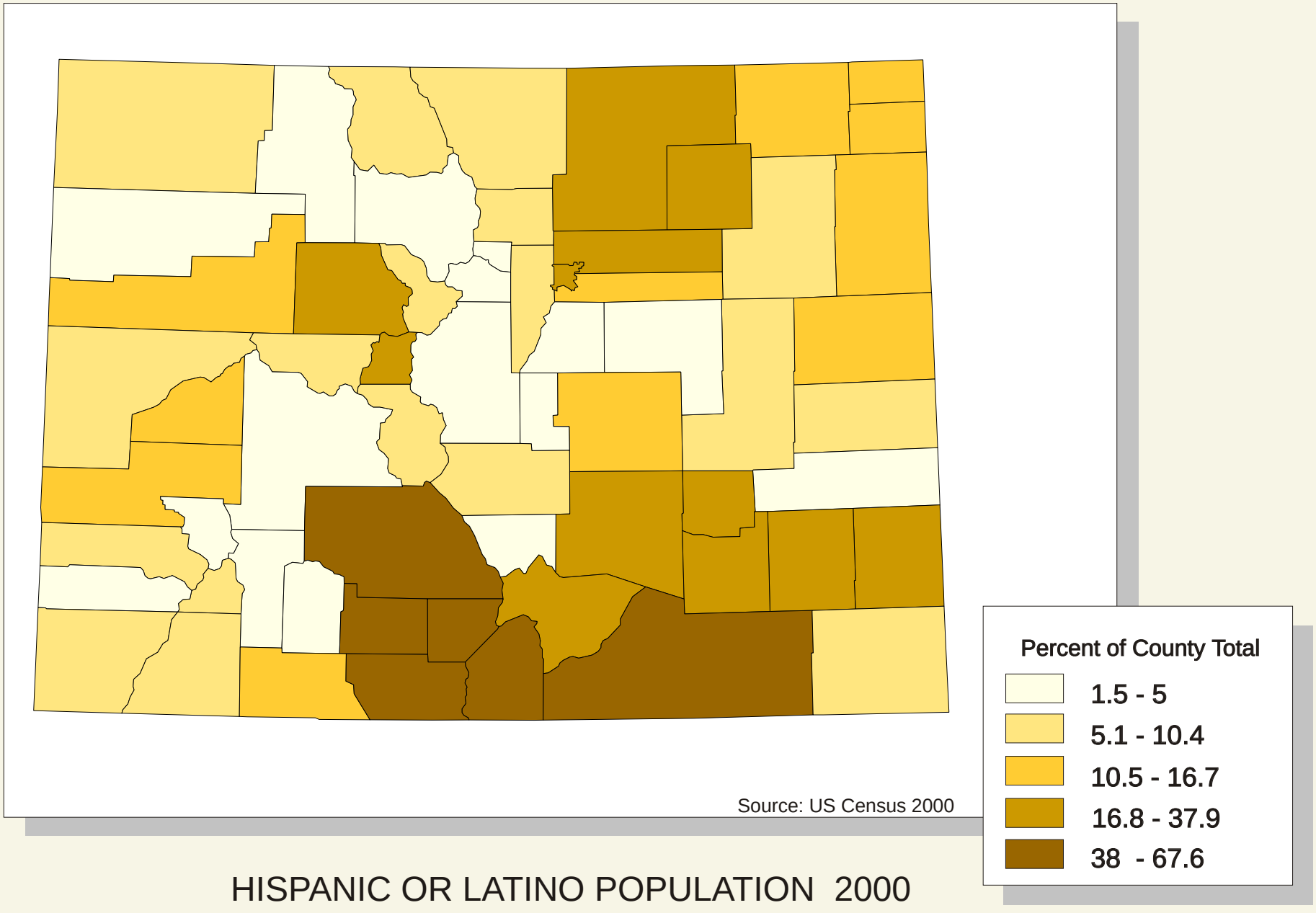


AFRICAN AMERICAN POPULATION 2000



Source: US Census 2000

HISPANIC OR LATINO POPULATION 2000



Source: US Census 2000

HISPANIC OR LATINO POPULATION 2000

HISPANIC AND LATINO POPULATION

First, a note about definitions. As used by the U.S. Census Bureau, the term Hispanic or Latino includes “Mexican, Puerto Rican, Cuban, Central or South American, or some other Latino origin”. Hispanics or Latinos may be of any race.

READING THE MAPS

It is important to first understand the differences between the two maps and what they are designed to show. The first map (page PO 24) plots the distribution of Colorado's Hispanic population by the percent of all Colorado Hispanics residing in any particular county. The second map (page PO 25) presents a picture of the intensity of Hispanic settlement at the county level. While Hispanic residents are widely scattered across Colorado, it is only in a block of southern counties that they constitute the majority of any county's residents.

In reality, Colorado is home to two distinctive Hispanic populations. The concentration in southern Colorado, in a region focused on Conejos and Costilla Counties but extending into adjacent counties, is a product of historic settlement dating from the early to mid-1800s. Settlers pushed into that region from adjacent areas to the south, part of a general northward moving settlement frontier originating in Mexico. These people and their descendants dominate several counties and are commonly referred to and refer to themselves as Hispano, Spanish-American, or Spanish-speaking, usually as distinct from Mexican or Mexican-American.

It is also possible to depict the state's Hispanic population in terms of sheer numbers. In this case the Front Range, and especially Denver County, stand out. This population represents a more recent migration stimulated by labor recruiters who sought workers for agricultural enterprises in the South Platte and Arkansas River valleys and for the steel mill in Pueblo. Beginning about the turn of the century, labor was initially recruited from Colorado's southern counties, then from New Mexico and Texas, and ultimately from Mexico. By 1920, several counties in the Front Range had identifiable resident minority populations, by far the largest proportion of whom were of Mexican origin.

Costilla County is the most Hispanic county in Colorado, with over 67 percent of its residents identifying themselves as such. Outward from this core the percentage declines, e.g., Conejos County (59 percent), Saguache County (45 percent), Rio Grande County (40 percent), Alamosa and Las Animas Counties (41 percent each). It is significant, moreover, that in each of these counties the largest group is classified as "Other Hispanic," that is, not Mexican, Puerto Rican, or Cuban. While notable numbers of Mexicans reside in each county, their arrival has been more recent and their number less than the Hispano population.

Denver County contains nearly 24 percent of Colorado's total Hispanic population. When Arapahoe, Jefferson, and Adams Counties are added, the four counties account for more than one-half of all Hispanics in Colorado. In contrast to the southern counties, in these Front Range counties most Hispanic residents identify themselves as Mexican or Mexican-American.

QUESTIONS TO THINK ABOUT

While the maps depict two population concentrations identified as Hispanic, are there ways in which these populations may differ, beyond ethnic/historic self-identification? Do the very different geographic locations of the two populations suggest possible social, economic, or even political differences? Do they live in different circumstances? Are their occupations similar or different?

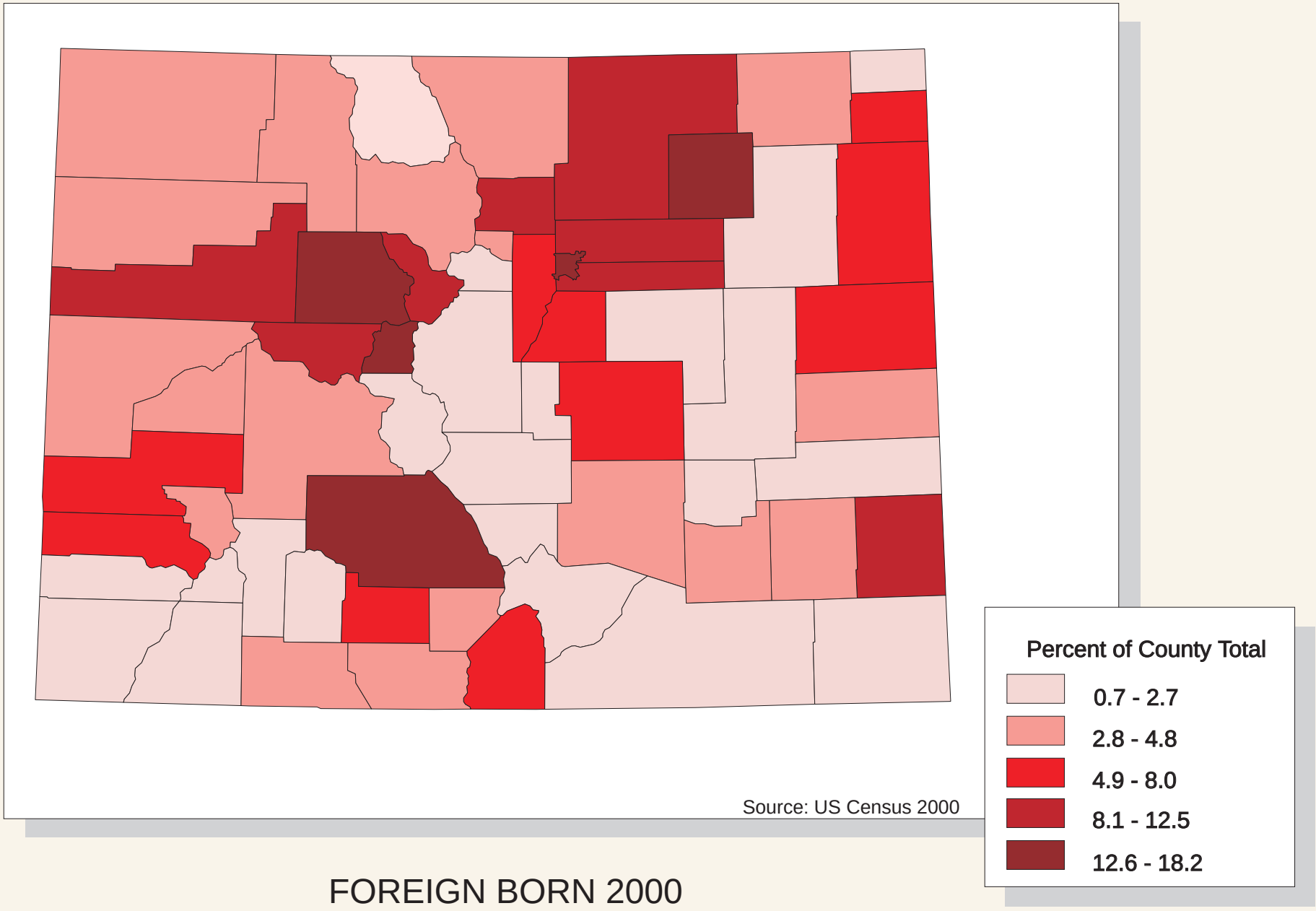
It is possible to spatially associate the Hispanic populations with social and economic circumstances depicted on other maps. For example, comparing the Hispanic Population maps with the maps of RURAL/URBAN or RURAL POPULATION, which Hispanic population cluster is more urban? Which probably contains a greater percent of farmers?

Likewise, comparison with maps of POPULATION 17 YEARS OF AGE AND YOUNGER, EMPLOYMENT, EDUCATION, MEDIAN FAMILY INCOME, OR FAMILIES BELOW POVERTY LEVEL suggests other distinctions between the two Hispanic population clusters. Is it possible to begin to differentiate these two Hispanic populations, at least statistically?

Based upon the map, it is possible to identify at least a seven to nine-county region in southern Colorado that can appropriately be termed "Hispanic Colorado." What are its unique characteristics? Landscapes? Place names? Business names? Names of its leaders? A phone book survey of these counties may yield ideas.

Compare the two maps. Are there any counties in the highest class interval for both Percent of State and Percent of County population? There are a few counties in the second highest interval on both maps. What conditions or opportunities might explain why so many Hispanics chose to settle in Pueblo County? There are a number of counties which appear in the lowest class interval on both maps. Do these counties occur in one part of the state more than in others, i.e., eastern plains, mountains, northern, western slope? What might make these counties or regions less attractive to the Hispanic population?

Note that there appears to be an emerging “third” concentration of Hispanics in the state located in Lake and Eagle Counties (see page PO 25). What might explain this “new” concentration?



FOREIGN BORN 2000

FOREIGN BORN

READING THE MAP

Based on the 2000 U.S. Census of Population, 8.6 percent of Colorado's residents were born in another country. This compares to a higher 11.1 percent foreign born for the entire country, which would suggest that Colorado is only moderately attractive to international migrants. However, the map reveals considerable place-to-place variation in the presence of the foreign born within Colorado.

The map draws one's eye to five counties where foreign born residents are comparatively numerous: Denver, Eagle, Lake, Morgan, and Saguache. Though two of the four counties are contiguous, their overall distribution does not suggest a region or concentration for those born abroad. Indeed, Denver county is almost totally urban, while the other four are lightly populated places, two in the mountains (Eagle and Lake), one in the plains (Morgan), and one (Saguache) in the very rural San Luis Valley and adjacent mountains.

A less intense or secondary region of foreign born exists in the northern Front Range counties, including Weld, Boulder, Adams, and Arapahoe. Morgan County is an extension of this region. These counties stand in rather sharp contrast to most of eastern Colorado that has a very low percentage of foreign born residents.

A closer examination of the five counties with comparatively the greatest percentages of foreign born residents, Denver, Eagle, Lake, Morgan, and Saguache, indicates some basic differences in the origins of these non-native residents. However, the overwhelming number of immigrants to these counties and the state as a whole are from Latin American nations. The following chart reveals both the total number and most common regional origins of these new Coloradoans.

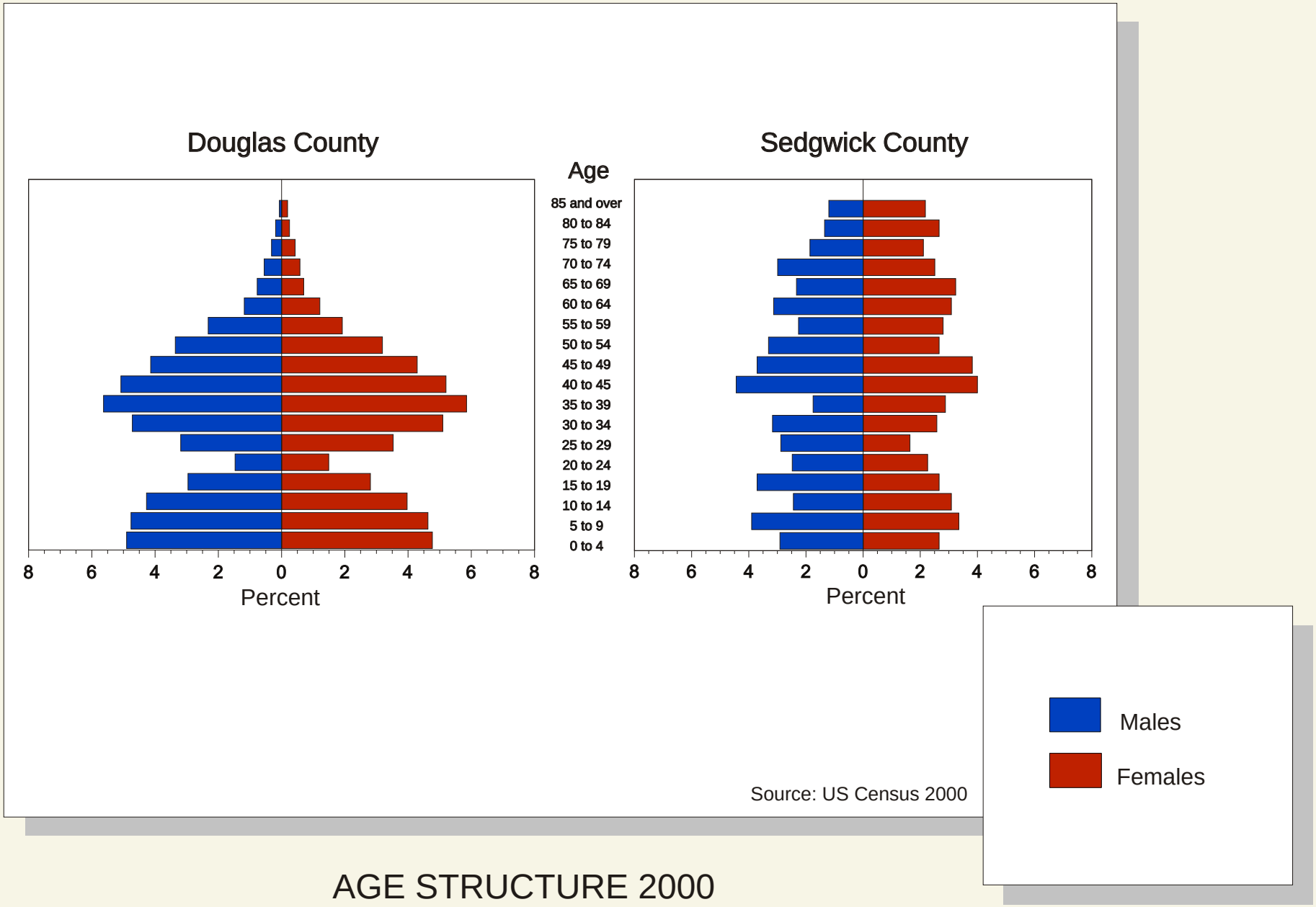
FOREIGN BORN

		Origin (%)		
County	Number	Latin America	Asia	Europe
Denver	96,601	70.5	13.3	10.5
Eagle	7,594	79.1	3.6	10.5
Lake	1,217	90.7	2.4	5.3
Morgan	3,976	96.1	1.4	2.0
Saguache	857	91.9	2.6	3.6
STATE TOTAL	369,894	55.6	19.6	17.6

QUESTIONS TO THINK ABOUT

What could be attracting Latin American-born residents to the urban lifestyle of heavily populated Denver County, but also to profoundly rural Saguache County? Do the two counties share some factor or factors responsible for this immigration, or are the reasons that Mexican citizens migrate and live in these counties quite different?

What is it about Denver County, and to a lesser degree Eagle County, that seems to attract those born in Europe? What do these two counties offer that is apparently absent in Saguache and Morgan counties?



AGE STRUCTURE 2000

AGE STRUCTURE

As with an individual, groups of people can be considered youthful, middle-aged, or old, each age having a particular set of attributes, abilities, and needs. For purposes of analysis, populations are arrayed in cohorts, which are groups of age peers customarily divided into either one or five year intervals. This categorization represents a population's age structure. The most conventional means of depicting the relationship of a population's cohorts to one another is with paired horizontal bar graphs (see below), in which each male and female cohort is represented by a separate bar. The resultant shape -- called a population pyramid -- provides a quick profile of past and present conditions concerning a group's fertility, mortality, and migration behavior.

READING THE GRAPHS

Douglas and Sedgwick counties offer, respectively, one of Colorado's younger and older county populations. In 2000, the median age of Douglas County residents was just over 33 years, while in Sedgwick County it was over 43 years. These differences, and several others, are reflected in population pyramids for the two counties with radically different shapes.

Douglas County

Douglas County has a relatively youthful population in which annual births exceed deaths by eight fold and net migration is consistently positive, i.e., more people arrive than depart. Douglas County is growing, having increased by over 191 percent between 1990 and 2000.

Douglas County's population is not young in the conventional sense, that is with the youngest cohorts being the largest. Rather, the county has a dramatic "younger middle-aged bulge." The four cohorts between 30 and 49 years of age are larger than those either younger or older. Unless we can assume that the older residents of Douglas County (fifty and older) were extremely fertile in the past, we must conclude that the county has experienced a heavy inflow of migrants in a specific age range, namely the late twenties to the late forties.

Given its location south of the Denver Metropolitan area, Douglas County has become an important residential setting for Metro area commuters. Parker, Highlands Ranch, and Castle Rock have all experienced exponential population growth. Douglas County’s foothills setting have resulted in numerous high-end residential developments. Housing prices in these high-end subdivisions have likely discouraged younger buyers, another reason for the low percentages of people in their twenties.

It is evident that the relative middle age bulge is responsible for modest growth in the three youngest cohorts. Conversely, at the other end of the pyramid it appears that Douglas County does not attract nor hold large numbers of elderly. Perhaps this reflects the recent population growth, the out-migration of the elderly to milder climes, or the high cost of living for persons on fixed retirement incomes.

Sedgwick County

In the case of Sedgwick County, the pyramid hardly seems like a pyramid at all. Instead, the age structure has become top-heavy owing to the relative accumulation of a high percentage of older persons. The broadness at the top of the Sedgwick County graph and the corresponding narrowness toward the bottom are related to two causes. One is an extended period of low birth rate, coupled with relatively long life expectancy. Simply stated, survivors from births occurring fifty or sixty years ago outnumber births during recent years. The second explanation is that Sedgwick County is experiencing a net outflow of younger persons and a small inflow of older persons, some returning to their birth area to retire.

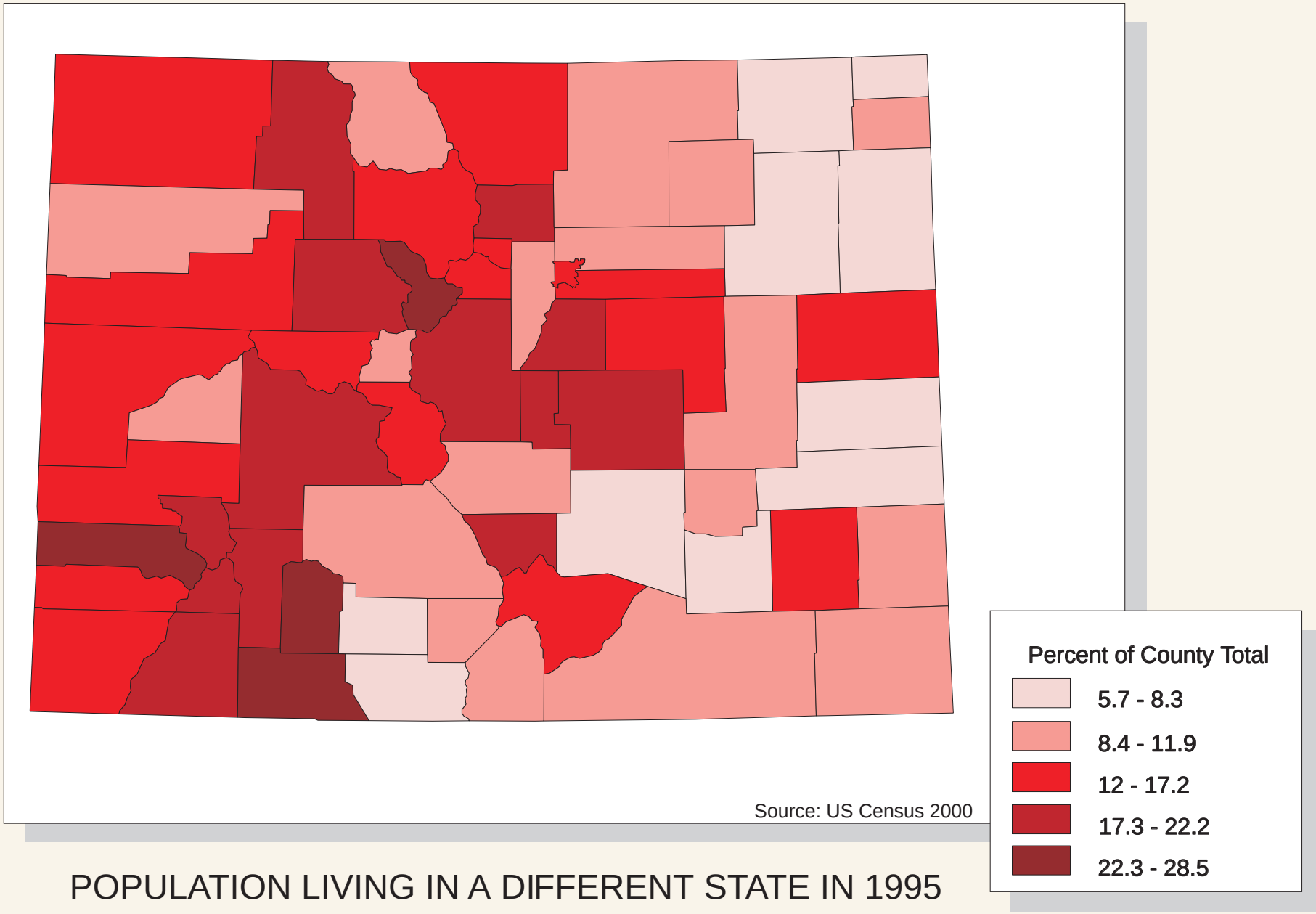
Given the rural and agricultural nature of Sedgwick County we may conclude that it has been the exodus of young persons that is chiefly responsible for the top-heavy age structure. Note, for example, the very small 20-24 year old cohort, a prime age for high mobility and migration associated with the pursuit of higher education and jobs. The affect of the departure of a significant portion of this cohort is compounded by the loss of fertility potential inherent in their youthfulness. At the same time, some older residents remain in agriculture or small businesses and upon retirement may choose to stay within the county.

Sedgwick County lost population in the early 1990s but has rebounded ever so slightly in the latter part of the decade. Most years record more deaths than births; likewise, net migration fluctuates between minimal outflow and inflow. Note that the county has a majority female population. This reflects the somewhat higher migration potential of males and longer life expectancy for females.

QUESTIONS TO THINK ABOUT

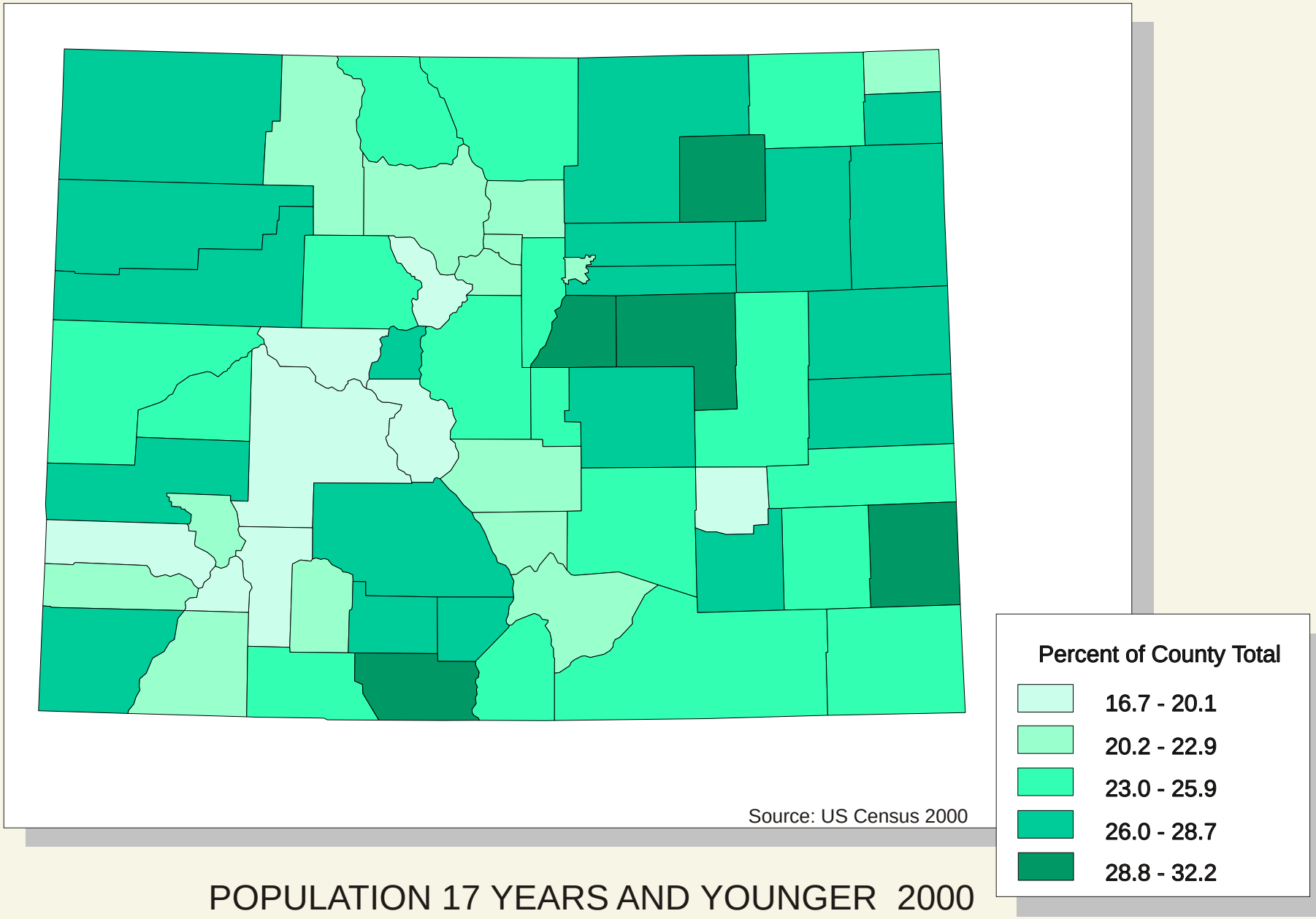
How do you think your county's age structure and population pyramid compare to the younger and older pyramids in the state? Does your county pyramid have any especially large or small cohorts? With a copy of the Colorado Census or the United States Statistical Abstract, you can construct your county's pyramid and compare it to others. First, calculate what percent of your county's total population is included in each male and each female cohort. It is easiest to use 5-year cohorts and that is the form in which the Census organizes age data. To calculate cohorts, divide the number in a cohort, e.g., the number of 5-9 year old males, by the total county population. Do not forget to move the decimal point two places to the right to indicate the percentage. Next, draw a bar proportional to that percentage. Remember, all the cohorts combined equal 100 percent of the population, so individual cohorts are some percent of the total population. Finally "stack" the bars horizontally from youngest cohort to oldest. It is traditional for male cohorts to be shown on the left of the pyramid and to extend from the center line toward the left, and female cohorts on the right and extending toward the right. Use the pyramids in the Atlas as a model. You may wish to make a very large pyramid and place it on the floor of your classroom!

Does your school have an age structure? Of course it does. You may want to construct a pyramid for it. In this case, use the same model provided and treat each grade as a cohort. Count the number of girls in the third grade, for example, and divide that number by the total number of students in your school. This gives you the percentage you need. Do the same with the girls and the boys for each grade. When you chart these percentages on the model you will have created a school population pyramid. Note, the more grades you include the better in terms of understanding what has happened in the past and what might occur in the future. If possible, do a K-12 pyramid. What value does the exercise have? Your teachers and administrators might be interested in the potential size of classes they will be dealing with in the future. Or, if your pyramid has much smaller cohorts in the upper grades than the lower it may suggest there is a drop out situation that calls for attention. There are several software packages (such as *Harvard Graphics*) that are available for making population pyramids and other types of charts and graphs.

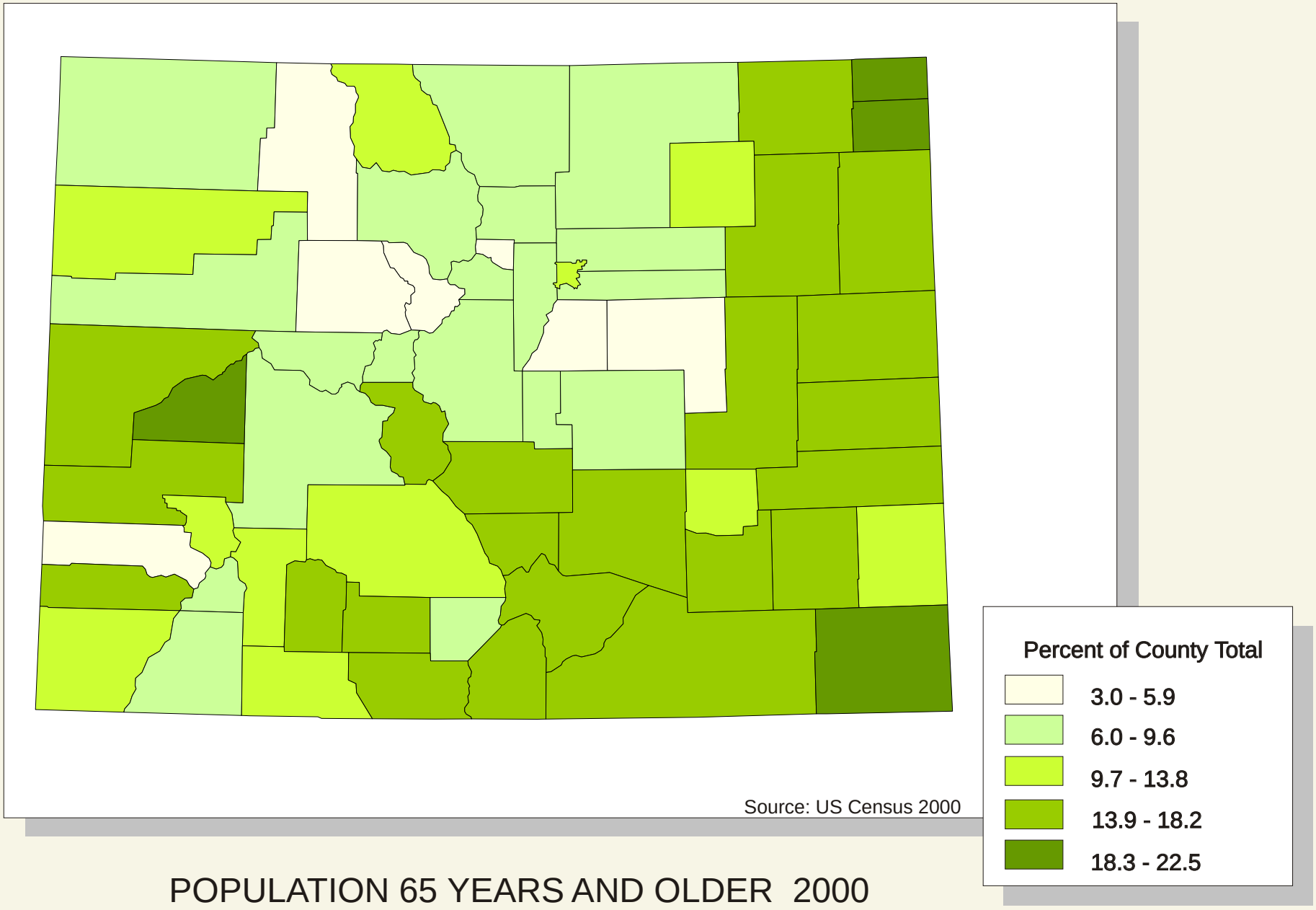


Source: US Census 2000

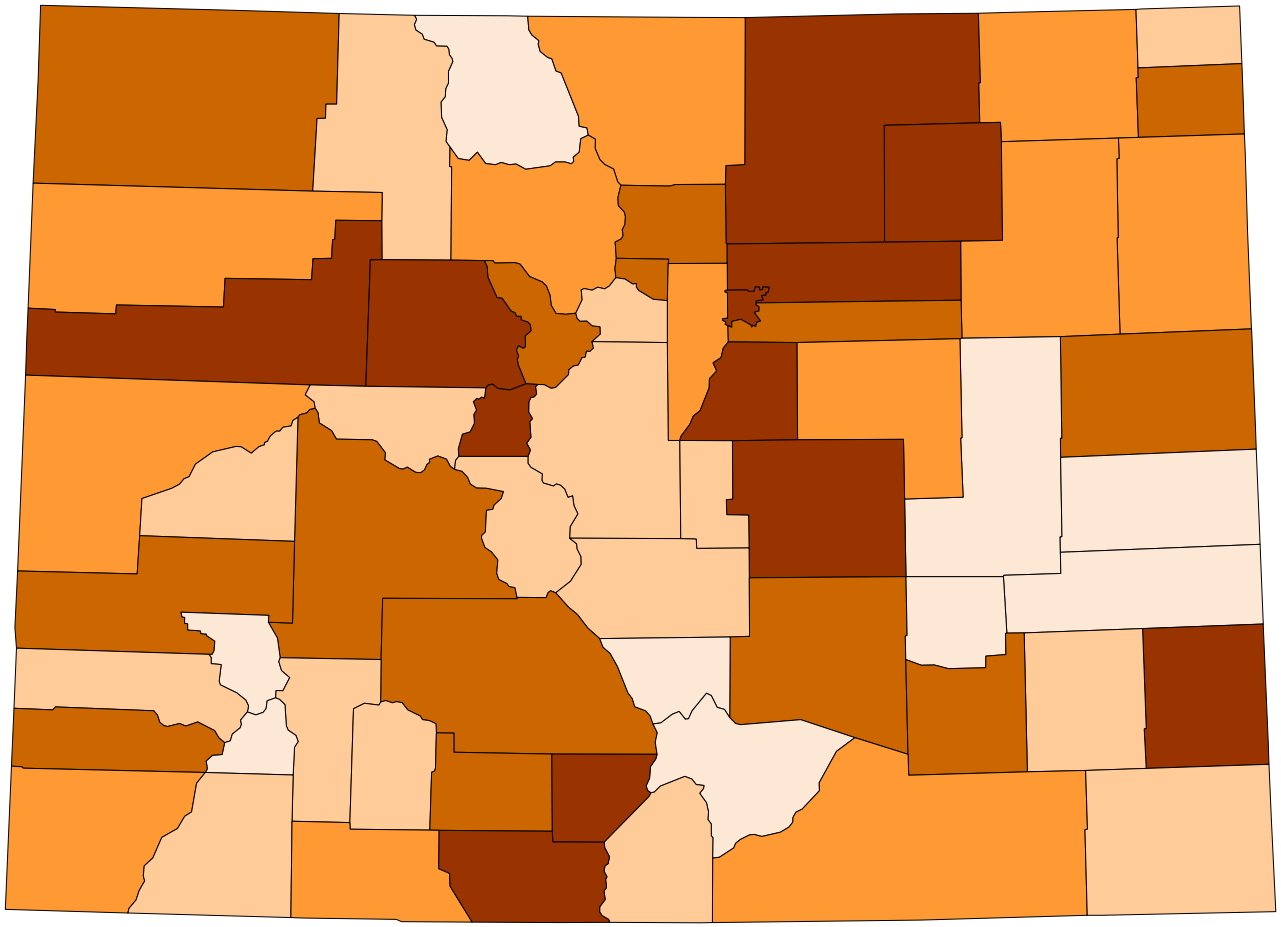
POPULATION LIVING IN A DIFFERENT STATE IN 1995



POPULATION 17 YEARS AND YOUNGER 2000



POPULATION 65 YEARS AND OLDER 2000

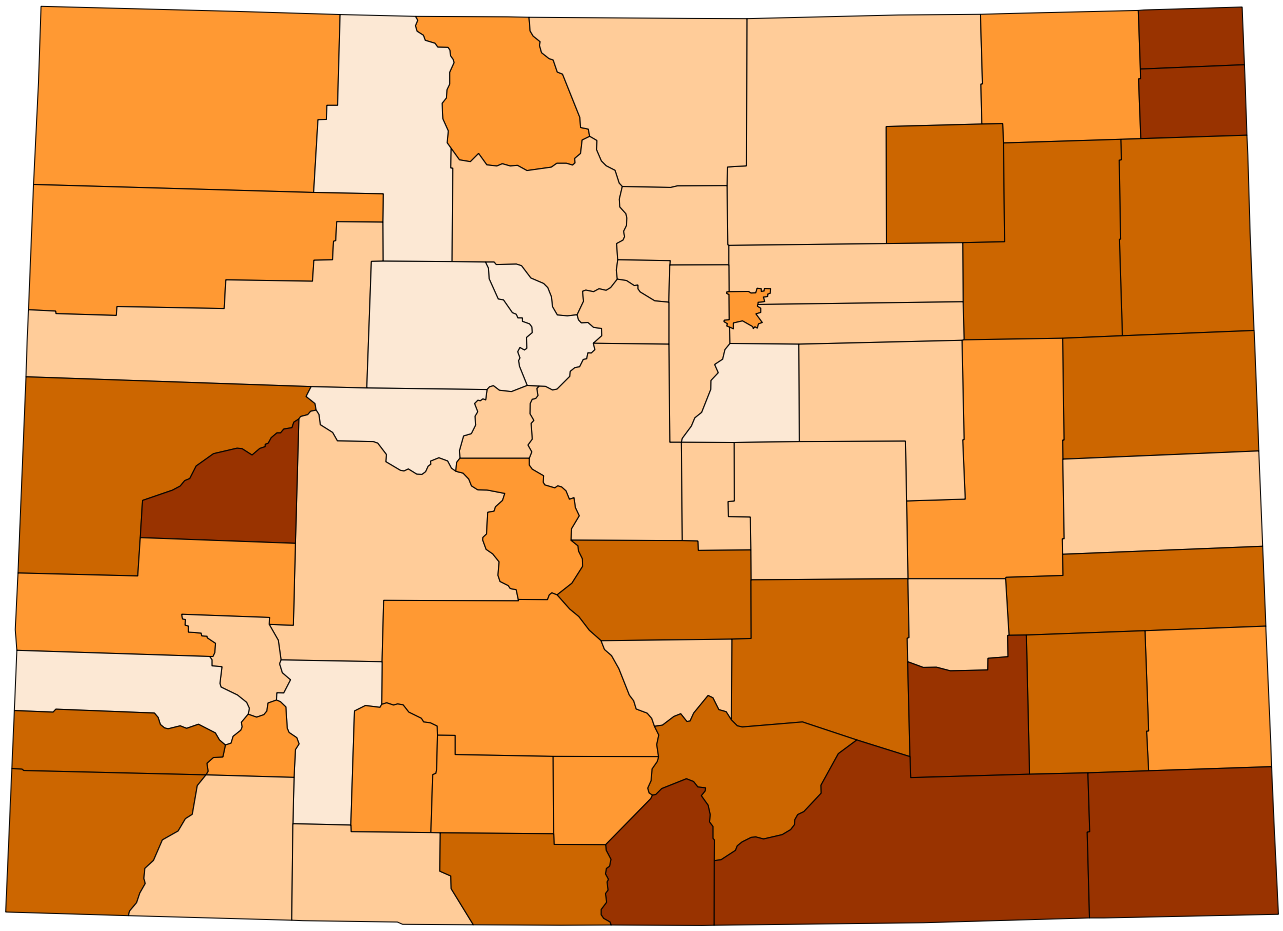


Per 1,000 Resident Population

- 7.1 - 9
- 9.1 - 11.1
- 11.2 - 12.9
- 13 - 15.1
- 15.2 - 19.7

Source: CO Dept. of Public Health and Environment

CRUDE BIRTH RATE 2000



Per 1,000 Resident Population

- 0 - 3.3
- 3.4 - 6.2
- 6.3 - 9.2
- 9.3 - 10.7
- 10.8 - 13.8

Source: CO Dept. Of Health and Environment

CRUDE DEATH RATE 2000

CRUDE BIRTH AND CRUDE DEATH RATES

Besides knowing the size of a particular population, it is at least as important to understand how the population got to that size and how it is changing. In that regard, all population change is explained by a combination of just three things - - births, deaths, and migration. When viewing a map of birth and death rates, it is critical to understand that this is a distribution of rates, not total births or deaths by county. This provides a degree of comparability between counties regardless of total county population since the rates are per a standard unit, i.e., per each 1000 persons in the county's total population.

READING THE MAPS

Before an intensive scanning of the maps, think first about conditions or factors that are logically associated with either high or low rates of birth and death. Here are some suggestions: more than 26 percent of all births in Colorado in 2000 were to women between the ages of 25 and 29 (and we can assume their partners were approximately the same age). Thus, places with a high percentage of women and men in their mid-to-late twenties can be expected to produce a high rate of births. Other age cohorts with high fertility behavior are 20-24 and 30-34. As for total deaths, over 70 percent were recorded for individuals 65 years of age and older. Other conditions might include income level, education level, disease, accidents, occupation, and ethnicity, to name only some.

First, are there groupings or clusters of similar rates on the maps? A group or cluster of the same colors would suggest a birth rate or death rate region. Four (or possibly only three) clusters might be identified. Douglas and El Paso Counties might make one cluster. Another to the north would include Weld, Morgan, Adams, and Denver Counties. Given their proximity, these two clusters might be considered as one. Do these counties have anything in common that might explain higher birth rates?

Next, notice the three counties to the west (Garfield, Eagle, and Lake). Do these counties share any similarities (age, ethnicity, economic). Finally, notice the two counties in the San Luis Valley (Alamosa and Conejos). Do these southern counties have anything in common? Are most of them rural, or urban, or in the plains, or perhaps the mountains? Do the counties with very low birth rates seem to share any characteristics?

With crude death rates, there appears to be a clustering, what might be considered a region, in the southeastern plains and southern San Luis Valley. There is a four-county contiguous region of high death rates in the south and southeastern corner, i.e., Baca, Las Animas, Otero, and Costilla; and Delta and Mesa Counties in extreme western Colorado form a second cluster. The counties of the northeastern plains could be considered a third cluster of high death rates. Are there any variables or factors that link most or all of these places?

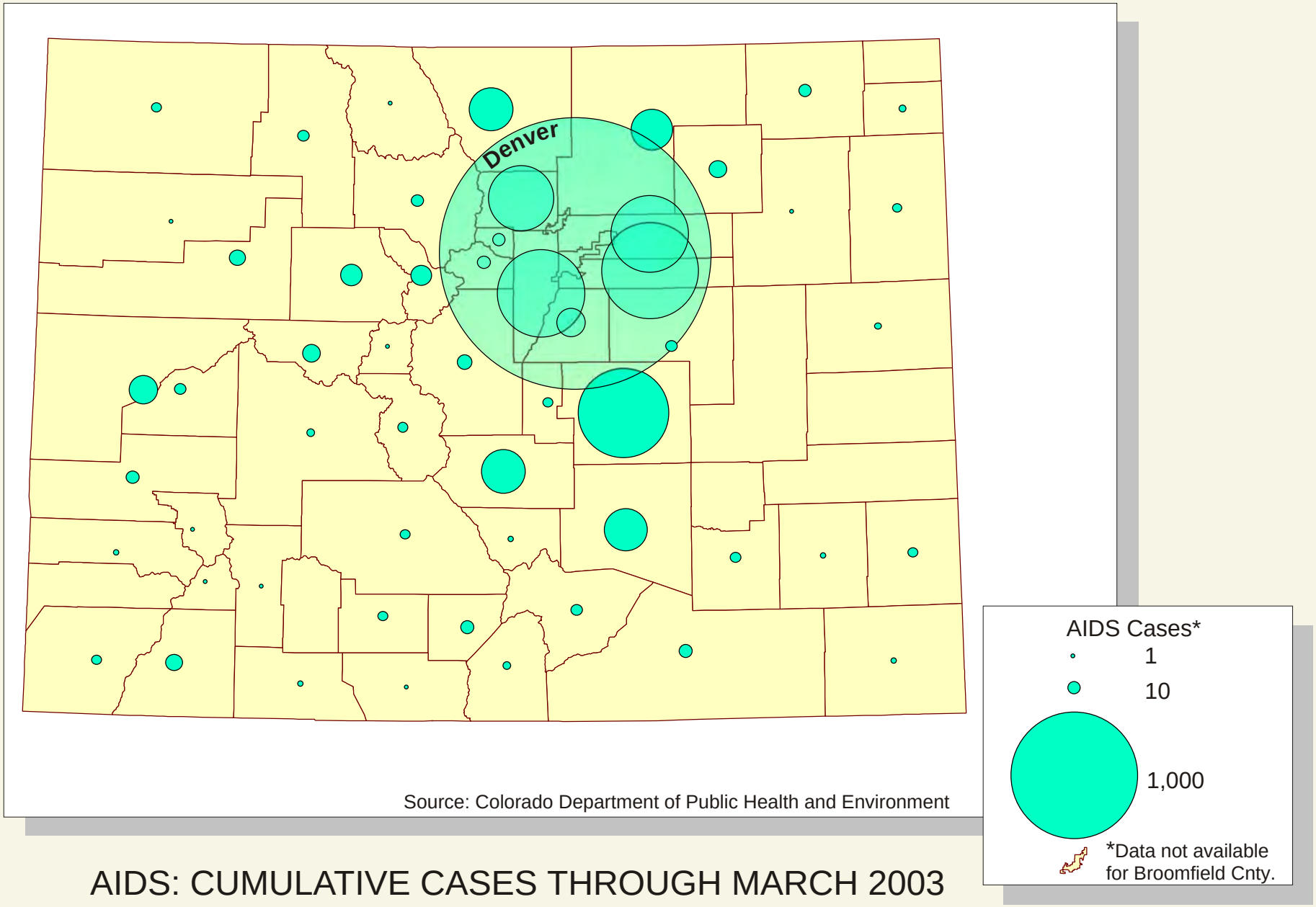
Low death rates exist in an four-county region in north-central Colorado, (Pitkin, Eagle, Summit, and Routt Counties). These counties are all or partially in the mountains. What does this suggest to you about health and the physical environment or setting? Does mountain-living make you healthy, or do younger healthy people choose to live in the mountains? Notice that there are other counties with low death rates that are not located in the mountains.

QUESTIONS TO THINK ABOUT

Four of the six counties with the highest death rates have populations that are very rural (see map of URBAN AND RURAL SHARE OF THE POPULATION). Do counties with high birth rates have low death rates, and vice versa? In a number of cases this is true. For example: Eagle County and Douglas County. But what could explain Phillips or Conejos Counties, where both birth and death rates are relatively high?

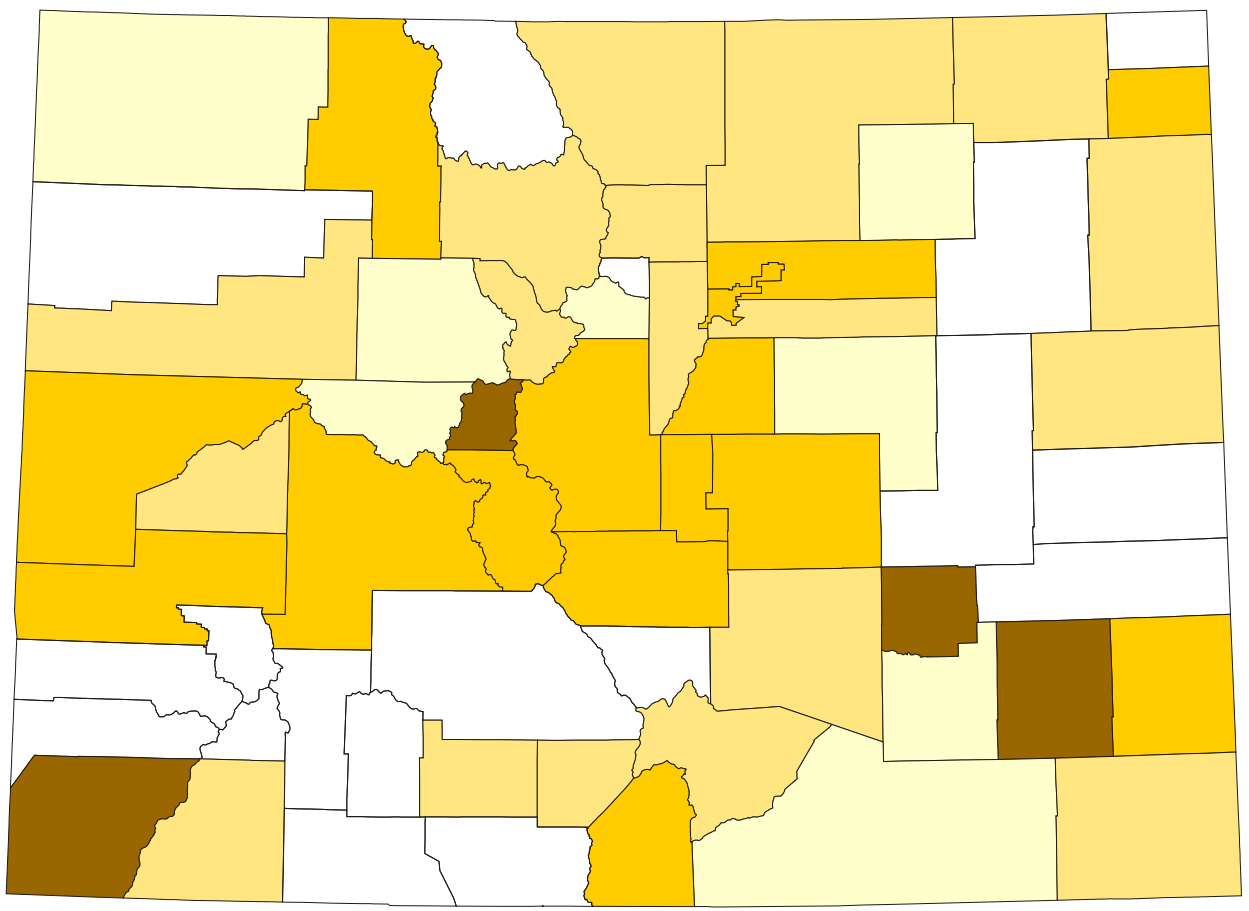
Earlier in the Atlas, Population Pyramids were presented for two counties, Summit and Sedgwick. How do the crude birth and crude death rates compare for these counties? Do you understand why they are so different?

At several points in this Atlas are warnings about maps and about numbers; both can be misleading at times. Maps must be interpreted and used thoughtfully. For example: the maps of crude birth and crude death rates reflect conditions for just one year (2000). Looking at these maps one cannot be certain that the birth and death rates are normal. It is possible that in counties with very small total or base populations, a single event during one year might shift the rate up or down one interval from what it was the previous year. Such events might include a very bad accident, a company hiring new workers, the opening of a retirement home, or a blizzard! How could you overcome this problem of short-term data?



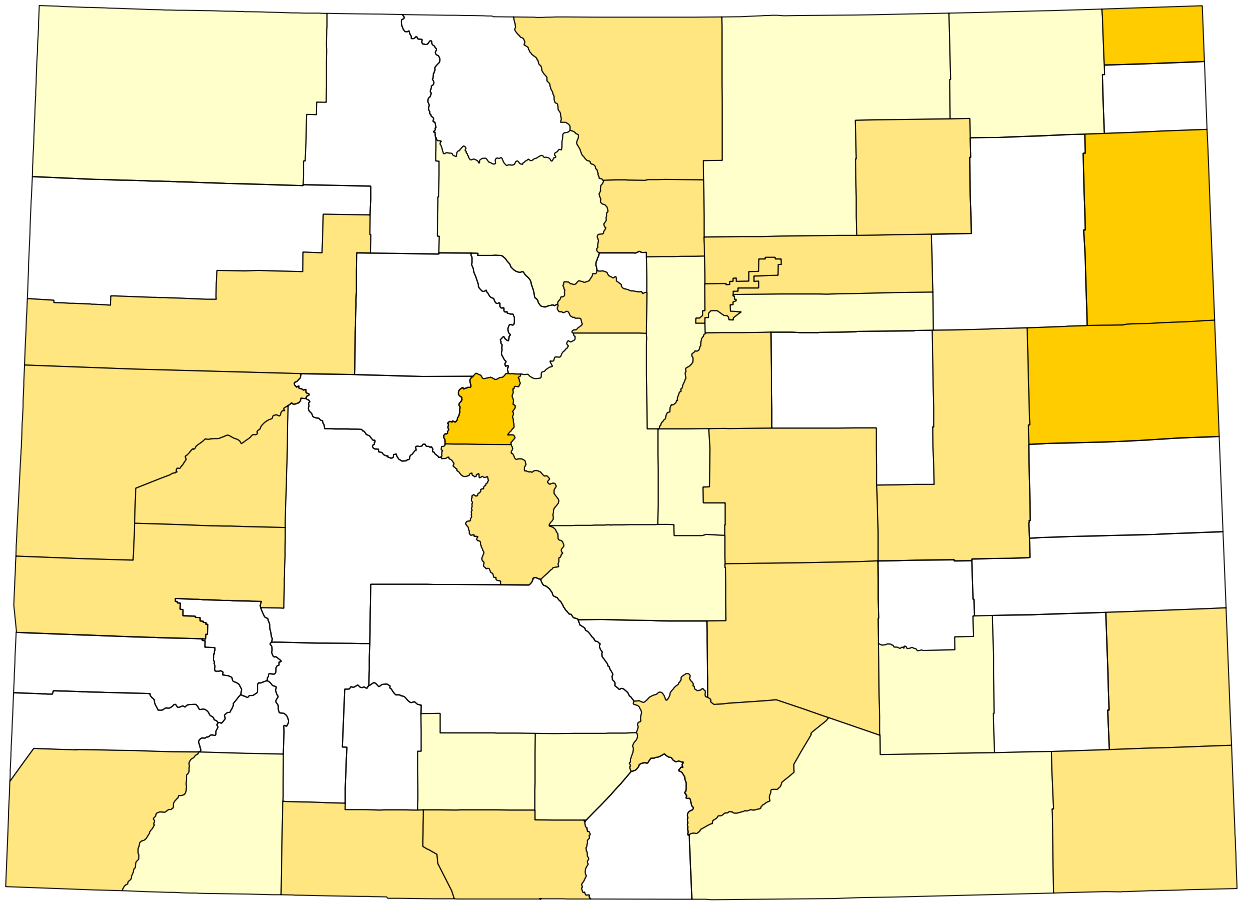
Source: Colorado Department of Public Health and Environment

AIDS: CUMULATIVE CASES THROUGH MARCH 2003



Source: Colorado Department of Public Health and Environment

AGE ADJUSTED INCIDENCE OF LUNG AND BRONCHUS CANCERS 1997 TO 1998



Rate Per 100,000 Females

- Less than 3 Events
- 7.7 to 35.5
- 35.6 to 58.2
- 58.3 to 87.9

Source: Colorado Department of Public Health and Environment

AGE ADJUSTED INCIDENCE OF LUNG AND BRONCHUS CANCERS 1997 TO 1998

AIDS AND LUNG CANCER

Geography is an excellent tool for studying the occurrence of many forms of disease. Nearly all human ailments have the ability to move from place to place owing to the mobility of their human hosts. But different diseases diffuse (spread) in different manners. Some are contagious and spread quickly from person to person, examples include influenza and the common cold. HIV (Human Immunodeficiency Virus), which causes AIDS (Acquired Immunodeficiency Syndrome) is transmitted through human body fluids and is classified as a Sexually Transmitted Disease (STD). It can also be transmitted through contaminated blood transfusions, contaminated instruments (e.g., needles, scalpels), and mothers may transmit HIV to their children during birth or through breast milk. In essence, people infect people with HIV.

Cancer is quite different regarding methods of transmission. You cannot "catch" cancer from another person. Rather, the spread of cancers (there are many types) is a function of a variety of factors. You can "catch" cancer from the environment (e.g., contaminated air or water); certain occupations increase the risk of cancer; personal consumption habits are contributors (e.g., smoking, drinking, some foods); and finally, one may inherit a susceptibility to certain cancers by virtue of genetic makeup. As a result of these factors some places have higher rates of cancers than do others.

READING THE MAPS

HIV and the resulting AIDS are relatively newly identified diseases, the first clinical diagnoses occurring in the early 1980s. In the United States, unlike some other parts of the world, AIDS is disproportionately a disease of males who practice a homosexual lifestyle. It is also a matter of record that AIDS cases in the U.S. are concentrated in major urban centers. That is also the case for Colorado.

The proportional circle map of Cumulative AIDS Cases, as with any map, must be read and interpreted with care. First of all, it is based upon the place of residence of persons diagnosed with AIDS at the time the diagnosis was made. It is also a cumulative record of cases, which means the map represents the multi-year build up of cases. It is possible that some AIDS patients diagnosed outside of Colorado subsequently moved into the state, and there may be those individuals who have AIDS but are not yet identified. Under reporting is a problem with any disease but especially one so stigmatized as AIDS.

The largest circle represents Denver County. Look at the map's legend and you will see that several of the circles representing 1,000 AIDS cases would be required to cover the same area as the Denver County symbol. To be exact, Denver's circle represents more than 4,600 AIDS sufferers who reside in that county. Notice also that several smaller circles are embedded within Denver's. These represent suburban counties adjacent to the City and County of Denver whose circles would otherwise be obscured. Clearly, AIDS in Colorado is most focused on the Front Range, Colorado's most urban region. There is one intriguing exception and that is Fremont County. This non-Front Range county has a significant concentration of residents diagnosed with AIDS.

At the opposite end of the spectrum of AIDS distribution are five counties where no cases have yet been diagnosed. Remember, even if a patient went to a large urban hospital for diagnosis, the case would be attributed to the county in which the person with AIDS resided at the time the disease was identified. Colorado also has a number of counties with only a single diagnosed case. These tend to be counties that are both small in total population and largely rural.

Two maps are provided to assess Lung and Bronchus cancer occurrences in Colorado because males and females do experience very different rates. One of the things to note at the outset is that in Colorado rates of female victims of lung and bronchus cancer never reach the same high levels experienced by males. When you compare the maps four counties (Lake, Montezuma, Crowley and Bent) have male rates between 88 and 153.7 cases per 100,000 residents, but not one county reaches this level for females. However, in two of the four counties, Lake and Montezuma, female rates are in the highest classification for females. The other two counties, Bent and Crowley, raise intriguing questions. While male rates are in the highest frequency classification for their gender, females are in the lowest for theirs!

An overall assessment of the LUNG AND BRONCHUS CANCERS map, for males and females, reveals a largely rural distribution. Notice that while some Front Range counties have significant rates, the highest frequencies tend to be away from that region. Recall the earlier comments about the role of environment, occupation, habits, and heredity in the incidence of cancers. Do any of these offer suggestions for the comparatively high rates in counties such as Kit Carson, Lake, Montezuma, or Routt?

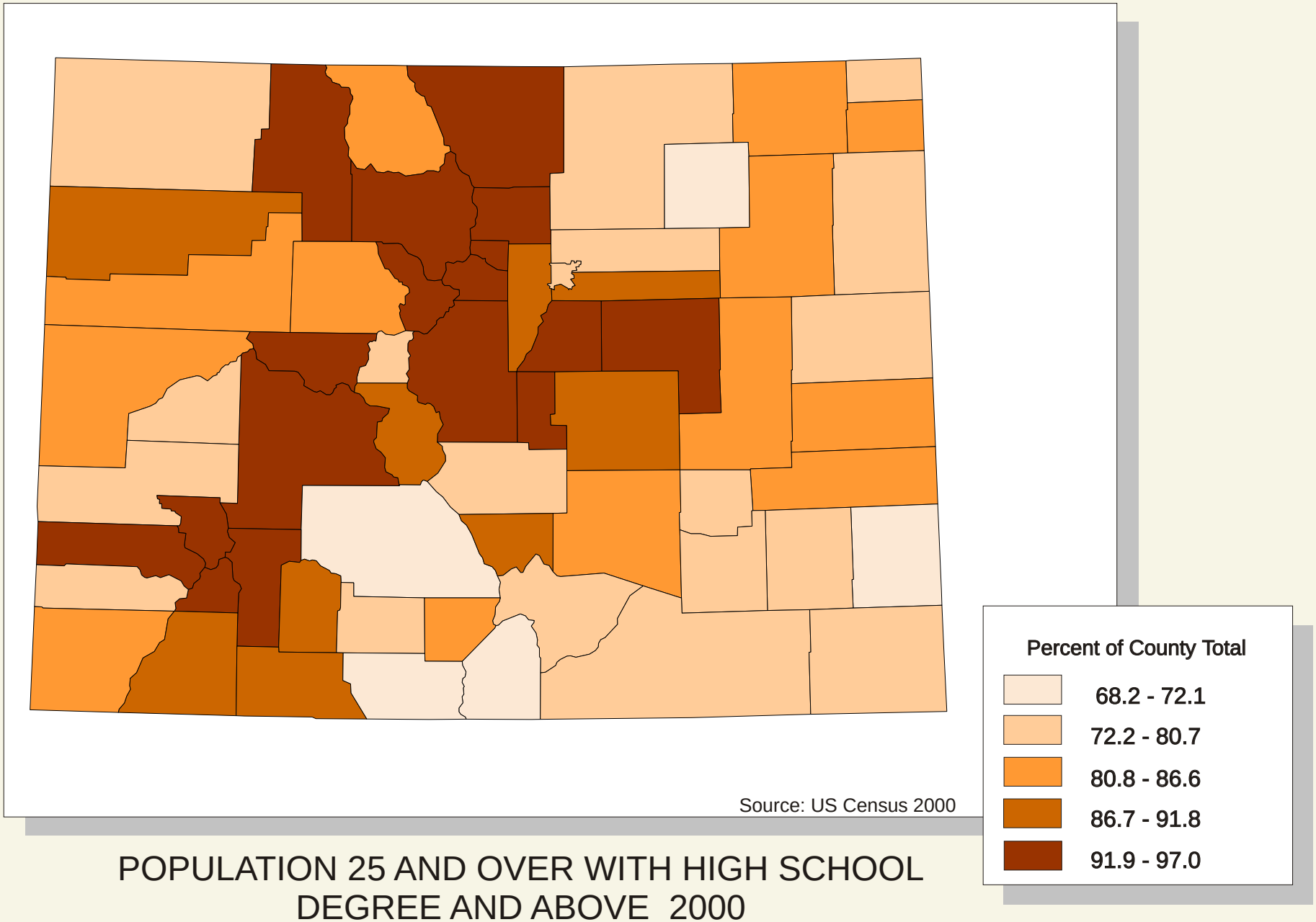
There is a tendency to immediately link lung cancers and smoking. And research has proven this relationship a fact. Indeed, in Colorado the high rates of the disease in an eight county region in the center of the state (Chaffee, Clear Creek, Custer, Fremont, Gilpin, Lake, Park, Teller) are linked in large part to high rates of smoking, almost 50% greater than for the rest of Colorado's residents (See http://www.cdphe.state.co.us/release/2001/112001.html) . However, other causes or factors can also be significant.

QUESTIONS TO THINK ABOUT

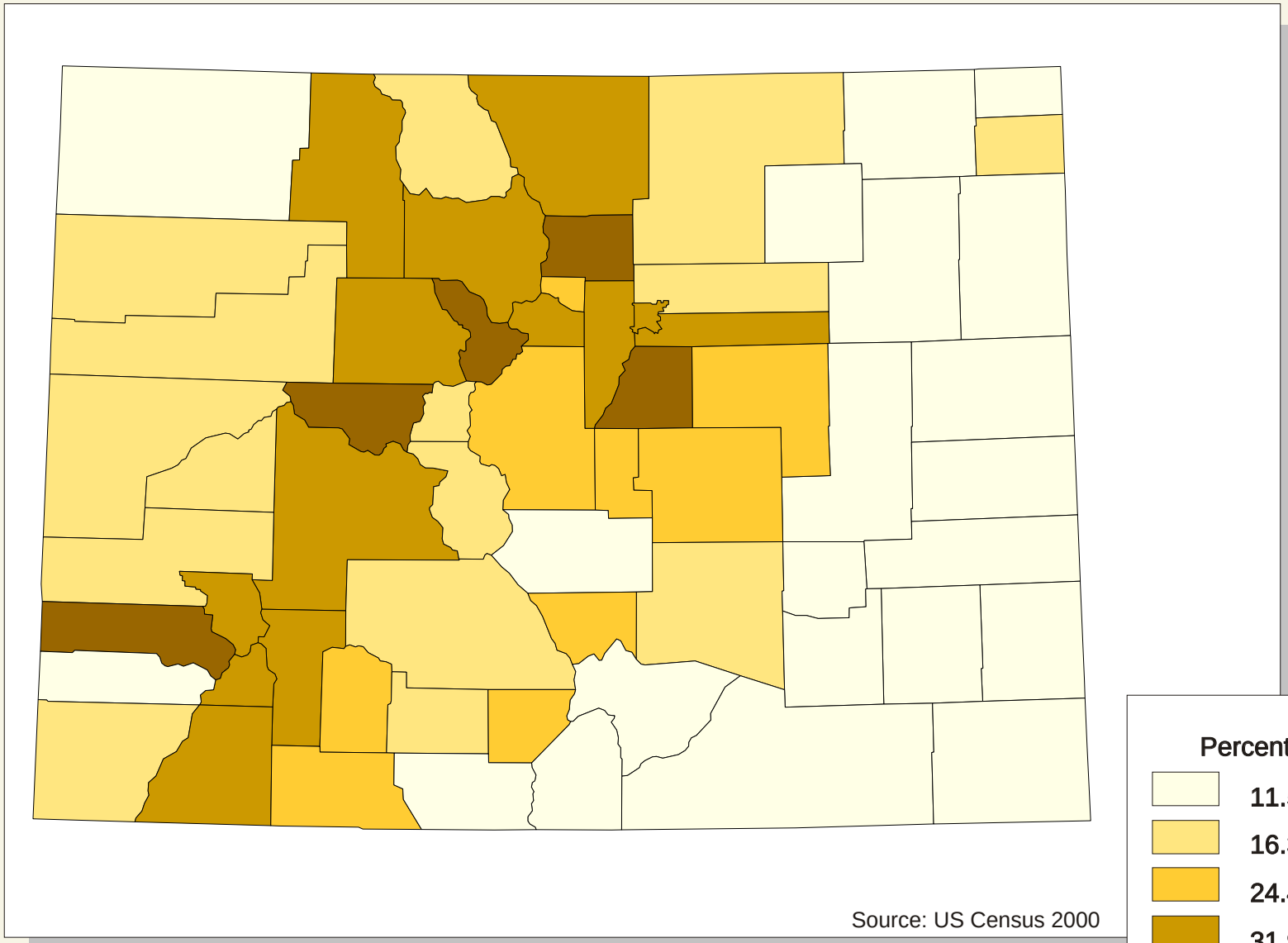
What is the nature of the apparently relationship between larger cities and higher rates of AIDS? You may be thinking that "of course Denver County has more AIDS, its population is so much larger than most Colorado communities." However, the combined populations of the five-county Metro Region (Adams, Arapahoe, Boulder, Denver, and Jefferson) is 2.3 million or 51% of the state's population, but accounts for 6,315 reported AIDS cases which equals 82 % of all cases in Colorado.

It would be scientifically indefensible to state that "cities cause AIDS." But there is an areal or spatial association. What is the nature of that association? Is it the sheer number of people and the frequency of their contacts? Is there something in urban culture, unlike rural or small town culture, that is either tolerant or conducive to the existence and transmission of AIDS? These are complex questions and consequently the associations are bound to be complex.

As for Lung Cancers, what factors should be investigated in addition to smoking? Intuitively, we can assume that some of the cancers that attack the lungs result from harmful materials that come in contact with the delicate lung tissue. It is true in some circumstances that "breathing is bad for your health," but clearly not as harmful as not breathing! People who work amidst polluted or "dirty" air are at an elevated risk of lung cancers. What sources of air pollution can you identify? The Denver Metro area's "Brown Cloud" comes to mind. But what are possible sources of contaminated air in Colorado's more rural regions? Could farming or mining be contributors?



POPULATION 25 AND OVER WITH HIGH SCHOOL DEGREE AND ABOVE 2000



Source: US Census 2000

POPULATION 25 AND OVER WITH BACHELOR'S DEGREE OR ABOVE 2000

EDUCATION

In 2000, Colorado significantly exceeded the national average for percent of residents twenty-five years of age and older who had earned a high school diploma, i.e., 86.9 percent versus 80.4 percent nationally. Similarly, a greater portion of Colorado's residents held a bachelor's degree (32.7%) than for the nation (24.4%). In the same year, however, the state's funding levels for elementary and secondary public education ranked Colorado thirty-fourth nationally (and 37th by 2001). This apparent dichotomy is but one of the challenges to the mapping and interpretation of apparent patterns of social variables such as educational attainment. Simply stated, people and their diplomas are very mobile. Indeed, the greater the education attained, the more mobile a person is likely to be.

READING THE MAPS

It is at once apparent on both maps that eastern and southern Colorado have lower levels of educational attainment than the rest of the state, especially when compared to north central Colorado. Western Colorado's education level is intermediate for both high school and college/university graduates.

Notice that nearly all counties at the highest class interval for high school graduates also rank in the highest or second highest interval for college degrees. Essentially, this suggests that counties with high percentages of those finishing high school also have rather high numbers completing an advanced degree. Conditions in these counties must be conducive to obtaining education.

At the other end of the spectrum, nearly all counties in the lowest interval for high school graduates also fall in the lowest interval for college degree holders. There is a similar parallel between counties with the second lowest high school graduate rate. Each of these counties is either in the lowest or second lowest interval for college graduates. It would seem that there are also conditions associated with lower educational attainment. What might these be?

QUESTIONS TO THINK ABOUT

What other maps or distributions of social variables might help explain this geography of education in Colorado? Place the maps of EDUCATION and the map of POPULATION 65 YEARS OF AGE AND OLDER side-by-side. Are there any spatial similarities? It appears that low levels of education in eastern and southern Colorado are spatially similar to high levels of older residents. CAUTION: remember that spatial association is not proof of the relationship! More thought and questions are needed. You may wish to interview some older persons, perhaps relatives, about schools and education when they were your age.

One method of investigating apparent spatial correlations or relationships is by hypothesis testing. For example, eastern and southern Colorado counties have high percentages of farmers in their populations. This is reflected on several maps, including EMPLOYMENT IN AGRICULTURE, FORESTRY, FISHING, AND HUNTING; AREA IN CROPLAND; TENANT FARMERS; and RURAL LAND USE. A hypothesis might be: farmers do not seek as much formal education as some other segments of society. Is this true? Perhaps the hypothesis should be stated in the past tense -- A generation ago farmers did not seek as much formal education as some other segments of society? How could you test this hypothesis?

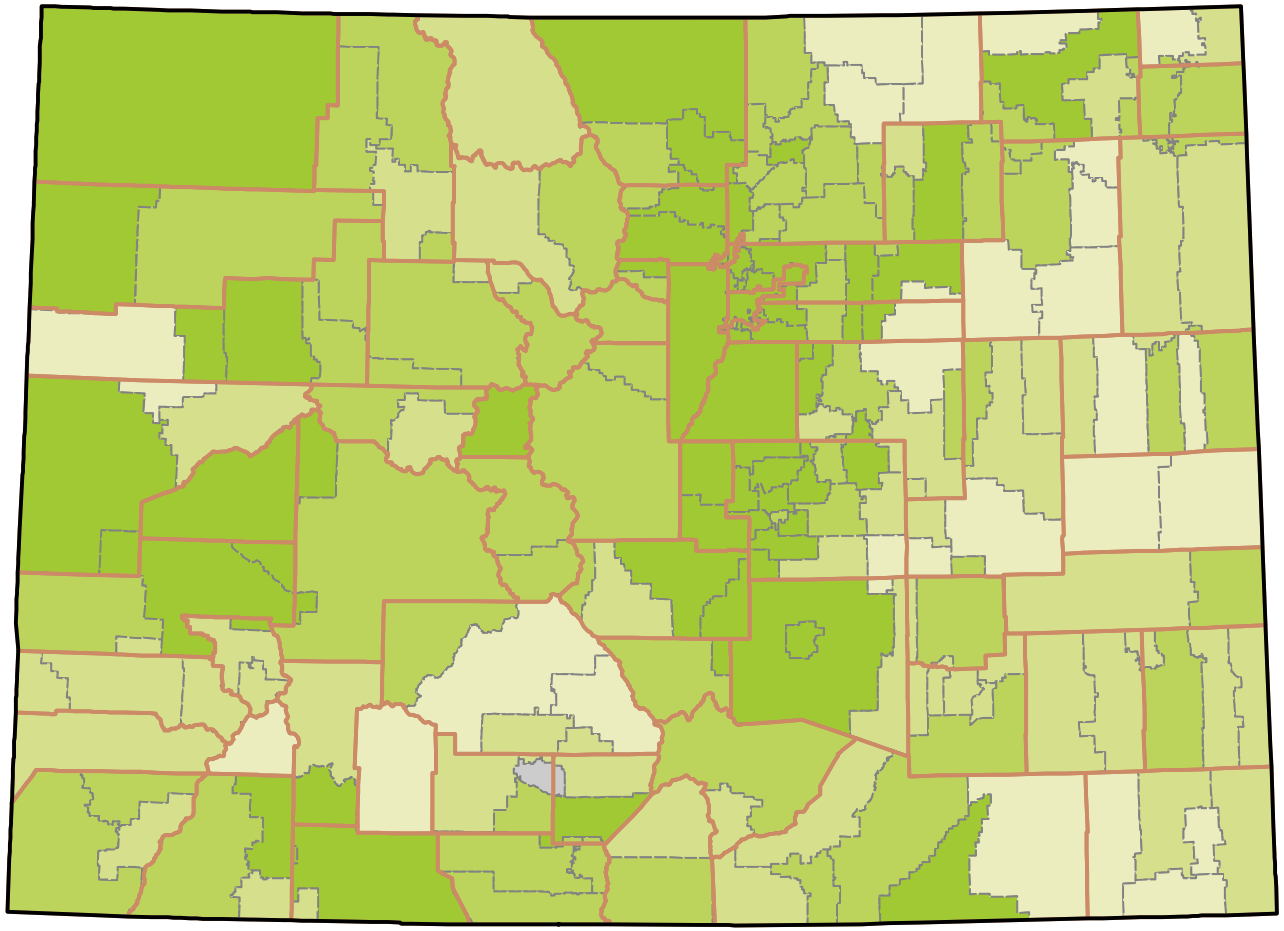
Do not accept hypotheses without testing them; do not assume that because they appear in this Atlas they are therefore valid. Many social patterns are the result of the interaction of multiple variables. In the present case of farmers-and-education, consider this: farming may require less formal or academic education than engineering. But older farmers (recall the apparent AGE-EDUCATION association mentioned above) may have had less opportunity for education. Another contributing variable is mobility or migration. Increasing mechanization in farming is decreasing the need for manual labor: fewer farmers farm more land. As a consequence, the children of farmers often take their educations, whether high school or university, and seek jobs away from the farm. Since these holders of high school and higher degrees now

live elsewhere, the U.S. Census of Population counts them in their new locations. The net result is that educational attainment is subtracted from some counties and added to others.

Speaking of the mobility of the educated, what do the five counties with the highest percentages of university degree holders have in common? They are not contiguous, that is, clustered together. Two are in the Front Range Region, two are in the mountains, and one is in the southwestern plateau region. Clearly, there is no locational nor physical geographic connection.

Compare this map (POPULATION 25 YEARS AND OVER WITH A BACHELOR'S DEGREE) with the map of POPULATION THAT LIVED IN A DIFFERENT STATE IN 1995, i.e. migration. Specifically, look at the five highest ranking counties in terms of advanced education, these being Boulder, Douglas, Summit, Pitkin, and San Miguel. Where do these counties rank on the map of migration, high or low? Education and mobility seem clearly linked. Consider this: In 1990, Summit, Douglas, and Pitkin counties ranked first, second, and third respectively among the 3,043 United States counties in terms of percent of residents with a high school degree or better. Pitkin ranked fifth nationally for residents with bachelor's degrees or better. Is Pitkin County the site of a major university or educational institution? As to movement, Summit County was sixth in the nation in percent of its resident population that arrived between 1985-1990, while Douglas County recorded the second highest rate of growth among U.S. counties for the period 1980-1992.

Questions you may wish to consider include: Do you think the above 1990 facts continued through the decade of the 1990s? What attracts the highly educated to Colorado, and in particular, the five high-ranking counties? Where do they come from? Do they migrate from other Colorado counties, other states, or other countries? What kinds of work do they do, or how do they make a living where they now live?

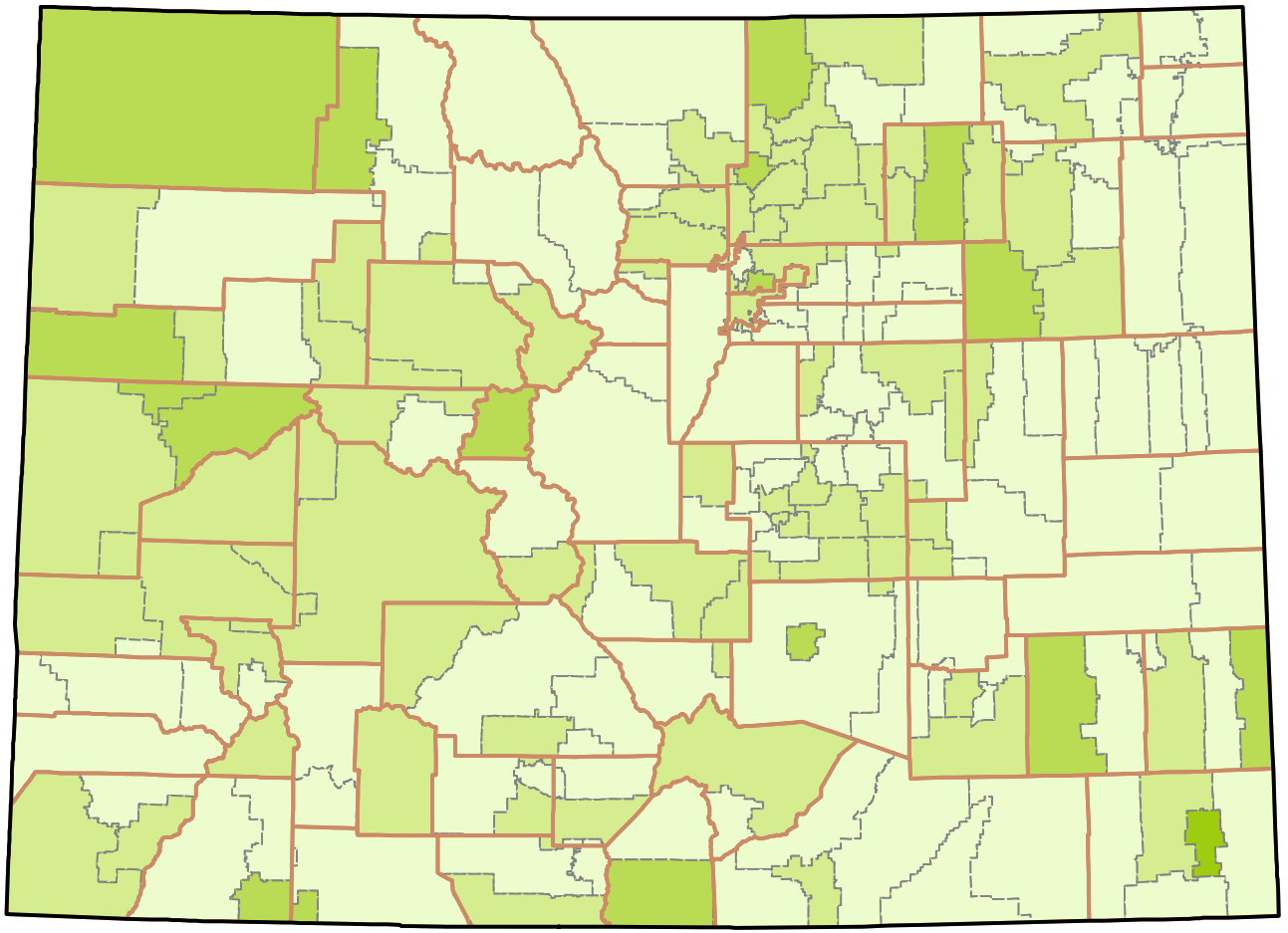


Source: Colorado Department of Education

Fall 2001 Ratio

- Data Not Published
- 5.6 to 9.8
- 9.9 to 13.4
- 13.5 to 16.0
- 16.1 to 19.6

PUPIL TO TEACHER RATIO



Source: Colorado Department of Education

Percent of Total Enrollment

- 0 to 1.3
- 1.4 to 3.3
- 3.4 to 7.1
- 7.2 to 26.7

DROPOUT RATE FOR GRADES 7TH THRU 12th, 2001-2002

PUPIL TO TEACHER RATIOS

DROPOUT RATES

Data relating to education often focuses almost exclusively upon such things as graduation rates or levels of schooling attained. While these are significant, they are far from the whole story. It is also important to investigate the conditions of the educational process as it is occurring. Pupil-to-teacher ratios also referred to as class size, generate much debate and there are many attempts to relate this ratio to quality of education. That is not the goal here. Instead, study the accompanying map for differing patterns of class size and try to relate these to other conditions and issues of society in general, and of education in particular.

Drop out rates imply failure, of the individual student and by extension, the school district. The accompanying map displays the distribution of drop out rates, but it is more productive to investigate possible areal (spatial) associations in an effort to identify possible causes of this problem. Does it have to do with other conditions within the field of public education? Or are the patterns of dropout occurrence more appropriately related to conditions within a school district, county, state, or even country?

READING THE MAPS

Notice first of all that the maps are based upon School Districts as enumeration units. This means that particular policies or conditions that are unique to a particular district can impact such things as pupil-to-teacher ratios and dropout levels. For convenience, county boundaries are superimposed over school district boundaries. In a few cases a single school district covers the entire county. More commonly, a county is divided into a number of separate school districts for purposes of administration, funding, and policy making. Also note that only grades 7-12 are being reviewed.

The PUPIL TO TEACHER RATIO map requires careful reading since no specific pattern “jumps out.” Note however, that what is commonly referred to as the Front Range Region, extending from Larimer County in the north to as far south as Pueblo County, is essentially a region of moderately high to high pupil-teacher-ratios. However, shift your view either to the east or west from this elongated region and the ratios show considerable change. Clearly, the largest number of districts with small class sizes is found in the eastern one-third of Colorado. Just west of the Front Range Region is a mixture of ratios or class sizes, most in the mid to upper range. And finally, on or near Colorado’s western border are a number of high ratio districts similar to the situation in the Front Range.

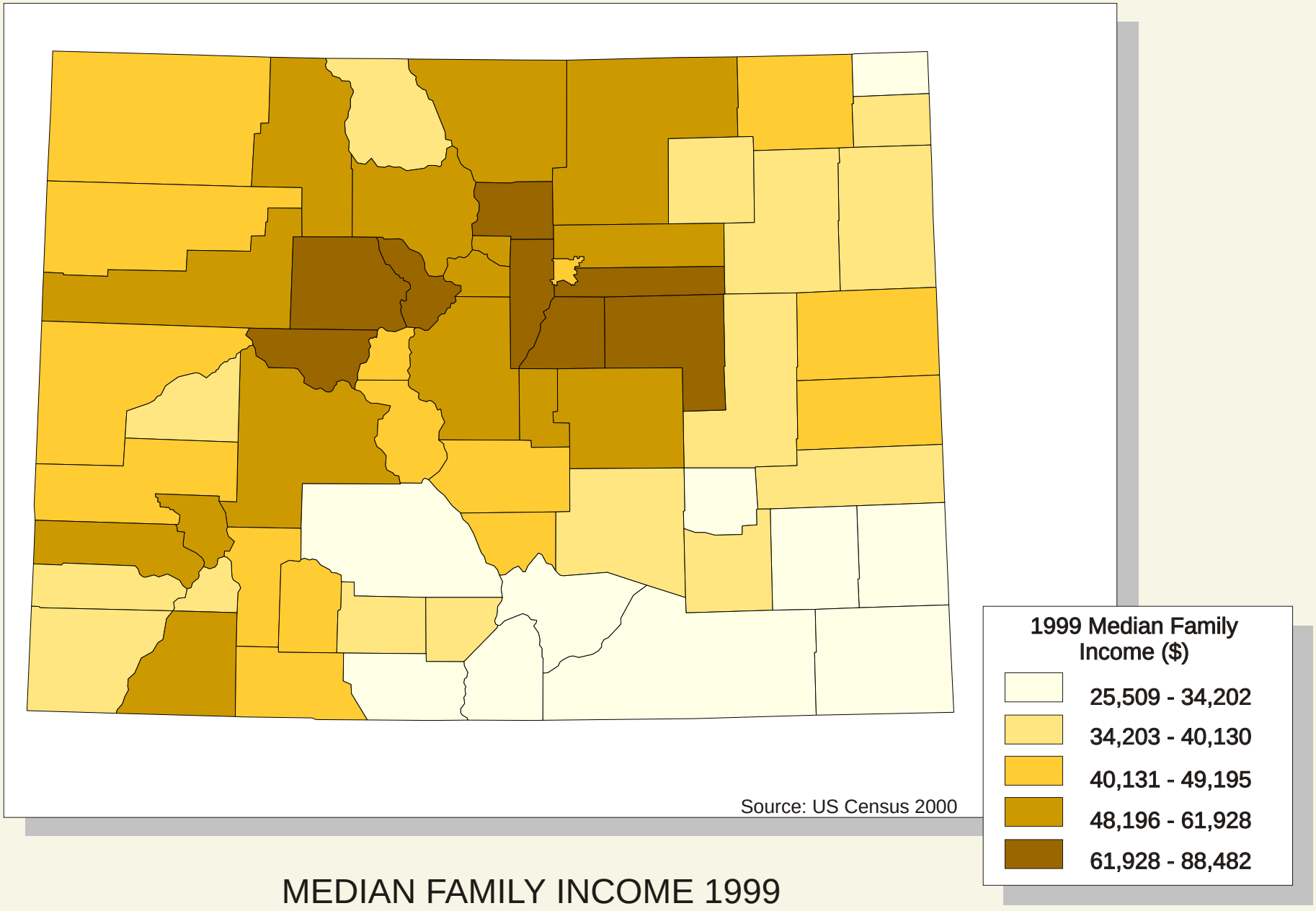
It is the nature of the statistics used to create choropleth maps that sometimes the patterns are skewed, or even misleading. In the case of the DROPOUT RATE map, only one school district is in the highest classification rate, e.g., 7.2 to 26.7 percent of Total Enrollment, and in fact is 26.7. There is little benefit spending too much time with this isolated case. Also remember that the data being used are for a single school year and may reflect an unusual circumstance for that brief time period.

As the remaining school districts are examined it becomes clear that there is apparently a great deal of spatial randomness. To be sure, low rates are more common in the Eastern Plains and Mountain districts than in the northern Front Range and far western districts. Notice, for example, that there are very few cases where there are two or more contiguous districts in the 3.4 to 7.1 percent dropout rate. Here a word of caution is also in order. Almost as soon as you glance at the DROPOUT RATE map your eye is drawn to Moffat county in the extreme northwestern corner of the state. It appears as a large dark area and may give the impression that this county-wide school district has an unusually high frequency of dropouts. However, Moffat County’s dropout rate of 4.6% involved just fifty-nine students, just one more student than Douglas County. Does Douglas County standout on this map?

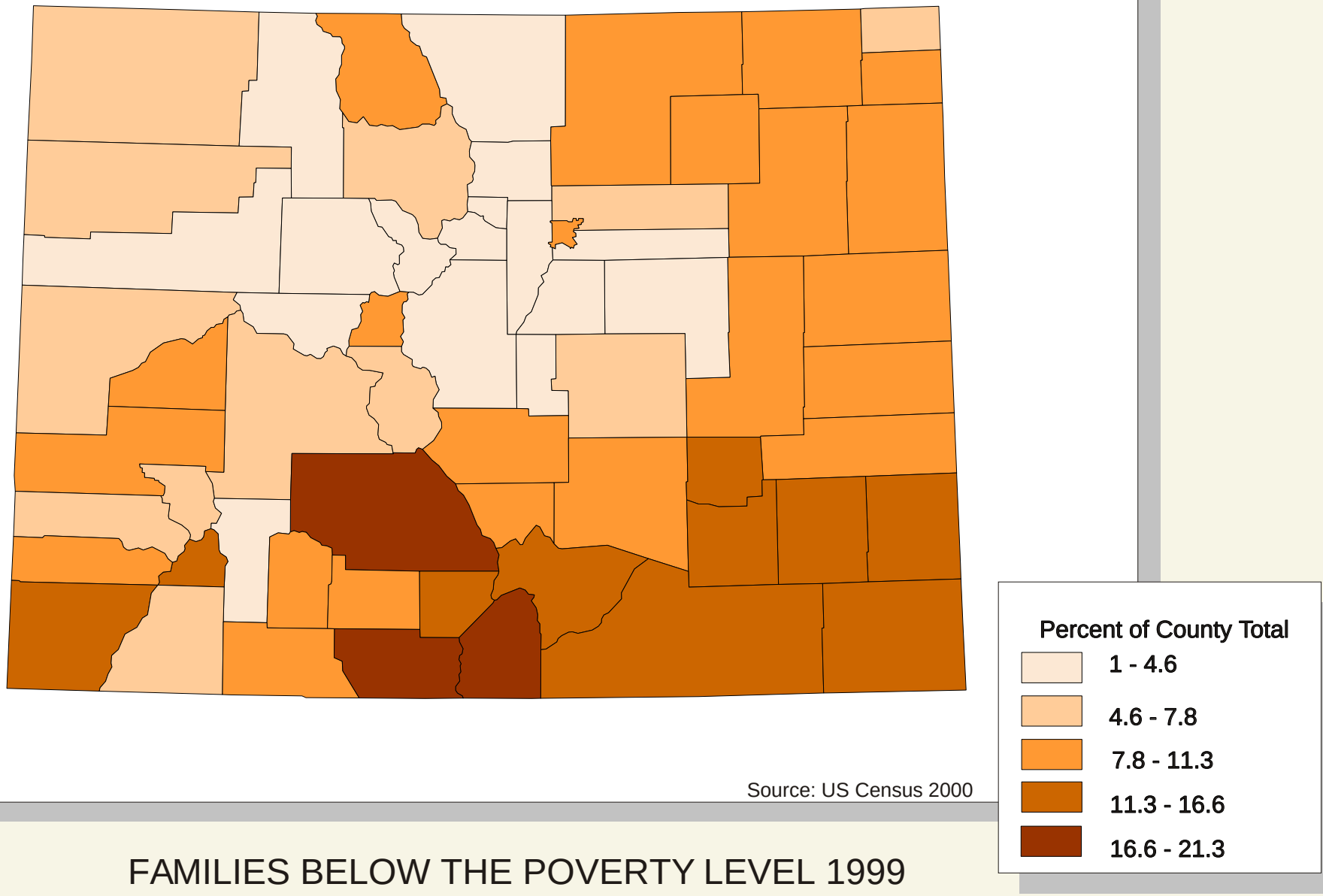
QUESTIONS TO THINK ABOUT

Geographers and geographic analysis often deal with areal or spatial association. In essence, this means that one map may help to explain another. But how do you choose the maps to compare to the one you are trying to interpret or analyze? First, common sense is required. Ask yourself this question: What might cause a school to have a high pupil-to-teacher ratio, in other words, large classes? Rapid population growth in a school district might be a factor since schools may have a difficult time keeping up with the number of new students moving into the district. What would happen if you compared the pupil-to-teacher ratio map to one showing population growth (See, POPULATION CHANGE 1990-2000)?

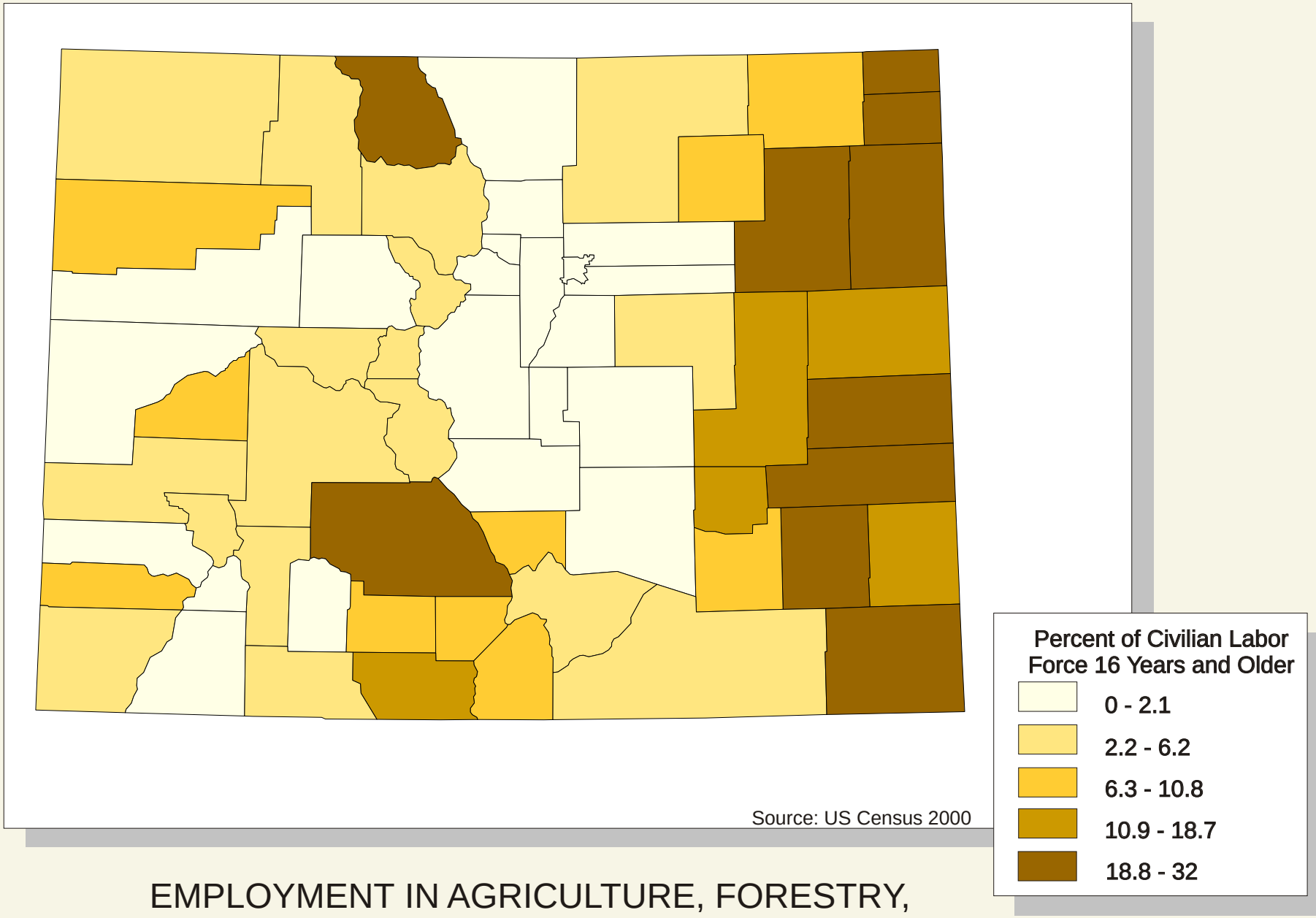
Why do Colorado school districts along the eastern border have low dropout rates and those along the western border comparatively higher ones? Being near these borders is not a logical factor, so it must have some relationship to the counties or to the local communities. Is it possible that some factor or factors in the school itself contribute to either low or high dropout rates? Colorado's ten highest enrollment school districts average about 19,000 students each and have an average dropout rate of just over 2 percent. At the other end of the size spectrum, Colorado's ten smallest enrollment districts average 40 students and experience a dropout rate of 0.4%. Can school size be a factor, or class size? Possibly, but so, too, may the economic and social nature of the community in which the schools are found. And what about grumpy teachers? No! We were just checking to see if you were paying attention.



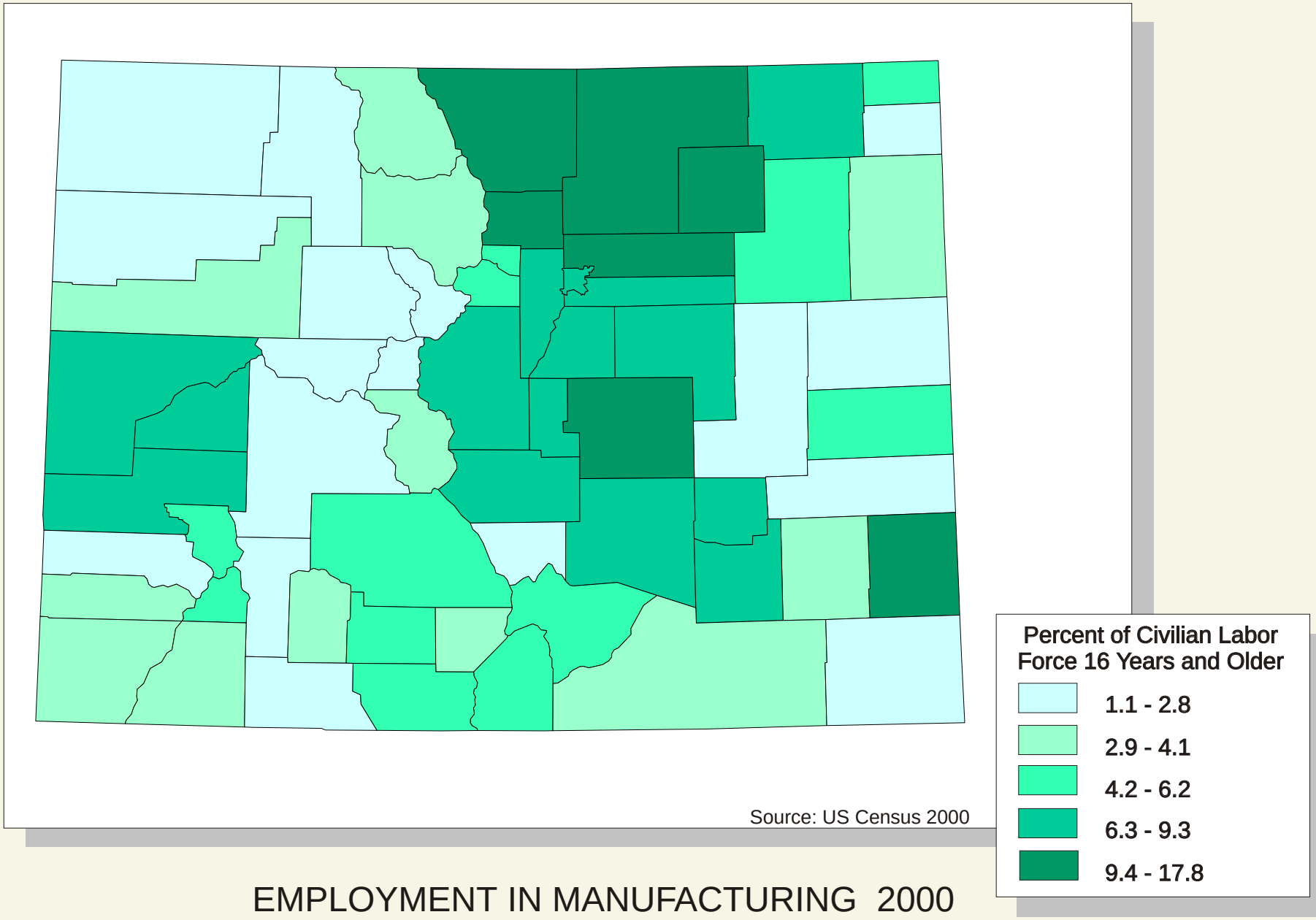
MEDIAN FAMILY INCOME 1999



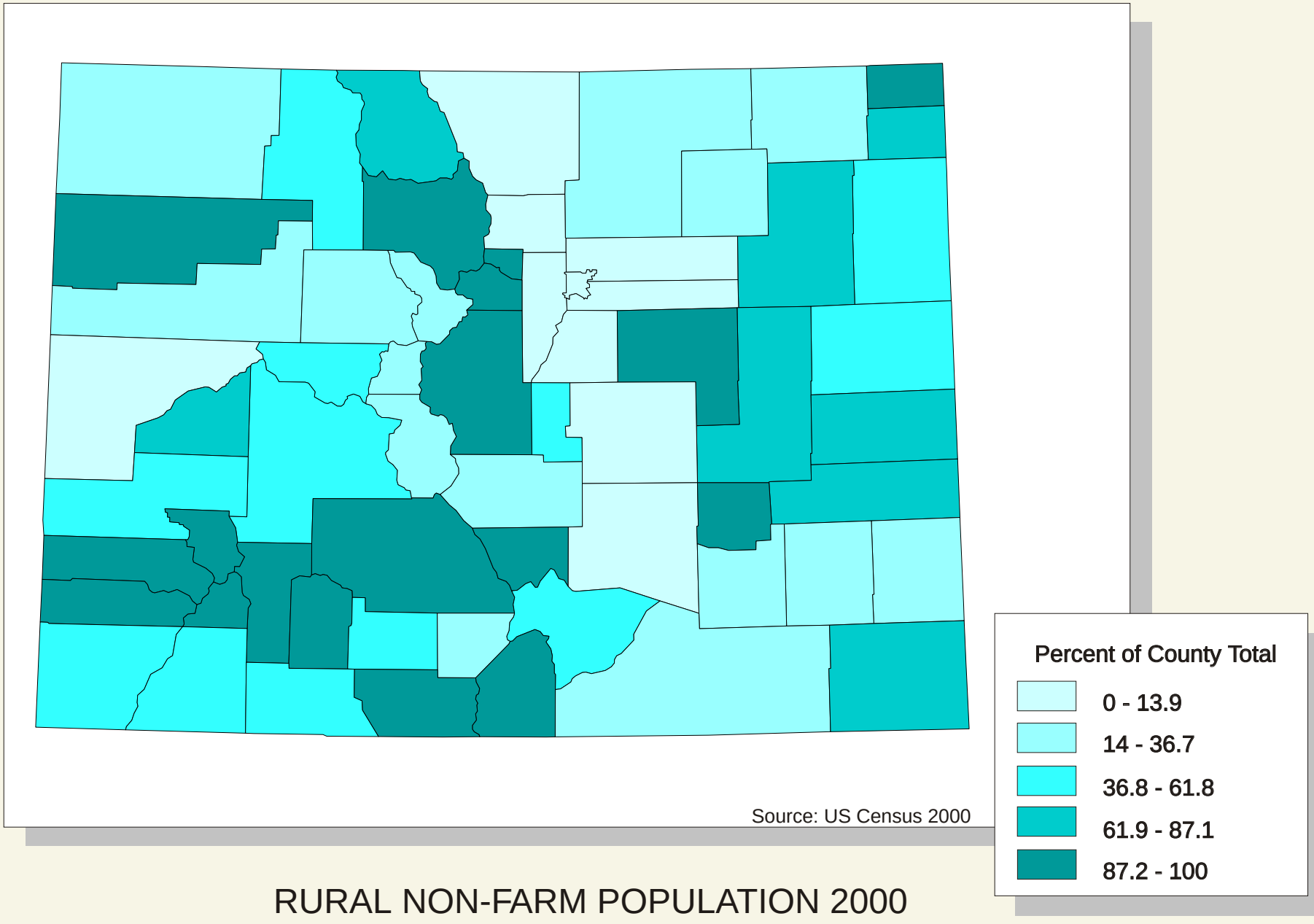
FAMILIES BELOW THE POVERTY LEVEL 1999



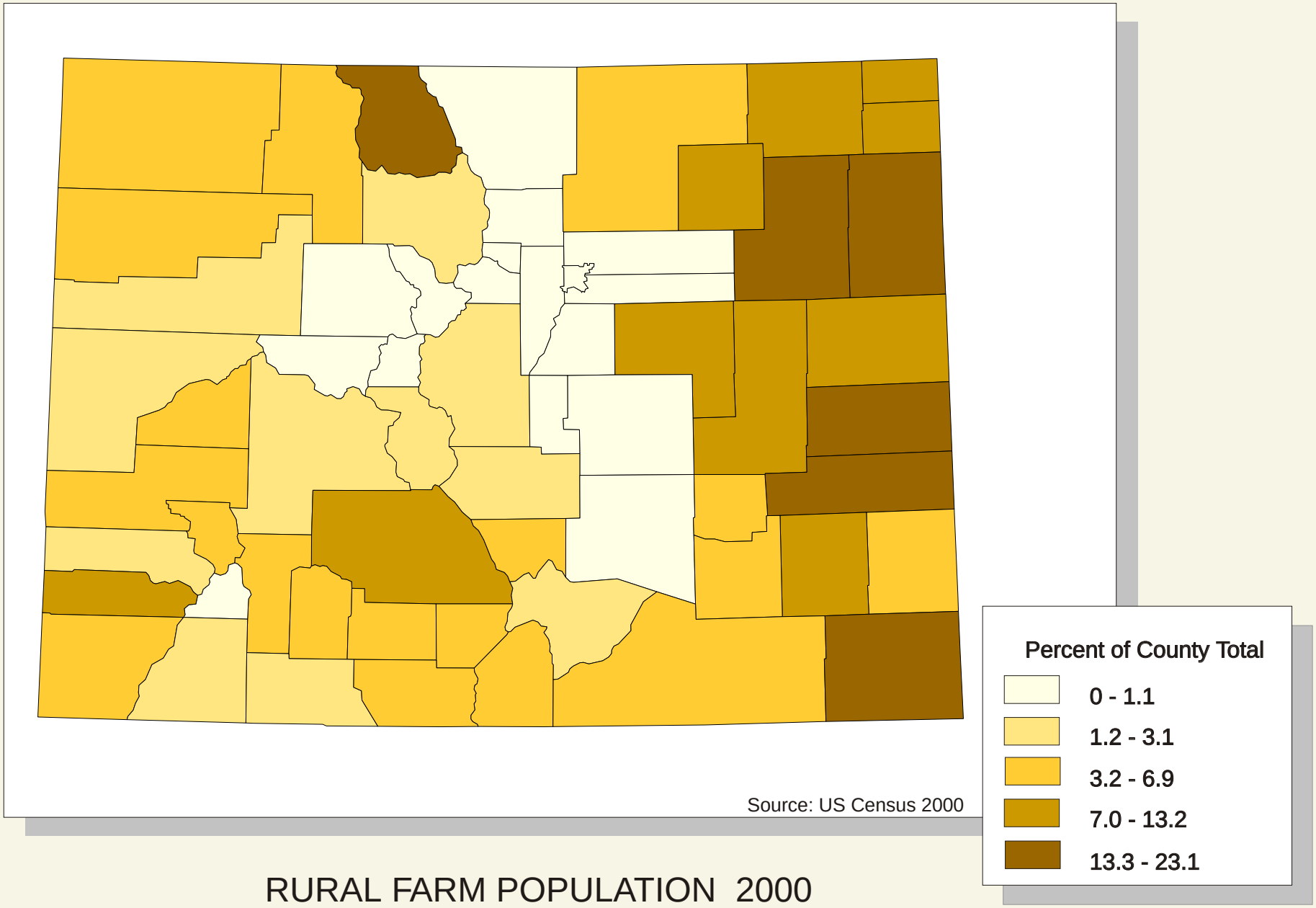
EMPLOYMENT IN AGRICULTURE, FORESTRY, FISHING AND HUNTING 2000



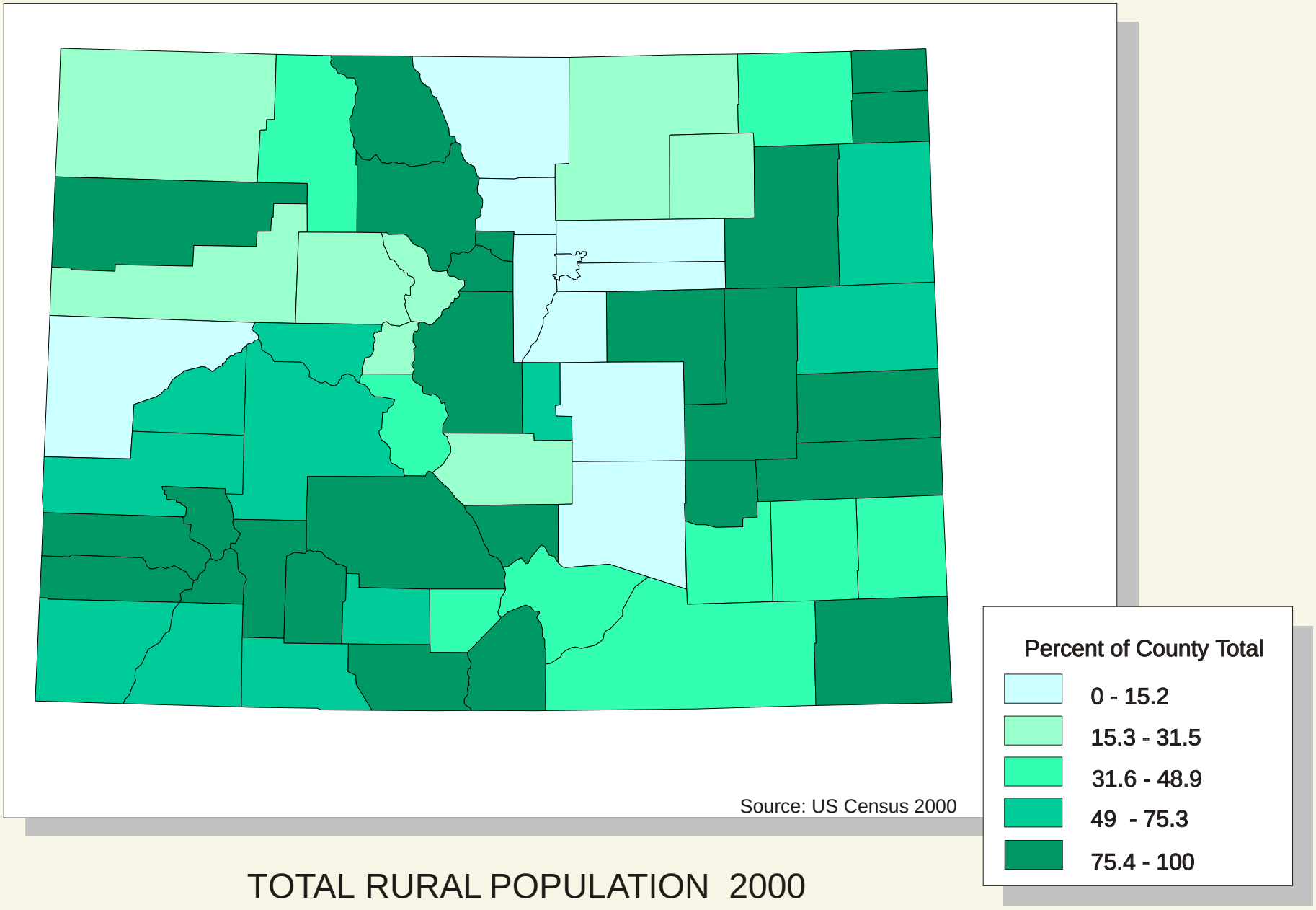
EMPLOYMENT IN MANUFACTURING 2000



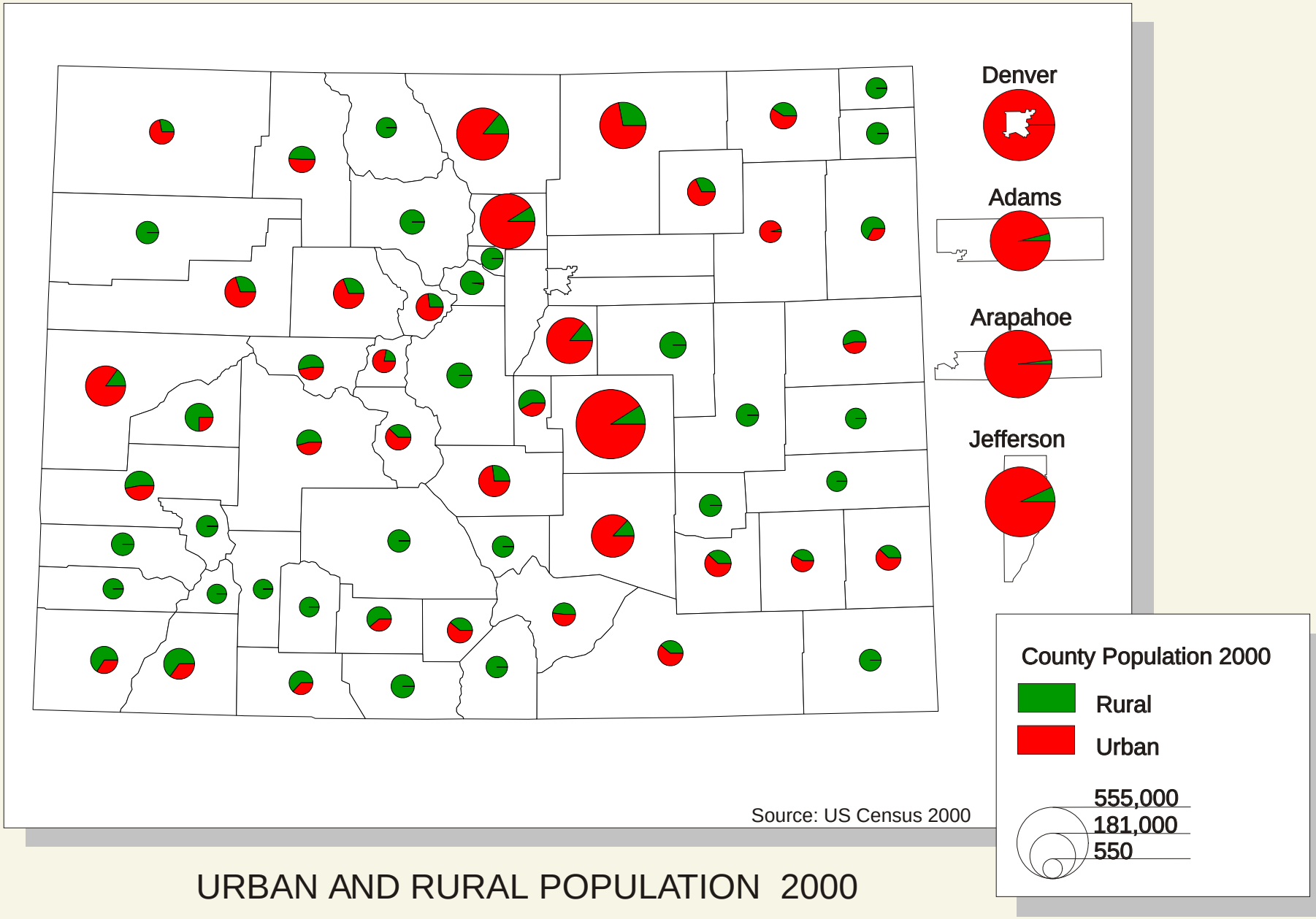
RURAL NON-FARM POPULATION 2000



RURAL FARM POPULATION 2000



TOTAL RURAL POPULATION 2000



URBAN AND RURAL POPULATION 2000

	1990	2000	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	MEDIAN	MALE
	POPULATION	POPULATION	WHITE	AFRICAN	AMERCIAN	ASIAN	HISPANIC	FOREIGN	AGE	FEMALE
COUNTY				AMERICAN	INDIAN			BORN		RATIO
Adams	265038	363857	77.3	3.0	1.2	3.2	28.2	12.53	31.4	102.8
Alamosa	13617	14966	71.2	1.0	2.3	0.8	41.4	4.7	30.6	99.0
Arapahoe	391511	487967	79.9	7.7	0.7	4.0	11.8	10.95	34.5	97.1
Archuleta	5345	9898	88.3	0.4	1.4	0.3	16.8	2.93	40.8	102.7
Baca	4556	4517	93.7	0.0	1.2	0.2	7.0	2.48	42.9	99.0
Bent	5048	5998	79.5	3.7	2.2	0.6	30.2	4.43	37.3	129.0
Boulder	225339	291288	88.5	0.9	0.6	3.1	10.5	9.36	33.4	102.2
Chaffee	12684	16242	90.9	1.6	1.1	0.4	8.6	1.99	41.8	113.6
Cheyenne	2397	2231	92.9	0.5	0.8	0.1	8.1	4.08	37.9	100.6
Clear Creek	7619	9322	96.4	0.3	0.7	0.4	3.9	1.86	40.2	108.8
Conejos	7453	8400	72.8	0.2	1.7	0.2	58.9	2.95	34.2	98.5
Costilla	3190	3663	60.9	0.8	2.5	1.0	67.6	6.88	42.1	99.8
Crowley	3946	5518	83.0	7.1	2.6	0.8	22.5	1.05	36.6	205.4
Custer	1926	3503	95.9	0.4	1.1	0.3	2.5	1.66	44.9	104.3
Delta	20980	27834	92.3	0.5	0.8	0.3	11.4	4.19	42.3	100.8
Denver	467610	554636	65.3	11.1	1.3	2.8	31.7	17.42	33.1	102.1
Dolores	1504	1844	95.3	0.1	2.0	0.4	3.9	0.92	42.4	107.2
Douglas	60391	175766	92.8	1.0	0.4	2.5	5.1	5.16	33.7	99.7
Eagle	21928	41659	85.4	0.3	0.7	0.8	23.2	18.18	31.2	121.0
El Paso	397014	516929	81.2	6.5	0.9	2.5	11.3	6.44	33	100.9
Elbert	9646	19872	95.2	0.6	0.6	0.4	3.9	1.88	37.2	100.6
Fremont	32273	46145	89.5	5.3	1.5	0.5	10.4	1.49	38.8	133.9
Garfield	29974	43791	90.0	0.5	0.7	0.4	16.7	10.42	34.2	105.6
Gilpin	3070	4757	94.4	0.5	0.8	0.7	4.3	3.38	38.3	112.7
Grand	7966	12442	95.2	0.5	0.4	0.7	4.4	3.42	36.9	112.7
Gunnison	10273	13956	95.1	0.5	0.7	0.5	5.0	2.94	30.4	118.3
Hinsdale	467	790	97.3	0.0	1.5	0.3	1.5	2.03	43.9	105.7
Huerfano	6009	7862	81.0	2.8	2.7	0.4	35.1	1.63	41.7	118.8
Jackson	1605	1577	96.2	0.3	0.8	0.1	6.5	1.9	40.5	101.4
Jefferson	438430	527056	90.6	0.9	0.8	2.3	10.0	5.39	36.8	99.0
Kiowa	1688	1622	96.1	0.5	1.1	0.0	3.1	1.42	39.7	100.0
Kit Carson	7140	8011	87.3	1.7	0.5	0.3	13.7	5.79	37.4	112.2
La Plata	32284	43941	87.3	0.3	5.8	0.4	10.4	2.66	35.6	103.6
Lake	6007	7812	77.6	0.2	1.3	0.3	36.1	15.58	30.5	115.8
Larimer	186136	251494	91.4	0.7	0.7	1.6	8.3	4.26	33.2	99.9
Las Animas	13765	15207	82.6	0.4	2.5	0.4	41.5	2.35	40.9	95.8
Lincoln	4529	6087	86.3	5.0	0.9	0.6	8.5	1.76	37.8	130.9
Logan	17567	20504	91.7	2.1	0.6	0.4	11.9	3.09	36.5	112.0
Mesa	93145	116255	92.3	0.5	0.9	0.5	10.0	2.96	38.1	96.0
Mineral	558	831	96.9	0.0	0.8	0.0	2.1	0.72	45	104.2
Moffat	11357	13184	93.6	0.2	0.9	0.3	9.5	4.14	35.4	107.7
Montezuma	18672	23830	81.7	0.1	11.2	0.2	9.5	2.17	38	96.7
Montrose	24423	33432	90.0	0.3	1.0	0.4	14.9	5.57	38.8	97.0
Morgan	21939	27171	79.7	0.3	0.8	0.2	31.2	14.63	33.5	100.4
Otero	20185	20311	79.0	0.8	1.4	0.7	37.6	4.87	37.7	95.6
Ouray	2295	3742	96.3	0.1	0.9	0.4	4.1	3.21	43.4	102.1
Park	7174	14523	95.1	0.5	0.9	0.4	4.3	2.18	40	107.1
Phillips	4189	4480	93.0	0.2	0.3	0.4	11.8	8.1	39.8	93.4
Pitkin	12661	14872	94.3	0.5	0.3	1.1	6.5	10.87	38.4	115.1
Prowers	13347	14483	78.6	0.3	1.2	0.4	32.9	10.61	32.4	101.0
Pueblo	123051	141472	79.5	1.9	1.6	0.7	38.0	2.96	36.7	95.8
Rio Blanco	5972	5986	95.0	0.2	0.8	0.3	4.9	3.16	37.5	101.9
Rio Grande	10770	12413	73.9	0.4	1.3	0.2	41.7	6	37.3	97.1
Routt	14088	19690	96.9	0.1	0.5	0.4	3.2	4.08	35	116.6
Saguache	4619	5917	71.3	0.1	2.1	0.5	45.3	14.48	36.9	101.7
San Juan	745	558	97.1	0.0	0.7	0.2	7.4	2.51	43.7	110.6
San Miguel	3653	6594	93.6	0.3	0.9	0.7	6.7	7.28	34.2	120.8
Sedgwick	2690	2747	90.5	0.5	0.2	0.8	11.4	2.73	43.2	100.1
Summit	12881	23548	91.8	0.7	0.5	0.9	9.8	11.63	30.8	139.0
Teller	12468	20555	94.9	0.6	1.0	0.6	3.5	1.8	39.4	102.7
Washington	4812	4926	96.4	0.0	0.6	0.1	6.3	2.52	40.2	103.4
Weld	131821	180936	81.7	0.6	0.9	0.8	27.1	9.26	30.9	100.6
Yuma	8954	9841	94.2	0.1	0.3	0.1	12.9	7.91	37.3	96.8

Mesa Verde

Humans have resided in the territory of present-day Colorado for at least 12,000 years. However, the best evidence of the earliest "developed" occupance comes from the southwestern corner of the state. A people generally termed the Anasazi or "Ancient Ones" left notable stone dwellings at Mesa Verde and numerous other sites. For perhaps a thousand years the Anasazi hunted, gathered, farmed, and even irrigated their fields here before departing about 1300 A.D.

Bent’s Old Fort

Trapping and fur trading brought the first significant and semi-permanent settlement of United States' citizens into the territory of Colorado. Bent's Old Fort, dated from 1835, was situated on the Arkansas River at a point where the tribal territories of the Ute, Cheyenne, and Pawnee converged. It was also a location accessible to beaver trappers in the Rockies, bison (buffalo) hunters on the plains, and Mexican traders from northern New Mexico and the San Luis Valley.

Pelts and Hides

Trade goods were brought by wagon, usually from St. Louis, Missouri, to be sold or traded to the "mountain men" and the local tribes. These included guns, gunpowder, knives, cloth, beads, mirrors, blankets, kettles, among others. Initially, beaver pelts dominated the cargoes carried by wagon to the east, but bison hides later became the staple. Today, a reconstructed Bent's Old Fort faithfully recreates the sights and sounds of that historic era.

Sand Creek

There is little evidence today of what some called a battle, but others refer to as a massacre. In the early morning of November 29, 1864, the Colorado Third Regiment, a group of volunteers, attacked six to seven hundred Cheyenne and Arapahoe camped at this site on Sand Creek. The attack was allegedly retaliation for raids that had brought most commerce and travel in eastern Colorado to a standstill. When the fighting ceased many Cheyenne and Arapahoe lay dead, including women and children.

Fort Garland

War broke out with Mexico in 1846 and the United States took control of all the territory that was to become Colorado. By this time the San Luis Valley had a growing population of Hispanic farming families, as well as various hunters and gold seekers. In order to protect this population, and to secure control of the land, the U.S. government established Fort Garland in 1858. Soldiers from the Fort, led at times by the frontiersman Kit Carson, carried out campaigns against the Utes.

Church at Conejos

The first permanent "European" colonization in the future Colorado was by Mexican settlers in *El Valle San Luis* (San Luis Valley). In 1833, settlers pushing up the valley of the Rio Grande attempted to settle the Conejos Land Grant. The initial effort was abandoned but in 1851 farm families established themselves permanently at San Luis. Here at Conejos (Spanish for “rabbits”), Colorado's oldest church was established in 1858.

Leadville

Minerals spawned the first sizeable settlements in Colorado's mountains. Boomtowns sprang up literally in days, only to decline almost as quickly when the gold or silver "played out." Leadville had two boom periods, a short-lived gold rush in 1860-61, followed in 1877-1880 by a much larger silver boom. Today the area is one of the largest U.S. Superfund clean-up sites. Local streams, including the Arkansas River, are contaminated by heavy metals that originate in flooded mine shafts and are leached from the extensive tailings that dot the hills.

Land Development

For some years, inexpensive, dry farmland east of the Denver Metro area has attracted exurban residential development, especially small hobby farms and ranchettes. With the completion of DIA, that process has been accelerated. As the state improves and increases transportation links to the new airport, realtors' signs spring up to line these route ways.

Vail Ski Slopes

Begun in the 1960s as a planned ski resort, Vail is now the center of one of the largest areas devoted to skiing in the U.S. A combination of topography, snowfall, and location along Interstate Highway 70 has contributed to the success of Vail, which is frequented by Colorado residents from the populous Front Range region and skiers from across the nation. Increasing attention is being given to making Vail a year-round resort with the construction of golf courses, biking trails, and conference centers.

Vail Valley Development

Vail, along with several other Colorado mountain towns, has become representative of a "Rocky Mountain lifestyle." Increased wealth, leisure time, mobility, and communications media make it feasible for more and more people to live away from their place of employment. However, Vail's narrow valley setting is linked to space problems, crowding, and a degree of air pollution, precisely the things many of its residents came here to escape.

Ranch Directories

Since statehood, Colorado's population has grown consistently, and often rapidly. However, the distribution of population is very uneven. In the eastern plains densities are low, towns are few, and ranches or farms are often so widely scattered that directories are provided to guide the visitor. The twenty-eight ranches listed cover an area of approximately three hundred square miles, meaning the average ranch is more than ten square miles (6,400 acres) in size.

Denver Metro Area

Denver and its suburbs, the Census defined Primary Metropolitan Statistical Area (PMSA), account for one-half of Colorado's population. This metropolitan zone is also the core of a region popularly called the "Front Range" which contains approximately 80 percent of the state's residents. Although not officially defined, the Front Range is a thirty-to-forty-mile broad corridor running parallel to the eastern edge of the Rockies and extending almost continuously from Fort Collins in the north to Colorado Springs in the south.

Douglas County

Several times in recent years Douglas County, Colorado has been identified as the fastest or second-fastest growing county in the United States. The county, formerly lightly settled ranching country, is situated midway between Denver and Colorado's second largest city, Colorado Springs. Commuters and realtors are rapidly converting this county into exurban developments or "ranchettes."

AGRICULTURE AND RURAL LAND USE

As one travels across Colorado there is often the impression that much of the land is devoted to agriculture of one sort or another. Herds of cattle and sheep graze in the mountains, plateaus, and plains of the state, or they fill huge feedlots. In the major river valleys, fields of corn, beans, sugar beets, alfalfa, and vegetables, as well as orchards of apples, peaches, cherries, and grapes appear to fill the landscape. Elsewhere, it is common to encounter broad fields of small grains, especially wheat and barley.

Colorado is an important agricultural state. Among all the states, Colorado ranks 10th or higher for more than thirty-five of the commodities produced on its farms and ranches. Still, perceptions can be misleading. For example, less than 3 % of the resident population is directly involved in agriculture. Moreover, almost one-half of all counties are experiencing a decrease in the amount of land devoted to farming. Many things account for this, including land taken out of production for conservation purposes, competition for water, and land converted to residential or other non-agricultural uses.

READING THE MAPS

The first map in this series uses a technique called graduated pie-charts to convey patterns of RURAL LAND USE. Typically the colors are the first element to attract attention. These depict one or more of three land use classifications for each county. From these it is possible to quickly judge if a county's land area is primarily devoted to crops, pasture and rangeland, or woodland. Notice also that the size of the circle (or pie) represents the total amount of land in the three uses just listed. Be aware also that some counties with large land areas may have relatively small pie charts. In such cases much of the county's land may be owned by the Federal Government and thus does not get classified according to our three-fold land use classification.

Two patterns emerge at once. Eastern and northeastern Colorado contain much land that is farmed, meaning that it is normally planted to some type of crop. Yet this same region also has significant amounts of pasture and rangeland. The second impression created by this map is that throughout Colorado much land is classified as pasture and rangeland. Some of this is actively grazed by cattle and sheep, but some of the land in this use is actually idle or has little agricultural production. However, notice also that much of the land in counties in the mountains is not classified as woodland but as pasture. Mountain lands are often used for summer grazing and thus fall into the classification of pasture and rangeland even when they may be forested.

* * *

The map of CROPLAND HARVESTED CHANGE 1949 TO 1997, must be examined with care. Notice in the legend that three of the four classes depicted represent a reduction or loss of cropland that is harvested. As mentioned in the introduction, agriculture in Colorado is experiencing significant change, but the change is not uniform.

Two regions are evident in which cropland increased between 1949 and 1997. The eastern region contains seven counties, five of which are along the Colorado-Kansas border. If you glance back at the RURAL LAND USE map it is clear that in these counties cropland constitutes one-half or more of each counties' area. This is truly rural Colorado and there is little competition for land apart from agriculture.

Cropland is also being expanded in and around the San Luis Valley in south central Colorado. Potatoes, malting barley, and lettuce are among the dominant crops in this region of growth. Notice again that this is a very rural portion of the state,

One factor linking the two cropland growth regions is a very modest rate of population growth. Between 1990 and 2000, the eastern region grew by 9 %. However, if Adams County is excluded (since it extends into the Denver Metro area) the growth rate drops to just over 4%. In the southern region the

decade of the 1990s produced a 17% increase in population. But neither region came close to matching Colorado's overall growth for the period, which exceeded 30%. What emerges are two regions with expanding cropland but comparatively little growth in population. This is made possible by modern agriculture in which fewer people farm more by heavy reliance upon mechanization.

* * *

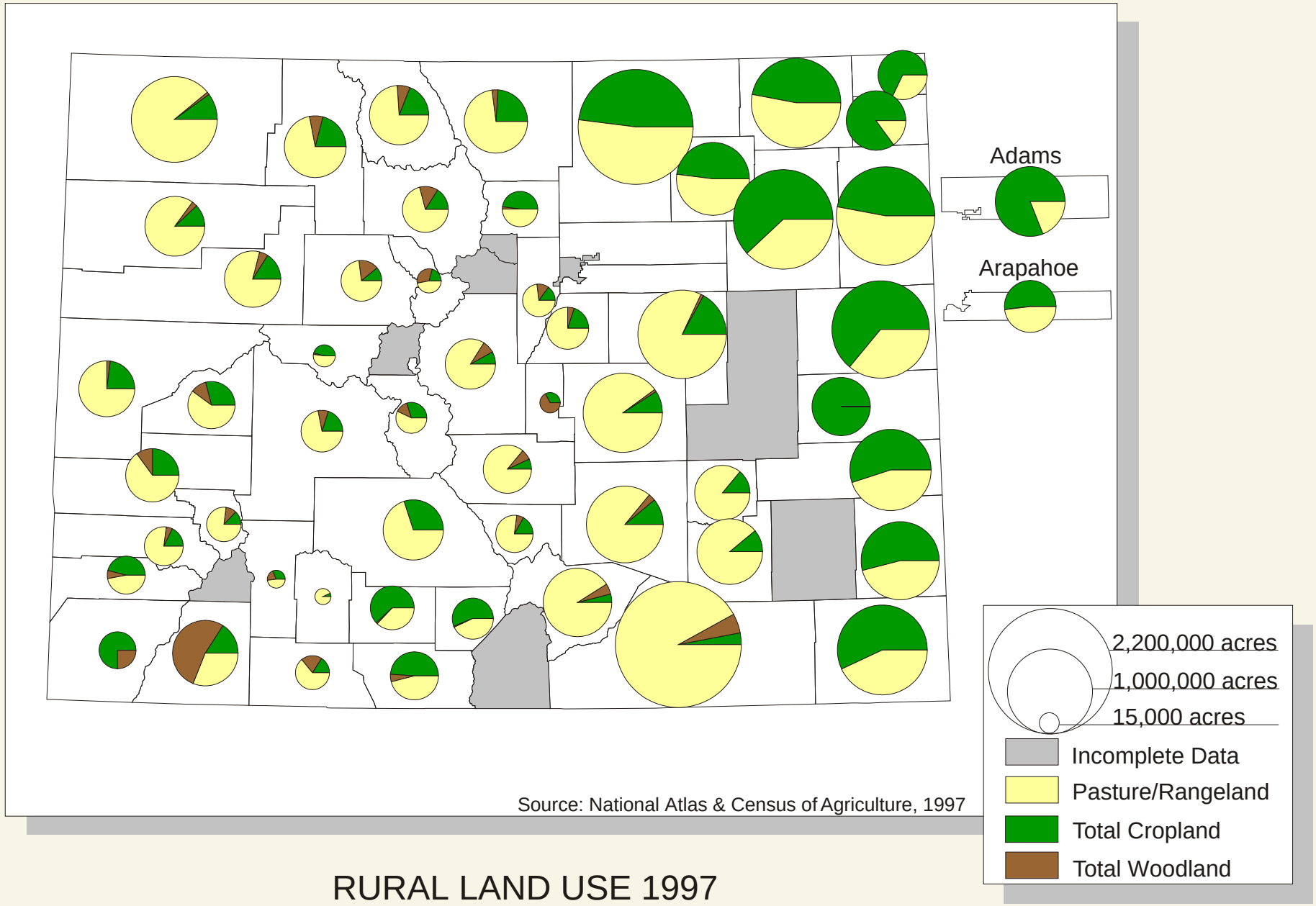
The collection of agriculture-related maps that follows includes both choropleth and dot-distribution maps. A variety of information is depicted including farm and ranch characteristics and crop and livestock distributions. The dot-distribution maps may be somewhat unfamiliar at this point. Remember this about such maps. Each dot represents a certain quantity of the item being depicted. By viewing the concentration or dispersion of dots, that is their relative density within a county, an impression of comparative importance is gained. Also, it is important to remember that the dots do not represent the actual location of the item being mapped. Rather, the computer program used to generate these maps randomly distributes the dots within the counties' boundaries.

QUESTIONS TO THINK ABOUT

While Colorado is a relatively large state (in area the 8th largest in the U.S.), there are a number of conditions that might limit how much its farms and ranches can produce. A partial list of these conditions or factors includes the portion of the state that is mountainous, the high average elevation of Colorado, and the relative aridity.

Can you discover on the maps of AGRICULTURE AND RURAL LAND USE patterns that reflect these physical constraints? Or patterns that suggest ways in which Colorado's residents have worked to overcome such constraints?

Economic, social, and political conditions also impact Colorado's agriculture. Can you think of any? Perhaps you can interview a farmer or rancher about his business. There are also books, magazines, and websites that provide information about agriculture. A good starting point is http://www.ag.state.co.us/ the URL for the Colorado Department of Agriculture.



Source: National Atlas & Census of Agriculture, 1997

RURAL LAND USE 1997

RURAL LAND USE 1997

READING THE MAP*

Segmented, proportional circles, also called pie charts, convey two types of information. In the current map it is possible to see the comparative or relative use of land within each county. Then, by comparing the size of the circles and their relative segmentation, one can make comparisons between or among counties.

Green was chosen as a strong color and symbolic of cropland, i.e., things being grown. It is immediately apparent that the eastern Colorado plains dominate in terms of the relative amount of land that is devoted to farming. Remember, this does not necessarily mean that production of crops is always greatest in the counties with the largest circles and the highest share of green, though that would be a reasonable association in most cases. Also remember that the measure is total cropland and does not distinguish between crops that are irrigated and those that are not.

Modern mechanized farming is best performed on flat to gently sloping terrain. For this reason eastern Colorado stands out in terms of the proportion of its area that is cultivated or farmed. However, with one exception even the plains counties have mixed land use. Some of the factors that influence whether land is used for crops or pasture/rangeland are availability of water, soil types, and terrain. At different times in Colorado's history much land that was perhaps best suited for grazing cattle was plowed in order to plant crops. One such episode in the late nineteenth and early twentieth centuries contributed to the infamous Dust Bowl of the 1930s. More recently, the ability to pump water from underground sources has allowed former rangeland to be farmed successfully.

The relatively small fraction of land in crops in central and much of western Colorado is explained by both terrain and water availability. The Rocky Mountains do not typically lend themselves to cultivation except in river or valley bottoms. To a lesser degree this is true of the plateau regions of western Colorado as well.

Note that with the exception of La Plata County, very little land use is classified as Woodland. This classification is understandably most common in Colorado's

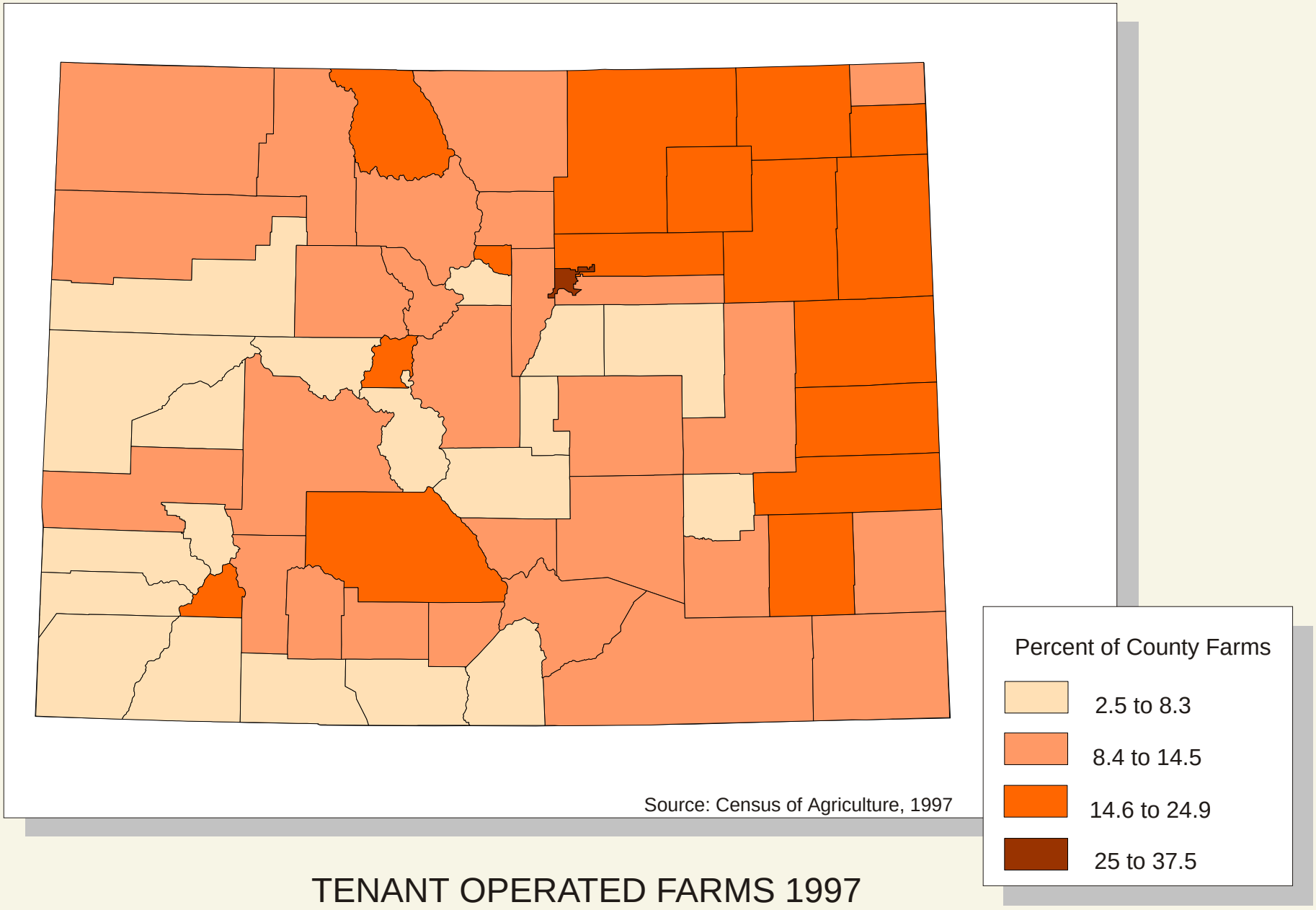
mountain counties. However, many forested areas of the state are also used for grazing and this may reduce the Woodland designation by shifting some of it into the Pasture/Rangeland category.

***NOTE:** It appears that Adams and Arapahoe Counties have been moved into Kansas. In fact, the circles for these two important counties could not be fitted into their actual location and instead had to be shown as an inset. This is a common cartographic technique.

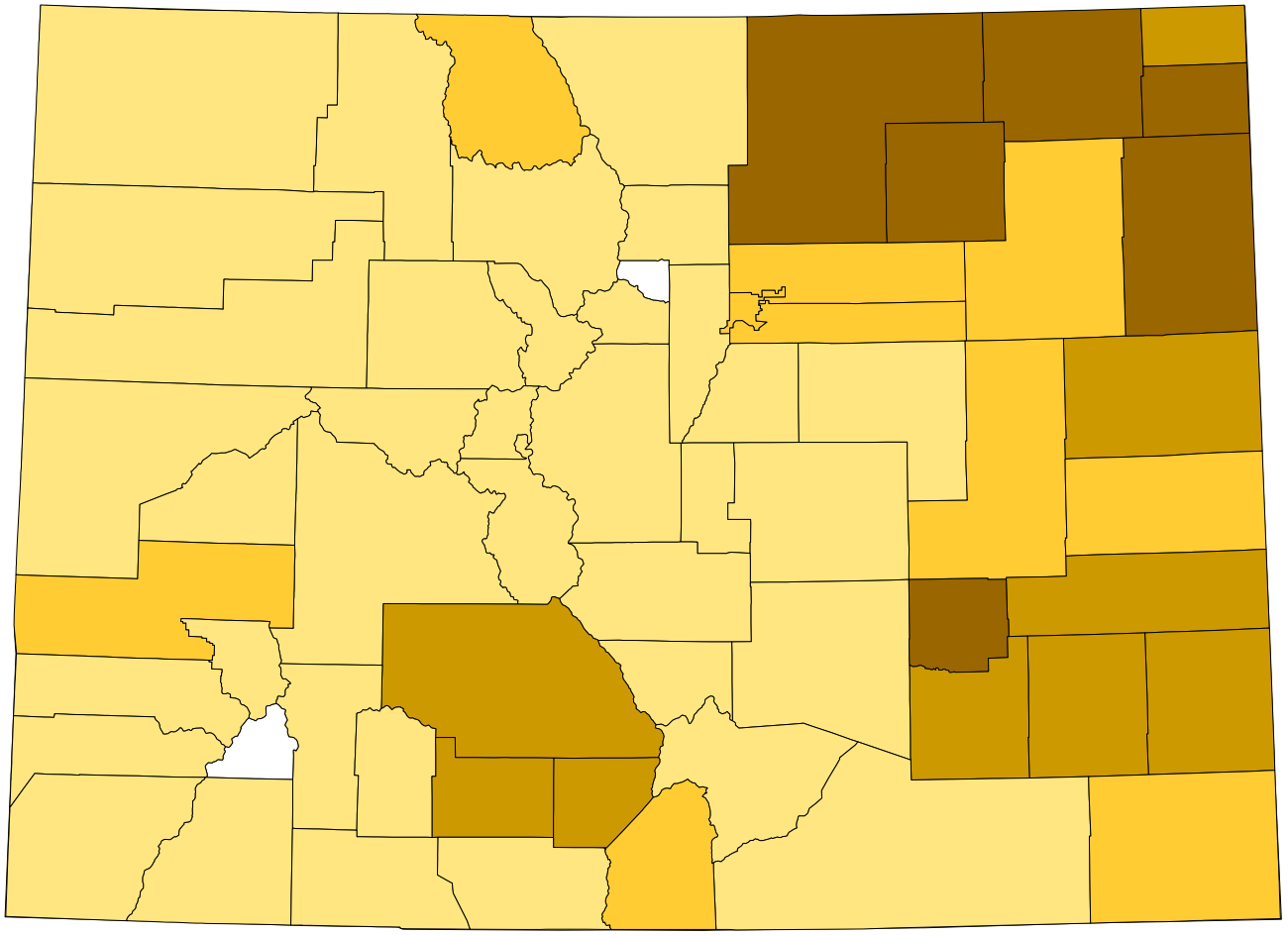
QUESTIONS TO THINK ABOUT

Most counties that are large in area have large land use circles or pies, e.g., Kit Carson, Las Animas, Washington, Weld, and Yuma counties. However, this is not always the case. Look for counties where the circle is much smaller than the county. How do you explain this? Are there other land use classifications that might account for the rest of the land in these counties? What might these be?

What changes or kinds of things might cause a shift in rural land use in Colorado? Can you anticipate factors that would cause cropland to be converted to pasture, or pasture to be converted to cropland? What might produce a change in the percent of land in Woodland? Are these factors related to the natural environment, changes in population, new laws, the state or national economy?



TENANT OPERATED FARMS 1997



Source: Census of Agriculture, 1997

Average Per Farm
(In US Dollars)

- Data Not Published
- 0 to 77,414
- 77,415 to 135,888
- 135,889 to 288,652
- 288,653 to 537,247

VALUE OF AGRICULTURAL PRODUCTS SOLD 1997

VALUE OF AGRICULTURAL PRODUCTS SOLD 1997

READING THE MAP

When viewing a choropleth map the eye is naturally drawn first to the pattern of colors or shades, especially the darker ones. However, it is important to quickly turn attention to the legend to understand what is being depicted and how that depiction is organized. In the present map the critical unit is **average** value of products sold **per farm** or **ranch.** Notice also that the range of values depicted in the four class intervals range tremendously, from 0 to more than half a million dollars in sales for an individual agricultural enterprise in a single year.

A first impression is that northeastern Colorado contains a majority of the counties with the highest average sales. Three of the counties are in the South Platte Valley, with two others adjacent. Notice next a region of five counties, one in the highest interval and four in the next highest. These occur in southeastern Colorado's Arkansas River Valley. Finally, there is a three-county region in the next to highest interval in southern Colorado corresponding to the northern end of the San Luis Valley. At this point you should be asking yourself if there is a common trait or situation that links these three highly productive regions, that is, beyond their productivity. The most evident commonality is that all three contain sizeable areas of irrigated agriculture. There may be others.

One should not assume that only the counties in the upper class intervals contain productive agriculture. Remember, the map is showing the value of sales for the **average** farm or ranch for that entire county. Other counties may have some very productive farms or ranches, but the presence of many less-productive units brings the county average down. Indeed, in some Colorado counties farms and ranches are being broken up into smaller parcels for people who want to live in the country and perhaps farm or raise livestock on a small scale. It also may be that for the year indicated (1997), the value of the products sold is not indicative of the normal productivity of farms or ranches. Some of Colorado's larger agricultural holdings, including dryland grain farms and ranches, have not been consistently productive in given years owing to a

variety of factors. These include weather conditions, plant or livestock diseases, and uncertain markets or prices for the commodities in which these large operations specialize.

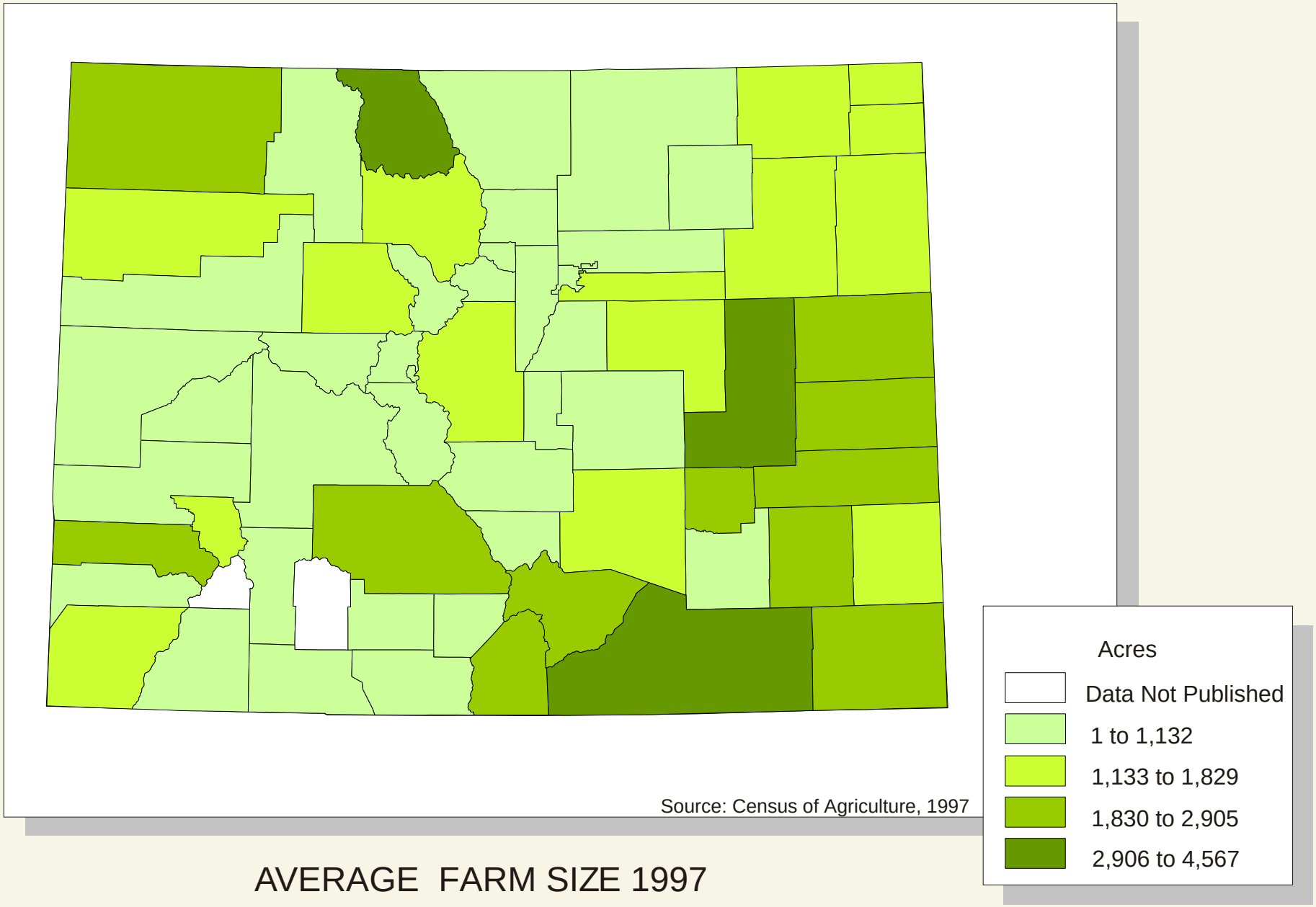
QUESTIONS TO THINK ABOUT

What, then, does the map tell you? Mainly this: you are more likely to find in the counties in the highest class interval (dark brown) farms or ranches that sold significant quantities of goods in 1997. It does not mean that all the agricultural operations in these counties are highly productive; nor should you assume there are no highly productive farms or ranches in the other intervals, even the lowest (light yellow). Remember you are dealing with county-wide **averages**.

Do you think farming and ranching conditions in Colorado were the same or different compared to 1998, or 2000, or 2004? Remember that farmers and ranchers must deal with many environmental conditions that can change from year to year or even week to week. What are some of these? Examples can include precipitation (too little or too much), temperatures (too high or too low), wind, hail, and various pests or diseases. Even the report of diseases elsewhere, such as “Mad” Cow Disease, can have a great impact on what a rancher or cattle feeder receives for his animals.

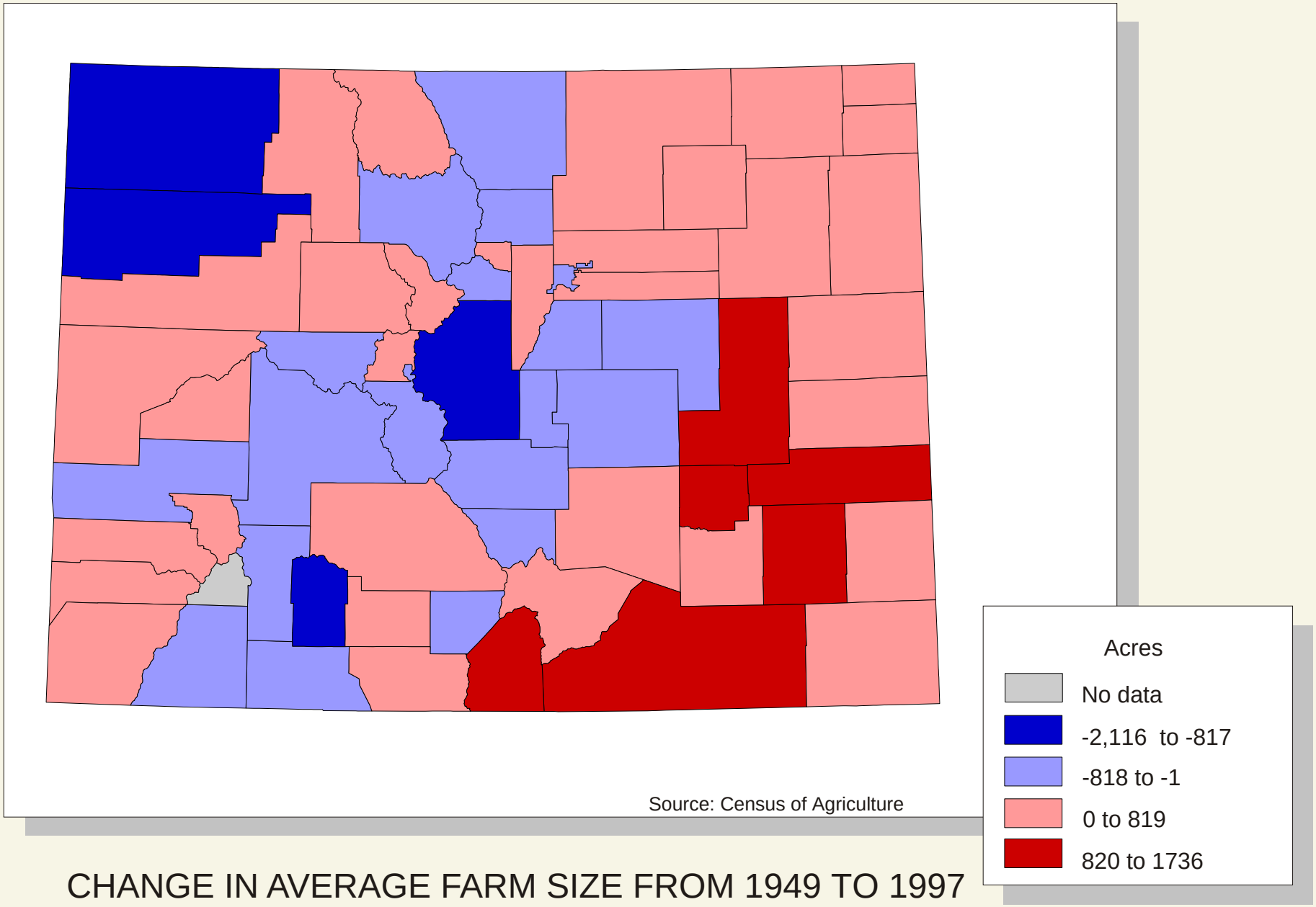
How do you explain the apparent relationship between location, irrigation, and agricultural production in Colorado? Which crops or products require irrigation? Which do not? Can livestock benefit from being in irrigated regions?

If a map shows conditions or a situation for just one particular year, is that good? Might there be a better or more accurate way to depict information? Would a multi-year average be a better way to measure and map some topics? Does it depend upon the topic you are trying to analyze and explain? When we choose information to map, what kinds are basically the same year after year and what kinds can change frequently?

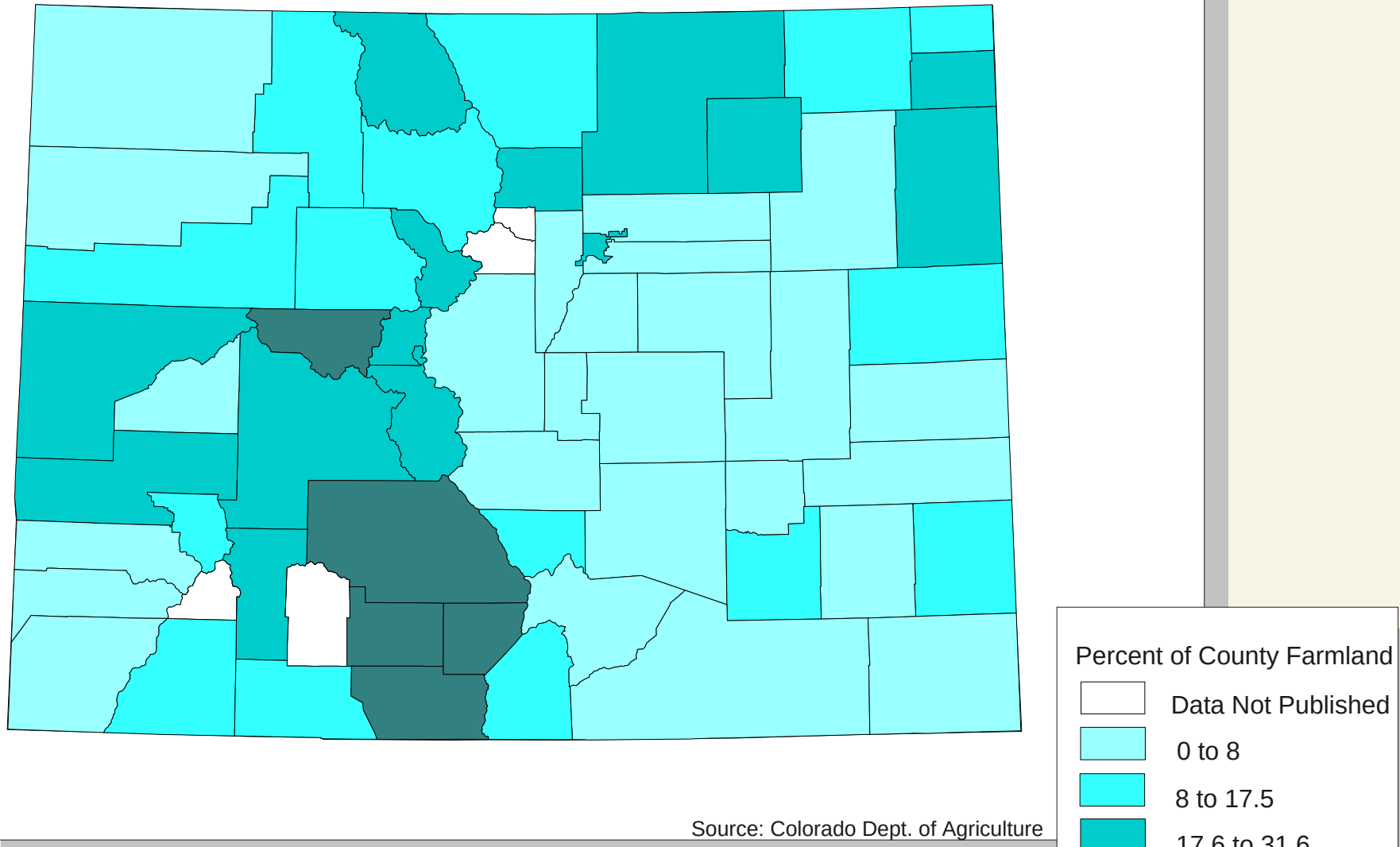


Source: Census of Agriculture, 1997

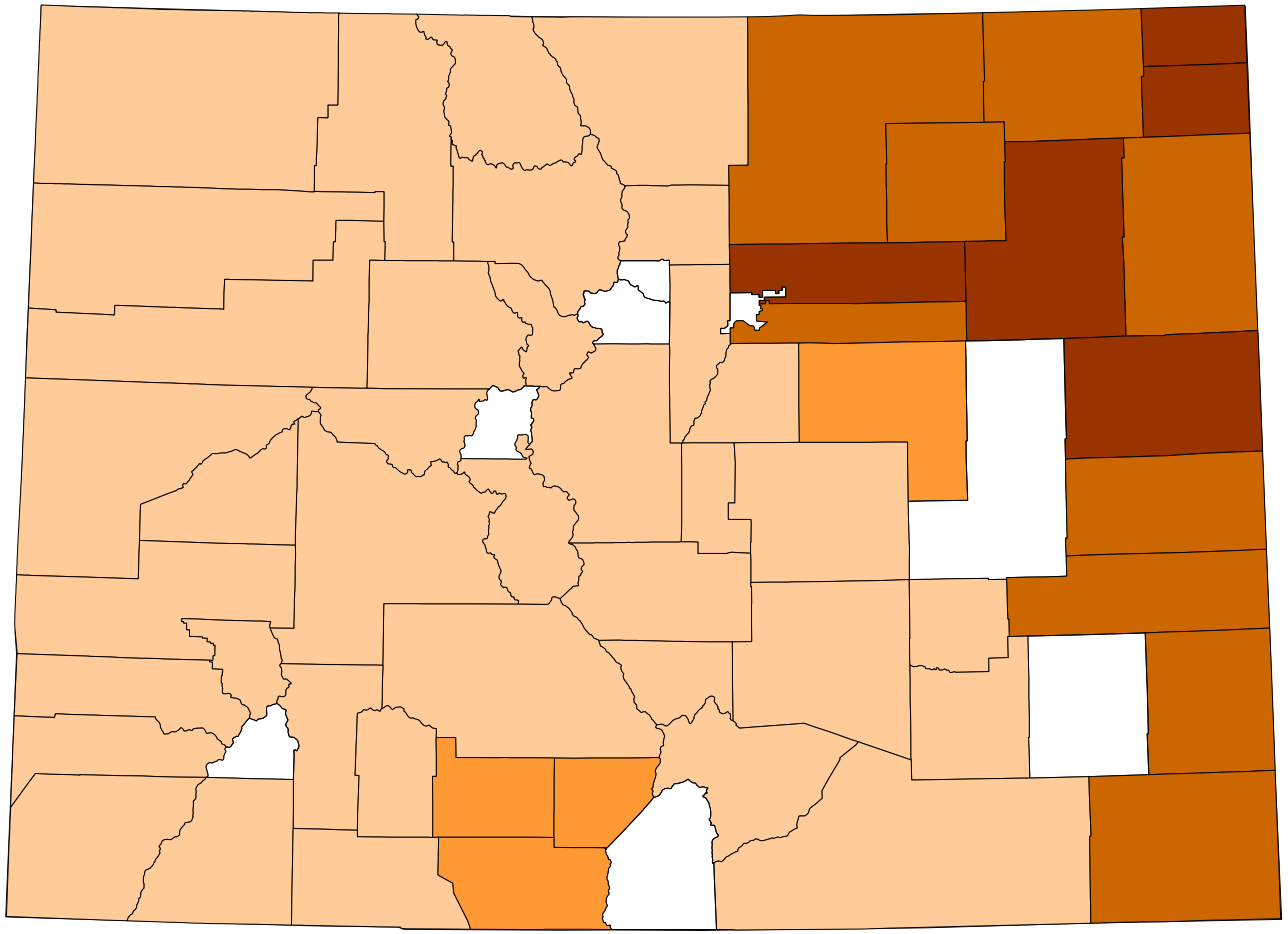
AVERAGE FARM SIZE 1997



CHANGE IN AVERAGE FARM SIZE FROM 1949 TO 1997



IRRIGATED LAND 1997

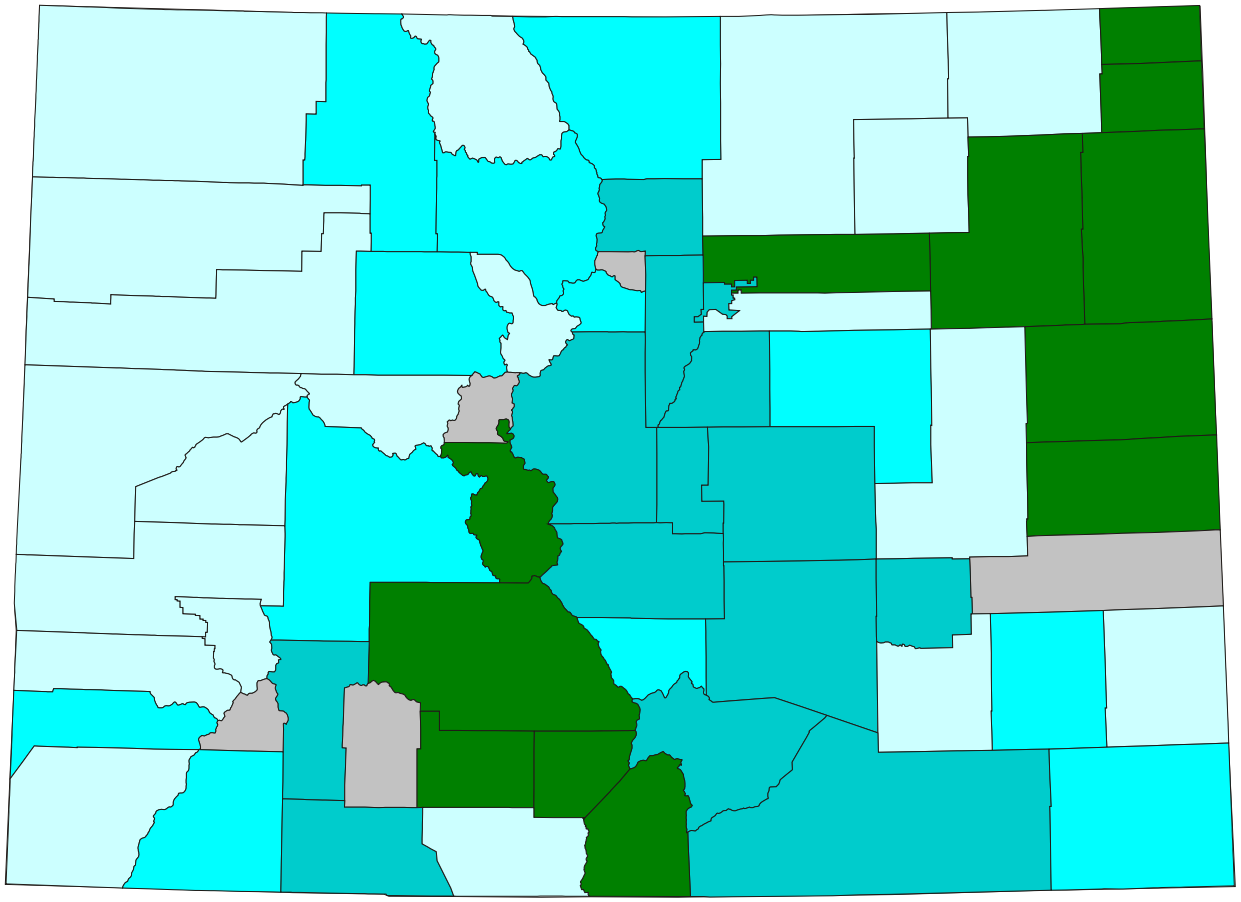


Source: Census of Agriculture, 1997

Percent of County Land

- Data Not Published
- 0 to 12.2
- 12.3 to 23.3
- 23.4 to 44.2
- 44.3 to 88

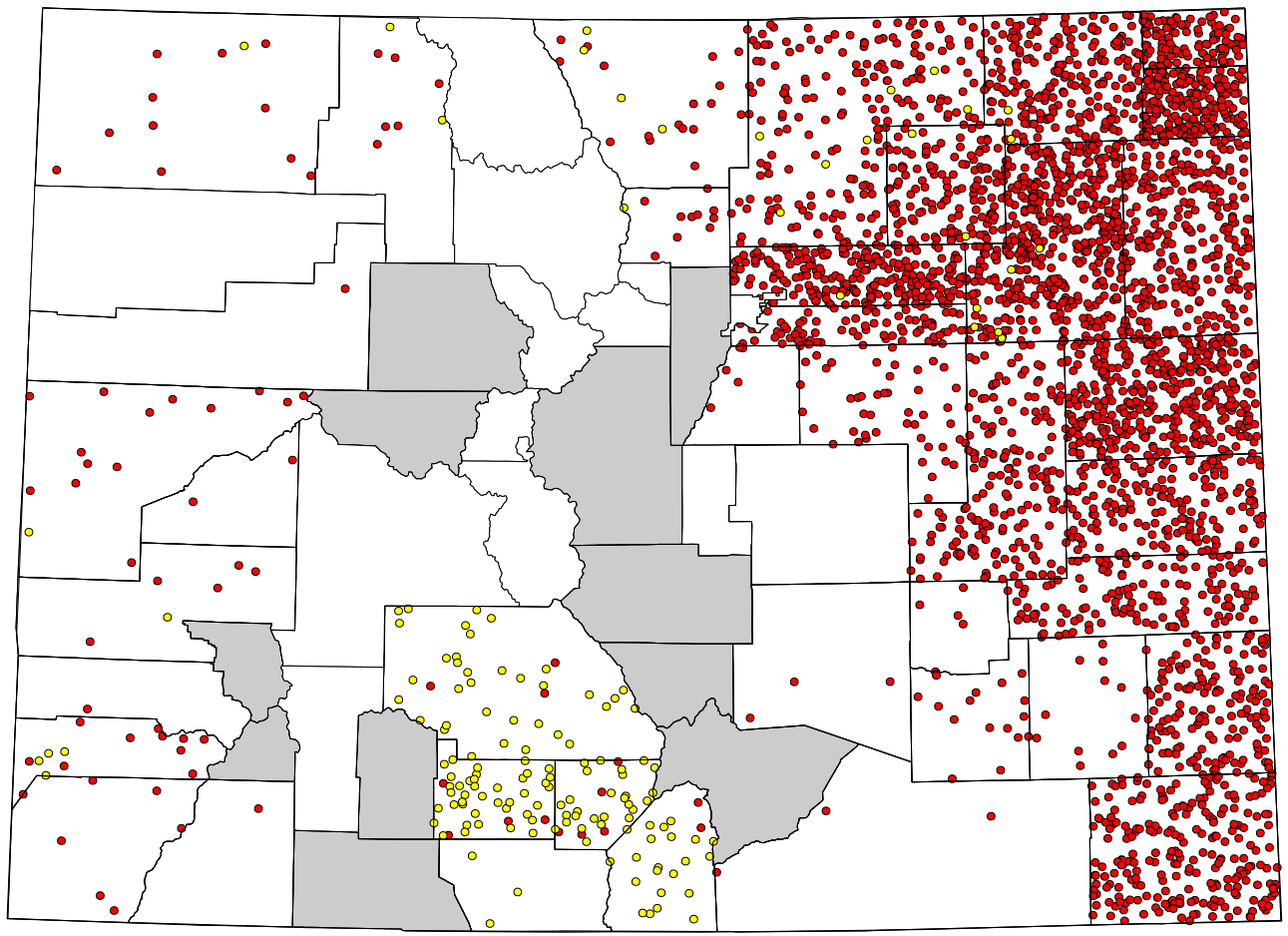
AREA IN CROPLAND 1997



Percent
Data Not Published
-96.7 to -52.4
-52.3 to -27.7
-27.6 to -0.1
0 to 29.2

Source: Census of Agriculture, 1950 & 1997

CROPLAND HARVESTED CHANGE 1949 TO 1997



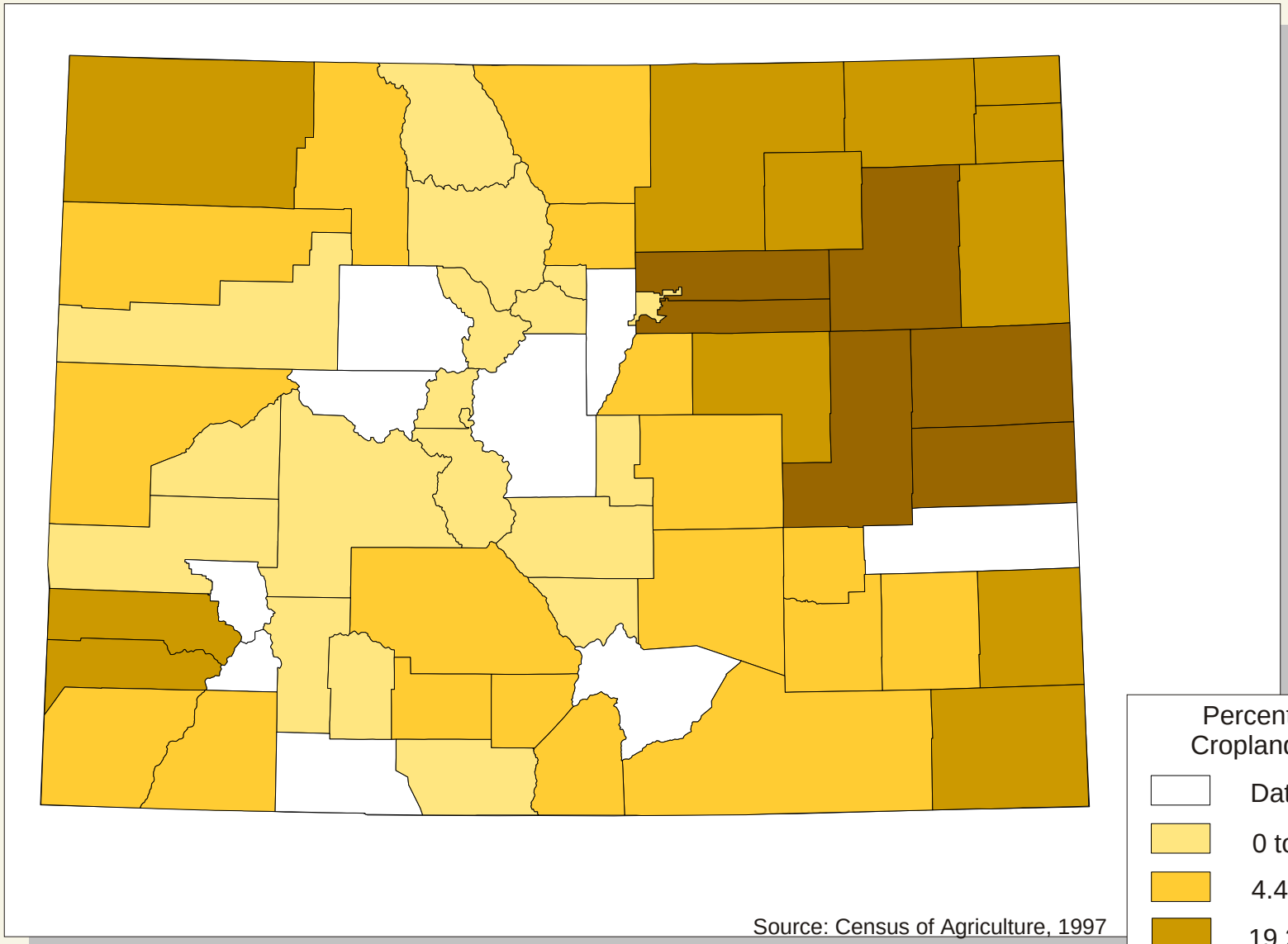
Source: Colorado Dept. of Agriculture

1 Dot = 20,000 Bushels of Spring Wheat

1 Dot = 20,000 Bushels of Winter Wheat

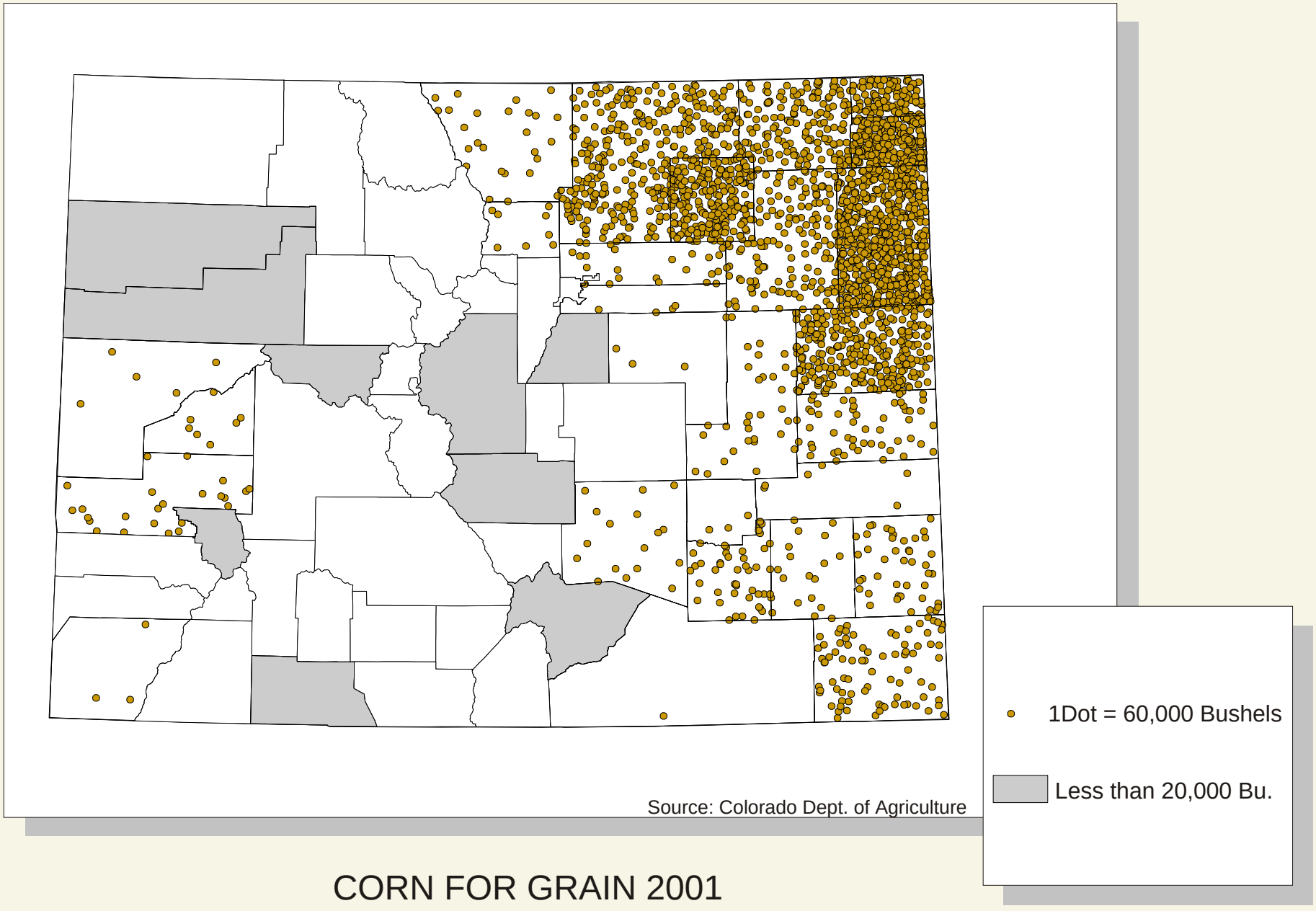
Less than 3,000 Bu.

WHEAT PRODUCTION 2001

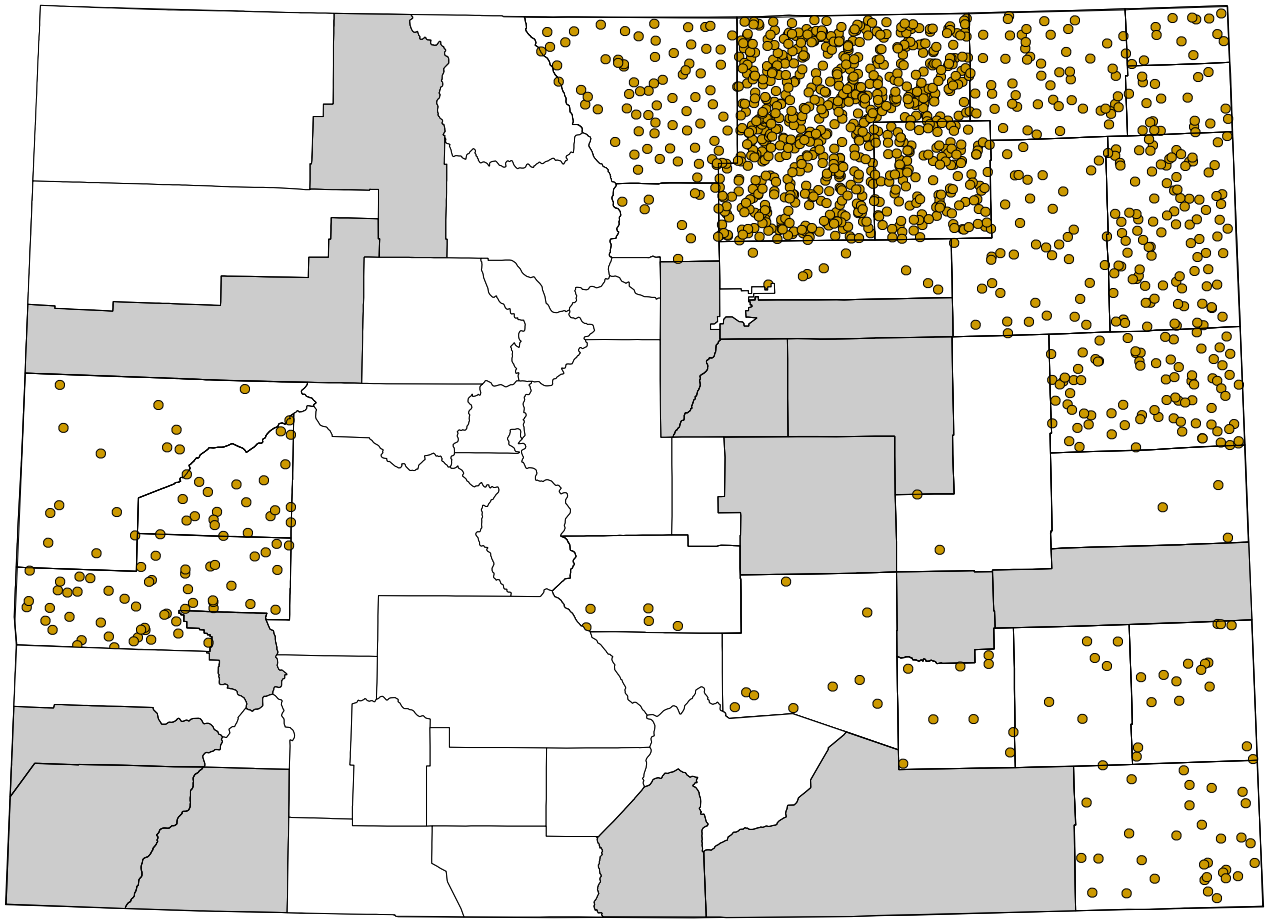


Source: Census of Agriculture, 1997

CROPLAND IN WHEAT 1997



CORN FOR GRAIN 2001



1 Dot = 2,000 Tons

Less than 1,000 Tons

Source: Colorado Department of Agriculture

SILAGE PRODUCTION 2001

SILAGE PRODUCTION 2001

READING THE MAP

Silage, corn chopped while green, is a specialized feed for livestock. Whereas corn for grain is fed to everything from chickens to hogs to cattle, silage is almost exclusively used as feed for the latter. Consequently, there is a spatial correlation between the production of silage and the presence of feedlots and dairies. A second correlation is with irrigation since most corn grown for silage, in order to attain maximum tonnage, is irrigated.

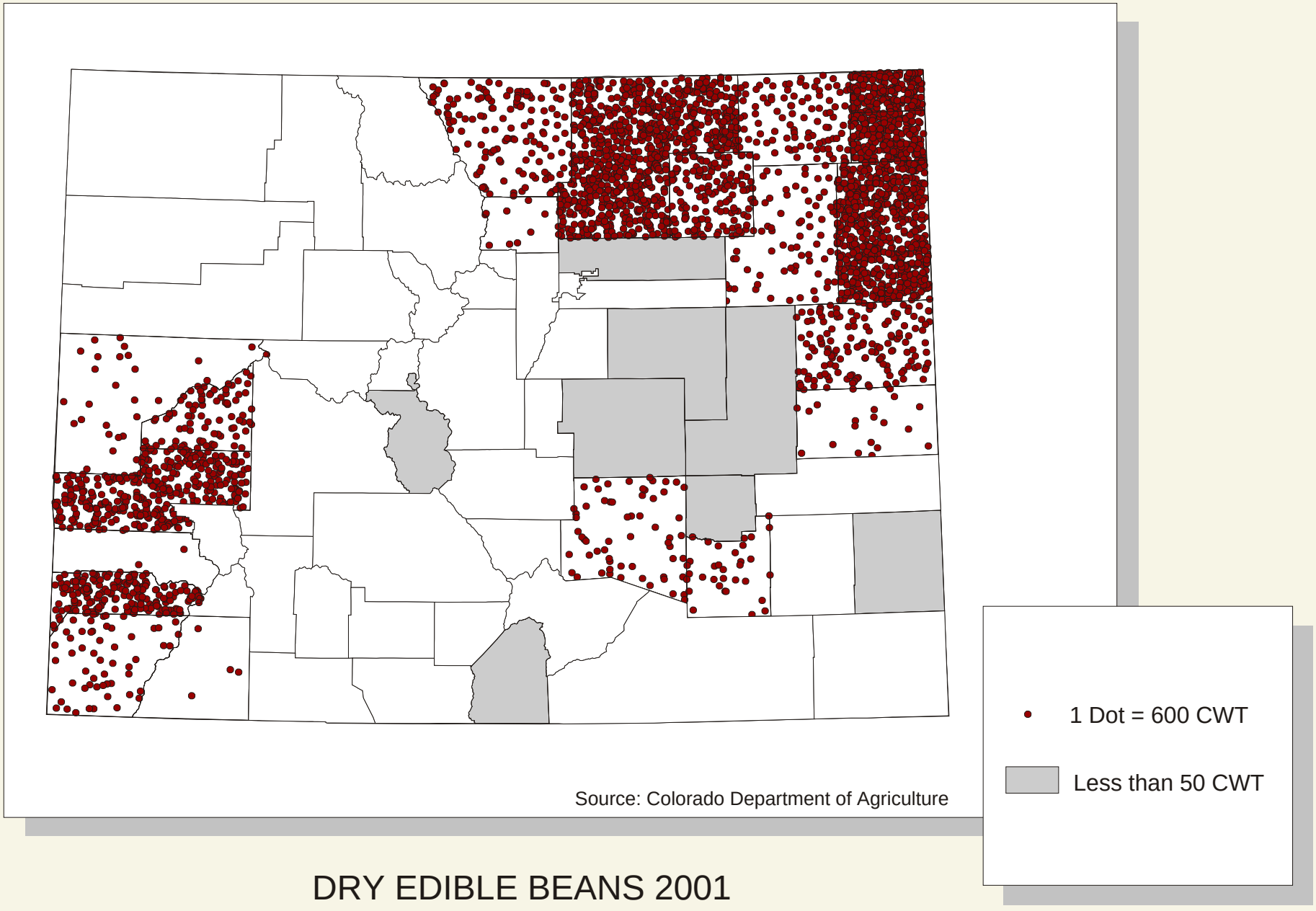
The dominant silage producing region is in the central South Platte Valley. Weld and Morgan counties together account for one-half of the state's total production. Other counties in the South Platte drainage are also important, as are Yuma and Kit Carson counties adjacent to the state's northeastern border. Secondary regions are located in the lower Arkansas River Valley and the Colorado river drainage in extreme western Colorado.

The spatial relationship between cattle and silage is reciprocal. Corn silage is typically stored in large pits (trenches in the ground) within a few miles of where the crop is grown. Since cattle are more mobile they are brought by truck to feedlots and dairies within the silage growing area. On the other hand, the presence of a large feedlot or dairy will encourage local farmers to grow silage corn to serve these markets.

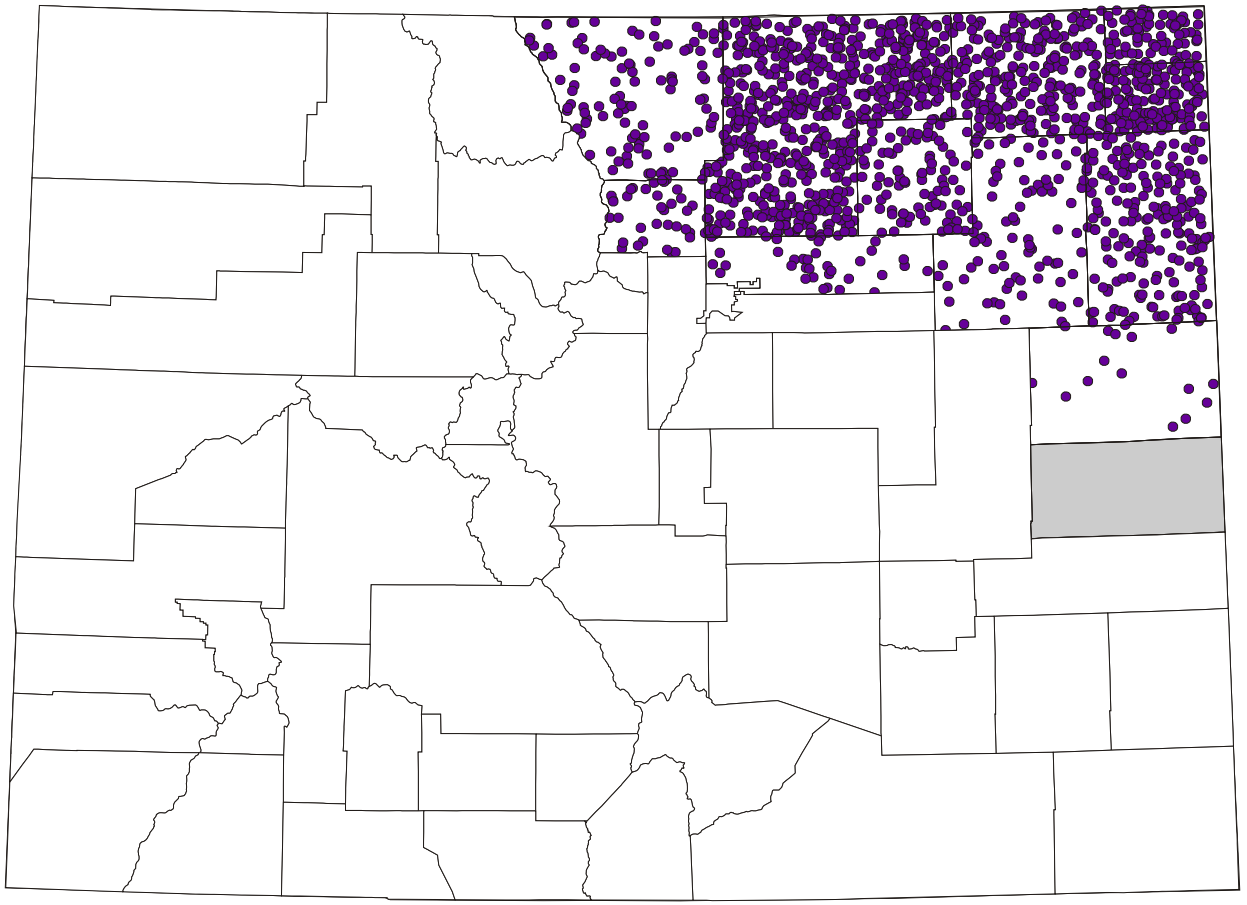
QUESTIONS TO THINK ABOUT

Why does it make more sense to haul cattle to the corn than vice-versa? Some kinds of cattle feed are hauled considerable distances, in fact, across several states. So why is corn silage not transported over long distances?

The answers to these questions involve both weight and the value, by weight, of feed versus cattle. A semi-truck load of corn silage, weighing approximately thirty tons, has a value of between $600-$700. A similar truck loaded with one hundred beef cattle, each weighing 400-500 pounds, can be worth more than $50,000. To haul the same value of product, the truck carrying silage would need to make more than seventy-five trips to equal the value of one truckload of cattle.



DRY EDIBLE BEANS 2001



1 Dot = 500 Tons

Less than 250 Tons

Source: Colorado Departent of Agriculture

SUGAR BEETS 2001

SUGAR BEETS 2001

READING THE MAP

It is immediately apparent that current sugar beet cultivation in Colorado has a ver concentrated distribution. While beets may be grown in some of the counties shaded in gray, the total amount is insignificant. Two variables largely dictate the dominance of northeastern Colorado. First, sugar beets in Colorado require irrigation. At one point significant amounts were grown in the Arkansas Valley and on the lower Colorado River, in addition to the Platte Valley of northeastern Colorado. However this broader distribution has been shrinking in recent years. For example, between 1997 and 2002, the total acreage and production each declined by more than 40 percent. The second locational variable for sugar beet production is access to refining facilities. Once harvested, sugar beets must be quickly refined. Unlike some other crops beets cannot be stored for long periods. Historically, sugar refineries were more widely dispersed in Colorado but today they operate only in northeastern Colorado. In a real sense sugar beets and sugar refineries are spatially co-dependent.

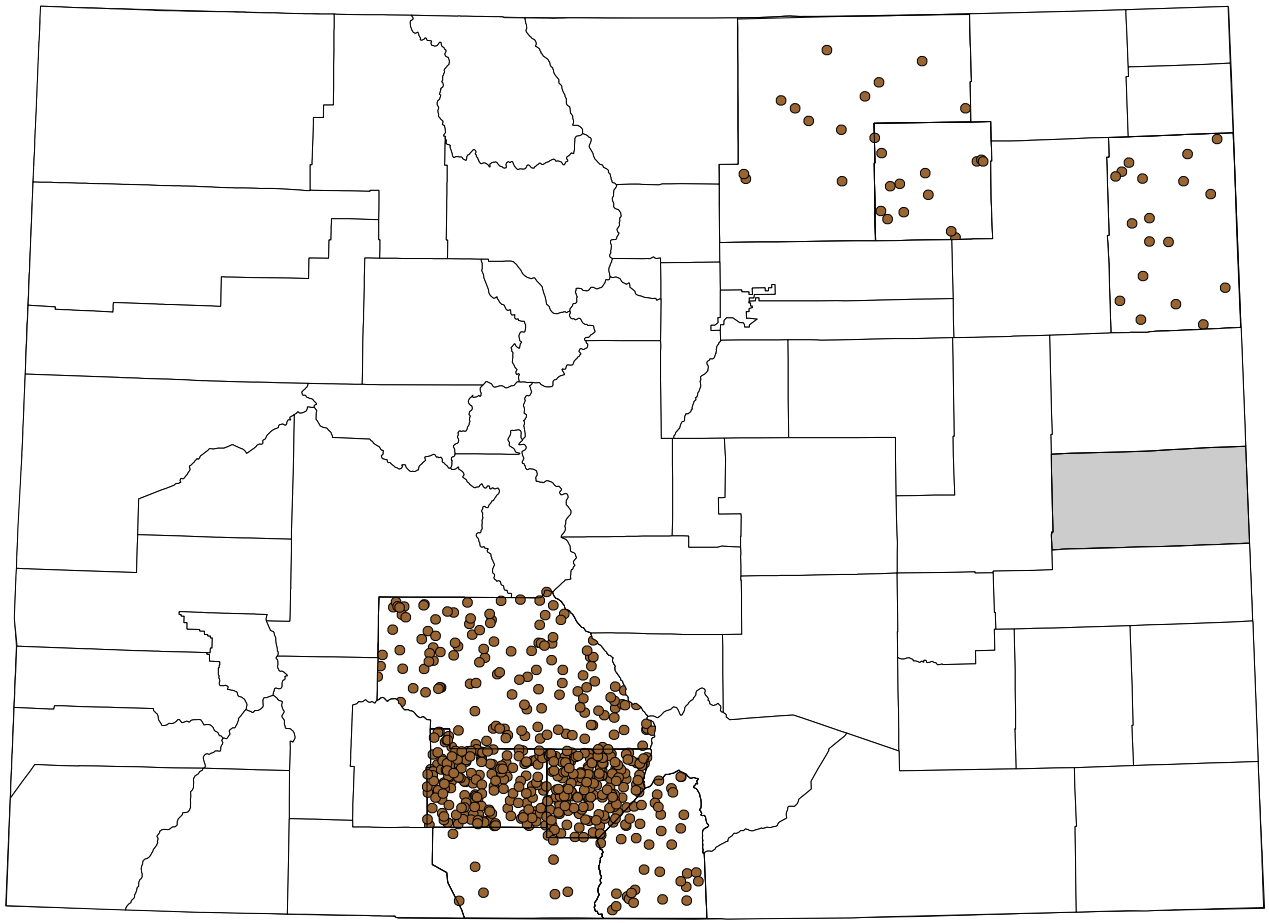
QUESTIONS TO THINK ABOUT

Crop regions are subject to constant change. For example, at one time the present U.S. “Corn Belt” was actually more important for growing small grains such as wheat, oats, and barley. Competition from higher yielding corn effectively “pushed” small grains westward into drier regions. In Colorado, the sugar beet region is also experiencing change. In the past sugar beets were considered an important cash crop, one that potentially earned the farmer more per acre than wheat or hay or vegetables. How has this changed?

Two factors impacting sugar beet farming are changes in diet and foreign competition. In the first case there is a concern about healthier diets, which usually is interpreted as eating less sugar or at least using more sugar substitutes. In fact, sweeteners made from corn are increasingly important.

Sugar produced in the U.S. comes from both beets and sugar cane. Much of the latter is grown on the Gulf Coast from Florida to Texas. However, most of the world’s sugar is produced in tropical regions from cane, with China, India, and Brazil the largest producers. In each of these countries production costs are much less than in the U.S. and so imports of foreign sugar continue to grow and constitute direct competition for sugar beet farmers in Colorado.

Should Colorado beet farmers try to change to crops that are healthier than sugar beets? Is your family eating more or less sugar than in the past? Will they make more or less money if they do so? Should U.S. farmers, including Colorado sugar beet farmers, be protected from foreign competition?

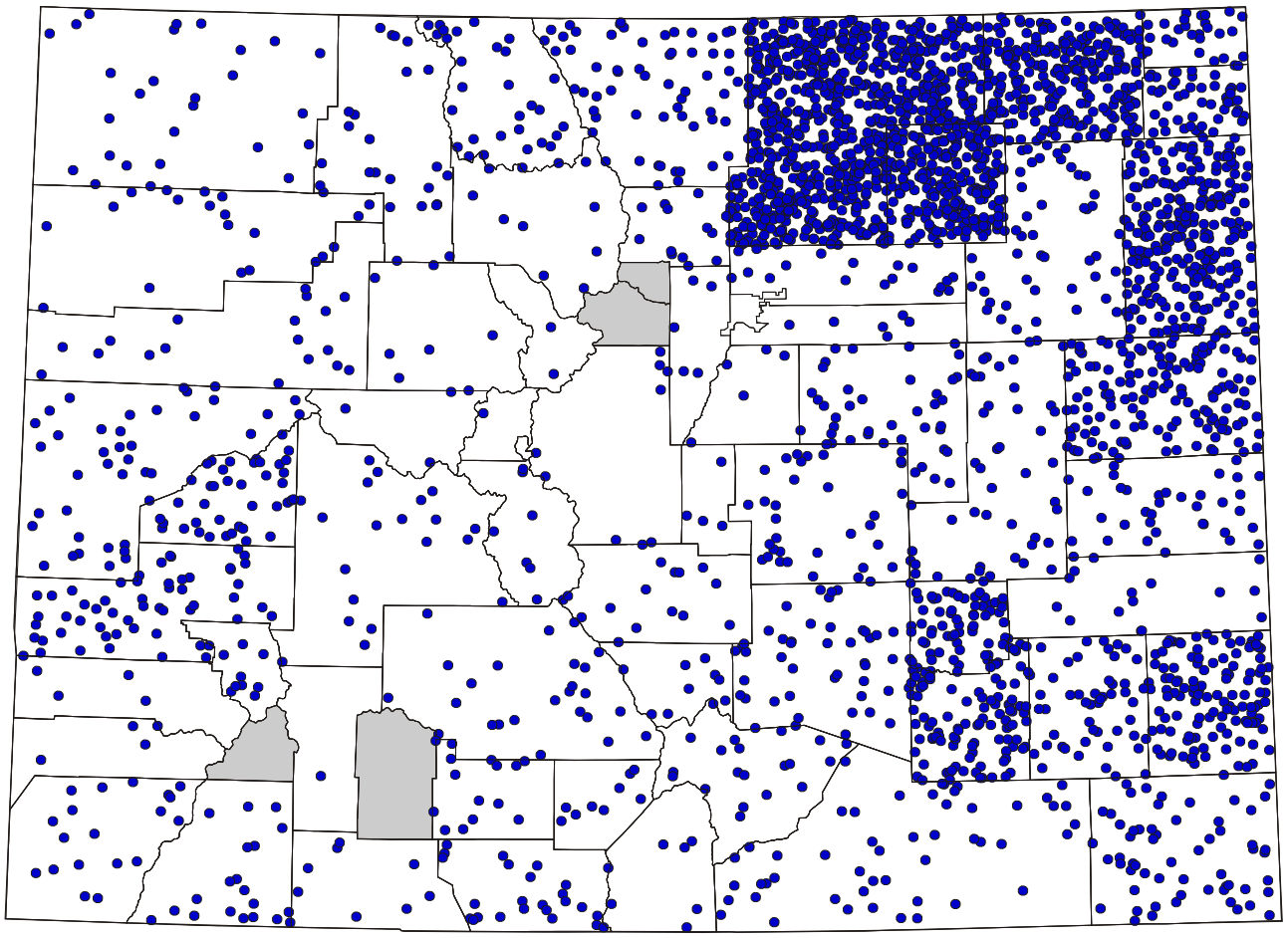


Source: Colorado Department of Agriculture

1 Dot = 40,000 CWT

Less than 20,000 CWT

POTATOES 2001



Source: Colorado Department of Agriculture

1 Dot = 1,000 Head

Less than 1,000 Head

CATTLE AND CALVES 2001

CATTLE AND CALVES 2001

READING THE MAP

Cattle are found in every Colorado county. Note that each dot represents 1,000 head. Also recall that the distribution of dots within a county is random and is not meant to indicate the precise locations of cattle and calves. The function of this dot density map, and any such map, is to create a comparative depiction or impression. Even at first glance the message is conveyed to the reader that the density distribution of cattle and calves is varied or uneven. The dark pattern of high density indicates that northeastern Colorado, and specifically a group of counties in the South Platte Valley, holds high numbers of cattle. A second region extends southward from the extreme northeastern corner of Colorado in a line of counties along the Nebraska and Kansas borders. The lower Arkansas Valley represents a third concentration of higher-than-average cattle numbers. A fourth region is apparent in western Colorado in Montrose, Delta, and Mesa counties.

Cattle and calves are part of three different types of agricultural operations. People often think of cattle in terms of grazing on ranches across the state. However, many of the state's cattle are found in feedlots, at least in the latter stages of their growth, fattening, and preparation for processing. Colorado also has significant numbers of cows and calves associated with the dairy industry. Each situation creates a somewhat different pattern of distribution.

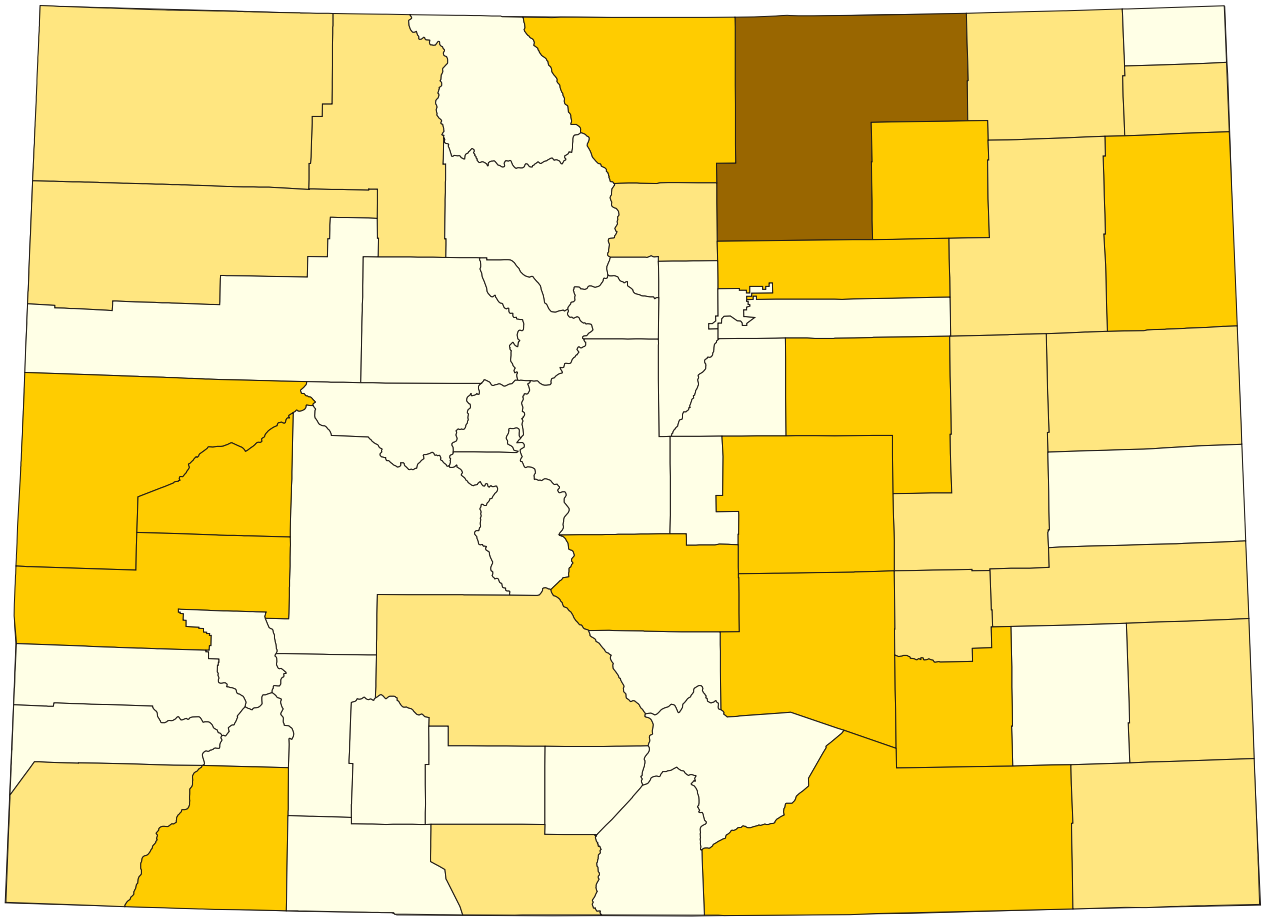
The climate and vegetation of Colorado do not support year-round grazing. Cattle that graze on pastures during the late spring, summer, and early fall are typically confined in pens and fed during the winter months. On the other hand, large commercial feedlots have cattle moving through on a continuous basis. Lighter weight cattle enter and are fed until they reach a certain weight at which time they are shipped to packing plants. Dairy cattle tend to be more stationary. While young replacement stock may be brought in, or raised locally, once a cow begins producing milk she normally spends her entire productive life in the same location.

Most of the cattle in counties of highest concentration are in feedlots. To a degree this distribution is related to locally produced feed. In counties such as Weld, Morgan, Yuma, etc., much of the farmland produces corn or alfalfa specifically for the feedlots or local dairies. Conversely, in counties along Colorado's southern border and in the northwest quarter of the state, cattle are more likely to be on grazing land. Some of these cattle will eventually be trucked to feedlots for fattening. Notice that in Colorado's more mountainous counties the number of cattle is less and the dots appear scattered. Grazing of cattle on mountain pastures is strictly seasonal. Mature breeding stock will be kept and fed over the winter but most young stock will be trucked out to feedlots on the plains. Finally, many of Colorado's largest dairy operations are situated to take advantage of both local feed sources and the market for fresh milk. With so much of the state's human population concentrated in the Front Range Corridor, it makes sense for dairies to locate nearby to facilitate shipping the perishable fresh milk to processors and consumers.

QUESTIONS TO THINK ABOUT

Are you aware that many specialized breeds of cattle exist in Colorado? Some types of cows have been bred (developed) to produce large quantities of milk. Other breeds produce milk that has more cream (a higher butterfat content) that can be used to make butter or cheese. But most cattle in Colorado are raised for meat. Certain breeds are preferred for grazing while others grow very rapidly and to a large size when fed in feedlots. The "Cattle Business" is very complex and utilizes many aspects of science and research involving nutrition and disease control.

You may be accustomed to thinking of cattle moving about the state but only in terms of their grazing upon the large pastures accorded by the extensive plains and mountain meadows. But did you realize that cattle travel a great deal? Trucks move cattle into, across, and out of Colorado on an almost daily basis. A map of cattle and calves in Colorado in July would look different from a map in November. And the products from these cattle are shipped to markets throughout the United States and around the world. If you have visited Tokyo and had a hamburger, it may have been made from beef grown in Colorado.

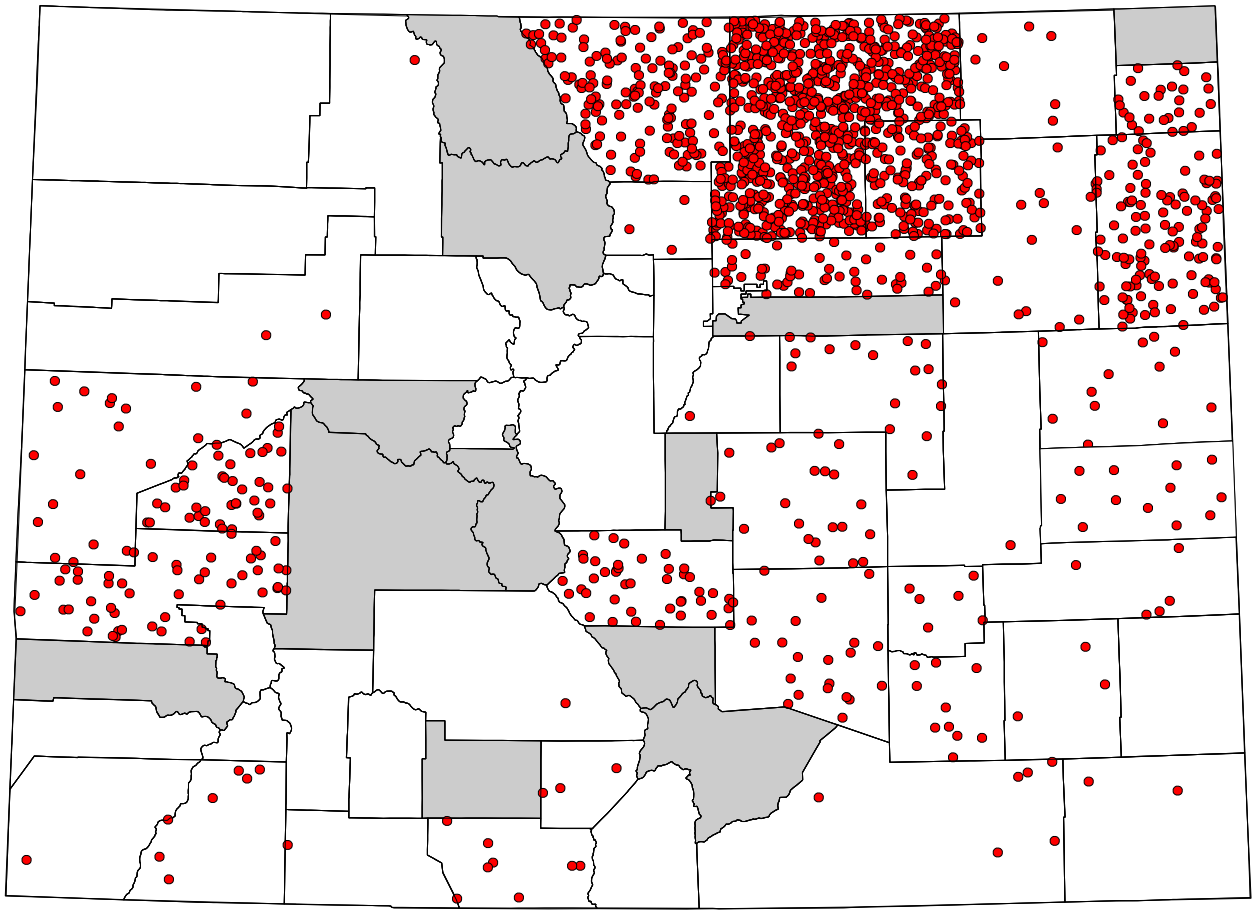


Source: Census of Agriculture, 1997

Percent of State Total

- 0 to 1
- 1.1 to 1.8
- 1.9 to 10
- 10.1 to 18.9

DAIRY FARMS 1997

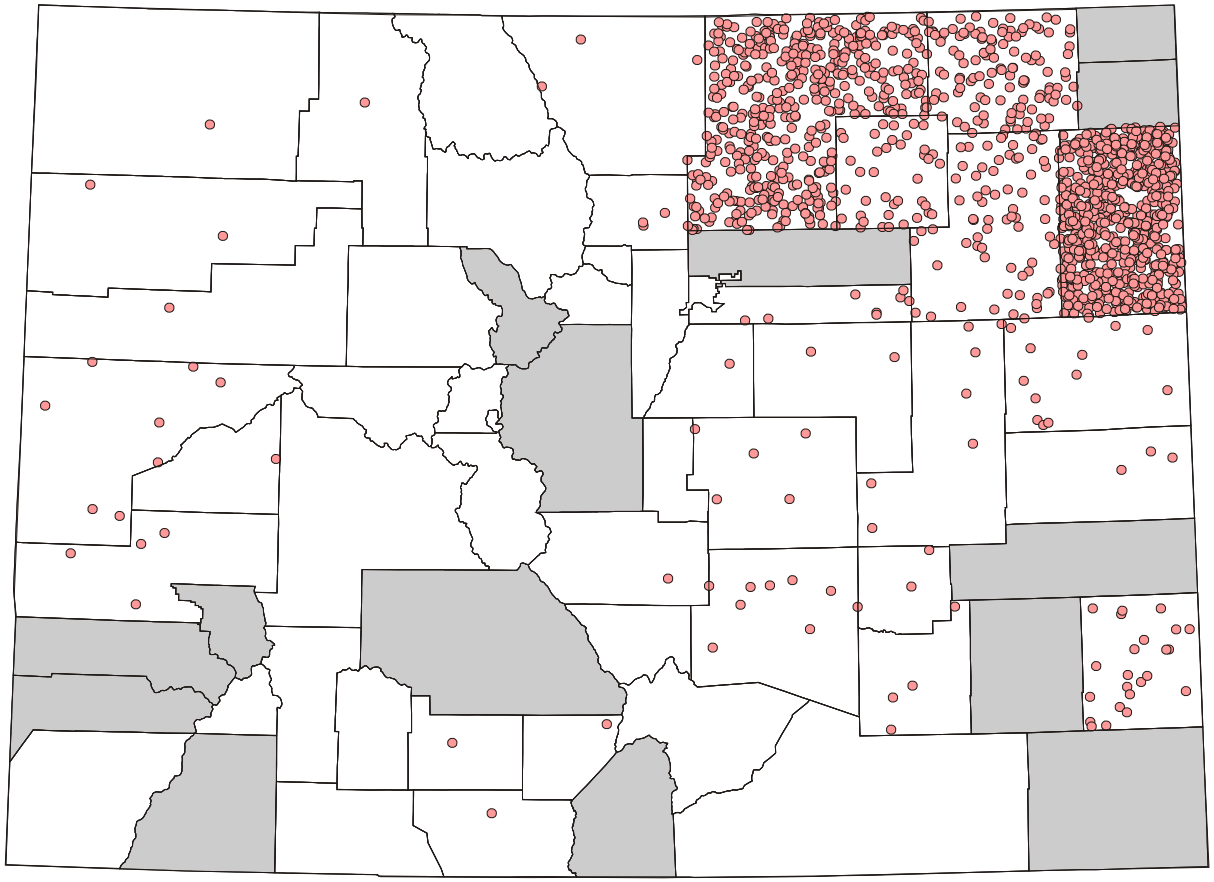


1 Dot = 50 Head

Data Not Published

Source: Census of Agriculture, 1997

MILK COWS 1997

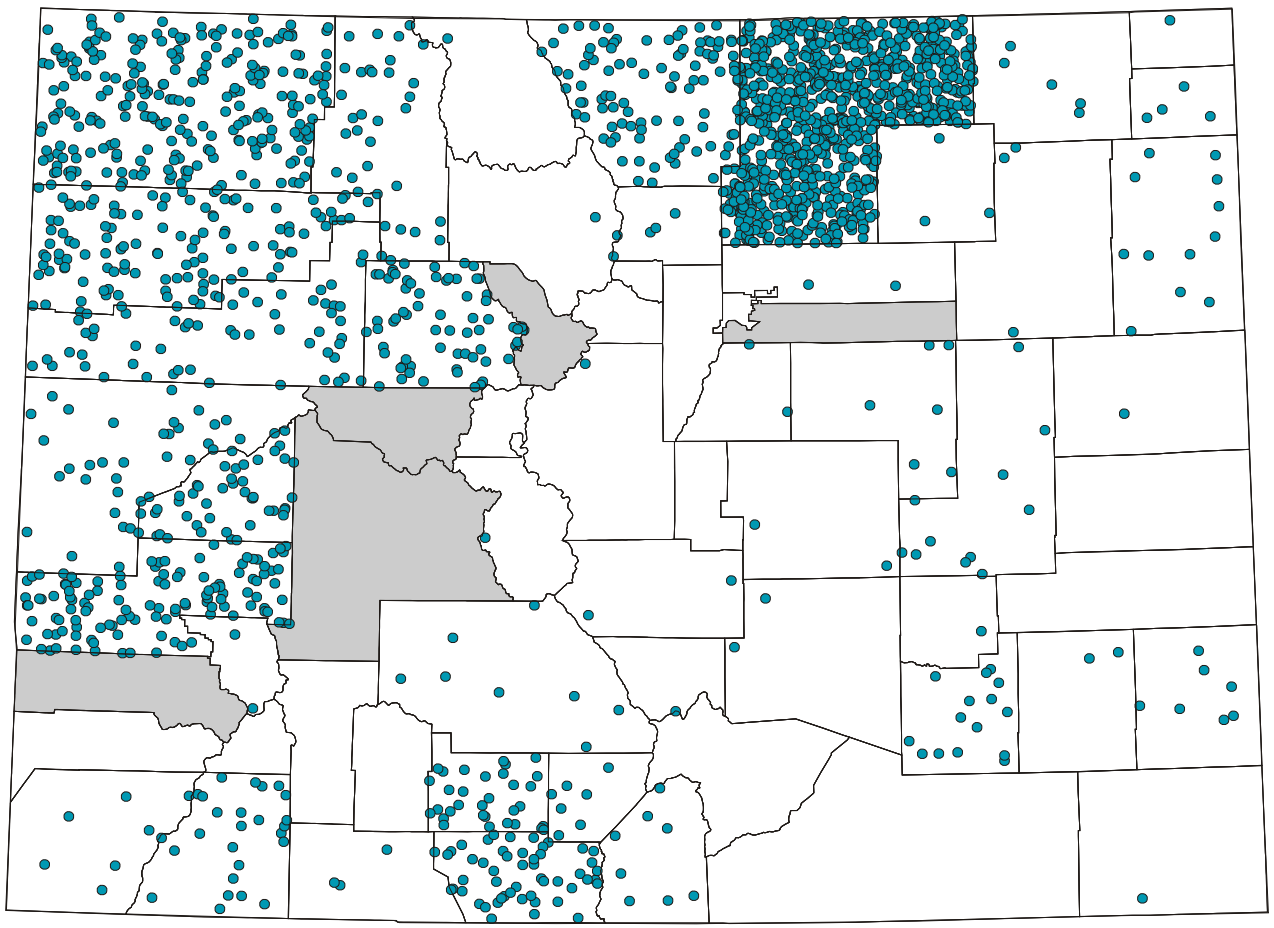


1 Dot = 300 Head

Data Not Published

Source: Census of Agriculture, 1997

HOGS AND PIGS 1997



1 Dot = 300 Head

Data Not Published

Source: Census of Agriculture, 1997

SHEEP AND LAMBS 1997

COUNTY	AREA (SQ. MILES)	NUMBER OF FARMS 1997	% OF OWNER OPERATED FARMS 1997	CROPLAND HARVESTED 1997 (ACRES)	IRRIGATED LAND 1997 (ACRES)	AVERAGE FARM SIZE 1949 (ACRES)	AVERAGE FARM SIZE 1997 (ACRES)	FARM SIZE CHANGE 1949-1997 (ACRES)	VALUE OF PRODUCTS SOLD AVERAGE/FARM 1997
Adams	1235	696	79.02	263940	27140	432	968	536	126062
Alamosa	719	306	80.07	82756	106104	751	621	-130	186912
Arapahoe	800	258	84.88	87414	3901	592	1290	698	91519
Archuleta	1353	206	82.04	5392	16764	915	547	-368	29850
Baca	2554	608	80.26	283882	65068	1297	1879	582	127252
Bent	1517	270	84.44	63074	62709	1394	2905	1511	188798
Boulder	742	657	84.02	41542	39464	201	195	-6	66471
Chaffee	1008	189	77.25	16327	24406	675	453	-222	27308
Cheyenne	1783	333	80.48	200850	20632	2104	2390	286	101035
Clear Creek	396	12	91.67	300	-9999	663	426	-237	2490
Conejos	1284	429	82.98	97938	130581	504	664	160	59411
Costilla	1227	171	78.95	36280	44010	1194	2124	930	93441
Crowley	790	203	83.25	20338	21647	859	1920	1061	362007
Custer	740	152	82.89	16391	19633	1137	949	-188	31681
Delta	1141	1041	87.90	46435	70981	202	271	69	37544
Denver	111	16	43.75	18	14	7	5	-2	135888
Dolores	1064	160	84.38	41914	7508	595	973	378	53753
Douglas	841	574	82.93	15999	3645	871	356	-515	29823
Eagle	1690	124	69.35	15212	16637	1032	1492	460	59784
El Paso	2129	851	86.60	35243	15010	1044	1019	-25	35641
Elbert	1851	822	85.28	79310	6135	1343	1332	-11	38016
Fremont	1538	561	89.13	9132	19272	553	505	-48	21615
Garfield	2952	475	79.58	39209	51383	584	899	315	48035
Gilpin	149	11	100.00	D	D	498	797	299	D
Grand	1854	161	72.05	27704	39778	1791	1560	-231	54861
Gunnison	3238	187	71.66	29444	51397	1324	1043	-281	45114
Hinsdale	1115	14	78.57	583	2324	1301	631	-670	26955
Huerfano	1584	273	81.32	14032	16208	1662	2348	686	35461
Jackson	1614	126	57.14	82141	123645	2967	3786	819	123754
Jefferson	768	377	79.05	7597	3277	193	259	66	51655
Kiowa	1758	339	79.35	D	5922	1653	2696	1043	182077
Kit Carson	2160	718	77.30	429646	145730	1175	1874	699	246588
La Plata	1692	781	88.09	41955	71855	1035	743	-292	20227
Lake	379	20	95.00	D	3917	793	859	66	25655
Larimer	2604	1298	81.97	86054	77695	430	418	-12	77414
Las Animas	4771	485	84.12	30157	24020	2831	4567	1736	41930
Lincoln	2586	467	82.66	201255	4509	2141	3530	1389	95873
Logan	1818	879	79.41	288121	109198	741	1284	543	333038
Mesa	3309	1489	87.98	58436	87648	216	280	64	33882
Mineral	877	10	40.00	D	183	2017	D	D	14551
Moffat	4732	389	83.55	54366	29576	3733	2651	-1082	48683
Montezuma	2038	718	90.39	67579	61081	618	1303	685	30465
Montrose	2240	866	87.30	65276	85040	433	429	-4	101933
Morgan	1276	759	80.11	204763	142212	549	976	427	534842
Otero	1247	512	83.59	54833	63001	736	1132	396	195731
Ouray	542	79	73.42	9683	18349	1081	1480	399	40980
Park	2192	183	72.13	15081	17998	3127	1700	-1427	19795
Phillips	688	344	75.00	248140	87816	818	1347	529	340302
Pitkin	968	70	67.14	7190	9650	542	360	-182	21812
Prowers	1629	522	80.84	230472	111091	888	1653	765	288652
Pueblo	2377	664	85.09	38628	35638	1040	1239	199	50666
Rio Blanco	3222	255	80.78	29190	35905	2646	1829	-817	55239
Rio Grande	913	348	77.87	110696	136141	406	666	260	209246
Routt	2367	494	81.38	58846	49920	928	1054	126	46271
Saguache	3167	248	67.74	121632	207200	1520	1942	422	202844
San Juan	388	4	100.00	D	D	D	D	D	D
San Miguel	1287	83	73.49	11242	12341	1235	1951	716	34907
Sedgwick	540	215	72.09	127048	51698	661	1368	707	254654
Summit	607	35	77.14	6117	10939	908	987	79	43166
Teller	559	84	80.95	2766	1646	1136	993	-143	15207
Washington	2520	792	83.21	438730	55568	1110	1760	650	123608
Weld	3990	2959	82.22	547532	393030	494	647	153	434821
Yuma	3365	896	80.02	435123	274057	1009	1524	515	537247

Wheat Equipment

The plains of eastern Colorado are another important region for grain growing. Wheat occupies the greatest acreage and virtually all is grown without irrigation. Such "dry" farming is risky since average yields are low and complete crop failures a fact-of -life owing to wind, hail, or even too much rain at times. Farming practices involve cultivating as many acres as possible as efficiently as possible, a strategy that requires large, expensive equipment.

Wheat Harvest

Ripe wheat must be harvested quickly before wind, rain, or hail can destroy the fragile crop. Large combines move rapidly across the huge fields, often operating late into the night. Custom harvest crews also assist with the work. Fleets of combines, trucks, trailers, and workers begin the harvest in the southern regions of the wheat belt, in Texas and Oklahoma, and make their way northward as the grain ripens, usually passing through eastern Colorado in the first half of July.

Grain Elevator

The tallest, most visible landmark on the Plains is often the grain elevator. Situated along railroads and highways, these large granaries hold wheat until it is moved to market either by train or by semi-truck. When traveling across eastern Colorado it is the elevator that gives the first clue that a town lies ahead; it is also the elevator that most prominently displays the town's name, as well as the nature of its economy.

Barley Storage

Commercial brewers of beer have exacting standards for the barley they use. Certain varieties are preferred and growing conditions are considered important for production of a quality beverage. The cool dry conditions of the San Luis Valley are reputedly excellent in this regard and the Coors Company contracts for much of the barley raised here.

Corn Harvest

Much of the corn grown in northeastern Colorado is fed to livestock. Here a large self-propelled cutter fills a truck with chopped green corn. This "silage" will be stored in large pits until it is needed. Corn silage is fed to both beef and dairy cattle, and to sheep. Some corn is harvested later in the year exclusively for grain. This "shell corn" is fed to cattle, hogs, and poultry.

Center Pivot Landscape

As with most innovations, center pivot sprinklers represent a series of tradeoffs. The high cost of the equipment ($100,000 and more) and of electricity to power it is offset by reductions in the water required to grow a crop and the amount of labor needed to apply that water. Farmers are able to farm more acres using a sprinkler and to farm land with an uneven topography that would prevent more conventional methods of irrigation. At some locations in Colorado's eastern High Plains the landscape has been transformed into hundreds of circles within squares.

Center Pivot Irrigation

Much of Colorado's agriculture is dependant upon irrigation to supplement limited natural precipitation. Farm operators and agricultural engineers continuously investigate more efficient methods of applying water to crops. A major innovation is the center pivot sprinkler that produces an artificial rain, in the process leaving large green circles on the state's often arid landscape.

Artesian Well

The San Luis Valley is underlain by extensive water-bearing layers or aquifers. Rain and snowmelt percolate into the San Juan mountains to the west, flow eastward beneath the valley, and are blocked by upturned strata of the Sangre de Cristo mountains along the valley's eastern margin. Drilling into the aquifers produces artesian wells that flow by hydrostatic or natural pressure. Most of the water is used for irrigation, but some supplements the flow of the Rio Grande. In recent years developers have sought unsuccessfully to divert part of this water to Front Range urban use.

Concrete Ditch

The competitive demand for water in Colorado produces innovations in all systems of irrigation. A concrete-lined ditch delivers more water to the crop by reducing percolation or seepage of water into the soil around the ditch. The aluminum siphon tubes lift the water from the ditch and into the field rows. Lined ditches and siphon tubes reduce labor and also the troublesome growth of weeds along the irrigation ditch by depriving them of water.

Irrigation Tubing

Often referred to by its trade name, Nu-flex, these thin-walled plastic tubes are an improvement over open ditches, even concrete-lined ones. By enclosing the water evaporation is held to a minimum; weed growth is also discouraged. At the end of the crop season the tube is discarded, while the individual gates through which the water is controlled are collected and reused.

Mellon Irrigation

The Arkansas Valley is renown for production of melons, including watermelons and cantaloupe. Irrigation of this field is by the traditional "flood/furrow" method. Small ditches are made between the rows of plants and the water percolates through the soil to reach the plants' roots. Though this is still the most common method of irrigation, its weakness is uneven application of water and loss of water by runoff and high rates of evaporation.

Potato Storage

San Luis Valley farmers must be able to store a portion of their crop in order to sell when (and if) the market prices rise. Potatoes must be kept at cool and constant temperatures. The concrete structure on the right uses mounded earth as natural insulation to maintain desirable temperatures. The steel structure on the left is lined with insulating material for the same purpose.

San Luis Valley Crops

The two most important crops in the valley are barley (left) and potatoes. Both crops are well suited to the high elevation (av. 7,500 feet) and cool temperatures of this intermontane basin. Potatoes are marketed fresh or for chips and fries. Nearly all of the barley is malting barley used for brewing. As in other regions of the state, center pivot irrigation has made a significant impact on farming practices.

Poultry Feedlot

While beef may still be the meat of choice in the U.S. diet, over the last two decades consumption of poultry has increased significantly. Chickens and turkeys are fattened in Colorado, in large part with locally grown feeds. The birds are confined to facilitate intensive feeding and sheltered to protect them from sudden or severe changes in the weather. This location is ideally situated to serve the expanding Denver Metro and Front Range markets.

Cattle Feedlot

Colorado ranks prominently among the fifty states in terms of cattle feeding. Using corn and alfalfa from the state's fields, as well as cattle and feeds imported from other states, companies fatten cattle in huge feedlots. This facility near Greeley, Colorado, is one of the largest in the world. The company-owned mill prepares and combines feeds so that cattle receive a nutritious mixture that causes them to grow quickly to slaughter weight.

Cattle Grazing

While the economic contribution of agriculture has declined relative to manufacturing or recreation, ranching and farming are still important to the state and to the nation. Moreover, these activities give visual character to the geography of the state's diverse regions. On a ranch on Colorado's eastern plains, cattle still graze the short but nutritious native Buffalo and Grama grasses as cattle have for more than a century. However, these animals will be trucked to market rather than driven, and perhaps sold to a buyer who has only seen them on video.

Vineyard, Palisade, Colorado

The valleys of the lower Colorado River system specialize in fruit farming. On this somewhat warmer western side of the state, apples, peaches, pears, and cherries are grown and marketed widely. A relatively new crop is grapes, which in some cases are replacing older orchards of peaches or pears. This vineyard is situated at the base of the Book Cliffs whose light colored face creates something of a warmer microclimate by reflecting and radiating solar energy. Note, however, the large stationary propeller which is used to move and mix the air when low temperatures threaten the fruit at critical growth times.