Suggested Audiences

- Citizens
- Community Leaders
- Eductors
- Students

Standard Categories

- Environment and Ecology
- Civics and Government
- Geography
- Mathematics

Standard Statements

2.5 Mathematical Problem Solving

2.6 Statistics and Data Analysis

4.2 Renewable and
Nonrenewable Resources

4.8 Humans and the Environment

5.1 Principles and Documents
of Government

5.3 How Government Works

7.1 Basic Geographic Literacy

7.3 Human Characteristics of Places
and Regions

Content Objectives

- Use measurement skills to compare and
contrast aerial photographs of an area, eval-
uating factors that affect land resources
- Interpret and compare the effects of change
in land uses over time and how develop-
ment relates to the environment
- Organize a timeline of land use events and
explain how they affected development
over time
- Describe three events that historically encour-
aged Pennsylvania land use patterns
- Analyze population and settlement patterns
and changes, determining the relationship
between growth and resource changes by
reading graphs and maps
- Discuss needs for land use planning
in Pennsylvania

Instructional Strategies

- Analysis
- Compare and Contrast
- Discussion
- Lecture
- Listening
- Map Reading
- Graph Analysis
- Organizing
- Reading Research
- Small Group Work

Assessment Strategies

- Participation in discussions, and completion
of tasks, worksheets and presentations

Materials

Included:

- Aerial Photographs
- Transparency Grid
- Aerial Photograph Worksheet
- Pennsylvania Maps
- Historical Timeline
- Historical Photos
- Historical Milestone Cards
- Digital Shaded-Relief Map
- PA Land Cover Map
- PA Geologic Map
- Physiographic Regions Cards and Photos
- PA Counties Map and Watershed Map
- Population Change in PA Worksheet
- Trends Worksheets
- Set of Maps and Charts for Each
Trends Team

Additional Materials:

- Erasable Markers for Transparencies
- Rulers
- Mylar Sheets

Time

- 3.0 hours (One hour per each activity)

Look around you. Pennsylvania communities are changing. There are more cars, more malls, more roads and more people. There are also fewer farms, fewer children walking to school, fewer corner

The Changing Face of Pennsylvania

stores and less open space. Changes in lifestyles have created pressures on land use. The evolution of communities is influenced by many factors—population, economics, natural resources, culture and technology.

Planning for change that enhances community character provides a valuable road map to guide land use decisions.

Understanding the changes of the past is important for making sound decisions for the future. This lesson provides opportunities to compare and contrast changes over time and to analyze historical events that impacted land use patterns. It involves skill development in using mapping tools, charts, graphs and data to trace patterns of land use in Pennsylvania, to analyze trends and predict future change.

Overview

The Changing Face of Pennsylvania includes three activities:

Activity 1: *Learning from Aerial Photographs*
Activity 2: *Historic Timeline*
Activity 3: *Learning About Pennsylvania*

The activities involve skills in using maps, aerial photographs and data to help understand trends and changes. These tools are utilized to communicate graphic interpretation of information through a one-to-one correspondence between places, events and data—portraying them through a visual representation. Graphs, charts and tables of information on population, growth and land use help participants to visualize trends that impact communities, counties and the state. Understanding the trends helps citizens in formulating future actions and decisions.

A series of aerial photographs taken at intervals of 10 or more years of the same location provides an account of changes in the landscape over time. Participants will observe and document the changes caused by growth and development. They can determine the percent of change in developed land and project the possible growth that will occur in the future. Introducing geographic information systems technology (GIS) enhances the activity.

By examining maps of Pennsylvania and of their communities, participants gain an understanding of features of physiographic regions such as geology, topography, land cover, etc. that influence growth and development patterns.

Students develop skills such as observation of a physical space, integrating observations into a unified whole, orienting a consistent viewpoint, scaling (ratio and proportion), using symbols, evaluating content and making predictions.

———
Activity 1

Activity 1:
Learning from Aerial Photographs

Summary: Participants review aerial maps taken over time to assess changes in growth and development.

Based on the aerial photographs, participants measure and determine how the changes affect natural and human resources.

Aerial photographs of state parks, schools and communities may be available through the Bureau of Topographic and Geologic Survey at www.dcnr.state.pa.us/topogeo. A set of aerial photographs of the city of Lancaster in Lancaster County is provided and may be used for this activity.

Questions: What tools are available to assess land changes and help us make sound land decisions? How does growth and development impact natural resources? Why is it important to protect natural resources and natural spaces? What factors influence the location of development? What can you predict about future growth patterns?

Preparation

• Copy and prepare aerial photograph sets of different years for each group (pp 31-36).

• Cover dates with a removable piece of paper prior to distribution.

• Prepare a transparency of the grid for each group (p 38).

• Prepare Aerial Photograph Worksheet (p 37).

• Provide each group with erasable markers, a map, and question sheet.

Optional: Land cover maps, geology maps and topographic maps could be distributed to each group and used to enhance the lesson.

Procedure

Aerial photographs, geologic maps and topographic maps are helpful tools used in making environmentally and economically sound land use and planning decisions. The first aerial balloon surveys conducted in 1858 introduced a dimension to mapping that provided a map-like view of terrain without cumbersome surveying.

As early as the 1930s, land use planners used aerial photography to assist in mapmaking. Specially equipped airplanes fly identical routes over several years. These photographs are compared over time and provide very useful information on land use trends.

1. Divide participants into four or five teams. Discuss the procedures for working in cooperative groups. Each team receives a set of aerial photographs, maps, grid and question sheet.

2. Participants examine one aerial photo. Determine the different colors (shades), figures, shapes and lines indicated on the map. Review the map features. How do you identify farmland, cities, trees, rivers, railroads, small roads, main roads, houses, cemeteries, airports, ball fields/tracks, quarries, parks and suburban housing developments?

3. Ask participants to examine the photographs and place them in chronological order. Assess their progress by asking each group to share clues they are using to determine the chronological order of the maps.

4. When groups have completed their task, have them remove the paper covers over the dates and self assess their success. Reorder their maps if needed.

5. Compare the most current photo with a state or county map and determine the location of the aerial photograph based on the major highways. View available maps and discuss why people settled in areas and why uses occurred where they did.

6. Distribute an Aerial Photograph Worksheet to each group. Place the grid transparency over the earliest or oldest aerial photograph (1947) aligning the grid with the southeastern corner of the photograph. Using wipeable markers, outline and color the built or "paved" areas where houses, roads or industries are located.

7. How many squares are "built?" How many squares are green space or open space? Compare the number of squares that are developed to the number of squares that are farms or open space. Determine percentages for agricultural lands, built/paved lands and natural lands based on the number of squares for each land use.

8. Using the same transparency and a different color marker, select a map about 30 years later (1971) and repeat procedures as indicated in the previous paragraph. Determine percentages of built lands, agricultural lands and natural lands.

9. Select a map about 50 years later (1999) and repeat procedures with a different color.

10. Once land is developed, could it ever revert to natural lands or does it remain as developed land? Discuss when that might happen.

11. Compare and contrast the three or more aerial photos. Grids can be projected on an overhead.

12. Using a different color marker, outline areas where you predict development will occur in the next 10 years. Explain your reasoning. Make three recommendations for the future of this community.

Activity 1

Assessment and Review

1. How did the periods compare?

2. What changes occurred over the years?

3. Why did development occur in certain areas?

4. What services and infrastructure are associated with development? (Discuss roads, highways, housing developments, wastewater treatment plants.) What are some of the problems expanding communities create? Why did the changes occur in those locations?

5. What impact does development have on natural resources such as land for wildlife habitat, surface water resources, groundwater resources, stormwater, erosion and air?

6. What actions can be implemented to conserve natural resources?

7. Many land uses alter wildlife habitat. Discuss how changes in habitats can cause changes in wildlife. Some changes destroy habitats such as filling of wetlands. Some changes create new habitat for wildlife, such as the increase in bird species at backyard feeders or increase in deer in suburban edges. Explain.

Discuss if participants are aware of changes in their own communities? If you could have planned before the changes occurred, what would you have done differently? What trends would you like to implement?

Activity 2:
Historic Timeline

Summary: Participants will develop a historic timeline of events that influenced land use practices. They will discuss past and future trends.

Question: What are the policies, technology and events that have influenced development and other land use patterns historically and presently?

Activity 2

Preparation

• Prior to the activity, prepare the timeline (p 39) on overheads or a flip chart.

• Prepare historical photos (p 40).

• Prepare sets of Historical Milestone cards for each group (pp 41-46).

• Prepare copies of Historical Timeline Worksheet for each group (p 47).

Procedure

In the previous activity we determined that communities change over time. Historically, there are periods of land use development that have been created by political, societal and population changes.

Certain government policies encouraged growth patterns. Such policies as the GI Bill of 1944 provided tuition assistance and mortgage subsidies to returning servicemen after World War II enabling American families to leave the cities to establish life in the suburbs. Levittown in Bucks County is one example of such a community.

The Federal Highway Transportation Act of 1956 created the interstate highway system. Federal and state governments poured millions into new highways that encouraged the outward movement of residents and industries from the cities yet they failed to put substantial funds into public transportation. People needed cars for transportation.

In the 1960s, the federal government promoted funding for low income public housing projects in cities. "Urban renewal" projects did not help old neighborhoods in cities like Erie, Reading and Altoona. The housing projects were measured as "successful" in renewing the quality of life in the cities, but in retrospect, instead of solving the

urban crisis, many housing projects contributed to urban deterioration.

1. Divide participants into four or five teams and discuss the procedures for working in cooperative groups.

2. Each team receives a set of historical event cards. Participants are to read the cards and place the cards in chronological order from past to present. Participants discuss the impact each event has on land use trends. *(Not all cards need to be given to each group.)*

3. Instructor displays the list of key events and milestones for historical land use. Participants assess and correct their card order as each event is reviewed.

4. Participants complete the Historic Timeline worksheet in a small group. Large group discussions review the worksheet and focus on how events impact changes in land use patterns and why.

Assessment and Review

What events, trends and technology will impact development in the future? What changes in land use are occurring in your neighborhood or community? Is there a new store, a greenway or a new park? Is there a new intersection, stop sign or traffic light? Is there a new development or is someone fixing an older home? What impact will these changes have on your community?

Activity 3:
Learning about Pennsylvania

Summary: This activity involves three parts. The first part participants explore information about Pennsylvania through a variety of maps to define physiographic regions and how the features of each region influenced early settlements and development patterns. The second part involves examining population trends

by county to assess the regional differences in community growth and development. In the third part, participants analyze data to determine population and land development trends. Such information provides a platform for predicting future trends.

Question: What are the characteristics of land forms and land cover in Pennsylvania? How do features in the physiographic regions influence community growth and development? How do population trends compare across Pennsylvania? What are some of the past and future trends of growth and development in Pennsylvania?

Preparation

• Participants are to work in groups. Discuss the process of working in groups. Have each group assign a leader, recorder, timekeeper, and presenter.

• Copy and prepare sets of the following and place them at each work station to be used by participants working in groups:

  • Sets of Physiographic Region Cards and Photos (pp 48-49)

  • PA Digital Shaded-relief Map (p 50)

  • PA Geologic Shaded-relief Map (p 51)

  • PA Land-cover Map (p 52)

  • PA Watershed Map (pp 53)

  • Map of Counties (pp 54)

  • Map of Municipalities (pp 55)

  • Large mylar sheet with erasable markers (optional)

  • Post-it notes

  • Standard rulers for each team

  • *Optional:* small toy vehicles

• Prepare copies of the Percent in Population Change Worksheet (p 56) for each team.

Activity 3

• Prepare copies of the Change in Population by County (2000-2002) pages (pp 57-58). For the most current information visit www.pasdc.hbg.psu.edu/.

• Prepare five different sets of graphs and charts along with the appropriate worksheet (pp 59-68). Each team will be given a different set of information. During the lesson each team will be asked to analyze the information and present a summary of their findings to the group.

Procedure

Part 1: Learning from Maps

The first part involves participants in exploring information about Pennsylvania through a variety of maps. Participants will define physiographic regions and how the features of each region influenced early settlements and current development patterns. Maps are provided. Additional maps and information are available from the Department of Conservation and Natural Resources, Topographic and Geologic Survey at www.dcnr.state.pa.us/topogeo.

Mountain ridges, plateaus, ravines, rivers, bogs, and farmland are all components of Pennsylvania's landscape. Landscape features can be organized and separated by land or water associations within the state. Geology and topography dictate how the landscape is classified into regions or provinces, such as the Ridge and Valley Province.

Natural resources and natural features of Pennsylvania provide the stage for building communities and development patterns in Pennsylvania. For communities to make wise decisions, it is imperative to understand the connection between people and physiographic regions. To understand the diversity of past settlements and future patterns of development, it is important to examine the features of the six distinct physiographic provinces located in Pennsylvania. Starting from the

southeast corner to the northwest corner, they are: the Atlantic Coastal Plain Province, the Piedmont Province, the New England Province, the Ridge and Valley Province, the Appalachian Plateau Province and the Central Lowlands Province.

Physiographic regions are a way to define the Earth's landforms into distinct areas based on geology and topography in a three-tiered approach of divisions, provinces and sections, first defined in the early 1900s. The basis of each region is its geology which in turn, influences the physical land forms. Other influences include water, climate, vegetation and other non-geological criteria. Each province has its own economic advantages and geologic hazards which play an important role in shaping everyday life in Pennsylvania.

1. Begin an exploration of Pennsylvania by examining the shaded relief map. The first activity is for participants to determine the size of Pennsylvania. Using a ruler and the map scale, participants determine the size and dimensions of Pennsylvania.

Pennsylvania is rectangular in shape. It is about 309 miles long and about 174 miles wide. It consists of 29 million acres of land or about 44,982 square miles. It ranks 33rd in size compared to the other states. It is 1/12 the size of Alaska and 1/6 the size of Texas.

2. Examine the digital shaded relief map and discuss the land features.

Discuss the following questions:

1. Why is it called a relief map? What does it tell us? How do you use the key?

2. Where are the flat lands, ridges, mountains, rivers?

3 .Where are the highest areas? Where are the lowest areas?

4. What are the most common features in Pennsylvania?

Activity 3

5. How would you group the features so that you have five to seven defined areas?

6. Write a description of Pennsylvania land features for an advertisement.

Have participants visualize the "textures" of the relief map by taking an imaginary journey across the state using their hands (or toy vehicle). Moving from the southeast to the northwest corner, participants dramatize the following paragraph as it is read out loud.

"Begin at the Delaware River in the Atlantic Coastal Plain at Philadelphia and rise to the gently rolling hills of the Piedmont Province with its rich, fertile soils. There is a little bump over the small sections of the New England province or the northern tip of the Blue Ridge. Follow the roller-coaster Ridge and Valley Province as we cross the Susquehanna River and ascend to the high rocky Appalachian Plateau rising in the western and northern portions of the state, traveling through the Ohio River drainage basin. The journey ends at the shores of Lake Erie at the Central Lowlands Province".

3. Review the information by providing teams with a set of descriptions of the physiographic provinces and corresponding photos. Each team is to place the corresponding cards in the appropriate regions. Each team is to discuss the features of each province and how the features would influence settlement patterns. An optional activity would be to place a mylar sheet over the map and draw an outline of each region. Check the information by examining a map of the physiographic regions.

4. Discuss how the geology, water resources and physical features of land influence how Pennsylvania developed. Using Post-it notes or mylar sheets, identify the locations of three early settlements. Where were early settlements located and what role did land features have in the development of early settlements?

Discuss how the different features encourage certain activities. Flat land and rolling hills are used for farming in turn may become prime locations for industry and development. Ridges and areas of high elevation are forested and thus used for lumbering. Valleys with rich soils are used for farming, highways, industry and development. Rivers and the land next to rivers provided transportation routes and influenced industrial development because of water power and transportation. Areas with geologic value are mined and require transportation routes which historically started with rivers, to canals, to rails and highways.

5. Geology: Determine the types of geologic resources located in the different regions by examining the geologic map. Discuss how geology is important to the development of the regions. Rocks and minerals with economic value include anthracite coal, bituminous coal, limestone, Marcellus shale, slate, oil and unconsolidated rock. If possible, examine samples of the actual geologic resources and place them on the map to signify where they are located. Discuss how these resources are important to Pennsylvania. What communities developed because of a geologic resource? How did these resources influence other community development?

6. Water: Water resources in Pennsylvania are classified into eight distinct river drainage basins and 9,855 different watersheds across the state (Myers et al. 2000). Watersheds and drainage basins are defined by the direction of water flow from land into streams and then into rivers or other bodies of water. Ridges define the boundaries of watersheds.

The Stroud Water Research Center defines watersheds on their website: *"The area of land that drains into streams, lakes, estuaries or other bodies of water are known as watersheds. They are also known as drainage basins or catchments. As precipitation falls to the ground, the water is*

Activity 3

The Changing Face of Pennsylvania

pulled downhill by gravity, which causes it to flow over the landscape or infiltrate through the soil into the groundwater. Topography—the hills, valleys, and other features that define the landscape—determine the boundaries of watersheds." www.stroudcenter.org

There are six major drainage basins to identify on the watershed map. Elk and Gunpowder watersheds occupy a small area of southern Pennsylvania and are not included in the following list. Examine the watershed map. Using Post-it notes, label the major drainage basins on the shaded digital-relief map. Determine the watershed in which your community is located.

• Delaware River Drainage Basin

• Susquehanna River Drainage Basin (Chesapeake Bay)

• Ohio River Drainage Basin

• Potomac River Drainage Basin

• Great Lakes Drainage Basin (Lake Erie)

• Great Lakes Drainage Basin (Genesee River)

Pennsylvania has more than 83,000 miles of streams and rivers. Historically, rivers have been a primary influence on growth patterns in Pennsylvania. Make a list of all the uses of rivers historically and presently: drinking water, waste treatment, irrigation, transportation of goods and people, water power for mills and steam, water power to generate electricity, industrial uses, aesthetics, recreation (swimming, boating, etc.), food (fishing, gathering, hunting), water for livestock, etc.

How did rivers help shape the growth of communities in Pennsylvania? What impact did historic communities have on water quality and water quantity? What impacts do communities make on water resources today? How do they compare? What do you project will happen in the future as communities grow and more demands are placed on water resources?

Activity 3

7. Landcover: What covers Pennsylvania? Analyze the Land Cover Map of Pennsylvania. Discuss the information provided by the map. This is an important tool to analyze land use based on assigning colors to various types of vegetation and development. The vegetation and built environment are divided into 15 classes which fall into one of five categories: Developed, Forested Upland, Herbaceous Planted/Cultivated, Barren, Water and Wetlands. How much of Pennsylvania is forested (60 percent)? Discuss the amount of Pennsylvania that is agriculture (about 30 percent). What type of land cover is in your county? Where is developed land concentrated? What does that indicate? What do you predict this map will look like in 10 years? 20 Years? 100 years?

8. Based on the maps studied, select your favorite place to live and your favorite place to visit? Discuss your selection. How do they differ and why?

What are some of the advantages and disadvantages in living in certain regions? What characteristics of land and water would you need to consider in making choices? Discuss some physical characteristics to consider before selecting a place to buy a home: water supply, steep slopes, flood zones, stormwater runoff, landslides, road construction, sewage and waste disposal, etc.

Part 2: Studying County Population Trends

1. Do you describe Pennsylvania as urban or rural? How would you define each? What characteristics are associated with rural and urban? There are 67 counties in Pennsylvania, 48 of which are considered rural and 19 considered urban by the calculations developed by the Center for Rural Pennsylvania.

In 2003, the Center for Rural Pennsylvania (www.ruralpa.org) adopted a definition of rural and urban based on population density by dividing the total

population by the total number of square land miles. In 2000, the population density of Pennsylvania was 274 persons per square mile. By using this method of computation, a county or school is considered rural when the number of persons per square mile is less than 274. If the calculation is more than 274 persons per square mile, then it is considered urban.

2. County population trends are changing. In 2000, there were 12.2 million people in Pennsylvania. The population of Pennsylvania has maintained a steady population for the past 10 years. However, some counties are experiencing a tremendous growth in population while others are losing population. Some county populations remain stable. Why do you think there is a difference in the population trends of different counties?

3. Which counties do you predict are growing? Which counties do you predict are declining? Provide a county map to each team. Ask participants to select three counties they predict are growing and mark them with a "+". Predict which 3 counties are declining in population and mark them with a "-". Have participants discuss and share their reasons.

4. Review the County Population Estimates and the Population Change Worksheet. Check the information on the counties you selected to determine if your response was correct. By reviewing the chart, have participants list the top eight counties that have increased in population. List the top eight counties that have decreased in population. List counties which remained the same.

5. Using the map of the counties, color the map with the following color key:

- Red for counties that have increased in population.

- Blue for counties that have decreased in population.

- Yellow for counties that have remained the same.

6. Discuss the reasons that county populations are changing. What pressures are causing population growth and decline? How does that impact the communities? What are some of the problems communities face when populations increase? What are some of the problems communities face when population decreases? How do the trends impact natural resources? What are some strategies that might help declining communities? What are some strategies that will help communities deal with tremendous growth?

7. Have participants access the U.S. Census Bureau web site at www.census.gov. Select Pennsylvania. This web site provides accurate and recent data on census information. The foundation of our American democracy is dependent on fair and equitable representation in Congress. In order to achieve accurate assessment of the numbers and location of the people, the U.S. Constitution mandates a census of the population every 10 years. The census population totals determine which states gain or lose representation in Congress. It determines the amount of state and federal funding.

The goal of the 2010 census is to count everyone only once and in the right place. Facts gathered help shape discussions for the rest of the decade about public health, neighborhood improvements, transportation, education, senior services and much more.

In 1790, the first census was taken by U.S. marshals on horseback. They counted 3.9 million people living in the United States. Census 2000 counted more than 281 million people. It is estimated that by 2010 there will be 310 million people living in the United States. Discuss how population growth will impact the communities in the United States. What ways can Pennsylvania plan for projected population changes?

Activity 3

The Changing Face of Pennsylvania

PENNSYLVANIA LAND CHOICES

The Changing Face of Pennsylvania

Part 3: Determining trends and patterns

Graphs and maps are located in the Annual Report on Land Use and are used with permission from the Governor's Center for Local Government Services (www.newpa.com).

1. Charts and graphs summarize data, providing a "snap-shot" of information that will help visualize changes that have taken place over the past several decades. With this information, you can determine the planning goals and objectives for the future of Pennsylvania. Participants will compare and contrast data presented in the graphs and maps. Participants will answer questions to determine trends in Pennsylvania. They will apply their knowledge in making land use decisions for the future of Pennsylvania.

2. Interpreting data and using information to make decisions is an important skill. Divide participants into five teams. Each team will examine data graphs and maps about their topic, read information and answer questions. Each team will present the information to the class.

- Team One: Population Growth
- Team Two: Land Development
- Team Three: Land Cover and Agricultural Lands
- Team Four: Wetlands, Forests and Parks
- Team Five: Vehicles, Road Miles and Public Transportation

3. Provide 15 minutes for participants to answer the questions. Have each team summarize what they found out about trends in Pennsylvania land use and population.

4. What projections can you make for the future? Based on the research, what trends are positive trends for

Pennsylvania? Discuss your reasons. What land uses do you want to change? How could planning protect the quality of living in Pennsylvania for the future?

Information: During the 1990s, Pennsylvania was the third-slowest growing state in the country. It grew by just 3.4 percent or 400,000 residents.

The population of 12.3 million has grown by just 0.44 percent between 2000 and 2002. This was an improvement from the 1970s and 80s when population was declining.

The startling fact is that even though the state population is barely growing, it has developed land at such a rate that it is the sixth largest "consumer" of land in the country, consuming more farmland and natural space per added resident than every state but Wyoming.

Between 1982 and 1997, Pennsylvania developed some 1.14 million acres of fields, open space and natural land. According to the Brookings Institution's *Urban and Metropolitan Policy, Back to Prosperity,* "…over those 15 years, the state consumed land at a rate equivalent to 209 acres a day, or nine acres an hour, every hour" This took place at a time when the population grew just 2.5 percent.

Pennsylvania's economy is declining. There is a hope that increased development will help the economy. At the same time, it is important to understand the importance of planning and guiding growth while protecting valuable natural resources and creating valuable and appealing places to live. Every citizen should become educated on how land choices are made and understand the consequences of land use decisions. Every citizen should become involved in shaping the future of their community. Land decisions

Activity 3

today will become part of history tomorrow. Planning for the future will help determine a direction for your community and for Pennsylvania.

Assessment and Review

1. What tools are used to assess land and community changes?

2. Predict the land use trends and patterns in 10 and 25 years. What changes could occur? What will the consequences and impacts be to the environment and to wildlife?

Extension

Geospatial Information System (GIS) is an information technology that allows management of spatial information. It is a toolbox for collecting, storing and retrieving data, and transforming the information onto maps. Counties use GIS extensively to generate reports. It is important for students and other participants to become familiar with this technology. Review the Resources section of this book for additional aerial photos and data resources.

> **We must not** *only protect the countryside and save it from destruction, we must restore what has been destroyed and salvage the beauty and charm of our cities…Once our natural splendor is destroyed, it can never be recaptured. And once man can no longer walk with beauty or wonder at nature, his spirit will wither and his sustenance be wasted.*
>
> **Lyndon B. Johnson (Former U.S. President)**

Activity 3

1947

1957

1964

1988

1992

1999

Activity 1: *Aerial Photograph Worksheet*

Names of Group Members _____

1. Place the grid transparency over the oldest photograph. Using a wipeable marker, outline the areas that are built or paved.

2. Select two different maps. Place the transparency over the next map. Using a different color marker for each map, outline the increase in the developed area for two other photos using the same transparency. Calculate the percent change of developed land from different periods.

3. Using a different color, project where develpment will occur in 10 years and 25 years. Add or label what might be added to the maps, such as an airport, mall, schools, etc. Where could housing be developed?

Year	Change in number of built or paved squares	Percent of built or paved change

Questions

1. Where did growth occur? Why?

2. What type of growth occurred?

3. How did the periods compare?

4. When did the most change occur?

5. Why did development occur in certain areas?

6. What services and infrastructure are associated with development?

7. Why did the changes occur in certain locations?

8. What changes in technology encouraged development in these areas?

9. What impact does development have on natural resources such as land for wildlife habitat, surface water resources, groundwater resources and air?

10. If you could have planned the changes, what would you have done differently?

11. What changes or trends would you like to see in the future?
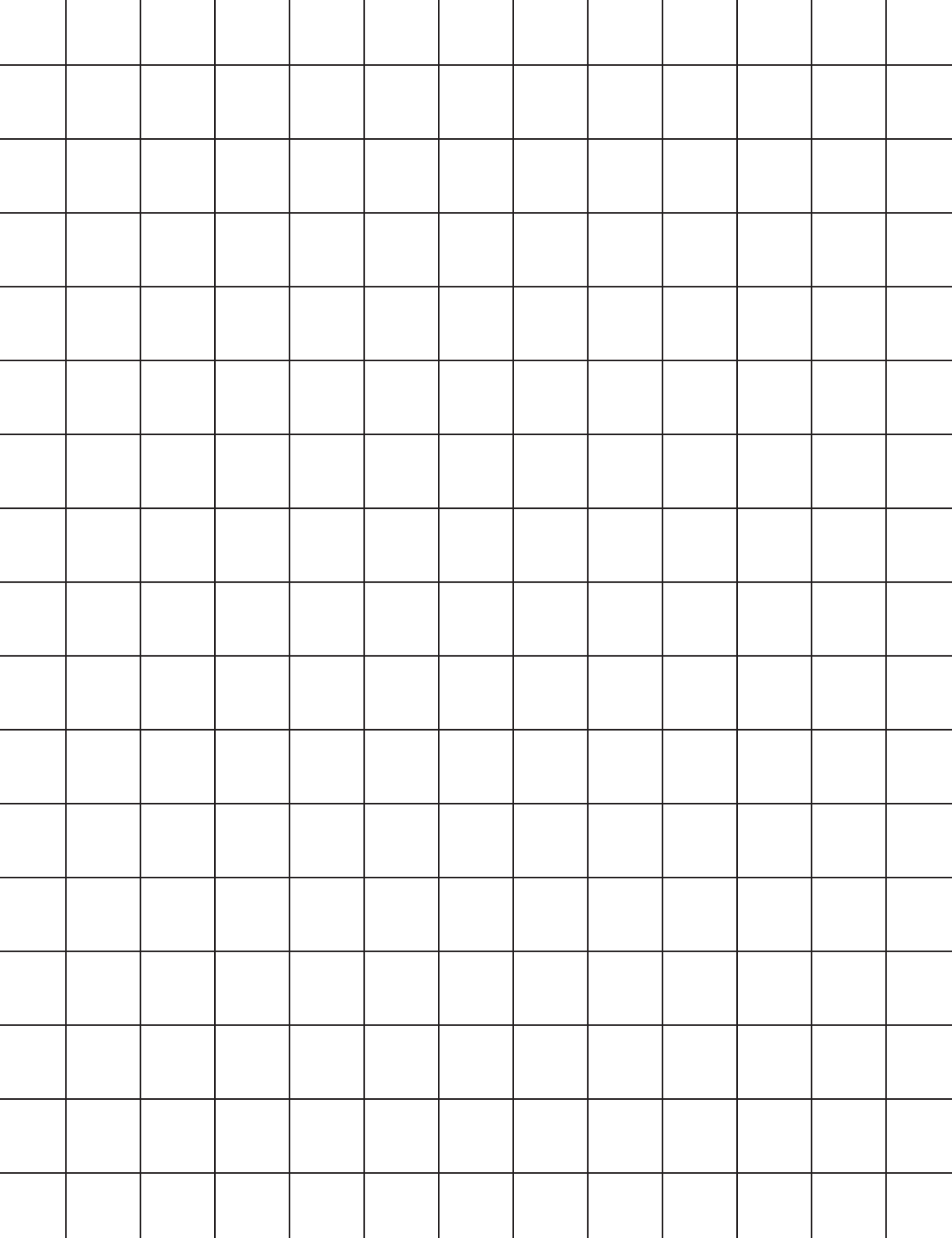
1775–1781 — American Revolution

1794 — PA Turnpike

1850s — "Balloon frame" House

1860–1865 — Civil War

1890–1910 — Industrial Revolution

1913 — Moving Assembly Line (By Ford)

1929–1939 — Great Depression

1940–1945 — World War II

1944 — GI Bill: *Serviceman's Readjustment Act*

1955 — U.S. Automobile Production Hits Record 9 Million

1956 — Federal Highway Act of 1956

1959 — Last Full Year of Trolley Service in Johnstown

1946–1964 — Baby Boom

1969 — Internet Brought Online
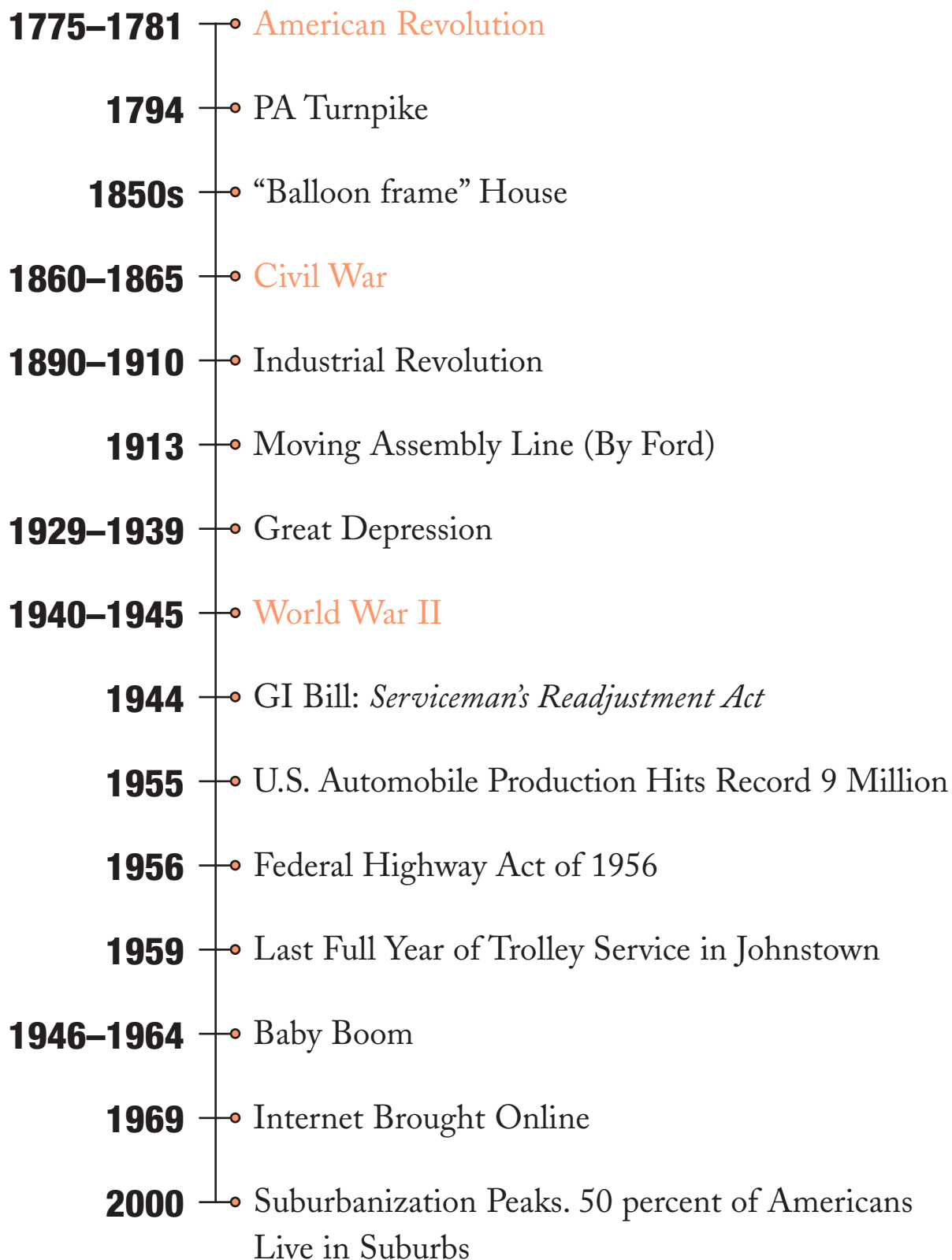
2000 — Suburbanization Peaks. 50 percent of Americans Live in Suburbs

Cut into cards and scramble the photos below. Have participants place the cards in chronological order. Discuss the relevance of the photo to historic changes impacting land use.

Activity 2: *Milestone Cards – Page 1 (1/6)*

Copy both sides of the following pages, and cut along the dotted lines. Have participants place events and milestones in chronological order.

Native Americans Live in Cluster Villages	**Private Turnpike Begins**
French and Indian War	**Steam Ferry Service**
William Penn's Charter of Rights	**Steam Railroad**
Revolutionary War	**Building and Loan Associations**
Steamboat Invented	**Shay Locomotive Invented**

Private turnpikes provide good roads for personal wagons or vehicles to travel short or long distances.

Native Americans live in small villages scattered throughout Pennsylvania's woodlands and along river and lakeshores.

Steam ferries allow horse and buggies to cross bodies of water easily.

It is part of the "Great War for Empire" between the British and French. Both sides see the importance of Western PA for future trade and expansion.

Steam railroads change the rate and quantity of moving of goods and people by land.

William Penn's Charter of Rights gives the elected assembly the power to initiate bills instead of just approving or rejecting them.

Building and Loan Associations provide the first long term loans for real estate.

The war achieves independence from Great Britain and the new government gives the power to the people.

New engines allow for the cutting of trees on steep slopes.

Steamboats increase ability to move goods and people over rivers and bodies of water.

Balloon Frame Housing

Automobile Produced
in the United States

Horse Railway

Moving Assembly Line

Civil War

Federal Road Act of 1916

Industrial Revolution

World War I

Agricultural Depression

Buses Replace Trolleys

The first car is built in America.

New way of building frame houses which is much easier and cheaper to build.

The assembly line makes cars much more affordable.

Horses pull passenger cars in city areas.

Improved funding for roads.

The war between the states sends most males to fight in battle.

The first World War creates a need to build more roads to move goods and services.

The beginning of the period of great growth and industry. Coal, coke and steel make Pennsylvania the heart of the industrial revolution.

Buses become a popular mode of transport as they didn't require a rail.

Prices for food continue to decrease. Cost of farmland is inexpensive.

Federal Housing
Administration Created

Railroad Declines

GI Bill

Age of Subdivisions

Trucks Become Popular

Interstate Highway Act

Baby Boom Begins

Company Towns Develop

Trucks begin to
replace the railroad

Federal Housing Administration provides
loans and reasonable housing for middle
to low income families.

Rural areas adjacent to cities
begin to develop into suburbs

Enlisted men are provided with money
which is used to build new housing.

Highway Act continues to expand
interstate highways.

Trucks are more affordable and better
roads are developed for hauling goods.

Towns develop around mines and mills.
Workers can walk to work and buy all they
need at the company store.

Many GIs return from war to start
families and need homes to live in.

Team Members _____

1. Describe how three historical events that have occurred in Pennsylvania over the past 100 years changed land use.

*1.*_____

*2.*_____

*3.*_____

2. Describe how three inventions changed Pennsylvania land use and why.

*1.*_____

*2.*_____

*3.*_____

3. List two reasons why people moved out of the city.

*1.*_____

*2.*_____

4. What changes in land use are occurring in your neighborhood or community? Is there a new store, a greenway, a bike path or a new park? Is there a new intersection, stop sign or traffic light? Is there a new development or is someone fixing an older home?

5. What do you feel about the changes you see? What do you like and dislike about the changes?

6. What ideas would help your community protect natural habitats and the environment?

Cut the cards and photos, scramble them. Participants are to place cards and photos in the appropriate regions of the maps.
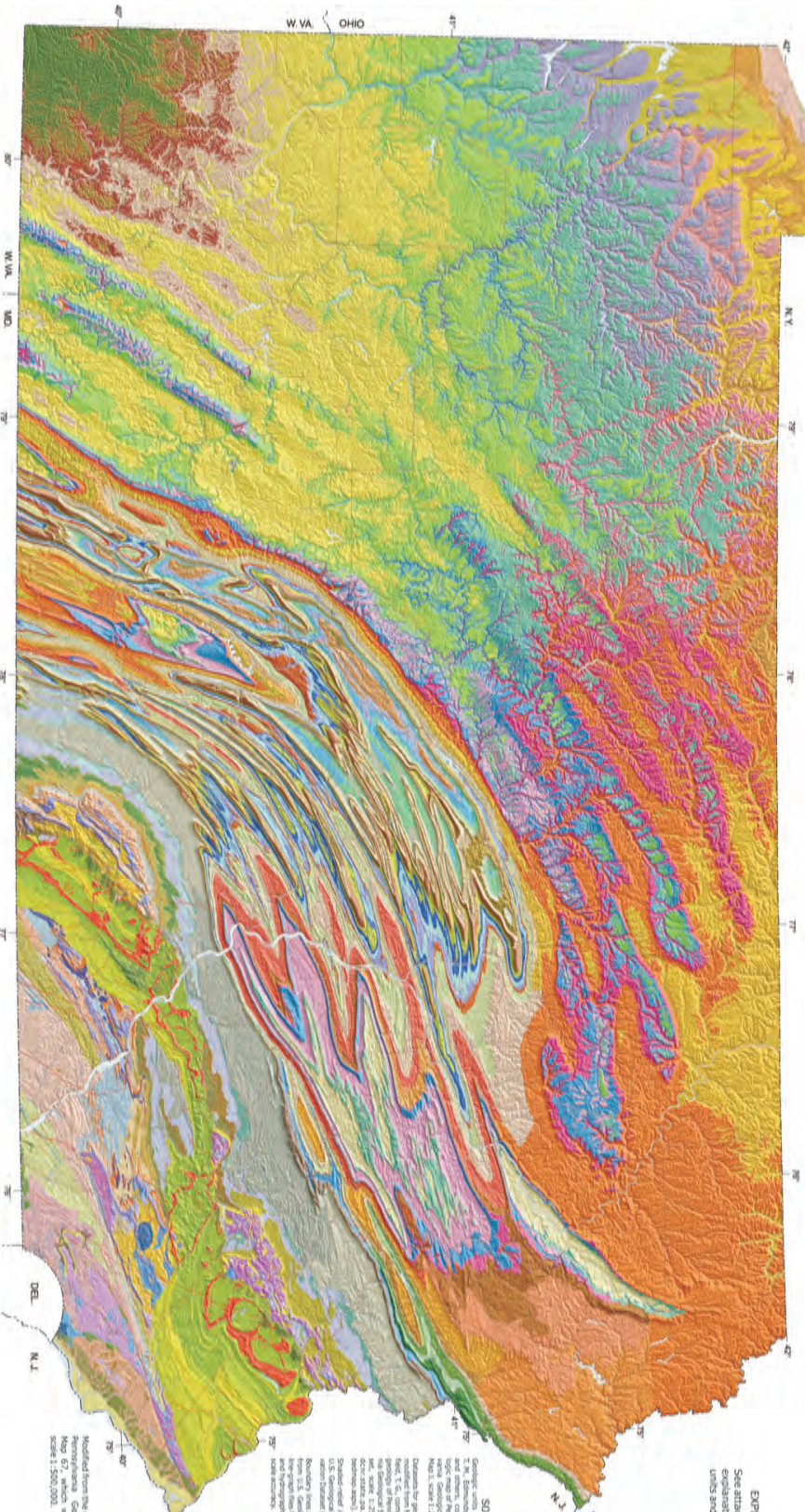
The Central Lowlands Province in Pennsylvania is a small section of low relief ridges parallel to Lake Erie. It exists along a glacial escapement adjacent to the lake. Local relief is quite flat, in most places less than 50 feet. Elevation at Lake Erie is 570 feet and rises southward to about 1,000 feet. Presque Isle State Park and Erie Bluffs are outstanding scenic geological features in this section.

The Atlantic Coastal Plain Province is a narrow, flat strip of land with elevations less than 200 feet adjacent to the Delaware River in the easternmost corner of Pennsylvania. It consists of bedrock buried under sand and gravel deposits. Many small tributaries have cut small gorges into the bedrock. It was once home to thousands of acres of fresh water tidal marsh, much of which was filled for industrial and residential development. Philadelphia is located in this province. The area is prone to floods. Neshaminy State Park is located here.

The New England Province has fragmented parts that extend into eastern Pennsylvania as the southern end of the Hudson Highlands from New York and New Jersey. The hills and ridges north and east of Reading are called the Reading Prong and consist of ridges of gneiss and quartzite which project above the softer sedimentary rocks. It occupies sections of Lebanon, Berks, Lehigh and Northampton Counties.

The Piedmont Province located northwest of the Coastal Plain is dominated by gently rolling hills and valleys. It has some of the best farmland in the state (Lancaster and Chester Counties) and some of the most fertile soils in eastern United States. The upland areas contain some of the oldest exposed rocks (Baltimore Gneiss). The lowlands contain limestone, sandstone, shale and a resistant diabase which is best seen at the Gettysburg battlefield. The famous fall line defines the Piedmont from the Coastal Plain. Some of the state parks in this section include Codorus, Marsh Creek and Ridley Creek.

The Appalachian Plateaus Province is the largest province in the state extending from the northeast corner to the entire western part of the state. Most of the rocks are not folded and faulted but remain relatively flat. There are a variety of sections each with their own characteristics. In western Pennsylvania, large bituminous coal fields exist. In glaciated sections, steep canyons developed and erosion created steep gorges. Ricketts Glen State Park contains examples of the escarpment that divides the high plateau. The Grand Canyon of Pennsylvania is in an isolated northern area of deep gorges, some at least 1000 feet deep. The Allegheny Front section includes Blue Knob (3,146 feet) that is an unusual bulge along the ridgeline. The Allegheny Mountain section contains Pennsylvania's highest point, Mount Davis (3,213 feet) near the Maryland border. The Pocono Mountain section is a glaciated part of this province and contains the sedimentary rocks such as sandstones. With elevations from 1,200 feet to 2,300 feet, this section has a few steep hills such as Camelback Mountain. Lackawanna and Promised Land are state parks located here.

The Ridge and Valley Province provides a roller-coaster ride of valleys and steep ridges. It is the second largest province in the state. The rocks are severely folded and contain numerous anticlines and synclines that plunge and fold due to continent collision. The Great Valley is known by three parts: the Lehigh Valley, the Lebanon Valley and Cumberland Valley. It is characterized by valuable carbonate rocks such as limestones and dolostones which are used for cement and fertilizers. The limetone areas are subject to cave-ins due to sinkholes. Blue Mountain, also known as the Kittatinny Ridge contain many water gaps such as the Delaware Water Gap and wind gaps. The anthracite coal fields are located in the northeastern section of the province. Landslides and acid mine drainage are some of the hazards here. Numerous state parks are located here including Beltzville, Greenwood Furnace, Lehigh Gorge, Jacobsburg, and Kings Gap—to name a few. (The northern tip of the Blue Ridge is included in this section but it was grouped as part of a separate province, creating a seventh province in Pennsylvania).

Activity 3: *Physiographic Region Cards and Photos – Page 2 (2/2)*

Cut the cards and photos, scramble them. Participants are to place cards and photos in the appropriate regions of the maps.

Full-size map located in back pocket.

Full-size map located in back pocket.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
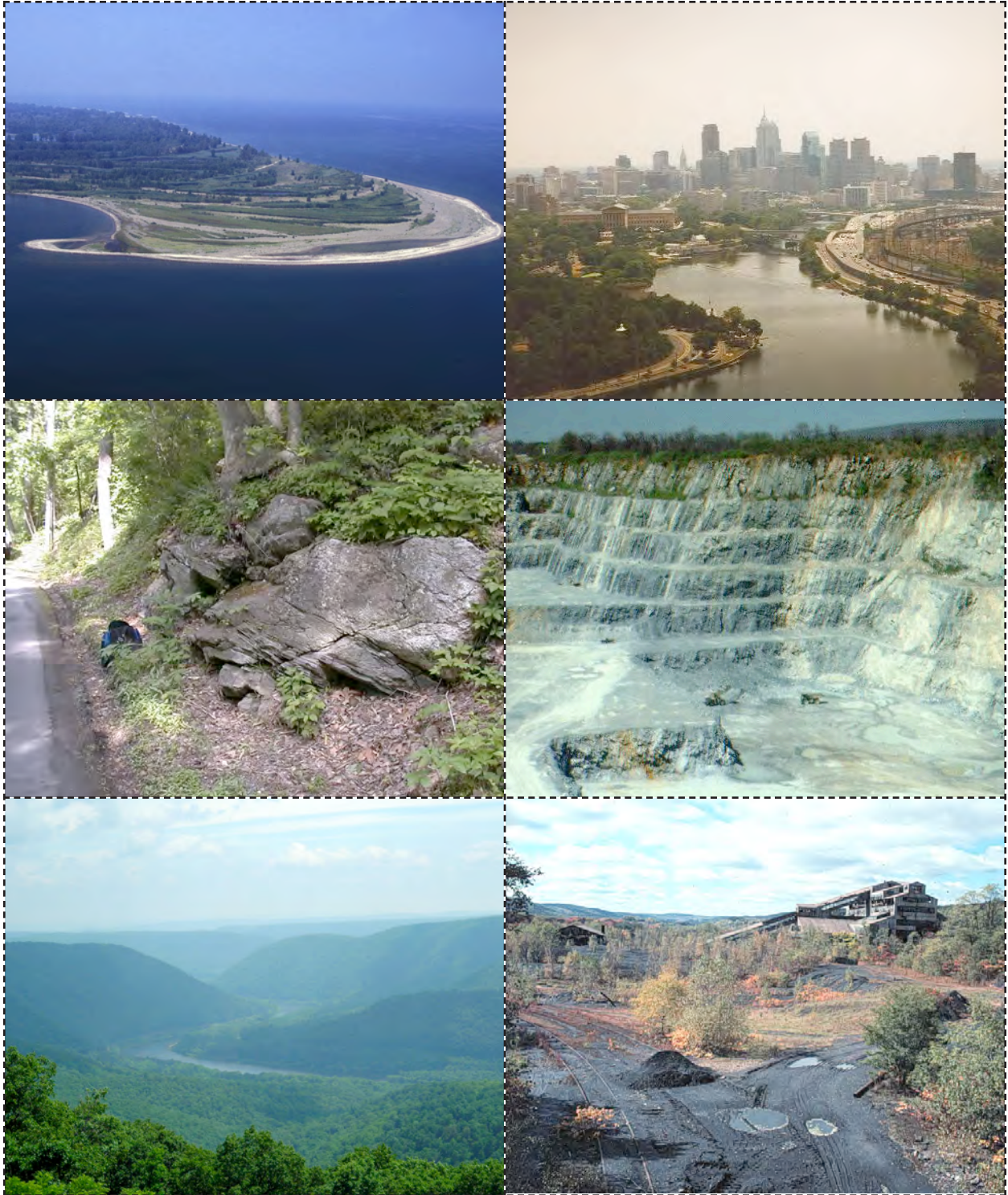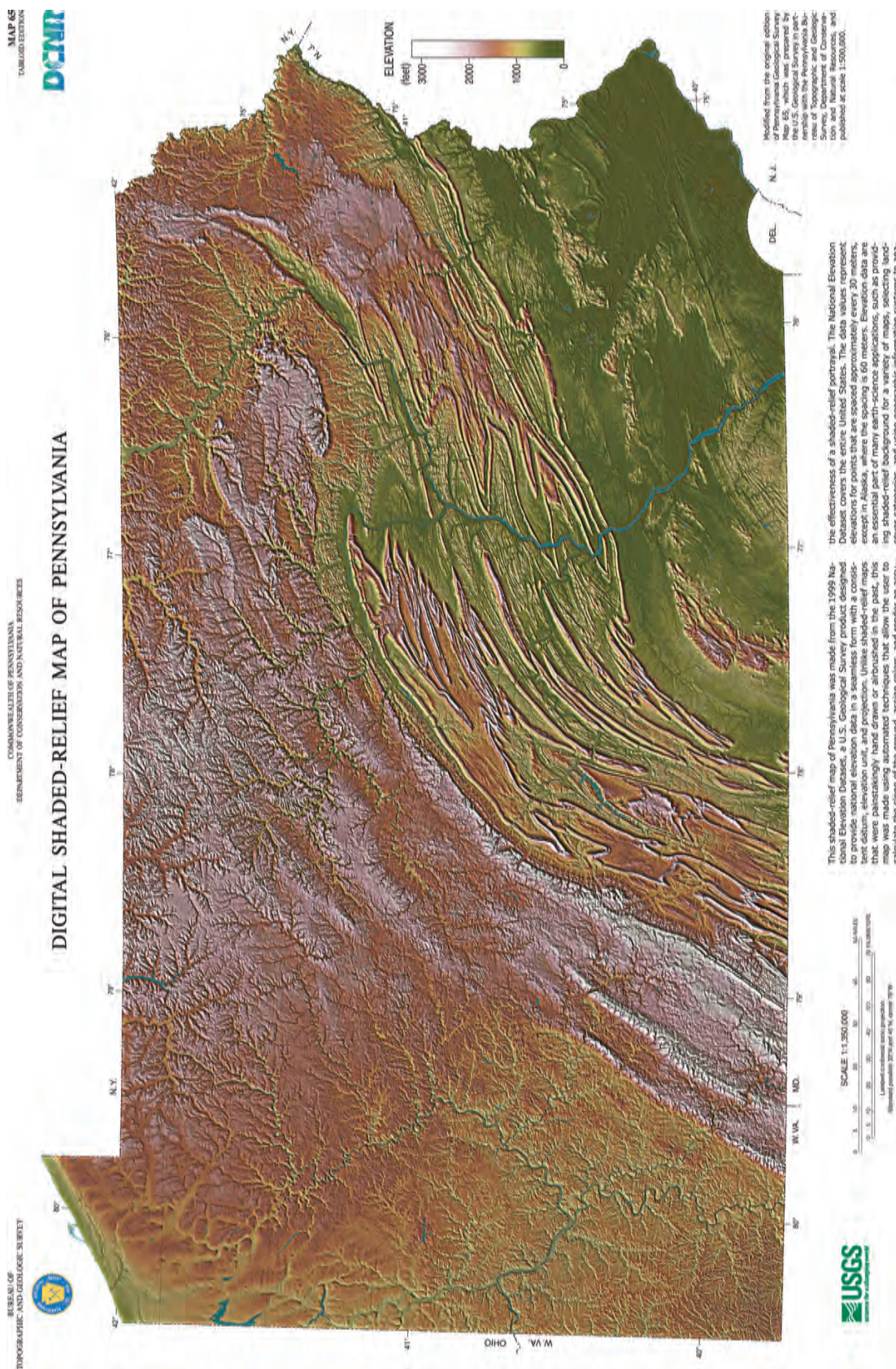
GEOLOGIC SHADED-RELIEF MAP OF PENNSYLVANIA

COMPILED BY
CHRISTINE E. MILES
2001

BUREAU OF
TOPOGRAPHIC AND GEOLOGIC SURVEY

MAP 67
TABLOID EDITION

Full-size map located in back pocket.

Pennsylvania Watershed Map

ERIE

OHIO

GENESEE

POTOMAC

SUSQUEHANNA

DELAWARE
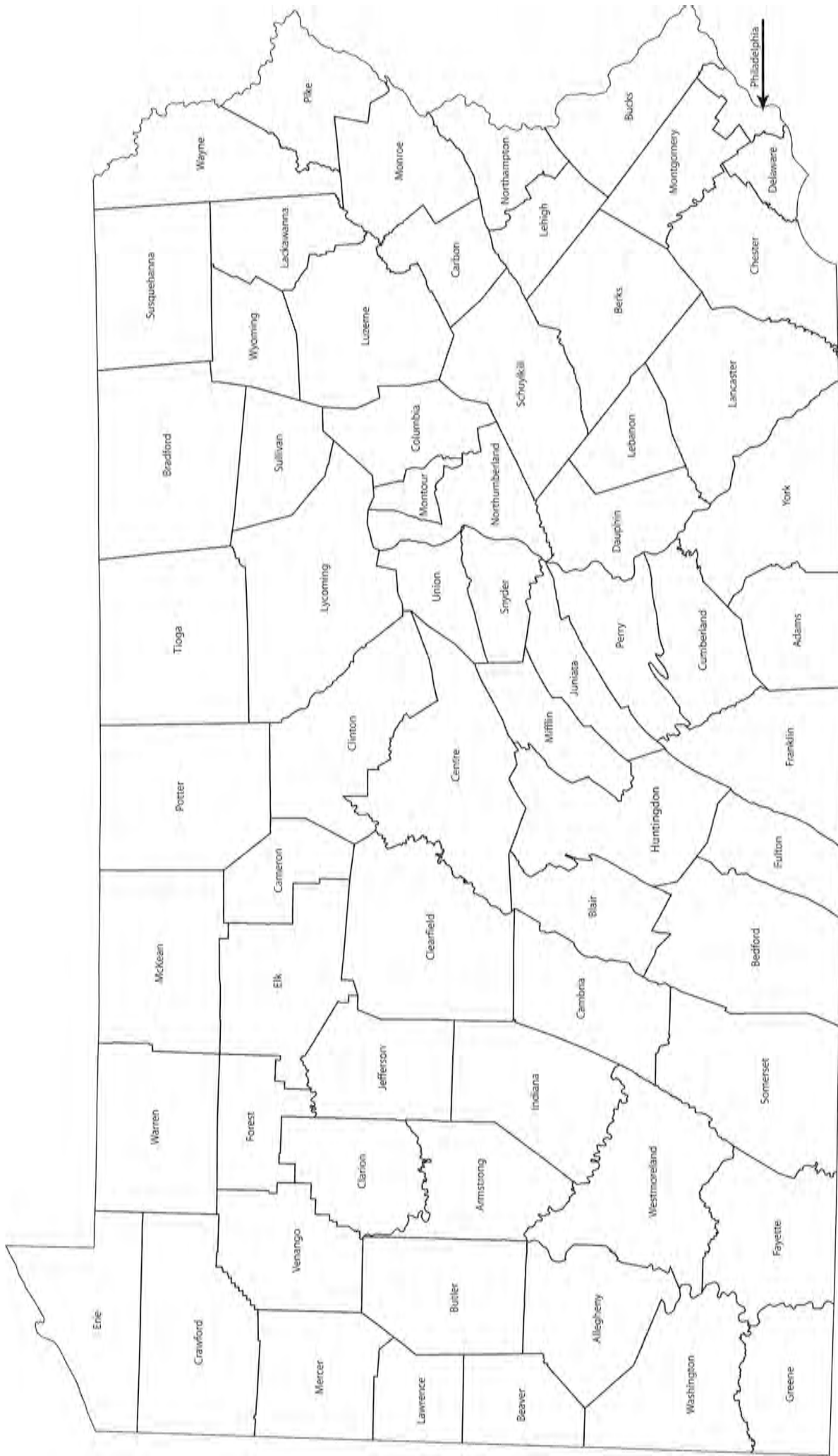
Counties of Pennsylvania

Municipalities of Pennsylvania
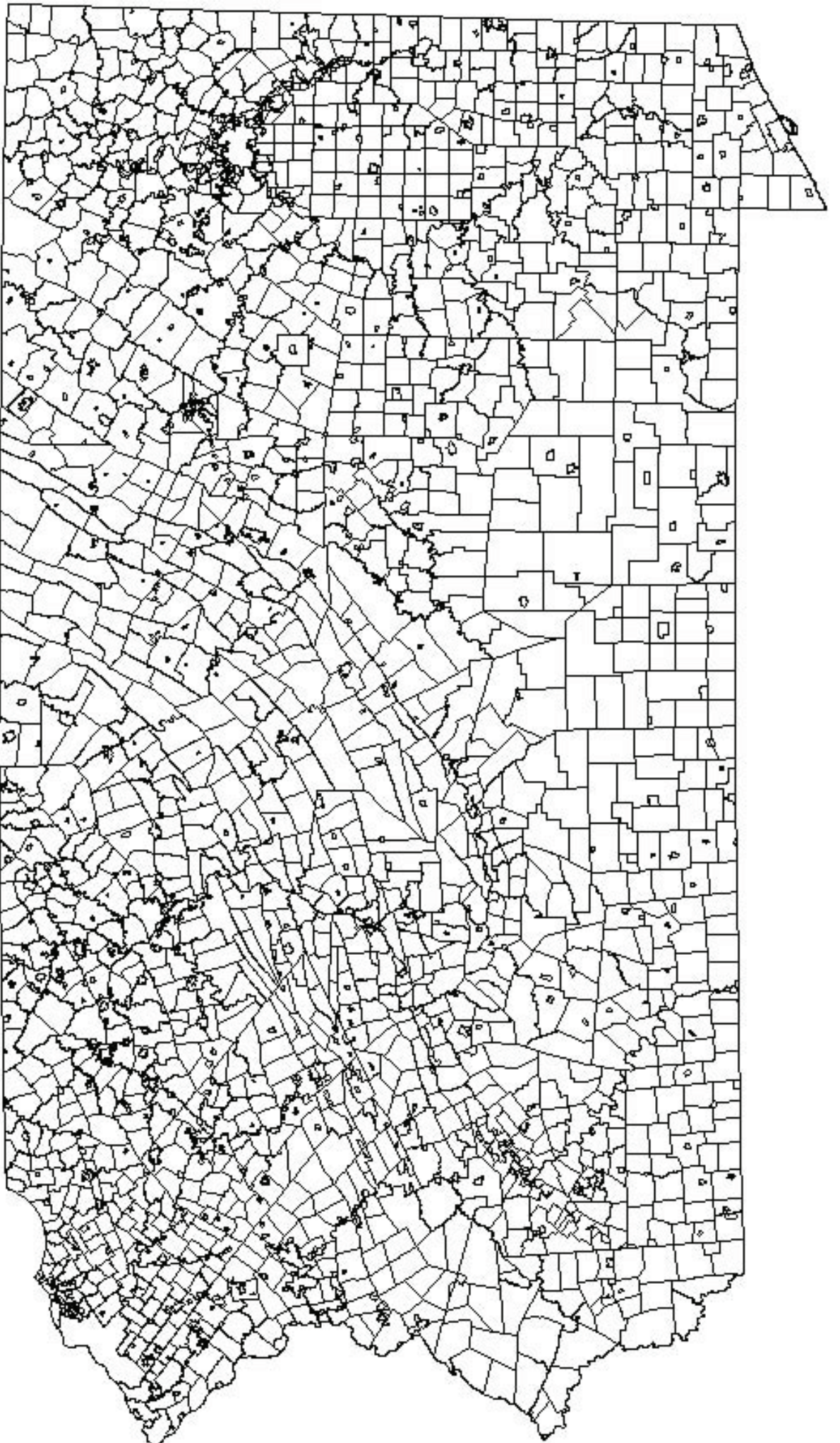
Activity 3: *Percent of Population Change Worksheet*

Team Members _____

How many counties are in Pennsylvania? _____

Top Eight Population Increase

County	Percent	Features
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

Top Eight Population Decrease

County	Percent	Features
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

No Change in Population

County	Features
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

Activity 3: *Change in Population 2000–2002 – Page 1 (1/2)*

County	Population 7/1/2002 *(Estimated)*	Population 4/1/2000	Change
Adams	94,437	91,292	+3,145
Allegheny	1,269,904	1,281,666	-11,762
Armstrong	71,673	72,392	-719
Beaver	179,351	181,412	-2,061
Bedford	49,944	49,984	-40
Berks	382,108	373,638	+8,470
Blair	127,840	129,144	-1,304
Bradford	62,810	62,761	+49
Bucks	610,440	597,632	+12,808
Butler	178,078	174,083	+3,995
Cambria	150,452	152,598	-2,146
Cameron	5,843	5,974	-131
Carbon	59,688	58,802	+886
Centre	138,524	135,758	+2,766
Chester	450,160	433,501	+16,659
Clarion	41,316	41,765	-449
Clearfield	83,203	83,382	-179
Clinton	37,680	37,914	-234
Columbia	64,134	64,151	-17
Crawford	89,856	90,366	-510
Cumberland	217,743	213,674	+4,069
Dauphin	252,933	251,798	+1,135
Delaware	553,435	550,864	+2,571
Elk	34,454	35,112	-658
Erie	280,370	280,843	-473
Fayette	146,654	148,644	-1,990
Forest	4,888	4,946	-58
Franklin	131,598	129,313	+2,285
Fulton	14,365	14,261	+104
Greene	40,520	40,672	-152
Huntingdon	45,707	45,586	+121
Indiana	88,780	89,605	-825
Jefferson	45,818	45,932	-114
Juniata	22,760	22,821	-61

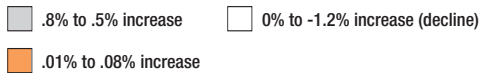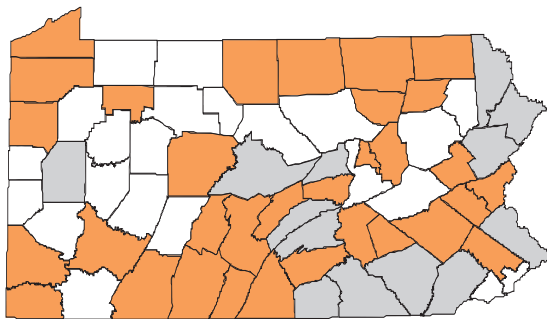| County	Population 7/1/2002 (Estimated)	Population 4/1/2000	Change
Lackawanna	210,711	213,295	-2,584
Lancaster	478,561	470,658	+7,903
Lawrence	94,104	94,643	-539
Lebanon	121,199	120,327	+872
Lehigh	317,533	312,090	+5,443
Luzerne	314,643	319,250	-4,607
Lycoming	119,000	120,044	-1,044
McKean	44,884	45,936	-1,052
Mercer	119,514	120,293	-779
Mifflin	46,435	46,486	-51
Monroe	148,839	138,687	+10,152
Montgomery	766,517	750,097	+16,420
Montour	18,214	18,236	-22
Northampton	273,324	267,069	+6,255
Northumberland	93,371	94,556	-1,185
Perry	43,876	43,602	+274
Philadelphia	1,492,231	1,517,550	-25,319
Pike	50,095	46,302	+3,793
Potter	18,217	18,080	+137
Schuylkill	148,505	150,336	-1,831
Snyder	37,828	37,546	+282
Somerset	79,456	80,023	-567
Sullivan	6,482	6,556	-74
Susquehanna	42,082	42,238	-156
Tioga	41,461	41,373	+88
Union	42,006	41,624	+382
Venango	56,810	57,565	-755
Warren	43,290	43,863	-573
Washington	204,110	202,897	+1,213
Wayne	48,889	47,722	+1,167
Westmoreland	368,428	369,993	-1,565
Wyoming	27,801	28,080	-279
York	389,209	381,751	+7,458

Activity 3: *Population Growth Graphs and Charts*

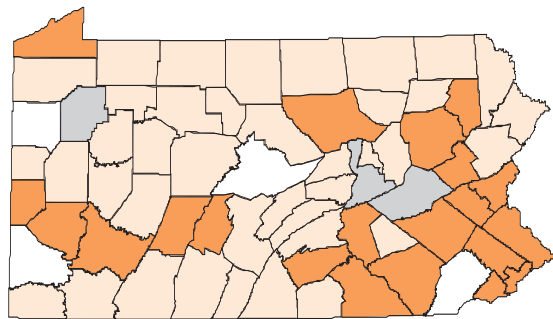### Pennsylvania Population: 1950-2000 (in millions)
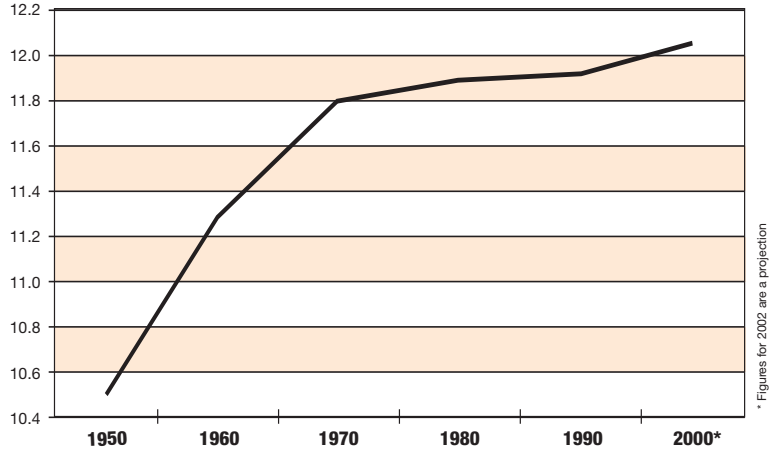
* Figures for 2002 are a projection

Pennsylvania Urban vs. Rural Growth: 1950-1990

	1950-1960	1960-1970	1970-1980	1980-1990
URBAN	9.4%	4.1%	-2.6%	-0.4%
RURAL	4.0%	4.4%	8.5%	1.4%

Pennsylvania Population Growth: 1988-1998

.8% to .5% increase
0% to -1.2% increase (decline)
.01% to .08% increase

Pennsylvania Urban and Rural Counties: 1990

Newly Classified Rural County
Newly Classified Urban County
Classified Rural County (Urban Population less than 50%)
Classified Urban County (Rural Population less than 50%)

59

1Team Members _____

Trends in Pennsylvania. The charts and graphs show changes that have taken place over the past several decades. Charts and graphs summarize data, providing a snapshot of information that will help you identify changes. With this information, you can better determine the planning goals and objectives for the future of Pennsylvania.

1. Using *Pennsylvania Population: 1950–2000* and *Pennsylvania Urban vs. Rural Growth: 1950–1990*, answer the follwing questions:

1. How has Pennsylvania's population changed since 1950? What is your projection for the future?

2. When was the time of greatest growth?

3. How much has it changed in the last 10 years?

2. Using the *Pennsylvania Population Growth: 1988–1998* and *Pennsylvania Urban and Rural Counties: 1990*, answer the following questions:

1. What is an urban area?

2. Compare the growth of urban and rural populations in 1950–1960 to the growth/decline in urban and rural populations of the 1970–1980, and 1980–1990.

3. When did the greatest change happen of people moving from urban to rural areas?

4. How many counties are newly classified from rural to urban? What happened?

5. How many counties are newly classified from urban to rural? What happened?

6. What is happening to rural areas? How could we plan to improve urban areas?

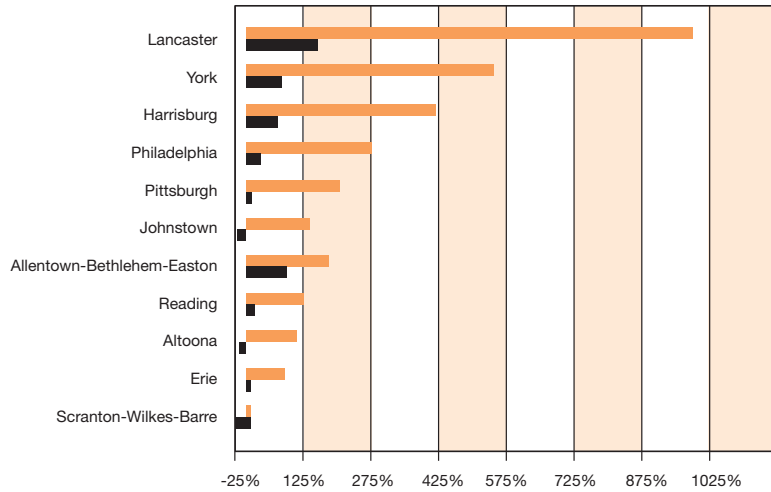*7. How many counties have had the greatest increase? Why?*

8. How many counties have declined in population? Why?
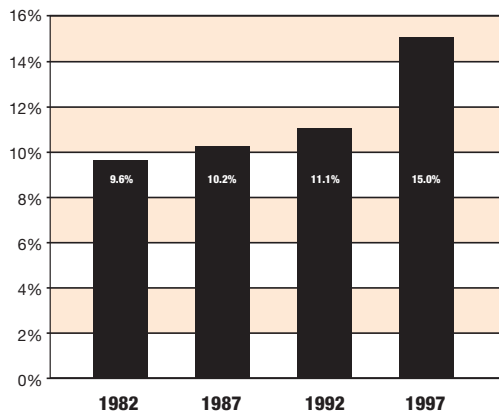
Activity 3: *Developed Land Graphs and Charts*

Pennsylvania Urbanized Development: 1950-1990

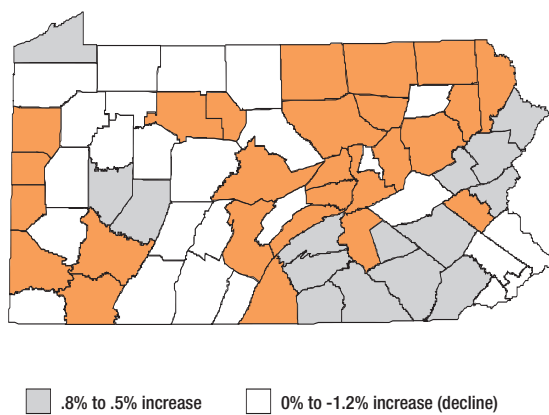City Population   City Land   Suburban Population   Suburban Land
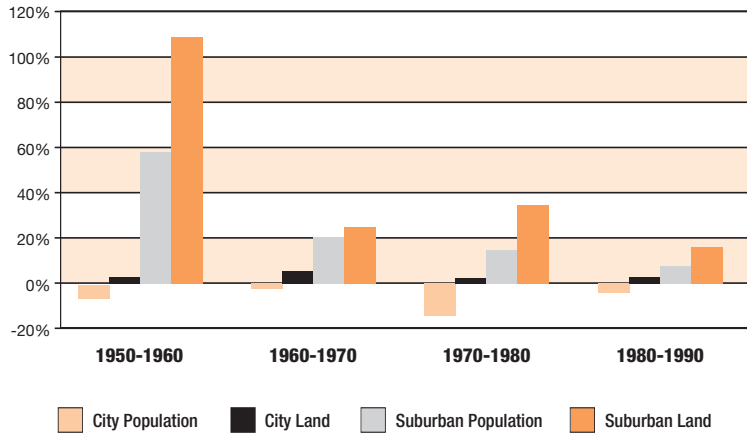
Pennsylvania Population: 1950-2000 (in millions)

Pennsylvania Percent of Land Developed: 1982-1997

Pennsylvania Growth in Developed Land: 1982-1997

.8% to .5% increase   0% to -1.2% increase (decline)

61

Team Members _____

Trends in Pennsylvania. The charts and graphs show changes that have taken place over the past several decades. Charts and graphs summarize data, providing a snapshot of information that will help you identify changes. With this information, you can better determine the planning goals and objectives for the future of Pennsylvania.

1. Using the *Pennsylvania Urbanized Development: 1950-1990* and *Pennsylvania Population: 1950-2000,* answer the following questions:

1. Define what is meant by "developed land."

2. How has developed land increased since 1982?

3. When did the greatest development occur?

4. Where did development largely occur? Why in certain areas?

2. Using the *Pennsylvania Percent of Land Developed: 1982-1997* and *Pennsylvania Growth in Developed Land: 1982-1997 charts,* answer the following questions:

1. What happened between 1950–1960 to city development compared to suburban development?

2. Describe what happened with population growth and land development between 1960 and 1990?

3. What three urbanized areas have the greatest growth in population? How does the population growth compare to the land growth?

4. If Pennsylvania's population has slightly increased less than one percent in the past 20 years, why has there been such an increase in developed land?

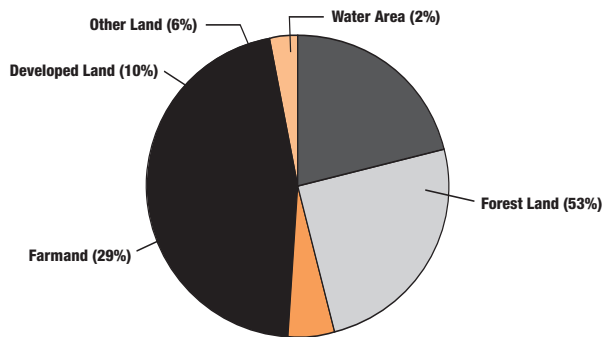**Activity 3:** *Land Cover and Agricultural Lands Graphs and Charts*
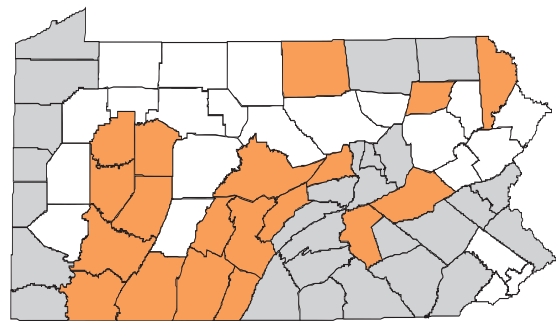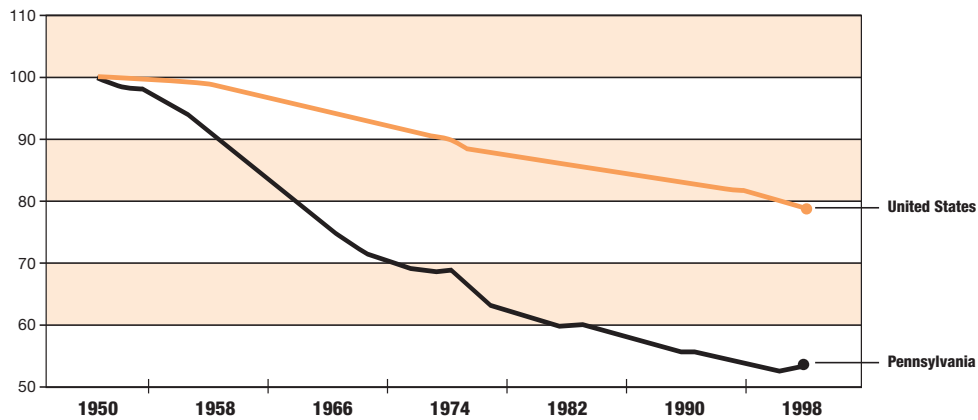
Pennsylvania Land Cover: 1982
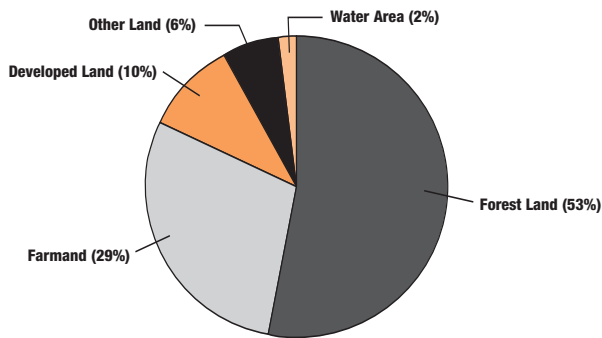
Other Land (6%)
Water Area (2%)
Developed Land (10%)
Forest Land (53%)
Farmand (29%)

Pennsylvania Land Cover: 1997

Other Land (6%)
Water Area (2%)
Developed Land (15%)
Forest Land (53%)
Farmand (24%)

United States Land Cover: 1997

Other Land (6%)
Water Area (2%)
Developed Land (10%)
Forest Land (53%)
Farmand (29%)

Pennsylvania Percent of Total Land in Farms: 1997

35% to 100%
0% to 19%
19% to 35%

Farm Acreage Index: 1950-1998 (in millions)

United States

Pennsylvania

Activity 3: *Land Cover and Agricultural Lands Worksheet*

Team Members_____

Trends in Pennsylvania. The charts and graphs show changes that have taken place over the past several decades. Charts and graphs summarize data, providing a "snapshot" of information that will help you identify changes. With this information, you can better determine the planning goals and objectives for the future of Pennsylvania.

1. Using the *Pennsylvania Land Cover: 1982, Pennsylvania Land Cover: 1997,* and *United States Land Cover: 1997 charts,* answer the follwing questions:

1. What are the categories of land cover?

2. Compare the change in land cover between 1982 and 1997. What land cover increased? What land cover decreased?

3. How many acres of farm land were developed between 1982 and 1997? Why?

4. How does Pennsylvania's developed land compare to the national average?

2. Using the *Farm Acreage Index* and *Pennsylvania Percent of Land in Farms: 1997,* answer the following questions:
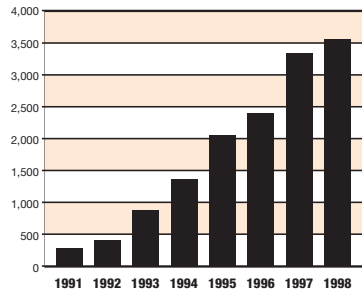
1. What has happened to Pennsylvania farmland since 1950 compared to the national average?
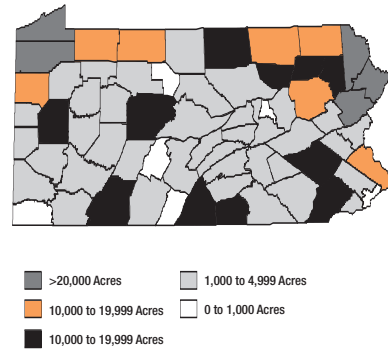
2. Why has farm acreage declined?

3. Where are the farmlands located that will be urbanized in the near future?

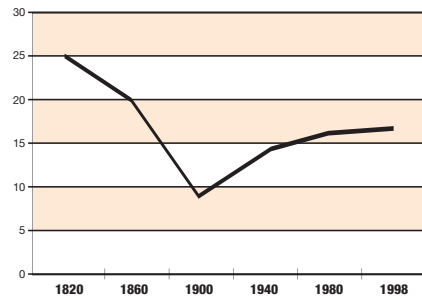**Activity 3:** *Wetlands, Forest and Park Land Graphs and Charts*

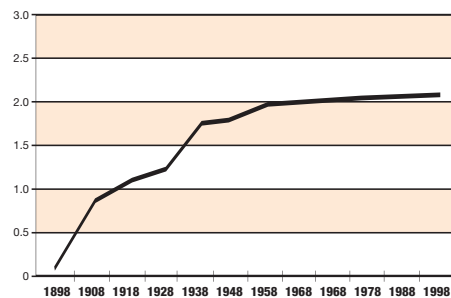### Pennsylvania Cumulative Acres of Wetland Restored: 1991-1998

Pennsylvania Acres of Wetland by County: 1990

- >20,000 Acres
- 10,000 to 19,999 Acres
- 10,000 to 19,999 Acres
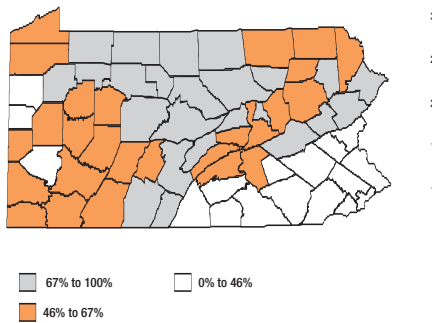- 1,000 to 4,999 Acres
- 0 to 1,000 Acres

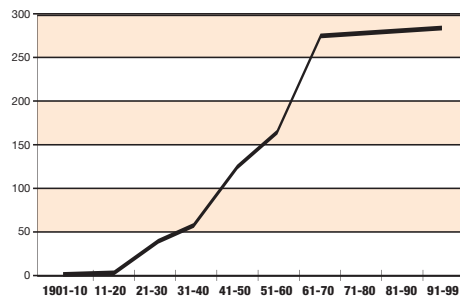### Pennsylvania Acres of Forest Land: 1820-1998 (in millions)

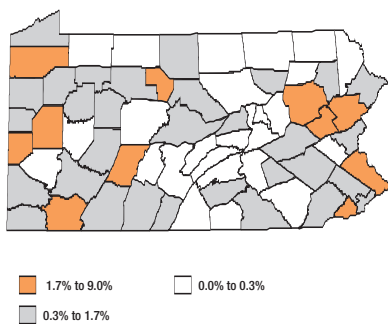### Pennsylvania Acres of State-owned Forest Land: 1898-1998 (in millions)

Pennsylvania Percent of Total Land that is Forest Land: 1989

- 67% to 100%
- 46% to 67%
- 0% to 46%

Pennsylvania Park Land: 1901-1999 (in thousands)

Pennsylvania Percent of Total Land that is State Park Land: 1994

- 1.7% to 9.0%
- 0.3% to 1.7%
- 0.0% to 0.3%

Team Members_____

Trends in Pennsylvania. The charts and graphs show changes that have taken place over the past several decades. Charts and graphs summarize data, providing a snapshot of information that will help you identify changes. With this information, you can better determine the planning goals and objectives for the future of Pennsylvania.

1. Using *Pennsylvania Cumulative Acres of Wetland Restored: 1991–1998* and *Pennsylvania Acres of Wetland by County: 1990,* answer the following questions:

1. Define wetlands. Why are they valuable?

2. What has happened to wetlands since the 1700s?

3. In 1990, which areas of Pennsylvania had the most wetlands?

4. Why are wetland habitats threatened in Pennsylvania?

5. How many acres of wetlands were restored between 1991 and 1998?

2. Using the *Pennsylvania Acres of Forest Land: 1820–1998, Pennsylvania Acres of State-owned Forest Land: 1898–1998,* and *Pennsylvania Percent of Total Land that is Forest Land: 1989,* answer the follwing questions:

1. What happened to forestland in the 1800's?

2. What happened to state-owned forest land since 1898? since 1970?

3. How many acres of Pennsylvania are forested?

4. Which regions are the most and least heavily forested? Why?

3. Using *Pennsylvania Park Land: 1901–1999* and *Pennsylvania Percent of Total Land that is State Park Land: 1994,* answer the follwing questions:
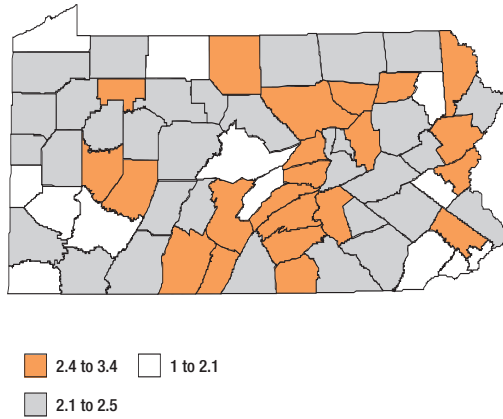
1. When did the greatest growth occur in state parks?

2. What has happened in growth of park land since 1970?

3. How valuable are state parks to Pennsylvania?

Activity 3: *Vehicles, Road Miles and Public Transportation Worksheet Graphs and Charts*
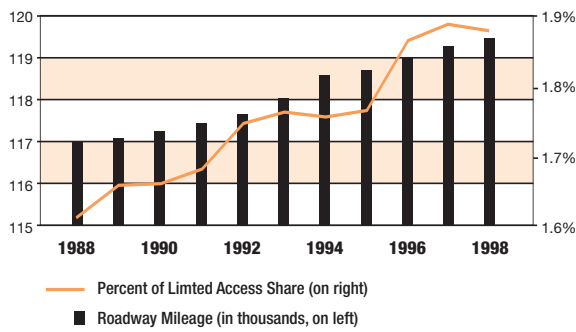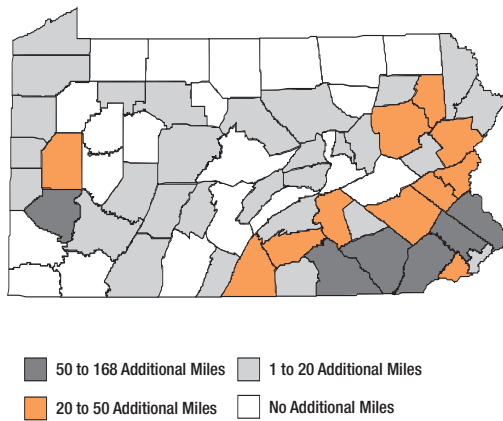
Pennsylvania Vehicle Registrations: 1978-1998
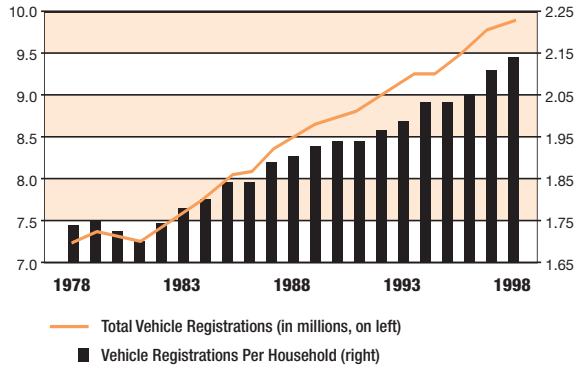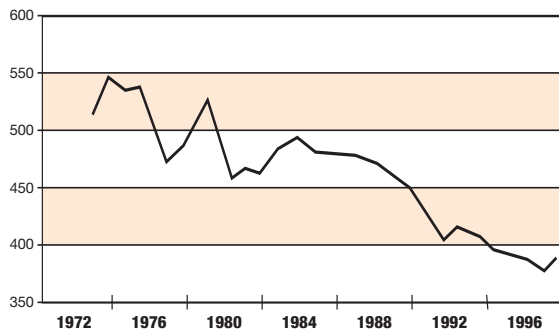

— Total Vehicle Registrations (in millions, on left)

■ Vehicle Registrations Per Household (right)

Pennsylvania Vehicle Registrations Per Household: 1998

■ 2.4 to 3.4   □ 1 to 2.1

■ 2.1 to 2.5

Pennsylvania Road Mileage: 1988-1998

— Percent of Limted Access Share (on right)

■ Roadway Mileage (in thousands, on left)

Pennsylvania Change in Public Road Miles: 1994-1998

■ 50 to 168 Additional Miles   ■ 1 to 20 Additional Miles

■ 20 to 50 Additional Miles   □ No Additional Miles

Pennsylvania Urban Transit Ridership: 1972-1996
(Number of passenger trips in thousands)

Pennsylvania Access to Public Transportation: 1998

■ Have Systems with Annual Ridership of 76 Million to 293 Million Trips   ■ Have Systems with Annual Ridership of .03 Million to 1 Million Trips

■ Have Systems with Annual Ridership of 1 Million to 3.7 Million Trips   □ Counties Without a Transit System

Team Members_____

Trends in Pennsylvania. The charts and graphs show changes that have taken place over the past several decades. Charts and graphs summarize data, providing a snapshot of information that will help you identify changes. With this information, you can better determine the planning goals and objectives for the future of Pennsylvania.

1. Using the *Pennsylvania Vehicle Registrations: 1978-1998* and *Pennsylvania Vehicle Registrations Per Household: 1998,* answer the following questions:

1. How has the number of vehicles changed since 1978?

2. How does vehicle registration impact Pennsylvania's land use?

3. What is the average number of vehicles per household in your county?

2. Using the *Pennsylvania Road Mileage: 1988-1998,* and *Pennsylvania Change in Public Road Miles: 1994-1998,* answer the following questions:

1. How have the miles of roads changed from 1988 to 1998?

2. How do road miles equate to land development?

3. Using the *Pennsylvania Urban Transit Ridership: 1972-1996* and *Pennsylvania Access to Public Transportation 1998,* answer the following questions:

1. What happened to the number of urban transit trips from 1972–1996?

2. Why is there a decline in public transportation?

3. How does efficient and desirable public transportation benefit land use in Pennsylvania?

Activity 3: *Answer Key for Percent of Population Change Worksheet*

Top Eight Population Increases	
County	Percent
1. Pike	8.2
2. Monroe	7.3
3. Chester	3.8
4. Wayne	2.4
5. Adams	3.4
6. Bucks	2.1
7. Butler	2.3
8. York	2.0

Top Eight Population Decreases	
County	Percent
1. Cambria	-1.4
2. Philadelphia	-1.7
3. Allegheny	-0.9
4. Beaver	-1.1
5. Lackawanna	-1.2
6. Schuylkill	-1.2
7. Elk	-1.9
8. Luzerne	-1.4