Save Our Soil- Exploring Agricultural Land Use Grades 6-12

Science, Earth and Space Science, Environmental Science, Social Studies, World Human Geography



Objectives

Students will learn about the distribution of agricultural land through a demonstration with an apple representing the earth. Students will discuss the impacts of land development. Students will make land use decisions for a variety of situations and justify their decisions. Students will learn about how human activity impacts the environment and our ability to produce food through hands-on activities and research. Students will learn about the factors behind rural to urban migration, public policy solutions to protect agricultural lands from urban encroachment, and the opportunities and challenges facing the world's megacities.

Vocabulary

arable—land suitable for growing crops, gardens and pastures. commerce—the exchange or buying and selling of goods and services ecosystem—a system made up of an ecological community of living things interacting with their environment especially under natural conditions erosion—the state of being worn away by the action of water, wind, or glacial ice grassland—an ecological community in which the characteristic plants are grasses hectare—a unit of area, equal to 10,000 square metres, commonly used for measuring land area; 1 hectare = 2.4710439 US survey acres infrastructure—the system of public works of a country, state, or region megacity—a city with populations over 10 million public policy—actions taken by a government in response to an issue or problem sprawl-the spreading of urban developments (as houses and shopping centers) on undeveloped or agricultural land near a city suburban-the residential area on the outskirts of a city or large town urban-related to a city; densely developed residential, business and commercial areas wetlands—land or areas (as marshes or swamps) that are covered with shallow water or have soil saturated with moisture

Background

Soil is formed when water, wind, temperature fluctuations, gravity, chemical reactions and living organisms break down rock. It can take up to 1000 years for just 1 cm of topsoil to be produced. Soil that is suitable for growing food is called **arable** land. Every year the world loses thousands of acres of arable land. Between 2000 and 2010, the number of acres used for growing crops in the US dropped by 8.6 million acres. The bulk of soil loss is due to human activity. Unsustainable farming techniques can cause soil loss through wind and water erosion. Overgrazing in hot dry areas can turn marginal land into deserts. But most of the loss during the first decade of the 21st Century was due to converting farmland to sites for homes, businesses, parking lots and roads.

Through ag-friendly **public policy**, many state and local governments have statutes in place to better protect prime agricultural land. As a result the total area of cropland has declined very slightly since 2012 and is expected to remain relatively stable through 2030. In the US, farmers are still able to produce enough food to supply our population and export the remainder to countries without enough agricultural land to support their populations.

Save Our Soil-Exploring Agricultural Land Use (continued)

In Oklahoma we have about 32.5 million acres utilized for food production and about 12.3 million acres in commercial, industrial or residential use. Between 2001 and 2016, 273,300 acres of Oklahoma farmland was converted to either commercial, industrial or residential land use, including 135,900 acres of our best agricultural land. While that sounds like a lot, it amounts to just a 0.4 percent reduction in cropland.

Since the beginning of agriculture, humans have been altering the landscape to produce food, create settlements, and pursue **commerce** and industry. Croplands, pastures, **urban** and **suburban** areas, industrial zones, and the area taken up by roads, reservoirs, and other major **infrastructure** all represent conversion of natural ecosystems. These transformations of the landscape yield most of the food, energy, water, and wealth we enjoy.

Historically, expansion of agriculture into forests, **grasslands**, and **wetlands** was the greatest source of **ecosystem** conversion. During the 20th century, however, expansion of urban areas, with their associated housing, roads, power grids, and other infrastructure, has also become a potent source of land transformation.

Urban and built-up areas now occupy about 4 percent of the world's land area. Almost half the world's population live in cities. Urban populations increase by about 160,000 people daily, adding pressure to expand urban boundaries into agricultural areas.

Suburban sprawl is often driven by the desire for larger homes and the belief that cities are no longer safe. This outward migration magnifies the effect of urban population growth, particularly in North America and Europe. As housing developments are built on the edge of cities, commercial property soon follows. The extra paved roads and parking lots can re-route the natural flow of runoff water and create flooding if the expansion is not well managed. There can also be conflicts between the normal sounds, odors and dust generated by farming and the new neighbors.

As people long for the open air and green space of rural areas, demand for property near cities grows. Property values increase to the point that some farmers take advantage of the ability to sell some land and pay off their farm debt. Some relocate their farming operations to other areas and some elderly farmers get out of farming all together.

In the US, the percentage of people living in urban areas increased from 65 percent of the nation's population in 1950 to 83 percent in 2020. The area covered by cities has quadrupled in size. Rural to urban migration is often driven by individuals and families seeking economic opportunities and convenient proximity to shopping, schools, medical care, etc.

From a land use perspective, urban migration is not all bad. In the US, population density within cities is about 1,600 people per square mile. In rural areas, it is about 35 people per square mile. In areas like New York City, some neighborhoods with high-rise apartments and condos have density levels of 33,000 people per square mile. As long as expansion to accommodate these additional residents uses marginal, rather than prime agricultural land, a higher population density actually leaves more arable land free for food production than when growth occurs in rural communities.

Save Our Soil-Exploring Agricultural Land Use (continued)

Urban migration has resulted in a new category of cities—**megacities**—with populations over 10 million. In 1950, there were only two megacities - New York/Newark and Tokyo. By 2020 there were 34 megacities located across Africa, Asia, Europe, North America and South America. Currently 60 percent of all megacities are located in Asia, but population projections indicate that by 2050, the largest cities will be in Africa.

By 2050 it is projected that about 70 percent of the world population will live in urban areas. In upper income areas, megacities are centers of wealth and opportunity for their residents. In low income areas, housing, infrastructure, utilities and services may not be able to keep up with the influx of residents. This can result in people living in substandard housing, often without adequate utilities (electricity, gas, water and waste disposal) and an increase in homelessness and crime.

Even though public policies have slowed the conversion of farmland to residential and commercial use, cities with insufficient green space do have serious environmental challenges. Many cities, like Chicago are planting trees in the heart of the city to increase the rate CO₂ conversion. Many Asian cities have rooftop and urban gardens in addition to rain barrels to increase food production and add green space.

Additional Reading

- Bigelow, D.P. and Borchers, A., *Major Uses of Land in the United States*, U.S. Department of Agriculture, Economic Research Service, 2017
- Freedgood, Julia, Hunter, Mitch, Dempsey, Jennifer, Sorenson, Ann, *Farms Under Threat: The State of the States*, American Farmland Trust, 2020
- Radwan, Taher M., Blackburn, G. Alan, Whyatt, J. Duncan, Atkinson, Peter M., *Dramatic Loss of Agricultural Land Due to Urban Expansion Threatens Food Security in the Nile Delta, Egypt,* Remote Sensing, February 8, 2019
- Spangler, Kaitlyn, Burchfield, Emily, Schumacher, Britta, *Past and Current Dynamics of U.S. Agricultural Land Use and Policy*, Frontiers in Sustainable Food Systems, July 21, 2020
- Zhou, Ting, Koomen, Eric and Ke, Xinli, *Determinants of Farmland Abandonment on the Urban—Rural Fringe*, Environmental Management, 65, 369-384, 8 February 2020

Websites

https://tradingeconomics.com/united-states/agricultural-land-percent-of-land-area-wb-data.html

https://www.nass.usda.gov/Publications/Todays_Reports/reports/fnlo0419.pdf

https://farmland.org/project/Farms-Under-Threat/

https://www.frontiersin.org/articles/10.3389/fsufs.2020.00098/full

https://www.sare.org/wp-content/uploads/2019-2020-National-Cover-Crop-Survey.pdf

https://mccartyfamilyfarms.com/wp-content/uploads/2018/11/EP-MFF-Executive-Summary-2017-Final_Updated-11-12-18.pdf

REV 12/2020

Grades 6-12 Teacher Resources and Standards

1 50 minute class period

Activity 1: Land Use

Activity 1

(Science, Earth and Space Science, Environmental Science)

Students will learn about how human activity impacts the environment and our ability to produce food through hands-on activities and research.

Oklahoma Academic Standards

Activity 1: Land Use (Science, Earth and Space Science, Environmental Science)

- 6.ESS2.1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.
- 7.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
- 7.ESS3.3 Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
- 7.ESS3.4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- ES.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can
- EN.ESS2.2 create feedbacks and interactions that cause changes to other Earth's systems.
- ES.ESS3.1 Construct an explanation based on evidence for how the availability of natural
- EN.ESS3.1 resources, occurrence of natural hazards, and changes in climate affect human activity.
- EN.LS2.7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Materials:

- apple
- one sharp knife (for demonstration)
- cutting board
- Activity 1 Teacher Guide "Land Use Diagram"
- Activity 1 Worksheet 1 "Land Use"
- Activity 1 Information Page "Facts About Land Use"

Activity 1- Continued

Grades 6-12 Teacher Resources and Standards

Procedures

- 1. Conduct the following demonstration for your class.
 - -Provide students with copies of Activity 1 Worksheet 1 "Land Use"

—Cut the apple as follows using Activity 1 Teacher Guide "Land Use Diagram" to demonstrate the distribution of land on Earth.

- The apple represents the Earth. Cut the apple into fourths.
- Three-fourths represent the oceans. Put those aside.
- The remaining one-fourth represents all the land on Earth. Cut the remaining fourth in half. This represents 1/8 of the land on earth. Put one of those pieces aside. That piece represents all the deserts, swamps, and mountain and the Arctic and Antarctic. These lands are not suitable for farming.
- Cut the remaining one-eighth into four pieces. These four pieces each represent 1/32nd of the land on earth. Three of these represent land where people can live, but not grow food. Some of it was never arable because it is too rocky, wet, cold, steep or has soil too poor to produce food. Some of it was once used for growing food, but is now developed. Other areas like parks, nature preserves and other public lands are not developed or used for food production. Hold up each 1/32 piece.
 - One section is too wet. Put that one aside.
 - One is too hot or too cold. Put that one aside.
 - \circ $\,$ $\,$ One is covered by poor, rocky soil. Put that one aside.
- The last piece represents 1/32nd of the earth. Most of the last piece is covered by housing, shopping malls, streets, highways, parking lots. Cut the peel from this last piece. This represents the topsoil available for feeding the people on Earth
- 2. Have students complete Activity 1 Worksheet 1 "Land Use" as you cut up the apple.
- 3. Using Activity 1 Information Page "**Facts About Land Use**," read the statements aloud and lead a class discussion in which you ask the following questions:

--What would happen if the sliver of topsoil we use for food production should suddenly wash into the ocean or become unusable because of chemical contamination or natural disaster? --What will happen if the world's population continues to grow larger, while the amount of topsoil continues to grow smaller?



Cut apple as shown below to represent land use.

Activity 1 Worksheet 1: Land Use

Name: _____

Date:

Label the segments of the graph, using the information your teacher reads to you. Color the graph. Using a different color for each segment.





Save our Soil-Exploring Agricultural Land Use Information Page Facts about Land Use

- 1. The world's population is growing by about 1.6 percent per year, and some experts believe it will double by the end of the 21st century. To feed the growing population, farmers will need more land for growing crops or much higher yields on current land.
- 2. About 85 percent of agricultural land contains areas judged to have been degraded by erosion, salinization, compaction, and other factors, Soil degradation has already reduced global agricultural productivity by 13 percent in the last 50 years,
- 3. Urban and built-up areas now occupy more than 471 million hectares worldwide—about 4 percent of land area. Over half the world's population—4.1 billion in 2017—live in cities. Urban populations increase by another 160,000 people daily, adding pressure to expand urban boundaries into agricultural areas.
- 4. Farm and ranch land is desirable for building homes and commercial structures because it tends to be flat, well drained and affordable.
- 5. The food and farming system in the US is important to the balance of trade and the employment of 22.2 million people including direct on-farm employment of about 2.6 million and 19.6 million in agriculture and food related sectors.
- 6. Far more farmland is being converted than is necessary to provide homes for the growing population. Urban areas in the US have increased at twice the rate of population growth since 1945. Over the past 20 years, the average acreage per person for new housing almost doubled.
- 7. Three times the current population of the world could fit in the State of Oklahoma. The State of Oklahoma has an area of 69,903 square miles. One square mile will accommodate 278,784 people if each person is allowed 100 square feet. At that rate the State of Oklahoma could accommodate 19.49 billion people—more than twice the Earth's 2018 population of 7.6 billion.
- 8. Farm and ranch lands provide food and cover for wildlife, help control flooding, protect wetlands and watersheds, and maintain air quality. They can absorb and filter wastewater and provide groundwater recharge.
- 9. Although total cropland area in the US declined steadily from 1945 to 2010, thanks to public policies to protect farmland, the amount of farmland has changed very little since 2012. The number of farms has continued to decline since a high of 2.2 million in 2007. As small farms are absorbed by larger farming operations or purchased by neighbors who want to expand their operations, the amount of land in farming stays constant, but the number of farms declines.
- 10. Cultivable land per capita in China has declined approximately 20 percent since 1978, mostly due to rural industrialization and small-town growth.
- 11. Global consumption of livestock products has more than doubled in the past 30 years. Demand for livestock products in developing countries grew three times faster than in industrialized countries. Because many developing countries lack modern transportation infrastructure for shipping food (particularly meat, which must be kept refrigerated), most of the expanded production of livestock and feed grains to feed their populations will have to be close to home.

Grades 6-12 Teacher Resources and Standards

For more lessons and resources, please visit <u>www.agclassroom.org/ok</u>

Activity 2: Protecting Agricultural Land

(Science, Earth and Space Science, Environmental Science)

Students will learn about how human activity impacts the environment and our ability to produce food through hands-on activities and research.

Oklahoma Academic Standards

Activity 2: Protecting Agricultural Land (Science, Earth and Space Science, Environmental Science)

- 6.ESS2.1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.
- 7.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
- 7.ESS3.3 Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
- 7.ESS3.4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- ES.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can
- EN.ESS2.2 create feedbacks and interactions that cause changes to other Earth's systems.
- ES.ESS3.1 Construct an explanation based on evidence for how the availability of natural
- EN.ESS3.1 resources, occurrence of natural hazards, and changes in climate affect human activity.
- EN.LS2.7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Materials:

- Activity 2 Reading Page 1 "Protecting Agricultural Land"
- Activity 2 Worksheet 1 "Protecting Agricultural Land"

Procedures

- 1. Have students read Activity 2 Reading Page 1 "**Protecting Agricultural Land.**" Discuss the impacts of placing marginal lands into crop production, removing native trees, etc. on erosion.
- 2. Have students complete Activity 2 Worksheet 1 "**Protecting Agricultural Land.**" For enrichment, contact the local Natural Resources Conservation Service (NRCS) office and ask for a guest speaker to share how the agency works with farmers to prevent erosion and manage water/runoff.



1 50 minute class period

Human activity impacts our ability to produce food and threatens air and water quality. Around the world, soil is being broken down faster than it is being replenished. Over past 40 years about ½ of the world's arable land has become unproductive. The activities listed below contribute to those changes:



- Business, housing and road construction not only takes land out of production, clearing land for construction leaves it vulnerable to wind and water erosion.
 - Cutting down forests not only decreases the amount of plant material available to remove CO₂ from the air and produce oxygen, when trees are removed, the soil is vulnerable to erosion without the roots to hold the soil in place
- Unsustainable farming practices like growing the same crop in the same place year after year causes soil to lose nutrients faster than they can be replenished.
- Overgrazing grasslands makes land vulnerable to erosion when grass is pulled out by the roots during grazing and when animals' hooves break up the surface.

Extreme Erosion

The period in the 1930's commonly called the "Dust Bowl" is an example of wind erosion brought on by extreme drought. According to the 1936 Great Plains Committee, weather patterns and unsustainable farming practices led to severe crop failure and loss of topsoil. While weather was the primary cause, the following activities played a part as well:

- Overstocking of grassland with livestock
- Inefficient use of water resources
- Lack of farm improvement/long-term planning
- Expansion of farming into marginal areas
- Over-cultivation of small landholdings
- Failure to recognize diversity of soil conditions across the region

To prevent further soil loss, the Soil Conservation Service took aerial photos and made detailed soil maps to identify the areas needing the most attention.

Because of the changes made in farming and livestock

management practices, recent droughts have caused crop failures, but have not resulted in the level of soil loss that occurred during the 1930's

Government agencies like the Cooperative Extension Service (OSU Extension) and Natural Resources Conservation Service (NRCS) work directly with agricultural producers to encourage adoption of farming and land management practices that protect soil and water resources.

As urban and suburban areas need land for expansion, some states have created regulations that restrict conversion of working farms to residential or commercial property and creates buffer zones between farms and housing developments.



Activity 2 Worksheet 2: Protecting Agricultural Land



Name: _____ Date: ____

Use information from Protecting Agricultural Land to answer the following questions

List three human activities that have negative impacts on soil and the environment

1.	
2.	
3.	

Why was the 1930's drought in the Great Plains called the "Dust Bowl"?

List two government agencies who work with farmers to encourage good land management practices.

1. 2.

How can city planners, local and state governments build community infrastructure, housing and businesses without disrupting the food supply?

Activity 2 Worksheet 2: Protecting Agricultural Land

ANSWER KEY

Name: _

Date: _

Use information from **Protecting Agricultural Land** to answer the following questions

List three human activities that have negative impacts on soil and the environment

- 1. Clearing land for construction of roads, businesses and homes
- 2. Cutting down forests and native trees to grow crops on the land
- 3. Unsustainable farming practices and overgrazing pasture land

Why was the 1930's drought in the Great Plains called the "Dust Bowl"?

The dust bowl describes a period of time when extreme drought in the Great Plains combined with

unsustainable farming methods caused severe crop failure and loss of topsoil through wind

erosion. Huge dust storms made it impossible to see very far, the the name the "Dust Bowl"

List two government agencies who work with farmers to encourage good land management practices.

- 1. Natural Resources Conservation Service (NRCS)
- 2. <u>Cooperative Extension Service (OSU Extension)</u>

How can city planners, local and state governments build community infrastructure, housing and businesses without disrupting the food supply?

As urban and suburban areas need land for expansion, some states have created regulations

that restrict conversion of working farms to residential or commercial property and creates buffer

zones between farms and housing developments.



Grades 6-12 Teacher Resources and Standards

Activity 3: Erosion

Activity 3

1-3 50 minute class periods

(Science, Earth and Space Science, Environmental Science)

Students will learn about how human activity impacts the environment and our ability to produce food through hands-on activities and research.

Oklahoma Academic Standards

Activity 3: Erosion (Science, Earth and Space Science, Environmental Science)

- 6.ESS2.1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.
- 7.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
- 7.ESS3.3 Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
- 7.ESS3.4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- ES.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can
- EN.ESS2.2 create feedbacks and interactions that cause changes to other Earth's systems.
- ES.ESS3.1 Construct an explanation based on evidence for how the availability of natural
- EN.ESS3.1 resources, occurrence of natural hazards, and changes in climate affect human activity.
- EN.LS2.7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Materials:

• Activity 3 Worksheet 1 "Erosion"

Erosion Demonstration

- 3 plastic 2-liter bottles
- Soil (enough to fill bottles after side is removed)
- 3 clear plastic cups
- Extra cups or blocks to support bottles
- Scissors or utility knife
- Mulch or dead leaves
- Sprinkling-style watering can
- Grass, rye, wheat seed, radish or leaf lettuce seed or bermuda grass sod cut to fit the cut opening in one bottle
- Tape, wire, hot glue or other materials to keep the erosion unit together

Activity 3- Continued

Grades 6-12 Teacher Resources and Standards

Procedures

- 1. Conduct the experiment on Activity 3 Worksheet 1 "**Erosion.**" Unless sod is available, one of the bottles must be prepared several weeks in advance for grass, rye or wheat to sprout and develop a root system to hold soil in place. You might also consider a thick planting of radish or leaf lettuce seed which sprout and develop a root system quickly.
- 2. After the demonstration, have students complete the questions at the bottom of the worksheet. Discuss how plants and mulch help prevent erosion.

Activity 3 Worksheet 1: Erosion



Ag in the Classroom

Date: ___

Materials Needed

- 3 plastic 2-liter bottles
- Soil to fill each bottle to within 2 inches of the cut edge (not potting soil, which contains materials that make the soil look darker)
- 3 clear plastic cups
- Cups or blocks to support your bottles
- Scissors or utility knife (utility knife works better)
- Mulch or dead leaves
- Sprinkling-style watering can or spray bottle
- Grass, rye or wheat seed, or bermuda grass sod cut to fit the cut opening in bottle
- Tape, wire, hot glue or other materials to keep the unit together
- 1. Cut off one side of each bottle leaving the neck and spout of the bottle.
- 2. Lay each bottle on its side and fill with soil. Tap to settle the soil and then water lightly and tap again. Repeat until soil is moist, but not saturated.
- 3. If sod is not available, plant grass, rye or wheat seed in one bottle. Water the seed and move bottle to a warm place until seeds have sprouted and the soil is covered with grass.
- 4. Add a layer mulch or dead leaves to one of the other bottles.
- 5. Leave the last bottle of soil plain or bare.
- 6. Suspend the bottles over the 3 cups at a 25 to 40 degree angle (2-3 inches higher at the back) with the spouts facing downward. Get creative in finding ways to accomplish this. Several cups can be stacked, bricks, wood blocks or blocks of styrofoam can be used.
- 7. Use tape, wire, hot glue or other materials to hold the unit together.
- 8. Use a watering can to apply equal amounts of water to each erosion model. Use enough to simulate a heavy rain and create runoff.

Look at the surface of the soil in each bottle.

Which surface shows the most change after the "rain event"?_____

Describe the changes in the surface _____

Which surface shows the least change after the "rain event"?

Which cup had the most soil suspended in the water?

Adapted from: Soil Science Society for America www.soils4teachers.org





Grades 6-12 Teacher Resources and Standards

1 50 minute class period

For more lessons and resources, please visit <u>www.agclassroom.org/ok</u>

Activity 4: Protecting the Environment

(Science, Earth and Space Science, Environmental Science)

Students will learn about how human activity impacts the environment and our ability to produce food through hands-on activities and research.

Oklahoma Academic Standards

Activity 4: Protecting the Environment (Science, Earth and Space Science, Environmental Science)

- 6.ESS2.1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.
- 7.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
- 7.ESS3.3 Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
- 7.ESS3.4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- ES.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can
- EN.ESS2.2 create feedbacks and interactions that cause changes to other Earth's systems.
- ES.ESS3.1 Construct an explanation based on evidence for how the availability of natural
- EN.ESS3.1 resources, occurrence of natural hazards, and changes in climate affect human activity.
- EN.LS2.7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Materials:

- Activity 4 Reading Page 1 "Protecting the Environment"
- Activity 4 Worksheet 1 "How Much Green Do We Need?"

Procedures

- 1. Have students read Activity 4 Reading Page 1 "**Protecting the Environment**" and discuss the challenges of producing more food for a growing population while increasing green space.
- 2. Using information from the reading page, have students complete Activity 4 Worksheet 1 "**How Much Green Do We Need?**"

Activity 4

As the world's population increases, we have the challenge of growing more food without increasing our carbon footprint. Trees, grass and crops absorb CO₂ and give off oxygen. It is possible to manage land for carbon reduction while meeting the world's food needs.

By returning some marginal farmland to native grass and trees and planting cover crops (which can be used for livestock grazing) between seasonal plantings of corn, cotton,

wheat, soybeans and rice, soil can be protected and enriched while increasing the conversion of CO₂ to O_2 in the atmosphere.

Between 2012 and 2017, use of cover crops with annual crops, fruits and vegetables increased by 50 percent in the United States. Survey respondents listed soil improvement and erosion control, weed management and livestock grazing as the top reasons.

Although mature trees and turf grass are the most efficient CO₂ converters, all plants take in carbon dioxide and give off oxygen. The more plant material available, the greater the conversion. In 2017, according to an independent audit of four large farms in Kansas and Nebraska, planting cover crops on land that once sat empty for part of the year helped these farms (12,300 acres) remove 6,922 tons of carbon dioxide from the atmosphere. That's as much as could have been stored by 7,300 acres of forest.

The 2019-2020 National Cover Crop Survey reported that 91 percent of farmers who regularly used cover crops saw an improvement in weed control - without sacrificing productivity. Many weeds have become resistant to available herbicides and cover crops provide an alternative to chemical control. Cover crops with deep root systems also break up heavy soils, and add nutrients as the crop dies.

Planting trees in neighborhoods and creating green spaces among high rise buildings can improve air quality in cities and protect soil and water. Oxygen production estimates of different plants vary, but a commonly accepted average is that a 25 x 25 foot area (625 square feet) of grass produces enough oxygen for one person. A large, fast-growing tree with a rapid photosynthesis rate can produce enough oxygen for up to 8 people. The World Health Organization recommends cities plan for about 100 square feet of green space per person including grass, trees, urban and rooftop gardens.

Source: 2019-2020 National Cover Crop Survey, A joint effort by USDA Sustainable Agriculture Research and Education (SARE) program, Conservation Technology Information Center (CTIC), and American Seed Trade Association (ASTA)





Protecting the Environment

Activity 4 Worksheet 1: How Much Green Do We Need?



Name: ____

Date:

During photosynthesis in green plants, light energy is captured and used to convert water, carbon dioxide (CO_2) , and minerals into oxygen (O_2) and energy-rich organic compounds. Obviously, this process "feeds" the plant, but the carbohydrates that form in plants serve as food for people, livestock and wildlife. Environmentally, photosynthesis acts as nature's air cleaner. Carbon dioxide is taken in, the carbon is removed and stored in either the plant or the soil, then oxygen is released into the air. The roots of long term vegetation, like trees and grass hold soil in place and prevent erosion while annual crops return nutrients to the soil when they die.



Using the information from the reading page, **Saving Soil Protects the Environment** along with the summary of photosynthesis above to answer the following questions:

1. How can population growth and the need for increased food production impact natural resources like soil, water and air?

2. List two things farmers are doing to preserve and improve soil while increasing the amount of CO2 converted to O2:

3. What are the top reasons farmers list for using cover crops?

4. As the world's population moves toward urban areas, how can city planners insure that enough green space is incorporated into developments?

Activity 4 Worksheet 1: How Much Green Do We Need? ANSWER KEY



Date:

During photosynthesis in green plants, light energy is captured and used to convert water, carbon dioxide (CO_2) , and minerals into oxygen (O_2) and energy-rich organic compounds. Obviously, this process "feeds" the plant, but the carbohydrates that form in plants serve as food for people, livestock and wildlife. Environmentally, photosynthesis acts as nature's air cleaner. Carbon dioxide is taken in, the carbon is removed and stored in either the plant or the soil, then oxygen is released into the air. The roots of long term vegetation, like trees and grass hold soil in place and prevent erosion while annual crops return nutrients to the soil when they die.



Using the information from the reading page, **Saving Soil Protects the Environment** along with the summary of photosynthesis above to answer the following questions:

 How can population growth and the need for increased food production impact natural resources like soil, water and air?
As the population increases, there is more need for housing, places to work, places to

shop, etc. All those people will need more oxygen to breathe, so we need more green

plants in the form of trees, grass and even the crops that become part of the food supply.

List two things farmers are doing to preserve and improve soil while increasing the amount of CO₂ converted to O₂:

By returning some marginal cropland to native grass, trees and forests and planting cover

crops between seasonal crops like corn, wheat and soybeans

3. What are the top reasons farmers list for using cover crops?

Farmers list soil improvement, erosion control, weed management and livestock grazing as

the main reasons they use cover crops.

4. As the world's population moves toward urban areas, how can city planners insure that enough green space is incorporated into developments?

The world health organization recommends about 100 square feet of green space per

person within a city. This can include grass, trees, urban gardens and rooftop plantings.



Grades 6-12 Teacher Resources and Standards

Activity 5: Urbanization

Activity 5

2-4 50 minute class period

(Social Studies, World Human Geography)

Students will learn about the factors behind rural to urban migration, public policy solutions to protect agricultural lands from urban encroachment, and the opportunities and challenges facing the world's megacities.

Oklahoma Academic Standards

Activity 5: Urbanization (Social Studies, World Human Geography)

- SS.6.4.1 Describe the commercial agriculture and industrial regions that support human development.
- SS.6.4.2 Evaluate the effects of human modification on the natural environment through
- SS.7.4.4 transformation caused by subsistence and commercial agriculture, industry, demand for energy, and urbanization.
- SS.7.3.4 Evaluate and summarize the impact of geography on population distribution, density,
- WG.2.2 growth, change, settlement patterns, the availability of resources, and migration, including push and pull factors.
- SS.7.5.1 Define the concept of region and explain how and why regions change over time through physical and human processes which operate to modify the Earth's surface.
- WG.5.3 Analyze settlement patterns associated with major agricultural regions and linkages among regions of food production and consumption.
- WG.7.2 Analyze contemporary patterns of rural migration on urban development including the concept of suburbanization, edge cities, megacities, and global cities.

Materials:

- Activity 5 Reading Page 1 "Agricultural Zoning"
- Activity 5 Worksheet 1 "Public Policy Solutions"
- Activity 5 Worksheet 2 "City Center or Edge of Town"
- Activity 5 Worksheet 3 "Nuisance Complaints"
- Activity 5 Worksheet 4 Big Box Store
- Activity 5 Worksheet 5 Ranching in Brazil
- Activity 5 Reading Page 2 Urban Growth
- Activity 5 Worksheet 6 Urban Growth
- Activity 5 Reading Page 3 The Future of Megacities
- Activity 5 Worksheet 7 Megacities Around the World
- Activity 5 Worksheet 8 Mapping Megacities
- Activity 5 Worksheet 9 Megacity Research
- Activity 5 Reading Page 4 How Reliable are your Sources?
- Activity 5 Worksheet 10 How Reliable are your Sources?

Activity 5- Continued

Grades 6-12 Teacher Resources and Standards

Procedures

- 1. Have students read and discuss Activity 5 Reading Page 1 "Agricultural Zoning Public Policy Solutions".
- 2. Have students complete Activity 5 Worksheet 1 "**Public Policy Solutions**" and discuss their answers.
- 3. Divide students into small groups to discuss the issues on the following worksheets:
 - —Activity 5 Worksheet 2 "City Center or Edge of Town"
 - —Activity 5 Worksheet 3 "Nuisance Complaints"
 - -Activity 5 Worksheet 4 Big Box Store
 - —Activity 5 Worksheet 5 Ranching in Brazil
- 4. Assign one issue to each group. After the group completes their worksheet, they should prepare a short presentation for the class to share their information.
- 5. Distribute the Activity 5 Reading Page 2 "**Urban Growth**", and have students read and discuss the positive and negative impacts of concentrating population in small areas.
- 6. Students will complete Activity 5 Worksheet 5 "**Urban Growth**", using the reading page as a reference.
- 7. Lead a discussion about megacities and have students read and discuss Activity 5 Reading page 3 "**The Future of Megacities**".
- 8. Have students use the internet to find the locations and populations of the 25 largest megacities listed on Activity 5 Worksheet 6 **"Megacities Around the World**.
- 9. Using the information from worksheet 6, Have students mark the location of each city on the world map on Activity 5 Worksheet 7 "**Mapping Megacities**". If you have a large world map in your classroom, students could also write the names of the cities on post-it notes and place them in the correct location on the map.
- 10. Assign each student one megacity for further research. Have them use Activity 4 Worksheet 8 **"Megacity Research"** to organize the information.
- 11. Provide copies of Activity 5, Reading Page 4 "**How Reliable are Your Sources**" to help students choose internet sites with accurate information
- 12. Each student should prepare and present a short oral report on his/her city.

Agricultural Zoning

Threats to Farmland

At the moment, there is more U.S. agricultural land than necessary to meet market demands. But over the long term, as populations in the U.S. and abroad continue to grow rapidly, there will be a greater need to protect the remaining finite amount of good agricultural land.

Farmland is steadily being lost through non-farm development on prime agricultural land when the development could be accomplished on less productive land. Even when cities are not



increasing in population, there is often development in the areas at the edge of cities where level, well-drained agricultural lands simplify construction.

Scattered development in farming areas removes agricultural land from production both directly and indirectly. Building homes, apartments, businesses and parking lots directly removes the land's agricultural productivity. Indirectly, development may force nearby farmers out of production when non-farm residents complain about dust, odors, sprays, and noise. Development can also result in a general rise in land values leading to higher property taxes. In Oklahoma, there are state statutes that protect farmland from higher property taxes when cities expand by evaluating it based on actual rather than potential use.

Farmland protection strategies used by state and local governments to preserve agricultural lands and protect working farms generally focus on:

- Protecting farmland from conversion to non-farm uses by prohibiting or restricting development on farmland
- Permanently protecting agricultural lands
- Minimizing conflicts between existing agricultural operations and new development.

Farmland Protections

Farmland protection plans help local governments inventory important farmland, set goals for its protection, and identify strategies for implementation. Such strategies include agricultural zoning, agricultural buffers, right-to-farm ordinances, transfer or purchase of development rights programs, farmland mitigation requirements, and cluster or conservation development regulations.

Some examples include:

- Density zoning, which limits the ability of landowners to subdivide large tracts of land
- Rules that prevent non-farm development of prime agricultural land
- Establish agricultural buffers between expanding residential development to minimize land use conflicts
- Establish and enforce right-to-farm provisions that protect farms from nuisance complaints
- Establish transfer of development rights programs that preserve working farmlands
- Enact agricultural lands loss mitigation requirements
- Require conservation or cluster development that preserves working farmland as permanent open space

Source: Farmland Protection, American Planning Association, https://www.planning.org/knowledgebase/farmlandprotection/

Activity 5 Worksheet 1: Public Policy Solutions



Name: _____

Date: ___

Use the information from **Public Policy Solutions - Agricultural Zoning** to answer these questions:

1. Why do developers choose agricultural land for housing or commercial developments when other land is available?

2. As demand grows for housing outside cities, property values sometimes increase on rural land. Developers may offer land owners far more money than they would receive in farm income. Selling a portion of the land seems like a good way for the farmer to make some money and still keep most of the farmland. What are some potential problems with this type of development?

3. What do farmland protection plans help local governments do?

4. List at least three examples of farmland protections that can be put in place by local or state governments:

Activity 5 Worksheet 1: Public Policy Solutions

ANSWER KEY

Ag in the Classroom

Name:

Date: _

Use the information from **Public Policy Solutions - Agricultural Zoning** to answer these questions:

 Why do developers choose agricultural land for housing or commercial developments when other land is available?
Land that is used for crop production is often level and well drained. It would require less dirt

work (leveling and filling) than more marginal land. Farmland is often surrounded by a good

road system to get agricultural products to market.

2. As demand grows for housing outside cities, property values sometimes increase on rural land. Developers may offer land owners far more money than they would receive in farm income. Selling a portion of the land seems like a good way for the farmer to make some money and still keep most of the farmland. What are some potential problems with this type of development?

Building homes, apartments, businesses and parking lots directly removes the land's

agricultural productivity. Indirectly, development may force nearby farmers out of production

when non-farm residents complain about dust, odors, sprays, and noise. Development can

also result in a general rise in land values leading to higher property taxes.

3. What do farmland protection plans help local governments do?

Farmland protection plans help local governments inventory important farmland, set goals for

its protection, and identify strategies for implementation.

^{4.} List at least three examples of farmland protections that can be put in place by local or state governments: <u>Density zoning, which limits the ability of landowners to subdivide large tracts of land</u> Rules that prevent non-farm development of prime agricultural land <u>Establish agricultural buffers between expanding residential development</u> Establish and enforce right-to-farm provisions that protect farms from nuisance complaints <u>Establish transfer of development rights programs that preserve working farmlands</u> Enact agricultural lands loss mitigation requirements <u>Require conservation or cluster development that preserves working farmland as permanent</u> open space

Activity 5 Worksheet 2: City Center or Edge of Town

Condominium in city



Name:

Date: _

Home on one-acre lot

Your family is moving to a new city. As you look for a place to live, there are two choices within your budget.

One choice is a condominium (multi-family housing) that is near your parents' jobs, shopping, restaurants and your new school. You will have to share a room with your sibling. The condominium complex has a recreation area with a swimming pool, tennis courts, a basketball court, and a playground. There is also a fitness center onsite.

The other choice is to buy single family home on a one-acre lot on the edge of town. There is a large, fenced back yard that will need to be cared for (water, weed, fertilize, and mow). You and your sibling will have your own rooms. Your parents will have a 20-minute commute to work and you will have a 45 minute bus ride to school. There are wheat fields just beyond your back fence.

List the advantages and disadvantages of each choice. Include the impact on you personally and the impact on local agriculture, local economy and the environment:

o on a on in an in only	
Advantages:	Advantages:
Disadvantages:	Disadvantages:

Looking at your lists, which choice is the right one for your family and why?

Activity 5 Worksheet 3: Nuisance Complaints



Name: ____

Date: ____

Your family has moved into a new housing development in an area that is surrounded by farms. Dust from the farm causes your asthma to flare up, and sometimes the noise from the farm machinery wakes you up when you want to sleep late on weekends.

A group from your housing development is gathering signatures for a petition to put restrictions on the farming operations. Do you think your parents should sign it? Why?

Consider the impact of the petition on you personally along with the impact on agriculture, the environment and the local economy.

Refer back the the Agricultural Zoning reading page. List some public policy decisions that your local or state government could have made to avoid this conflict:

Are they any zoning restrictions that protect agricultural land near your community? If so, briefly summarize them below:

Activity 5 Worksheet 4: Big Box Store

Name: ____

Date: ___

You live in a relatively small town. Most of the businesses in your town serve the surrounding farms. You must drive 30 miles to buy anything but groceries, livestock feed or fertilizer. A big box store wants to build a store on land at the edge of town that is surrounded by farms. A citizens' group has gathered enough signatures on a petition to bring the required zoning change up for a vote of the people in the county.

The surrounding farmland drains slowly after heavy rains. The traffic from the new store could disrupt the surrounding farming operations. How will you vote? Why?

How would the addition of a big box store impact agriculture, the environment and the local economy?

How would having more convenient shopping impact you and your family?

Are they any zoning restrictions that protect agricultural land near your community? If so, briefly summarize them below:



Activity 5 Worksheet 5: Ranching in Brazil



Date: ___

You are a rancher in Brazil. The demand for beef in your country is growing more every year. The population of the nearby city is growing as well. A developer has made a very generous offer to buy your ranch so he can build apartments to meet the growing demand for housing.

You can take the money and buy land in the rainforest and continue your cattle operation there. What do you do? Why?

How would building apartments on your land impact other farmers/ranchers in the area?

List the environmental impacts of moving your cattle operation to the rainforest:

What kinds of expenses could you expect with relocating your cattle ranch?

How would a move to an isolated area in the rainforest impact you and your family personally?



Urban Growth



Human activity has caused a decrease in arable land and an increase in CO_2 emissions. Paved roads and parking lots have changed the flow of water and decreased the surface area available to purify water as it makes its way to aquifers, streams and lakes. As the world population continues to increase, the need for housing, food and infrastructure will continue to grow as well.

Without careful planning, urban growth will be at the expense of agricultural land. Throughout history, civilizations developed where fertile land and fresh water were plentiful.

It is reasonable to assume that as population centers expand, the farmland adjacent to cities would be the most convenient place for new construction. When productive farmland is covered with buildings, streets and parking lots, the ability to feed the growing population decreases.

In low and middle income nations, the migration from rural to urban areas is fueled by job opportunities. In some countries, farmers do not actually own the land they cultivate and can be forced from the land by local governments. As these families move into cities in search of jobs, this creates a type of forced migration and results in the need for further encroachment into rural areas.

Although rapid urbanization is often seen as a problem, generally the more urbanized the nation, the higher the average life expectancy and the literacy rate and the stronger the democracy. In the United States, 83 percent of the population lives in urban areas that cover only 3 percent of the total land area. In Oklahoma, 65 percent of people live in the Oklahoma City and Tulsa metropolitan areas. Urban economies account for almost 92 percent of wage income and 88 percent of all jobs in the US. Even though the US urban population is growing, the conversion of forest or agricultural land to suburban and urban use is decreasing overall.

Well planned urban areas have many positive characteristics:

- Multiple family housing units (apartments, condominiums, etc) allow a large number of people to live on a small amount of land.
- Businesses, shopping, services, entertainment and recreation are located close to housing.
- Good public transportation makes owning a car less important.
- Job opportunities are often more plentiful in urban areas.

All highly developed areas have challenges:

- Urban areas without adequate public transportation have severe traffic congestion.
- Lack of affordable housing in city centers can cause migration to outlying areas where agricultural land is sometimes developed for housing, businesses and shopping.
- In warm climates, air temperatures tend to be about 5°F warmer in summer than rural areas
- Unless trees and green space are a major part of the city design, air quality can suffer
- Runoff water from paved surfaces requires extensive storm drainage and water management systems to minimize flooding and direct rainwater into existing natural waterways.

Sources: US Cities Fact Sheets, University of Michigan Center for Sustainable Systems World Population Review, Oklahoma Department of Commerce



Activity 5 Worksheet 6: Urban Growth



Name: _____

Date: ___

Using Challenges and Opportunities for Urban Growth, answer the questions below:

- 1. Why do cities tend to spring up and expand in areas with good agricultural land?
- 2. List examples of forced rural to urban migration:
- 3. What are three advantages found in countries with well developed urban areas?

4. Growth of cities and development of the surrounding farmland can have positive and negative outcomes. List them below:

Positive Characteristics	Challenges			

Activity 5 Worksheet 6: Urban Growth

ANSWER KEY

Ag in the Classroom

Name: ____

Date: _

Using Challenges and Opportunities for Urban Growth, answer the questions below:

1. Why do cities tend to spring up and expand in areas with good agricultural land?

Historically, people settled where there was good water, fertile soil and materials available to

build shelter. As other settled, they joined existing communities

2. List examples of forced rural to urban migration:

When farmers do not own the land, they can be forced to relocate when the government takes

their land. Crop failures, droughts, foreclosures and lack of local jobs also force migration

3. What are three advantages found in countries with well developed urban areas?

higher average life expectancy

higher literacy rate

stronger democracy

4. Growth of cities and development of the surrounding farmland can have positive and negative outcomes. List them below:

Positive Characteristics	Challenges
Many people live on small amount of land.	Traffic congestion.
Jobs and services located close to housing	Lack of affordable housing and safety
Good public transportation	Temperatures are botter than in rural areas
More ich opportunities	
	All quality suriers without green space
	Poor water management causes flooding
	<u> </u>

Save our Soil- Exploring Agricultural Land Use The Future of Megacities



Megacities are defined as urban areas with at least 10 million residents. Tokyo (Japan) is currently the largest 'megacity' in the world with over 37 million residents. Today, 60 percent of the world's megacities are in Asia. However, the number and size of large cities in Africa are expected to increase dramatically during the remainder of the 21st Century.

While large cities deal with noise, traffic and the crush of humanity on a daily basis, rural villages are empty and the

howl of the wind becomes the only company for its aging residents. The concentration of world population in urban centers is an increasing trend. According to UN projections, by 2030, more than 60 percent of people will live in urban areas..

Throughout history, people have migrated to large urban centers in search of opportunities. In the coming years, megacities will capture a high percentage of the world's wealth and their enormous potential will attract thousands of people. However, in emerging countries where the urban population will likely increase without a proportional growth of their economy, the future is more uncertain.



As megacities grow larger the challenge of providing basic services and minimum infrastructure will be difficult to meet - especially in poor countries. Such an increase will lead to changes in production and consumption patterns which will conflict with limited natural resources.

Innovation will be key in responding to the problems arising from the development of these megacities. The following initiatives can help:



- Reduce the carbon footprint, through improved energy efficiency and increased green space.
- Promote citizen participation and social cohesion by listening to concerns and finding creative solutions.
- Create urban green space to minimize the effects of urban heat islands. In Chicago, 70,000 new trees have been planted in the city to fight this phenomenon.
- Install green roofs made with native vegetation and rain barrels to capture and store rainwater.
- Promote city agriculture, from vertical gardens aimed at purifying the air inside buildings through biofiltration, to urban vegetable gardens.
- Utilize technology applications to reduce environmental impact, maintain the citizens' safety and
- improve their quality of life.
- Support the use of eco-efficient technologies in all areas.
- Develop an intelligent public transport system.

It is clear that how megacities continue to produce and consume energy and goods will be crucial to their social, ecological and economic survival.

Source: Megacities, A Future Challenge, https://www.iberdrola.com/environment/megacities-urban-area

For more lessons and resources, please visit <u>www.agclassroom.org/ok</u>

Activity 5 Worksheet 7: Megacities Around the World

Name: _

Date: _

Use internet resources to find information on the Megacities listed below to complete the table. Use the map on the Worksheet 8 to plot the location of each city.

	City	Country	Continent	Population
1	Bangalore			
2	Beijing			
3	Buenos Aires			
4	Cairo			
5	Chongqing			
6	Delhi			
7	Dhaka			
8	Guangzhou			
9	Istanbul			
10	Karachi			
11	Kinshasa			
12	Kolkata			
13	Lagos			
14	Los Angeles/Long Beach/Santa Ana			
15	Manila			
16	Mexico City			
17	Moscow			
18	Mumbai			
19	New York/Newark			
20	Osaka			
21	Paris			
22	Rio de Janeiro			
23	São Paulo			
24	Shanghai			
25	Tokyo			



Activity 5 Worksheet 7: Megacities Around the World

ANSWER KEY

Name: _

Date:

Use internet resources to find information on the Megacities listed below to complete the table. Use the map on the Worksheet 8 to plot the location of each city.

	City	Country	Continent	Population*	
1	Bangalore	India	Asia	12.32 million	
2	Beijing	People's Republic of China	Asia	20.46 million	
3	Buenos Aires	Argentina	South America	15.15 million	
4	Cairo	Egypt	Africa	20.9 million	
5	Chongqing	People's Republic of China	Asia	15.87 million	
6	Delhi	India	Asia	30.29 million	
7	Dhaka	Bangladesh	Asia	21 million	
8	Guangzhou	People's Republic of China	Asia	13.3 million	
9	Istanbul	Turkey	Asia & Europe	15.19 million	
10	Karachi	Pakistan	Asia	16.09 million	
11	Kinshasa	Democratic Republic of Congo	Africa	14.34 million	
12	Kolkata	India	Asia	14.85 million	
13	Lagos	Nigeria	Africa	14.36 million	
14	Los Angeles/Long United States Beach/Santa Ana		North America	12.44 million	
15	Manila	Philippines	Asia	13.92 million	
16	Mexico City	Mexico	North America	21.78 million	
17	Moscow	Russian Federation	Asia	12.53 million	
18	Mumbai	India	Asia	20.41 million	
19	New York/Newark	United States	North America	18.8 million	
20	Osaka	Japan	Asia	19.16 million	
21	Paris	France	Europe	11.01 million	
22	Rio de Janeiro	Brazil	South America	13.45 million	
23	São Paulo	Brazil	South America	22.04 million	
24	Shanghai	People's Republic of China	Asia	27.05 million	
25	Tokyo	Japan	Asia	37.39 million	

*Population from UN Department of Economic and Social Affairs, Population Dynamics, World Urbanization Prospects 2018,



Activity5 Worksheet 8: Mapping Megacities

me	
Naı	
_	

Date:



Plot the megacities from worksheet 2 on the map below, using the numbers in the first column.



Activity 5 Worksheet 8: Mapping Megacities

ANSWER KEY

Name:

Date:



Plot the megacities from worksheet 2 on the map below, using the numbers in the first column.



Page 36

Activity 2 Worksheet 9: Megacity Research

Name:	Date:				
Choose one of the Megacities listed on	Worksheet 6 and conduct research to learn more about city.				
Name of City					
Country Continent					
Current Population EstimatePopulation Density					
Primary language(s)					
Climate					
Major Industries or businesses (where o	do people work?)				
Type of Government					
Positive Characteristics					
Challenges					
How has city growth impacted local agr	iculture?				



Save Our Soil-Exploring Agricultural Land Use How Reliable Are Your Sources?

- When conducting research, make sure you use reliable information from legitimate sources. Reliable information is well-researched from sources that are well-respected and as objective, or neutral, as possible. the best way to find legitimate sources is to go to the library and use scholarly journals, reference books and other well-researched sources.
- 2. Another place to find information is the internet. Conducting research on the internet is convenient, but it can also be tricky. There are many thousands of Web pages that have little actual content and are mainly links to other pages, which may be links to other pages, and so on. Anyone can post anything to the internet. To make sure you have found a reliable source of information, ask yourself these questions:
 - Who is responsible for the Web site? Is the Web page associated with a reliable organization, such as a university or a government agency?
 - What interest does the organization responsible have in the information presented.
 - For example, will the organization profit from the information presented?
 - Who wrote the information? If the author is not listed or has no credentials, it may not be a credible source. Pay attention to the author's credentials or experience. Is the source really an authority on this particular matter or someone with an impressive title that has no connection to the subject matter?
 - When was the information written? Is it current? Is it still relevant?
 - Are there other sources that agree with statements made on the site, or do other sources contradict this source? In that case you may need to search further. It's always a good idea to gather more than one source.
 - Are any sources cited? If the author does not document anything, then the information may simply be someone's opinion.
 - If statistics used come from a survey, how was the data collected? Who conducted the survey or poll? Was the sample representative of the population? How many were surveyed? What percent of the population?
- 3. When choosing between the library and the internet keep in mind that up to 90 percent of the contents of college library collections are not on the internet. Because of copyright laws it is too expensive to put all scholarly work on the internet. This means that the most comprehensive source of information is still the library.

Activity 5 Worksheet 10: How Reliable are your Sources?

Name:

_ Date: _



Is the site legitimate or questionable?				
How did you find the site?				
What sources are cited?				
Who is the writer?				
When was it written?				
What Organization is responsible for the site?				
Website Name				

