Historical Air Photo Interpretation

Objectives:

The student will be able to:

- Identify and analyze land use changes over time with historic aerial photographs.
- Learn to classify different land use into categories

Author:

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Time:

50 minutes

Grade:

6-12

Standards:

AZ Science Strands
Social Perspectives

AZ Social Science Standards
Government and Geography

NGSS - Core Ideas
Biogeology; Human impacts; Design solutions

Practices
Analyzing; Explanations; Arguments; and more

Crosscutting Concepts
Patterns; Cause and effect,; Scale, proportion, and quantity

Specific AZ, Common Core, and NGSS standards on page 2.

Background:
Aerial photographs are one way to look at change over time. In the metropolitan Phoenix area, much of the urban growth has taken place in the past 50 years, so it is possible to find photographs from the same location and see dramatic changes. This activity will encourage your students to think about patterns of development in the changing urban landscape. These photographs are part of Central Arizona-Phoenix Long-Term Ecological Research Project data base (http://caplter.asu.edu/research/research-projects/?id=19) . Research about land use is an integral part of CAP LTER, a recent highlight can be found here: http://caplter.asu.edu/research/research-higlights/research-highlight-10/

Vocabulary:
See handout of land use categories

Advanced Preparation:
Students should be able to read aerial photographs and identify land-use categories

Materials:
Aerial photographs from the several locations taken over time. Print out a set of each location for every group of students. You can find maps at: http://ecologyexplorers.asu.edu/overview/slide-sets/ Click on "Historical Aerial Photos without dates". (direct link: http://ecologyexplorers.asu.edu/docs/explorers/historical_aerial_photos_without_dates.pdf). The "key" should be printed in color.

Suggested Procedure:

Engagement

1) Ask students how they think their neighborhood has changed over time. What was the landscape before there were houses? When did changes happen and who made the decision

Exploration

2) Hand out the first set of historical aerial photographs to each group of students. Allow the teams to become familiar with the photographs. Use the attached land-use categories (Student Worksheet #1) to classify the area and complete Student Worksheet #2.

3) Have the students identify land uses in each of the photographs and then place the photographs in the correct sequence. What patterns did they use to place the photographs in sequence? Hand out the key. Were they correct? Have students respond to the question on Student Worksheet #2 for each set of photographs, "What do you think this area will look like in 20 years?"

4) Proceed with the next four sets of photographs as previous.

Explanation & Expansion

5)Facilitate a discussion about past, present and future trends. Discuss differences among the historical photographs. Are there differences in land use changes in areas that were agriculture vs desert? How have the changes affected the lifestyles

of people living in the areas? Note: some changes in the landscape reflect zoning restrictions—you could ask students why different areas allow different types of buildings/houses. Also note in some of the pictures there is an increase in multi-family housing as the amount of land for single family housing declines

6)Use Student Worksheet #3 to prompt independent student reflections.

Evaluation:

- Observation during the activity and participation in discussion.
- Student responses to reflection questions.

Extensions:

- Calculate the percent changes in land-use types over time for each area.
- Study local historical documents to understand changes in land use
- Interview long-time residents or a local historian about these changes
- Identify social and political impacts of these changes on the community and the environment

References:

Barnaba, E., M. Krasny, L. Kasperek, S. Hoskins, J. Hope. 2000. Explorations from an aerial perspective. Cornell University.

Standards

Arizona Science Standards

Science Personal & Social
S3-C2-GR7-PO1
S3-C2-GR7-PO2
S3-C3-GRHS-PO1
S3-C3-GRHS-PO2

Arizona Social Studies Standards

American History
SS1-C1-GR6-8-PO4
SS1-C1-GR7-PO8
SS1-C1-GR8-PO8
SS1-C1-GRHS-PO6
SS1-C2-GR7-PO4
SS1-C2-GR8-PO5

Arizona Geography Standards

SS4-C4-GR7-PO1
SS4-C4-GR6-PO3
SS4-C4-GRHS-PO5
SS4-C5-GR7-PO3
SS4-C5-GR7-PO5
SS4-C5-GRHS-PO4
SS4-C6-GR6-PO2

NGSS Core Ideas

ESS2.E: Biogeology
ESS3.C: Human impacts on Earth systems
ETS1-2: Evaluate design solutions

NGSS Practices

Asking questions
Analyzing and interpreting data
Constructing explanations
Engaging in argument from evidence
Obtaining, evaluating, and communicating information

NGSS Crosscutting Concepts

Patterns

Cause and effect

Scale, proportion and quantity

Systems and system models

Stability and Change

AZCCRS/ELA Literacy

RST7: Integrate content from diverse formats
WHTS1: Write to support claims
WHTS2: Write to convey ideas and information
SL1: Participate in collaborations and conversations

Student Worksheet (#1)
Land Use Categories

Land-Use Categories (adapted from CAP LTER, MAG, and Explorations from an Aerial Perspective)

Residential

▪Single-family home: small rectangular buildings with driveways aligned to street

▪Single-family home large lot: small rectangular buildings on large lots (less housing density than single family homes)

▪Multi-family (apartments/town homes): multi-storied buildings, off street parking

Commercial/Industrial

▪Businesses: rectangular buildings, larger than houses, grouped along major streets

▪Shopping Malls: large, flat-roofed buildings, large parking areas

▪Manufacturing: large flat-roofed buildings with loading docks, possibly with loading docks, piles of raw materials or smokestacks

▪Mining: most commonly gravel pits associated with waterways

Open Space

▪Golf Courses: presence of sand traps, grass, small ponds

▪Neighborhood Parks: vegetated areas, lawns, ball fields, playground, tennis courts

▪Vacant: surrounded by development

▪Desert Parks/Land : desert vegetation, washes, different elevations

Public

▪Schools: large rectangular buildings, adjacent to fields, athletic track

▪Church: rectangular building, parking lots, along major streets, may see steeple

Water

▪Canals: linear water ways

▪Lakes/Ponds: small bodies of water (lakes in residential developments/parks)

▪Reservoirs: large bodies of water (Tempe Town Lake)

Agriculture

▪Cropland/Pasture: rectangular fields, machinery, fences

▪Orchards: rectangular fields with trees

Transportation

▪Highway: limited access multi-lane roads

▪Major Road: multi-lane roads, typically lined with businesses, churches, shopping centers

▪City Streets: two-lane, dense rectilinear grid patter with residential development

Railroads: linear, passenger and freight lines

Student Worksheet (#2)
Historical Air Photo Interpretation

Look at the various photographs given to you by your teachers. These aerial photographs were taken at the same location over the past 30 years. Use the features on the maps to place each set in order from the earliest to most recent photo. The first picture was taken in 1970, the other pictures were taken in 10 year intervals (1970, 1980, 1990, 2000, 2010)

Fill in the table, recording the major land use changes and when they happened.

Location	Describe major changes including the decade most change happened	What do you think this area will look like in 20 years?
Pinnacle Peak		
Lower Buckeye		
McKellips & Stapley		
Shea & 27th		
Union Hills		

Student Worksheet (#3)
Historical Air Photo Reflections

Comparing the environmental changes from 1970 to today, how have people's lives changed? What things are better? What things are worse?

2. Describe how changing land use over time may have impacted animal life.

3. Describe how changing land use over time may have impacted farming and water supply.