

RSG Lesson 5
CHANGE OVER TIME
TEACHER INFORMATION

Lesson Summary: Students study a chronological series of images and maps of Fairbanks or Nenana, looking for evidence of change.

Objectives: Students will understand that maps and images capture and reflect the changing nature of the landscape.

Estimated Time: 30 minutes to 1 hour

Correlation to Alaska Standards:

Cultural E-2 Understand the ecology and geography of the bioregion they inhabit.

Geography A Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.

Science A-1 Develop an understanding of the processes of science.

BACKGROUND FOR THE TEACHER

Maps and images represent the landscape at a particular point in time. Comparison of different map or image vintages can yield visual clues and valuable insights into how a place has changed over time. Depending upon the data available, changes in infrastructure, land cover or watershed characteristics are just a few of the observations one might be able to infer from image comparisons. Some of these changes are the result of natural processes such as erosion and deposition in a river system followed by a cycle of vegetative growth on gravel bars, while others are the result of human impact. For example, in handout RSG4A *Fairbanks Time Series 1*, one can easily see such things as: massive housing and road development in the Chena Ridge area; the creation and expansion of the Fairbanks International Airport; the disappearance of Marconi Slough; the cutting off of Deadman's Slough by airport construction; and the on-going erosion and build-up of sandbars and banks in the Tanana River.

This lesson is intended to supplement classroom study of the cycles and processes of earth as a system but can also be used to enhance student air photo and map interpretation skills. For other approaches to the concept of change over time, see MapTEACH GIS 14 Change Over time: Shorefast Sea Ice or MapTEACH GE 4 Change Over Time.

There are various ways that one might want to use these map or image time series, but two options are presented below.

MATERIALS

Option 1 – Students arrange images in chronological order

- One set of RSG5B images per student pair
- One Student Exercise for each student
- Overhead or slide of each image for class discussion

Option 2 – Students trace features of 2 images and compare

- One color print of RSG5C time series per student
- One to two sheets of mylar or transparent binder sleeves per student
- Colored pens
- Paper clips
- Overhead of each image for class discussion

INSTRUCTIONAL PROCEDURES

Getting Ready


- There are four different data choices for this exercise:
 - RSG5A: Fairbanks Time Series 1. Four maps/images including the dates the maps/images were created.
 - RSG5B: Undated Fairbanks Time Series 1.
 - RSG5C: Fairbanks Time Series 2. Includes just 2 of the 4 maps/images included in A and B above, but these are enlarged for easy tracing.
 - RSG5D: Nenana River Series.
- Any of these data sets will work for this activity but it is written with the Fairbanks data sets in mind.
- Make color copies of the time series you will be using.
 - Option 1: For each student pair, make one color copy of the RSG5B and cut images apart. Compile image sets of all four images for each student pair.
 - Option 2: Make a color copy for each student of RSG5C

Explore

Option 1 – Arrange in chronological order

- Ask students how they think Fairbanks and its surrounding area might have changed since about the end of World War II until the present. Record their predictions on the board. Hand out the Student Exercise and a set of RSG5B – Undated Fairbanks Time Series 1 images to each student pair.
- Explain that the student's task is to carefully observe, compare and analyze the images and to order them in a time sequence from the earliest map/image to the most recent.
- Students should record the order and observations on their Student Exercise, justifying their inferences as directed.
- When students finish, ask them to share/explain the order they chose and why.

Answer Key for RSG5B

 Earliest Map/Image Most Recent Map/Image			
A	B	C	D
Black and White Air Photo (1949)	CIR Air Photo (1978)	USGS Topo Map (1954, revised 1972, 1973 and 1994)	Spot 5 Satellite Image (2003)

- Prompt students to think about observations they might have missed by asking such questions as:
 - Why do you suppose there was so much more development on the north side of the Tanana River than the south side? What can you see in the images that might explain this?
 - Why do you suppose Marconi Slough disappeared?
 - How stable do you think Byers Island is and why do you think so?

Option 2 – Tracing and comparing

- Ask students how they think Fairbanks and its surrounding area might have changed from about the end of World War II until the present. Record their predictions on the board.
- Hand out color copies of RSG5C - Fairbanks Time Series 2, mylar or transparent binder sleeves, paper clips and colored pens to each student.
- Explain that the student's job will be to carefully observe the photos, noticing things that have changed as time progresses. They should pick one particular theme to focus on (for example roads, housing developments, water bodies or the shoreline of one river).
- Explain that students will now trace the feature they have chosen on the map and then, trace the same feature on the Spot 5 image using a different color. Model the student activity using the overhead projector to demonstrate the steps:
 - Secure mylar or sleeve to the topographic map with paper clips.
 - Identify a very prominent feature that is in both images and "register" the image by tracing that feature clearly. (This registering process will serve as a reference that students will use to align their second image.)
 - Instruct students to use just one color to thoroughly trace chosen feature on the topographic map.
 - Once students have finished with the topographic map, have them remove the mylar, align the "registered" feature with the same feature on the Spot 5 satellite image, and secure the mylar with paper clips.
 - Have students choose a different color for the second image and trace the feature.

- When students finish, give them some time to analyze and record how their feature has changed over time.
- Have students use the overhead projector to share observations and discuss their ideas about why those changes occurred.
- Prompt students to think about observations they might have missed by asking questions such as:
 - Why do you suppose there was so much more development on the north side of the Tanana River? What can you see in the images that might explain this?
 - Why do you suppose Marconi Slough disappeared?
 - How stable do you think Byers Island is and why do you think so?

MORE EXPLORATIONS

- In MapTEACH Google Earth Lesson 4 students compare a time series of images of Metlakatla, Alaska looking for change over time and identifying those changes using Google Earth mapping tools
- In MapTEACH GIS Lesson 14 students use GIS to analyze changes in the extent of shorefast sea ice. They extract information from multi-year and single year data and look for trends over time.

TEACHER RESOURCES

Vermont Landscape Change Program provides teaching lessons and ideas for documenting landscape change using historical and repeat photography at: <http://www.uvm.edu/landscape/>

Exploring Landscape Change through Repeat Photography is a website under development for the Denali National Park and Preserve. It will be an engaging and interactive look at ecosystem and human change in the park using repeat photography.

Names: _____

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STUDENT EXERCISE

- Carefully examine the four images of Fairbanks. Arrange them in order from the earliest image to the most recent image, and write the photo names in order in the boxes below.

Earliest Map/Image		→	Most Recent Map/Image	
A	B	C	D	

- Compare **A** and **B**. Why do you think **B** is a more recent map/image than **A**? Write down at least three observed differences supporting your placement.

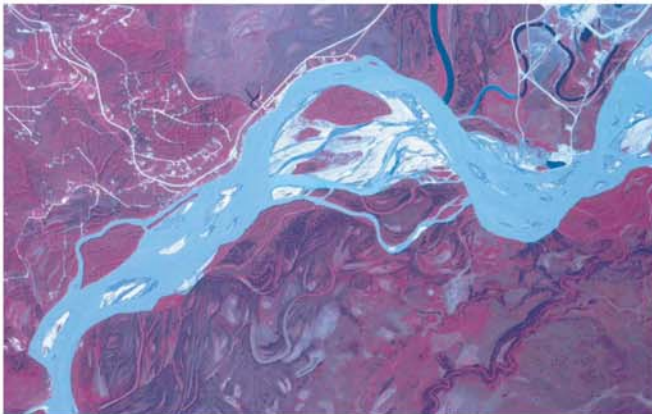
- Compare **B** and **C**. Why do you think **C** is a more recent map/image than **B**? Write down at least three observed differences supporting your placement.

- Compare **C** and **D**. Why do you think **D** is a more recent map/image than **C**? Write down at least three observed differences supporting your placement.

**RSG5A:
Fairbanks Time Series 1**



**Air Photo
1949**



**Air Photo
1978**



**USGS Topographic Map
1954
Revised 1972, 1973, 1994**

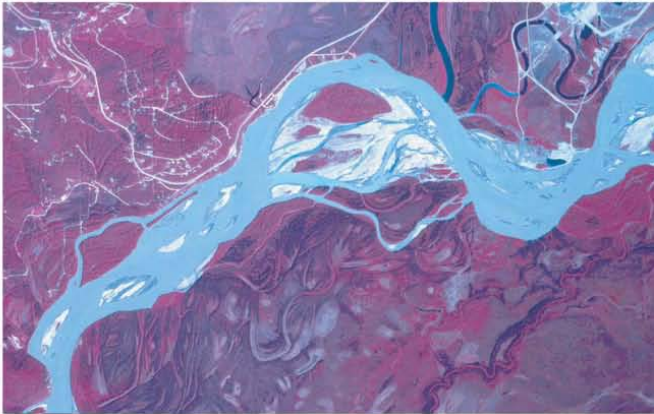


**SPOT5 Satellite Image
2003**

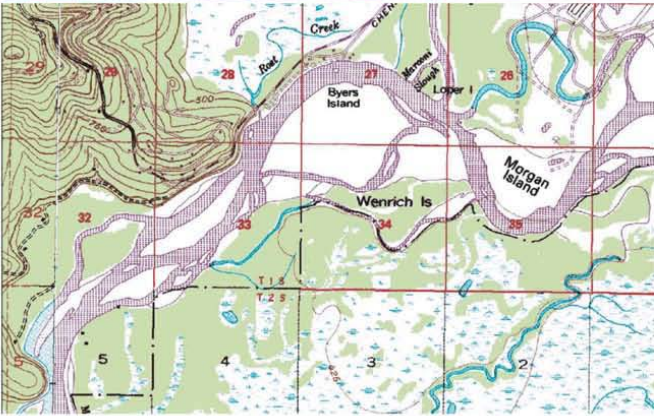
**RSG5B:
Undated Fairbanks
Time Series 1**



**Black & White
Air Photo**



CIR Air Photo

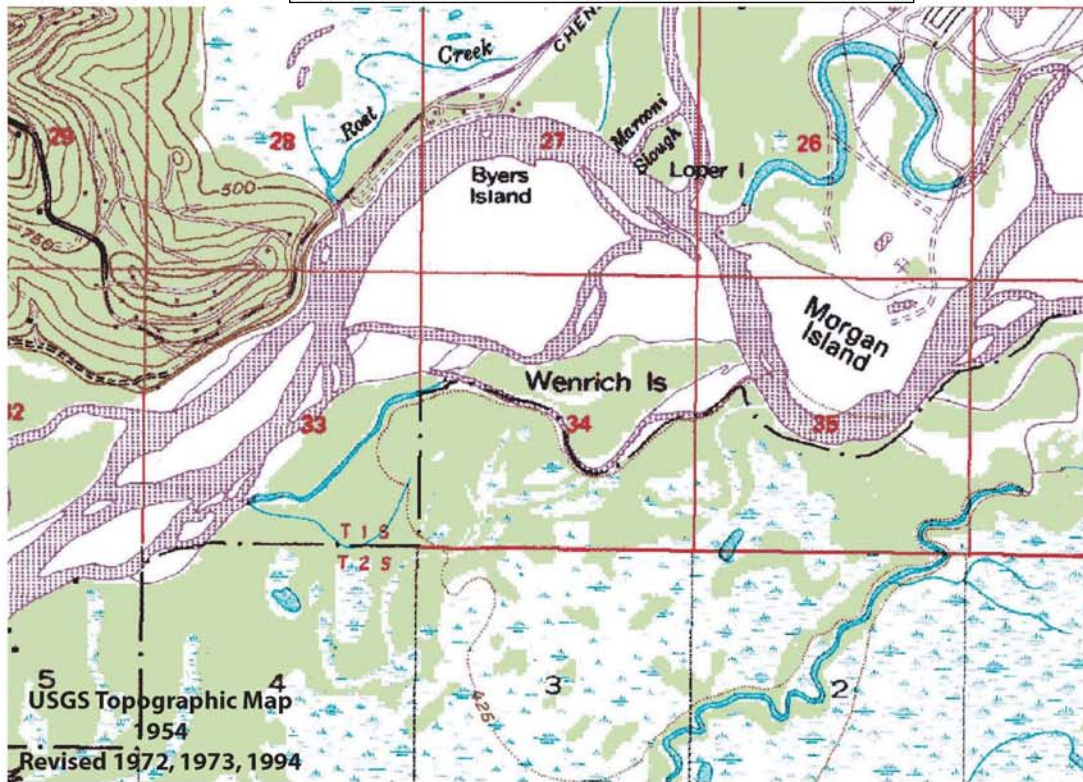


**USGS Topographic
Map**



**SPOT 5
Satellite Image**

RSG5C: Fairbanks Time Series 2



RSG5D: Nenana River Series

USGS Topographic Map
(1950, minor revisions 1978)



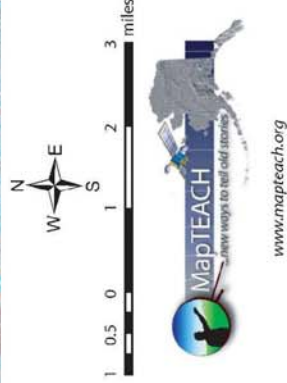
Color-infrared Aerial Photograph
(1986)



Landsat Satellite Image
(1991)



SPOT5 Satellite Image
(2003)



Fifty-three Years of Landscape Change in the Nenana Area, Alaska

This series of images shows how the landscape around Nenana has changed since 1950. Dramatic changes have taken place in the course of Tanana River just upstream of Nenana next to the air strip, and about 4 miles downstream of Nenana. The course of Nenana River has also undergone major changes about 2-1/2 miles above its confluence with Tanana River. Expanding infrastructure and other human impacts are also readily observed in this sequence of images.

Compiled 06/01/06 by Alaska Division of Geological & Geophysical Surveys - MapTEACH Project
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