

RSG Lesson 4
EVALUATING EROSION
TEACHER INFORMATION

Lesson Summary Students use their air photo interpretation skills and prior knowledge of river systems to interpret erosion and deposition features in several CIR air photos.

Objectives Students will develop a better understanding of how running water changes the shape of the landscape.

Estimated Time 20 minutes

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 D-2 Develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth.

BACKGROUND FOR THE TEACHER

As you know from RSG Lesson 1, air photos reveal patterns and features of the Earth that can't be seen in any other way. They not only portray river channels, shorelines and islands, but through differences in color, tone, texture and size, air photos also reveal features such as gravel bars, vegetated islands and cutbanks and thus provide a window into erosion and deposition processes in river systems. Some of these features were represented in the Air Photo Key from RSG Lesson 1, but here we take a closer look at river processes as seen in air photos. The Major River Types handout provides background information for both you and your students, and an answer key is provided for you at the end of this lesson. This lesson is intended to supplement classroom study of erosion and deposition in river systems and work with stream tables, but can also be used to enhance student air photo interpretation skills.

MATERIALS

- Copy of Student Exercise and *Major River Types* handout for each student
- *Air Photo Key* from RSG Lesson 1 for each student

INSTRUCTIONAL PROCEDURES

- Review and discuss prior river and air photo studies
- Provide students with copies of the *Major River Types* handout and discuss.
- Have students work through the Student Exercise.
- Share and discuss student interpretation.

MORE EXPLORATIONS

Besides fully investigating stream processes through the use of hand-made stream tables as described in the resources below, have students use topographic maps, CIR photos, black and white air photos and/or satellite imagery to build a small scale model of your community and its river. Teacher Sam Barney of Huslia, Alaska created this lesson for his middle school class. Students were broken into teams with the following jobs:

- 2 Engineers oversaw the whole project
- 2 River Construction Workers used topographic maps to construct the river
- 2 Village Construction Workers used black and white air photos to construct the main landmarks of the village
- 2 Vegetation Construction Workers used CIR images to accurately place vegetation along the river banks
- 1 photographer document the whole process

They then ran water through this model as a way to understand the effects of river erosion along the banks. This not only generated lots of enthusiasm and learning, but as the picture implies, was incredibly fun to boot!



Sam Barney and his students.

TEACHER RESOURCES

Understanding and Evaluating Erosion Problems. 1998. Prepared for the Alaska Department of Community and Regional Affairs by Woodward-Clyde Consultants. <http://commerce.alaska.gov/dcra/pub/Understanding&EvaluatingErosionPub.pdf>

Smith, Michael J. and J. B. Southard. 2001. *Investigating Rocks and Landforms Teacher's Guide*. It's About Time, Inc., Armonk, New York.

Sneider, Cary and K. Barrett et al. 1997. *River Cutters Teacher's Guide*. Lawrence Hall of Science, University of California at Berkeley.

The U.S. Army Corps of Engineers maintains a useful Internet reference list of documents pertaining to erosion problems in Alaska at: <http://www.poa.usace.army.mil/hm/default.htm>

See RSG Lesson 1 for air photo interpretation resources.

STUDENT EXERCISE ANSWER KEY

1. The Kobuk River is a meandering river.
2. The white material on the inside bend is gravel and indicates that point A is a point bar.
3. Erosion would occur at point B.
4. The multiple stream channels indicate that the Tanana River is a braided river.
5. Point A is a cutbank, indicating that erosion was taking place.
6. The white and gray material on the inside bend is a gravel point bar and indicates that point B is an area of deposition.
7. Yes, the airport is located on the eroding, outside bend of the river.
8. The Yukon is a split channel river.
9. The banks of split channel rivers are typically very stable, and bars and islands (which are really a special kind of bar that happen to be in the middle of the river) are more erodible. Therefore we would expect erosion to occur at point A.
10. Islands are typically more rounded on the upstream side and elongated on the downstream side, indicating this river is flowing from right to left.

Name: _____

RSG Lesson 4
EVALUATING EROSION
STUDENT EXERCISE

Using your air photo interpretation skills and what you've observed and learned about river and beach erosion, answer the questions about the images that follow.

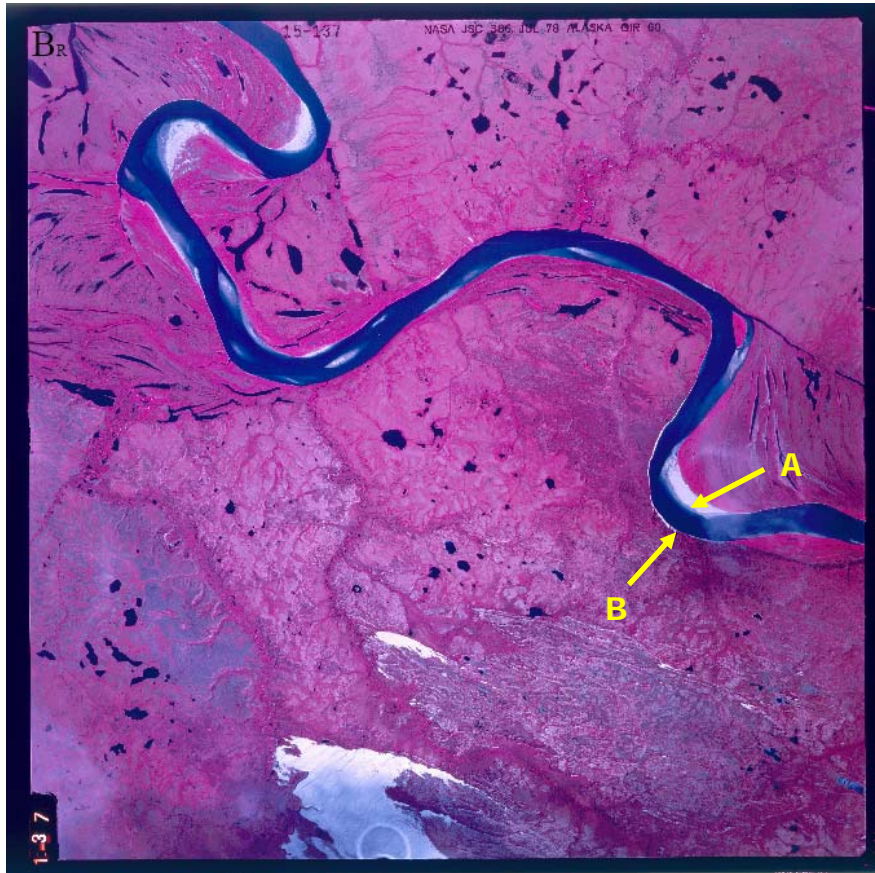


Figure 1 – Kobuk River

The Kobuk River runs through this image. To determine what type of river it is, use your "Major River Type" handout.

1. The Kobuk River is a _____ river.
2. Use your "Major River Type" handout to find a term that can be used to describe the feature at point A. What is it?

3. Where would you expect erosion to occur, at point A or point B? _____



Figure 2 – The Tanana and Nenana Rivers near Nenana

The Nenana River joins the Tanana River at the village of Nenana. To determine what type of river the Tanana River is, use your “Major River Type” handout.

4. The Tanana River is a _____ river.
5. Do you think erosion or deposition was taking place at point A when this aerial photograph was taken in 1986?

6. Where would you expect deposition to occur, at point A or point B? _____
7. Find the Nenana Airport in Figure 2. Do you think that erosion is a problem for the Nenana Airport?

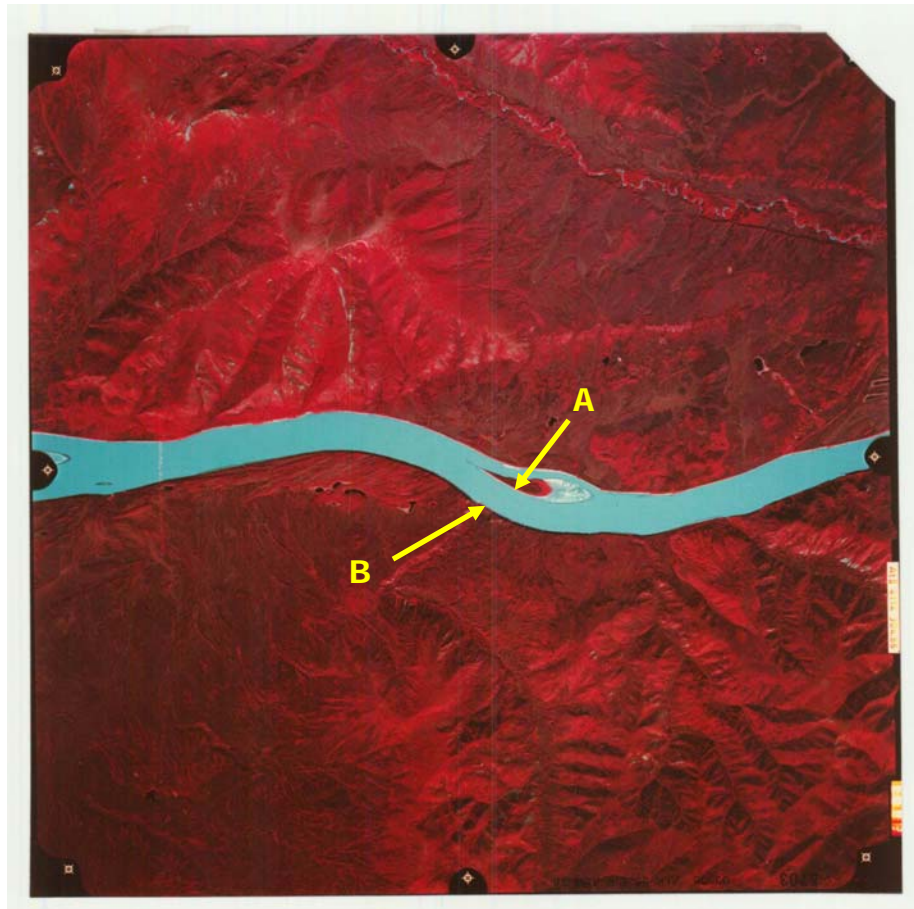


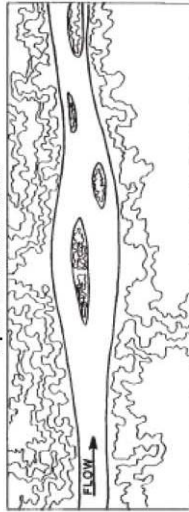
Figure 3 – The Yukon River

The Yukon River runs through the middle of the image above. To determine what type of river it is, use your "Major River Type" handout.

8. The Yukon River is a _____ river.
9. Where would you expect erosion to occur, at point A or point B? _____
10. Which direction do you think the river is flowing across the image: from right to left or from left to right? (Hint: look for clues on the "Major River Type" handout.)

Major River Types

Split Channel River



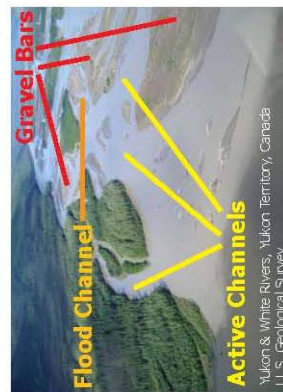
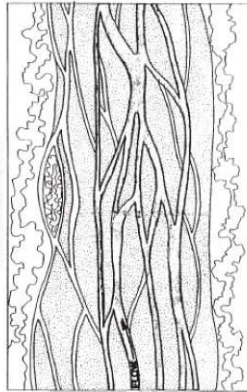
A **split channel river** has islands that split the flow into two channels.

Banks of **split channel rivers** are vegetated and relatively stable.

Gravel bars along the sides or in the middle of the river are more **erodible** than the banks. As a result, the bars rather than the banks **erode** during flood events, resulting in a channel that does not shift or move its banks.

Modification of the River and shoreline configuration section of Understanding and Evaluating Erosion Problems. Prepared for the Alaska Department of Community and Regional Affairs by Woodward-Clyde Consultants, revised March 1998

Braided River



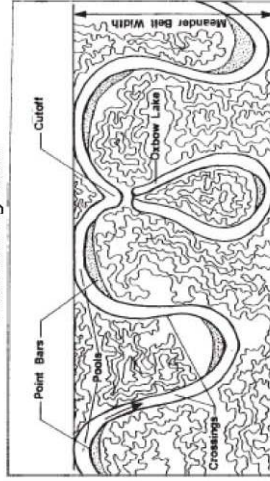
A **braided river** has multiple branching channels separated by many gravel bars and islands.

Flood channels only carry water during floods.

The **active channel** carries flow most of the time.

Channels shift by bank **erosion** and/or by channel diversion into what were previously flood channels. Channel shifts often occur during flood events.

Meandering River



A **meandering river** that loops back and forth within the **floodplain**.

Flow is contained in a single channel.

There is a **point bar** at each inside bend where new material is deposited.

There is a pool, or deep water, on the outside bend where the main current is. The greatest **erosion** occurs at outside bends and result in **cutbanks**.

"Oxbow lakes" form when a channel shift cuts off a bend in the river.