RC1: Defining Regional Boundaries

Purpose

To identify a region for study as a system, and to establish a list of characteristics and features useful for determining the boundaries of regional systems

Overview

Students discuss their current understanding of what Earth systems are and how they work, and consider how to identify the boundaries of a region for Earth system study. In small groups, they select a region for recommendation to the class, and they make a list of characteristics and features that can mark the boundaries of regional systems. After presentations by each group, the class chooses one region for study as an Earth system. Then they mark the boundaries of their chosen region on their Landsat image, topographic map, or other map.

Student Outcomes

Students will be able to,

- define "region" as an area which has similar features throughout;
- identify a specific region for study as an Earth system by finding boundaries; and
- describe the region's boundaries so that others can find them on a map.

Science Concepts

Earth and Space Sciences

Weather changes from day to day and over the seasons.

The sun is the major source of energy at Earth's surface.

Solar insolation drives atmospheric and ocean circulation

Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).

Physical Sciences

Heat is transferred by conduction, convection and radiation.

Heat moves from warmer to colder objects.

Sun is a major source of energy for changes on the Earth's surface.

Energy is conserved.

Chemical reactions take place in every part of the environment.

Life Sciences

Organisms can only survive in environments where their needs are met.

Earth has many different environments that support different combinations of organisms.

Organisms' functions relate to their environment.

Organisms change the environment in which they live.

Humans can change natural environments.

Plants and animals have life cycles.

Ecosystems demonstrate the complementary nature of structure and function.

All organisms must be able to obtain and use resources while living in a constantly changing environment.

All populations living together and the physical factors with which they interact constitute an ecosystem.

Populations of organisms can be categorized by the function they serve in the ecosystem.

Sunlight is the major source of energy for ecosystems.

The number of animals, plants and microorganisms an ecosystem can support depends on the available resources.

Atoms and molecules cycle among the living and non-living components of the ecosystem.

Scientific Inquiry Abilities

Analyzing maps
Collaborating with classmates
Communicate results and explanations.

Time

One or two class periods

Level

Middle, Secondary

Materials and Tools

Landsat image of your school (provided by GLOBE)
Topographic maps and/or others such as vegetation, physical, soil maps of the region covered by the Landsat image (as available)

Preparation

Review the Landsat image and maps.
Make student copies. (See Step 1, Preparation.)

Prerequisite

Students must have some familiarity with Landsat images and maps for this activity.

Crosswalk to Other GLOBE Learning Activities

Hydrology Investigation: Model a Catchment Basin

Watersheds provide useful boundaries for study of the Earth system, and this activity introduces students to their watershed and how it works. It also builds their skills of interpreting maps and images, as they use these to construct a three-dimensional model of a watershed.

What to Do and How to Do It

Step 1. Preparation

Review the Landsat image and maps to find regions you may wish your students to identify.

GIS (Geographic Information System) images showing watersheds, soils, and vegetation and other land cover types can enrich the activity.

Identifying a Region

The region or regions you identify may be large or small. They should be larger than a study site, (defined by what one might see while standing in one place), and small enough for students to learn about them in a short period of time. If you need a specific size guideline, select an area that is about 5 km on a side.

Natural boundaries are best, but if by using only natural boundaries you have a region that is too large, use a man-made feature, such as a road.

Do not worry if regional boundaries cannot be sharply defined.

Because one of the great values of this module is the opportunity it provides for integration with the rest of your students' work on GLOBE, you may want your students to identify a region that includes one or more GLOBE study sites.

With your preparatory review of the Landsat images and maps, you will be able to gauge whether or not your students need help in interpreting them before they do this activity.

Make Student Copies

Section of the Landsat image that includes the regions you have selected for student investigation
GIS images (if you plan to use them)
Work Sheets:
Identifying a Region for Study
Student Self-reflection Log: Identifying a Region
Assessment rubric for this activity (You may want to share with students.)

Step 2. Explain the purpose of the activity: to better understand the Earth at the regional scale by viewing it as a system.

Explain that students will explore a new way of looking at the Earth – that is, as one system, a set of interconnected parts or components.

If you have any question about your students' grasp of what a system is, you might wish to take a few minutes to have each of them write a definition and share it in discussion with the class.

Advanced students should need little help here. Beginning students may need to consider some familiar systems. You can elicit their ideas about what some systems might be: a car, a social group, a sports team, the human body. You might draw a simple diagram of such a system on the board or on an overhead, or ask students to do that for the class.

Explain to students that they will work with their GLOBE Landsat image, maps, and possibly other materials to identify and delineate the boundaries of a region for study as a system. In the next activity, they will consider the inputs and outputs of that regional system, i.e. what enters and leaves it such as water, soil particles, living things, energy, and chemicals.

Make it clear to students that there are no right or wrong answers in this activity, and there is no one region that students will be expected to identify. What is important is for them to improve their skills at analyzing geographic information, at viewing regions as systems, and at justifying whatever choices of regions they make.

Step 3. Have the class focus on and describe the area around the school, or a selected GLOBE study site, or other sites that may be familiar to them.

Distribute the student copies of the Landsat image and any topographic maps or other maps of the area that you have. Look at the image and maps with students, and help them interpret what they see. What are the general features of the area? Discuss them. What can you conclude about land cover types, vegetation, and soils from the maps? Can you determine where all the water at the site comes from, and where it goes?

Explain that a region should have some features that are homogeneous throughout, and boundaries that can be described. Do any regions become apparent to the class?

Step 4. Ask students for a definition of "region."

Discuss their suggestions.

A region can be defined as a geographic area that has some consistent features or characteristics throughout. Regional boundaries are places where those features or characteristics change. Regions can be large or small.

Step 5. Ask students what characteristics and features one might use to define a particular region.

If they need prompting, suggest they consider the characteristics listed here.

- Bodies of water: streams, canals, rivers, ponds, lakes, or an ocean
- (A watershed makes an effective region for study as an Earth system.)
- Topographic features such as mountains, plateaus, or valleys
- Vegetation types: Forest, meadow, wetland, desert
- Soil types
- Soil moisture
- Dams
- Roads, bridges, and other areas of human development (homes, office buildings, factories, and shopping centers) if they are large enough to affect inputs and outputs to the region
- Political boundaries such as county or state lines
- Parks

Have one student record a class list of characteristics on the board.

Step 6. Distribute the *Identifying a Region for Study Work Sheet.* **Organize students into small groups, and ask them to identify a specific region to recommend to the class for study in the next activity.**

Students should keep in mind the purpose of defining a region for Earth system study in this set of activities, because, in the next activity, they will look at the region as a system

of interacting components and will explore what enters the system and what leaves it. The regional boundaries they establish now will have much significance in the next activity, as students attempt to identify what crosses those boundaries.

Tell them that each group will be asked to describe its chosen region to the class and to justify the choice.

Request that each group designate a spokesperson.

Step 7. Have student groups present and justify their chosen regions.

Explain that the class will now choose one region to study as a system. The region the class ultimately chooses is of less importance than the process of student thinking about regions as systems, and of their collaborative work with each other. If you conduct *Activity RC2,* your students will have an opportunity to discover how well their characteristics and features for regional boundaries work when they consider specific inputs and outputs to the region as an Earth system.

Step 8. Help the class reach consensus on which region would work best for study as a system.

If the class has difficulty reaching consensus, encourage them to look at how clearly a given region is defined by its boundaries, and how feasible and interesting it might be to study a particular region as a system with inputs and outputs.

Step 9. Have students draw the boundaries of the class region on their copies of the Landsat image or map.

Have students keep their copies of the map, or collect them for safekeeping until the next activity.

Step 10. Collect the *Identifying a Region for Study Work Sheet,* **and distribute the** *Student Self-reflection Log: Identifying a Region Work Sheet* .

The *Self-reflection Log* can be completed either in class or as homework.

Student Assessment

These student products can be used for assessment:

Work Sheets

Identifying a Region for Study

Student Self-reflection Log: Identifying a Region

Copies of maps on which students draw the boundaries of their group's selected region

An assessment rubric covering the first work sheet, (group presentations and maps) is provided. Students' responses to the questions on the *Self-reflection Log* cannot be quantified, yet they play a special role in student learning. Students experiencing confusion or other problems with the topic may be more comfortable expressing themselves on the work sheet than in front of the whole class.

Further Investigations

Earth System on Foot

Take students to explore the selected Earth system region. Visit the areas that students identified as regional boundaries, and invite them to reconsider the appropriateness of those boundaries. Give them an opportunity to modify their list of characteristics and features.

Land Management with Earth System Science

Ask land management professionals how they define regions for their work, what criteria they use, and how effective they think those criteria are. Find out which land management issues are being addressed on the basis of watershed boundaries, and why.

Usefulness of Diagrams at Different Scales

For students who have completed *Activity LC2* or *LC4*: Ask students to predict how well their diagrams of the local study site will apply to the regional scale, without looking again at those diagrams. Then have them retrieve the diagrams, evaluate how well they apply to the regional scale, and complete a short written report on their evaluation.

As mentioned earlier in this activity, the regional scale is geographically larger than the local scale, but many of the processes that shape the Earth system act in similar ways over a range of scales.

Identifying a Region for Study

Work Sheet

Name:_____ Class: _____Date:_____

1. What is a region? Write your definition here.

_____

_____

_____

_____

_____

2. With the other members of your group, find a region to recommend to the class for study as a system. Describe it here.
   Remember that you want a region you can look at in terms of what goes in and comes out of it (inputs and outputs).

   a. What features or characteristics are you using to identify your region? Why?

_____

_____

_____

_____

_____

   b. How will you describe your region to the class? List the geographic landmarks that will help you identify the full circumference of the region's boundaries – north, south, east, and west. You can use latitude and longitude lines, if necessary.

_____

_____

_____

_____

_____

Identifying a Region

Work Sheet-2: Student Self-reflection Log

Name:_____ Class: _____Date:_____

Your responses to the questions below are intended to help your teacher become aware of what you're thinking and what you need help in understanding. You will not be graded on these responses.

1. What have you learned about identifying regions that you feel confident about?

_____

_____

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_____

2. What are you having trouble understanding about regions?

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3. What more would you like to know about the region you have identified?

_____

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_____

Assessment Rubric: RC1: *Defining Regional Boundaries*

Identifying a Region for Study as a System

	4	3	2	1
Definition of Region	Defines a region as an area with some features that are heterogenous (the same) throughout; features are scientifically appropriate	Defines region as an area that is different from others around it	Defines region as a particular area	Has not yet defined region
Presentation of Region Selected	Fully and clearly describes specific features that are heterogeneous throughout the area,	Partially describes features that are heterogeneous throughout the area,	Partially describes features that are heterogeneous throughout the area	Has not yet attempted to justify selection of region
Boundaries Marked and Described	Clearly marks full circumference of boundary on map, and describes it with specific geographic place names and/or latitude/longitude lines	Clearly marks full circumference of boundary, and describes it in general terms	Marks and describes some of boundary in general terms	Incompletely and vaguely describes boundaries