

## **Lesson Plan** Welcome to the World's Forests Edition of the *Natural Inquirer!*

Have your students read the first paragraph. (When students read this journal, they may read silently or you may select students to read paragraphs out loud.) Next, have students “do the math” and give the answer. (In 2008, the UN was 63 years old.)

Students should then read the next paragraph. Then hold a discussion about the meaning of the word “improve.” What does it mean to them? What might improvement mean to a country in transition and modernization?

Students should read the next paragraph. Ask them to identify the main idea of the

paragraph.

The next paragraph begins with “Trees are often planted...” Have students read this paragraph and follow up with a class discussion. Questions to get you started: “How is your life improved by forests?” “What do you think is the topic of this journal?”

Examine Figure 1. Has anyone seen a forest plantation? Have them tell about it.

Have students read the next paragraph in preparation for examining Figure 2. Have them locate their region and if appropriate, their subregion.

## **Lesson Plan** for Thinking About the Environment

Have students read the first paragraph. Questions to generate discussion include: “What is the main idea of the paragraph?” “Who or what benefits from forests?”

Examine Figure 3. What does the photograph show?

Now do the Reflection Section on page 7. Students may read silently and write a list of benefits. Their lists should be shared with the class, where a master list can be created. As your class reads through the journal, add to the list of benefits.

## **Lesson Plan** for Thinking About Science

Read first the paragraph. Ask students to think of a time in the last 3 days when they collected information. This can be numeric or non-numeric. Challenge students to think of numeric data recently collected. For example, they may have checked the temperature, the cost of something, or the distance to a location.

Read the next paragraph. Check for student comprehension by asking questions about using a standardized unit of measurement. (When you come to an italicized word, check

to make sure all students understand its meaning).

The following 2 paragraphs will also explain standardized units of measurement. After students read the paragraph, ask someone to explain the main idea of the paragraphs.

The final paragraph in this section introduces country correspondents. After students read this paragraph, have them clarify the role of the country correspondent in relation to FAO scientists.

## **Lesson Plan** for Introduction to the Inquiries

Have students read this entire section silently. After they have finished, check comprehension by asking them if the correspondents used the same unit of measurement as FAO. If students understand

the term, they will know that the same unit of measurement was either necessary, or FAO had to be able to transform any data received into a standardized unit of measure.

# Lesson Plan for Inquiry 1

Before beginning Inquiry 1, have students read "Thinking About the Environment" and "Thinking About Science". This will give students an introduction to the importance of global forests and to FAO's effort to understand the world's forests.

**Need:** Journal, paper, pencils, a globe or world map with lines of latitude, internet or library access, and copy of the Table on page 31.

Have students read the title and first paragraph of "The Situation". Check comprehension by asking the difference between weather and climate. Ask students to identify the two ways that FAO could have classified forests, based on the information in this paragraph. Check comprehension of the word classify. It is important for students to fully understand classification before continuing.

Have students read and answer the question in the next paragraph.

After reading the paragraph that follows, have students examine Figures 6 and 7. Explain latitude, especially as it relates to the equator and Earth's climate. Now do the activity below to determine your latitude

## **DETERMINING LATITUDE.**

Using a globe or a world map, have students identify where on Earth they are located. Primarily, have them identify their latitude, or distance from the equator. Some maps may show latitude in degrees, minutes, and seconds. Others may only show degrees and minutes, or just degrees. Have them identify the closest degree of latitude to their geographic location. After they have located their latitude, determine how far between the equator and one of the poles their location is. (Latitude is 0 degrees at the equator, 90 degrees at the poles.)

Students should read the paragraph that begins, "About 71 percent of Earth....". After reading the paragraph, they should examine Figure 8.

After reading the next paragraph, ask students to identify the paragraph's main idea. Then, ask them to describe the natural area close by. How much rainfall does it receive? Ask students to describe the trees and vegetation growing close to home.

Students should read the next paragraph, then examine Figures 9, 10 and 12.

Next, have students do research in the library or on the internet to discover their elevation and amount of annual rainfall. Elevation is the height of the land above sea level. Using Figures 9, 10 and 12, have them identify what kind of forest, if any, should naturally grow nearby.

Using the picture of the distribution of the world's forests on page 13, you can further check the understanding of the students by asking them to explain why they think that there are no forests in North Africa.

Now, using Figure 5, have students identify into which ecozone forests close to home should be placed.

Read the paragraph beginning with "In addition to latitude,..." Hold a class discussion based on the last sentence in the paragraph. Then read the next paragraph.

Using Table 1, hold a class discussion on the closest forest to their home. Into which FAO category would they place this forest? Explore the advantages and disadvantages of each forest type. Students can work in small groups to do this. Do plantation forests look different than more natural forests? How? Do students think different animals might live in different types of forests? Why or why not? What evidence do they have to support their answer?

The next four paragraphs should be read by students, and a short class discussion should be held between each paragraph. This will

bring students to the end of The Situation. Some ideas for discussion include:

- Paragraph 1:** How many of the 5 categories contain trees planted by humans? Is this a surprise? Why or why not?
- Paragraph 2:** Do you think fruit orchards should have been included by FAO in their study? Why or why not?
- Paragraph 3:** Discuss the difference between primary forests and protective plantations.
- Paragraph 4:** Discuss the idea of understanding trends and examining trend data.

### WHAT THEY DISCOVERED

Read the entire section. Use your globe, a world map, or Figure 2 to locate the Amazon area of South America. Read the next paragraph and examine Figures 11 and 13. Ask students to identify which category of forest is comprised of the least amount of land. Have them “do the math (first problem only).” Students can use Figure 11 to do this calculation. Ask a student to explain what this

means about the current character of most of the world’s forests.

Have students “do the math” (second problem) and briefly discuss the meaning of the results.

### REFLECTION SECTION:

In small groups, have students discuss the two "questions" and appoint a representative to make a short presentation to the class. You can use this presentation as an informal assessment of student comprehension.

### EXTENSION:

Kenya’s Green Belt Movement ([www.greenbeltmovement.org](http://www.greenbeltmovement.org)) has developed a program to reforest Kenya. The program suggests what types of trees should be planted for what purposes and where. Using the Table below (developed by the Green Belt Movement), have students identify into which of FAO’s 5 categories of forests each type of planting should be placed. Remember that in every case and in the Table below, humans are planting trees. Therefore, none will be categorized as primary forest or modified natural forest.

<b>PURPOSE</b>	<b>BEST SUITED SPECIES</b>	<b>PRIMARILY PLANTED IN</b>	<b>FAO CATEGORY</b>
Environmental conservation	Native	Public places	
Household needs	Fast growing non-native	Farms	
Fodder	Fast growing non-native	Farms	
Medicine/herbs	Native	Public places	
Food security	Non-natives and fruit trees	Farms	
Shade	Native	Farms	
Increase biological diversity	Native (to support birds, animals, and plants)	Public places	
Protecting cultural sites	Native	Public places	

## Lesson Plan for Inquiry 2

Before beginning Inquiry 2, have students read "Thinking About the Environment" and "Thinking About Science" if they have not yet done so. These sections will give students an introduction to the importance of global forests and to FAO's effort to understand the world's forests.

**Need:** Journal, pencils, paper, copy of the Table below.

Read paragraph 1. Ask students: What is the main idea from this paragraph? (The main idea is that we have not yet learned whether forests are growing or shrinking in size worldwide.)

Read paragraph 2. Hold a class discussion about the idea of renewable resources. Here are some questions to get the discussion started. "What are renewable resources, and what makes forests renewable?" "What are some other renewable resources?" "What are some non-renewable resources?" "What is the advantage of using renewable resources?"

Examine Figure 14. Ask if any students have planted trees. If so, ask them to share their experiences.

Have a student read the next paragraph, beginning with "FAO wanted to know..." Then hold a class discussion using the Reflection Section. This may also be done in small groups.

Ask students to read the first 2 paragraphs in "What They Discovered" and examine Figure 15. Using the Table below, have students calculate the amount of forest per person for each region. Have students compare their region with other regions. Order the regions from the most forest per person to least forest per person.

Now hold a class discussion based on these questions:

1. Where is my region on the list? Is it near the top or bottom, or near the middle?
2. How does my region compare with other regions in the world?
3. What are some of the reasons my region is ranked where it is on the list?
4. How might the country I live in compare with my region as a whole? (If you have access to the internet, visit and download the FRA 2005 Global Tables in excel from the main

<b>REGION</b>	<b>POPULATION (2004)</b>	<b>FOREST AREA (HECTARES)</b>	<b>AMOUNT OF FOREST PER PERSON</b>
Africa	868 182 000	635 412 000	
Asia	3 837 943 000	571 577 000	
Europe	723 495 000	1 001 394 000	
North and Central America	508 064 000	705 849 000	
Oceania	32 764 000	206 254 000	
South America	364 668 000	831 540 000	

page. Table 1 contains population Figures and Table 3 the area of forest. Using these resources, your students can calculate an estimated amount of forest per person for any country included in the report.)

Have students read the remaining paragraphs and examine Figure 17. After examining Figure 17, have your students look at Figures 18, 19, 20 and 21. You may have to explain these maps to your students. For more information about these maps, visit <http://www.worldmapper.org/about.html>. Have them “do the math” to determine how many fewer hectares are being lost now than in the past. Hold a class discussion about these numbers. What do they tell us? Is this good news? Why or why not? (Students may break into small groups for these discussions.)

Have students read the last paragraph and examine figures 17, 20 and 21 and answer the questions. (Refer to page 37 for answers). Hold a class discussion based on the reflection questions. Here are some additional questions to get the discussion started:

1. What is happening in our region or subregion that is leading to the loss or gain of forests?
2. Do you think this trend might change in the future? Why or why not?
3. What might happen to cause a change in the trend?

Hold small group discussions about whether your current regional or subregional trend is desirable or should be changed. Remember that not all deforestation is bad. Some forests may have to be converted to agriculture to provide enough food or to provide land for roads, houses and ports. In these groups, have students identify 3 advantages and disadvantages to the current trend. Have each group develop 2 action items that will either support or try to change the trend. Each group will identify a spokesperson to present their action items and rationale to the class.

As a class, identify any action items that can be taken by the students.

**EXTENSION:** The Green Belt Movement  
Using the internet, visit:

<http://www.greenbeltmovement.org>.

Have students research this site and others to discover how one African woman has made a difference by planting trees. If possible, explore options for planting trees near your school or in your community.

## Lesson Plan for Inquiry 3

Before beginning Inquiry 3, have students read "Thinking About the Environment" and "Thinking About Science" if they have not yet done so. This will give students an introduction to the importance of global forests and to FAO's effort to understand the world's forests.

Need: Journal, pencils, and paper.

Have students read the first paragraph and ask them to study the carbon cycle (Figure 22). Discuss the carbon cycle in your classroom. Before moving forward, make certain your students understand that all living things contain carbon, and that carbon moves from the atmosphere, through living matter, into the soil and water, and is released again into the atmosphere.

Ask students to read the next paragraph. Ask them to identify the main idea of the paragraph.

Now have them read the next paragraph (beginning with "From Figure 22") and examine Figures 23 and 24. Ask students if they can guess why FAO wanted to estimate the amount of carbon held by the world's forests. To do this, your students must connect information from the previous paragraphs. The logical conclusion should be that forests absorb and hold carbon, and therefore may help address climate change.

Have students read the next paragraph. That paragraph should confirm the conclusion made in the previous exercise.

Have students read the next paragraph beginning with "Scientists believe...". Check their understanding by emphasizing that after all water is removed from a tree's living parts, about half of the remaining weight is carbon. Ask students if they think humans have carbon in them as well. (This question will allow you to check their comprehension.) About 18 percent of a human body is carbon. Remind your students that carbon is the most abundant element on Earth, because all living

things contain carbon.

Using the Reflection Section on page 18, hold a class discussion about the evidence for climate change. Students may have differing opinions on this, and they should examine their own reasons for believing as they do. What evidence are they using? Is that evidence credible? How do they know?

Have students read all paragraphs in "What They Discovered" and look at Figure 25. Ask them if they can guess what "biomass" is. For the purposes of this graph, biomass is the living material of trees. (Biomass usually refers to living and once-living material.) Ask students if they can guess why South America has more carbon in biomass than other regions of the world. (South America contains a large area of rain forest, which contains a massive amount of leafy green biomass).

Now have students "do the math." Considering how many elephants it would take to equal the amount of carbon in the world's forests, ask them if they think there is more carbon in plant or in animals on Earth. Earth's human population is almost 7 billion, but your students must consider that other animals live on Earth as well. (After comparing the numbers and considering the size of other animals, students should conclude that worldwide, plants must contain more carbon than animals.)

Now ask students to consider the reflection questions. This may be done in small groups. For the first question, students should conclude that the two pieces of information are compatible. That is, as more forest land is lost than is gained, it makes sense that the amount of carbon in the world's forest should be declining. Ask students to discuss the second question in small groups and report their conclusion to the class.

Based on this Inquiry, students should identify the holding of carbon as another benefit of forests. This benefit should be added to the classroom list of forest benefits.

## Lesson Plan for Inquiry 4

Before beginning Inquiry 4, have students read "Thinking About the Environment" and "Thinking About Science" if they have not yet done so. This will give students an introduction to the importance of global forests and to FAO's effort to understand the world's forests.

**Need:** Journal, pencils, paper.

Have students read the first sentence under "The Situation". Have them read the definition of sustainable. Hold a class discussion about what sustainability means. Some ideas you can use include:

1. Have students brainstorm words, phrases, or concepts that mean sustainability to them. This could be things like regular meals, going to school, being a member of a family, etc.
2. Now challenge students to think about environmental sustainability. What does environmental sustainability mean to them?
3. Have students review the definition of criteria. Make certain students understand what criteria means before continuing.
4. Examine Figure 27. Have students guess what each of these terms might mean.

Now have students read the paragraph following Figure 27. Discuss the term "indicator" with them. In small groups, have students identify 3 criteria and two indicators for each criteria. The criteria can be something from their own life. Examples of criteria might include maturity, human intelligence, good farming weather, etc. For each of the criteria identified, ask students to identify 2 indicators that can be measured. Measurable indicators are ones to which you can apply a specific number and a unit of measurement.

Before continuing, make certain students understand what criteria and indicators are.

Have students examine Table 2 (page 22) and answer the reflection question. Then, ask students if any of the indicators are not measurable. Ask students to think about whether FAO researchers could determine how sustainable the world's forest management is today if the indicators were not measurable. Hold a discussion about measurement in science. Although most science is based on measurement, not all scientific studies use measured evidence. At the scale of the planet, or even regionally and subregionally, however, it would be difficult to determine sustainability without consistent measurement.

Have students break into 6 small groups. Assign one of the next 6 paragraphs to each group. Each of these paragraphs describes in more detail one of the FAO's criteria for sustainability. Each group will read and discuss their paragraph, then explain the criteria to the class. The first paragraph begins with "You learned about the extent..." The last of the six paragraphs begins with "Forests also provide financial..." As an extension, students may use the internet or library to do additional research about their criteria. For the criterion on forest health, note that not all forest fires are negative. Some forest types, for example, depend on occasional fire to remain healthy. Emphasize that this criterion is focused on threats to forest health, not on all forest fires.

Read the next paragraph ("Using these 6 criteria..."). Ask students if they agree with the FAO's criteria for sustainable forest management. Ask students to contribute any additional criteria for sustainable forest management.

Have students complete the reflection question on page 24. You may do this as a class, or use the six small groups from the

previous exercise. If there are no forests nearby, select a forest type with familiar characteristics.

Have students read the first paragraph after What They Discovered. Students should refer to Table 3 on page 24. Ask students if, based on what they have read so far, they are surprised that scientists found both positive and negative trends across the world. Why or why not?

Read the next paragraph. Hold a class discussion about rural poverty and forest sustainability.  
Discuss the implications of this finding.

Have students read the remainder of the article, including an examination of Table 3. Using Table 3, have students identify their own region or subregion (if applicable). Have them look down the column at the indicators for their region or subregion. In small groups, have students develop a method to compare columns. Have each group share their assessment with the class.

Hold a discussion about forest sustainability in their region or subregion. Include the reflection questions in the discussion. Does their analysis suggest that something needs to be done? If so, discuss options for action. Are there any actions that individual students or the class can take?

**EXTENSION:** If the class has identified any actions that can be taken, give students time to plan and implement their action. For example, they might write letters to the government in support of reforestation. They might decide to plant trees in their community. They might start a Green Belt Movement in their community. Any action taken should be carefully considered for its practicality, keeping available resources in mind.