

## ECOS Inquiry Template

1. CONTRIBUTOR'S NAME: SAM STIER

2. NAME OF INQUIRY: ECOLOGICAL FOOTPRINT

3. GOALS AND OBJECTIVES:

a. Inquiry Questions: What is an ecological footprint, and what is *your* ecological footprint?

b. Ecological Theme(s): Everything is connected, and whatever you do has an impact on the world around you.

c. General Goal: To encourage students to think about the ecological impact their decisions have on the environment.

d. Specific Objectives: This specific objectives of this inquiry are relatively abstract, but nonetheless extremely relevant.

e. Grade Level: 4<sup>th</sup>-12<sup>th</sup>

f. Duration/Time Required:

→ Prep time

Time is required to familiarize oneself with the website “[www.myfootprint.org](http://www.myfootprint.org)”

→ Implementing Exercise During Class

This inquiry fits well into a standard 50 minute class, but can be extended with discussion and experimentation (see below) as needed.

→ Assessment

An assessment component can be added, particularly as homework (see below).

4. ECOLOGICAL AND SCIENCE CONTEXT:

a. Background (for Teachers): This is a basic exercise to introduce students to the concept of ecological footprints, or, simply that one's choices and actions result in a measurable impact on the environment around them. While ecological footprints are a vitally important concept for students to understand, the key is to avoid making the lesson depressing. Using the website in the manner described below actually makes the exercise fun.

b. Background (to present to Students):

1. Discuss the meaning of “ecological footprint”

“Can anyone tell me what an ecological footprint is?”

Generally, students have not heard of this concept, and usually say something literal about footprints on the ground. One can convey the concept by breaking the phrase into each part and asking students for the meaning of each, and then asking them to put the two concepts together. This is obviously more challenging for younger students. We found 8<sup>th</sup> graders quickly understand the phrase, but that 4<sup>th</sup> graders only gradually understand the concept by doing the exercise.

“That's right; an ecological footprint is a metaphor describing the impact we have on the environment from our day-to-day activities. We all know at some level that we have an impact on the environment, but we rarely stop to think about what that impact is, and we probably never consider actually quantifying or measuring the degree of that impact.”

## 2. Student brainstorm about the kinds of ecological impacts their day-to-day activities cause

It's nice at this point to ask students to think about what ecological impacts they think they may have on the world around them just from their day-to-day activities. While leading this discussion, you may want to organize what the students say on the board under categories such as: food, water, materials, electricity, fuel, etc.

To jumpstart the discussion, you can ask students what they ate for breakfast this morning. Then, trace with the students all of the environmental resources needed to produce this breakfast. For example, if a student says "waffles", you can ask what waffles are made of, then how wheat is grown (water, petrochemicals), packaged (fiber, fossil fuels), and shipped (fossil fuels).

Other examples to continue the discussion:

\*Have each student look at the clothing tag of their neighbor's shirt, and tell the class what the shirt is made of, and where it is from, and then discuss the resources involved in its production. For example, polyester (fossil fuels), from Sri Lanka (fossil fuels). For younger students, it's nice to identify all of the different countries on a map, to graphically illustrate the enormous distances the classes' clothing comes from.

\*Ask students what the first thing they did this morning was. Often it is turning on a light. Then you can ask them where the electricity comes from. This often is an interesting discussion, as students will often begin by saying, "from the lightbulb". You can help them trace the source of the electricity (e.g., to hydrologic dams or fossil fuels), and discuss the resources used and impacts.

\*If doing this inquiry in the winter, you can ask students how warm it was in their house when they woke up this morning, and proceed to discuss the resources needed to heat houses (or schools).

## 3. Do the exercise on the website [www.myfootprint.org](http://www.myfootprint.org)

Once the students have generated a fairly complete list of ecological impacts that are organized by category on the board, you can introduce the internet exercise they will be doing to actually measure their specific impact on the environment. We found it useful to project the website on a screen, and have the class do the exercise together. This requires that they "average" their answers as a class (see below) so that an "average" ecological footprint of the class is produced in the end. (In order to allow students who deviate from the average to still assess their own personal ecological footprint, you can have students note their personal answers on their own sheet of paper during the exercise). In order to reach an average answer for the class, some form of raising hands is generally required for each of the questions.

The first page of the website shows a map of the world, so you can describe how any citizen of any country can do this exercise [later on, you can try this exercise with the class imagining you are from another country, and compare it to your results from the U.S.A.].

The second page of the website asks some basic demographic and other questions, which help "warm" the students up and get them familiar with the website's approach.

The proceeding pages ask several substantive questions about the participant's use of resources, covering such resources as food, materials, dwelling, transportation, etc. Many of the questions are self-explanatory and easy for the students to provide answers for. However, some questions are less easy for them to understand, and it is helpful to have a strategy to address each of these questions as you go. Some suggestions follow:

Question 2 states “How much of the food that you eat is processed, packaged, and not locally grown...” Students often do not know whether their food is locally grown, so you can ask students to raise their hands if they buy most of their food at the grocery store (and then explain that most food in the grocery store is not locally grown), or if they grow or hunt most of their food.

Question #5 asks for the size of your home. Most students do not know the square footage of their homes. You can ask students to show on their fingers the number of bedrooms their homes have. Then, you can determine an average number of bedrooms your class has, and translate this into an estimate of square feet (e.g., 3 bedrooms might translate into about 1500-1900 square feet).

Question #10 asks for the distance traveled in a car each week. Students generally need help estimating this. You can break this into the number of trips they take per week to nearby towns, to the grocery store, etc. You can also ask them to estimate the amount of time they spend in a car each week, assume an average speed of 45 mph, and calculate an average distance traveled.

Question #15 asks for the miles per gallon of the car driven. Students often will not know this, but you can ask them if they generally drive in a small passenger car, an SUV or truck, etc., and then translate this into miles per gallon.

The final page (following question #16) gives the results of the exercise. It is important to explain these results to students thoroughly, so they understand them. The results give an estimate of the physical area of their ecological impact, in acres. This is generated by translating all of the resource use determined from the preceding questions into an amount of biologically productive land that would be required to sustain these activities. For example, the website’s program determines the amount of fossil fuels used by the participant, and then calculates how much land would be required to produce this much energy through biofuels. Students must understand this for the results of the exercise to make sense.

The final page provides other interesting information, such as how much of this area is accounted for by which kinds of activities, the average amount of area used by other citizens from the participant’s country, and the amount of acres available to all people on the planet if equally divided.

Finally, this page explains how many planets would be needed if everyone on the planet lived like the participant. This is graphically represented by showing a number of earths. In general, this is the most impactful moment of the entire exercise to the students.

#### 4. Wrap-up discussion

It’s nice to end this exercise by asking students to now create a list together of actions they could take to reduce their ecological footprint. As some students may suggest actions that are unreasonable (e.g., not eating), it is important to emphasize that you only want them to suggest realistic actions (e.g., ride your bike more often).

You can ask for students to raise their hands when they have a suggestion, and/or go around the room and ask each student to make one suggestion. Writing these suggestions on the board will visually demonstrate how quickly students can come up with a lot of good suggestions.

Finally, you can discuss the fact that even if students are not inclined to reduce their ecological footprint for altruistic reasons, they may want to for selfish, financial reasons. There are two basic rationales for this. The first, and most obvious, is that in many cases one can save money by reducing one’s ecological footprint (e.g., turning off lights reducing monthly utility bills). The second reason is macroeconomic, in that as resources get used up, they become more expensive, so that conservation results in personal savings again.

## 5. MOTIVATION AND INCENTIVE FOR LEARNING:

Because this activity takes place on a website, students are generally interested in the activity even if they are not that interested in the topic. However, as soon as students see the results, particularly the number of earths required for each person to live as they do, they tend to become noticeably more interested in the topic.

## 6. VOCABULARY:

Ecological footprint  
Sustainability

## 7. SAFETY INFORMATION:

NONE

## 8. MATERIALS LIST (including any handouts or transparency masters):

ONLY CLASSROOM ACCESS TO INTERNET, A COMPUTER PROJECTOR, AND A SCREEN.

## 9. METHODS/PROCEDURE FOR STUDENTS: NOT APPLICABLE

a. Pre-investigation work:

b. Investigation work:

- 1) What evidence (data, samples) do students collect?
- 2) How do students present the evidence (data)?
- 3) What conclusions are drawn from the evidence students collect?
- 4) Include examples of data sheets.

## 10. ASSESSMENT:

One of the teachers we worked with included a homework component to this exercise that could be used for assessment. Students were asked first to generate a list of possible steps they could take to reduce their ecological impact. Then, they were asked to complete a list of questions with their parents about some of these steps, such as which ones were they willing to consider doing, would not do, etc. The results of such a survey could be used as an assessment tool.

## 11. EXTENSION IDEAS:

IF TIME ALLOWS IT'S ENJOYABLE TO GO BACK THROUGH THE WEBSITE AND TRY OUT DIFFERENT ANSWERS TO SEE HOW THIS AFFECTS THE RESULTS. THIS ALSO GIVES TEACHERS AN OPPORTUNITY TO DISCUSS EACH QUESTION WITH THE CLASS AND HOW EACH QUESTION RELATES TO ONE'S ECOLOGICAL FOOTPRINT.

## 12. SCALABILITY

WE FOUND THIS EXERCISE EQUALLY APPLICABLE WITH 4<sup>TH</sup> GRADERS AND 8<sup>TH</sup> GRADERS, AND CAN IMAGINE IT WOULD ALSO BE APPLICABLE TO HIGH SCHOOLERS. HOWEVER, WITH 4<sup>TH</sup> GRADERS, MORE TIME MUST BE SPENT ON THE ABSTRACT CONCEPT OF ENVIRONMENTAL IMPACT.

13. REFERENCES:

WWW.MYFOOTPRINT.ORG

14. LIST OF EXPERTS AND CONSULTANTS

15. EVALUATION/REFLECTION BY FELLOWS AND TEACHERS OF HOW IT WENT:

WE FOUND THIS EXERCISE TO BE A LOT OF FUN AND A GREAT WAY TO DISCUSS AN IMPORTANT TOPIC. SOME PEOPLE MAY FEEL THE TOPIC BORDERS ON CONTROVERSIAL ISSUES (E.G., RESOURCE USE) BUT WE DID NOT FIND ANY SUCH DIFFICULTY WHEN CONDUCTING THE EXERCISE AS DESCRIBED. STUDENTS WERE GENERALLY WILLING TO CONSIDER THEIR ECOLOGICAL IMPACTS AND FOUND THE QUANTIFICATION OF THEIR ECOLOGICAL IMPACT GIVEN BY THE COMPUTER PROGRAM FASCINATING.