STREAM TO SEA ACTIVITY

Ecological Footprint – How Does The Way We Live Affect Earth?

A classroom activity and discussion that uses a measurement tool that allows students to calculate and consider the effects of their personal resource use.

Prescribed Learning Outcome(s) met and Curriculum Organizer(s)

It is expected that students will:

Home Economics 10

Addressing Needs and Wants:

- Demonstrate and awareness of the global implications of decisions that individuals and families make about their needs and wants
- Describe the impact of leisure and career choices on family life

Home Economics 11 and 12

Social And Economic Issues

- Identify environmental and health issues related to the production and consumption of food

Social Studies 11

Economic Issues

- •Demonstrate awareness of disparities in the distribution of wealth in canada and the world

Environmental Issues

- Explain the environmental impact of economic activity, population growth, urbanization, and standard of living
- Identify and assess environmental issues facing Canadians

Geography 12

Resources Of The Earth (Nature Of Resources)

- Explain contemporary concepts of sustainability

Resources Of The Earth (Sustainability Of Resources)

- Assess the compatibility of human activities and population growth with concepts of sustainability

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Overview of Activity:

In this classroom activity and discussion, students are made aware of there being a finite amount of resources on Earth and how population and daily choices affect what is available for others. Students will calculate an estimate of their own Ecological Footprint (a measure in hectares of Earth's resources used) and how this Footprint compares to their classmates' and the Canadian average. Students will also determine which of their daily choices have the most effect on the amount of resources they consume, and will create a ranked list of actions they can (or will) take to reduce the size of their Footprint. Extension activities allow for a graphing and extrapolation exercise and a comparison and critique of ecological footprint calculations [Internet required].

Estimate of time required:

Number of lessons: 2 lessons
Each lesson requires: 1-2 hours
Can be done: Anytime ☒ Fall ☒ Winter ☒ Spring ☒ Summer

STREAM TO SEA ACTIVITY

Notes: The basic lesson can be completed in as little as one and a half hours, but extension activities provide additional hours' worth of exploration of the topic.

Natural Area Required: None - Indoor Activity ☐Ocean OR ☐Stream OR ☐Estuary

Overview of Materials and Resources Required:

Material Available for downloading:

☒Activity Description(s)
- "Activity Description"

☒Student Handout(s)
- "Ecological Footprint Calculator – How Does The Way We Live Affect Earth?"

☒Background Information
- [Included in "Activity Description" document]

☒Discussion Questions
- "Questions"

☒Evaluation /Assessment Tool(s)
- "Answer Key"

Other Required Material:
- None

Suggested Assessment Activities:
- Discussion questions may be used as an assessment tool; an answer key is provided.

Recommended Additional Resources and Optional Enrichment Activities:

(E.g. Web-sites, Teaching Guides, Student Reading, Videos/Audio-tapes, Posters and Brochures, Field Trips):
- SEEDS Foundation - Green Schools - This Canadian program encourages students to be environmentally responsible and to take personal action at school and with their families www.greenschools.ca
- Greenhouse Gas calculator www.climatechange.gc.ca/onetonne/calculator/english
- Lessons in Sustainability Education - data base of lesson plans for K to 12 www.lsf-lst.ca/en/teachers/classroom_active.php
- Footprint Calculator www.optimumpopulation.org/opt.ecofoot.html
- Footprint Calculator www.ecovoyageurs.ca/EcoSite%20English/INDEX.HTM
- Footprint Calculator www.rprogress.org/newprojects/ecolFoot/faq/#accuracy1

Support may be Available.

Contact your local Stream to Sea Education Coordinator or Community Advisor.
www-heb.pac.dfo-mpo.gc.ca/community/contacts/ec_e.htm
or phone (604) 666-6614 to find out if an Education Coordinator in your area assists with this activity.

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ECOLOGICAL FOOTPRINT:
HOW DOES THE WAY WE LIVE AFFECT EARTH?

Stream to Sea Secondary

ACTIVITY DESCRIPTION

1. **Initial class discussion** (10 – 20 minutes)
   - All living things use the Earth's resources in varying amounts.
     Humans are only one species of about 30 million resource-consuming species on the planet.
   - Which of Earth's resources do we use to support our lives?
   - Are these resources evenly distributed around the world?
     Only 25% of the planet is productive. The west coast of North America is
   - What do you think an "Ecological Footprint" is?

2. **Introduce definitions and provide some background information** (20 minutes)

In essence, an "Ecological Footprint" (EF) is how much of the Earth we use for our food, clothing, play, energy, shelter, waste, etc. Ecological Footprints can be calculated for an individual, for a family, for a city, or for entire countries. EF calculations are simply estimates or an inventory of how much of the Earth's renewable and non-renewable resources we use.

When humanity's Footprint exceeds the amount of renewable resources available, a draw-down in natural capital is required and this is considered unsustainable. Global Footprint analysis indicates that over the last 40 years or more, humanity's cumulative Ecological Footprints appear to have surpassed Earth's ecological limits; this is not sustainable in the long term. At our current consumption rate, there is not enough Earth to meet our demands!

We live in an era where there is an imperative to shrink our Ecological Footprints. There are many ways we can choose to alter the size of our EF's. In most cases, Less = More.

3. **Work through the student exercise to calculate personal Ecological Footprints.**

(30 minutes to 1 hour dependent on math abilities and grade level)

Emphasize that these calculations will provide an estimate of how much of the planet we use; they are simplifications that do not take into account the many other ways we use the Earth's resources. Also, this Ecological Footprint calculator is not a judgement of good or bad lifestyles; it is simply a value-neutral tool that allows us to objectively obtain a snapshot of how much of our resources are being used.

4. **Discuss results of Questionnaires and explore concepts** (1 hour)

Work through the discussion questions provided. Question 1 to 8 should be done individually, questions 9 and 10 could be done by means of a class discussion

EXTENSION ACTIVITIES

1. Graph the class' Ecological Footprints and extrapolate to larger communities

Prepare a chart in advance:

	Size of Ecological Footprint					
	2-4 hectares	4-6 ha	6-8 ha	8-10 ha	10-12 ha	12-14 ha
Number of students						

Have students anonymously indicate which category their calculated Ecological Footprint falls into. Create a bar graph (# students vs. size of Ecological Footprint) to show the class distribution. Calculate the average Footprint per student; how does the students' average compare to the calculated Ecological Footprint for Canada of 8.8 hectares?

Calculate the total Footprint for all the students. Extrapolate to calculate a total Footprint for all students in the school, for all citizens of their municipality, or for all of Canada. Compare these cumulative Footprints to the size of the municipality, the Territory or Province, or Canada. Do these Footprints exceed the size of available land?

[Canada's population is approximately 32 million in 2004, with an estimated per capita Ecological Footprint of 8.8 hectares. Canada measures 10 million square kilometres. 1 hectare = 0.01 km^2].

2. Discuss the need for action and how small changes really do have big impacts.

Have students complete a "Ten Point Challenge" coming up with 10 ways they will work toward reducing their ecological footprint. Looking at where they would have gotten negative points in the ecological footprint calculation also provides insights. Have students rank their Ten Point list items according to what they think will have the most potential for positive impacts.

Other ideas are at www.ecovoyageurs.ca/EcoSite%20English/Action/suggestions.htm

3. Compare different Ecological Footprint calculators [Internet Access required]

- www.ecovoyageurs.ca/EcoSite%20English/Calculator/calculator.htm (Calculates an average over 3 days: Day 1= the day before yesterday; Day 2 = yesterday; and Day 3 = today.)
- www.myfootprint.org
- www.mec.ca/Apps/ecoCalc/ecoCalc.jsp

Suggested questions:

- Which one of the 3 Ecological Footprint calculations did you find the most reliable?
- Give at least 3 reasons why you think this calculation is more reliable than the others, and 3 shortcomings of the other two methods of calculation.
- Are there any resources you use that are still not being taken into account in these calculations ?
- Regardless of how much our calculated Ecological Footprint varies per method of calculation, what do these calculations indicate to us?

ECOLOGICAL FOOTPRINT CALCULATOR

(Adapted from Sea to Sky Outdoor School's Ecological Footprint Questionnaire www.seatosky.bc.ca)

Name: _____

Fill in the questionnaire based on a typical day for you.

WATER USE

Points

Choose one:

- If your shower is usually 1-2 minutes or your bath is ¼ full, you get **+40**
- If your shower is usually 3-6 minutes or your bath is ½ full **+60**
- If your shower is usually more than 10 minutes or your bath is full, you get **+80**..... _____

Choose one:

- If you flush the toilet every time you use it your get **+30**
- If you let the "yellow mellow" sometimes you get **+15**..... _____

If you use a water-saving device in your toilet tank, you get **-5**..... _____

If you use a water-saving toilet and washer, you get **-5**..... _____
If you use a water-saving shower head, you get **-10** ..... _____
If you always wash your clothing in cold water, you get **-10**..... _____
If you brush your teeth with the water running, you get **+30** ..... _____

Choose one:

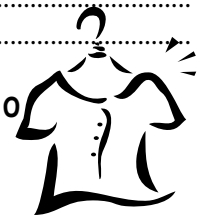
- If your family usually washes the car and/or waters the garden every week, you get **+60**
- If your family usually washes the car and/or waters the garden every 2nd week you get **+30**
- If your family usually washes the car and/or waters the garden every 3rd week or more you get **+20**..... _____

Add up your Water Use subtotal **Water Subtotal:** ☐

CLOTHING

Points

If some of your clothes were bought brand new for you or by you, you get **+100** ..... _____
If about ¼ of your clothes are second-hand or hand-me-down, you get **-10**..... _____
If some of the clothes that you often wear have been mended or fixed, you get **-10** ..... _____
If you sew some of your own clothes, you get **-10** ..... _____
If you are wearing some of the clothes you were wearing yesterday, you get **-5** ..... _____



Choose one:

- If you hardly ever wear about ¼ or less of the clothes you own, you get **+10**
- If you hardly ever wear about ½ of the clothes you own, you get **+40**
- If you hardly ever wear about ¾ of the clothes you own, you get **+60**
- If you hardly ever wear more than ¾ of the clothes you own, you get **+80** ..... _____

Add up your Clothing subtotal **Clothing Subtotal:** ☐

Points

STUFF

If you have repaired something this week that might have been thrown out, you get **-5** ..... _____

For each that you fully recycle give yourself **-5** points: newspaper; office paper; cans; hard plastic; plastic bags; glass; old clothes; batteries; motor oil from the car; cardboard, boxboard ..... _____

Choose one:

- If all your household cleaners are environmentally friendly, give yourself **-10**
- If some of your household cleaners are environmentally friendly, give yourself **-5** ..... _____

If you use non-environmentally friendly pesticides, give yourself **+400** ..... _____

Choose one:

- If all your garbage on a typical day would fit into 1 garbage can, you get **+120**
- If all your garbage on a typical day would fit into a basket, you get **+90**
- If all your garbage on a typical day would fit into a shoebox, you get **+70**
- If all your garbage on a typical day would fit into a cup, you get **+30**
- If you typically have no garbage all day, you get no **(0)** points. ..... _____

Choose one:

- If you really try to avoid using "disposable" items (e.g., pens, cameras, drink containers), you get **-5**
- If you do not avoid disposable items, you get **+20** ..... _____

For each dollar you spend on a typical day, give yourself **+1** ..... _____

Add up your Stuff subtotal **Stuff Subtotal:** ☐

SHELTER

Points

Write down the number of rooms in your home (do not include bathrooms) ___ (A)

Write down the number of people that live in your home _____(B)

Calculate the number of rooms per person (A divided by B) = _____

Choose one:

- If the number of rooms per person is less than 2, you get **+20**
- If the number of rooms per person is 2 to 4, you get **+70**
- If the number of rooms per person is 5 to 10, you get **+100**
- If the number of rooms per person is more than 10, you get **+150** ..... _____

If you share your building with non-family members (e.g. it's an apartment building or there are rented suites in your house), you get **-10** ..... _____

If you have a second home or vacation home that you do not own together with another family, you get **+400** ..... _____

If you have a second home or vacation home that you own together with another family, you get **+200** ..... _____

If you always turn off the lights and other electrical appliances when you leave a room, give yourself **-20** ..... _____

If you keep the house temperature cool in winter and wear a sweater, give yourself **-20** ..... _____

Choose one: _____

- If all your light bulbs are energy conserving bulbs, give yourself **-20** .....
- If some of your light bulbs are energy conserving bulbs, give yourself **-10** .....

Add up your Shelter subtotal **Shelter Subtotal:** ☐

TRANSPORTATION **Points**

If you usually spend some time on your bike on a typical day, you get **+5**..... _____
If you usually spend some time of the day on a public transport (bus or ferry), you get **+30**..... _____
If you usually spend some time carpooling (travelling with others in their car), you get **+50**..... _____
If you usually spend some time travelling just with your family in your car, you get **+100**..... _____
If you usually spend some time walking to where you're going, you get no (**0**) points!..... _____

Choose one:

- If you usually spend more than an hour per day in a vehicle, you get **+70**
- If you usually spend ½ to 1 hour per day in a vehicle, you get **+40**
- If you usually spend less than ½ hour per day in a vehicle, you get **+20**
- If you usually do not spend any time travelling in a vehicle, you get no **(0)** points ..... _____

Choose one:

- If your family does not own a car, you get **-5**
- If your family uses one car, you get **+20**
- If your family uses two cars, you get **+40**
- If you family uses more than two cars, you get **+60** ..... _____

Choose one:

- If the car you are most often in is a small car (often only 2 doors), you get **+30**
- If the car you are most often in is a medium-sized car (often 4 door), you get **+60**
- If the car you most often in is a huge car (e.g. SUV), you get **+100**..... _____

Add up your Transportation subtotal **Transportation Subtotal:** ☐

FUN **Points**

For you to do your activities on an average day, consider how much land has been changed into fields, rinks, pools, gyms, ski slopes, movie theatres, parking lots etc?
(One hectare is 100 metres squared, 2.47 acres, or about 1.5 football fields.)

Choose one:

- If very little land has been changed (less than 1 hectare), you get **+10**
- If some land has been changed (between 1 – 2 hectares), you get **+40**
- If lots of land has been changed (more than 2 hectares), you get **+60**..... _____

Choose one:

- If you usually spend more than an hour on the computer and/or watching TV per day, you get **+70**
- If you usually spend less than an hour on the computer and/or watching TV, you get **+40**
- If you don't usually spend any time watching TV or at the computer, you get no **(0)** points .... _____

Choose one:

- If you need a lot of equipment for your average day's activities (e.g. ski gear), you get **+40**
- If you need some equipment for your activities (e.g. soccer ball), you get **+30**
- If you need only a little equipment for your activities (e.g. binoculars), you get **+20**..... _____

Add up your Fun subtotal **Fun Subtotal:** ☐

FOOD **Points**

- If you grow a lot of your own food, you get **-10 points** ..... _____

Choose one:

- If some of the food you usually eat was grown in BC, you get **+20**
- If none of the food you usually eat was grown in BC, you get **+40**
- If everything you usually eat was grown in BC, you get no **(0)** points ..... _____

Choose one:

- If some of the food you usually eat is organic (grown without pesticides, etc), you get **+20**
- If none of the food you usually eat is organic, you get **+40**
- If all your food is organic, you get no **(0)** points ..... _____

Choose one:

- If you compost all your fruit and vegetable waste, you get **-10**
- If you compost some of your fruit and vegetable waste, you get **-5**
- If you do not compost, you get **+30** ..... _____

Choose one:

- If you usually throw out about ½ your food, you get **+100**
- If you usually throw out about 1/3 of your food, you get **+70**
- If you usually throw out about ¼ of your food, you get **+40**
- If you usually throw out less than ¼ of your food, you get **+15**
- If you make sure you never waste food, you get no **(0)** points ..... _____

Note: You are going to get a lot of points in the next section because you have to eat!

For each time in one week that you eat non-organic beef, give yourself **+20** ..... _____
For each time in one week that you eat organic beef, give yourself **+10** ..... _____
For each time in one week that you eat non-organic pork, give yourself **+15** ..... _____
For each time in one week that you eat organic pork, give yourself **+10** ..... _____
For each time in one week that you eat non-organic or factory-raised chicken, give yourself **+15** .. _____
For each time in one week that you eat organic, free-range chicken, give yourself **+5** ..... _____
If farmed fish is part of your diet, you get **+100** ..... _____
If wild fish is part of your diet, you get **+40** ..... _____

Choose one if you eat eggs:

- If non-free range eggs are part of your diet, you get **+40**
- If free-range eggs are part of your diet, you get **+20** ..... _____

If dairy products (milk, cheese, yoghurt, etc) are part of your diet, you get **+40** ..... _____
If fruit is part of your diet (and it should be!), you get **+20** ..... _____
If vegetables are part of your diet (and they should be!), you get **+20** ..... _____

Add up your Food subtotal **Food Subtotal:** ☐

Now add up all your Subtotals. Total = _____

Divide by 100 (e.g. 527 becomes 5.27) = _____. This is your Ecological Footprint

My Ecological Footprint is ☐ **hectares***

*One hectare = 100 metres square, 2.47 acres, or 1.5 football fields.

ECOLOGICAL FOOTPRINT:
HOW DOES THE WAY WE LIVE AFFECT EARTH?

QUESTIONS

Around 12.5 billion hectares of the Earth is made of productive land and water (it can provide us with our needs and wants). The estimated world population is 6.4 billion. (Source: World population clock http://www.census.gov/cgi-bin/ipc/popclockw)

1. **How many hectares are there for every person on the planet?**

   Calculate our "Personal Earth Share" using the formula below:

   $$\frac{\text{Total number of productive hectares}}{\text{Human population}} = \frac{\text{12.5 billion hectares}}{\text{6.4 billion}} = \frac{\text{hectares}}{\text{person}}$$

2. **How does your calculated Ecological Footprint compare to the Personal Earth Share above?**
3. **If everyone lived like we do (based on one day's "lifestyle snapshot"), how many Earths would we need to sustain everybody?**
4. **Do you think that the Personal Earth Share has been shrinking or expanding in the last 10 years and why?**
5. **Is there anything wrong with the Personal Earth Share calculation?**
6. **Can you think of additional items that should be considered to calculate a more accurate Ecological Footprint for yourself?**
7. **Can the following calculation be used to determine a town's Ecological Footprint? What else might be considered missing from this simple equation?**

   (number of citizens in a town) x (average ecological footprint) = the Town's Footprint

8. **What could you do to reduce the size of your Ecological Footprint?**
9. **What are the repercussions of large Ecological Footprints, and how does this relate to the concept of sustainability?**
10. **How does Canada compare to other parts of the world?** [Internet required]

Using data from the Optimum Population Trust's Living Planet Report 2002 (available at www.optimumpopulation.org/opt.af.lpr02.tab2.xls), discuss which countries have smaller ecological footprints than Canada and the USA and why.

"There may be some grand, sacrificial, heroic answer, but the best answers I know are almost trivial. Environmental problems are caused by billions of small, unthinking actions. They'll be cured by billions of small, sensible actions, simple substitutions of environmentally conscious habits for thoughtless and wasteful ones." Anonymous

ECOLOGICAL FOOTPRINT:
HOW DOES THE WAY WE LIVE AFFECT EARTH?

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ANSWER KEY

1. How many hectares are there for every person on the planet?

About 2 hectares.

2. How does your calculated Ecological Footprint compare to the Personal Earth Share above?

Most students will have calculated an Ecological Footprint between 4 and 10 hectares, which is between two to five times the size of our Personal Earth Share.

3. If everyone lived like we do (based on one day's "lifestyle snapshot"), how many Earths would we need to sustain everybody?

We could need anywhere from 2 to 6 Earths, depending on the students' calculations.

4. Do you think that the Personal Earth Share has been shrinking or expanding in the last 10 years and why?

The Personal Earth Share has been shrinking. Earth's population has been increasing. Productive or agricultural land is being used up by development (houses, supermarkets, industry infrastructure, roads, mega-cities, etc.). Productive waters are declining (biological and chemical pollutants, over-fishing, agricultural or industrial use).

5. Is there anything wrong with the Personal Earth Share calculation?

There are about +/-10 million other species that we share this planet with, all of which depend on the same productive lands and waters. The calculation likely overestimates our Personal Earth Share. There is actually less available for our use because the calculation does not take the needs of all the other species into account.

6. Can you think of additional items that should be considered to calculate a more accurate Ecological Footprint for yourself?

Airplane travel; feeding pets; energy efficiency of vehicles and appliances; use of environmentally friendly products (e.g., hemp fabrics, eco-friendly paint, toothpaste, etc.); how much stuff you buy (e.g., do you have 20 T-shirts or much less); if you generate some of your power through solar or wind energy, what your hobbies are…

Students may also consider how the Ecological Footprint estimate would need to be adjusted if calculated for one's entire family, for the whole town or city; for a local industry or for the whole country.

7. Can the following calculation be used to determine a town's Ecological Footprint? What else might be considered missing from this simple equation?

This calculation accounts only for the sum of the Ecological Footprints of the people living within a town. It omits several very important ideas, such as: space paved for roads, parking lots, and buildings; infrastructure (sewage, water pipes, lighting, public transit, etc.); industries present in the town, etc.

8. What could you do to reduce the size of your Ecological Footprint?

By analysing their Ecological Footprint, students could deduce how to lower their score. The intent is that students recognize that they are empowered to make a significant difference often just through small changes. Significant change is effected through a combination of:

- *Frequent, small actions (e.g. turning off water when brushing teeth, eating more locally grown food, not leaving the car running when stationary, buying ecologically-friendly and biodegradable products)*
- *Less frequent big decisions (e.g. what kind of vacation to take, what kind of birthday presents to buy) and*
- *infrequent major (often family) decisions (e.g. does the family require a second vehicle, should we move to a condominium or a house).*

9. What are the repercussions of large Ecological Footprints, and how does this relate to the concept of sustainability?

Possible discussion point: The ecological footprint of the 9.5 million people living in Los Angeles is 40 times bigger than the area of Los Angeles. Their collective footprint is larger than the entire state of California. Is this sustainable?

North American lifestyles require the depletion of resources in third-world countries to maintain their current rates of consumption; we require more resources that can be sustainably produced within the boundaries of our own continent.

10. How does Canada compare to other parts of the world? [Internet required]

Possible points for discussion include the impacts of:

- *Less wealth (e.g., natural resources like oil, arable land, forests, water)*
- *Warfare*
- *Political systems*
- *Natural disasters*
- *Disease*
- *Climate*
- *Location (whether easily accessible for transport)*
- *Country having better environmental policies and awareness*
- *Consumerism vs. simpler lifestyles*
- *Population*

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has." (Margaret Mead)

And NEVER doubt the wisdom of youth and their power to make a difference!

"There may be some grand, sacrificial, heroic answer, but the best answers I know are almost trivial. Environmental problems are caused by billions of small, unthinking actions. They'll be cured by billions of small, sensible actions, simple substitutions of environmentally conscious habits for thoughtless and wasteful ones." Anonymous