



# Teachers' Guide



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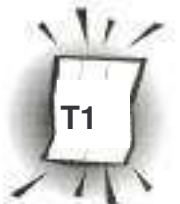
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# Introduction: ECOVOYAGEURS, REDUCING OUR ECOLOGICAL FOOTPRINTS

## The Goal

The goal of EcoVoyagers is to assist learners in making informed decisions and taking constructive actions towards the environment and others by developing and applying new knowledge, skills and attitudes.

In the early 1970s, Donald Johanson uncovered the "Lucy" skeleton, which changed our perceptions of human evolution.<sup>1</sup> As one of our oldest human ancestors, Lucy is a powerful reminder that in one form or another, we have been walking on the earth for about the last 3 million years and leaving footprints for equally as long. In 1978, footprints were found extending across what once was a bed of ash spewed out by a volcano over three and a half million years ago.<sup>2</sup> Humans, it would seem, are capable of leaving quite an impression.

In EcoVoyagers, students learn how to measure the demands we make on our environment. This measure is called the **Ecological Footprint**. The Ecological Footprint is a metaphor for our human impact on the earth. In their book, *Our Ecological Footprint, Reducing Human Impact on the Earth*, Mathis Wackernagel and William Rees from the University of British Columbia have defined this footprint as a measure of the productive land and water "that would be required to support a person's current lifestyle forever."<sup>3</sup> All that we consume and use, and all the waste resulting from our consumption, is supplied by, and absorbed by nature. The Ecological Footprint is, stated simply, a measure of how much "nature" we need to support ourselves.

## The Footprint

*What gets measured gets acted upon.* The Ecological Footprint is an accounting tool that lets us measure and understand how much nature we use and how much we have. By understanding the size of our Ecological Footprint, we can reduce it. The Ecological Footprint consists of a variety of categories of human consumption that are translated into the area of productive land required to produce and absorb them. The categories include food, housing, transportation, consumer goods and services. In EcoVoyagers, these footprint categories have been altered to food, water, garbage, energy and transportation.

Recent studies have shown that there are 1.8 hectares of productive land and sea space for each person on the earth if we all shared equally.<sup>4</sup> In Canada, the average Canadian uses over four times this much. Understanding how much we have, and how much we need we can then move forward on our EcoVoyage to find new ways to live within the earth's limits.



## The Quest

In EcoVoyageurs, students embark on a mythical quest where they learn to measure, and then reduce, their Ecological Footprint. The quest is made up of four stages. In the first stage, the students study the footprint left by their feet and their lifestyle. In the second step, they learn that their Ecological Footprints, the footprints of their lifestyles, consists of five areas - water, transportation, energy, food and garbage. In the third stage, students participate in activities that explore each of the five footprint areas. And finally, in the fourth stage, students produce EcoPlans to reduce their Ecological Footprint.



# ECOVOYAGEURS SUMMARY

## Chapter 1 First Steps

This chapter helps students realize that they have an impact on the environment and that they have a responsibility to themselves and to future generations. They will be introduced to the characters in the chronicles, learn about their voyage or quest, and prepare for their journey.

### **The Environment**

Focus: Everyone has an impact; everyone has a responsibility.

Activities: Complete introductory activity; create a portfolio; read EcoGuardians chronicles; put up the tree of Life poster.

## Chapter 2 Learning to Walk

In this chapter, students develop data management tools to estimate their Ecological Footprints. They look at their footprints both quantitatively and qualitatively to develop an understanding and appreciation of the cumulative effect that footprints have on their community and on the larger communities of which they are a part.

### **Our Ecological Footprint**

Focus: Quantify, qualify and analyze our footprints.

Activities: Read/listen to chronicles; complete survey; conduct experiments; graph.

## Chapter 3 Walking Lightly

In Chapter 3, the core activities for Water, Transportation, Energy, Food and Garbage allow students to explore further the information and issues related to the survey questions used in Chapter 2.

### **Why the Ecological Footprints Grow**

Focus: Looking at our lifestyles: water, transportation, energy, food and garbage.

Activities: Read/listen to chronicles; complete hands-on activities.

## Chapter 4 Walking Together

In the final chapter, students synthesize what they have learned in order to generate, execute and evaluate their own EcoPlans.

### **Reducing our Ecological Footprints**

Focus: Ways we can reduce our impact on the earth

Activities: Read/listen to chronicles; design and conduct EcoPlan



# THE ECOLOGICAL FOOTPRINT

## Background

**"If everyone on Earth lived like the average Canadian, we would need almost four Earths to provide all the food, materials and energy we need, and to absorb all the waste we currently produce."**<sup>5</sup>

The earth's population exceeded 6.5 billion people in 2006.

Earth's population continues to grow by 75 million people every year. How many more resources will we need, and how much do we have available?

Mathis Wackernagel and William Rees from the University of British Columbia have devised a way to measure humans' impressions on the earth: the **ECOLOGICAL FOOTPRINT**

The Ecological Footprint of a population is the ecologically productive area necessary to support an individual or a population. It is a measure of how much nature we consume to sustain ourselves.

*This Ecological Footprint is a measure of the productive land and sea (nature) that would be required to support each individual's current lifestyle forever.*<sup>6</sup>

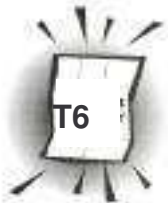
Living in cities and our comfortable homes, we easily forget that we are part of nature, and that we depend on the earth to meet our basic needs like food, water, energy, and shelter. The earth also recycles our wastes and provides us with the air we breathe, the water we drink and the food we eat. Despite our technological wizardry, human society remains in a state of dependence upon the ecosphere.<sup>7</sup>

### How much nature is there per global citizen?

Only 16% of all land on the earth is biologically productive. This includes arable land, pasture, forest and built upon land. Per capita, this translates into 1.8 hectares of land per global citizen. This includes productivity from coastal regions, also called sea space.

It also includes all the land necessary to absorb all of the CO<sub>2</sub> we produce.

This all adds up to 2.2 hectares of space per global citizen.



## Biologically productive land

0.49 ha	Cropland
+ 0.17 ha	Forest
+ 0.14 ha	Grazing
+ 0.14 ha	<u>Fishing Grounds</u>
= <b>0.94 ha</b>	Food, Fibre and Timber
+ 1.2 ha	Energy Footprint
+ 0.1 ha	<u>Built-up land</u>
= <b>2.24 ha</b>	<b>Global Ecological Footprint</b>
<b>1.8 ha/pp</b>	<b>Biocapacity (what's available)</b>

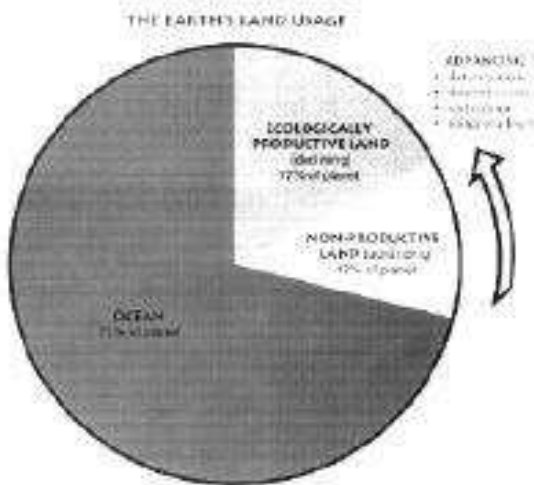
Further, these 2.2 hectares have to nurture and house not only humans, but also 30 million fellow species. According to the World Commission on Environment and Development, at least 12% of the ecological capacity — representing all ecosystem types — should be preserved for biodiversity protection. This estimate ranges as high as 75 percent.

That leaves 1.8 hectares per capita per person available for human use.

This 1.8 hectares becomes the ecological benchmark figure for comparing people's Ecological Footprints. The current world Ecological Footprint is 2.2 ha. Footprint calculations reveal that today's average Canadian depends on over 7.5 hectares of productive land, roughly equivalent to 5 city blocks to provide for his or her consumption.<sup>8</sup> This seemingly innocent figure becomes dramatically meaningful when we extrapolate that if everyone on earth lived like the average Canadian, we would need more than four planet earths to provide all the materials and energy required.<sup>9</sup>

What also needs to be considered is that these 1.8 hectares are expected to drop to 1 hectare over the next 40 years once the world population reaches its predicted 10 billion.<sup>10</sup> If current growth trends persist, this will happen in little more than 30 years.

# THE EARTH'S LAND USAGE



The Earth's supply of ecologically productive land is being reduced through advancing deforestation, desertification, soil erosion and rising sea levels.

- ADVANCING
- deforestation
  - desertification
  - soil erosion
  - rising sea levels

**OCEAN - 71%**

**ECOLOGICALLY PRODUCTIVE LAND (declining) - 17%**

**NON-PRODUCTIVE LAND (advancing) - 12%**

We must consider that not all ecologically productive land can be treated equally. The earth has 8.3 billion hectares of land capable of growing plants. Through a process of photosynthesis, these plants create food energy for all living things. Since every place on the surface of the earth offers different combinations of moisture, temperature, nutrient levels and sunlight, conditions for plants to produce food energy will vary. On a few precious parcels of the planet, the weight of plant material produced on every square metre of surface is very high (rainforests, wetlands, coral reefs and estuaries). However, on over 40% of the planet's land area, ecosystems produce only very little plant matter (desert, rocks, ice, parking lots, etc.). Only 10 % of the surface is fit for cultivation, and much of it is over-used already. Therefore, these high food energy areas must be preserved and new ways of living within nature's means must be found.<sup>11</sup>

Even though not everybody on the planet consumes as much as Canadians, the Ecological Footprint of humanity (2.2 ha) as a whole is at least 35% larger than what nature can sustain in the long term.<sup>12</sup> Humanity is consuming more than nature can produce and this trend is increasing with time. Further evidence is, for example, our disappearing forests, soils, ozone layer and biodiversity. Also, we are producing more waste than the earth can assimilate, such as green house gases, acid rain and toxic waste. Most of us are unaware of the impact our lifestyles have on the earth. We need to start carefully considering what it is we really need, and how our choices today might limit the choices of people tomorrow. If we are to avoid suffering and hardship now and in the future we cannot continue to consume more than nature can produce.<sup>13</sup> We must begin to create and innovate a way of life that helps us to live within the capacity of nature today. Ecological Footprints are not about how bad things are, just about how things are. Much in the way that an economist measures bottom lines, the Ecological Footprint measures how much land and sea space is available. The Ecological Footprint is our bottom line — how much we have, and the rest is up to us to balance our "budget."

## **WE DON'T HAVE A CHOICE ABOUT WHETHER TO DO THIS, BUT WE CAN CHOOSE HOW WE DO IT.<sup>14</sup>**

Comparing the Canadian footprint to what is available on a per capita basis in the world allows us to measure whether we live within our ecological means. While affluent societies have healthy account and trade balances in monetary terms, they "are running massive, unaccounted, ecological deficits with the rest of the planet."<sup>15</sup> We all want to improve our quality of life. That said, communities must be given the flexibility to choose how they are going to reconcile these two goals.

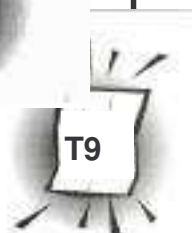
Many people are trapped by the belief that only further economic growth and material wealth improve quality of life. In a world already ecologically stressed, the reality is that quality of life can no longer be secured through quantity.<sup>16</sup> What is quality of life? According to Joe Dominguez and Vicki Robin, authors of *Your Money or Your Life*, the perfect life would

**... OFFER ENOUGH CHALLENGE TO BE INTERESTING. ENOUGH  
EASE TO BE ENJOYABLE. ENOUGH CAMARADERIE TO BE  
NOURISHING. ENOUGH SOLITUDE TO BE PRODUCTIVE.  
ENOUGH HOURS TO GET THE JOB DONE. ENOUGH LEISURE  
TO FEEL REFRESHED. ENOUGH SERVICE TO FEEL NEEDED.  
ENOUGH SILLINESS TO HAVE FUN. AND  
ENOUGH MONEY TO PAY THE BILLS ...<sup>17</sup>**

Vicki and Joe stress the need to question whether more is always better and to explore what is **enough**. "*If you live for having it all, what you have is never enough.*"<sup>18</sup>

Everybody wants a secure and fulfilling life. On the one hand, this depends on securing basic needs like food, shelter, health care and education, feeling connected and finding meaning in life. On the other hand, achieving this hinges on living within nature's means. To build a sustainable future, individuals and communities must start to make decisions about how they are going to accomplish these two goals. These decisions must be weighed by more than concerns about money. Ecological Footprints can provide a broader frame of reference in which to make decisions about our future.

**KNOW YOUR FOOTPRINT! AND THEN REDUCE IT!**



# WHAT IS ECOVOYAGEURS?

**IN ECOVOYAGEURS, STUDENTS WILL LEARN ABOUT THEIR ECOLOGICAL FOOTPRINTS AND HOW TO REDUCE THEM.**

**STUDENTS EMBARK ON A MYTHICAL QUEST AS ECOGUARDIANS TO PRESERVE THE TREE OF LIFE.**

## YOUR ECOVOYAGEURS KIT CONTAINS:

- Teachers' Guide/Student Book
- 4 Posters
- MP3 Download of Chronicles

EcoVoyageurs has been designed as a multidisciplinary project. It provides a holistic framework for *Grades 6 - 9 science, social studies, English language arts and mathematics*. As students engage in the EcoVoyageurs quest, specific core curriculum skills are developed and exercised within a meaningful and evolving problem-solving, decision-making context.

## HOW MANY CLASSES WILL ECOVOYAGEURS TAKE?

Ideally, the project should be used in its entirety over about 15 classes. However, each section may be used independently. For suggested time frames refer to page T12.

## HOW IS ECOVOYAGEURS ORGANIZED?

EcoVoyageurs uses the story of three friends who undertake a journey to save Solana, the Tree of Life, by deciphering codes, stumbling over clues and enlisting the aid of unusual companions.

Through this storytelling, students in the classroom parallel the friends' quest and find ways to reduce their own Ecological Footprints.

The stories and posters create a mystical atmosphere and capture the imagination of students. The activities, data gathering and research surrounding the stories reinforce the concepts presented in the chronicles and invite students to take a hands-on approach to the environment. The EcoVoyage is finished when students generate and complete their own EcoPlans—local projects designed to transform attitudes and beliefs into changed behaviours needed to reduce their Ecological Footprints.

The EcoGuardian portfolio is the journal of the students' progress on their voyage of discovery. It encompasses working notes, data collection, research, graphs, analysis, questions and answers and all other information accumulated during the project. It is the source of insight for each student EcoGuardian and provides the basis for the EcoPlan.



# ECOVOYAGEURS OUTCOMES

## Essential Learnings:

- raise questions and pursue creative solutions using a variety of strategies;
- use appropriate ideas, models, and theories to investigate and describe the natural and human-made worlds;
- demonstrate care and concern for the environment;
- make informed choices that will contribute to students' physical, mental, emotional and spiritual well-being.

## Program Areas & Specific Learning Outcomes

### ARTS

- create art works that explore environmental concerns in depth.

### MATHEMATICS, SCIENCE & TECHNOLOGY

- analyze the design of various products, processes and systems, assess how effectively these products, processes and systems function and how aesthetically appealing they are, and suggest ways to improve them;
- explain the effects of students' food, water, shelter, etc. from different sources on regional, national and global environments and societies;
- analyze investigations to determine how accuracy, thoroughness, persistence and creativity contribute to the solution of a problem;
- solve problems in different ways and accept that other people's ways of solving them may be equally valid;
- evaluate ways in which living things are used/treated by society;
- describe environmental cause and effect relationships that occur on regional and global scales, explain how or why they occur, and suggest possible solutions to environmental problems;
- describe some natural functions that occur in students' local bioregion and relate these functions to global environmental concerns;
- use probability and statistics in a variety of investigations;
- describe regional, national and global environmental problems related to the use of technology, and investigate ways of sustaining life in the future;
- assess environmental problems in the school or community and prepare and implement an action plan to address them.

### PERSONAL & SOCIAL STUDIES: SELF & SOCIETY

- use advocacy skills to promote environmental and social awareness and responsible behavior in the school and community;
- make and use a variety of graphs, maps, charts and diagrams to represent and analyze information;
- distinguish between healthy and unhealthy lifestyles and make choices that contribute to personal well-being;
- use a variety of social skills as a regular part of daily life and assess their effectiveness;
- analyze the interconnections among natural and human-made aspects of a system or process, and suggest ways in which changes to any aspect will affect the other aspects (e.g., the relationship among resources, population distribution and environmental quality);
- describe the interrelationships among the resources, people and products of the world.
- Essential learnings and specific outcomes from: The Common Curriculum, Policies and Outcomes, Ontario Ministry of Education and Training, 1995.



# ECOVOYAGEURS—TIME FRAMES

EcoVoyageurs incorporates core science, math and social studies curricula. Suggestions for using the materials over 5 classes or over 15 classes are provided. Each class is assumed to be 50 minutes.

These are general guidelines and do not account for discussion periods or extension activities.

## 5 CLASSES:

### Classes 1 & 2

- Read EcoGuardians' 1<sup>st</sup> Chronicle, pages S6-S11
- Do Chapter 1, Part I, Introductory Activity & Activity on T16
- Read EcoGuardians' 2<sup>nd</sup> Chronicle pages S14-S18
- Do Chapter 1, Part II, Introductory Activity and Activity T21

### Class 3

- Read EcoGuardians' 3<sup>rd</sup> & 4<sup>th</sup> Chronicles, pages S22- S24, S28-S30
- Do Chapter 2, Part III, Introductory Activity & Activity T42

### Class 4

- Do Chapter 2, Part III, Extensions T45
- Read EcoGuardians' 5<sup>th</sup> Chronicle, pages S42-S44
- Do Chapter 3, Part II, Introductory Activity & Activity T61

### Class 5

- Do Chapter 3, Part II, Extensions T62
- Read EcoGuardians' 6<sup>th</sup> Chronicle, pages S83-S86
- Summarize ways to reduce your Footprint (EcoPlans)

## 15 CLASSES:

### Classes 1 & 2

- Do Chapter 1, Part I on T16
- Do Chapter 1, Part II on T21

### Classes 3 & 4

- Do Chapter 2, Part I on T25

### Classes 5 & 6

- Do Chapter 2, Part II, Introductory Activity on T30 and Activity on T31

### Classes 7 & 8

- Do Chapter 2, Part II, Activities #3, #4 and Extensions on T31
- Do Chapter 2, Part III on T42

### Classes 9-11

- Do Chapter 3, Part I, Introductory Activity on T44 and Activity on T44-45

### Class 12

- Do Chapter 3, Part I, Extension #1 on T45

### Classes 13-15

- Do Chapter 4, Introductory Activity, Activity and Extension #1 T64-T65



ACTIVITIES	SCIENCE			SOCIAL STUDIES				ENGLISH LANGUAGE ARTS				MATHEMATICS				INTEGRATED SKILLS				
	ENERGY	ENVIRONMENT	WATER : FOOD CYCLE	WORLD ISSUES	PATTERNS IN OUR COMMUNITIES	HUMAN MANUFACTURING	NATURAL & PHYSICAL RESOURCES	READING & LITERATURE RESPONSE	GROUP DISCUSSION LISTENING & SPEAKING	RESEARCH & INTERVIEW	DEBATING	NUMBER OPERATION	MEASURE-MENT	COLLECT, ORGANIZE & REPRESENT DATA	COLLECT, COMPARE & ANALYZE DATA	RECORD KEEPING	INQUIRY EXPERIMENT OBSERVATIONS	PROBLEM SOLVING	DECISION MAKING	TECHNOLOGY
ECOGUARDIANS' 1ST CHRONICLE							X	X							X					
ECOGUARDIANS' 2ND CHRONICLE								X		X										
ECOGUARDIANS' 3RD CHRONICLE											X	X			X	X				
EVERYBODY LEAVES A FOOTPRINT								X				X	X	X	X	X				
CALCULATING THE ECOLOGICAL FOOTPRINT								X			X	X			X	X				X
STUDENT FOOTPRINT SAMPLE SURVEY											X				X	X				
STUDENT ORGANIZED FOOTPRINTS: THE RIPPLES					X							X	X	X	X	X				
EXTENDING THE SURVEY: WAVES OF THE RIPPLE				X	X			X				X	X	X	X	X				X
ECOGUARDIANS' 4TH CHRONICLE					X		X	X							X	X				
ECOGUARDIANS' 5TH CHRONICLE					X	X	X	X							X	X				
EXPLORING THE TRANSPORTATION FOOTPRINT	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EXPLORING THE WATER FOOTPRINT		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EXPLORING THE FOOD FOOTPRINT	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EXPLORING THE GARBAGE FOOTPRINT		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
EXPLORING THE HOME ENERGY	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
THE ECOPLAN					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ECOGUARDIANS' 6TH CHRONICLE								X							X	X				X

CURRICULUM OVERVIEW

# ECOVOYAGEURS POSTERS

Eight posters are included with EcoVoyageurs. These posters serve as a focus for the entire project, as well as reference and groundwork for each chapter, and for its various activities. Together the eight posters form a large tree, reinforcing the Tree of Life image introduced in the Chronicles. The posters will be assembled after the students are introduced to the characters in the EcoGuardians' 1st Chronicle: First Steps. The posters should be arranged as follows:

Title	Water	Ecological Footprints
Transportation	Energy	Garbage



## Symbols

Several symbols are used throughout the Teacher's Book for easy reference:

Chronicle Questions, Answer Key	EcoPlan	Posters	Student Portfolio