

# Reducing Pollution and Waste

## Unit 4 Overview

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# Unit 4 Reducing Pollution and Waste

In this unit, students build an awareness of the amount of waste generated by humans and how this affects the Earth and everything on it, including humans. The water cycle serves as a link between Earth and human body systems as students track the movement of energy and materials in water. Students are challenged to come up with a solution to the waste problem by developing a method to reduce pollution and waste.

## Introduction

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### CHALLENGE

Create a method to reduce pollution and waste.



### PHENOMENA

Everything on Earth is connected. Recognize the importance of minimizing pollution on a healthy planet.



### SCIENCE METHODS

Develop models of the water cycle and cells.



### CULMINATING EXPERIENCE

Develop and carry out an action plan to reduce waste and pollution.

## NGSS Mapping

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### 20 LESSONS

#### PERFORMANCE EXPECTATIONS

- ESS2-4
- LS1-1, LS1-2, LS1-3, LS3-2

#### SCIENCE & ENGINEERING PRACTICES

- Engaging in Argument from Evidence
- Developing and Using Models
- Planning and Carrying Out Investigations

#### DISCIPLINARY CORE IDEAS

- ESS2.C The Role of Water in Earth's Surface Processes
- LS1.A Structure and Function
- LS1.B Growth and Development of Organisms
- LS3.A Inheritance of Traits
- LS3.B Variation of Traits

#### CROSSCUTTING CONCEPTS

- Scale, Proportion and Quantity
- Systems and System Models
- Cause and Effect
- Energy and Matter
- Structure and Function

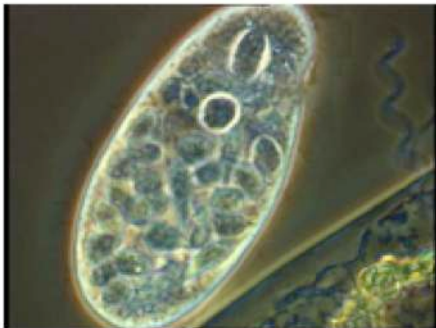


# Background

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Waste and pollution are major concerns for the health of the Earth and its inhabitants. Humans generate over 2.6 trillion (that's 12 zeros!) pounds of garbage each year, with over half of that going to landfills. Most of this waste comes from people living in developed countries, including countries in North America, Europe, and Asia. Managing all this waste is a huge job, and, regardless of where it ends up, trash has a negative impact on the environment. The emphasis of this unit is on solutions to the problem of excess waste that design methods to reduce waste and pollution.

Students begin the unit by building an awareness of the large amount of waste produced by humans. They do this through researching landfills, analyzing trash at their school, documenting their own waste production, and tracking the flow of waste as it moves through the Earth's water cycle. Students follow water—and pollution—through each stage of the water cycle, identifying energy from the Sun and the force of gravity as the driving forces for each stage of the cycle. Students build concept map models of the water cycle and extend their learning by writing comic strips chronicling the journey of a water molecule as it makes its way through the water cycle.



The unit investigates solutions to trash and pollution to guide student interest and engagement around water and cells. This photo is an example of the cellular structure of bacteria from a pond of water, illustrating the complexity and beauty of even very small things.

Students take a (very) close-up look at water as they zoom in on pond water using microscopes and begin to investigate life too small to see with the naked eye. This leads to exploring life at the cellular level and understanding cellular structures and processes. Students develop models of cells and look at plant and animal cells under microscopes to build their understanding. Students conduct hands-on activities to identify the characteristics of living things and to describe processes, such as diffusion, that move energy and matter through them. They expand their study of cells to organs and systems and the ways these systems interact inside the human body.



# Green Ninja Connections

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Reducing Pollution and Waste: Students continue to examine how human activities can adversely affect the Earth and look at ways to mitigate the effects of these activities. The focus of this unit is on waste and pollution. As in previous units in the Green Ninja curriculum, students are given a challenge. These challenges are designed to allow students to develop solutions to a problem and implement the solutions in a real-world situation. The challenge for this unit is to reduce waste and pollution. The unit begins with the *Fatal Atrashcan* video, which asks the question, “Have you ever thought about where your trash goes after you ‘throw it away?’” Students are introduced to the truth—that our trash never “goes away!” They also learn that there are ways to reduce the amount of trash we generate. The Green Ninja video *The Crude, The Bad, and The Ugly* highlights how waste can enter the Earth’s waterways, as the villain dumps used motor oil into a storm drain. In class, students examine this and other pathways for waste and pollution to enter the Earth’s waterways.

In preparation for the unit challenge, students get up close and personal with trash at their school! They then examine their personal trash output by keeping records of all of the waste they produce over a five-day period. Students are tasked with developing action plans to reduce the amount of waste they produce. Students implement the plans and evaluate their effectiveness by again recording the amount of waste they produce over a five-day period. As a culminating activity, student teams prepare posters highlighting their action plans and share them with the class.

