

## Balloons on the Beach

Where are balloons coming from, and how can we prevent their escape into the environment?

### Overview

Latex and foil balloons are commonly found during beach clean-ups conducted in the Pacific Northwest. In this lesson, students will determine where this type of marine debris may be coming from, and the processes that contribute to the material becoming marine debris. Students will propose solutions to interrupt the escape of balloons into the environment.

### Essential Questions

- *How and why are balloons normally used, and who uses them?*
- *How do balloons end up in the marine environment?*
- *What could be changed to prevent balloons from ending up in the environment?*
- *What are the costs and benefits of changing the way balloons are used and managed?*

### Learning Goals

Students will learn the following:

- *Materials are selected for a purpose based on a cost/benefit analysis.*
- *Understanding the life cycle of a plastic item can help identify ways in which the item impacts the environment.*
- *Systemic changes in practice can reduce human impacts on ecosystems.*

### Learning Objectives

Students will be able to:

1. *Identify potential sources of balloons that are found on beaches in the Pacific Northwest U.S.,*
2. *Describe the life cycle of balloons, and*
3. *Propose solutions that would interrupt the escape of balloons into the natural environment.*

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### Grade Level

6-12

### Anchoring Phenomenon

Balloon Debris on the Beach

### Driving Question

Where are balloons coming from, and how can we prevent their escape into the environment?

### Standards

#### Next Generation Science Standards

ESS3.C: Human impacts on Earth systems

ETS1A: Defining and delimiting and engineering problem

solutions

[See page 8 for full NGSS](#)



Balloon on an Oregon beach

### Introduction

Marine debris is a complex, global, environmental problem that negatively impacts ecosystems. Persistent, solid materials that are discarded or abandoned into the marine environment can pose ingestion or entanglement hazards to wildlife, disrupt marine fishing and tourism economies, and pose hazards to human health.

Worldwide, communities are addressing the problem of marine debris by *removing* items from the ocean and beaches, as well as by creating mechanisms that *prevent* materials from becoming marine debris in the first place.

Have you ever found a piece of marine debris on the beach and wondered where it came from? In order to prevent a material from becoming marine debris item, we need to know its story.

The anchoring phenomenon of this lesson focuses on balloons that have been abandoned or discarded and which end up on beaches in the Pacific Northwest. Balloons may be made of latex or foil (aka, mylar), and may include strings or ribbon attachments at their base, as well. Where did these balloons come from, and how did they end up on the beach? To *prevent* this type of marine debris, students will research a few ways balloons are commonly used, identify points at which the escape of balloons could be prevented, and propose solutions for ways to interrupt the generation of balloon marine debris.

### Lesson Procedure

#### ENGAGE

Begin the unit by helping students realize that balloons are among the marine debris items found on beaches.

- **Field option:** During a student beach or coastal river clean up, students encounter and collect balloons. Some marine debris data cards do not include a space for specifically recording balloons, so the instructor will have to facilitate the sorting effort to help students 'see' this particular type of debris. Be aware that students may not find any balloons during a single beach clean-up.
- **Classroom option:** Show students an excerpt from the [Balloon Beach Clean Challenge](#) video (time 1:45 to 4:09) which shows a person spending one hour collecting balloon marine debris from a beach in Long Island, NY.

### Definition of Marine Debris

*Marine debris is defined as any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes. - NOAA*

### Addressing the Problem

- NOAA MD [Prevention projects](#)
- NOAA MD [Removal projects](#)
- [Oregon Marine Debris Action Plan](#)



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### Lesson Resources

#### The Hook

- Video: [Balloon Beach Clean Challenge](#) [9:56]



Photo credit: NOAA

In a class discussion or using [Student Worksheet #1](#), solicit students' initial ideas about their personal experience with balloons, how and when balloons are used, and what balloons are made of. Collect student ideas about where they think balloons that end up on the beach may have come from. Ask students to draw and label a possible life cycle or story about this item which begins with the production of the balloon, moves on to its intended use, and the end of life for the material. At which point(s) in the cycle might a balloon escape into the marine environment?

### EXPLORE

In this section, students explore data to find out the degree to which balloons are found on beaches. They also explore the materials used to make balloons and the potential hazards that latex and mylar balloons can pose to the ecosystem.

#### Activity: Quantifying Balloons on Beaches

Have students explore data from beach clean-ups to assess where, when, and how many balloons are found on local beaches. Depending on the time available and the desired level of complexity, use any of the following sources to explore projects and data:

- Data collected by the students themselves
- Sort and graph from the [Balloon Beach Clean Challenge](#) video shown earlier in the lesson
- The short [Balloon Debris on Maryland Beaches](#) video from Maryland Sea Grant shows researchers finding and summarizing balloon debris counts along the Atlantic coast
- See several [NOAA Marine Debris blog articles](#) focused on balloon debris, including one called [The Washington Coast Five-Year Balloon Project](#)

Connect with locals who participate in beach clean-ups hosted by organizations such as [SOLVE Oregon](#), [Surfrider](#), or [Oregon Shores Conservation Coalition](#) and ask they have found and/or quantified balloons.



Balloon on an Oregon beach

#### Starting the Story

- [Student Worksheet #1 \(pdf\)\(doc\)](#)



Photo by esraa gamal on Unsplash

#### Quantifying Balloons on Beaches

- Video: [Balloon Debris on Maryland Beaches](#) [1:46]
- [NOAA Marine Debris blog articles](#)
- [The Washington Coast Five-Year Balloon Project](#)

#### Oregon Beach Clean Up Crews

- [SOLVE Oregon](#)
- [Surfrider – Oregon Region](#)
- [Oregon Shores Conservation Coalition](#)

#### Data Discussion Prompts

- How many balloons are found on beaches?
- Are latex and mylar balloons found with the same frequency?
- Are there patterns in the data?
- What factors could explain the trends you see in the data?
- How might effort affect how many balloons are collected?

### Activity: What materials are balloons made of?

Most balloons today are constructed either from latex or from mylar foil.



Latex (left) and Mylar (right) balloons are both found on Oregon beaches.

- **Latex** balloons are made from liquid rubber which comes from the sap of rubber trees grown in southeast Asia. But does this mean latex balloons are biodegradable, as some manufacturers claim? In [The Alarming Truth About Biodegradable Balloons](#) students learn that this claim came from one study conducted decades ago ([Burchette, 1989](#)), and that a more recent study concluded that in fact latex balloons act like plastic, persisting and causing harm to the environment ([Gilmore and Lavers, 2021](#)).

- **Foil** balloons, also commonly called [Mylar balloons](#), are made of foil and plastics such as polyethylene or nylon. As summarized in the [Petroleum Product of the Week: Foil Balloons](#), “foil balloons are made using a petroleum-derived, polyester film called biaxially-oriented polyethylene terephthalate (boPET).” Use the [Plastics and the Plastic Life Cycle](#) resource sheet to find lessons and readings for teaching students about plastics and the life cycle assessments of plastic products. The string or ribbon often found tied to the end of both kinds of balloons may also be comprised of plastic.

Each balloon has a life cycle which can be traced from *cradle to grave*. Engineers use *life cycle assessments* to understand the environmental impacts of a product at every stage of production and use so that they can identify ways to improve recycling and reduce waste.

As they learn more about the materials that make up balloons, students can use [Student Worksheet #2](#) to make modifications to their original life cycle drawing as necessary.

#### Vocabulary / Key Concepts:

- Latex
- Mylar
- boPET
- Cradle to Grave
- Life Cycle Assessment

#### Biodegradable Latex Balloons?

- Article: [The Alarming Truth About Biodegradable Balloons](#)
- Study: [Burchette, 1989](#)
- Study: [Gilmore and Lavers, 2021](#)

#### Plastic Life Cycle

- [Mylar balloons](#)
- [Petroleum Product of the Week: Foil Balloons](#)
- [Plastics and the Plastic Life Cycle \(pdf\)](#)

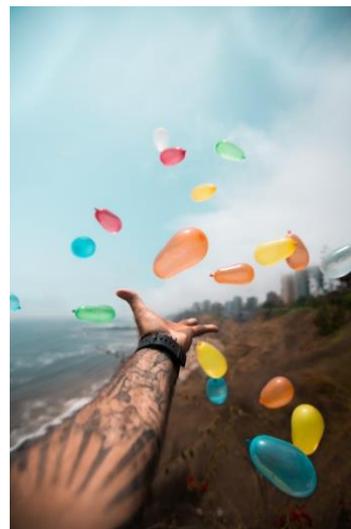


Photo by Sebastián León Prado on Unsplash

#### Adding to the Story

- [Student Worksheet #2 \(pdf\)\(doc\)](#)

### Activity: Balloon Impacts on the Environment

Balloons are fun because when they are filled with helium they float. However, what goes up must come down, and when balloons end up released into the environment, they can cause a lot of problems. Have students read the article [Hold on to Those Balloons](#) from the NOAA Office of Response and Restoration, which summarizes many negative impacts of balloon debris. Balloons can get tangled in trees and power lines, leading to 100 to 150 power outages each year according to the PG&E article [Hang on to Your Metallic Balloons](#). Wildlife may become entangled in balloons, especially when strings or ribbons are attached, or they may mistake floating balloons as food items. A recent scientific study found that balloons are the highest-risk debris item for seabirds ([Roman, et.al. 2019](#)). Visit the [Balloons Blow](#) website to find images of wildlife that have ingested or become entangled in balloon debris.

### EXPLAIN

In this phase, students discover how balloons are used and the ways they can end up discarded in the environment. They can then begin looking for ways to interrupt the escape of balloons.

### Activity: Balloons in Use

Balloons are typically used as a fun decoration in celebrations for events such as birthdays and graduations. One characteristic that make balloons 'fun' is that they float when filled with helium gas. Unfortunately, floating balloons are susceptible to floating away, out of reach. But the balloons eventually land somewhere, littering the environment.

Begin this section with a class discussion about balloon use and escape. Students likely have personal experiences with balloons and will be able to come up with a list of occasions and events where they know balloons are used locally. They also may have experience losing or witnessing a balloon floating away by accident. Have students use [Student Worksheet #3](#) to organize information about the different types of balloons and how they may be unintentionally released.

### Activity: Balloon Releases

Students may be less familiar with the practice of intentional balloon releases. Most people who release balloons are doing so to draw attention or celebrate something, perhaps even to memorialize the life of someone who has died. Little thought may be paid to what happens to the balloons once they are out of sight.

### Impacts of Balloon Debris

- Article: [Hold on to Those Balloons](#)
- Article: [Hang on to Your Metallic Balloons](#)
- Study: [Roman et.al. 2019](#)
- Website: [Balloons Blow](#)



Balloon with strings attached  
Photo credit: Russ Lewis



A juvenile Kemp's ridley sea turtle ingested a balloon.  
Photo credit: Blair Witherington

### Balloons In Use

- [Student Worksheet #3](#)  
([pdf](#))([doc](#))

One spectacular example of a large intentional balloon release and the immediate negative consequences is the [Balloonfest of '86](#) event, during which 1.5 million balloons were released as a fundraising attempt. In addition to charitable events, balloon releases may be tied to commercial advertising, launching balloons with coupons for products or otherwise trying to gain attention with a spectacle.

For many people, the sight of a colorful balloon floating into the sky is beautiful and moving. A mourner who has lost a loved one may see a balloon release as a comforting metaphor for the release of spirit. Others may release balloons with notes or wishes for the future.

Balloons that float away can travel great distances. An article entitled [Up, Up and Away](#) reports that a balloon intentionally released by a child in the United Kingdom was recovered more than 10,000 miles away in Australia. However, most released balloons will never be recovered. Because balloons can travel such distances before they land further underscores the problem that balloons released on the Oregon Coast may very well end up on someone else's shoreline, forest, or field. Similarly, the balloons found on Oregon beaches could have originated from very far away.

Furthermore, balloons that float away can end up in seemingly remote places. In [The Scary Truth About Party Balloons](#), a student analyzing ROV footage discovered several balloons on the seafloor at depths of 1000 meters or more.

### Activity: Balloon Industry Updates

In response to mounting negative public perception of balloons on the environment, a group of balloon retailers, distributors, and manufacturers formed an organization in 1990 called [The Balloon Council](#). The purpose of this industry organization has been to educate consumers about how to properly handle balloons so that they will not cause harm to the environment. To learn more about the balloon industry perspectives, students can explore The Balloon Council's [Smart Balloon Practices](#) campaign and their 2018 [Worth the Weight](#) statement concerning intentional balloon releases.

### Activity: Local Industry Connections

To help students devise solutions for balloon debris, have them use [Student Worksheet #4](#) to think about members in the community who use or have influence over the local use of balloons. Students will identify questions that they could ask to

### Balloon Releases

- Video: [Balloonfest of '86](#) [6:35]
- Article: [Up, Up and Away](#)
- Article: [The Scary Truth About Party Balloons](#)

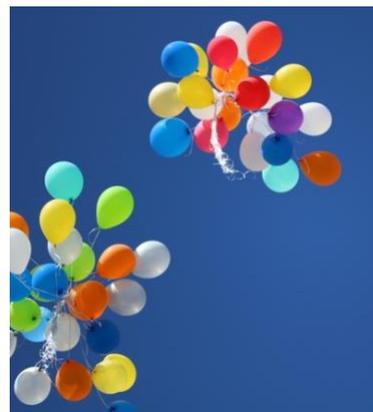


Photo by Ankush Minda on Unsplash



This foil party balloon was observed at a depth of 1,116m during Dive 16 of the ROV Exploration of the Northeast US Deepwater Canyons 2013 expedition. Photo credit: Laura Anthony, NOAA

### Balloon Industry Updates

- Website: [The Balloon Council](#)
- [Smart Balloon Practices](#)
- [Worth the Weight](#) stance

### Local Industry Connections

- Student Worksheet #4 ([pdf](#))([doc](#))

determine how and why balloons are used and what possible solutions might reduce balloon debris. Ask if an industry community member would be willing to participate in an in person or virtual visit to the classroom.

### ELABORATE

In this section, students identify ways to interrupt the escape of balloons, including cost/benefit analysis of potential solutions.

#### Exploring Possible Solutions

What kinds of solutions have already been identified? Students can research possible solutions online and explore the feasibility of potential solutions as they interact with community members who use or have influence over the use of balloons.

- Weight – Adequately weight down and secure balloons so that they don't float away
- Engineering – Put an inflated balloon on top of a stick rather than filling it with helium
- Changes in Practice – Provide and promote acceptable alternatives for balloons in local celebrations, and work to end any intentional balloon releases
- Technology – Develop a truly biodegradable balloon or reusable balloons
- Education – Create outreach messages to help create awareness and encourage actions that reduce balloon debris
- Policy – Develop and share rules and best practices with decisionmakers
- Waste Management – Develop procedures to make disposal of balloons easier and to improve compliance among users

#### Activity: Students Propose Solutions

In this activity, students use what they have learned about the balloon debris issue to propose a possible solution for the problem.

#### Audience:

- The students may create proposals with a specific audience in mind. For example, the class may have already connected with a local representative would be interested to hear about and respond to student proposals to manage or reduce balloon use at a particular event.
- Align with an organization that already interacts with users and suggest ways they could incorporate waste reduction practices and messages into their outreach materials.

#### *Ideas for Celebrating and Decorating Without Balloons*

- *Flags, banners, streamers, and dancing inflatables*
- *Ribbon dancers*
- *Kites and garden spinners*
- *Bunting*
- *Pinwheels*
- *Tissue paper pompoms*
- *Drumming*
- *Floating flowers*
- *Blow bubbles*
- *Colored LED lights*

Source: [Balloons Blow](#)

#### *Ideas for Honoring a Loved One Without Balloons*

- *Organize a memorial walk or hike*
- *Plant a native tree*
- *Donate time or money in their honor*
- *Practice random acts of kindness*
- *Reconnect with the living*

Source: [The Reluctant Enthusiast](#)

#### *What NOT to Substitute for Balloons*

- *Floating lanterns (fire hazard!)*
- *Releasing invasive species*
- *Plastic confetti or glitter*

Students may describe a method to interrupt the local escape of balloons that has been identified or implemented in other regions, or the student may propose a related or novel idea.

Have students redraw the life cycle of balloons to include their solution(s).

### EVALUATE

In this section, students share solutions with stakeholders to get their feedback, and then revise their proposals as necessary. Ideally, industry members and students can come up with a Next Step that they can work on together to move forward with making the solution a reality.

For example:

- Design and share a prototype of a solution.
- Share identified best practices with decision-makers to encourage their adoption in new areas.
- Identify a shovel-ready project for the Oregon Marine Debris Action Plan.
- Develop outreach messages to share solutions to industry and policy makers
- Implement data collection system for balloon debris in Oregon to track changes over time

### Next Generation Science Standards

#### Performance Expectation(s):

MS-ESS3-3 - Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.  
HS-ESS3-4 – Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

#### Science & Engineering Practices:

Asking questions and defining problems  
Constructing explanations and designing solutions

#### Disciplinary Core Ideas:

ESS3.C: Human impacts on Earth systems  
ETS1A: Defining and delimiting and engineering problem  
ETS1B: Developing possible solutions

#### Crosscutting Concepts:

Cause and Effect  
Stability and Change

### Students Propose Solutions

- Develop educational messages to inform the public about balloon debris problem and promote best practices for managing balloons
- At school, promote alternatives to celebrating with balloons at graduation and other events
- Work with a local industry to provide them with messages that they can share with audiences about ways to celebrate without releasing balloons
- Ask balloon sellers to offer and promote alternatives to balloons in their stores
- Propose a balloon release ordinance to local lawmakers

### Acknowledgments

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