



The Journey of Waste

THE PEOPLE, PROCESSES,
AND PROGRAMS DRIVING THE
FUTURE OF TRASH



 **LCSWMA™**

PA STEELS-ALIGNED
ENVIRONMENTAL LITERACY &
SUSTAINABILITY LESSON

GRADE BANDS:
Grades 3-5, 6-8, & 9-12

DURATION:
45, 60, or 90 minutes

FOCUS AREA:
Environmental Literacy & Sustainability



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TABLE OF CONTENTS

A Note to Teachers	2
Who is LCSWMA?	3
About the Lesson Plan	4
Lesson Overview.....	4
Phenomenon.....	4
Driving Questions.....	4
Learning Objectives.....	5
Success Criteria.....	5
Teacher Planning Table.....	5
Extension Activities.....	6
PA STEELS Alignment.....	7
STEELS Alignment	8
Grades 3–5 Alignment.....	8
Grades 6–8 Alignment.....	9
Grades 9–12 Alignment.....	10
Teacher Notes	11
Grades 3–5.....	11
Grades 6–8.....	11
Grades 9–12.....	11
Lesson	12
Vocabulary & Materials.....	12
Engage: Phenomenon Introduction.....	13
Explore Part 1: Waste Ecosystem.....	14
Explain: Waste Management Hierarchy.....	15
Explore Part 2: What Influences the Waste Stream?.....	15
Explore Part 3: Litter Timeline Investigation.....	16
Elaborate: Sustainability.....	17
Elaborate: Where Does LCSWMA Fit?.....	18
Evaluate.....	18
Lesson Notes	19

A Note To Teachers

Dear Teachers,

At the Lancaster County Solid Waste Management Authority (LCSWMA), we are committed to helping our communities understand their role in the waste ecosystem. Trash affects all of us every day, and the choices we make have lasting impacts on our environment, economy, and quality of life. Through educational programs and public awareness campaigns such as Recycle Right Lancaster, Safe Battery Disposal, and Think About Waste-to-Energy, we empower residents to make informed decisions that affect the environment and contribute to a more sustainable future.

We are especially grateful for educators like you who take complex environmental, scientific, and mathematical concepts and make them meaningful and engaging for students. Your work inspires curiosity, encourages critical thinking, and helps students develop a sense of environmental stewardship. Through your efforts, the next generation of leaders and problem-solvers gains the knowledge and skills needed to address real-world challenges.

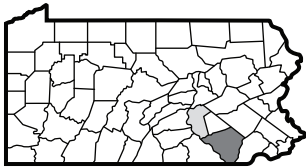
We developed this lesson guide for grades 3-12. The guide is aligned with Pennsylvania STEELS Standards and provides lessons and activities designed to help students explore the science, engineering, environmental, and societal impacts of waste management. Through hands-on learning and inquiry-based experiences, students will deepen their understanding of sustainability and resource conservation.

Thank you for partnering with LCSWMA to educate future generations. Together, we can empower students to make informed decisions, care for their communities, and contribute to a cleaner, more sustainable tomorrow.

Sincerely,

Your Team at LCSWMA





Who is LCSWMA?

The Lancaster County Solid Waste Management Authority (LCSWMA) is a municipal authority that manages municipal solid waste (MSW) and recycling for Lancaster County and MSW for Harrisburg and Dauphin County. Once waste is delivered by private haulers, LCSWMA employs a multi-step approach to processing and disposal known as an Integrated System. Nationally recognized for sustainability and innovation, LCSWMA's Integrated System promotes recycling, conserves landfill space, and creates clean, renewable energy.

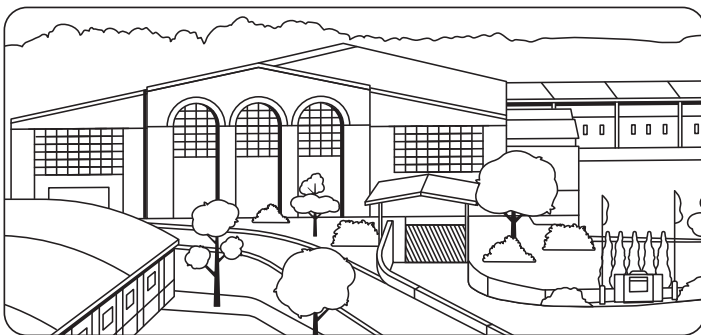
LCSWMA owns and operates four facilities that work together to manage nearly one million tons of waste annually:

MISSION

Managing Waste as a Resource to Protect and Benefit Our Communities

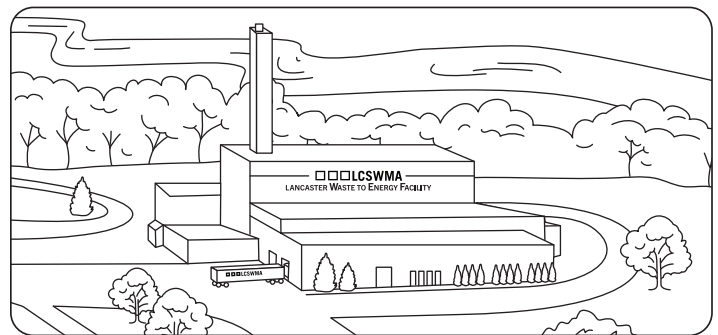
VISION

Rethinking Waste for a Sustainable Future



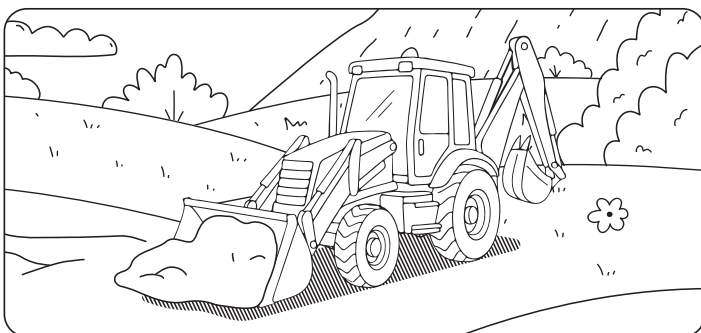
Transfer Station Complex

1299 Harrisburg Pike, Lancaster, PA 17603



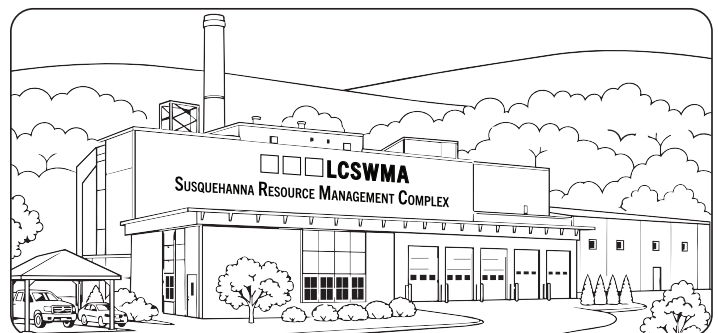
Lancaster Waste-to-Energy Facility

1911 River Road, Bainbridge, PA 17502



Frey Farm Landfill

3049 River Road, Conestoga, PA 17516



Susquehanna Resource Management Complex

1670 South 19th Street, Harrisburg, PA 17104

Beyond operating waste management facilities, LCSWMA is committed to educating residents about their role in the **waste ecosystem**. Through programs and campaigns such as **Recycle Right Lancaster**, **Safe Battery Disposal**, and **Think About Waste-to-Energy**, we help people understand how everyday decisions affect the environment and contribute to a more sustainable future.



About the Lesson Plan



LESSON OVERVIEW

Every day, the average American generates approximately 4.9 pounds of waste. While most people place waste in a bin and never see it again, that waste continues on a journey involving many stakeholders, facilities, and management systems. Through investigations, discussions, and hands-on activities, students will explore how waste moves through the waste ecosystem, how individual choices influence waste outcomes, and how sustainable actions can help communities manage waste more effectively.

CORE MESSAGE

What we throw away doesn't disappear—our choices help determine what happens next.



PHENOMENON

The average American generates approximately 4.9 pounds of waste each day, yet most people never see what happens after they throw something away.



DRIVING QUESTIONS

Grades 3–5

How do my choices affect the waste ecosystem?

Grades 6–8

How do our choices affect the waste ecosystem?

Grades 9–12

Why does sustainable waste management require multiple stakeholders?



LEARNING OBJECTIVES

Students will:

1. Explain how waste moves through the waste ecosystem.
2. Identify stakeholders involved in waste management.
3. Evaluate actions using the Waste Management Hierarchy.
4. Explain how litter can impact the environment.
5. Define sustainability and identify sustainable actions.
6. Describe how organizations such as LCSWMA support waste management efforts.
7. Identify one personal action that supports sustainable waste management.



SUCCESS CRITERIA

Students will:

1. Explain that waste does not disappear after it is thrown away.
2. Identify stakeholders in the waste ecosystem.
3. Describe how the Waste Management Hierarchy prioritizes waste management actions.
4. Explain why litter can remain in the environment for long periods of time.
5. Identify sustainable behaviors and community programs.
6. Commit to one action that supports sustainable waste management.



TEACHER PLANNING TABLE

Lesson Component	45-Minute	60-Minute	90-Minute
4.9 lbs. Phenomenon & Video	✓	✓	✓
Notice & Wonder	—	✓	✓
Waste Ecosystem Cards	✓	✓	✓
Systems Model (Yarn Activity)	—	Optional	✓
Waste Hierarchy	✓	✓	✓
Hierarchy Sorting Scenarios	—	Brief	✓
Waste Stream Brainstorm	—	✓	
Litter Timeline Activity	✓	✓	✓
Sustainability Discussion	✓	✓	✓
Community Programs	Brief	Brief	Expanded
LCSWMA Connection	✓	✓	✓
Reflection/Action Commitment	✓	✓	✓



EXTENSION ACTIVITIES

These extension activities provide additional ways for students to deepen their understanding, apply waste-management concepts, and connect classroom learning to real-world environmental action:

- **Waste Generator Audit:** Students observe classroom or cafeteria waste for one day, tally categories, and identify one improvement.
- **Stakeholder Interview:** Students interview a custodian, cafeteria worker, recycler, municipal staff member, family member, or waste professional about their role in waste management.
- **“One Item, Many Futures” Scenario Sort:** Students choose one common item, such as a plastic bottle or food container, and map different possible outcomes depending on user choices.
- **Trash-Free Lunch Challenge:** Students plan or participate in a lunch that creates as little waste as possible, then reflect on what was easy, difficult, and realistic.
- **Waste Hierarchy Scavenger Hunt:** Students look around the classroom, cafeteria, home, or community for examples of reduce, reuse, recycle, compost, energy recovery, and disposal.
- **Design Better Bin Signage:** Students create clear, student-friendly recycling or waste-sorting signs to reduce contamination.
- **Community Action Plan:** Students identify a school or community waste issue and propose a realistic action plan with stakeholders, materials, timeline, and expected impact.
- **Waste Data Calculations:** Students calculate the estimated daily, weekly, or yearly waste generation for their class, school, or household using the 4.9 pounds-per-person figure.
- **Local Resource Research:** Students investigate local recycling, household hazardous waste, composting, or cleanup resources and create a simple guide for families.



PA STEELS ALIGNMENT OVERVIEW

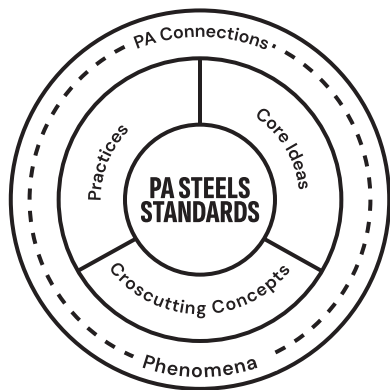
This lesson is primarily aligned to the **Environmental Literacy & Sustainability (ELS)** strand of the Pennsylvania STEELS standards. Students investigate waste management as an interconnected system, evaluate the impacts of human choices, and identify actions that support sustainability.

The lesson also incorporates the **Science & Engineering Practices** of:

- Asking Questions and Defining Problems
- Developing and Using Models
- Constructing Explanations
- Analyzing and Interpreting Information
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts emphasized throughout the lesson include:

- Systems and System Models
- Cause and Effect
- Stability and Change



PA STEELS DIMENSIONS

Multiple “dimensions” are combined to form each STEELS Standard, laying out the different skills, ideas, and concepts students need to know and be able to do to meet the learning goal. These dimensions include Disciplinary Core Ideas, Crosscutting Concepts, Science and Engineering Practices, and Technology and Engineering Practices.

SCIENCE, TECHNOLOGY, AND ENGINEERING PRACTICES

A set of skills that scientists, technologists, and engineers use to explain the world or solve problems.

Example Practices:

Communication; Planning and Carrying Out Investigations

DISCIPLINARY CORE IDEAS

Explanatory ideas in each science discipline that scientists, technologists, and engineers use.

Example Disciplinary Core Ideas:

Wave Properties;
Weather and Climate

CROSSCUTTING CONCEPTS

Concepts that scientists, technologists, and engineers use to deepen their understanding of situations and make connections across subject areas.

Example Crosscutting Concepts:

Cause and Effect;
Structure and Function



STEELS Alignment

GRADES 3-5 ALIGNMENT



ENVIRONMENTAL LITERACY & SUSTAINABILITY

• 3.4.5.A

Construct an argument with evidence that some changes caused by humans have positive effects on the environment and some changes have negative effects on the environment.

Lesson Connection

Students:

- Compare littering and cleanup efforts.
- Evaluate recycling, reuse, and waste-reduction behaviors.
- Discuss environmental impacts of waste-management choices.

• 3.4.5.B

Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment.

Lesson Connection

Students:

- Explore community recycling programs.
- Learn about cleanup initiatives.
- Identify how waste-management organizations support environmental stewardship.



SCIENCE & ENGINEERING PRACTICES

• Asking Questions and Defining Problems

Students investigate:

- Where waste goes after disposal.
- How waste is managed.
- How choices affect the environment.



CROSSCUTTING CONCEPT

• Systems and System Models

Students model relationships among stakeholders within the waste ecosystem.

GRADES 6-8 ALIGNMENT



ENVIRONMENTAL LITERACY & SUSTAINABILITY

• 3.4.8.A

Analyze and interpret information about environmental impacts to determine how communities can reduce effects on people and environments.

Lesson Connection

Students:

- Analyze decomposition timelines.
- Investigate litter impacts.
- Evaluate sustainable waste management practices.

• 3.4.8.B

Construct explanations for how human activities influence environmental systems.

Lesson Connection

Students:

- Connect personal choices to waste outcomes.
- Analyze stakeholder interactions.
- Explain how sustainable actions influence environmental systems.



SCIENCE & ENGINEERING PRACTICES

• Developing and Using Models

Students:

- Develop a stakeholder model of the waste ecosystem.
- Examine relationships within the waste-management system.

• Constructing Explanations

Students:

- Explain how waste moves through the ecosystem.
- Explain how actions affect sustainability outcomes.



CROSSCUTTING CONCEPTS

• Cause and Effect

Students analyze how behaviors such as littering, recycling, and reducing waste influence environmental outcomes.

• Systems and System Models

Students examine the waste ecosystem as an interconnected system.

GRADES 9-12 ALIGNMENT



ENVIRONMENTAL LITERACY & SUSTAINABILITY

• 3.4.12.A

Evaluate evidence of how human activities affect environmental systems.

Lesson Connection

Students:

- Evaluated waste-management practices.
- Compare strategies within the waste hierarchy.
- Analyze sustainability outcomes.

• 3.4.12.B

Design or evaluate solutions intended to reduce human impacts on environmental systems.

Lesson Connection

Students:

- Analyze sustainable waste-management strategies.
- Evaluate community programs and resources.
- Identify personal and community actions.

• 3.4.12.C

Evaluate tradeoffs associated with environmental decisions.

Lesson Connection

Students:

- Compare source reduction, recycling, energy recovery, and disposal.
- Analyze stakeholder roles and responsibilities.
- Evaluate environmental and community impacts.



SCIENCE & ENGINEERING PRACTICES

• **Analyzing and Interpreting Information**

Students:

- Analyze waste-generation information.
- Interpret decomposition estimates.
- Evaluate waste-management examples.

• **Obtaining, Evaluating, and Communicating Information**

Students:

- Gather information from videos, discussions, activities, and stakeholder cards.
- Communicate understanding through discussion and reflection.



CROSSCUTTING CONCEPTS

• **Systems and System Models**

Students evaluate waste management as a complex system involving multiple stakeholders.

• **Stability and Change**

Students analyze how sustainable behaviors influence long-term environmental outcomes.

• **Cause and Effect**

Students evaluate how individual choices affect waste generation and management.



Teacher Notes

This lesson is designed to be adaptable across grade bands. While the core activities remain consistent, the depth of discussion, complexity of systems thinking, and expectations for analysis should increase with grade level.

GRADES 3-5

Focus on:

- Personal responsibility
- Community helpers
- Basic environmental impacts

Instructional Emphasis:

- Use concrete, relatable examples (home, school, community).
- Emphasize that waste does not disappear and must go somewhere.
- Introduce stakeholders as “helpers” in the waste system.
- Keep the Waste Management Hierarchy simple (reduce, reuse, recycle, trash).
- Guide students through observations rather than abstract analysis.

Student Thinking:

- Identify where waste goes after disposal
- Recognize that people have different roles in managing waste
- Describe basic cause-and-effect relationships (e.g., littering vs. cleanup)
- Understand that their personal choices can help or harm the environment

GRADES 6-8

Focus on:

- Stakeholder relationships
- Systems thinking
- Cause-and-effect relationships

Instructional Emphasis:

- Encourage students to explain how stakeholders interact within the waste ecosystem.
- Expand the Waste Management Hierarchy to include reasoning behind priorities.
- Use activities (timeline, stakeholder modeling) to build connections between actions and outcomes.
- Prompt students to justify answers with evidence and reasoning.
- Introduce the idea that choices impact others within a system.

Student Thinking:

- Explain how waste moves through an interconnected system
- Analyze how individual and group choices affect outcomes
- Interpret decomposition timelines and environmental impacts
- Make connections between behavior (sorting, littering) and system-level effects

GRADES 9-12

Focus on:

- Sustainability analysis
- Tradeoffs and decision-making
- Evaluation of environmental solutions

Instructional Emphasis:

- Facilitate deeper analysis of the waste ecosystem as a complex system with multiple stakeholders.
- Encourage evaluation of waste-management strategies using the Waste Management Hierarchy.
- Incorporate discussions of tradeoffs, limitations, and real-world constraints (economic, environmental, social).
- Push students to support claims with evidence and consider multiple perspectives.

Student Thinking:

- Evaluate how different stakeholders influence sustainability outcomes
- Analyze tradeoffs between waste-management strategies
- Assess environmental impacts using evidence and reasoning
- Propose and defend solutions for improving waste systems and reducing impacts



Lesson

VOCABULARY

- Waste Generator
- Waste Ecosystem
- Stakeholder
- Waste Management Hierarchy
- Sustainability
- Recycling
- Composting
- Energy Recovery
- Disposal
- Litter

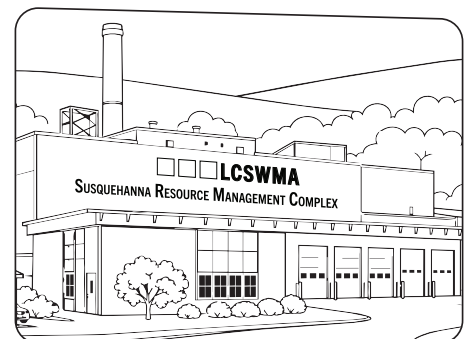
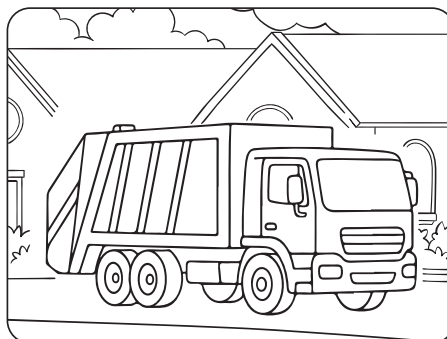
MATERIALS

Required

- “What Happens to My Garbage?” introductory video: <https://vimeo.com/809139013>
- Waste Ecosystem stakeholder cards
- Waste Management Hierarchy graphic
- Whiteboard or chart paper
- Markers
- Litter decomposition timeline cards
- Reflection or commitment card

Optional

- 4.9-pound demonstration bag
- Landfill image
- Facility images
- Yarn or string for systems-modeling activity
- Sticky notes
- Modeling the Waste Ecosystem handout
- Making Smart Choices: Waste Hierarchy Challenge handout



ENGAGE: PHENOMENON INTRODUCTION

Key Takeaway: Waste does not disappear.

NOTICE & WONDER

Show a bag containing approximately 4.9 pounds of waste or display a visual comparison showing average daily waste generation.

Ask:

- "What do you notice?" (Observations only)
- "What do you wonder?" (Pose questions that arise from the observations)
- "How much waste do you think the average person creates in a day?"

After students respond to the questions, reveal that the average person generates approximately 4.9 pounds of waste every day.

Ask: "If everyone in the room creates this much waste every day, where does it go?"
Record student responses.

Common Responses

- Dump
- Landfill
- Trash truck
- Recycling facility

Do not correct students yet. Allow misconceptions to surface.

VIDEO

Before viewing, ask students to look for:

- "What happens to waste after it leaves a home or school?"
- "Who is involved in managing waste?"
- "What surprised you about the process?"



Show the "What Happens to My Garbage?" Video
<https://vimeo.com/809139013>

Video Debrief

Ask: "What did you notice?"

Possible responses:

- Waste goes through multiple steps.
- Many people are involved.
- Not all waste goes directly to a landfill.
- Waste can be used to produce energy.

EXPLORE PART 1: WASTE ECOSYSTEM

Key Takeaway: Waste management is a system involving many interconnected stakeholders.

EXPERT CARD ACTIVITY

Assign stakeholder cards to small groups.

- Students read their card, discuss their stakeholder's role, and become experts.
- Groups then teach their stakeholder's role to the class.

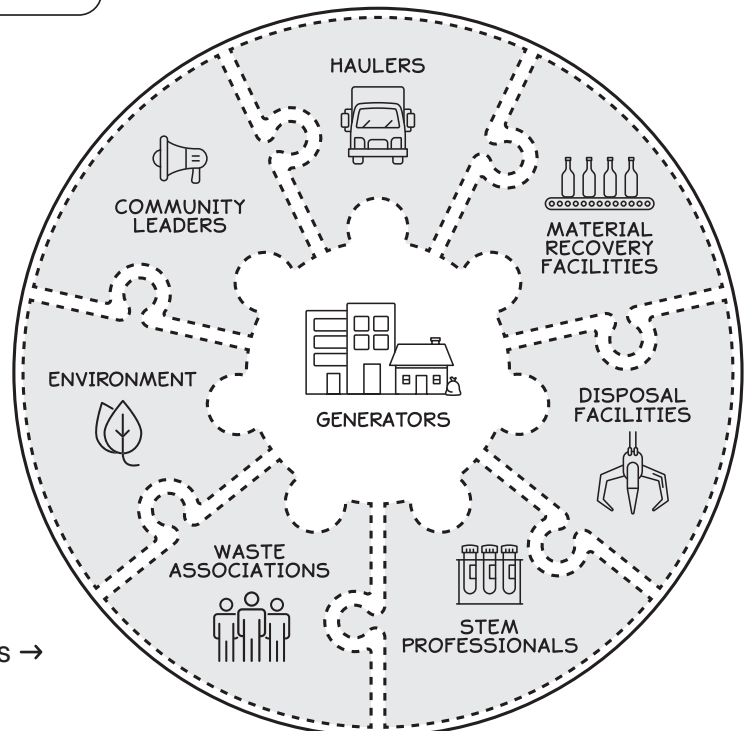
Alternative/Additional Activity –

Modeling the Waste Ecosystem handout

Systems Thinking Extension

Arrange students physically into a waste ecosystem model.

- Suggested sequence/Waste Stream:
Waste Generator → Hauler → MRF/Recyclers → Disposal Facilities
- Place STEM Professionals, Waste Associations, and the Environment around the system to demonstrate connections.
- (Optional) Use yarn or string to show relationships.



DISCUSSION QUESTIONS

Grades 3–5:

- Where do you fit in the ecosystem?
- What would happen if one stakeholder disappeared?

Grades 6–8:

- How do stakeholders depend on one another?
- How do the choices of waste generators affect others?

Grades 9–12:

- Which stakeholders have the greatest influence on sustainability outcomes?
- Why is collaboration important?

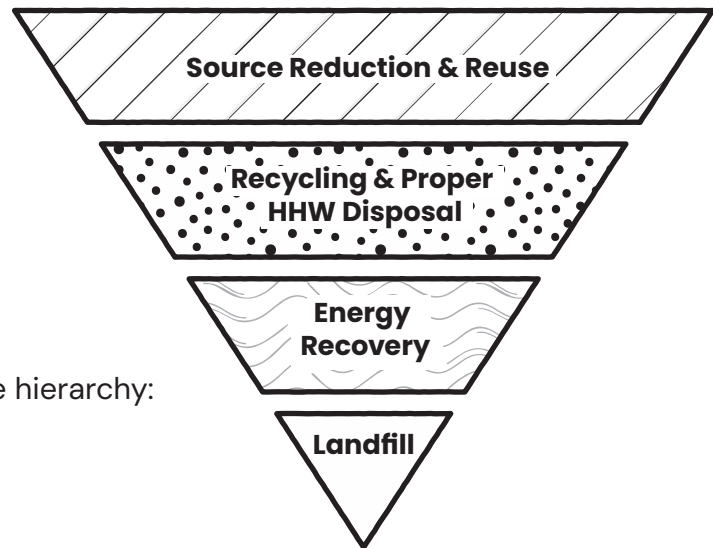
EXPLAIN: WASTE MANAGEMENT HIERARCHY

Key Takeaway: The most sustainable waste is waste that never enters the waste stream.

Review:

- Source Reduction & Reuse
- Recycling & Composting
- Energy Recovery & Volume Reduction
- Landfill

Discuss why actions at the top of the hierarchy are preferred.



PRACTICE SCENARIOS

Ask students to place actions within the hierarchy:

- Use a reusable water bottle
- Donate clothing
- Compost food scraps
- Recycle an aluminium can
- Throw something away

EXPLORE PART 2: WHAT INFLUENCES THE WASTE STREAM?

Ask: "What actions affect what enters the waste stream?"

Record student responses.

Possible Answers:

- Recycling
- Reusing materials
- Composting
- Littering
- Purchasing choices
- Community cleanups

Alternative/Additional Activity – Making Smart Choices: Waste Hierarchy Challenge handout

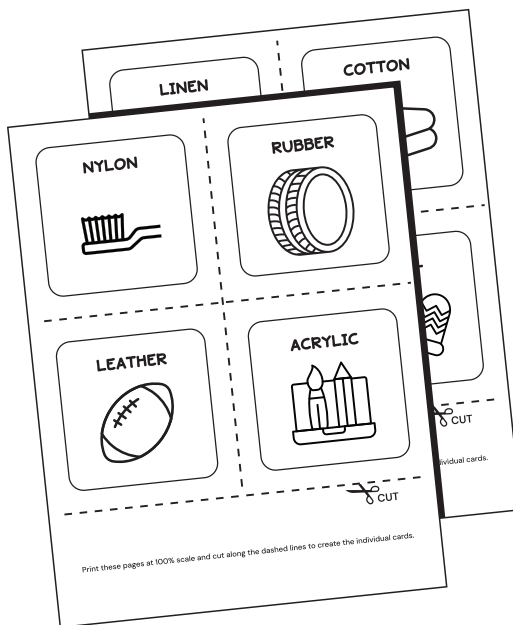
EXPLORE PART 3: LITTER TIMELINE INVESTIGATION

Key Takeaway: Some materials remain in the environment longer than people expect.

Distribute decomposition timeline cards.

Examples:

- | | |
|-------------------|------------------|
| ▪ Cotton | ▪ Paper Towels |
| ▪ Rubber | ▪ Apple Core |
| ▪ Nylon | ▪ Batteries |
| ▪ Wool | ▪ Waxed Carton |
| ▪ Polyester | ▪ Chip Bag |
| ▪ Linen | ▪ Aluminum Can |
| ▪ Leather | ▪ Banana Peel |
| ▪ Acrylic | ▪ Cardboard |
| ▪ Plastic Bags | ▪ Glass Bottle |
| ▪ Fishing Line | ▪ Newspaper |
| ▪ Plastic Bottles | ▪ Tin/Steel Cans |
| ▪ Styrofoam Cup | |



Students place the items on a timeline and justify their reasoning.

Reveal decomposition estimates.

DISCUSSION QUESTIONS:

- "Which items remain in the environment the longest?"
- "Why do some materials break down more slowly than others?"
- "Who or what might be affected while these materials remain in the environment?"

Possible Responses:

- Wildlife
- Streams
- Parks
- Communities
- Stormwater systems

ELABORATE: SUSTAINABILITY

Ask: What does sustainability mean?

Suggested Definition:

Sustainability means meeting today's needs while ensuring future generations can meet theirs.

Return to the class brainstorm list.

Identify actions that support sustainability and mark them with stars.

Community Programs to consider:



Lancaster County:

- Community Cleanups
- Composting Programs
- Recycling Resources
- Household Hazardous Waste Collection



Dauphin County:

- Community Cleanups
- Local Municipal Composting Programs
- Recycling Resources



Other Communities:

- What cleanup programs are available?
- What composting options are available?
- What recycling resources are available?
- Where can household hazardous waste be taken?

Teacher Note: Have students research their county, municipality, waste hauler, school district, parks department, or watershed organization to identify local sustainability programs.

Discuss how these community programs support sustainability and help move waste management higher on the hierarchy.

ELABORATE: WHERE DOES LCSWMA FIT?

Key Takeaway: LCSWMA plays multiple roles within the waste-management system, but sustainable waste management depends on the choices of many stakeholders.

Ask: “Where does LCSWMA fit within the waste ecosystem and hierarchy?”

Possible Answers:

Waste Ecosystem Connections:

- Disposal Facilities
- Recycling Support
- Education and Outreach
- Community Programs

Waste Hierarchy Connections:

- Source Reduction (through education)
- Recycling & Composting Support
- Energy Recovery
- Landfill

EVALUATE

REFLECTION PROMPTS:

- Before today, what did you think happened to waste after it was thrown away?
- What do you understand now about the waste ecosystem and waste hierarchy?
- What is one action you can take to help manage waste more sustainably?

Alternative Assessment – Commitment Card:

- One thing I learned: _____
- One action I will take: _____

FINAL LESSON MESSAGE: What we throw away doesn’t disappear, and our choices help determine what happens next.



Lesson Notes

TIMELINE FORMAT EXAMPLE

< 1 Year
1-20 Years
21-50 Years
51-200 Years
200+ Years

ANSWER KEY

Material	Time to Decompose
Textiles	
Linen	2 weeks – 6 mos.
Cotton	1 – 5 mos. (Untreated) Up to 5 yrs. (Heavily Dyed)
Wool	1 – 5 yrs.
Polyester	20 – 200 yrs.
Nylon	30 – 40 yrs.
Acrylic	> 200 yrs.
Leather	25 – 40 yrs.
Rubber	50 – 80 yrs.
Plastics	
Plastic Bottle	450 – 1,000 yrs.
Foam Cup	50 yrs.
Fishing Line	600 yrs.
Others	
Waxed Carton	3 mos. – 5 yrs.
Banana Peel	2 – 8 weeks
Chip Bag	10 – 20 yrs.
Aluminum Can	80 – 200 yrs.
Glass Bottle	1,000,000 yrs.
Tin/Steel Can	50 yrs.
Apple Core	2 – 8 weeks
Paper Towels	2 – 6 weeks
Newspaper	2 – 6 weeks
Cardboard	2 mos.
Batteries	100 yrs.