

The Road to the Landfill



A student investigation of the path of waste.

The Road to the Landfill outlines a hands-on, “how does it work” investigation of the path of waste from classroom and home to the landfill and more. This plan helps students identify the method and cost of their own waste disposal and the associated environmental implications and protections. The intention is that with an understanding of the process of solid waste management, students will make educated choices on their own solid waste reduction in the future. This lesson has real-world applications in technology, math, careers, environment, and geography.



The Road to the Landfill



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Don’t Waste Montana

<http://DontWasteMontana.org>

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Teacher Resources



1. Introduction

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2. Tools to Coordinate your Lesson

- Field trip Information Form—share with your solid waste professionals to document details of your lesson and trips.
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- **My School Garbage — Teacher Version:** Calculate the amount of trash that leaves the school
- **My Home Garbage — Teacher Version:** Calculate the amount of trash that leaves home.
- **In My Garbage — Teacher Version:** An investigation of the materials found in students trash.
- **Field Trip Worksheet (2 pages) — Teacher Version:** Track trash information from home and school to recycler, waste transfer station and landfill.
- **Sample Map:** Students create a geographic map or a process map of the trash route .

Teacher Introduction



Background

“The Road to the Landfill” is designed to be a framework lesson to lead students and teachers through an investigation of their own solid waste stream with help from their solid waste professional. The investigation provides a “how does it work” hands-on, real world, investigation of the waste stream. Figure 1 shows the logical progression of a possible investigation, although each investigation may be slightly different. The intention of the lesson is for students to follow their natural curiosity to understand the waste stream and develop a logical reasoning for why reducing solid waste is important.

The lesson was developed under the “Don’t Waste Montana” program in Lewis and Clark County. The program served Broadwater,

Jefferson and Lewis and Clark counties. “Don’t Waste Montana” helps rural Montana communities manage solid waste disposal practices by providing tools needed to reduce the amount of solid waste delivered to transfer stations, which ultimately ends up in landfills. For more, visit <http://DontWasteMontana.org>.

Getting Started

“The Road to the Landfill” should be tailored to your own waste stream, your interest, and your resources.

1. Work with your solid waste professional to identify your waste stream, resources available to you, and involvement of your solid waste professional. (see “Find Your Solid Waste Professional” on the next page).
2. Determine how much time you plan to invest in your lesson. A minimum, yet effective plan is:
 - one partial day in the classroom to introduce the lesson and investigate the classroom and school waste stream using the worksheets. Invite your solid waste professional to visit, answer students questions, and introduce the field trip.
 - one evening of student home investigation using the worksheet
 - one day (or half day depending on distance) of field trip followed by a student discussion and application of the information students collected.

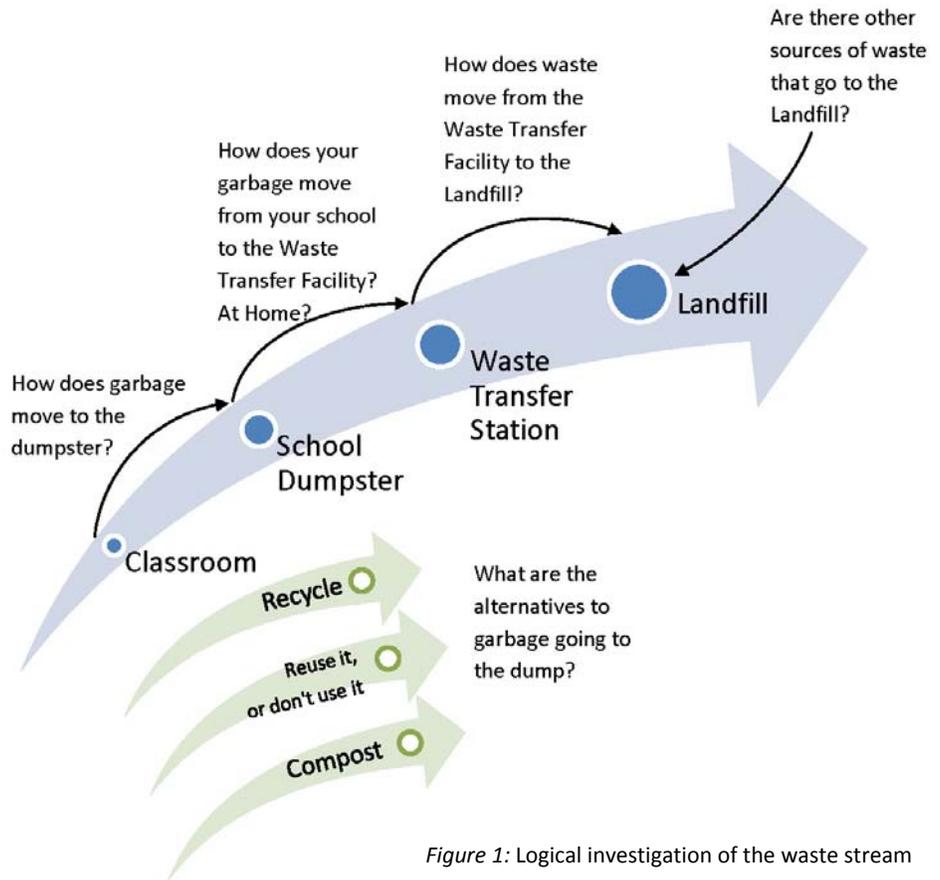


Figure 1: Logical investigation of the waste stream

Find Your Solid Waste Professional



Find Your Solid Waste Locations & Solid Waste Professional

Montana Department of Environmental Quality hosts an online mapping program marking the locations of solid waste facilities. Find your location, then use the mapping program to find the closest solid waste facilities. In Montana, typically there is one waste transfer site and one landfill to serve each county, but not in all cases.

Link: <http://goo.gl/maps/92ghJ>

Montana Department of Environmental Quality Recycling Division can also be a helpful resource of statewide recycling information and contacts:

Link: <http://deq.mt.gov/Recycle/default.mcp>

Don't Waste Montana hosts an online resource of recycling locations statewide.

Link: <http://DontWasteMontana.org>

There may be other solid waste or recycling resources available to you. Contact Don't Waste Montana, Montana Department of Environmental Quality, or your local solid waste personnel to identify other possible facilities.

Working With Your Solid Waste Professional

A Solid Waste Manager is typically a county employee who oversees operations at the landfill. The Solid Waste Manager oversees landfill employees, manages landfill operations, negotiates costs of services, and ensures environmental protections are in place. Each landfill is independent and may provide different services. Providing an opportunity for students and residents to view the landfill and understand their waste stream is part of the job. There are other solid waste professionals in your waste stream that may also be helpful, including garbage haul services or waste transfer site operators.

When contacting your solid waste professional:

1. Introduce yourself and where you are calling from.
2. Briefly describe the project and your intention of the project.
Ask questions about your solid waste stream [For your school, what is the path of waste and who is responsible for each (i.e. city? county? private corporation?)? Does this vary for the homes of students in your class? Where are the facilities located?]
3. Briefly describe what you would like assistance with and when.
4. Provide them with the field trip information page and complete the form together.

Your solid waste professional can provide valuable information to you and your students, but they are not a teacher and their ability to relate to your students will vary between professionals. Consider having leading questions ready for your professional to ask your students and for students to ask your professional. Consider discussing points of interest so that your professional knows in advance what topics are important. The more you guide this experience, the more both your students and your solid waste professional will gain from the experience.

Lesson Information



Level

This lesson is designed to meet a 4th grade level; however, its content can easily be utilized at any level.

Lesson Purpose

The purpose of “The Road to the Landfill” is to provide a “How does it work?” investigation of the waste stream used by the students. The information provided in this lesson creates a framework to guide the investigation, while each location may have a different waste stream to follow. The intention of the lesson is for students to follow their natural curiosity to establish an understanding and value of solid waste management to promote students choices to reduce solid waste in the future.

Format

Teachers and solid waste professionals work together to guide student’s investigation both in the classroom and on a fieldtrip. Student’s expand their investigation to their school and home. The format may be tailored to the interest and resources available; however, we recommend the following format:

Classroom: Students are introduced to basic concepts in the classroom and complete the classroom worksheet. Consider inviting your solid waste professional to visit the classroom. Students research their waste stream at the school. Students take the home worksheet to research their home waste stream.

Field Trip: Students follow the path of their waste stream from the school to the landfill (i.e. visit the waste transfer station, visit the landfill, visit the recycling center). Students should complete the remaining worksheets during the fieldtrip.

Discussion: At the end of the fieldtrip, discuss the results of the students investigation. Help students draw conclusions from their investigation using the discussion guides. The results of the discussion will vary between solid waste streams and student ability level.

Goals

At the end of this investigation students should:

- understand the solid waste stream used by their school and their home.
- understand in concept how each portion of the solid waste stream works; for example, waste transfer function, recycling center processes, basic structure of a landfill, or other portions of the solid waste stream.
- understand that fees are part of solid waste management and identify the costs and sources of payment.
- relate environmental protections to the solid waste stream; for example, water quality monitoring and protections at facilities.
- consider the effect solid waste management has on communities in the short and long term.
- rationalize the options available in solid waste management, including the costs and benefits of trash disposal, recycling, reusing materials, and not using materials.

Lesson Information

(continued)



Keywords

The following keywords may be utilized during this lesson; however, there may be additions or omissions depending on your particular waste stream:

landfill, waste transfer station, ton, recycle, solid waste,

Lesson Notes

Leading a Student Discussion



Discussion

Aiding students in processing the information they learned is a critical piece of the investigation. During the class work and field trip, students collected background information and data on their solid waste stream. The next step is to apply that information in a meaningful way. Consider holding your student discussion with your solid waste professional present, perhaps at the end of a fieldtrip, so that your solid waste professional can help answer questions. This investigation is designed to lead a group through an examination of their solid waste stream, therefore, results of each investigation will vary. However, there are some important points that can be part of a student conversation:

Economics:

While tons of trash, recycling systems, and how trash is moved is often new to students, none of them may be more interesting than how much it costs. Students easily latch on to the importance of money at most any age. The cost of solid waste disposal and recycling can be staggering. Students can attempt to quantify the cost of solid waste disposal by calculating:

- Cost per mile to move trash—calculate based on the miles traveled from the school
- Cost per ton to dispose of trash—calculate based on the tons per year generated by school and home.
- Cost to recycle, such as product transfer of recycled goods.
- Cost to maintain facilities, equipment and employees.

Environment:

Students may have shown interest in the environmental implications of solid waste disposal. Consider discussing the following:

- What protections are in place at the facilities you visited to protect the environment?
- How do solid waste professionals know that the environment is safe?
- What parts of the environment could be at risk? (Groundwater? Stream water? Air? Birds and other wildlife?)
- What are the impacts to the environment long from now? (for example, what will happen when the landfill is filled? After it is filled, what will happen to the trash inside? How long will the environment be safe? What could disrupt the safety to the environment?)

Community:

What impacts do solid waste disposal operations have on a community? For example, what is nearby the landfill? Near the other sites visited? Would students want to live near the landfill? Near the other sites visited? Why or why not? Should we consider this when we consider our trash disposal?

Reducing Solid Waste:

Now that students have been exposed to the whole waste stream, ask students their impression of where our solid waste should go and how much solid waste we should produce. Ask students if their impression of the facilities visited changed the way students want to dispose of their waste. If so, how? What will they do to reduce solid waste to the landfill?

Additional Resources



Additional Resources

The following list provides references to additional resources:

Reduce Reuse Recycle

[Environmental Activities for Kids](#)

[Great Ways to Protect the Environment](#)

[Recycling Program Educator Career](#)

[Earth-Friendly Activities for Kids](#)

[Don't Throw That Out!](#)

<http://twistedifter.com/2012/06/creative-ways-to-repurpose-reuse-and-upcycle-old-things/>

<http://pinterest.com/candacefox/upcycle-and-re-purposing/>

Composting

[Reduce, Reuse, Recycle: Composting](#)

[Compost: What is It?](#)

[Composting Bins](#)

[Monitoring Compost Moisture](#)

[The Compost Pile](#)

[Composting Tips and Information](#)

[School Composting Resources](#)

[Kids Composting Toolkit \(PDF\)](#)

[The Compost Connection \(PDF\)](#)

[Kids' Recipes for Composting \(PDF\)](#)

[How to Compost with Scraps and Refuse](#)

[The Adventures of Herman the Worm](#)

[Composting with Willie the Worm](#)

[Building a Worm Farm](#)

[Worm Composting for Kids](#)

[Aerobic Decomposition](#)

[Responsible Use of Resources](#)

[Backyard Biology](#)

Road to the Landfill

Classroom AND Landfill Field Trip Information Form

CLASSROOM VISIT

Date and time of classroom visit: _____

School : _____

School address: _____

Teacher's name: _____

Phone: _____ Ext. _____ Email: _____

How many students: _____ Grade level: _____

FIELD TRIP

Date and time of field trip: _____ Inclement weather date: _____

Name of landfill: _____

Solid Waste Manager: _____

Phone: _____ Ext. _____ Email: _____

Landfill personnel who will be conducting field trip tour

(if other than Solid Waste Manager): _____

Phone: _____ Ext. _____ Email: _____

Designated meeting place at landfill: _____

Estimated length of landfill visit: _____

What students can expect to learn during the classroom visit:

Additional instructions and/or rules to follow at the landfill:

My School Garbage

Do the math...

How much trash does your school generate?

Teacher Version



How much trash from your classroom? *(The answers to questions 1-4 could be a volume, weight, or both)*

1. What is the capacity of the trash can in your classroom?

Consider looking at the bottom of the can for a stamp of volume or have students measure volume.

2. How full is it at the end of the school day?

i.e. Completely full? Half full? Quarter full?

3. How much trash is generated in your classroom each week? (This is the amount of trash in one day added up 5 times, one for each day)

Weight would be best as it applies to the estimate of tons produced by the school. [Pounds of trash per week = pounds per day x 5 school days per week]

4. How much trash is generated in your classroom each year? (This is the amount of trash in one week added for each week of school)

[Pounds of trash per year = pounds per week x 40 weeks of school]

How much trash from your school?

Interview your school custodian for help answering question 5. The garbage hauling company that empties your school dumpster might be able to help too.

5. What is the weight of the trash that your school produces each week? (For example, if your dumpster is emptied once per week, then this could be the size of your dumpster)

Pounds can be estimated. Students could also investigate the volume of the dumpster and compare it to the classroom can volume.

6. What is the weight of the trash your school produces each year? (This is the amount your school produces in a week added for each week of school).

[Pounds of trash per year = pounds per week x 40 weeks of school]

Tons of Trash

Landfills measure trash by tons, which is a weight. In order to compare the trash created by your school with the trash sent to the landfill, we need to know how many tons your school produces each year. There are 2,000 pounds in 1 ton. Ask for help to estimate how many tons of trash leave your school each year. You will use this number on your field trip.

7. Number of tons of trash my school produces each year = [Tons of trash per year = Pounds of trash per year ÷ 2000 pounds]

My Home Garbage

Do the math...

How much trash does your home generate?

Teacher Version



How much trash does your home produce?

1. Describe how much trash is created by your home each week.

Do you use a garbage can? Do you live in a place like an apartment where many people put their trash into one dumpster? In either case, describe how much trash your home produces each week. For example, "We fill one garbage can each week. The garbage can holds 30 gallons, so we produce 30 gallons each week" - or "We fill one garbage bag twice a week and take it to the dumpster. Each bag holds 10 gallons, so we create 20 gallons of trash each week."

This can be described any way it makes sense to the student. Encourage students to use weight since it compares to the school, but not all students will be able to weigh their garbage.

2. How much trash is generated by your home each year? This is the amount of trash your home produces each week added together 52 times since there are 52 weeks in one year.

[Pounds of trash per year = pounds of trash per week x 52 weeks in a year]

Tons of Trash

Can you weigh your trash to measure the number of pounds of trash your home produces in a week? Landfills measure trash by tons, which is a weight. In order to compare the trash created by your home with the trash sent to the landfill, we need to know how many tons your home produces each year. There are 2,000 pounds in 1 ton. Ask for help to estimate how many tons of trash leave your home each year. You will use this number on your field trip.

3. Number of tons of trash my home produces each year = *[Tons of trash per year = Pounds of trash per year ÷ 2000]*

How is your trash moved?

4. Where does the trash go after it leaves your house?

This will be different for each student, for example Waste Transfer Station, then Landfill. Encourage students to identify where each site is.

5. How much does it cost your family for trash service each year? How is it paid and to whom?

Have students ask their family for the cost and how it is paid.

In My Garbage

What is in your trash?

Teacher Version



Your School Garbage

Look in your classroom garbage can and examine the trash.

1. What materials do you see? (Plastic? Paper? Cardboard?)

For example, paper and plastic.

2. Could any of this material be used another way? For example, could the material be recycled or reused? How?

For example, the paper and plastic could be recycled.

Your Home Garbage

Look in your home garbage and examine the trash.

3. What materials do you see? (Plastic? Paper? Cardboard?)

For example, plastic, cardboard, food waste, used diapers.

4. Could any of this material be used another way? For example, could the material be recycled or reused? How?

For example, the plastic and cardboard could be recycled. The food waste could be composted. I don't think that we can do anything else with the dirty diapers, but we could use reusable diapers instead of disposable diapers.

The Road to the Landfill

School

Home

Name:

Teacher Version



List the path of trash at your school:

1. Classroom garbage can
2. School Dumpster
3. Garbage Truck
4. xxxxxx City Waste Transfer Station
5. xxxxxx County Landfill

How many tons of garbage leave your school each year (from your "My School Garbage" worksheet)?

tons per year

Who pays for garbage to be hauled?

i.e. The school district. Information could come from principal.

How much does it cost?

i.e. \$ per year

Does your school recycle? Circle one

YES NO

Does your school do anything else with its waste (for example, does your school compost lunch room waste?) Circle one

YES NO

List the path of trash at your home:

1. Kitchen garbage can
2. Garage garbage can
3. Dad moves can to the transfer station.
4. xxxxxx City Waste Transfer Station
5. xxxxxx County Landfill

How many tons of trash leave your home each year (from your "My Home Garbage" worksheet)?

tons per year

Who pays for garbage to be hauled?

My parents in their taxes or in their rent.

How much does it cost?

\$ per year

Does your home recycle? Circle one

YES NO

Does your home do anything else with its waste (for example, does your home compost food waste?) Circle one

YES NO

Recycler

Waste Transfer Site

Landfill

Name of Facility: _____

Location: _____

How many miles is it from your ...

School? _____ Home? _____

What year did it open? _____

What materials are recycled here?

How much recycling goes through each week? (Based on that number, figure out how many tons of recycling for each year. This is the amount per week added 52 times):

[tons per year = tons per day x 52 weeks in a year] _____

How many people work here? _____

Who owns it? _____

Who uses it? _____

Do people get paid for bringing in their recycling? How much?

How much land does this facility cover?

Name of Facility: _____

Location: _____

How many miles is it from your ...

School? _____ Home? _____

What year did it open? _____

What is it used for?

How many tons of trash goes through each week? (Based on that number, figure out how many tons of trash for each year. This is the amount per week added 52 times):

[tons per year = tons per day x 52 weeks in a year] _____

How many people work here? _____

Who owns it? _____

Who can use it? _____

Is there a fee to use it? How much is it?

How much land does this facility cover?

Name of Facility: _____

Location: _____

How many miles is it from your ...

School? _____ Home? _____

What year did it open? _____

What can be dumped here?

How many tons of trash is dumped here each week? (Based on that number, figure out how many tons of trash for each year. This is the amount per week added 52 times):

[tons per year = tons per day x 52 weeks in a year] _____

How many people work here? _____

Who owns it? _____

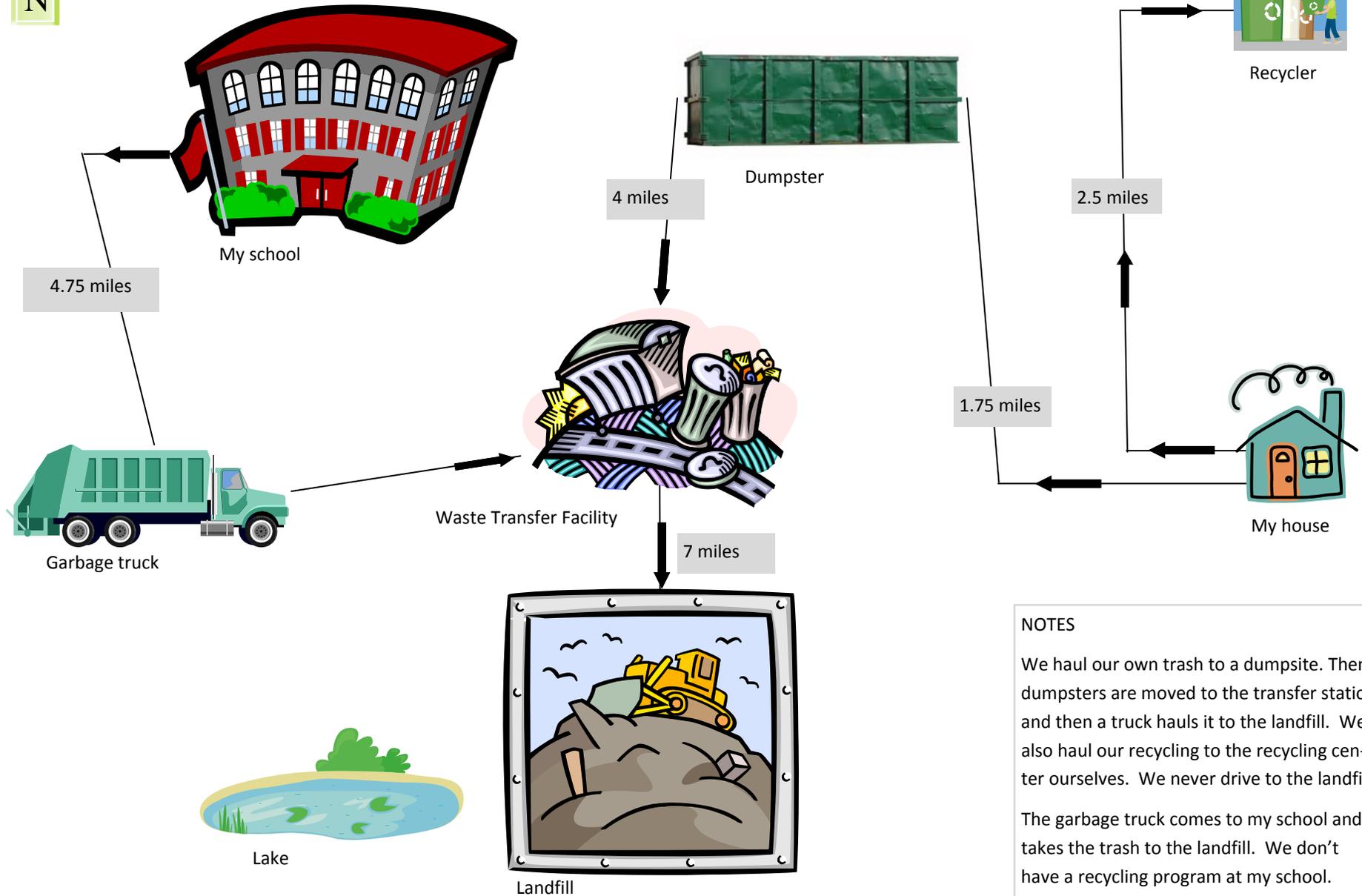
Who can use it? _____

Is there a fee to use it? How much is it?

How much land does this facility cover?



My Road to the Landfill - Sample Student Map



NOTES

We haul our own trash to a dumpsite. Then dumpsters are moved to the transfer station and then a truck hauls it to the landfill. We also haul our recycling to the recycling center ourselves. We never drive to the landfill.

The garbage truck comes to my school and takes the trash to the landfill. We don't have a recycling program at my school.

Student Worksheets



1. **My School Garbage:** Calculate the amount of trash that leaves the school.
2. **My Home Garbage:** Calculate the amount of trash that leaves home.
3. **In My Garbage:** An investigation of the materials found in students trash.
4. **Field Trip Worksheet (2 pages):** Track trash information from home and school to recycler, waste transfer station and landfill.
5. **Map:** Students can create a geographic map or process map of the route of their trash.

The Road to the Landfill



Investigating the Path of Your Trash



My School Garbage

Do the math...

How much trash does your school generate?



How much trash from your classroom? *(The answers to questions 1-4 could be a volume, weight, or both)*

1. What is the capacity of the trash can in your classroom?
2. How full is it at the end of the school day?
3. How much trash is generated in your classroom each week? (This is the amount of trash in one day added up 5 times, one for each day)
4. How much trash is generated in your classroom each year? (This is the amount of trash in one week added for each week of school)

How much trash from your school?

Interview your school custodian for help answering question 5. The garbage hauling company that empties your school dumpster might be able to help too.

5. What is the weight of the trash that your school produces each week? (For example, if your dumpster is emptied once per week, then this could be the size of your dumpster)
6. What is the weight of the trash your school produces each year? (This is the amount your school produces in a week added for each week of school).

Tons of Trash

Landfills measure trash by tons, which is a weight. In order to compare the trash created by your school with the trash sent to the landfill, we need to know how many tons your school produces each year. There are 2,000 pounds in 1 ton. Ask for help to estimate how many tons of trash leave your school each year. You will use this number on your field trip.

7. Number of tons of trash my school produces each year = _____

My Home Garbage

Do the math...

How much trash does your home generate?



How much trash does your home produce?

1. Describe how much trash is created by your home each week.

Do you use a garbage can? Do you live in a place like an apartment where many people put their trash into one dumpster? In either case, describe how much trash your home produces each week. For example, "We fill one garbage can each week. The garbage can holds 30 gallons, so we produce 30 gallons each week" - or "We fill one garbage bag twice a week and take it to the dumpster. Each bag holds 10 gallons, so we create 20 gallons of trash each week."

2. How much trash is generated by your home each year? This is the amount of trash your home produces each week added together 52 times since there are 52 weeks in one year.

Tons of Trash

Can you weigh your trash to measure the number of pounds of trash your home produces in a week? Landfills measure trash by tons, which is a weight. In order to compare the trash created by your home with the trash sent to the landfill, we need to know how many tons your home produces each year. There are 2,000 pounds in 1 ton. Ask for help to estimate how many tons of trash that leaves your home each year. You will use this number on your field trip.

3. Number of tons of trash my home produces each year = _____

How is your trash moved?

4. Where does the trash go after it leaves your home?
5. How much does it cost your family for trash service each year? How is it paid and to whom?

In My Garbage

What is in your trash?



Your School Garbage

Look in your classroom garbage can and examine the trash.

1. What materials do you see? (Plastic? Paper? Cardboard?)
2. Could any of this material be used another way. For example, could the material be recycled or reused? How?

Your Home Garbage

Look in your home garbage and examine the trash.

3. What materials do you see? (Plastic? Paper? Cardboard?)
4. Could any of this material be used another way? For example, could the material be recycled or reused? How?

The Road to the Landfill

School

Home

Name:



List the path of trash at your school:

1. Classroom garbage can
- 2.
- 3.
- 4.
- 5.

How many tons of garbage leave your school each year (from your "My School Garbage" worksheet)?

Who pays for garbage to be hauled?

How much does it cost?

Does your school recycle?

YES NO

Does your school do anything else with its waste (for example, does your school compost lunch room waste?)

YES NO

List the path of trash at your home:

1. Kitchen garbage can
- 2.
- 3.
- 4.
- 5.

How many tons of trash leave your home each year (from your "My Home Garbage" worksheet)?

Who pays for garbage to be hauled?

How much does it cost?

Does your home recycle?

YES NO

Does your home do anything else with its waste (for example, does your home compost food waste?)

YES NO

Recycler

Name of Facility: _____

Location: _____

How many miles is it from your ...

School? _____ Home? _____

What year did it open? _____

What materials are recycled here?

How much recycling goes through each week? (Based on that number, figure out how many tons of recycling for each year. This is the amount per week added 52 times):

How many people work here? _____

Who owns it? _____

Who uses it? _____

Do people get paid for bringing in their recycling? How much?

How much land does this facility cover?

Waste Transfer Site

Name of Facility: _____

Location: _____

How many miles is it from your ...

School? _____ Home? _____

What year did it open? _____

What is it used for?

How many tons of trash goes through each week? (Based on that number, figure out how many tons of trash for each year. This is the amount per week added 52 times):

How many people work here? _____

Who owns it? _____

Who can use it? _____

Is there a fee to use it? How much is it?

How much land does this facility cover?

Landfill

Name of Facility: _____

Location: _____

How many miles is it from your ...

School? _____ Home? _____

What year did it open? _____

What can be dumped here?

How many tons of trash is dumped here each week? (Based on that number, figure out how many tons of trash for each year. This is the amount per week added 52 times):

How many people work here? _____

Who owns it? _____

Who can use it? _____

Is there a fee to use it? How much is it?

How much land does this facility cover?

Map your Road to the Landfill. Include your home, school, the waste transfer station, the recycler, the landfill, and natural features, such as lakes, parks or wetlands.



My Road to the Landfill

NOTES: