CHAPTER 2: What Is Litter?
**TRASHY TOXINS**

**OBJECTIVE:** To learn that certain types of materials release toxins that contaminate our waters and soils when disposed of improperly or dumped as “litter.”

Students will:
- Simulate the improper discarding of chemicals and heavy metals;
- Map/analyze the impact of chemical and metal pollutants;
- Collaborate to process information;
- Make decisions about personal actions concerning proper solid waste disposal and litter prevention.

**Materials**

**Pre-Lab:**
*It is suggested that the tasks below be completed ahead of time.*
- Construct or have students build a “spreader” for each group. Cut the bottom off of a small box. Punch four holes at the top of each side. Insert at least 100 cm of string per side and knot on the inside of the box. Tie the four sides of strings together and securely attach it to at least 15 meters of string with a rubber band or duct tape. Put a 1/2-inch screen on the bottom of the box, securing the box with brass paper brads or with duct tape.

*More Information: “Midnight Dumpers” by Air & Waste Management’s Environmental Resource Guide: Nonpoint Source Pollution Prevention for Grades 6-8 page 39 (Hydrologic Cycle) and page 40 (How To Make And Operate A Slinger (Spreader)).*

- Prepare three sets of colored popcorn using non-toxic food coloring. Each color of popcorn will represent a toxin that is liberated by a material when it is left in the environment.
  - Blue = heavy metals [http://www.dnr.sa.gov.au/epa/pdfs/water_general.pdf](http://www.dnr.sa.gov.au/epa/pdfs/water_general.pdf) (Note: this article is from an Australian government source. This is a worldwide problem.)

  Set A: 200 pieces of red; 300 pieces of blue; 100 pieces of yellow
  Set B: 300 pieces of red; 100 pieces of blue; 200 pieces of yellow
  Set C: 100 pieces of red; 200 pieces of blue; 300 pieces of yellow

- Mix all the colors together in a garbage bag and load into the spreader.

- Mark off three 10-meter by 10-meter grids with string or field-lining chalk on your campus and mark them as Area A, Area B, and Area C. (If you have a large class, you may want to consider having multiple study sites.) Select sites that have geographic features such as ridges, storm drains, curbs, shrubs and tree vegetation, as well as grassy lawns, and maybe even the parking lot. If each study site is different, each group will have different results to report, creating greater learning and more like real life.

- Before students begin the investigation, use the “spreader” to distribute the three sets of toxins over the three corresponding 10 x 10 grids.
Outside:
• Journals.
• Pencil (also colored pencils will work).
• Three 10 x 10 grids.

**QUESTION TO CONSIDER:** How can we measure and interpret the impact of toxins from certain litter sources?

**Procedure:**

1. **Before Beginning Lab**
   - Discuss with students:
     • What they think/know about discarded materials or chemicals found in various materials. Have students complete a KWHL (know, want, how, learn)

<table>
<thead>
<tr>
<th>What do I know?</th>
<th>What do I want to know?</th>
<th>How can I find out what I want to know?</th>
<th>What did I learn?</th>
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Set the stage for this lesson with a scenario like, “It’s midnight. A man drives a company van up to a country farm. The driver gets out. From the beam of the headlights, he can be seen dumping leftover chemicals in the field and nearby creek.” Or, “It’s 12 noon. Mr. Neighborly walks out to the sidewalk and street curb to pour his household hazardous waste down the storm drain so it can be treated at the city’s sewer treatment plant.” What’s wrong with this picture? Let’s find out!

• Do materials that become litter contain pollutants? How would we know?
• What are some examples of materials that may contain pollutants?
• How do we determine the “source” of pollutants?
• How can we measure pollutants in an environment?
• Describe how the pollutants will be distributed and then have student groups design a data collection system. Students will record data in their journals. Try to use three 10 x 10 study site grids.

2. **Outside**
   - Students can do the spreading, or the teacher can do this ahead of time.
     • Caution students to stay out of the swing path of the “spreader.”
     • Have students practice without the “spreader” being loaded.
     • Hold a piece of heavy paper or cardboard under the wire to load with assorted colors of popcorn.
     • “Spread” the chemical pollutants over the study site.
     • Have students sketch the study site onto the 10 x 10 grid. Be sure to indicate any hills, water, erosional features, stormwater drains, etc.

3. **Student groups will methodically go through the grid, collecting data from the colored popcorn.**
   The popcorn can be picked up and bagged by color for later counting. In addition, students will be practicing litter management.
In Classroom

Analyze Impact of Chemicals:
4. Have students analyze and generate new understandings about toxins found in trash.
   • Make a graph showing the distribution of reds, blues and yellows.
   • Record the location of the “toxins” on the 10 x 10 study site grid.
   • Research the type of litter each color represented. See Web sites in Pre-Lab and other sections. Do they all agree?
   • Have each group analyze the impact of the dispersal of the chemicals/litter they have identified. How could these toxins be spread or dispersed over a broader area? (Initially dumped, eaten by animals and biomagnified through food chains, percolated into soils and groundwater by rainwater or stormwater washed off the land into surface waters by rainwater or stormwater, etc.).
   • Infer how each type of litter could cause harm to the environment — on surface water, groundwater, soils, plants, wildlife, and people.
   • Have students complete the KWHL in journals.

Conclusions
5. Facilitate a discussion.
   • What is the “take-away message” from this investigation? Toxic pollutants can enter the environment through illegal dumping or improper disposal by anyone! Toxic chemicals and heavy metals can be further dispersed from where they are dumped or disposed of, impacting surface water, groundwater, soils, plants, wildlife, and people. Environmental contamination is an environmental hazard, a public health threat and expensive to clean up. Prevention is key!
   • Discuss the concept of visible and invisible litter. In addition to the visible litter we see in or near waterways during a Big Sweep cleanup, there also could be invisible litter (chemicals) that is carried by rainwater or sometimes directly from factory pipes into our waterways and groundwater.
   • Evaluate how this models what we see in the real world. What is similar? Different?
   • What could be done differently to improve the situation?

Evaluation
6. Have students choose a project to demonstrate their learning.
   • Design a plan to educate the public on the hazards of littering.
   • Design an awareness campaign (for radio, TV or newspapers) that focuses on proper disposal of chemicals and household hazardous waste and why it’s important (focusing on the “right” thing to do, rather than the “wrong” thing that is being done).
   • Develop a musical jingle that increases the public’s awareness of toxic litter and its negative effects, while encouraging people to prevent litter in the first place.
   • Become familiar with Rachel Carson, one of the first people to recognize the environmental health effects of chemicals. Read her book *Silent Spring*, published in 1962. Carson was born 100 years ago (May 27, 1907). What do you think she would say about toxic litter if she were still alive? Write a speech that she might give to your class that would reflect her thoughts. Give the speech to your class as if you were Carson.
   • Research designer materials, biodegradable plastics, photodegradable materials and other innovative materials that contain less toxic ingredients. Prepare a brochure to educate the consumer about packaging.
   • Design a poster to educate your peers on careers in solid waste management.
Research and Discuss

• How are the landfills in my town constructed and monitored for leaching of pollutants? See: http://www.kab.org/kids/defaultx.htm
• What can you do to reduce/prevent chemicals/litter pollution?
• What can the class do to reduce/prevent chemicals/litter pollution?
• What can the school do to reduce chemicals/litter pollution?
• What can the community do to reduce/prevent chemicals/litter pollution?
• What can a city/town do to reduce/prevent chemicals/litter pollution?
• What can the nation do to reduce/prevent chemicals/litter pollution?
Possible answers may include: participating in Big Sweep and volunteering time and energy to keep your watershed litter free. You also can educate your family, friends and community on what they can do to recycle or properly dispose of household chemicals, preventing litter in the first place.

Other Connections

• Research real spills and impacts on the environment. Who would have this information in your county? In your state? Who cleans up these spills?
• Compile data on real examples of groundwater pollutants. Find examples of local university research focusing on ways to remediate contaminated groundwater.
• What are Superfund sites? How many are in your town?
• How many people in your community rely on well water for their drinking water? How could polluted groundwater affect well water?
• Find out how landfills are constructed to minimize the leaching of pollutants from decomposing trash. How are they monitored? How often?

http://www.purdue.edu/dp/envirosoft/housewaste/house/prodmenu.htm
http://www.skidmore.edu/academics/IPC/cec/recycling/index.htm
Also see article on heavy metals from electronics:
**Wildlife and Litter Trash Endings**

**OBJECTIVE:** To learn that certain types of materials release toxins that contaminate our waters and soils when disposed of improperly or dumped as “litter.”

**QUESTIONS TO CONSIDER:**
- How is litter harmful to wildlife?
- How does long-lasting litter create a hazard to wildlife?

<table>
<thead>
<tr>
<th>What do I know?</th>
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<th>How can I find out what I want to know?</th>
<th>What did I learn?</th>
</tr>
</thead>
</table>

1. Have students set up a KWHL chart, like the one shown above, in their journals.

2. To activate students’ prior knowledge and to create an interest in the materials of litter, make a transparency of the overhead entitled, “How Long Are You Staying?” (See page 23.) As a class, predict the time it will take for each type of trash to decompose. Ask questions to tease out the evidence students are using to make their decisions.

3. Show the transparency “Wildlife and Litter” (See page 24.) Ask students to think about why we should be concerned about how long certain types of litter materials remain in the environment. How can a plastic bag floating in water be a hazard to an animal? Litter can harm or kill wildlife by ingestion or entanglement. Ask about other types of litter on the list, “How long are you staying?”

4. Ask students to design an experiment that will reveal how long it will take for certain types of trash to begin to show signs of decomposition. Designs must include:
   - Purpose statement
   - Background information: Think about all of the variables (presence of microbes — and will they “eat” trash? — water/moisture, air/O₂, volume, light, etc.) that will influence whether or not something will break down over time. Choose one variable below to test, trying to keep others constant. Don't forget to set up a control!
     - Hypothesis;
     - Materials and procedures;
     - Data;
     - Analysis; and
     - Conclusion
   Remember to keep questions focused and testable.

http://www.ciwmb.ca.gov/schools/Curriculum/CTL/K3Module/Unit4/Lesson2.pdf

Introduce students to ITW Hi-Cone, a local North Carolina manufacturer that makes plastic six-pack rings for beverages. To reduce six-pack rings’ life cycle in the environment, the company engineered them to be photodegradable.


To prevent wildlife entanglement, the Zebulon plant encourages schools to be “ring leaders” in collecting six-pack rings so they can be remade into new six-pack rings at its California plant that employs disabled people. http://www.ringleader.com/quest/menu/resources/closed_loop_recycle.html

Results: http://www.ringleader.com/quest/menu/resources/6-pack_ring.html
<table>
<thead>
<tr>
<th>Litter</th>
<th>Predicted Decomposition Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car tire</td>
<td></td>
</tr>
<tr>
<td>Glass bottle</td>
<td></td>
</tr>
<tr>
<td>Plastic six-pack ring</td>
<td></td>
</tr>
<tr>
<td>Glass jar</td>
<td></td>
</tr>
<tr>
<td>Polystyrene foam cup</td>
<td></td>
</tr>
<tr>
<td>Paper plate</td>
<td></td>
</tr>
<tr>
<td>Plastic bag</td>
<td></td>
</tr>
<tr>
<td>Aluminum soda can</td>
<td></td>
</tr>
<tr>
<td>Waxed cardboard milk carton</td>
<td></td>
</tr>
<tr>
<td>Newspaper</td>
<td></td>
</tr>
<tr>
<td>Plastic grocery bag</td>
<td></td>
</tr>
<tr>
<td>Banana peel</td>
<td></td>
</tr>
<tr>
<td>Cigarette butts</td>
<td></td>
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</tbody>
</table>
WILDLIFE AND LITTER TRANSPARENCY

Turtle bound in fishing line

Bird entangled in net lines

Manatee entangled
ESSENTIAL QUESTION: How does litter impact the quality of water and wildlife in a river basin over time?

SUPPORTING QUESTIONS:
1. What is the current picture of litter in my river basin (amount, location, type, harmfulness, etc.)? How are Big Sweep volunteers helping to reduce or prevent littering?
2. Compare N.C. Big Sweep statistics in various counties within my river basin. What are the similarities? Differences? Why? How do they compare over time? Is there more litter and fewer volunteers or less litter and more volunteers? What would each of these results indicate? Are things getting better or worse?
3. How might population growth in my river basin impact the litter issue? How might my town’s policies/laws impact the litter issue? How might a weak/strong education and public outreach program impact the litter issue? How might littering in my river basin impact population growth? Are there economic development consequences to a littered community?

Resources:
Viewfinders Too curriculum from the Dunn Foundation.

Keep America Beautiful research on litter causes and results.

# Teacher's Choice

<table>
<thead>
<tr>
<th>Required Activities/Competencies</th>
<th>Product/Performance Required</th>
<th>Assessment – Required Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is litter and where is it commonly found?</td>
<td>1. Write notes in notebook.</td>
<td>1. Take notes.</td>
</tr>
<tr>
<td>2. What hazardous chemicals are found in products that are commonly littered?</td>
<td>2. Draw a map of river basin with Big Sweep area highlighted. Highlight areas that may be potential or known sources of litter. Based on a topography map, draw a line along the ridges of the watershed of the Big Sweep cleanup site.</td>
<td>2. Make a chart on chemicals.</td>
</tr>
<tr>
<td>3. Where does Big Sweep occur within your river basin? What is the surrounding area like? Are there roads, lakes, ponds, wetlands, beaches, lots of farming, golf course, industry, residential development?</td>
<td>3. Write a paragraph reflecting the human impact and litter in your river basin.</td>
<td>3. How are communities changing their policies or creating incentives for people to dispose of their trash properly? Compare “carrots” to “sticks.”</td>
</tr>
<tr>
<td>4. After examining the N.C. Big Sweep data for your river basin, hypothesize how human impact of litter is affecting or could impact the ecosystems along the streams and rivers of your river basin.</td>
<td>4. With a buddy, photograph an illegal dump in your community. Always keep safety first and don't forget to wear boots and rubber gloves. Write a paragraph about how a pile of debris might have gotten there. What could you do to prevent it?</td>
<td>4. Take exam.</td>
</tr>
<tr>
<td>5. Who litters? What are the primary reasons people litter?</td>
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</table>
BIG SWEEP 20 Fun Activities

Bodily/Kinesthetic
1. Make a board game with at least 20 facts about litter.
2. Write and illustrate a children's book suitable for elementary grades. Show the importance of keeping the state's waterways and roads free of litter. Volunteer to read the book to an elementary class or at the library for story hour. Write a play about the Wartville Wizard and act it out for an elementary school class. Go to: www.amazon.com/Wartville-Wizard-Don-Madden/dp/0689716672.
3. Organize a contest for slogans on trash receptacles used in schools, homes and around the community. Set up judging criteria so everyone knows what the rules are. Select a panel of students to serve as judges. Conduct the contest and select winners. Have prizes donated by community partners and businesses. Get approval from the school administrators and government officials before placing the slogans on trash receptacles.
4. Design a public service announcement (PSA) that could be aired on TV and promotes an idea, position or stand about litter. Write the script, tell how it should be staged and recruit others to help with props for the set. Make a PSA video to share with your class and your school community. Photograph litter in your community and make a slide show with music. Share it with your class. You also can organize an after-school litter cleanup around the school grounds.

Visual/Spatial
5. Using Big Sweep data, make a bar graph with the types and amounts of litter found for the past several years. Contact your county coordinator to find the location of your county cleanup and mark that linear distance on a map. Post your map in the school library with information about Big Sweep.
6. Using a map of your river basin as a base, plot all roads, industries, large developments, agricultural operations, open spaces, highways, wetlands and other environmental factors that contribute to litter or are protected from litter. Provide an analysis of your map. Find the Big Sweep site closest to your school. Using a topographical map, show the watershed that drains to the site.
7. Create a litter slogan to put on a T-shirt. Remember that litter starts and ends with individual actions/knowledge. Make sure to use YOU in the slogan.

Musical/Rhythmic
9. Write two poems or songs that express concern or awe about your river basin. Be prepared to share them with the class.

Verbal/Linguistic
10. Design a flyer that highlights important litter facts and issues, as well as actions that citizens can take to protect water and soil in your area. Use these facts in a speech.
11. Write a five-paragraph essay and take a stand on the following issue: Litter from a local fast food restaurant is found along a stretch of highway near your school. Should the fast food company, highway department or the city be fined? Should taxpayers or the litterer be fined? Is a fine a good idea? Will it fix the problem? Support your ideas with facts and projections. Openly debate these questions during an oral presentation.
12. Invent a "Superhero" whose mission is to change people's littering behavior. Design a comic book, short story or play about how your character would accomplish his or her mission. Go on the web to find some "real" Superheroes or Superheroines who have tried to change littering behavior. Visit the Web: http://msnbc.msn.com/id/8471450/
13. Create a brochure about "Earth Etiquette" for dealing with litter. Set up a radio call-in show on this topic.
14. Interview an older member of the community. Find out the changes that have occurred in the community. How have the changes affected the physical environment? Are these changes "litter friendly?" Have you had a similar conversation with your grandparents or other older relatives? Ask your relatives about their environmental ethics. How do other family members feel about littering?
15. Locate an article on litter education and provide a written response on litter issue. Use evidence from the article and your knowledge to support your thoughts.

Naturalist
16. Design a brochure to show how litter impacts wildlife. Contact your local wildlife preserve to find local stories. Write and illustrate a Big Sweep field guide for "litterbugs" and or Big Sweep "Volunteers." Provide physical and behavioral characteristics of litterbugs/volunteers like in a bird identification guide. Show how they have adapted to commit or prevent littering. Show litterbugs' territorial range, their current status and how they don't like to get caught. Design a "Have-A-Heart Trap of Litterbug." Look for descriptions of these in the Rob Cumow Web site under "Teacher Resources."
17. Create a collage that illustrates litter issues throughout your river basin. Include a brief summary of litter issues. Go online to: www.ncbigweep.org for specific information. For example, look at the "unusual finds" data. Create a dichotomous key that categorizes litter in different categories, including litter sources such as a fisherman or boater.
18. Write a story about a time when you littered or witnessed someone else littering. How would you respond now? Create a campfire program that introduces a "code of ethics" for those who spend time in the great outdoors.
19. Make paper out of recycled materials. Consider adding some dryer lint to the paper mixture to add texture and color. Plan for the paper to take longer to dry. For more information, go to the Wisconsin Paper Council Web site: www.wipapercouncil.org and click on "fun & learning."

Mathematical/Logical
20. Using Excel, generate a spreadsheet that will help you make a series of charts and graphs to help you visualize the following Big Sweep information found on the Web: www.ncbigweep.org.
   • In 2003, the United States produced 200,000,000 tons of garbage per day. Figure out a way to show how much this number is. Generalize the topic to use with a data set.
   • Design a product that will reduce litter and determine its impact.
   • Determine your ecological footprint.
   • Conduct a survey to determine how many times a week an identified study sample litters. Make a graph and share results.
   • Conduct a survey to determine the reasons an identified study sample litters. Organize your findings and present them in a class discussion.
   • Extrapolate the results from your survey. How does this show the importance of individual action and impact?
Student-Guided Activities

In a journal, choose two of the following activities and write a response to them. Make phrases consistent.

- Is litter a health problem?
- Are people who litter lazy?
- Are people careless when they litter?
- How can personal awareness and action reduce littering?
- How can businesses reduce litter?
- How can products be designed differently to reduce litter?
- Throwing something away is not getting rid of it. The second law of ecology is: “Everything must go somewhere. There is no away.”
- We live in a “throwaway” world. How can you get rid of a throwaway society and create one that cares?
- Give ten reasons to prevent littering in the first place.
- Why does N.C. Big Sweep rock?
- Why should I volunteer to pick up someone else’s litter?
- Write a letter to a litterbug.
- Write an essay: “You know you’re a Big Sweeper when”....
Chapter 3: Trash Statistics

Illustration by Matthew Uehling, Cubreth Middle School
Bin Missin’
Mapping Litter Patterns on Your Campus

OBJECTIVES:
• To collect data on the proximity of litter to trash bins.
• To investigate what percentage of litter is recyclable in your community.
• To determine litter “hot spots” and propose solutions for change.
• To develop an understanding of how to use data.

Materials:
- Map of campus
- Trash bags
- Meter tape
- Data log
- 10 x 10 grid
- Pencil
- Gloves
- Compass
- Trash grabbers

Procedure

Before collecting data:

1. Divide students into groups of three or four.

2. Take students on a campus walk to observe and mark trash bins, recycling bins and dumpsters on the campus map. Also pay attention to the areas where you see litter. Take note of the surroundings. Is it near a parking lot? Bus circle? An athletic field? You may wish to make a campus map for each group.

3. Back in the classroom, have each group compile notes, locations of trash bins, recycling bins and dumpsters. Have students shade in areas on the map where they noticed litter. Have students generate a hypothesis about the litter pattern. The hypothesis will be recorded in the journal or log book.

4. To save time, assign groups to various areas of the campus for the “Litter Patterns” exercise. Have each group go to their assigned area with the tape measure and 10 x 10 grid sheet and their data logs.

5. Mark the trash bin at the 0,0 coordinate. Determine the north using a compass. Then using the tape measure, determine the distance from the bin to the piece of trash. You may wish to draw a table in your log similar to the one below. Feel free to design your own data collection system.

<table>
<thead>
<tr>
<th>Bin Location</th>
<th>Type Of Litter</th>
<th>Distance From Bin</th>
<th>Recyclable (+ or -)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gym lobby</td>
<td>Aluminum</td>
<td>36 inches</td>
<td>+</td>
</tr>
</tbody>
</table>
This grid is a part of the MOSS program, “Mapping Our School Site.” You can find an excellent investigation for students at this site: http://www.ncsu.edu/sci-link/studysite/.

Grid for Recording Study Site Features

Grid:

- ● = trash bins
- □ = aluminum can

Sample Data Page

36 inches

(o.0)
Analyzing Data

Once each group has measured the litter distance from the bin, students will need to collect the litter in a trash bag. Have students count each piece of litter. Students will now determine the following:

a. Total pieces of litter collected;

b. Percentage of each type of litter by category (metal, glass, paper, plastic, food, other);

c. Percentage of recyclable materials to nonrecyclable materials (Keep in mind that some materials that are recyclable in another community may not be recyclable on your campus. Count only those items that you can recycle on your campus.);

d. Range of distance;

e. Average distance of litter from the bin; and

f. Litter pattern for your school campus

Be sure to note roadways, walkways, etc. This is a great opportunity for students to generate charts and graphs in Excel or a similar program. Compare your group's data with other groups. Discuss your findings.

Conclusion

Write a conclusion:

• Reflect on your hypothesis.

• Respond to the littering pattern. Why do people litter? There is research supporting three possible reasons. Which of these reasons do you think caused people to litter on your campus? (Go to: http://kab.org/aboutus.asp?id=34&rid=55.) Propose a solution based on data that will encourage responsible environmental behavior.

Introduce the concept of “social marketing” in which commercial marketing concepts and techniques are used to target specific audiences to achieve positive social change. Or in simpler words, develop an enticing reason for a person to change how someone acts by reframing the problem and offering a workable solution.

In a nutshell:

• It’s more than just making people “aware” of the problem. You want them to ACT to solve or prevent the problem.

• Stay POSITIVE by telling people what they can do, instead of what they are doing wrong. No one likes to be scolded!

• Give them CHOICES by offering three to five different actions that will make a difference. Turn the DON'TS into DO'S.

• Answer the question SO WHAT? Why should they care? Give them a GOOD REASON. What's in it for them (your audience)? Your “Understanding Littering Behaviors” survey (see page 40) will help you answer this important question! Below is a Web site that shows how a social marketing business, “Marketing 4 Change,” created a social marketing campaign for the Chesapeake Bay Program. Instead of saying “don't overfertilize because it causes nutrient overloading and leads to eutrophication,” the organization focused on the lifestyle of their residents and their love for seafood. They developed the slogan: “Save the crabs, then eat them!”
http://www.m4change.com/our_work/chesapeake_bay.htm

Encourage student creativity as in the evaluation projects outlined in “Trashy Toxins” on page 18.
This grid is a part of the MOSS program, “Mapping Our School Site.” You can find an excellent investigation for students at this site: http://www.ncsu.edu/sci-link/studysite/

Grid for Recording Study Site Features
OBJECTIVE: To examine your county and river basin data and compare your river basin data to another river basin.

Before you begin, contact your Big Sweep County Coordinator about the location of the Big Sweep cleanup. (To find your County Coordinator, go online to: www.ncbigsweep.org/coord.html.) Check to see if your county has more than one cleanup area. Compare cleanups along creeks or rivers separately from cleanups on lakeshores or ocean beaches. Once you have this information, contact the coordinators of the other counties in your river basin to find out the location of cleanup areas. Construct a data table with this information for students to use in the investigation.

Materials (per pair of students):
- Computer with Internet connection
- Big Sweep navigation page
- Map of N.C. river basins
- Big Sweep cleanup areas for your river basin, provided by teacher
- Journal/lab book
- Big Sweep data card — either a hard copy or Web version (see http://www.ncbigsweep.org/form.html)

Procedure
1. Ask students what they know about litter and litter patterns. Have students predict areas where they could expect litter to be a significant problem. Have students record predictions in the journal/lab book.
2. Log onto: www.ncbigsweep.org (See the Big Sweep Navigation on page 36 for help.)
3. Navigate to your county and analyze the trash statistics. Have students make a table in the journal or lab book to record the information.

QUESTIONS TO CONSIDER WHEN ANALYZING DATA:
- What kinds of trash statistics are collected?
- N.C. Big Sweep trash data is available for several years on the Web site: www.ncbigsweep.org.
  Click on “Our Cleanup Results,” and then “Counties.” Create a chart to display changes in trash statistics over time. What inferences can be made about the causes?
- How does your county compare with other counties in your river basin?
- Investigate the “Unusual Finds” data. Create a chart to list animals that have been affected by litter in your county and river basin. Why did the animals get entangled?

   Once in this PDF document, scroll through the materials until you find your river basin. The report categorizes impaired streams by river basins. Compare your Big Sweep data to the impaired stream data. Record any patterns found.
5. Locate the area cleaned along your waterway on a road map. Is there any evidence that would explain why litter was found in this location?
Conclusions

1. Write down patterns observed and give evidence to support your ideas.
2. What are some possible solutions to the litter problem?
3. How does Big Sweep help to address the litter problem?
4. Why are Big Sweep data cards important?
5. How does the International Coastal Cleanup use the N.C. Big Sweep data in country and state categories? (Visit the Web site for the answer!)
   http://www.oceanconservancy.org/site/PageServer?pagename=press_icc
6. Do you think volunteer projects like Big Sweep are effective? Why/why not?

Possible Products

1. Create a poster with a map to communicate your findings.
2. Create a newspaper with articles, photos, graphs, charts, and maps to communicate your findings.
3. Write an article for the school newspaper to educate others about litter in your county and river basin. Organize a Big Sweep cleanup for your class and write the article from your real-life experience. Contact your County Coordinator on the N.C. Big Sweep Web site for details:
   www.ncbigsweep.org/coord.html.
4. Develop a “Litterbug Exterminator” kit. Based on research data, what should it contain to encourage people not to litter? How would people use each item in your Litterbug Exterminator kit? Why is this a great idea?
5. Design a radio campaign to recruit more citizen volunteers for Big Sweep. Why would people want to give their time and energy to picking up litter in a stream, lake, river or wetland? Why is it important to involve residents in taking care of their river basin?
6. Write a script and dramatize a reality TV show episode that features a Big Sweep cleanup at a local creek. Who are the main characters? How can the Big Sweep data be used? What is the conflict that adds interest to the plot? How can the problem be resolved in the end?
How to Navigate Big Sweep Web Site

1. Log on to: www.ncbigsweep.org
   Your screen should look something like the one below:

   Welcome to the North Carolina Big Sweep home page!
   We're the award-winning 501(c)(3) grassroots nonprofit organization whose mission is litter-free watersheds. We conduct year-round education to prevent litter and coordinate The 2007 North Carolina Big Sweep, the North Carolina component of the International Coastal Cleanup—an event in which volunteers from all 100 counties in the State and approximately 90 countries worldwide come together to clean up our watersheds. Although many counties have completed their fall cleanups, go to the County Coordinators page to find out how to contact your County Coordinator and find out about additional cleanups. Thank you!

   Check out the topics below to see how you can help and to find out more details about our cleanup and educational efforts. Thank you for your interest in our environment!

   ABOUT US:
   County Coordinators  Donate Your Vehicle Or Boat  Bid On Our Donated Items! Raffle Winners Announced!
   Board Members  Become A Member Today  Order Your Official Big Sweep T-Shirt
   Sponsors  How To Volunteer  See Our Cleanup Results:
   General Info  Educational Resources:
   Press Room  Help Prevent Littering
   Animal Entanglements

2. Investigate litter in your county by clicking on “By County.”

   North Carolina Big Sweep

   Below are the results for The 2007 North Carolina Big Sweep.

   What an exciting cleanup! We broke our all-time record for volunteer turnout! Many counties arranged multiple cleanup dates that enabled us to remove almost 739,000 pounds of debris from our environment. This is really important because litter hurts our economy (especially tourism and new business recruitment) and it endangers people and wildlife.

   During the 2007 North Carolina Big Sweep cleanups, there were 17 entangled animals discovered statewide—only one of which was able to be released alive. Click here to find out which animals were found entangled. (Note: animal entanglements are in red.) What do you think can be done to prevent these entanglements?

   Read on for more details about the 2007 cleanups. If you would like to contact N.C. Big Sweep, please see our address, phone, fax, and email at the bottom of this page. Thank you to everyone who helped in these much needed cleanups. And thank you for visiting our Web site!
## The 2007 North Carolina Big Sweep Results

<table>
<thead>
<tr>
<th>County</th>
<th>Volunteers</th>
<th>Est. Miles</th>
<th>Tires</th>
<th>White Goods</th>
<th>Bags with Recycling</th>
<th>Bags with Trash</th>
<th>Est. Weight</th>
<th>Unbaggable/Unusual Finds</th>
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</thead>
<tbody>
<tr>
<td>Alamance</td>
<td>72</td>
<td>32.5</td>
<td>2</td>
<td>0</td>
<td>31</td>
<td>58</td>
<td>1,560</td>
<td><a href="#">Link here for entanglements and other unusual findings in all counties.</a></td>
</tr>
<tr>
<td>Alexander (w/Catawba)</td>
<td>See</td>
<td>Catawba</td>
<td>County</td>
<td>For</td>
<td>Results</td>
<td></td>
<td></td>
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<tr>
<td>Alleghany (w/Ashe)</td>
<td>See</td>
<td>Ashe</td>
<td>County</td>
<td>For</td>
<td>Results</td>
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<td></td>
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</tr>
<tr>
<td>Anson</td>
<td>24</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>420</td>
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<tr>
<td>Ashe</td>
<td>128</td>
<td>34.4</td>
<td>155</td>
<td></td>
<td></td>
<td>218</td>
<td>7,460</td>
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<tr>
<td>Avery</td>
<td>See</td>
<td>Watauga</td>
<td>County</td>
<td>For</td>
<td>Results</td>
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<tr>
<td>Beaufort</td>
<td>54</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td></td>
<td>39</td>
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<tr>
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<td>Bladen</td>
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<tr>
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<td></td>
<td></td>
<td>233</td>
<td>4,647</td>
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<tr>
<td>Buncombe</td>
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<td>200</td>
<td>0</td>
<td></td>
<td>400</td>
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<td>Burke</td>
<td>80</td>
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<td></td>
<td>155</td>
<td>2,800</td>
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<td></td>
<td></td>
<td>167</td>
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<tr>
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<td>10</td>
<td></td>
<td></td>
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<tr>
<td>Camden</td>
<td>15</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>8</td>
<td>15</td>
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<td></td>
<td>37</td>
<td>721</td>
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<tr>
<td>Caswell</td>
<td>53</td>
<td>12.5</td>
<td>20</td>
<td>3</td>
<td></td>
<td>71</td>
<td>2,527</td>
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<tr>
<td>Catawba</td>
<td>90</td>
<td>15</td>
<td>19</td>
<td></td>
<td></td>
<td>3,000</td>
<td>60,000</td>
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</table>
2007 Big Sweep Cleanup

During the 2007 Big Sweep cleanup, volunteers picked up litter at Rocky Branch in Raleigh.

Volunteers included Cary High School students.

Volunteers recorded trash data.
UNDERSTANDING LITTERING BEHAVIORS

OBJECTIVE: To explore the habits associated with littering and the kinds of people who litter.

Time: (2) 50-minute periods or one-block period.

Materials Needed:
Computer with Web access
Pencil
Chart paper
Markers
N.C. road maps
Map of your city or town area

Procedure:
1. Divide the class into small groups. Give each group a piece of chart paper. Have each group divide the chart paper into four quadrants.
   • Write “Before” in the upper left quadrant.
   • Write “After” in the upper right quadrant.
   • Write “Possible Questions” in the bottom left quadrant.
   • Write “My Community” in the lower right quadrant.

2. Make an overhead transparency of the following questions:
   1. What is litter? (misplaced waste)
   2. Why do people litter?
   3. What kinds of people litter?
   4. Where do most people litter? In North Carolina, uncovered trucks have been identified as a large source of roadside litter that goes into or ends up in the waterways. Recently, N.C. legislation was passed to mandate truck covers.
   5. When do most people litter? Construction sites can be a problem when workers litter their fast food lunch trash on their way back to work sites.
   6. How can you determine who litters? Is there a certain profile?

3. Have student groups answer questions 1-6 in the quadrant labeled “before.”

4. Facilitate a discussion about student responses and generate a list of common answers.

5. Have students visit and compare Web sites:
   http://www.kab.org

6. Once students have spent time exploring the sites, have them answer the same questions in the quadrant labeled “After.”

7. Facilitate a discussion about their findings. Record student responses.
8. Now, introduce students to the task at hand: Write a survey to uncover the littering behaviors of people in your school community. Publish a final report in your school newspaper. Have each group generate a list of questions they feel should be asked. Go online to: http://www.ryerson.ca/~mjoppe/ResearchProcess/WriteBetterQuestion.htm. Once students have generated questions, scales and survey method, compile the final survey and include no more than 10 to 12 questions.

9. Get permission to administer the survey.

10. Administer and then compile results. Are littering attitudes and behaviors universal in the world? Would you get the same survey responses if you asked students your age in Mexico, Australia or Korea?

11. Generate a final report for your school/community.

12. Write a short, concise “Executive Summary” that tells people — in one page — the purpose of the survey and the most significant findings.

For a review of a local survey, have students go to the link: “Stormwater Knowledge, Attitudes & Behaviors: A 2005 Survey of North Carolina Residents” that students could review as a local survey example: http://www.ncstormwater.org/pdfs/stormwater_survey_12506.pdf.

Revisit the Australian EPA site: http://www.environment.nsw.gov.au/litter/factsaboutlitter.htm. In your journals, complete the following questions with well-developed responses:

1. How accurate were your findings?
2. Did your findings indicate something you’ve not thought about?
3. How could you have improved the project?

The U.S. EPA Web site also has some interesting links and action suggestions. (Go online to: http://epa.gov/students/).
"FUTURE" TRASH

OBJECTIVE: To research the manufacturing of a few high tech gadgets and explore what happens when this outdated or unwanted technology enters the waste stream.

As the tools and technology for meeting communication needs have changed over time, the global community is faced with a new problem: High tech trash, their hidden toxins and potential health risks.

Materials:
* High Tech Trash: Digital Devices, Hidden Toxics, and Human Health by Elizabeth Grossman
* Computer with Internet connection
* Access to a telephone or e-mail (to be supervised by the teacher)

Procedure:
1. Divide students into groups.

2. Have students draw for or assigned to the different high tech trash items to be investigated. See List of Digital Devices (page 43)

3. Student page: Investigative Lesson (page 44)

4. Once students have finished their investigations, have each group choose a project that demonstrates their new understandings about high tech trash. See project list below:
   - Find and share a high tech trash newspaper article.
   - Design a brochure on the item or items you researched.
   - Create public service announcements about specific pieces of high tech trash.
   - Make a video in the form of a documentary.
   - Illustrate colorful, eye-catching posters for your school hallways.
   - Write and publish an information flyer about the type of trash that you investigated. The flyers can be circulated locally.
   - Interview someone in your local solid waste program about how high tech trash is managed. Write a report for your school newspaper.
   - Research innovative ways unwanted high tech trash is being collected and distributed to people who need these communication tools — from various social programs (homeless centers, women and children protection programs, latch key children, etc.) to third-world countries where this technology is rare or very expensive.

Charlotte-Mecklenburg's Cell Phones for Domestic Violence:
Cell Phones for Charity: http://www.wirelessrecycling.com/home/index.html
EBay's Rethink donation site: http://rethink.ebay.com/odcs/custom.htm?template=donate
LIST OF DIGITAL DEVICES

This list may include but is not limited to:

- Cell phones
- Computer monitors
- CD and DVD players and recorders
- MP3 players
- DVD disks
- Flash drives
- GPS devices

- Desk top computers – CPU and all its components
- Plasma TVs
- iPods
- Laptop computers
- CDs
- Semiconductors
Copy these questions into your journals/log books or fill out this form.

1. What is the digital device or product you are researching? Why did you choose this product?

2. What is it made of and where does that raw material come from? All the resources are either farmed or mined.

3. What is the manufacturing process for this product? What chemicals or special procedures are used in the manufacturing process?

4. What potential toxins are contained in this product? What potential toxins are produced as by-products or waste products? How are they disposed of? Can these toxins be “neutralized” or made less harmful through another process? Is it affordable? Doable?

5. How might these toxins affect the human body and/or the environment over time? Are people being alerted to potential dangers? Why/why not? What are YOUR suggestions for improving this digital device (either ridding it of toxins in the manufacturing process or from being discarded improperly) so we can have good technology, as well as a healthy planet and people?

6. What kinds of products do you think might be invented in the future that would be toxic to the environment? Is there something that could be done now to prevent future products from containing toxic substances? What would you suggest to protect humans and the environment from “future toxins”?

Be sure to write down the names of the print resources and page numbers, and/or Web sites.

Go to: www.howstuffworks.com for product information and manufacturing information. A good bit of information can be found here. Otherwise, do a Google or other search options.
<table>
<thead>
<tr>
<th>Teacher's Quick Reference</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Page: Life Lessons From Litter</td>
<td>13</td>
</tr>
<tr>
<td>Trashy Triangle Transparency</td>
<td>16</td>
</tr>
<tr>
<td>How Long Are You Staying?</td>
<td>23</td>
</tr>
<tr>
<td>Wildlife and Litter Transparency</td>
<td>24</td>
</tr>
<tr>
<td>Teacher's Choice</td>
<td>26</td>
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<tr>
<td>Big Sweep 20 Fun Activities</td>
<td>27</td>
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<tr>
<td>Student-Guided Activities</td>
<td>28</td>
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<tr>
<td>Grid for Recording Study Site Features</td>
<td>33</td>
</tr>
<tr>
<td>Student Page: Investigative Lesson</td>
<td>44</td>
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</table>
Statewide Headquarters:
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E-mail: ncbigsweep@bellsouth.net
Web site: www.ncbigsweep.org

North Carolina Sea Grant, www.ncseagrant.org
National Oceanic and Atmospheric Administration,
www.noaa.gov
GlaxoSmithKline, www.gsk.com
UNC-SG-07-01