Louisiana Public Broadcasting

Enviro-Tackle Box™

Teacher's Guide

Module 2: Decisions Based on Science

Instructional Video: Decisions Based on Science

Tackle Trash

Your Burger and the World

A Zoo View

Extreme Weather

ENVIRO•TACKLE BOX™

Module 2

Decisions Based on Science

Table of Contents

Enviro•Tacklebox™

Module 2

Decisions Based on Science

Funding for this module of Enviro-Tacklebox™ was provided in part from a 5-year Star Schools grant to the Satellite Educational Resources Consortium (SERC) from the U.S. Department of Education under contract R203A970032.

Project Director
Homer Dyess

Project Coordinator
Claudia Fowler

Curriculum Specialist
Jean May-Brett

Content Team
Jo Dale Ales
Brenda Nixon
Anne Rheams
Faimon Roberts
Jill Saia
John Trowbridge

Video Producers
Kevin Gautreaux
Randy LaBauve

Graphic Design
Jeanne Lamy
Tammy Crawford
Steve Mitchum
George Carr

Executive Producer
Clay Fourrier

Deputy Director
Cindy Rougeou

President & CEO
Beth Courtney

SERC More Power to You

LPB Louisiana Public Broadcasting

Star Schools U.S. Department of Education

Enviro-Tacklebox™ Overview

Enviro-Tacklebox™ Project Overview

Background Information

What is the Enviro-Tacklebox™ Project?

The Enviro-Tacklebox™ is a program directed toward middle school students that focuses on environmental education topics. The project is being developed by Louisiana Public Broadcasting working as a sub-grantee of the Satellite Education Resource Consortium. Enviro-Tacklebox™ is funded through a five year U. S. Department of Education Star Schools grant.

The goals of the project are to:

- Develop thematic modules that focus on environmental issues and promote student interest and the attainment of critical thinking skills that will support decision making;
- Enhance student learning by using the environment as an integrating theme;
- Engage and support community outreach efforts through workshop presentations at science conferences at the state, regional and national level; and
- Increase the level of awareness and understanding of K-12 teachers about environmental education issues.

The Enviro-Tacklebox™ includes the following components:

1. A series of five thematic modules, each of which consists of five tele-lessons and accompanying teacher guides with student activities. An interactive web site complements each module.

2. Professional development teleconferences, delivered by satellite, that address topics of national interest to all formal and informal educators involved in environmental education.

3. Workshops presented at professional conferences, in school districts and other appropriate educational settings to raise the awareness of the Enviro-Tacklebox™ project.

Topics for each module were selected in response to a national survey of middle school teachers and were developed by a curriculum design team of educators. Materials from each module have undergone extensive review at the state and national levels. All materials reflect the ***National Science Education Standards*** and the North American Association for Environmental Education's ***Excellence in Environmental Education-Guidelines for Learning (K-12)***.

There are five student video lessons in each module with the exception of Module II, which has four student video lessons and one teacher professional development video. This "how to" video for educators is not for student viewing but instead provides the instructor with a model for teaching decision-making strategies.

For information concerning purchase of the Enviro-Tacklebox™ materials contact:

GPN
P.O. Box 80669
Lincoln, NE 68501-0669
1-800-228-4630
http://gpn.unl.edu

Louisiana Teachers interested in broadcast dates or purchasing information should contact:

Louisiana Public Broadcasting
7733 Perkins Road
Baton Rouge, LA 70810-1009
225-767-4206
http://www.lpb.org

Module 2

www.Enviro•TackleBox™.org

Instructional Video
Decisions Based On Science: Mastering the Skills of Decision Making

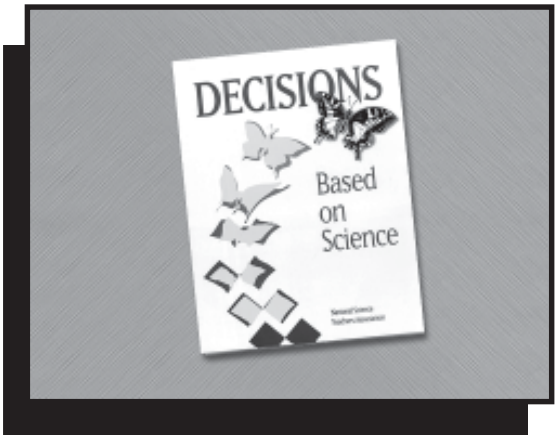
ACTIVITY GUIDE

INSTRUCTIONAL VIDEO: Decisions Based on Science

Background Information

Decisions Based on Science: Mastering the Skills of Decision-Making

America's schools are being called upon by business and industry to produce scientifically literate students who can **think critically**, **problem solve** and **make informed decisions**. Students, as well as adults, are increasingly confronted with questions that require the processing of information and demand the use of scientific thinking in order to make informed decisions. Whether the decision appears to be simple (the salad line or the hot food line at school lunch), or of a more complex nature (to smoke or not to smoke), students should, given the opportunity, be able to make an informed decision based upon a methodology that is rational and scientific.



Teaching decision-making skills has not traditionally been an integral part of science education; however, one of the most important things students need is an understanding of how to develop scientific ways of thinking in order to make decisions. The ***National Science Education Standards*** point out that "Americans are confronted increasingly with questions in their lives that require scientific information and scientific ways of thinking for informed decision making" and that everyone should be able to "...engage intelligently in public discourse and debate about matters of scientific and technological concern." These concerns and the decisions associated with them (whether of a personal or civic nature), are often complex. Because students have different experiences and interests, they do not all view a problem in the same way. It is essential for educators to provide opportunities for students through which they can gain the experiences that will help them master the skills of informed decision making.

Four of the eight categories of the ***National Science Content Standards*** reflect the skills of decision making, i.e. Science as Inquiry, Science and Technology, Science in the Personal and Social Perspective, and History and Nature of Science. These skills are also reflected in the four strands of the ***Excellence in Environmental Education-Guidelines for Learning (K-12)***: Questioning and Analysis Skills, Knowledge of Environmental Processes and Systems, Skills for Understanding and Addressing Environmental Issues and Personal and Civic Responsibility.

Module II includes one teacher professional development "how to" video and four student video lessons. The professional development video is not meant for student viewing but rather is designed to help teachers better understand the decision making process by providing a model of some strategies that may be used in the decision making process. The video is facilitated by textbook author and science educator Michael DiSpezio, who takes classroom teachers through the decision making processes outlined in the National Science Teachers Association (NSTA) publication, ***Decisions-Based on Science.*** In the video, participants apply a variety of decision-making strategies including importance bars *(page 10, figure 1)*, decision charts *(page 10, figure 2)*, and the identification of both options and outcomes to relevant every day examples. These strategies can also be used by students to develop their own decision-making skills as they apply them to situations outlined in the four student videos in this module.

The four student videos in this module are described below along with information on the student activities:

A Zoo View examines the evolution of zoos from early menageries to modern educational and enrichment facilities. Students research ways to provide for endangered species and their habitats.

Extreme Weather focuses on severe weather phenomena and their effects on both people and the environment. Using background information and evidence provided, students must decide whether a city should be evacuated.

Tackle Trash identifies the growing amount of waste generated by our society and focuses on the need for waste reduction. Students investigate a midden and determine ways to reduce the consumption of valuable resources.

Your Burger and the World addresses some of the environmental issues associated with the classic American burger! In the activities, students gain knowledge of their role as consumers so they may make environmentally friendly choices.

For additional information contact:

Louisiana Public Broadcasting
7733 Perkins Road
Baton Rouge, LA 70810-1009
225-767-4206
http://www.envirotacklebox.org

National Science Teachers Association
1840 Wilson Boulevard
Arlington, VA 22201-3000
703-243-7100
http://www.nsta.org

Figure 1

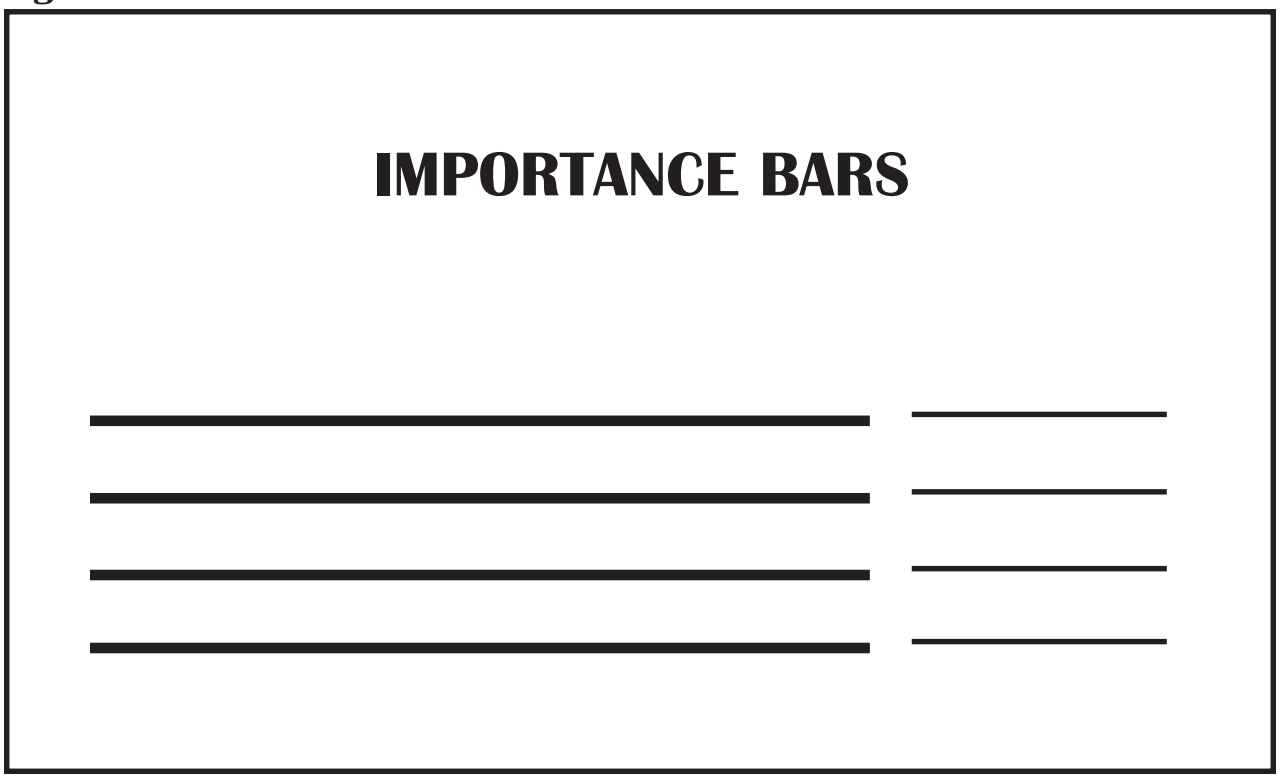
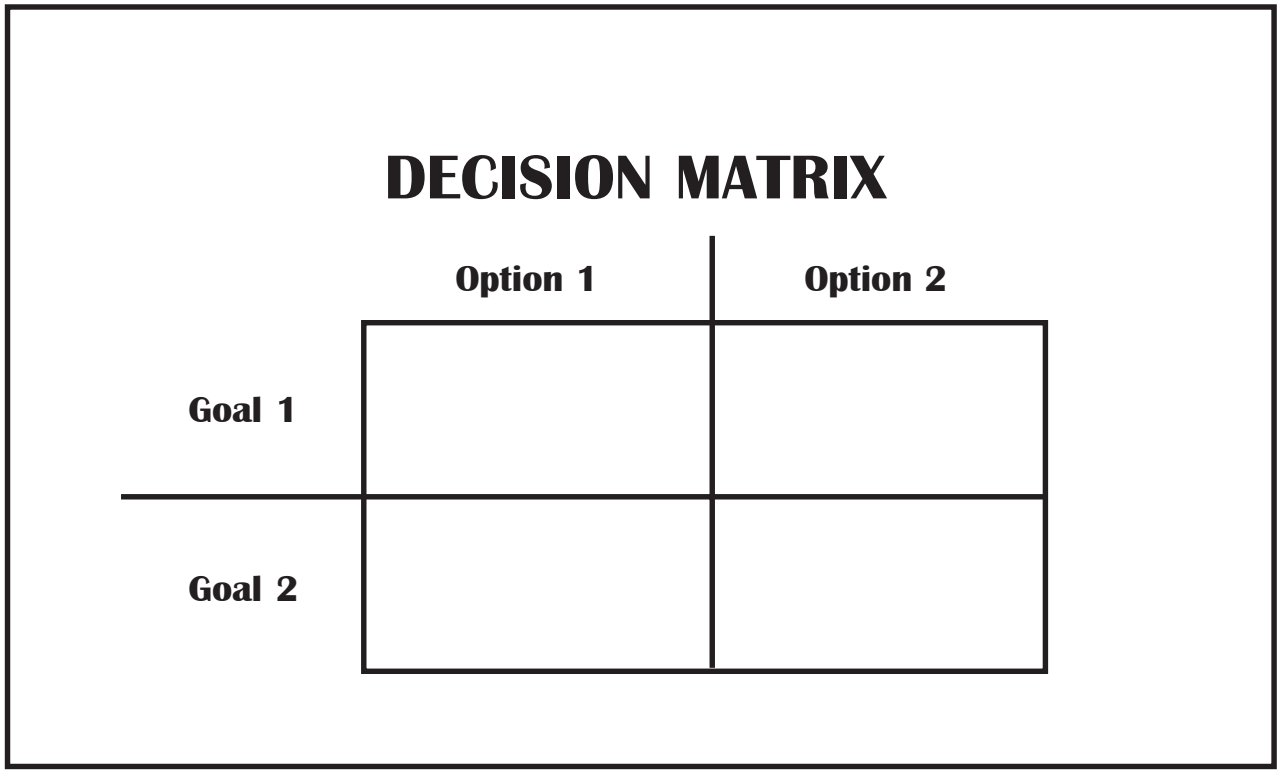


Figure 2



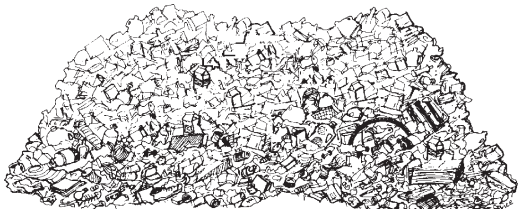
Tackle Trash

ACTIVITY GUIDE

TACKLE TRASH

Background Information

The world's population has surpassed the 6 billion mark, and while Americans account for approximately 5% of that population, we lead the world in resource consumption. In fact, Americans consume **about 30%** of the world's resources, and have a per capita energy consumption rate that is 5 times greater than that of the rest of the world. Although some of the resources and energy are used in the manufacturing of products that are exported worldwide, much of the energy and resources are expended to support our growing economy and maintain our high standard of living.

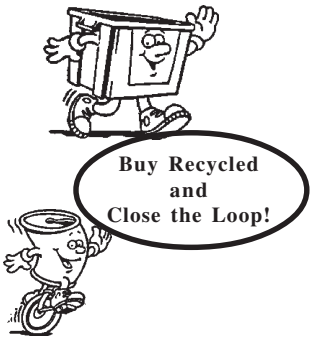


Midden = a heap of trash

Consumption of resources directly impacts the amount of waste generated. In the United States, we discard about 4.3 pounds of trash per day for every man, woman and child. If you add construction debris and sludge from sewage-treatment plants, the amount increases to 6 pounds of waste per person per day. This amount is over 200 million tons of garbage each year...enough to fill a fleet of garbage trucks encircling the earth six times!

Waste from the various streams is classified as Municipal Solid Waste (MSW).

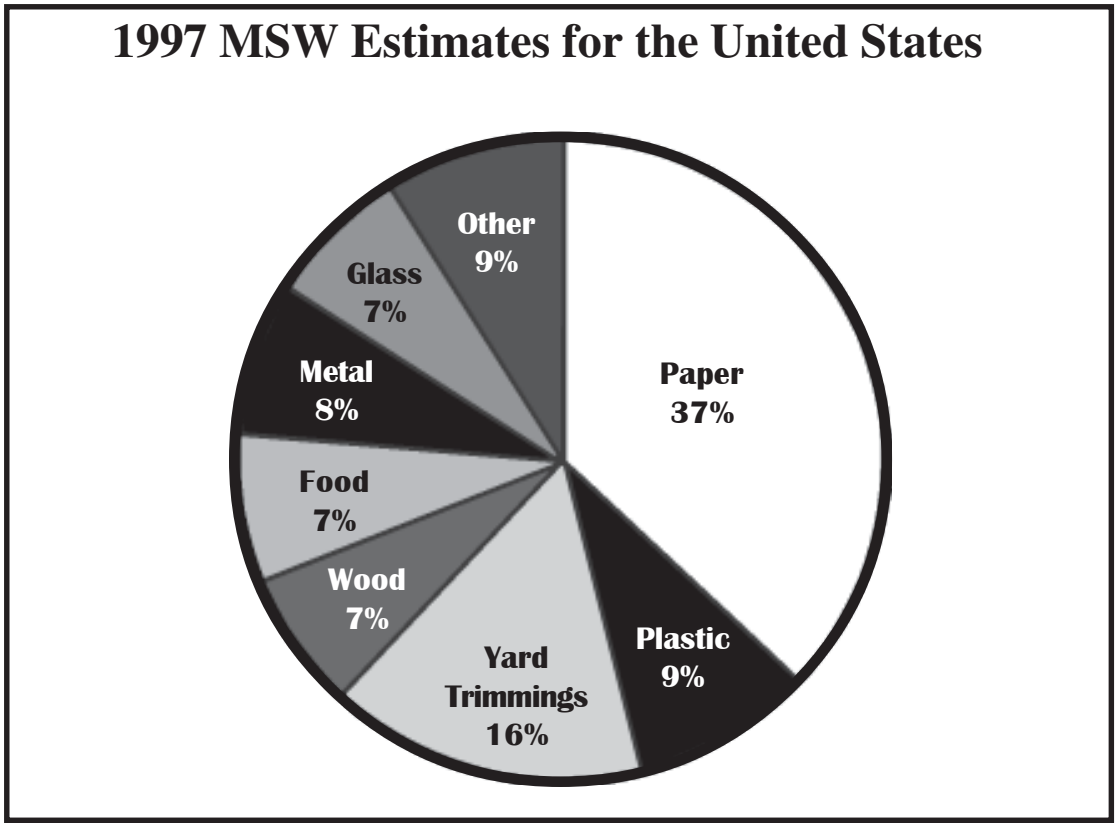
Source reduction and recycling are the keys to waste management



- **Source reduction involves reducing the amount and toxicity of waste produced and subsequently discarded.**
- **Recycling is a system of collecting, processing, and remanufacturing materials into new products. Once these recycled materials have been purchased by consumers, the *"recycling loop"* is closed.**

Waste Streams: Waste is categorized in terms of types of "streams." They are described as streams because of the flow of materials associated with the various categories:

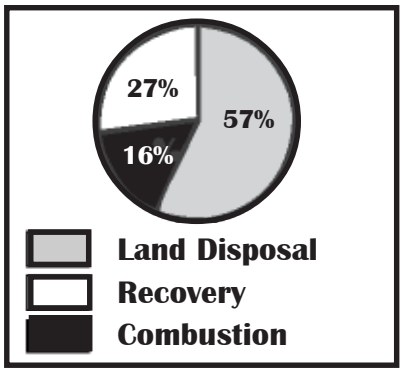
Waste Stream Category	Waste Source
Household	Private residences only
Commercial	Businesses, restaurants, services
Industrial	Manufacturing and processing facilities
Municipal	Collected waste from a city, community, region
Infectious	Health care facilities, hospitals ("red bag" waste)
Construction/Demolition Debris	Building and construction
Hazardous	Toxic, corrosive, ignitable and/or reactive materials



Where is "Away?"

Many of us do not think about where our garbage goes once we remove it from our homes. In most communities, everything that enters the waste stream is either landfilled or incinerated. There really is no *away* when we throw things in the garbage can.

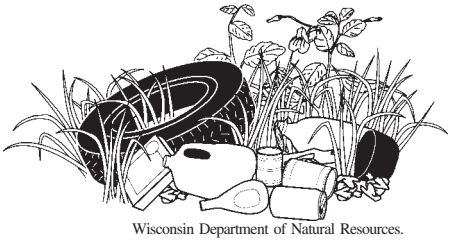
"Away" is Usually a Landfill



While a few cities use incineration to dispose of waste, most of what is thrown away ends up in a landfill. Landfills are expensive to build and operate. Although regulations require strict standards for new landfills to protect groundwater and wildlife, evidence indicates that many landfills are not effective in preventing ground and water contamination.

Landfills have both clay and plastic liners to help prevent groundwater contamination. Rainwater that passes through the layers of dirt and garbage and comes to rest above the clay and plastic liners is funneled into pipes and pumped to the surface. This water is identified as *leachate* and must be treated and tested before it is released into the environment. If it is not trapped, pumped and collected, it can contaminate groundwater. Another safety feature of a modern landfill is the insertion of pipes that allow the escape of explosive methane gas and carbon dioxide that occurs when organic waste decomposes in the landfill. In some landfills the methane gas is collected and recovered for use.

Each day, as waste is delivered to a landfill, it is spread out and compacted by bulldozers. At the end of the day, the waste is covered with dirt. Covering it with dirt helps keep odors in check and discourages small animals from foraging in the landfill. The resulting layers of dirt and waste may rise above the normal level of the land by 50-100 feet, significantly altering the environment throughout the area.



Wisconsin Department of Natural Resources.

Composting converts yard waste into a valuable soil amendment for gardening. It's recycling…naturally.

Reusing is using a product again, either for its original purpose, or in a completely different way. For example, a can could be used for watering plants, or as a pencil holder, etc.

Recycling is the process of making new products out of used materials. When aluminum cans are recycled, the aluminum is melted, pressed into sheets, and reformed into a new product.

Individual Decisions are Important Steps in Reducing, Reusing, and Recycling

Personal choices and the decisions that are made by each person can have a significant impact on resource consumption, waste generation, and the environment. Consumers can:

- ✓ practice precycling by reducing the amount of waste at the source (This includes buying items that can be reused or have minimal packaging. Almost $1.00 of every $10.00 spent for food and beverages in America pays for packaging. Packaging contributes about 30% of the weight and 50% of the volume of household waste.);
- ✓ reuse products as much as possible ;
- ✓ close the recycling loop by buying goods made from or packaged in recycled products; and
- ✓ help establish and maintain a community recycling program and encourage participation.

Economics Drives Decision-Making

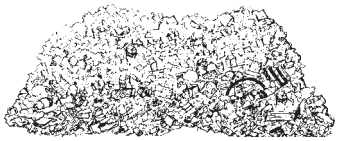
There are important issues to consider in waste management, and economics is one of the most significant. Recycling and composting programs are costly, and sometimes communities spend much more for recovery programs than they would if they sent everything to the local landfill. At present, many municipal recycling and composting programs are so expensive to operate some communities are choosing either to close their existing programs or not to establish new recycling programs.

Locating businesses within a particular region that will accept recyclables can also be challenging. In some cases, items that were designated to be recycled have been placed in landfills because no markets exist for their use. To remedy this problem, consumers should support recycling by buying products made from recycled materials. When the demand grows, the market will expand and businesses will be able to offer their goods at more competitive prices. So, by closing the loop and purchasing new products made from recycled materials, recycling will become more economically advantageous and help reduce the amount of waste sent to landfills.

Tackle Trash

Lesson 1 Activity: Trash...it really piles up!

Lesson Overview:

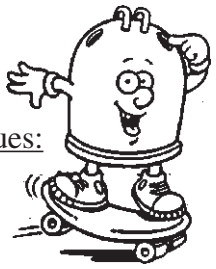


How much trash do we generate every day? And what DO we throw away? Archeologists study what people left behind many years ago to get clues about their life-styles. In this lesson, students investigate a contemporary "midden" by analyzing trash collected from various sources and determining life-style choices people make.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:

Population, Resources, and Environments



Excellence in EE—Guidelines for Learning

Strand 3: Skills for Understanding and Addressing Environmental Issues:

2. Decision-Making and Citizenship Skills

Key Concepts:

1. Trash and garbage are sent to collection areas for incinerating or landfilling.
2. Many of the items normally thrown "away" in the trash can be recycled or reused.

Objectives:

Students will:

- infer the choices people make by examining their trash.
- identify the results of those choices.
- recognize that reducing the amount of waste entering the waste stream benefits our environment.

Cross-Curricular Connections:

Language Arts

- Communicate information through research, discussion, and completing the data sheets.

Mathematics

- Weigh collected trash.

Social Studies

- Analyze recycling and precycling choices made by individuals.

Process Skills:

Observing	Communicating	Comparing
Investigating	Inferring	Applying

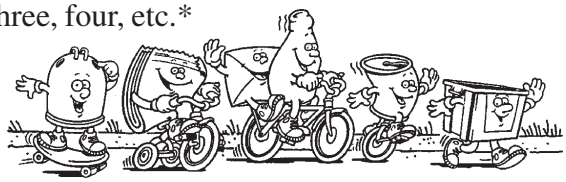
Lesson 1 Activity: Trash...it really piles up!

Materials:

Per Student
- Student Response worksheet
- Home Garbage Survey

Per Group
- Large bags of clean trash labeled one, two, three, four, etc.*
- Data Collection worksheet

Per Class
- Scale



***Several days prior to conducting this activity, ask a few friends or neighbors to each save one large bag of clean trash. Bottles, cans and jars should be rinsed. Items easily broken, i.e., light bulbs, materials with sharp edges, etc., should be removed. In addition, any item that might present a health risk should be avoided. Only 15-20 items are needed per bag. Although collecting trash may be time consuming, this lesson is invaluable in getting students to really think about the everyday choices that are made by each individual. Try to arrange collecting the trash from a variety of people with various life-styles. Examples include: a family with teenagers, a family with young children, a retired couple, etc. This will provide opportunities to compare how trash reflects peoples' life-styles and encourage cross group analysis of the data. Each bag should weigh between 4 and 5 pounds so that students can see how much waste is generated daily by each American.**

Note: *It is suggested that Lesson One be completed prior to viewing the accompanying video.*

Suggested Time Frame:

One or two 50 minute sessions with the *Home Garbage Survey* assigned for homework**.**

Procedure:

This lesson introduces the concept of waste generation in our daily lives. The choices we make everyday can make a difference in the amount of material funneled through various waste streams. Rather than telling students this information, allow them to sort and classify the trash with little prior discussion. Their subsequent discussion will provide a format for content information to emerge based on student input and interests. Encourage students to determine their own methods of categorizing and reporting the data.

1. Each group of students selects a bag and weighs it. (Bathroom scales may not be accurate to measure low weights. However, having a student measure/record his/her weight, then taking a second measurement while holding the bag improves accuracy.)
2. Students remove the trash from the bag, sort the trash and determine categories. After discussing the contents, they complete the Data Collection worksheet and return the trash to the bag.
3. Each student completes the Student Response worksheet.
4. Each group then shares its findings with the rest of the class and posts the data sheet.
5. Construct a class data chart to compile the data and compare the results from each group.
6. Assign the Home Garbage Survey for homework. After completion, students compare their home surveys with others in their group and note differences and similarities.

Suggested Discussion Questions

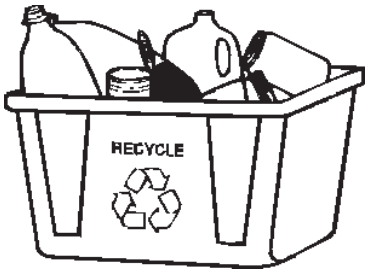
- What kinds of materials did you find the most/least?
- Did the other groups have similar data?
- What kinds of things might be ordinarily thrown away that weren't included in your bag? (Food waste, etc.)
- Can you infer what kind of life-style people lead by looking at their trash?

Further Investigations

- Conduct a survey in the school or community to investigate attitudes about recycling and waste disposal/recycling habits practiced.
- Contact the local waste management office and determine how the community disposes waste.
- Contact the local recycling office for information on the local recycling program if one is established in the community.
- Determine the origin of the word "midden."

Career Opportunities

Waste Management Consultant
Recycling or Composting Program Manager
Environmental Engineer



Wisconsin Department of Natural Resources.

Assessment Procedures

- Score activities by a rubric.
- Write a creative story from the perspective of the family or individual profile established during the trash investigation.
- Outline ways to stop unnecessary waste generation at home or school.
- Create a concept map using *Waste* as the overarching concept.

Additional Resources:

Can Manufacturers Institute. (1999). ***The Great American Aluminum Can Roundup.*** (202-232-4677)

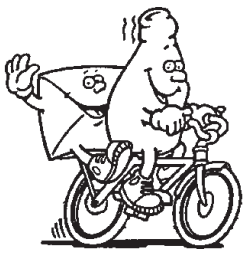
Dow Chemical Company, & National Science Teachers Association. (1997). ***An Ounce of Prevention: A Middle School Science Curriculum on Source Reduction.***

Environmental Protection Agency. (1992). ***The Consumer's Handbook For Reducing Solid Waste.*** (EPA530-K-92-003).
(Call the EPA Hotline 1-800- 424-9346 for free EPA publications.)

Environmental Organization Web Directory, Available at http://www.webdirectory.com/Recycling (accessed on August 20, 2000)

The Environmental Education Network. Available at http://www.envirolink.org/enviroed (accessed on August 20, 2000)

United States Environmental Protection Agency, Recycle City. Available at http://www.epa.gov/recyclecity (accessed on August 20, 2000)


The Recyclettes courtesy Snohomish County Solid Waste Division of Public Works.

Lesson 1 Activity: Student Response

Name _____ Date _____

What can you infer about the people who threw this material away? You will want to include how many people you think are in this family, their ages, and the kind of life-style you believe they practice. Other questions you may want to answer: Do they have any pets? What evidence do you have that may indicate hobbies, interests, etc.? Be sure to justify your reasons with the evidence you collected during your investigation of the midden.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Compare your life-style with that of the midden you investigated. How are they the same and/or different? What evidence do you have to support your answer?

_____

_____

_____

_____

_____

_____

_____

_____

_____

Lesson 1 Activity: Data Collection

Names of Group Members: _____

_____

Date: _____ Trash Bag Number: _____ Weight: _____

Directions: Open your bag, take out the items, and sort everything into categories. Discuss with your group how you want to categorize your trash and estimate the amount of material you have in each category. Once you have determined your method, record your data below.

Category	Approximate Amounts

Lesson 1 Activity: A Home Garbage Survey

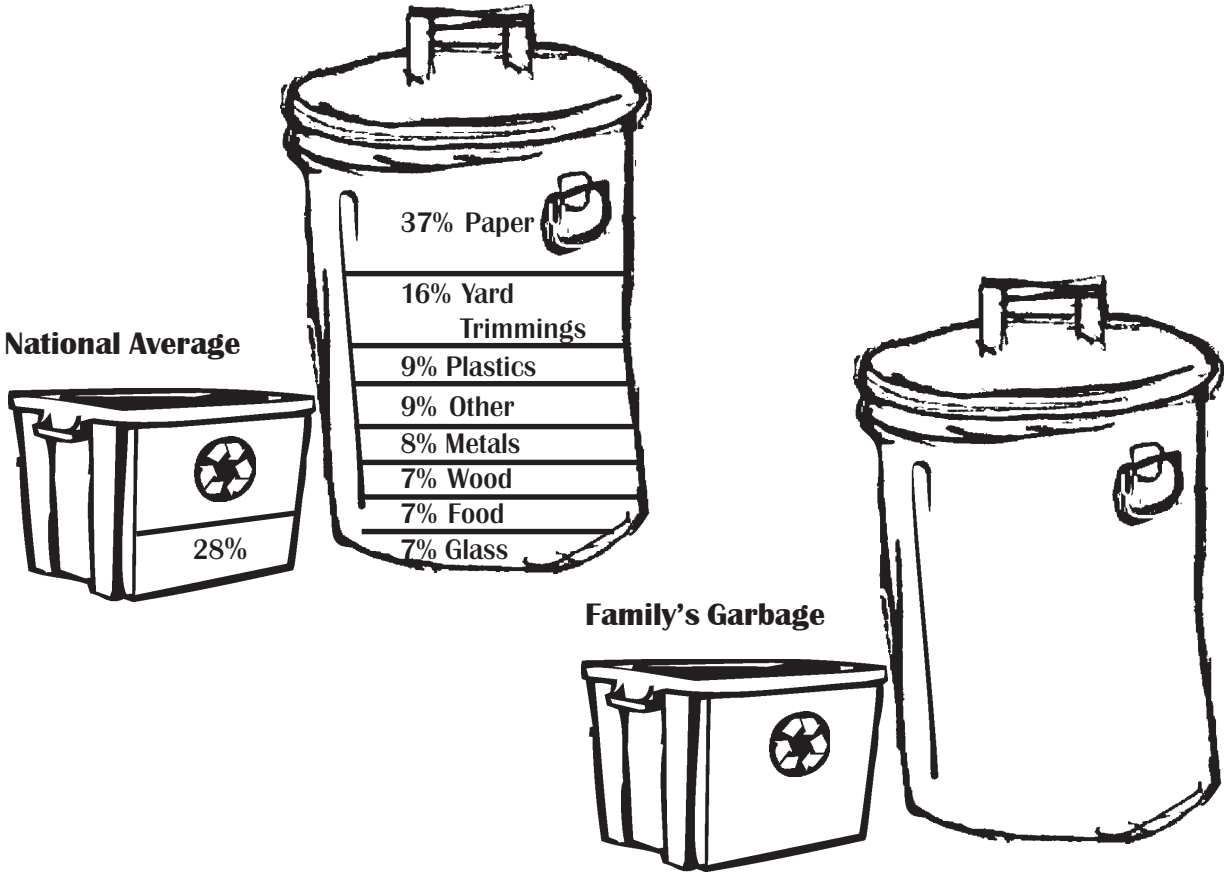
Name: _____ **Date:** _____

How much garbage does your family throw away or recycle in one 24-hour period? Conduct a survey and find out! If you go out to eat, remember to count everything that is thrown away or recycled.

Directions:

1. Categorize the garbage according to the material from which it is made. Record the categories in the first row on the chart below.
2. Use tally marks under the various categories to record the number of items you throw away or recycle. At the end of the 24 hours, total your tally marks in each category. (For example: one banana peel equals one tally mark under *Food*.) Circle the tally marks that represent items you recycle.
3. Estimate the percentages of the different categories and fill in the empty garbage can and recycling bin.

How did your garbage and recyclables compare with the national average?



Tackle Trash

Lesson 2 Activity: A Community Decision!

Lesson Overview

This activity provides a forum for students to investigate possible solutions to a growing problem that many communities are facing—handling the waste generated by a burgeoning population. Through a simulated role-playing activity, students investigate some issues associated with the establishment of recycling and composting facilities. Students use decision charts to help organize their presentations and justify their decisions. (This activity is best completed at the conclusion of the unit of study.)

National Science Education Standards

Content Standard F: Science in Personal and Social Perspectives

Population, Resources, and Environments

Excellence in EE—Guidelines for Learning

Strand 3: Skills for Understanding and Addressing Environmental Issues:

2: Decision-Making and Citizenship Skills

Key Concepts:

1. There are both costs and benefits involved when establishing community-wide recycling and composting programs.
2. Decision-making is a process that can involve many different strategies in order to determine the best possible solution.

Objectives:

Students will:

- incorporate specific strategies in the decision-making process.
- recognize there are many factors to consider when making decisions.
- investigate a number of possible solutions and determine the best possible decision.
- defend decisions based on evidence.

Cross Curricular Connections:

Language Arts:

- Communicate information through research and discussion.
- Justify positions taken on issues.

Social Studies:

- Simulate governmental, policy-making roles in society.
- Identify problems that relate to contemporary issues and determine possible solutions.

Lesson 2 Activity: A Community Decision!

Process Skills:

Observing	Communicating	Comparing
Investigating	Inferring	Applying

Materials:

Per Group

- *A Community Decision* worksheet
- Overhead projector pens
- Overhead projector transparencies

Per Class

- Overhead projector

Suggested Time Frame:

One or two 50 minute sessions depending on time set aside for researching costs/benefits.

Procedure:

1. Introduce the role-playing activity and appoint each group of 4-6 students to serve on the Mayor's Environmental Commission.
2. Explain the decision-making formats and allow time for students to determine which method they will use.
3. Depending on the background knowledge of students, allow time for researching the issue to better defend their positions and provide convincing evidence.
4. Students complete one of the sample decision formats and transfer the method they used to an overhead transparency.
5. Each group presents their decision to the "City Council" (classmates), using their overhead chart to explain the process.
6. Council members should be encouraged to ask questions.
7. Compare the class findings with the local recycling/composting initiatives and determine what actions the class could take to promote environmental awareness in recycling and composting in their own community.

Suggested Discussion Questions:

- Do you ever make important decisions without thinking of the consequences or affects of those decisions?
- What are some ways using a decision chart like this can help you make better decisions?
- Do you think it is important to involve people in the community when decisions are made that will affect everyone in the area? Why?

Lesson 2 Activity: A Community Decision!

Further Investigations:

- Contact the local waste management/recycling office and determine how the community disposes waste.
- Research the costs incurred by the local community related to waste disposal. Are taxes used to offset the costs? Is there a set fee for each household to defray waste disposal costs? Are tipping fees involved when using the waste disposal facility?
- Visit the local MRF (Materials Recovery Facility) if one is in your area.
- Establish a school recycling program.
- Invite a spokesperson from government to present information about local programs/future plans for waste disposal.

Career Opportunities:

Waste Treatment/Waste Management Engineer
Resource Management/Recycling/Composting Engineer
Environmental Engineer
Governmental Policymaker
Marketing Consultant
Commodities Trader

Wisconsin Department of Natural Resources.

Assessment Procedures:

- Assess presentation/defense using a rubric.
- Use a rubric to assess completed worksheets.
- Design a recycling/composting program for the school.
- Design a bumper sticker/slogan/logo/poem/song/etc. to encourage source reduction, recycling, reusing, precycling, and composting.

Additional Resources:

The Environmental Education Network
http://www.envirolink.org/enviroed/
(accessed August 20, 2000)

Environmental Protection Agency
http://www.epa.gov/recyclecity
(accessed August 20, 2000)

Glass Packaging Institute
http://www.gpi.org/
(accessed August 20, 2000)

The National Association for Plastic Container Resources
http://www.napcor.com/
(accessed August 20, 2000)

Proctor and Gamble Company. (1997).
Planet Patrol: An Educational Unit on Solid Waste Solutions

Steel Recycling Institute
http://www.recycle-steel.org/
(accessed August 20, 2000)

Lesson 2 Activity: A Community Decision!

Date: _____

Commission Members' Names: _____

_____

You have been asked to serve on the Mayor's Environmental Commission to investigate the costs and benefits of establishing a recycling/composting program in your community. The mayor has asked the commission to make a recommendation concerning the program. The decision the commission makes will determine the future of recycling/composting in your area. Discuss the problem with the other commission members. Use one of the decision charts below to help you organize your information and make your decision whether to begin a program or take no action. Be prepared to defend your decision to the City Council.

	Option 1	Option 2	Option 3
Goal A:			
Goal B:			
Goal C:			

IMPORTANCE BARS

Goal A _____ _____

Goal B _____ _____

Goal C _____ _____

Your Burger and The World

ACTIVITY GUIDE

YOUR BURGER AND THE WORLD

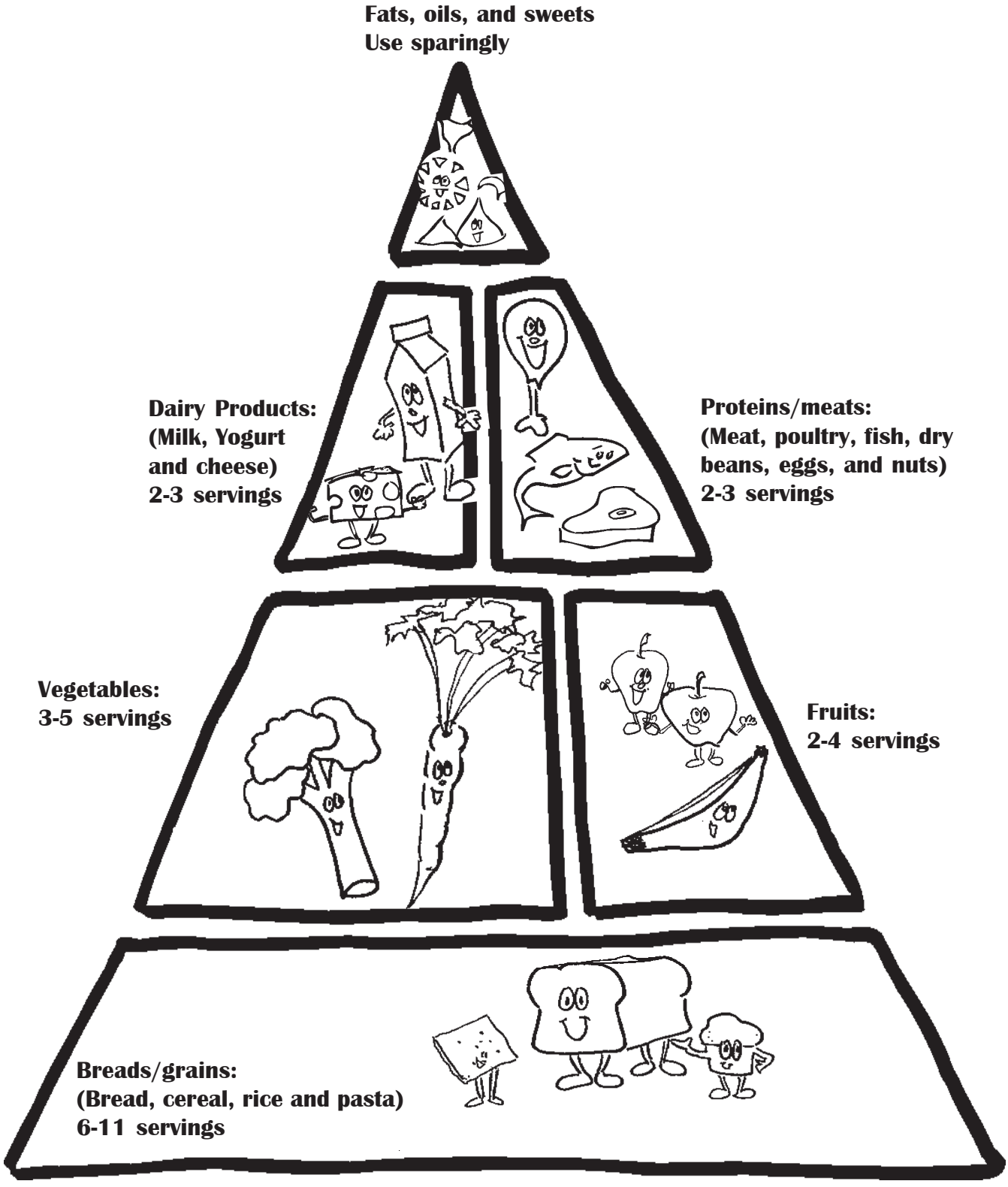
Background Information

What we eat is part of our personal environment. We can have a healthier personal environment by making good decisions about diet including what foods to eat, when to eat them, and what amounts to eat. Nutrients in these foods supply the energy and molecules that our bodies need in order to grow, develop, repair damage, and perform the activities of life. The food pyramid guide *(page 27)* lists the recommended number of servings we should eat each day.

One important thing that food gives us is energy. The heat energy in foods can be measured using a calorimeter. The unit of measurement of the heat energy in foods is a calorie. As members of a food chain we consume food and can transform its energy into mechanical energy during exercise. This is our energy output. It is important to maintain a balance between our daily energy input and output in order to remain healthy.

Breakfast is often called the most important meal of the day because it provides the energy needed by the body after resting all night. It helps meet the body's nutritional needs for the day and also helps keep you from snacking and consuming unnecessary calories. Breakfast food is also referred to as "brain food!" Research has shown that students who eat breakfast generally have a better attention span and are more alert. Some studies even indicate that students who eat breakfast make better grades in school. A balanced and healthy breakfast should include servings from the pasta, fruit, yogurt and cheese groups; however, life-styles play a role in what people eat for breakfast and whether they eat breakfast at all.

Throughout life you must balance your needs as an organism with your personal choices in order to maintain a healthy body. Our needs change throughout our lifetime. In general, the calories in foods are burned more rapidly by adolescents who have a higher rate of metabolism than by older adults whose metabolic rate is generally slower. Individuals must be aware of these changing needs and change their diets accordingly in order to maintain a healthy personal environment throughout their lifetimes. Healthy eating early in life can become a lifelong habit.



Food pyramid: (USDA) Recommended number of servings per day.

YOUR BURGER AND THE WORLD

Lesson 1 Activity: Breakfast: Healthy for Me and Healthy for the Environment

Lesson Overview:

Students will develop criteria for a healthy and environmentally friendly breakfast and use these criteria to design a breakfast menu. They will use a decision chart to evaluate their choices.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:
Personal Health

Excellence in EE —Environmental Guidelines for Learning:

Strand 4: Personal and Civic Responsibility:
D. *Accepting Personal Responsibility*

Key Concepts:

1. Food gives us the energy and nutrients our bodies need for growth and development.
2. Students make decisions that affect their personal environment.

Objectives:

Students will:

- plan and evaluate a breakfast that is both healthy and environmentally friendly.
- develop decision making skills by planning a breakfast menu.

Cross-Curricular Connections:

Health

- Determine the nutrition requirements for a healthy breakfast using the Food Pyramid Guide and Food Nutrition Labels.

Language Arts

- Communicate through group discussion.

Mathematics

- Calculate the cost and preparation times of different breakfast foods.
- Weigh and measure food packaging materials.
- Organize and graph the data that is collected.

Social Studies

- Identify how decision making influenced by culture and individual life-styles.

Process Skills:

Problem Solving	Inferring	Predicting
Analyzing	Communicating	Problem Solving

Lesson 1 Activity: Breakfast: Healthy for Me and Healthy for the Environment

Materials:

Per Student

paper and pencil

graph paper, graphing calculator, or computer graphing program

CAUTION !

***SAFETY NOTE** - You may want each student to bring in a breakfast food to serve as a part of his or her group's menu. Determine if any students are allergic to these foods.*

Per Group

Food Pyramid Guide

stopwatch or kitchen timer to use if students actually prepare the breakfast menu

Suggested Time Frame:

Two 50 minute class periods

Procedure:

Session 1

1. Instruct the class in how to use the ***Decisions Based on Science*** process as described in the professional development video.
2. Discuss what is meant by an "environmentally friendly" breakfast.
3. Have groups use the Food Pyramid Guide to brainstorm ideas and plan a healthy breakfast that is also environmentally friendly. Encourage them to consider factors that affect the decision of what to eat for breakfast. These factors may include health benefits, effects on school performance, preparation time, cost, packaging, availability of food items, effect of food production processes on the environment, effect of menu preparation on the environment, food source, quality of taste, and ease of recycling the packaging materials. The Student Record Sheet may be used to record these ideas. The minimum breakfast should include a beverage, grain, fruit, and protein source.
4. Each group should then construct a decision chart based on the factors they included in their decision making.
5. Ask each group to finalize a menu that best meets the criteria they have established.
6. You might assign each group member a specific food item to bring the next day or to research at the grocery store. An option may be to have a grocery store donate food items.

Session 2

1. Ask each group to use importance bars to evaluate its menu. During the evaluation students can weigh and measure the packaging, time (or estimate) how long it takes to prepare the breakfast, determine its cost, and assess the other factors they have listed. They should then reach a final decision about whether the breakfast menu is both healthy for them and for the environment.
2. As a culminating activity, have groups compare their menus during a class discussion.

Suggested Discussion Questions:

Group Brainstorming:

- Is it important to eat breakfast every day?
- How do you feel when you eat breakfast?
- How do you feel when you do not eat breakfast?
- What are some reasons why you skip breakfast?
- What environmental factors could be involved in providing food for your breakfast?
- What life-style factors are involved?

Further Investigations:

- Students may use additional graphic organizers such as charts and graphs to organize the data.
- Students survey classes in the school by grade and 1) calculate the mean number of breakfasts skipped by the students in a week 2) determine the percent of students who eat breakfast at school 3) determine whether one grade level skips more breakfasts than another 4) determine the number of kids who fix their own breakfasts 5) survey the adults in the school and compare their responses to those of the students.
- Students record their breakfast diets for a week and reflect on their choices through journal writing.
- Have the school dietician speak to the class about how she selects what foods to serve the students for breakfast.
- Students research what kids eat for breakfast around the world and/or prepare an international breakfast buffet.
- Monitor TV and magazine food advertisements for healthy vs. junk food that are directed towards the middle school age group. Graph the results. (This activity is adapted from Berglund, 1999.)

Career Opportunities:

Dietician
Chef
Grocery Store Manager
Public Relations Expert
Graphic Design Artist
Nutritionist
Research Scientist

Assessment Procedures:

- Assessment rubrics in ***Decision Making Based on Science*** can be used to assess the decision making process.
- During ongoing assessment observe intercommunication among the group members and note the quality of their questions and explanations.

Additional Resources:

American Dietetic Association
http://www.eatright.org/ (accessed August 20, 2000)

Shape Up America!
http://www.shapeup.org/
http://www.shapeup.org/kitchen/index.htm
(accessed August 20, 2000)

Trends in Teen Nutrition
http://ificinfo.health.org (accessed August 20, 2000)

Berglund, K. (1999, January). Thought for food. ***Science and Children,*** 38 - 42.

Campbell, V., Lofstrom, J., & Jerome, B. (1997). ***Decisions Based on Science.*** Arlington, VA: National Science Teachers' Association.

Vancleave, J. (1999). ***Food and Nutrition for Every Kid.*** New York, NY: John Wiley & Sons

Lesson 1 Activity: Breakfast: Healthy for Me and Healthy for the Environment

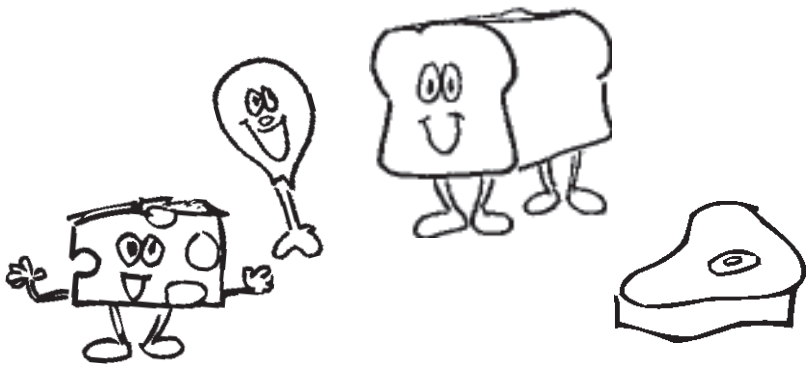
Student Record Sheet
Names of Group Members _____

_____ Date: _____

Directions: Brainstorm factors that make breakfast healthy for you and the environment. Use the Food Pyramid Guide to help with your selections.

Record your ideas in the chart below. Next complete the blank Decision Chart to reach decisions on the following: (a.) whether you should eat breakfast and (b.) if a breakfast that is healthy can also be good for the environment.

Breakfast Factors	Healthy for Me	Healthy for Environment
Cost	+	No effect



BLANK DECISION CHART:

DECISION MATRIX

	Option 1	Option 2
Goal 1		
Goal 2		

YOUR BURGER AND THE WORLD

Lesson 2 Activity: Transforming Food Energy: A Balancing Act

Lesson Overview:

This activity helps students understand their role as consumers. Students use a purchased calorimeter or make their own simple calorimeter to measure the energy content in selected foods. Students estimate their own energy output during different forms of exercise. They learn that during energy transformation, balancing their energy input (from food) with energy output (through exercise) is important to their personal health.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives
Personal Health
Content Standard C: Life Science
Populations and Ecosystems

Excellence in EE — Guidelines for Learning:

Strand 2: Knowledge of Environmental Processes and Systems
2. *Organisms, Populations, and Communities*

Key Concepts:

1. Balancing energy input with energy output is important to our personal health.
2. Humans are consumers in food webs.

Objectives:

Students will

- measure the heat energy in food.
- determine the relationship between energy input and energy output and one's personal health.
- analyze the role of humans in a food web.

Cross- Curricular Connections:

Arts

- Construct graphic organizers, draw cartoons, make a collage, perform a skit, or compose a song.

Health

- Analyze energy input (nutrition) and energy output (exercise).

Language Arts

- Communicate through written and oral expression.

Mathematics

- Measure mass and temperature and determine the relationships between temperature changes and heat energy in foods.
- Organize data and calculate their energy use.

Lesson 2 Activity: Transforming Food Energy: A Balancing Act

Process Skills:

Problem Solving | Inferring | Predicting
Analyzing | Communicating

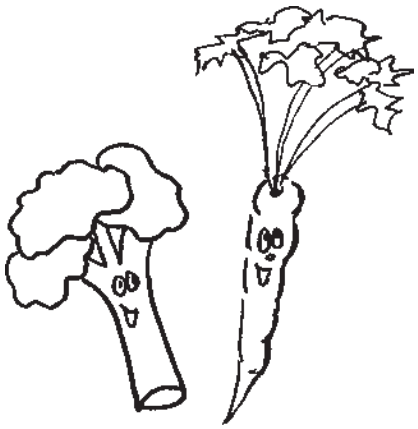
Materials:

Per Student

paper and pencil
graph paper, graphing calculator, or computer graphing program

Per Group

food samples including a marshmallow, a nut such as ½ shelled peanut, almond, ½-shelled pecan (larger sizes may take too long to burn)
balance to determine the mass of food samples
purchased calorimeter or one clean aluminum soft drink can
matches
cork
ring stand and clamp
fireproof pad
thermometer
paper clip
water source
graduated cylinder
watch glass or mortar in which to place food sample
standard safety goggles
table - Calories Burned During Exercise
Record Sheet



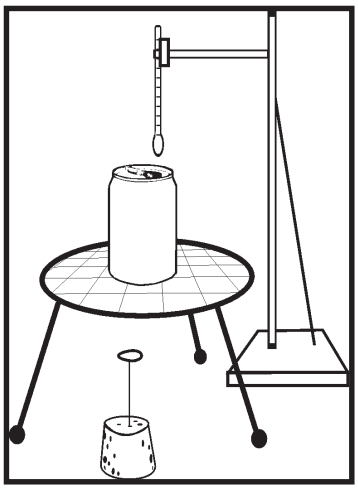
CAUTION !

SAFETY NOTE: **Safety is always a concern in the science lab. Teachers may prefer to demonstrate the use of the calorimeter and assign students the job of reading the thermometer, etc. Accepted safety precautions should be taken when using an open flame, including the use of standard protective eyewear.*

Suggested Time Frame:

Three 50 minute class periods

Procedure:



How to construct a calorimeter.

1. Obtain a clean aluminum soft drink can.
2. Fill the can 1/3 full with water (150 mL).
3. Set the can on a fire pad over a ring stand.
4. Use a ring stand and clamp to suspend a thermometer through the opening of the can. Make sure the thermometer is in the water but does not touch the bottom of the can. The thermometer will measure any changes in the temperature of the water.
5. Straighten out a paper clip. Spear the food to be tested onto one end and stick the other into the cork so that it will fit below the soft drink can as shown.

Session 1

1. Introduce the lesson by engaging students in a discussion of energy needs and food chains.
2. Explain how the calorimeter works and review safety precautions. Set up a calorimeter for a teacher demonstration or have the students set up their individual ones. Have each group weigh the recommended amounts of the foods given and record their measurements in grams on the Record Sheet.
3. Fill the calorimeter with the amount of water (mL) indicated by the manufacturer. Read and record the initial water temperature (°C). Light the food and let each type burn for a maximum of five minutes. During the burning observe any water temperature changes. Record the final water temperature (°C) either after the food has completely burned, or after five minutes, whichever occurs first. Record the burning time in minutes. Calculate the temperature difference between the initial and final temperature of the water and record this as change in heat energy. Each group should use a graphic organizer to record the process.
4. Have each group present its data to the class for class discussion.
5. Assign the Record Sheet, *My Energy Output* for homework. Students are to keep a lunch diary and record their physical activity that occurs over a few days or a week depending on the amount of time available.
6. Ask students to calculate their own energy output as a number of calories per hour that they use during an activity listed in the chart. Some students may be sensitive about their weight and consequently you may choose not to discuss this personal information in class.

Session 2

1. Have students construct a visual representation that illustrates a food chain of which they are a part. These might include flow diagrams, scale diagrams, tree and web diagrams, bird's eye views, or maps.
2. Direct a class discussion of student findings and interpretations to arrive at a conclusion about the energy relationships among members of a food chain.

Suggested Discussion Questions:

Session 1

- Have you ever thought of yourself as a consumer in a food chain?
- Does eating consume energy or produce energy?
- How do you obtain energy and then transform it?
- What trophic level of the food chain are you on?
- Does your energy input balance with your energy output?
- How does eating lower on the food chain compare with eating higher on the food chain?

Session 3

- Where are you on the food chain?
- Do you eat high or low on the food chain?
- How does your trophic level affect the energy transfer through an ecosystem?
- Are you balancing energy input with energy output? If you are, what are the benefits? If you are not, what are the consequences?
- Do you think your current eating and exercise patterns will affect your health as an adult?

Further Investigations:

- Have the students write a short story or make a collage of their life as they picture it in 10 years. They are to include their predictions about their health as a result of their diet and exercise now. They should make connections between their present health and their career or life-style in the future.

Career Opportunities:

Exercise Physiologist
Nutritionist
Dietician
Home Economist
Farmer
Rancher

Assessment Procedures:

- The graphic organizers used for the calorimetric data can be evaluated.
- Assessment of measuring and other lab skills is ongoing.
- Visual representation, record sheets, short story or collage should be evaluated.

Additional Resources:

American Council on Exercise
http://www.acefitness.org
(accessed August 20, 2000)

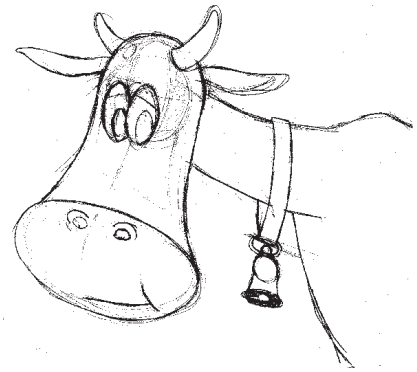
American Council on Kids Health
http://kidshealth.org
(accessed August 20, 2000)

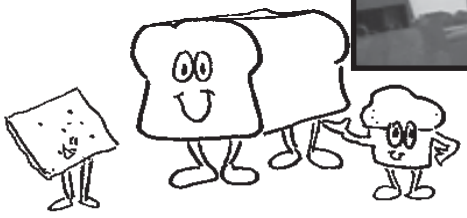
American Heart Association
http://www.americanheart.org
(accessed August 20, 2000)

Campbell, V., Lofstrom, J. & Jerome, B. (1997). ***Decisions Based on Science.*** Arlington, VA: National Science Teachers' Association.

Clark, N. (1997). ***Nancy Clark's Sports Nutrition Guidebook***. Brookline, MA: Human Kinetics.

O'Shea, M. (1998). Parade's Guide to Better Fitness. ***Parade Magazine***, Sept. 27, 1998.





Lesson 2 Activity: Transforming Food Energy: A Balancing Act

Caution! Wear protective eyewear.
Use care around an open flame. Follow the manufacturer's warning when using the calorimeter.

Record Sheet
Names of Group Members _____

_____ Date: _____

The engine of an automobile produces the energy needed to make the car move by combining the selected fuel with oxygen. You may have heard food called a fuel because it provides energy for your body. Does your body burn fuel like an automobile? When a fuel is burned it gives off some of its energy in the form of heat. Does the food you eat give off heat, too?

A calorimeter is an instrument used to measure the energy or heat contained in foods. In this activity you will compare the heat energy in different foods using the calorimeter your teacher provides or one you construct yourself.

1. As you heat the food, what do you predict will happen to the temperature of the water? Why?

   _____

   _____

2. Does a calorimeter measure the energy in food directly or indirectly?
   Explain your answer. _____

   _____

3. Design and carry out an experiment using the calorimeter to show that food contains energy.
   a. Select two foods to be tested from those your teacher has provided. What **problem** will you investigate?
   b. Form a **hypothesis** about the foods you will test and the problem identified in "a."
   c. How will you use the thermometer to record the amount of energy in the food sample?
   d. Record the **Initial Water Temperature**.
   e. Follow the safety instructions and directions your teacher has given you. Light the food and record the time it takes to burn for up to 5 minutes. Record the **Final Water Temperature** at the instant the food finishes burning or at 5 minutes, whichever comes first. Record the **burning time** in minutes. What caused the change in temperature of the water?
   f. Construct a data table that records the data you have gathered: 1) **Type of Food** 2) **Mass** of food in grams 3) **Initial Water Temperature** in degrees Celsius 4) **Final Water Temperature** in degrees Celsius 5) **Burning Time** in minutes
   g. Complete the data table.
   h. Analyze the data and draw conclusions. Did your data support your hypothesis? Share your conclusions with the class.

Lesson 2 Activity: Transforming Food Energy: A Balancing Act

Problem: _____

Hypothesis: _____

Data Table:

FOOD		TEMPERATURE			TIME
Type	Mass(g)	Initial T ºC	Final T ºC	Change ºC	Min.

Analysis: _____

_____

_____

_____

_____

Conclusion: _____

_____

_____

_____

Food energy input and energy output: It's a balancing act.
Record Sheet
Name _____ Date _____

Arctic explorers must understand how exercise and diet work together to help the body balance energy input and energy output, as they burn between 4,000 - 6,000 calories per day in order to meet their minimum energy needs. That means that they have to eat more than two pounds of food per day! They must choose an endurance diet because they use so many calories; but the calories must be released slowly from the food instead of in a quick burst or they will run out of energy.

What about your energy needs? How many calories do you need when you play soccer, hang out with your friends, or take a test? What about clicking the TV changer or taking a nap? How do diet and exercise affect your ability to perform each day? What happens when your energy input and your energy output are not balanced? What if energy input is greater than energy output or vice versa?

You are a consumer in a food chain which means that you transform energy just as the other organisms do. As energy moves up the food chain from organism to organism, almost 90% of it is lost as heat to the environment at each level. That means only 10% is available to be used by the organisms at the feeding level above them. When you eat food, where does the 90% go? For example, only 10% of the energy in an apple is usable energy for you. In this activity, you will find out how many calories you burn during a particular activity. The number of calories you need and how long you need them can help you decide what foods will best provide those calories for you.

Directions:
In this activity, you will estimate how many calories you burn during certain types of exercise.
1. First, estimate your body weight.
2. Select 4 activities from the list in Table 1, *Calories Burned During Exercise*
3. Calculate the number of calories per hour that you burn during each activity you selected.
4. Record your results on the Record Sheet.
5. Construct a graphic organizer to display your results.
6. Write a comparison of the energy you burn during the activities

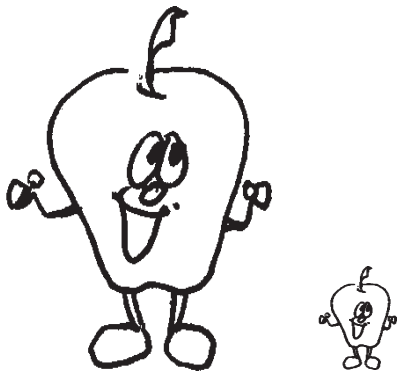


Table 1 Estimated Calories Burned During Exercise

This information represents the number of calories burned at a comfortable pace. If you push yourself harder, you should add more calories.

Activity	Calories per hour per pound of body weight
Badminton	2.6
Bicycling, 10 m.p.h.	2.7
Dancing, modern	1.6
Golf, walking	2.3
Hiking, hilly	3.6
Horseback riding, trot	2.8
Jogging, 6 m.p.h.	4.2
Skating, ice	2.6
Skiing, cross-country	3.7
Skiing, downhill	2.6
Swimming, slow crawl	3.5
Soccer	3.7
Tennis, singles	2.9
Tennis, doubles	1.8
Volleyball	2.2
Walking, 3.5 m.p.h.	2.4
Water Skiing	3.0
Weight training	1.9

Adapted from Clark, Nancy, 1990, ***Nancy Clark's Sports Nutrition Guidebook*** (Windsor, Ont: Human Kinetics)

Calculation of number of calories per hour that you burn during the activity.

My Energy Output			
Activity	**Calories** per hour per pound of body weight	**Total Calories** burned by me in one hour	**Total Calories** burned by me during the entire activity

A Zoo View

ACTIVITY GUIDE

A ZOO VIEW

Background Information

Since 2300 B.C.E. man has kept wild animals in captivity. The number, size and types of exotic animals held in early menageries (collections) represented the wealth and power of the "owners," who were usually royalty. Animals were often exchanged as gifts from one ruler to another to solidify alliances.

According to Linda Koebner in her book, ***Zoo Book: The Evolution of Conservation Centers,*** zoos have moved through many evolutionary stages, from menageries, to zoological parks, to conservation centers. Where are today's zoos on this evolutionary track? Unfortunately, there are still remnants of "collections." For example, animals can still be found in cages at roadside tourist stops purely for the amusement of travelers and as a commercial venture.

Only 10% of the 1400 zoos in North America are accredited by the American Zoo and Aquarium Association (AZA). The AZA enforces strict rules for the care and treatment of animals and periodically sends inspectors to assess compliance with these rules. Animal rights groups also monitor both accredited and nonaccredited zoos to make sure animals are not being mistreated.

Many animal rights and conservation groups advocate the purchase of natural habitat to be placed into conservation so that animals may remain in the wild. Some zoos are beginning to incorporate similar missions in their strategic plans.

So why do we need zoos? Many of the endangered species found in zoos are from habitats that are in decline. In fact, some endangered species are found only in zoos. Reintroducing them into the wild is difficult, if not impossible because of disease, pressure on the habitats, and/or poaching (illegal hunting). Zoos allow people to see animals they may never have an opportunity to see in the wild. Zoos also offer educational programs and information to help visitors better understand the needs of the animals.

Some of the issues addressed by today's zoo are described below:

Environmental Enrichment is an attempt to provide humane ways to keep animals in captivity. The complexity of animals' physical, social, and psychological lives in the wild has led both zookeepers and the zoo-going public to call for higher environmental standards for animals in captivity.

Environmental enrichment practices can be very complex (artificial, fleeing-prey devices for leopards) or very simple (providing dirt burrows for prairie dogs). A simple structure such as a tree stump for bears to scratch their backs on can provide a more natural environment for the animals, allowing them to exert some control over their environment. This can result in healthier, more relaxed animals that can successfully breed. While environmental enrichment may be helpful, it can never take the place of the animals' natural habitats. Environmental enrichment can, however help prevent stereotyped behavior problems, common in captive animals. For example an elephant may rock and swing for hours, bears may pace; monkeys stare, and rhinos circle. Both bar-biting and rail-sucking are also common with bears and giraffes. It is suggested that some stereotyped behavior problems are caused by boredom, loneliness, frustration, stress and habitat deprivation.

Naturalistic Upgrading is used to improve an animal's captive habitat and make it more like its natural environment. Some zoos have not used natural elements at all; their exhibits are constructed with plastic and other synthetic materials that are strictly design features intended for the benefit of the viewer. However, some zoos have made impressive strides in upgrading their animals' environments. Two excellent examples are Zoo Atlanta and the Roger Williams Park in Providence R.I. Both have proved that it is possible to enrich the animals' space with little money and lots of creativity.

Science meets Mother Nature in **Captive Breeding** programs. Tissue, sperm, eggs and embryos of the world's most endangered species are stored in protective cryogenics freezers. Species survival plans are developed and implemented to match captive animals for mating and also contribute to a healthy gene pool. There is much debate over the success of captive breeding programs. While many scientists think these high tech programs are the best way to help endangered species survive, others think that they can't be saved with captive breeding alone. Many zoo scientists are also concerned that a number of key species are being left out of the program.

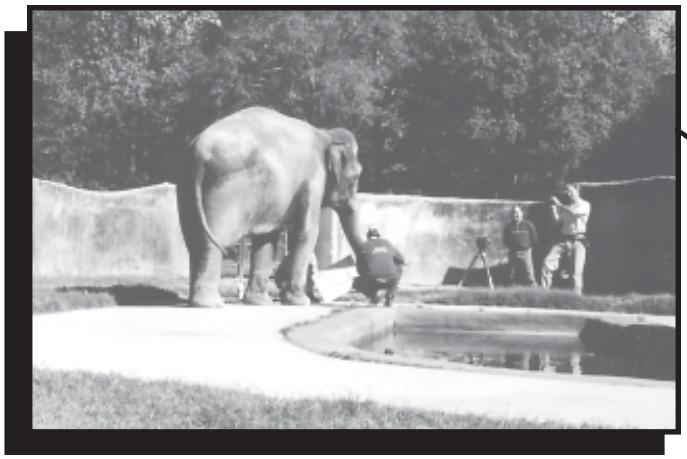
Some zoos, such as the Bronx Zoo's Wildlife Conservation Society (WCS), are implementing **Habitat Conservation** efforts for wild species. The WCS' strategies include gathering the field research necessary to devise long-term conservation plans, opening wildlife parks and reserves, and training local scientists to work in their own countries. Some key zoo leaders believe that habitat conservation should be the mission of zoos. Terry Maple, Director of Zoo Atlanta says conservation plans "...allow us to save the wild. We just flat aren't going to save these animals in zoos..."

Many zoos have made **Species Reintroduction** efforts a part of their mission. Reintroduction is expensive and it is not known how a captive species will adapt in the wild until it has been released. Will it know how to hunt? Hide from predators? Build a home? Mate? Socialize? Forage? Navigate? How much of its habitat is left? Are the forces that drove this animal out still at work? Has the local public been educated about the animals? Ben Beck of The National Zoo has done extensive research on this topic. In his study, "Reintroduction of Captive-Born Animals" in ***Creative Conservation: Interactive Management of Wild and Captive Animals***, he found that of 145 reintroduction schemes involving 126 different species (13 million captive-born individuals total) throughout the world since 1900, only 16 have succeeded.

A more in-depth description of these and other concerns can be found in Vicki Croke's book ***The Modern Ark: The Story of Zoos; Past, Present, and Future***.

What does the future hold for animals in zoos? The work of the Bronx Zoo's WCS is an excellent example of the direction a zoo can follow along its evolutionary track. But not all zoos have the kind of funding that the WCS enjoys. Lack of funding is a crucial problem facing zoos today and will continue to be in the future as most depend upon admission fees, private donations and various grants to exist. Can zoos survive or will they too become an endangered species?

Students can help shape the future of zoos. By keeping the issues that were defined and discussed above in mind while visiting zoos and conservation parks, students can be proactive and encourage these facilities to make improvements for the animals. Becoming involved in education efforts and junior keeper programs offered by many zoos can empower students and help implement some of these improvements.



A ZOO VIEW

Lesson 1 Activity: "Home Sweet Home?"

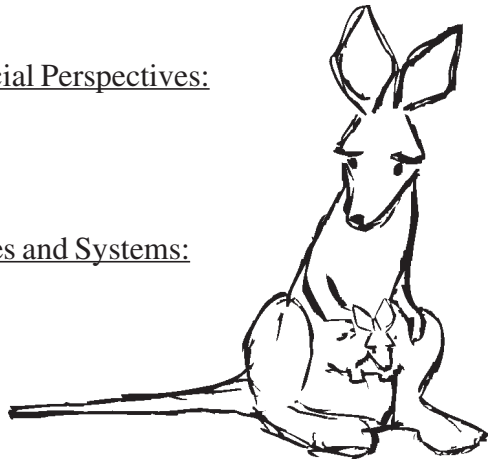
Lesson Overview:

Students must decide if it is better for an endangered animal to remain in a zoo or be released back into its native habitat.

National Science Education Standards:

Content Standard C: Life Science:
Structure and Function of Living Systems
Reproduction and Heredity
Regulation and Behavior
Populations and Ecosystems
Diversity and Adaptations of Organisms

Content Standard F: Science in Personal and Social Perspectives:
Populations, Resources, and Environments



Excellence in EE—Guidelines for Learning:

Strand 2: Knowledge of Environmental Processes and Systems:
2.2: *The Living Environment*
2.3: *Humans and Their Societies*
2.4: *Environment and Society*

Key Concepts:

1. Animals have habitat needs and pressures.
2. Conservation practices are necessary for endangered species to survive.
3. Environmental enrichment is an attempt to provide humane ways to keep animals in captivity.

Objectives:

Students will:

- determine the benefit of keeping animals in zoos or reintroducing them to their natural habitat.
- understand the complexity of endangered species and zoo issues.
- research and draw conclusions based on their research.

Lesson 1 Activity: "Home Sweet Home?"

Cross-Curricular Connections:

Language Arts:

- Write an essay, song, or letter to the editor based on their research.

Mathematics:

- Record natural habitat needs of endangered species in square miles or acres and compare with space in the zoo.

Science:

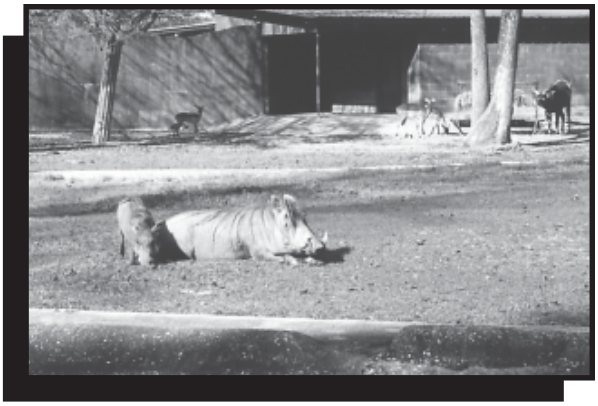
- Research habitat needs of endangered animals.

Social Studies:

- Investigate human impacts to endangered species' natural habitat.

Process Skills:

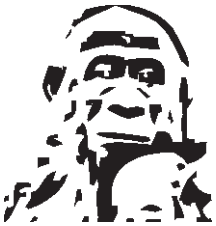
Analyzing	Communicating	Comparing
Inferring	Problem-solving	Researching



Materials:

Per Group

Decision Chart
Internet
Encyclopedia
Animal reference books



Suggested Time Frame:

Three 50 minute class periods:

1. introduction to lesson and background discussion;
2. research and data recording;
3. drawing conclusions.

Lesson 1 Activity: "Home Sweet Home?"

Procedure:

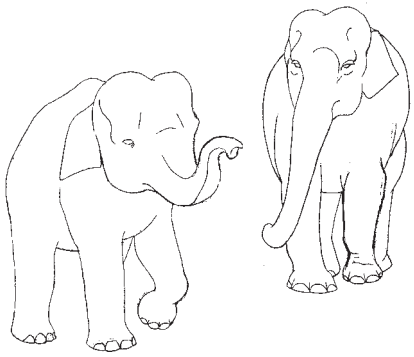
Either individually or in cooperative groups, have the students do the following:

1. Choose an endangered animal that is found in North American zoos and aquariums. Examples: Asian tiger, Asian or African elephant, Orca whale, Mountain gorilla, Polar bear, Florida panther, Black rhino, California condor, Kemps Ridley Sea Turtle, American Burying Beetle, or any other animal the student may be interested in researching.

2. Research the animal's natural habitat needs (amount of territory in square miles or acres, food source, place in the food web, water source, cover for safety, place in the ecological biodiversity of the environment, the role it plays within the ecosystem).

3. Investigate the SURVIVAL problems encountered by the animal in its natural habitat. Is there development pressure, such as the building of suburban houses? Is there pressure on the natural resources of the habitat, such as deforestation? Is there enough space for the species to survive based on its needs. Is there poaching (illegal hunting) of this animal in its territory? Are there or have there been diseases affecting the health of the animals in the area? Is the birth rate stable enough to continue the population or is there high infant mortality?

4. Research the animal's zoo life. What are the benefits the animals receive in a zoo? Research the amount of care given to the animal at an AZA-accredited zoo. Does the animal get regular veterinary care? Does it have a naturalistic habitat in the zoo? Are there successful mating programs at the zoo for this species? Is the animal provided environmental enrichment activities? Is the animal protected from being sold to buyers? Is the animal taken care of even if it is considered surplus, or is it destroyed?



5. Research some existing programs for reintroduction of endangered species into their native habitat. Determine what made some reintroductions, like the Arabian oryxes, successful and what made some failures, as in the case of orangutans. Suggested resources include: Ben Beck's study, "Reintroduction of Captive-Born Animals" in ***Creative Conservation: Interactive Management of Wild and Captive Animals, The Modern Ark*** by Vicki Croke and ***Zoo Book: the Evolution of Wildlife Conservation Centers*** by Linda Koebner.

6. Using the Decisions Chart, list the pros and cons for selected species to live in a zoo versus its natural habitat.

7. Write an essay, a song or a letter to the editor describing which home would be better for selected species, the zoo or the natural habitat, based on the Decisions Chart. Students must substantiate their choice with information based on their research.

Lesson 1 Activity: "Home Sweet Home?"

Suggested Discussion Questions:

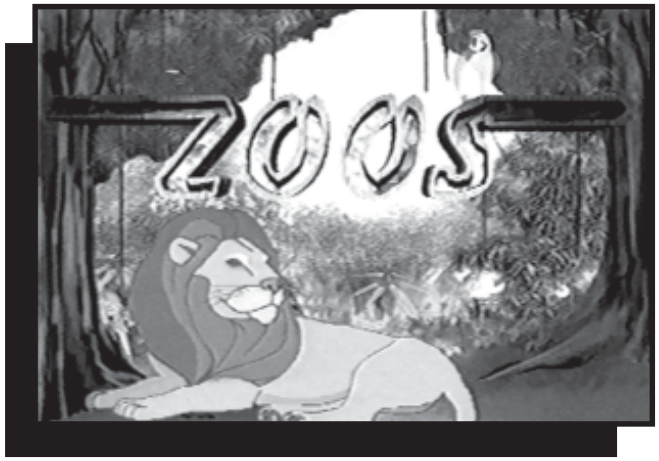
- What are some solutions to habitat loss? Are zoos part of the solution?
- Are there particular regions of the world with more habitat loss than others? Explain.
- Does the decision to keep animals in zoos have any benefits to humans?
- Does the decision to conserve natural habitat have any benefits to humans?

Further Investigations:

- Propose ways to help conserve and protect native habitat for endangered species.
- Think about your own habitat. Record how much space you use for your home, school, shopping, and for recreation.
- Confine yourself to your house and school for a certain period of time (a day, two days, a week.) How does this affect the way you feel, your behavior, and your activities?
- Investigate endangered and threatened plants of the world and list the benefits that humans will lose (medicinal, clean air) if these plants become extinct.

Career Opportunities:

Zoologist
Biologist
Environmental scientist
Land manager
Real estate agent
Statistician
Junior zoo keeper.



Assessment Procedures:

- Use Decision Chart for assessment.
- Student essays.
- Participation in class discussions.

Lesson 1 Activity: "Home Sweet Home?"

Name: _____

_____ Date: _____

DECISION CHART:

SPECIES NAME:			
Zoo		**Natural Habitat**	
Pro	**Con**	**Pro**	**Con**

DECISION CHART	Option A: Satellite Zoos	Option B: Preserve Habitat
Goal: Provide greatest benefit to endangered species		
	•more accessible to visitors for education	• not many successfully bred in captivity
	•breeding program helps maintain genetic diversity	•not many bred are returned to wild
	•unavailability of suitable habitat	•own environment meets physical, psychological, social and behavioral needs
		•habitat conservation good for preserving biodiversity and ecological connections

Additional Resources:

American Zoo and Aquarium Association
http://www.aza.org (accessed August 20, 2000)

Born Free Foundation
http://www.bornfree.org.uk
(accessed August 20, 2000)

The San Diego Zoo
http://www.sandiegozoo.org/
(accessed August 20, 2000)

Wildlife Conservation Society
(Conservation arm of Bronx Zoo).
http://www.wcs.org/
(accessed August 20, 2000)

Bostock, Stephen. (1993). ***Zoos and Animal Rights: The Ethics of Keeping Animals.*** London and New York: Rutledge.

Croke, Vicki. (1997). ***The Modern Ark.*** New York: Scribner Pub.

Koebner, Linda. (1994). ***Zoo Book: The Evolution of Wildlife Conservation Centers.*** New York: Tom Doherty Associates, Inc.

A ZOO VIEW

Lesson 2 Activity: Who's Watching The Zoo?

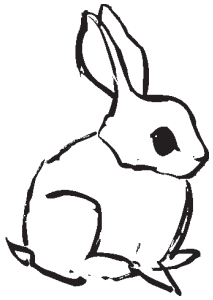
Lesson Overview:

After watching the accompanying video, "A Zoo View" students will research and investigate a zoo to determine how well the zoo takes care of its animals.

National Science Education Standards:

Content Standard C: Life Science
Structure and Function of Living Systems
Reproduction and Heredity
Regulation and Behavior
Populations and Ecosystems
Diversity and Adaptations of Organisms

Content Standard F: Science in Personal and Social Perspectives
Populations, Resources, and Environments



Excellence in EE—Guidelines for Learning:

Strand 2: Knowledge of Environmental Processes and Systems
2.2: *The Living Environment*
2.3: *Humans and Their Societies*
2.4: *Environment and Society*

Key Concepts:

1. It is important to protect endangered species.
2. Zoo architecture specializes in design of naturalistic habitats for captive animals.
3. Observing the behavior of animals can provide information about their health and well being.

Objectives:

Students will:

- determine the needs of animals in zoos.
- determine if the needs of animals in zoos are being met.
- rate the performance of zoos based on an assessment of how the zoo is meeting the animals' needs.

Lesson 2 Activity: Who's Watching The Zoo?

Cross Curricular Connections:

Language Arts
- Transcribe interviewee responses and keep journals.

Science
- Investigate the well-being of animals in a zoo based on habitat and health.

Social studies
- Interview zoo keepers and interpret responses using a qualitative rating scale.

Processes and Skills:

Cooperating	Communicating	Comparing
Evaluating	Observing	Researching

Materials:

per group
Zoo Review Sheet
Zoo Scale
Internet access
Pad
Pencil

Suggested Time Frame:

Four 50 minute class periods
1. One class period to introduce topic and lesson.
2. One field trip to a local zoo if possible. One class period for research and working in groups.
3. One class period for analyzing data and rating.
4. One class period for discussion.

Procedure:

Have the cooperative groups do the following:
1. Visit a local zoo and interview a zoo keeper or educator using the Zoo Review Sheet.
2. If a field trip is not possible, ask a local zoo keeper to visit the class, or use the internet and email the questions to a zoo.
3. Using the answers to the questions, rate the zoo on the Zoo Scale. While some zoos may answer with an Above Average rating for one question, they may answer with an Average or Below Average rating on other questions. The group must decide the overall rating of the zoo based on what they think is most important for the animals.

Zoo Review Sheet

1. What is the main purpose(s) of the zoo?

2. How many threatened or endangered species does the zoo hold?

3. Has the zoo sold or given animals to any of the following types of organizations in the past two years? circuses, research institutes, animal dealers?

4. Has the zoo destroyed any animals other than for reasons of ill health in the past two years?

5. Does the zoo keep its animals in naturalistic environments that encourage a wide range of natural behaviors?

6. Do any of the animals display unnatural behavior such as pacing, rocking back and forth, biting the bars, or self-destructive acts?

7. Does the zoo employ a veterinarian?

NOTE: *You can use these same questions to rate an aquarium.*

Zoo Review and Scale

Definitions:

Rate the zoos based on this scale: **+** means above average (at the top of the zoo evolution chart with no major need for improvements), ✓ means average (it is in the middle of the evolution chart and needs some improvements), and **-** means below average (it is at the bottom of the evolution chart and should be shut down or completely overhauled). Circle one answer per question.

Answers:

1. **+**: Education, conservation, protection of endangered species
   ✓: one of the above only
   -: none of the above

2. **+**: several different species
   ✓: only one or two species
   -: none

3. **+**: no, or only other AZA accredited zoos
   ✓: research institutes
   -: circuses and animal dealers

4. +: none
✓: a few
-: many

5. +: all species have naturalistic environments
✓: only some species have naturalistic environments and others are confined to cages
-: all animals are in cages

6. +: no
✓: some
-: many

7. +: yes, on staff
✓: only in emergencies
-: no

COMMENTS:

_____
_____
_____
_____
_____

ZOO RATING SCALE

AZA Accredited*	Non-AZA Accredited*	Roadside Attractions
Above average (+)	Average (✓)	Below Average (-)

*American Zoo and Aquarium Association

NOTE: *These questions are adapted from ZooCheck created by the Born Free Foundation and are in agreement with the AZA's Code of Professional Ethics used for accreditation. Components of this Code are: the zoo demonstrates appropriate level of care, keeps records on animals' health, employs veterinarian care, implements education/conservation programs, provides security, and designs exhibits with aesthetic values.*

Lesson 2 Activity: Who's Watching The Zoo?

SUGGESTED DISCUSSION QUESTIONS:

- What was the best habitat design for a particular animal in the zoo?
- What were some of the zoo's features that made you rate it as you did?
- Was there evidence that the zoo is using best practices for animals?

FURTHER INVESTIGATIONS:

- Design a zoo habitat for your favorite animal.
- Research and report on the debate between animal rights groups and zoos and aquariums.

CAREER OPPORTUNITIES:

Zoologist
Biologist
Zoo keeper
Environmental scientist
Zoo architect
Journalist
Junior zoo keeper

Image courtesy of Zoo Atlanta.

ASSESSMENT PROCEDURES

- Use interview transcriptions.
- Have students do reflections in journals while at the zoo.
- Use the groups' Zoo Review Sheet and rating scale.
- Participation in class discussion.

Additional Resources:

American Zoo and Aquarium Association
http://www.aza.org (accessed August 20, 2000)

Cincinnati Zoo and Botanical Garden
http://www.cincyzoo.org/
(accessed August 20, 2000)

The San Diego Zoo
http://www.sandiegozoo.org/
(accessed August 20, 2000)

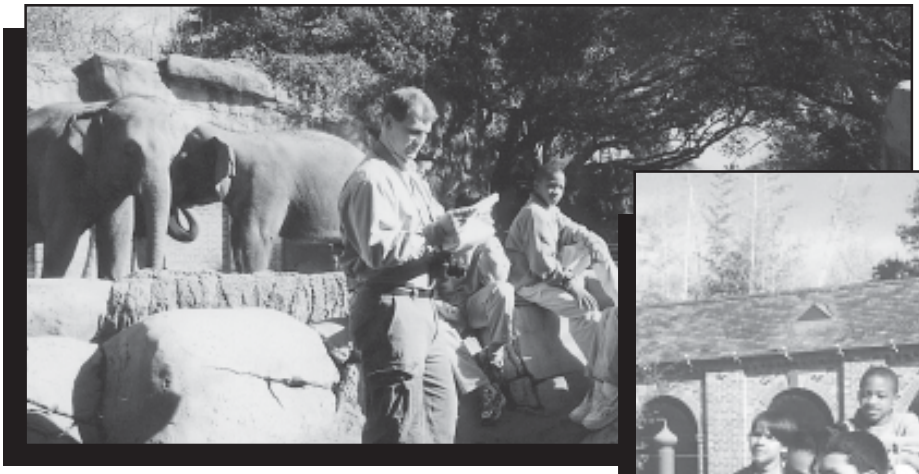
Wildlife Conservation Society
(Conservation arm of Bronx Zoo).
http://www.wcs.org/ (accessed August 20, 2000)

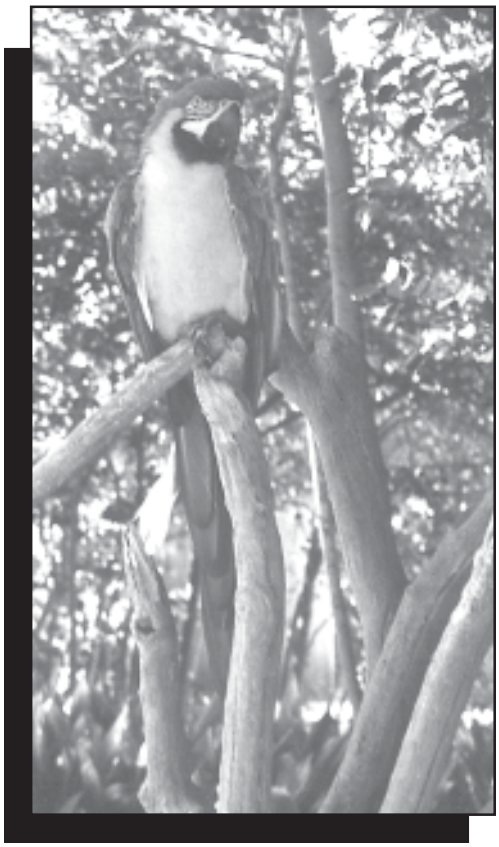
Bostock, Stephen. (1993). ***Zoos and Animal Rights: The Ethics of Keeping Animals.*** London and New York: Rutledge.

Croke, Vicki. (1997). ***The Modern Ark.*** New York: Scribner Pub.

Maple, Terry, and Archibald, Ericka. 1993. ***Zooman: Inside the Zoo Revolution.*** Marietta, GA: Longstreet Press.

Lesson 2 Activity: Who's Watching The Zoo?





Extreme Weather

ACTIVITY GUIDE

EXTREME WEATHER

Background Information

16,367 DEAD / 45.2 BILLION DOLLARS IN DAMAGE
WEATHER
What YOU Can Do About It
Cover: Life Magazine, August 1998

One of the ways we characterize our environment is by describing the weather or climate. Weather is the term that refers to the conditions of the atmosphere that we experience each day, while climate is the average of the day-to-day weather conditions over a long period of time. For example, using the terms arctic environment, temperate environment, or tropical environment gives us an idea as to the weather and general climate of a given area. When examining a particular environment we tend to look at averages such as annual precipitation, average temperatures, and average wind speed and direction. What we miss sometimes are the extremes. The extremes occur infrequently and may not affect the average very much. For example, a particular city's average rainfall may be 50 inches per year, but one storm could drop 15 inches of rain and flood the city. When averaged over a ten or twenty year period, this unusual occurrence may not stand out. What we want to look at are extremes of weather or certain severe weather phenomena.

Climates in the U.S. include low desert, high desert, subtropics, tundra, and temperate zones. Blizzards, tornadoes, hurricanes, droughts, and flooding can occur in many locations, but these types of severe weather are more common in some areas than others. Even Death Valley, California, occasionally experiences flooding and in Miami, Florida, residents have experienced heavy snow. In 1997, flooding along the Red River heavily damaged North Dakota communities that hadn't experienced such high water since they had been built. These unusual weather occurrences are labeled "50 year or 100 year events." Such a designation doesn't mean that unusual events will come along every 50 years; it means that statistically, an event would be expected to occur only once in every 50 years. For example, an event could happen twice in a decade—then 90 years could possibly pass before it happens again.

Because weather is so important to our lives, governments around the world spend considerable effort and money to monitor it. The collected data, gathered by thousands of weather stations around the globe, are placed in huge databases and used in a variety of ways. For example, a weather broadcaster would use these data when announcing that this was the hottest July 4th in the community since 1957. Meteorologists can estimate weather conditions on a given day and discover whether it rained under similar conditions in previous years. They can also use the data to produce climate models that provide better long-range forecasts.

EXTREME WEATHER

Lesson 1 Activity: Severe Weather - Deciding Where to Live

Lesson Overview:

In this exercise students will recognize the variety and frequency of severe weather occurrences. Students will research the type of severe weather that may occur in their area as well as determine the frequency of occurrence. The students will put themselves into the role of a farmer who has to make a decision based upon scientific data.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:

Natural Hazards

Risks and Benefits

Excellence in EE—Guidelines for Learning

Strand 2: Knowledge of Environmental Processes and Systems:

2. The Earth as a Physical System

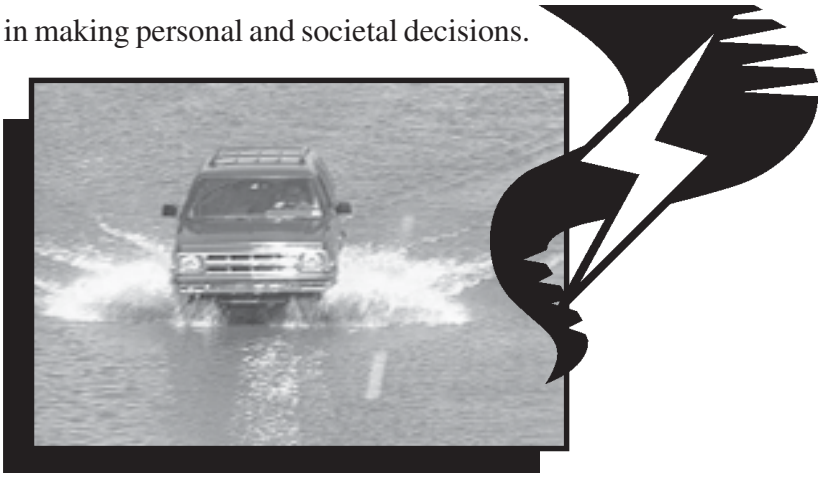
Key Concepts:

1. There is a variety of severe weather.
2. It is necessary to plan for severe weather.
3. Personal and societal decisions are made based upon an understanding and probability of severe weather.

Objectives:

Students will:

- recognize the range and variety of severe weather.
- plan for severe weather conditions that students may experience on an immediate and long-term scale.
- use climate information in making personal and societal decisions.



Lesson 1 Activity: Severe Weather - Deciding Where to Live

Cross-Curricular Connections:

Economics:
- Estimate the cost of severe weather such as the damage after a hurricane.

Mathematics
- Calculate percentages and the probability of encountering severe weather.

Science:
- Communicate the need to understand climate and predict weather.

Sociology:
- Analyze peoples choices to live in areas vulnerable to severe weather.

Process Skills:

Classifying Predicting
Investigating Interpreting

Materials:

Per Group or Per Student

Decision Chart
Sources of weather information about your area such as almanacs, newspapers, or Internet sites.

Suggested Time Frame:

One 50 minute class period

Procedure:

1. Have the students play the role of a farmer who is preparing to purchase land for a new farm. Inform them that they have found fertile and affordable land near the cities listed on the worksheet (page 64). Since severe weather is especially tough on crops and livestock, they need to choose a location that poses the least weather danger to their investment.
2. Students complete the worksheet that includes information on severe weather.
3. Students determine the weather factors in their community by using the Internet, local newspapers, television stations or other resources.
4. If there are other weather data that students would like to consider in locating their farm, extend the worksheet to include their suggestions. (Other potential benefits and risks of building a farm in these locations can also be included.)
5. Based on the data, students should decide which location will be best for their new farm.
6. Have students select other locations for further comparisons.

Lesson 1 Activity: Severe Weather - Deciding Where to Live

Worksheet: Severe Weather Comparisons

	Tornadoes/yr.	Hurricanes/yr.	Blizzards/yr.	Floods/yr.
Fargo, ND	0	0	2	0.4
Charleston, SC	1	0.2	0	4
Tulsa, OK	44.2	0	0	1
Your Home Town				

Suggested Discussion Questions:

- How much freshwater should you have on hand for emergencies such as the aftermath of severe weather?
- Approximately how long can food stay in a freezer before it starts to spoil?
- How would you cook food if your home appliances were not working?
- How would you let others (family or friends) know that you are OK or that you need their help?
- Do you have a list of medications family members need? Likewise, are the family's important papers in a fire and waterproof box?
- Are there elderly or infirm people in your neighborhood that need assistance?

Further Investigations:

Preparedness = Survival

Being prepared for severe weather will greatly enhance the safety of you and your family. Anticipate and think through conditions that may occur when severe weather strikes.

- What are the immediate precautions you need to take?
- How do you stay informed about the weather, especially if there is no electricity?
- How will you survive after the severe weather?

Consider each of these questions and research the answers for each type of severe weather mentioned in the table above. Create your own severe weather brochure that can be sent home to parents.

Severe Weather Slogan

Most everyone is familiar with slogans such as "Stop Drop and Roll" or "Just Say No!" These slogans are very helpful because they preprogram a decision to be made quickly. Military personal, police officers, and firefighters often encounter dangerous situations in which quick decision-making is crucial. They often indicate that they relied on their training. Do you think a familiar slogan like those mentioned above would improve someone's survivability of a severe storm?

Storms Affect History

Research how storms have affected history; for example, how the Russian winter impacted the defeat of Napoleon.

Lesson 1 Activity: Severe Weather - Deciding Where to Live

Careers Opportunities:

District Planner
Meteorologist
Hydrologist
Federal Emergency Management Agency (FEMA) Disaster Specialist
Media Specialist

Assessment Procedures:

- The completed worksheet should be evaluated.
- Use a rubric to evaluate the student's choice of farm locations.
- Have the students develop and present a personal plan for the type of severe weather that they may encounter. This should include long term and immediate action. Plan what can be done ahead of time to prepare and what to do when severe weather strikes.

Additional Resources:

Smith, S. P. & Ford, B. A. (1994). ***Project Earth Science: Meteorology***. Arlington, VA: National Science Teachers Association

Lyons, W.A. (1997). ***The Handy Weather Answer Book*** ™ Detroit, MI: Visible Ink Press

National Center for Atmospheric Research
Information and Education Outreach Program
P.O. Box 3000
Boulder, CO 80307-3000
Phone: (303) 497-8600
Internet site: http://www.ncar.ucar.edu/

NOAA
http://www.noaa.gov/
National Climatic Data Center
http://www.ncdc.noaa.gov
(accessed August 20, 2000)

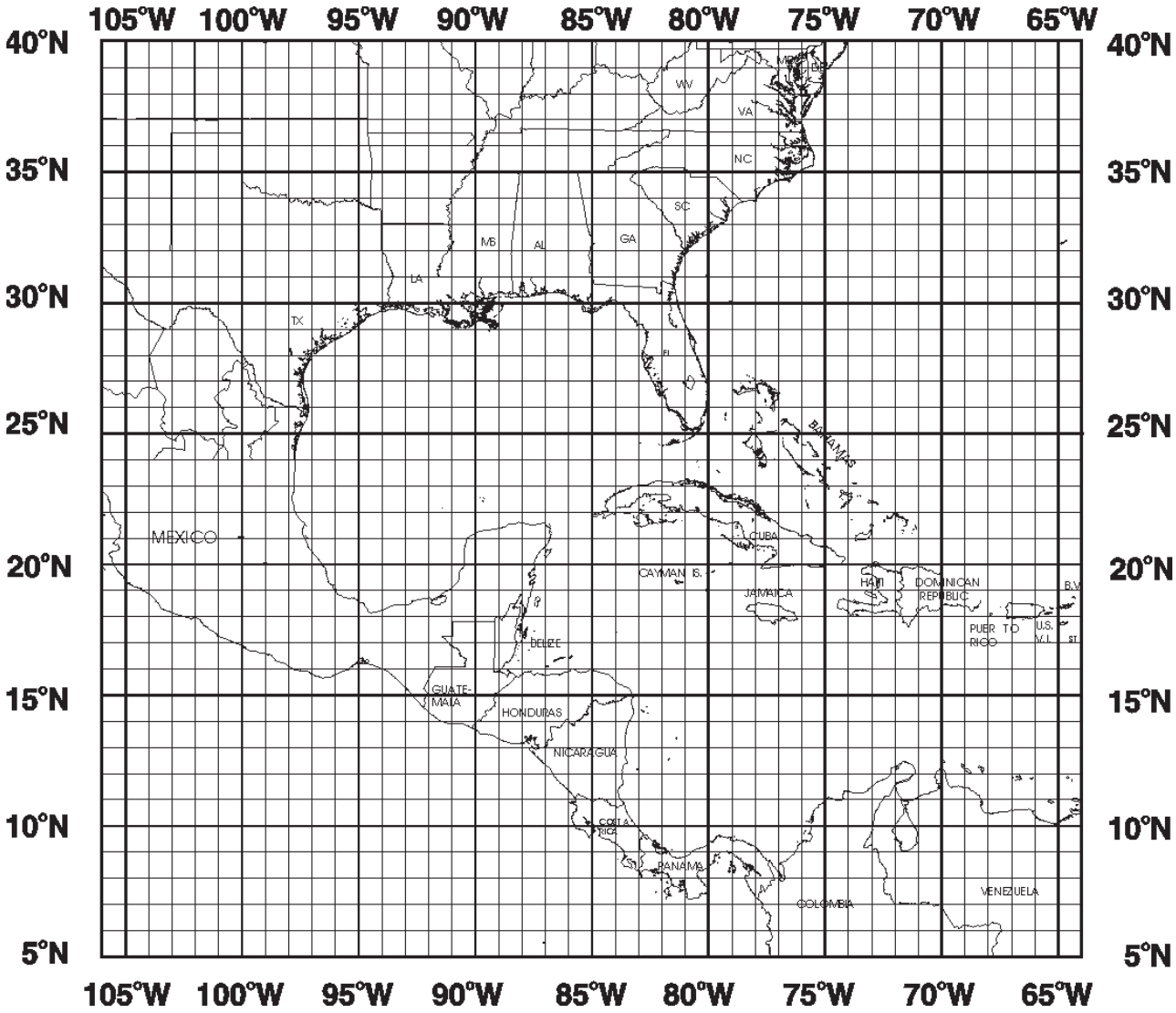
National Severe Storms Laboratory
http://www.nssl.nassa.edu
(accessed August 20, 2000)

Weather Underground: The University of Michigan
http://blueskies.sprl.umich.edu/
(accessed August 20, 2000)

Appendix C: Hurricane Tracking Chart

Names: _____

_____ Date: _____



Atlantic Basin Hurricane Tracking Chart
National Hurricane Center, Miami, Florida

This is a reduced version of the chart used to track hurricanes at the National Hurricane Center

EXTREME WEATHER

Lesson 2: Predicting Severe Weather

Lesson Overview:

This lesson will focus on two types of severe weather; hurricanes and tornadoes. In this exercise, students weigh the options, make predictions, and determine the economic impact of their decisions.

National Science Education Standards:

Content Standard F: Science in Personal and Social Perspectives:
Natural Hazards
Risks and Benefits

Excellence in EE—Guidelines for Learning

Strand 2: Knowledge of Environmental Processes and Systems:
1. The Earth as a Physical System

Key Concepts:

1. There is a variety of severe weather.
2. It is necessary to plan in advance for severe weather.
3. Personal and societal decisions are made based upon an understanding of the probability of severe weather.

Objectives:

Students will:

- recognize the range and variety of severe weather.
- plan for severe weather conditions that they may experience on an immediate and long-term scale.
- use climate information in making personal and societal decisions.

Lesson 2: Predicting Severe Weather

Cross-Curricular Connections:

Economics:

- Determine the cost of severe weather such as the damage incurred by a hurricane.

Mathematics:

- Calculate the percentages and probability of encountering severe weather.

Science:

- Communicate the need to understand climate and predict weather.

Sociology:

- Identify the reasons people choose to live in areas vulnerable to severe weather.

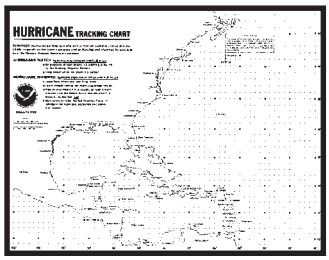
Process Skills:

Graphing Interpreting
Predicting Investigating

Materials:

Per Student:

Hurricane tracking chart (and data) *(page 66)*



Date/Time	Latitude(N)	Longitude(W)	Wind Speed (knots)
9-21/00	16.7	60.6	110
9-22/00	18.2	66.4	100
9-23/00	18.8	70.3	80
9-24/00	20.3	75.3	65
9-25/00	22.9	79	75
9-26/00	24.7	83.1	90
9-26/12	26	85	90
9-26/18	26.3	85.9	90
9-27/00	27	86.5	95
9-27/06	27.6	87.2	95
9-27/12	28.2	87.8	95
9-27/18	28.75	88.3	95
9-28/00	29.3	88.5	95
9-28/06	29.7	88.7	90

Suggested Time Frame:

Two 50 minute class periods

Procedure:

Scenario 1

1. Using a Hurricane Tracking Chart, have students individually plot a hurricane's daily coordinates on the tracking chart.
2. Once the storm has entered the Gulf of Mexico, cooperative groups should make the decisions required in the Decision section.

Scenario 2

1. In cooperative groups, make the decisions required in the Decision section *(page 69)*.

Scenario 1

1. Each cooperative group is to assume the role of the emergency planning agency for the city of New Orleans. Through the results of studies and strategic modeling, it has been determined that it will take 48 to 72 hours to evacuate the city. It has also been calculated that the cost of such an evacuation will be 50 to 75 million dollars a day, due to loss of revenue to business and the additional public safety expenses.
2. Students should use the information gleaned from the hurricane tracking map to decide whether or not the city should be evacuated and at what point they should call for an evacuation. Have the students justify their decisions based on scientific data.
3. Have the students continue plotting the storm and making decisions after each data entry.
4. Have the group reflect on how the time-frame for evacuation influenced these important decisions.

Scenario 2

1. Your group is comprised of the Superintendent of Schools, Associate Superintendent, Chair of the School Board, and the Mayor of a small city in the mid-western part of the US. It is springtime. The weather forecast calls for a cold front to pass through your area sometime in the mid-afternoon. At 1:00 PM you are alerted that in locations where the cold front has passed, severe thunderstorms have occurred and two tornadoes have been spotted. At 2:00 PM a Severe Thunderstorm Warning and a Tornado Watch have been posted for counties that are approximately 50 miles to the west of your city. The storm is traveling toward the Southwest at 30 miles an hour. Normal school dismissal is at 3:30 PM. It takes the busses approximately 45 minute to finish their routes. Baseball and track practices are also scheduled after school.
2. Based upon this information: Do you dismiss school early? Do you delay the dismissal of school? Do you cancel extracurricular activities? Justify your decisions. What scientific information did you use to make your decisions?
3. Consider what would be the consequences of leaving school early or late to you, your family, or your community.
4. Reflect on the time frame given to make this decision.

Suggested Discussion Questions

- What other information would have helped you make these decisions?
- Who in the community should be responsible for making such decisions?
- Should economics be considered along with decisions to save human life?
- Can you create a flow chart that would automate or speed up the decision making process?

Further Investigations

Flooding

- Obtain GIS data or topographic maps for your local area. Create scenarios of the flooding associated with severe local weather such as flash floods, snow melts and long periods of heavy rain. Identify the areas that will probably be flooded and determine evacuation routes. Research the emergency action plan established by the local agencies.
- A similar activity can be done using storm surge protections. Select a coastal area where a storm surge of 5 meters (approximately 15 ft.) is predicted. What areas will be flooded by the storm surge?

Predictions

- Using temperature and barometric pressure data for major cities across the United States, draw isotherms and isobars on a map. Predict the next day's weather in several cities.

Emergency Planning

- Have students develop a personal emergency plan for the type of severe weather they may encounter. Each student should consider worst case scenarios and include plans for preparation, immediate action when the severe weather strikes and long term conditions.
- What contingencies should be planned? For example, it is important to know which roads will flood early limiting evacuation routes and forcing people to use alternate routes. Students may develop a severe weather plan as a group activity. Students could assume the roles of the various planners, public safety officials or weather forecasters.

Career Opportunities

District Planners
Meteorologist
Hydrologists
Federal Emergency Management Agency (FEMA) disaster specialist
Media specialist

Assessment Procedures

- Student hurricane maps may be evaluated.
- Use a rubric to assess student presentations/justifications for their decisions.

Additional Resources

Smith, S. P. & Ford, B. A. (1994). ***Project Earth Science: Meteorology.*** Arlington, VA: National Science Teachers Association

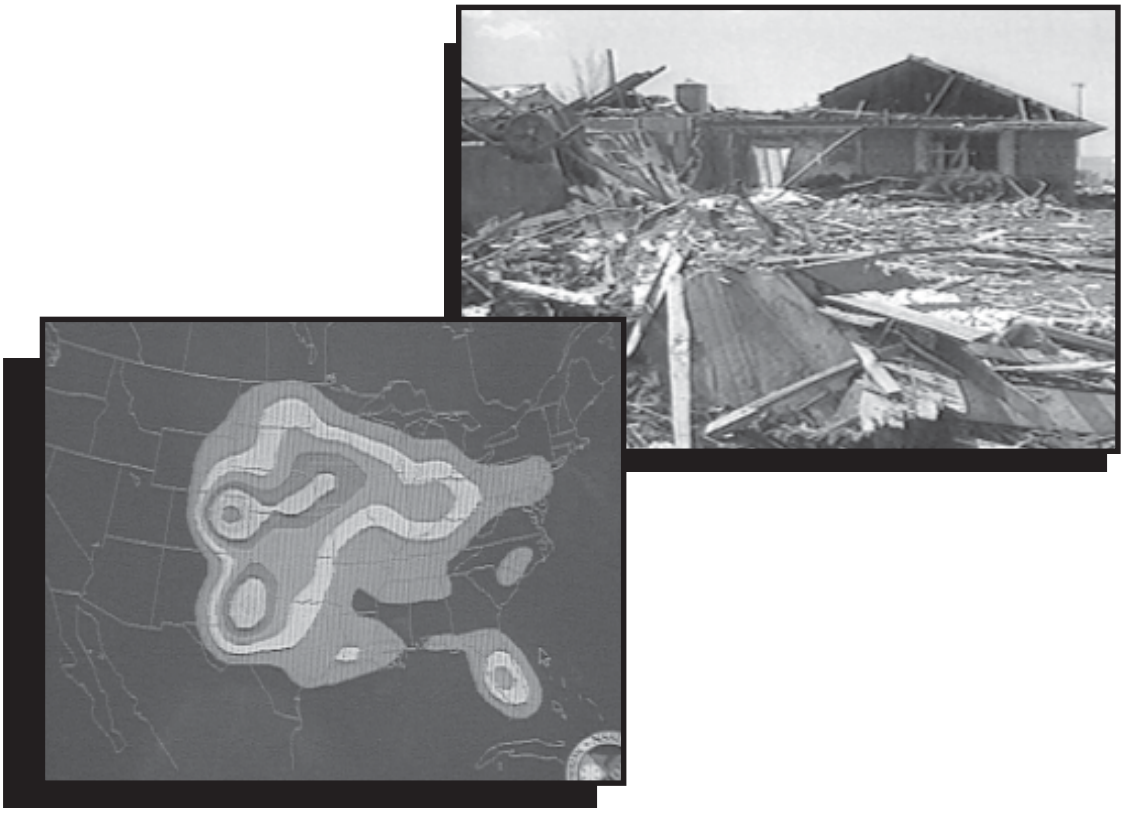
National Geographic Society
Education services
17th and M Streets, NW
Washington, DC 20036
Phone: (202) 921-1330
Internet site: http://www.nationalgeographic.com

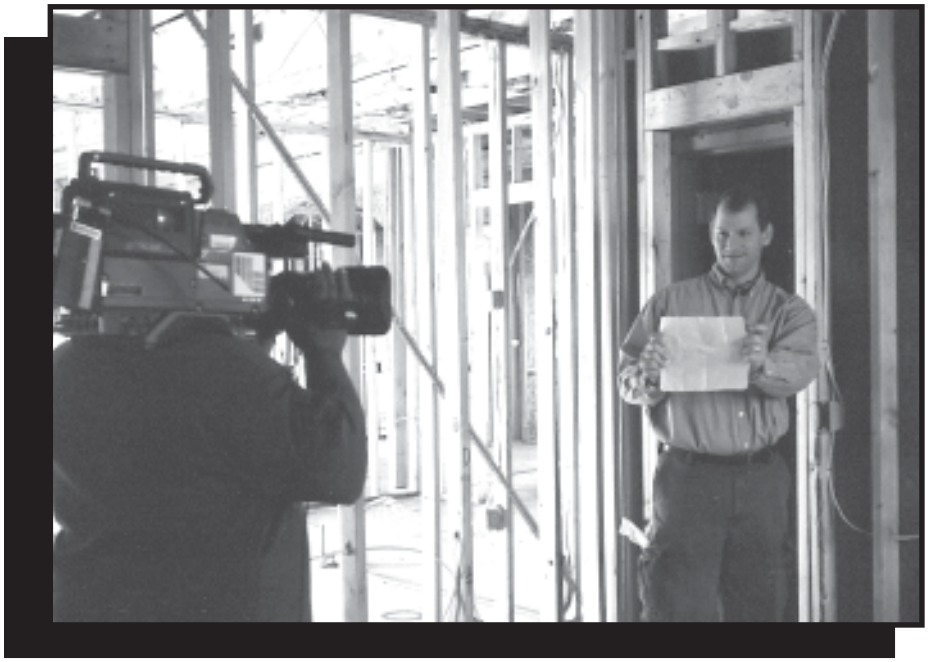
National Center for Atmospheric Research
Information and Education Outreach Program
P.O. Box 3000
Boulder, CO 80307-3000
Phone: (303) 497-8600
Internet site: http://www.ncar.ucar.edu/

National Severe Storms Laboratory
http://www.nssl.nassa.edu
(accessed August 20, 2000)

The Weather Page
http://www.esdim.noaa.gov:80/weather_page.html
(accessed August 20, 2000)

Weather Underground: The University of Michigan
http://blueskies.sprl.umich.edu/
(accessed August 20, 2000)






National Severe
Storms Laboratory
Storm Prediction Center
1

Distributed by:

LPB

7733 Perkins Road
Baton Rouge, LA 70810
Phone: 1-800-272-8161 • 1-225-767-5660
Fax: 225-767-4299
www.lpb.org
www.envirotacklebox.org