The mission of the National Wildlife Federation® is to educate, inspire, and assist individuals and organizations of diverse cultures to conserve wildlife and other natural resources and to protect the Earth's environment in order to achieve a peaceful, equitable, and sustainable future.

As America's largest member-supported conservation group, NWF leads grassroots efforts to safeguard wildlife, wild places and the natural resources on which we all depend.

The National Wildlife Federation has been a leader in environmental education for nearly 65 years. From our Schoolyard Habitats® program and teacher workshops to Ranger Rick™ magazine and our award-winning television shows and films, NWF's dynamic education efforts reach out to help people discover, experience and connect with the wild in our world.

For more about NWF's education programs, visit us at www.nwf.org.

The National Wildlife Federation's *Keep the Wild Alive*™ program is an ambitious endangered species campaign that aims to build support for endangered species, engage the public in species conservation efforts, and move several imperiled species closer to recovery.

For more information about the *Keep the Wild Alive* campaign, or to learn about simple actions you can take to help endangered species, please visit the *Keep the Wild Alive* website at www.nwf.org/keepthewildalive or call (202) 797-6800.

Founded in 1924, the American Association of Zoological Parks and Aquariums, now known as the American Zoo and Aquarium Association (AZA), is a nonprofit organization dedicated to the advancement of zoos and aquariums in the areas of conservation, education, science, and recreation. AZA's vision is to work cooperatively to save and protect the wonders of the living natural world.

The AZA and its accredited zoo and aquarium members constantly strive to maintain the highest standards in wildlife care and conservation. To demonstrate this commitment, AZA members participate in over 700 cooperative conservation and management programs. Through these programs, AZA assists its members in managing their captive populations and conducting and overseeing zoo and aquarium-based and field-based conservation, research and education projects. Since 1991, AZA's Conservation Endowment Fund has awarded over $2 million to support 146 projects benefiting wildlife worldwide.

AZA-accredited zoos and aquariums draw over 134 million visitors each year. With their incomparable commitment to conservation education in living classrooms, AZA zoos and aquariums teach more than 12 million people annually. More than nine million students enjoy on-site education programs at our member institutions each year — over three and a half million receive them free of charge.

We are proud of our dedication to conservation and science and conservation education. In 2000 alone, AZA members supported over 2200 conservation and associated scientific and educational projects in 86 countries worldwide. In the same year, over 58,000 volunteers contributed over five million hours to support AZA member zoos and aquariums. Through projects like the Butterfly Conservation Initiative and other local efforts, AZA institutions are becoming community conservation centers. Contact your local accredited zoo or aquarium to find out how you can get involved. Visit www.aza.org or call (301) 562-0777 to learn more.

BUTTERFLY LIFE CYCLE

Summary

Students identify life cycle stages of butterflies. Older students learn threats facing the endangered Karner blue butterfly at each stage in its life cycle.

Grade Levels: K-2; 3-4

Time: 45 minutes – 1 hour

Subjects: history, science, art

Skills: construction, synthesis

Learning Objectives:
Students will be able to:

- ✓ Identify the stages in a butterfly's life cycle.
- ✓ Discuss some of the habitat requirements of butterflies in their area and look for ways to provide them.
- ✓ Name several factors that make the Karner blue butterfly susceptible to endangerment at each stage in its life cycle (Grades 3-4).

Materials:

- ✓ Construction paper
- ✓ Scissors
- ✓ Glue or tape
- ✓ Pencils and paper
- ✓ Markers or pipe cleaners
- ✓ Copies of the Butterfly Life Cycle activity sheet
- ✓ Copies of the Butterfly Threats activity sheet (Grades 3-4)
- ✓ Nature journals (optional)

Background

The life cycle of the Karner blue butterfly is similar to that of many other butterflies, and can be used as an example of butterfly life history and the kinds of habitat threats butterflies face. Karner blue caterpillars feed only on wild lupine *(Lupinus perennis)* plant leaves. Wild lupine grows within the oak savanna and pine barren ecosystems that range from Maine to Florida and west to Minnesota, but Karner blues live only on the lupine of New Hampshire, New York, Michigan, Wisconsin, Indiana, Ohio, Minnesota, and possibly Illinois and Ontario.

Two generations of Karner blue butterflies are born every year. In mid-April, the first set of caterpillars hatch from eggs that were laid the previous summer. In mid-May the caterpillars pupate and form chrysalises, and adult butterflies emerge approximately two weeks later in late May or early June. Unlike caterpillars, adult butterflies feed on a variety of flowering plants that produce nectar such as dewberry, goldenrod, New Jersey tea as well as wild lupine and many others.

In June, the newly emerged butterflies mate and the females lay their eggs on or around wild lupine plants. The female adult butterflies from this first generation die after laying their eggs, and the males die soon after that. The eggs take a week to hatch, and the emergent caterpillars feed for three weeks exclusively on the lupine before pupating and emerging as butterflies in July.

Members of the second generation of Karner blues mate soon after emerging in July, and the females lay the eggs that will hatch the following April. The females from the second generation lay their eggs on plant litter, on the grass at the base of the lupine, or on the lupine pods or stems.

The second-generation female Karner blues die after depositing their eggs, and the males from this generation die by the end of August or early September. These eggs are left on and around the wild lupine for the winter. If the eggs survive the winter, they will hatch the following spring and become the first generation of next year's Karner blues.

Like many other butterflies, the Karner blue butterfly faces many human-caused and natural threats during its different life cycle stages, including the following:

Fire suppression: A history of stopping or preventing naturally occurring fires has led to woodland and forest succession, which closes the forest canopy and blocks out light that lupine and other sun-loving plants need to survive. This has caused a loss of suitable Karner blue butterfly habitat and a decrease in populations of wild lupine, which depend on fire to eliminate tree cover and open up the canopy in order to obtain the sunlight they need for growth. This human action has the greatest impact on caterpillars because they are solely dependent on lupine for food, but it also reduces populations of nectar plants used by adults. Fire supression does not affect all butterflies.

Urban/suburban development: The continual sprawl of construction for housing and shopping centers has wiped out much of the butterfly's habitat throughout its range.

Lack of snow and snowpack during winter: Eggs are laid in the fall and may have to survive harsh winter temperatures before hatching in the spring. Winter snows protect eggs from dehydration and provide insulation from freezing temperatures through the coldest part of the year. If the weather during the winter is mild or dry and there is not enough snow or if the snowpack melts too quickly, the Karner blue eggs may not be sufficiently insulated to survive until spring.

Mowing: Natural meadows are a crucial part of Karner blue habitat, providing food, water, cover, and places to lay eggs. Mowing for lawns decreases both lupine and nectar plants, food for larvae and adults, causing the greatest threat when the eggs are overwintering, the caterpillars are feeding, and the chrysalises have formed. Seasonally mown natural meadows, however, can emulate the effects of fire and are used as a management strategy for Karner blues.

Preparation

Gather a list and pictures of local butterflies and the plants they need to eat and rest on, or have your students do this. For help, try www.enature.com, where you can search by area for local species, and the Northern Prairie Wildlife Research Center's Butterflies of North America site: www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/bflyusa.htm where you can also search by state.

Procedure

1. Ask your class what they know about butterflies. *Do they know the link between caterpillars and butterflies?* (There are lots of cute stories and puppets on this theme!) Hold up a picture of a caterpillar, and then a butterfly. Ask, *Do you know how these two animals are alike?* Tell students that they are actually the same animal, even though they look very different. This animal changes (metamorphoses) over its life cycle. Ask, *What does that mean?*

2. Review each stage of a butterfly's life: egg, caterpillar, chrysalis, butterfly. *What is the animal's main activity in each stage?* (*Egg*: growing and developing, *caterpillar*: eating, *chrysalis*: changing form, *butterfly*: eating and reproducing.) Show pictures of each stage or have students follow along using the Butterfly Life Cycle activity sheet.

3. Tell students they are going to make their own butterflies. To make the butterfly wings, have students cut four wing shapes out of construction paper. If desired, provide wing stencils made from cardboard for students to use. With older students, you can discuss that the wings are symmetrical. (Ask, *What does that mean?)*

4. It is time to assemble butterflies! Give each student a pipe cleaner or piece of construction paper to use as the butterfly's body. With their four wings, have students glue or tape two wings to each side of the body. If desired, have students decorate their butterflies like one of the local species, such as a monarch or zebra swallowtail. Provide pictures as examples. Have students label their butterflies' species on the back. If they wish, students can create antennae for their butterflies out of pipe cleaners.

5. Ask students, *What do butterflies need to survive? Have you seen any butterflies in our schoolyard or in your own backyard?* Show students several pictures of the local butterflies and the plants these butterflies need to survive. *Do we have these in our schoolyard?* Let's go find out!

6. *For Grades 3-4:* Take students outside for a butterfly plant hunt. As a group, search for the plants you identified. Alternatively, divide students into groups and have each group look for one specific plant. Depending on the time of year, students can also look for butterflies and draw what they see in a nature journal or on a sheet of paper.

For Grades K-2: Have students look for butterflies on the school grounds and draw what they see on a piece of paper or in a nature journal. An alternative is to cut out squares of construction paper of different colors. Hand out one or more (depending on the level of the students) squares of several different colors to each student. Take students out to the schoolyard or other outdoor area and have them look for butterflies or flowers that have their color in it. If possible, have them look for butterflies or flowers that have more than one of their colors. Ask students to observe these animals/plants carefully and draw them when they return to class.

7. When you return to the classroom, examine your results. Make a list (or simple sketches) of the plants and/or butterflies you found. *Could you add any plants to make the schoolyard a better place for butterflies?* Consider planting or starting a butterfly garden as part of a Schoolyard Habitats® site. Visit www.nwf.org/schoolyardhabitats for more information on Schoolyard Habitats.

Modifications for Older Students (Grades 3-4)

1. Explain that the students will be learning about the Karner blue butterfly, an endangered species of butterfly in the northeastern and mid-western United States. They should brainstorm problems the butterfly might face at each stage of its life cycle. *What might a caterpillar need for food and cover that is different from what an adult butterfly might need?*

2. Give each student a copy of the Butterfly Threats activity sheet. Have them cut out each of the Threat and Life Cycle Stage cards.

3. Students should pair each stage of the butterfly life cycle with a logical threat at that stage. Note that students will come up with multiple pairings. Sample pairs include: *fire suppression*: caterpillars or butterfly; *development*: all four stages; *snow*: eggs; *mowing*: all four stages. Discuss with the class how and why they decided to pair each life cycle stage and threat. If desired, students can play a second round to try other pairings.

Extensions

✔ *For Grades K-2:* Musical butterflies: Write the words: egg, caterpillar, chrysalis, butterfly on plain paper (eight times each, for a total of 32 pieces of paper). You can do this activity with any group size; just change the numbers, making sure you have an even number of each life cycle stage. Shuffle the pages randomly and place them in a circle in a large open area, either on the ground or on chairs.

Have students pick a place to sit/stand and then begin to play music as the students move around the circle. When the music stops, all students should stop where they are and pick up the nearest piece of paper. *Which life cycle stage are they?* Ask all students to strike a pose as if they were a butterfly in that stage (e.g., eggs get into a ball on the ground, etc.). Then, tell them to move about and act their life stage for a few moments. *What does a chrysalis do? What does a caterpillar do?* Now turn on the music and repeat a couple times, allowing students to try the different stages.

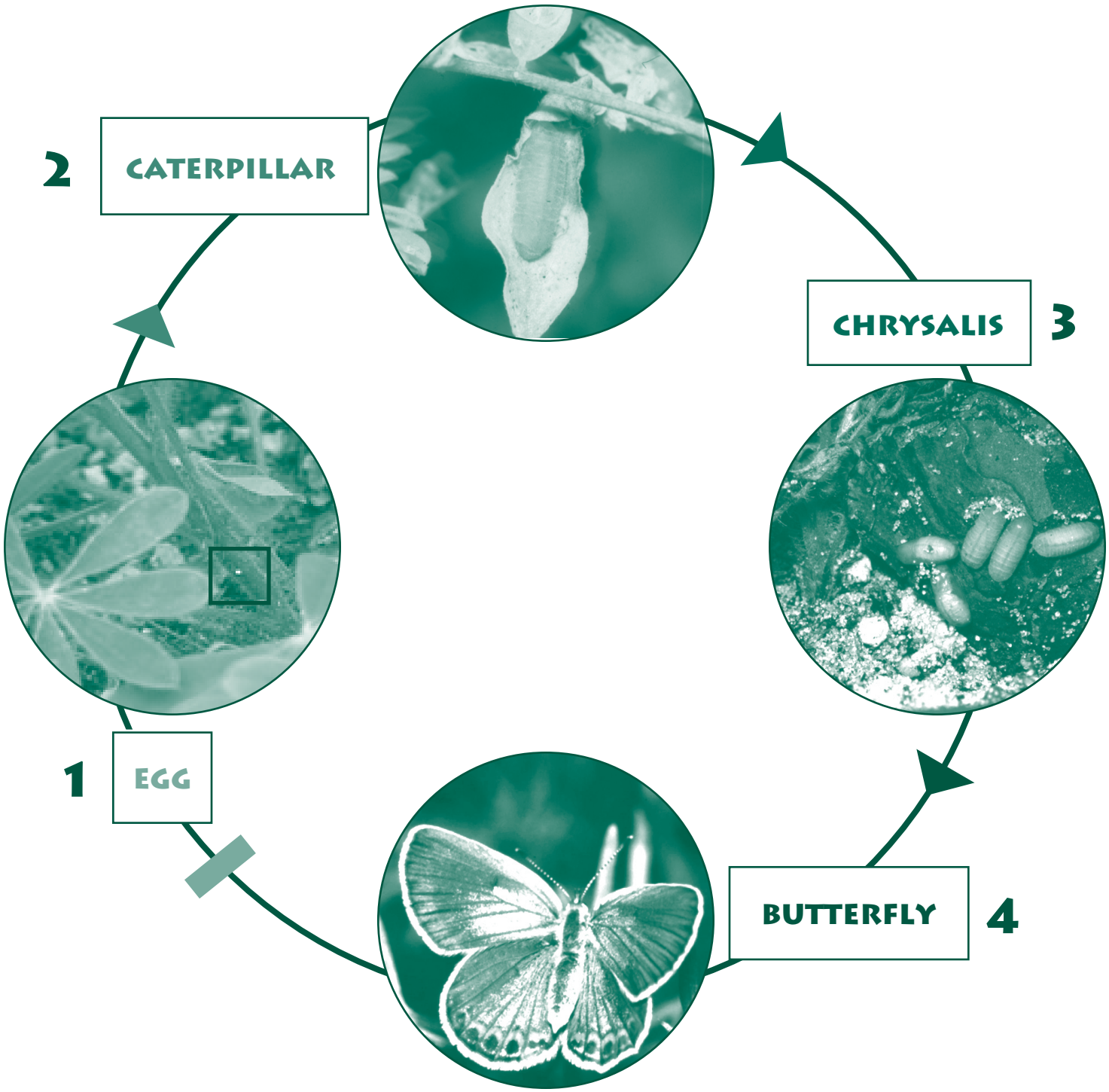
✔ If you have found good pictures of local butterflies and their host plants, make them into cards and tape them to a board or easel paper. Have students play a matching/memory game to match up the butterflies with their respective host plants!

Assessment

✔ Have students design a poster depicting the different stages of a butterfly life cycle. Older students can indicate on the poster what kinds of conservation threats butterflies face at each stage.

WORKSHEET

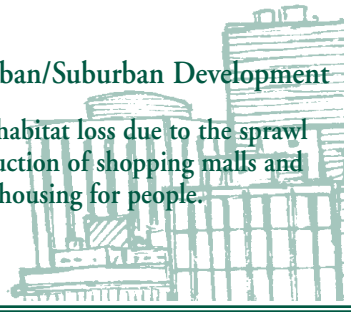
BUTTERFLY LIFE CYCLE



WORKSHEET

BUTTERFLY THREATS

Directions: Cut out the cards below. Match each threat with a life cycle stage. Some stages may match with more than one threat.

Stage One: Egg **Activity**: growing and developing	**Threat**: Fire Suppression Loss of habitat and decrease in populations of wild lupine due to stopping or preventing naturally occurring fires. These fires prevent the closing of the forest canopy which blocks out the sun that lupine and other sun-loving plants need to survive.
Threat: Urban/Suburban Development Butterfly habitat loss due to the sprawl of construction of shopping malls and housing for people. 	**Stage Three**: Chrysalis **Activity**: changing form
Threat: Lack of snow/snowpack during winter Snow acts as an insulator for one stage of the butterfly life cycle. Without enough snow, will not be insulated enough to survive freezing temperatures.	**Stage Four**: Butterfly **Activity**: eating and reproducing
Stage Two: Caterpillar **Activity**: eating	 **Threat**: Mowing Natural meadows provide food, water, cover, and places to raise young. Mowing decreases lupine and nectar plants.

ACTIVITY 2

POLLINATION PARTNERS: AN INQUIRY INVESTIGATION

Summary

Students study the role of butterflies in pollination.

Grade Levels: 3-8

Time: several class periods spread out over several weeks.

Subjects: science

Skills: observation, prediction, description, research

Learning Objectives:

Students will be able to:

- ✓ Describe the process of pollination.
- ✓ Identify butterfly roles in pollination.
- ✓ Name several different kinds of butterflies.

Materials:

- ✓ Notebooks
- ✓ Pencils
- ✓ Cut flowers
- ✓ Photos of flowers and butterflies
- ✓ Magnifying glasses

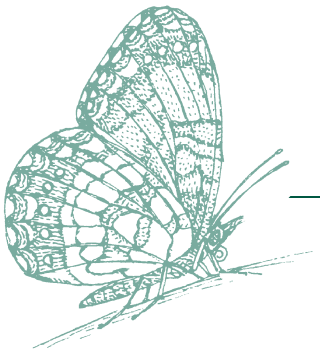
Background

Animals play a key role in the reproduction of many flowering plants. Bees, butterflies, hummingbirds, bats, wasps, moths, beetles and others visit flowers in search of food. In the process, animals pollinate the flowers, bringing reproductive cells (**pollen**) from one plant to another. When animals visit multiple plants of the same species, they transfer pollen from plant to plant. This movement of pollen is called **pollination**. Pollination leads to **fertilization**, the development of new seeds, and, in some plants, fruit. The young seeds (either contained in fruit or not) may be carried by wind, water or animals to a new location where, if all goes well, they will grow into new plants and start this process all over again.

How does the process of pollination work? Flowers contain a plant's reproductive parts, including the male stamen and the female pistil (see diagram, pg. 12.). The structure of the flower forces the male **anther**, holding pollen grains, to brush up against the pollinating species while it is looking for its food, the nectar. The female **pistil** includes the **ovary**, which contains **eggs** or **ova**, **style**, and **stigma**; the stigma is sticky and collects pollen from the bodies of animal visitors. When pollen grains fertilize an ovum, a new seed begins to develop.

Since plants are rooted in one place, they need help transferring pollen to other flowers of the same species. Some flowers rely on wind to carry pollen grains, while others use water. As you might imagine, lots of pollen carried by wind or water never actually reaches flowers of the same species. Animal pollinators, however, give plants an advantage, since they deliver pollen directly to the flower. While collecting nectar from the base of a flower, butterflies brush against pollen from the flower's anther. The butterfly ends up carrying a load of pollen on its body. At the next flower the butterfly visits, some of that pollen reaches the female reproductive parts while the butterfly feeds. This direct contact is what makes butterflies and other nectar-feeding animals great pollinators. The pollination relationship is mutually beneficial to flower and animal — one gets food while the other receives help with reproduction.

Over time, flowers have developed adaptations to ensure that the most suitable pollinator for their species will visit and return often to feed. In fact, flowers' fragrances, bright colors, nourishing nectar and pollen and varied shapes are considered adaptations to attract certain pollinators. For example, the bright colors of flower petals are thought to help flowers stand out against a green background. The shape of



the flower also plays a role in determining the kind of pollinator that can feed from the flower. Butterflies must have a perch to land on while feeding, while hummingbirds can hover near flowers while feeding. Pollinators are also well adapted to ensure that they will have access to flower nectar.
Animal adaptations associated with pollination include sense of smell, color preferences, beak shape (in birds), and tongue length. A butterfly's "tongue," or proboscis is very effective in reaching nectar at the base of flowers because it is long (compared to the butterfly's body) and also very flexible. When not in use, the butterfly proboscis is coiled up. When the butterfly needs to feed on nectar, it will uncoil its proboscis to sip the nectar at the base of the flower.

Pollinators play a critical role in both agricultural and natural systems. Many of the plants that produce the food we eat depend on pollinators — from apples to watermelon. In fact, scientists estimate that every third bite of food humans eat is made possible by the act of pollination. Pollinators are also key to maintaining ecosystem health and biodiversity. Healthy pollinator populations ensure that many plants that help clean our air and water and serve as food and cover for wildlife can reproduce, which in turn sustain our ecosystem functions and a diversity of life.

This activity will allow students to engage in their own student-directed investigation of the relationship between butterflies and their nectar plants.

Procedure

1. Ask students what they know about butterflies and pollination. *How do butterflies help to pollinate flowering plants? What does this mean?*

2. Provide students with several photographs/drawings of butterflies and flowers, including real cut flowers if you have them available. Divide your class into smaller groups and give each group the same materials. Give students time to explore their materials and encourage them to jot down questions they have about butterflies and pollination. Ask them to think about how the flowers are shaped, and then guess what kind of body shape, tongue, etc. would be best for pollinating a particular flower structure.

3. Next, take students outside to observe butterfly/plant interactions in your schoolyard or near-by outside area. Students should bring their notebooks outside with them. Have each student spend about 10 minutes quietly observing on their own and writing questions about their observations. They should write down additional questions that occur to them as they observe. If they don't see any butterflies, have them list possible reasons why.

4. Have students get together in their groups and spend another few minutes observing and writing down questions together.

Butterfly Observation Tips:

1. Wear comfortable clothing without bright colors, since those may startle butterflies. Greys and browns are good colors to wear while butterfly watching.

2. Most butterflies spend the majority of their time in the sun. Butterfly watching is likely to be most rewarding during midday on a sunny, warm day without much wind.

3. Look for butterflies on or near nectar-producing flowers.

4. Take binoculars and butterfly field guides with you to help you identify the different species of butterflies you encounter.

5. When you return to the classroom, have students write their questions on large strips of paper and give them to you. Look at the questions and sort them by category, (determined by the questions themselves), and then post around the room in the categories you have determined. This will give you a chance to eliminate questions that are either inappropriate, irrelevant, or will be impossible to actually investigate given the time and materials and level of students you have available. While you are doing this, students can either take a break, draw illustrations of the butterflies they saw, or focus on something else.

6. Ask students to spend a few minutes wandering through the room, looking at the questions, and picking one they are most interested in studying. Have students form small groups based on which questions they pick.

7. In their groups, ask students to develop an investigation plan for how they will answer their question of choice. *What materials do they need? How much time do they need? What are the steps in their investigation?* Have them lay out their investigation plans in as much detail as possible. Check in with each group to provide them with assistance or make lists of materials they will need.

8. If you have time, have students carry out their investigations — over the time needed to complete them. Assist them as necessary, when they appear stuck, but encourage them to explore as much as possible. Allow students to conduct their investigations into butterfly/plant interactions.

9. Have student groups give presentations on their conclusions, sharing the information they collected through their investigations.

Note: Read the options below for alternative activities.

Option 1: If your time is limited or you are working with younger students and you want to conduct a more structured observation activity, provide students with the Pollination Partners activity sheet, and have them make observations over several class periods.

Option 2: For classes with limited outdoor access, complete Steps 1 and 2 above. After the overview of pollination, have students research locally occurring butterflies (try www.enature.com) and the host and nectar plants the butterflies would need. Have students draw the host and nectar plants along with the butterflies and create a butterfly habitat mural on a piece of butcher paper or a bulletin board. Plants and butterflies can also be created out of art materials such as tissue paper, cotton balls, and fabric scraps. Older students can write a schoolyard butterfly habitat proposal that outlines where on the school grounds a site could go, what native plants they are interested in planting, and what butterfly species the site would attract. The proposal could also include how classes could use the site, what benefits it would provide the school and community, and fundraising ideas. For additional information on creating a Schoolyard Habitats site, visit www.nwf.org/schoolyardhabitats.

Extensions

✔ Have students think about where their investigations led them, and what kind of follow-up they would like to do. Have them design these follow-up investigations and conduct them if time allows.

✔ Explain to students that some butterflies are endangered because the plants they depend on as hosts for the caterpillars are being decimated due to habitat destruction. Have students conduct research to find out if there are any endangered butterflies in your area, and explore the factors leading to their endangerment.

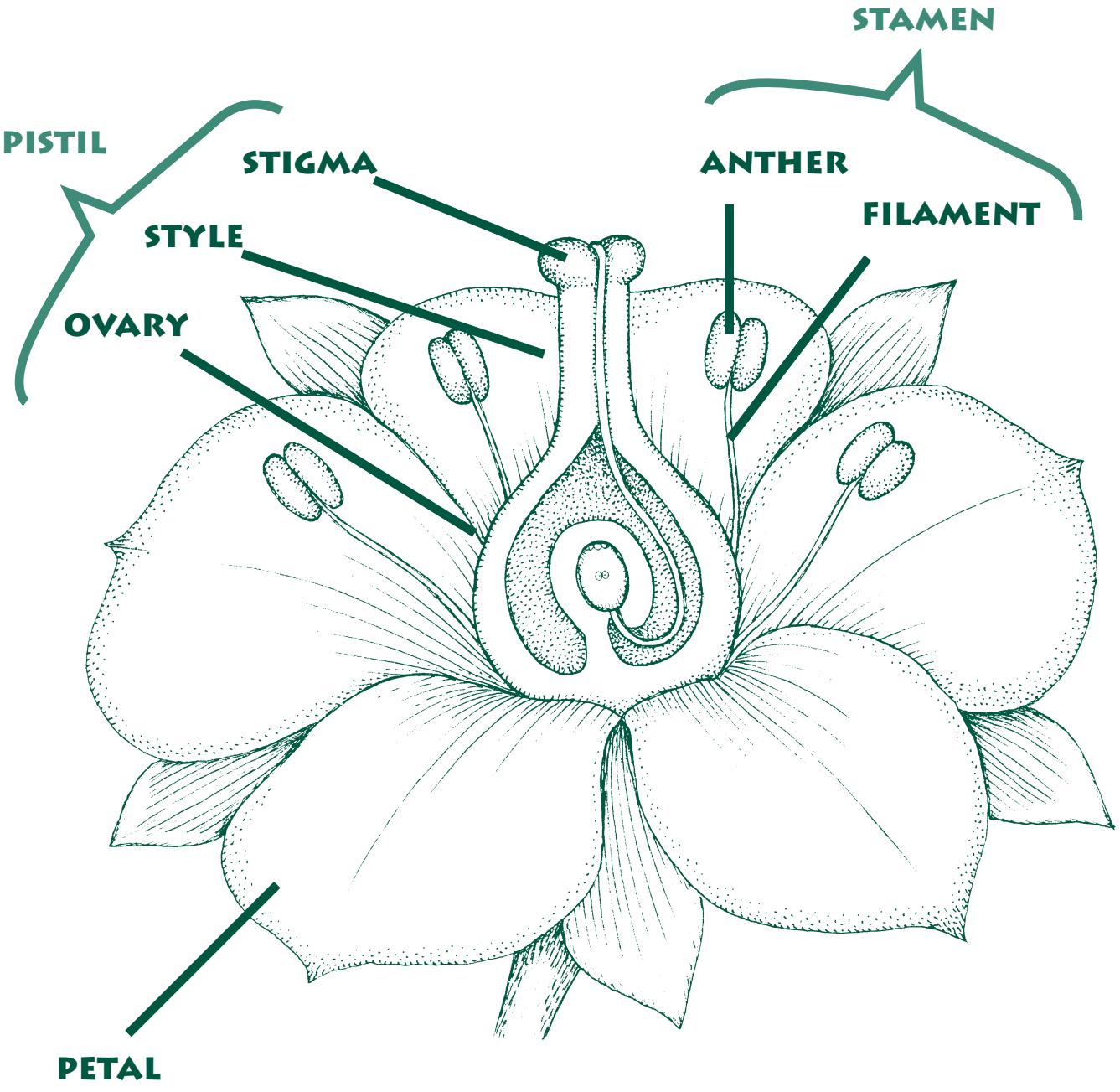
✔ Have students research the characteristics of flowers that attract butterflies (e.g., *How have flowers adapted to make butterfly pollination possible? How are these flowers different from those pollinated by bats, hummingbirds, bees, etc.? Can you tell by looking at a flower how it is pollinated?*). Then, in small groups have students design an "ideal" flower for a butterfly on large poster-size paper, pointing out those qualities that are especially suited for butterflies. (You may choose to have some students research and design flowers pollinated by other animals, so that students can see the different adaptations.)

Assessment

✔ Student presentations can serve as excellent assessments of their work. Develop an evaluation rubric with students prior to their presentations, determining what criteria should be used to assess them.

WORKSHEET

FLOWER DIAGRAM



WORKSHEET

POLLINATION PARTNERS

Name: _____

Date: _____ Time: _____

General weather conditions: _____

Location of plant I will be observing: _____

Name of plant: _____

Sketch it:

Hypothesis: When I observe a butterfly, I will see: _____

Observation: Number of times I saw a butterfly on my plant: _____

Same kind or different species? List the species if you know the names. _____

_____

What did the butterfly do while on the plant? Watch carefully. _____

_____

How long did each one spend on the plant?

Butterfly	Time on Plant
1.	
2.	
3.	

Where did the butterfly go next? _____

Sketch your butterflies:

Conclusions:

Was your hypothesis supported by your observations or not? _____

_____

What other questions do you have about butterflies and plant interactions? _____

_____

THE GREAT BUTTERFLY MIGRATION

ACTIVITY 3

Summary

Students trace butterfly migration routes.

Grade Level: 5-8

Time: 1 class period

Subjects: science, geography

Skills: research, predicting, communicating

Learning Objectives:

Students will be able to:

✓ Define the term migration.

✓ Explain how and why some animals migrate.

✓ Trace North American butterfly migration routes.

Materials:

✓ Copies of blank maps of North America

✓ Research sources (internet or reference books)

Background

Approximately 13 species of North American butterflies migrate north in early spring and south in late summer. Most of these migrations go unnoticed, but they are truly spectacular considering the small size of the butterflies and the tremendous distances they travel.

These annual migrations rank high on the list of amazing insect accomplishments. Consider that the monarch butterfly can migrate 4,500 km from eastern Canada to their wintering sites in Mexico. For an animal with a body of about 3 cm (0.03 m), flying a distance of 4,500 km is about 150,000,000 body lengths for a monarch butterfly. An equivalent feat for a 1.8 m (6 ft) tall person would be 270,000 km or about 11 times around the earth. Each year hundreds of millions of butterflies make their way across North America. This is a truly amazing feat!

This activity will allow your students to examine several butterfly migration routes.

Procedure

1. Ask students what they know about migration. *What is it? Which animals do they know of that migrate?* (Examples: whales, many songbirds, zebras, butterflies, caribou, whooping cranes, hummingbirds, manatees.) Make a list on the board.

2. If students do not mention it themselves, point out that several species of butterflies migrate very long distances. *How is this possible? Why would they want to do that?* Make a list of reasons on the board. Be sure to touch on: temperature, climate, food sources, and habitat conditions.

3. Give students blank maps of North America (on pg.16), and a choice of migratory butterflies. (Common buckeye, red admiral, painted lady, mourning cloak, monarch, gulf fritillary, question mark, cloudless giant sulphur, pipevine swallowtail, dwarf yellow, Mexican yellow, sleepy orange, and long-tailed skipper.) Have students conduct research on their butterfly of choice to determine where this species spends its summer and winter, and map out its approximate route along the way. Students should mark these routes on their maps.

4. Ask students, *What threats do these animals face on their migrations? What threats would migratory insects face that might*

not affect other migratory animals? Why would migratory insects face greater threats than animals that do not migrate?

5. Have students study the migratory routes they mapped out and research some of the locations through which their butterfly species travels. *Are there any major cities along these routes? Areas of large human population? Large agricultural areas?* Have students mark these places on their maps as well. *What challenges do the butterflies face along their migratory route?* Have students conduct research and prepare posters showing their butterfly routes and the challenges faced on these routes as they attempt to meet all their habitat needs for food, water, cover, and places to raise young. *Are any of these butterflies considered endangered? Why might that be?*

6. Ask each small group of students to give a poster presentation, explaining their findings to the class.

Note: To participate in an actual migration-monitoring project, visit The Journey North, www.learner.org/jnorth, where students can report their sightings and communicate with other students nationwide. You may also want to visit www.monarchwatch.org for more information on tracking butterfly migrations.

Extension

✔ Create a large outline map of North America on the ground in a large outdoor area. Using reference sheets you provide, have students create large-scale models of migratory butterfly species out of construction paper and assorted craft materials. Provide student groups with butterfly migration map outlines. (Visit www.monarchwatch.org/tagmig/index.htm for monarchs. Other species require more in depth research and you may need to draw up the map yourself after some research.) Have students trace identified migration routes by walking over the approximate route, demonstrating to others where the butterflies go in spring and fall. If possible, have a couple of students stand still in key locations to show where major cities are located in North America. Ask students volunteers to explain where these butterflies will find food, water, cover, and place for their young along their migration routes.

Assessment

✔ Have students write creative "breaking news" newspaper stories about their migratory butterflies' arrival, departure, or journey through their key locations, including challenges they face along the way and what they are looking forward to at each location.

WORKSHEET

NORTH AMERICA MAP

Directions:

Mark the migration route of your chosen butterfly on the map. Mark any major cities, large agriculture areas, and other important landmarks along the butterfly's route.

ACTION PROJECTS

Butterflies are critical components of functioning ecosystems due to their key roles as pollinators and as indicators of ecosystem health. Butterflies are also beloved by the public, which is largely unaware that many species are threatened or endangered. The National Wildlife Federation has joined the American Zoo and Aquarium Association and the U.S. Fish and Wildlife Service in a multi-year Butterfly Conservation Initiative, aiming to enhance recovery of imperiled butterfly populations in North America and raise public awareness about the ecological role of butterflies and the need to preserve them and their habitats.

NWF has many programs that focus on butterflies and provide opportunities to help conserve them, including the *Keep the Wild Alive* campaign, Backyard Wildlife Habitat and Schoolyard Habitats. Drawing on the conservation and education experience of these different programs, NWF would like to provide several model projects that can be easily carried out with or without our assistance.

The main objectives of these projects are: 1) to enhance students' knowledge of butterfly ecology and conservation through hands-on, interactive learning experiences; 2) to raise public awareness of the threats to butterflies and the need to conserve them; and 3) to give students opportunities to contribute to imperiled butterfly protection and habitat restoration.

Project 1: Create a Schoolyard Butterfly Habitat

Suggested Age Group: K-8

Educators and students can work together to create a butterfly habitat on school, facility or community grounds. By planting the appropriate native host and nectar plants and providing water sources and other habitat features, you can turn your school grounds into a National Wildlife Federation certified Schoolyard Habitats site — it's easy and fun! Schoolyard Habitats projects provide unique, hands-on, outdoor learning opportunities that cannot be duplicated in the traditional classroom setting and become an important part of your local ecosystem. Your new site will provide outdoor learning opportunities that are interdisciplinary, standards-based, and inexpensive — as well as beneficial to butterflies and other local wildlife. NWF's Schoolyard Habitats program can provide resources, training and curriculum support to participating schools, institutions and community groups. Visit www.nwf.org/schoolyardhabitats for more information.

Project 2: Growing and Transplanting Host Plants

Suggested Age Group: K-8

Since 1999, NWF's *Keep the Wild Alive* campaign has been working with grade school students in Concord, New Hampshire to help the endangered Karner blue butterfly. Working with the New Hampshire Fish and Game Department (NHFG), students grow wild lupine (*Lupinus perennis*), the host plant of the endangered Karner blue butterfly, in their classrooms during the winter and then transplant the seedlings to U.S. Fish and Wildlife Service (USFWS) conservation land during spring. This is an especially effective tool in teaching the close relationship between plants and animals and transferring the knowledge gained to a natural, habitat-wide context. This creative project can be replicated in many areas where imperiled butterflies are found, as long as the project is implemented in partnership with the appropriate national, state or local partner charged with conserving threatened and endangered species. In fact, AZA member Roger Williams Park Zoo began working with NWF, NHFG, USFWS and other partners on the New Hampshire project in 2002. NWF can provide contact information for local resource agencies and educational resources to interested classrooms. Contact: (202) 797-6892 or wildalive@nwf.org for additional information. AZA can provide contact information for accredited zoos and aquariums working with butterflies and host plant conservation. Contact: (301) 562-0777 for additional details.

Project 3: Restoration of Butterfly Habitat

Suggested Age Group: Middle and High School

Classrooms and youth service programs can participate in a restoration event hosted by refuges, land trusts, or other organizations overseeing imperiled butterfly recovery, including many AZA institutions. Many endangered butterfly habitats managed by the Fish and Wildlife Service and other resource agencies need help implementing habitat management plans. For butterflies, often the most effective habitat restoration method is the most simple: removal of invasive exotic plants. This activity does not require much expertise and is suitable for almost all ages. It also teaches a valuable lesson on the benefits of native species versus invasive exotics and can advance students' understanding of the intimate relationship between butterflies and plants. NWF's *Keep the Wild Alive* campaign and AZA can help participants identify a local partner to help design a restoration project and host the event, as well as assist educators in preparing students before they participate in the event. Contact: (202) 797-6892 or wildalive@nwf.org for additional information from NWF or (301)562-0777 for information from AZA.

BUTTERFLY CONSERVATION NEWS

The American Zoo and Aquarium Association (AZA) and the National Wildlife Federation (NWF) have joined forces with the U.S. Fish and Wildlife Service (FWS) and other partners, including the Xerces Society to promote the recovery of imperiled North American butterfly populations. One of our many goals is to raise public awareness about the ecological role of butterflies and the need to preserve them and their habitats through an exciting project called the Butterfly Conservation Initiative.

The aim of the Butterfly Conservation Initiative (BFCI) is to bring together the energy and expertise of a wide range of individuals and organizations committed to community conservation. Through the BFCI, gardeners, school groups, entomology experts and critter fans can all come together to help make a difference in our communities.

For more information, contact the NW'sF *Keep the Wild Alive* campaign at (202)797-6892 or the American Zoo and Aquarium Association at (301)562-0777.

BUTTERFLY CONSERVATION INITIATIVE

ACTION REPORTS

Singing the Karner Blues at the Toledo Zoo

For over ten years, scientists and volunteers at the Toledo Zoo have been working hard to reintroduce the tiny Karner blue butterfly to the Oak Openings habitat in the Toledo area. Before the Zoo team started on this project, this endangered insect was extinct in Ohio. Karner blues depend on the oak savanna habitat, much of which has been lost to development and is no longer available to Karner blue butterflies. To help with this problem, staff from the Toledo Zoo have been working with the Ohio Department of Natural Resources, U.S. Fish and Wildlife Service biologists, and land managers from the Nature Conservancy to restore Karner blue habitat near the Zoo.

Earning a Gold Medal for Silverspot Conservation at the Oregon Zoo

In the Pacific Northwest, biologists at the Oregon Zoo are working hard to recover the Oregon silverspot butterfly and its host plant, the western blue violet. Together with the Nature Conservancy, the U.S. Fish and Wildlife Service, Washington State Department of Fish and Wildlife, and Seattle's Woodland Park Zoo, Oregon Zoo staff are raising silverspots in captivity for release into the wild. The recovery team is also working to restore butterfly habitat so the released silverspots have enough nectar to eat and good places to lay eggs. The Zoo and its partners are now working to protect the endangered Fender's blue butterfly as well.

AZA-Accredited Zoos and Aquariums With Butterfly Exhibits and/or Gardens

Did you know that in addition to being fun places to see bears and penguins, lots of AZA-accredited zoos and aquariums also have butterfly exhibits and special gardens designed to attract butterflies and other pollinators?

Visit your local AZA-accredited zoo or aquarium to see what they're doing to help butterflies in their own backyards and all over the world!

Arizona
Arizona-Sonora Desert Museum, Tucson

California
Oakland Zoo, Oakland
Sacramento Zoo, Sacramento
San Diego Wild Animal Park, Escondido
San Francisco Zoo, San Francisco
Six Flags Marine World, Vallejo

Colorado
Cheyenne Mountain Zoo, Colorado Springs
Denver Zoo, Denver
Pueblo Zoo, Pueblo

Connecticut
Beardsley Zoo, Bridgeport

District of Columbia
Smithsonian National Zoological Park, Washington

Florida
Brevard Zoo, Melbourne
Caribbean Gardens: The ZOO in Naples, Naples
Central Florida Zoo, Lake Monroe
Miami Metro Zoo, Miami

Illinois
Brookfield Zoo, Chicago
Henson Robinson Zoo, Springfield

Indiana
Fort Wayne Children's Zoo, Fort Wayne
Indianapolis Zoo/White River Gardens, Indianapolis
Mesker Park Zoo and Botanic Gardens, Evansville

Kentucky
Louisville Zoo, Louisville

Louisiana
Audubon Insectarium, New Orleans

Massachusetts
Franklin Park Zoo, Boston

Michigan
Detroit Zoo, Detroit

Minnesota
Minnesota Zoo, Minneapolis

Missouri
Dickerson Park Zoo, Springfield
Saint Louis Zoo, St. Louis

Nebraska
Folsom Children's Zoo, Lincoln

New Jersey
Bergen County Zoological Park, Paramus

New York
Bronx Zoo, Bronx
New York State Living Museum, Watertown
Rosamond Gifford Zoo at Burnet Park, Syracuse
Ross Park Zoo, Binghamton
Seneca Park Zoo, Rochester

North Carolina
North Carolina Zoo, Asheboro

Ohio
Cincinnati Zoo and Botanical Garden, Cincinnati
Cleveland Metroparks Zoo, Cleveland
Columbus Zoo and Aquarium, Columbus
Toledo Zoo, Toledo

Oregon
Oregon Zoo, Portland

Oklahoma
Oklahoma City Zoo, Oklahoma City
Tulsa Zoo, Tulsa

Pennsylvania
Elmwood Park Zoo, Norristown
Erie Zoo, Erie

Tennessee
Memphis Zoo, Memphis

Texas
Dallas World Aquarium, Dallas
Moody Gardens, Galveston
San Antonio Zoological Gardens and Aquarium, San Antonio

Utah
Utah's Hogle Zoo, Salt Lake City

Washington
Woodland Park Zoo, Seattle

Canada
Calgary Zoo, Calgary, Alberta
Toronto Zoo, Toronto, Ontario
Vancouver Aquarium, Vancouver, BC

RESOURCES

Native Plants:

The Lady Bird Johnson Wildflower Center has a comprehensive directory listing native plant suppliers across the United States www.wildflower.org

The New England Wildflower Society has also compiled a directory of botanical clubs and native plant societies in both the United States and Canada www.newfs.org/nps.htm

NWF's Backyard Wildlife Habitat Website features a searchable native plant guide www.nwf.org/backyardwildlifehabitat/index.cfm?pid=42&

Butterflies:

eNature
www.enature.com

Journey North
www.learner.org/jnorth

North American Butterfly Association
www.naba.org

Northern Prairie Wildlife Research Center's Butterflies of North America
www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/bflyusa.htm

Monarch Watch
www.monarchwatch.org

Partnering Organizations:

American Zoo and Aquarium Association
www.aza.org

National Wildlife Federation
www.nwf.org

US Fish and Wildlife Service
www.fws.gov

Xerces Society
www.xerces.org

Further Resources:

Enchanted Learning has a variety of on-line activities
www.enchantedlearning.com/subjects/butterfly/activities

Photos Courtesy of:

Cover: Karner blue butterfly—Mitch Magditch, Toledo Zoo; page 2: Karner blue butterfly—Ken Cole, Animals Animals; page 5: monarch butterfly—Albert P. Bekker, California Academy of Sciences; page 6: all stages of Karner blue butterfly—Mitch Magditch, Toledo Zoo; page 11: buckeye butterfly—T. W. Davies, California Academy of Sciences;

Alignment with National Science Education Standards

STANDARDS	Butterfly Life Cycle	Pollination Partners	Great Butterfly Migration
SCIENCE AS INQUIRY			
Science as inquiry		✔	
LIFE SCIENCE			
Characteristics of organisms	✔	✔	✔
Life cycles of organisms	✔		
Organisms and environments	✔	✔	✔
Structure and function		✔	
Reproduction and heredity	✔		
Regulation and behavior	✔		✔
Diversity and adaptations		✔	
Populations and ecosystems	✔		✔
SCIENCE AND TECHNOLOGY			
Technological design			
Understanding about science/technology			
SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES			
Populations, resources, environment	✔		✔
Risks and benefits			
Science/technology in society			
HISTORY AND NATURE OF SCIENCE			
Science as a human endeavor			
Nature of science		✔	
PHYSICAL SCIENCE			
Properties and changes in properties in matte			

NOTES:

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