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.

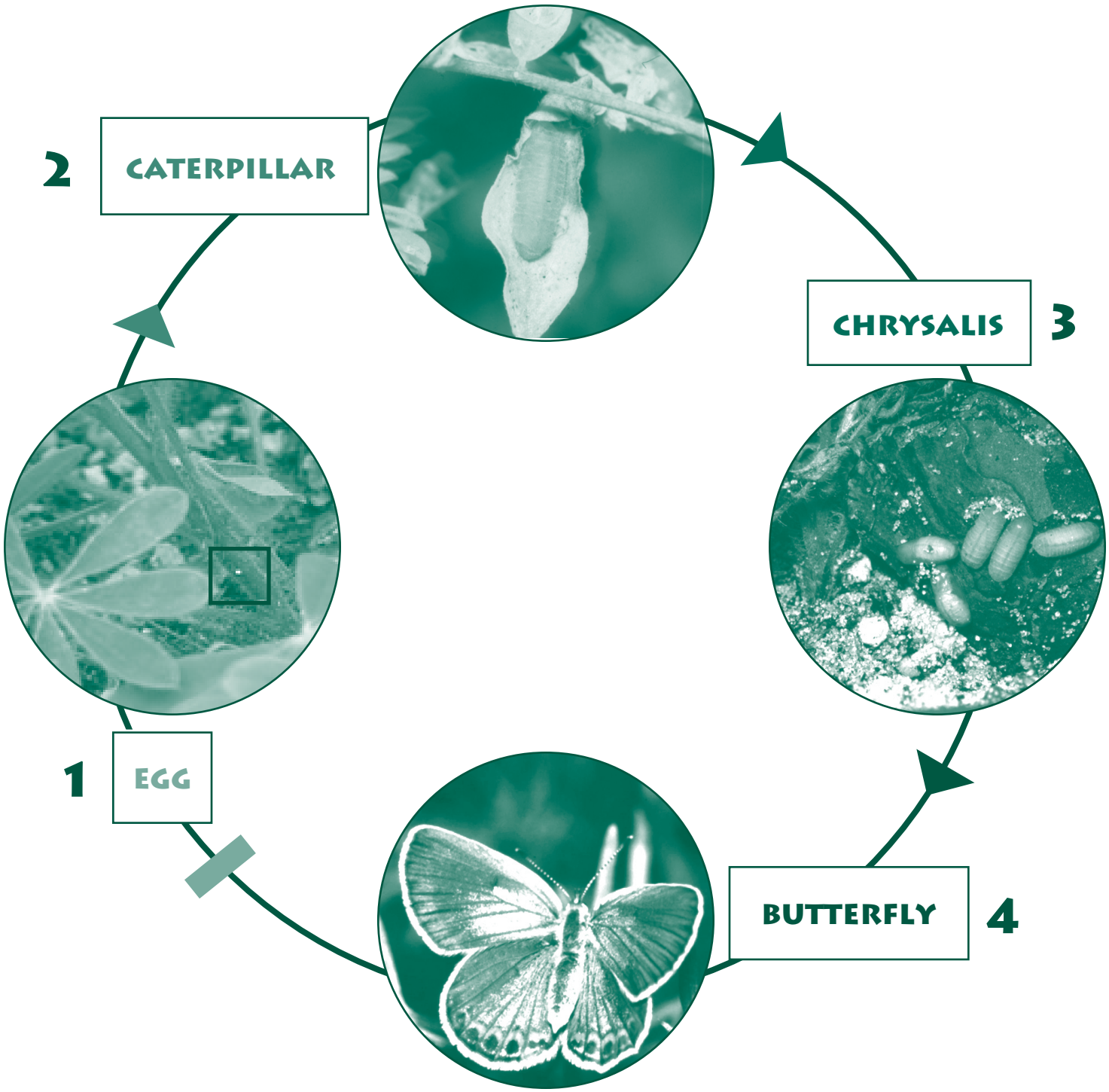
✔ If you have found good pictures of local butterflies and their host plants, make them into cards and tape them to a board or easel paper. Have students play a matching/memory game to match up the butterflies with their respective host plants!

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

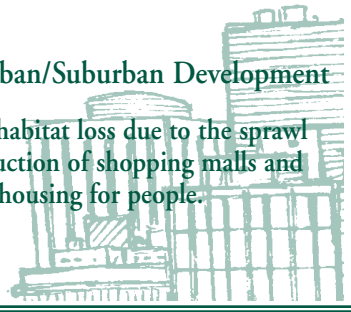
BUTTERFLY LIFE CYCLE



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.