PLANT AND ANIMAL PARTNERS

A forty-five minute Desert Discovery Class

ARIZONA-SONORA DESERT MUSEUM

To the Teacher:

Thank you for your participation in the Arizona-Sonora Desert Museum's educational programs! We are pleased to bring you the *Plant and Animal Partners* program. During this exciting educational program, students will see live desert animals, handle artifacts, and perhaps serve as a volunteer for a program demonstration.

Plant and Animal Partners is a program about the exciting relationship between animals and plants. It explores how animals play the role of pollinators, helping plants make seeds, as well as seed dispersers after pollination and seed production occurs. This Teacher Idea Packet provides activities to help you integrate these themes into your curriculum.

This packet contains pre- and post- program information and activities along with a vocabulary list and suggested resources. These materials were developed to help you extend this class topic with both introductory and follow-up lessons. Since the program is designed for two age groups – audiences from grades K-2 and 3-5 – corresponding materials are presented with ideas for their application with younger students (K-2) and older students (3-5). The pre-visit information will introduce students to some of the basic concepts presented in *Plant and Animal Partners* and help prepare them for the class. We hope you'll find this information useful and easy to incorporate into your science curriculum. For more information about the Desert Museum and the Sonoran Desert, visit our website at **www.desertmuseum.org**.

We look forward to working with you and your students.

Sincerely,
ASDM Center for Sonoran Desert Studies
Education Department

CLASS OBJECTIVES

Through the examination of live animals, artifacts and interactive demonstrations students will:

- Identify the structures of flowers important to pollination and plant reproduction.
- Describe the process of pollination.
- Describe relationships and interdependence between pollinators and the plants they pollinate.
- Identify and model relationships between groups of plants and animal pollinators.
- Understand the role of animals in plant reproduction as pollinators and seed dispersers.

ARIZONA ACADEMIC STANDARDS IN SCIENCE CORRELATION

The Plant and Animal Partners program and supplemental activities correlate to these Arizona Academic Science Standards. See each activity for specific standards and performance objectives.

SC00-S1C1-02, SC00-S1C3-01, SC02-S1C3-01, SC02-S4C1-01, SC03-S4C1-01, SC03-S4C4-01, SC00-S4C3-01, SC01-S4C1-03, SC07-S4C3-06, SC03-S3C1-01&02, SC03-S4C3-03&04, SC01-S5C1-01

Science Standards:

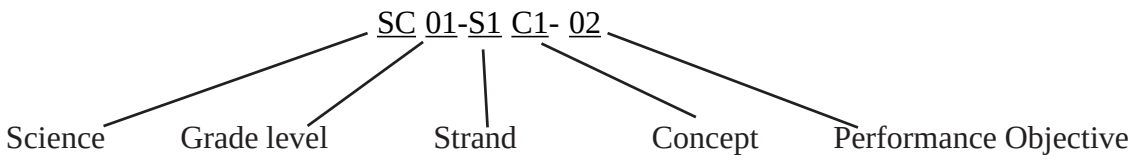
Strand 1: Inquiry Process
- Concept 1: Observations, Questions, and Hypotheses
- Concept 2: Scientific Testing
- Concept 3: Analysis and Conclusions
- Concept 4: Communication

Strand 2: History and Nature of Science
- Concept 1: History of Science as a Human Endeavor
- Concept 2: Nature of Scientific Knowledge

Strand 3: Science in Personal and Social Perspectives
- Concept 1: Changes in Environment
- Concept 2: Science and technology in Society
- Concept 3: Human Population Characteristics

Strand 4: Life Science
- Concept 1: Characteristics of Organisms
- Concept 2: Life Cycles
- Concept 3: Organisms and Environments
- Concept 4: Diversity, Adaptation and Behavior

The shorthand for each standard is read this way:



RESOURCES

Literature and Field Guides:

- Arizona-Sonora Desert Museum. *A Natural History of the Sonoran Desert.* Tucson: ASDM Press, 1999.
- Adams, Richard. *A Nature Diary*. Middlesex, England: Viking, 1985.
- Baldwin, Mark K. *The Naturalist's Journal. A Way to See, Draw and Write About Nature.* A Workshop for Teachers. Roger Tory Peterson Institute. June 15, 1995.
- Brackenbury, John. *Insects and Flowers: A Biological Partnership*. Dorset, England: Blandford Press, 1995.
- Buchmann, Steve L. and Gary Paul Nabhan. *The Forgotten Pollinators.* Island Press: Washington, DC. 1996.
- Cole, Joanna. *The Magic School Bus Plants Seeds: A Book About How Living Things Grow*. New York: Scholastic, 1995.
- Cornell, Joseph. *Sharing Nature with Children*. Nevada City, CA: Dawn Publications, 1979.
- Criswell, Susie Gwen. *Nature With Art*. New York: Prentice Hall, 1986.
- Johnson, Sylvia A. *Roses Red, Violets Blue: Why Flowers Have Colors*. Mpls, MN: Lerner Publications, 1992.
- Leslie, Clare Walker. *Nature All Year Long*. New York: Greenwillow Books, 1991.
- Morgan, Carne, ed. "The Creative Journal, An Environmental Education Tool." *E.E. News.* Winter, 1993. Vol. 10, No. 2. Madison, WI: Wisconsin Department of Natural Resources.
- O'Toole, Christopher and Anthony Raw. *Bees of the World*. London, U.K.: Blandford Publishing, 1991.
- Overbeck, Cynthia. *How Seeds Travel*. Minneapolis: Lerner Publications Co., 1982.
- Proctor, Michael, Peter Yeo, and Andrew Lack. *The Natural History of Pollination*. Portland, Ore.: Amadeus Press, 1996.
- Robbins, Chandler S., Bertel Bruun and Herbert S. Zim. *A Guide to Field Identification. Birds of North America*. New York: Golden Press, 1983.
- Zim, Herrbet S. and Clarence Cottam. *Insects*. New York: Golden Press, 1987.

Activity Books:

- OBIS (Outdoor Biology Instructional Strategies). Lawrence Hall of Science, University of California, Berkley. OBIS. 1977. "Terrestrial" and "Sensory Hi-Low Hunts"; "Shake It".
- Tucson Audubon Society. *Dr. Strangeplant*. Tucson, Arizona: Tucson Audubon Society, 1989.

Organizations and Websites:

- **Arizona-Sonora Desert Museum:** 2021 N. Kinney Rd., Tucson, AZ 85743. Phone: (520) 883-3025. The Migratory Pollinator Program offers a wealth of information on migratory pollinators. www.desertmuseum.org
- **Missouri Botanical Garden:** http://www.mbgnet.net/bioplants/
- **National Gardening Association:** They have products, materials and resources for teachers to use in developing educational gardening programs. 1 (800) 538-7476. http://www.kidsgardening.com/
- **Smithsonian Institution:** Their Education Office has produced an activity on pollination available through their website http://smithsonianeducation.org/educators/lesson_plans/partners_in_pollination/index.html

VOCABULARY

Adapt - To grow and change in response to environmental conditions.
Adaptation - Special body features or behaviors that help a creature survive in its environment (i.e. an eagle has sharp talons that help it grab and hold its prey).
Adjective - A word that describes a noun or pronoun.
Anther - The pollen-producing part of the flower.
Describe - To express characteristics. To tell what something is like.
Disperse - To spread.

Filament - The stalk upon which the anther is suspended in a flower.
Habitat - A place an animal or plant lives which provides food, water, shelter, and space for its survival.
Journal - A diary; a written record of events.
Metamorphosis - The process of change from young to adult in which the young is very different from the adult (examples: a caterpillar changes into a butterfly; a tadpole matures into a frog.)
Migration - The seasonal, usually two-way and goal-oriented movement from one place or habitat to another to avoid unfavorable climatic conditions and/or to seek more favorable energetic conditions.
Migration corridor - The route along which animals migrate between seasonal feeding and breeding grounds. Migration corridors are typically linear habitats surrounded by a wider matrix of less intact habitat.
Native - Indigenous to and dwelling within a specific area for an entire lifespan.
Nectar - A sugary fluid produced by flowers to attract animal pollinators.
Observe - To look at, watch carefully.
Ovary - Female floral tissue that contains undeveloped egg cells. When mature, an ovary becomes a fruit.
Ovule - An unfertilized egg cell contained within the floral ovary. When mature, an ovule becomes a seed.
Petals - Usually colorful flower parts that surround the floral reproductive structures.
Pistil - The name for the collective female floral reproductive parts including the stigma, style, and ovary.
Pollen - A collective name for pollen grains. Pollen bears sperm for seed plant reproduction.
Pollen tube - Tube formed after germination of the pollen grain. It carries the male reproductive information to the ovule.
Pollinated - The condition of a flower in which the female flower (or female parts of one flower) have received pollen transferred from the male parts of the same or another flower of the same species.
Pollination - The spreading of pollen from the male parts (anther) to the female parts (stigma) of a flower, either between flowers of the same kind or within the same flower, resulting in the production of seeds and fruits.
Pollination strategies - General trends among groups of pollinators and the flowers they pollinate. (Example: hummingbird flowers are generally red and tube-shaped.)
Pollinator - An animal that carries pollen from anther to stigma, fertilizing plant "eggs" with plant "sperm."
Record - To write down to preserve evidence, information, memory.
Reproductive organ - A part of a living organism that enables the organism to have offspring.
Seed - The part of the fruit of a plant which is capable of growing (germinating) and producing a new plant.
Sepals – A whorl of leaf-like structures outside of or below the petals which serve to attract pollinators, and support and protect the flower. Sepals usually form the protective covering over an unopen bud. Many flowers have sepals that are the same color as the petals.
Sketch - An outline or simple, rough drawing of an object.
Solitary - Living alone instead of in groups or colonies.
Stamen - The name for the collective male floral rerproductive parts including the anthers and filaments.
Stigma - The female reproductive tissue that provides a surface for pollen grains to land upon and germinate.
Style - The slender structure connecting the stigma to the ovary through which a pollen tube must grow to reach and fertilize an egg cell.
Swarm - A group of honeybee worker bees and queen traveling together to find a new location for a nest.

PRE-PROGRAM INFORMATION AND ACTIVITIES

BATS, BEES, BIRDS, AND BLOSSOMS

Students build a pollination model or complete a crossword puzzle to understand and describe the partnership between flowering plants and their animal pollinators.

FLOWER DISSECTION

Students dissect a variety of flowers to identify floral structures.

POST-PROGRAM INFORMATION AND ACTIVITIES

POLLINATION STRATEGIES

Students make model flowers and pollinators to demonstrate the relationship between four major groups of pollinators and the flowers they pollinate.

TRAVELING SEEDS

Activities to demonstrate how seeds are adapted for dispersal.

CREATING A GARDEN JOURNAL

Create science journals and record observations from the schoolyard pollination garden.

WHAT'S THE BUZZ ON NATIVE BEES?

Students learn about the diversity of native bees and make shelters for solitary bees to attract these important pollinators to the desert garden.

BATS: NEED NECTAR, WILL TRAVEL

Students play the role of nectar feeding bats on their annual migration and try to avoid the different haz ards that hinder their progress.

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