

Pest Populations: A Game of Survival

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Standard Statements:

Know types of pests. 4.5.4.A
Identify classifications of pests. Identify and categorize pests.

Explain pest control. 4.5.4.B
Know reasons why people control pests.
Identify different methods for controlling specific pests in the home, school and community

Content Objectives:

Student will be able to:
Name and identify pests found in the home, school and community;
recognize the specific conditions needed for the survival of an organism considered a pest;
list tactics associated with integrated pest management which may be used to control specific pests.

Assessment Strategies:

Student should be able to:
Identify the physical characteristics of at least five pests.
List factors in a habitat which support the survival and reproduction of at least five pests.
Name a pest which is not a pest if living in another location.
List two ways to alter the habitat of a pest which may be used in place of using a pesticide.
Identify a natural predator of a specific pest.

Introduction:

In this activity students will play a game which illustrates the combination of factors necessary to insure the survival of an organism in a particular habitat. Each student will represent a particular pest and will strive to obtain all the needs of this organism. Students must be wary of changes made to the habitat of their pest and must attempt to avoid pest management tactics or they must find an opportunity to adapt to the changing conditions.

Procedures:

1. Prepare game boards and cards in advance or provide students with poster board, markers, rulers, and construction paper to do so. The following are instructions to make the game board.

Modeled on a monopoly-type board, create a square arrangement of 40 spaces. Make spaces large enough to accommodate the instructions for each listed below. The starting point will be "Space #1" and will continue to "Space #11" as the first corner space. The remaining two corner spaces are "Space #21" and "Space #31".

Space # 1: Water Source - Take a Water Card
2: Safe Hiding Spot

Suggested Level:

Grades 4-6

Standard Category:

4.5.4 A
4.5.4 B

Materials:

Poster paper or foam board to make a game board for every 5 - 6 students
Construction paper or card stock of 6 colors
Tokens for each student (colored chips, donated game pieces or plastic insect toys)
Markers
Rulers

Instructional Strategies:

Direct Instruction
Games
Task Analysis
Small Group Activity

- 3: You have transmitted a disease -move ahead two spaces
- 4: Take a Habitat Card
- 5: Take a Pest Management Card
- 6: Take a Food Source Card
- 7: You may trade a card with another player
- 8: Food is scarce - lose one turn
- 9: You may return any card to its pile and redraw
- 10: Take a Reproduction Card
- 11: If you are a mammal, go back 3 spaces.
- 12: If you are an insect or other arthropod, go back 3 spaces.
- 13: Take a Habitat Card
- 14: You may trade a card with another player.
- 15: Take a Food Source Card
- 16: Take an IPM Card
- 17: You may return any card to its pile and redraw
- 18: Food is scarce - lose one turn
- 19: If you are an insect, go back 2 spaces.
- 20: Take an Adaptation Card
- 21: You have transmitted a disease - move ahead 3 spaces
- 22: Safe Hiding Spot
- 23: Take a Habitat Card
- 24: Take an IPM Card
- 25: Take a Food Source Card
- 26: You may trade a card with another player.
- 27: Low on Food - lose one turn
- 28: You may return any card to its pile and redraw
- 29: If you are a mammal, go back 3 spaces
- 30: If you are an insect or other arthropod, go back three spaces
- 31: Take a Habitat Card
- 32: You may trade a card with another player
- 33: Take a Food Source Card
- 34: Take an IPM Card
- 35: Your water source is gone - return all Water Cards.
- 36: Food is scarce - return all Reproduction Cards
- 37: If you are a mammal, go back 2 spaces
- 38: Take an Adaptation Card
- 39: Take a Reproduction Card
- 40: If you are an insect or other arthropod, go back 5 spaces

2. Prepare 20 cards for each type as indicated below.

Food Source (green)
Habitat (yellow)
Water Source (blue)
IPM (orange)
Adaptation (red)
Reproduction (purple)

3. Refer to the "Pest Background Sheets" to make Pest Information Cards (information is provided to make 15 different pest cards - each player selects a pest card at the beginning of the game to use as a reference).

4. Food Source and Habitat Cards should also be prepared from information on the "Pest Background Sheets". Each of the 20 pests should have a corresponding Food Source and Habitat Card to meet its "needs."

5. Water Source Cards and Reproduction Cards require no further information printed on them.

6. IPM Cards should be prepared as follows (4 cards for each):

"Food Source Removed: Turn in all your Food Source Cards"

"A Natural Predator was Released in Your Habitat: Turn in all your Habitat Cards"

"Your Habitat has been made Unsuitable for Breeding: Turn in your Reproduction Cards"

"Food Source is Contaminated with a Pesticide: Lose All your Cards"

"You've Been Trapped: Lose All your Water Source Cards"

7. Adaptation Cards should be prepared as follows (4 cards for each):

"Find a New Food Source: Draw a Food Source Card"

"Find a Great Hiding Place and Escape from a Natural Predator: Draw a Habitat Card"

"Find a New Breeding Location: Draw a Reproduction Card"

"What Great Genes you Inherited! Survive the Pesticide Application: Draw a Food Card"

"You've Seen that Trap Before: Draw a Water Source Card"

8. Review the objectives of the game:

A player represents the pest indicated on their Pest Information Card. The player must meet all the needs of this pest by obtaining the Food Source Card and the Habitat Card which matches the information on their Pest Information Card. In addition, in order to win the game a player must have at least one Water Source Card and one Reproduction Card to insure the survival of their population. The game is over once a player satisfies all the needs of its pest population.

9. Review the directions.

Discuss the instructions indicated on the spaces of the game board. Have students select a token and begin the game on Space #1: "Water Source. Whenever a player lands on this space a "Water Source" Card is taken; a card is not taken as a player passes by this space in traveling around the board. A pair of dice is rolled to advance ahead, however, students must select which die will be used to move their token. The number on the dice are not added together. Only one die is counted.

Players continue around the board following directions as they land on a space. For a space which indicates that a card may be traded with another player, any type of card can be traded for another (a Food Source for a Habitat Card, for example). If a space allows a student to redraw, it must be for the same type of card. Some spaces further the survival of the pest population, such as one which gives a direction to select an Adaptation Card; others are used to control the populations, such as the Integrated Pest Management Cards.

10. Up to 6 students could play the game together. If the game is progressing too slowly, adapt the instructions on the spaces to allow for two favorable cards to be drawn or traded at the same time.

Estimated Duration: preparation time: 1 - 2 class periods, playing of game: 1 class period

Conclusion:

In this activity students have become familiar with the specific needs of several organisms which are considered pests. They have also explored management tactics to control populations of these pests and have recognized that in some situations pests are able to adapt to changes in their habitat or are able to survive physical, biological or chemical methods of control.

Extension:

Provide students with web sites to view pictures of the pests detailed in this game. Use a pre-test to assess students' knowledge of pest and IPM tactics and compare to a post-test after playing the game.

Pest Background Information Sheet

Mammals:

Norway Rat (*Rattus norvegicus*)

Physical Characteristics: coarse grayish brown fur speckled with black, large naked ears, 5" - 7" tail, Rounded nose, large feet

Food Preferences: barnyard poultry and young livestock, garbage, fish, meat, peanut butter, cereals and pet food

Habitat: requires a lot of water and likes to live in sewers and storm drains, inside likes cluttered areas, inside walls

House Mouse (*Mus musculus*)

Physical Characteristics: brownish- gray fur, 5 - 7" long with tail, pointy nose, slightly protruding, beady eyes

Food Preferences: grains and seeds, peanut butter, dog food

Habitat: in dark, warm places that are close to food, wooded areas near people's homes, wheat and corn fields

Mole (*Scalopus aquaticus*- Eastern Mole)

Physical Characteristics: short, dense, velvety fur (black, gray or brown tones), short, naked tail, large, spade-like feet, 5 - 8"

Food Preferences: soil invertebrates, corn, wheat, tomatoes, apples, potatoes and seeds

Habitat: underground tunnels which may affect lawns and golf courses

Vole (*Microtus pennsylvanicus* - Meadow Vole)

Phys. Characteristics: 5 - 7", short, dense chestnut brown fur, beady black eyes and short, rounded ears concealed in fur

Food: grass roots and seeds, trunks of young apple trees and other seedlings

Habitat: underground burrows close to food sources

Groundhog or Woodchuck (*Marmota monax*)

Phys. Characteristics: Compact, chunky body, grizzled brownish-gray, 16 - 20", forefeet have long, curved claws

Food: soybeans, beans, peas, carrot tops, alfalfa, clover and grasses

Habitat: burrows in open farmland and in suburban areas where there is good cover and food sources

Raccoon (*Procyon lotor*)

Phys. Characteristics: stocky build, fur of long coarse gray hair and short, soft underfur, 7 - 11", broad face covered with a "mask", heavily furred tail

Food: corn, fleshy fruits, carrion, and aquatic prey

Habitat: woodlands close to streams, ponds or lakes, farmlands, suburban and urban areas where trash can be "picked"

Insects and Other Arthropods

Carpenter Ants (*Camponotus ferrugineus*)

Phys. Characteristics: light red to brown or black, 12 segments on antennae
Food: wood in buildings, dead trees, logs, dead and live insects, juices of fruits
Habitat: any wooded areas, moist conditions around windows or leaky pipes

Yellow Jackets (*Vespula pennsylvanica*)

Phys. Characteristics: abdomen banded with black and yellow, eye encircled in yellow band, wings folded fan-like
Food: nectar, ripe fruit, insect parts
Habitat: build nests in the ground or hollow logs

House fly (*Musca domestica*)

Phys. Characteristics: head and abdomen have brown markings, thorax is black, sponging mouthparts
Food: maggots eat decaying food material including manure
Habitat: homes, fields anywhere food is available

Mosquito (*Culex pipiens*)

Phys. Characteristics: long, narrow wings with scales, long sucking mouthpart
Food: nectar of flowers and fruit juices, females drink blood from living animals
Habitat: near watery areas to breed

German cockroach (*Blatella germanica*)

Phys. Characteristics: adults have wings, brown with two black stripes on their thorax
Food: scavengers, will eat almost anything, people food, pet food, wallpaper paste, leather, hair
Habitat: enclosed, dark, very moist areas, under sinks, near refrigerators

Flea (*Ctenocephalides felis* - Cat flea)

Phys. Characteristics: dark brown in color, lack wings, extremely narrow body, mouthparts for piercing and sucking
Food: blood of living animals
Habitat: very humid areas, carpets, animal hair, bedding, damp soil

Human Lice (*Pediculus humanus capitus* - head lice)

Phys. Characteristics: grayish- white, abdomen longer than they are broad, wingless, sucking mouthparts
Food: blood of humans
Habitat: eggs are glued to human hair

Blacklegged (deer) tick (*Ixodes scapularis*)

Phys. Characteristics: small head, large reddish abdomen, 8 legs
Food: blood of birds, small mammals, deer, humans
Habitat: carried on the bodies of warm-blooded vertebrates, drop into wooded areas or on lawns

Silverfish (*Lepisma saccharina*)

Phys. Characteristics: gray or silver with long antennae and three long filaments coming out from the abdomen

Food: any substance containing starch, books, wallpaper, cereals

Habitat: cool, damp areas of houses

Resources:

Arnett, Jr., R.H., Jacques, Jr. R.L. Guide to Insects. Simon and Schuster, Inc., N.Y., 1981.

Borror, D.J., White, R.E. A Field Guide to Insects. Houghton Mifflin Company, Boston, MA, 1970.

Jacobs, Steve. The Pest Sheet: Fleas. College of Agricultural Sciences, Cooperative Extension, Penn State University, 1998.

Jacobs, Steve. The Pest Sheet: Four Common Ticks of Pennsylvania. College of Agricultural Sciences, Cooperative Extension, Penn State University, 1998.

Jenkins, Erica B. Exploring Urban Pest Management: Activities and Resources for Teaching K - 6. Michigan State University, 2001.

Merritt, Joseph F. Guide to Mammals of Pennsylvania. University of Pittsburgh Press, 1987.

Thurston, S.N., Brittingham, M.C., Williams-Whitmer, L.M. "Woodchucks." Wildlife Control Fact Sheet #8. College of Agricultural Sciences, Cooperative Extension, Penn State University, 1997.

Related Web Sites:

Dennis Kunkel Microscopy, Inc.
<http://www.denniskunkel.com/PublicHtml/Education05.asp>

Koday's Kids
<http://www.ivyhall.district96.k12.il.us/4th/kkhp/1insects/bugmenu.html>

<http://schoolipm.ifas.ufl.edu/>