

**TEACHING KATE
TEACHING KIDS ABOUT THE ENVIRONMENT**

**COMPARING ECOLOGICAL COMMUNITIES:
HUMAN INFLUENCE AND SPECIES DIVERSITY**

Grade Level: 9-12

Time Required: 5 class periods

SC Science Standards

This lesson plan was correlated with only the grade level specified unless otherwise noted.

- I. B. 1, 2, 5, 8
- II. D. 2. a
- II. D. 4. c, d
- II. D. 5. b

Purpose

Students will measure species diversity in a “natural” and a human dominated ecosystem. Students will assess and describe the relationship of organisms at various trophic levels within these systems. Students will analyze the role of humans in altering species diversity. Students will understand the impact of man’s activities on the environment.

Skills

Analyzing, classifying, describing, estimation, graphing, identifying, inferring, interpreting, measuring, listening, observing, recording and reporting data.

Concepts

Diversity is a measure of the number of different species, ecological niches or genetic variation present in an area. The abundance of a particular species is often inversely related to the total diversity of the community. More natural (or less disturbed) ecosystems have a great deal of biological diversity, whereas, highly disturbed ecosystems tend to have a reduced number of species, although there may be a great many individuals of a given species present. Disturbances to a community occur through natural process, population levels and human intervention. All

things in the environment are interconnected. Humans are an integral part of the environment and cannot be separated from it. Seemingly localized human actions and policies often have far-reaching effects.

Materials Needed (per group unless otherwise indicated)

| | |
|--|----------------------------------|
| 2 collecting jars | 1 soil thermometer |
| 1 random number table | transparent tape |
| pencil | 400 ml beaker or waxed paper cup |
| petri dish | 4 labels |
| probe or dissecting needle | trowel |
| forceps | zip-lock bag (small size) |
| lamp with 25 watt bulb | meter stick |
| ring stand | butterfly net |
| ring clamp | paper |
| funnel | graph paper |
| hand lens | alcohol |
| microscope | |
| 1 quadrat (see instructions in teacher preparation section) | |
| fine mesh screen disk to fit funnel (see diagram in teacher preparation section) | |
| student worksheets (one each, per student) | |
| key to trophic levels of organisms (one each, per student) | |
| poster board (2 sheets needed for entire class) | |

Definition of Terms

| | |
|-----------------------------|--|
| <u>Abiotic</u> | Environmental factors that are non-living components of ecosystems. |
| <u>Abundance</u> | An expression of the total number of organisms in a biological community. |
| <u>Autotroph</u> | An organism that is able to synthesize food molecules from inorganic molecules by using an external energy source, such as light energy. |
| <u>Biodiversity</u> | (See Biological Diversity) |
| <u>Biological Diversity</u> | The variety of different species (species diversity), genetic variability among individuals within each species (genetic diversity), and variety of ecosystems (ecological diversity). |

| | |
|------------------------------|--|
| <u>Biotic</u> | All of the environmental factors created by living organisms. Living organisms make up the biotic parts of ecosystems. |
| <u>Carnivore</u> | An animal that feeds on other animals. |
| <u>Community</u> | Populations of all species living and interacting with each other in a given area at a particular time. |
| <u>Consumer</u> | An organism that obtains energy and nutrients by feeding on other organisms or their remains. |
| <u>Decomposer</u> | Organisms that break complex organic material into smaller molecules and absorb the soluble nutrients. Decomposers consist of various fungi and bacteria. |
| <u>Detritivore</u> | Organisms that feed on detritus (organic litter, parts of dead organisms, and cast-off fragments and wastes of living organisms). |
| <u>Dichotomous Key</u> | Identification key based on a series of choices between alternative characteristics. |
| <u>Ecological Niche</u> | The total way of life or role of a species (population) in an ecosystem, including what resources it uses, how and when it uses the resources, and how it interacts with other populations. |
| <u>Ecological Pyramid</u> | (See Pyramid of Energy Flow). |
| <u>Ecological Succession</u> | The process in which communities of plant and animal species occupy a site and are gradually replaced over time by a series of different and usually more complex communities. |
| <u>Ecology</u> | The scientific study of interactions of living organisms with each other and with the non-living environment of matter and energy. It is concerned with the life histories, distribution and behavior of individual species as well as the structure and function of natural systems at the level of populations, communities, and ecosystems. |
| <u>Ecosystem</u> | A specific biological community and its physical environment interacting in an exchange of matter and energy. |
| <u>Environment</u> | All the external conditions or factors, living and non-living (chemicals and energy), that surround an organism or group of organisms as well as the complex of social or cultural conditions that affect an individual or community. |

| | |
|-------------------------------|---|
| <u>Food Chain</u> | The linear sequence of organisms in an ecosystem through which energy and materials are transferred, in the form of food, from one trophic level to the next. |
| <u>Food Web</u> | A complex network of many interconnected food chains and feeding relationships. |
| <u>Herbivore</u> | An organism that eats only plants. |
| <u>Heterotroph</u> | An organism that is unable to synthesize its own food and, therefore, must feed on other organisms. |
| <u>Omnivore</u> | An organism that feeds on both plant and animal material. |
| <u>Population</u> | A group of individuals of the same species living within a given area. |
| <u>Producer</u> | An organism that uses solar energy (green plant) or chemical energy (some bacteria) to manufacture the organic compounds it needs as nutrients from simple inorganic compounds it obtained from its environment. |
| <u>Pyramid of Energy Flow</u> | A diagram representing the flow of energy through each trophic level in a food chain or food web. With each energy transfer, only a small part (typically 10%) of the usable energy entering one trophic level is transferred to the organisms at the next trophic level. |
| <u>Pyramid of Numbers</u> | A diagram representing the number of organisms of a particular type that can be supported at each trophic level from a given input of solar energy at the producer trophic level in a food chain or web. |
| <u>Species</u> | A group of organisms that resemble one another in appearance, behavior, chemical makeup and process, and genetic structure. Organisms that reproduce sexually are classified as members of the same species only if they can actually or potentially interbreed with one another and produce viable offspring. |
| <u>Trophic Level</u> | A step in the movement of energy through an ecosystem. All organisms that are the same number of energy transfers away from the original source of energy (e.g., the sun) are said to be at the same trophic level. For example, all producers belong to the first trophic level and all herbivores belong to the second trophic level. |

Before the Session

Assemble the necessary materials and equipment (you may wish to assign study groups in advance of the activity). Review definitions and background information. Select the study sites (note and possible hazards such as fire ant mounds, etc.). Arrange for transportation if necessary. Make copies of all student worksheets. You may wish to have students work through the Key to Selected Invertebrates (using the sketches) as a classroom activity prior to doing the field study, in order to review the process and provide an introduction to the types of organisms they might find in their soil samples. Set up funnel apparatus.

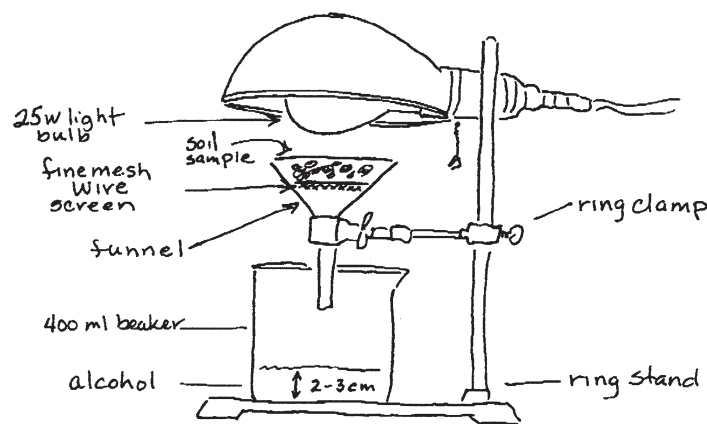


DIAGRAM OF FUNNEL APPARATUS

Background Information

Natural ecosystems have a tremendous diversity. Many different kinds of organisms interact with each other and with the abiotic factors in the environment to create a stable, but not static, functional unit called an ecosystem. Frequently, however, communities with a large number of species often only have a few members of any given species in a particular area. There are many reasons for this diversity gradient. Geology, climate and history each play an important role. Political policies and decisions often have far-reaching effects. For example, the decision made in Washington years ago to eliminate fire within the boundaries of our national parks adversely affected the regeneration of many fire-dependent species, and in the opinion of many experts, established conditions that made the raging fires in Yellowstone Park (summer of 1988) all but inevitable.

A key factor that affects the diversity gradient in ecosystems, however, is the direct interference of man in the natural process. We cut, we plow, we manage, we select for particular species to suit our economic or aesthetic needs or wants, for example; a beautiful lawn, a crop of wheat, or a profitable pine forest. Selecting for a few species has an impact on the diversity and abundance of the entire ecosystem. As a rule, diversity decreases, but individual abundance increases, when

areas come under strong human domination. There may also be distinct changes in the abiotic portions of the system. Construction of towns, cities and highways also impacts broad areas of land surrounding them, and trends toward changes in biodiversity may be detected in these areas as well.

If organisms are arranged according to trophic levels, they often form a pyramid with a broad base and only a few individuals at the top. The producers are generally found in large numbers at the bottom of the pyramid, whereas, the top consumers are relatively few in number. This relationship of numbers provides for an adequate supply of available energy at each trophic level.

Typically, only about 10 percent of the energy in one trophic level is passed on in the next higher level. Some of the food that organisms eat is undigested and does not provide usable energy. Much of the energy that is absorbed is used in the daily process of living, or is lost as heat when it is transferred from one form to another.

Suggested Lesson Plan

Day 1

1. Review background information by facilitating a whole class discussion on basic ecological principles and relationships. Go over definitions for key terms. Students should take notes during the discussion.
2. Review the steps for using a dichotomous key. You may wish to have students work the key for this activity as a classroom exercise prior to keying out collected samples.
3. Divide students into groups of two, three or four, depending on the size of the class. Then assign half the groups to Team 1 and the other half to Team 2. Explain that Team 1 will be responsible for surveying an intensely human-dominated field, and Team 2 will survey the less human-dominated (more nature-managed field). An example could be a mowed field versus a field left fallow. Be sure to point out that in this country there are virtually no areas where man's influence has not been felt, and that the terms "man-managed" and "nature-managed" refer to degrees of influence (example: a well-manicured school yard compared to the shoulder of a roadway that is mowed only once every six weeks or so.)
4. Close the period by giving instructions for conducting the field study on day two.

Day 2

1. Distribute Data Sheets. Instruct the students to make a survey of the ecosystems chosen for the study. These can be suited to your local situation. Just make sure they are similar but that one is under intense human influence and the other is not.

- Using the quadrat to determine the size of the area each group will study, select a random study site in the assigned field.

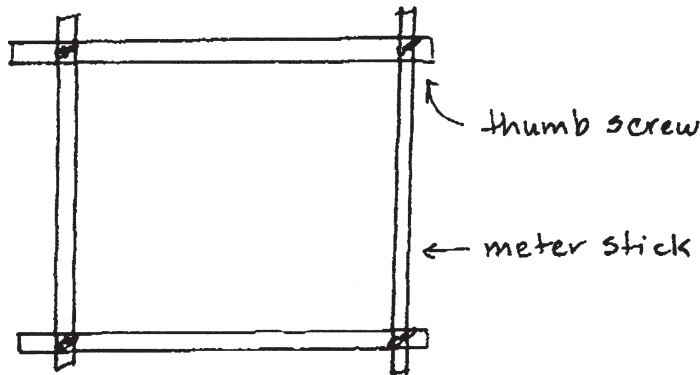
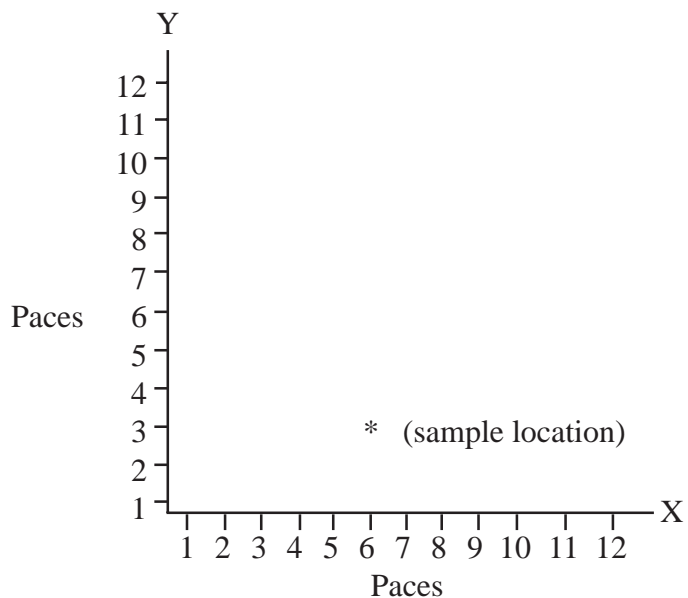


DIAGRAM FOR CONSTRUCTION OF QUADRAT

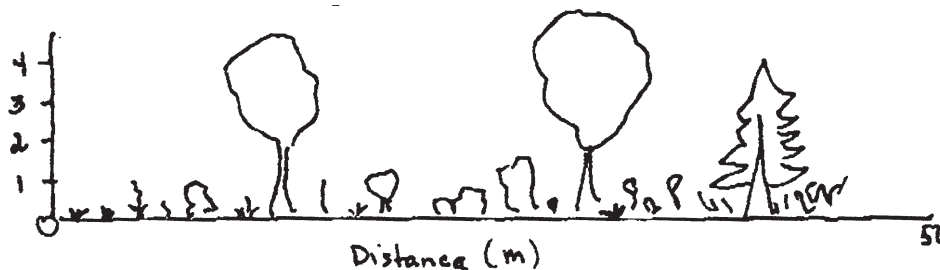
The instructor will designate a point in the field as an “origin” (corresponding to the origin of a graph). Each student will select 2 random single digits from the random number table and use those numbers to pace off the sample location along the X and Y coordinates that the instructor designates (as if plotting a point on a huge graph).

EXAMPLE (6,3) - Pace X Axis Then Y Axis



- Have students sweep the plot to collect insects. They should make a list of what they catch. How many of each kind are there? This information is recorded on the Student Data Sheet. One of each species should be retained and the remaining insects released. Avoid catching the same insects a second time.

4. Students take notes on the abiotic environment such as soil characteristics (color, compactness, etc.), soil surface, litter depth, or anything else you find significant. They should record this information on the Data Sheet.
5. From within the area of the quadrat students are to collect a sample of each different organism (plant and animal) and record the number of each species present. (Example: 75 small yellow flowers, 68 long slim-bladed grass, 8 ants, etc.) Students should be sure to count plants, and not individual blades of grass, etc. Organisms may be found beneath the surface, or in the air, as well as on the surface. An example of each plant species should be taped to the lab handout and one of each animal placed in a jar.
6. Temperatures of the air at eye level and ground level, and beneath ground level should be recorded. Be sure thermometer is held by its edges and not by the probe.
7. Each group should collect a soil sample, as instructed in Data Sheet, to be taken back to the lab.
8. In the space provided on the Data Sheet have students draw a vertical profile of the ecosystem, taken along an axis. This should include a sketch of the different plants present.



EXAMPLE: Vertical Profile Sketch

9. Students should measure the height of the various plant materials in their study area. Have averages recorded on the Data Sheet. Collect Data Sheets.

Note: Collection and recording methods should be the same for all study groups and for both study sites. Label all samples.

Day 3

1. In the lab. Students should put soil samples in the funnels of the diagramed Funnel Apparatus. Be sure samples are labeled - which field, which collectors. Use diagram to instruct students in appropriate set-up arrangement. Students should be sure the lights are on. Any “critters” in the soil will be extracted overnight.

2. Other collected insects should be preserved in 70% alcohol and the jars labeled. Jars should be placed on an appropriate shelf or table out of direct sunlight.
3. Distribute Data Sheets. As a class project, have students tape all plant samples to the poster board and record next to the sample the number of that species found. Be sure they add the total of a particular species when doing final tallies. See diagram on student worksheet.
4. Distribute Student Worksheets. Review procedures for completion. If time allows, students may begin the plant tally on page 1 of the Data Sheet. Collect Student Data Sheets and Worksheets.

Day 4

1. Have microscopes set up prior to beginning this session.
2. Distribute Data Sheets and Worksheets. Students should key out and count the number and kinds of organisms found in their soil sample. Have them record this information on their Data Sheets. Classification should be according to trophic level, not as individual species.
3. Instruct students to key out and count the other collected and preserved insects in the same manner.
4. Students should complete the plant tally if this was not done at the close of Day 3. Have them complete all other portions of the Data Sheets and Worksheets.
5. When all groups have completed their counts, each group should enter their information on a master tally on the board or on a large poster board at the front of the room.

Day 5

1. Review activity parts completed on previous day. Have students reform groups. Respond to any questions that may have arisen from the previous day's work.
2. Collect, correct and grade student data and response sheets as a means to evaluate mastery of activity purposes and concepts.
3. Facilitate whole class discussion of entire activity to bring closure to the mini-unit.

Note: Be sure to monitor the groups throughout the activity to provide assistance and support to the students as necessary.

Application

It is important for students to understand that most communities and ecosystems are continually changing. Succession is a normal process in nature. It reflects the results of a continuing struggle between various species with different adaptations to obtain the food, light, space and nutrients they need to survive and reproduce under changing environmental conditions. Immature ecosystems (or intensely managed ones) tend to have only a few species (low species diversity), and fairly simple food webs, made up mostly of producers fed upon by herbivores, with relatively few decomposers.

In contrast, more mature (or relatively undisturbed) ecosystems tend to have high species diversity and complex food webs dominated by decomposers. Most plants are larger herbs and trees that produce smaller numbers of large seeds. They use most of their energy and resources to maintain their root, stem and leaf systems rather than to produce large numbers of new plants.

Communities and ecosystems are complex and variable, and there is difficulty in conducting controlled experiments on a short term basis. However, students should be able to realize and state these trends from this field experience. They should, from the results of the study, infer that man's direct influence on an ecosystem has a strong impact on the species diversity within the system.

Extension

If the study area is in a location that could be maintained in such a way that future surveys would be possible, then reference points for the sample plots could be established so that data could be accumulated from year to year, and succession could be observed over time.

Resources Available

Ecology Discovery Activities Kit. Janet R. Galle and Patricia A. Warren. 1989. The Center for Applied Research in Education.

Environmental Education Activity Guide, 2nd edition. 1994. Project Learning Tree, American Forest Foundation.

Environmental Science: A Global Concern, 3rd edition. 1995. William P. Cunningham and Barbara Woodworth Saigo. Wm C. Brown Pub.

Living in the Environment: An Introduction to Environmental Science, 7th edition. 1992. G. Tyler Miller, Jr. Wadsworth Publishing Co.

South Carolina: The Making of a Landscape. 1989. Charles F. Kovacik and John J. Winberry.
University of South Carolina Press.

Student Lab Activity Manual. Francis Marion University.

The Diversity of Life. 1992. Edward O. Wilson. The Belknap Press of Harvard University Press.

Teaching KATE. January 1995. Coalition for Natural Resource Education.

Prepared by: Betty L. Brodhun

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KEY TO TROPHIC LEVELS OF SOME INVERTEBRATE GROUPS

| | TROPIC LEVEL |
|--|-------------------------|
| 1. Animals with worm-like body form | 2 |
| 1. Animals with non-worm-like body form (ARTHROPODA) | 6 |
| 2. Body unsegmented | NEMATODA O |
| 2. Body segmented | 3 |
| 3. Without appendages | ANNELIDA D |
| 3. With appendages | 4 |
| 4. With 0-3 pairs of legs on thorax, 0-9 pairs on abdomen | some immature INSECTA H |
| 4. With many pairs of legs and at least one pair per segment | 5 |
| 5. 12 pairs of legs, 1 pair per segment | SYMPHYLA O |
| 5. 15-200 pairs of legs, 1 pair per segment may have poison 'fang' | CHILOPODA C |
| 5. Many pairs of legs, 2 pair per segment | DIPLOPODA D |
| 6. Seven thoracic segments, each with a pair of legs | ISOPODA H/D |
| 6. With cephalothorax and usually with four pairs of legs (Arachnids) | 7 |
| 6. With three pairs of legs and body divided into head, thorax, and abdomen | 9 |
| 7. With a segmented abdomen | PSEUDOSCORPIONIDA C |
| 7. With an unsegmented abdomen | 8 |
| 8. With cephalothorax separated from the abdomen (spiders) | ARANEAE C |
| 8. With cephalothorax and abdomen fused (mites and ticks) | ACARI O |
| 9. Antennae absent, abdomen with 9-12 segments, thorax segmented | PROTURA D |
| 9. One pair of antennae present | 10 |
| 10. Narrow waisted, ant-like (ants) | HYMENOPTERA H |
| 10. Antennae with 10 or more segments; abdomen usually with 11 segments, with forcep-like or long segmented cerci | THYSANURA D/O |
| 10. With 6 or fewer abdominal segments; under side of abdomen usually with a long, double appendage (springtails) | COLLEMBOLA H/D |
| 10. Front wings hardened, not used for flight but to protect rear flight wings (beetles) | COLEOPTERA H |
| 10. Metathoracic (rear) legs usually large (cricket mantids, grasshopper, cockroach) | ORTHOPTERA H |

**KEY TO TROPHIC LEVELS OF SOME INVERTEBRATE GROUPS
CONTINUED**

| | TROPHIC LEVEL |
|--|------------------|
| 10. Has a pointed cone-shaped head with a triangular “face” and needle-like probocis; wings form a “tent” (leaf hoppers, cicadas)..... | HOMOPTERA |
| | H |
| 10. Has only one pair of wings, second wings reduced to knob-like structures (flies, mosquitoes, gnats) | DIPTERA |
| | O/H |
| 10. Forewings thickened basally and membranes distally; folded, the wings form an X on the back (bugs) | HEMIPTERA |
| | H |
| 10. Soft-bodied insects with large showy wings that are covered with scales (butterflies) | LEPIDOPTERA |
| | H |

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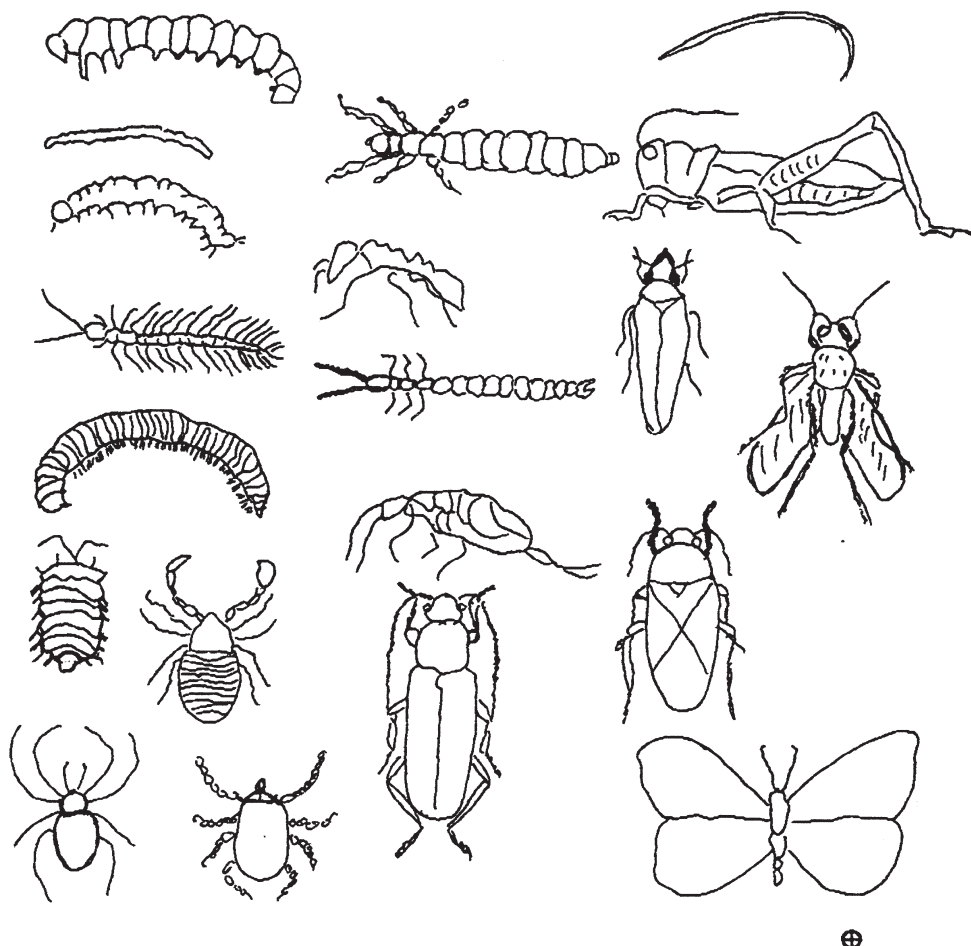
KEY TO TROPHIC LEVELS OF SOME INVERTEBRATE GROUPS
IDENTIFICATION SHEET

C = Carnivore

D = Decomposer

H = Herbivore

O = Omnivore or mixed group (some species of the group are herbivores and some or carnivores). **Note:** Most members of this group are opportunistic and will eat whatever comes their way. Since the bulk of the diet is plant matter, for purposes of this activity, they will be counted with the herbivores for the pyramid of numbers.



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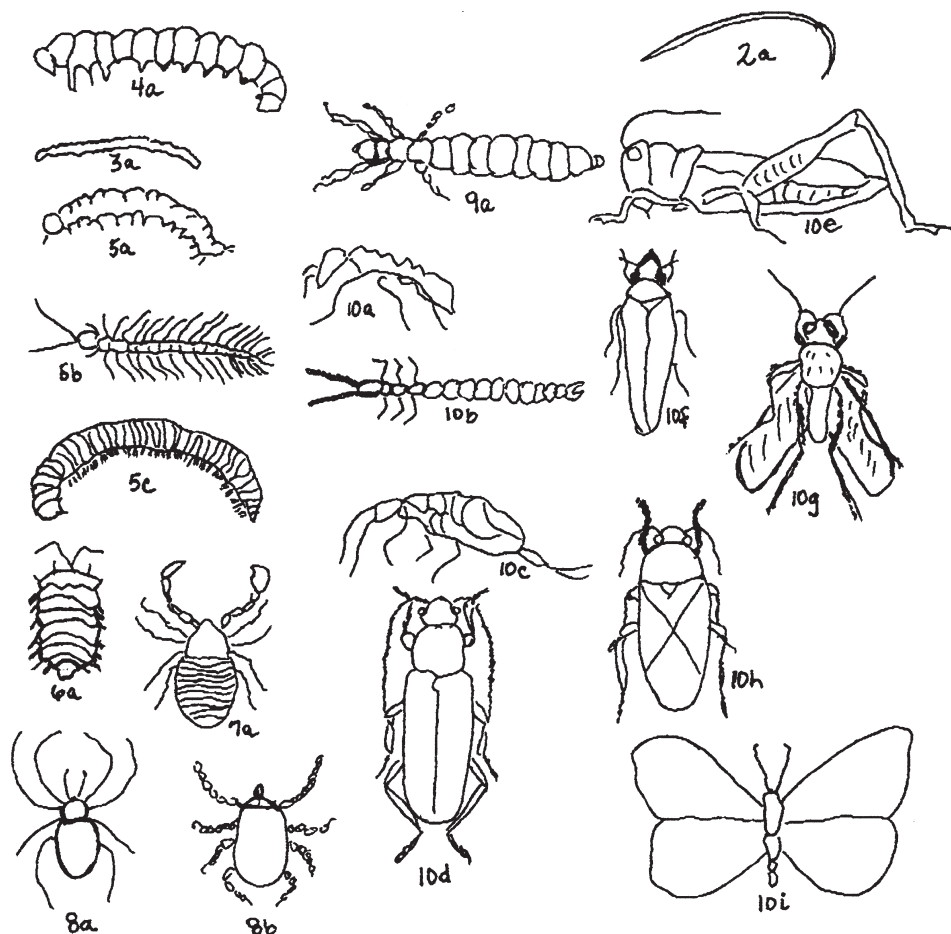
KEY TO TROPHIC LEVELS OF SOME INVERTEBRATE GROUPS
IDENTIFICATION SHEET - TEACHER'S GUIDE

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DATA SHEET

Name:

Date:

Group Number:

Study Site:

Record the following information:

I. Temperature: _____ air

_____ soil surface

_____ beneath soil surface

II. Total number of plant species in your quadrat _____ .

III. Average plant height _____ .

IV. In the space provided, draw a vertical profile of your study plot, taken along an axis. This should be a sketch of the different plants present and their approximate height relationships.

**DATA SHEETS
CONTINUED**

Name:

Date:

Group Number:

Study Site:

- V. You will be comparing your findings with those of others whose field exhibits a different level of human influence. The sampling methods used should be exactly the same for both study sites. Why?
- VI. Sweep your site for insects. Record and release any large specimens such as butterflies, mantids, etc.
- VII. Note and record any birds or other large animals, such as lizards, etc., that may pass through or over your site.
- VIII. Sweep the site for any insects found in the plant matter or on the ground. Place these in the collecting jar and label the jar. You will be attempting to identify these according to trophic level when you return to lab.
- IX. Take a soil sample by digging about 4 inches into the soil and placing the trowel full into a plastic bag. Label the bag.
- XI. Make any additional notes related to your study site (such as moisture level of the soil, texture of the soil, amount of shade from nearby vegetation, etc.) that you feel are significant. Use the space below.

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PLANT SAMPLES

Name:

Date:

Group Number:

Study Site:

Tape samples of plant material to this sheet. Be sure to record the number of each species you have collected that you found within your study site. For example: 2 plants with small pink flowers, 35 wide-bladed grass plants, etc.

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WORKSHEET

Name:

Date:

Group Number:

Study Site:

- I. Key the soil animals and insects from your soil sample and collecting jar. Use the microscope and a hand lens to help you find characteristics. Use the key provided to determine the trophic level of the various organisms.

Classify as a herbivore, detritivore/decomposer, omnivore or carnivore. *Count omnivores into the total for herbivores for purposes of this study since it is difficult to determine exact placement for many of these organisms.

When all groups have completed their counts, place your group data on the large table on the board, and place the class tally in the appropriate spaces on the table below.

| | Your Data | | Class Data | |
|-------------|-------------|----------------|-------------|----------------|
| | Man-Managed | Nature-Managed | Man-Managed | Nature-Managed |
| Carnivores | | | | |
| Herbivores* | | | | |
| Plants | | | | |

*Including omnivores and decomposers.

Note: Your group data will occupy only one of the two possible columns - select the appropriate column.

- II. Make a pyramid of numbers by drawing 3 horizontal bars representing the number of organisms in each category. The length of each bar should represent the number of individuals at that level. (Example: 100 individuals should be represented by a bar twice as long as a bar representing 50 individuals.) Indicate the scale you have chosen in the space provided. **USE CLASS DATA TO CONSTRUCT THE PYRAMID OF NUMBERS. DRAW ONE PYRAMID FOR THE INTENSELY MANAGED FIELD AND ANOTHER FOR THE LESS MANAGED FIELD.**

**WORKSHEET
CONTINUED**

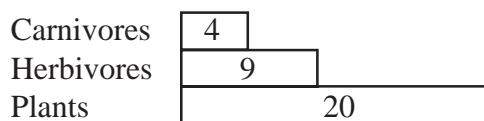
Name:

Date:

Group Number:

Study Site:

Use the following example to assist you in constructing your pyramid of numbers. Develop a scale appropriate to your numbers.



Scale: 1 cm = 5 individuals

PYRAMID OF NUMBERS - INTENSELY MANAGED FIELD

Scale: 1 cm = ___ individuals

PYRAMID OF NUMBERS - LESS INTENSELY MANAGED FIELD

Scale: 1 cm = ___ individuals

**WORKSHEET
CONTINUED**

Name:

Date:

Group Number:

Study Site:

III. What is the numerical relationship between plants, herbivores, and carnivores in the intensively managed field?

IV. How does this relationship change in the less intensively managed field?

V. What reason can you suggest for the existence of this relationship?

VI. Compare the number of plant species per m² in the two study sites. Why do you think this difference exists?

**WORKSHEET
CONTINUED**

Name:

Date:

Group Number:

Study Site:

VII. What other differences do you detect between the two study sites? (Soil texture, moisture, temperature, etc.)

VIII. Looking at your collected samples, what do you think might occur if a disease or insect infestation killed all the grasses in both the study sites? (Or in a large area of similar conditions.)

IX. What would happen in an ecosystem if the secondary consumers outnumbered the primary consumers?

X. What would happen to an ecosystem in which the number of predators was greatly reduced?

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**WORKSHEET
TEACHER'S GUIDE**

- I. Answers will vary. Be available to assist students with microscope observations and use of key.
- II. Answers will vary.
- III. Students should realize that the numbers will be tipped heavily in favor of plants and that carnivores will be relatively few in number in either study site.
- IV. This relationship should not vary greatly.
- V. Answers will vary. Lead students to a discussion of the path of energy flow through the ecosystem.
- VI. Answers will vary. Students should realize that selection and succession play a part.
- VII. Answers will vary. Differences should take note of factors such as temperature, soil texture, moisture, etc.
- VIII. Answers will vary. Students should realize the value of a diverse community in maintaining stability in times of stress, etc.
- IX. Answers will vary. Students should recognize that there will be shortages of food and diminishing of populations at the higher trophic levels. There may be significant depletion of primary consumers due to over predation. Producers would flourish. In time the general instability of the ecosystem would reach a turning point, and natural succession would begin again.
- X. Answers will vary. Students should recognize that many changes would occur, but eventually populations would stabilize. The ecosystem may not be exactly the same in terms of populations and communities, but a stable ecosystem will exist.

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RANDOM NUMBER TABLE

| | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| 20992 | 58215 | 70639 | 96056 | 52452 | 89261 | 93127 | 71486 |
| 55109 | 53846 | 09668 | 12421 | 79118 | 02822 | 75523 | 69336 |
| 78521 | 67847 | 26725 | 76020 | 15875 | 69232 | 40569 | 63995 |
| 04663 | 27984 | 76672 | 81822 | 67620 | 99705 | 36951 | 11364 |
| 06008 | 94370 | 76325 | 39786 | 93547 | 91591 | 22906 | 77264 |
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| 69487 | 29812 | 20911 | 69236 | 13446 | 50330 | 46847 | 30502 |
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| 56503 | 82763 | 64726 | 42593 | 79976 | 16812 | 99492 | 13458 |
| 71015 | 17195 | 28047 | 01113 | 26127 | 22397 | 72410 | 19644 |
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| 36337 | 57894 | 55979 | 32366 | 92344 | 51869 | 69706 | 46652 |
| 50516 | 68759 | 53029 | 68632 | 51847 | 89899 | 86694 | 38378 |
| 33278 | 58374 | 47802 | 77266 | 41215 | 72363 | 96003 | 52210 |
| 24396 | 06462 | 23756 | 80834 | 28309 | 60061 | 47443 | 29941 |
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| 84386 | 33877 | 64988 | 54861 | 51100 | 04285 | 05189 | 49320 |
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| 77008 | 73460 | 32199 | 26759 | 59282 | 86439 | 24162 | 54662 |
| 81770 | 85125 | 00781 | 09231 | 72061 | 65095 | 61608 | 38863 |
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| 66841 | 24942 | 21715 | 28145 | 05657 | 21784 | 29258 | 67617 |
| 62673 | 21470 | 87761 | 89201 | 99766 | 11632 | 95345 | 25213 |
| 35996 | 00510 | 81653 | 57462 | 86941 | 88315 | 13448 | 12066 |