

Teaching Ecology in the Urban Environment

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With the trend toward increasing urbanization in the United States, more and more biology students come from an urban background. To these students discussion of plant succession or stream communities brings the same feeling of "newness" as discussion of protein synthesis or the Krebs cycle. Since the current college ecology textbooks organize ideas and examples around forest, field, and aquatic ecosystems, a considerable number of high school biology teachers do not have the background to present ecologically oriented field studies in a city environment. Instead they may feel compelled to devote less time to ecology or to arrange one big, expensive field trip to a distant park or zoo. Advanced students attempting science projects naturally find themselves drawn to studies which can be conducted in the laboratory.

While this trend occurs in the high schools, the demand by government and industry increases for persons able to apply ecological thinking to the problems of the city. Much national attention has been given to the problems of animal pests, garbage, air pollution, and deterioration in the urban environment. In the classroom, however, these problems are often forgotten or examined only at a distance. In urban areas, pigeon and sparrow flocks, rat and mouse populations, cockroach and termite infestations, garbage cans, thermal inversions, vacant lots, and deteriorating buildings can be found near virtually any city school and can form readily accessible outdoor laboratories for ecological exercises that will be meaningful to students in terms of their prior experience.

Organization of an outdoor laboratory exercise need not be elaborate. Walking trips through

various habitats may suffice for some introductory classes. More desirable is the kind of exercise in which data or observations are recorded for later discussion in class. Advanced biology classes may do more intensive projects which culminate in written or oral reports. Interested students can be encouraged to develop science projects based on their environmental studies.

Outdoor classes require little preparation or equipment, but the opportunity to see many aspects of the urban environment for the first time can often be more rewarding to students than a "discovery" in the laboratory. Consider some of the kinds of ecological exercises that can be done outside the city classroom.

Habitat Survey. Students working in groups catalog the habitats available to birds, mammals, insects and plants in several city blocks. This exercise requires some initial study of the habits and requirements of the species being considered. A pair of binoculars for each group will be helpful and the importance of note taking and mapping should be stressed. Back in class the teacher can supply figures to help students determine the potential flora and fauna of their city block. Class discussion can center around ways of increasing or decreasing the urban biota through management techniques.

Productivity of a Garbage Can. Selected garbage cans containing fresh garbage are exposed to insect invasion, then covered with screen traps. After 12 or 13 days the emerging adult insects are anesthetized by freezing or fumigation, then identified and counted. A variation on this exercise may be done by inoculating garbage cans with known numbers of flies, then measuring production after several days.



Fig. 1. Garbage can fitted with a screen trap for collecting flies.

The Vacant Lot Community. Vacant lots generally contain a variety of plants and insects, one or more bird species (English sparrows, starlings, robins), several mammals (dogs, cats, rats, mice, squirrels), and various other animals, such as garter snakes, toads, and earthworms. Even this limited biota can form the basis for many kinds of ecological studies designed to help students discover the varie-



Fig. 2. Rat tracks in dusting powder (plaster of paris) placed along a runway in a basement.



Fig. 3. The rat—a common mammal in cities.

ty of life that can be uncovered by careful observation and to illustrate the interaction and interdependence of biological organisms. If relatively undisturbed lots of different ages can be found, studies of community succession can be done by comparative sampling. Many exercises can be done annually to build a file of reference data for future classes.

Bird, Mammal, and Insect Ecology. Ecological and ethological studies of many sorts may be designed for students using urban birds, mammals, and insects. Territoriality, flocking behavior, daily movements, and population distribution in the city may be determined for starlings, pigeons, and sparrows by watching flocks or by walking daily survey routes. Feeding and movement patterns of rats and mice may be determined through the use of traps or tracking powder (plaster of paris), by observation, or by interviewing city residents. Movement of cock-



Fig. 4. Marking a cockroach with paint for later identification.

roaches can be followed by trapping, marking, and releasing animals which may later be recaptured at another location. Development of mosquitoes can be studied in temporary pools on roof tops and streets. With some prior preparation students can design their own field studies.

Inclusion of laboratory exercises and discussions oriented toward urban ecology will help students

apply their biological principles and will help them learn first-hand some of the biological solutions to urban problems. A balanced biology program must

prepare students to look intelligently at their own environment, as well as the forests, fields, and streams which they rarely see.

A SHELLFISH INDUSTRY FOR NEW HAMPSHIRE?

The New Hampshire Fish and Game Department's Division of Inland and Marine Fisheries is currently engaged in a study to determine the potential for a seed oyster industry in Great Bay. The project, jointly operated and financed by the Department and the U.S. Bureau of Commercial Fisheries, is being directed by Prof. George Moore of the University of New Hampshire Zoology Department.

To determine the suitability of Great Bay for a seed oyster industry, it is necessary to establish the location, extent and acreage of oyster beds in this more than 6,000 acre body of water, and it is also necessary to learn when the oysters spawn, the abundance of larvae, and the reproduction potential of the oysters.

Depending on temperature and food conditions, oyster larvae go through a 10 day to 4 week period as planktonic organisms while they develop to the setting stage. When they are ready to metamorphose, the larvae permanently attach themselves to some solid object in the water. This may be natural culch, such as existing rocks, driftwood, dead oyster shells, or living oysters, or it may be planted culch, such as the strings of oyster and pecten shells Dr. Moore and his assistants have provided.

TURKEYS

Turkey is a traditional part of American Thanksgiving dinners but what do these big birds consider a holiday feast? Pennsylvania game protector Richard Donahoe reports a young wild turkey gobbler harvested by a hunter on Armedia Mountain near Troy last November had dined on the following: 245 grasshoppers, several hundred witch hazel seeds and oats grains, 23 pebbles, 1 preying mantis egg case, 178 red berries (species unknown), 5 weed seed pods, 1 kernel of corn, black cherry seed, and 1 hawthorn apple.

ALASKA ADOPTS NEW POLAR BEAR REGULATIONS

New regulations adopted by the Alaska Board of Fish and Game may act to prevent the annual sportsmen's kill of polar bears from rising above 300. There presently is no indication that hunters are taking an excessive number of the great white bears, but knowledge about the animal's abundance, movements, and basic biology is far from complete.

Only holders of individual, non-transferable permits may hunt polar bears with the use of aircraft during the open season, under the new regulations. Only licensed hunters may apply for one of the 350 permits, and nonresidents, who make up much of the clientele of the pilot-guides group, will be required to possess a nonrefundable \$10 hunting license to be eligible for a permit. A public drawing will be held in case more than 350 applications are received for the permits. Another new application bars a sportsman from taking more than one bear every three years.

Alaska residents still will be permitted to take bears except cubs and sows with cubs for food, if aircraft are not used to help bag the animals. Not many bears have been taken for food in recent years. The effect of the changes, according to some observers, will be to peg the polar bear bag at about 300 animals a year, the average kill of the last two years.

MEASLES

There are more than 4 million cases of measles in the United States each year. Despite the fact that many people consider this disease an inevitable and largely harmless experience of childhood, probably 450 to 500 die each year from the complications of measles. It is estimated that one case in every 1000 results in some brain damage which will mar the child for life.