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## Utilization of a Natural Area in Teaching Junior High School Biological Science

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It has long been suggested that biology, being the study of life, should place emphasis on living organisms. This should be especially true of junior high school study. For this reason the use of any available natural area should be exploited to the utmost. Since there is a natural area immediately adjacent to the school in which the author teaches, this study has been developed.

Junior high school students in biological science courses spend much time learning to describe and identify organisms. This is an important part of this course and junior high school students usually enjoy this type of work. But this seems to become an end in itself and the teacher may become discouraged because these skills are not put to some immediate, particular use. Many junior high students are ready to carry out more challenging activities. And since, in any biology course various principles of ecology are considered, what could be more appropriate than to see, describe, and explain some of these phenomena in a dynamic state.

*Objectives of the Study:* This study was carried out in order to take the fullest advantage of the area under consideration and to help the students develop the use of their skills of description and identification.

The first consideration of the study was to determine and describe the plant and vertebrate animal populations which existed on the area. These data were then utilized to teach junior high school students the ecological principles as follows:

- (1). Evaluation of the area to determine habitat requirements of plants and vertebrate animals.
- (2). Preference and utilization of habitat by vertebrate animals, especially birds.
- (3). The role of territory in the biology of birds.

Special emphasis has been given to the description of the bird population since birds lend themselves most readily to population studies (Odum, 1950). Some of the data presented in this paper will be used for a paper presented to the faculty of Macalester College for partial fulfillment of the requirements for a Master of Education degree.

*Description of the Area:* The school and immediate area are located on Carson's Bay of Lake Minnetonka. This area was along the eastern border and midway between the north-south extremes of an area known to early settlers of Minnesota as the Big Woods. The Big Woods was a vast deciduous forest about 100 miles long from north to south and 40 miles wide at its southern end (Rosendahl, 1928). The present flora may be di-

vided into four types (1) marsh, (2) low shrubs, (3) grasses, (4) mixed hardwoods.

The dominant species of the marsh were broad-leaved cattail (*Typha latifolia*), great bulrush (*Scirpus validus*), and sedges (*Cyperus spp.*).

The narrow strip at the southwest corner of the study area between Carson's Bay Road and the marsh was predominantly low shrubs. The dominant shrub species were common elder (*Sambucus canadensis*), red osier dogwood (*Cornus stolonifera*), smooth wild rose (*Rosa blanda*), willows (*Salix spp.*) and young growth of green ash (*Fraxinus pennsylvanica subintegerrima*). The dominant herbaceous species were common milkweed (*Asclepias syriaca*), wild cucumber (*Echinocystis lobata*), Canada thistle (*Cirsium arvense*) goldenrod (*Solidago sp.*), and common ragweed (*Ambrosia artemisiifolia*). At the eastern edge of this strip there is a stand of trembling aspen (*Populus tremuloides*) immediately adjacent the mixed hardwoods.

The mixed hardwoods are split into two parts by a wet grassland. In the spring of the year and during any season of heavy rain there is standing water in the center of this area, which is drained into the lake by a slow-flowing drainway. This wet grassland had some vegetation characteristics of other areas already described particularly that of sedges and willows. Among the many grasses foxtail (*Alopecurus pratensis*) dominated. Common elder and spotted touch-me-not (*Impatiens capensis*) dominated the well-shaded southern side. Along the well drained, sunny northern slope, white sweet clover (*Mellilotus alba*) dominated. This grassland was spoon-shaped with the spoon pointed east and the handle (water drainway) leading west to the lake. As the handle neared the lake there was a narrow strip which led northwest along the lake to join with a railroad right-of-way. Between this strip and the lake there is a dense willow stand.

The railroad right-of-way was a weedy grassland, along the northern side of the study area. It is dominated by white sweet clover, foxtail, common milkweed, Canada thistle and mullein (*Verbascum sp.*).

Mixed hardwoods make up the largest vegetation type on the area. As stated earlier this type was divided in two parts by the wet grassland. The northern section was smaller and more open in all layers than the southern section.

The overstory of the mixed hardwoods was dominated by American elm (*Ulmus americana*), basswood (*Tilia americana*), sugar maple (*Acer saccharum*), white oak

(*Quercus alba*), swamp white oak (*Quercus bicolor*) and red oak (*Quercus rubra*). Most of these trees were mature as indicated by one oak cut down in the summer of 1960 and determined to be over 100 years old.

Along the southern edge by Carson's Bay Road, the understory was very dense being composed of young hardwoods of the same species found in the overstory and choke cherry (*Prunus virginiana*). Along the eastern edge of the southern section staghorn sumac (*Rhus typhina*, Virginia creeper (*Parthenocissus quinquefolia*) and frost grape (*Vitis vulpina*) dominated the understory. Ironwood (*Ostrya virginiana*) was a dominate of the understory in certain parts of the southern section as was wild red raspberry (*Rubus strigosus*). Northern prickly ash (*Xanthoxylum americanum*) was an extensive dominant in some parts of the southern section, making up some very dense stands. The overstory at the northwestern corner of the southern section bordering on the wet grassland, consisted of a stand of young paper birch (*Betula papyrifera*). The more open northern section lacked the dense understory, but what little existed was dominated by young red cedar (*Juniperus virginiana*).

The ground cover of the southern part of the southern section was dominated by poison ivy (*Rhus radicans*) and bloodroot (*Sanguinaria canadensis*). The center of this section was dominated by hog peanut (*Amphicarpa bracteata*), tick trefoil (*Desmodium nudiflorum*), and aster (*Aster sp.*). The western edge on the steep bank sloping toward the lake was dominated by columbine (*Aquilegia canadensis*). The northeastern corner was dominated by pearly everlasting (*Anaphalis margaritacea*). Dispersed throughout this section as dominants of various small areas were golden-rod, wood anemone (*Anemone quinquefolia*), rue anemone (*Anemonella thalictroides*), and smoothish yellow violet (*Viola pennsylvanica*). The ground cover of the northern section was dominated by white sweet clover, common milkweed, and foxtail.

Amphibians and reptiles of the area include the tiger salamander (*Ambystome tigrinum*), American toad (*Bufo americanus*), green frog (*Rana clamitans*), leopard frog (*Rana pipens*), snapping turtle (*Chelydra serpentina*), spiny softshell turtle (*Trionyx ferox*), western painted turtle (*Chrysemys picta belli*), and common garter snake (*Thamnophis sirtalis sirtalis*).

Mammals of the region include the spotted skunk (*Spilogale interrupta*), muskrat (*Ondatra zibethica*), red-backed vole (*Clethrionomys gapperi*), gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiascivus hudsonicus*), eastern chipmunk (*Tamias striatus*), cottontail rabbit (*Sylvilagus floridanus*), short-tailed shrew (*Blarina brevicauda*), pigmy shrew (*Microsorex hoyi*), common mole (*Scalopus aquaticus*), and northern deer mouse (*Peromyscus leucopus noveboracensis*).

The area was thoroughly censused by the author during the bird breeding season of 1960 and 1961. The data gathered are reported here for 1961 with reference to the apparent habitat preference.

There were fifteen red-wing blackbird (*Agelaius phoeniceus*) territories along the edge of the marsh. More red-wing blackbird territories were within the marsh proper, but this was not censused.

Seven yellow warbler (*Dendroica petechia*), four song sparrow (*Melospiza melodia*), five yellow throat (*Geothlypes trichas*) and two catbirds (*Dumtella carolinensis*) territories were located in the low dense shrub habitat. Much of this habitat was along the marsh edge.

Territories of two crested flycatchers (*Myiarchus crinitus*), three red-eyed vireos (*Vireo olivaceus*), two wood pewees (*Contopus virens*) and one warbling vireo (*Vireo gilvus gilvus*) were established in the mixed hardwoods. Many other birds were active on the area, but since no breeding territory was determined they were not reported on here.

*Utilization of the Area for Teaching:* After background in identification of plants, work is carried out which should lead the student to understand the relationship of plants to certain environmental conditions. And that certain plants have similar requirements and are associated together. This work might be the mapping of the area's vegetation with the instructor, or by student teams, or a combination of these whichever is most fitting. Regardless of the method used much discussion is usually required to establish basic principles. The most easily understood example is the marsh and its vegetation, so it is used first. If time permits the complete description and relationships of the flora of the area can be established. Since field work is done in the fall and spring it can be shown that dominants of the ground cover in the mixed hardwoods change with the season. This may be expanded upon to consider what changes in vegetation might occur over long periods of time, or if the environmental conditions were modified. The wet grassland with some marsh plants as well as grasses are brought into consideration at this time also. No particular conclusions need be reached, but the students are allowed to discuss and consider alternatives.

Animals present a dynamic study of ecological principles. Background for identification of animals has usually been carried out during the winter months by studying laboratory specimens. Birds are most easily studied because of their conspicuous nature and activities during the breeding season. After several trips in the field observing and recording the various birds, certain principles are easily shown. Many male birds establish a rather definite territory. Discussion of the purpose of territory is carried out when this is considered. Birds have distinct habitat requirements or preferences. Because of the dense cover of shrubs along the narrow southwest strip and the abundance of birds here, someone is usually quick to note unequal distribution of birds. The relationship of cover and population density is then considered.

Mammals and other vertebrates are not completely neglected. Snap traps are set for small mammals, and other organisms collected are given consideration. But

these animals do not readily lend themselves to study of the above mentioned principles.

The best utilization of a natural area for teaching purposes can be made by careful analysis by the teacher. The pains and hard work are well worth the effort when the instructor fully knows his area and how it can best be used.

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## SCIENCE AND EDUCATION

# *The Land-Grant Movement and its Influence on Scientific Agriculture in Minnesota*<sup>1</sup>

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INTRODUCTION: Agriculture is the most basic of all human enterprises. Quantity and quality, as related to food production, are founded upon principles of science; a situation whereby man can use his own ingenuity to instrument selected benefits by modifying the course of nature. History provides evidence of a correlation between development of a primitive agriculture and a numerical increase in human population. Furthermore, records of the past show that food supplies have delimited man's geographic distribution, frequently have directed the policies of his government, and ultimately have seemed to mark the boundaries of his social progress.

In modern times the United States has been known for its abundance, yet in this same period three quarters of the world population in general has been hungry. For preeminence in production of things agricultural, the American people must honor their predecessors who laid the foundation on which that abundance has been built—outstanding of which has been the Land-Grant College System. If viewed in retrospect, one of the most clever undertakings by the Americans for their ultimate good was begun in 1862 when President Lincoln signed a bill creating these institutions where knowledge for use and knowledge for all was made available to virtually every citizen. From this time on, education took on a dynamic aspect. This year we can evaluate a century of progress since this event took place, a century in which this country has surpassed all others in several areas of human endeavor. Herein was created a development which has become a traditional way of life in this country and the principal ideas formulating its basic nature have been contagious around the world.

<sup>1</sup>Paper No. 1118, Miscellaneous Journal Series, Minnesota Agricultural Experiment Station.

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THE FORMATIVE YEARS: The land grant idea was not new in 1862. Society has supported agriculture through government since the beginning of civilization. In the United States, the federal government has, since colonial times, made grants of land to states for support of various enterprises. Among these were such things as common schools, the ministry, seminaries and colleges, the military, industries, and other undertakings of public interest. Reference to such a concept was made by George Washington, who proposed the establishment of a National University where there would be "aids to encourage and assist a spirit of discovery and improvement." "Discovery" and "improvement" were needed in agriculture and the mechanic arts, areas where 4/5 of the population was engaged. A National Agricultural Board would, according to Washington, have had duties almost identical to those functions outlined for the United States Department of Agriculture founded several decades later. In his last message to Congress on December 7, 1796, he stressed that the improvement of agriculture through a national bureau would be "a cheap instrument of immense national benefit." Furthermore, he not only made a proposal for the university, but bequeathed a fund in his will toward the endowment of it.

As early as 1785 the science of practical agriculture was taking shape. In this year the Philadelphia Society for Development of Agriculture was organized and offered premiums for records of "actual experience" in testing various farm practices. Suggestions were made relative to methods of evaluation: "Respecting experiments on the products of land, the circumstances of the previous and subsequent state of the ground, particular culture given, general state of the weather, etc., will be proper to be in the account exhibited. It is recommended that reasoning be not mixed with the facts." This society "had farms and all foreign and domestic trees, shrubs, plants, seeds and grains—they may be cultivated and if approved useful, disseminated—the thoughts and suggestions of in-