

PRESERVES OF NATURAL CONDITIONS²

BY VICTOR E. SHELFORD, UNIVERSITY OF ILLINOIS

- I. Introduction
- II. Some Reasons For Preserving Natural Areas
(Prepared by the Committee on the Preservation of Natural Conditions of the Ecological Society of America, arranged and illustrated by V. E. S.)
- III. Combination of Interests in Preserves
- IV. Management of Preserves
- V. Methods of Securing Reservation of Areas
- VI. General Problems Related to the Preserves
 1. Agricultural Practice.
 2. Swamp drainage and Aquicultural Experiment Stations
- VII. Descriptions of Natural areas
 1. Preserved Areas
 2. Proposed Preserves

I. INTRODUCTION

A few years ago the writer was appointed chairman of a committee charged with the listing of all preserved and preservable areas of natural conditions in North America. The committee is composed of about twenty-five members scattered throughout the United States and Canada. The first work was to make the list and when this had made some progress, to agitate for the reservation of such important areas as demanded immediate attention. The whole problem of securing the preservation of areas which is one of the objects of the work is very complex. At the outset the committee felt the lack of any definite guides in carrying on the work. However, a certain amount of progress has been made and out of this progress we can distinguish certain high places.

² The work of a Committee of the Ecological Society of America Edited in proof by the Academy's Committee on an Ecological Survey of the State.

In part a contribution from the Zoological Laboratories of the University of Illinois No. 160. The University supplied the illustrations.

II. SOME REASONS FOR PRESERVING NATURAL AREAS

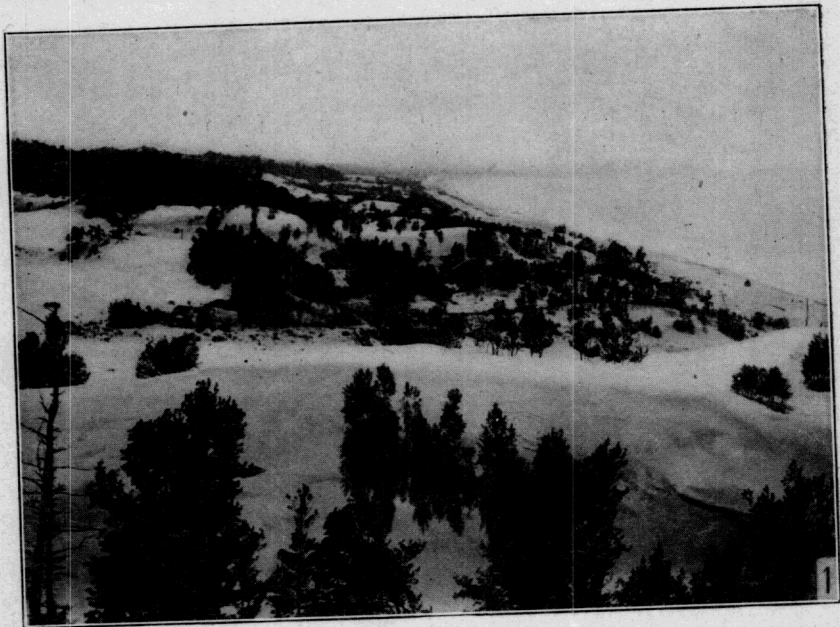
GENERAL REASONS

"To realize the greatest profit, therefore, from the plant and animal life of the national parks, their original balance should be maintained. Park areas should be conserved unmodified in the interest of research and natural history. For, as the settlement of the country progresses, and the original aspect of nature is altered, the parks will probably be the only areas unspoiled for scientific study, and this is of the more significance when we consider how far the scientific methods of investigating nature then obtaining will be in advance of those now applied to the same study."—J. GRINNELL.

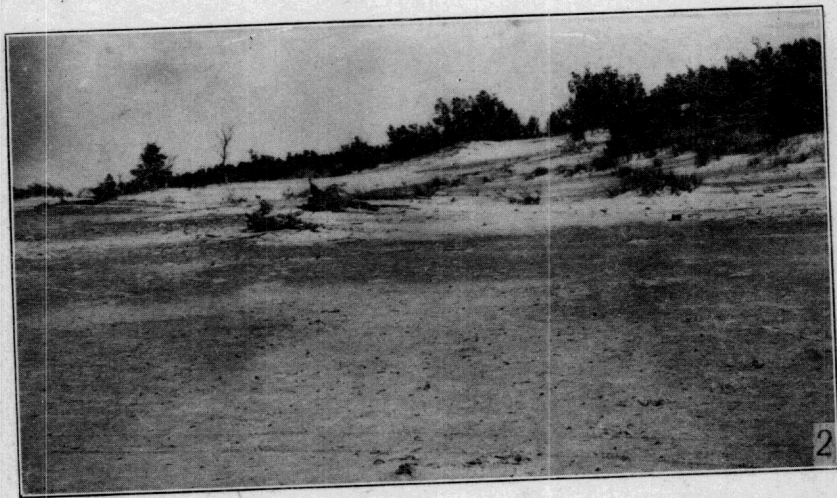
Among the recreative elements in nature the following are important: "First: either perfect quiet, or an absence of all save primitive and natural sounds, such as those caused by the wind in the trees, by running or falling water, or by singing birds. Second: landscapes that relieve the eyes from close work by offering distant views, quiet harmonies of color, and a quiescent atmosphere, varied by occasional touches of movement in such objects as running or falling water, scurrying squirrels, or birds in flight. Third: accessible mountains, which encourage climbing and allow the visitor to combine the exhilaration of overcoming obstacles with the physical exercise attending the woodsman's mode of travel. Fourth: natural phenomena that make a purely intellectual or esthetic appeal, as do the conflicts between the great insentient forces of nature, the processes of geological upbuilding and destruction, the intimate inter-relations of plants and animals, and the contentions for mastery that are forever recurring throughout the whole realm of living things. We believe the last, the mental appeal, to be the element of greatest recreative value in nature, but the other three are of only slightly less importance."—J. GRINNELL and T. I. STORER.

IMPORTANCE OF EARLY ACTION

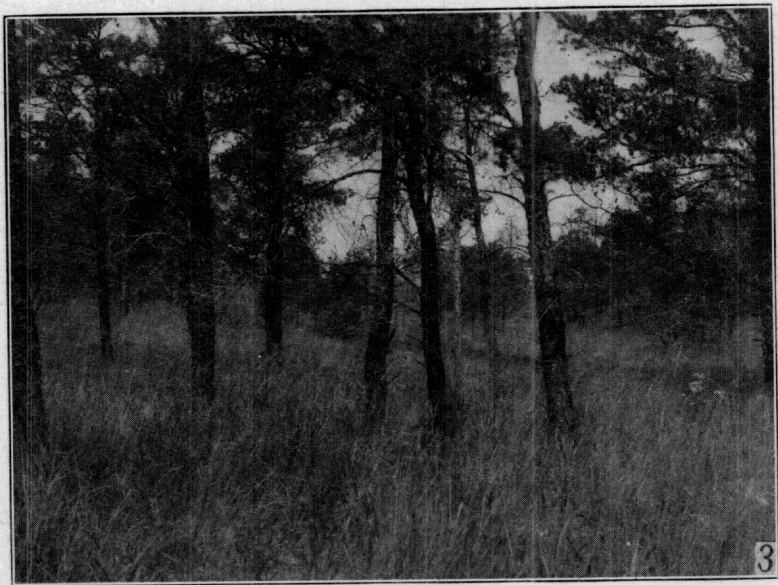
"After civilization has developed in any area, every one realizes the desirability of parks and reservations



1. The dunes at the head of Lake Michigan, looking west, taken fifteen years ago, showing land now held at an enormous price, which at that time had reverted to the state for taxes. Tall stacks and a cloud of smoke now stand out in such a view at the center of the picture, locating Gary, Ind.



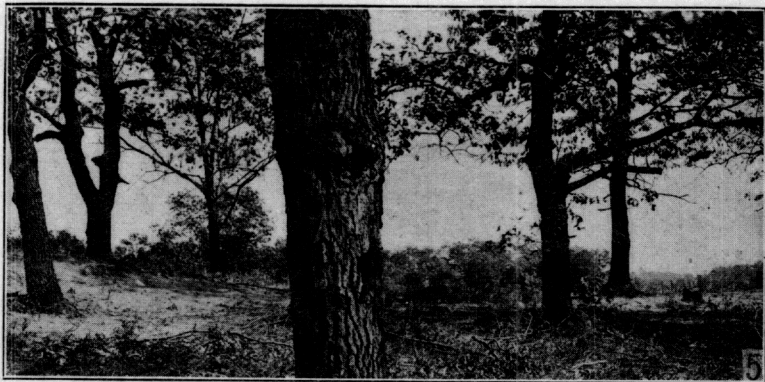
2. Beach near Gary fifteen years ago. These areas are of immense interest to Illinois' most crowded population.



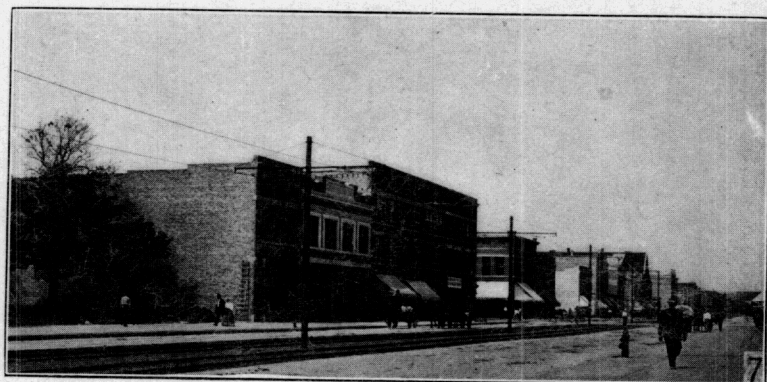
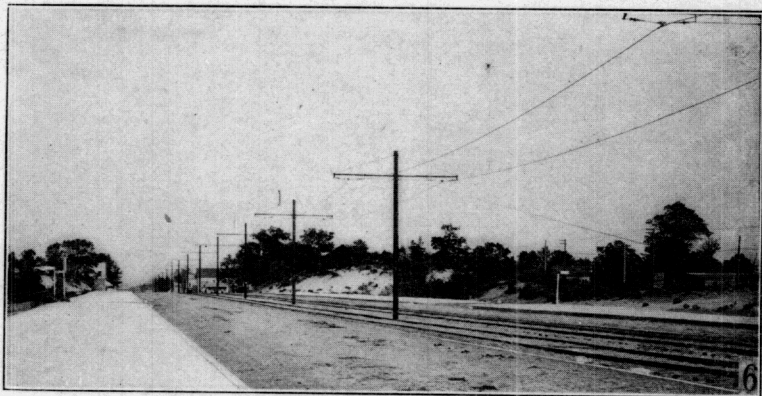
3. Early stage of forest development once common in northern Illinois and Indiana, now almost gone. This picture was taken on the site of Gary in 1905.



4. A later stage than that shown above, once common on the site of Chicago. Taken on the site of Gary in 1905.



5. Some of the oak woods in 1910 in a place similar to that shown in figure 4 showing needless destruction of vegetation.



6 and 7. Showing remnants of this vegetation along the main street of Gary in 1911.

which shall preserve something of the original conditions that existed before the advent of man, but in most cases it is already too late to secure the necessary action when the desirability of it becomes evident to most people. It is, on the other hand, extremely easy in many cases to secure reservations in unsettled country where there are no local interests to be interfered with by such action.

“The reservation of the Katmai National Monument in Alaska, which comprises some seventeen hundred square miles and is, next to the Yellowstone and Yosemite, the largest member of our National Park System, involved no difficulty whatever for the simple reason that it was carved out of an absolutely uninhabited country and there were no settlers on the ground whose interest could be interfered with by the withdrawal of the land from entry.

“The same situation obtained at the time of the creation of the Yellowstone Park, but now, when it is desired to extend the boundaries of the Yellowstone to include a considerable amount of country which it is universally admitted would be a highly desirable addition to the park, it requires much agitation and heavy expense to secure the requisite action because of the development of the country in the interim.

“The principal objection that is raised against the setting aside of areas in unsettled country is that they are in no danger of being disturbed by civilization and that therefore there is no occasion for their being reserved. In every case on record, however, history shows that the extension of civilization so far exceeds expectations that within a few decades at the most, the wilderness becomes peopled with a dense population and, where action was not taken in the early stages, it has become forever impossible to secure the parks of which everyone then recognizes the need.

“Any statesman-like view of the situation will convince one that the people who live in this country fifty years hence will be extremely grateful to this generation for every area it may succeed in having reserved, however

slight the present need of preservation may appear.”—
ROBERT GRIGGS.

Early action is always important, for the destruction of natural areas is continuous and progressive. Fifteen years ago the present site of Gary, Indiana, was public land, having reverted to the state for taxes. There was no particular reason why a considerable area could not have been reserved at that time by mere legislative act. The areas of dunes in northern Indiana are of immense importance to thousands of citizens of Chicago and other parts of Illinois; high schools, and two or three large universities need them for instruction in natural science, and they lie close at hand (see figures 1 and 2). Now however the land is held at an enormous price and the argument that reserves will interfere with commercial development has to be met. The Dunes National Park Association is striving to secure the reservation of some parts, but for considerable distances about each of the industrial centers the natural vegetation has been destroyed and no parks have been reserved by the municipalities concerned.

One who is interested in the preservation of an area usually wakes up to the fact that it is in immediate danger when the destruction is in progress and it is too late to stop it. Early action is the only effective kind of action.

RECREATION AND PRESERVATION

“The most efficient means for preserving areas for study is by creating a lasting public interest in them and the public is interested mainly in that with which it most comes in contact. One cannot hope to be successful in a general policy of establishing preserves without developing an active public interest. Outside of material advantages, which have been so ably set forth, the chief public interest in preserves is, and will continue to be, a recreational interest. Interest, direct or indirect, in camping, hunting, and fishing is the greatest power available for establishing and maintaining preserves, for public interest is as necessary for the maintenance as for the establishment of preserves. As with life in general

few things have no disadvantages so in this case camping, hunting, and fishing seriously disturb the natural conditions of balance but the ecologist cannot afford to neglect to avail himself of this interest because of that fact. Most preserves must be established with this dual purpose of recreation and study and proper measures taken to allow the one and protect the other. One has only to consider the comparatively small number of preserves established at the present time which have not had the direct or indirect support of this recreational interest or the economic, to be convinced that where the one carries less force the other must be utilized."—G. W. GOLDSMITH.

THE AUTOMOBILE

"The automobile is fast opening up the most inaccessible sections of the country to the hunter and the industrial exploiter, as well as to every week-end excursionist who chances to own a 'tin Lizzie.' All are combining to destroy our native fauna and flora, and to upset the general balance which was maintained for ages before the entrance of man. Nearly every day's papers throughout the summer and fall, chronicle a considerable list of forest fires, most of which, according to wardens, are due to carelessness on the part of campers or hunters. But this list does not include the hundreds of square miles of brush and chaparral which are burned over every season."—F. B. SUMNER.

HEREDITY

"The science of ecology, for example, depends upon undisturbed patches of nature as its 'material.' More important still, all that we have learned of geographic distribution and geographic variation has come from the study of native species taken in their original habitats. This work is far from being practically completed throughout our country, as some may be inclined to think. For the genus *Peromyscus*, I am disposed to think that the real task has only *just begun*. I know that there are other biologists who believe, as I do, that the problems of heredity and evolution are not all to be solved by rear-

ing pedigree-cultures of the fruit-fly and evening-primrose. We must study the actual products of evolution as they have arisen *in nature*.

“The main thing is to recognize (as many biologists do at present) the need of concerted action, in order to save certain small fragments of living nature. Without this, we shall certainly lose the greater part of the material upon which our sciences of ecology, geographical distribution, taxonomy, etc., are based.”—F. B. SUMNER.

SUBSTITUTES FOR WOOD

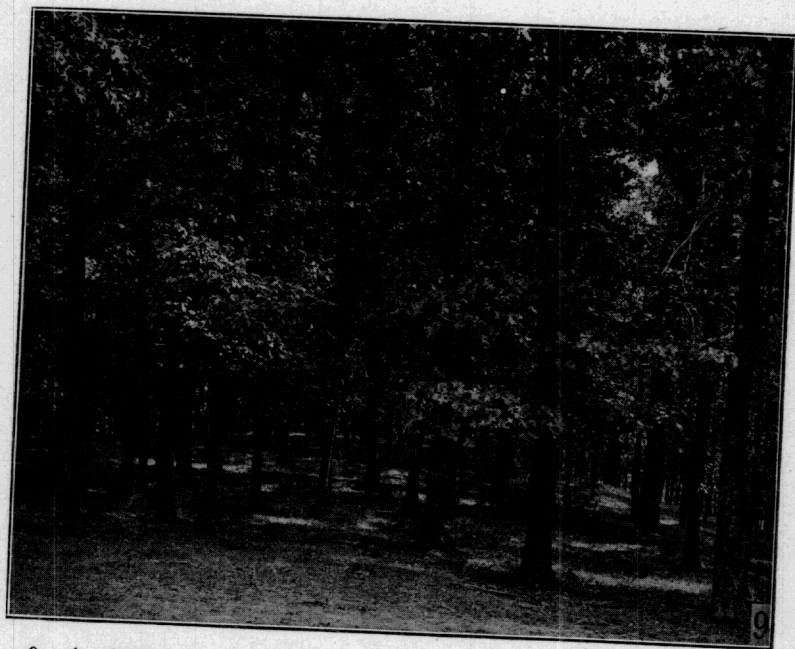
“A favorite argument of those opposing forest conservation for their own ends is that when our valuable species are gone we will find substitutes, grown in a shorter time, and that ‘this will involve no necessary impairment of public wealth.’ Also, that steel, cement and other products will take the place of wood. This can be answered by saying that in spite of the increasing use of substitutes, the per capita consumption of wood goes right on increasing. The substitute is usually more expensive and not so satisfactory. Engineers have been trying for years to invent a satisfactory steel or cement railway tie, but have not been successful. Steel ties lack elasticity, are subject to damage by freezing and thawing, and are much harder on the rolling stock. Where can we find substitutes for hickory for spokes, ash for handles, and oak for ties and furniture? Why wait until these valuable species are exhausted? Let us rather conserve while we may the remaining supplies at the same time saving the industries dependent upon these species for their raw material.”—R. B. MILLER.

DOES IT PAY?

“I know that in this section of Canada (British Columbia) something more is required than is covered by the arguments submitted above. In the first place we have to show that it pays to have reserves. It has paid Switzerland, it has paid New Zealand, it has paid the United States, to set aside parks; the sums of money brought in to those countries by visitors to those regions, are greater



8. Showing a piece of Illinois second growth with many seedlings indicating rapid forest reproduction.



9. A similar area pastured showing the complete destruction of seedlings of future forest trees.

than those expended in protecting the parks and making them accessible.

"Just as we preserve the works of great masters, and find that the longer we have preserved them, the greater their value becomes; so we are seeking to preserve the works of the greatest of Masters, and if length of time increases the value of these works they are infinitely more valuable than works of art. In this we appeal to almost all sections of the community. The economic aspect is dominant in our immediate vicinity. 'Will it pay?,' has been answered satisfactorily. They are attractive to the artist and poet as a source of inspiration; to the educator as a source of illustration; to students of geology, botany, physiography, etc., as a source of instruction; and to all as a source of health and recreation which leads one's thoughts away from the mundane affairs of this world 'Through Nature up to Nature's God.'"—JOHN DAVIDSON.

The ideas brought out here, as reasons for preserves, all include reasons why "it's paying." It pays to preserve forests and swamps as watershed protectors and flood preventers. It pays to educate the public in forest practice, fish culture, culture of water plants, etc.

SIZE OF PRESERVES—LOCATION

"The Governor of Illinois stated that he was strongly in favor of rather large preserves, averaging say a thousand acres. He also said that these should be well distributed through the state so that all citizens in the state would take a large interest in the movement. My own personal feeling is that an effort should be made also to have preserves in proximity to each of the major population centers."—H. C. COWLES.

EFFECT OF LUMBERING IN PRESERVES

"I am of opinion that from the point of view of ecological study, the result is unfavorable. That is to say, if it is desirable for that purpose that the occurrence and proportionate representation in the forest of the various elements of the vegetation should be exactly as

nature developed them, then any kind of lumber operation is bad. The opening up of the forest cover, and the cutting and destroying of certain species to the exclusion of others, is almost sure to encourage a type of vegetation not found before the forest was disturbed."—
R. T. FISHER.

GRAZING IN PRESERVES

"The sheep destroy the young trees and when the old ones die no forest will be left."—H. C. COWLES.

"I wish to urge that every side of the problem be considered before forest reserves and, particularly, national monuments, are opened for sheep grazing. In my natural history field work through the state I have had occasion to observe the disastrous results following upon close sheeping. These results are such as to leave the territory in many cases open to soil erosion and practical effacement of original conditions. Cattle grazing is not nearly so injurious.

"I have been fortunate in having spent three months in field work this year in the east-central part of California and western edge of Nevada. The only human industry affecting wild life there is grazing of sheep; for instance the White Mountains, in Mono County, are altogether too closely sheeped, with the result that the riparian and palustrine fauna and flora of the higher altitudes are almost completely tramped out. For example, a shrew was newly named from there in 1891. The intensive work of our party the past summer failed to find a single shrew. The near vicinity of the small streams, springs and seepages is now a mere dust wallow."—
J. GRINNELL.

Cattle are less serious but destroy the forest nevertheless. See Fig. 8-9.

AQUATIC PRESERVES

"It is our belief that the preservation of marshes is a most important step. In so doing you will be providing an important nesting place for game birds rapidly being driven out by drainage of land, and a tract peopled with

small animals particularly suited for aquaria for public schools.

"Many swamps lie in the direct migration route of many species of birds which are used as food, or which destroy crop pests farther north. This is so important that through gifts and state acquisition Louisiana has set aside areas of swampy land along the southern coast to serve as way stations for migrating birds and as a breeding place for the native species. Thus, swamps have a real value from the standpoint of birds alone; they are not the only animals found in and about marshes, which provide us with necessities, including food, furs, buttons, and other articles. The marshes and water courses of Louisiana yield upward of \$700,000 per year in products including turtles, frogs and furs.

"Upland marshes also have values similar to those of the lowland and coastal swamps, and an additional and important function. With the clearing off of timber and the draining of such swamps the streams appear to be subject to greater floods and to more extreme low water. The latter conditions in particular are important in connection with the effects of pollution. It is at extreme low stages that the streams are overloaded, and that a small amount of pollution overtaxes the self-purification mechanisms, with results almost as disastrous to fishes and similar animals, as if the low water occurred throughout the year.

"A part of any large swamp, such as the Okefinokee Swamp, or any other natural area is as valuable as the most expensive American museum, one which requires say \$10,000,000 endowment and \$500,000 annual expense. Such swamps are really museums of living things, the value of which at any time may become infinitely great in the solution of important scientific problems, which involve living animals. Each year animals and plants find new uses and new values. No one would have thought white rats, guinea pigs, and common mice worth saving a century ago; if the question of sacrificing all of them for a little additional land to cultivate had been raised it would have received but one answer, there would be none of these animals now. Yet by far the greater part of our

laws of immunity from disease, heredity of cancer, as well as of heredity in general have been, or are still being, worked out on them. The investment in equipment and salaries for such investigation amount to millions of dollars every year. Preserves of our native flora and fauna are more important than museums of dead animals. To quote a recent writer on water culture: 'We urge that water areas, adequate to our future needs for study and experiment, be set apart and forever kept free from the depredations of the exploiter and of the engineer.'

"The nation has preserved certain areas as national parks, national monuments, national forests, etc., for the use of the nation as a whole. The states have reserved some similar areas. The humblest citizen has a right to the recreation values of the bodies of water near his home, and his children should be able to wade in a nearby stream and pick up stones without danger to health. The day is past, even in America, when population is so small and resources so great that these general interests can be sacrificed for the profit of a small group of citizens."—V. E. SHELFORD.

LITERATURE

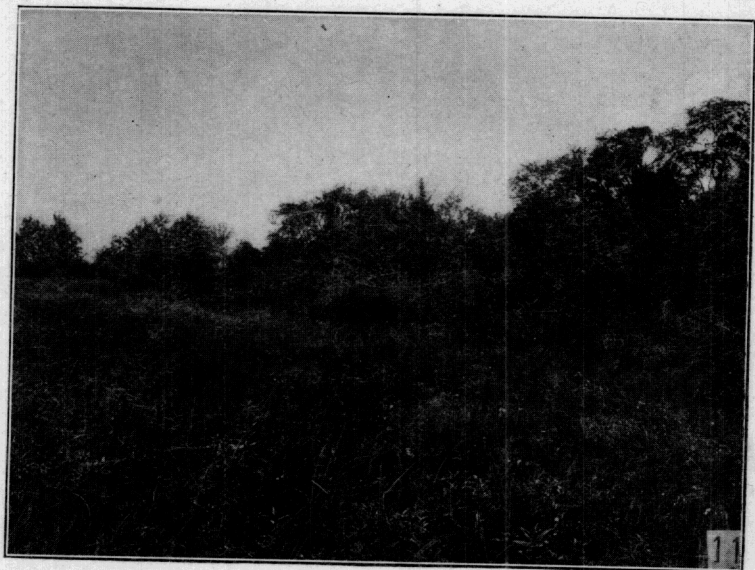
When one reads such poems as Bryant's "Prairies," he wonders how future generations are to interpret his works.

"These are the Gardens of the Desert, these
 The unshorn fields, boundless and beautiful,
 For which the speech of England has no name—
 The Prairies. I beheld them for the first,
 And my heart swells, while the dilated sight
 Takes in the encircling vastness.
 The hand that built the firmament hath heaved
 And smoothed these verdant swells, and sown
 their slopes
 With herbage, planted them with island
 groves,
 And hedged them round with forests. Fitting
 floor
 For this magnificent temple of the sky."

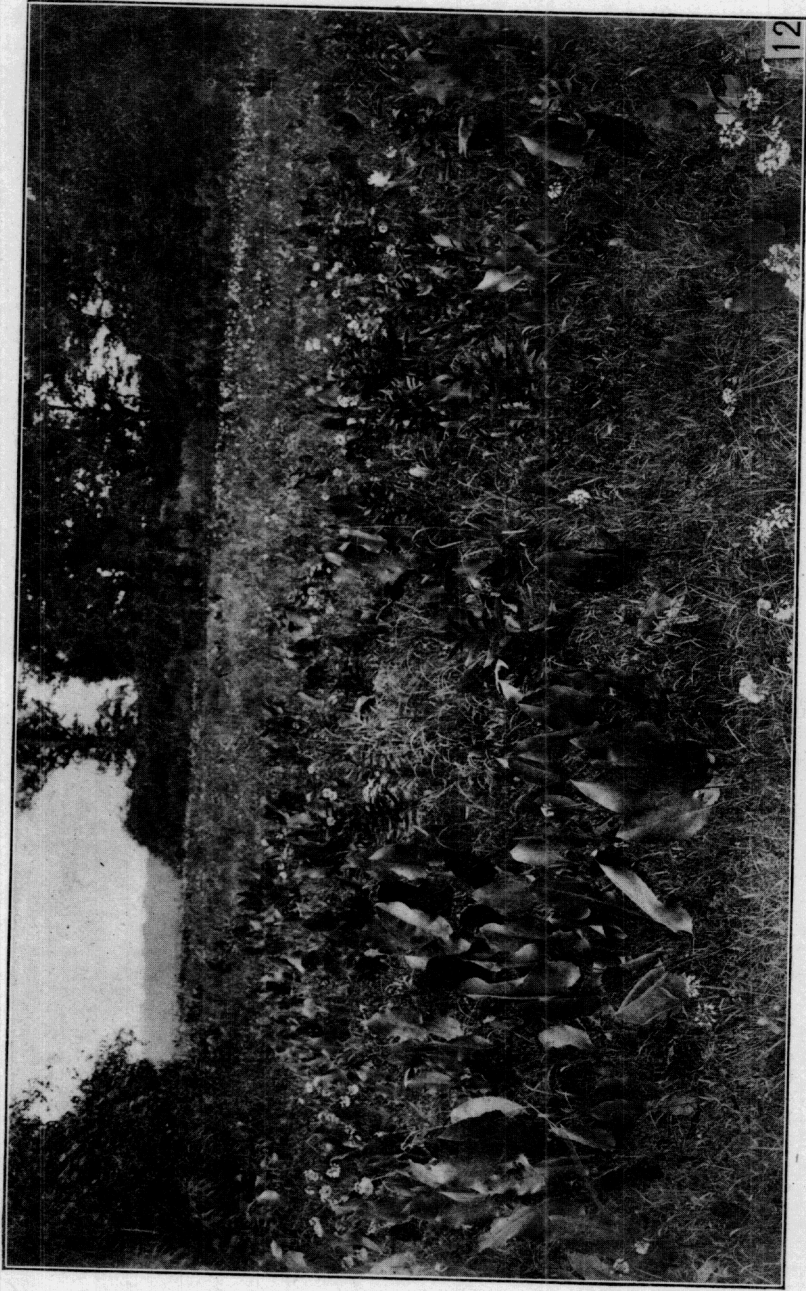
—Bryant.



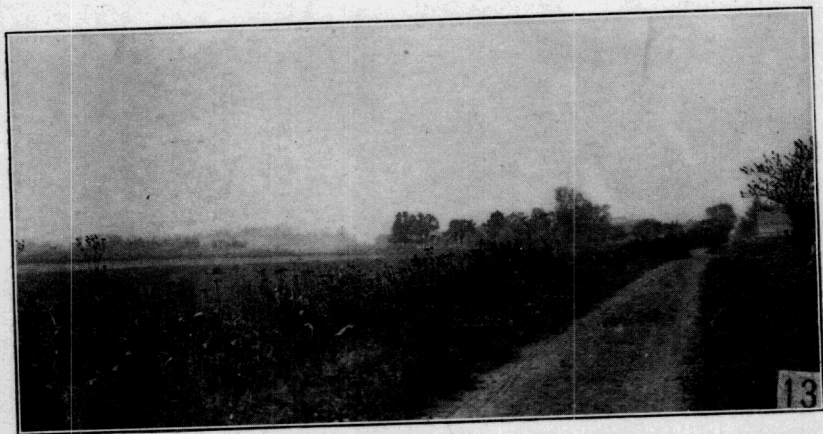
10. Showing a typical prairie peninsula—surrounded by forest on three sides, characteristic of Illinois. Note forest edge of shrubs. (Riverside, Ill.)



11. Close view of low prairie-forest edge shrubs.



12. Close view of prairie amid forest groves (Riverside, Ill.)



13. Prairie plants in autumn, skirting a road side, with scattered trees in the distance—suggestive of the original condition in northern Illinois.

Where will students expect to find the source of the poet's inspiration?—V. E. SHELFORD.

See Figs. 10, 11, 12 and 13.

III. COMBINATION OF INTERESTS

The work of the committee has shown further that there are many different groups with common interest in natural conditions: There are various state and national *forests* the primary purpose of which are to provide lumber under forest culture conditions. Some of these areas are large and would permit of a reservation of subdivisions for particular purposes. (1) Foresters themselves maintain what they call *sample plots* or small areas in which they have measured all the trees and taken a very complete census of woody plants. They propose to leave these small areas in their original condition and merely note the natural changes which take place in the forest. (2) Sportsmen, likewise, desire to increase the amount of game and in many states certain forest areas are set aside as *game sanctuaries*. In Pennsylvania a game sanctuary has a single wire stretched around it and is kept carefully guarded by wardens. No hunting is allowed inside the wire. The game is allowed to reproduce unmolested and overflows into the surrounding territory where hunting is permitted. The game in the areas is not likely to become very much more numerous under such conditions than it was originally with its natural enemies, such as wolves, etc, roaming about. Thus perhaps within the sanctuary the condition of balance of animal life is as nearly like the original one as could be hoped. (3) Ornithologists are interested in areas which afford a *protected nesting place* for a great many birds and (4) Wild-flower lovers desire to see the flowers preserved and accordingly are interested in natural areas which may act as *reserves and seeding centers*. (5) Artists and landscape gardeners wish beautiful spots of nature for *subject matter*. (6) Historians wish to know the character of the original vegetation for use in *interpreting history*. (7) Students of literature desire areas which may serve as a basis for *interpretation of past literature*. (See p. 46.) (8)

Biological investigators require reserves for investigations in ecology, general biology, zoology, botany. It is often possible for these several groups to combine and make a strong plea for the setting aside of areas bounded by natural topographic features as preserves of natural conditions to serve all the eight or more purposes enumerated. In addition to this there are often *water-sheds which supply water to cities* and water for *irrigation* purposes which will always be maintained and are available for sample plots, bird preserves, ecological study, and perhaps game sanctuaries. Forest practice retains some of the natural features. The combination with recreation interests is by no means impossible.

IV. MANAGEMENT OF PRESERVES

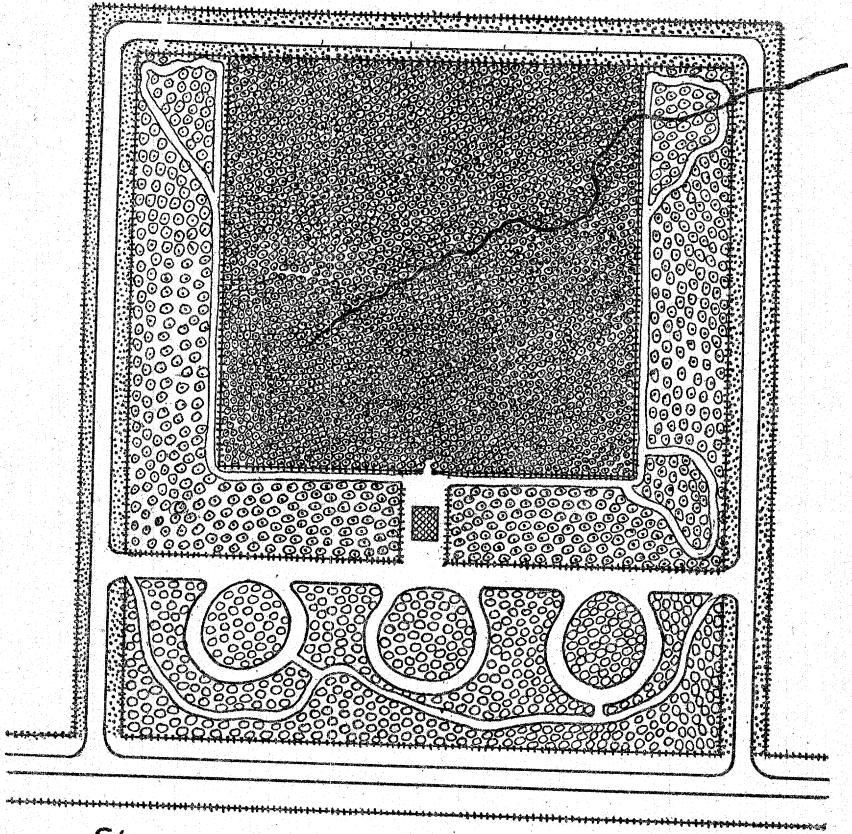
1. *Mismanagement.* In Illinois two types of mismanagement have been noted. The first amounts to no management at all; the public is merely excluded, some times an untrained guard is present and at other times he is not, resulting in offense to the public, and followed by opportunity for retaliation when he is not at hand. No removal of plants and animals is allowed except by a large flock of chickens from an adjoining farm yard. The closing of the woods has caused dissatisfaction to the public and injured the cause of preserves. A man may be only a skunk trapper but to exclude him from his trapping preserve is offensive and undesirable.



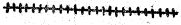






The second type consists of general disregard of the wild natural features. Automobile roads are cut through woods where only trails should be opened. No places are reserved for camping and recreation. The result is that the wild parts are destroyed. Exotic trees and shrubs are planted. Considerable areas are modified as golf courses. Cattle, sheep and goats are pastured in the preserves and forest reproduction prevented. Wild flowers are picked and rooted up and carried off. Care takers are untrained for their work, have no knowledge of silviculture, etc.

2. *Management.* Each reserve should be roughly divided into recreation and preserve areas and in most

cases also some portion should be set aside for silviculture or at least for demonstration work.

Figure 14 shows a plan for a 60 acre tract designed primarily for a preserve of natural conditions. The en-



Stream		Park	
Fence		Forest	
Road		Natural	
Trail		Shrubs	
House			

14. Suggested management of a 60 acre tract of forest, combining a small forest park with three circles for lunch fires, an area for farm wood-lot forestry demonstration, an area of natural conditions, the entire area surrounded by a drive to serve as a fire break. The drive margins set with native forest edge shrubs and designed to serve as nesting sites for native birds.

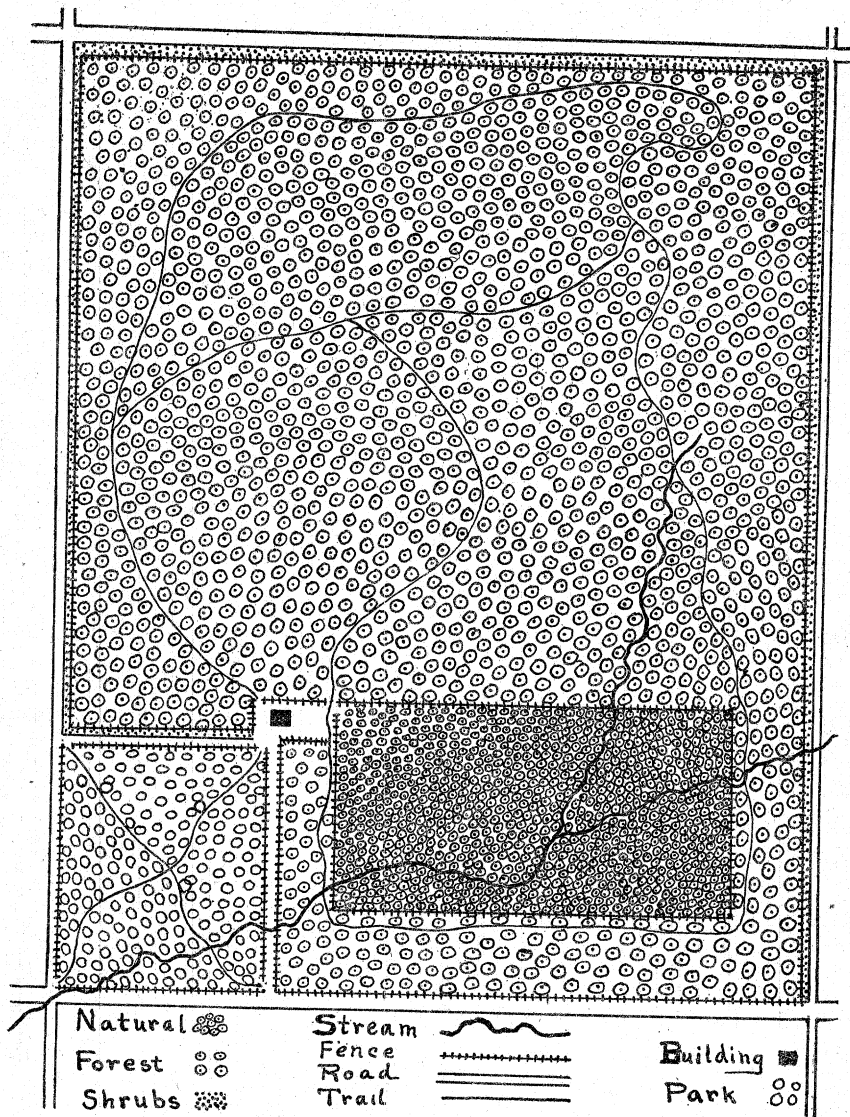
tire tract is surrounded by a drive to prevent fires. The drive margin is set with native shrubs such as grow at the edges of woods, etc. designed to attract a maximum number of birds. The front portion adjacent to the public highway containing about 14 acres is a public forest park with three circular drives within which fires may be built. Behind this are two areas (with the keeper's house at the center). The central area is a preserve open only to those with special interests and designed as a game sanctuary, wild flower center of seeding, a bird sanctuary, etc. Surrounding the central preserve area, is another, designed for silviculture, the chief object of which is the demonstration of farm woodlot forestry. This is open to the public with some restrictions.

Figure 15 shows a similar plan for a 1,600 acre tract, devoted primarily to silviculture. The public forest park is in the lower left hand corner.

V. METHODS OF SECURING RESERVATION OF AREAS

The nation, state, counties, or municipalities must own preserves. Nothing can ordinarily be done without public interest. Probably the best way to arouse it is by the organization of a local society having a particular preservation project as its sole or main object. For example a society known as the Okefinokee society was recently organized at Waycross, Georgia, for the express purpose of securing the preservation of Okefinokee swamp. This society has tried to interest various people throughout the United States in the project. It has two classes of members, those who pay larger or smaller contributions or dues for the support of publicity work and those who are called associate members who merely sign a pledge to support the project without paying dues.

An organization has been formed on the Pacific coast having for its object the preservation of an area of redwoods. Its name is Save-the-Redwoods League. They charge a fee to all members and accordingly have been a little less successful, perhaps, in enlisting a considerable body of men on account of the high cost of living and the rather high cost of membership.



15. Plan of management of a 1,600 acre tract to serve for the most part as a timber growing project. 120 acres is set aside as a public park for camping, hunting, etc. A somewhat larger tract serves as a natural preserve and a game sanctuary and is surrounded by a single wire. Such a tract will support a number of deer and in fact should have them to maintain a condition such as was originally present.

The Okefinokee Society has secured action in the Georgia legislature which memorialized Congress to make a national park of Okefinokee Swamp. At the last meeting of the American Association for the Advancement of Science both of these societies presented resolutions which were passed by several biological societies interested in these projects, asking the Council of the American Association to recommend the two preservation projects to the federal government officials. At the present time the National Research Council is in close touch with the federal government and in a position to get in touch with Congress. It is an additional body to which appeal may be made.

Preservation of areas by the state requires similar effort; similar general methods may be followed. But methods may be more direct as it is easier to reach state officials directly than the national officials and it is the states that have been especially interested in game sanctuaries and in some cases in bird preserves. Thus the people interested in preservation of natural conditions for purposes of study should undertake to get their project before the fish and game officials and the bird societies of the state.

Many states have state foresters who usually are interested in reserve projects and who often would be able to combine their sample plots with the proposed project for the preservation of natural conditions. In the state of Illinois, for example, a law in force for some years renders possible the formation of county forest preserves in counties with municipalities. The signatures of a body of citizens and the ruling of the county court favorable to the project following a hearing for objections, can automatically condemn a selected tract of woodland as a forest preserve, and bond the county to purchase the same to be paid for from a county mill tax provided for in the law. This method is probably not particularly valuable except near the large centers of population where the securing of the signatures is comparatively easy and preserves more appreciated than in the small communities.

Certainly in Illinois and in all other states there should be preserves of natural conditions in the vicinity of all the larger institutions of high rank. These are needed in connection with all the various biological courses but particularly forestry. Certainly they have a value in the interpretation of literature and art in a great many cases at least, and often as well in the understanding of history.

Doubtless in many cases the preservation of natural conditions may be combined with recreation projects, tracts may be provided which are in part in their natural state and in part made up of tree-covered pasture land such as the public desires for camping and picnics. The Cook County forest preserves are serving various purposes. It is probable that in the more thickly settled parts of the country no tract of forest will be in original condition; any considerable tract will contain some original stand, some second growth, some pastured area. The second growth is good for forestry purposes, the pastured areas particularly good for recreation, and the undisturbed situations particularly if they lie within these can easily contain certain sample plots of the forester and serve as game sanctuaries and bird preserves.

VI. GENERAL PROBLEMS RELATED TO PRESERVES

These are (1) the preservation of portions of the original flora and fauna, in the semi-natural conditions accompanying agriculture, including (2) the preservation of the nesting sites of swamp birds, and of the swamp flora and fauna generally, also (3) the drawing of correct conclusions from the conflicting views of bird protectors, on the one hand and clean-culture agriculturalists and entomologists on the other. They are, however, closely related to the task with which we are concerned.

1. Clean-culture (roadside mowing; burning) vs. roadside and streamside shrubbery and bird and original life preservation. Birds are decreasing because of lack of nesting sites. Entomologists and some agriculturists maintain that this destruction is necessary to agriculture; while the bird men insist that birds are also essen-

tial. The practice in the United States should be ascertained; the areas in which specially destructive and drastic measures such as burning are necessary, should be clearly defined and limited.

2. Upland marshes are important water-storage sponges letting it out slowly during dry seasons thus controlling floods. Such marshes are gradually being drained and the flood menace is increasing every year. The only way to save these natural resources and at the same time the swamp faunas, especially the birds, is to utilize the swamps for aquiculture. To this end several aquicultural experiment stations should be established.

For the present there should be one perhaps at Cornell University to deal with upland marsh problems. There should be another in connection with Okefinokee Swamp and one in connection with the coastal swamps of New Jersey. In addition to frogs, fish, and birds, a number of plants are good for food, etc.; cattail flour and cattail paper have recently been tried with success. Swamp potatoes, the corms of arrowhead, and seeds, roots and stalks of our native lotus served as food for the American aborigines and pioneers. Hedrick (*Science* 40: 611), Claussen (*Sci. Mo.* 9:179), and Needham and Lloyd ("Life of Inland Waters") have discussed these questions and are actively interested.

VII. DESCRIPTIONS OF NATURAL AREAS

A listing of all preserves and preservable areas now in a natural condition constitutes an inventory of what has been done and what may still be done. The list, now incomplete but in tentative form, indicates that there are certain kinds of areas of which we have no preserved samples or no areas proposed for preservation. For example, certain types of semi-desert have attracted so little attention that there is a possibility of none of the type of vegetation which they represent being preserved. The list also shows that there are many preserved areas of certain types and very few or none of others, and that the territory near educational institutions which can make use of such preserves, in many cases, is almost

without any facilities such as reserves afford. Thus the general list serves to give us an idea of what should be done in the way of securing the preservation of additional areas.

It is desirable that State Academies gather all possible information relative to preserved and preservable areas in their respective states. This does not need to be of the nature of an accurate survey. So long as the size and location of the tracts are approximate and the general character of the vegetation is known, the tracts can be about as well described as the limits of printing descriptions will permit. It will be well for academies to print lists of areas suitable for ecological and other biological study and related to the various interests enumerated on page 47 and circulate them among the people of the state.

The Ecological Society of America desires to publish a National and International list of Areas suitable for biological study, etc., and will appreciate securing copies of these descriptions. This society desires to publish the list covering all of North America and South America to the Equator which is the territory being visited by American scientists at the present time. A general plan for uniform descriptions and descriptive terms has been worked out and is indicated below.

1. *Preserved Areas. Model Description*

The description below is offered as a model for those describing areas.

Riverside Flood Plain and Savanna Forest¹ in the Cook County Forest Preserve. About 20 acres along the Desplaines River; typical mature flood plain forest of maple, elm, basswood, walnut and oak—shows succession from middle age to mature stage. Forest edge with sinuate outlines, outlying groves; grass covered portions, typical mesophytic prairie; general aspect characteristic

Figures in ft. indicate elevation above sea level.

† Especially important; should be preserved unmodified.

|| Hotel or boarding house during touring season only.

§ Camp outfit desirable; ** camp outfit necessary.

of large areas in Illinois oak grove savanna.⁷ See Bryant's poem "The Prairies." The fauna of the forest edge is especially characteristic; in the forest, raccoons, gray squirrels, and many characteristic invertebrates. Stream badly polluted. 630-650 ft.; level (See Figs. 10 to 13).

Chicago⁸, 12 miles west, C. B. & Q. R. R. or La Grange Electric; ½ mi. N. W. from (w) Riverside, Ill. John Doe.

Name each preserve according to a locally known point, as a village, river, mountain or the like, and the natural ecological features.

The model would be preceded by a general description of the Cook County Forest Preserves. Describe general areas first; for example a National Forest, and follow it by the descriptions of important natural areas within it accompanied by the phrase e. g. "in the Teton National Forest".

The first name of a town or city following the description is the nearest station at which through trains stop, the nearest town with good hotel accommodations, or the like; where practicable the town should be large enough to be on available small scale maps and serve as a catch word for location. It is followed by the distance and direction *to* the locality's nearest postoffice with name of transportation routes available; after this follows the distance and direction *from* the nearest postoffice which is given last followed by the state or province, and finally the name of the person describing the area.

Letters in parentheses preceding the name of the nearest post office indicate desirable means of reaching the area as follows: (w) on foot; (a) by automobile; (h) horse back.

The following types of conditions have been recognized. The first twenty with the possible exception of the S. E. conifer forest are believed to be dependent upon climate. The last four or five are known as local or edaphic or microclimatic conditions.

⁷ Refers to numbered paragraphs describing large communities which appear in the main to be dependent upon climate.

⁸ Hotel or boarding house facilities.

1. Tundra or Barren Grounds (Arctic of Merriam); Northern part of the continent, in N. E. United States during glacial times.
2. Northern Conifer Forest (Canadian and Hudsonian of Merriam except in the Pacific slope area); Northern United States and Canada, extending southward into the mountains where it has been designated as Mountain Conifer Forest.
3. The Northwestern Moist Conifer Forest (Vancouverian of VanDyke); Pacific slope Northern California to Alaska.
4. Semi-desert Conifer Forest; on the western desert mountain slopes and foothills.
5. Poplar Savanna; a narrow strip skirting the conifer forest on the south and west; Wisconsin to Alberta.
6. Deciduous Forest; Eastern United States and Southern Canada.
7. Oak Grove Savanna; Mississippi Valley,—Illinois was originally of this type. (See Figs. 10-13).
8. Southeastern Conifer Forest; S. E. United States, near the coast.
9. Grassland and Steppe; the Great plains.
10. Temperate Semi-desert Broken Steppe; the Snake River Valley, Northern Texas, and portions of New Mexico.
11. Mexican Plateau Desert; the Chihuahua-Zacatecas area in Mexico.
12. Extreme Desert (small leafed shrub desert); Lower Colorado River Area.
13. Sage Brush Desert; the Great Basin.
14. Eastern Succulent Desert; West Texas.
15. Western Small tree and Succulent Desert; Arizona and Sonora.
16. Mesquite Semi-desert; Southern Texas and N. E. Mexico.
17. Broad-Leafed Evergreen Semi-Desert (Californian of Van Dyke); California.

18. Temperate Rain Forest; possibly the "Ham-mocks" of Florida and some mountain sides in Mexico.

19. Tropical Rain Forest; S. E. Tip of Florida (?), West Indies and portions of Mexico and Central America.

20. Tropical Deciduous Forest; portions of Mexico, West Indies and South America.

21. Alpine Summits; chiefly in the western states, and Mexico.

22. Lakes, ponds, and streams;

Designate streams as "torrential"; "swift"; "moderate"; "sluggish" or intermittent; give your estimate of width and depth at mean low water.

Designate ponds and lakes as "young" with much terrigenous bottom; middle aged with little terrigenous bottom; or old with no terrigenous bottom, etc.

23. Swamps and marshes.

24. Marine shallows and embayments.

25. Sand areas, talus slopes and gravel slides.

Designate topography as "level"; "rolling"; "sharp"; "precipitous"; "badlands"; "dissected"; i. e. comparatively level and cut by many deep ravines. Terms such as mountain, hill, level plain, ravine, canyon, bluff, shore, and sandy, rocky, glacial floodplain, etc. are used.

The agency which owns, and controls, and manages the preserve should be given. Any matters which need attention, such as lack of management or mismanagement should be mentioned.

2. *Proposed Preserves.* The description of these should be similar to that of the preserved areas but uses which the preserve will serve should be given, the population centers, schools, colleges, museums and societies which can make use of it should be stated.