The Contribution of State and National Parks and Similar Areas to Recreation

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The Contribution of State and National Parks and Similar Areas to Recreation

by

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CHAPTER I

THE PROBLEM
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Broadly speaking, it is safe to say that previous to the twentieth century America had no positive philosophy about social or educational values of play or recreation. There were recreational activities, but no national recreational ideals or philosophical principles or customs concerning recreation that were accepted by public leaders, social workers or educators. This was due in a large measure to the fact that the people of the United States had come out of the pioneer days without the conscious need of recreation or the opportunities to develop recreational ideals. Pioneer days carried with them the emotional stimulus, excitement, and strenuousness that caused recreation which is considered of little value today. But back of this pioneer influence, stood Puritanism opposing play. Seriousness was exalted; play was frowned upon. It was something to be feared. This attitude had associated with it two other prejudices; the survival of ascetic and scholastic attitudes. In the ascetic attitude, the mind was exalted; the body debased. In the scholastic attitude, the intellect was exalted; the emotions ignored. This under-current of prejudices in thought and feeling were powerful among social groups in proportion to their cultural ambitions.
Lawyers, doctors, professional people in general and school people in particular thought in terms of work. Play was plainly a waste of time. Even after the playground and Recreation Association began its campaign, the prejudices against its objectives were frequently heard. It was only through the presentation of facts that the attitudes of people interested in social problems were changed.

However, today, everywhere attention is being attracted to the increased importance of recreation in the life of the people. The report of President Hoover's Research Committee on Social Trends points to the movement by the American people toward more adequate recreational facilities as one of the significant trends of recent times.

Recreation is essential for happiness. It helps to change the point of view of people. It sometimes changes an individual, or a group of individuals, from gloom to joy. The happiness that man's nature demands comes from within himself. Until this happiness begins to come from within through self-creative life, man is devitalized. He must consider not only what he may do to develop or protect nature, but also what he may do to develop his enjoyment of it. Wordsworth emphasized the enjoyment of nature as coming from within. It was he who indicated that if an interest in out-of-door life is once developed, there is something that gives a light in life, wherever
one happens to be he may form a mental picture that would
recreate and give real pleasure through reading literature.

Such is the message in Wordsworth's poems:

"The budding twigs spread out their fan
To catch the breezy air;
And I must think, do all I can,
That there was pleasure there."

That is, to be sure, only a point of view, but it means
putting into the lives of great numbers of people some-
ting that gives enjoyment and has a healing value such
as perhaps found in no other way.

Recreation is more necessary than ever in the present
time of maladjustment in the economic and social order.
The effects resulting from this maladjustment have spread
rapidly until almost every phase of society has been touch-
ed. There is much danger of breaking the spirit of the
people.

Play is an important factor in keeping the spirit
aglow. For the many who have prospered temporarily, who
have lost their possessions and are unemployed, the de-
pression has a deep and significant meaning. The need of
play and recreation is of paramount importance to them.

How to provide for their leisure time becomes an increasing-
ly important problem. There are also people who are re-
creationally lost because they have become accustomed to

1. Wordsworth, William, "Lines Written in Early Spring."
   Literature and Life Book I, 1930, p. 517.
a form of recreation too expensive to continue under their present circumstances. They need help and guidance in adjusting their recreational life as much as they do for their economic life. This shift of play from the expensive and somewhat artificial to the simple has a much richer and perhaps more lasting value.

There is a common mistake that should be referred to. It is the idea that recreation consists only in the playing of games - golf, bridge, tennis, baseball, and all the other games that are played by children and adults. Of course, recreation does include all of those games, but it does not consist of them alone. There is something more. Recreation includes all the beautiful skills, crafts, and hobbies that people can practice. It includes an understanding on the part of the individual. It is more than a vacation. It may mean a vacation from one's daily activities, although it will mean activity, perhaps, of an entirely different nature. It must be an activity based on the interest of the individual.

As L. P. Jacks says:

"Recreation is not an escape from the toil of education into the emptiness of a vacation, but a vitalizing element in the process of education itself. It is a matter of complete indifference whether we speak of 'education through recreation' or of "recreation through education". When that point is reached the problem of leisure, as it is called, will solve itself in a flash; or rather will disappear, for the problem of leisure exists only so long as we think of leisure as a vacation or vacuum.
separated from the rest of life and needing to be filled with activities specially designed for filling it. In the life of a rightly educated man there is no such vacuum. By combining his education with his recreation we fill up all possible vacuums in advance....

So universal is the impulse to play, so fundamental is it to life, that there is no part of the world in which play and play traditions do not exist in some form:

"Recreation is basic to the integration of the foreign-born into American life and nothing is more important in the citizenship program. As America is helping foreign countries develop play centers, so the play movement in America has benefited by the traditions and physical education programs of other countries. Among the countries which have most profoundly benefited by the play movement in America are Germany and England."

A revival of the play spirit in the home and community and especially among adults is greatly needed. If a trip is impossible, there is much that can be done in the yard. One may equip it with a fireplace, and cook his meals over the open fire; provide recreational facilities suitable to the yard; visit with friends and neighbors; take time to sit and talk. The country-side is full of interesting trails. Hiking is one of the most beneficial recreational activities known.

"The whole end and object of education," said Aristotle, "is training for the right use of leisure." It is only recently that the importance of this declaration has been felt. In the first place, the amount of leisure time has been constantly increasing. In the second place, urban civilization has disrupted traditional recreational activities, and the individual's control over his own leisure, thus making necessary community action.

Aside from the tremendous amount of enforced leisure brought about by the increased use of machinery, attention has been directed to the constantly shortening working day and week. The housewives have been largely released from the drudgery and long hours by the modern conveniences of the home. Not only has the number of children per family decreased but the mother's responsibility for educating and rearing the children has been largely assumed by the community. In the face of such facts and with even more striking prospects for the future, guidance for the right use of leisure is very important.

The first obligation of every community, however, is to its children. There is no substitute for their unquenchable thirst for play. Recreation is necessary for the proper growth of a child, and he must have the proper recreational facilities. The play life is the educational life of a child, and future society depends upon the children of to-day. If proper play habits are formed and
and right use of play time is made, which is impossible without good recreational facilities, many problems confronting the community will be solved.

There is great need to increase the facilities of the recreation clubs for boys and girls and to expand the recreational opportunities in every community. The entire program of recreational activities for the young people should be increased. However, a better understanding of the attitude of children is essential in order to provide an effective program. It is difficult to understand them unless one plays with them. There is a common understanding when people enjoy play experiences together.

The development of the state's appreciation of the value of man and his rights as an individual have been seen in the steps it has taken toward increasing the recreational facilities of its citizens. That the individual has certain fundamental rights to the "pursuit of happiness," which he could not enjoy, to the fullest extent, without educational advantages is proving a stimulus to education in a new direction, and the effort is being made to reach and satisfy the whole nature of the individual as never before in the history of the world. Accordingly, attention is being paid to the aesthetic nature of pupils in the schools. The fine arts are being taught - music, painting, sculpturing, modeling, and drawing are taking places in
the curriculum of the state schools.

The recreational activities which have been provided in connection with social training of to-day has helped its individuals a step higher in social adjustment. In an atmosphere of freedom from restraint, those of different nations, classes, and races have come to have a proper regard and respect for the rights and privileges of one another. Playgrounds, pageants, historical, and national celebrations, patriotic gatherings, and many other forms of recreational education, have made their contribution to this social advance.

Probably no more significant movement toward this social equipment of the individual has been made than through recreational activities, now a recognized factor, providing wide opportunities for the development of a proper means of recreation for the individual. The constantly expanding field of recreational activities in education is a challenge to everyone. The more it expands the greater opportunity it affords. However, in the attempt to provide suitable recreational activities, there is a danger of standardizing them to the extent that they will become more of a grind than the work ever was. Facilities and leadership have respective places, and they require organization and supervision. But again it is essential to be on guard lest, following the ideals of dominant culture patterns, the real purpose of recreational activities
A desirable recreational activity must fulfill four main requirements: first, it must have the capacity for being relatively interesting; second, it must be as different as possible from the activities of one's vocation; third, it should have both its origin and its fulfillment in the individual himself; and fourth, that it should be at least compatible with, if not conducive to physical and mental health.

Under the first criterion, namely, that of permanent interest, it might seem that one subject in the curriculum is as valuable as another in training for leisure. But the problem is not so much a question of subject matter as of the attitude in which teaching and learning take place. The second criterion, that of being as different as possible from one's vocational activities, implies that the chief modification needed in the present curriculum in order to afford more adequate training for leisure for most people is greater emphasis on the arts, the crafts and the enjoyment of nature. The third criterion, that of having its origin and its fulfillment in the individual, signifies that the curriculum must be changed to the extent that pupils will be stimulated to undertake and carry through numerous recreational activities both in and after leaving school. The fourth criterion, that of being compatible with the physical and mental health of the
of the individual himself, demands that the curriculum be broad enough that each individual may be able to select activities that will meet his particular mental and physical needs. In other words, activities should be suggested to them that will develop their greatest weaknesses, be they physical or mental. In addition, schools should do more than they are doing to develop a fondness for outdoor life and the enjoyment of nature closely related in general participation to outdoor sports on an amateur basis.

There are many problems with which the schools have to deal in their problem of recreational activities. The growth of the great cities, with the accompanying overcrowding, has interfered with recreational activities by not leaving sufficient space for outdoor play. While the modern trend of building up residential sections away from the more congested central portions of these cities may relieve the deficiency in part, the reservation of necessary areas for play or the provision for equivalent facilities of other types of recreation remains a problem for many communities.

The development by the government of parks, playgrounds, camping places, museums, national forests, and other recreational centers may solve the problem in part. In recent years, since automobiles have been commonly used for travel, the natural scenery of America has been enjoyed much more than ever before. This recreational activity has
been facilitated by the Federal and State governments in setting aside from private use, for the enjoyment of all, places of great natural beauty, in which the United States is very rich. Among the many types of recreation which are enjoyed to-day, there are few which afford deeper and more lasting satisfaction than the scenes of nature. One of the common bonds of experience among all groups and types is the enjoyment of natural beauty.

Therefore, on account of the universal desire to play and its usefulness to the individual, and for the sake of the conservation of its natural resources, the government, as has been said before, has set aside great natural recreational areas. The development of these areas has passed through three stages:

"Our national parks have passed through three definite stages of development. First, is the stage of preservation. A second period of development is the one called preparation. These great nature wilderness areas are being prepared for you and for our friends who wish to visit them. Roads are being built, and from the roads trails lead out into high country. During this 'preparation' period, hotels have been built and other physical improvements which administer to the comforts of mankind. The third period, one which we have been entering the past decade, is a period of highest utilization."

Playground and park functions have so expanded to meet the needs of the modern city that they are not practically identical. The object of the playground is to provide activity for young and old, and at the same time to be so beautiful that the playgrounds are almost like neighbors. The primary function of the park is to provide activities for young and old. The beautification of the park is merely incidental to the forming of a proper background for conducting activities.

The natural areas also offer opportunities for the schools in many ways. In some cities the children may be taken to see some of these areas. In other communities suitable exhibits, or specimens of nature's creations, may be taken to the schools. Traveling exhibits, pictures, lectures, lantern slides, handbooks and the like help the parks and similar areas to serve the schools. Most natural areas have something to teach every pupil from the kindergarten to the university. Close cooperation between the natural areas and the educational institutions is of a mutual advantage, because the natural area will furnish illustrative material for study and the school will produce the workers.

In addition the parks afford excellent opportunities for recreation. If the visitor receives the necessary emotional excitement, produced by his having admired and his having been impressed, the park will have fulfilled
its function of entertaining. If the recreation is the useful and enjoyable employment of one's leisure time, then the modern park with its uplifting and restful scenes is a large factor in any program of education and recreation.

A realization of the educational opportunities afforded by the physical and natural sciences is indicated by Dr. C. C. Adams, Director of the New York Museum:

"The slow perfection of the scientific method, as worked out in physical and natural science, is now being consciously extended to those natural history sciences which center about man and which have come to be called humanities. The application of the same methods of careful, scientific analysis and synthesis is to-day the primary scientific and practical problem of human society."

Among the functions of the Division of Science he lists the fact finding, or research functions:

"To conduct the state scientific surveys of the natural resources. The rocks, minerals, fossils, plants, animals and special scientific and economic problems, such as relate to sand and gravel, limestone, injurious plants, insects and other animals, constitute an unending session of field and laboratory studies urgently demanding attention. Not limited to the preliminary or 'survey' aspect of the problems, but extended to thorough investigations leading to and bearing directly on public policies."

6. Ibid.
The park exhibits themselves are primarily designed for educational purposes, and are a phase of applied science and art, combined so as to tell a story that the general public may readily understand. It may be said, however, that science is not merely a source of aesthetic satisfaction, but it is sufficiently broad and rich to give the individual indefinite opportunity for growth and understanding --- it is not a self-limited area of interest, and is worth exploring by any individual in search of certain kinds of adventure:

"A sense of beauty is as essential to good citizenship as a sense of morality. The average person is critically confronted with the problem of creating an environment conducive to the aesthetic, economic and emotional satisfaction. Man is essentially a spiritual being, revealing strong impulses to escape from the tyranny of eating and sleeping, and the monotony produced by the machine age. Modern methods of mass production and labor-saving machinery give to the average working man precious leisure hours that must be put to profitable, wholesome use. What to do with leisure time becomes a problem."  

The state and national parks offer an excellent solution to the aforesaid problem. However, one must understand something about the natural development of these state and national parks in order to enjoy them to the fullest extent and to fully appreciate their natural beauty. Understanding leads to appreciation and

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enjoyment. Just as an understanding of music leads to an enjoyment and appreciation of the works of great composers, so an understanding of the formation of canyons, caverns and mountains, the development of glaciers, the cause of erosion, the habitat and distribution of plants and animals for different zones leads to a greater interest in and enjoyment of nature and its workings. In other words, there is a cause for every change. This cause produces certain definite effects under certain conditions. If the observer has been trained to see not only the picture as shown on the surface, but also certain scientific principles at work back of all this development it may become permanently interesting. If one understands the formation of the glacier system of Mount Rainier so that seeing is understanding, then he really appreciates its natural beauty. It is not sufficient for one to merely form a mental picture of how the Grand Canyon looks without having some interest in the working of nature and in how these formations took place. The child through the study of science should gather enough scientific knowledge based upon the natural laws of science to cause him to be able through observation to understand his environment and to give him an inspiration for further study of the natural phenomena:

"There is an insatiable desire in the human breast to resolve in some short formula, some brief statement, the facts of human experience. It leads the savage to 'account' for all the natural phenomena by defying the wind and the stream and the tree. It leads
civilized man, on the other hand, to express his emotional experience in the formula or so-called laws of science. Both works of art and laws of science are the product of the creative imagination. Both furnish material for the gratification of the aesthetic judgment. 

On every level of education in science, and for adults as for young people and children, it becomes necessary for the learner to take part in the processes that bring forth scientific ideas and understandings. It is for this reason that a study of the realities of the out-of-doors, under suitable guidance, is so well worth cultivating.

The purpose of this study is to present a subjective and analytical treatment of how state and national parks and similar areas may contribute to recreational activities; to discuss some opportunities for education afforded by these natural areas; and to give some school activities that may be used in connection with the study of science.

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CHAPTER II

PARK AREAS
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Parks, whether created by municipalities, counties, states or the nation, serve many other purposes besides that of providing pleasant areas to which its citizens may repair for recreation. Of course, they are playgrounds of the higher order -- the highest order, in fact. But also, they are museums of the mighty past of the earth's makings; exhibits upon an enormous scale of the operations of the great forces which shaped and still are shaping this land; areas for the conservation of the native wild life of America; and, because of these functions they are places of inspiration for the development of education, patriotism, art, and literature. Men and women return from the mountain tops better shop-keepers and tailors, as well as better pupils, lawyers and painters.

The main attractiveness of the parks to visitors who can see beyond golfing, baseball, and canoeing, lies in physical features and the vegetation and animal life with which man or nature has covered them. This is due in a large measure to the fact that one's interest in nature depends to a large extent on one's knowledge and understanding of the scientific facts of geology and biology. Nothing is more easily and pleasantly acquired; for what most persons suppose are dull sciences are, in their
simplified outlines, most interesting to study and fascinating to apply to nature's tremendous examples.

National parks are the creation of the government in most countries, and one of their primary uses is the study of nature and recreation in the wilds. Museums have developed in these places in order to preserve, indoors, specimens of those things which admit of exhibition. Even in the out-of-doors there are being developed in American national parks what are called "trail-side museums," so that travelers under competent guidance may be shown, while they are walking to places of interest, the birds and flowers and minerals and fossils that are characteristic of these places of wonder. In this way the primary purpose, that of extending education and recreation, is furthered.

NATIONAL PARK OPPORTUNITIES FOR EDUCATION

The opportunities afforded for education promise exceptionally good results in the national parks of the United States, because of the great variety of natural laboratories scattered from the Arctic to the tropics. A few outstanding examples of the marvelous workings of nature are found in the following parks. In Mount McKinley National Park there is the highest mountain mass in North America, standing at one end of graded series of mountains which extend to the Isle of Euentian chain. Along that line, Katmai National Monument, is the scene of one of the largest volcanic eruptions of the century. At Mount Ranier National Park
there is a combination of a warm volcano and mighty glaciers and a unique development of the Rocky Mountain uplift. At Crater Lake and Lassen Volcanic National Parks there are volcanoes still partially active. In the Yellowstone National Park there are the greatest geyser districts in the world.

The following descriptions of the national parks are intended to show that although many of the parks contain similar features yet each of them has one or more characteristics which individualizes it, distinguishes it from the others, and affords an opportunity for studying a particular phase of natural science.

THE YELLOWSTONE NATIONAL PARK

The Yellowstone National Park is the most celebrated in all the world because of: its large number of geyser, its profound river trenching, its fossil forests, and its wild life.

Its geyser are celebrated the world over for size, power, and variety of action, as well as number. The following quotation may give a clear picture of the number and location of the geyser, also of their action:

"There are about 3,000 geyser and hot springs in the park. Most of them are located in the six principal geyser basins: the Norris, Lower, Midway, Upper, Heart Lake, and Shoshone Basins, all lying in the west and south central parts of the park. The geyser exhibit a large variety of character and action. Some spout at quite regular intervals, longer or shorter. Others
Others are irregular. Some burst upward with power. Others shoot streams at angles or bubble and foam in action. 9

Geysers occur only at places where the internal heat of the earth approaches close to the surface. Water from the surface runs down through cracks in the rocks and comes in contact with intense heat. The water itself becomes intensely heated and gives off steam which expands and forces upward the cooler water that lies above it. Finally, the steam from the bottom expands so rapidly under the continued heat that the cooler water above it can no longer hold it down so the water bubbles over, thus relieving the pressure on the super-water below, which suddenly flashes into steam forcing the entire mass into eruption. The water rises many feet into the air and continues to flow until practically all the water in the crater has been expelled. The water, cooled and falling back to the ground, runs off or with other water seeps through the surface together, as before, in the crater's depth, and soon becomes reheated to the bursting point, when the geyser blows again.

Nearly the entire Yellowstone region is remarkable for its hot-water phenomena. Beautifully colored hot springs, mud volcanoes and other strange phenomena are

Microscopic plants grow on the edges and sides of these basins, assisting in depositing mineral matter and painting them many colors.

Another very characteristic and interesting feature of the Yellowstone National Park is its wild life. It is one of the largest and most successfully preserved in the world. Its large mountainous areas remain almost as nature made them. There are great herds of elk, several hundred moose, innumerable antelopes, mule, deer, mountain sheep, buffaloes and bears. The following quotation describes the wild life:

"The grizzly bear, for instance, is one of the shiest of wild animals and may be seen only with difficulty. It lives principally on roots, berries, nuts and honey — when honey can be had. It can not climb trees like the brown bears. Its little ones are born in caves where the bears hibernate through the winter.

The brown, cinnamon, and black bears, which, by the way, are the same species only differently colored — the blondes and brunettes, so to speak, of the same bear family — are quite different. They are playful, comparatively fearless, sometimes even friendly. They are greedy fellows and steal camp supplies whenever they can. This wild animal paradise now contains ................. More than two hundred species of birds live natural undisturbed lives in the Yellowstone."

The habitat and distribution of wild life is dependent

upon many factors such as: climatic conditions, water, and food supply. Some wild animals prefer the valleys, while others live high upon the mountain side. The muld deer and their fawns are found mostly in the valleys where the grass is tall and furnishes a convenient hiding place from other wild animals. Mountain lions live high upon the mountain side on account of their shyness. However, there are very few mountain lions found in the Yellowstone National Park. Wild cats live principally on the mountain sides during the day and frequent the valleys at night to get food and water. Mountain sheep range on the west side of the mountain peaks because of the prevailing winds which keep this side free from snow. There are very few mountain sheep to be found in this park. Elk are found in many sections of the park. They require the grass on the west slopes of the mountain for food, the forested middle slopes for protection and raising their young, and the open valleys lower down for winter range. Near the rivers and lakes are found geese, grouse, swans, pelicans, gulls and ducks.

The petrified forests of the Yellowstone offer wonderful opportunities for scientific observation and study. Something of the age of these forests may be seen from the following quotation:

"One peculiarly fascinating glimpse of the Yellowstone's tempestuous past afforded in the petrified forest of the Specimen Ridge neighborhood, where many levels of upright petrified trunks may be found alternating, like the layers in
a cake, with the levels of lava; which plainly shows that after the first forest grew on the volcano’s slope and was engulfed by a fresh run of lava, enough time elapsed for a second forest to grow upon the level and that this in turn was engulfed with new lava to make the level another forest, and so on. There is a cliff 2,000 feet high composed wholly of these alternate levels of engulfed forests and the lavas which engulfed them. All

From this quotation it seems that there is evidence that the forests were buried by the lava from the volcanoes and that the water flowing through this lava carried with it the silica from the volcanic ash. The woody structure of the trees was dissolved and the silica was deposited in its place, because the petrified trees contain none of the original wood of the trees, but is merely a reproduction in rock of the original form of the trees.

THE GRAND CANYON NATIONAL PARK

The Grand Canyon National Park is in many respects one of the most outstanding parks. A very striking feature of this park is the formation of the Grand Canyon of the Colorado River. A brief description of the formation of the roadside canyons may help to make clear the formation of the Grand Canyon.

"The rain falling in the plowed field forms rivulets in the furrows. The rivulets unite in a muddy torrent in the roadside gutter. With succeeding showers the gutter wears an ever-deepening channel in the soft soil. With the passing season the gutter becomes a gulley. Here and there, in places, its banks undermine and fall in. The rivulets from the field wear tiny tributary gullies. Between the breaks in the banks in the tributaries, irregular masses of earth remain standing, sometimes resembling mimic cliffs, sometimes washed and worn into mimic peaks and spires." 12

Such roadside scenes are familiar to everyone. Many times has one noted the beautiful water-covered walls and slopes of these ditches. But seldom, perhaps, has he realized that the muddy roadside ditch and the world-famous Grand Canyon of the Colorado are, from nature's standpoint, identical, that they differ only in soil and size.

It is believed that in ages before history the Colorado River flowed upon the surface of the sun-baked loose soil; but, like the roadside ditch, it gradually wore an ever-deepening channel; and in time, as with the roadside ditch, the banks caved in, and the current carried the soil away.

More ancient geological history is revealed in the walls of the Grand Canyon than in any of the National parks.

12. Ibid., p. 49.
The horizontal strata seen in the walls of the canyon were formed during the Paleozoic era; they represent the oldest series of rock that have yielded clearly identifiable traces of life. Many of the strata contain remains of marine animals and were therefore evidently laid down on the bottom of the sea, although the region now stands high above the present sea level. Others, notably certain beds of red shale and sandstone in the Supai and Hermit formations, appear to have been spread out as mud and sand on semiarid, low-lying land or on delta plains by shifting streams; and one formation, the Coconino sandstone, is supposed by many geologists to be sand dunes. Nearly all the Paleozoic formations contain some traces of life. Fossil tracks of small animals, probably early forms of amphibians, occur in the Hermit and Coconino sandstone. The aggregate thickness of the Paleozoic rocks varies from place to place, but in the part of the Grand Canyon that is included within the national park it averages 4,000 feet.

There are many agents that have contributed to the formation of the canyon. The Colorado River, together with its tributaries, the rain, snow and frost, many chemical activities, and especially the great pull of gravity has aided in its formation. All of these agents are still at work on this beautiful piece of earth sculpture. The Grand Canyon of today is the accumulated results of the action of these forces that have left from year to year but slight traces of their action, but that through the ages have produced great results.

The rocks of this canyon reveal many geological events. The softer beds which were present above the limestone have been removed by erosion from the area adjoining the canyon. Faulting, aided by the alternating sequence of hard and soft formations, has been an important factor in the development of the walls of the canyon. The adjacent rocks have been crushed by the movement along some of the faults and have formed zones of weakness which, through erosion, have become deep ravines or gorges. The rocks along the river are weak shales of the Algonkian type. These stratified rocks have been, in many places, replaced by hard Archean crystalline rocks. As these hard crystalline rocks are not arranged in beds and are all practically equally resistant to erosion, the walls of the Granite Gorge have a steep, continuous slope which is different from the step-like arrangement of the walls in the overlying Paleozoic rocks. The bottom of the canyon is covered with Bright Angel shale.

Due to these wonderful formations and the marvelous colorings of the sides of the canyon it has been pictured by Hamlin Garland as a beautiful spectacle. He says:

"It had a thousand different moods. No one can know it for what it is who has not lived with it every day of the year. It is like a mountain range - a cloud today, a wall of marble tomorrow. When the light falls into it, harsh, direct, and searching disturbing - but wait! The clouds, sunset and moonrise will transform it into a splendor no mountain range can surpass. Peaks will shift and glow, walls darken,
craggs take fire, and gray-green mesas,  
dimly seen, take on the gleam of opalescent lakes of mountain water. 14

There is thus a geographical opportunity, elsewhere unequalled, which the Grand Canyon of the Colorado River offers for the study of mountain erosion of types of rocks, of rivers, and of uplifting and shifting of the lands at times of earthquakes. In these things this national park offers many excellent opportunities for scientific observation and study.

THE HOT SPRINGS NATIONAL PARK

The Hot Springs National Park is different from any of the other national parks, but in its own particular way is an extraordinary as any of them. This park is located in the Ouachita Mountains in Arkansas and is given a distinguished place among American resorts of national character and ownership, despite the fact that it has no spots of unusual scenic beauty. It is in one sense the oldest national park, having been created a special reservation in 1832, forty years before the wonders of the Yellowstone had inspired Congress with the idea that scenery was a national asset deserving preservation for the use and enjoyment of succeeding generations. It was given national park status in 1921.

This park contains forty-seven hot springs which are grouped around the base of the Hot Springs Mountain. The gases issuing from these hot springs are composed almost entirely of atmospheric gases, carbon dioxide, being in greater percentage of the volume than in air. Nearly all of these springs issue from sandstone and limestone, where the formations rise to the surface from considerable depths as a result of anticlinal folding. They invariably issue only at the lowest exposures of these rocks in different anticlines and are therefore commonly found only in those anticlines which the water-bearing formations are exposed at lower elevations than in adjacent anticlines.

The hypothesis as to the source of the heat and water supply of these hot springs that is most consistent with the facts of their chemical composition and geologic occurrence is that they are due to the artesian circulation of the meteoric water through permeable beds, the water being taken in at a relative high outcrop of the permeable bed in an anticline and discharged where the same bed is exposed at a lower level in an adjacent anticline. The temperature of the springs is an expression of the normal earth temperatures in the synclinal basins through which the water moves, as through great inverted siphons.

There is little reasonable doubt that the spring-bearing formations in the bottoms of the synclines through which the water circulates have a temperature appreciably higher
than that of the hot springs water. Undoubtedly, water moving through these basins would attain a temperature approximately equivalent to that of the rocks at these depths. However, the water is cooled as it comes in contact with colder rocks in ascending to the outlets of the springs. If the rate of flow from intake to outlet were constant, the water would probably emerge at about the average temperature of ordinary springs. But the conditions of the intake and outlet are such that the rate of flow through the basin is not uniform. Water is fed into the basin all the way from the spring-bearing formation to the outlet, whereas the water escapes at only a few places. Water entering at the intake, moreover, probably sinks but a few feet before it reaches the water level, and its downward movement thereafter is very slow, being dependent upon the rate of discharge of the springs and the capacity of the rock reservoir in the basin. The discharge of the water from the basin of the springs is probably not analogous to the overflow of a lake or pond, in which the top water is drained off. The movement toward the outlet is analogous to that noted in some oil fields where the lowering of pressure produced by a very rapid discharge of oil causes hot water to rise in the well.

In general, the water from sandstone is not as highly mineralized as that from limestone or shale, though both limestone and shale yield some water of very low mineral-
The water of high sulphate content comes from limestone and is characterized by a high percent of bicarbonate as well as a high percent of sulphate. The high sulphate content results from the alteration of pyrite to ferrous sulphate by the action of oxygen. On contact with water the ferrous sulphate is hydrolyzed, with more or less complete precipitation of ferric oxide and the formation of free sulphuric acid. Acid solutions that are formed act strongly on the elements of the rock, gradually neutralizing the acid bicarbonates and producing an alkaline water of high sulphate content. The sulphates produced are largely derived from this source.

In addition to these hot springs whose water is supplied to bathhouses, the park also contains cold springs with palatable waters which are extensively used both in the treatment of disease and as table waters. Therefore, due to the large per-cent of chemical compounds found in these waters, both hot and cold, the park offers opportunities both for the study of science and for the treatment of diseases.

THE CARLSBAD CAVERNS NATIONAL PARK

The Carlsbad Caverns National Park contains the largest series of underground caverns yet explored. Because of its magnitude and the beauty of its limestone caverns, the area was given national park status in May, 1930.
Formerly it has been designated a national monument under the administration of the Department of the Interior.

Carlsbad Caverns, thirty miles distant from the town of Carlsbad in southeastern New Mexico, like most caverns, consists of a series of lofty spacious chambers in limestone which was formed by percolating ground water. Once water enters limestone it begins to dissolve it. First, a water-soaked limestone, then gradually water moves from crevice to crevice until a series of large openings are developed. These openings vary much in size, extend in all directions and are connected. The amount of water that enters increases with each rain, and these cavities tend to enlarge with each rain, thus forming caves and passageways. Finally, the water flowing through these passageways leaves the limestone in the form of seepages or springs.

Caves are sometimes formed by the water dissolving embedded salt or gypsum, which is sometimes accompanied by the caving in of the walls and even the ceiling. If this process were to continue indefinitely, all the limestone would be removed, but the amount of water entering most caves is checked either by flowing in another direction or by clogging the pores of the limestone. When this stage is reached precipitation replaced solution and removal.

In the Carlsbad Caverns there are many beautiful stalactites which scientists estimate have been in the process of formation for millions of years. When the
amount of water that enters the opening is too great to be evaporated, part of it falls to the floor and gradually builds up stalagmites and other masses of limestone which frequently assume peculiar shapes. In some cases the stalactites and the stalagmites join, thus forming huge columns. These formations are due to the decomposition of limestone which has been carried in solution by ground water and which crystallized upon the walls of the caves. After the pores in the limestone become partially filled and the circulation of ground water has almost stopped a small amount of water, saturated with lime, gradually seeps through the surface of the cave, it evaporates and deposits a small amount of lime. A small opening is to be found in the center of each stalactite, through which the water passes. This constant addition of small amounts of lime to the surface by the evaporation of the water gradually makes these cave formations.

An interesting feature of the caverns to the adventitious mind is the fact that always beyond lies some region, probably of equal beauty, perhaps entirely new in type of decorations, waiting to be explored. The scientific explorations of the National Geographic Society during a period of six months covered about twenty-one miles, and four additional miles have been explored since then, part within the past year.

Of interest, also, are the bat flights from Carlsbad
Caverns, which each evening during the summer may be seen for about two or three hours. About dusk these little animals, which during the day rest in a portion of the cave which is not reached by visitors, start coming out. At first, only a few in number, they increase steadily until they form a black column which, seen from a distance, resembles smoke. It has been estimated that nearly three-million bats leave the cave on these nightly forays, always flying south as they come out. Early the next morning they return, but not from the south. Somehow during their flight they must have made a big circle, for they always return from the north.

Carlsbad Caverns is one of the national parks of the desert; therefore it is characterized by plants and animals which do not require a large amount of water for their subsistence. Within the caverns are found bats, ring-tailed cats, spotted skunks, cave mice, crickets, spiders, and flies. While the surface area offers a habitat for cactus wrens, rock wrens, horned toads, curved-billed thrashers, black-throated sparrows and rock squirrels, and for a profusion of the strange plants of the desert. Alike in belonging mostly to the cactus family, with a fibrous toughness and protection by hook, barb, and spine, their variety of form is amazing. Several times higher than men grow some of these desert plants, like the yucca and saguaro plant, while others are delicate growths to be measured in inches.
The spring flowers of the region are a revelation to those unfamiliar with the flora of the Southwest.

THE CRATER LAKE NATIONAL PARK

In the heart of the Cascade Mountains of the Northwest is the Crater Lake National Park. Where its volcanoes were once in constant eruption is one of the prettiest lakes in the world.

Near the lake the flowers present a beautiful sight:

"As one descends the trail to the lake one of the first plants to attract attention is the trailing raspberry, Rubus lasiocalyx. Its leaves form a carpet in the shade while scattered white blossoms, at a hasty glance, give the impression of a strawberry. In similar localities are found the one-sided winter-green with its greenish flowers all on one side of the stem, Pyrola secunda, and often associated with it the dainty two-leaved orchid with its inconspicuous green flowers, the tway-blade, Listera caurina. Farther down, the crater's sides are ablaze with yellow arnica and other sunflowers, and at the very bottom the glory of the mountains, the purple monkey flower, Mimulus lewisii, its masses of petunia beds of old fashioned gardens."15

One of the largest of these aforesaid volcanoes was Mount Mazama. It stood in the southwestern part of what is now Oregon two hundred miles south of Mount Ranier and nearly as lofty as it. It was about the height of Mount

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Sheeta, in plain sight of which it rose nearly a hundred miles to its north.

Many centuries ago, the entire part of Mount Mazama caved in leaving its crater-like sides extending sharply downward to an unknown depth.

The first awful depth of this vast hole no man can guess. But the volcano was not quenched; it burst up through collapsed lavas in three places, making lesser cones within the greater, but none so high as the surrounding rim.

Then the fires ceased, and gradually, as the years passed, springs emptied into the vast basin and filled it with water within a thousand feet of its rim. The lake is two thousand feet deep in places. It has no inlet of any sort, nor is there any stream running out of it; but the water is supposed to escape by underground channels and to reappear in the Klamath River, a few miles away.

Great numbers of birds, many varieties of which are seldom found elsewhere, are found in Crater Lake National Park:

"The Eagle Crags have furnished nesting places for the golden eagles and the American bald eagle; Llao Rock is the home of the falcon. Ospreys have been seen, and the horned owl forages nightly. California gulls visit the park and black cormorants are known to have nested and raised their young on the lake. There are ravens and half a dozen varieties of hawks. Canvas-back and golden-eyed ducks frequent the lake, and the Sierra grouse the timber lands. Clark's crow, the camp robber, and California, crested, and gray jays make
their presence known around the camp grounds. 16

Geologists find Crater Lake of special interest because of the way Nature made it. Many volcanoes have had their tops blown off. Mount Ranier is one of these. But no other in the United States has fallen into itself, as Mount Mazama has.

THE MESA VERDE NATIONAL PARK

The Mesa Verde National Park is located on the right bank of the Mancos River, down to which a number of small, rough canyons, once beds of streams, slope from the top of the Mesa. It is in the sides of these small cliff dwellings that the most wonderful and best preserved cliff dwellings in America, if not in the world, are found today. It was for their preservation that Congress set apart this park.

Those who have traveled through the Southwestern States have seen innumerable mesas, or isolated plateaus, rising several hundred feet from the bare and often arid plains. The word mesa is Spanish for table, and in fact many of these mesas when seen at a distance resemble a table.

Once the level of these mesa tops was the level of all of this vast southwestern country, but the rains and floods

through many centuries have washed away all the softer earth, leaving standing only the rocky spots or those so covered with surface rocks that the rains could not reach the softer ground underneath.

The Mesa Verde, or green mesa, because it is covered with stunted cedar in a land where trees are few, is one of the most widely known of the mesas. Through erosion, over a long period of time, the sandstone has been gradually washed away forming small canyons and leaving standing masses of rock many feet above the plains. These are called the talus. Above the talus, yellow sandstone walls rise precipitously two or three hundred feet higher to the mesa's top.

In prehistoric times the Pueblo Indians lived in these cliff dwellings of the Mesa Verde, seeking there a home for protection. When one speaks of the Pueblo Indians, he does not mean an Indian stock or tribe, but merely Indians, possibly of various stocks and tribes, who used to live, and a few of whose descendants still live. The builders of these prehistoric dwellings were of the pueblo type.

The following quotation shows some of the steps of development of house structure among these prehistoric Indians as has been shown by recent excavations and archaeological surveys made in the Mesa Verde National Park:

"...they constructed their roughly circular subterranean rooms not only in the sandy floor of the caves but also in the red soil
on the comparatively level mesas separating the numerous canyons........the floors were sunken slightly below the surface and the low walls plastered with clay or reinforced with thin slabs of stone... Horizontal masonry replaced the cruder attempts of the cruder house-wall construction; rectangular or squarish forms replaced the somewhat circular and earlier type; and gradually the single-room structure was grouped in ever-enlarging units....they shaped stones into regular forms, sometimes ornamenting them with designs, and laid them in mud mortar, one on another. Their masonry has resisted the destructive forces of the elements for centuries. "17"

The Mesa Verde National Park has many attractions besides its ruins. It is noted for its weird, natural beauties. In winter it is inaccessible on account of deep snows; in some months it is dry and parched, but in June and July, when rains come, vegetation is in full bloom; the plants flower, and the grass grows high in the glades; the trees put forth their new green leaves. The Mesa Verde is attractive and full of interest for those who love the unusual and picturesque mountain scenery.

MOUNT RANIER NATIONAL PARK

In the northwestern corner of the United States rises, from the Cascade Mountains, a series of extinct volcanoes, ice-clad the year round. Foremost among them is Mount Ranier surrounded by which is the Mount

Ranier National Park. This park has many outstanding characteristics, chief among which are: its enormous glaciers, its beautiful wild flowers growing apparently under peculiar conditions, and its large forests.

Mount Ranier has a glacier system far exceeding in size and impressive beauty that of any in the United States. From its summit and cirques twenty-eight named rivers of ice flow slowly down its sides. There are many other unnamed ones. The formation of these glaciers is a very interesting feature of the park:

"Every winter the moisture-laden winds from the Pacific, suddenly cooled against its summit, deposit upon its top and sides enormous snows. These settling in the mile-wide crater.... press with overwhelming weight down the mountain's sloping sides.

Thus are born the glaciers, for the snow under its own pressure quickly hardens into ice. Through twenty-eight valleys, self-carved in solid rock, flow these rivers of ice, as they may be roughly called, now turning, as rivers of water turn, to avoid the harder rock strata, now roaring over precipices like congealed waterfalls, now rippling, like water currents, over rough bottoms, pushing, pouring relentlessly on until they reach those parts of their courses where warmer air turns them into rivers of water."18

The Nisqually is the best known, though by no means the largest of the glaciers. It is five miles long and at Paradise Valley it is half a mile wide. Although it is very white and fairly smooth at its summit, when it reaches

there it is soiled with dust and broken stone and twisted by terrible pressure into fantastic shapes.

Like all glaciers the Nisqually gathers on its surface masses of rock with which it strews its sides, just as rivers of water strew their banks with logs and floating debris. These are called side moraines. Many rocks are carried in midstream to the end of the glacier and dropped when the ice melts forming a terminal moraine. Sometimes the side moraines are miles long and many feet high terminating in a great mass of stones or rocks, the terminal moraine.

The Nisqually river flows from the cave in the end of the Nisqually Glacier's snout, for the melting begins miles upstream under the glacier. The river is the color of rock when it first appears, because it carries sediment and powdered rock, which, however, it deposits later, becoming quite clear.

Several species of minute insects live in the ice, hopping about like tiny fleas. They are harder to see than the so called sand fleas at the seashore because much smaller. Slender dark brown worms live in the surface of the ice. Microscopic rose-colored plants also grow there in such great numbers that they color the surface.

The following quotation will give a concise picture of the floral beauty and distribution of the flowers for different life zones in Mount Rainier National Park:
"The region of greatest floral beauty is about 4,500 feet. Here the plants are large, growing in fertile soil. Here the color of the leaves as well as the floral organs is superb. All colors are represented. The principal plants having red flowers in this zone are Indian paint brush, Lewis' monkey flower, red heather, rosy spirea and the fireweeds; those having white flowers are valerians, mountain dock saxifragas, avalanche lilies, several umbelliferous plants, and the cud-weeds; those having blue flowers are speedwells, lupines, mertucias, pentstemons, and violets; those having yellow flowers are the arnicias, potentillas, butercups, deer tongues, stonecrops, mountain dandelions and monkey flowers. The principal plants in the pumice fields above the timber line are the mountain phlox, golden aster, Lyall's lupine, yellow heather, scarlet pentstemon, hulseanna, purple phelia, golden daraba, and smolowskie. The last two vie with each other for attaining the highest altitude."

PARKS IN VIRGINIA

Virginia has been rather slow to develop her natural scenery. However, there are developments under way in this state at the present time; the Shenandoah National Park and seven state parks. In addition to these parks, there is the Colonial Monument connecting America's three most historic points: Jamestown, where the first permanent English settlement was made; Williamsburg and Yorktown, where American independence became a reality. These parks and monuments with Virginia's other historical points of

interest, are attracting the tourists of America.

SHENANDOAH NATIONAL PARK

The general region of the Shenandoah National Park lies in three geologic or geographic provinces. The park area is part of the northern Blue Ridge, characterized by high ridges and deep narrow valleys. The mountains vary in altitude from 3,000 to 4,500 feet. Hawshill and Stony Man are the highest peaks, being approximately 4,000 feet above sea level. Several gaps, or shallow passes, such as Swift Run Gap and Thornton Gap, occur at intervals along the crest of the Blue Ridge. The Shenandoah Park area affords an excellent opportunity to study geology. Each scenic feature is in a real sense a record of some interesting geologic events.

The rocks along the crest of the Blue Ridge are chiefly greenstone, or altered lavas covered by coarsely crystalline igneous rocks such as granite; along the east slope there are metamorphosed sedimentary rocks, and along the west slope are found quartz and sandstone. The western part of the Piedmont section is underlain principally by granitoid rocks. Limestone and shales underlie the Shenandoah Valley. Massanutten Mountain is capped by firm sandstone. Most of the bed of rocks has been folded. Some of the folds have been broken so that large masses of rocks have been shoved some distance northwestward. This
is well shown between Luray and Front Royal, where the older crystalline rocks of the Blue Ridge have been thrust over into the Shenandoah Valley.

The geologic history took place as follows:

"In remote geologic periods, pre-Cambrian, great bodies of molten rock invaded unknown older rocks, and upon cooling crystallized into granitic rocks. Some of the molten material poured out upon the surface to form the greenstone lavas. Subsequently, Paleozoic era, the region lay beneath a broad shallow mediterranean sea in which were deposited thousands of feet of sediments. The sands, muds, and limy muds were consolidated into the sandstones, shales, and limestones which now occur in the valley and which formerly covered the Blue Ridge. Toward the close of this era the ancestral Appalachian Mountains were folded and faulted upward and westward under the urge of enormous pressure in the earth's crust. Through a long era of relative crustal stability the old mountains were eroded to a vast plain or peneplain close to sea-level. This plain was then uplifted vertically for a thousand feet and the rejuvenated streams dissected it into ridges on the resistant rocks and valleys in the weaker rocks. Flattish remnants of the old peneplanes are found along the summit of the Blue Ridge and the even crest of the Massanutten Mountain. The broad surface of the Piedmont region and the Shenandoah valley are the younger peneplanes which also have been uplifted and are being dissected into a new group of valleys and hills."

The Blue Ridge contains many species of beautiful trees distributed according to types: ridge, slope and bottom. The ridge type of trees, as the name indicates, are found on the tops of the mountains and extends a short distance down the sides. It is restricted to the

thin soils which dry readily, hence extends lower down on
the south slopes which are exposed to the sun. The
characteristic trees are chestnut oak and chestnut; the
former predominates, and often forms pure stands on the
thinnest soils, while the latter becomes more abundant
as the soil depth and moisture increase. Associated with
these are white and scarlet oak, black locust and hickory,
with basswood, maple, northern red oak and black gum on
the cooler slopes. Because of the poor growth conditions,
the ridge type trees are normally short, limby, crooked
and defective. Hence they are of little value as lumber
producers, but prevent erosion, aid in regulating drainage,
produce extracts, cordwood, and serve as a game sanctuary
and a recreation area. The land occupied by this type of
forest is less than ten percent of the total area of the
region.

The slope type of forest occupies at least sixty
percent of the forested area. It occupies all the slopes
except where the ridge type extends downward on the
southern exposure, and the bottom type reaches upward on
the protected northern slopes. Within this area two of
the most common hardwood trees are characteristic. These
are the white oak and chestnut. The oak reaches greatest
size and abundance in the lower areas, while in other
places the chestnut is liable to predominate. Associated
with these are chestnut oak, scarlet oak, red oak and
black oak, hickory, white pine, walnut, poplar, beech, maple, black gum, black birch, and basswood. The exact proportion of each of these depends upon slope, depth of soil, and moisture.

The bottom type occurs along the streams of the valleys extending upward on the adjacent slopes. Pure stands of hemlock, the characteristic tree, are frequently found, though the same species is commonly intermixed with soft maple, sycamore, black gum, river birch, and beech. Only a small present of this area is occupied by this type.

Due to the large forests and many streams of the Shenandoah National Park it furnishes a wonderful habitat for wild life. It is naturally within the range of the bear, opossum, raccoon, long-tailed weasel, mink, skunk, red fox, gray fox, wild cat, gray squirrel, flying squirrel, chipmunk, woodchuck, rabbit, muskrat, deer, and mountain sheep. The wild turkey is also present, although this turkey is reported to be a hybrid with the domestic turkey. This region has been inhabited by man for generations, until the animal life is no longer abundant. Therefore, there will have to be a great deal of restoration before the fauna can begin to resemble its former status.

This park would serve as an ideal habitat for sheep, due to its high altitude, cool temperature, abundant food supply, and bountiful mountain streams. It is true that
domestic sheep have inhabited this section until there would be much difficulty encountered in establishing wild sheep there on account of disease. Therefore, they would have to be inoculated against some of the more common diseases before they could be satisfactorily maintained within the park.

The Shenandoah National Park also contains numbers of wild flowers. Each month there are found different kinds of flowers, from trailing arbutus of early spring, to the aster and golden rod of the fall. The mountain laurel that blooms in June is perhaps the most spectacular of its flowers. The principal other flowers to be found there are: violets, golden buttercups, trilliums, honeysuckle, wild roses, white daisies, azaleas, and several varieties of orchids.

STATE PARK SYSTEM

The State Park System is composed of seven state parks, which are: Chesterfield Park, Douthat State Park, Family Stone State Park, Hungry Mother State Park, Sea-shore State Park, Staunton River State Park, and Westmoreland State Park. This system has been clearly thought out from the point of view of giving all citizens of the state an equal opportunity for recreation. With the exception of the following counties: Sussex, Southampton, Greensville, Brunswick, a portion of Prince George, Wise,
Lee, Scott, and Dickinson, every point in Virginia is within a fifty mile radius of a proposed state park.

Apart from the economic values to be derived from these developments, one of the most valuable features of the park system will be the conservation of humanity. The opportunity to help rehabilitate the thousands of boys and men who are unemployed -- through the C. C. C. camps -- and the supervisory personnel that have passed through the hands of the Division of Conservation of Natural Resources, would alone justify the division's existence.

Virginia is the first state to recognize the necessity for the development of its natural resources and to take advantage of the opportunities presented. One of the outstanding features planned in connection with park development in Virginia is the construction of lakes in the mountain regions. The conservation of its beach areas, long considered by many authorities to be the most important phase of state park development, is considered a very progressive step. On the completion of the program that the park division now has under consideration, the State of Virginia will possess one of the most intelligently handled state park developments in the United States.

RECREATIONAL OPPORTUNITIES OF FORESTS

In any consideration of parks in connection with their recreational advantages, forests are usually included. They
are an essential part of the majority of the parks. Many national parks are surrounded by national forests. The United States Forest Service has an important problem involved in the coordination of recreational use with other uses of the national forests. Lumber supplies, wild life, and range for livestock are national forest resources that must be protected and developed along with recreational opportunities.

The forest is a natural conservator of water, and through its help April rains go to make up man's available supply. When one has been in the woods during a rain, he must have noticed that the water does not beat down in seemingly unbroken streams, as it does in the open. This is because the thick forest forms a blanket of leaves and branches which breaks the fall of the rain. When the rain reaches the ground, it again meets obstruction which checks the water in its flow over the surface. The water seeps down through the humus to the mineral soil. There is joins the reservoir of underground water that feeds the springs, brooks, and rivers, insuring them a steady and even flow throughout the year.

Protection for wild life is afforded by forests. The destruction of these forests means the destruction of much of the wild life. It is of greatest importance when seeking to preserve wild life that a habitat be provided for it, and under conditions prevailing in the United States, where
forests are being recklessly destroyed by man, fire and other agencies and where many of the types of wild animals are becoming practically extinct, it seems that the greatest opportunity for the preservation of wild life is in national parks and forests.

In the report of the Forester of the United States Department of Agriculture for the year ending June 30, 1932, appears the following statement:

"During the year recreational use of the national forest took on an increased economic significance. To many regions it attracted sources of income without which much financial hardship would have been felt. To many unemployed persons it afforded not only enjoyment and health but also opportunity to live inexpensively amidst pleasant surroundings. Many parties occupied national-forest lands for extended periods. As in earlier years, the campers came from practically all the states and territories. An exact census of visitors is impractical, but estimates made as in previous years, with which every effort to avoid duplication, indicated that during the calendar year 1931 visitors to the national forests numbered 32,108,045, an increase of about 480,400. They included 493,255 special use committees and guests; 2,193,643 campers; 3,785,027 pickickers, and 24,037,428 transient motorists."

In all of the national forests, however, recreation is an inevitable feature of their development. A country of such variety, invested with attractive scenic areas and accessible natural playgrounds, affords great oppor-

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tunities for health and pleasure resorts of the people, as well as a resource for their economic value. The national forests are among the nation's finest recreation grounds. Their woods, rivers, lakes, Alpine meadows, snow fields, and lofty peaks, afford recreational opportunities to all lovers of the great out-of-doors. Fish in the streams and lakes and game in the back country attract the fisherman and the hunter. Snow covered peaks challenge the mountain climber. The tourist, the hiker, and the nature lover find much pleasure in these vacation lands.

Recreation, therefore, forms one of the major uses of the national forests. These are visited by thousands of pleasure seekers every year. To the extent that available funds permit, the United States Forest Service each year improves its recreational facilities. Mileage of roads and trails are being increased, opening up new areas to travelers. Improvements are being made upon camp grounds, and there has been established within the national forests, for public education and recreation, a series of representative areas known as primitive areas. In these areas primitive conditions of environment, transportation, habitation and subsistence are as far as possible maintained. Thus is being preserved for the nation representative areas of wild country in the natural state, free from exploitation and not changed by man. This affords
many opportunities to enjoy nature.

Since most of the national parks include mountainous sections, many of the outstanding recreation areas are publicly owned. The Forest Service has designated a number of recreation areas within the national forests where recreation is the primary concern in administration. A free public camping ground is usually maintained, and a forest ranger stationed at the area to give information and advice to recreationists. During the summer the forester delivers nightly illustrated lectures on the flora and fauna of the area.

Not only do forests offer recreational opportunities in summer, but also in autumn, when in addition to their beauty, they afford many other delights. Not the least of these is the large variety of edibles that are highly prized by most people. There are to be found: beechnuts, butternuts, chinquapins, chestnuts, hazelnuts, and several kinds of hickory nuts including walnuts and pecans. All of these are highly nutritious and are favorites with old as well as young, and all except the chestnut are still fairly abundant. Of the other edible fruits of the forest perhaps the best-known is the persimmon, which is edible only after it is thoroughly ripe.

When the trees are bare and the undergrowth has died off, one may get many more glimpses of the wild forest animals and easily follow them to observe their habits of
life. These may also give one the thrill of trailing some wild creature to its home. If for no other reason, however, the forest is fascinating in winter because of the beauty of the trees themselves.

In winter the evergreens are beautiful and form a fascinating picture for visitors. The hardwoods, too, show off to a good advantage. The beech is very outstanding with its smooth gray bark. The oaks in winter still hold some of their brown leaves, while the holly attracts the eye of visitors with its green leaves and red berries.

Perhaps one of the first things noticed about trees on a winter woods excursion is the difference in their shapes. Some trees stand very straight, while others are angular. And, too, all trees do not branch alike. Some have straight trunks extending upward to the tips, with branches growing out from the sides; others have a main branch that divides into numerous large branches.

Another feature of trees very noticeable in winter is the bark, which is especially interesting because it is so varied. It differs much in the various species, and even on the branches and trunk of the same tree. On some trees it is hard and smooth, like that of the beech; while on others it is deeply furrowed, like that of the ash. On the hickory the bark separates into loose strips, while the bark of the birch peels off into thin layers. The color of the bark is frequently very distinctive; for
instance, the different colors on different branches. The white oak gets its name from its light gray bark. Another tree with characteristic bark is the sycamore, which is one of the most easily recognized and attractive inhabitants of the winter woods.

One of the most interesting features of the tree is the winter buds. These buds are formed in summer during the growing season, and are found at the tip of the twig or stem and along its sides. They contain complete branches which develop in the spring into a new crop of twigs.

Winter buds vary greatly. In shape they may be slender, flat, oval, pointed, or round. The horse chestnut has a distinctive bud. It is large, brown and covered with a gummy substance.

The forests also offer opportunities for the lovers of hunting — the hunting being restricted by game laws to certain seasons of the year in order that game may be protected and man may have the enjoyment of a chase with its health-giving benefits. However, in recent years these laws have not been as necessary as formerly, because, through education, people have come to realize that the inheritance of wildlife is theirs to enjoy and not to destroy. They are, therefore, glad for the game to be protected as, by protection, better opportunities for recreation and enjoyment will be afforded them and their children. So one find many who were formerly hunters with
the gun now hunters with the camera. If the wild life disappears, the opportunities for outdoor recreation will be curtailed, because without the wild life the forests would be much less interesting and attractive.

Trips to the forest, therefore, bring knowledge of the leaves, the bark, and the fruit of the trees. There one may witness some of the many interesting things which are daily taking place. He may watch the birds at their work of home-making and raising their young, the animals in their natural habitat, butterflies and other insects as they go from plant to plant seeking food and shelter, and men carrying on the business of lumbering.
CHAPTER III

EDUCATIONAL OPPORTUNITIES OF PARK AREAS
EDUCATIONAL OPPORTUNITIES OF PARK AREAS

PROVISIONS IN PARKS FOR EDUCATION OF VISITORS

The entire idea of parks has recently undergone a great change. The park was once interested in landscaping and formal gardens. Many city parks are still dominated by this old idea. This is seen in the typical "city block parks," with the walks running into the center from the four corners, the center being occupied by a flagpole or a drinking fountain surrounded by a few benches. It became evident to the park people that these parks were defeating their own purposes. Instead of attracting women and children to them to enjoy their beauty, they attracted loafers who occupied their benches. This became so prevalent that women and children did not attempt to use them.

Frederick Law Omstead says:

"The whole park exists for no other purpose than to furnish forms of recreation for the public, and the business of educating and guiding the public to the full and proper use of the facilities provided calls for the constant exercise of greater or less degree throughout all the parks of the same qualities of tact, imagination, sympathy, firmness, and common sense that are so essential in playground directors."22

Through its educational division, the National Park

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Service is endeavoring to help every visitor to enjoy these great areas with an enjoyment based upon understanding.

The principles that have been developed and the methods which have been used in the national parks can be applied in any outdoor area. Among the educational opportunities are many distinct lines of endeavor which seem to fall into four groups.

1. General information
2. Exhibits
3. Instruction
4. Research

There are great possibilities in general information concerning the national parks. One of these is the field for radio broadcasting. It is often possible to deliver an address on the national parks and their educational features. The opportunities for educational information about the parks and other national areas are unlimited.

In many of the national parks small libraries are being started, and books on both technical and popular subjects relating to the parks are available to visitors. The educational division of the National Park Service publishes several very interesting wild-life bulletins which are called "Nature Notes." In many parks they are mimeographed and distributed weekly or monthly to many individuals and newspapers.

Besides "Nature Notes," the Park Service publishes
popular bulletins on wild life, geology, trees, flowers and similar subjects. The bulletin "Plants of Glacier National Park" gives a definite idea of the type of popular publications being distributed.

Another very important activity which might be listed under opportunities afforded through general information is that of visual education through motion picture films, lantern slides, and other photographs. In this way, many besides visitors come into contact with the activities of the national parks.

A number of types of work are included in the educational activities having to do with exhibits. Perhaps the most important of these is the establishment and maintenance of park museums, which are essential in developing recreational areas and furnishing recreation to visitors. It might be of interest to describe briefly the Yosemite Museum, in order that this may serve as an example to demonstrate the principles followed in the establishment of such museums in the parks.

"......Stepping through the main entrance, the visitor finds himself in a foyer devoted to the topography of the park, and it is here that he may examine relief maps of the state, the entire area of the park, and in detail the Yosemite Valley itself. Other maps and pictures further help him to become oriented as an introduction to the region in which he finds himself.

The visitor then steps into the geology room, when instead of being confronted with a confusing multitude of specimens, he sees at first four relief models, a series showing the geological
development of the Yosemite Valley in the following stages:
(1) Uplift of Sierra Nevada Range; (2) the glacial invasion of the park; (3) a large relief of the Yosemite Valley showing the retreat of the glaciers; and (4) Yosemite Valley as it is today. This gives a brief but comprehensive outline of the Yosemite's remarkable interesting geology as crowds call for this information.

From the geology room one steps into the natural history room. Only five comparatively small natural history groups have been attempted, and the function of these is not merely to present visitors a few mounted animals but, instead, to demonstrate how the birds, flowers, mammals, and trees of the region live together in natural communities, in what are called life zones occurring at very definite levels one above the other. The Upper Sonoran, Transition, Canadian, Hudsonian, and Alpine Arctic Zones are thus pictured in five groups, a number of plants and animals being shown living together as a community in each.

The ethnology room is next in circuit, and introduces the visitors to the people who inhabited this region before the coming of the white man. In this room are exhibited only materials which help to tell the story of the customs and daily life of the Yosemite tribe and demonstrate the excellence of their one art, that of basket making.

The history room, last of the circuit, seems to hold the visitors longer than any other type of exhibit. The historical material exhibited is arranged here so that it tells a consecutive story, beginning with early Spanish conquests and carrying the visitors through successive periods of exploration, migration, discovery of gold, and finally to the discovery of the Yosemite Valley. The local history is then, in an interesting way, brought up to the present time. Much attention was paid to the careful preparation of labels and elimination of needless exhibits, so that each article, with its description, forms a definite part of the story of Yosemite. After spending half an hour or less in making this
circuit, our Yosemite visitors have a logical conception of the park as a whole, and are prepared to look upon other facts regarding the park each in its proper perspective. 23

The importance of branch museums should be stressed since it is exceedingly important to preserve natural features in place and since the educational appeal of exhibits preserved in place is far greater than that of exhibits transported to a museum. Therefore, in all probability, a number of small branch museums will eventually be found in the parks at points of educational interest. A number of these have already been constructed. In Yosemite National Park there is Glacier Point Lookout, a branch of the Yosemite Museum. This small granite building is equipped with a powerful binocular telescope which brings the peaks of the High Sierra, which are twenty miles distant, to within half a mile of the observer. Here the ranger naturalist on duty can tell the geological story of the Yosemite region, using the valley itself for demonstration, and reaching out with his telescope to distant facts hidden from the naked eye.

At Grand Canyon another small branch museum is being erected, and here again is a splendid opportunity for telling the geologic story, a story which in this case begins millions of years before that of the Yosemite.

Old Faithful ranger station in Yellowstone Park is now being used as a branch museum. The exhibits here are limited to those which tell the story of thermal action.

Another educational activity which utilizes exhibits in their natural habitat is the establishment and maintenance of natural trails. This way of helping the public to become acquainted with the trees, birds, flowers, and other natural features had its origin under Dr. Lutz, in Palisade Interstate Park, some two or three years ago. Near the beginning of each natural trail is a sign, somewhat like that at the starting point of the first trail in Palisade Park, which reads, "A friend who knows something of natural history is walking with you and will be glad to help you to become acquainted with the natural things along the trail." Features of interest are labeled, not merely with their names, but in such a manner that the visitor's attention is attracted, and he is stimulated to discover facts for himself. By establishing similar trails in several of the national parks it is found that the novelty of discovering for themselves the natural features of the trailside greatly appeals to guests.

The third type of educational activity in the national parks is concerned with personal instruction. Park naturalists (educational officers) have been appointed for a number of national parks, and during the summer season ranger
naturalists or ranger guides are employed in almost all parks. The temporary positions are filled, for the most part, by university instructors, who serve during the vacation period. Men are employed who are competent to identify birds, flowers, and geological features of each park in a simple way that both interest and instruct the visitors. The services of specialists are secured where unique natural features are the chief source of interest. In the geyser basin of the Yellowstone, for example, the ranger naturalists are trained geologists; likewise, at Grand Canyon.

In several of the larger parks, namely, Mount Rainier, Yellowstone, and Grand Canyon, permanent educational officers are employed by the park service. These officers aim to point out the educational advantages afforded by the parks. They give lectures on natural history at various places in the park; but usually they are given before the camp fire at the nightly gathering of the hotel camp, or lodge. The information thus given on natural history subjects must be scientifically accurate as well as interesting.

The foregoing discussion points out many educational advantages afforded by the national parks. It can clearly be seen that the parks, as they are organized today, serve not only as recreational centers but at the same time are of educational advantage to the visitors.
SCHOOL ACTIVITIES

Forests

The study and discussion of forests and their uses should be based, as far as possible, on experiences that pupils have had during vacation periods, week-end trips, hikes, and school field-trips to parks, hills, canyons, forests, and seashores. The class study should lead pupils to look for outdoor phenomena whenever they go on such trips. They should collect pictures, clippings, specimens and then report their observations and show their collections to the classroom.

The making of colored charts, the illustration of written accounts, the keeping of life history developments, the representation in series of pictures to show various developments and changes; the location of certain areas on outline maps showing where parks and forests are located, and all means of visualising and integrating the study of the natural areas with school work should be utilized. The teacher may discuss with the class the use of trees to the human race from the time of the early cave man to modern days. She may begin by telling about the first use of wood for clubs, spears, bows and arrows; then its use through burning and giving heat and cooking; its use in the form of branches and bark for the first homes; the use of the inner bark for making baskets and
mats; the use of scooped out logs and of certain bark for making canoes; the use of berries, wild fruits, nuts, roots, tender shoots for feed; and the use of roots, berries, herbs and juices for medicinal purposes. She may discuss the modern man's method of using sap for industrial purposes and for food; trees for lumber; wood pulp for paper and cloth; and as homes for birds and wild animals.

The pupils should be encouraged to tell of their experiences in the forests, while on vacation trips, picnics, or walks. They may discuss the effect of pleasure while visiting these places of natural scenery; of the pleasure of sleeping and camping in the forests.

The pupils may study the effect of plants and trees on the conservation of water. They may discuss how roots of plants not only prevent the topsoil from washing away, but also keep the rain from rushing down to the bottom of the canyons or flooding the lower level places.

The teacher may take the pupils to a bank or cliff to observe soil erosion and to a grove to observe soil conservation. She may discuss with the class how rain water, when held back by roots, leaves and trunks in the groves and forests seeps slowly into the ground forming springs, streams, ponds and lakes, and how this water can be conserved for use in the rainless periods.
Yellowstone Park

Since one of the outstanding features of the Yellowstone National Park is the geysers an experiment may be planned in the laboratory to demonstrate the action of these geysers. This may be done with a test tube, a little water and a bunsen burner. This geyser, when in action, plays at short regular intervals. The water is heated in a metal bulb and finds its way to the surface through a winding tube. After the eruption it drains back into the bulb by another tube where it remains until it becomes sufficiently hot to repeat the performance.

The fauna of the Yellowstone National Park would furnish another very interesting activity. It would be of interest to learn what animals were native and abundant before the park was developed; what caused the numbers to decrease; what kinds of animals are now entirely extinct; and if there are any animals there now that were not there when the park was first developed. Here will enter discussions of the trapping and hunting of the pioneers for necessity, later by other people for pleasure and adornment, followed by the passing of national and state laws for the protection of the remainder of the fish and animals, the present continued need for protection of wild life outside of this park, and attempts to transfer groups of almost extinct animals to this park.
Class charts or booklets of wild animals now extinct or fast disappearing will aid in this activity. The pupils may collect newspaper and magazine clippings and pictures and arrange them in a booklet or on a chart. This should relate as much as possible to experiences that pupils have had on vacation and week-end trips. Not only may newspaper and magazine clippings be collected but much literature may also be sent for and much reading done. Colored charts of the habitat and distribution of the wild animals may be made and used to illustrate written and oral reports.

The pupils may be encouraged to tell of visits to any of the national parks of the United States and of the animals seen there, whether hunting and trapping were allowed there, and whether guns or dogs were allowed there. This may lead to a discussion of the need for protection of all wild animals. They may discuss the work of the game commission which exists in every state and the necessity for such a commission. Letters may be written to the Virginia Game Commission to find out what it does in the protection of Virginia's wild animals.

A discussion of the economic and recreational value of the wild animals may prove very interesting. It would be a question for debate as to which is of more importance to man, the economic or the recreational value of wild animals.
Other activities that may prove of interest are feeding wild animals, breeding wild animals, history of wild animals, making a wild life survey, formulating a wild life administrative plan, investigating the species facing the greatest danger of becoming extinct, finding out a practical means of securing species for reintroduction, the cost of same, practical measures for protecting the new stock until it establishes itself, and determining how much the fauna in the surrounding territory has been altered from its primitive condition. These are some of the activities that may be developed not only in a study of the Yellowstone National Park, but also in a study of any of the national parks that are rich in fauna.

GRAND CANYON PARK

The Grand Canyon National Park offers many opportunities for pupils to study erosion. In this study, as in the study of fauna, collecting pictures and bulletins and observing outdoor phenomena will be the principal methods used. Many of the pupils are familiar with erosion of one form or another. They may never have thought of the roadside ditches as canyons. The pupils may visit places where the water has gradually washed away the loose soil and formed ditches and gullies. There they may study some of the forms of strata exposed, through erosion, in the banks of the small canyons. Also the pupils may locate
some uneven place on the school grounds where the rains have worn out a small gulley. They may notice the work of the rain in tearing down the soil cover, and making miniature valleys, hills and ridges, and may observe how the top soil has been carried away leaving clay or rocky soil beneath. A visit to such a place just after a rain storm would afford a fine opportunity to see erosion taking place. A collection of specimens may prove interesting. Letters may be written to the State Commission on Conservation and Development for literature pertaining not only to the Grand Canyon but also to erosion in general. It may be possible to take the class to one of the soil erosion camps in the state, where they may see both examples of erosion and the methods being employed to check it. Oral and written reports may be made on the examples of erosion observed. Charts and booklets may also be made through the collection of pictures and magazine and newspaper clippings. Through a study of this nature pupils should form a mental picture of the enormous amount of erosion that the Colorado river has caused in the Grand Canyon. Then, too, through the observation and study of the smaller examples of erosion the pupils will have a better understanding of geology which will lead to a deeper interest in and appreciation of nature.
The most characteristic feature of the Hot Springs National Park is the constituent elements of the water, which is used for medicinal purposes. Chemical activities may prove interesting in connection with a study of this park. The pupils may find out through reading government bulletins and other literature the elements found in the water of the springs of this park and list these elements. Then it would be interesting to let the pupils bring samples of water from home and make a chemical analysis of these samples to find out if they contain any of these elements. Since the kind and amount of salts found in water depends not only upon the chemical composition of the soil and rocks through which the water flows, but also upon the solubility of the salts, it may prove interesting to let pupils make tests in the laboratory to determine which salts are insoluble in water and which are soluble in water, and also the degree of solubility of the soluble salts. Then the pupils may make soil tests to determine which salts are found most abundantly in certain types of soil—the same experiment may be made with soft types of rock. After they have determined the salts in water, they may readily conclude how these salts get in the water. They may continue this study to determine the value of these salts found in the water from the springs to the body. In connection with these
experiments, many class discussions, oral and written reports and much planning may prove of value and interest to the pupils.

Carlsbad Caverns Park

The region around Carlsbad Caverns contains many beautiful and interesting desert plants. Carlsbad Caverns National Park, therefore, offers splendid opportunities for the study of plant life. It would be interesting to let pupils study soil and climatic conditions that exist in desert sections. Then they make a study of the habitat and distribution of plants. After having read considerably along this line, the pupils may conclude what plants would be most likely to be found around these caverns. In connection with these activities several observations may be necessary. That is, the pupils may try to find in the community some specimens of flowers that grow on hills, in valleys, in swamps and in dry places. The teacher may encourage pupils to bring back from week-end trips and hikes in the fields specimens of flowers. After as many different kinds of flowers as possible have been collected, the pupils may study the different characteristics of flowers that grow on high and low places and in wet and dry places. She may also let the pupils observe the colors, odors, and nectar lines, or bee paths, inside the petals.
which the bees, butterflies, and other insects follow to the nectar cups of these flowers. Colored plates and pictures may be shown to the pupils. Slides and stereographs of flowers may also be used to demonstrate certain specimens. This study may lead to the classification and naming of the flowers collected.

Other activities may be worked out such as: collecting pictures, making booklets, making charts, making slides for study by the aid of a microscope, raising flowers at home and at school, and reading what many poets and writers have said about flowers. Through a clearer and deeper understanding of flowers both from an economic and aesthetic standpoint the pupils may develop a greater appreciation of flowers in particular and of nature in general.

Carlsbad Caverns are also noted for peculiar bat flights. Through a study of the caverns pupils may have their curiosity aroused to the extent that they will want to know something about the conditions under which bats live. They may make a thorough study of the entire bat family. It would be interesting to have pupils observe the flights of bats to see if there is any similarity between the directions in which they leave and return. Many pupils may already have been in caverns. If so, they should be given an opportunity to tell about what they saw.
A very interesting and valuable activity in connection with the Carlsbad Caverns would be a study of how caverns are formed. In this connection, the pupils may test the solubility of limestone and gypsum in the laboratory. They may dissolve some of the limestone compounds in water, at a temperature higher than that of the room, until the water becomes supersaturated and then observe the precipitation. From this activity the pupils may learn something about the principle which is involved in the formation of caverns and the stalactites and stalagmites which are found in them.

**Crater Lake Park**

Due to the fact that Crater Lake is thought to have been formed by the collapse of Mount Mazama, the only volcano in the United States that has fallen into itself, a study of volcanoes in connection with it would be a very worthwhile activity. The pupils may try to find out something about the cause of volcanoes. They may read to learn what islands, lakes, and mountains have been formed as a result of volcanic eruption. It would be interesting to let the pupils locate on maps these volcanic formations. It would also be of value to let the pupils find out whether there are any active volcanoes now, and if so, where. They may make a study of the sections of the country where there are the largest number of volcanoes.
The pupils may find it interesting to make a study of the frequency of volcanic eruptions. In this same connection, they may make a study of the rocks and soil resulting from volcanic eruptions. On trips or walks out-of-doors children may collect rocks for classification. Some of the common rocks may be classified as: volcanic, metamorphic, sedimentary, fossil, and miscellaneous. The teacher may encourage the children to bring to school any rock samples they may have at home. She may let them find out where their samples came from and classify them if possible. It would be interesting to study something about the minerals found in the rocks collected.

**Mesa Verde Park**

A study of the Mesa Verde National Park from a geologic standpoint should prove very interesting. The formation of the numerous mesas found there is of unusual interest—through the ages the floods and rains have gradually washed away the softer earth and have left standing only the rock spots or those spots so covered with surface rocks that the rains could not reach the softer ground underneath. Examples of this, in a miniature form may be seen almost anywhere. Pupils may take trips to various sections of the country and observe something about how this has taken place. This would be an excellent activity with which to follow up a study of the
Grand Canyon. Some of the pupils may have visited a park that had some small mesas in it. If so, it would be of interest to have them tell the class something about what they saw. There may be a park nearby which the class may visit and observe with the teacher some of these formations. For the pupils to develop interest in the wonderful scene at first sight and at the same time to understand something of the cause of all of this development would mean a greater appreciation of it and a greater permanent interest in it.

Since the caves of Mesa Verde furnished the dwelling place for prehistoric man, it may be of value to let the class find out something about the different stages of development of houses from the cave dwellers down to the present time — the ruins of four distinct stages of development may be seen in the park. They may trace the development of the equipment of the modern home from its very crude beginnings to its present stage. It may prove interesting to let the pupils make a comparative study of the developments made in agriculture. They may compare the scientific farm machinery, methods of planting, cultivating and harvesting of today with those of the cave man.
Mount Rainier Park

Mount Rainier National Park offers many opportunities for the study of glaciers and mountains. The pupils may collect bulletins, other types of literature and pictures pertaining to glaciers. Then the pupils should do much reading in order to get a clear conception of the formation and disappearance of glaciers. A class discussion in which the pictures are used may be valuable. It may be that some of the pupils have seen a glacier, or perhaps a small glacier without realizing that what they saw was a glacier. This study may cause the pupils to make investigations relative to the climatic conditions at Mount Rainier. They may note the difference in temperature for the different life zones on the mountain. If possible the class should visit a mountain and observe the difference in temperature at the foot of the mountain and at its top. It may be interesting in this connection to observe the difference in barometric pressure for different levels. Booklets may be made showing the difference in plant and animals for different life zones. Pupils may study local weather conditions with respect to seasons, winds, rains, floods and droughts. Through a clear understanding of some of these scientific principles many superstitious ideas may be overthrown.

Shenandoah Park
The Shenandoah National Park offers opportunities to study the trees and plants at different life zones. It may be interesting and worthwhile for the teacher to discuss with the pupils the different kinds of trees that grow in different life zones. Not only would a study of the different kinds of trees be worthwhile, but a study of the size and characteristics of these trees would also be very beneficial. The flowers and trees that grow on the top of the mountain will be found to differ considerably from those that grow on the sides or even at the foot of the mountain.

The fauna the Shenandoah National Park affords many interesting activities for schools. The pupils may determine the original status of fauna in the park region. They may do this by making a study of the grounds, old game trails, skeletal remains, horns, and antlers. They may interview pioneers, early residents, search written records, letters and diaries, periodicals, books, scientific reports, paintings and drawings. It would be of value to have the pupils make a study of the history of the fauna of the region under white man's influence; to trace causes of present conditions; and to learn what unfavorable influences have caused a reduction in the number of wild animals. The pupils may make a study of skin collections; work out life histories of species; study the human factor as related to the ecology of the
area; and finally, make a study of the different diseases that are common to the fauna and the best methods of combating these diseases.

A visit to the Shenandoah National Park would be worthwhile not only from the standpoint of studying the features of the park itself, but also from that of observing and studying the canyons, forests, rocks, plant life, wild life, layers of strata, erosion, birds, and caverns. Through this the pupils would gain a better understanding of the other national parks and an appreciation of the recreational advantages to be derived from the national parks and similar areas. The location of the Shenandoah National Park makes it possible for Virginia schools to plan trips for the classes to visit this park, without traveling too great a distance, during the school term. Therefore, it may be said that to Virginia schools, Virginia parks offer greater opportunities for both study and recreation than do out-of-state parks.

CONCLUSION

Through a study of the state and national parks one is afforded an opportunity to gain a better understanding of the development of plant and animal life and the physical phenomena of nature. There will be aroused more sympathy and love for all animals and plants as well as for those studied and cared for. Through the methods
and materials used in studying the park areas in the
schools it is hoped that the child will obtain practical
help in the solution of everyday problems arising in
his life. These may help the child to enjoy worthwhile
pleasures during his leisure time and may eventually be
the means of helping him choose a vocation related to
scientific subjects.

In opening the eyes of the child to the wonders of
the development of plant and animal life and to the
interesting manifestations of physical phenomena there
may be afforded him another helpful, healthful means
of employing his leisure time. When the proper kind of
recreation is found in the out-of-doors, there will be
less chance to seek pleasure in unnatural, artificial
and unsanitary places of amusement.

The health objective in nature education may be
obtained by keeping one's physical well being at its
maximum through understanding and following nature's
laws, through deriving relaxation from nervous strain,
by interest in our-of-door things, and through develop-
ing an adequate background for understanding and appre-
ciating the laws of nature. Finally, through one's
imagination, his appreciation, his wonder and his interest
will be aroused and developed.
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23. National Park Service:
   Crater Lake National Park, 1935.
   Fauna of the National Parks of the United States, 1935.
   Glimpses of Our National Parks, 1931.
   Grand Canyon National Park, 1935.
   Hot Springs National Park, 1933.
   Mesa Verde National Park, 1933.
   Mount Rainier National Park, 1933.
   Shenandoah National Park Project, 1932.
   Yellowstone National Park, 1933.

The bulletins listed above are published by the United States Government Printing Office.


29. Showalter, W. J., "Virginia a Commonwealth that has Come Back," The National Geographic Magazine, 56:608-80, April, 1929.


ORGANIZATIONS INTERESTED IN RECREATIONAL ACTIVITIES

These organizations have published material and in most cases have catalogues listing such material. Catalogues or lists may be secured on request.

American Bible Society, 4th Avenue and 8th St., New York, N. Y.
American Child Health Association, 370 Seventh Avenue, New York, N. Y.
American Folk Dance Society, 370 Seventh Avenue, New York, N. Y.
Association Press (Y. M. C. A.), 347 Madison Avenue, New York, N. Y.
Boy Scouts of America, Park Avenue, New York, N. Y.
Camp Directors Association, Western Reserve University, Cleveland, Ohio
Campfire Girls, 110 East 42nd St., New York, N. Y.
Catholic Boys Brigade, Michigan Boulevard, Chicago, Illinois
Christian Endeavor Union, Quincy, Illinois
Girl Scouts Inc., 670 Lexington Avenue, New York, N. Y.
Manual Arts Association, 237 Monroe St., Peoria, Ill.
Methodist Book Concern, 150 Fifth Ave., New York, N. Y.
Missionary Education Movement of United States and Canada, 150 Fifth Ave., New York, N. Y.
Modern Health Crusaders, 570 Seventh Ave., New York, N. Y.
National Amateur Athletic Federation of America, 6 North Michigan Blvd., Chicago, Ill.
National Recreation Association, 315 4th Ave., New York, N. Y.
Northern Baptist Convention, Board of Missionary Cooperation, 276 Fifth Ave., New York, N. Y.
Playground and Recreation Association of America, 315 Fourth Avenue, New York, N. Y.
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