A STUDY OF THE EDUCATIONAL OPPORTUNITIES OF YELLOWSTONE NATIONAL PARK

APPROVED:

James 7, Webt

Massu

Minor Professor

Deen of the School of Education

Deen of the Graduate School

A STUDY OF THE EDUCATIONAL OPPORTUNITIES OF YELLOWSTONE NATIONAL PARK

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By

Eugenia Reedy, B. A., B. S. 156248
Dallas, Texas

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CHAPTER I

INTRODUCTION

Purpose of the Study

The purpose of this study is to present both the educational and the geographical opportunities of Yellowstone National Park which is a region that provides inspiring areas of observation and experiences for American children. The writer will attempt to present trends and events that tend to show values of learning perceived through insight of things as a whole. It is important to have a general understanding of the problem to be studied and Yellowstone National Park provides that variety of geographical phenomena in its canyons, waterfalls, lakes, mountains, geysers, and weird, impressive landscapes which lends much to its general interest and its educational value. The problem is so to present the Yellowstone National Park with its land forms, climate, and elevation to the students that they may understand the regional developments of nature and the varied results of their correlation. The geographical purpose of this study is to re-evaluate as a modern and invaluable teaching technique the necessity for providing a pattern which will meet all prerequisites necessary for a

complete study of other parks and their phenomena. The visual method is a means of satisfying the psychological needs, providing actual contact with the world, stimulating interest and developing desirable individual and social traits.

Origin of the Study

This work has been prepared with the view that the writer is endeavoring to make clear the many interesting and notable geological questions to be found in Yellowstone National Park and to offer such a general view of the region, with its varied topographical features, as will enable the reader to understand clearly something of its physical geography and geology. It was the writer's father, a highly experienced lecturer and tour conductor, who recognized the patterns of geographical phenomena and spent his life inspiring people to see andappreciate God's great gift to the American people. It was toward the end of his life, after he had completed about thirty-seven consecutive summers in the vicinity of Yellowstone National Park as a tour conductor and student of this region, that he realized that these experiences had not been collected and tabulated. The purpose of this paper is to supplement his ambition by presenting Yellowstone National Park as a pattern for other national parks.

Source of Data and Procedure

In making a study of this problem, years of personal observation as well as personal discussions, recent interviews, and survey methods of research were all combined. Among these resources were (1) books, (2) magazines, (3) bulletins, (4) maps, and (5) letters of correspondence. Because of the wide range of this study, much of the material was gleaned from notes of lectures or statements made by such men as E. H. Mooreman, Manager of the Yellowstone Park Company; Arthur D. Howard, Associate Professor of Geology, Stanford University, California; David de L. Condon, Chief Park Naturalist, Yellowstone National Park; Huntley Child, Jr., Manager of the Division of Lodges and Tourist Cabins, Yellowstone Park Company; Edmun B. Rogers, Superintendent of the Department of the Interior, National Park Service: M. M. Goodsill, General Passenger Agent for the Northern Pacific Railway: F. E. Miller, Superintendent, Museum of Natural History, Dallas, Texas; and Professor Taylor Thom, Department of Geology, Princeton University. During the earlier years of her father's tours, the writer spent several summers in the Park as a visitor, but within the past ten years her experiences have been as a summer employee in different sections of the Park. It was during the summer of 1946 that the desire grew to describe the panoramic patterns of the Park to others and so stimulate

a desire for a personal insight of this vast wonderland of nature.

Limitation of the Problem

The size of Yellowstone National Park presents a problem within itself as the various types of topography are so very closely integrated and yet so individual. The survey method of research is limited by the cooperation and accuracy of those who provide information. An evaluation of the educational opportunities of the Park as determined by questionnaires was deemed impractical because only the total number of tourists entering the park or attending the lectures and museums is noted, and few schools employed the excursion to this area during the war period. Therefore, this study was confined to a general discussion of the importance of an understanding of the geographical values as well as the educational interpretations received after an excursion to the Park.

Present Status

The reason for this interpretative analysis is to stress the fact that Yellowstone National Park presents a veritable wonderland of scenic correlation for a geographical and geological pattern. Once the student is able to analyze the fact into its parts, each part is perceived in relation to the whole. It is hoped that this presentation of the subject will provide the reader with some degree of

realization of what these pleasure areas ought to mean and what so easily they may be made to mean to everyone.

Plan of the Study

This study of Yellowstone National Park has been developed from two angles: the geographical and the educational. The geographical phase presents the geological and historical developments of that section of the United States. This is presented as a pattern for other national parks. The chapter following presents the educational values received from a visual interpretation of such awe-inspiring phenomena as are to be found in the Park. The final chapter brings to a conclusion the values received from these interpretations.

CHAPTER II

GEOGRAPHICAL PHENOMENA IN YELLOWSTONE NATIONAL PARK

Physiographical Provinces

No greater area provides more regions of observation than does Yellowstone National Park located in the state of Wyoming and considered an excellent pattern because of its broader physical features. The variety of types include the south portion of the Park where the Tetons stand out prominently above the surrounding country, the highest, grandest peaks in the northern Rocky Mountains. Northward the ridges fall away abruptly beneath the lavas of the Park; only the outlying spurs come within the limits of the reservation. To the east of the Tetons, across the broad valley of the Upper Snake, generally known as Jackson Hole, lies the well-known Wind River Range, famous from the earliest days of the Rocky Mountain trappers. Then along the entire eastern side of the Park stretches the Absaroka Range -- so called from the Indian name of the Crow Nation. Abseroke Range is intimately connected with the Wind River Range, the two being so closely related that any line of separation must be drawn more or less arbitrarily, which indicates that the topography here is based more upon

geological structures and forms of erosion than upon physical limitations. The Absarokas offer, for more than eighty miles, a bold, unbroken barrier -- a rough, rugged country dominated by high peaks and crags from 10,000 to 11,000 feet in height. 1 At the northeast corner of the Park a confused mass of mountains connects the Absarokas with the Snowy Range. This Snowy Range shuts in the park on the north and is an equally rough region of country, with elevated mountain masses covered with snow the greater part of the year. The Gallatin Range incloses the Park on the north and northwest. It lies directly west of the Snowy, only separated by the broad valley of the Yellowstone River. It is a range of great beauty, of diversified forms, and of varied geological problems. Electric Peak, in the northwestern corner of the Park, is the culminating point in the range, and affords one of the most extended views to be found in this part of the country.

Yellowstone National Park is one of the wonders of the world because of the verious slope exposures of its mountain ranges, the fertility of its intervening velleys or basins, and the aridity of its desert spaces, all of which present a study of geographic and vertical distribution of wild life that is in many particulars unique.

Table 1, containing a list of various national parks,

Arnold Hague, Geological History of Yellowstone National Park, p. 4.

with their location, area, and most important characteristics, is presented on the following pages. The study of geographic and vertical distribution of life with the governing factors and attendant problems is valuable as a matter of scientific research and in the attainment of practical knowledge. It has become increasingly evident that life zones furnish a fairly accurate index to average climatic conditions and therefore are useful as marking the limits of agricultural possibilities, as far as these are dependent upon climate.

Let us now turn to a geographical phenomenon and realize that the various patterns of geologic conditions to stimulus and environment here in the Park have brought about a significant and an inspiring edifice to instil a student with the desire to have further experience and to gain additional knowledge hidden in its vast depths. The Abserokas rise as a formidable barrier to the eastern side of the Park, the Gelletins as a steep mural face on the west side, while the other ranges terminate abruptly, rimming in the park on the north and south, and leaving a depressed region covering a more extended area with a relatively deeper basin. The region has been one of profound dynamic action, and the center of mountain building on a grand scale.

²National Park Service, Department of the Interior, Glimpses of <u>Our National Monuments</u>, p. 1.

³Hague, op. cit., p. 6.

TABLE 1
THE NATIONAL PARKS AT A GLANCE

Name of Park	Location	Area in Square Miles	Distinctive Features
Acadia 1919	Maine coast	16	The group of granite mountains upon Mount Desert Island and also
			bold point on opposite mainland across French-man's Bay. Formerly called the Lafayette National Park.
Bryce Canyon 1928	Southwestern Utah	23	Box canyon filled with countless array of fantastically eroded pinnacles. Best exhibit of vivid coloring of earth's minerals.
Carlabad Caverns 1930	Southwestern New Mexico	1 1/8	Beautifully decorated limestone caverns be- lieved to be largest yet discovered.
Crater Lake 1902	Southwestern Oregon	249	Lake of extraordinary blue in crater of extinct volcano. Sides 1,000 feet high. Interesting lava formations. Fine fishing.
General Grant 1890	Middle eastern California	4	Created to preserve the celebrated General Grand Tree, 40.3 feet in diameter. 31 miles by trail from Sequois National Park.

TABLE 1 -- Continued

Name of Park	Location	Ares in Square Miles	Distinctive Features
Glacier 1910	Southwestern Montana	1,534	Rugged mountain region of unsurpassed alpine character. 250 glacier-fed lakes of romantic beauty. 60 small glaciers Precipices thousands of feet deep. Almost sensational scenery of marked individuality. Fine trout fishing.
Grand Can- yon 1919	North cen- tral Arizona	1,009	The greatest example of erosion and the most sublime spectacle in the world.
Grand Teton 1929	Northwestern Wyoming	150	Includes most spectacu- lar portion of Teton Mountains, an uplift of unusual grandeur.
Great Smoky Mountains 1930 (proposed)	North Caro- lina and Tennessee	248	This area is not to be developed as a national park until at least 427,000 acres have been donated to the United States, as specified in the organic act. Meanwhile the park area of 158,876. 50 acres already in Federal ownership is being protected by National Park Service.
Haweii 1916	Hawali.	245	Interesting volcanic areas. Kilauea and Mauna Loa, active volcanoes on the island of Hawaii. Haleakala, a huge extinct volcano on the island of Maui.

TABLE 1 -- Continued

Name of Park	Location	Area in Square Miles	Distinctive Feetures
Hot Springs 1921	Middle Ar- kenses	1.5	46 hot springs said to possess healing properties. Many hotels and boarding houses. 19 bathhouses under Government supervision. Reserved by Congress in 1832 as the Hot Springs Reservation to prevent exploitation of hot waters.
Lessen Vol- canic 1916	Northern Celifornia	163	Only active volcano in United States proper. Lassen Peak, 10,453 feet. Cinder Cone, 6,913 feet. Hot springs. Mud geyser.
Mesa Verde 1906	Southwestern Coloredo	80	Most notable and best preserved cliff dwell-ings in United States, if not in the world.
Mount Mc- Kinley 1917	South cen- trel Aleska	2,645	Highest mountain in North America. Rises higher above surrounding country than any other mountain in the world.
Mount Lanier 1916	West central Washington	325	Largest accessible sin- gle peak glacier system. 28 glaciers, some of large size. 48 square miles of glacier, 50 to 500 feet thick. Wonder- ful sub-alpine wild- flower fields.
Platt 1902	Southern Oklahoma	1	Sulphur and other springs possessing medicinal value.

TABLE 1 -- Continued

Name of Park	Location	Area in Square Miles	Distinctive Features
Rocky Moun- tain 1915	North cen- trel Colo- rado	401	Heart of the Rockies. Snowy range, peaks 11,00 to 14,255 feet alti- tude. Remarkable rec- ords of glacial period.
Sequois 1890	Middle eas- tern Cali- fornia	604	The Big Tree National Park. Scores of Se- quoias 20 to 30 feet in diameter, thousands over 10 feet in diameter. General Sherman Tree, 37.3 feet in diameter.
Sullys Hill 1904	North Dakota	1	Small park with woods, streams, and a lake. Is a wild-animal pre- serve.
Wind Cave 1903	South Dakota	17	Cavern having several miles of galleries and numerous chambers containing peculiar formations.
Yellowstone 1872	Northwestern Wyoming, southwestern Montana, and northeastern Idaho	3,426	More geysers than in all rest of world together. Boiling springs. Mud volcenoes. Petrified forests. Grand Canyon of the Yellowstone, remarkable for gorgeous coloring. Large lakes. Many large streams and waterfalls. Vest wilderness, one of the greatest wild bird and animal preservations in the world. Exceptional trout fishing.

TABLE 1 -- Continued

Name of Park	Location	Area in Square Miles	Distinctive Features
Yosemite 1890	Middle east- ern Cali- fornia	1,139	Valley of world-famed beauty. Lofty cliffs. Romantic vistas. Many waterfalls of extraordinary height. 3 groves of Big Trees. High Sierra. Waterwheel Falls. Good trout fishing.
Zion 1919	Southwestern Utah	148	Magnificent gorge (Zion Canyon), depth from 1,500 to 2,500 feet, with precipitous walls. Of great beauty and scenic interest.

The knowledge thus gained has been noted and the investigations have progressed chronologically as the life zones have been mapped.

Throughout the history of this awe-developing geological apparition the age of volcanism was the motivating force controlling drainage, as there was a period when Yellowstone had no rugged eastern boundary, due to erosion which had worn down the old mountains almost before they had reached their full height. Streams gnawed at the slopes and carried the debris to the rugged floor of the Yellowstone Basin. This basin was filled with waste thousands of feet above the

old lowland. Then the climate grew more moist. Streams were replenished and struggled with new vigor to cut through the sedimentary fill. 4 During this exciting geological period volcanoes grew, exploded, and grew again and yet the fury of the volcances was helpless against the eroding streams. The centers of new deposits shifted and new deposits buried the old, and that was the method by which the Absarokas were built. The largest rocks fell nearest the vent that catapulted them forth: the finest ash flew farther. Sometimes. too, volcances recaptured themselves in fury, and broke into a series of fractures that radiated out from the center. Then lava bubbled up from the earth to fill the fractures with vertical sheets of rock. These narrow sheets of rock are still standing, stretching outward like the spokes of some huge wheel. The simplest forms of mountains are volcanoes. What a valued lesson this could be to children!

Since the dying out of the rhyolite eruptions, erosimn has greatly modified the entire surface features of the park. Some idea of the extent of this action may be realized when it is recalled that the deep canyons of Yellowstone, Gibbon, and Madison Rivers -- canyons in the strictest use of the word -- have all been carved out since that time. Today these gorges measure several miles in length and from 1,000 to 1,500 feet in depth. 5 Changes modifying the surface

⁴Arthur D. Howard, Yellowstone through the Ages, p. 27.

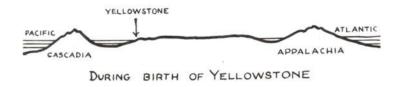
⁵Hague, <u>op. cit.</u>, p. 10.

features of the Park in recent times are mainly those resulting from the filling up with detrital material of the valleys and depressions worn out by glacial ice, and those produced by the prevailing climatic conditions. By its topographical structure the Park is designed by nature as a reservoir for receiving, storing, and distributing exceptional water supplies, not exceeded by any area near the headwaters of any other great continental rivers. The Continental Divide separating the waters of the Atlantic from those of the Pacific, crosses the Park plateau from southeast to northwest. On both sides of this divide lie several large bodies of water, which form so marked a feature in the scenery of the plateau that the region has been designated the lake country of the Park. On the following page is shown a geologic picture of the history of Yellowstone National Park and of North America as drawn by Arthur Howard. It is a realistic thrill for a student to experience seeing and being on the Continental Divide.

A simple survey could be made at this point in regard to the educational and geographical phases of our study by repeating a thought of Will Durant, that "progress is the increasing ability of men to do great things." The other angle would be to observe that the section of Wyoming now being studied has a variety of physiographic, climatic, and

^{6&}lt;sub>Ibid., p. 23.</sub>

NORTH AMERICA



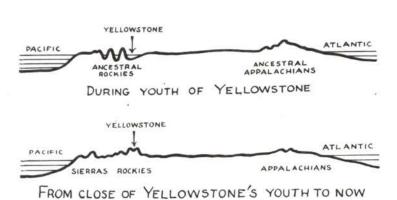


Fig. 1. -- A geologic picture of the history of Yellowstone National Park and of North America (from Arthur D. Howard, Yellowstone through the Ages).

great natural resources. The surface features may be classified broadly as mountains, plains, and valleys or basins which afford a generous representation of animal and plant This is largely due to the varied climate resulting from a difference in altitude within its borders of nearly 10,700 feet; and in a lesser degree to a difference in latitude of four degrees, and a wide range of local physicgraphic conditions. Much valuable agricultural land in the valleys and basins awaits future development. Although well supplied with mountains, Wyoming is perhaps better known for its vest open plains. These are either level or rolling, lying mainly between 4,500 and 7,000 feet elevation, and they are distinguished by characteristic types of vegetation, such as the sage plains of the high, arid, interior plateaus, and the grassy plains to the east and the northeast, which are part of the Great Plains. 8

In order to receive the clearest picture of the vegetative growth of this region, let us note the life zone ranges from the Upper Sonoran to the Arctic-Alpine Zone on the crests of the highest mountain range. The five zones present in Wyoming are briefly characterized as follows: Upper Sonoran, the zone of broad-leaved cottonwood, juniper, slat bush and yucca, occupying most of the valleys and the plains;

⁷Merritt Cary, North American Fauna, Bulletin No. 42, Bureau of Biological Survey, p. 10.

^{8&}lt;sub>Ibid</sub>.

Transition, the one of yellow pine, narrow-leaved cotton-wood, and pure sagebrush, embracing the high plains, the basal slopes of the mountains, and all except the highest foothills; Canadian, the Boreal forest belt of spruce, fir, lodgepole pine, and aspen covering the middle mountain slopes and highest foothill ranges; Hudsonian, the narrow zone or belt of white-barked pine and dwarfed spruce, fir found in the timberline region; Arctic-Alpine, the treeless zone, on mountain crests and peaks above the timberline. In a survey of native mammals, birds, reptiles, and plants made at a given locality, a marked preponderance of characteristic species of zone decides the zonal position; while a nearly equal representation, or a marked absence, of species peculiar to two adjoining zones is indicative of an intermediate position, or the approximate boundary.

The faune and flora are fairly consistent throughout the Park but include many special species such as sagebrush, yellow pine, and grasses. The Transition area is noted particularly on streams along the bases of the mountains generally and the zone is marked by narrow-leaved cottonwood, diamond willow, and usually by a dense shrubbery of Rocky Mountain birch; on foothills and lower mountain slopes, both in the forest as undershrubs and in the open, are wild red currants and mountain mahogany, while throughout are a

^{9&}lt;u>Ibid.</u>, p. 12.

great many herbaceous plants. 10 A considerable number of birds of both zones are found here, particularly during the nesting season. The mammals are chiefly restricted to the Transition Zone in different parts of Wyoming and include the plains white-tailed deer, Black Hills red squirrel, and Wyoming ground squirrels. A marvelous study of animal life for children is here in its natural setting.

Turning next to the Canadian Zone, which includes most of the extensive undulating forested plateau of Yellowstone National Park, we find a large rolling or hilly tract of mixed forest and open country on the borders of Jackson Hole. Traces of the zone, indicated usually by aspens and lodgepole pines or merely by dense, scrubby thickets of aspens, are on the upper, cool slopes of the Aspen Mountains; the Bear River Divide, a few desert peaks along the continental watershed between South Pass and Steamboat Mountain; and now end then on Heart Mountain north of Cody, and on Pyramid and Heath Peaks along the upper Platte. In Jackson Hole, the Yellowstone Valley, along both forks of the Shoshone River, and at the heads of many other narrow valleys deeply penetrating the mountain mass of northwest Wyoming, the Canadian element reaches a low elevation, and on cold slopes is often unmixed with Transition species at 6,000 feet. Over this region the mean summer temperature is low, the cold air of the surrounding mass of Boreal country

¹⁰ Ibid., p. 33.

settling into the velleys and canyons at night, and frequent frosts occur during the warmest months. Furthermore, these mainly steep-walled valleys receive a minimum of sunlight, and many slopes are shaded during the warmest part of the day. The cooling influence of cold streams and of descending cold air currents which flow down gulches and canyons regularly carries narrow tongues of Canadian Zone far below the average level on mountain slopes. This is very noticeable on some of the streems at the southwestern base of the Wind River Range. The chief value of this zone is its natural adaptation, in abundant forest and plant cover and cool summer temperatures, to moisture retention. The extensive forests, its greatest natural resource, are now largely under Federal control. 11 These are of great value, especially the forests of lodgepole pine and the areas of Engelmenn spruce, but large areas are as yet inaccessible. Winter temperatures are low, and in the small areas which are physically adapted to agriculture the prevalent summer frosts preclude the growing of more than a few of the hardiest crops and vegetables for ranch use. A rich fauna and flora uniformly characterize the Canadian Zone in Wyoming. Forest species predominate and in many cases those similar to ones found in the Rocky Mountains are in evidence, although a small number have a very restricted range. With the exception of many of the breeding birds,

¹¹ Ibid., p. 42.

which merely make their summer home in the Canadian Zone,' all are species adapted to a region of long, cold winters and short, cool summers. A child needs to experience weather and climate and to observe causes and effects.

We now cross the threshold into a new world which is confronted with more to do in education than any nation has yet seriously attempted. The schools are social institutions developing substantial progress toward these goals which rest on the sure foundations of competent professional leadership. Nearly every subject can be enriched through field trips. If it be geography, visual education will enrich the concept of the subject and vocational education suggests many places and processes for observation. Good planning bears fruit by reducing discipline problems and saving time. 12

Early History of the Formation of Yellowstone National Park

Educators have found that all the elements of an instructional program should be viewed in their proper relationship and may be classified in these three groups;

(1) direct learning through experience, involving immediate sensory contacts with reality; (2) vicarious learning through audio-visual materials, involving mechanical reproduction of reality, such as films and models; and (3) vicarious learning through words or abstract symbols of reality

¹² American Association of School Administrators, The Expanding Role of Education, 26th Yearbook, p. 215.

such as speech, formulas, and writing. 13 Then let us begin by viewing this breath-taking penorams from the dizzy heights of Mt. Washburn and realize that somewhere near at hand -- in the wells of the Grand Canyon, in the steep face of Sheepeater Cliffs, in the sheer slopes of the Gallatin Range -- you will find jutting ledges of rock. Each layer of rock, whether it be an old lava or an ancient limestone, has a story to tell; the lava tells of an ancestral volcano or of a yawning fissure vomiting volcanic rock; the limestone, of a long-forgotten sea. Read the story of each rock, compare it with that of its neighbors, arrange them in order, and the complete story of Yellowstone emerges.

We find that Yellowstone as a region emerged half a billion years ego as part of a vast western region submerged by vacillating seas. Once dry and barren, then flooded by the sea; arid again, then weshed by another flood, it has had a tempestuous geologic history. Then came a long period of quiet when slimy creatures at home on land or sea came first; later, weird fin-back brutes roved farther inland. And through the air droned giant insects, many times the size of their modern descendants. King of them all was a dragon fly with a wingspread of twenty-nine inches. These were the creatures that knew Yellowstone in her infancy. 14 About this time there came a great upheaval and

parts of the crust of the earth were twisted and shattered. The shift of highland to lowland bewildered and destroyed some of the creatures which had lived in the quieter days of the earth. Mountain glaciers covered soil that had once nourished lowland meadows. Winds and ocean currents were changed by the continent's rise: flowers and trees were starved, and deserts spread sand over the parched roots. Only a few hardy families of animals survived; the finback reptiles, and others whose lives had depended on warmth and abundant vegetation, vanished. 15 All of this geological history might have remained a secret were it not for the formation of the horizontal layers of sediment concealed between layers of rock. Without the upheaval and folding of layers, we should never have known that the seas swept in or how far they covered the land; and we should still wonder what plants and animals lived on the ancient earth.

Now let us read through erosion which has bared the edges of the crumpled rock layers just what did take place during that period of growth of this region, revealing at each turn a wonderland unfoldment and granting the observer an insight into its mysterious depths. The beginning of the last stages of the great flood which engulfed most of our own country was also the last stage of the dinosaurs' day,

^{15&}lt;u>Ibid.</u>, p. 19.

and once again the sea swept over the land, flooding the continent from the Arctic Ocean to the Gulf of Mexico. The new generation was well fed; within the aquarium that was Yellowstone lived millions of little shelled animals. The sea reptiles gobbled them up and grew fat and contented. For almost half a billion years Yellowstone had been buffeted about, and so smid the thunder of distant volcanoes, the earth heaved and writhed and shook its crust of sediment. The crust folded and broke and Yellowstone emerged. She flung up piles of sediment and formed the Gallatin Range -- mountains which climbed toward the sky much as they do now. Then Yellowstone barricaded herself on the north. She crumpled more sediment into folds and shaped the mighty Beartooth Range. She looked into the future and formed her eastern barrier -- the ancestors of our Abseroka Mountains. And in the south she heaved up the snow-clad summits of the Wind River Range. 16 The southwest border of Yellowstone reached upward slightly and remained for a while as a low and broken basin rim, where now, miles away, we glimpse the Tetons, topped by the craggy head of the Grand Teton. the Washburn Range waited for birth, and centuries passed before the Red Mountains grew up between two placid lakes. Where we see the broad, level shelf of Yellowstone Plateau, there was then only a deep basin, its floor littered with sediment.

^{16&}lt;sub>Ibid., p. 24.</sub>

It has been realized that the greatest memorials of the periods of volcanic quiescence are the petrified forests. While volcances rested, new soils grew over the debris in the basin. Trees rooted themselves in the earth and grew gigantic. On the north flank of Specimen Ridge about a dozen of the primevel forests are buried, one above the other. The geologist tells us that after the trees were buried, underground waters, percolating through the soil, dissolved their woody tissue and put in its place silica, harder than wood, which has withstood erosion. Thus Yellowstone preserved her ancient forests. 17 It is not so hard to imagine those days of fire and crater smoke when we can still see their handiwork, for it took approximately tens of millions of years to build the Absarokas, but the massive pile that was built is more than 10,000 feet thick. Part of it, carved into hills and valleys, is underground, buried in the depths of Central Plateau. 18

Sediments from the Yellowstone Plateau disclose the information that it was forced from the once-molten lava, and the geologist calls it rhyolite. In some places the lava cooled rapidly to form the shiny black rock called obsidien. Its evidence is plainly seen in the freshly broken surfaces of Obsidien Cliff, from which the red men made countless pilgrimages into Yellowstone in quest of this

¹⁷ Ibid., p. 28.

^{18&}lt;u>Ibid.</u>, p. 29.

hard, shiny rock so easily flaked into arrowheads and spear points. The scientists of today have discovered another formation from the foam and froth of the lava sea which congealed rapidly and formed a porous rock, some of which mantles the summit of Obsidian Cliff. This is pumice, a rock highly prized in modern times as an abrasive. 19 After the lava stopped flowing, Yellowstone began to split, and like a balloon slowly emptying and collapsing, the plateau settled. Sometimes those shifting segments lay flat, but more often the blocks slid into place in such a way that one end was tilted upward. It was as if a giant, sleeping below the surface of Yellowstone, stirring in his bed, had rumpled the blanket of lava which covered him. Probably the wide, irregular basin of Yellowstone Lake was the result of one of the gient's yawns.20 The Washburn Mountains did not escape the changes taking place and though they may have been tall before, when the lava ceased flowing the mountains stretched and grew hundreds of feet higher, and carried with them part of the plateau. Today this broad bench jutting out along the southern segment of the range can still be seen.

The heat from the volcanic upheaval was not the only element which left a scar on this geological history of Yellowstone, for a field of ice thousands of feet thick also

¹⁹Ibid., p. 33. 20<u>Ibid.</u>, p. 35.

lay over the northern half of North America. A million years ago the first ice came. Before it came, there were no deep canyons. Yellowstone was cutting its way into the lava plateau, but the canyon was only a deep valley. 21 the wintry blasts from the ice-laden peaks to the north swept over the plain, Yellowstone became a desolate waste. Twice the glacier melted away and returned, but each time left definite impressions, for from its second recession Yellowstone Lake and portions of the Canyon were formed. The glaciers left the mountains laden with rock debris and sometimes even scraped and gouged the bottoms and sides of the valleys, thus leaving a tell-tale trail over the regions once covered by ice. Such a trail of debris is known as ground moraine. All of these changes took place ten thousand years ago, but much of the convalescence from that icy ordeal still remains laid down in Yellowstone Lake and in the Grand Canyon, which may be viewed on the relief map drawn by Arthur D. Howard and reproduced on the following page. On the highest peaks the struggle between heat and cold still rages. A remnant of that vanquished host is Grasshopper Glacier, which contains millions of grasshoppers, frozen and completely preserved, which were blown upon the ice and buried under successive snows. The Great Ice Age did its work, left its monuments, and departed.

^{21&}lt;u>Ibid.</u>, p. 46.

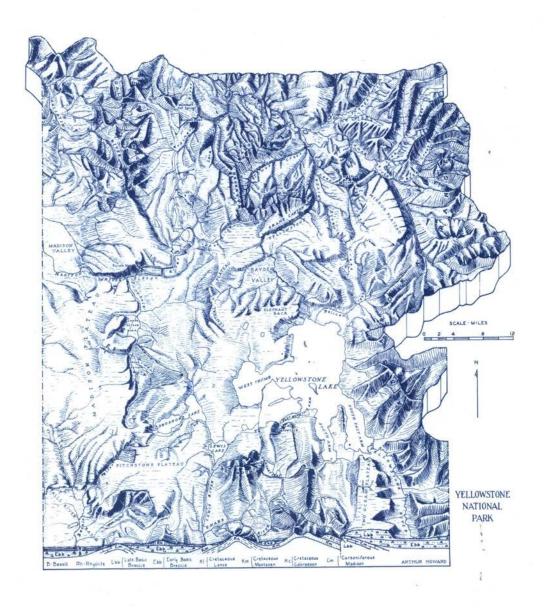


Fig. 2. -- Relief map of Yellowstone National Park (from Arthur D. Howard, Yellowstone through the Ages).

Historically, we recall the discovery of Yellowstone was made by John Colter in 1807-1808. The next recorded visit was made by a trapper named Joseph Meek in 1829, who described it as "a country smoking with vapor from boiling springs and burning with gases issuing from small craters." From some of these craters, he said, "issued blue flame and molten brimstone." The idea that eventually the area should be developed as a national park was created after the Washburn Expedition of 1870. One of the members of the party, a Mr. Langford, wrote an article in the New York Tribune of January 23, 1871, in which he stated:

This is probably the most wonderful and remarkable region of natural attractions in the world and, while we already have our Niagara and Yosemite, this new field of wonders should be at once with drawn from occupancy, and set apart as a public National Park for the enjoyment of the American people for all times.²³

This is the origin of the idea which has found realization in our present Yellowstone National Park. The history of the act of dedication, by which the Park was created, may be briefly told, for the bill was introduced in the House of Representatives by a Mr. Clagett on December 18, 1871. In the House the Hon. Mark H. Dunnell of Minnesota, chairman of the sub-committee having the bill in charge, addressed a letter under date of January 27, 1872, to the Secretary of

²² Isabelle F. Story, <u>Glimpses of Our National Parks</u>, p. 19.

²³Hiram Martin Chittendon, The Yellowstone National Park, Historical and Descriptive, p. 91.

the Interior, asking his opinion upon the proposed measure. The Secretary replied, under date of January 29, fully endorsing the project and submitting a brief report by Dr. Hayden, which forcibly presented all the main features of the case. 24 The bill, being thus before Congress, was put through mainly through the efforts of three men, Dr. F. V. Hayden, N. P. Lengford, and Delegate William H. Clagett. The Senate bill came up from the Speaker's table in the House of Representatives, February 27. The Hon. Dunnell stated that the Committee on Public Lands had instructed him to ask the House to pass the Senate bill. The Hon. H. L. Dawes of Massachusetts, warmly advocated the measure, which was then passed by a decisive vote. The bill received the President's signature March 1, 1872. It was a notable act, not only on account of the transcendent importance of the territory it was designed to protect, but also because it was a marked innovation in the traditional policy of governments. From time immemorial such a vast region as the Yellowstone National Park had never been set apart for the use of all the people and their enjoyment.

Once again, let us return to Mt. Washburn and gaze across the primeval wilderness penetrated by only a few roads and known intimately to all who seek the depth of beauty and grandeur. Down among those trees live elk and antelope, black bears and grizzly bears, buffalo and moose; and the rocky

²⁴Ibid., p. 92.

slopes below us are favorite haunts of bighorn sheep. eyes travel over the panorams and we again follow the trail which Colter must have followed -- those are the very trees through which he wandered. Meadowlands break the line of forests; elk and antelope are browsing there, just as they were when John Colter hunted them. Now we can see that the plateau is not everywhere flat, and spouts of steem mark the site of one of the main geyser basins. Then coming around to the south, we see that the blue waters of Yellowstone Lake fill a vast hollow in the southern plain over which we find Hayden Valley and down the narrow gorge, the Grand Canyon of the Yellowstone. This canyon was well described by those who early saw it as the "cameo of canyons." Erosion has given it its present depth and etched its walls. and the hot waters and vapors have brought out the brilliant coloring of the rocks. Now looking up, we behold a striking view of the walls of Yellowstone National Park etched against a skyline of pyramidal peaks in the form of the Gallatin Range. Majestic we see it, a long range, rocky brown merging into the purple smong the summits for only twenty miles of the Gallatin Range belong to the Park. Looking for a fleeting minute toward the east, we view the Abserokes which shield Yellowstone National Park in that direction from the outside world. This vast wilderness completely surrounded by wildness menages to squeeze the Yellowstone Plateau through a gap formed by the slope of the grand

Tetons, and so the Park ends a few miles on the outside of its forested precipice which overlooks the lower plains of Snake River. This magnificent monument is a mountain-encircled plain 8,000 feet above sea level, a land of strange phenomena and a haven for animals.

Natural Geological Phenomena

New types of curriculum materials are becoming available in increasing amounts in which there will be no isolated subjects. 25 It is essential that the large group of school systems become more aware of this fact and develop programs for development and improvement which incorporate procedures that will motivate these changes. The language arts or the social studies constitute the main big program. Readiness is recognized as an essential basis for good work and educators are concerned with its cultivation. One phase of progressive education is noted in the visual approach. The essential part played by teachers or instructors is to guide and direct this "activity program" that it may broaden the individual's desire for knowledge of and appreciation for the cultural.

The topographical and physiographic study of Yellowstone National Park is widespread and far-reaching, but to overlook some of the chemical reactions that take place in this Nature's laboratory would be inexcusable. The reacting

²⁵James F. Webb, class notes for Education 532, North Texas State Teachers College.

substances in Yellowstone National Park are the gases rising from the uncooled magmatic masses far below the surface. the characteristic rocks of this region, the ground water which penetrates the rocks to varying depths, and the atmospheric oxygen which interacts with certain of the magmatic gases. The hot springs are of great variety, for each represents the result of a peculiar set of conditions found below the surface at that point. The geology of the region and the causes of the thermal activity in the Park may be gained from the fact that there are some three thousand hot springs scattered in groups unevenly over an area roughly sixty by thirty miles. In Yellowstone National Fark the magmetic masses from which the gases ere believed to be issuing lie at such a great depth that direct analysis of the gases is impossible. Careful analyses have been made of the gases escaping from certain vents and springs, but it is recognized that these may contain atmospheric contaminants or other gaseous products which have distilled out of sedimentary rocks below the surface. They must have lost certain original constituents which have been dissolved or condensed from interaction before the gases reach the surface.26

There are found different types of mineral-content water which respond in different sections of this wonderland

²⁶Irwin B. Douglass, Some Chemical Features of Yellowstone National Park, p. 7; reprinted from Journal of Chemical Education, XVI (September, 1939).



in different manners. The alkaline is one area which is quite a study because of the acid or sulfate reaction intermingling through an area high in bicarbonates, chlorides, and fluorides. The alkaline springs are almost exclusively found in areas where the topography would suggest an abundent and deep-seated supply of ground water: this is the area in which Old Faithful geyser is located. At the bottom limits of the zone of ground water there must exist an active alteration of the rhyolite by the hot carbonic acid, which accounts for the bicarbonates in the water. 27 scientists have noted that the alkaline areas show much less evidence of rock alteration by the thermal waters than in the typically acid areas. In the Mammoth area, the thermal waters below the surface in this region are charged with carbon dioxide and come in contact with extensive beds of Paleozoic limestone. When the water breaks forth on the surface, it has a high content of calcium bicarbonate. With the decrease in partial pressure of carbon dioxide, the gas escapes from the hot solution and calcium carbonate precipitates in the form of travertine, building up huge terraces which often engulf large trees. There is probably no other place in the world which affords the interested person as good an opportunity to observe the properties of large quantities of water at or near the boiling point, These geysers are noted for the tendency of the water to

²⁷Ibid., p. 13.

In some pools the superheat may amount to three centigrade degrees. Some points in the surface of a pool may be much hotter than others, and a pool which is below boiling one minute may be superheated five minutes later. One of the geysers most frequently illustrated is the Sapphire Pool in the Upper Basin. This pool, which is thirty feet or more in dismeter and about thirty-five feet deep, erupts to a height of two to four feet every twelve minutes. As the water starts to rise just before the eruption, its surface is as smooth as though covered with oil, yet if dry sand is thrown into the water or it is stirred with a stick, it boils violently. The explanation seems to be that the water is heated by magmatic steam in chambers end tubes below the visible bottom of the pool. When this hot water enters the bottom of the pool, hydrostatic pressure prevents it from boiling, but in the wide pool there is opportunity for convection currents and the hot water from the bottom rises because of its lower density and reaches the surface at a temperature above the normal boiling point. 28 There it should boil, but because there are no nuclei about which the bubbles can form, it remains superheated until it cools by evaporation or spontaneously starts to boil. Just what part, if any, the dissolved and colloidally dispersed minerals play in preventing the water from boiling normally is uncertain.

^{28&}lt;u>Ibid</u>., p. 23.



Another phenomenon often seen and still more often read about is Old Faithful, which has an altogether different story to its actions: for the scientists, after close study and observation, have analyzed its eruptions as being due to the fact that the temperature of the water in the tubes and chambers which constitute the plumbing system must all be very near the boiling point. The boiling of water in some smell chamber or in the tube seems to fill the tube with a mixture of steam bubbles and water which, because of its lower density, reduces the hydrostatic pressure and causes the water in the lower parts of the plumbing system to be superheated. The sudden boiling of the large masses The last and of superheated water causes the eruption. often less-mentioned but still quite interesting geyser or gaseous phenomenon is given the title of "mud pots." These huge boiling pots, which are pools or craters somethmes fifty feet in diameter, are filled with thin clay and other finely divided minerals kept in a continual state of agitation by the escape of gases. They are almost inveriably found in areas deficient in ground water. They are springs without an outlet and very often there is considerable variation in color depending upon the purity of the clay and the degree to which it is contaminated with free sulfur, arsenic sulfide, iron oxide, and black pyrite.29 It is difficult to enumerate all the chemical wonders around these

²⁹ Ibid., p. 21.

geysers and their activities. There apparently is much still to be learned about these phenomena, and the chemists who sid in the solution of the many unsolved problems will contribute to a better understanding and a greater appreciation of this remarkable region.

As a summary of the natural features of Yellowstone National Park, the area is here represented in four sections, noted on the aerial topographical maps seen on the following pages: Gallatin, Canyon, Lake, and Shoshone; and these embrace geographically the parallels of 44° and 45° north latitude and the meridians of 110° and 111°. It is situated in the northwest corner of the state of Wyoming and includes 3,412 square miles.30

The story of the general geology may best be told according to the rock formation, which is reiterated by a study of the Archeen formations, which are graphically illustrated in Figure 7. The oldest rocks in this region are crystalline granites, gneisses, and schists of various kinds, and like similar occurrences elsewhere, are assigned to the Archean age. They are thought to constitute the earlier rock formations of the crust of the earth. No exposures of Archean rocks are known in the central region, but they occur in connection with all the great mountain uplifts that encircle the Park plateau. Next come the Algonkian rocks which occupy limited and isolated areas and

³⁰ United States Geological Survey, Yellowstone National Park Folio, 1896.

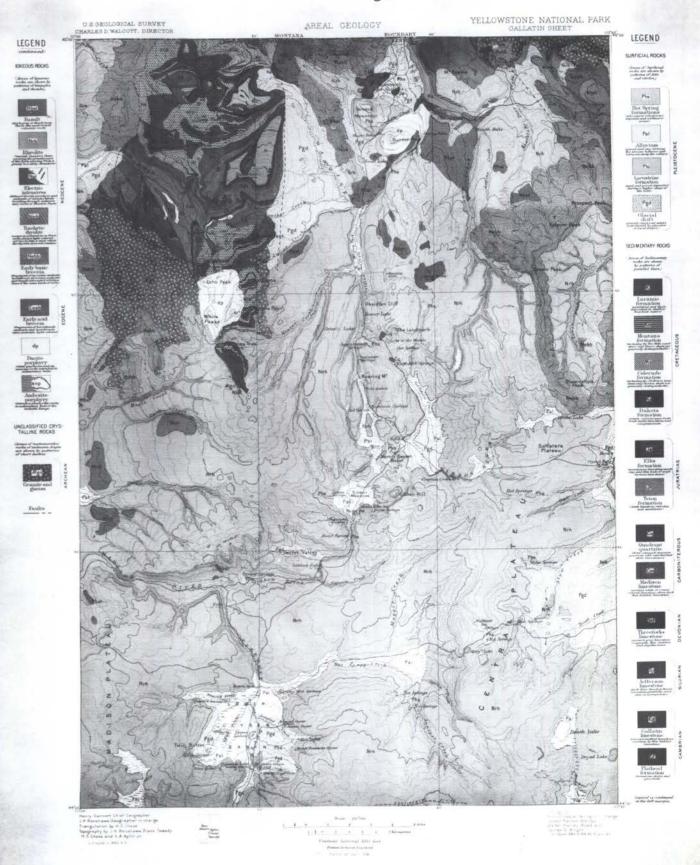


Fig. 3. -- Aerial geology map of the Gallatin region, Yellowstone National Park.

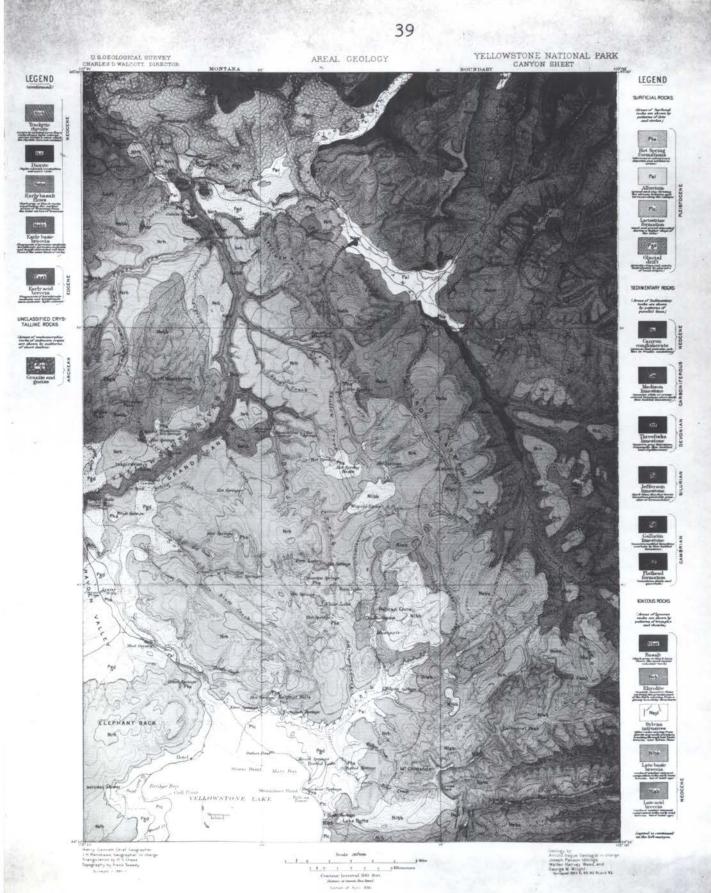


Fig. 4. -- Aerial geology map of the Canyon region, Yellowstone National Park.

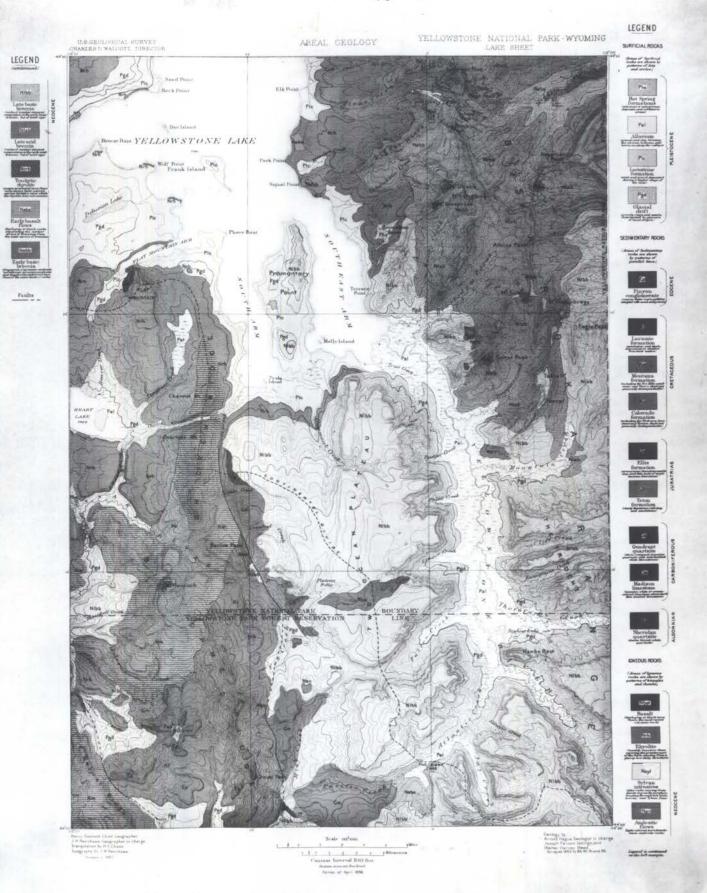


Fig. 5. -- Aerial geology map of the Lake region, Yellowstone National Park.

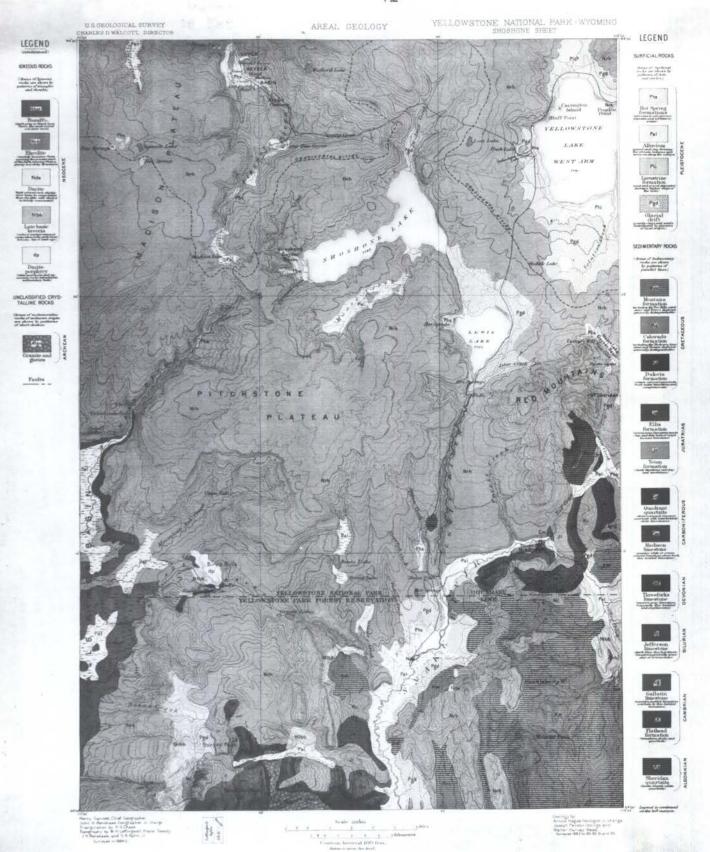


Fig. 6. -- Aerial geology map of the Shoshone region, Yellowstone National Park.

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Fig. 7. -- Generalized geologic column of Yellow-stone National Park, showing the historical eras of rock formation through a physical view of a mountain (from Arthur D. Howard, Yellowstone through the Ages).

This column shows the sequence and general character of the rocks in the Park. At no one place is the entire section revealed. In former ages erosion carried away much of the old rock layers, and at other places they are concealed beneath volcanic rocks or glacial debris. The total thickness of known rock layers is approximately 12,000 feet.

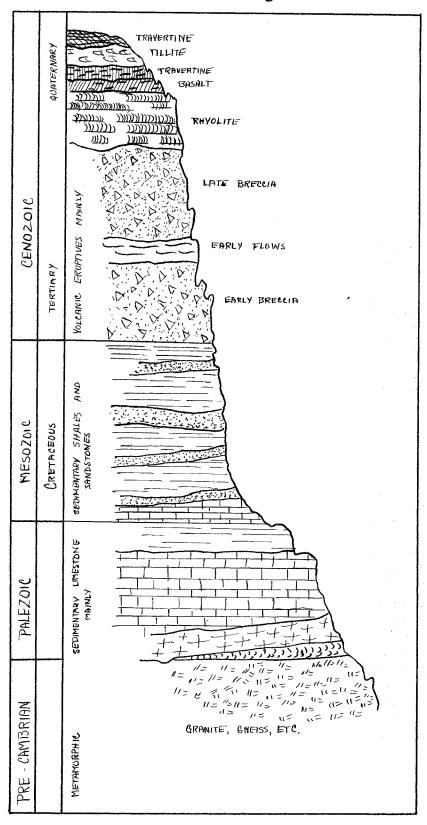


Fig. 7. -- Continued.

for the most part lie buried beneath lava flows. After the cessation of the volcanic energy which forced to the surface the baseltic breccias and flows, a long period of erosion followed. Then, with renewed activity, immense volumes of thyolite were poured out, which converted the depressed basin lying between the surrounding ranges into the Park Plateau. Only a few large vents or centers of eruption of the rhyolite are known, the two principal sources being the grand volcano of which Mount Washburn is now the culmineting peak, and the Sheridan volcano, of which Mount Sheridan is the central point. On all sides the long slopes of the pre-existing ranges were submerged beneath the rhyo-It rests against the deeply eroded slopes of the Absaroka Range and buries the outlying low spurs of the Teton Range. The Grand Canyon of the Yellowstone is a magnificent and picturesque gorge penetrating deeply into the volcanic The Yellowstone River, leaving rocks of the Park Plateau. Yellowstone Lake at its broad outlet, flows northward through an open valley for about fifteen miles, then suddenly plunges, by two impressive waterfalls, respectively 110 and 312 feet in height, into the Grand Canyon. All that portion of the canyon represented has been excavated out of the rhyolite, which, however, still forms the underlying rock of the river. The wells of the canyon rise with more or less abruptness 800 to 1,100 feet above the rushing, turbulent stream at the

bottom of the gorge. The vicinity of the canyon has been active as a center of hydrothermal energy throughout a long period of time. Much of the exquisite beauty and impressive grandeur of the region comes from the brilliancy of coloring found in the canyon walls. Probably no other area of equal extent in the world affords so varied and vivid a bit of natural coloring. Hot springs, steam vents, and solfateres are still found along the river banks, remnants of a much earlier and more powerful thermal activity. Every shade and tint of red occurs on the canyon walls, from delicate pink and salmon to a vivid Indian red, the prevailing color being a deep orange. It is this everchanging condition of rock texture, brought about by these processes of decomposition, that has produced the varied and fantastic forms of rock sculpturing which present so characteristic a feature of the Grand Canyon of the Yellowstone and which have made it so femous throughout the world. Since the close of the glacial period no geological events have brought about any marked changes in the physical features of the Park other than those produced by the active agencies of steam and thermal waters.

The school with its elastic curriculum is so devised as to aid the child through educational means in developing his interests that he may be able to adapt himself to his environment. Interests are not only the tools of the trade

but also the technique. Living creatures respond to the environment by active degrees of interest or aversion by movements toward or away from the exciting stimulus. Therefore, our last item of geographical importance which pertains to the life of an individual as a vital, functionary unit is the stimulus received from natural environment. A study of climate in Yellowstone National Park reveals that there are no great extremes of heat and cold, or of moisture or drought. The sir is clear, electrical, and bracing, the nights always cool, the altitude exhibarating, the odor of the evergreen forests invigorating, while the varied and beautiful scenery exalts the mind and diverts attention from all cares which are often the real cause of physical ills.

Table 2 on the following page gives a climatic summary for 1941.31 In the middle of the day and under the direct influence of the sun, August temperatures sometimes reach ninety degrees. But no such heat pervades the general atmosphere, and in the shade the air always seems cool. The winter temperatures of the Park are much less extreme than is generally supposed. The proportion of clear days which characterizes its summers is equalled if not exceeded by those of its winters. The snowfall never reaches a depth that blockedes travel, if there is any determined effort

³¹ United States Department of Agriculture, Climate and Man, 1941 Yearbook, p. 1201.

TABLE 2 CLIMATIC SUMMARY OF YELLOWSTONE NATIONAL PARK, 1941

Open je se	Temperature								
Weather Station	Length of Record	Ave.	July Ave.	mum	Mini- mum	Length of Record	Jan.	Feb.	
	Yr.	op	op	oF	oF	Yr.	In.	In.	
Buffalo Ranch	31	12.9	57.6	98	-58	32	1.32	1.10	
Gallatin Lake	18	11.6	54.9	97	-54	25	1.39	.97	
Lake Yellow- stone	30	11.4	55.0	94	-56	31	2.07	1.55	
Snake River	28	12.9	53.2	93	-56	29	4.32	2.93	
Yellowstone Park	40	18,1	51.4	96	-41	40	1.29	1.00	
West Yellow- stone	29	12.5	57.7	97	-66	30	2.15	1.61	

TABLE 2 -- Continued

	Average Precipitation									
Mar.	Apr.	May In.	June In.				Oct.	Nov.		Annual Total In.
1.18	1.19	2.00	2.06	1.75	1.60	1.25	1,24	1.05	1.13	16.87
						1.34	1.65	1.32	1.42	17.96
2.07	1.45	1.93	2.01	1.66	1,41	1.37	1.54	1.35	1.56	19.97
3.53	2.21	2.25	2.30	1.59	1.56	1.62	2.06	2.59	2.89	29.85
1.46	1.41	1.82	1.65	1.28	1.19	1.24	1.44	1.07	1.16	15.99
1.63	1.35	1.60	2.01	1,42	1.25	1.36	1.39	1.58	1.70	19.05

to keep the roads open. In the Upper Park the weather is much colder and the snowfall much greater, and it doubtless totals twenty feet in the course of an average winter. Drifts accumulate in enormous magnitude and numberless avalanches fall from the mountainsides every winter. Nevertheless, it is not until late in the winter that the fall of the snow really blockades travel, and it would doubtless be possible to maintain open roads the year round. Even with the temperature below the freezing point the snow disappears with very noticeable progress. On the whole, Yellowstone National Park climate, both in summer and winter, is thoroughly a tonic in its effect upon the human body.

In considering climate according to geological zones, the Canadian zone is marked by the precipitation which is in the form of frequent sharp showers in summer and heavy snows in winter, but there is also occasional rains of greater duration in spring and fall. The chief functional value of this zone is its natural adaptation to moisture retention. Winter temperatures are low, occasionally reaching -45° Fahrenheit and yet in this small area the country remains physically adapted to agriculture. An almost Arctic climate prevails in the Hudsonian Zone, which in winter is buried under deep snow and in summer is flecked with huge drifts, many of which never entirely leave protected gulches. Although the climate is rigorous for the three winter months

of each year and myriads of mosquitoes greet one in the summer, this highly interesting region well repays the arduous climb entailed to reach its confines. There are a few traces of the Arctic-Alpine Zone on a few mountains in the bleak, wind-swept region of excessive rainfall, sleet or snow, even in the short summer; and Arctic temperatures prevail throughout the year. On all the ranges snow fills the gulches and partly covers cold slopes and declivities even in the warmest months, while such massive elevated ranges as the Wind River, Absaroka, and Tetons carry extensive snow fields and even a few perennial ice fields or glaciers in the protected Alpine valleys.

Man Explores and Develops

The geography of this awe-inspiring country has taken the foreground up to this point in this chapter, but now we will turn to those persons who first occupied the surrounding country and from bits of information gleaned from the Indians by the trappers learn that they knew little of the Yellowstone National Park region. The explanation ordinarily advanced is that the Indians had a superstitious fear of the geyser regions, and therefore avoided them. There were three great families of Indians -- the Sicusan, the Algonquien, and the Shoshonean -- who originally occupied the country around the sources of the Yellowstone. Of these three families the following tribes alone are of

interest in this connection: the Crows, of the Siousan family; the Blackfeet, of the Algonquian family; and the Bannocks, the Eastern Shoshones, and the Sheepesters, all of the Shoshonean family.

The home of the Crows was in the valley of the Yellowstone and Big Horn Rivers, below the mountains, where they have dwelt since the white man's earliest knowledge of them. Their territory extended to the mountains which bound the Yellowstone National Park on the north and east, but they never occupied or claimed any of the country beyond. were generally friendly to the whites, but enemies of the neighboring Blackfeet and Shoshones. 32 They were everywhere encountered by the trapper and the prospector, who generally feared them more on account of their thievish habits than for reasons of personal safety. The Blackfeet dwelt in the country drained by the headwaters of the Missouri. The distinguishing historic trait of these Indians was their settled hostility to their neighbors, whether white or Indian. They were a tribe of perpetual fighters, justly characterized as the Ishmaelites of their race.33 They were the terror of the trapper and miner, and hundreds of the pioneers perished at their hands. Like the Crows, they were a well-developed race, good horsemen and great rovers, but in fight, given to subterfuge and strategem

³² Chittenden, op. cit., p. 6. 33 Ibid., p. 7.

rather than to open boldness of action. In marked contrast with these warlike and wandering tribes were those of the great Shoshonean family. It was an humbler branch of this family which alone is known to have permanently occupied what is now the Yellowstone National Park. They were unfit for warlike contentions and therefore sought immunity from their avericious and dangerous neighbors by dwelling among the inaccessible fastnesses of the mountains. There is abundant evidence that they actually occupied the park area because of the numerous Indian trails, though generally indistinct, which were everywhere found by the early explorers, usually on lines since occupied by the tourist routes. ditional evidence may be seen in the widespread distribution of implements peculiar to Indian use. Arrows and spear heads have been found in considerable quantities. Cliff was an important quarry, and the open country near the outlet of Yellowstone Lake, a favorite camping ground. Certain implements, such as pipes, hammers, and stone vessels, indicating the former presence of a more civilized people, have been found to a limited extent.

The Indians on the whole knew little or nothing about this strange wonderland and the explanation has been given that there was nothing to induce the Indians to visit the park country because three fourths of the year that country is inaccessible on account of snow. It is covered with

dense forests, which in most places are so filled with fellen timber and tangled underbrush as to be practically impassable as a highway of communication between the valleys. 34 All the conditions, therefore, which might attract the Indians to this region were wanting. Even those sentimental influences, such as a love of sublime scenery and a curiosity to see the strange freaks of nature, evidently had less weight with them than with their pale-face brethren.

John Colter was the first white man to set foot within the territory of the Yellowstone National Park, and as the story goes, Colter was with the Lewis and Clark expedition in 1806 when he decided to remain in the country for additional trapping. It was during the year 1807 that he went exploring and according to the sketch which he gave to General Clark in St. Louis, Colter's route carried him directly across the present Yellowstone National Park, from southwest to northeast. His adventures and experiences are very clearly narrated in his book titled <u>Captain Bonneville</u>, for on his return to St. Louis in 1809, he gave Clark the important data for his forthcoming map of the Lewis and Clark expedition.

The entrance of man brought enother regime into this mystic country which for so long was viewed by nature's creatures as their security. Far in advance of the tide of

³⁴ Ibid., p. 14.

settlement the lonely trapper, and after him the trader. penetrated the unknown West. Gradually the enterprise of individuals crystallized around a few important nuclei and there grew up those great fur-trading companies which for many years exercised a kind of paternal sway over the Indiens and the scarcely more civilized trappers. Along with these developments came inevitable rivalry. A long and bitter strife ensued between the Hudson's Bay Company and the great Northwest Fur Company of Montreal. A compromise was effected in 1821 by an amalgamation of the two companies under the name of the older rival. business taxed the resources of nature beyond its capacity for reproduction. The few years immediately preceding and following 1830 were the halcyon days of the fur trade in the United States.35 Thenceforward it rapidly declined and by 1840 had shrunk to a mere shadow of its former greatness. With its disappearance the early knowledge of the Upper Yellowstone also disappeared. Subsequent events -- the Mormon migration, the war with Mexico, and the discovery of gold -drew attention, both private and official, in other directions; and the great wonderland became again almost as much unknown as in the days of Lewis and Clark.

There were two other notable trappers whose adventures and experiences merit mentioning at this time for their personal knowledge of the area which is now Yellowstone National

^{35&}lt;sub>Ibid., p. 34.</sub>

Park. These men were James Brider, who began traveling through the area in 1830, and Captain W. F. Raynold. This latter explorer was a member of the Corps of Topographical Engineers, U. S. A., who on the thirteenth of April, 1859, made an expedition into the country through which flow the principal tributaries of the Yellowstone River and the mountains in which they and the Gallatin and Madison Forks of the Missouri, have their source. Being conducted on special orders, this was the first government expedition directed to the precise locality which is now embraced in the Yellowstone National Park. Among the members of this famous expedition was the geologist, Dr. F. V. Hayden, whose name is so intimately connected with the history of the Park.

The true function of education is to open channels for the flow of human energies and to furnish tests for the validity of individual and social action. A course of study or a school focused upon the goal of integration could now introduce the pupil to the world of knowledge, not merely as knowledge, but as experience which bears upon his perplexing questions. Now we are approaching that portion in our study in which the pattern is discerned by the values produced as a whole from the works of man in this tract of nature's wonderland. The Park is a very extensive tract of country and its points of interest are widely separated from each other. The ordinary tour of excursion or observation requires about 150 miles of travel and one week's time.

The road system of the Park is designed to provide an entrance on each of the four sides, and to give access to all the more important objects of interest. When it is considered that these roads are in the heart of the mountains, where the country is wild and rugged, it will be understood that the problem of working out a satisfactory system is a very large one. Questions of drainage, dust, character of road-bed, and so on are much more exacting in highway construction. During these later years careful attention has been given to the location of the roads, an important consideration always being to carry them where they will develop the scenery of the Park to the best advantage.

The principal highway structures are the entrance gate at the north boundary, the Golden Gate Viaduct, the Melan Arch Bridge over the Repids of the Yellowstone, the wooden arch bridge over a dry ravine in the same vicinity, a steel arch bridge over Cascade Creek, the new Baronett Bridge over the Yellowstone, the arch bridge over Tower Creek, and the five-span steel arch over the Middle Gardiner. These are some of the main features in the road system of the Park, but the government will continually endeavor to build up here the finest system of mountain roads in the world. Some of the arrangements for the future are accounted as follows: the improvement of the surface should be carried on until a rock road-bed is everywhere secured; the strong guard wells

^{36&}lt;u>Ibid.</u>, p. 266.

should be built along all side hill grades; the trees thinned out and grass and shrubbery introduced to beautify the roadside and induce geme to show themselves; the structures should be built of rustic design in the rough native stone; and all other work should be carried out with due reference to the purpose of the roads as public highways in the world's greatest natural park. The opportunities for artistic work in harmony with the surroundings are almost endless, and it is to those who are to follow after the pioneer work is done that the real satisfaction of definite results will come.

In the early days of the Park, tourists were carried from point to point in coaches usually drawn by four horses, sometimes by six. The present system is the result of long development and is as complete as any in the world, for in the big modern buses which accommodate about thirty passengers, sightseeing in the Park is a real comfort. The longest single drive is between hotels, which are planned and furnished for the visitors' comfort. Forest Rangers and guides form a huge organization in this wonderland at the present time and have become interested in the interpretations of the individual and his development as a whole organism. This is shown by the repeated returns of the visitors whose gratified appreciation of the values received from the knowledge and insight obtained is always evident.

³⁷ Ibid,, p. 267.

The reason for this interesting interpretation is that parts derive their properties from wholes. Once the child is able to analyze the face into its parts, each part is perceived in relation to the whole.

Industrialization

Now the coined word, "Industrialization," for our present age comes to the foreground and to a very meager extent is applicable here. The Park scenery is too grand, its scope too immense, its details too varied and minute for adequate description, save by someone who can seize upon the salient points and with just discrimination throw into proper relief the varied features of mingled grandeur, wonder, and beauty. To the early explorers, in particular, who entered this region before it became generally known, its strenge phenomena appealed with an imaginative force which the guide-book tourist of today can hardly realize. 38

The best season for the tourist is in the early days of July. The rain and snew end chilly air, not uncommon in June, are gone. The drought and smoke of August and September are still remote. It is late enough to call forth in their richest glory the magnificent profusion of flowers which everywhere abound in the Park. The air is at its best, full of life and energy, and clear. The skies, as they appear at this season, are found to surpass the empyreal depths of a beauty and fascination forever lacking

^{38&}lt;sub>Ibid.</sub>, p. 275.

in the dingy air of civilization. In short, the Industrial Age has met its equal and must take a sideroad, that this most attractive and invigorating panorama may become a pattern of beauty and grandeur as a lasting monument to our cultural education. It is through experiencing such visions as these that the artistic nature of a child can be inspired to see the beauty of God's great firmament. He will fully understand what is meant by the scriptural reference, "The heavens declare the glory of God and the firmament showeth His handiwork."

CHAPTER III

EDUCATIONAL UNDERSTANDINGS EMPLOYED TO SHOW THE EDUCATIONAL OPPORTUNITIES INVOLVED IN A STUDY OF YELLOWSTONE NATIONAL PARK

Yellowstone National Park offers a variety of avenues for approach to thorough interpretative study of this region. The unfolding of this wonderland creates a desire to understand further the phenomena within the Park. The great importance of recognizing individuels as to ability, achievement, growth, and development contains the points for presenting such a region as a pattern.

It is important that educators direct attention to the individual student. Webster's definition of education is "derived from the Latin <u>educere</u>, meaning to lead out." A leading out, a drawing forth then, of those spiritual, mental and physical qualities which, in a greater or less degree, are inherent in that curious compound of living substance which makes up an individual. The word education like all word currency in ideational exchange has lost the freshness of its new-minted meaning. It has come to signify "the impartation or acquisition of knowledge, skill or discipline of character." It is the student's reaction and

development from problems which are set before him that determine the progress education is making. Many of the social institutions have found their old processes were not functioning and are now in the state of invoicing and reorganizing their programs, so that they take into account the person for whom it is made as well as the environment or society that are the problems of unsettled democracy. The behavior pattern varies with the changing needs. Herein lies the foundation of all adequate adjustments to life.

There are many classrooms in which teaching is rich and learning is effective. It is not uncommon to find teachers encouraging the use of several reference books and many supplementary reading materials. Nor is it unusual to find teachers increasing interest and a greater retention of what is learned by bringing into the classroom pictures, real objects, models, maps, charts, slides, motion pictures, recordings, and other devices that enable them to provide richer and more meaningful experiences for the children. The most successful teachers are using in their classrooms a large number and variety of instructional aids, but always for a definite purpose. In using slides or charts, they would prefer a few well-chosen ones with ample pupil discussion, rather than a large number rapidly following each other and to secure these supplementary aids at a time

¹Daniel Alfred Prescott, Emotion and the Educative Process, p. 217.

most effective.

Another caution observed by the teacher prior to the presentation of any supplementary material is to make sure that it will meet the purpose at hand. Where this involves materials with which the teacher is unfamiliar, it necessitates the process of previewing on the part of the teacher. It is through integration that the resultant interactive activities are possible and the highest value received from an inner sense of awareness of the problem viewed as a whole. Democratic interaction is always a mutually contingent relationship between the individual and his environment. The program for the growth and development of the individual must be so constructed that a greater number of well-integrated citizens will fully develop and carry on the activities of life. Also it is necessary that the citizens hold and trust the heritage of an idea for a true democracy that asserts that all men are created equal in a netion that we hope will be continued indivisible with liberty and justice for all. When growth leads to continued growth, it is education. It is the modern educator's business to arrange a kind of experience that does not repel a student but that leads him to desirable future practices that live fruitfully and creatively. We know and realize that democracy as well as education is a way of thinking, feeling, and acting in regard to the associations of men and of

groups, one with another. The fundamental concept is a belief in the inherent worth of the individual, in the dignity and value of human life. If experiences arouse curiosity, strengthen initiative, and set up desires and purposes, they ere sufficiently intense to carry him over the hard places. To preserve everybody's right to life, liberty, and the pursuit of happiness, no man can live to himself alone, expecting to benefit from social progress without contributing to it. Educators should be aware of the general principle of the shaping of actual experiences by environment. and be able to recognize the experiences that lead to growth and interaction. The environment is whatever conditions interact with personal needs, desires, purposes, and capacities to create the experience which is had. Our basic need is to perceive the inherently rich advantages of cultural diversity. The failure to adapt materials to needs and capacities of individuals may cause an experience to be noneducative. We must develop a deep sensitivity to the emotions, the hopes, and the needs of human beings. This may be mastered only when sympathetic understanding of the values and aspirations proves the awareness of their inherent superiority.

A distinct characteristic of the new education is the purposeful arrangement of experiences which give children first-hand contact with the world. Youth is interested in

all that surrounds it. Radio, the motion pictures, magazines, newspapers, books -- all have proved effective in creating unity, for it is through these cultures that the student of tomorrow has his stimulating desire to grow. The present aim and object of teachers and of the administrative staff is a modifying of their ideas in making plans and programs for those whose needs, interests, and purposes are different in 1948.

The recent world conflict has made this country more conscious of its own hidden natural wonderlands. The geographical as well as social sciences present, with their wealth of information concerning the world, its products, and its activities, an opportunity to help satisfy the child's eager quest concerning his possible future activities. As he observes and participates in the activities of the classroom, whether it be an imaginative or a real excursion, a desire is created in the pupil, an ambition is stirred to play his part in this realistic venture. Valuable thinking starts and intensive reading begins when a child wonders where these strange formations come from; how they are developed; how animals live where there is so much hot, gaseous fumes and water; how one little stream or lake can cut down through such rock; how the sand forming the sides of the steep walls can be so beautiful; and how the hot spouting water can be next to a beautiful lake and neither be affected by the other. The most enlightening

method is first to present a large map showing all the places selected. Informational charts would form the nucleus for starting a mental excursion to be supplemented by an itinerary stating the places visited and the time of arrival and departure. After the trip, the children participating could make original contributions to the collections in the form of booklets, drawings, or models. Any related material obtained temporarily from outside agencies such as museums and aquariums would prove of value. Lists of reading references, room records of visits made, announcements of Ranger talks as instructional guides for the phenomena, and their occurrence are to be noted.

One of the main items for a special emphasis on the Northwest section of our own country is to gain a first-hand knowledge of the realistic and dramatic courses which nature holds unfolded to everyone. They are buried deep within her varied monuments displayed in Yellowstone National Park. It is not the purpose here to discuss procedures involved in preparing for and conducting tours but rather to present the appreciable values gained from the wealth of knowledge and appreciations received by observation. The valuable outcomes used in presenting this visual phase of experience may be summed up as follows:

1. Acquaints the child with his environment inmnature to the point of reasonable recognition -a state never reached by the child who is limited to classroom textbook experiences.

- 2. Relates school work and school life to out-ofschool work and life. Some writers feel tours or excursions are the best means of acquiring first-hand experience with nature as well as many other experiences.
- 3. Gives concreteness and impressive realism to work -- it vitalizes, intensifies interest in, and affords a basis for the work in the classroom.
- 4. Arouses interest in and sympathetic understanding for people of all vocations.
- 5. Acquaints the prospective citizen with patterns of Park Reservations which provide a realistic basis for the development of citizenship.
- 6. Introduces the child, first-hend, to some of the marvels of a geologic development.
- 7. Develops habits of safety and protection on the trails and roads and in dangerous situations.2

The fact that trips and excursions have been established as an indispensable procedure in the new education affirms the need for frequent end more study into the lore of nature and the values received from its untold depths of scientific history. The progressive education movement with its large units of work, the activity curriculum, child-interest basis, and creative self-expression of pupils assumes trips and excursions to be but details of a larger picture to be taken for granted. Appreciation develops only through intimate association. Familiarity brings knowledge and with it comes increasing pleasure and understanding. Therefore, knowledge of strange phenomena out of which grew the history of men can be more clearly understood, though

Department of Elementary School Principals, <u>Excursions</u> and <u>Exhibits</u>, llth Yearbook, p. 463.

It took place centuries ago, through visible explanations. These pictures acquire meaningful shapes adapted to useful purposes when their underlying patterns of line, rhythm, and color are revealed. In emphasizing values of an educational nature derived from a rich insight, the student develops more effective individual responses for social sciences. This is one of the created objectives in studying the variety of patterns presented through the study of Yellowstone National Park. Diversity in purpose is a potential source of strength in the integration of social studies for geographical and historical correlations. From the experimental approach of today may well come the general objectives of tomorrow.

Understandings Derived through First-hand Observation of Yellowstone National Park

Modern educators are beginning to realize more and more the interpretative values oriented through the provision of a rich and stimulating environment in which children will have contact with ideas and with major human achievements. Observation of this statement made by Huntington and Cushington relative to progress in learning is worthy of note:

"It is doing things unusually well -- better than ever before -- that makes the progress of civilization and education." Education is a continuous process all through life, involving observational learning and the interpretation of

each stimulating desire or intuition in such a way as to receive the most individual advancement and self-confidence. Educators find that a subject presented in such a manner that the application may be made when the opportunity presents itself to the student is highly worth-while. When the student perceives similarity to a previously studied pattern and interprets the subject matter according to individual plans of organization, the worth is enhanced. A fully integrated personality exists only when successive experiences are integrated with one another. If experiences lead a student to study, to go on learning, then his native capacities will enable him to cope with real life and with its new problems. 3

Today there develops a need to teach by precept and concept the master techniques of the understanding heart. A certain amount of freedom, like that afforded in observational activities as a student visiting Yellowstone National Park, is necessary for maturation, but it is a means and not an end. Each day we realize that there is maintained through perception of the whole a personal sense of permanent achievement and thereafter automatic possession. A fully integrated personality exists only when successive experiences are integrated with one another. We find that our physical health depends upon obeying the laws of our own

³John Dewey, Interest and Effort in Education, p. 13.

physical nature and strength of character issues from obedience to the degree of conscience. If we are to grow and maintain a valued personal interpretation on life, we must be subject to a keen sense of learning through observation and application. In so far as possible, each should be able to do his best, and those of limited mental ability do not make it undesirable to have superior values in any educational field. The failure to adapt materials to needs and capacities of individuals may cause an experience to be non-educative quite as much as the failure of an individual to adapt himself to materials.

It is essential that the large group of school systems become more aware of interpretation of subject matter through observational learning and develop programs in the curriculum for the social-studies units. Readiness is recognized as an essential basis for good work, and curriculum procedures are concerned with its cultivation. Also experiments show that during the last World War in teaching the eighteen-year-olds through visual education it was possible to achieve more in a shorter span of time. Everyone desires to develop a status in this world and that status is stimulated through approval and praise. It is hoped that educational psychologists will not confine themselves exclusively to the minutiae of specific learnings, but will

⁴James F. Webb, class notes for Education 326, North Texas State Teachers College.

devote attention to the problems of personality adjustment in a larger sense, with the promise that in this direction lies the possibility of making the greatest contribution to human well-being and happiness. The greatest psychological aid in the construction of curriculums will come only as teachers achieve insight, understanding, and skill, that they may provide adequate curriculum experiences for boys and girls, thereby acknowledging the aim of the Gestalt theory as a conception of the wholeness influencing every specific action. Let us note that learning is problem-solving and includes more than memory, but insight is the keynote. One does not profit from experience unless that experience leads to insight.

An interpretation through observational learning of our national parks displays the fact that they are not only scenic wonderlands, but many of them contain unique examples of nature's handiwork and are therefore of great interest to the student, tourist, and scientist. It is interesting to note that the conception of the pattern of one gives us an insight of the knowledge of the origin and history of each interesting phenomenon. It is the function of this chapter to coordinate and correlate the scientific material and cultural facts to make them applicable to everyone. Many investigators have been interested in

⁵P. M. Symonds, "A New Meaning for Educational Psychology," Journal of Educational Psychology, 1939, p. 33.

interpreting Yellowstone National Park in order to obtain a better understanding of the events of its past history which have brought about its beautiful canyons, waterfalls, lakes, hot springs, geysers, and accumulations of volcanic materials. Therefore, educators are interpreting the visual method as a means of satisfying the psychological needs, providing actual contact with the world, stimulating interests, increasing information, developing desirable individual and social traits and increasing loyalty to civic institutions. If we should set about to explore the scope of interpretations through observational learning and then place into practice much of the above-stated agenda, important progress would be noted toward completing the unfinished business of our curriculum development for schools today.

Concepts Motivated through Modern Education

Modern educators are noting the importance of the needs of an individual and his reaction and development from problems met before him which will determine the progress education is making. Many of the social institutions have found their old processes were not functioning and are now in the state of invoicing and reorganizing these schedules

⁶Howard, op. c1t., p. 5.

⁷Henry C. Atyeo, The Excursion as a Teaching Technique, p. 48.

so that they take into account the person for whom they are made as well as the environment or society from which develop the problems of unsettled democracy. Life is fundamentally a process of designing. It is selecting, purposing, planning, organizing, and directing the ever-moving streem of experience. Designing a curriculum is primarily a job for pupils in corporative democratic interaction with sdults.8 Interest creates a unified activity and is first subjective and then objective. There is a definite stimulation of growth through social studies and objective concepts may be motivated in the following ways: (1) children-teacher planning, (2) change plans according to needs, and (3) children become independent. The value received from any program is a utilization of materials already on hand as well as supplementary materials. The results of such a program are as follows: (1) creative expression -the student is very happy; (2) subject-matter more interesting: (3) child more observant of people, things, and places; and (4) do away with inferiority complexes.

Let us now turn to the teacher's criteria of the abovestated stimulated program of study. The instructor receives possibly the following reactions: (1) better understanding of child's ability, (2) cooperation, (3) attractive classroom, and (4) keeps teacher out of plain routine work. We

⁸L. Thomas Hopkins, <u>Interaction</u>: a <u>Democratic Process</u>, p. 326.

know that interest finds an object for its attachment; if we omit this, object or goal or purpose, interest disappears and relapses into an empty unsatisfied feeling. Teachers of the past were skilled in handling words; the teachers of the present day must be skilled in handling experiences. The teacher of the past evaluated literature, but the teacher of the present must evaluate vital experiences. 9 It is hardly necessary to go outside the realm of daily experience to bring to mind the importance of the visual representation in forcing the formation of lasting impressions. We remember that which has been unusual, and that which has been heard or seen clearly. A multiplicity of sensory expressions is helpful in all phases of learning. Concepts motivated through visual sids make for vividness and permanence of mental images, intensify the association of ideas and stimulate creative responses. Thus through imaginative concepts a day's journey through the Park unfolds new enjoyments. One finds that there is a cumulative charm and impressiveness in the experiences of each new day. landscape changes with amazing suddenness. Each wonder spot, when passed, is found to be but the preface to something more inspiring. The observer notes with increasing surprise nature's verying pageant in which are embraced mountains and canyons, geysers, tumbling streams, hot

⁹Etta Schneider, "Monthly Digest," <u>Educational Screen</u>, XVII (March, 1941), 120.

springs, mud cauldrons, paint pots, weird and impressive landscapes, and all that is picturesque, odd, inviting, and agreeable in the world-out-of-deers. It would be a rare pen which could justly describe the many wonders of this wild and wide domain. One who indulges even in plain, simple narrative description lays himself open to a charge by those who have never seen the Park. 10

Today, modern educators are presenting stimulating experiments for broadening the visual concepts through materials and instruction from the history, literature, philosophy, and fine-arts groups. These programs are integrated around a central theme and offer excellent opportunities to stimulate and challenge students who are interested in developing a fine, firm foundation for future professions. They can make an invaluable contribution to the international understanding so needed in our time. The students of this age are chiefly motor-active. For them a new type of schooling must be designed which shall give due weight to the value of manual work and other forms of activity, in that process of the development of intelligence and its trained power of application to environment which we call education.

¹⁰william Lee Popham, Yellowstone Park Romance, Introduction.

CHAPTER IV

CONCLUSION AND SUMMARY

Conclusions

This study of the geographical and educational values of Yellowstone National Park leads to the following conclusions:

- 1. It was found that Yellowstone National Park presents a pattern to stimulate a desire for geographical knowledge.
- 2. The study brought out that visual education from visiting the park motivates growth for well-rounded learning.
- 3. It has been shown that Yellowstone National Park develops spiritual growth as well as an appreciation for and an understanding of the American heritage with its natural beauty and wonders.
- 4. The study brought out that Yellowstone National Park creates an interest in things as a whole.
- 5. It was found that Yellowstone National Park presents a pattern which is a key to many varied geographical phenomena.

Future as an Industrialized Park

The mere fact that for many years after the white man first looked within the borders of what is now Yellowstone

National Park, a rare combination of circumstances prevailed to keep it from becoming generally known until the time had arrived when the government could effectively reserve it from settlement, is within itself a significant phenomenon. It is true that in dedicating this tract of country to the benefit and enjoyment of the people, the founders of the Yellowstone National Park were wiser than they knew. people go to the park to see its "wonders," and in their hurried visits this is about all the mind will absorb in a limited time. There is no better method suggested then to accompany the youth of today on a tour of the Park, explaining its features of interest as they come under observation. A scientifically planned trip through Yellowstone National Park under parent or school supervision would have more lasting value. There was recorded in a late summer edition of the Dallas Morning News, 1947, the following statement:

These Western playgrounds were never in better natural condition. Such waterfalls as those of the Yellowstone, the Shoshone, and many other streams are particularly gorgeous this summer. Train, bus and auto travel is at "an all-time high." Highways for the most part are in good condition. All fears that the geysers of the Yellowstone Park are lessening their activity is groundless. Old Faithful has speeded up its performances by several minutes. This is doubtless due to the heavy snowfall over the entire park, some even in late June, which provides more than normal percolation of ground waters to the volcanic hot strata beneath the surface. Geyser activity in some parts of Yellowstone Park has increased so greatly that recently one

burst through the middle of a park highway pavement and necessitated considerable engineering to reroute the streams of hot water and steam.

The social-science program of educational institutions is far-reaching and progressive, as is shown by the fact that through the schools and the communities the families become interested and motivated for a broadening concept of cultural development near and far. More people visited Yellowstone National Park during the travel year just after World War II than comprise the combined populations of the states of Montana and Wyoming. Superintendent Edmund B. Rogers announced, with the release of the final 1946 travel and recreation figures which are presented in Table 3 in the Appendix, that this large increase was due largely to the desire of the American people to enjoy again a prosperous and peaceful vacation. Table 4 in the Appendix is based on percentages of total travel entering Yellowstone National Park.

Summary

The reasons for certain activities are that educators believe they are the kinds of learning experiences that will bring about the achievement of desirable objectives.

Observational concepts or excursions recently have acquired new significance and revealed new educational implications.

The Yellowstone National Park forms one of the finest illustrations for a basic pattern as resource for instruction that so often is confined within the wells of a schoolroom

and has been concerned so exclusively with textbooks and with textbook methods. We cannot leave it to chance whether pupils learn how modern man is influenced by his geographic environment and how he in turn shapes this environment to his needs. Every pupil needs to understand the facts about natural resources and the need for conservation; about trade and manufacture, transportation and communication, and the interdependence of nations. The educational, cultural, and geographical study of these patterns of progressive educational trends has been accepted and practiced by the world's great teachers and now are receiving the most widespread attention ever accorded to them. These learning activities that involve a great deal of seeing, feeling, and hearing are active participation on the part of the pupils. The fundamental reasons behind this presentation of an educational program of work and study are the formation of lasting patterns for cultural, individual development which inspired the creation of Yellowstone as the first national park to be designated as a public park or pleasuringground for the benefit and enjoyment of the people, to continue as such throughout all future generations.

APPENDIX

TABLE 3

PER CENT OF TOTAL TRAVEL REPRESENTED BY RAIL TRAVEL (NORTHERN PACIFIC, UNION PACIFIC, BURLINGTON) FOR TWELVE-YEAR PERIOD, 1936-1947 INCLUSIVE*

Year	Total Travel	Rail Travel	Per Cent
1936	432,570	19,472	4.50
1937	499,242	20,526	4.11
1938	466,185	18,308	3.93
1939	486,937	17,009	3.49
1940	326,437	17,781	3.38
1941	581,761	18,254	3.26
1942	191,830	No travel	* * * *
1943	64,144	during	* * * *
1944	85,350	war	• • • •
1945	178,296	yeers	* * * 4
1946	814,207	16,076	1.97
1947	932,503	21,910	2.35

*National Park Service, Yellowstone National Park, press release, 1947, pp. 1, 8, 9.

TABLE 4

COMPARATIVE TRAVEL INTO THE PARK AT THE FOUR ENTRANCES, GIVEN IN PERCENTAGES FOR 1946, 1945, AND 1941*

Entrance	1946	1945	1941
North	14.3	15.4	12.5
West	35.6	35.3	28.2
East	24.7	25.0	31.0
South	15.9	18.1	18.1
Northeast	8.6	6.2	10.2

^{*}National Park Service, Yellowstone National Park, press release, 1947, pp. 1, 8, 9.

TABLE 5

ATTENDANCE FOR NATURE WALKS AND CARAVANS,
LECTURES, AND MUSEUMS IN YELLOWSTONE
NATIONAL PARK, 1947, 1946, 1941

Place	1947	1946	1941			
Nature Walks and Caravans						
Canyon	2,691	1,644	3,619			
Fishing Bridge	4,249	3,490	3,817			
Mammoth	8,244	11,223	13,279			
Norris	23,068	14,718	28,988			
Old Faithful	17,058	20,496	28,057			
West Thumb	1,213	401	21,005			
Tower Falls	403					
Total	56,926	51,974	99,175			
	Lecture Atte	ndance				
Canyon	12,182	13,412	150,067			
Fishing Bridge	44,742	40,550	33,350			
Madison	17,117	26,919	28,204			
Mammoth	36,135	16,920	23,477			
Norris	12,974	13,530	29,725			
Old Faithful	297,741	274,734	423,469			
West Thumb	9,606	9,950	7,033			
Tower Falls	9,997					
Total	439,392	396,016	695,323			

TABLE 5 -- Continued

Advision .

Place	1947	1946	1941			
Museum Attendance						
Fishing Bridge	89,743	74,197	59,965			
Madison	61,791	70,650	35,764			
Mammoth	119,776	105,829	102,604			
Norris	92,290	56,638	80,872			
Old Faithful	222,345	219,858	203,469			
Total	585,945	527,172	482,674			

BIBLIOGRAPHY

Books

- Your

- Atyeo, Henry C., <u>The Excursion as a Teaching Technique</u>, New York, Bureau of Publications, Teachers College, Columbia University, 1939.
- Bailey, Vernon, Animal Life of Yellowstone National Park, Springfield, Ill., Charles C. Thomas Publisher, 1930.
- Bauer, Clyde Man, <u>Yellowstone Geysers</u>, Yellowstone Park, Wyo., Haynes, Inc., 1947.
- Bowmen, Isaish, Geography in Relation to the Social Sciences, New York, Charles Scribner's Sons, 1934.
- Caswell, Hollis L., and Campbell, Doak S., <u>Curriculum Development</u>, New York, American Book Company, 1935.
- Cary, Merritt, North American Fauna, No. 42, United States Department of Agriculture Life Zone Investigations in Wyoming, Bureau of Biological Survey, Washington, Government Printing Office, 1917.
- Chittenden, Hiram Martin, The Yellowstone National Park,
 Historical and Descriptive, Stanford University Press,
 Calif., 1905.
- Climate and Man, 1941 Yearbook of the United States Department of Agriculture, Washington, Government Printing Office, 1941.
- Dent, Ellsworth Cherles, <u>Audio-Visual Handbook</u>, Chicago, Society for Visual Education, Inc., 1937.
- Dewey, John, <u>Interest and Effort in Education</u>, Boston, Houghton Mifflin Company, 1913.
- Douglass, Irwin B., Some Chemical Features of Yellowstone

 National Park, reprinted from Journal of Chemical Education, XVI (September, 1939).
- Ferris, Werren Angers, <u>Life in Rocky Mountains</u>, Rocky Mountain Book Shop, 1940.

- Freeman, Ellis, Principles of General Psychology, New York, Henry Holt and Company, 1939.
- Freeman, Frank N., Visual Education, Chicago, Chicago Press, 1924.
- Hague, Arnold, <u>Geological History of the Yellowstone National Park</u>, United States Geological Survey, Department of the Interior, Washington, Government Printing Office.
- Hartmann, George W., Gestelt Psychology: A Survey of Facts and Principles, New York, Ronald Press, 1935.
- Haynes, Jack E., <u>Haynes' Guide to Yellowstone</u>, Yellowstone National Park, Wyo., Yellowstone Library and Museum Association.
- Hilgard, Ernest R., Theories of Learning, New York, D. Appleton-Century Company, 1948.
- Hoban, Cherles F.; Hoben, Charles F., Jr.; and Zisman, Samuel B., <u>Visualizing the Curriculum</u>, New York, Cardon Company, 1937.
- Hopkins, L. Thomas, Interaction: A Democratic Process, Boston, D. C. Heath and Company, 1941.
- Hopkins, L. Thomas, <u>Integration</u>: <u>Its Meaning and Application</u>, New York, D. Appleton-Century Company, 1937.
- Howard, Arthur D., <u>Yellowstone</u> through the Ages, New York, Columbia University Press, 1938.
- Hussey, Russell Claudius, <u>Historical Geology</u>, New York, McGraw-Hill Book Company, 1944.
- Johnston, Sir Harry Hamilton, The World of Today, New York, G. P. Putnam's Sons, 1924.
- Kelley, Earl C., Education for What Is Real, New York, Harper and Brothers, 1948.
- Lindsey, Charles, The Big Horn Besin, Lincoln, Neb., 1932.
- Langford, Nathaniel P., The Discovery of Yellowstone Park, Boxeman, Mont., J. E. Haynes, 1870.
- Meckinder, Sir Holford John, <u>Democratic Ideals</u> and <u>Reality</u>, New York, Henry Holt and Company, 1942.

- Mather, Kirtley Fletcher, Old Mother Earth, Boston, Hervard University Press, 1928.
- Mercer, Asa Shinn, The Crowning Infamy of the Ages, New York, Garbhorn Press, 1935.
- Norsworthy, Naomi, and Whitley, Mary Theodore, The Psychology of Childhood, New York, Macmillan Company, 1918.
- Paxson, Frederick Logen, The Last American Frontier, New York, Macmillan Company, 1910.
- Pomfret, John Edwin, The Geographic Pattern of Mankind, New York, D. Appleton-Century Company, 1912.
- Prescott, Daniel Alfred, Emotion and the Educative Process, Washington, American Council on Education, 1938.
- Popham, William Lee, Yellowstone Park Romance, Louisville, Ky., Mayes Printing Company, 1911.
- Starch, Daniel, Educational Psychology, New York, Macmillan Company, 1929.
- Steele, Joel Dorman, The Story of Rocks, New York, A. S. Barnes Company, 1871.
- Story, Isabelle F., Glimpses of Our National Parks, Washington, Government Printing Office, 1941.
- Texas Association of School Administrators, Elementary Educational Goals for 1957, a Ten Year Program of Action for Texas, 1947 Yearbook of the Texas Association of School Administrators, Austin, 1947.
- Thompson, Henry Dewey, <u>Fundamentals of Earth Science</u>, New York, D. Appleton-Century Company, Inc., 1947.
- Twenty-sixth Yearbook, American Association of School Administrators, The Expanding Role of Education, Washington, National Education Association, 1948.
- United States Geological Survey, Geologic Atlas of the United States, Washington, Government Printing Office, 1898.
- Wertheimer, Max, <u>Productive Thinking</u>, New York, Herper and Brothers, 1948.
- Williams, Henry Smith, The Biography of Mother Earth, New York, The National Travel Club, 1931.

Wolf, J., What Is Psychology? New York, Grune and Stratton, 1947.

Pamphlets and Periodicals

- Arbuthnot, May Hill, "Teachers -- Today and Tomorrow," National Education Association Journal, XXXVII (April, 1948), frontispiece.
- Baldwin, J. W., A Survey of the Present Status and Current Trends in the Social Studies Curriculum in Texas Schools, University of Texas Publications, No. 4132, Austin, 1941/1942.
- Bathurst, Effie G., Conservation Excursions, Washington, Government Printing Office, 1940.
- Berg, E. L., "Recent Visual Aids of Intercultural Education," <u>High Points</u>, XXVIII (December, 1946), 65-69.
- Brooker, I. A., "Eyes to See; Ears to Hear," National Educational Association Journal, XXXVI (March, 1947), 206-207.
- Conrad, Joseph, "Geography and Some Explorers," National Geographic Magazine, XV (Merch, 1924), 239-253.
- Corey, S. M., "What Should We Do In Audio-visual Aids?" Scholastic, LV (April, 1947), 193-194.
- Department of the Interior, <u>Glimpses of Our National Monuments</u>, Washington, Government Printing Office, 1946.
- Department of the Interior, <u>Yellowstone Celebrates 75th</u>
 Anniversary, National Fark Service, Washington, Government Printing Office, 1947.
- Department of the Interior, <u>Yellowstone National Park</u>, National Park Service, Memorandum for the Press, October, 1945.
- Ellinger, C., "Looking Backward in Visual Education -A. D. 2000---1945, Journal of Business Education,
 XV (June, 1945), 27-29.
- Eisenstaedt, Alfred, "Old Faithful -- A Visit to Yellowstone," <u>Life Magazine</u>, XXI (August 10, 1946), 6-10.
- Gauger, N. B., "Seeing Is Believing," Wisconsin Journal of Education, LXXIX (February, 1947), 282.

- Geologic Atlas of the United States, Yellowstone National Park Folio, Wyoming, United States Geological Survey, Department of the Interior, Washington, Government Printing Office, 1896.
- Hollinger, John Adems, <u>Visual Aids Related to the Curriculum</u>, Washington, National Education Association, 1933.
- Judd, Charles Hubbard, "Educational Trends and the General Social Order," National Education Association Journal, 1933.
- Education Association Journal, XXXVII (February, 1948), 68.
- Melby, E. R., "Education Must Save Freedom," <u>Survey Digest</u>, XXXVI (November, 1947), 634-636.
- Palmer, M. L., "Leaders Learn Visually," Journal of Religious Education, XX (July, 1944), 4-5.
- Roosevelt Wild Life Forest Experiment Station, Roosevelt

 Wild Life Bulletin, Predstory and Fur-bearing Animals
 of Yellowstone Park, Vol. IV, Syracuse University
 Bulletin, 1927.
- Roosevelt Wild Life Forest Experiment Station, Roosevelt Wild Life Animels, the Beaver in Yellowstone National Park, Syracuse University Bulletin, 1926.
- Schneider, Etta, "Educational Screen," Monthly Digest, XVII (March, 1941), 278.
- Schutte, D. F., "Visualizing the Science Curriculum," Science Teacher, XIV (April, 1947), 82.
- Steward, B. Anthony, "Welcome to Yellowstone," National Geographic Magazine, LXXXVIII (August, 1945), 153-188.
- Stubbe, O. A., "When Seeing Is Learning," Parents' Magazine, XXII (April, 1947), 30.
- Studebaker, J. W., "Zeal for Democracy," School Life, XXX (October, 1947), 2.
- Storm, G. E., "Visual Aids in School and Community," Educational School Journal, XLVII (September, 1946), 11-13.

- Symonds, P. M., "A New Meaning for Educational Psychology,"

 Journal of Educational Psychology, 1939.
- Troland, Leonard Thompson, The Present Status of Visual Science, 1922, Washington, National Research Council, 1922.
- Tyler, Ralph W., "Adult Education Is for Teachers, Too,"

 <u>Texas Outlook</u>, XXXII (February, 1948), 32.
- United States Forest Service, Forest Conservation Packet, Washington, Government Printing Office.
- United States Geological Survey, Geologic Atlas of the U.S., Nos. 107, 141, 142, 150, Washington, Government Printing Office, 1907.
- Vosburgh, Frederick G., "Fabulous Yellowstone," National Geographic Magazine, IXXVII (June, 1940), 160-165.
- White, G. L., Jr., "Why Do We Fear the Opportunists?"

 <u>Educational Screen</u>, XXV (December, 1945), 567-568.
- Witham, Marie, <u>Visual Review</u>, published by the Society of Visual Education, Inc., Chicago.
- Yard, Robert S., <u>Difference between a National Park and a National Monument</u>, National Parks Portfolio, Washington, Government Printing Office, 1921.
- Yellowstone Library and Museum Association, <u>Trailside Notes</u>, Series 1, Washington, Government Printing Office.
- Yearbook No. 11, Excursions and Exhibits, Department of Elementary School Principals, Washington, National Education Association, 1932.
- Yellowstone, a map prepared by the United States Geological Service, Washington.