THE GEOLOGICAL SURVEY OF WYOMING

WESTERN PARK COUNTY AREA

BY

C.L. Dake

1916

OPEN FILE REPORT 16-1

This report has not been reviewed for
conformity with the editorial standards
of the Geological Survey of Wyoming.

WESTERN PARK COUNTY AREA

BY

C. L. DAKE

1916

LIST OF ILLUSTRATIONS

Plates.

1. Geologic map of region. (In pocket)

Figures.

1. Key map of Wyoming showing area mapped.

INTRODUCTION

The region covered in this report (see Key Map Fig. 1) is a narrow mandolin-shaped area about 70 miles in north-south extent and with a maximum east-west width of about twenty miles. It lies between the area mapped in Hague's Absaroka Folio No. 52 on the west, and in Fisher's Big Horn Basin Report, Professional Paper No. 53, on the east. Although the United States Geological Survey has mapped the surrounding territory, this area strangely enough, has received no attention whatever, probably on account of the complexity of the structures involved.

During the season of 1916, the writer undertook a reconnaissance of the region for the Wyoming Geological Survey, primarily for the purpose of securing information which would permit the completion of this portion of the new State Geological Map now in preparation. The structural results of the work were so interesting and unexpected that it has been thought worth while to publish them as a brief report on the area involved.

Thanks are due to Mr. Russell Kimball of Cody for many maps and much information regarding the land net. Maps and valuable information were also received from Supervisor Allen, of the Shoshone National Forest, and every possible curtesy was received at the hands of the forest rangers.

PHYSIOGRAPHY

General

The region varies in elevation from about 4300 feet, where the Clark Fork leaves its eastern boundary, to over 12,000 feet along the crest of Carter Mountain. Along the eastern edge, it embraces a

narrow strip of badlands, which pass abruptly into rather rugged and deeply dissected mountains to the westward.

The main drainage lines (see map pl. 1) in order from the north are the Clark Fork of the Yellowstone, the North Fork of Shoshone River (formerly and preferably known as the Stinkingwater), the South Fork of the Shoshone, and the Greybull. These divide the area into several rather well marked physiographic units.

Beartooth Plateau

The northern of these is known as the Beartooth Plateau. It is a great granite upland, fringed on the east by a narrow band of steeply upturned sediments. The upland, averaging over 10,000 feet in elevation, is deeply trenched by very rugged canyons, many of which head in minor cirques. Glaciation has produced typical rounded knobs interspersed with abundant lakes and swamps. The higher portions are above timberline. The valleys and north facing slopes are ussually timbered. Reasonably good trails open the region to pack outfits.

Clark Fork Canyon

The Clark Fork Canyon itself is a wild, etremely picturesque gorge, bottomed wholly in granite. The northern walls show little sedimentary rock, a few fragments of Deadwood still being visible, but on the south the granite walls are capped by the entire sedimentary series up to and including the Madison. A good trail leads up the canyon, entirely across the area mapped. Throughout the western half, the trail rises to a bench on the canyon wall to avoid an entirely impossible box canyon averaging over 1000 feet deep, with walls

that are nearly sheer; in places overhanging.

Divide between Clark Fork and North Fork

Between the Clark Fork and the North Fork of Shoshone River is an extensive upland, composed chiefly of Madison limestone, carved into fantastic cliffs and pinnacles by the canyons of Sunlight, Elk, Dead Indian, Trout and Rattlesnake Creeks. In the western portion, the higher divides of this upland are all capped with a chocolate brown andesite lava, in sharp color contrast with the Madison limestone.

A resonably good wagon road crosses this highland, from the Allison Ranch on Pat O'Hara creek to the Sunlight Basin, and the Upper Clark Fork. The road crosses Dead Indian Hill, long famous as one of the worst pieces of highway in the state. A new road with an easy grade has been laid out making Sunlight Basin readily accessible. From the crest of Dead Indian Ridge can be obtained one of the most beautiful and comprehensive mountain views to be had anywhere in the entire region, embracing the Beartooth Plateau, Clark Fork Valley, Sunlight Basin, and Dead Indian Canyon.

From the crest of Bald Ridge, further east along the same road, an extensive view of the Big Horn Basin and the Badlands may be had, with the Big Horn Mountains far to the east. Along the head of Paint Creek, the Red Beds are widely exposed, giving name to the creek. The white limestone above the Red Beds is the Madison, which normally should be below, but due to a large fault (see section on structure) has been thrust out over the younger beds. A feature of some interest on Bald Ridge is the so-called " Natural Corral ", in sections 7 and 18 Township 55 North, Range 103 West, and sections 12 and 13, Township 55 North, Range 104 West. It appears to be a broadening or irregular en-

largement of a steep-walled gorge down the Embar dip slope of Bald Ridge. The depression is over 200 feet deep and occupies about a square mile. It is nearly circular. In its cliff-like walls, which are practically unbroken save for the valley inlet and outlet, are exposed from top down the Embar, Tensleep, and Amsden; the red shales of the latter forming the floor of the hollow. With but little artificial enclosure it forms an excellent corral from which fact the name is derived.

North Fork Valley

After emerging from the famous Shoshone Canyon, westward along the Government Road to Yellowstone Park, one passes along Shoshone Reservoir into the valley of the North Fork. Rattlesnake Canyon, opening out from the north, presents an eastern wall of remarkable beauty, formed by nearly vertical beds of Madison limestone constituting the western limb of the Rattlesnake Mountain Anticline. For a few miles, the road passes through typical badland topography carved in Cretaceous shales, and then enters between steep walls of flat lying Madison limestone that compose the fault scarp described in the section on structure.

Farther west, the Madison Hills are capped with brown lava which along Trout Creek, near Morris Post Office, presents unique pinnacles of weathering along the north side of the road. A short disance above Wapati Post Office the lava closes in, and beyond the limit of this area, no sediments appear in the canyon walls. Gravel terraces form a marked feature of the topography of the valley.

Divide between North Fork and South Fork

Between the North and South Forks, the eastern end of the

divide consists of badlands of Cretaceous rock, exposed along the Shoshone Reservoir. Over this has been thrust older Madison limestone, forming the prominent limestone cliffs of the divide. Farther west the limestone is capped with lava, which, west of Morris Post Office forms practically the whole divide.

South Fork Valley.

The South Fork of Shoshone River occupies a broad open valley, largely of Jurassic and Cretaceous beds but gravel terraces occupy extensive areas in the valley, largely obscuring the bed rock geology. A prominent Madison cliff on the north is the fault scarp already mentioned. Westward, this scarp is buried below the lava which forms the main canyon wall. The high cliffs on the south side of the valley are wholly of lava.

Carter Mountain

This mountain, or range, which consists wholly of lava, contains the highest peaks in the area mapped, reaching altitudes of over 12,000 feet. It forms the divide between the South Fork and the Grey bull. Its northern flank consists of a forbidding " rim rock ", for many miles quite impossible to scale. The mountain is more accessible from the east and south. A very interesting case of probable future stream piracy is illustrated along the " Metcetsee Rim ", at the east end of Carter Mountain, in Sections 27, 28 and 29, Township 50 North, Range 102 East. (see fig. 1). In this vicinity the Cody shale (Pierre?) and Gebo sandstone (Laramie) dip strongly eastward. Formerly they were overlain with discordance by a yellow sandstone of probable Fort Union age, considerable remnants of which still remain. Over one of these large remnants of Fort Union?, the Metcetsee Creek

flows eastward transverse to the buried structure. Sage Creek, a tributary of the Shoshone, ran over the same Fort Union (?), above and parallel to the strike of the dipping, buried Cody shale. In its lower course, the Sage Creek cut through the Fort Union (?), and a tributary worked out a strike valley on the softer Cody shale, causing the headward retreat of the Fort Union (?) escarpment known as the " Meteetsee Rim ".

The head of Sage Creek is now at least two hundred feet lower than Meteetsee Creek, with a steeper gradient, and already appears to have beheaded one or more small tributaries of the latter. The " Meteetsee Rim " will not have to retreat over ½ mile more to capture Meteetsee Creek. The recession seems to be going on at a rapid rate, and the capture will probably take place in what is geological speaking a very short time.

Landslide hills, of the type produced by slow creep of so-called rock glaciers, is a marked feature of the east end of Carter Mountain, where they greatly resemble the kame areas of glaciated regions.

Grayhull Valley

The lower valley is broadly carved from soft Cretaceous and Tertiary (?) sediments, with steep lava cliffs to north and south. Just above the upper Palatte Ranch, the lava walls close in, and above this point, the valley becomes precipitous canyon, of great beauty. It is followed by a trail, which is difficult during high water season, but reasonably accessible after July 1st. Gravel terraces occupy broad areas of the lower valley, while the central portion is marked by extensive landslide areas.

Frank's Peak Highland

The highland south of the Greybull constitutes the divide between Greybull and Wood Rivers, and culminates, just south of the area mapped, in Frank's Peak, 13,140 feet high. The highland consists wholly of volanic rocks, shiefly of the familiar chocolate colored andesite, and is similar in its physiography to Carter Mountain.

GLACIATION

The northern portion of the region, especially the Beartooth Plateau, has undergone severe glaciation. The granite highlands north of the Clark Fork show the bare rounded knobs, lakes, swamps, cirques, and moraines typical of glaciated territory. Striations on bowlders and bed rock are not uncommon. The plateau seems to have been occupied by a central ice cap, from which movement was outward, at least toward north, east, and south. The valleys of Line Creek and Bennet Creek show especially well marked moraines, where they emerge into the badlands of the "Basin". The evidence is less conclusive along the mouths of Little Rocky Creek and Clark Fork Cayon.

On the south side of Clark Fork valley peculiar conditions obtain. Here and there granite bowlders are seen well up on the sedimentary slopes. The first well marked moraine was noted in the canyon of Elk Creek, along the line between Sections 13 and 14, Township 55 North, Range 105 West. In an unmistakable bowlder clay were noted striated bowlders of limestone, granite and Deadwood flat pebble conglomerate. Andesite bowlders were almost wholly lacking in the till. There are no rocks older than Madison limestone outcropping above the moraine and about two miles above the moraine, the valley lies wholly in andesite. The presence of granite, and the absence of

andesite make it quite certain that the ice moved up the walley. Doubtless a tongue of the Beartooth ice cap crossed the Clark Fork, forced intself into the common mouth of Dead Indian, Elk, and Sunlight Creeks, and crowded a considerable distance up these walleys.

Numerous moraines with abundant granite bowlders were noted in Dead Indian Canyon, and scatering granite bowlders were noted above the lava, on the south slope of the low pass, between Dead Indian Creek and Rattlesnake Valley, showing that the ice had crowded several miles up Dead Indian, and entirely over the divide. A well marked moraine, with many granite bowlders was noted across Sunlight Valley, along the line between Sections 15 and 16, Township 55 North, Range 105 West, although no granite is exposed further up the valley. This moraine is referred to by Hewett, who however, evidently failed to realize that the ice moved up the valley, though the presence of granite, and the scarcity of andesite is a striking feature of the moraine. The marked U shape of the valley above this moraine is due probably less to glacial scour than to al old glacial lake bed, above the moraine dam, which has caused the filling of the valley to a considerable depth. A similar moraine, with abundant granite, and very little andesite is noted well up Russell Creek, where granite bowlders are found resting on the andesite. The evidence is conslusive, that the ice movement was from the Beartooth Plateau, southward across the Clark Fork, and up the tributaries on the south side. At the summit of the pass on the Lodge Pole Trail, at the head of Lodge Pole Creek, just west of this area, granite was noted far up on the andesite slopes. This makes the glaciation definitely post andesitic.

The immaturity of the drainage on Beartooth Plateau further dates the glaciation as very recent. No positive evidences of glaciation were noted south of Dead Indian Creek, though moraine-like ridges were observed on Jack Creek, a tributary of the Greybull, and on the upper Greybull itself.

STRATIGRAPHY

The formations outcropping in this area have already been described by Fisher (1), Hague (2), Hewett (3) and Lupton. Since the field work for this report was very general, and the faulting and volcanics rendered difficult the measuring of exact sections, the reader is referred to the above reports for detailed descriptions of the formations involved. These formations will be here mentioned only very breifly, giving such additional information or variations as the writer observed in a rather cursory examination. Any one desiring further stratigraphic detail should read the reports above mentioned, from which the following tabular stratigraphic summary is compiled.

1) Fisher, C.A., Geology and Water Resources of the Big Horn Basin, U. S. Geological Survey, Prof. Paper 53, (2) Hague, Arnold, Absaroka Folio, U. S. G. S. Folio No. 52 (3) Hewett, Shoshone River Section, U. S. G. S. Bull. 541 pp 89 - 113 (4) Lupton, C.T., Oil & Gas near Basin, Wyoming, U. S. G.S. Bulletin no. 621 L

TABLE OF FORMATIONS

System	Formation	Characteristics	Thickness in feet
Quaternary		Glacial till and terrace gravels	?
Tertiary		Andesitic breccias and lavas	?
Cretaceous or Tertiary	Ft. Union	Buff to yellow sandstones, conglomerates, red and gray shales.	300 +
	Cody	Gray to black shale, sandy near top	2000
	Frontier	Gray sandstones and shales, with bentonite	500
Cretaceous	Thermopolis & Mowry	Gray and intensely black shales, with sandstone and bentonite	900
	~~Cloverly~~	Gray cross bedded sandstone, some shale	110
Jurassic or Cretaceous	Morrison	Variegated red, gray, maroon (etc) shale and sandstone	500
Jurassic	Sundance	Greenish gray shales and sandstones and thin fossiliferous limestones	500
Permo-Tria.	Chugwater	Red sandstones and shales with gypsum	750
	Embar	Massive gray limestone	100
	Tensleep	Massive gray sandstone and brown quartz	100
Carboniferous	Amsden	Red shale and red to gray limestone	150
	~~Mattison~~	Massive gray limestone, conglomeratic at the base in places	1000
Ordovician	Big Horn	Massive gray limestone	300
Cambrian	Deadwood	Conglomerates, sandstone and limestone	800
Pre-cambri.		Red granite, gneisses, and schists	?

PRECAMBRIAN

Granites and Gneisses

The oldest formation in the region is exposed in the Beartooth Plateau, along the Clark Fork Canyon, and for a short distance up Sunlight and Dead Indian Creeks. For the most part it consists of coarse grained massive red granite, although some phases are finer grained, and some gray granite was noted. Remnants of biotite schist, hornblende schist, and hornblende gneiss were observed at many points. These shhists are much contorted, and are cut by granitic stringers. They also occur as irregular enoliths in the granite, and without much doubt represent the older rock into which the granites were intruded. At several points this basement is cut by basic dikes, the age of which cannot be stated more definitely than post-granitic.

CAMBRIAN

Deadwood Formation

The lower part of this formation has been traced continuously westward into the Flathead formation of the Absaroka region. At the base, it is a quartzite and conglomerate of granite bowlders. Above this is a considerable thickness of gray and green shales, with thin sandy members. Following these shaly layers is a massive limestone perhaps 150 feet thick, which forms a very prominent ledge along the sedimentary south wall of Clark Fork Canyon throughout its entire extent across the region. This limestone traces continuously into the lower member of the Gallatin formation of Hague's area, and is sufficiently distinct to warrant mapping as a separate unit. Its position within the Deadwood (which is mapped as one color) is shown by lightly drawn boundary lines.

Where the road over Dead Indian Hill crosses the prominent scarf of this limestone above Dead Indian Crossing, a few fragments of trilobites were collected. These were submitted to Mr. Edwin Kirk of the U. S. Geological Survey, who says of them, " The material ..... is probably referable to the Gallatin, and of the upper Cambrian age. From my knowledge of the Cambrian section in this part of Wyoming, I should expect this material to occur at a lower horizon than the fossils previously reported on. (Collections 5, 6, and 7, see pp. _____). The trilobite is new, both as to genus and species. It probably falls within the same genus as material listed as Bathy uriscus (?) by Walcott in various faunal lists. " Toward the top, the formation is largely a very thin bedded limestone, the most characteristic feature of which is the presence of numerous layers of flat-pebble conglomerate. The pebbles are limestone, ussually with a distinct greenish color. As the formation has suffered very little metamorphism, it is evident that the flatness of the pebbles was imparted to them on some old shingle beach.

In the SE¼ SE¼ Section 2, Township 55 North, Range 105 West, along the north slope of Sunlight Creek, the following partial section was observed across the contact between the Deadwood and Big Horn. At the base of the exposure, about 200 feet above the crest of the Gallatin scarp, occurs about 2 feet of flat pebble conglomerate. The slopes below are covered. The pebbles are greenish limestone many of which stand edge-wise in the matrix. Above this conglomerate is about three feet of extremely thinbedded limestone, breaking off in slabs 2 to 3 feet square and less than one-half inch thick. On the weathered surface this limestone is a rusty yellow, resembling a clay shale, but on fresh fracture it is a bluish gray. Above this is about

15 feet of buff, non-bedded, much brecciated limestone, containing several species of coral. This is followed by a few feet of gray non-fossiliferous limestone. Above this the slopes are covered for over a hundred feet, to typical Madison cliffs. The corals in the above section were submitted to Mr. Edwin Kirk, who says of them," Collection No. 5, Section 2 - 55 - 105, Park County, Wyoming, Holysites gracilis,Hall, Streptelesma rusticum,Bell, The fossils listed from this lot are of Big Horn age."

In unsurveyed territory, but in what is approximately the center of Section19, Township 55 North, Range 104 West, on a similar slope, above the Gallatin Scarp, the same succession was noted as has just been described. In addition, just below the flat pebble conglomerate, there occurs a considerable thickness of interbedded greenish shale and conglomeratic limestone, rather poorly exposed. Loose slabs believed to come from these beds yield abundant trilobite fragments and brachiopods. The fossils were submitted to Mr. Edwin Kirk who makes the following classifications: Collection No. 6, Section 19, Township 55,Range 104, Park County, Wyoming, Billingsella Coloradoensis (Shumard) , Ptychoparia sp., Trilobite genus.

Mr. Kirk reports the material to be entirely upper Cambrian.

In the NE¼ NE¼ Section 16, Township 57 North, Range 103 West, similar slopes above the typical Gallatin Scarp show a small exposure of flat pebble conglomerate and in the float above it, slabby yellow limestone.

On the north side of Clark Fork Canyon, near the center Section 7, Township 56 North, Range 103 West, there are about 300 feet of slope above the same Gallatin scarp. About 50 feet of inter-

bedded conglomeratic limestones and green shales outcrop near the middle of the slope. Fossils were collected, and submitted to Mr. Edwin Kirk who makes the following classifications: Collection No.7 Section 7 - 56 - 103, Park County, Wyoming, Eocorthis desmopleura, (Meek) Billingsella coloradoensis (Shumard) Ptychoparia sp., Trolobite genus. Mr. Kirk also determines this to be of upper Cambrian age. This horizon must represent Hague's upper thinbedded member of the Gallatin. It is differentiated by boundary lines, but not by colors, on the map.

Fisher gives the total thickness of the Deadwood as 700 to 1500 feet. Hague assigns to the Flathead a thickness of 700 feet and to the Gallatin 400 feet. Due to the unconformity at the base the thickness is variable.

The Deadwood everywhere fringes the granite areas, except for a short distance along the northeastern front, where it has been cut out by faulting. A small patch is exposed, where Tick Canyon cuts the Rattlesnake Mountain anticline. The Dillworth Bench, on the north wall of Clark Fork Canyon is also floored with a remnant of Deadwood and a small patch occurs at the extreme southeast of the Beartooth Plateau.

The lower massive Gal atin member caps the prominent mesa just north of Russell Creek.

ORDOVICIAN

Big Horn Limestone

This formation lies without physical evidence of unconformity on the Deadwood. It consists of a fairly massive gray to buff limestone, which breaks off in large bowlders and forms a heavy talus. Its thickness is reported by Fisher as 150 to 300 feet. It outcrops every

where in a fringe bordering the Deadwood, but stands up in steep cliffs for the most part, forming only a narrow belt.

Judging by the relations showin the partial section already described from the SE¼ SE¼ Section 2, Township North 55, Range 105 West, the Big Horn must be at least in part equivalent to the Jefferson formation of Hague's report, since both lie directly above the thin bedded upper member of the Gallatin. This probability is indicated by Fisher[1] who says, " The Jefferson limestone probably includes the Big Horn Limestone and possibly higher beds also". Willis[2] indicates definitely that the Jefferson is Devonian, but it is evident from the above facts that at least in the area mapped by Hague, the Jefferson, whatever else it may contain, is in its lower part at least, equivalent to the Big Horn.

Siluro-Devonian (?)

In the hurried nature of the present work, no beds were noted which could be identified with either the Jefferson or the Three Forks of Hague, except as already indicated under the description of the Big Horn.

CARBONIFEROUS.

Madison Limestone.

The Madison limestones of Fisher and Hague trace into one another with perfect continuity. The formation consists of gray to buff massive limestones, outcropping in prominent cliffs. Exposures are extensive, north of the South Fork of Shoshone River. South of that only one small exposure was noted, in the NE Cor. Sec 36, Township 51

1. Fisher, C.A. Geology and Water Resources of the Big Horn Basin, Wyoming, United States Geological Survey, Prof. Paper no. 53, pp 12.
2. Willis, Bailey, Index to the Stratigraphy of North America, United States Geological Survey, Prof. Paper No. 71, pp 283, 284, 319-323.

North, Range 103 West, where an isolated patch of it rests, by reason of thrust faulting, on beds of probable Fort Union age. The presence of much Madison afloat along the east and south sides of Carter Mountain makes it altogether probable that the Madison is present in that divide, buried beneath the lavas, or perhaps exposed in small outcrops which have been overlooked along the lava cliffs which form the Carter Mountain " Rim Rock ".

In Tick Canyon; also at a point near the center of Section 35, Township 55 North, Range 104 West; and particularly along the west slopes of Dead Indian Creek, about ½ mile north of where the government thrail starts up the mountain, and several hundred feet above the valley bottom (approximately at the SW cor. Township 55 North, Range 104 West) the base of the Madison carries haavy conglomerates, wholly of limestone bowlders; up to two feet or more in diameter at the latter named locality. This conglomerate probably marks the unconformity long believed to exist at the base of the Madison. Red limestones and shaly layers, very closely resembling the Amsden, were noted near the middle of the Madison throughout the area north of the head of Dead Indian Creek. Fisher reports the Madison as from 600 to 1000 feet thick, while Hague assigns it a thickness of 1600 feet. Both consider it Mississippian. The formation is fairly fossiliferous but no collections were made.

Amsden Formation

This formation is not recognized by Hague and is found most extensively developed on the east side of Rattlesnake valley; along Bald Ridge; and on Dead Indian Ridge. Particularly good exposures are to be seen in the cliffs of the " Natural Corral" on Bald Ridge.

It consists of a lower member of red shale, overlain by reddish to gray thin bedded limestone and sandstone, in all about 150 feet. It is sparingly fossiliferous, but no collections were made. It was mapped wholly on lithologic character and stratigraphic position. Fisher considers it Pennsylvanian in age.

Tensleep Sandstone

This formation traces continuously into the Quadrant quartzite, which Hague mentions as outcropping extensively on Dead Indian Hill. Its distribution is about that of the Amsden given above. Fisher describes it as a massive, crossbedded sandstone varying from 30 to 230 feet in thickness. It does not outcrop south of the North Fork of Shoshone River. Toward the eastern part of the area, the sandstone if fairly white and friable, weathering brown. Further west, particularly on Dead Indian Hill, it becomes highly quartzitic, in places approaching the appearance of vein quartzite. On the divide between Dead Indian Creek and Rattlesnake Creek, it becomes so iron stained and brown that at a few feet distant it is readily mistaken for the brown andesitic lava. Fisher reports it as Pennsylvanian.

Amsden Formation

A gray, very cherty limestone, moderatly fossiliferous, about 75 feet thick, overlies the Tensleep, and is exceptionally well developed on Bald Ridge, where it forms an extensive dip slope. Its distribution is essentially that of the Amsden and Tensleep. It is considered by Fisher to be of Pennsylvanian age. Many poorly preserved brachiopods were seen but no collections were made.

PERMO-TRIASSIC

Chugwater Formation

This formation, locally known as the "Red Beds", outcrops along

the east side of Rattlesnake valley, on Bald Ridge and along the east front of the Beartooth Plateau. It consists of alternating red shales and sandstones with a massive gypsum bed near the top. It is about 750 feet thick, according to Fisher's section on Clark Fork Canyon.

JURASSIC

Sundance Formation

The formations from the Jurassic to the Tertiary have been described by Hewett*, whose work is later and more detailed than that of Fisher. Another recent description of these formations is found in Lupton's paper*, " Oil and Gas Near Basin ". The latter's division of the Cretaceous seems best to fit the area studied, and has been adopted. For more detailed descriptions than are given here, see the above two papers.

The Sundance consists of alternating thin-bedded, greenish-gray shales and limestones, with considerable greenish sandstone near the top. The limestone layers are thin, and more abundant near the base. They are extremely fossiliferous throughout and characterized by an abundance of pentagonal crinoid stems. There are no other limestones in this region with which they can be confused.

The shales are greenish gray with a red shale near the middle. The shale slopes are everywhere covered with fossils in unusual profusion. Gyphea Calceola and Belemites densus are most abundant, and in places might literally be shovelled up by wagon loads. The sandstones near the top of the formation are greenish gray, and intricately cross-bedded. Hewett gives a considerable list of fossils collected from the formation. He reports a thickness of about 530 feet.

* (1) Hewett, D.F., The Shoshone River Section, U.S.G.S. Bull 541 pp. 89 - 113.
(2) Lupton, " Oil and Gas Near Basin " U.S.G.S. Bull 621 L

Along the valley of the South Fork in Sections 29 and 32, Township 50 North, Range 105 West, a considerable area of fossiliferous Sundance extends westward into the area where Fox Hills and Pierre are mapped in the Absaroka Folio. It was overlooked in the earlier mapping.

Jurassic or Cretaceous

Morrison Formation

This formation consists of 580 feet of alternating shale and sandstone, the most characteristic feature of which is the variegated color effect, shown in the rapid alteration of gray, buff, yellow, red, maroon, brown, black and white. No fossils were found, but Hewett mentions Saurian bones. The formation is probably terrestrial. At several points, particularly near the SE corner of section 19, Township 51 North, Range 103 West, there lies, between typical Sundance and Typical Morrison, from 5-20 feet of coarse pebbly sandstone. The pebbles are all small, mostly less tha ½" in diameter, and consist of gray shale, gray sandstone, black chert, and vein quartz, mostly well worn and rounded. This is unlike anything described by either Hewett or Fisher from the Sundance-Morrison contact.

CRETACEOUS

Cloverly Formation

This formation has variously been correlated with the Dakota and the Kootenai. It consists of buff, massive sandstones at the base, overlain by a gray sandy shale, and this in turn by a buff sandstone, very thin bedded, and much rippled marked. A marked feature of the upper sandstone is the minute crossbedding associated with the cross section of ripple marks noted everywhere on the weathered surface. Hewett gives the thickness as 110 feet. No fossils were

noted.

Thermopolis Shale

This is the lower portion of Hewett's Colorado. It consists essentially of a dark gray to intense black shale, with thin sandstone members. It has a thickness of about 800 feet. The most characteristic feature is the presence of numerous beds of bentonite. This peculiar clay is fairly abundant in the Thermopolis, Mowry and Frontier but seems to be quite absent from the Cody. This served as one of the ready means, in the field, of distinguishing between Thermopolis and Cody. Another characteristic feature is the intense black of these shales which is nowhere duplicated in the region.

The contact of the Cloverly and Thermopolis is marked by a thin horizon yielding a peculiar concretion of a grayish brown color, about the size of a walnut, with a radiating structure, and brown on the freshly broken surface. These concretions can be picked up by the hundreds on the weathered slopes, and were noted at no other horizon.

The only fossil noted was a peculiar variety of silicified wood with the grain running at an angle of about 20 degrees to the bark. This wood is widely distributed, wherever the formation occurs but was noted at no other horizon.

Mowry Shale

The Mowry shale was here and there identified by its abundance of fish scales, but was not mapped as a separate formation. On the map it is included with the Thermopolis.

Frontier Formation

This formation consists of about 500 feet of gray sandy shales and gray sandstone. It corresponds to Hewett's middle Colorado. Both

Lupton and Hewett have measured and described detailed sections. The two main sandstones occur near the top and not far above the base, and are characterized by a peculiar pepper-and-salt gray. They have been called respectively the Torchlight and Peay sandstones, and have been oil producers in adjacent regions. The formation carries many thin beds of bentonite. At several points in this area studied, the characteristic black, well polished, chert pebbles, described by Lupton, were noted. Though detailed sections were not measured, the Frontier seems to show an increasing proportion of sandstone as it is traced westward. The only fossils noted were wood fragments.

Cody Shale

This formation corresponds to Hewett's upper Colorado and Fisher's Pierre and consists of about 2000 feet of shale, with very minro amounts of sandstone. The color varies from greenish gray to nearly black, though never becoming the intense black of the Thermopolis. The upper part is lighter colored, and very sandy. It has been variously classified as Colorado and Montana.

Several varieties of Baculites and Coiled Ammonites were found. A characteristic fossil is Inoceramus, of which at least two, and probably three, species are present. At many places, the presence of Inoceramus was indicated by the loose spicules of aragonite which formerly constituted the columnar structure of the shells. Shells, covered with Ostrea Congesta are abundant at places.

In the area covered by theis report, none of the above fossils were found in any formation but the Cody, though several are known to have a greater range.

CRETACEOUS OR TERTIARY

Fort Union (?)

The formation here mapped as Fort Union (?) consists of alternating beds of yellow sandstone and red and white clays. The sandstones are buff to light yellow, from 2 - 20 feet thick, and intricately cross-bedded on a large scale. They contain many large concretions of sandstone usually darker than the matrix, which vary from less than six inches up to ten feet or more in diameter. These concretions weather out, and lie strewn in abundance over the surface of the outcrop. Some are nearly perfect spheres, and resemble large cannon balls.

Many of the sandstones are pebbly, the pebbles ranging from 1/8" or less, up to 2" and over, but commonly about ¼" to ½". Among the pebbles were found shale, red granite, basalt, sandstone, quartzite, black chert, and yellowish brown chert. The shales contain thin layers of lignite, up to a few inches in thickness, and fragments of leaves, too poorly preserved for identification. Along the South Fork these beds carry at least one thin coal seam. The red clays at a few points are as brightly colored as the Morrison.

These sandstones and shales pass under the Madison at several points indicating their deposition before the fault which thrust the Madison far out over the younger beds. In the NE¼ section 34, Township 50 North, Range 102 West, this formation rests with slight angular unconformity on the Cody. On the other hand, in section 16, Township 48 North, Range 103 West, it partakes of the folding, showing dips up to 10 to 15 degrees.

The correlation of these beds with Hewett's Fort Union is wholly on lithologic and structural grounds. The presence of the red clays, the pebbly character, the unconformity (probably angular) between these and the Cody, all point to the probability that these beds

are not the Gebo, Ilo, and Meteetsee, or any part of them. The red color and the conglomerates are characteristic of Hewett's Fort Union, as is the unconformity at the base. The large sandstone concretions are not described by Hewett from any of his formations. The writer himself noted similar ones in the basal Laramie of Fisher, just east of Carter Mountain. At the same locality, he also noted similar concretions from the top of Frost Ridge, at a much higher horozon, probably near the top of Fisher's Laramie. The latter horizon probably corresponds with Hewett's Fort Union, as nearly as could be determined. Fisher describes similar sandstone concretions, from the Laramie, but from what part of the formation does not make clear.

These beds trace continuously into those along the North Fork of Shoshone River mapped by Hague as Pierre and Fox Hills (undifferentiated). Hewett,* however, who saw them, within the margin of Hague's Absaroka Folio, calls them " Tertiary sandstones and shales probably of Wasatch age "

Inasmuch, however, as the beds in question are involved in the major thrust fault, it seems probable that they are earlier Tertiary than Wasatch, since it seems to be pretty well established that the major folding and faulting of the region was pre-Wasatch in age.

Tertiary

The higher divides throughout the southern and western parts of the area are capped with varying but considerable thickness of volcanic material. This consists for the most part of an andesitic breccia which traces continuously into the early Basic Breccia of Hague's Absaroka Folio. The rock is usually pale green on freshly

* (1) Hewett, D.F., Sulphur deposits in Park County, Wyoming, Bulletin U. S. Geological Survey No. 540, p. 478.

fractured surfaces, but weathers to a rich chocolate brown. Interbedded with the breccias are flows, and the whole is cut by many dikes. Along the western edge of the area, some of Hague's basic volcanics are also exposed, but no effort was made to differentiate these.

QUATERNARY

The Quaternary consists largely of extensive terrace gravels and alluvial fans along the valleys of the Greybull, South Fork, and North Fork. They are derived from the local rocks, and vary in coarseness, composition, and extent, from valley to valley.

In the Beartooth Region there are considerable deposits of ground and terminal moraine.

Structure

General Features

The area here described constitutes the eastern flank of the Shoshone, Absaroka and Beartooth Mountains, a great anticlinal range, complicated by faulting. The folding and faulting was followed by deep erosion, and that in turn by the formation of extensive sheets of breccia, themselves deeply trenched by later erosion but still occupying undisturbed positions along the major part of the higher divides.

Structure of the Shoshone Mountains

The Shoshone Mountains, which flank the Big Horn Basin on the west, extend from the North Fork of the Shoshone River south to Wind River, beyond the limits of this report. They comprise a broad uplift of Paleozoic, Mesozoic, and Tertiary sedimentaries, complicated by minor folding and much faulting. Over these sedimentaries lies a thick series of horizontal andesitic breccias, obscuring most of the

details of structure in the older beds, except along the extreme eastern edge of the region, and along the valleys of the Greybull and the South Fork of Shoshone River, where erosion has removed most of the volcanics and trenched considerably into the older formations.

The most complicated structures noted in the entire region are those occuring along the valley of the South Fork. Here the Mesozoic and Tertiary are compressed into a series of close folds passing into overturned folds and thrsut faults. The axes of these folds strike about North, 45 degrees East, or about parallel to the General trend of the valley. There is also normal dip faulting, which has offset the folds and thrust faults. The mapping of these complex structures was rendered more difficult by a heavy cover of terrace gravels, at critical points, and the map represents a great deal of generalization in this area.

Structure of the Absaroka Mountains

This range is a continuation of the Shoshone Range, the two being essentially one uplift. It occupies the area between the North Fork of Shoshone River , and the Clark Fork, along the west side of Big Horn Basin. The main axis of the range extends nearly north and south, throughout this distance. At the south east, Rattlesnake Mountain diverges as a separate anticline, striking about South, 20 Degrees East, and extends east considerably beyond the limits of this area. Further north Black Mountain also diverges, striking much more nearly east and west, and extending eastward into the area already mapped by Fisher.

Bald Ridge and Dead Indian Ridge (also known as Dead Indian Hill, but not to be confused with Dead Indain Peak) together constitute a broad uplift with a nearly north and south axis. The folding and faulting are much less complicated, in general, in the

Absarokas than in the Shoshone Mountains.

Structure of the Beartooth Mountains

The Beartooth Mountains occupy the front range, north of Clark Fork, extending northward into Montana. This plateau consists essentially of a great core of Precambrian granite, from which sedimentaries chiefly Paleozoic, dip outward gently to the south, steeply eastward. Along the east flank, the folds are for the most part overturned, passing at many points into thrust faults of considerable proportions. That portion of the plateau included in the area of this report has been almost entirely denuded of sediments.

The Heart Mountain Overthrust

The most marked single feature of structure in the entire area is an overthrust of major proportion, best exposed along the north Fork of Shoshone River. The main slipping has occurred along the base of the Mississippian, and the Madison limestone is thrust far out over younger beds, varying in age from Madison to Fort Union (?). Throughout the entire distance over which the fault has been traced, the Madison is believed to be that formation lying next above the fault plane, though it is possible that in part the massive limestone may include Big Horn not differentialted in the field. These massive limestone beds rest for the most part on softer shales and sandstones of the younger beds, the trace of the fault therefore is usually marked by a pronounced Madison scarp, in many places of several hundred feet.

The valley of the North Fork of Shoshone River has been cut entirely through the block of faulted Madison, exposing Cretaceous and Tertiary (?) shales and sandstones below, and the cliffs of nearly horizontal Madison along the fault trace on either side of the valley consitute one of the most striking features of the topography for

several miles above the government reservoir, along the Cody - Yellowstone road. Traced westward up the valley, the fault on either side passes beneath the Tertiary volcanics, and is lost. It passes in a bold escarpment around the east end of the divide between the North and South Forks , and extends for several miles up the north side of the latter valley, where it is again buried beneath the Tertiary breccias. It does not reappear on the south side of the valley of the South Fork except as an isolated peak of Madison resting on Fort Union (?) at the east end of Carter Mountain in the NE¼ section 36, Township 51 North, Range 103 West. Several miles south of this point, however, abundant Madison bowlders are noted along the slopes on the east and south east of Carter Mountain, indicating that the fault block of Madison probably occurs buried beneath the lavas of that mountain, or even possibly outcropping in small overlooked exposures along the lava scarp of that divide.

On the north side of the North Fork Valley, the scarp makes a sharp re-entrant, where Trout Creek cuts through the faulted block. In Section 6, Township 52 North, Range 103 West, the scarp bends abruptly northwest ward, and extends for a long distance along the west side of Rattlesnake valley, overlapped at several points by Tertiary volcanics, beneath which it passes at the head of the valley. In this distance the Madison rests in turn on successively older beds, from Cody shale to Chugwater " Red Beds ". The trace of the fault could not be found on the east side of Rattlesnake valley, from w ich the block of faulted Madison has probably been largely removed by later erosion. It is suspected that fragments of the block still remain on the top of Rattlesnake Mountain Anticline, but if so they probably rest, Madison on Madison, and have not been detected. Along

the divide between the head of Rattlesnake valley, Pat O'Hara valley, and Dead Indian valley, the trace of the fault plane could not be found, either because wholly removed by erosion, or because Madison was faulted on Madison and not detected here. In section 3, Township 54 North, Range 104 West, the fault plane again emerges from beneath a small patch of Tertiary breccia and traces easily northwest ward to the point where the wagon road crosses Dead Indian Ridge. Throughout this distance the Madison rests on the Red Beds. In Section 22, Township 55 North, Range 104 West, two prominent hills of Chugwater are capped with isolated patches of Madison.

In section 16, Township 55 North, Range 104 West, the trace of the fault plane is lost probably becaue it passes wholly into the Madison, where it is not easily detected. This view is supported by the fact that the Madison in this region appears to be excessively thick, as though repeated.

Not far from the center of Township 54 North, Range 102 West some distance east of the area mapped in this report, occurs an isolated peak known as Heart Mountain. It consists of a cap of several hundred feet of Madison limestone, entirely surrounded by late Cretaceous and Tertiary sediments. It has been described* as due to a circular fault, as a result of which a plug of Madison has been supposed to have been driven up through younger sediments a distance of several thousand feet vertically. From the time this explanation was ventured it has seemed to most geologists highly improbable. Since this mass of Madison is entirely isolated in outcrop, it is not possible to demonstrate the continuity of the major thrust, just described, to this point. But the supposition hearly admits of doubt, that Heart Mountain constitutes a portion of the large fault block so widely

* (I) Fisher, C.A. U.S. Geological Survey Prof paper 53 p. 37

exposed to the west, especially in view of the similarity of stratigraphic units involved.

The extreme irregularity shown by the fault trace is largely due to erosion in part possibly to later deformation, since the fault plane dips at various but low angles, at various points.

The north south extent of the fault has been proved for over 27 miles in a straight line; more than double that distance measured along the sinuosities of its trace. Exclusive of the Heart Mountain outlier, the eastern-most and western most exposures are separated by a distance of 7 miles; including Heart Mountain, by about 15 miles. The fault may, then, be safely said to have a proved horizontal thrust of over fifteen miles, without allowing for any recession of the eastern front. The actual horizontal displacement is probably much more. Using Fisher's figures for the thickness of the beds involved, the vertical displacement is about 10,000 feet.

There was nothing sufficiently definite about the dip of the fault plane to indicate the direction of shove, but the almost undisturbed nature of the rocks in the Big Horn Basin for nearly a hundred miles eastward indicates plainly enough that the faulted block did not come from the east. The thick volcanic capping to the westward precludes the possibility of getting any information in that direction, but nevertheless it seems clear enough that the large faulted block moved from west to east.

The age of the fault seems to be rather closely limited. The youngest rocks resting below the fault plane are Fort Union (?). The fault is at many places concealed below the andesitic Early Basic Breccias of Hague's Absaroka Folio. This would date the fault as occurring during the early Tertiary time.

<u>Associated Minor Thrusts</u>

South Fork Fault

Along the lower valley of the South Fork, for several miles, a second thrust fault is exposed on both sides of the valley, below the Heart Mountain thrust already described. As far as this fault could be traced, Sundance was found resting on Cody or Fort Union and a section from the river level to the top of the ridge on the south side of the valley revealed the following situation: -

Top

Madison - Major thrust
Fort Union
Cody
Frontier
Thermopolis and Mowry
Cloverly
Morrison
Sundance
-------- Minor thrust
Cody

Bottom

On the north side, the section is as follows

Top

Madison
-------- Major thrust
Frontier
Thermopolis and Mowry
Cloverly
Morrison
Sundance
-------- Minor thrust
Cody

Bottom

This fault seems to pass wholly into Cody shales both to the north and south, and cannot be traced more than 6 or 8 miles. It probably shows again, in section 11, Township 52 North, Range 103 West, on the north side of the North Fork where abundant Sundance fossils are found on Cody shale slopes, just at the base of the main Madison scarp. It has a horizontal displacement approximating ten miles, and a vertical movement of about 3,000 feet.

Beartooth Fault Zone

Along the eastern edge of the Beartooth Plateau north of of Clark Fork, is a zone of thrust faults, probably related to the same causes, but not continuous with the faults already described. These faults are several in number, the largest of which (Sec 28, Township 58 North, Range 103 West) thrusts the Precambrian granite out over the Red Beds to the East. These faults are all associated with overturned folds.

A good summary of the recognized thrust faults of great magnitude in the northern Rocky Mountains is given in a paper by Richards and Mansfield * . It seems altogether probable that the fault here described belongs to the same general disturbance as the overthrusts known from northern Utah to Alberta, and forms a further link in the correlation of these major faults.

ECONOMIC GEOLOGY

Coal

Frontier Formation

In the NE¼ SW¼ section 12, Township 51 North, Range 104 West, a six foot seam of lignite was encountered in the Frontier Shales. The beds are practically vertical, and the outcrop extends two hundred feet or more up the hillside. The material is a soft brown woody lignite, of no present or prospective value.

At several other points, seams of similar lignite were observed varying from half and inch to three inches in thickness. Nothing was observed to encourage a search for coal in this formation.

Fort Union (?) Formation

Near the common corner of section 28, 29, 32, 33, Township

* (I) Journal of Geology Vol. 20, 1912 pp 681 - 709.

51 North, Range 104 West, just beneath a massive sandstone of the Fort Union (?) occurs a 30" seam of coal, which is being mined for local consumption. The mine is known as the Jones Coal Mine. The seam does not outcrop. The coal is hard and black with a good luster, and it is said to burn well. No analysis was made. Not testing has been done and nothing regarding the extent of the seam is known. It has been worked for local consuption, the product being used at neighboring ranches. The mine is located about three miles from the county road, and about forty from the railroad.

Several thin seams of lignite, under two inches, were noted in the Fort Union (?) but no other workable coal was seen.

Peat

Just south of Sawtooth Butte, on the Beartooth Plateau between the Clark Fork and the head of Little Rocky Creek, is a peat bog of several acres, in which there is a considerable accumulation of peat. No4 tests were made of its depth or quality.

Oil and Gas

From time to time there has been considerable local interest in certain anticlinal areas in the general region of this report, though up to date no drilling has been undertaken. The only anticlines are eroded so deeply that there is little prospect of any oil or gas accumulations, especially since most of the structures are accompanied by intense faulting.

Palatte Anticline.

This structure extends diagonally across Township 48 North, Range 103 West, and is particularly marked along the Greyhull River, and the main road, about a mile east of the Middle Palatte Ranch. Where the road crosses the axis of the fold, Mowry beds are exposed, and the

river probably cuts through into the Thermopolis. The Cloverly and Embar formations are not exposed, but probably are not oil bearers in this vicinity. The structure is not considered favorable.

" Metaantaea Rim " Anticline

This anticline strikes north and south, across the east one-half section 27, Township 52 North, Range 102 West. At its crest is is eroded so as to expose possibly half or two-thirds of the Frontier Formation. There is very strong reason to believe also that the fold is cut by a fault along its crest line. The structure is reported to be covered by oil leases but has not been drilled.

South Fork Structures

In Townships 50 and 51 North, Range 104 West, there are a number of anticlinal structures of very complicated nature, most of which are eroded down to the Sundance, and which at several places pass into thrust faults. The conditions are not favorable to oil or gas accumulation.

Bentonite

This is a hydrous silicate of aluminum, having an abnormal absorptive power. It has some economic value * but is nowhere mined in this district. It occurs in thin beds in the Thermopolis, Mowry, and Frontier formations.

Gypsum

The only gypsum of importance noted is a thick bed at or near the top of the Chugwater, along the east margin of the region studied, from Trail Creek north to the State line. It is not utilized and no analyses are available. At several points it appears to be of a high degree of purity.

* (I) Fisher, C.A. Geology and water resources of Big Horn Basin, U. S. G. S. Paper no. 53 p. 50

Gravel

An abundance of stream gravel occurs on the Clark Fork, for about three miles below the mouth of Dead Indian Creek. Above and below these bars the river beds are made up of large bowlders. Some gravel also occurs along the North and South Forks of Shoshone, and on the Greybull, particularly near the mouth of Venus Creek, but for the most part the river beds are made up of large bowlders.

Terrace gravels occur abundantly along the the valleys of the three latter streams, and also on Sage and Metcetsee Creeks. These are rather coarse, and for general constructional work would have to be screened.

Building Stone

Except locally at a few ranches, no rock is quarried in the area. In the Clark Fork and Beartooth region it shoudl be possible to get good quality granite although jointing is strongly developed and might make it difficult to get out good stone. The Madison should quarry well, and yield good limestone, especially in the upper portion. The sandstone of the Chugwater Red Beds is well cemented, and would probably prove of value as an ornamental stone. The Sundance sandstones have been used locally though for the most part they are too friable. The Cloverly is usually too thin bedded and shaly to be of much value. The gray sandstones of the Frontier appear well suited at many points to yield an attractive and durable stone.

Irrigation

No irrigation is practiced on the Clark Fork or its tributaries within the area covered by this report, though some small areas are under ditch in Sunlight and Clark Fork Valleys, farther west. There is

very little irrigable land in these valleys.

A few small ranches are under ditch in Rattlesnake Valley. These cover practically all the available land along that stream.

Along the North Fork of Shoshone River, considerable land is watered, in part directly from the main stream but largely from small tributaries. The same is true of the South Fork, and most of the land suited for farming in these valleys is now under ditch. The Government reservoir of the Shoshone project lies in part within this area and furnishes storage for a large volume of water utilized wholly outside the area mapped.

Several small streams heading on the eastern end of Carter Mountain water small tracts of land. Among the most important of these are Marquette Creek, Carter Creek, Sage Creek, Metcetsee Creek, Antelope Creek, Rawhide Creek, Fourbear Creek, and Rock Creek. These streams are probably capable of somewhat larger development but can never have more than the mostlocal value.

Considerable land along the Greybull is watered, both from the main river and from tributaries. A somewhat more extensive development may be expected on the flat west of Rock Creek. There is no irrigable land above the mouth of Jack Creek.

It may be said in general that there is a very small fraction of the area examined that is capable of irrigation, and a large proportion of that fraction is now watered.

Scenic Value

The Government automobile road from Cody to Yellowstone National Park follows the North Fork of the Shoshone River across the area from east to west. Just east of the eastern margin of the area, the road passes

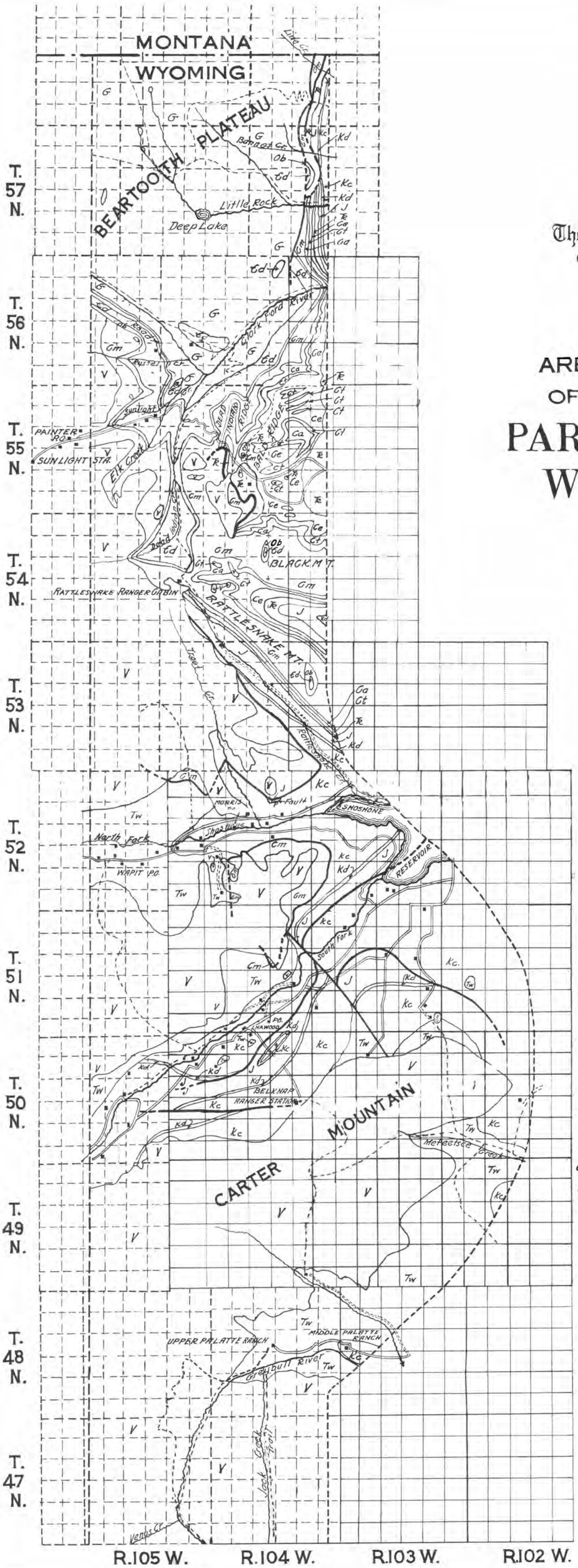
through Shoshone Canyon, in full view of the new Government dam. This canyon exposes a section, between Cody and the dam, ranging from Cretaceous to Pre Cambrian. In addition, it is a noted scenic attraction. A good automobile road also follows the South Fork entirely across the area. Along the North Fork there is mail service twice a week, and three times weekly along the South Fork. Along both these routes are numerous ranches, known as " Dude Ranches " where tourists find good accommodations including the use of saddle horse, at prices ranging from $100 to $150 per month.

More picturesque, but less accessible, is the upper valley of the Greybull, which can be reached by automobile from Cody, via Meteetsee. Tourists going to this region should be equiped with camp outfit, as there are few ranches where accommodations can be secured. A feature of this trip is the herd of antelope which ranges along Rock and Fourbear Creeks. Trout fishing is good on the upper Greybull and its tributaries.

By far the most beautiful sections of the whole region, however, are the Clark Fork and Sunlight Basins, and the Beartooth Plateau. Tourists can get good accommodations including saddle and pack horses at Painter just west of the are a mapped. Mail is received here once a week, and the place can be reached by fair wagon road, inone day from Cody. From this pont as a center, a large number of very attractive horse-back trips can be made. Especially beautiful is the trip through Clark Fork Canyon, one of the most wonderful bits of scenery in the State. Another beautiful trip is that onto the Beartooth Plateau, with a stop at Beartooth Lake, (just west of this area) where the fishing is excellent.

Moose, elk, deer, antelope and mountain sheep as well as occasional bear, mountain lion, lynx and gray wolves still claim this

region as a remnant of their rapidly diminishing range. To the tourist or hunter, as well as geologist, the region is equally attractive and the expense and effort necessary to visit it are many times repaid.



The State of Wyoming
Office of State Geologist
Cheyenne

AREAL GEOLOGY OF A PORTION OF PARK COUNTY, WYOMING.

BY

C.L. DAKE.

1916

0 — 4 MILES

N

LEGEND

TERTIARY	VOLCANIC	V
	WASATCH & FT. UNION	Tw
CRETACEOUS	MONTANA	Kp
	COLORADO	Kc
	CLOVERLY	Kd
JURASSIC	MORRISON & SUNDANCE	J
TRIASSIC	CHUGWATER	Tr
CARBONIFEROUS	EMBAR	Ce
	TENSLEEP	Ct
	AMSDEN	Ca
	MADISON	Cm
ORDOVICIAN	BIGHORN	Ob
CAMBRIAN	DEADWOOD	Cd
	GRANITE	G
	FAULTS	
	TRAILS	

* This unit does not appear on the map (editor's note, 1988).

This map has not been reviewed for conformity with the editorial standards of the Geological Survey of Wyoming