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Yellow Ore, Yellow Hair, Yellow Pine: A Photographic Study of a Century of Forest Ecology

R. R. Progluske

R. H. Sowell

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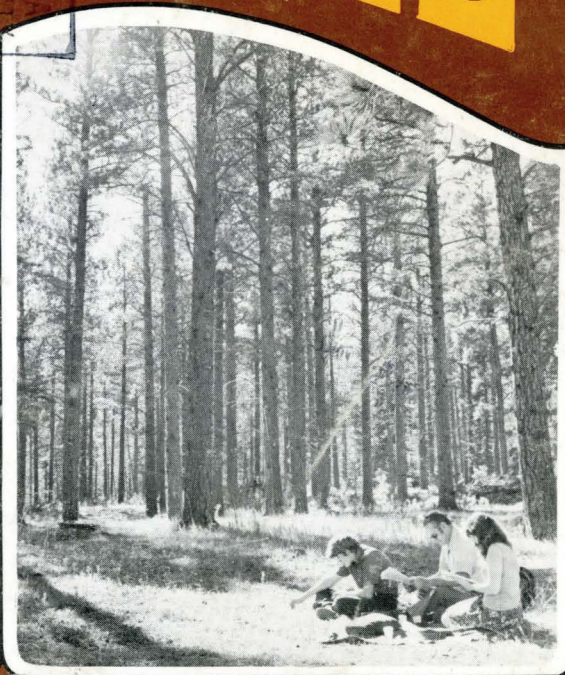
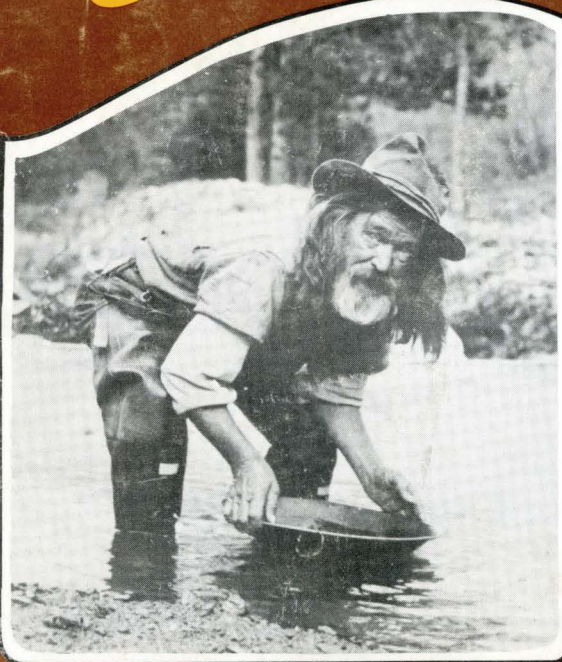
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YELLOW YELLOW YELLOW ORE HAIR PINE



A Photographic Study of a Century of Forest Ecology

Yellow Ore, Yellow Hair, Yellow Pine

**A Photographic Study
of a Century of Forest Ecology**

**By
Donald R. Progulske**

**With Photography
by Richard H. Sowell**

**Bulletin 616 ● July 1974
Agricultural Experiment Station
South Dakota State University, Brookings**

1984669

Donald R. Progulske, author of this publication, was formerly head of the Department of Wildlife and Fisheries Sciences, South Dakota State University. During that time Dr. Progulske did most of the research and field work in connection with this publication. He is now head of the Department of Forestry and Wildlife Management, University of Massachusetts, Amherst.

Richard H. Sowell, who took the "today" pictures used in this publication, is a photographic technician with the Audio-Visual Photo Lab, South Dakota State University, Brookings.

Editing, design, layout, and preparation of maps by Frank J. Shideler, Editor, Agricultural Experiment Station, South Dakota State University.

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Photo credits in "Album" section: Unless otherwise noted, all 1874 Illingworth photos from South Dakota State Historical Society, Pierre, S. D.; matching photos SDSU Agricultural Experiment Station. All other photos SDSU Agricultural Experiment Station or as credited.

Contents

	Page
Preface	7
Black Hills and Mount Rushmore	8
"Mount" and "Advance"	9
The Black Hills: Physical Features and Climate	10
Indians' Paha Sapa	11
Learning of the Resources	12
Making Up the Expedition	13
The Expedition Photographer and His Work	16
Where They Went: The Expedition Route	18
The Expedition Route on Modern Maps	19
What They Saw: A Photographic Album	35
The Forest Through a Century	118
Wildlife Then, to Wildlife Now	122
The Forest of the Future (Summary)	126
Selected References	128
Appendix A—Photos Similar to Those in Text	130
Appendix B—Photos at Unlocated Sites	135
Appendix C—Photos Fort Lincoln to Black Hills	149
Appendix D—USGS Map Quadrangle Index	161
Appendix E—Photo Identification by Sites	161
Appendix F—Photo Identification, Numbering	162
Appendix G—Data on Comparative Photos	163
19th Century Kilroy	167
Approximate Expedition Route, Black Hills	168-169

Front Cover

Johnny Perrett, "Potato Creek Johnny," exemplifies the early Black Hills gold seeker. He worked the gulches on Iron Creek and Potato Creek, tributaries of Spearfish Creek. Born in Wales, Johnny came to the Black Hills in 1883 and prospected for the precious yellow metal most of the rest of his life. He died in February 1943 and is buried beside Wild Bill Hickok in Mount Moriah Cemetery, Deadwood.



Deadwood Chamber of Commerce

General Custer poses with a grizzly bear shot during the 1874 Expedition. Known for his long, flowing locks, Custer was often referred to by the Indians as "Yellow Hair."



South Dakota State Historical Society

Cameron Ferweda, BHNF, Custer

A section of the Black Hills National Forest where multiple purpose management provides for scenic beauty, lumber production, wildlife and natural resource conservation, and fire protection. Ponderosa pine, shown here, is also known as western "yellow pine."



Preface

This is an attempt to show man's impact on the Black Hills, a natural forest in western South Dakota and eastern Wyoming. This region up to less than a century ago was under "total management" by Nature through rain, hail, snow and ice storms, tornadoes, ravages of insects, and frequent fires caused by lightning or by humans.

Although the Black Hills are not historically old in terms of settlement by the white man, geologically they are among the earth's oldest features in North America. Ponderosa pine appears to have been the natural dominant forest for eons. This prevailing forest, together with interspersed prairie openings, was maintained by natural forces. Since the intrusion of white settlers and subsequent movement of other people into the Black Hills, drastic changes have occurred in the forest and the wildlife it supports.

Concern for the forest appears to have developed in the late 19th century when the greater portion of the Black Hills was set aside by Congress as one of the first national forest reserves in the country.

This publication not only considers these major changes, but also documents photographic sites from the Custer Black Hills Expedition in 1874—sites that can be used for ecological and other studies in centuries to come. Fortunately, many of these original 1874 glass negatives and other photographs have been preserved in appropriate archives (See Appendix). By comparing "then and now" scenes an appreciation can be gained of the vegetational and man-made changes which have occurred at some sites over the past 100 years. With my associates, weeks were spent in the field attempting to locate key rocks and other prominent features so that our camera could be set at the precise spot upon which pioneer photographer Illingworth set his tripod in 1874. We were not totally successful as several sites were not found before field study was terminated (Appendix B).

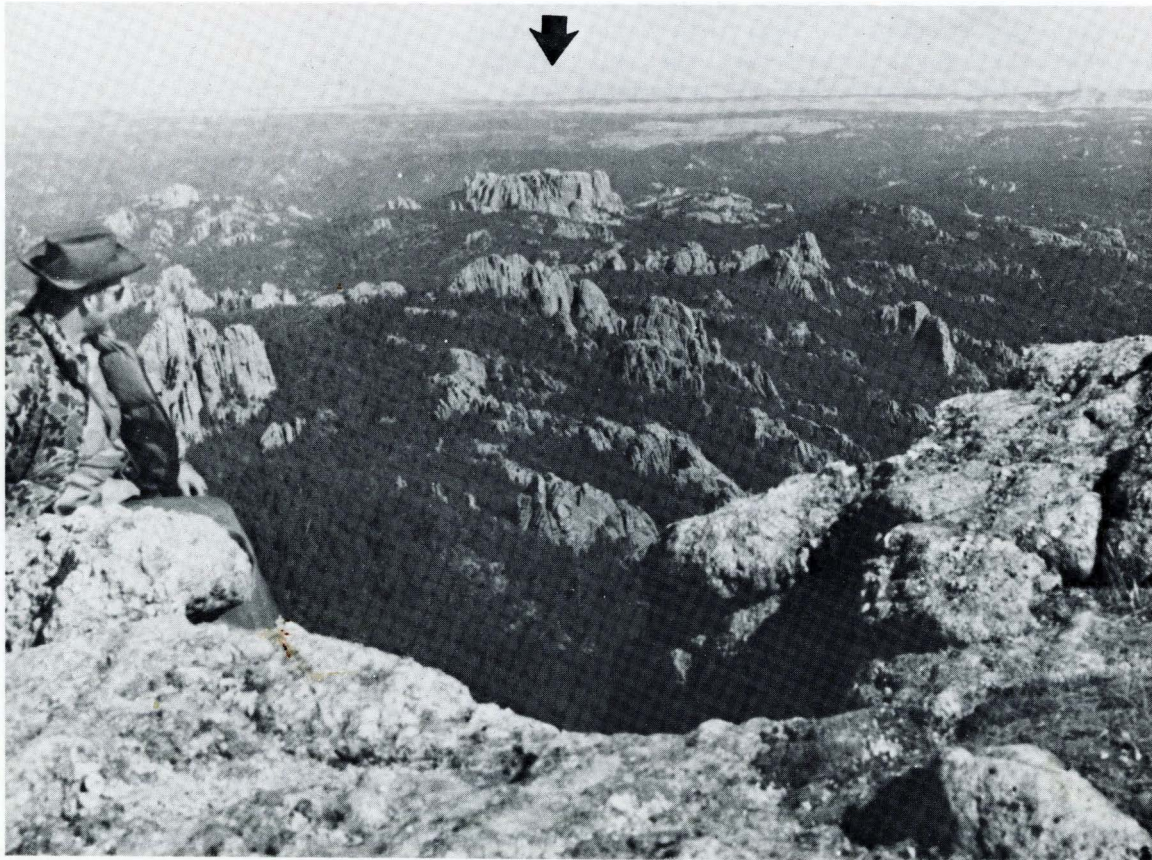
Without continued help and personal involvement of several individuals this work would not have been accomplished. My partner, Richard H. Sowell, during many pleasant days in the field proved to be a master

in meeting my demands for photographic excellence. Frank J. Shideler, Editor, South Dakota State University Agricultural Experiment Station, periodically was a catalyst who encouraged me because of his genuine interest in the early western frontier. I especially appreciate his diligent search for historical facts and editorial assistance to produce this end product. Cameron E. Ferweda, Forester, U. S. Forest Service, Black Hills National Forest, Custer, S. D., was ever alert for new information. He contributed significantly to the project, particularly in charting the expedition route. Personal interest and assistance given by Dayton W. Canaday, Director, South Dakota Historical Society, Pierre, S. D., his assistant, Bonnie Gardner, and other staff members, were most important as they provided access to the original Illingworth photographic material which inspired me to begin the study. Morris D. Johnson, a fellow wildlife biologist and an avid history buff of Denver, Colo., gave immeasurably of his time searching for and providing many pertinent documents and facts.

I am also grateful for assistance given by many other persons, including: Alan R. Woolworth, Chief Archaeologist, Minnesota Historical Society; John D. Young, Historian, Custer Battlefield National Monument, Montana; Mrs. Virginia Brainard Kunz, Executive Secretary, The Ramsey County (Minnesota) Historical Society; Dr. Lawrence A. Frost, Curator, Custer Museum, Monroe, Michigan; Donald D. Jackson, Editor, Papers of George Washington, University of Virginia, and author of *Custer's Gold*; Norman Paulson, Museum Curator, State Historical Society of North Dakota; Mrs. Lolita Lundquist, Minnesota Historical Society; Mrs. Reta Brace, University of Massachusetts; Kenneth C. Scholz, former Supervisor of the Black Hills National Forest, and his successor, David S. Johns.

Financial support was provided by the South Dakota Agricultural Experiment Station, South Dakota State University, Brookings (McIntire-Stennis Project 556). Additional support was given by the University of Massachusetts, Amherst—D. R. P.

**MOUNT RUSHMORE NATIONAL MONUMENT
IN THE BLACK HILLS OF SOUTH DAKOTA**



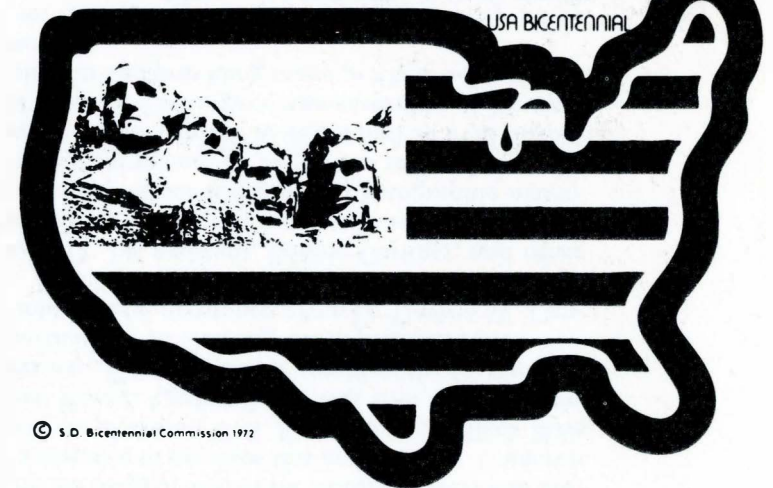
Mount Rushmore National Memorial

Mount Rushmore National Memorial, designated a "focal point" in the national Bicentennial observance, is less than 100 miles south of the geographical center of the continental United States (49 states). Millions of visitors have seen this Shrine of Democracy and it will be a major attraction during the Bicentennial observance in South Dakota.

The South Dakota Bicentennial logo (below, right) prominently features Mount Rushmore.

General Custer and a reconnoitering group to the Harney Peak area on July 31, 1874 in viewing the panorama of the Black Hills undoubtedly saw this reverse side (western side) of what was to become Mount Rushmore (beneath arrow). Harney peak itself is the highest point in the U. S. east of the Rocky Mountains.

South Dakota 1976



© S.D. Bicentennial Commission 1972

MT. RUSHMORE — SHRINE OF DEMOCRACY / USA BICENTENNIAL FOCAL POINT



“Mount” and “Advance”

The lead horses stepped out into the massive western prairie, quickly picking up the snappy cadence from *Garry Owen*, the 7th Cavalry's theme song played by the unit's 16-piece band. Excitement was high among the 1,200 troopers and attached civilians as they peeled off into the line of march that hot July morning in 1874.

Thus began the historic journey from Fort Abraham Lincoln, Dakota Territory, to the Black Hills lying as a mysterious island on the prairie some 300 miles southwestward. Interest in the Black Hills was keen nationwide, spurred shortly after the Civil War by rumors and talk of rich deposits of gold. By 1870 reports of gold in paying quantities in the Black Hills had spread to the East and West Coasts. “*Yellow Ore*” fever hit many an adventurer pointing his thoughts—and often his action—toward the largely unknown region to which the Indians held claim.

Pressure to open the Black Hills to gold seekers had been mounting, especially in the early 1870s. It reached the point at which President U. S. Grant, through General P. A. Sheridan, ordered a complete military expedition to explore and map the Black Hills despite objec-

tions by Indians to whom the land belonged and from which non-Indians were excluded by treaty.

Brevet Major General George Armstrong Custer, the flamboyant young cavalry officer the Indians called “*Yellow Hair*,” was selected to organize and lead the expedition. General Custer and his command left Fort Abraham Lincoln on July 2, 1874 heading across rolling prairie to the northwestern edge of the Black Hills under orders “. . . for the purpose of reconnoitering the route from that post to Bear Butte in the Black Hills and exploring the country south, southeast, and southwest of that point.” The orders additionally stated that the Expedition “. . . will return to Fort Abraham Lincoln within sixty days . . .” This mission General Custer accomplished to the day.

The Black Hills are not black. The name stems from the Indian “*Paha Sapa*” as well as from the dark appearance when they are noted from a distance rising out of seemingly endless prairie. Vegetation grows abundantly in the Black Hills, the main species being western “*Yellow Pine*,” now known as ponderosa pine (*Pinus ponderosa*).

George Armstrong Custer, Brevet Major General (Lieutenant Colonel), Commanding, 7th U. S. Cavalry. Born 1839, died 1876.



South Dakota State Historical Society

The Black Hills: Physical Features and Climate

The Black Hills proper, encompassing an elliptical area of some 4,500 square miles, is the easternmost ridge of the Rocky Mountains. They were formed when uplifting molten material forced from the earth's interior, broke through the layered crust of thick sedimentary rock which had been originally deposited at the bottom of the intermittent inland sea between 600 million and 70 million years ago. The uplift pushed the sedimentary formations to elevations nearly 20,000 feet above sea level. During this mountain building process the molten mass solidified and formed igneous rock, mostly granite. Some of the sedimentary rocks,

such as sandstones and shales, were converted to metamorphic rocks millions of years ago by extreme heat and pressure. Secondary uplifting in the northern Black Hills further changed the physical features as did continued erosion over the entire mountain range. Most sedimentary rocks from the higher elevations were worn away and exposed the granite area in which Harney Peak and Mount Rushmore are situated.

Presently a limestone plateau surrounds the central hills and is higher in the western portion than in most of the central area. It forms the major divide of drainages which spread radially and flow either into the Belle Fourche River system on the north or into the

Cheyenne River along the south and east. Erosion of this plateau has resulted in spectacular canyons and towering cliffs.

A hogback ridge encircles the inner hills and creates the Red Valley or "Race Track," conspicuous for its red sandstone and soil.

The Black Hills are a geologist's paradise because of structure and occurrence of numerous rock formations, some of which contain fossils, while others contain interesting or valuable mineral deposits.

The present climate of the Black Hills is very different than it was during the various geologic periods when the uplift was surrounded by a shallow inland sea millions of years ago or influenced by glaciers some 150 to 200 miles to the east

in more recent geologic times. Climate is similar to the semi-arid Great Plains but is modified by elevation of the sheltered hills. The growing season is wide in range, from 151 days at Rapid City (elevation 3,259 feet) to 90 days at Deerfield on the limestone plateau (elevation 6,000 feet). Freezing temperatures have been recorded at Deerfield during every month of the year.

Annual precipitation is also variable, increasing with altitude from 16 inches on the surrounding plains to 25 inches at the high north central area. Snow is similarly variable as Rapid City, at the eastern edge, has an annual fall of 34 inches and the northern high elevations have 100 inches or more annually.

Cameron Ferweda, BHNF, Custer



SDSU Ag. Exp. Sta.



Indians' Paha Sapa

The vast plains region, in which the Black Hills form an "island," was long held by Sioux, Cheyenne, and Arapaho Indian tribes. The Black Hills were known as "Paha Sapa," Sioux words meaning, hill, black.

Invasion of this land by white prospectors, travelers, and settlers led to a series of disputes and military engagements which generated animosity between Indian and white. Forts were established along the Missouri River, at Laramie, and at other scattered points to bring the military nearer warring bands of hostiles and to protect white men in the area.

One reason for the Indian unrest lies in the agreement concluded at The Laramie Council in 1851¹. The agreement guaranteed the Sioux that lands west of the Missouri River should be held inviolate for them. After 17 years of skirmishes and killings, the Treaty of 1868 was signed at Laramie to resolve differences and eliminate tensions.²

Among the numerous articles in the Treaty, the Black Hills and all other land lying essentially west of the Missouri River to the 103rd meridian, south of the Cannonball River to the Nebraska border was "... set apart for the absolute and undisturbed use and occupation of the Indians ... and ... no persons [except authorized agents, officers, and employees of the U.S. government] ... shall ever be permitted to pass over, settle upon, or reside in the territory described. . ."

The Treaty temporarily checked the westward trek but not for long.

Ever-mounting pressures were brought to open the Black Hills for mining and settlement. At the same time, hostile bands of Indians moved with increasing frequency southward out of their sanctuary designated by the recent treaty. General William T. Sheridan, the Commanding General of the Army, felt it was timely to order a reconnaissance of the Black Hills with the dual purpose of finding a site for a new fort and mapping the terrain.

In January 1873 the Legislative Assembly of Dakota Territory asked Congress for an exploration

of the Black Hills³. Then through similar action 3 days later, the assembly attempted to persuade the Government to confine the Indians in the area of the 1868 treaty to a small part of the prescribed reservation and open the Black Hills to white settlement⁴. The argument for the latter Memorial to Congress was that the Indians were using the Black Hills only as a refuge after carrying out hostilities on the frontier.

Feelings against the Sioux continued to intensify. On August 16, 1876 Congress enacted legislation to cease providing subsistence to the tribes until they relinquished all claims to the Black Hills region⁵. Soon the Sioux, Northern Cheyenne, and Arapahoes gave in and

on September 26, 1876 signed such an agreement in which they ceded all the territory originally guaranteed by the Treaty of 1868. By this action the Sioux people gave up all claims to the Black Hills for payment of \$4.5 million and the region was opened for settlement February 28, 1887.

¹United States Statutes at Large, XI, 749.

²United States Statutes at Large, XV, 635-40.

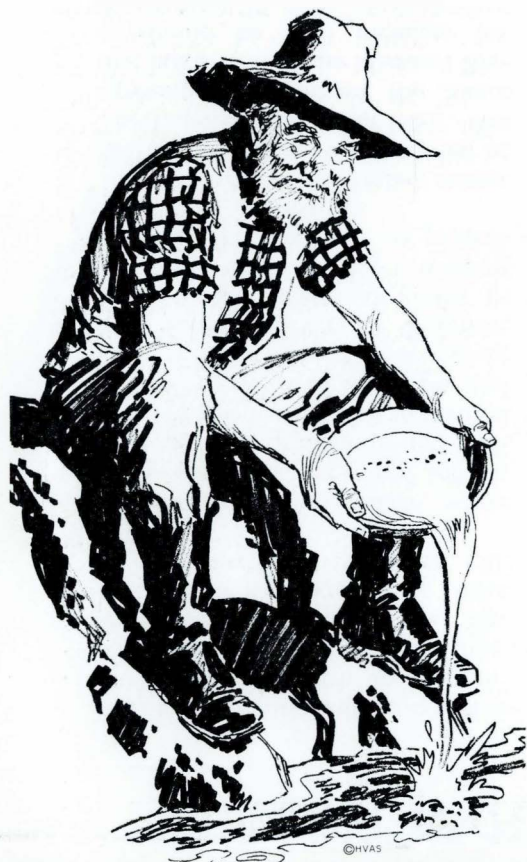
³Legislative Assembly of Dakota Territory, "Memorial Asking for a Scientific Exploration of that Territory." 42nd Congress, 3rd Session, *Senate Miscellaneous Document No. 43*.

⁴Legislative Assembly of Dakota Territory, "Memorial in Reference to the Black Hills Country Serving as a Retreat for Hostile Indians." 42nd Congress, 3rd Session, *Senate Miscellaneous Document No. 65*.

⁵Act of Congress August 16, 1876. *United States Statutes at Large XIX, 254-57*.



Learning of the Resources



Knowledge of the Black Hills was scant until General Custer led his expedition of military men, scientists, and correspondents there in the summer of 1874.

According to records, the two Verendrye brothers, Francis and Louis-Joseph, were the first white travelers in the Black Hills and surrounding Indian land. These two Frenchmen entered the Black Hills from the northeast and reached the interior prairies on the plateau before they headed back eastward to the Missouri River. They planted a lead plate near the Missouri on March 30, 1743 to commemorate discovery of the country and to claim it for the King of France⁶.

Not until the Lewis and Clark Expedition, exploring the Louisiana Purchase in 1804, was further information about the Black Hills collected. Although that expedition did not actually visit the area, members were told of the mountain range by French traders and Indians. Similar reports came from the Astar Party which moved through the surrounding plains in 1811.

Some prospectors were in the Black Hills as early as 1833 but none was known to have ever returned to the "outside world." One such prospecting party spent about a year there and found gold in considerable quantity. Nothing was heard about the party until 1887 when Louis Thoen, a stone mason, discovered a flat stone⁷ near Spearfish upon which was inscribed, "Came to the Hills in 1833, seven of us, Doctor Lacon, Ezra Kind, G. W. Wood, T. Brown, R. Kent, William King, Indian Crow, all dead but me Ezra Kind. Killed by Indians beyond the High Hill. They got all our gold June 1834.

Got all the gold we could carry; our ponies were got by the Indians. I have lost my gun and have nothing to eat. Indians are hunting me."

Father Jean Pierre DeSmet, a Catholic missionary who was working with Indians and travelled in the Black Hills, in 1848 mentioned presence of gold there.

Several military and scientific groups were in the area in the 1850's and 1860's before it was officially recognized as Sioux Indian land. One such military expedition was led by Lieutenant G. K. Warren in 1857. Dr. F. W. Hayden, a noted geologist, was with the contingent to gather information on the geology, topography and drainage of the Black Hills by making a hurried trip through them. Dr. Hayden had visited the area with General Harney in 1855 and again in 1859 with Captain W. F. Reynolds. In a report of his continued studies Dr. Hayden wrote, "... all the formations known in the west are revealed in zones or belts around the granite nucleus in their fullest development ... In all the western country I have never seen the Cretaceous, Jurassic, Triassic, or Red Beds, the Carboniferous and Potsdam rocks, so well exposed for study as around the Black Hills." He also mentioned that grains of gold could be found along almost any small stream.

When Dr. Hayden had issued a full report on his lengthy study in 1869, the Black Hills became even more familiar to scientists, the military and the general public.

The Custer Black Hills Expedition in 1874 provided the most extensive information about the terrain and resources. Photographs from the expedition were widely published in newspapers and mag-

azines across the nation thereby further exciting the general public and adventurous prospectors. This probe into the Hills which led to the gold rush is discussed in following chapters⁸.

A small expedition from Spotted Tail Indian Agency led by Reverend and Samuel D. Hinman and escorted by two companies of the 3rd cavalry under command of Captain Charles Meinhold, plus several guides and some Agency employees, went into the southernmost part of the Black Hills in August 1874, the same month General Custer left to return to Fort Lincoln.

Another later expedition was ordered into the Black Hills by the federal government, this time under jurisdiction of the Department of the Interior rather than under the War Department. Organized at Fort Laramie and departing from there on May 25, 1875, the group was under the leadership of Walter P. Jenney of the New York School of Mines. The military escort was commanded by Lieutenant Colonel Richard I. Dodge. Both men reported on their findings⁹. Information was gathered amidst many miners who were in the area illegally.

⁶The plate, discovered near Fort Pierre by a schoolgirl in 1913, is now in the South Dakota Historical Collection in Pierre.

⁷The Thoen Stone is now in the Adams Memorial Museum at Deadwood, S. D.

⁸For a complete history of the invasion of the Black Hills by gold seekers see: Briggs, Harold E. 1931. "The Black Hills Gold Rush." North Dakota Historical Quarterly, Vol. 5, No. 2, pp. 71-99.

⁹See Walter P. Jenney. "Report on the Mineral Wealth, Climate and Rainfall and Natural Resources of the Black Hills of Dakota." 44th Cong., 1 Sess., Exec. Doc. No. 51; and Richard Irving Dodge. Reprint 1965. "The Black Hills."

Making Up the Expedition

General Sheridan, upon authorization from General Sherman to order an expedition to the Black Hills, directed General Alfred H. Terry of the Dakota District to have the expedition organized at Fort Abraham Lincoln.

The Command was given to Lieutenant Colonel George Armstrong Custer who, at the age of 34 years, was awarded the rank of Brevet Major General for the expedition. (Some 10 years earlier during the Civil War Captain Custer had been appointed a Brevet Brigadier General just 2 days before the Battle of Gettysburg).

The Expedition included an engineering and an artillery detachment, two companies of infantry (one each of the 20th and 17th Infantry), and 10 companies of the 7th Cavalry. It also included a small corps of civilian employees: Indian scouts, frontier guides, a photographer, correspondents, miners, scientists, sutler, wagonmaster, and a black cook, the only woman on the Expedition. Each company had horses of the same color, a practice Custer carried out in his regiment. Trumpeters were assigned gray horses so they could be easily spotted among the mass of men, wagons, and livestock.

The Expedition was assigned a 3-inch mountain howitzer and three of the relatively new Gatling guns, an early type machine gun. The make-up and size of the Expe-

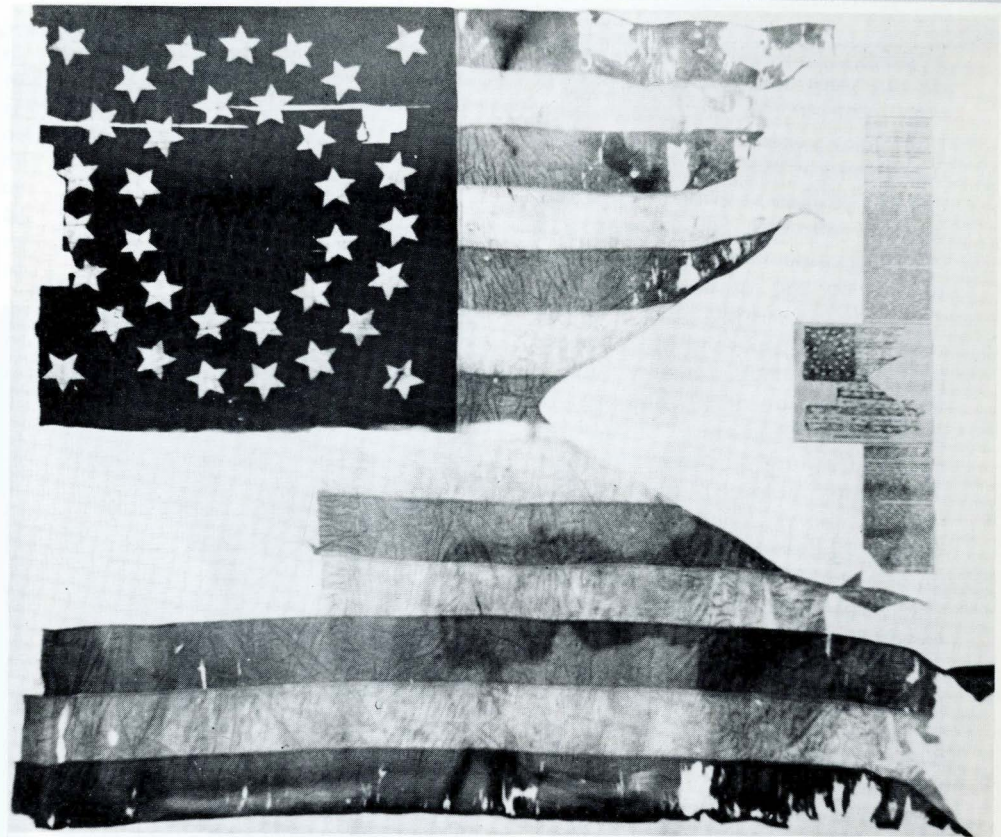
dition as explained by General Terry was to prevent trouble, not make it. Also provided were about 110 wagons and ambulances, 700 or more mules to pull the wagons, 1,000 cavalry horses, and 300 cattle to slaughter along the way if needed for meat.

Brevet Lieutenant Colonel William Ludlow, 31 years of age at the time, was assigned one of the most important duties: Chief Engineer. As such he was responsible for mapping the area through which the wagon train passed as well as to chart and measure the route of travel.

The Expedition was given 60 days to complete the mission to the Black Hills and return. After only a month of preparation and daily training it trailed out of Fort Abraham Lincoln on July 2, wagons four abreast with the bandsmen mounted on white horses in the lead. Upon completing the 883rd mile the Expedition would be back at the point of departure, Fort Abraham Lincoln, on the bank of the Missouri River near Bismarck, North Dakota.

Not one human life was lost because of hostile action during the Expedition, although three soldiers died from disease and a fourth was shot and killed by another soldier in a dispute over cross-hobbling a horse.

Although General Custer was and has been the dominant personality of the Black Hills Expedition,



numerous others making the trek gained a niche of varying proportions in history.

Major G. A. Forsyth commanded a band of 51 citizen scouts that fought off a thousand Indians for several days before relief in the 1868 battle of Beecher Island in the Arikaree Fork of the Republican River, south of Wray, Colorado. On the Expedition he was breveted as a Brigadier General and assigned as a battalion commander.

Colonel Fred Grant, son of President U. S. Grant, was attached to the command as an aide and made the trip.

Tattered and shot-torn troop colors of the 7th Cavalry found on the battlefield at Little Big Horn in 1876. (Photo Custer Battlefield National Monument, National Park Service, U. S. Department of Interior.)

Two of Custer's younger brothers were on the Expedition. Brevet Lieutenant Colonel (Captain) Tom Custer, an experienced frontier cavalryman, was in command of Cavalry Company L. Boston Custer, the general's youngest brother, was Forage Master, a civilian employee, according to an 1893 account of the Expedition by Fred S. ("Antelope Fred") Snow, who had been a wagonmaster, forage mas-



E flat cornet and baton used in the 7th Cavalry band in 1873-1876 by band-leader and official bugler, Felix Villiet Vinatieri. A Civil War veteran, Vinatieri re-enlisted for the third time at the urging of General Custer who heard the Italian-born musician play during social functions while the 7th Cavalry was in Yankton, S. D. (then Dakota Territory) enroute to Fort Abraham Lincoln.

Vinatieri organized the first City Band at Yankton, where he was a well-known music teacher and composer. He named one of his compositions "The Black Hills Polka" and penciled on the edge of a music sheet was a notation, "The Black Hills make a very beautiful park." The late Ehrum Vinatieri, a son, loaned the cornet to the Dakota Territorial Museum (Yankton County)

ter, packer and scout for several army units on the frontier.

Important civilians with the group included "Lonesome Charlie" Reynolds, a famous frontier guide; George Bird Grinnell, the well-known naturalist who later became known for his work among the Indians, and his assistant, Luther North, another famous frontier guide; Professor Newton H. Winchell, a University of Minnesota geologist; Horatio Nelson Ross and William T. McKay, miners; news correspondent William Ellery Curtis; Bloody Knife, an Arikaree who headed the Indian scouts and long



Felix Villiet Vinatieri
Chief Musician 7th U. S. Cavalry

where this photograph was taken with assistance by a granddaughter, Mrs. Walter F. Grimm, Yankton, who also furnished the photograph of her grandfather.

one of Custer's favorites; and, of course Illingworth, the photographer.

The 7th Cavalry band, mounted on white horses, must have been an imposing — and somewhat bizarre — sight on prairie expanse or mountain dell. Leader of the band was Felix Villiet Vinatieri, an Italian-born musician-composer and U. S. Civil War veteran. As a resident of Yankton he organized that city's first band and played for dances given for the 7th Cavalry when the troopers were in the Dakota Territory Capital prior to leaving for Fort Abraham Lincoln. General Custer talked with Bandmaster Vinatieri about joining the 7th Cavalry to replace the leader of the unit's 16-member band who had asked to be relieved because of illness. Vinatieri accompanied the 7th Cavalry to Fort Abraham Lincoln and was sworn in as Chief Musician during May of 1873. While on the Black Hills Expedition Vinatieri conducted the band, wrote and arranged numerous band numbers and served as official bugler. He was mustered out of service at Fort Abraham Lincoln in 1876 and with his family resettled in Yankton where he again engaged in teaching music and composing.

One woman accompanied the Black Hills Expedition. She was Sarah (Aunt Sally) Campbell, a frontierswoman in her own right who claimed to have cooked on the first boat up the Missouri. On the Expedition she was assigned as the sutler's cook. She was a kind, faithful servant of General Custer and their admiration was mutual. The same news dispatch in the *Chicago Inter-Ocean* of August 27, 1874 that



"As a member of the Custer Expedition to the Black Hills in 1874 she ventured with the vanguard of civilization" is the inscription on this grave marker erected in 1934 by a neighbor and friend of Sarah (Aunt Sally) Campbell, the only woman on the historical trek of 100 years ago. She later returned to the Black Hills, lived and worked in Crook City, Galena and had a ranch on Elk Creek. Years ago a friend recalled that Aunt Sally while working for a neighbor often took time to come to the family home to visit and take a "good smoke from a pipe."

Aunt Sally was described as a large woman, and greatly interested in people. Apparently she had accumulated property and had settled down in Bismarck to comparative ease and luxury before deciding to go on the Custer

Expedition. She died in 1887 and was buried in this small cemetery on Vinegar Hill near Galena.

Some persons believe that Aunt Sally is shown in at least two of Illingworth's photographs, others believe that such identification is incorrect or that it is impossible to tell because of picture quality.

Fred G. Borsch (above), Galena, helps maintain the old cemetery on land he acquired in 1931 including the Galena townsite. Borsch himself has a place in South Dakota history. The silhouette of a coyote on markers throughout the state is adapted from a picture of "Tootsie," an orphaned coyote which Borsch raised and kept at his home. It was through efforts by Borsch that the coyote was designated as South Dakota's state animal.

was generally credited as being responsible for the gold rush to the Black Hills includes an interview with Aunt Sally. She had wanted to see the Black Hills for a long time, the Expedition gave her the opportunity, and once there she wanted to return someday. And return she did to add a generous contribution to the history of the region. When gold was discovered in late July 1874 at what was to later become the city of Custer, Aunt Sally had claim "No. 7 below discovery" when Expedition members formed the Custer Park Mining Company. Old Aunt Sally was a humanist—she loved people, notes the *South Dakota Negro Year Book* for 1962. Besides working in Galena, near Deadwood, as a cook and housekeeper, she had a ranch on nearby Elk Creek, just a couple of miles or so from the route the 1874 Expedition had taken on leaving the Black Hills less than 10 years before. She adopted a German orphan boy who helped take care of the ranch when she was engaged in other households and he remained with her until her death in 1887. She is buried among the pines in a cemetery on Vinegar Hill near Galena.



William H. Illingworth, photographer, Black Hills Expedition.

Illingworth was born in England and was later trained to help his father in the jewelry and clockmaking trade. His first western photography was on the Fiske Expedition to Montana in 1867, the same year he established his own gallery in St. Paul when he was 23 years old.

Photo courtesy of Minnesota Historical Society.

The Expedition Photographer and His Work

Interest in the American western frontier was intense by the mid-1800's. Scenes captured by early photographers, using either the recently introduced stereoscopic camera or massive cameras producing 18x20-inch or larger glass plates, helped incite movement of easterners to a new "El Dorado" in the West.

Among the notable photographers then was William H. Illingworth of St. Paul, Minnesota, a young man who had mastered the new "wet plate" process to make glass plate negatives for stereoscopic photographs. He had accompanied the Fisk immigration expedition into Montana Territory in 1866 and returned with about 30 stereoscopic pictures. He was considered an expert commercial photographer when he was hired by Colonel Ludlow for the 1874 expedition to the Black Hills. Illingworth was provided a stereoscopic camera and other equipment and supplies including the "traveling darkroom" wagon used on the Yellowstone Expedition in 1872.

Illingworth was commissioned to make six sets of prints for the U. S. Army from negatives made on the Black Hills Expedition with the understanding that he could retain the glass negatives for his own use. As it turned out, he failed to meet his obligation to the War Department but no legal action was taken. In the meantime he was selling complete sets of his pictures through a firm in St. Paul.

Illingworth left no record of the number of photographs he made while in the Black Hills but evidence indicates he produced several more than the 79 now accounted for (See Appendix Table F). The glass negatives (4½x8 inches in size) which Illingworth carried to his St. Paul studio after the Expedition were retained by Illingworth's son until 1900 when they were purchased by Edward A. Bromley. Bromley indicated then, "...three-fourths of the Custer-Ludlow set were still in excellent condition..."¹⁰ In 1920 the set was sold by Bromley for \$60 to the South Dakota State Historical Society in Pierre, South Dakota¹¹. Seventy-two plates are in the South Dakota archives. One plate is known to be in the Minneapolis Public Library collection. It is possible that others might be held by private individuals.

Undoubtedly some of the plates have been broken since Illingworth developed them in 1874. For example, six photographs, but not the plates, were located in the National Archives. This seems to substantiate that the present collection of plates is less than the final set prepared by the photographer. Fifty-nine of the 79 known photographs were taken in the Black Hills; the others were taken on the prairie

¹⁰Letter from Edward A. Bromley to Doane Robinson, September 2, 1919.

¹¹Letter from Edward A. Bromley to Doane Robinson dated September 6, 1920.

over which the Expedition travelled (Appendix C).

Use of the old photographs for interpreting changes in the landscape over the years is an important spin-off of the Expedition. Little did Illingworth realize that he was making a major contribution to science by establishing a base from which ecological studies can be made! The photographs not only serve as permanent study "plots," but also help trace the route of the Expedition in the Black Hills.

Illingworth must have had difficult chores at times when taking the photographs. Several sites were on high bluffs 400 feet or more above the valley floor or on rough high rocks overlooking a broad area. Although an assistant helped him, the task of scrambling a con-

siderable distance up a slope or over rough rocks to a site, setting the camera on its tripod, returning to the wagon or a special tent darkroom to coat the glass plate, carrying the plate before it dried back to the camera and exposing it for 15 to 20 seconds, then returning to develop the negative must have been tedious, demanding and often-times uncomfortable in the hot, light-tight, fume-laden darkroom. It is safe to assume that many attempts to make photographs were unsuccessful.

Illingworth made most of the photographs in stereoscopic form. His large wooden folding camera was provided with at least two lens plates—one with the pair of lenses for stereoscopic photography and the other with a wide-angle lens

for panoramic views. Some plates therefore carry almost double (side by side) images of a scene while others have only one broad full-width image. Technical information about his camera could not be found; however, photography references indicate that stereoptic cameras of the time had a wide range of lens openings (f8 to f128) and that many photographs were taken at f64. Since then new cameras, films, emulsions, and processing procedures have been developed so that present day photographers have a wider range of choices to obtain satisfactory photographs. (It is somewhat fitting that a "Kodak" camera was developed on the Dakota prairies in 1880.¹²)

Even though the early photographers were forced to work within

narrow limits of film and chemicals, men such as Illingworth produced remarkably clear and detailed results. Some of the Black Hills photographs show this, especially in contact prints made directly from the glass negatives. Some detail is lost in enlarging or in reproducing photographs for publication. One illustration of detail is Appendix Figure B-3, (apparently taken when Custer led a small exploration group on a brief mission away from camp). In contact print size, it is so detailed that, with a magnifying glass, one can read an inscription on the end of the cigar box on the table ("... Colorado ...") It is almost possible to read labels on the bottles! In another contact photograph taken at a prairie stream (Appendix Figure C-6), three men far from the camera can be seen bathing and splashing water while their clothes are visible on the bank.

Cameron Ferweda, BHNF, Custer



This is one of the "easier" photographic sites used to match one taken in 1874 on the Custer Expedition. Many hours were spent locating exact matching sites, several were never found. It was necessary to climb to rocky ledges, through dense pine growth, up and

down hills to find some of the locations. Here Photographer Richard Sowell (right) takes a light reading while Cameron Ferweda (left), of the U. S. Forest Service, and Author Donald R. Progulske check landmarks in file copies of the 1874 photographs.

¹²According to M. F. Hammer, *History of the Kodak*, 1940, p. 17, "... the invention ... was christened *Kodak*, after the name of the state, and groomed for its patent debut in 1881."

Where They Went: The Expedition Route

Retracing precisely the Expedition's route of travel is most difficult because only two of 16 campsites in the Black Hills can be positively documented from photographs. Although latitudes and longitudes appear in official reports of the Expedition, some are in apparent error. It is estimated that an error of one second in either reading could result in a difference of as much as a mile. Sextants used by Colonel Ludlow, or his civilian assistant, W. H. Wood, to make astronomical observations probably were not sufficiently accurate to pinpoint the location of camps. This was apparent when the given latitudes and longitudes were plotted on topographic maps prepared by the U. S. Geological Survey. Some camps located by this method were in unlikely spots. Evidence suggests that a nearby valley or other site was more plausible.

Several versions of the Black Hills route have been prepared by students of the Expedition. Each agree on the general route as pieced together from guiding statements in official reports by General Custer and Colonel Ludlow but many of the segments are uncertain. Published data plus further definition from photo sites discovered during this study were used in preparing the maps in the following sections. Despite this

added guidance, short segments of the trail are still in doubt: where necessary, the route presented is an interpretation of the terrain relative to the forest and topography that likely existed in 1874.

Engineers under direction of Colonel Ludlow were responsible for logging the miles traveled. Sergeant Charles Becker with an assistant rode a special two-wheeled odometer cart which recorded the number of wheel revolutions. Sergeant Wilson, with another assistant, rode an ambulance also equipped with two odometers, at a distance from but parallel to the cart. At the end of the daily march the odometer readings were averaged for greater accuracy and the result was then converted into equivalent miles. Sergeants Becker and Wilson gained at least momentary popularity when soldiers descended upon them at the end of the day to learn the distance covered.

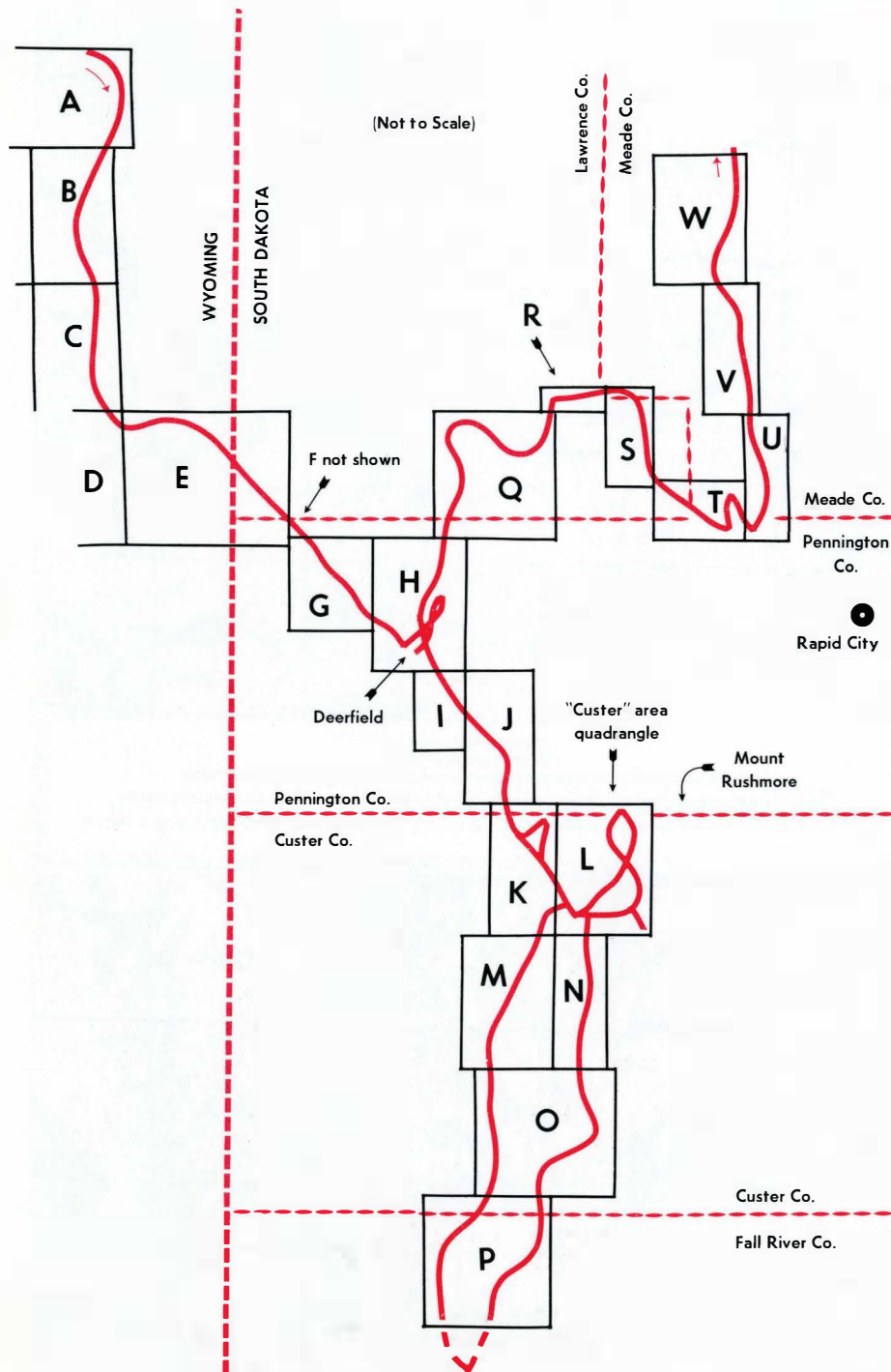
Sergeant Becker and five other men were also usually busy with prismatic compasses, aneroid barometers, thermometers, and chronometers to chart the route and make notes on weather and elevation. W. H. Wood assisted Colonel Ludlow with transit and sextant to record general topography. Sergeant Becker prepared the official map for Colonel Ludlow after he returned to headquarters at St. Paul.

If you follow the entire route of the Expedition to the Black Hills

today you would move southwesterly from the west bank of the Missouri River at Bismarck, North Dakota, into extreme northwestern South Dakota, thence angle into the southeastern corner of Montana, then south into Wyoming abreast of but west of the Black Hills and then easterly again into South Dakota near Inyan Kara Mountain to the ultimate destination. Your route homeward would emerge from the Black Hills south of Bear Butte near Sturgis, then



Young visitors use skyline features to spot areas included in 1874 and modern photographs from a public road in the Black Hills near Deerfield, S. D. As a guide they use a SDSU publication, "Passport to 1874," which contains several comparative sets of photos in a 1972 progress report on the research project. The skyline above the girls can also be recognized in Figures 11 and 12 in the section, "What They Saw: A Photographic Album."



more or less north across the prairie, intercept the earlier trail near the North Dakota line, then sweep circularly northeastward to old Fort Abraham Lincoln.

Along the trail you would pass the twin graves of Private John Cunningham and Private George Turner along Wyoming Highway 585 east of Inyan Kara and the single grave of Private James King just off the road about 3 miles due west of Blackhawk (northwest of Rapid City). The grave of Sergeant Charles Sempker, the last man to die during the Expedition, is on the prairie about 80 miles west of Bismarck. These graves as well as some of the Expedition's route are marked with monuments or signs.

As the distance between the Expedition and trail's end lessened, the men became more jubilant even though many were exhausted and ill. At 4:30 p.m. on the 60th day of the mission, the happy contingent moved into Fort Abraham Lincoln led by the 7th Cavalry band playing the familiar *Garry Owen* on trip-battered instruments.

The Expedition had officially traveled 883 miles plus 322 miles in various reconnaissances to make a total of 1,205 miles surveyed, Colonel Ludlow stated in his official report of the Expedition. The

troops had made camp 47 times along the way.

* * * * *

If you care to follow General Custer's route within the Black Hills you can do it by armchair or auto with the "before and after" photographs included in this publication. Most of the area is within 30 miles of Rapid City to the northeast and almost any spot along Custer's route will be within 25 miles of such attractions as Mount Rushmore National Memorial, Jewel Cave National Monument, Wind Cave National Park, and Custer State Park.

Motor vehicle roads on or adjacent to the route are generally good. While much of Custer's route was over what is now private land, many of the comparative views shown in this publication can be seen from public roads.

Markers designating sites traversed by the Expedition have been erected at various points. Additional route markers that do not offend the surroundings are planned along some roads by Custer County and other western South Dakota 4-H groups as a contribution to both the Custer centennial in 1974 and the Nation's Bicentennial in 1976.

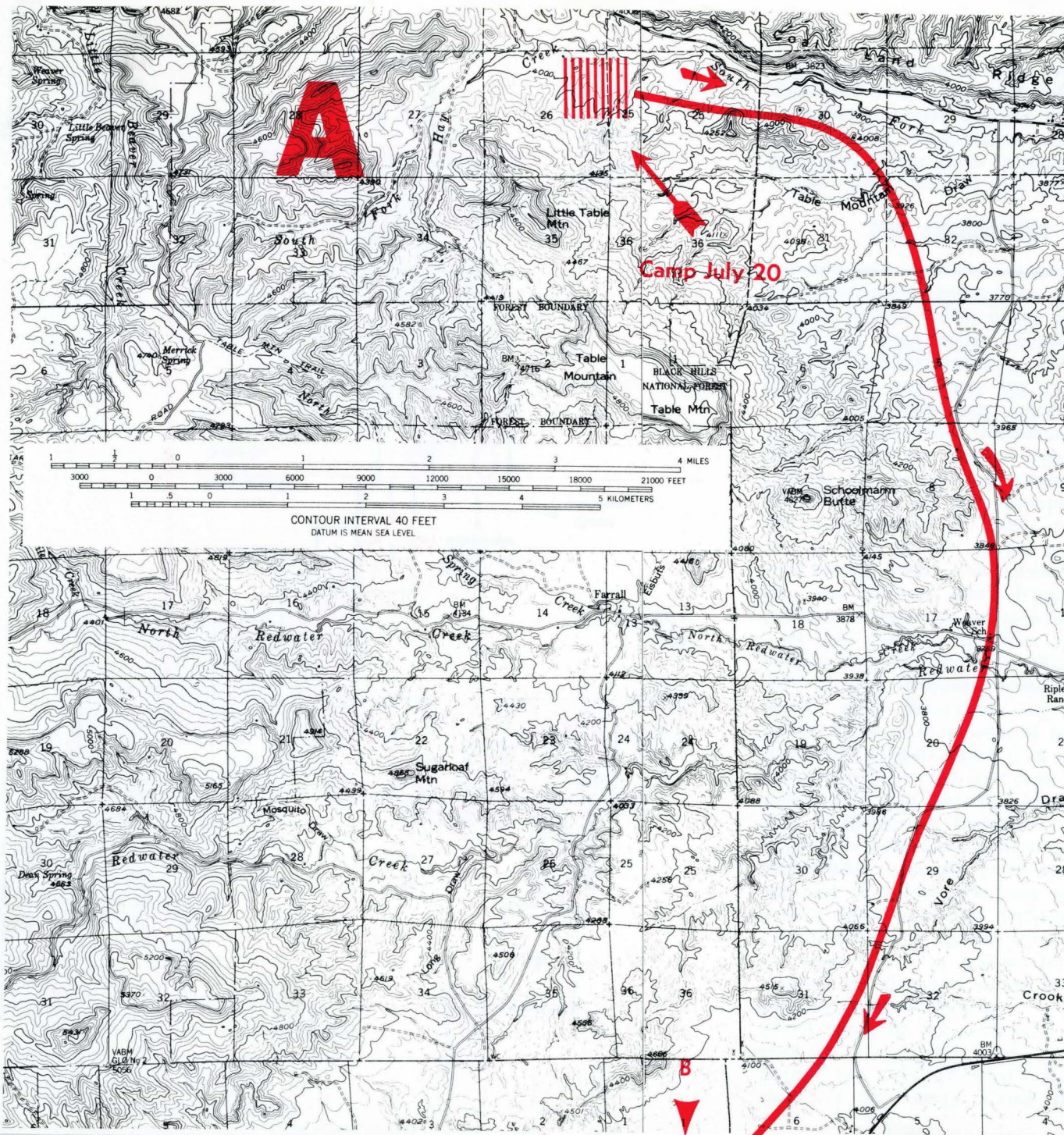
THE EXPEDITION ROUTE ON MODERN MAPS

This index map of the Black Hills Expedition route is divided into lettered quadrangles which correspond to more detailed maps appearing on the following pages.

The route shown on these maps

was determined from studies of various reports of the Expedition, from reconnaissance in the field, and from comparisons of Illingworth photos.

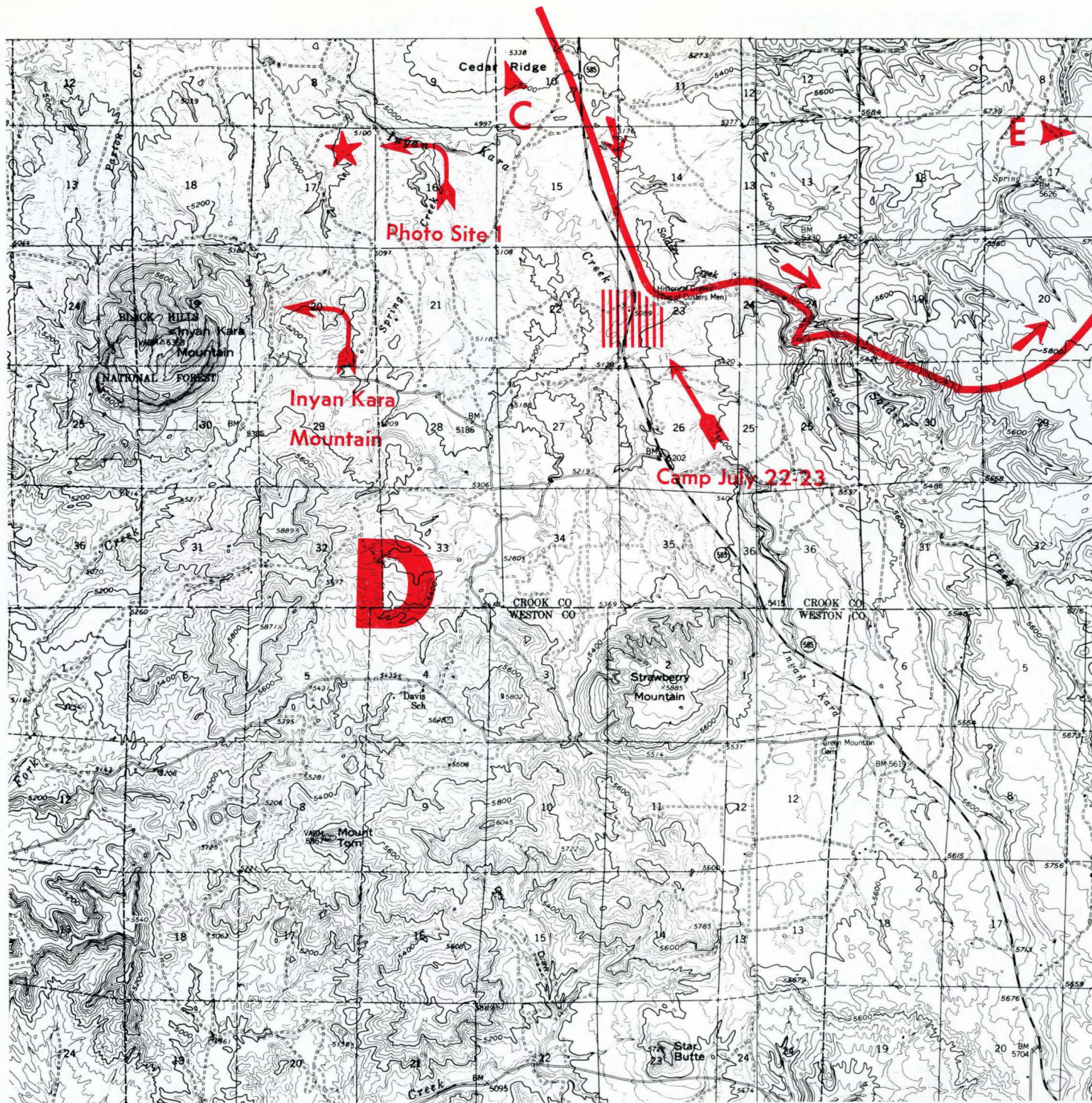
The route shown on these maps

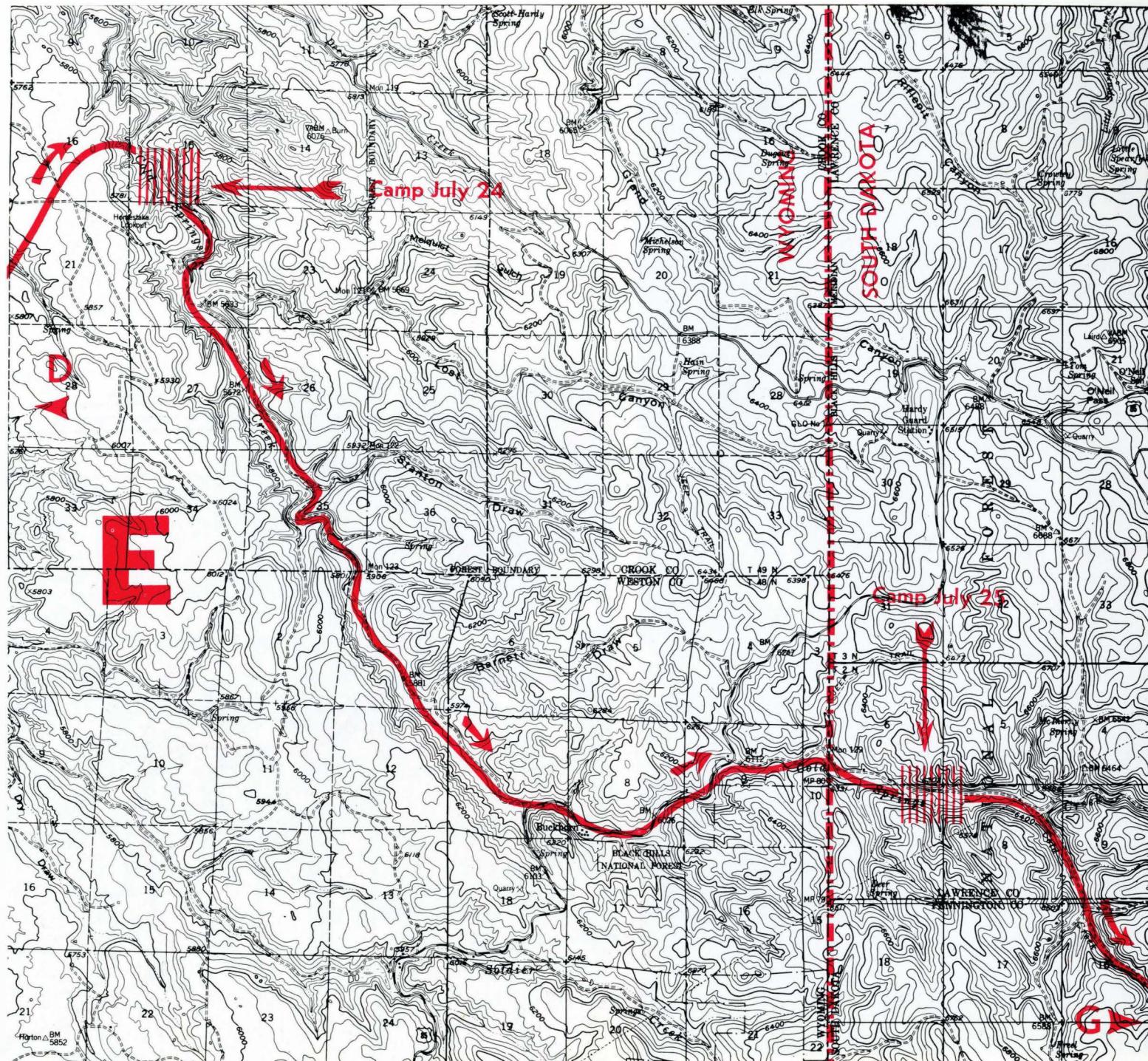


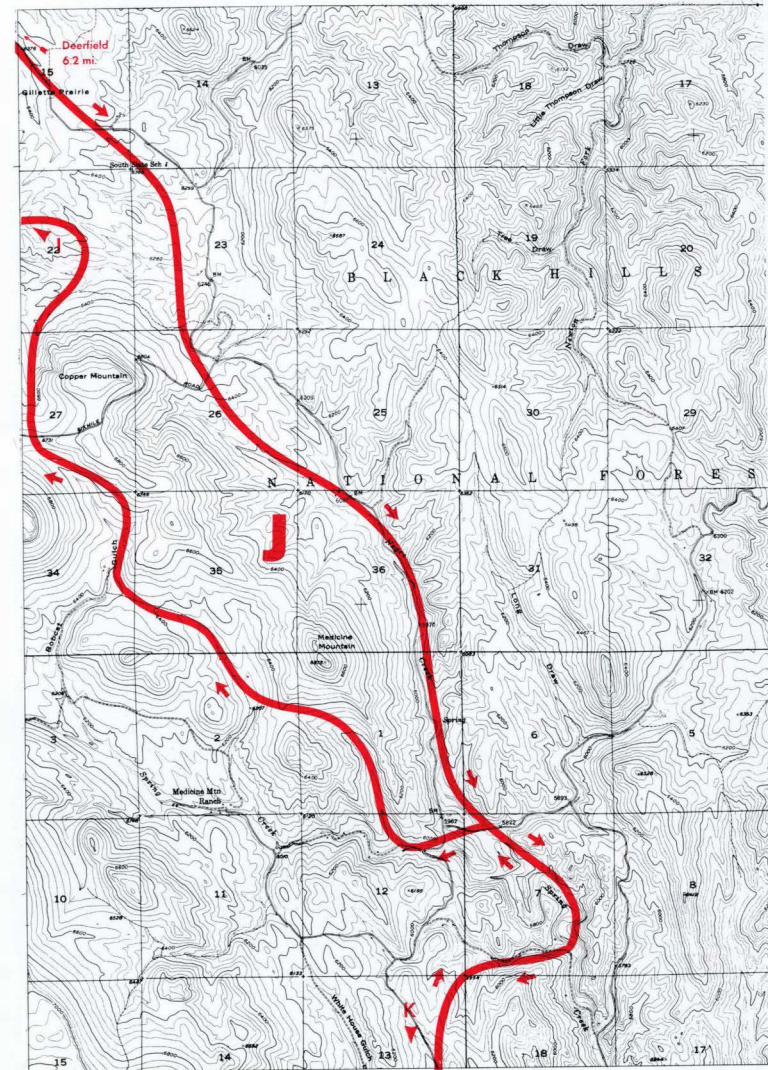
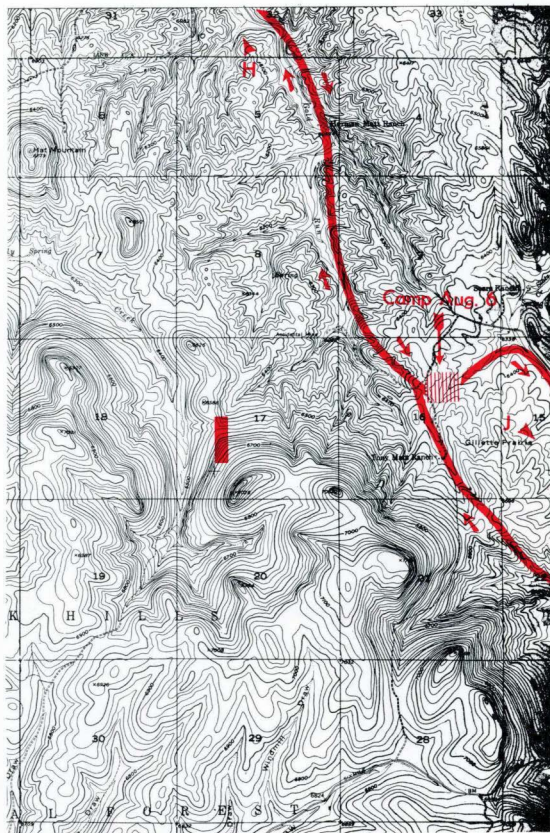
includes sidetrips or reconnaissances to Harney Peak, northeast of Custer, and south of Custer into Fall River County, South Dakota. A sidetrip along French Creek from the "permanent" camp east of the city of Custer is not shown here. This sidetrip went east through what is now Custer State Park to Fairburn and returned on a route slightly to the north.

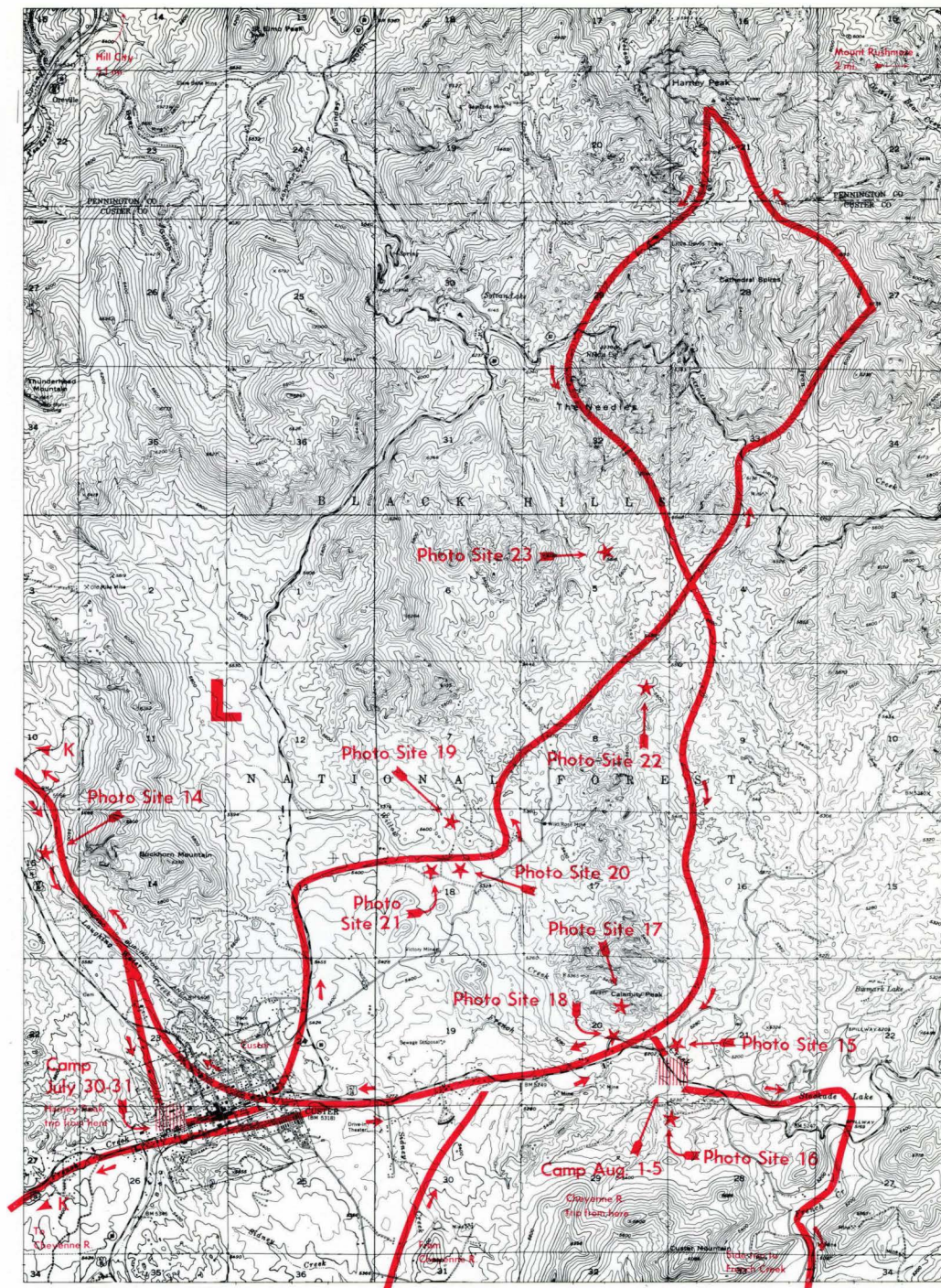
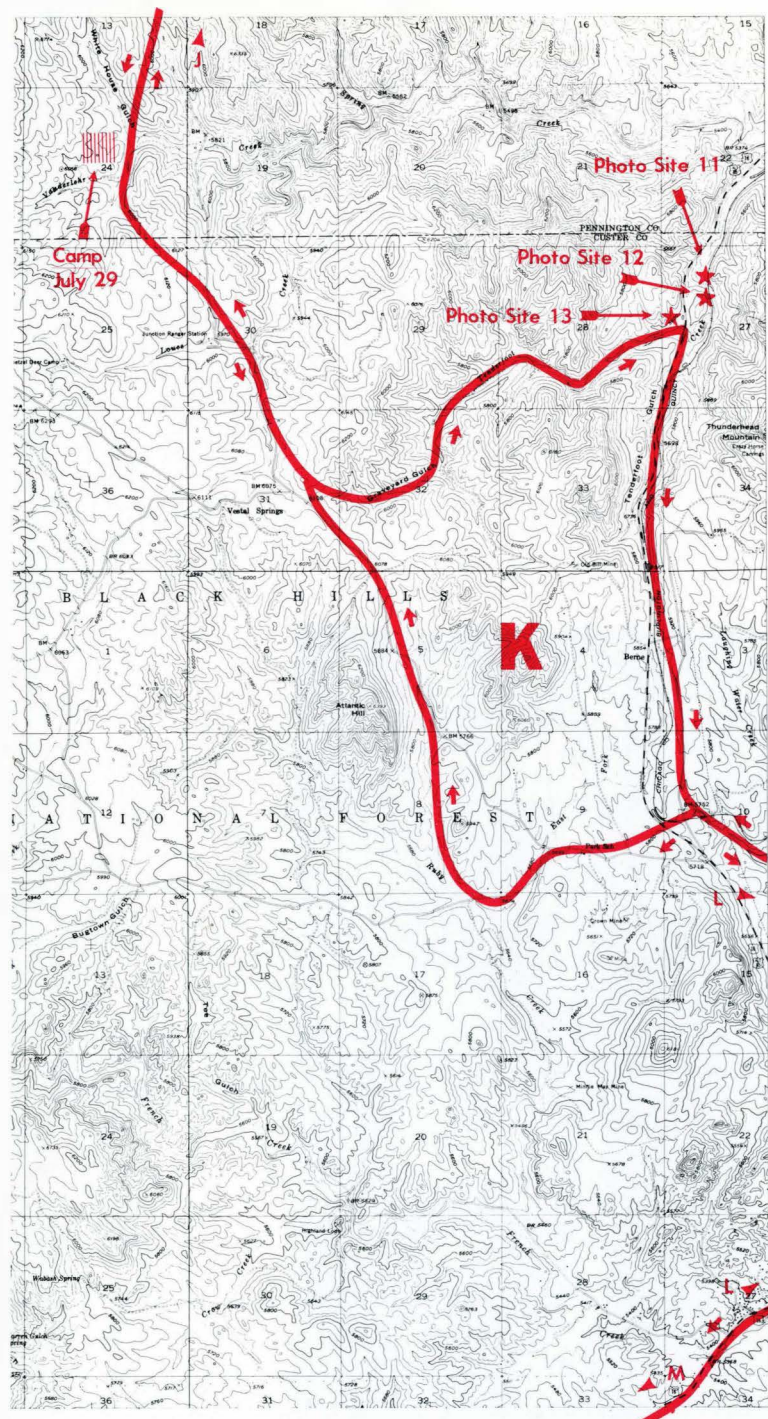
Route marking and other details shown in color were made as overlays on quadrangle sections of topographic maps by the United States Department of the Interior, Geological Survey. Quadrangles lettered A, B, C, D and E (mostly in Wyoming) were reduced from the USGS 15 minute series, scale 1:62500 maps. The other quadrangles, all in South Dakota, are from reductions of USGS 7.5 minute series scale 1:24000 maps. Comparative measurement scales are parts of quadrangles A and G. Some of the maps which follow are the same as the USGS quadrangle indexing system, others combine or are segments of quadrangles.

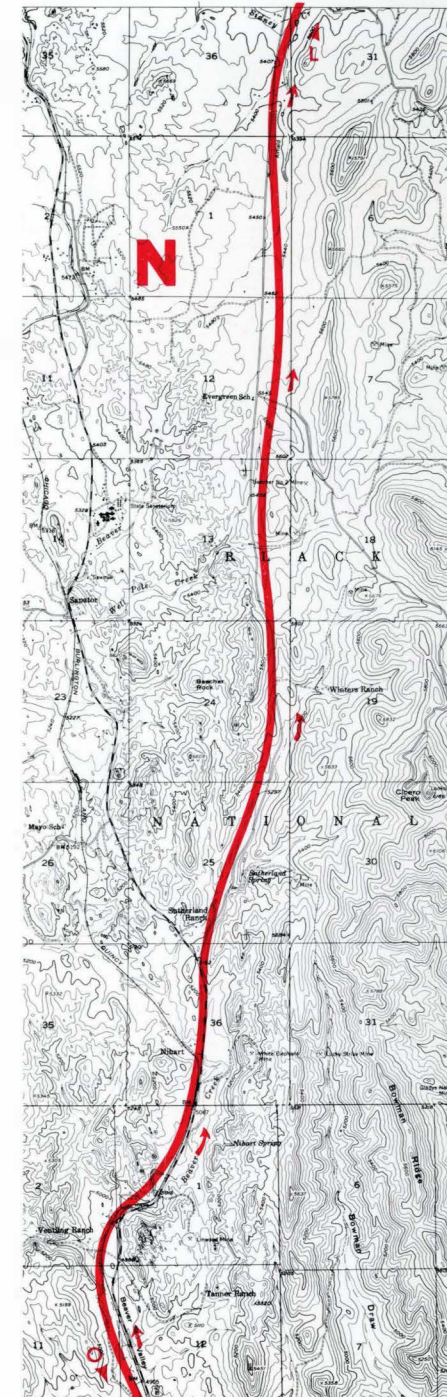
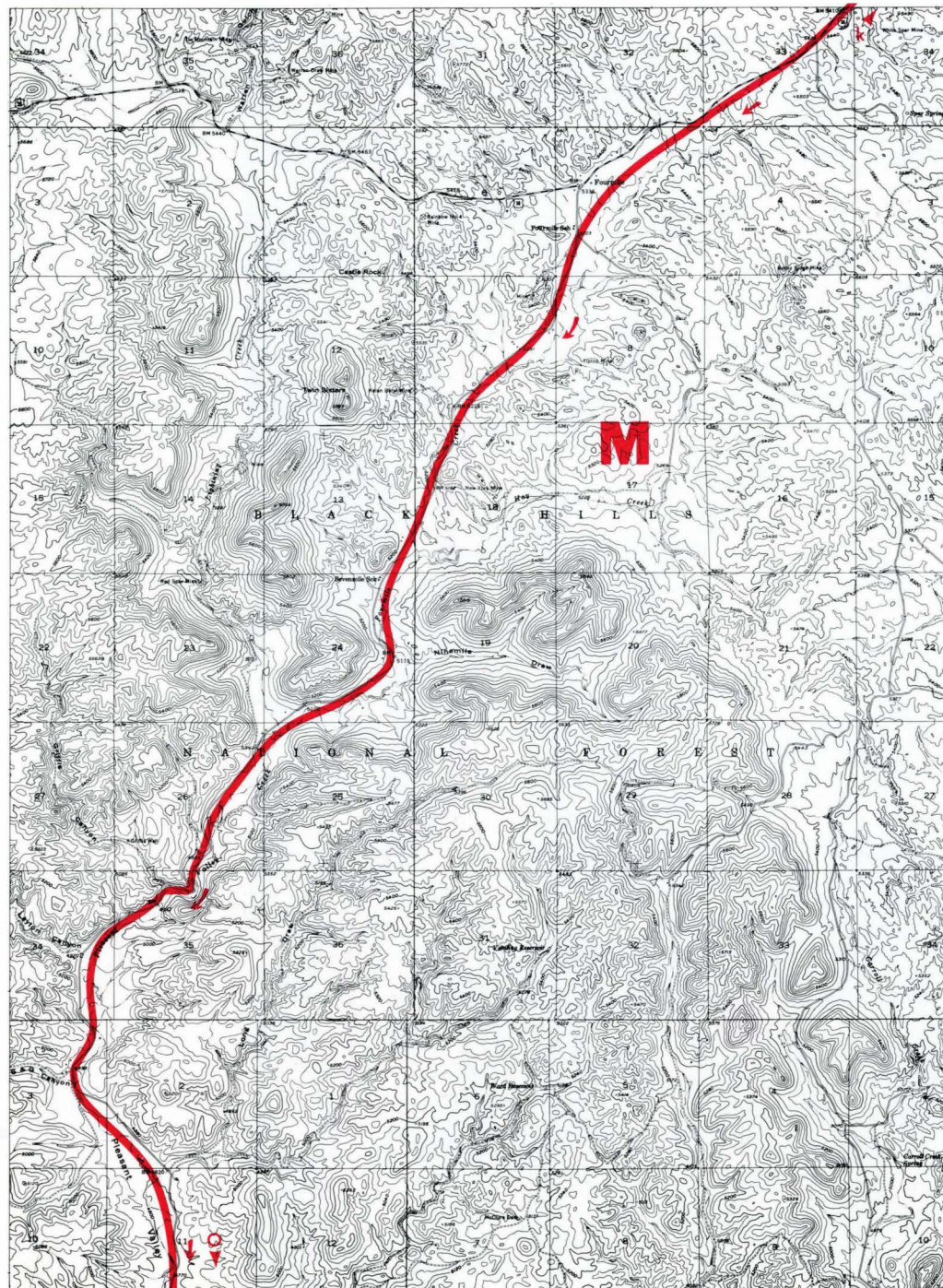
As the Expedition route enters or leaves a map quadrangle a small pointer and letter can be noted. This is to facilitate the matching of the route from one quadrangle to another. The pointer indicates the direction toward the adjoining quadrangle and the letter identifies the adjoining quadrangle. North is at the top in all maps.

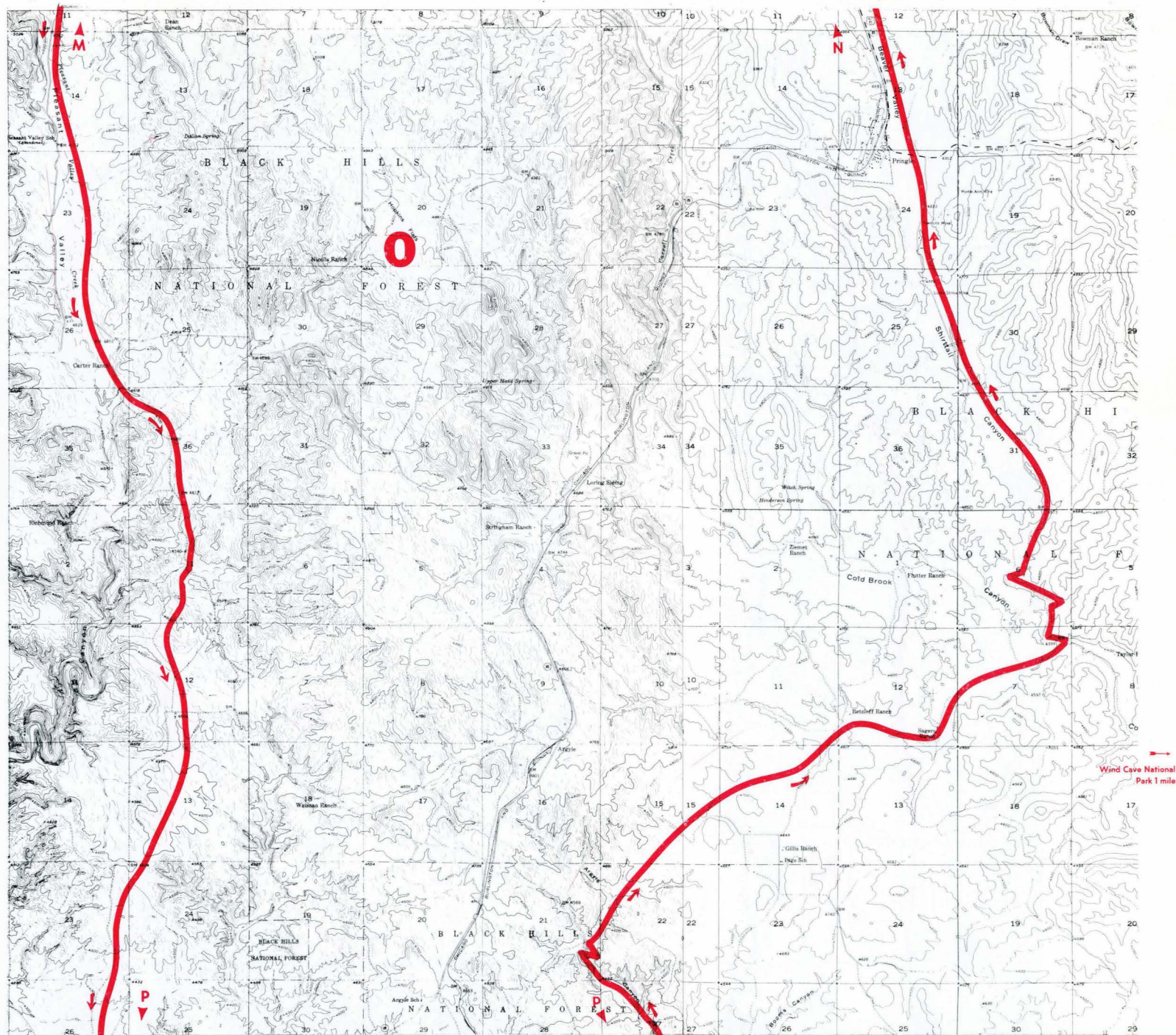


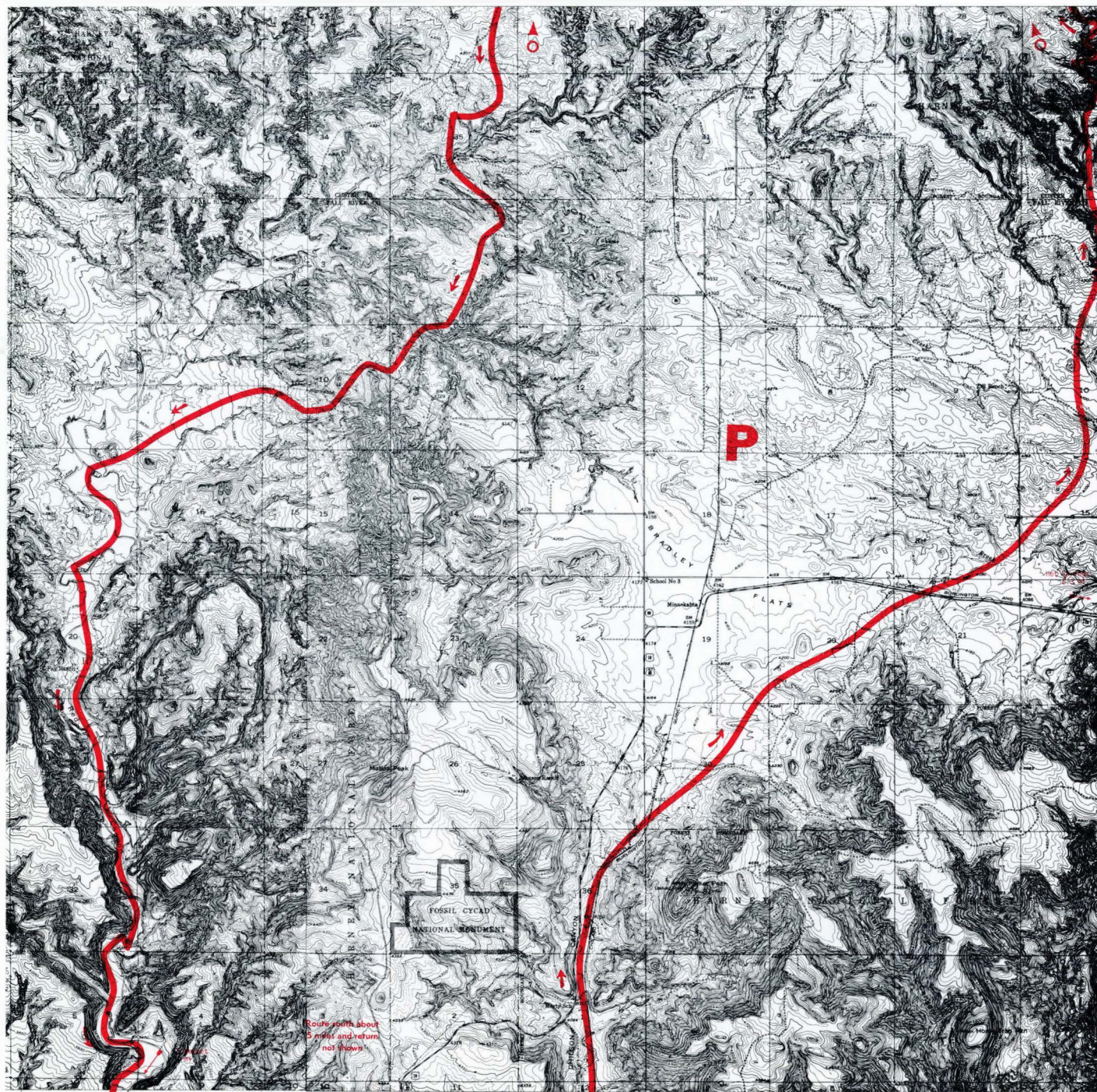


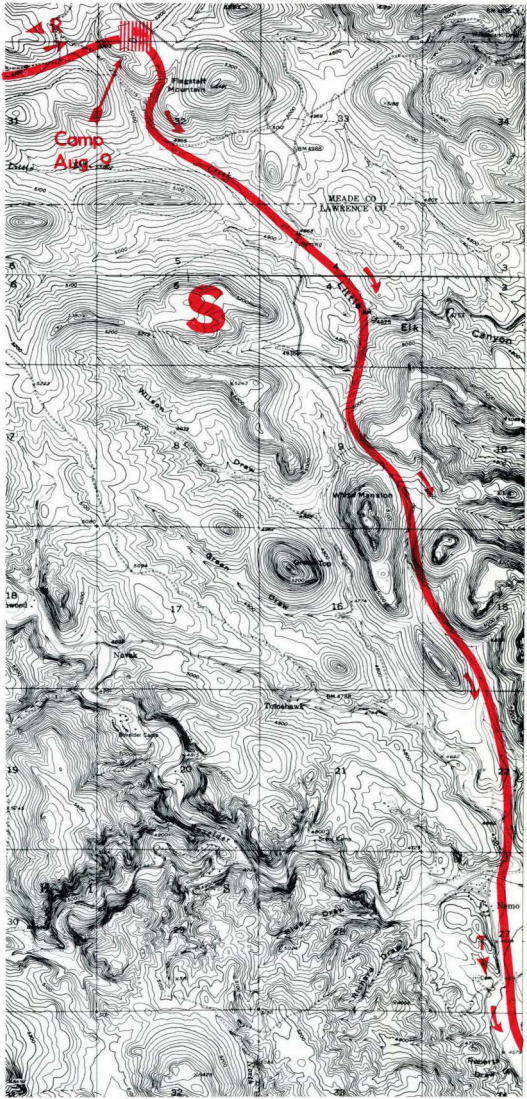
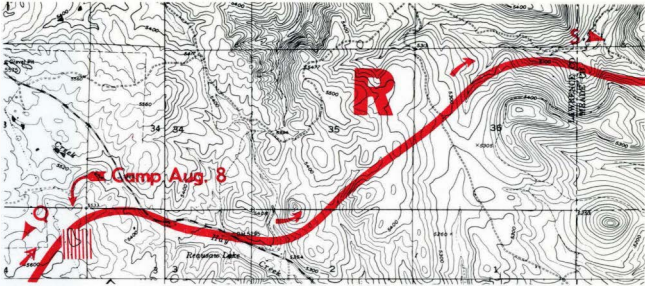
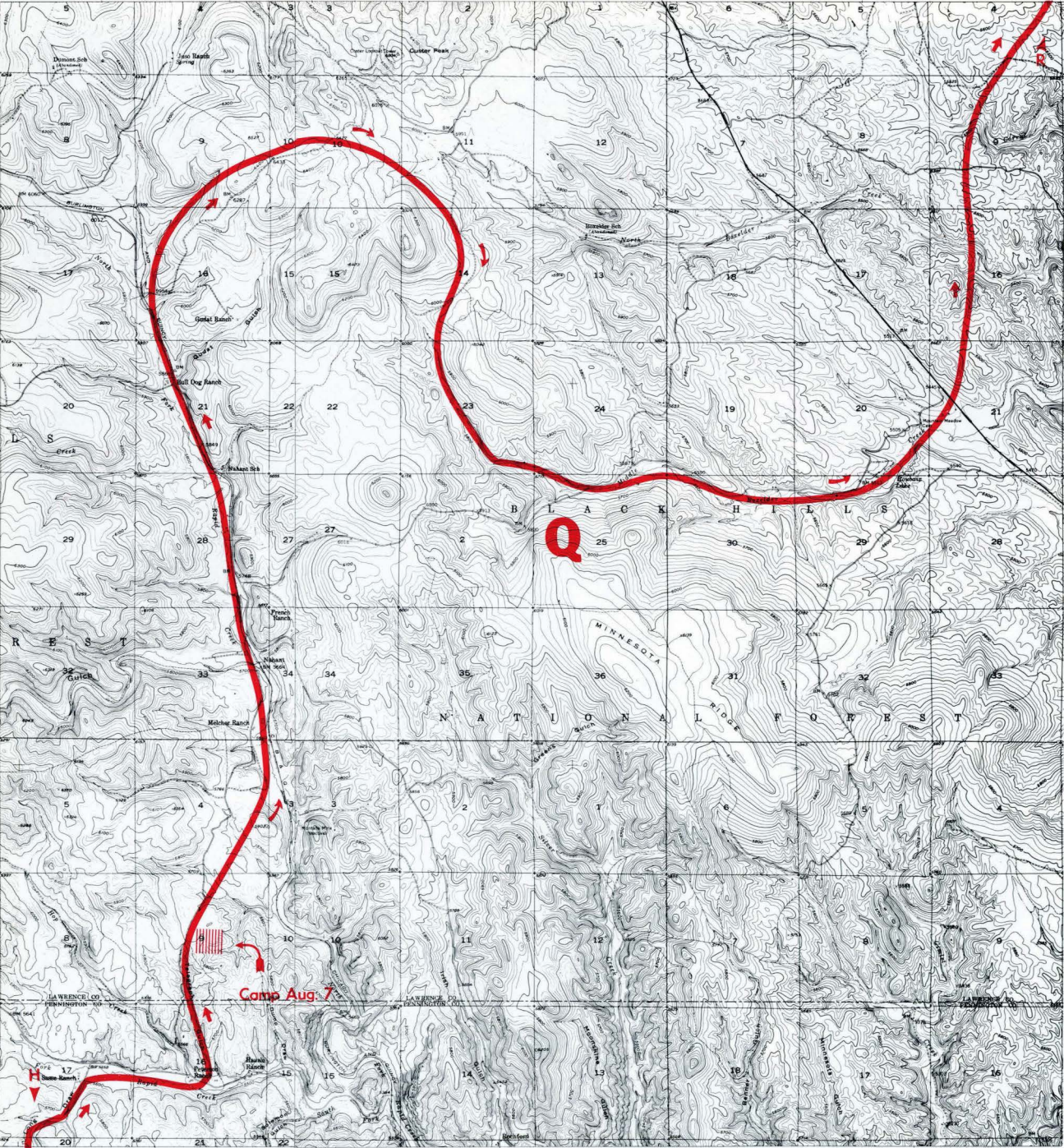


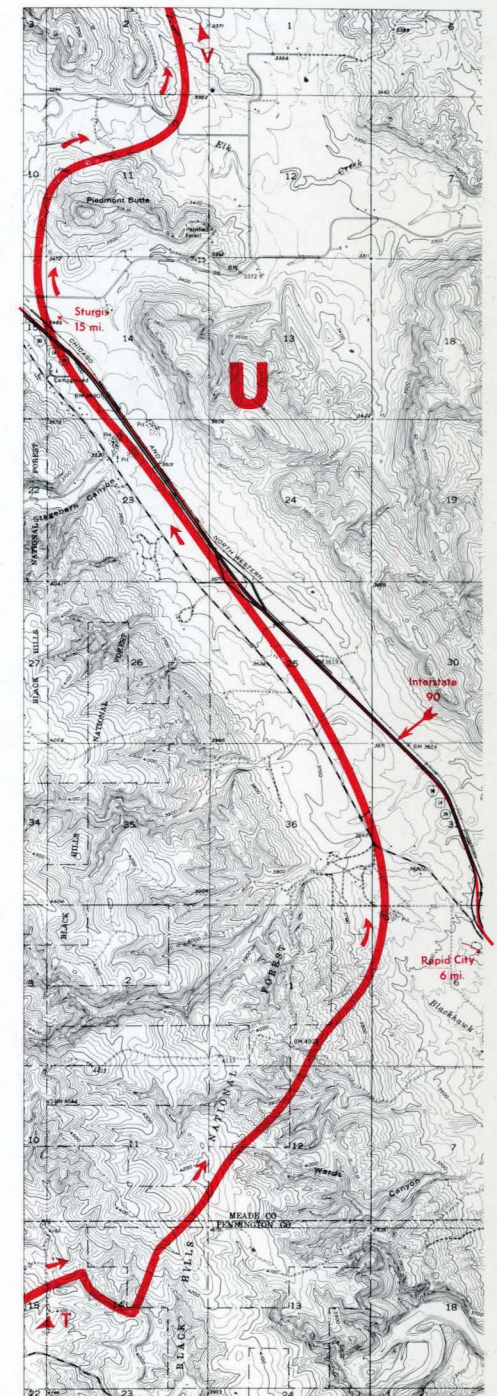
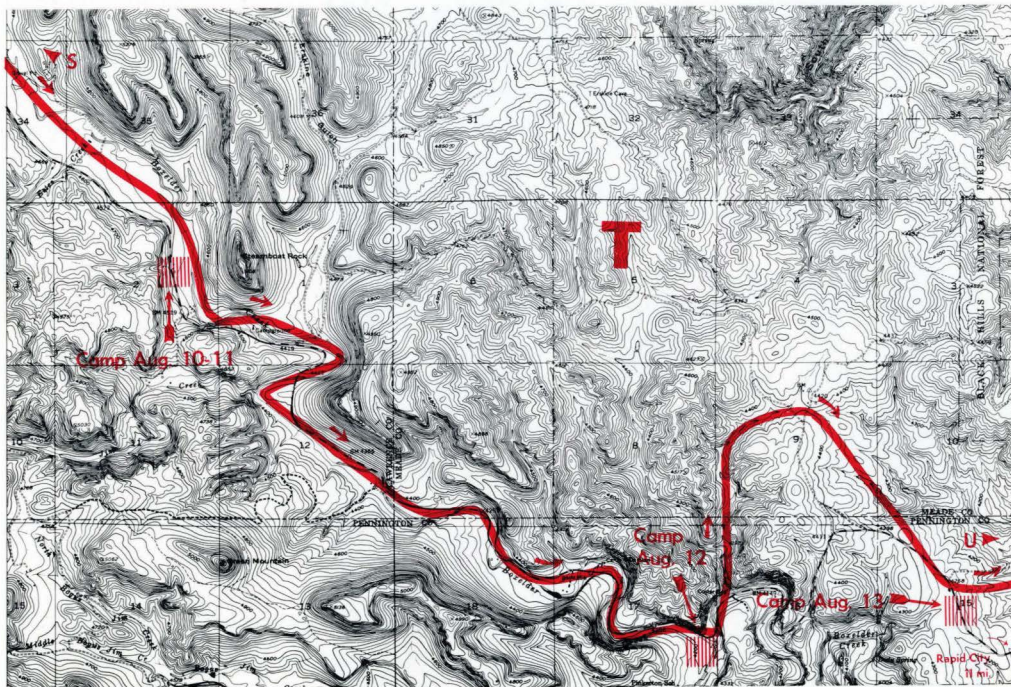


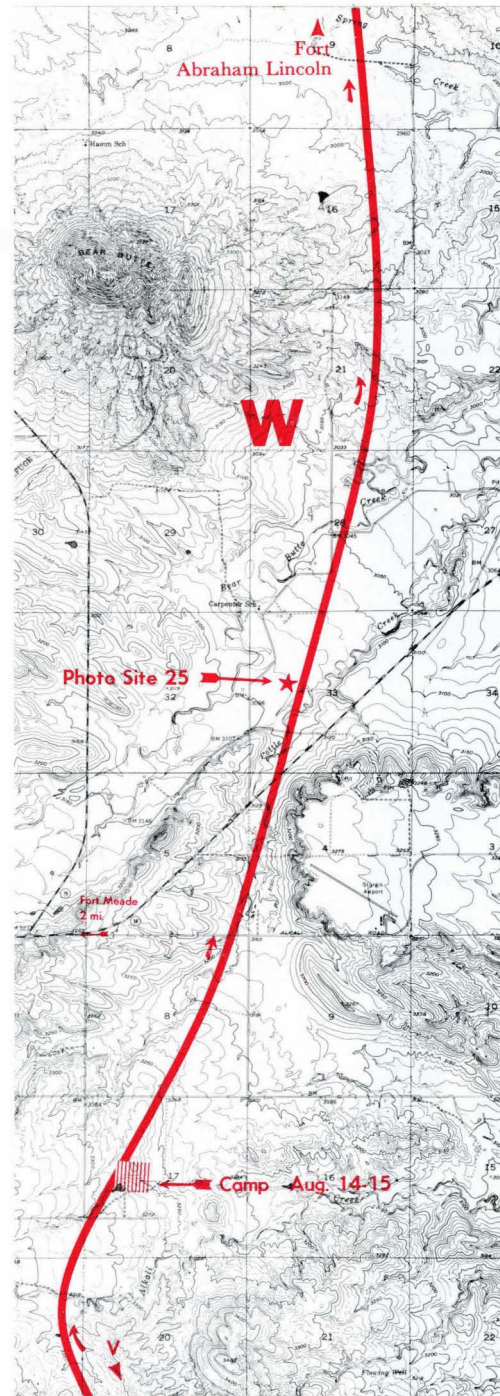
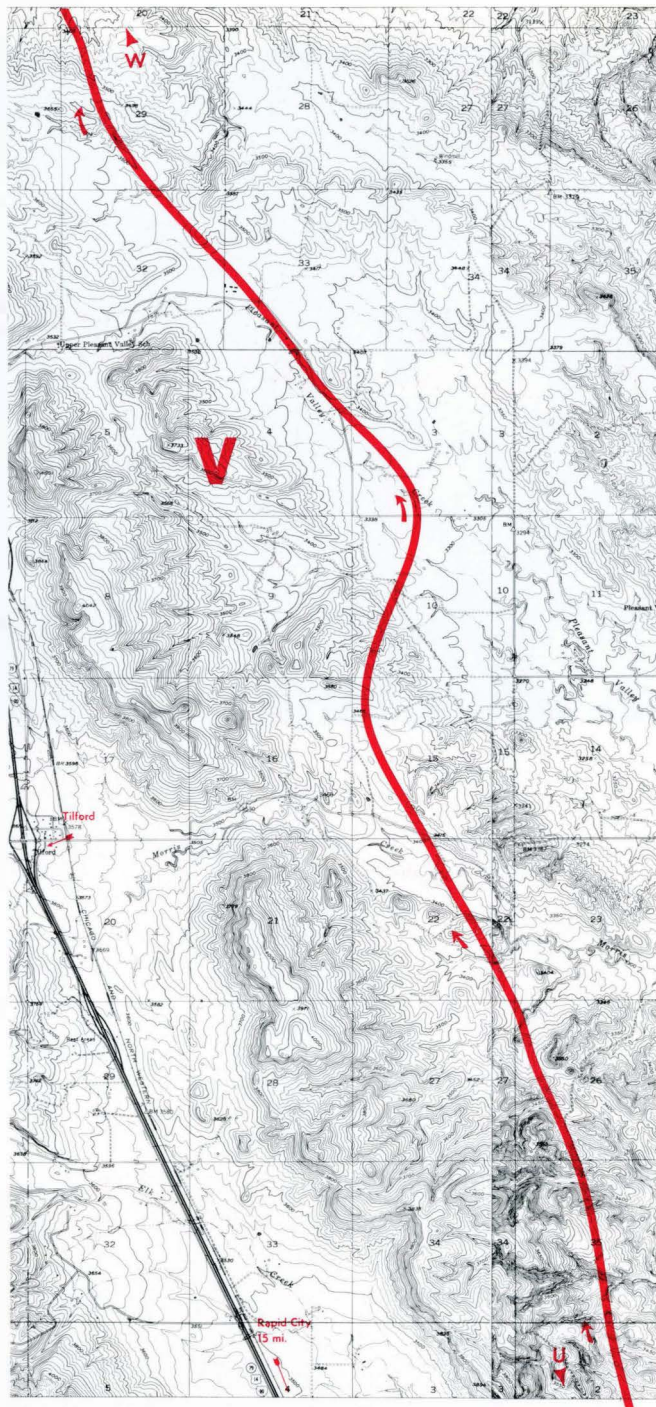




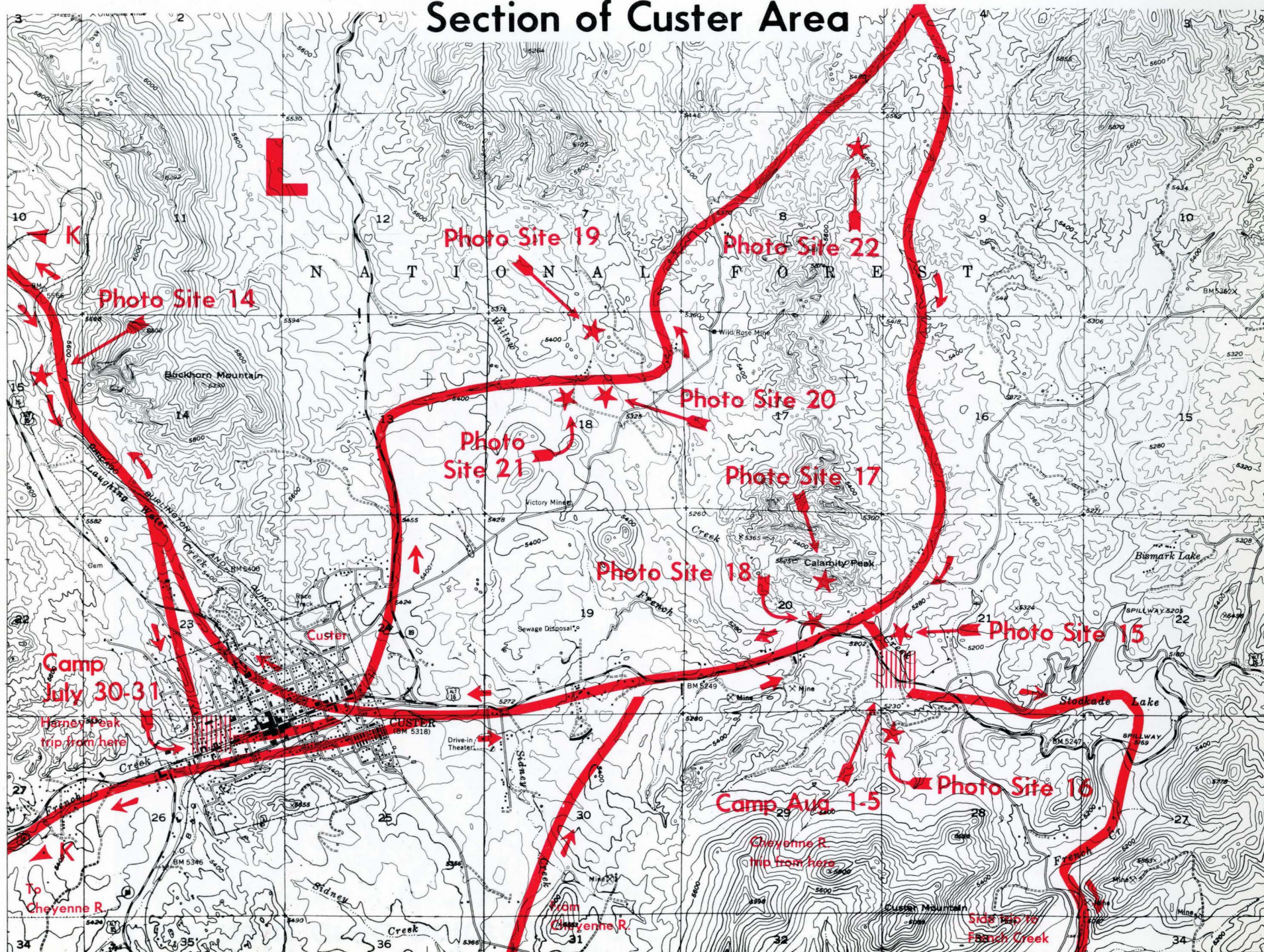




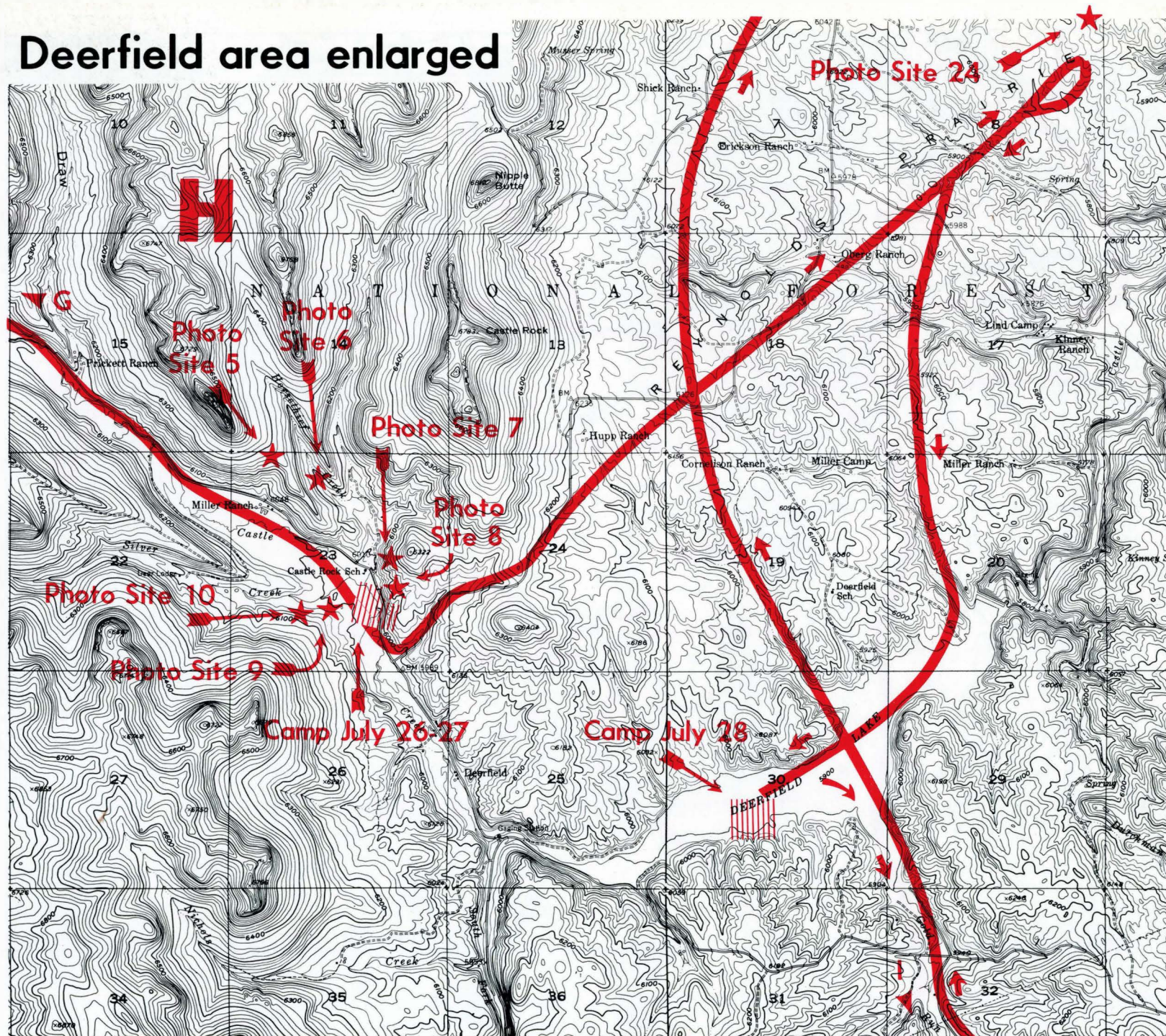




Section of Custer Area



Deerfield area enlarged



What They Saw: A Photographic Album

Finding precise spots at which Illingworth photographed scenes nearly 100 years ago was laborious but often challenging. Several visits were necessary to some areas before a major clue was discovered to indicate the direction of the scene. Features such as mountain profiles, abundance of rocks, thickness of soil, escarpments, and configurations of streams were used as guides to lead to a general locale. By aligning certain of these features as they show in Illingworth's work, it was possible to determine the compass direction for the photographs. Then a search was made for specific rocks or dead trees which led to the "target" spot. Many of these key rocks were hidden by thick stands of young trees (Figures 32B and 35B).

Once the photo site was located, direction and length of tree shadows and extent of shadows on rock walls were studied to determine the time of day Illingworth made his photograph. The date, within a day or two, was determined from Custer's official report of the Expedition. Exact duplication of all

Early morning sunlight casts a long shadow of the 19th century photographer (left), Scratches and dirt mar the top of the negative.

scenes was not possible because time and weather conditions did not permit revisits to some sites.

Photographs in this "album" section are arranged to follow the Expedition route from entrance at Inyan Kara, 12 miles south of Sundance, Wyoming to exit at Fort Meade, near Sturgis, South Dakota,

The spiral binding was selected for this publication so that the pages, when the book is open, will lie flat. Looking at the pairs of photographs with the book open, the 1874 pictures are at top and the 1972-73 pictures are directly beneath.

What to look for: Usually, the most obvious difference between the 1874 photographs and those of the 1970's show up as more trees or heavier cover *now* than a century ago. Many skylines have been changed slightly because heavier tree cover now "rounds off" ridge lines in the later photos. Rock outcrops in the distance or individual rocks or trees in the foreground provide clues to make comparisons.

The 20th century photographer had a clear view in this matching photo (top, right) but faced a wall of trees at another photo site.





Figure 1. A "formal" portrait of the Custer Black Hills Expedition of 1874. It is believed this photo was taken when the wagon train was departing for the Black Hills from its base at Fort Abraham Lincoln on the Missouri River near Bismarck, Dakota Territory, now North Dakota.

Figure 2. Dayton Canaday, director of the South Dakota State Historical Society and Historical Center at Pierre, shows one of the Illingworth glass plate negatives with what is believed to be the original storage box used by Custer Expedition photographer. Plates fit into grooves along the sides of the wooden box which is $6\frac{3}{4}$ inches wide, $8\frac{1}{2}$ inches high and $22\frac{3}{4}$ inches long. The several dozen plates in this collection measure about $4\frac{1}{2} \times 8$ inches in size and are now kept in special glassine, acid-free envelopes to help prevent deterioration of the emulsion.





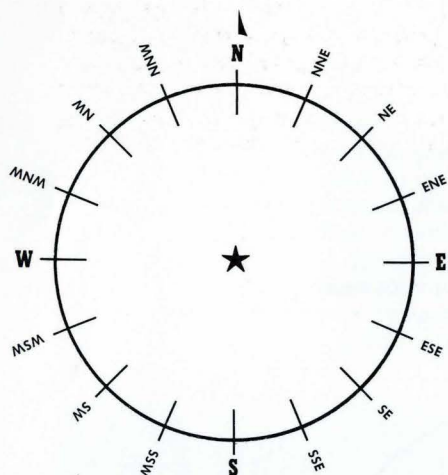
Figure 3. Illingworth's mobile dark-room. This was also used on an expedition to the Yellowstone 2 years earlier. Note the dog taking advantage of the shade beneath the wagon. It is probably one of General Custer's hounds.



Figure 4. Closure of the forest results in thick stands of pine because trees are not naturally thinned by fire or purposely thinned by man. Note the lack of ground vegetation needed by many wildlife species. This photograph was taken in the Black Hills in 1973 and illustrates what is termed a "dog hair" stand.



Figure 5. A healthy pine stand, as this one, should be thinned about every 15-25 years to assure maximum annual growth and allow ground vegetation to develop for wildlife food and cover. Such a stand also uses minimum moisture, thus enhancing water production into streams and reservoirs.



Direction points used with these photographs.

Photo Site 1
Look WSW

Figure 6-A. The 1874 photograph of Inyan Kara Mountain on the western edge of the Black Hills. Note shadow of photographer, his camera and tripod in the foreground.



Figure 6-B. The same scene as in Figure 6-A but taken nearly a century later. Note more trees in the background and that tree stumps still exist and are in virtually the same spots (foreground) as nearly 100 years earlier.



**Photo Site 2
Look SE**

Figure 7-A. One of the first photographs made when the Expedition got into the Black Hills proper. This is the upper region of Castle Creek viewed downstream. Note the men and horses (center).



Figure 7-B. Cut road bank prevented the modern photographer from recording the exact scene as in Figure 7-A. Black Hills spruce grow on the more moist north facing slopes (right) while ponderosa pine dominate the drier south and west slopes (left). Compare this set of photos to evaluate closure of forest under past fire suppression programs.



Photo Site 3
Look NNW

Figure 8-A. The Expedition's wagon train wends down Castle Creek Valley toward the camera site high on a ledge. Note open slopes and burned tree snags which are still standing a century later.



Figure 8-B. Another example of forest closure are these modern views looking toward the valley which the Expedition wagon train traveled nearly a century before. The inset (8-C) was taken about 20 feet to the left of Illingworth's site to show dense pine stands which have developed since 1874. A road now skirts the valley to the right of where the Expedition passed.



**Photo Site 4
Look SE**

Figure 9-A. Looking down Castle Creek from the same bluff where Figure 8-A was taken. Tracks can be seen on the valley floor indicating wagons had passed this location. Arrows and numbers refer to identifiable tree trunks as seen in the modern view (Figure 9-D, page 49).



Figure 9-B. Trees block the view in the distance in this modern photograph taken from the same spot where Illingworth photographed Figure 9-A.





Figure 9-C. A better view of the valley and the quite evident closure of forest on distant slopes is shown in this offset location (corresponding to Figure 9-A) in which the camera was moved a short distance from the original Illingworth site.

Figure 9-D. This modern offset site scene shows the remains of some tree trunks (arrows and numbers) as shown in the 1874 photograph (Figure 9-A).

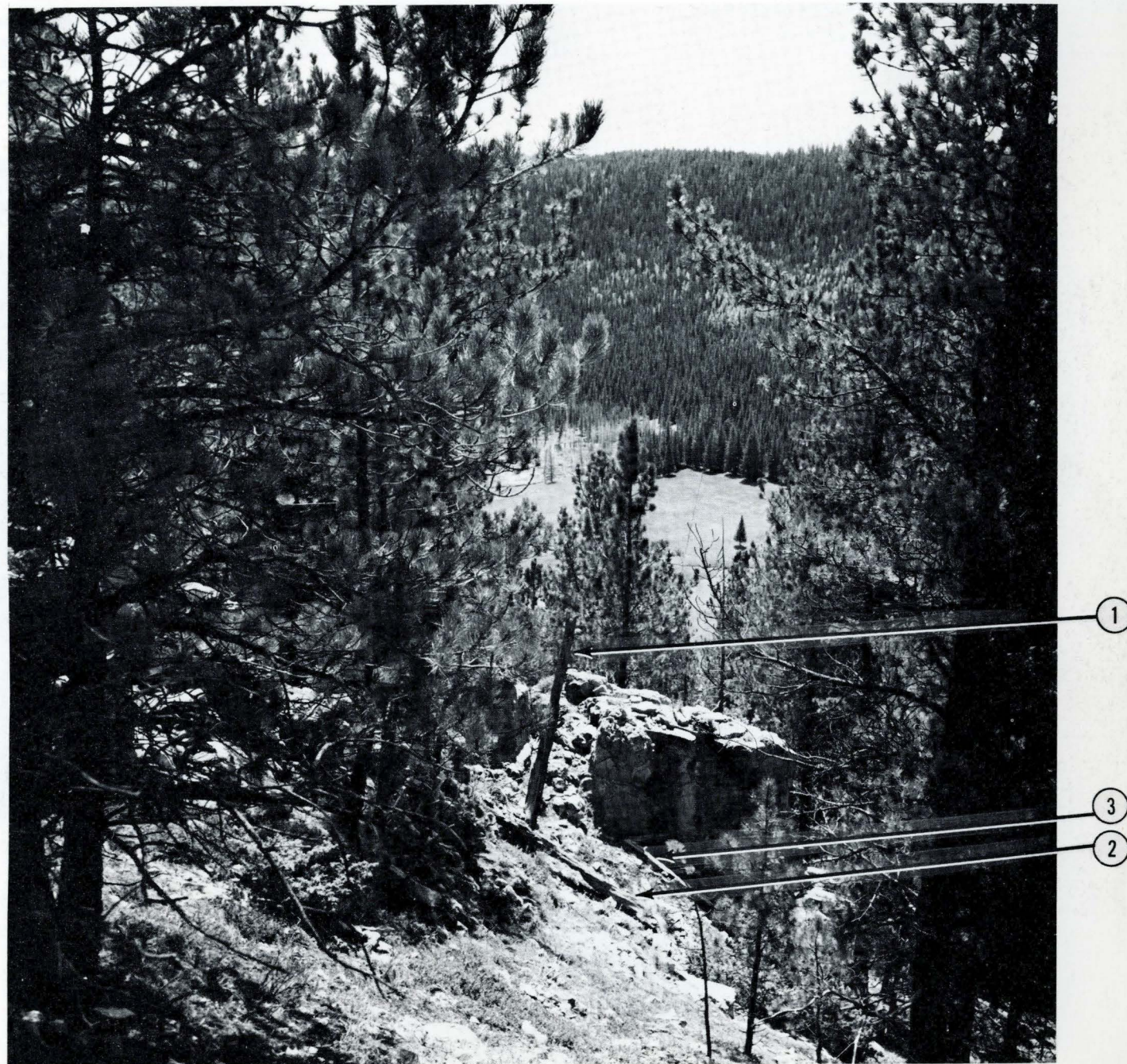


Photo Site 9
Look NE

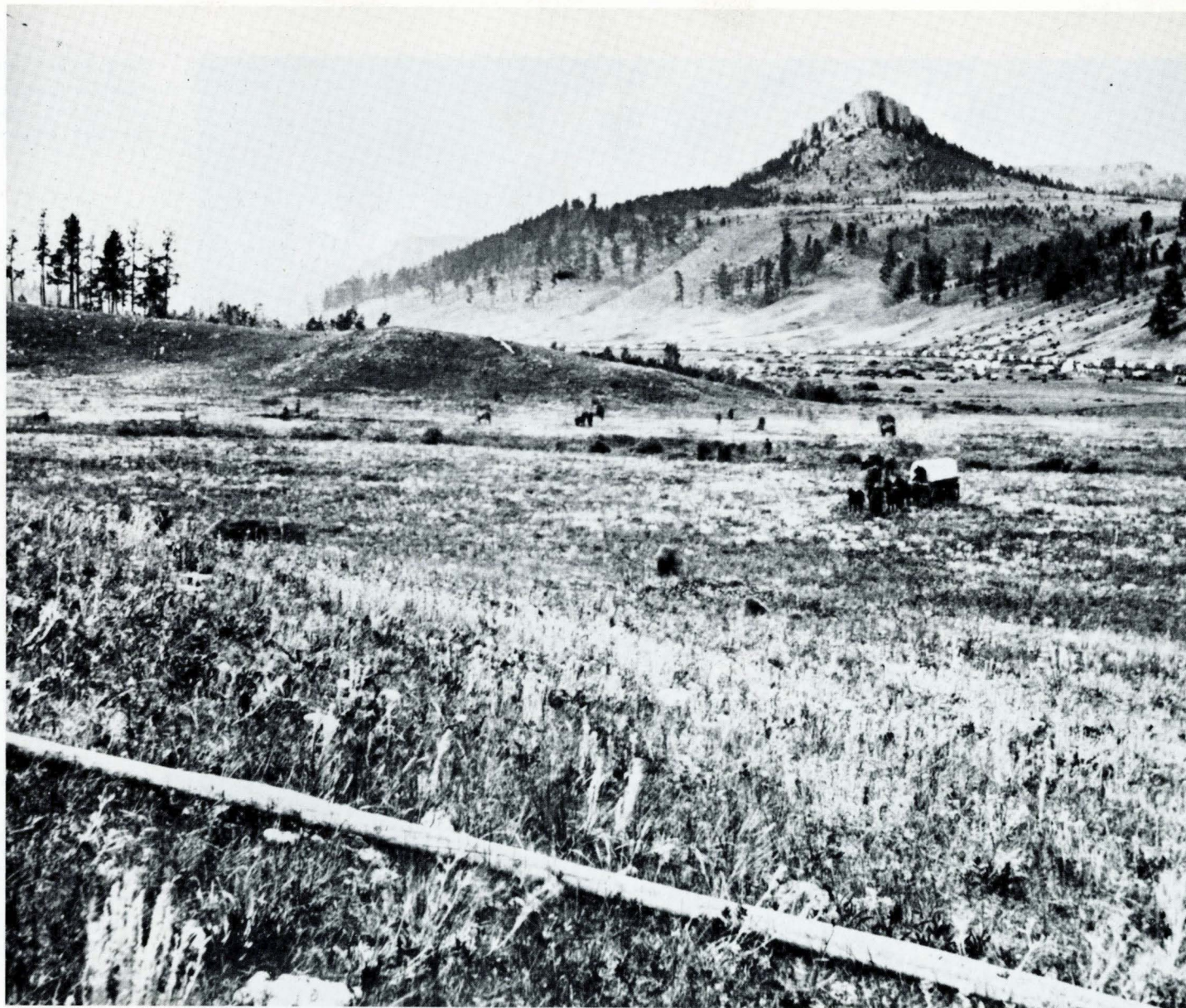


Figure 10-A. The Expedition begins to make camp in an area near the present community of Deerfield, S. D. A limestone outcrop is a prominent towering landmark in the distance. Silver Creek flows in the foreground from the left.



Figure 10-B. Viewed today, the limestone outcrop and adjoining background slopes are now grown over with pine trees. A fence in the foreground reveals that the previously wide mountain meadow is now a pasture for cattle.

Photo Site 8
Look SW

Figure 11-A. Part of the encampment shown in Figure 10-A. The open "park-like" forest is evident on the far slope.

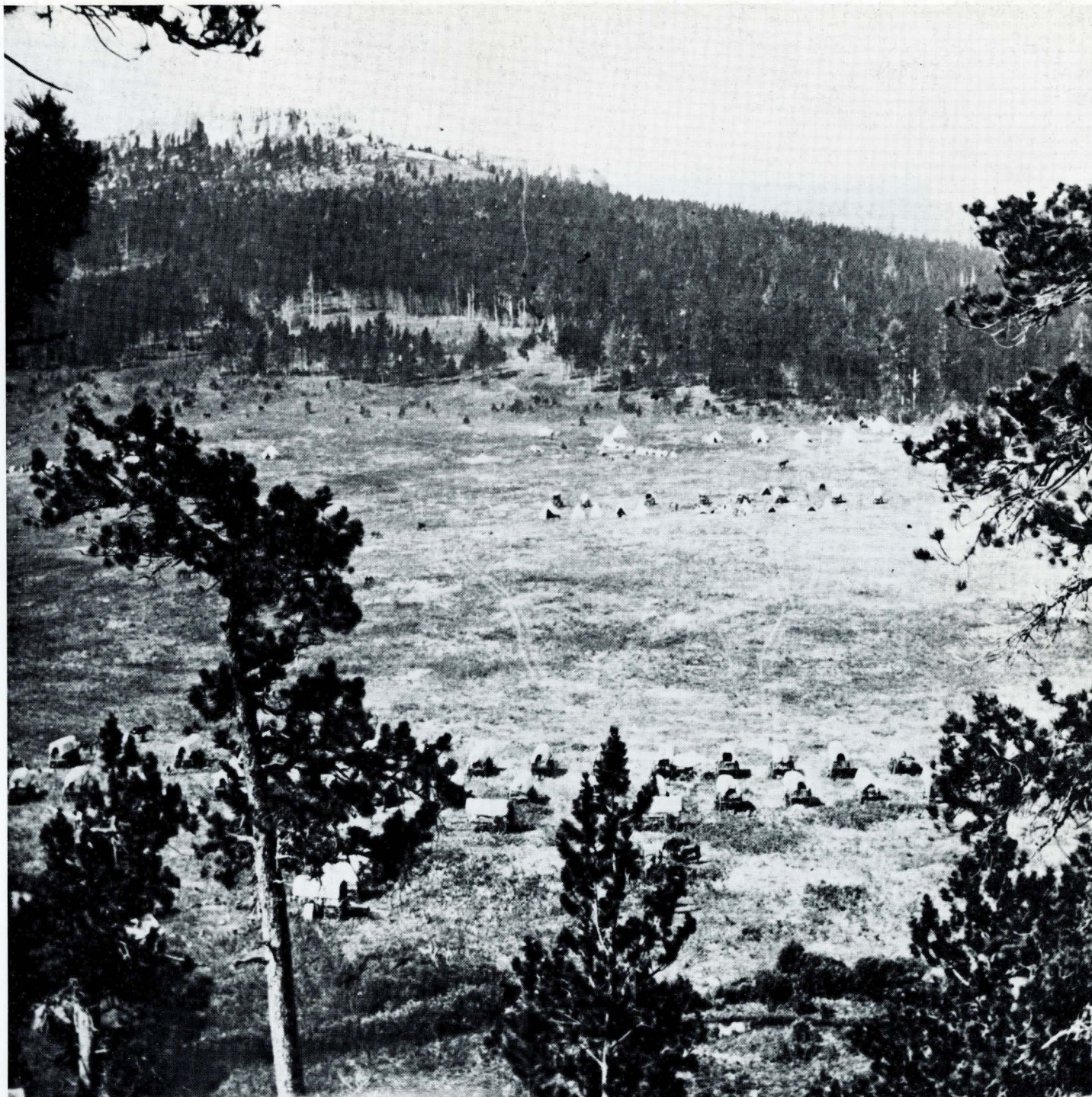


Figure 11-B. A century of ecological changes, mainly caused by man, have allowed pines to become excessively dense in some areas as shown in this companion photograph to Figure 11-A.



**Photo Site 8
Look W**

Figure 12-A. Another view of the Deerfield camp looking up Silver Creek near its confluence with Castle Creek at right. Note the horses grazing beyond the line of tents and the "laundry" spread on bushes along the stream at lower left.



Figure 12-B. A comparison of this 1973 view with the 1874 photograph (Figure 12-A) provides a striking example of how the forest has "closed."



Photo Site 7
Look NNE

Figure 13-A. Nipple Butte in the Deerfield area near the Expedition campsite as seen from the same slope as in Figure 12-A, but from a different direction.



Figure 13-B. A young pine frames this modern companion photo of Figure 13-A.



**Photo Site 5
Look SE**

Figure 14-A. Looking down Castle Creek, Illingworth caught another view of the Deerfield encampment showing grazing horses, clustered wagons, tents and campfires in the lush mountain meadow. The lines in the upper right center of this photograph are from imperfections in the original glass plate—possibly a fingerprint . . . of Custer? . . . of Ludlow? . . . of Illingworth?



Figure 14-B. The top of Hat Mountain in the distance remains in prairie but lower and distant hills have become overgrown with pine. The Deerfield community is around the far bend of the road.



Photo Site 6
Look NE

Figure 15-A. Nipple Butte (see also Figure 13-A) as observed in 1874 from a nearby slope. Aspen and pines grow along drainage areas.

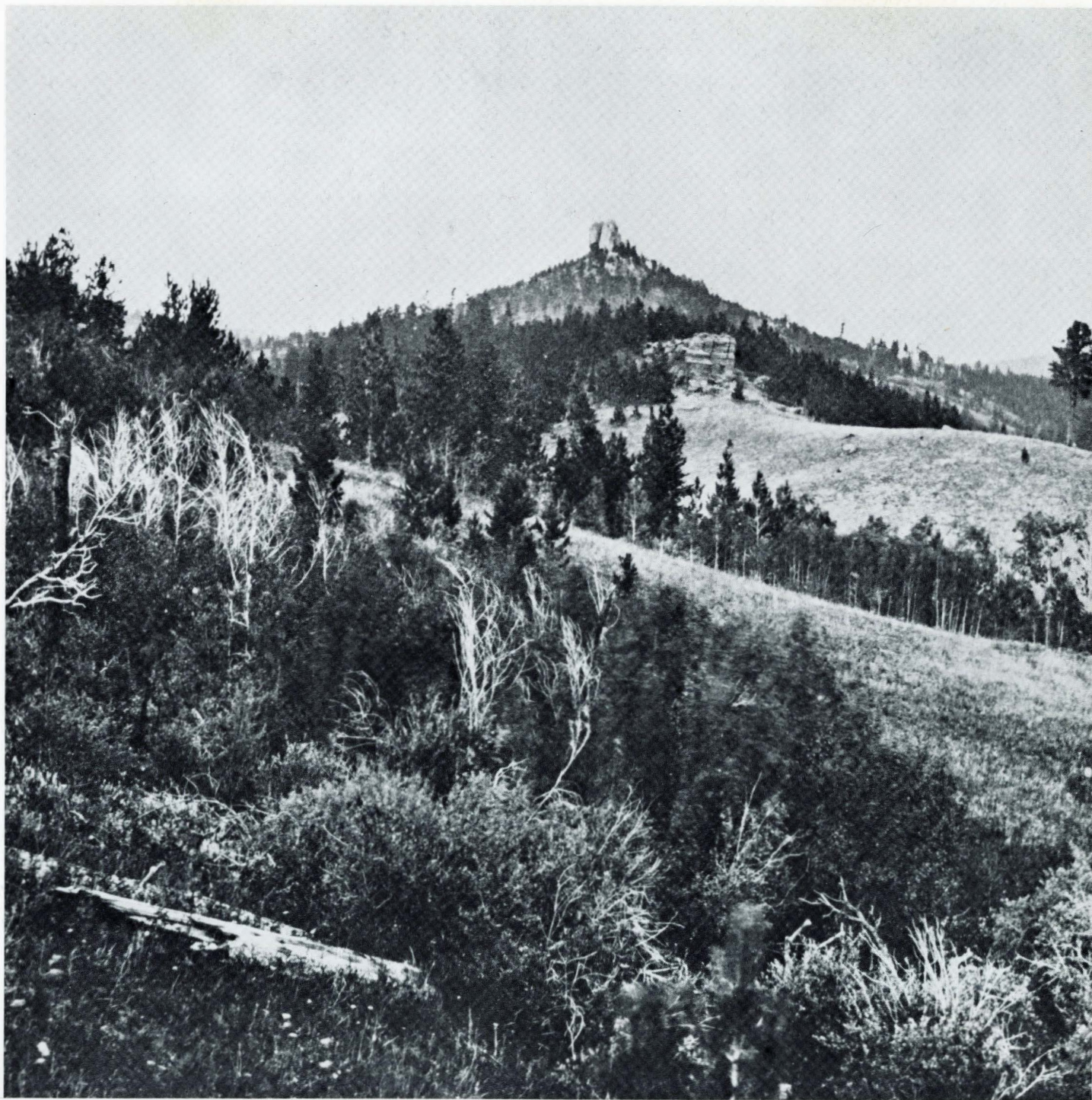




Figure 15-C (inset). To show Nipple Butte it was necessary to move or offset the modern camera site about 20 feet to the right. Note the same two rocks on the rise in mid-distance as in Figure 15-A.

Figure 15-B. Although a wall of trees today obscures the view of Nipple Butte as Illingworth saw it, startling changes have occurred in the forest on these slopes during the past 100 years. As in most other open grasslands in the Black Hills, the area is currently grazed by livestock.



**Photo Site 24
Look NW**

Figure 16-A. This pile of elk antlers was found by the Custer Expedition as it crossed a Black Hills meadow. Indians in the area must have used the antler pile for ceremonies or as a landmark. Originally named Elkhorn Prairie because of the many shed elk antlers found there, the opening is now called Reynolds Prairie.



Figure 16-B. This photo shows a prairie situation today similar to that of the area shown in Figure 16-A. It is not a matching photo.



**Photo Site 11
Look NNE**

Figure 17-A. Illingworth called this "Turkey Rock" when he photographed it in 1874. (Photo from National Archives.)



Figure 17-B. Today the background slopes from "Turkey Rock" are more heavily wooded. Turkey Rock was as elusive as its namesake, the wild turkey, as many hours were spent in seeking this formation.



**Photo Site 12
Look E**

Figure 18-A. Gold Quartz Mountain in 1874. Natural fires were probably the major factor which prevented the forest from becoming thicker.





Figure 18-C (inset). This modern photograph was offset about 30 feet to the left to obtain a view of the background hills and thicker pine cover to nearly match Figure 18-A.



Figure 18-B. Note corresponding rocks (foreground) in this modern match to Figure 18-A.



**Photo Site 12
Look SE**

Figure 19-A. Another 1874 view of Gold Quartz Mountain. This plate apparently was broken and then rejoined.





Figure 19-C (inset). This offset view was taken about 15 feet to the right of Illingworth's site so that the background would be included.

Figure 19-B. This later photo toward Gold Quartz Mountain shows the thickened pine forest.



**Photo Site 13
Look E**

Figure 20-A. Several areas of the granite range north of Custer, S. D., and Crazy Horse Monument were included in Illingworth's photographs. Soil is relatively shallow, thus the forest is somewhat naturally restricted.



Figure 20-B. A striking combination of natural and man-caused changes over the past century can be observed in this photograph. Excluding fire as one of Nature's management tools has probably been the major factor in allowing the pine to "come in" much thicker. Construction of Highway US 385, domestic livestock grazing and killing of the willow by the willow borer undoubtedly have been the major factors which have eliminated much of the shrub vegetation along the valley bottom.



**Photo Site 14
Look NNE**

Figure 21-A. Late afternoon sunshine causes long tree shadows and emphasizes crevices in the distant rock wall. Note the soldiers in the right foreground shadows.



Figure 21-B. Illingworth called the scene "Sunshine and Shadow Mountain." This interesting rock formation is just north of the city of Custer along Highway 385.



**Photo Site 15
Look S**

Figure 22-A. Illingworth photographed several scenes of the "Permanent Camp" in the meadow flats adjacent to the west end of Stockade Lake and east of the city of Custer. Smoke from campfires hangs over the tents and grazing horses. The hills in the background are sparsely timbered. Compare this photograph with Appendix Figure A-3 and note the photographer must have removed—or added—a small pine tree at center foreground.





Figure 22-C. This modern photograph was taken from in front of the trees (in Figure 22-B) to show the background.



Figure 22-B. Trees obstruct the view of Figure 22-A as seen from the same spot today, thus comparative scenes, Figures 23-B and 23-C, were taken a short distance to the right.

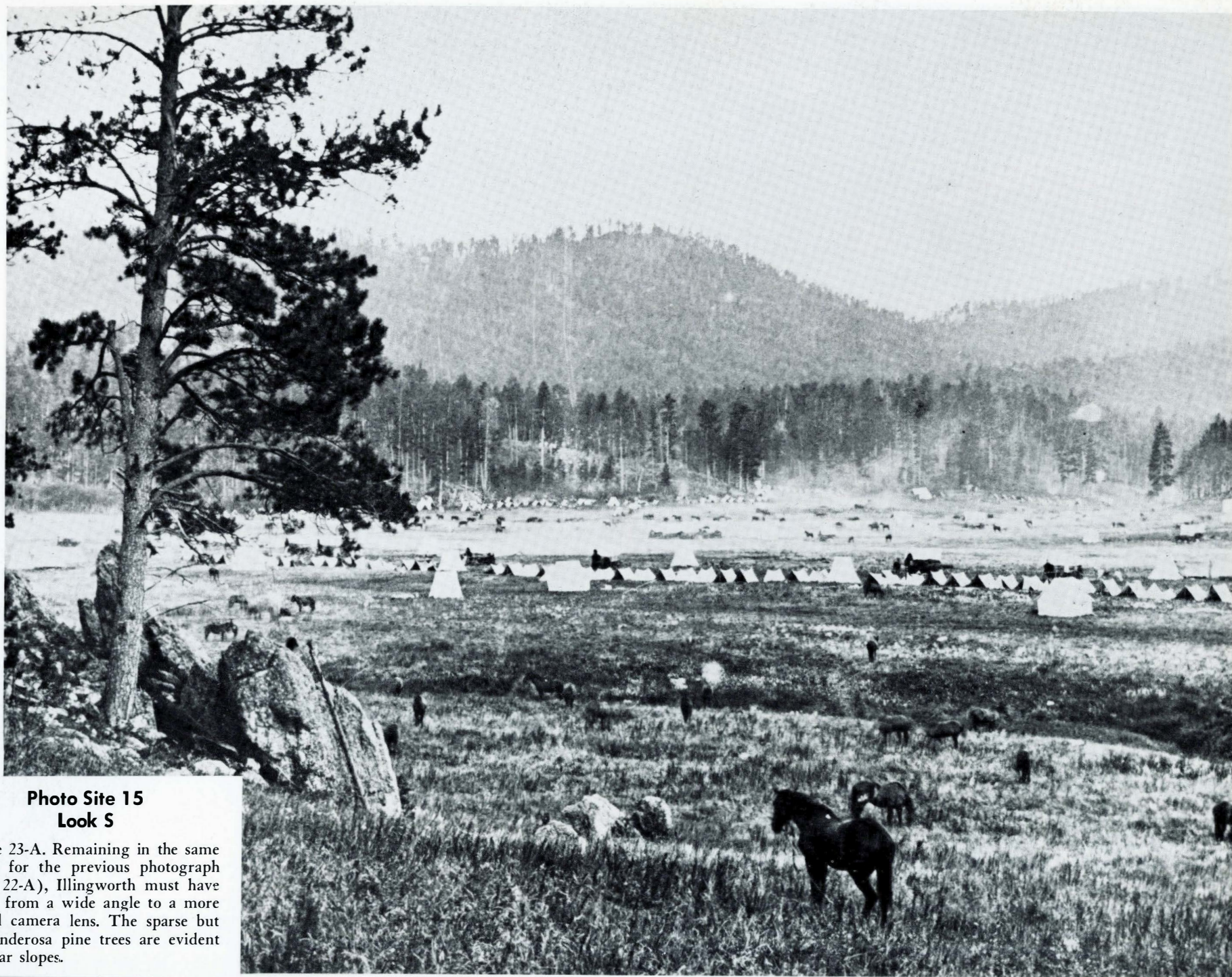


Photo Site 15
Look S

Figure 23-A. Remaining in the same spot as for the previous photograph (Figure 22-A), Illingworth must have changed from a wide angle to a more powerful camera lens. The sparse but large ponderosa pine trees are evident on the far slopes.



Figure 23-C. The hills in the background are now producing excellent timber and wildlife habitat because the pine stands have been thinned. They are part of a U. S. Forest Service intensive management area.



Figure 23-B. The distant hills are screened by trees and to show them today (Figure 23-C) the photographer moved to the right.

**Photo Site 16
Look N**

Figure 24-A. Illingworth captured this Permanent Camp scene from high rocks situated across the valley in the left center of the Figure 22 and 23 series of photographs which were taken from the edge of the row of pines jutting into the meadow above the row of tents.



Figure 24-B. The scene in Figure 24-A today, similar to many others, shows the forest growth. This photograph illustrates man's use of the locality. The distant hills (to the north) are known as the "Needles." The highway is from Custer (to the left) into Custer State Park and along Stockade Lake (to the right). A South Dakota historical marker (not shown here) is along the highway left of center.



Photo Site 16
Look NNE

Figure 25-A. The photographers in 1874 and 1972 swung their cameras to the left from the views in Figures 24-A and 24-B. The same line of tents appears in both photos— 24-A and 25-A.



Figure 25-B. A tourist rock shop shown in this modern match for Figure 25-A now occupies nearly the same place where tents were set a century ago. Replica covered wagons now stand almost exactly where Expedition wagons were parked in 1874.



Photo Site 16
Look NW

Figure 26-A. Remaining at the same spot with the camera swung still more to the left than for the Figure 25 series, this 1874 scene shows a few tents of the Permanent Camp which was strung along the valley. An earlier, one-night camp was set up near the downtown area of the present city of Custer. The General then moved his Expedition to this site for 6 days because of more plentiful grass and water.



Figure 26-B. The forest has not spread out appreciably in this area (matching Figure 26-A) because of the bare granite hills. Stands have thickened, however, since 1874.



**Photo Site 17
Look N**

Figure 27-A. This 1874 scene near the Permanent Camp shows an old weathered pine tree in the crevice of the rocks.



Figure 27-B. Weathering of dead trees is obviously a slow process in the Black Hills. Note the same tree and its branches in both this photo and Figure 27-A. The present day photographer was able to capture more background details than did the photographer in 1874.

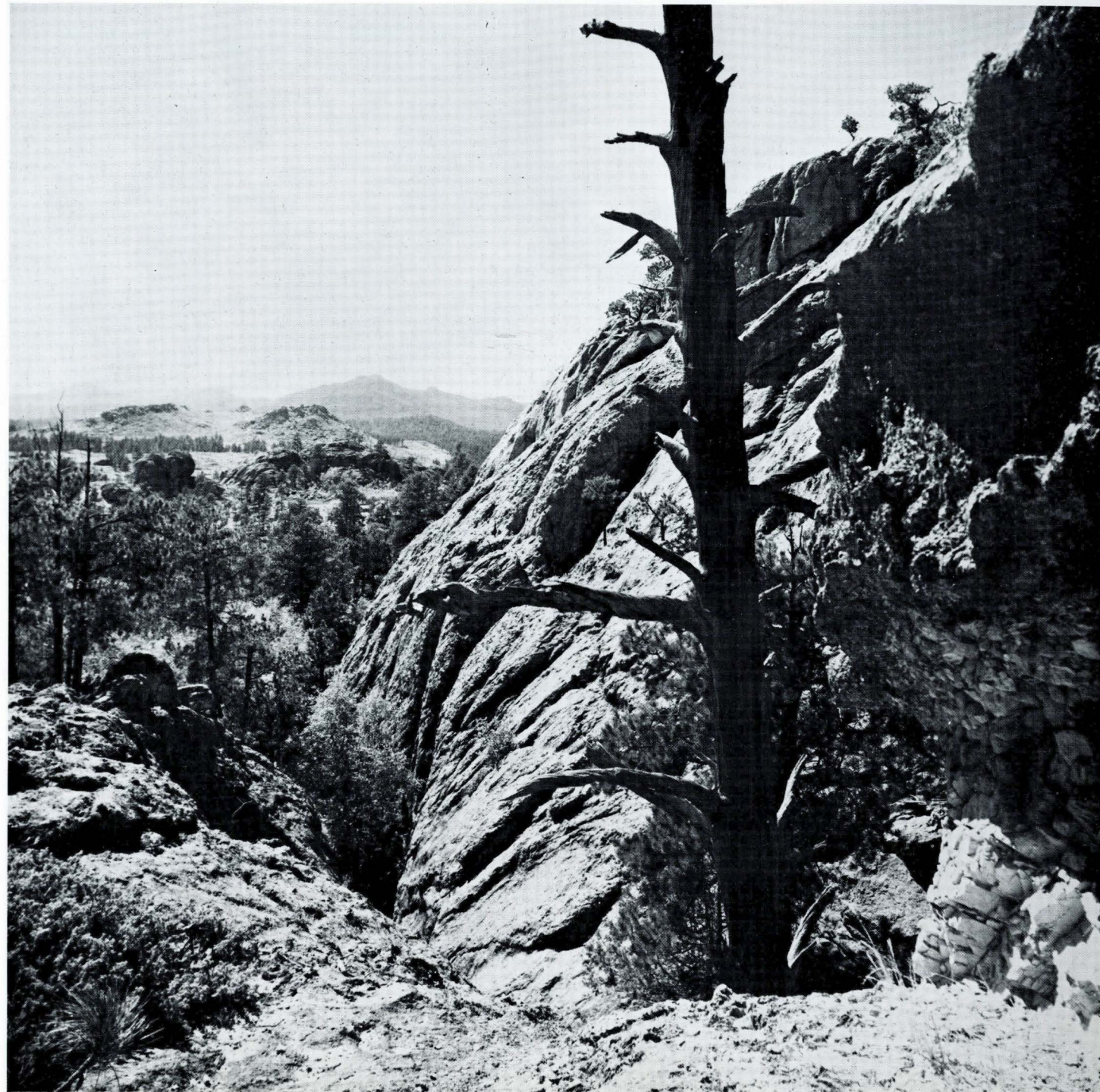


Photo Site 17
Look ESE

Figure 28-A. Figure series 27, 28 and 29 were taken from Calamity Peak near the Permanent Campsite east of Custer. This one is a view towards the east showing relatively few trees on the distant hills in 1874.



Figure 28-B. Closure of the forest is evident in this modern photo. Note man-made Stockade Lake in the upper right and road leading up a meadow (center).



Photo Site 17
Look SE

Figure 29-A. Another 1874 view from Calamity Peak showing a string of tents within a curve of French Creek. Note the wagon road that has been formed to the right of the tent line.



Figure 29-B. In addition to the thickened forest, note that the stretch of gravel road (which is old Highway 16) runs almost precisely where the wagon road did a century ago. The bends in French Creek are still identical. The same tree is in the foreground of both photos but very little growth has taken place because of the lack of soil nutrients and available moisture. A marked grave, dated 1876, of a private of the 5th Cavalry is at the edge of the road near the white building in upper center.

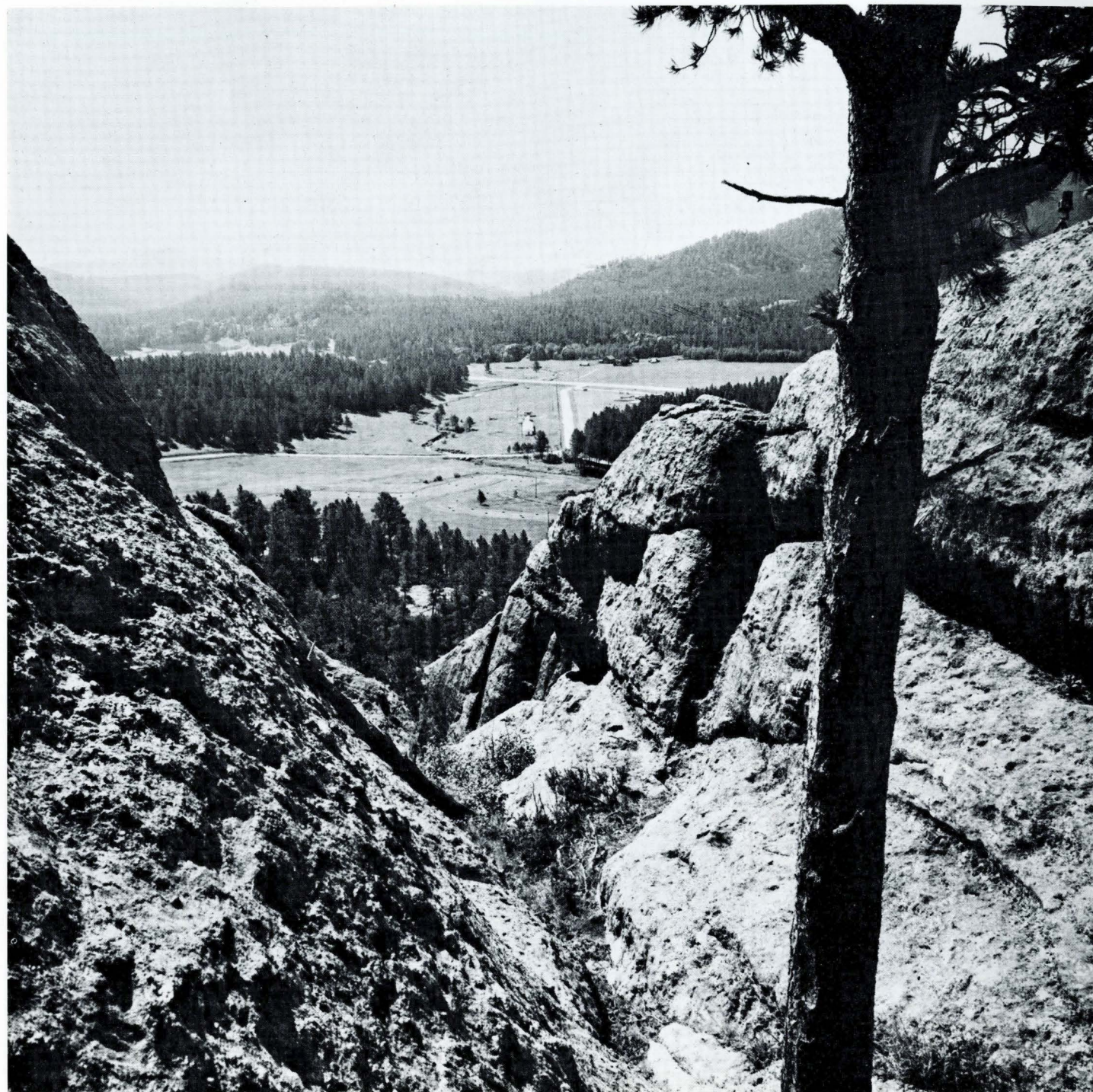


Photo Site 18
Look WNW

Figure 30-A. This is the meadow on French Creek at the base of Calamity Peak where gold in paying quantity was found. Reports differ on where (and when) gold was first discovered. One report states it was at this point, other reports state it was at the site of the present city of Custer. Horatio N. Ross, a civilian miner with the Custer Expedition, is credited with discovering gold on July 27, 1874. Following the Expedition, Ross returned to Custer in 1875 and engaged in mining and as sheriff of Custer County for many years. (Photo from National Archives.)





Figure 30-B. Trees have grown around the original photo site (shown in inset); thus, the photographer moved down in front of them for this scene. Man's use of the area is reflected by fences, mowed fields, and roadways. The nearest background hills were recently ravished by a wild fire. When fire—natural or prescribed—is excluded from the pine ecosystem in the Black Hills, young trees fill in the openings. These young trees then compete for soil nutrients, sunlight and moisture with themselves, and older trees and grass and forb species needed for wildlife habitat. The forest floor becomes a tinderbox of pine needles, cones and branches. When wildfire comes, it burns so hot everything is destroyed.

Photo Site 18
Look NNW

Figure 31-A. A different view of one reported gold discovery site. Perhaps the second figure from the left is Horatio N. Ross, the civilian miner who accompanied the 1874 Expedition. (Photo from National Archives.)



Figure 31-B. Highway 16A east of the city of Custer was constructed through the original photo site and tall trees now obstruct the view of lower Calamity Peak. The locale also proved to be an attractive one for a modern home (inset).

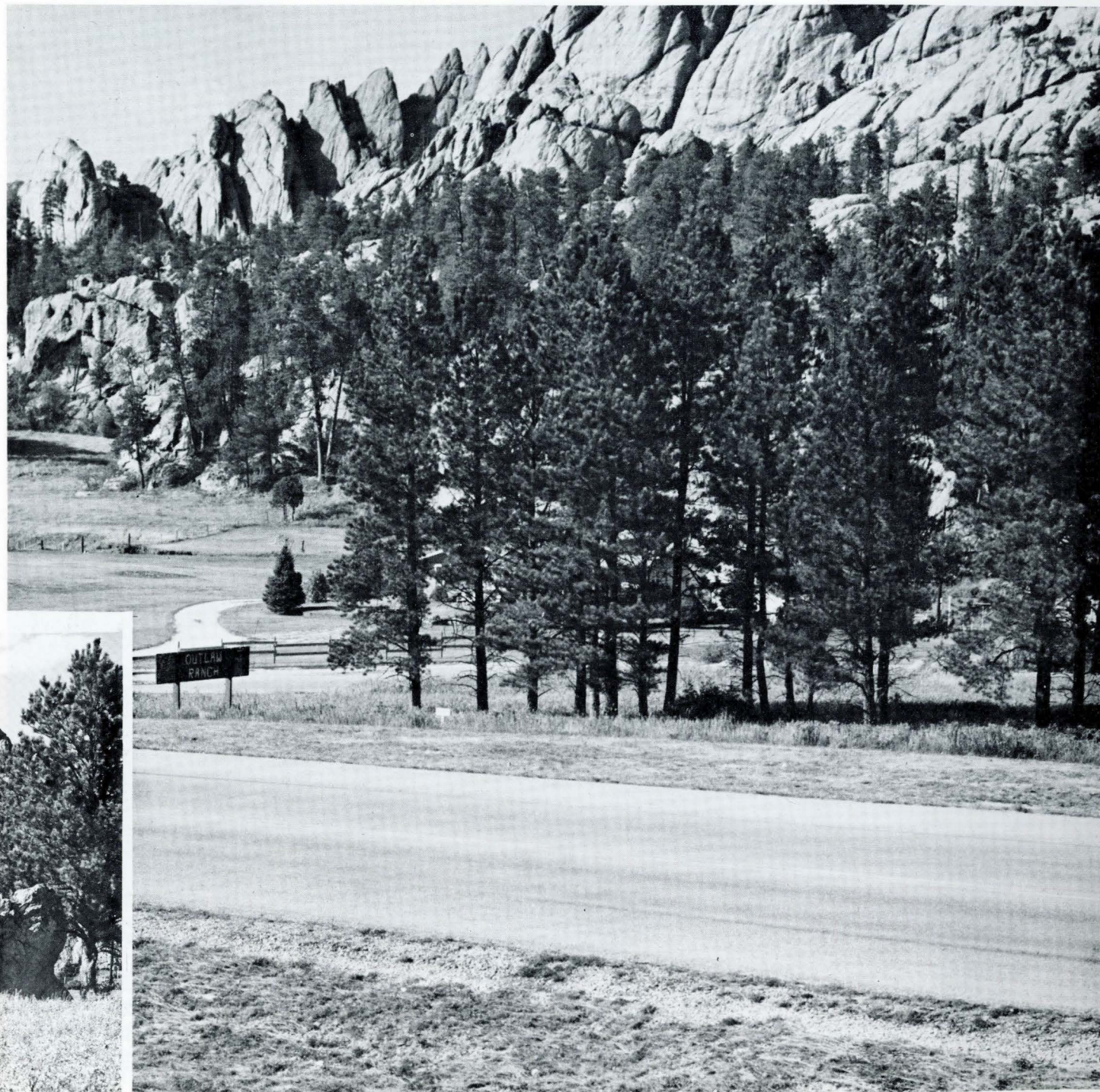


Photo Site 19
Look NNW

Figure 32-A. This picturesque meadow seems to flow out of Cathedral Rock in the background. Relatively few trees were growing on the slopes and ridges in 1874. Some young trees can be seen in the open foreground.



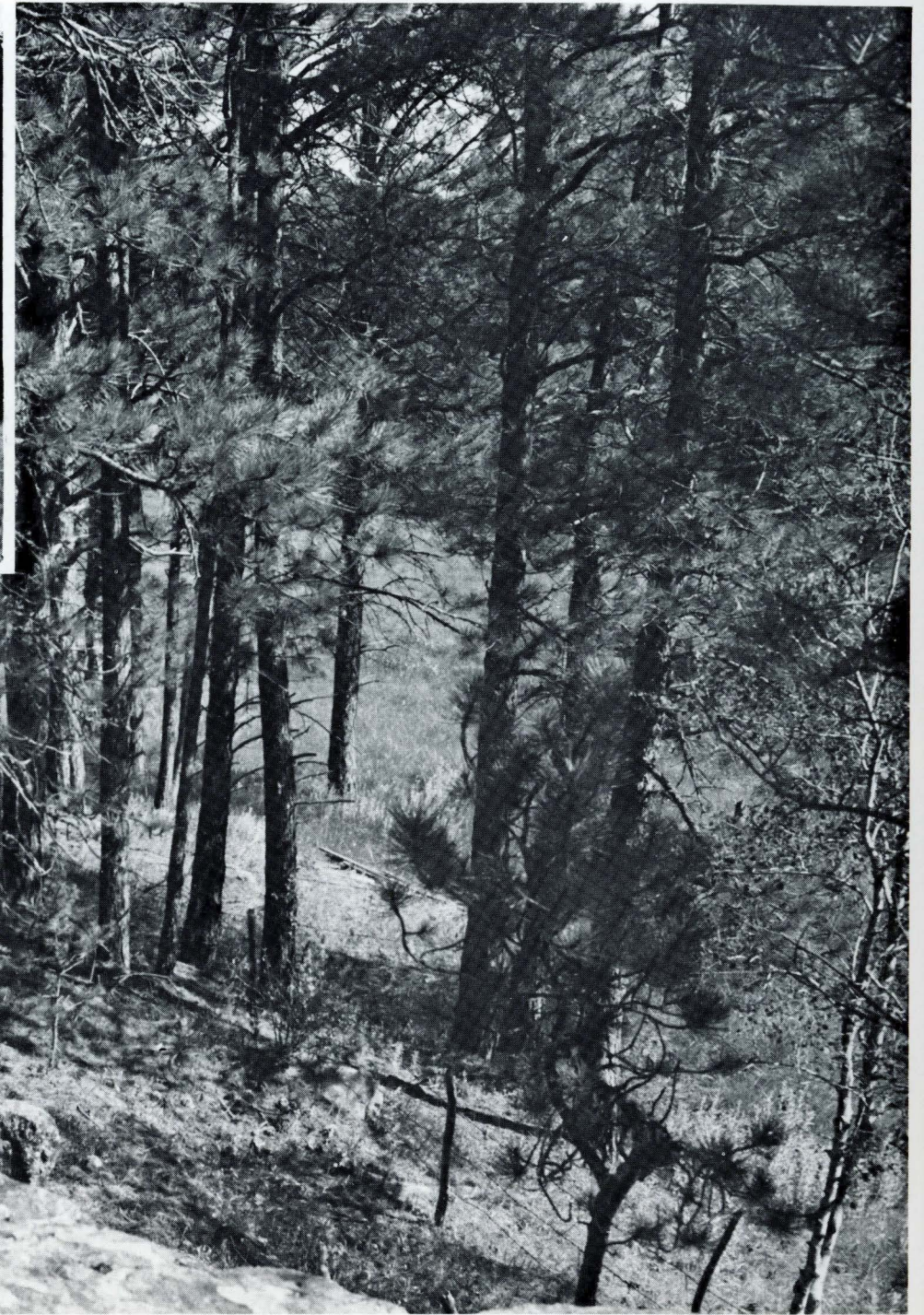


Figure 32-C (inset). An offset was necessary to photograph the same meadow shown in Figure 32-A. Barbwire fences are common in the area now.

Figure 32-B. With today's camera set at the same spot, the meadow is not visible because forests have thickened and in many places have encroached on previously open areas. The same pointed flat rock (bottom left) in this and in Figure 32-A identifies the exact location.

Photo Site 19
Look SSE

Figure 33-A. This 1874 scene is at the mouth of the meadow in Figure series 32.





Figure 33-C (inset). Offsetting slightly from the screen of trees in Figure 33-B, change is readily noted in vegetation since 1874 as well as man's cultural signs such as fences, power poles and livestock shelters. The conical hill on the right has been burned off.



Figure 33-B. The scene today is screened by a few ponderosa pine trees which grew around the landmark rocks in front of Illingworth's camera.

**Photo Site 21
Look NW**

Figure 34-A. Another "open" meadow north of the Permanent Camp in 1874.



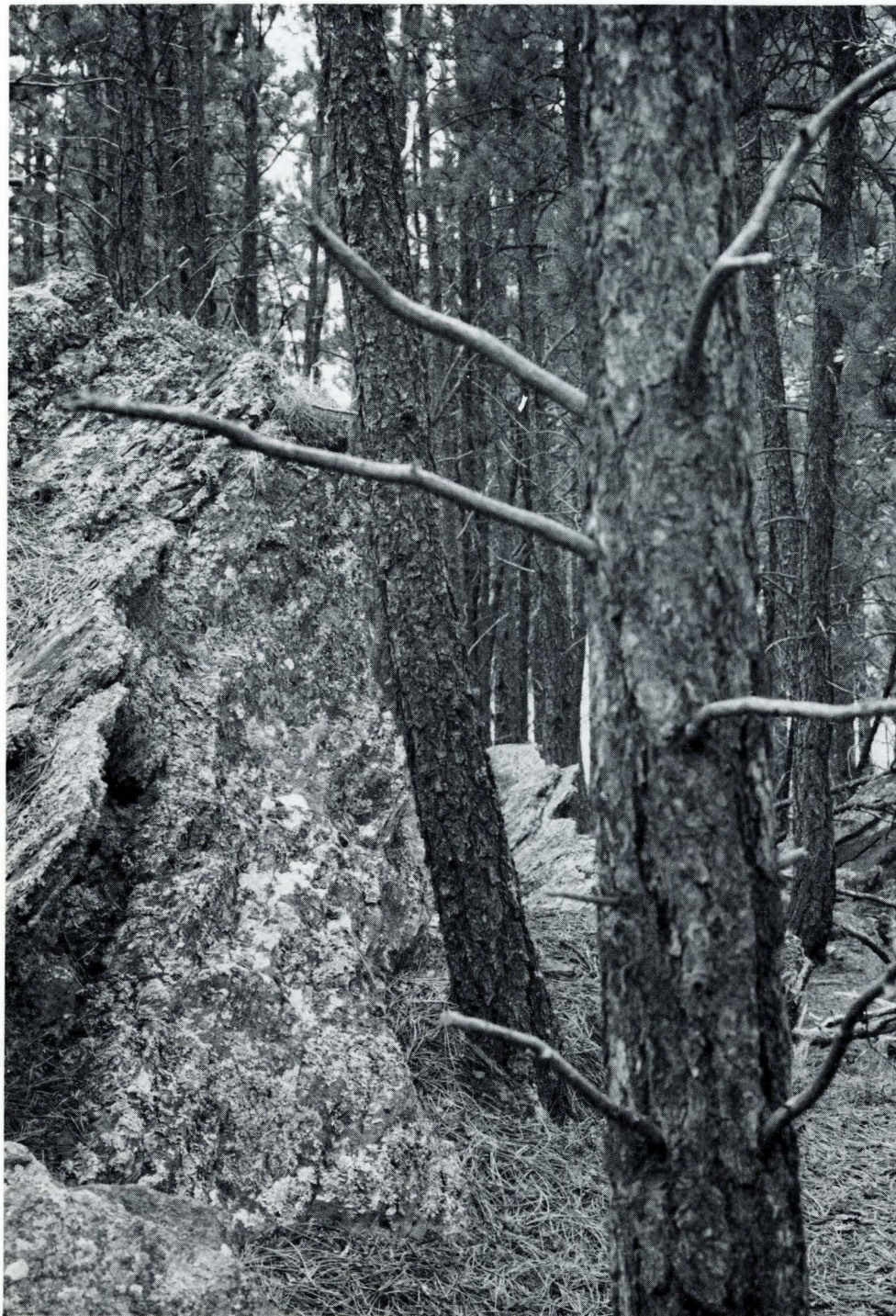


Figure 34-C (inset). By moving to the edge of the pine stand (Figure 34-B), man's impact in the area is readily seen. Man has replaced the native meadow vegetation with tame hay, some of which is baled.

Figure 34-B. The site from which Figure 34-A was taken is today deep within a growing pine stand which masks the meadow. There is little wild-life food in this dense stand.

**Photo Site 20
Look N**

Figure 35-A. Two similar photos were made of this 1874 landscape (see also Appendix Figure A-5).



Figure 35-C (inset). This photo site is near that for Figure 34 series and the meadow is, the same. The Needles area is on the skyline.

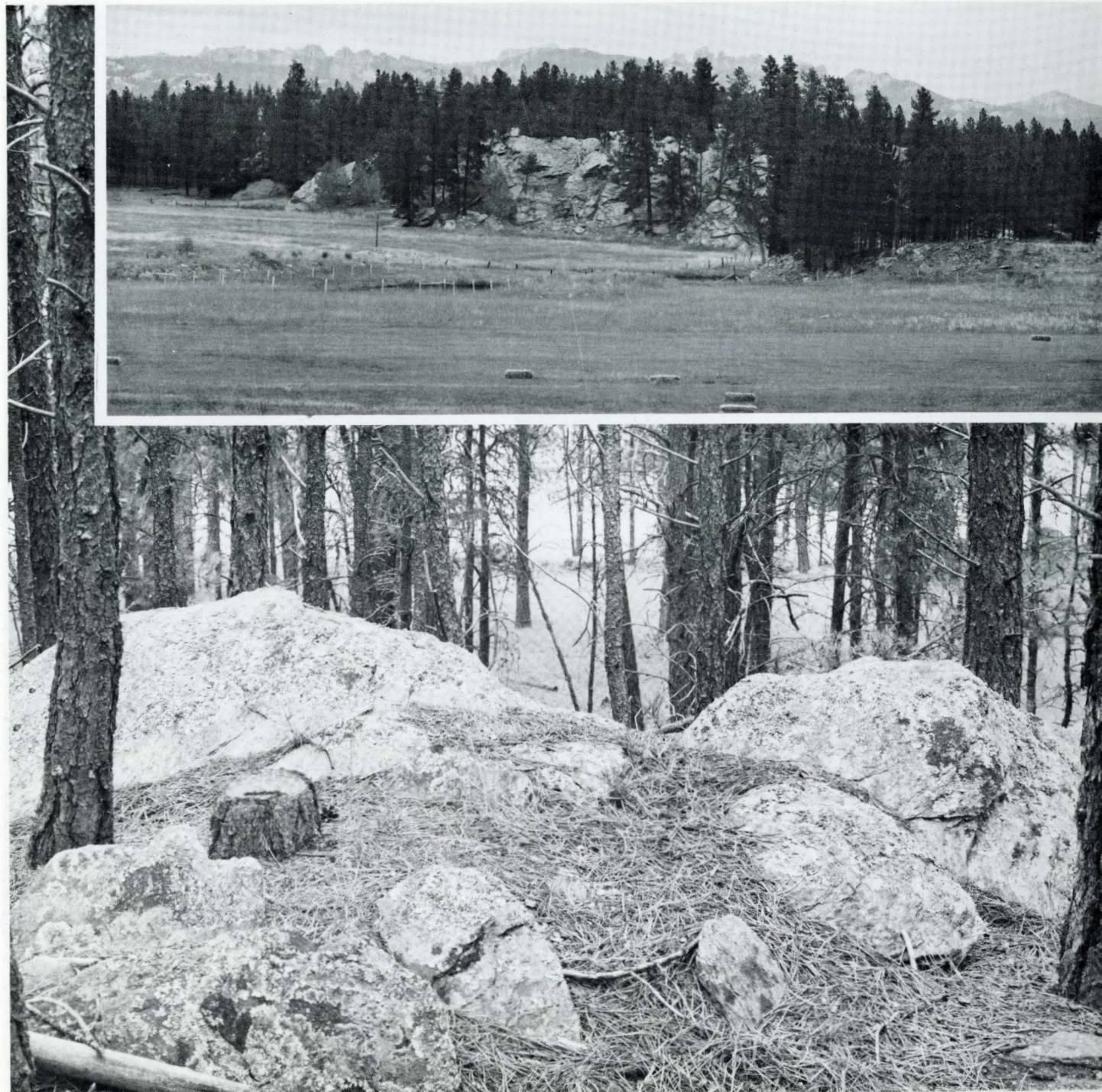


Figure 35-B. As at other modern sites, pine trees have grown and spread into open areas leaving little food or browse for wildlife. Note the corresponding rocks in the foreground.

**Photo Site 20
Look N**

Figure 36-A. In 1874 a vigorous young pine stand was growing among a sparse stand of large mature trees. Cathedral Rock is prominent against the sky.



Figure 36-B. Although the exact photo site was not located, this modern view is very similar to the companion 1874 photograph (Figure 36-A). Some of the small trees shown in the original photograph grew to harvestable size and were cut for lumber.



**Photo Site 22
Look N**

Figure 37-A. Another meadow watered by a small, clear stream was photographed in 1874 in this view looking towards the Needles. Pine stands are restricted by environmental factors.



Figure 37-B. The stand has thickened over the years and foreground trees virtually block out the small stream in this modern photograph. Rocks in front were used as a location key.



Photo Site 23
Look SW

Figure 38-A. Illingworth climbed from the Permanent Camp valley to capture this scene. The meadows in previous photographs lie below and the Needles are at a higher elevation behind the camera.



Figure 38-B. The modern view is toward the city of Custer with smoke rising from it, top right. The meadows have become more distinct as the pine forest thickened since 1874.

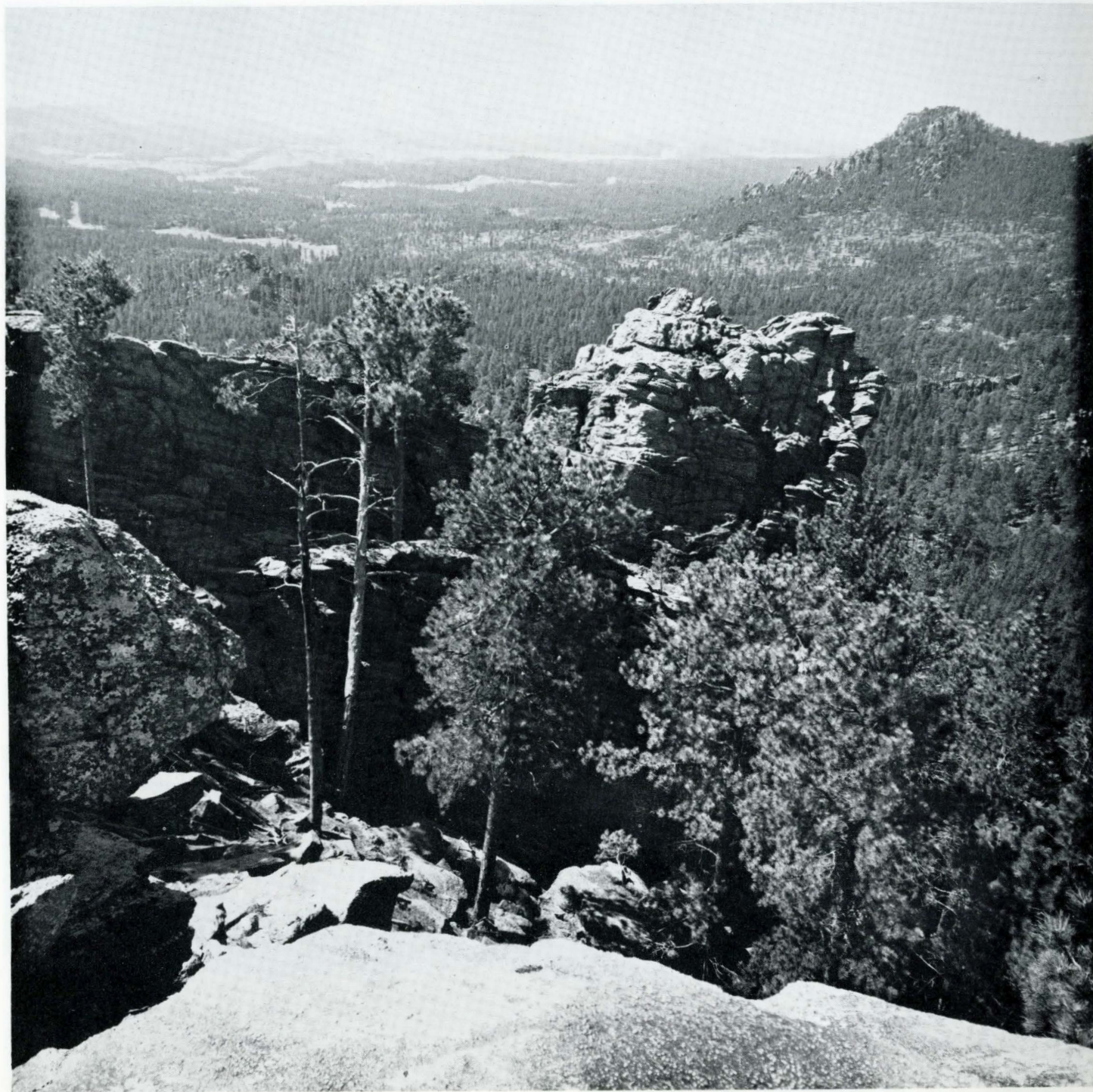


Photo Site 23
Look NW

Figure 39-A. Nearly a century ago this is the appearance of an area about 4 miles northeast of Custer.

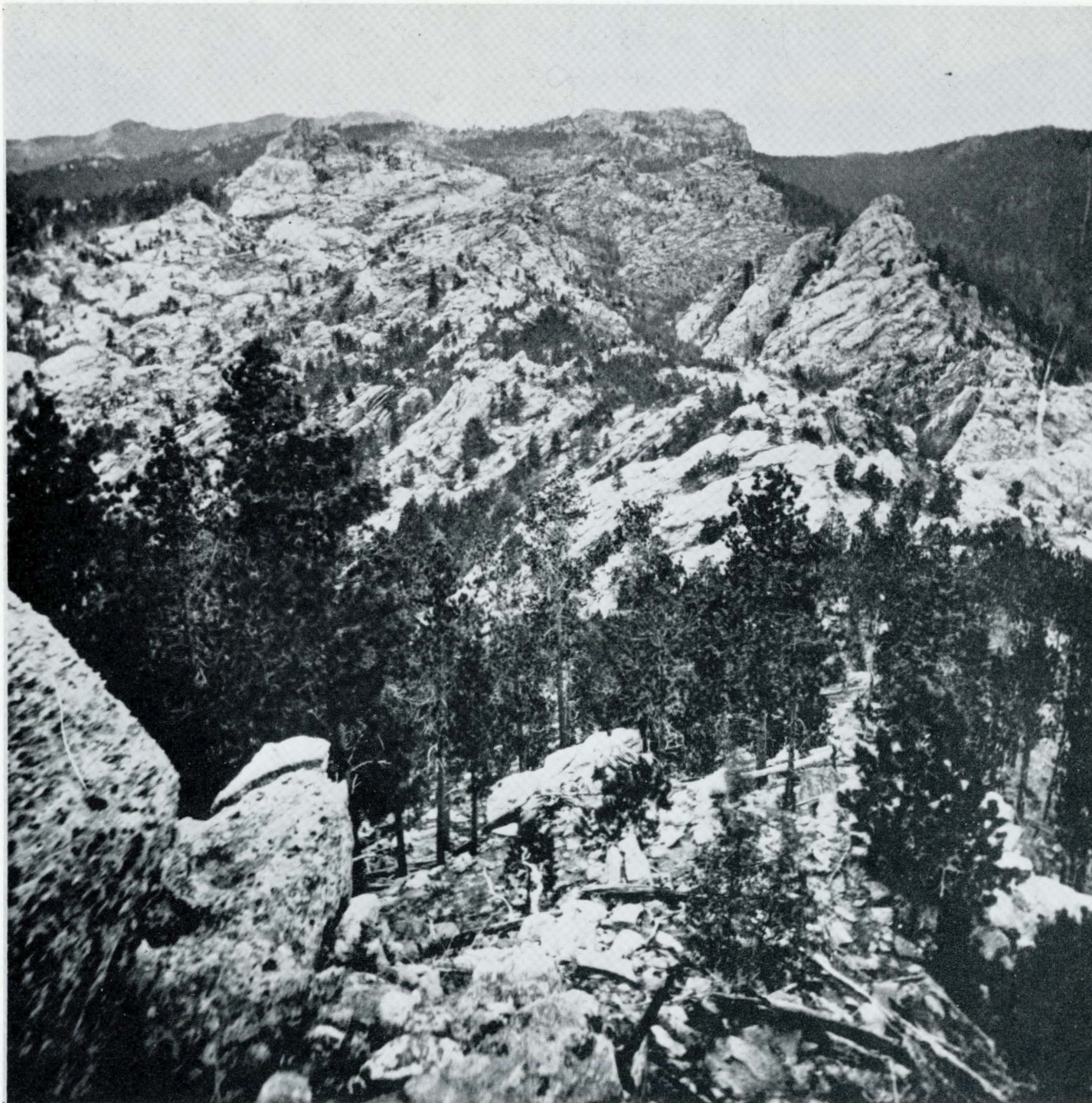


Figure 39-B. In spite of the seemingly solid granite, pines here also have become thicker during the past century.



**Photo Site 23
Look NNE**

Figure 40-A

Figures 40 and 41. Photographers swung their cameras to the right to get these views of areas north of Custer (note foreground rocks). The "A" views are from Illingworth and the matching "B" views were taken in 1973. (Figure 41-A is from the National Archives.)



Figure 40-B





Figure 41-A

Figure 41-B

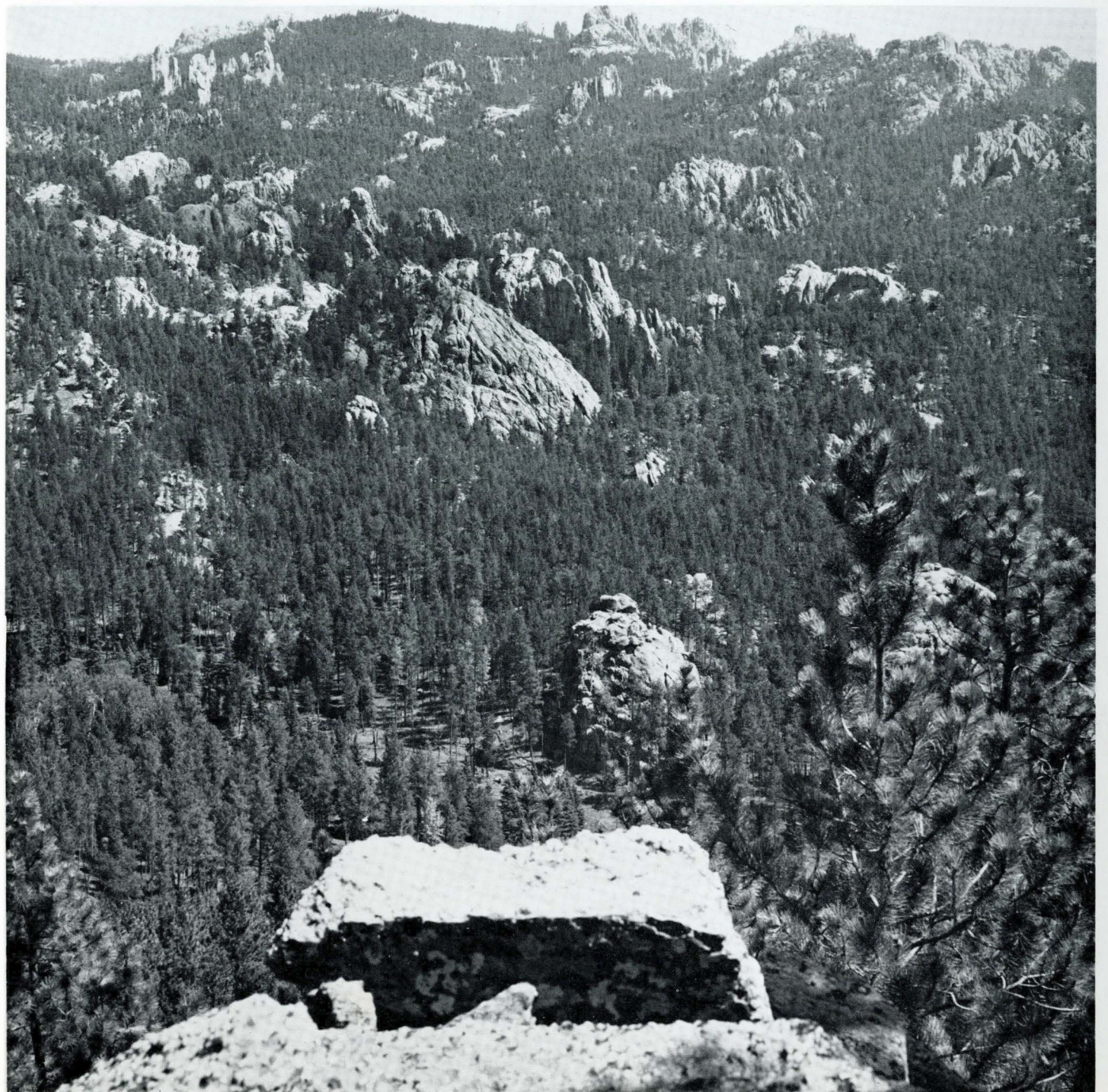


Photo Site 25
Look NE

Figure 42-A. The Expedition left the Black Hills south of the present city of Sturgis, S. D., and in mid-August 1874 camped here near Bear Butte which stood like a lone sentinel adjacent to the previously unexplored area.



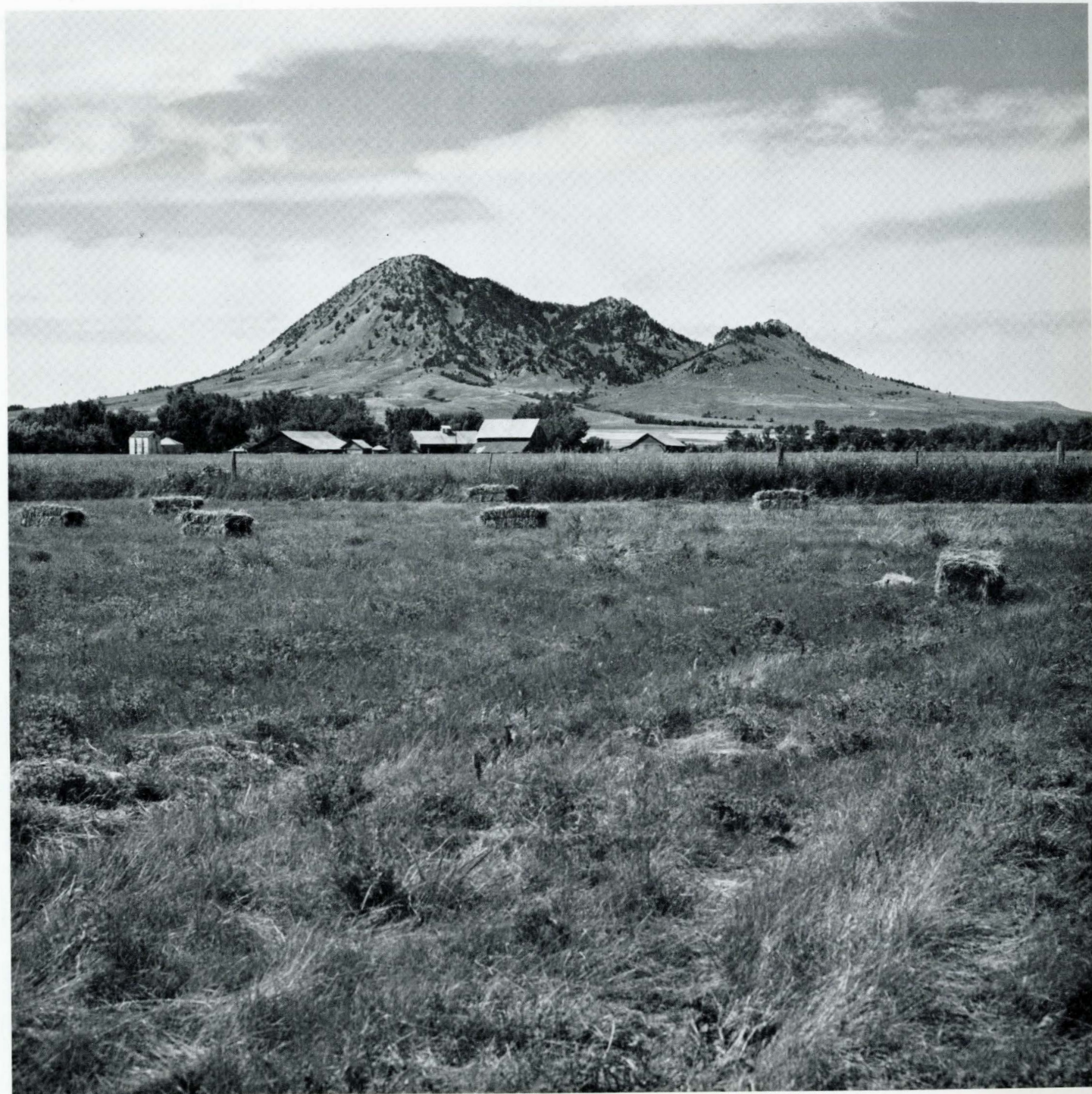


Figure 42-B. Today ranches flank Bear Butte, an ancient volcanic cone. A State Park has been established on the base slope.



Figure 43. This photograph of the Expedition was probably made enroute to Fort Abraham Lincoln after exploring the Black Hills. The glass negative was not found and copies of print do not show details fine enough to determine where the photograph was taken. Some

wagons appear to be arrayed with deer and elk antlers. Also, only two Gatling guns and the field piece are shown. (The Expedition lost one Gatling gun, the forerunner of the machine gun, down a ravine in the Black Hills.) It is

surmised that the animals at top left are part of the 300 head of cattle driven with the Expedition as a source of meat but which were returned because of plentiful game enroute. (Photo from National Archives.)

Figure 44. General Custer satisfied a life-long ambition to kill a grizzly bear while on the Black Hills Expedition. Shown left to right are Bloody Knife (a Ree Indian scout), General Custer, Private Noonan (Custer's orderly) and Colonel Ludlow. One of Custer's hounds sleeps in the sun at Bloody Knife's right. A large deer or elk antler is in the grass at right, center.



The Forest Through a Century

Like other vegetational areas of the world, the Black Hills forest developed in response to local soil and climate as well as to ecological factors (storms, fire, insects) which modify the basic pattern of development. Three major vegetational features are noted: the pine forest, grasslands, and the scrub forest. Plant ecologists term them *climaxes* because they are the maintained end-point of a series of vegetation types. *Associations*, which are divisions of climaxes, are characteristic groups of vegetation maintained locally by a nearly uniform climate. Some of the several associations observed in the Black Hills are white (Black Hills) spruce, oak-ash-elm, birch-aspen, mixed prairie vegetation, and sedge meadows in wet areas around beaver dams.

If the Black Hills were viewed from a high look-out such as Harney Peak, or perhaps in ERTS (see back cover) or Skylab satellite imagery, one would readily recognize the interior grasslands, old burns still open or covered with birches and aspens, and the vast area of the pine forest. The interior grasslands are particularly interesting and are covered with prairie grasses and forbs. Some ecologists believe many of these grasslands originated from forest fires, thus would revert to pine if grazing, mowing, and fires were eliminated. The other grasslands, such as Reynolds and Gillette Prairies, are probably maintained by soil conditions because

the surrounding forest does not readily invade them.

Role of Fires

Composition of the forest, grassland, and scrub climaxes and associations in the Black Hills has been recorded only during the last 100 years, beginning with the Custer expedition. Paleontologists, however, have determined the history of development of prehistoric vegetation by studying fossil plants. History of the recent forest prior to 1874 can be partially "read" from growth rings of large pine trees, charcoal in the soil, charred remains of trees, and from some stands of old living trees. We know, by back-dating some of these clues, the frequency and time major fires occurred in the forest. According to a U. S. Forest Service document¹³ the oldest fire "on record" burned about 1730-40. Present stands of large trees nearly 200 years old apparently started in openings created by that fire.

The next extensive fire was thought to have burned between 1780 and 1800 because the second-growth pines on the limestone plateau and in the northern Black Hills, which were cut for mining, originated in that period. Another major fire occurred on the plateau a few years before Custer and his men passed through. Perhaps this was the fire that left the snags (dead trees) noted in Figures 8A and 9A.

Indians told of an even earlier fire. According to J. C. Sherman, an

old resident of Pactola who talked with them, the entire hills were ablaze sometime around 1842.

All fires in the Black Hills prior to 1875 were either set by Indians to drive game or were the result of lightning. The first fire caused by white men was allegedly started by soldiers about 1875 near Custer City but the first one on record was accidentally set May 1, 1876 by settlers camped near Deadwood.

While many other fires are known, several were particularly devastating. In 1893 more than 20,000 acres around Roubaix were burned, the results are still obvious.

The Iron Creek fire, naturally-caused, scorched approximately the same amount of acreage in 1901 but the Rochford fire, set by a young man in 1931, destroyed 21,600 acres of timber and was one of the most spectacular.

On July 8, 1939, lightning started the McVey fire, considered to be the most destructive to the Black Hills forest during recorded history. It was estimated that more than 12 million board feet of saw timber, nearly 19,000 acres of

¹³Anon. 1967. "Annals of the Black Hills." Unpublished manuscript. Black Hills National Forest, Custer, S. D. 72 pp.

Fire in the forest. (Photo Black Hills National Forest.)



young growth timber as well as 17 cabins and 100 head of cattle were destroyed. This burn area adjacent to Deerfield Reservoir now produces an abundance of deer because of the great amount of shrubby growth and ground vegetation available for them to eat.

The most recent spectacular burn threatened the entire Deadwood area. Ignited from a trash burner during extremely dry, hot, and windy conditions on September 8, 1959, the fire was burning out of control 8 minutes after it began. Although Deadwood was not destroyed, the fire which covered 4,500 acres, burned within the city limits, destroying many buildings and caused damages estimated at \$1.5 million.

Many persons view fire as a malverick in the forest, something that must be suppressed as soon as it blazes among the pines.

Whether natural or man-caused, fires are an important force in the Black Hills forest community. Prior to settlement of the area, fires set by lightning striking dead trees or by Indians to drive game, burned under natural conditions. Many sections of the forest burned over quite regularly, perhaps every 15 to 20 years. Thus only thin layers of combustible material could accumulate on the ground. Most of the fires burned "cool," consuming only the ground layer although some jumped into tree crowns and up trunks killing the cambium (growing) layer under the outside bark. Ground fires frequently eliminated

mat of pine seedlings under large overstory trees and prevented excessively thick stands of unhealthy trees from developing. Much of the forest was kept open and park-like as Custer found it a century ago.

Man has inadvertently created in many areas conditions favoring devastating crown fires as well as overpopulation of trees.

Other Natural Forces

The bark beetle, a constant member of the forest community, multiplies rapidly when living conditions are just right, then remains very numerous for a number of years. Invaded trees are killed when these insects feed on the cambium, or growing, layer under the bark. Nearly half of the Black Hills forest is estimated to have been affected by bark beetles at one time or another. Reported first in 1895, these insects were exceedingly plentiful for 14 years with that outbreak apparently peaking in 1904. Another serious occurrence was evident in the 1960's when thousands of acres of trees were affected.

In 1973 the bark beetle infestation killed an estimated 600,000 trees amounting to a loss of 60 million board feet of lumber valued at \$3 million. While some infected trees can be salvaged for lumber, poles, or posts, others cannot be economically removed. Nevertheless the beetle, like fire, remains a strong natural force locally reducing the number of trees in the forest.

Storms and Floods

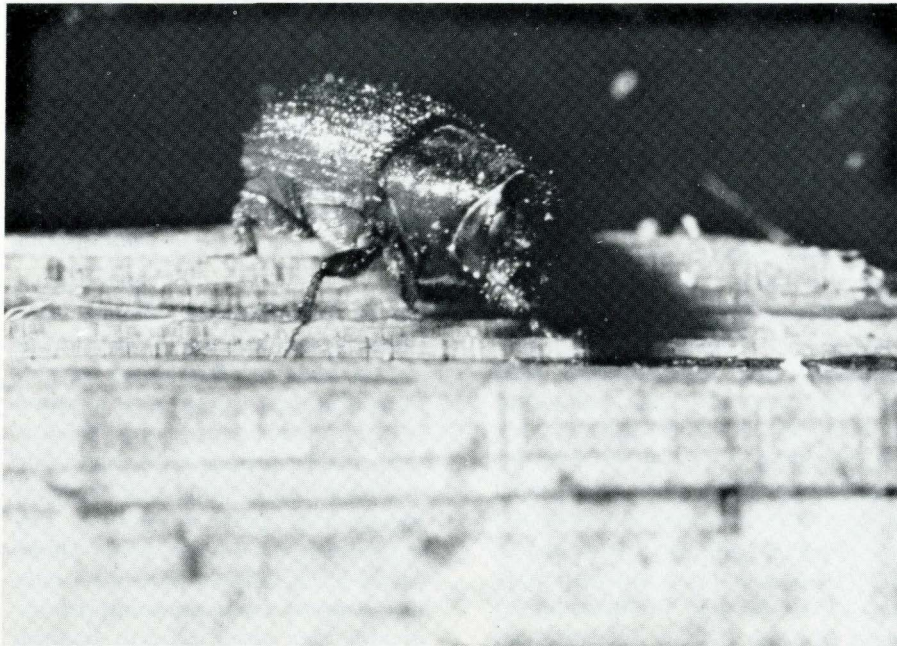
Severe vagaries of nature have wrought destruction in the forest on many an occasion. Tornadoes, heavy snow, hail, rain and ice

storms have damaged trees. Paths of tornadoes which touched down in the forest are clearly evident and one can imagine the striking force when viewing thousands of broken and prostrate trees after a blow. One tornado in 1940 leveled an estimated 1.5 million board feet of timber on the Homestake Mining Company land in the northern Black Hills. Fortunately two-thirds of the trees were salvaged.

Locally-strong hail storms and freezing rains have also destroyed hundreds of trees at a time. Heavy rainfalls are common in the Black Hills and generally little damage is inflicted to the forest or road system but one storm is worthy of note.

Rain conditions began to develop during mid-day on June 9, 1972 when the author and photographer were searching for Illingworth photo sites in the central hills. Later heavy cloudbursts on the east slopes caused very rapid and excessive run-off, even on thickly vegetated areas which usually absorb most of the water that falls. Twelve or more inches of rain fell in 6 hours resulting in disastrous flash floods in downstream portions of major streams, particularly Boxelder and Rapid Creeks. Surges of water pounded down canyons wrecking everything in the line of flow. Millions of dollars of damage was inflicted in Rapid City and other communities when water tumbled hundreds of automobiles like toys, ripped apart scores of homes, and claimed the lives of more than 200 persons that horror-filled night. A hydrologist who studied circumstances of the storm estimated that the measured amount of rainfall was an amount

Bark beetle, enlarged. (Photo Black Hills National Forest.)



unlikely to occur more than once in several thousand years. In the storm area most road bridges were swept away, creek beds were thoroughly and violently scoured, recreational facilities and dams were damaged, and many flood level trees were destroyed. The cost of repairs on National Forest lands was estimated at over \$4 million. In spite of the seriousness of the storm to humans, little damage was inflicted on the forest itself.

Exploitation

During the early mining days and settlement, large quantities of wood were used for houses and other buildings within mining camps growing into towns such as Rockerville, Keystone, Hill City, Lead, Deadwood, and Custer. Cordwood was used as fuel for heating, cooking, and operating the stamping mills that crushed gold-bearing quartz. Lumber was also required for mines. At that time pine trees, good for lumber, were found mainly in gulches or other sites where soil and moisture were most suitable for growth. Sawmills brought in by bull trains from the East were set up near mining camps and trees in the immediate vicinity were the first cut. As demands for lumber grew, pines were cut progressively farther away from the mills. When hauling was no longer feasible mills were moved to the timber supply.

The mining camps, even those which grew into sizeable towns, were unstable communities because the fevered rush to locations of new gold strikes meant abandonment of some towns and instantaneous expansion of others. One example is Custer City in which nearly 6,000 people resided less than 2 years af-

ter discovery of gold there in 1874. In the spring of 1876 reports of rich gold deposits in Deadwood Gulch to the north brought renewed excitement and people swarmed there from towns and camps throughout the area. Within a few weeks Custer City became nearly an abandoned settlement with less than 100 persons remaining by that summer's end. The town grew to a population of about 400 in 1877 but soon dropped drastically as a census on September 5, 1878 revealed only 57 inhabitants (37 men, 11 women and 9 children).

Such vigorous shifting of people within the Black Hills gold fields meant the death of many mining towns — Gayville, Galena City, Castleton and Cleveland. It also brought continued pressures on the standing timber supply. Before long large expanses of pines were completely cut and virgin timber was all but gone from the landscape.

Booming sawmills consumed vast amounts of timber to meet immediate demands of settlement, while additional supplies were needed for construction of the Elkhorn (now Chicago and North Western) and the Burlington railroads in the Black Hills area from 1885 to 1890. One U. S. Forest Service document indicates that timber use from the northern Black Hills during this period of construction amounted to an estimated 1.5 billion board feet. Because timber was locally plentiful, only best trees were cut in some areas and only best logs were taken to mills for sawing. Standing dead and unhealthy trees, as well as dry remains of cut trees, created conditions which resulted in several de-



This October 29, 1897 photograph, from Black Hills National Forest files, has the notation: "View looking due west from west ridge of Crow Peak. Showing country along which the reserve line should run, Bull Pine. Photographer: G. Pinchot."

vastating fires that focused national attention on the rapidly dwindling forest resource.

Congress Helps

Responding to concern over exploitation of forest resources, Congress in 1877 passed the first bill of a long series of legislation favorable to forest preservation, particularly on federal lands. One significant Act in 1881 created a Division of Forestry (forerunner of the present Forest Service) in the Department of Agriculture. Ten years later other legislation was enacted that allows the President to set aside unappropriated federal lands as forest reserves (within the Department of the Interior) to protect the public domain "from destruction by fire and reckless cutting and insure a more regular flow of water in the streams." President Cleveland created the first reserve and subsequently signed 13 million acres of forest into the reserve system.

The Black Hills became a focal point of the forestry movement when the Black Hills Forest Reserve¹⁴ was established by proclamation by President Cleveland on February 22, 1897. Because boundary lines were not clearly established, the Black Hills Reserve was not put under full administration until late in 1898.

Through the closing years of the 19th century the general public, according to Gifford Pinchot, the first head of the Bureau of Forestry, "knew little and cared less about forestry, and regarded the forest — like all other natural resources — as inexhaustible." He considered the Black Hills Forest Reserve a guideline in federal forest management.

¹⁴Later acts amended boundaries of the Forest, e.g. addition of the Bear Lodge Mountains, creation of Wind Cave National Park and Jewel Cave National Monument within the Forest. Although the Black Hills National Forest encompasses more than 1½ million acres, 80% of it is in the Black Hills portion.

As Chief Forester, Pinchot visited the Black Hills in 1897 and again in 1899 as Head of the Bureau of Forestry to learn first-hand the attitudes of people toward the forest reserve and to observe forest conditions. His work and that of others in succeeding years resulted in transfer of Forest Reserves in 1905 from the Interior Department to the Agriculture Department and also designation of the Bureau of Forestry as the Forest Service. Under the Forest Service the National Forests (changed from "Forest Reserves" by Congress in 1907) are presently managed for the public according to the principles of the Multiple-Use and Sustained Yield Act of 1960. This Act states "that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes" and further, "that due consideration shall be given to the relative value of the various resources in particular areas."

Reforestation

Settlement of the Black Hills occurred at a time in ecologic history when large sections of the forest were denuded from natural causes — fires, bark beetles, and storms of various kinds. Man's initial impact of extensive cutting of good timber then leaving areas in a condition prone to devastating fires was a final blow to the forest. And the fires did come! Struggling parts of the forest were killed, especially around Roubaix, Custer Peak, and Spearfish Canyon.

Five years after the Black Hills forest was put in reserve by Presi-

dent Cleveland, foresters estimated that more than 1,000 square miles of land needed to be artificially reforested because necessary seed trees had been removed by forces of nature and man. Sowing of pine seeds and planting of seedling trees on a 40-acre experimental plot in 1905 marked the beginning of an extended period of reforestation. By 1948 more than 13,000 acres had been planted.

The Harvesting

Man's quest for roundwood used as pulp, posts, poles, and firewood has imposed continuous cutting of trees in the Black Hills. Tree cutting during early years of settlement was mainly for convenience without regard for the deteriorating forest. Timber management began when the public forest was put in reserve, then enhanced in 1905 when the National Forest and U. S. Forest Service were established. Creation of the Custer State Forest and management of that land for timber and wildlife added to improvement of the entire forest. Large blocks of private land, especially Homestake Mining Company holdings, are managed for production of timber with side benefits to water conservation and wildlife.

Harvesting of trees is an important phase of proper forest management. Approximately 120 years are required to grow a saw-log size ponderosa pine in the Black Hills. Under long range plans, stands should be thinned periodically to promote rapid growth of healthy trees. The first three thinnings spaced approximately 20 years apart should yield pulpwood, posts

and poles, in that order. The final harvest would be timber large enough to cut into lumber.

Commercial production of wood from the Black Hills probably began when mining towns were beginning to spring up. It is significant that the first commercial harvest on any federal forest was made on the Black Hills Forest Reserve in 1899. This famous "Case No. 1" involved a contract with Homestake Mining Company which needed timber for its growing operation.

More than a million acres of National Forest land in the Black Hills is suitable for producing commercial timber. Harvest during the past 5 years has averaged 86 million board feet of timber and roundwood annually.

Game Reserves Within the National Forest

Initially named Custer State Forest, Custer State Park in the southern portion of the Black Hills has afforded the South Dakota state game agency opportunities to restock native wildlife species and to introduce others, mainly for viewing by park visitors. The present park of nearly 72,000 acres of forest and open land was created by a compromise with the U. S. Forest Service in 1910 to amalgamate more than 60,000 acres of state-owned¹⁵ timberland scattered throughout the Black Hills so that both the State Forest and the National Forest could be better managed.

This State Forest was designated as a game reserve in 1913 and an 8-foot high fence was erected

around 700 acres to retain game within the boundaries. In 1918 it became Custer State Park managed for certain types of outdoor recreation, timber, and wildlife. Forest management practices including a maximum annual harvest of 6 million board feet of timber helps provide ideal habitat for several species of wildlife. Elk and buffalo herds are kept in balance with their food supply through controlled hunts but other species are not harvested.

Adjacent to the south of Custer State Park is another wildlife sanctuary, Wind Cave National Park of more than 28,000 acres. Created in 1903, this park features unspoiled native prairies, some low grade timber, an abundance of wildlife as well as famous Wind Cave. Personnel of the U. S. Park Service which administers this public land frequently work closely with Custer State Park personnel to maintain the native flora and fauna of the area. Hunting is forbidden in national parks; therefore, when elk or buffalo herds need to be reduced, other methods are applied.

Additional wildlife sanctuaries within the Black Hills National Forest are at Mount Rushmore National Memorial and Jewel Cave National Monument.

¹⁵When South Dakota became a state in 1889, Congress granted Sections 16 and 36 (one square mile or 640 acres each) of each 36-section township to the state specifically for the benefit of the state school systems. Many of these school lands have since been sold to the state park system or to private individuals or are leased for farming and ranching with the proceeds being deposited for the public schools and colleges.

Wildlife Then, to Wildlife Now

History of changes in wildlife populations during the past century or longer are not as easily deciphered as are changes in the forest. Unlike trees, no single animal lives long enough nor carries evidence attesting to what has happened decade by decade. Therefore, we must rely on reports of early explorers and settlers for scattered information about animals which might have been present when white men began to visit the Black Hills and later when mining for the yellow ore.

The best accounts of animal life in the Black Hills in the 1870's are from observations by George Bird Grinnell, former naturalist at Yale's Peabody Museum who was with Custer in 1874, and by Lieutenant Colonel David Irving Dodge, military leader of the "Jenny Expedition" sent into the Hills by the Interior Department in 1875. Jenny and Dodge spent nearly three months in the Black Hills area, thus had considerably more opportunity to observe animal life than did Grinnell who was there for 20 days in mid-summer.

Although the Black Hills in 1875 must have been excellent habitat for many species of wildlife, Dodge was disappointed because he wrote in his official report (p. 120), "Certain portions of the Hills we found teeming with animal life, other portions, equally beautiful and apparently equally well-fitted for game, were almost entirely without it . . ." and further (p. 121), "Animals [mammals], birds, fish, and reptiles are in comparatively little variety, and not in very great numbers any-

where in the Hills. In a few localities . . . we found great numbers of deer . . . but . . . I have seen more deer in Texas, in one day, than I saw in the whole of my three months in this apparently perfect game country."

Mammals

Both Dodge and Grinnell marvelled at the abundance of deer (mainly white-tailed which they called red deer because of the rusty red summer pelage) in certain areas of the Black Hills, particularly in upper watersheds of Spring, Castle, Rapid, and Box Elder Creeks. Dodge estimated that his party probably killed 1,000 deer for food.

General Custer, in his final report of the 1874 Expedition, said that he had never seen as many deer as in the Black Hills. Even though a herd of 300 head of cattle was driven along as a meat supply, many of them were taken back to Fort Abraham Lincoln because the Expedition obtained ample supplies of deer and antelope meat along the way. About 100 white-tailed deer were killed by the command on August 3 in the vicinity of the "permanent camp" along French Creek. It is not surprising that Col. Dodge found the great south mesa especially bare of deer and other animal life because the scrubby pines with branches low to the ground are not conducive to growth of lush ground cover so essential for most wildlife species. Added to this is the lack of moisture in that portion of the Black Hills which in some places supports arid chaparral-type vegetation found in the desert South-

west. Even today there is a scarcity of wildlife in these scrubby pines unless the stands are "opened" to allow natural growth of forbs and grasses under the trees.

Just as today's hunters and wildlife observers, Grinnell noted the obvious difference in size between the white-tails in the Black Hills and those on the surrounding prairies. The Black Hills deer were so much smaller that he thought they were of a different species.

Mule deer, stiff-legged companions of white tails, were also found in considerable numbers in the frontier days. Grinnell found them mainly around the Black Hills on the prairie's edge and Dodge reported them very abundant in broken country on each side of the great northern rim.

These two competent observers saw but few elk although sign was evident everywhere, indicating recent presence of large numbers. Grinnell told of a collection of horns [antlers] gathered by Indians on the Elkhorn Prairie and the Expedition photographer captured the scene (Figure 16A). Scores of shed antlers were also found strewn over open areas of the Black Hills.

Grizzly, brown, and black bears (the latter two were likely color phases of the same species) were reported common in the Black Hills a hundred years ago. Grinnell described in detail the old male grizzly killed by General Custer and Colonel Ludlow not far from where the Expedition made camp on August 7 (Figure 44). The General wrote to his wife, Libbie, "I

have reached the hunter's highest round of fame. I have killed my grizzly." An old female and two cubs were killed later in the trip by Indian scouts but these bears were probably found out on the prairie, not in the Black Hills proper.

Neither Grinnell nor Dodge saw any buffalo on their trips. However, partial remains of a skull with some hide on it, and a jawbone with tissue clinging to it, were found on French Creek near the Big Cheyenne on the outskirts of the Black Hills. Some of Dodge's hunters reported that they had seen a buffalo but the location was not indicated.

Two or three cougar were spotted by members of the Jenny Expedition in 1875 and Grinnell wrote that he saw one when he was with Custer. From his observations of signs, he considered cougars quite numerous in the locality. Likewise bobcat and Canada lynx were reported common by both expeditions.

Neither Grinnell nor Dodge observed any coyotes in the Black Hills but both agreed that a large wolf was present. Grinnell in referring to it as the gray or timber wolf wrote, "I found the gray wolf one of the most common animals in the Black Hills and hardly a day passed without my seeing several . . . Their howlings were often heard at night." This was reported to be a large wolf species comparable to the timber wolf of the north woods. Foxes, skunks, chipmunks, and mice were very common as were beaver along most streams. Mountain sheep, however, were apparently scarce as Dodge consider-

ed them few in number but didn't indicate if any were actually seen by members of his group. Also reported to be present but not numerous were woodchucks, red squirrels, flying squirrels, and mink.

Birds

As naturalist on the 1874 Black Hills Expedition, George Bird Grinnell was responsible for collecting specimens of all sorts, observing animals along the way, and recording factual data. After the Expedition completed its mission he submitted reports about fossils, mammals, and birds, the latter which included a check list of 50 species found in the Black Hills. Sixty other species were observed in the prairie between Fort Lincoln and the Black Hills. His survey of bird life, like that of fossils and mammals, was necessarily superficial because of limited time allowed enroute.

The summer after Grinnell was in the Black Hills, Colonel Dodge made records of birds he observed while accompanying the Jenney scientific expedition. His list was generally similar to Grinnell's except longer because he had extended opportunity to observe during summer and early fall. He wrote in his journal, "In the fall, all the streams and ponds, both inside and outside of the Hills, are alive with myriads of migrating waterfowl, geese, brandt, ducks, etc., in endless variety." Such abundance was somewhat in contrast to the bird life he noted 2 to 3 months earlier. Apparently he was not in error when noting a scarcity of birds there during June and July because breeding-bird censuses made by Whitney¹⁶ during the summers 1954

through 1958 showed this to be an annual occurrence.

Other Animals

The cool pure and abundant water of the Black Hills supported only two species of fish in 1875 according to Dodge as he found suckers and a dace plentiful. Although he observed rattlesnakes, garter snakes, a snake he called a water moccasin, marsh frogs, striped-head turtles, and a "fish-lizard," reptiles and amphibians were few in number. Some of these were likely found only outside of the Black Hills but he did not list them as to location.

Grasshoppers and certain other insects were apparently exceedingly common. Dodge wrote that grasshoppers breed in immense numbers, then leave the Black Hills as soon as they grow wings. General Custer also noted hordes of grasshoppers, especially on the prairies as he was enroute southward.

* * * * *

By changing the natural ecology of the area, either deliberately or unknowingly to suit his own desires, man destroyed certain types of wildlife habitat and created or enhanced others. Wild animals had to adapt to these changes to survive. Some did, some did not.

¹⁶Whitney, Nathaniel R., Jr. 1955-1958. *Annual Breeding Bird Census*.



The Black Hills of South Dakota (center) from the earth orbiting Skylab workshop. Note curvature of the earth in distance. (Photo courtesy Remote Sensing Institute, SDSU.)

During the full century that gold seekers, settlers, and following generations of ranchers, woodsmen, miners, foresters and businessmen lived in the Black Hills, natural conditions drastically changed to a landscape featuring substantial communities, ranches, artificial lakes, reservoirs, stock dams, recreation areas, and the myriad of businesses associated with the tourist industry. Years of exploitation, then a reversal toward forest regeneration, protection, controlled harvest, and multiple-use management contributed to changes in the pattern of the forest and its associated interior prairies.

As habitat changed, so did the wildlife. But man was always an important factor. Some species disappeared from the fauna altogether. Some which faded were purposely reintroduced while others held their own and many flourished even with increased human activities. Still other species were brought anew to the Black Hills.

Grizzly bears and gray wolves have long vanished from the scene and black bears and mountain lions are very rare because neither man nor these animals tolerate each other.

Present populations of deer, buffalo, elk, antelope, beaver, and wild turkey are results of restocking and management by the state game agency which has jurisdiction over resident wildlife, even in the National Forest.

White-tailed and mule deer, probably the most commonly observed wild animals in the Black Hills, are likely as numerous today as when General Custer and Colonel Dodge told of them. After the herd declined for many years, the

hunting season was closed in 1925 and deer were shipped in from Arizona for restocking. Management efforts were so successful that hunting was reopened in 1930. During the late 1940's deer were so plentiful they caused substantial damage to their natural food supply as well as to rancher's fields of oats, corn, and alfalfa. Consequently 31,000 hunters, being allowed to bag two deer each for the 1953 season, harvested 42,000 head. That essential cropping of the population has kept the herd from starving and allowed habitat in most sections of the Black Hills to heal from the overbrowsing. The legal annual harvest, now closely regulated according to the size of the herd and to competition by grazing livestock, approximates 4,000 and the total herd numbers from 20,000 to 25,000 animals.

Realizing that protected grasslands of Custer State Park and adjacent Wind Cave National Park were suitable for native buffalo, game officials purchased 25 head in 1914 from a rancher in Fort Pierre then released them into the game enclosure. The herd grew slowly but later was augmented by another 60 animals obtained from Pine Ridge Indian Reservation in 1951. Presently the herd is annually cropped to approximately 1,400 to balance it with available forage. A smaller wild herd is maintained within Wind Cave National Park.

Elk were also reintroduced into the Black Hills. Shipments were made to Custer State Forest from Wyoming. The first load of nearly 65 head escaped from the corral in 1912 and spread into the surrounding area. Later another group was successfully placed in the game en-

closure. Several years after the herd was established, some of the animals escaped from their pasture and moved to other parts of the Black Hills. The Custer State Park herd is reduced each fall by controlled hunts and hunting of free-roaming elk is allowed in certain sections of the Black Hills every few years.

Antelope were returned to the Black Hills fauna when a dozen young animals were taken from the prairies to the north then released in the game reserve in 1916. The herd has prospered and now shares the grasslands of Custer State Park and Wind Cave National Park with the prominent bison and prairie dogs. Presently they are not a hunted species in the Black Hills.

A sometimes highly-sought furbearer, beaver, were re-introduced into the Black Hills after a devastating drought just before World War II as an attempt to restore trout streams. Beaver became so numerous by 1953 they were in danger of starvation because they had cleaned the streambanks of aspen and other foods. When erosion of soil on these denuded feeding areas became evident the state game department began a control program because the low price of pelts failed to induce private trappers to keep the animals at tolerable levels. Today, beaver are found throughout the Black Hills, and as long as they do not overpopulate again, visitors will be able to marvel at the picturesque ponds and dams along most of the tributary streams.

Another example of a re-established species is the wild turkey although those in the Black Hills today constitute a southwestern sub-

species and not the eastern turkey originally found there. After unsuccessful attempts to stock the eastern bird, Merriam's turkeys were brought in from New Mexico and Colorado in 1948-1950. The increase which followed was so phenomenal that a hunting season was allowed in 1954 and 3 years later the birds, now classified as big game, were so numerous that many were trapped then transplanted in other parts of South Dakota.

The most comprehensive account of birds in the Black Hills is that by Pettingill and Whitney (1966) in which 131 regular species are listed, 87 additional are identified as rare, casual, irregular, or having been reported at least once, and 8 species that hypothetically visit there. Eastern and western forest species as well as prairie species attest that the Black Hills indeed constitute a transition between the Rocky Mountains to the west and the broad prairies leading to the eastern forest.

Pettingill and Whitney concluded that substantial increase in water areas through construction of reservoirs, ponds, and lakes influenced the natural bird populations, especially the shorebirds and waterfowl.

Prominent Exotics of the Fauna

Six Rocky Mountain goats (a species not native to the Black Hills) brought from Canada and released in the game reserve in 1924 now provide a "trophy" animal for visitors to see. From this stocking, a stable population of 300-400 of these sure-footed creatures now range freely in the high granite area of Harney Peak, the Needles, and Mount Rushmore. All goats had escaped from the

game reserve before 1930 and became the breeding stock of the wild population which has remained unchanged since 1950. A small number of permits to hunt goats is issued each year as an attempt to keep the herd healthy.

Few successful trout fishermen in the Black Hills realize that rainbow, brook, and brown trout are not native to the area — nor are trout of any species. Cool, tumbling clear water of the mountain streams seemed ideally suited to trout so as early as 1886, some three years before South Dakota attained statehood, several cans of fingerling fish were brought by wagon from Leadville, Colorado. From that time on trout populations have been nurtured and fishermen have been grateful. Some lakes and streams in the Black Hills are now stocked several times each year under joint agreement between the South Dakota Department of Game, Fish and Parks which operates the Cleghorn Springs trout hatchery at Rapid City and the U. S. Bureau of Sports Fisheries and Wildlife which produces fingerling and legal size rainbow, brook, and brown trout at the McNenny hatchery west of Spearfish. This active and successful trout management program is one of the best in the nation.

LIVESTOCK GRAZING

Ever since the Black Hills National Forest was established, use of the land for livestock grazing has been controversial. Limited grazing is now an accepted use of the National Forest as long as it doesn't jeopardize other major uses, particularly active uses by the public. Under a controlled system of permits and land allotments, approximately 23,000 cattle and 4,500

sheep are allowed on the National Forest land during the summer grazing season. Livestock are barred from Custer State Park; thus year-round grazing is limited to private land interspersed in the national forest.

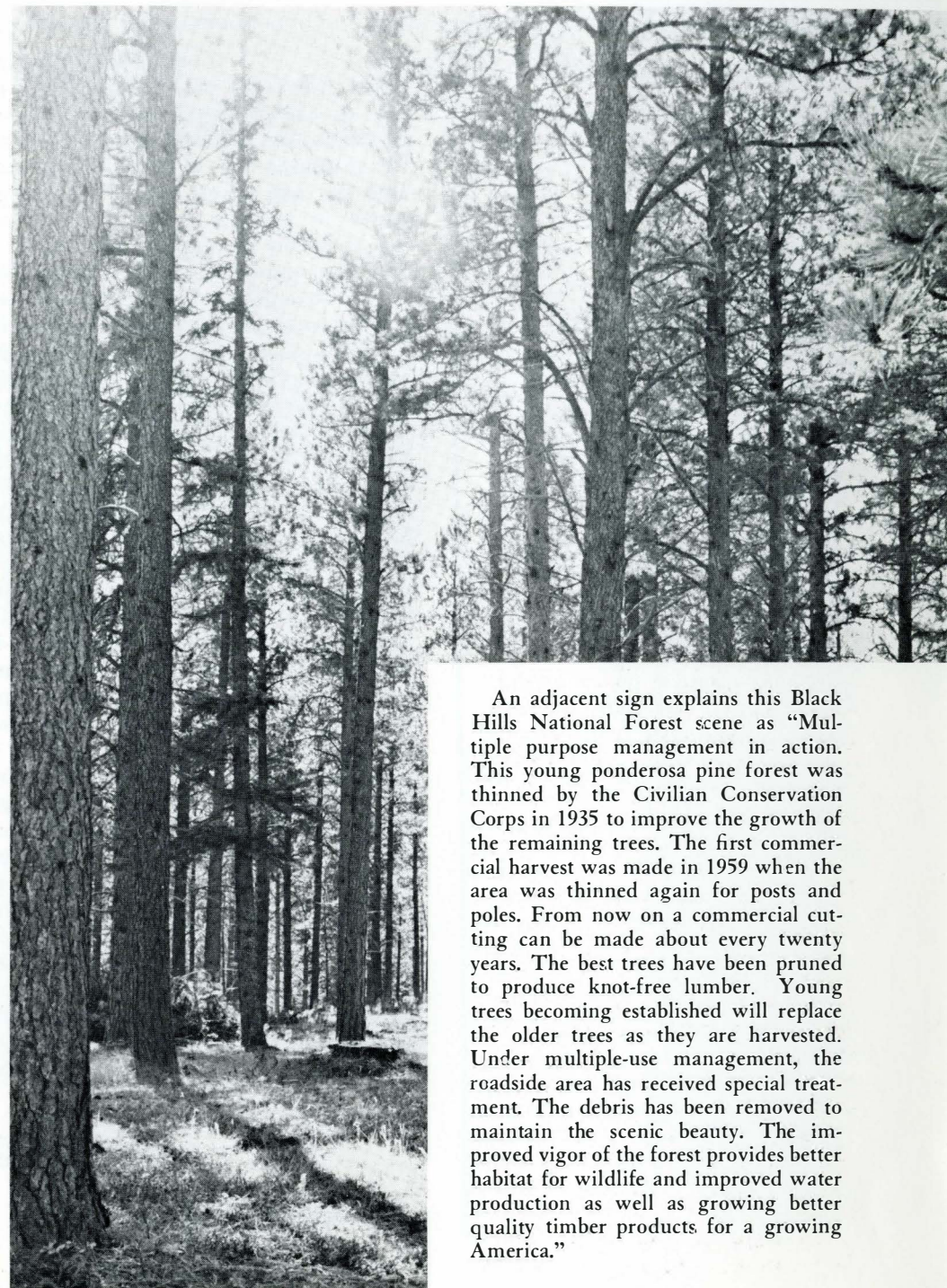
OUTDOOR RECREATION

Millions of visitors are drawn to the Black Hills each year to see the beauty of the area including Mount Rushmore National Memorial, Wind Cave National Park, Custer State Park, Jewel Cave National Monument, and numerous private attractions. Figures recently compiled by the U. S. Forest Service reveal that well over 1.5 million visitor days¹⁷ were spent in the Black Hills National Forest in 1973. The number of visits is expected to continue increasing, especially during 1976, the American Revolution Bicentennial Year, because Mount Rushmore has been designated as one of the Nation's Bicentennial focal points.

The type of recreation enjoyed in the Black Hills is nearly endless and involves both consumptive and non-consumptive activities. Fishing, camping, boating, and picnicking are centered at specific areas developed on public and private lands. Planners of the national forest and state park purposely locate heavy-use recreation areas so as to preserve the general wilderness of the mountain area. They agree that only a few additional developments (campgrounds, picnic grounds, boat launches, and beaches) can be permitted.

All lakes and reservoirs in the Black Hills are man made.

¹⁷A visitor day is one person staying at a site 12 hours or 12 persons at a site for 1 hour or any combination totaling 12 hours.



An adjacent sign explains this Black Hills National Forest scene as "Multiple purpose management in action. This young ponderosa pine forest was thinned by the Civilian Conservation Corps in 1935 to improve the growth of the remaining trees. The first commercial harvest was made in 1959 when the area was thinned again for posts and poles. From now on a commercial cutting can be made about every twenty years. The best trees have been pruned to produce knot-free lumber. Young trees becoming established will replace the older trees as they are harvested. Under multiple-use management, the roadside area has received special treatment. The debris has been removed to maintain the scenic beauty. The improved vigor of the forest provides better habitat for wildlife and improved water production as well as growing better quality timber products for a growing America."

The Forest of the Future (Summary)

What man has done to take from the Black Hills forest and disrupt its natural ecology during the past century will show into the years of 2074, 2174 and beyond. His marks are permanent! For better or for worse, timber harvest, re-forestation, fire suppression, road building, development of recreation areas, construction of lakes and reservoirs, timber stand improvement practices, and mining will dictate the future pattern of the forest.

We have learned from mistakes that the forest can be abused and there can be no turning back from some of the misdeeds. We now understand that there can be too many trees in the forest. Like seedling carrots, beets, and radishes in the backyard garden or fish in a fertile pond, too many individuals cause stunting of all. The forest must be thinned. Millions of selected trees must be freed from competition by removal of several millions more at appropriate times. Without enough nutrients and water, trees make but little diameter growth each year but under favorable conditions they can grow five or six times as fast.

We no longer let nature thin the forest by fire because we have said "all forest fires are bad." We have generally failed to keep the forest healthy and productive for many uses by eliminating trees. Perhaps man can do it in a more directed

way than did natural fires. Perhaps we will find that fire, when employed under control conditions, will become a useful tool in management of the forest and prairies of the Black Hills.

The U. S. Forest Service is the dominant force and leader in shaping the Black Hills forest. Its program is to develop an esthetically acceptable forest to produce timber and optimum wildlife habitat, maintain native prairie vegetation, maximize water production and still meet recreational needs of the public. What the public demands and allows to happen is a key factor in the future of this forest resource. What is done in another hundred years can be documented by ecologists and photographers visiting the same sites identified during this study.

Whoever ordered a photographer to accompany the Black Hills Expedition of 1874—whether it was General Custer himself, Colonel Ludlow, or the Commanding General — unknowingly established a base upon which patterns of the forest can be measured long into the future. While the supply of yellow ore will be virtually exhausted and Custer's travel into the area will remain in our historical accounts, the growing and abundant yellow pines will be a slow but living indicator of the forest under man's control.

Actual diameter of log
about 5 inches.

This cross section of a log summarizes the intent of the part of this publication dealing with ecology of a forest. The closely spaced annual rings in the center illustrate slow development in the early life of this tree, possibly caused by crowding and competition for sunlight and plant nutrients. Within the final decade of the life of this tree the annual rings expanded suddenly, possibly indicating a clearing of the forest or other factors which permitted more rapid growth.



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Appendix A

Photos similar to some appearing in text.



Photo A-1



Photo A-2



Photo A-3



Photo A-4



Photo A-5

Appendix B

Photo sites not located
during study.



Photo B-1



Photo B-2



Photo B-3



Photo B-4



Photo B-5



Turrent Rock

Photo B-6



Forsyth Glenn

Photo B-7



Forsyth Dell

Photo B-8



Photo B-9



Photo B-10



Photo B-11



Photo B-12



Photo B-13



Photo B-14

Appendix C

Photos between Fort Abraham Lincoln and the Black Hills. Top portion has been broken of photo (below) of Fort Lincoln.

Photo C-1





Photo C-2



Photo C-3

Illingworth identified this man as "our wagon master." The wagon master or train-master of the Expedition was Michael Smith.

Photo C-4





Photo C-5

Photos C-6 and C-7 apparently involved only a change of lens.

Photo C-6

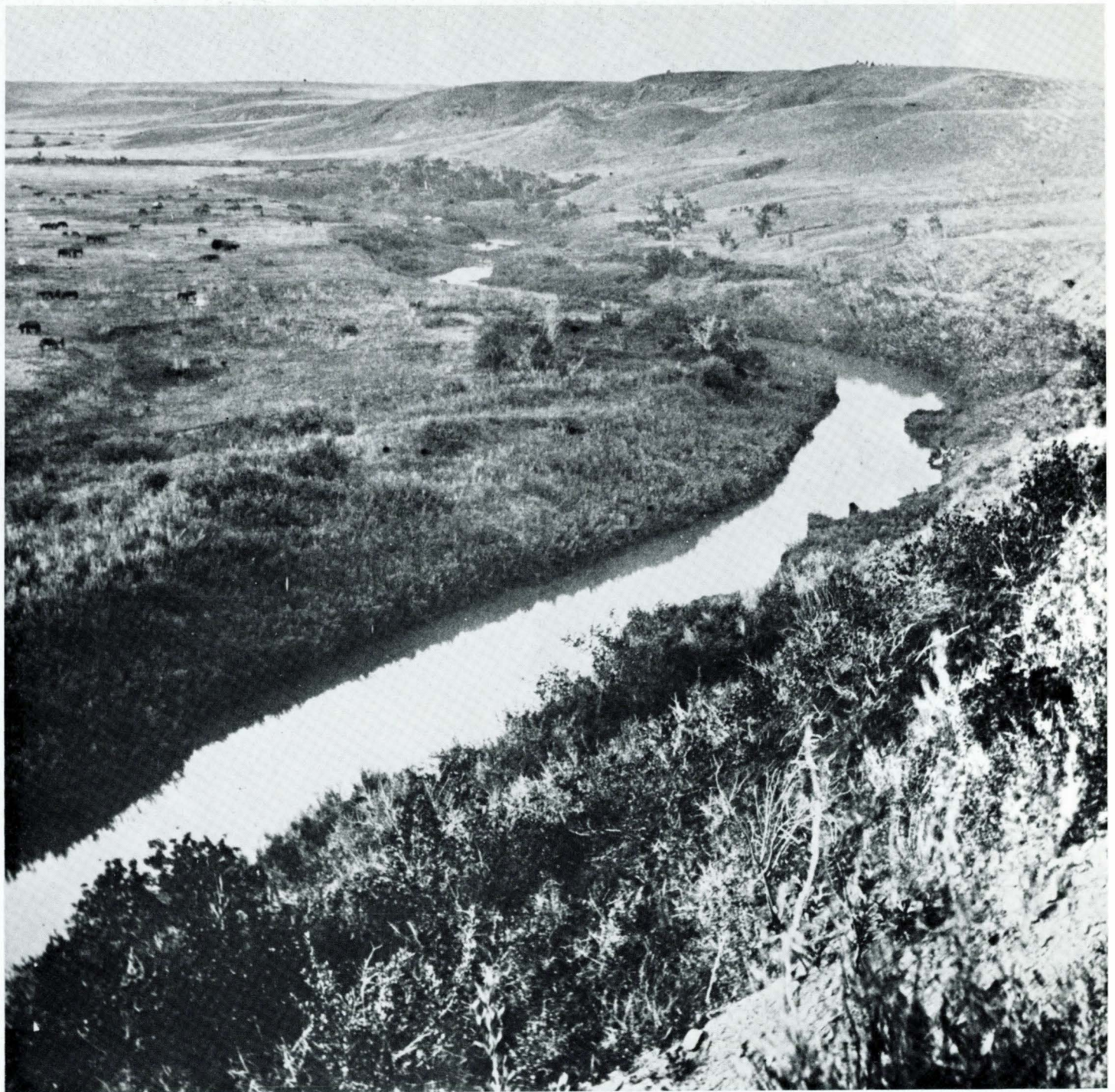




Photo C-7

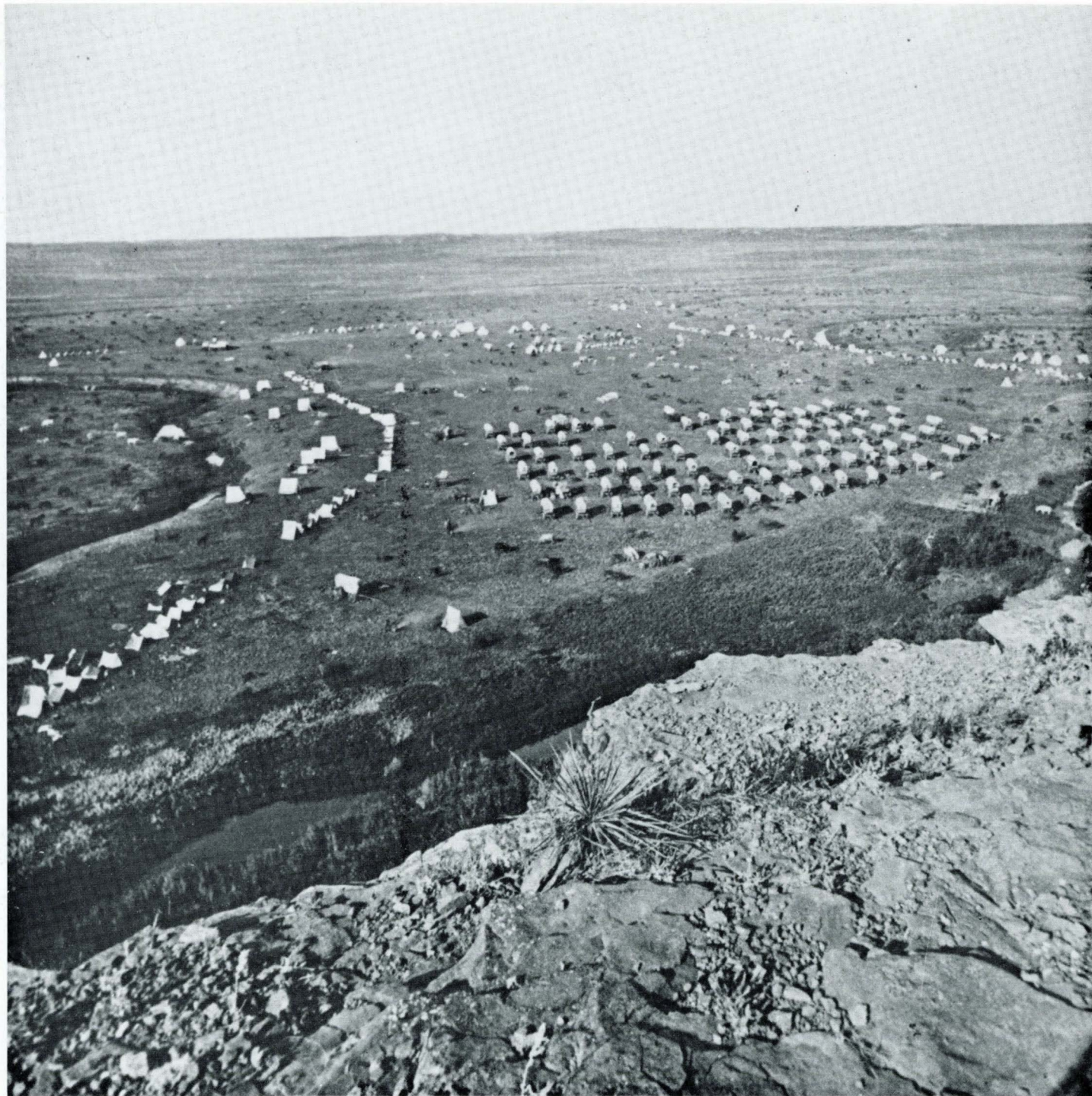


Photo C-8



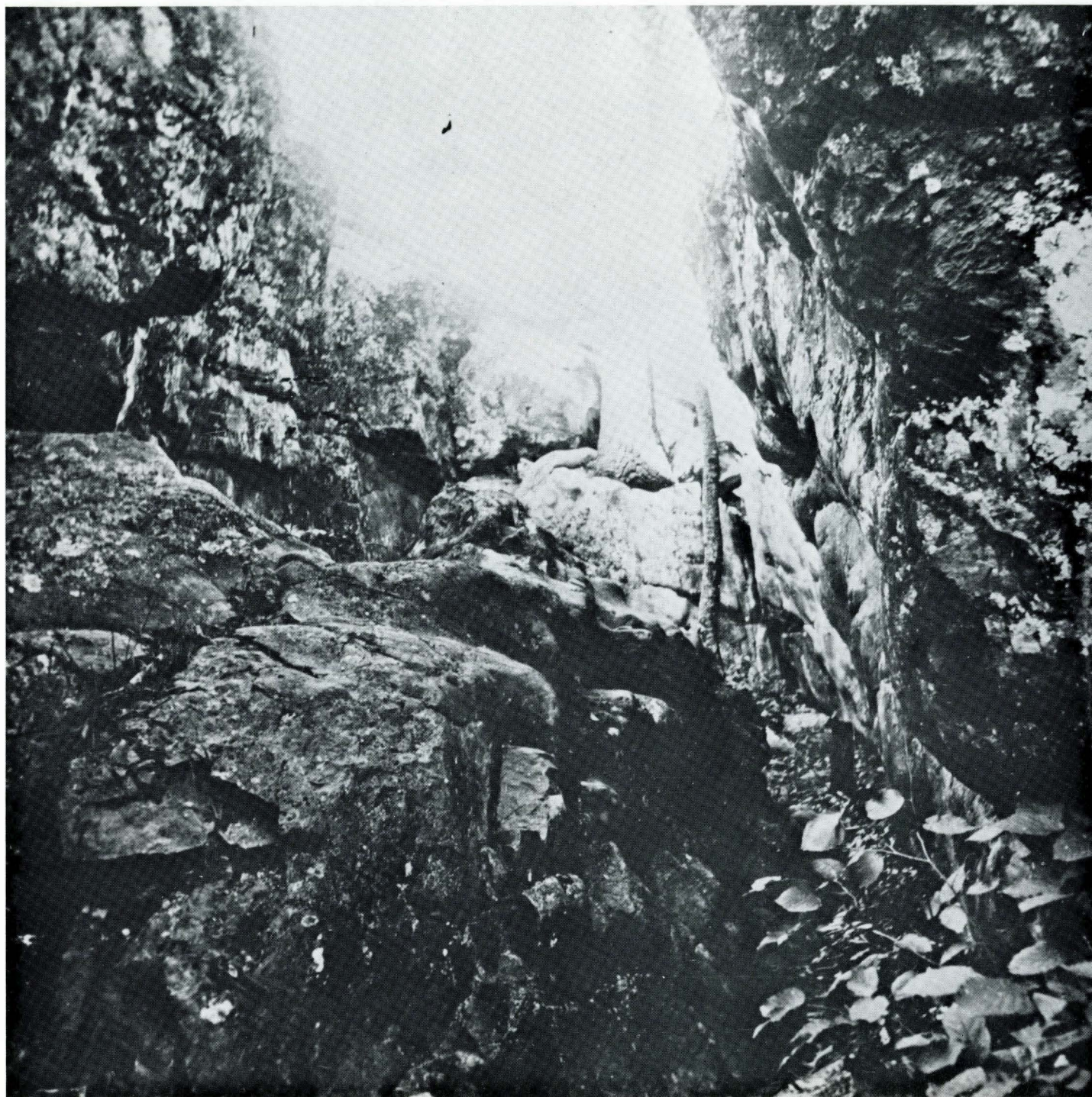
Photo C-9



Photo C-10

Ludlow Cave

Photo C-11

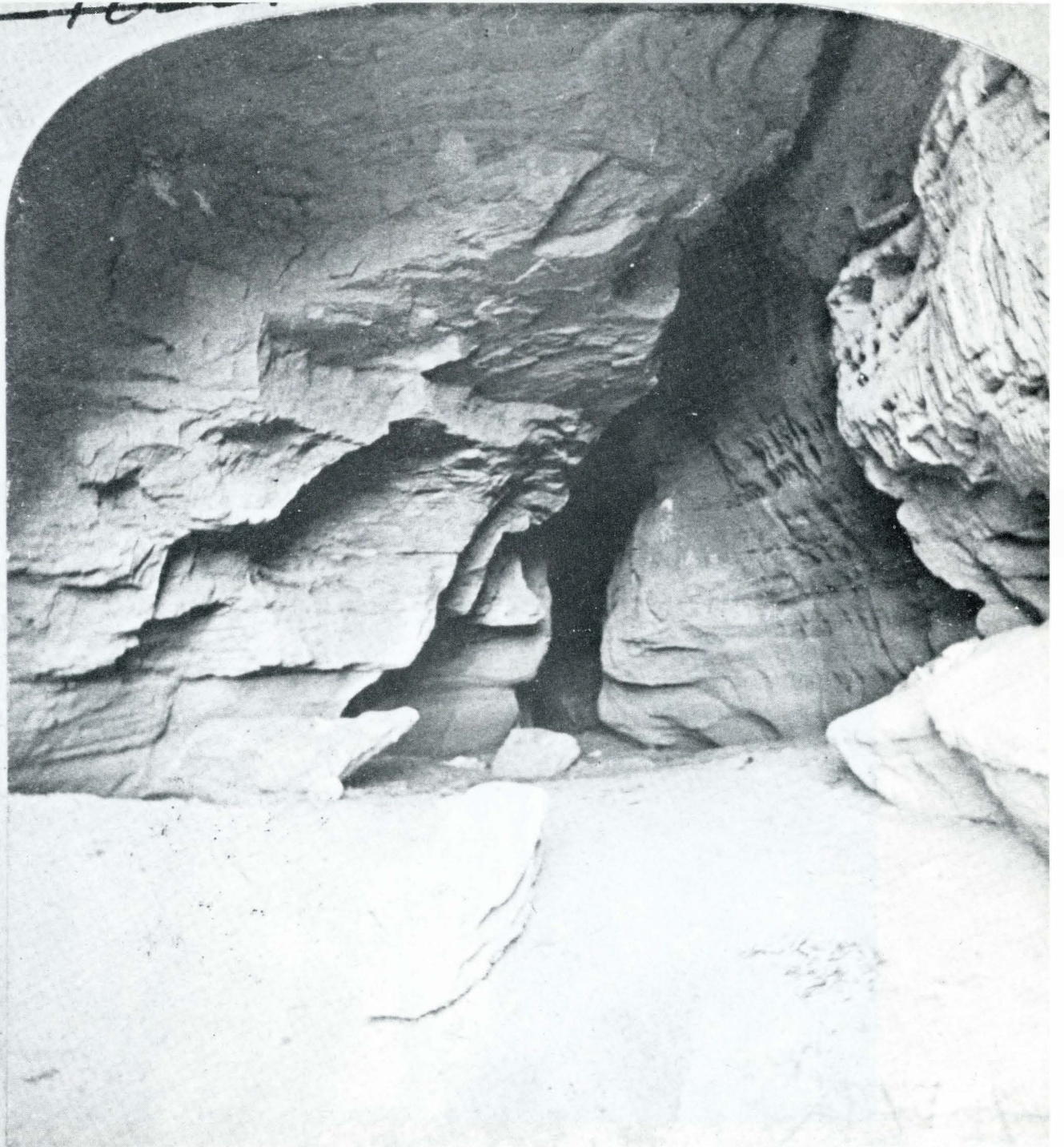


Interior Ludlow Cave

Photo C-12

STEREOGRAPHS OF THE BLACK HILLS.

Photographed by W. H. Ulingworth.



Appendix D

USGS MAP QUADRANGLE INDEX

Base maps for the Black Hills Expedition route overlay are United States Department of the Interior, Geological Survey topographic maps. These are listed by named quadrangles in the USGS "Index to Topographic Maps" of South Dakota and Wyoming.

Maps designated A, B, C, D, and E in this publication are in the 15 minute series, scale 1:62500. Other

lettered maps are in the 7.5 minute series, scale 1:24000. Large quadrangle maps are for sale through: Distribution Section, U. S. Geological Survey, Federal Center, Denver, Colorado 80225.

Letter designations in this publication were made on the following USGS quadrangles:

A—Alva, Beulah (Wyoming).

B—Alva, Beulah, Sundance (Wyoming).

C—Sundance (Wyoming).

D—Inyan Kara (Wyoming), Four Corners (Wyoming and South Dakota).

E—Four Corners (Wyoming and South Dakota).

(The remainder of the letter-quadrangle designations are all South Dakota).

F—Crooks Tower (not shown).

G—Crows Nest Peak.

H—Deerfield.

I—Ditch Creek.

J—Medicine Mountain.

K—Berne.

L—Custer.

M—Fourmile.

N—Cicero Peak.

O—Argyle, Pringle.

P—Edgemont NE, Minnekahta.

Q—Nahant, Minnesota Ridge.

R—Deadwood South, Deadman Mountain.

S—Deadman Mountain, Nemo.

T—Piedmont.

U—Blackhawk.

V—Tilford, Fort Meade SE.

W—Fort Meade.

Appendix E

PHOTO IDENTIFICATION BY PHOTO SITES

Photo Site	Photo numbers this publication	Map letter	USGS quadrangle
1	6A-6B A1	D	Inyan Kara
2	7A-7B	G	Crows Nest Peak
3	8A-8B-8C	G	Crows Nest Peak
4	9A-9B-9C-9D	G	Crows Nest Peak
5	14A-14B	H	Deerfield
6	15A-15B-15C	H	Deerfield
7	13A-13B	H	Deerfield
8	11A-11B 12A-12B	H	Deerfield
9	10A-10B	H	Deerfield
10	A2	H	Deerfield
11	17A-17B	K	Berne
12	18A-18B-18C 19A-19B-19C	K	Berne
13	20A-20B	K	Berne
14	21A-21B	L	Custer
15	22A-22B-22C 23A-23B-23C A3	L	Custer

Photo Site	Photo numbers this publication	Map letter	USGS quadrangle
16	24A-24B 25A-25B 26A-26B A4	L	Custer
17	27A-27B 28A-28B 29A-29B	L	Custer
18	30A-30B-30C 31A-31B-31C	L	Custer
19	32A-32B-32C 33A-33B-33C	L	Custer
20	35A-35B-35C 36A-36B A5	L	Custer
21	34A-34B-34C	L	Custer
22	37A-37B	L	Custer
23	38A-38B 39A-39B 40A-40B 41A-41B	L	Custer
24	16A-16B	H	Deerfield
25	42A-42B	W	Fort Meade

Appendix F

Photo identification and numbering systems.

These numbers are presented in the approximate sequence in which the photographs were taken.

This Study	South Dakota Historical Society	National Archives	Illingworth	This Study	South Dakota Historical Society	National Archives	Illingworth
A-3	46	111-SC-98515	----	C1	60	-----	----
23	17	-----	----	C-2	31	-----	----
24	41	" " " -843	843	1	14	77-HQ-264-852	852
A-4	18	-----	----	C-3	66	" " " -854	854
25	45	-----	----	C-4	11	" " " -853	853
26	27	" " " -845	845	C-5	13	-----	----
B-3	50	-----	----	C-6	63	" " " -803	803
B-4	73	-----	----	C-7	21	-----	----
27	43	" " " -838	838	C-8	9 & 69	" " " -801	801
28	49	" " " -840	840	C-9	32	" " " -802	802
29	12 & 65	" " " -839	839	C-10	34	" " " -800	800
30	-----	" " " -837	837	C-11	6	-----	----
31	-----	" " " -836	836	C-12	-----	" " " -804	804
B-5	25	" " " -833	833	6	10 & 16	-----	----
32	42	" " " -830	830	A-1	56	" " " -805	805
33	28	77-HQ-264-829	829	B-1	36	" " " -807	807
34	48 & 67	" " " -835	835	B-2	37	" " " -806	806
35	55	" " " -835	835	7	22	" " " -808	808
A-5	59	" " " -831	831	8	52	" " " -809	809
36	23 & 71	" " " -842	842	9	24	" " " -810	810
B-6	-----	" " " -841	841	10	3	" " " -811	811
37	5	" " " -828	828	A-2	29	" " " -816	816
38	57	" " " -825	825	11	20	" " " -814	814
39	26	" " " -827	827	12	39	" " " -813	813
40	-----	" " " -826	826	13	33	-----	----
41	-----	" " " -850	850	14	16	77-HQ-264-812	812
B-7	-----	" " " -819	819	15	30	-----	----
B-8	15	" " " -824	824	16	53	" " " -817	817
B-9	2 & 54	" " " -818	818	17	38	" " " -820	820
B-10	47 & 70	" " " -847	847	18	19 & 62	" " " -822	822
B-11	4	" " " -848	848	19	72	" " " -821	821
44	68	" " " -849	849	20	-----	" " " -823	823
B-12	44	" " " -851	851	21	51	" " " -832	832
B-13	7	" " " -854	854	22	58	-----	----
B-14	8	-----	----				
42	40	-----	----				
43	-----	-----	----				

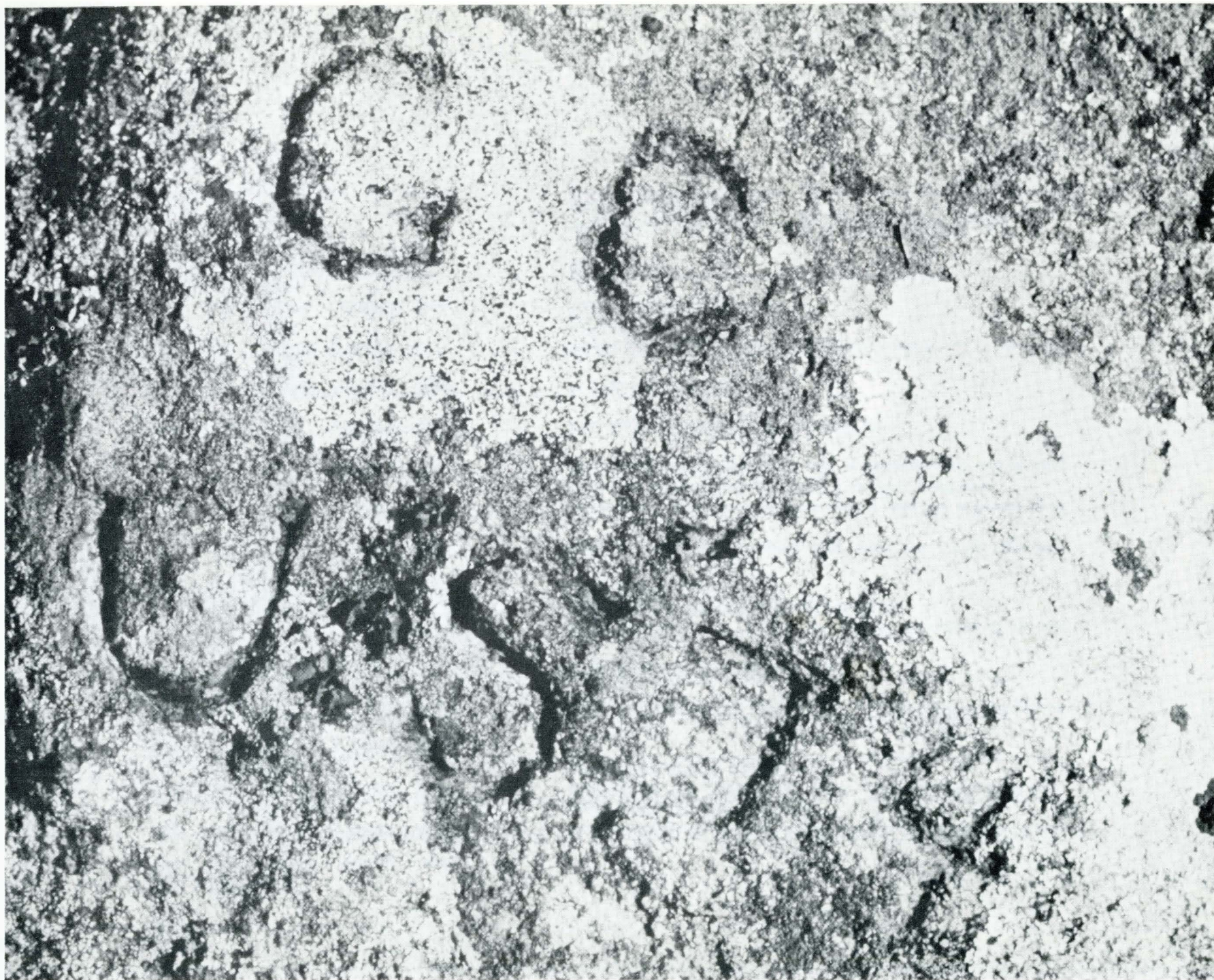
Appendix G

Data on comparative photos.

Illingworth Photo No. in this publication	Matching Photo No.	Date and Time	Exposure	Filter	Remarks
1					Wagon train on prairie
	2				Glass plates in wooden case
3					Photographer's wagon
	4	8-2-73 1130	1/50-F11	None	Doghaired stand of trees
	5	8-2-73 1500	1/100-F11	None	Open stand of trees
6A	6B	7-11-72 0800	1/125-F18	G	Inyan Kara, bright sunlight after overcast
7A	7B	7-29-71 1015	1/15-F32	None	Broken clouds in bright sunlight
8A	8B	8-2-72 1000	1/60-F22	G	Castle Creek
8A	8C	8-2-72 1015	1/60-F22	G	Offset 7 feet to the left from 8B to serve as reference photo
9A	9B	8-2-72 1100	1/60-F18	None	East end of ridge from Photo 8A, overcast
9A	9C	8-2-72 1115	1/60-F18	None	100 feet east of 9A to view valley
9A	9D	8-2-72 1125	1/60-F18	None	Offset to show rocks and snags
10A	10B	7-29-71 1115	1/30-F22	None	Castle Creek looking at limestone outcropping near Castle Rock
11A	11B	7-28-71 1000	1/30-F22	None	Approximately 90 feet downslope on ridge to left, apparently where Illingworth stood, overcast skies
12A	12B	7-28-71 1030	1/30-F22	None	Swung camera to right of 11A—overcast
13A	13B	7-28-71 1050	1/30-F16	K2	Complete overcast, Position around hill from 12A. View is Nipple Butte and Castle Rock.
14A	14B	7-10-72 1445	1/100-F16	G	Castle Creek School House Hill
15A	15B	8-4-73 1030	1/400-F11	None	
15A	15C	8-4-73 1040	1/400-F11	None	Approximately 20' to right of 15B—offset
16A	16B	6-6-73 1020	1/100-F16	G	16B is not a matching photo but does show a similar type of prairie

Illingworth Photo No. in this publi- cation					Remarks
	Matching Photo No.	Date and Time	Exposure	Filter	
17A	17B	6-7-73 1535	1/100-F11	G	This rock is about 8' long
18A	18B	6-7-73 1430	1/25-F16	G	
18A	18C	6-7-73 1445	1/100-F22	G	Offset 30' to the left of 18B to show background
19A	19B	6-7-73 1610	1/100-F16	G	
19A	19C	6-7-73 1630	1/100-F16	G	Offset 25' to the right of 19B to show background
20A	20B	7-29-71 1400	1/15-F32	K2	Along Highway No. 385. Heavy clouds, some broken.
21A	21B	8-3-73 1830	1/100-F8	None	
22A	22B	8-3-73 1330	1/25-F16	None	
22A	22C	8-3-73 1345	1/25-F22	None	Offset 15' forward of 22B site, just in front of trees to show background
23A	23B	8-3-73 1400	1/25-F16	None	
23A	23C	8-3-73 1415	1/25-F16	None	Offset 15' forward of 23B site, just in front of trees to show background
24A	24B	8-1-73 1750	1/200-F22	None	
25A	25B	8-1-73 1815	1/100-F11	None	
26A	26B	8-1-73 1800	1/100-F16	None	
27A	27B	6-8-73 1630	1/50-F16	None	Same tree in picture. It has leaned some to the left.
28A	28B	7-31-73 1020	1/50-F22	None	
29A	29B	7-31-73 0950	1/50-F16	None	
30A	30B	9-12-72 1650	1/100-F16	G	
30A	30B-1	9-12-72 1640	1/100-F16	G	Offset 30' forward of 30B site, just in front of trees to show background
31A	31B	9-12-72 1610	1/100-F18	G	
31A	31B-1	9-12-72 1650	1/100-F16	G	Offset 150' forward of 31B site, just front of trees to show background

Illingworth Photo No. in this publi- cation	Matching Photo No.	Date and Time	Exposure	Filter	Remarks
32A	32B	7-30-71 0930	1/50-F32	None	Northeast of Custer. Sky clear, bright sunlight. Approximately ¼ mile up glade from Dr. Meyer's Ranch.
32A	32C	7-30-71 0945	1/50-F32	None	Reference for 32B (32A). Taken below rock from 32B and 45' from present fence running across glade.
33A	33B	8-1-73 1415	1/50-F11	None	
33A	33C	8-1-73 1400	1/50-F16	None	Offset 30' forward of 33B site, just in front of trees to show background
34A	34B	8-18-71 1040	½ sec.-F32	None	Meyer Ranch; 50' E of 35B, light rain.
34A	34C	8-18-71 1130	1/15-F32	None	Inline downslope 3100' to edge of trees; 40' downslope of old tree stump which is large tree in Illingworth photo
35A	35B	8-18-71 1020	¼-F32	None	Meyer Ranch; light rain
35A	35C	8-18-71 1100	1/15-F32	None	Inline downslope approximately 3100' from 35B (35A); light rain
36A	36B	8-18-71 1145	1/30-F32	None	Meyer Ranch; heavy overcast. From crest of slope SW of house; top of knoll west of drive; down slope 500' from other ranch house
37A	37B	6-5-73 1525	1/100-F16	K2	End of dumproad; East about ½ mile up valley on south side of valley
38A	38B	8-1-73 1050	1/200-F16	None	This site is approximately 70' above 40B site
39A	39B	7-30-73 1200	1/50-F11	None	8' to the left of 40B site
40A	40B	7-30-73 1115	1/25-F22	G	Needles area in the background. Highway overlook just to left of top center of pics
41A	41B	8-1-73 1130	1/200-F22	None	Swung camera to right of 40B site
42A	42B	7-8-72 1430	1/100-F22	G	Bear Butte
43					Wagon train on the Prairie, on the way back to Fort Lincoln.
44					Bear shot near Nahant, S. D.



GO

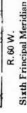
US 74

19th Century Kilroy. (Traced from photo page 166)

North Half



South Half





The Black Hills as seen from space. This is a black and white copy of a color slide taken from Skylab, the space workshop orbiting nearly 250 miles above the earth. Note the drainage lines radiating from the Black Hills, an area of about 4,500 square miles.

Rapid City, S. D. is the lighter area, just above center right and adjacent to the darker forested area. North is at the top of the page.

This photo was provided by the Remote Sensing Institute, headquartered on the campus of South Dakota State University, Brookings, S. D. Original imagery from National Aeronautics and Space Administration, EROS Data Center, Sioux Falls, S. D.

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