

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

**NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY -- NOMINATION FORM**

FOR FEDERAL PROPERTIES

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RECEIVED JUN 8 1987

DATE ENTERED JUL 13 1987

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC

Brow Monument

AND/OR COMMON

Brow Monument

LOCATION

STREET & NUMBER

Kaibab National Forest, North Kaibab Ranger District

N/A

CITY, TOWN

NOT FOR PUBLICATION

Big Springs Admin. Site

VICINITY OF

3

CONGRESSIONAL DISTRICT

STATE

Arizona

CODE

04

COUNTY

Coconino

CODE

005

CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE
<input type="checkbox"/> DISTRICT	<input checked="" type="checkbox"/> PUBLIC	<input type="checkbox"/> OCCUPIED	<input type="checkbox"/> AGRICULTURE
<input type="checkbox"/> BUILDING(S)	<input type="checkbox"/> PRIVATE	<input checked="" type="checkbox"/> UNOCCUPIED	<input type="checkbox"/> MUSEUM
<input type="checkbox"/> STRUCTURE	<input type="checkbox"/> BOTH	<input type="checkbox"/> WORK IN PROGRESS	<input type="checkbox"/> COMMERCIAL
<input type="checkbox"/> SITE	PUBLIC ACQUISITION	ACCESSIBLE	<input type="checkbox"/> EDUCATIONAL
<input checked="" type="checkbox"/> OBJECT	<input type="checkbox"/> IN PROCESS	<input checked="" type="checkbox"/> YES: RESTRICTED	<input type="checkbox"/> ENTERTAINMENT
	<input type="checkbox"/> BEING CONSIDERED	<input type="checkbox"/> YES: UNRESTRICTED	<input type="checkbox"/> GOVERNMENT
	N/A	<input type="checkbox"/> NO	<input type="checkbox"/> INDUSTRIAL
			<input type="checkbox"/> MILITARY
			<input checked="" type="checkbox"/> OTHER: None

AGENCY

REGIONAL HEADQUARTERS: (If applicable)

USDA Forest Service, Southwestern Region

STREET & NUMBER

517 Gold Avenue, SW

CITY, TOWN

Albuquerque

N/A VICINITY OF

New Mexico

STATE

85073

LOCATION OF LEGAL DESCRIPTION

COURTHOUSE,
REGISTRY OF DEEDS, ETC.

Kaibab National Forest

STREET & NUMBER

800 South 6th Street

CITY, TOWN

Williams

STATE

AZ

86046

6 REPRESENTATION IN EXISTING SURVEYS

TITLE

Kaibab National Forest Site Survey Files: Site # AR-03-07-03-129

DATE

September, 1978

FEDERAL STATE COUNTY LOCAL

DEPOSITORY FOR
SURVEY RECORDS

Kaibab National Forest, 800 S. Sixth St.

CITY, TOWN

Williams

STATE

AZ

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
<input type="checkbox"/> EXCELLENT	<input type="checkbox"/> DETERIORATED	<input type="checkbox"/> UNALTERED	<input checked="" type="checkbox"/> ORIGINAL SITE
<input checked="" type="checkbox"/> GOOD	<input type="checkbox"/> RUINS	<input checked="" type="checkbox"/> ALTERED	<input type="checkbox"/> MOVED DATE _____
<input type="checkbox"/> FAIR	<input type="checkbox"/> UNEXPOSED	1878	

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

Summary/Context:

Brow Monument, a triangulation station constructed during the 1871-72 Powell Survey, is located on what is now the North Kaibab Ranger District of the Kaibab National Forest. It rests on the western edge of a flanking bench on the Kaibab Plateau at 7250 feet in elevation, about three miles west of Big Springs administrative site. It is known as Brow Monument because it is located just off the top of a ridge on a slight bench; in other words, at the brow of the ridge. Pinon, juniper, and scattered ponderosa pine trees surround the monument.

Description:

The monument is described in an 1894 United States Geological Survey document as follows: "A small tree from which the lower branches are cut so as to leave a tuft at top. About its base is piled a triangular pyramid of stone 8 feet high" (Gannett 1894: 138). Today the monument still bears a strong resemblance to this early description. The pyramid of unshaped limestone blocks is cribbed with axe-cut pinon and ponderosa pine logs. It measures approximately 3 meters (9 feet) across and is about 1 meter (3.5 feet) high. Many rocks have fallen off and are scattered downslope, but it appears doubtful that the monument could ever have been eight feet high, based on the number of remaining rocks. According to Kaibab National Forest Land Surveyor Roger Green, survey crews were often required to construct monuments to a specified size. In the field, it was not always possible to comply with the specifications due to a dearth of suitable building materials, or even lack of time or energy. The published survey description, therefore, often reflected the ideal size of monuments, rather than the real. The cribbed log and stone surrounds a now fallen pinon tree (the original sight tree) which measures 12 inches in diameter and about 18 feet long. All but the three top branches of this tree have been removed. A long thin pole of ponderosa pine now stands in the center of the monument.

Forest Service archeologists removed several tree-ring samples from the monument in the summer of 1986, and they reveal interesting information about its construction. Despite the loss of most of its branches, the central pinon sight tree lived past the year of 1907, the last discernable ring. One cribbing log provided a cutting date of 1878; another dated 1874, but this was not an outside ring. Although these dates seem to contradict the fact that the present monument dates to the original 1872 survey, they are evidence of a survey conducted by geologist G.K. Gilbert in 1878. In the fall of that year, he remeasured the elevations of several triangulation stations in the survey area. Gilbert undoubtedly stabilized the monument at that time.

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Integrity

Brow Monument has suffered some deterioration from natural forces in the one-hundred odd years since it was built. Specifically, the central pinon pine sight tree has fallen over and some of the rock cribbing has scattered around the base. However, the monument still appears essentially the same as it did when first established in 1872. It retains integrity of location, setting, materials, feeling, and association.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
<input type="checkbox"/> PREHISTORIC	<input type="checkbox"/> ARCHEOLOGY-PREHISTORIC	<input type="checkbox"/> COMMUNITY PLANNING	<input type="checkbox"/> LANDSCAPE ARCHITECTURE	<input type="checkbox"/> RELIGION
<input type="checkbox"/> 1400-1499	<input type="checkbox"/> ARCHEOLOGY-HISTORIC	<input type="checkbox"/> CONSERVATION	<input type="checkbox"/> LAW	<input type="checkbox"/> SCIENCE
<input type="checkbox"/> 1500-1599	<input type="checkbox"/> AGRICULTURE	<input type="checkbox"/> ECONOMICS	<input type="checkbox"/> LITERATURE	<input type="checkbox"/> SCULPTURE
<input type="checkbox"/> 1600-1699	<input type="checkbox"/> ARCHITECTURE	<input type="checkbox"/> EDUCATION	<input type="checkbox"/> MILITARY	<input type="checkbox"/> SOCIAL/HUMANITARIAN
<input type="checkbox"/> 1700-1799	<input type="checkbox"/> ART	<input type="checkbox"/> ENGINEERING	<input type="checkbox"/> MUSIC	<input type="checkbox"/> THEATER
<input checked="" type="checkbox"/> 1800-1899	<input type="checkbox"/> COMMERCE	<input checked="" type="checkbox"/> EXPLORATION/SETTLEMENT	<input type="checkbox"/> PHILOSOPHY	<input type="checkbox"/> TRANSPORTATION
<input type="checkbox"/> 1900-	<input type="checkbox"/> COMMUNICATIONS	<input type="checkbox"/> INDUSTRY	<input checked="" type="checkbox"/> POLITICS/GOVERNMENT	<input type="checkbox"/> OTHER (SPECIFY)
		<input type="checkbox"/> INVENTION		

SPECIFIC DATES

1872, 1878

BUILDER/ARCHITECT

Members of the Powell Survey

STATEMENT OF SIGNIFICANCE

Summary:

Brow Monument is significant for its association with the historic Powell Survey of 1870-1879. Congress charged the survey with the task of mapping a vast region of southern Utah and northern Arizona, the last remaining unknown expanse of land in the continental United States. The members of the survey crew accomplished this by using a baseline and triangulation points. The Brow triangulation station is one of the few topographic monuments from the Powell Survey which survive today, and the only one in existence on the Kaibab National Forest. It marks a geographical point, but it also commemorates the efforts of a survey crew working under difficult and primitive conditions. It is significant under the theme of exploration/settlement because the map produced by the survey resulted from exploration of a previously unknown area, and it facilitated settlement in the region of homesteaders. It is also significant under the theme of politics/government because of its association with John Wesley Powell and the Powell Survey, forerunner to the United States Geological Survey.

Historical Context

The physiographic region known as the Plateau Province covers a large part of Utah, western Colorado, northern Arizona, and New Mexico. It is characterized by arid high plateaus dissected by deep canyons. Historically, it was a place forbidding to exploration and settlement, because it lacked mineral wealth, water, and travel routes. Consequently, it became the last unknown and unexplored region of the continental United States, and a challenge to explorer John Wesley Powell.

Powell was born the son of a Methodist minister in Mount Norris, New York in 1834. As a youth, he moved west with his family, eventually settling in southern Wisconsin. Although Powell had little formal education and never received a scholarly degree, his natural aptitude for learning and educating led to a teaching job in a one-room schoolhouse. For several years he lived the life of an itinerant scholar in the midwest, and was elected secretary of the Illinois Natural History Society in 1859. He enlisted in the Union Army during the Civil War, and lost his right arm at the Battle of Shiloh in 1862. In 1864, he earned the rank of Major, a title he carried for the rest of his life. After the war Powell desired more adventure, and in the summer of 1867 he led

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a coterie of students on a field trip west to the Rocky Mountains. Among the party of eleven were his wife Emma Dean Powell, his brother-in-law Almon Thompson, and student Frank Bishop. The latter two would figure prominently in the 1871-72 topographical survey. The 1867 trip was successful, and whetted Powell's appetite for exploration.

The following year, Powell gathered another crew for the now-famous 1868 voyage down the Green and Colorado Rivers. This privately-funded expedition provided a curious public with fascinating reading of the crew's adventures, but it amounted to little more than a reconnaissance of the area for scientific purposes. In 1870, Powell persuaded Congress to fund another expedition which would result in the charting of an accurate map and scientific descriptions of the region. The expedition's official title was the "Geological and Topographical Survey of the Colorado River of the West," and it was also known for a time as the "United States Geographical and Geogical Survey of the Rocky Mountain Region," but its popular name has always been simply the "Powell Survey".

The United States had funded surveys of the American West since the 1804-1806 Lewis and Clark Expedition in the Northwest Territories. After the southwestern United States was acquired from Mexico, Congress needed information on the area's resources, particularly regarding potential transportation routes. During the 1840s and 1850s, survey parties explored throughout the west seeking practical routes for railroads and wagon roads. Among the better-known explorers of the period were Stephen W. Kearney, John C. Fremont, Lorenzo Sitgreaves, Amiel W. Whipple, and Edward F. Beale. Naturalists and topographers accompanied the expeditions, but their reports and observations were most often broad in scope. Maps were drawn unsystematically, without benefit of triangulation, resulting in finished products which merely suggested rather than accurately portrayed the true lay of the land.

These surveys added greatly to our general knowledge of the regions explored and did result in development of transportation routes. However, a more rigorous survey methodology was required for precise measurement of the land. Thomas Jefferson developed survey methods in the late 1700s which became known as the rectangular survey system. Rectangular surveys precisely define property lines, and they became an essential means of parceling the land in the expanding American West. The General Land Office (GLO), established in 1812, administered the survey of public lands, and throughout the 19th century individual surveyors worked under contract for the GLO. Undoubtedly, the first survey task in Arizona was to lay out the old United States-Mexico boundary in 1851. (This was the boundary for lands acquired by the 1848 Treaty of Guadalupe-Hidalgo; the Gadsden Purchase of 1853 extended the

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boundary southward to its present location.) One of the large stone monuments which marked the boundary near the junction of the Gila and Salt Rivers became the initial point of the Gila and Salt River Meridian in 1865. This point is the baseline from which all land lines in Arizona are drawn. Probably the most important function of General Land Office Surveyors was to classify land types to determine future use, such as for mining or homesteading. Before 160-acre homestead tracts could be issued, the legal land lines had to be drawn, and this was the job of the GLO surveyor. Their maps contained very little information about the land other than legal boundaries, however.

Topographical survey was not concerned with land lines, but rather with features like mountains, valleys, plains, rivers, canyons, and so forth. In 1813, the Corps of Topographical Engineers was created to map the United States, primarily for military purposes. The Corps used techniques developed for geodetic survey (such as triangulation from a baseline with survey instruments) to produce topographic maps. They had not succeeded in mapping much of the west, however, before the Civil War interrupted their activities. The Corps of Topographical Engineers was disbanded after the Civil War, and the void was filled by the four "Great Surveys" established between 1867 and 1870 to produce information on the western territories. These were the United States Geological Survey of the Fortieth Parallel directed by Clarence King, the United States Geological and Geographical Survey of the Territories directed by Ferdinand Hayden, the Geographical Surveys West of the 100th Meridian directed by George M. Wheeler, and finally, the Powell Survey. These four surveys formed the basis for the United States Geological Survey, which was established in 1879.

The Powell Survey used state-of-the-art triangulation techniques, and was thus far more accurate than the reconnaissance surveys in Arizona which had been conducted up to that time. The surveyors did not, however, lay out land lines or tie the survey into the already established Gila and Salt River Meridian.

The Colorado River had intrigued (and often repelled) the early explorers on their reconnaissance surveys, and the various parties remained south of the Grand Canyon along the 35th parallel, or far north of it along the 38th parallel. The Colorado Plateau Province remained largely unexplored until Powell and his crew ventured into its arid canyons.

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Powell and his party began their government-sanctioned survey at Green River, Wyoming in May of 1871. They traveled by boat down the Green and Colorado Rivers and in November reached what is now known as Lee's Ferry. They left the river at that point to conduct the overland survey. The crew assembled in Kanab, Utah, which would be the base of operations during the winter and spring. Powell, preoccupied with events in Washington D.C. and elsewhere, placed his brother-in-law Almon Thompson in charge of the survey. Although an entomologist by training, Thompson would make his mark as a skilled topographer. Other crew members included topographers F.M. Bishop, F.S. Dellenbaugh, and S.V. Jones; photographers E.O. Beaman, J.K. Hillers, and W.C. Powell (Major Powell's cousin); the cook, A.H. Hattan; and various assistants from the local Mormon settlements. In December of 1871, they began laying out a nine-mile long baseline south from Kanab. The baseline was accurately measured with rods supported by wooden trestles, and the north-south azimuth was determined by astronomical observation. Thompson calculated the latitude and longitude of the baseline in early 1872, and triangulation from the baseline began soon after.

Triangulation is based on geometric principles. If the length of one side of a triangle and two of its angles is known, then the length of the other two sides can be calculated. The baseline served as the known length, and expedition members projected triangles to prominent topographic features. Once these lengths were calculated, they could serve as baselines for further measurement, eventually covering a vast expanse of land. The crew erected permanent markers at triangulation points, usually a large pyramid of stone, sometimes a blazed tree, or cribbed logs, and placed a red-and-white flag high above them, to facilitate telescopic readings from the baseline. Elevation above sea level was established by barometric readings. With this information, topographic relief could be drawn on maps with contour lines.

The survey work was both difficult and dangerous. The crews rode by horseback into rough, unknown territory which harbored uneasy Paiute Indians (three members of Powell's 1868 expedition were killed by a band of these Indians). Much of the survey area was covered by deep snow, and the cold winds of winter made the crew more uncomfortable. Because their pack animals were loaded with scientific equipment, axes, and shovels, they had little room for creature comforts such as tents or cooking utensils, and meals were spartan. Finding appropriate triangulation points, building stone monument cairns, setting up sight poles, and triangulating to other stations under such conditions was trying at best.

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The topographic survey work continued until August of 1872, when Powell rejoined the expedition and they resumed their trip down the Colorado River as far as Kanab Creek. In September, they returned to the town of Kanab to complete their overland survey and begin drawing the map. Thompson and Dellenbaugh finished the map in a tent at Kanab in January, 1873. The 1872 expedition surveyed an area covering about 45,000 square miles.

In 1875 Thompson conducted additional triangulation work from a baseline at Gunnison, Colorado, about 150 miles northeast of Kanab. He connected the two baselines by triangulation, and thus tied in the Kanab survey with the surveys conducted by the King and Wheeler expeditions. The Kanab and Gunnison surveys gave control points for topography covering an area about 108,000 square miles.

Geologist G.K. Gilbert joined the Powell Survey in 1875 to assist with the topographic work and to describe the geology of the region. He devised a new, more accurate barometric measurement for determining elevations. In the fall of 1878, he returned to the Kanab area and remeasured the elevation at the baseline as well as at some topographic points. Since one cutting date from the Brow Monument cribbing is 1878, Gilbert probably added some logs to the monument at that time. Geologist Clarence E. Dutton and Topographer Sumner H. Bodfish refined previous topographical measurements on the Kaibab Plateau in the summer of 1880.

The Powell Survey employed mapping methods which were far more accurate than anything that had yet been attempted in the region. However, the triangulation, completed under primitive conditions, was only of fourth-order accuracy, and thus fell below the first-, second-, and third-order standards adopted by the U.S. Geological Survey of 1921. This may be why the area was resurveyed in 1933 and again in 1953. A United States Geological Survey crew headed by B.H. Yoakum reset Brow Monument in 1933. The original monument was located in an unusual place, just off the top of the ridge on a slight bench. The 1933 crew may have found this a difficult location on which to sight, so they set their brass cap at the top of the ridge about 300 feet east of the 1872 monument, calling it "Brow 2". In 1953, the United States Coast and Geodetic Survey reset the monument for a third time, and their brass cap remains in place. It is located in the same place as the 1933 monument. Moving the monument's location in 1933 likely saved the original Brow Monument from destruction, as surveyors routinely tear down old monuments during resurvey work (Roger Green, personal communication 1987).

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It was probably while Powell was exploring the arid country of the Colorado Plateau and living among the Mormons of Southern Utah that he began to formulate ideas which he expounded in his 1878 Report on the Lands of the Arid Regions of the United States. He realized that the country west of the 98th Meridian was too arid for anyone to successfully homestead a standard-size 160-acre tract unless it happened to contain a permanent water source. Sources of permanent water in such a region are relatively rare, and Powell feared that individuals could monopolize huge areas of land simply by gaining control of water rights in small parcels. This was already happening at an alarming rate in the 1870s, and it called for quick Congressional action. Powell proposed that homesteads in the arid west be increased to 2560 acres in size from the standard 160-acre tract. Each homestead would contain dry pasturage and have 20 acres of irrigable land to farm on, with inseparable water rights. To maintain irrigation systems, settlers would organize into cooperatives similar to those formed by the Mormons. Powell further proposed that property survey be based on topography rather than the geometric land line survey techniques of the General Land Office. The irregular property lines which would result would give everyone water frontage and make maximum use of the land. However, before the land could be parceled in this manner, the topography of the entire western United States had to be mapped. As director of the U.S. Geological Survey in the early 1880s, Powell set the mapping project in motion. He designed topographic maps with contour lines showing land types like desert, swamp, timber, arable, and pasturage with shading and color. The maps would prove far more useful for many more purposes than the simple land line maps of the General Land Office. Although Congress eventually repudiated Powell's ideas for western settlement, they did authorize the mapping project, which continues to this day. Thus, the 1872 Powell Survey might be considered the progenitor of the topographic maps which today are so commonly used.

Significance:

Brow Monument is significant under the theme of exploration/settlement and politics/government because of its association with the Powell Survey. The expedition succeeded in exploring and mapping the last uncharted region of the continental United States. Information from the survey was used by the government in planning the pattern of land use and settlement in the region. It was during the expedition that Powell began formulating his visionary ideas on how the arid regions of the United States should be developed. Furthermore, the Powell Survey is significant because it was incorporated into the United States Geological Survey, established in 1879 as a result of Powell's efforts.

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Few of the 47 survey monuments from the 1871-72 Powell topographical survey remain today. Neither of the baseline ends exist, and the only other monument placed on what is today the Kaibab National Forest (Brink, which was originally a target of cribbed logs) was destroyed at some time in the past (Schiowitz 1984). Brow Monument is only one of 11 known survey monuments erected in the state of Arizona by the expedition. As such, it is a tangible reminder of the pioneering work conducted by the Powell Survey in the winter of 1871-72. The monument serves as more than just a survey marker; it is truly a monument to the dedication of the members of the Powell Survey.

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Staack, J.G.

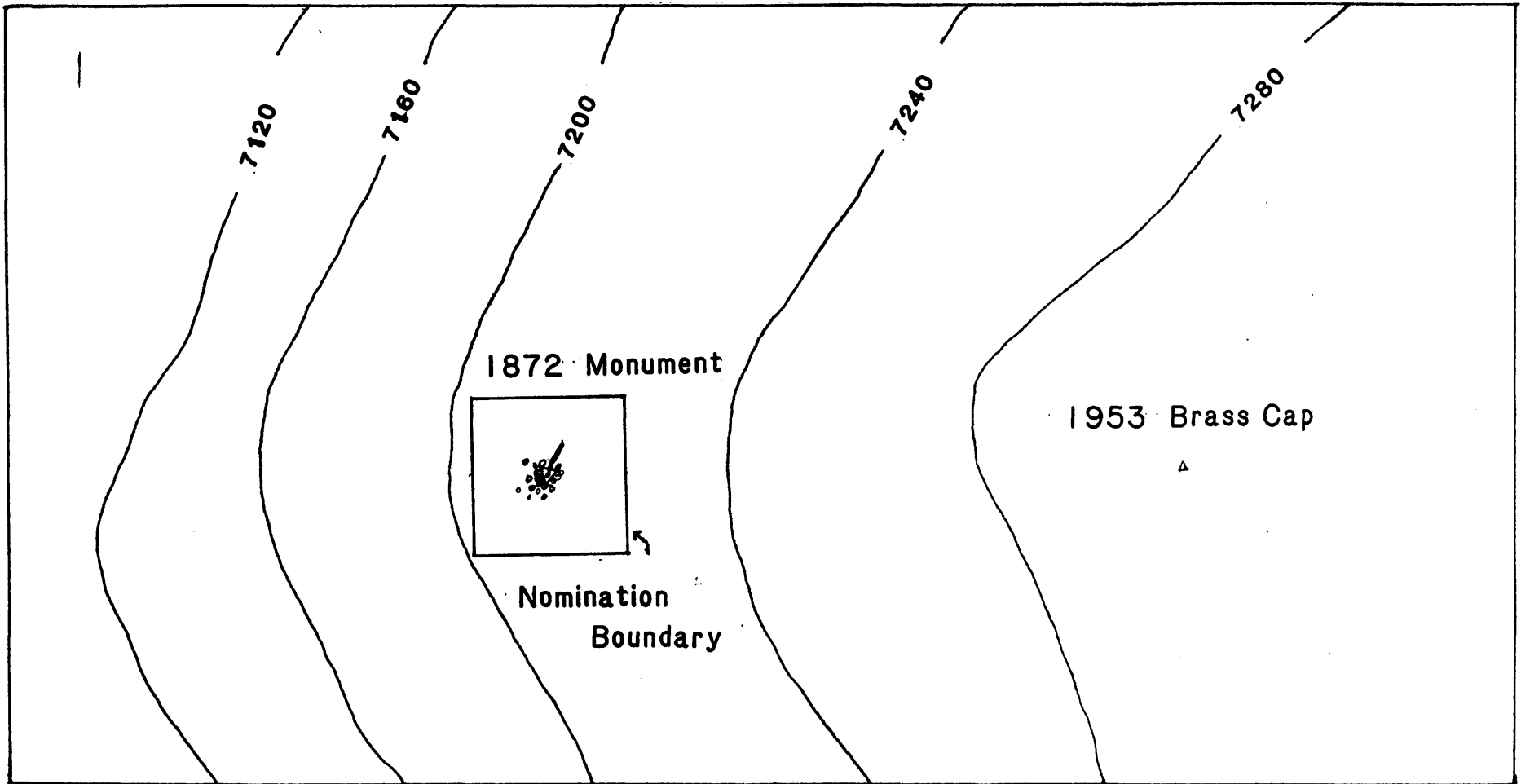
1940

"Triangulation in Utah 1871-1934." U.S. Geological Survey
Bulletin No. 913. U.S. Government Printing Office, Washington,
D.C.

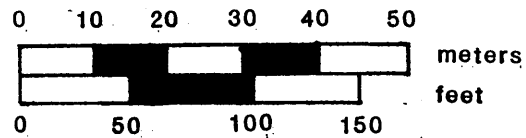
Stegner, Wallace

1953

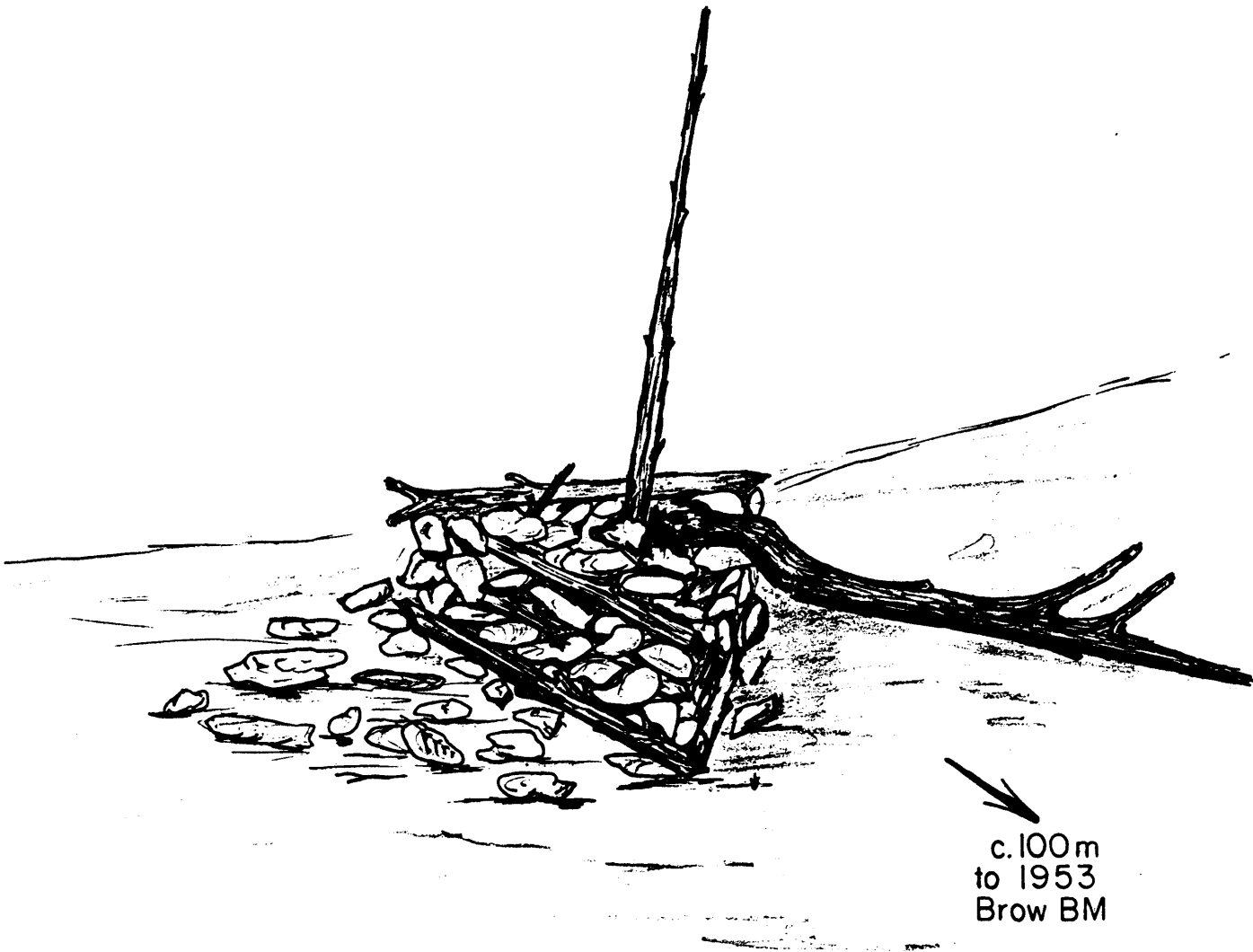
Beyond the Hundredth Meridian. Houghton Mifflin, Boston.



BROW MONUMENT (AR-03-07-03-129)



JUL 8 1987



c. 100m
to 1953
Brow BM



SITE PLAN
1871 BROW MONUMENT
AR-03-07-03-129

0 1 2
Meters

TC/rft 1/6/87