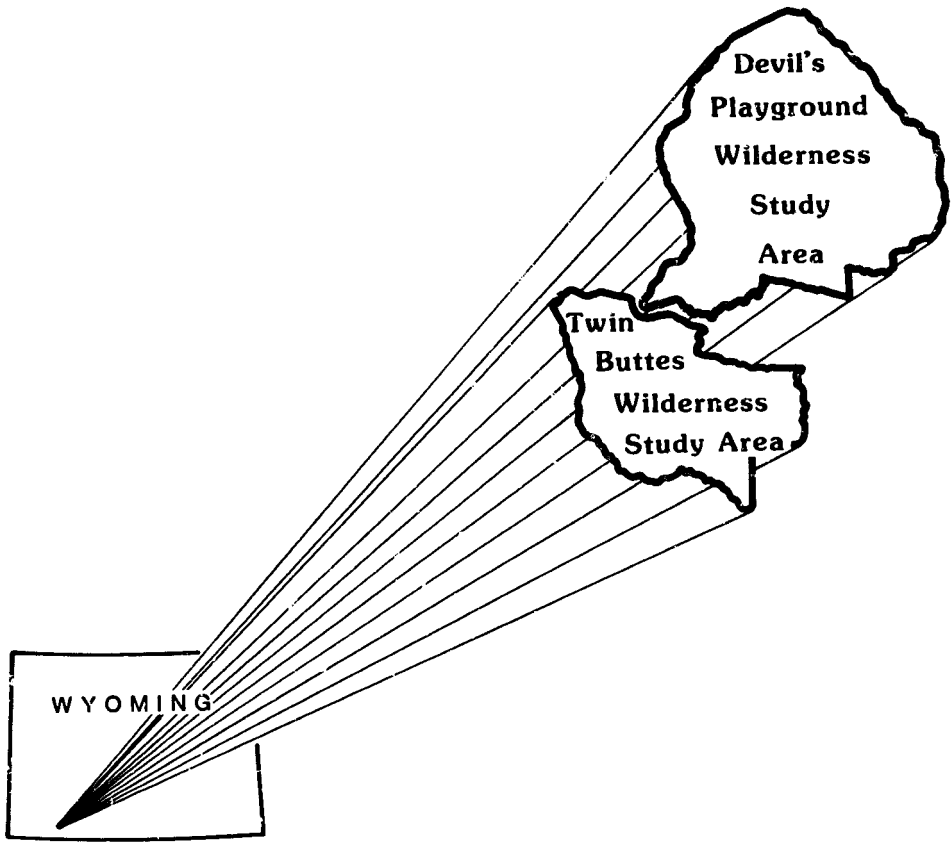
MLA 7-90

Mineral Land Assessment
Open File Report/1990

Mineral Resources of the Devil's Playground (WY-040-401) and Twin Buttes (WY-040-402) Wilderness Study Areas, Sweetwater County, Wyoming



BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF THE DEVIL'S PLAYGROUND (WY-040-401) AND TWIN BUTTES (WY-040-402) WILDERNESS STUDY AREAS, SWEETWATER COUNTY, WYOMING

by

Michael E. Lane

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1990

Intermountain Field Operations Center
Denver, CO

UNITED STATES DEPARTMENT OF THE INTERIOR
Manuel Lujan, Jr., Secretary

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PREFACE

The Federal Land Policy and Management Act of 1976 (Public Law 94-579) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Devil's Playground (WY-040-401) and Twin Buttes (WY-040-402) Wilderness Study Areas, Sweetwater County, Wyoming.

This open-file report summarizes the results of a Bureau of Mines wilderness study. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. This study was conducted by personnel from the Resource Evaluation Branch, Intermountain Field Operations Center, P.O. Box 25086, Denver, CO 80225.

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UNIT OF MEASURE ABBREVIATIONS

ft^3	cubic feet
ft	foot
mi	mile
%	percent

MINERAL RESOURCES OF THE DEVIL'S PLAYGROUND (WY-040-401) AND TWIN BUTTES (WY-040-402) WILDERNESS STUDY AREAS, SWEETWATER COUNTY, WYOMING by

Michael E. Lane, U.S. Bureau of Mines

SUMMARY

In June 1990, the Bureau of Mines conducted a mineral investigation of the 16,704-acre Devil's Playground (WY-040-401) and the 9,964-acre Twin Buttes (WY-040-402) Wilderness Study Areas in Sweetwater County, southwestern Wyoming. The investigation was requested by the Bureau of Land Management and authorized by the Federal Land Policy and Management Act of 1976 (Public Law 94-579).

Using data from two drill holes within 1 mi of the study areas and computer-generated isopach maps supplied by the Bureau of Land Management, inferred trona resources of about 1.2 billion tons are estimated to underlie the study areas at depths of between 2,200 ft and 3,100 ft. The trona beds are between 2 ft and 14 ft thick; additional information, including drilling, would be needed to verify the presence, delineate the trona beds, and determine purity (grade).

No prospects or mining claims are in the study areas. Seven samples of the Bridger Formation in the Twin Buttes study area indicate no unusually high concentrations of elements. Oil shale is interbedded with the trona beds in the region; additional drilling is needed to determine if a resource exists beneath the study areas. The study areas are rated as having high potential for oil and gas, but no energy

resources were identified as a result of this investigation. Of samples taken by the U.S. Geological Survey, one had a zeolite content of 80%; all other samples contained 10% zeolite or less. However, no zeolite resources were identified. Coal was not found in outcrops in the study areas; if coal exists beneath the surface, it would be at depths that would make it subeconomic.

INTRODUCTION

In June 1990, the Bureau of Mines, in a cooperative program with the U.S. Geological Survey (USGS), investigated the mineral resources of the 16,704-acre Devil's Playground and the 9,964-acre Twin Buttes Wilderness Study Areas (WSAs), Sweetwater County, Wyoming, on lands administered by the Bureau of Land Management (BLM), Rock Springs District Office.

The Bureau surveys and studies mines, prospects, and mineralized areas to appraise reserves and identified mineral resources; the USGS assesses the potential for undiscovered mineral resources. This report presents the results of the Bureau of Mines study, which was completed prior to the USGS investigation.

Geographic and geologic setting

The Devil's Playground and Twin Buttes WSAs are in southwestern Wyoming, in Sweetwater County, about 23 mi southwest of the town of Green River, and about 8 mi north of the Utah State line (figure 1). Flaming Gorge Reservoir is about 2 mi east of Devil's Playground WSA. Access to both

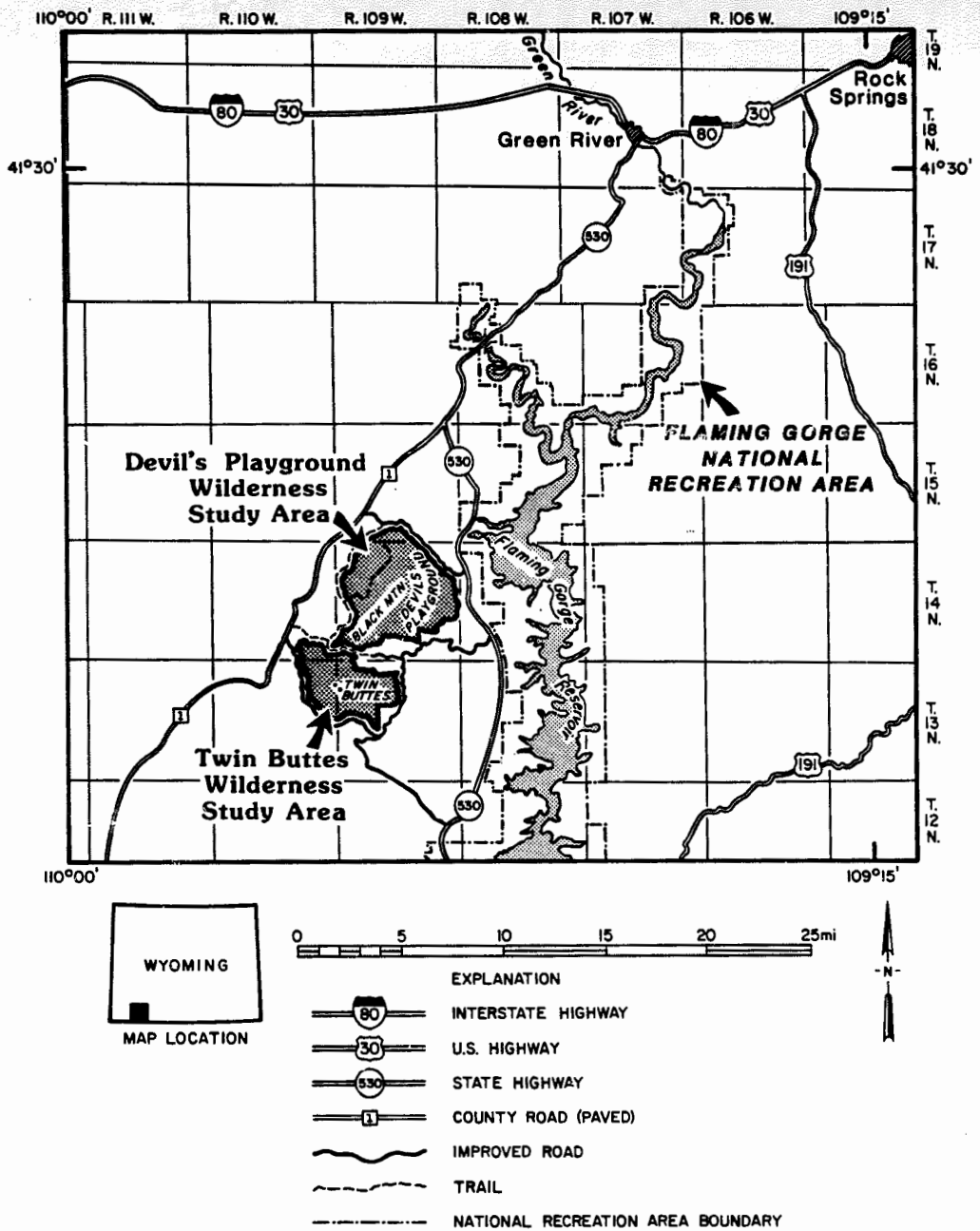

Figure 1. Index map of the Devil's Playground and Twin Buttes Wilderness Study Areas, Sweetwater County, Wyoming.

study areas is by improved roads and trails from State Highway 530 and Sweetwater County Road 1.

The badlands terrain consists of weathered buttes, hills, and knobs. The highest elevation in the Devil's Playground WSA is about 7,980 ft on Black Mountain in the southwestern part of the study area; the lowest elevation is about 6,200 ft near the northeastern boundary. The highest elevation in the Twin Buttes WSA is about 8,040 ft on the northernmost butte of Twin Buttes; the lowest elevation is about 6,760 ft along the east and west boundaries. Vegetation in the study areas consists of sage, grasses, and scattered juniper trees.

The WSAs are in the Wyoming Basin division of the Great Plains physiographic province (U.S. Geological Survey, 1970, p. 56). The surface of the study areas is comprised of the Eocene-age Bridger Formation and the Oligocene-age Bishop Conglomerate.

The Bridger Formation is about 1,800 ft thick and consists predominantly of tuffaceous limestone, dolostone, and claystone with interbedded mudstone and medium-grained tuffaceous sandstone. There are also abundant volcanic-ash beds containing little, if any, clastic material (Bradley, 1964, p. 49). The beds have a regional dip of 2 to 3 degrees to the west.

The Bishop Conglomerate overlies the Bridger Formation and caps the Twin Buttes and Black Mountain. In the Twin Buttes WSA the conglomerate has been eroded and only two small outcrops remain on the northernmost butte. In Devil's Playground WSA, the conglomerate is 75-100 ft thick and is well exposed. The conglomerate consists of rounded cobbles and boulders of limestone, red quartzite, and metamorphic rocks. (See U.S. Bureau of Mines and U.S. Geological Survey, 1990, p. 51; Bradley, 1964, p. 55)

Underlying the Bishop Conglomerate and the Bridger Formation, the Wilkins Peak Member of the Green River Formation consists of thin persistent beds of oil shale, marlstone, claystone, trona, limestone, and tuff.

Method of investigation

Bureau personnel reviewed literature concerning mining and geology of the region. In addition, BLM records were reviewed for mining claim information and oil and gas leases and lease applications, which are shown on plate 1. As of June 1990, no mining claims within the study areas were on file with the BLM.

In June 1990, two Bureau geologist spent 7 days conducting a field examination in and within 1 mi of the study areas. A total of seven rock-chip samples was taken from outcrops of the Bridger Formation during the field investigation. All samples were analyzed by neutron

activation for 34 elements, including gold and silver by Bondar-Clegg Inc., Lakewood, CO.

Mining history

Trona is currently being mined about 25 mi northwest of the study areas. No mines or prospects were found during the field investigation and no mining districts are in the study areas.

Acknowledgments

The Bureau of Mines appreciates information supplied by Dave Hutcheson of FMC Corporation and Robert Doser of Rhone-Poulence Company concerning trona occurrences and mining procedures in the region. Both companies are currently mining trona west of Green River and about 25 miles northwest of the study areas.

APPRAISAL OF SITES EXAMINED

Analyses of the seven samples taken by the Bureau of Mines did not indicate any elevated concentrations of any element. Several drill holes are near the WSAs. Two holes adjacent to the study areas, the Twin Buttes #1 (T. 14 N., R. 109 W., sec. 33) and the Buckboard Ranch #2 (T. 15 N., R. 109 W., sec. 32), intercepted trona beds in the Green River Formation at 2,664 ft and 2,222 ft, respectively (BLM file data). The Buckboard Ranch #2 hole was drilled for trona by Joseph Perkins in July 1959, five trona beds were found (table 1,(14, 15, 16, 17, and 18)). The Twin Buttes #1 hole was drilled in July 1975 by Farmers Union Central Petroleum

Company to investigate oil and gas. Twelve trona beds (1, 2, 3, 4, 9, 12, 13, 14, 15, 16, 17, and 18) were encountered. The Twin Buttes #1 hole was not cored or analyzed.

Trona

Trona ($Na_2CO_3NaHCO_3\ 2H_2O$) is an evaporite mineral formed in nonmarine alkaline lakes and marshes (Culbertson, 1966, p. 159). These types of deposits are rarely economic (Lefond, 1983, p. 1188); however, the world's largest trona deposits are being mined west of Green River (U.S. Bureau of Mines, 1989, p. 149). These deposits occur as numerous tabular beds in the Wilkins Peak Member of the Green River Formation. Culbertson (1966) assigned numbers to 25 trona beds that exceeded 3 ft in maximum thickness and have an areal extent of 100 square mi or more; these numbers are used in this report. Trona bed 17 is being mined by FMC Corporation and is 8 to 14 ft thick, about 1,600 ft deep, and has purity of 80 to 90% trona and 10 to 20% insolubles (shale stringers, halite, and other impurities) (Dave Hutcheson, oral commun., FMC Corporation, 1990).

Trona is readily processed to form soda ash (sodium bicarbonate). Soda ash is mostly used in making glass and paper, but it is also used in soaps, detergents, and pharmaceuticals. Thirteen trona beds projected to extend beneath the WSAs, have been identified from drill hole data (Table 1). The beds range in thickness from 2 ft to 14 ft. Using drill hole data and computer-generated isopach maps

supplied by the BLM, about 1.2 billion tons of inferred trona resources were calculated for beds 17, 14, and 12 underlying the WSAs. These calculations do not contain purity estimates because of limited data. The calculations were done using a tonnage factor of 15 ft^3 per ton and maps that showed outlines and thicknesses of projected trona beds. Additional data, including drilling, would be needed to verify and more accurately delineate trona beds and determine the quality of the resources. Table 1 shows drill hole data for the two drill holes.

Zeolites

Zeolites are naturally occurring hydrated aluminum silicate minerals in which the atoms are arranged in a three-dimensional crystalline framework giving zeolites unique physical and chemical properties. Zeolites are used in air pollution control, aquaculture, construction materials, as a desiccant, detergents, dietary supplement for livestock, mining and metallurgy, nuclear waste disposal, odor control, paper products, petroleum refining, solar energy, soil conditioning, and waste water treatment. Zeolites can be manufactured for specific needs. (see Tripp and Mayes, 1989)

Occurrences of zeolites in the study areas have been reported by Harris and others (1985). During a field investigation in July 1990, the USGS collected 35 rock-chip samples in and near the study areas; eleven samples taken in

Table 1. Data and analysis for the Twin Buttes #1 and the Buckboard Ranch #2 drill holes.(BLM file data, Rock Springs District Office)
[na, not analyzed; ?, not known]

Drill Hole	Depth to top of bed (ft)	Bed number	Thickness of bed (ft)	% Trona
Twin Buttes #1	2664	18	3	na
do	2710	17	4.5	na
do	2762	16	10	na
do	2781	15	6.5	na
do	2836	14	11	na
do	2854	?	3	na
do	2881	13	10	na
do	2902	12	6	na
do	2951	9	9	na
do	3008	4	2.5	na
do	3020	3	3	na
do	3034	2	2	na
do	3079	1	3	na
Buckboard Ranch #2	2222	18	6	na
do	2259	17	11	81.9
do	2311	16	9	42.5
do	2329	15	14	21.5
do	2381	14	10	46.1

the study areas contained zeolites (localities shown on plate 1). The highest zeolite content, present as the mineral clinoptilolite, was 80%; the remaining zeolite-bearing samples contained 10% or a trace zeolite. No other zeolite minerals were found and no resources were identified. Table 2 shows sample data for zeolite-bearing samples.

Table 2. Sample description of zeolite samples taken by the U.S. Geological Survey. (Richard VanLoenen, written communication, 1990) [Tr, trace]

Sample no.	Zeolite content (%)	Description
TB-1	80	One-foot thick, mottled light-brown and light greenish gray altered tuff.
TB-2	10	Grayish green tuffaceous sandstone.
TB-3A	10	Yellowish gray dolomitic limestone.
TB-6B	Tr	Light greenish gray dolomitic mudstone (tuffaceous) in the Sage Creek upper white layer.
TB-6C	10	Light greenish gray dolomitic tuffaceous siltsone in Sage Creek upper white layer.
TB-6D	Tr	Yellowish gray dolomitic tuffaceous siltstone in Sage Creek upper white layer.
TB-6F	10	Yellowish gray dolomitic tuffaceous siltstone in Sage Creek upper white layer, about 10 ft thick.
TB-13B	Tr	Grayish yellow dolomitic siltstone.
TB-22C	Tr	Yellowish gray dolomitic tuffaceous fine-grained sandstone in the Sage Creek upper white layer.
TB-22D	Tr	Yellowish gray dolomitic tuffaceous siltstone in the Sage Creek upper white layer.
TB-23	10	Yellowish gray tuffaceous limestone 25 ft below TB-22.

ENERGY RESOURCES

Spencer and Powers (1983) rate the WSAs as having high potential for oil and gas resources based on the presence of a geologic environment highly favorable for occurrence of oil and gas accumulations; the study areas are on a trend with existing fields which produce from structural and stratigraphic traps.

In the region, oil shale is found in the Wilkins Peak Member of the Green River Formation and is interbedded with the trona. The oil shale occurs as lenses, from a few inches to 4 ft in thickness and contain between 10 and 40 gallons of oil per ton (Culbertson, 1966, p. 160). Additional drilling is needed to determine if oil shale exists under the study areas in sufficient quantity and quality to be a resource.

Coal was not found in the study areas; if coal exists beneath the study areas it would likely be at depths exceeding 3,000 ft and development would be unlikely. (Richard Jones, oral commun., Wyoming Geological Survey, 1990).

CONCLUSIONS

Inferred resources of 1.2 billion tons of trona are estimated to underlie the study areas at depths between 2,200 ft and 3,100 ft. Additional information, including drilling, would be needed to accurately delineate trona beds and determine grade.

The WSAs are rated a having high potential for oil and gas accumulations beneath the areas. Coal was not found during the field investigation. If coal does exist beneath the WSAs, it would probably not be developed in the foreseeable future. Additional drilling is needed to determine if oil shale resources underlie the WSAs.

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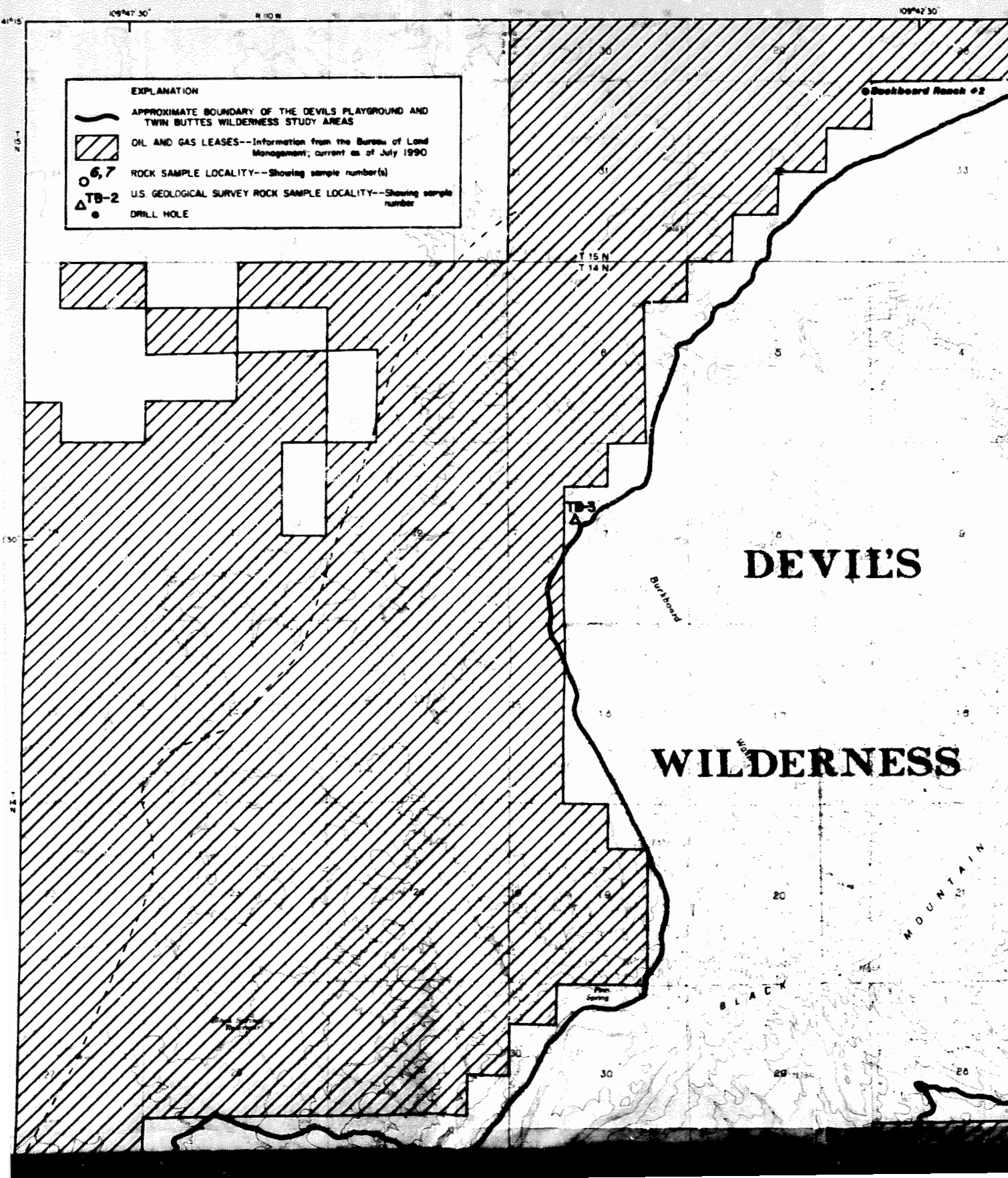

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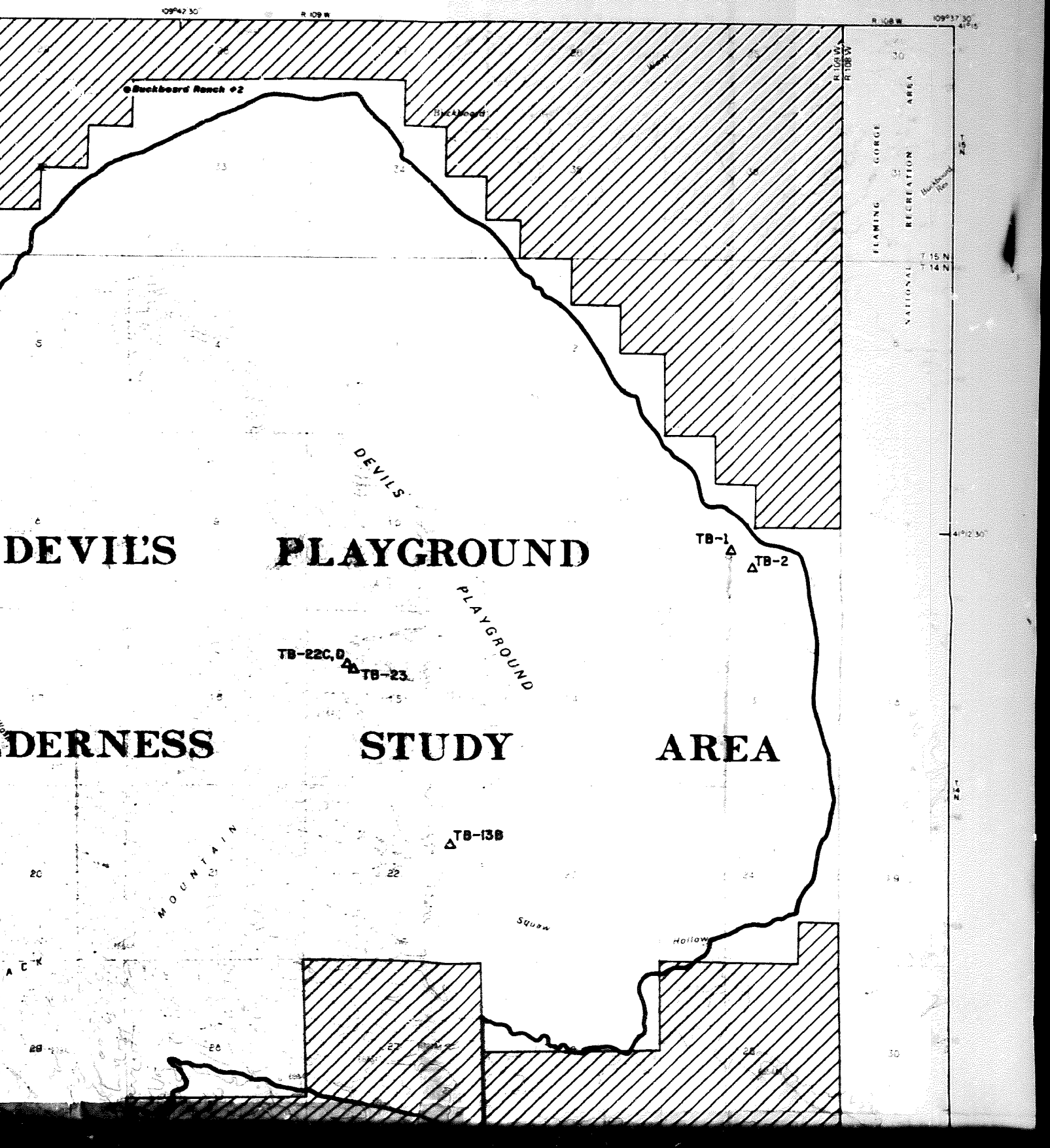
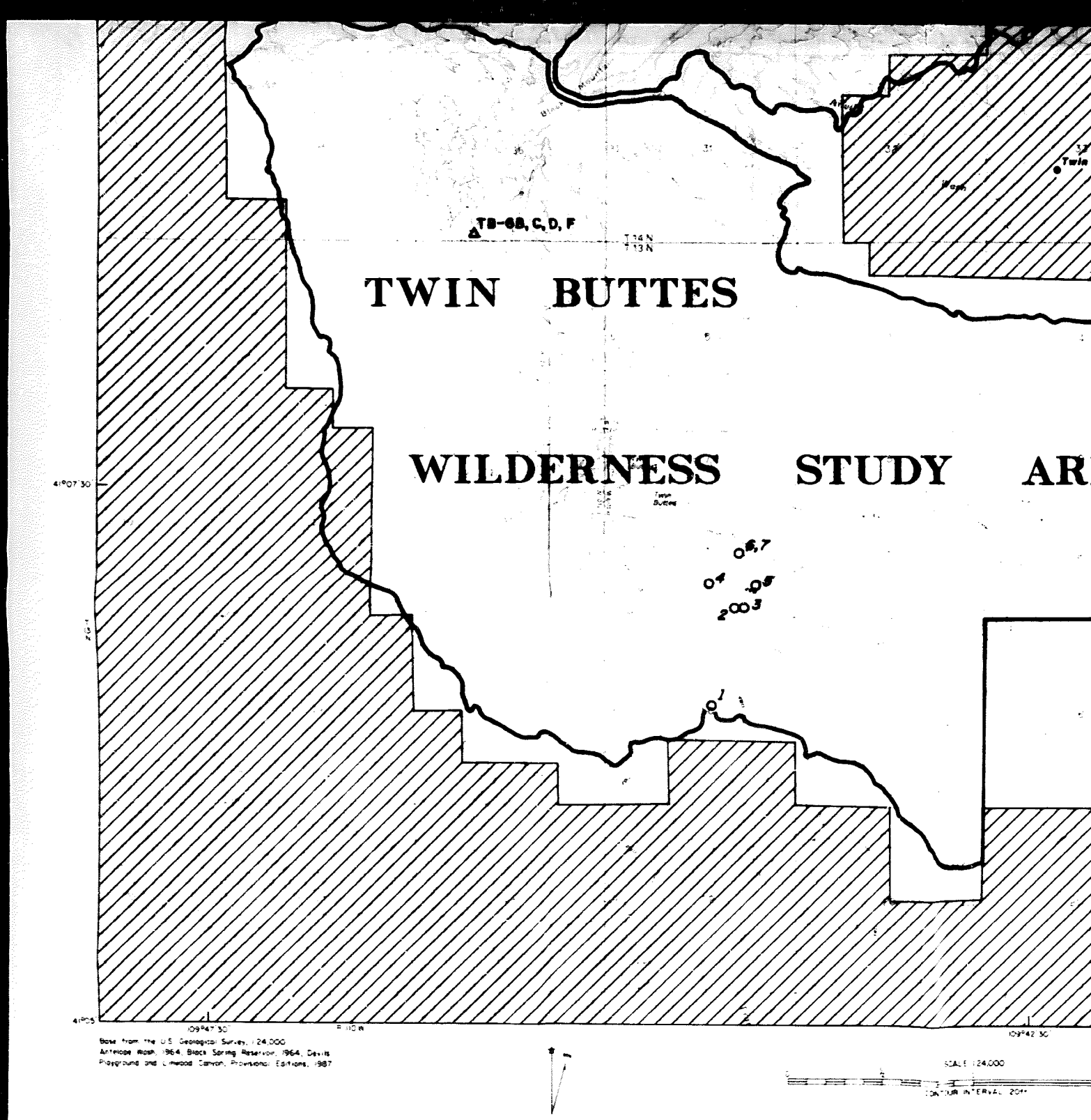
PLATE 1



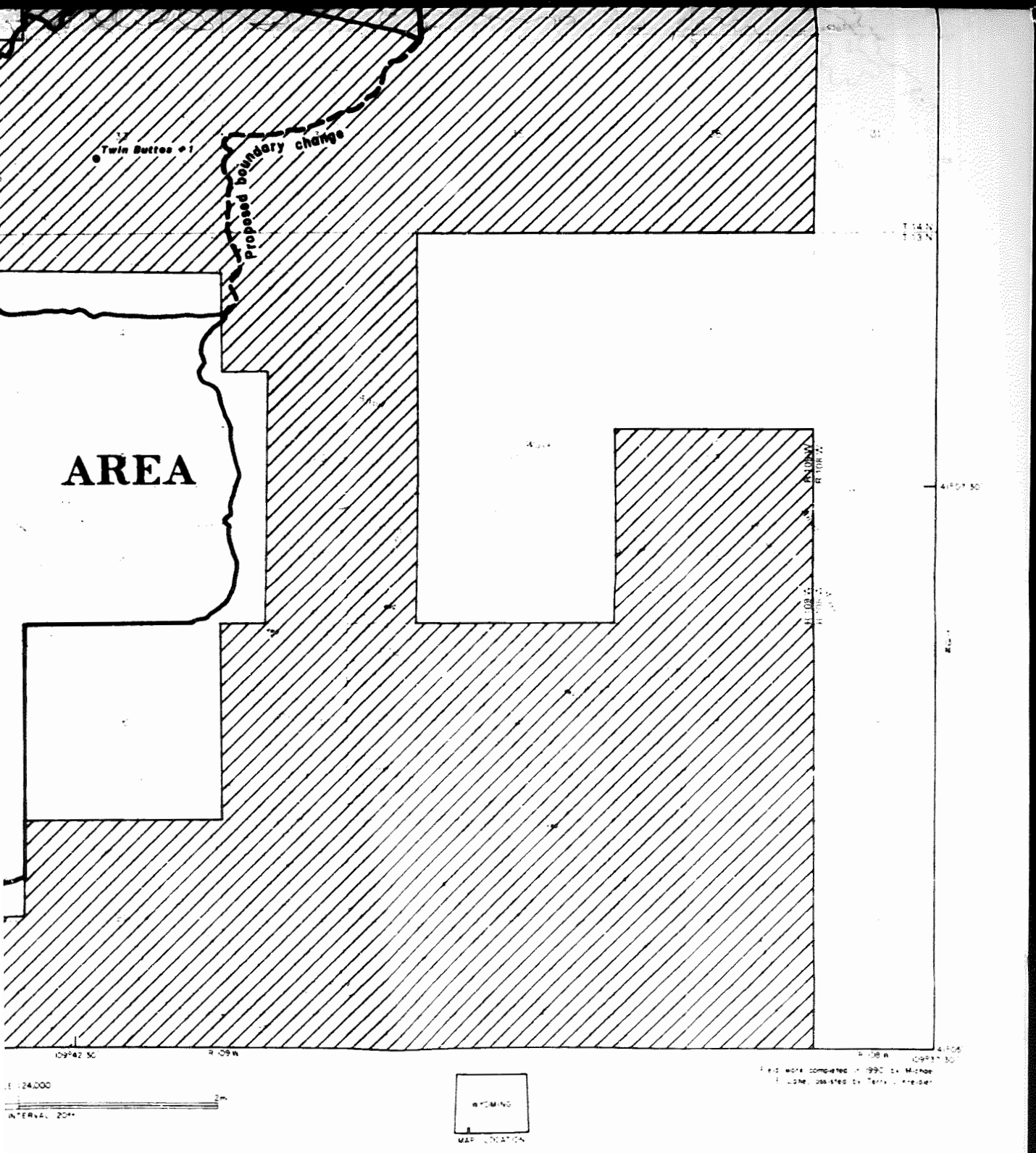


SAMPLE LOCALITY AND OIL AND GAS LEASE MAP OF THE DEVIL'S PLAYGR
SWEETWATER COUNTY, W

BY

MICHAEL E. LANE, U.S. BUREAU

1990



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