THE GEOLOGICAL SURVEY OF WYOMING
Gary B. Glass, State Geologist

MAP SERIES 14

MS-14

METALLIC AND INDUSTRIAL MINERALS MAP OF WYOMING

1985

Compiled by
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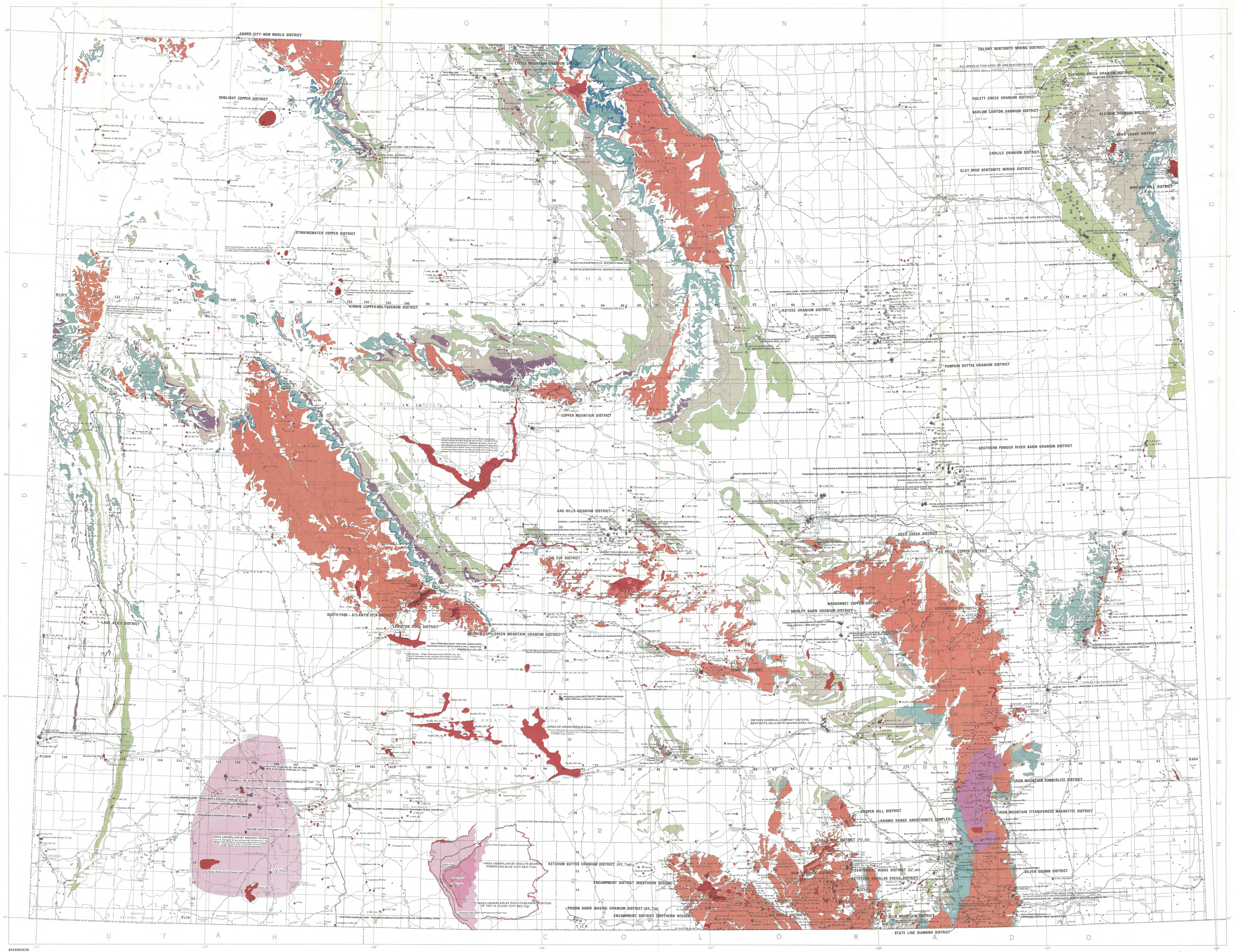
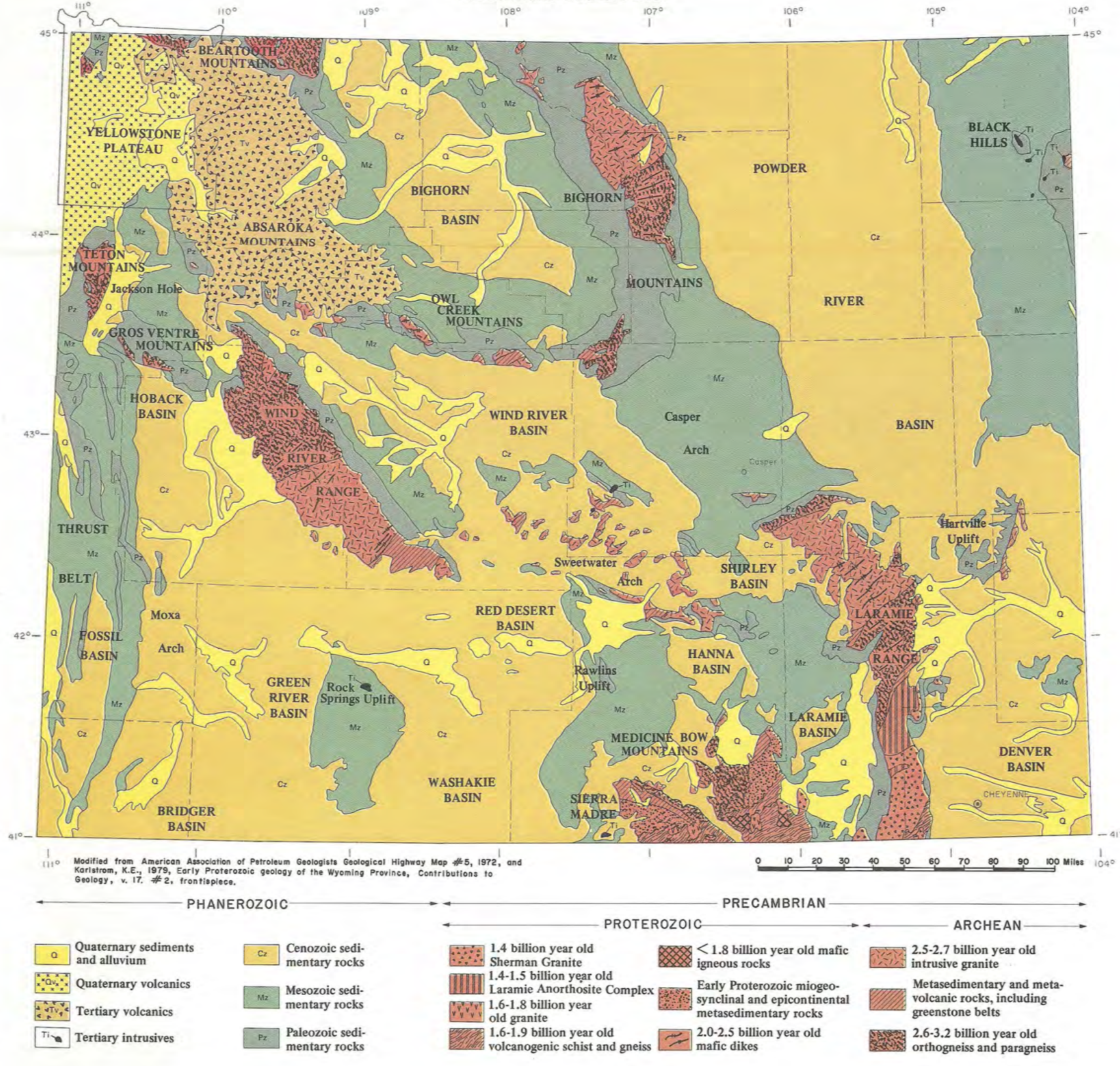

M O N T A N A
S O U T H D A K O T A
N E B R A S K A
C O L O R A D O
U T A H
I D A H O
YELLOWSTONE NATIONAL PARK
COOKE CITY-NEW WORLD DISTRICT
SUNLIGHT COPPER DISTRICT
STINKINGWATER COPPER DISTRICT
KIRWIN COPPER-MOLYBDENUM DISTRICT
LITTLE MOUNTAIN URANIUM DISTRICT
COLONY BENTONITE MINING DISTRICT
ELKHORN CREEK URANIUM DISTRICT
HULETT CREEK URANIUM DISTRICT
BARLOW CANYON URANIUM DISTRICT
ALADDIN URANIUM DISTRICT
BEAR LODGE DISTRICT
CARLILE URANIUM DISTRICT
CLAY SPUR BENTONITE MINING DISTRICT
MINERAL HILL DISTRICT
ALL MINES IN THIS AREA ARE BENTONITE PITS
KAYCEE URANIUM DISTRICT
PUMPKIN BUTTES URANIUM DISTRICT
MONUMENT HILL URANIUM MINING AREA
SOUTHERN POWDER RIVER BASIN URANIUM DISTRICT
BOX CREEK URANIUM MINING AREA
COPPER MOUNTAIN DISTRICT
GAS HILLS URANIUM DISTRICT
TIN CUP DISTRICT
CROOKS GAP - GREEN MOUNTAIN URANIUM DISTRICT
SOUTH PASS - ATLANTIC CITY DISTRICT
LEWISTON GOLD DISTRICT
LAKE ALICE DISTRICT
SEMINOE DISTRICT
SHIRLEY BASIN URANIUM DISTRICT
WARBONNET COPPER DISTRICT
ESTERBROOK DISTRICT
DEER CREEK DISTRICT
LA PRELE COPPER DISTRICT
IRON MOUNTAIN KIMBERLITE DISTRICT
IRON MOUNTAIN TITANIFEROUS MAGNETITE DISTRICT
COOPER HILL DISTRICT
LARAMIE RANGE ANORTHOSITE COMPLEX
GOLD HILL DISTRICT (FV, ml)
NEW RAMBLER DISTRICT
CENTENNIAL RIDGE DISTRICT (SZ, am)
KEYSTONE-DOUGLAS CREEK DISTRICT
SILVER CROWN DISTRICT
KETCHUM BUTTES URANIUM DISTRICT (RX, Tnp)
ENCAMPMENT DISTRICT (NORTHERN REGION)
ENCAMPMENT DISTRICT (SOUTHERN REGION)
POISON BASIN (BAGGS) URANIUM DISTRICT (RX, Tbp)
BIG CREEK DISTRICT
JELM MOUNTAIN DISTRICT
STATE LINE DIAMOND DISTRICT
AREA UNDERLAIN BY BEDDED TRONA
The U.S. Geological Survey estimates that 42 beds within the Wilkins Peak Member of the Eocene Green River Formation contain as much as 81.7 billion tons of trona and 52.7 billion tons of mixed trona and halite.
AREA OF URANIFEROUS COAL
The U.S. Geological Survey estimates that more than 60 million pounds of U3O8 are contained in strippable coal in the Eocene Wasatch Formation in concentrations of 0.003% U3O8 or greater.
AREA UNDERLAIN BY ZEOLITE-BEARING ROBINS EGG BLUE TUFF BED (Twa)
AREA UNDERLAIN BY ZEOLITE-BEARING PORTION OF THE LA CLEDE TUFF BED (Tgl)
OWYHEE CHEMICAL COMPANY HISTORIC BENTONITE (WILKINITE) MINING AREA (Ks)
The U.S. Geological Survey estimates the Pass Peak Formation to contain a gold resource of more than 46 million ounces.
The U.S. Geological Survey reports placer gold in Quaternary alluvial terraces and bars along the Wind River, Little Wind River, and Popo Agie River and their tributaries. In places, the alluvial gold deposits also cap benches and buttes, and blanket the plains and uplands within several miles of the present streams. The most continuous deposits are in the flats along the main streams; these average 12 to 14 feet thick over widths of 2 to 4 miles.
Geochemical surveys by the U.S. Geological Survey have identified anomalous concentrations of gold in the Harebell Formation, Pinyon Conglomerate, Wind River Formation, Pass Peak Formation, and Flathead Formation in this region.
Bentonite occurs in this area in five or more beds in the Cretaceous Belle Fourche, Mowry, and Newcastle Formations.
111°
110°
109°
108°
107°
106°
105°
104°
45°
44°
43°
42°
41°

GEOLOGIC INDEX MAP


YELLOWSTONE PLATEAU
BEARTOOTH MOUNTAINS
ABSAROKA MOUNTAINS
TETON MOUNTAINS
Jackson Hole
GROS VENTRE MOUNTAINS
HOBACK BASIN
THRUST BELT
FOSSIL BASIN
Moxa Arch
BIGHORN BASIN
BIGHORN MOUNTAINS
OWL CREEK MOUNTAINS
WIND RIVER RANGE
WIND RIVER BASIN
POWDER RIVER BASIN
BLACK HILLS
Casper Arch
Hartville Uplift
Sweetwater Arch
SHIRLEY BASIN
RED DESERT BASIN
GREEN RIVER BASIN
Rock Springs Uplift
Rawlins Uplift
HANNA BASIN
LARAMIE RANGE
LARAMIE BASIN
MEDICINE BOW MOUNTAINS
SIERRA MADRE
WASHAKIE BASIN
BRIDGER BASIN
DENVER BASIN
0 10 20 30 40 50 60 70 80 90 100 Miles
PHANEROZOIC
PRECAMBRIAN
PROTEROZOIC
ARCHEAN
Quaternary sediments and alluvium
Quaternary volcanics
Tertiary volcanics
Tertiary intrusives
Cenozoic sedimentary rocks
Mesozoic sedimentary rocks
Paleozoic sedimentary rocks
1.4 billion year old Sherman Granite
1.4-1.5 billion year old Laramie Anorthosite Complex
1.6-1.8 billion year old granite
1.6-1.9 billion year old volcanogenic schist and gneiss
<1.8 billion year old mafic igneous rocks
Early Proterozoic miogeosynclinal and epicontinental metasedimentary rocks
2.0-2.5 billion year old mafic dikes
2.5-2.7 billion year old intrusive granite
Metasedimentary and metavolcanic rocks, including greenstone belts
2.6-3.2 billion year old orthogneiss and paragneiss

Modified from American Association of Petroleum Geologists Geological Highway Map #5, 1972, and Karlstrom, K.E., 1979, Early Proterozoic geology of the Wyoming Province, Contributions to Geology, v. 17, #2, frontispiece.

EXPLANATION

- 🟩 **OUTCROP AREA OF BENTONITE-BEARING STRATA.** Includes the Cretaceous Mowry, Thermopolis, Belle Fourche, Frontier, Newcastle, Hilliard, and Aspen Formations. Bentonite is an authigenic sedimentary rock formed by the alteration of volcanic ash.
- ⬜ **OUTCROP AREA OF GYPSUM-BEARING STRATA.** Includes the Permian Goose Egg and Forelle-Satanka Formations, the Triassic Spearfish and Chugwater Formations, and the Jurassic Gypsum Spring and Sundance Formations. May locally include Triassic to Permian (undivided) formations. These gypsum-bearing sedimentary rocks are evaporite deposits formed in place.
- 🟪 **OUTCROP AREA OF PHOSPHATE-BEARING STRATA.** Includes phosphate-bearing rocks of the Permian Phosphoria Formation. These phosphatic sedimentary rocks are chemical precipitates.
- 🟦 **OUTCROP AREA OF LIMESTONE-BEARING STRATA.** Includes the Mississippian Madison and Pahasapa Limestones, the Mississippian-Devonian Guernsey Limestone, the predominantly carbonate portion of the Pennsylvanian Casper Formation, and the Permian Minnekahta Limestone. These calcareous sedimentary rocks are chemical precipitates.
- 🟦 **OUTCROP AREA OF DOLOMITE-BEARING STRATA.** Includes the Ordovician Bighorn Dolomite, where mapped separately. Dolomitic strata are present but not distinguished in portions of the Mississippian Madison Limestone and the Pennsylvanian Casper Formation. These calcareous sedimentary rocks are chemical precipitates or diagenetically altered limestones.
- 🟪 **OUTCROP AREA OF LARAMIE RANGE ANORTHOSITE COMPLEX.** Predominately high-alumina anorthosite of Precambrian age. Includes zones of noritic anorthosite, feldspathic norite, and olivine anorthosite. Anorthosite is a magmatic igneous rock.
- 🟧 **OUTCROP AREA OF UNDIFFERENTIATED PRECAMBRIAN ROCKS.** See geologic index map, above.
- 🟥 **MINERALIZED AREA.***
- ● **MINERAL OCCURRENCE OR PROSPECT.*** Circles denote areas not to scale.
- ⌒ **OUTCROP OF MINERALIZED STRATUM OR VEIN***
- ▨ **DEPOSIT IN SUBSURFACE**
- ✦ **OCCURRENCE REPORTED AT DEPTH.*** Indicated by well logs, cuttings, or core. Depth to top of mineralized zone, given where known.
- ● **HYDROGEOCHEMICAL ANOMALY.** Well or spring with anomalous concentrations of elements or minerals.
- × **PLACER DEPOSIT.** Recent placers in Quaternary gravels, unless otherwise indicated.
- × **CONSTRUCTION AGGREGATE PIT OR QUARRY.** Includes crushed rock, sand, sand and gravel, baked rock (clinker or scoria), or limestone mined for aggregate.
- ⚒ **ACTIVE SURFACE MINE.***
- ⚒ **ABANDONED OR INACTIVE UNDERGROUND MINE* WITH MORE THAN 200 FEET OF WORKINGS.**
- ⚒ **ABANDONED OR INACTIVE SURFACE MINE.***
- ◆ **ACTIVE IN-SITU LEACH MINE***
- ◆ **ABANDONED OR INACTIVE IN-SITU LEACH MINE.***
- ⚙ **ACTIVE MILL OR PROCESSING PLANT**
- ⚙ **ABANDONED OR INACTIVE MILL OR PROCESSING PLANT.**
- ⬚ **MINING DISTRICT.** Dashed line shows extent of district, on basis of favorable and similar geology. Dotted line indicates that the extent of favorable geology is not completely known. Unlabeled mines contain the dominant mineralization of the district.

*Abbreviations accompanying mineralized areas, mineral occurrences or prospects, mines, and mining districts refer to dominant mineralization, classification of occurrence, and rock type or formation name, if known. For example, Albany – Cu (SZ, gn) means that the Albany mine was operated for copper ore from a shear-zone deposit hosted by Precambrian granite gneiss.

CHEMICAL SYMBOLS AND MINERAL ABBREVIATIONS

Ag	Silver
As	Arsenic
Au	Gold
B	Boron
Ba	Barium
Be	Beryllium
Bi	Bismuth
C	Graphite
Co	Cobalt
Cr	Chromium
Cu	Copper
F	Fluorite
Fe	Iron
Hg	Mercury
Ir	Iridium
K-spar	Potassium Feldspar
La	Lanthanum
Li	Lithium
$MgSO_4$	Magnesium Sulfate
Mn	Manganese
Mo	Molybdenum
NaCl	Sodium Chloride
Na_2CO_3	Sodium Carbonate
Na_2SO_4	Sodium Sulfate
Nb	Niobium
Ni	Nickel
Os	Osmium
Pb	Lead
Pd	Palladium
Pt	Platinum
py	Pyrite
Ra	Radium
REE	Rare Earth Elements
S	Sulfur
Sb	Antimony
Sn	Tin
Ta	Tantalum
Te	Tellurium
Th	Thorium
Ti	Titanium
U	Uranium
V	Vanadium
W	Tungsten
Zn	Zinc

CLASSIFICATION OF MINERAL OCCURRENCES[1]

DEPOSITS OF IGNEOUS OR HYDROTHERMAL ORIGIN	
EARLY MAGMATIC	
DISSEMINATED CRYSTALLIZATION (ORTHOMAGMATIC)	*OR*
SEGREGATION DEPOSITS	*SG*
LATE MAGMATIC	
RESIDUAL LIQUID SEGREGATION	*LM*
RESIDUAL LIQUID INJECTION (PEGMATITES)	*PG*
RESIDUAL LIQUID CRYSTALLIZATION	*RC*
SUBLIMATES	*SB*
CONTACT METASOMATIC	*CT*
SUBMARINE EXHALATIVE	*SE*
HYDROTHERMAL	
MAGMATIC	*MH*
FISSURE VEINS	*FV*
SHEAR ZONE DEPOSITS	*SZ*
PORPHYRY TYPE	*PR*
STOCKWORKS	*SW*
BRECCIA FILLING	*BF*
FRACTURE FILLING	*FR*
REPLACEMENT	*RP*
HOT SPRING	*HS*
AUTOMETASOMATIC	*AM*
DEPOSITS ASSOCIATED WITH METAMORPHIC ROCKS	
PROGRADE	*PM*
RETROGRADE	*RM*
VEINS	*MV*
CONTACT METAMORPHIC	*CM*

DEPOSITS OF SEDIMENTARY ORIGIN	
SYNGENETIC	*ST*
CHEMICAL PRECIPITATES	
MARINE PHOSPHORITES	*MP*
LAND-PEBBLE PHOSPHORITES	*LP*
CO-PRECIPITATES	*CO*
BLACK SHALES	*BL*
RESIDUAL CONCENTRATIONS (LAG DEPOSITS)	*RS*
MECHANICAL CONCENTRATIONS	
RECENT PLACERS	*PC*
PALEOPLACERS	*PP*
ALLOGENIC	*AL*
EVAPORITES	*EV*
DIAGENETIC	
AUTHIGENIC	*AU*
HYDROALLOGENIC	*HA*
HOSTED IN PALEOKARST SETTING	*PK*
HOSTED IN RED BEDS	*RB*
PRECIPITATED IN COAL AND OTHER ORGANIC-RICH ROCKS	*OP*
REDOX	*RX*
DEPOSITS RELATED TO CONTEMPORANEOUS SURFACES	
NONCONFORMITY-RELATED	*UC*
VEINS OF UNKNOWN ORIGIN	*VN*

[1] Modified from Jensen and Bateman, 1979 and Mickle and Mathews, 1978. Classification of deposits based on published and unpublished reports and field examination.

FORMATION NAMES OR ROCK TYPES

CENOZOIC

Quaternary undivided	Qu
Quaternary alluvium	Qal
Quaternary rhyolite	Qr
Quaternary alkalic intrusive rocks	Qi
Tertiary undivided	Tu
Bug Formation	QTb
Moonstone Formation	Tms
North Park Formation	Tnp
Browns Park Formation	Tbp
Ogallala Formation	Tmo
Split Rock Formation	Tsr
Oligocene undivided	Tou
White River Formation	Twr
Chadron Member	Twrc
Bishop Conglomerate	Tbi
Ice Point Conglomerate	Tip
Eocene undivided	Teu
Wiggins Formation	Twi
Washakie Formation	Twa
Wagon Bed Formation	Twb
Tepee Trail Formation	Tt
Aycross Formation	Ta
Bridger Formation	Tb
Tatman Mountain Formation	Tta
Green River Formation	Tg
Laney Member	Tgl
Wilkins Peak Member	Tgw
Tipton Shale Member	Tgt
Wasatch Formation	Tw
Cathedral Bluffs Tongue	Twc
Conglomerate facies	Twcg
Willwood Formation	Twl
Wind River Formation	Twdr
Battle Spring Formation	Tbs
Fowkes Formation	Tf
Pass Peak Formation	Tp
Fort Union Formation	Tfu
Hanna Formation	Tha
Pinyon Conglomerate	TKp
Tertiary volcanics, undivided	Tv
Tertiary intrusives, undivided	Ti
Tertiary alkalic volcanics	Tav
Tertiary alkalic intrusives	Tai
Tertiary syenite	Tsy
Tertiary carbonatite	Tic
Tertiary calc-alkaline volcanics	Tfs
Tertiary calc-alkaline intrusives	Tqd

MESOZOIC

Lance Formation	Kl
Harebell Formation	Kha
Lewis Shale	[illegible]
Pierre Shale	Kp
Mesaverde Group	Kmv
Almond Formation	Kal
Ericson Formation	Ke
Rock Springs Formation	Kr
Steele Shale	Ks
Cody Shale	Kc
Niobrara Formation	Kn
Frontier Formation	Kf
Belle Fourche Shale	Kbf
Mowry Formation	Kmr
Aspen Shale	Ka
Newcastle Sandstone	Knc
Muddy Sandstone	Km
Thermopolis Shale	Kt
Cloverly Formation	Kcv
Inyan Kara Group	Kik
Fall River Sandstone	Kfr
Fuson Shale	Kfu
Lakota Sandstone	Klk
Beckwith Formation	KJb
Jurassic undivided	Ju
Morrison Formation	Jm
Sundance Formation	Js
Stump Formation	Jst
Gypsum Spring Formation	Jg
Twin Creek Limestone	Jtc
Nugget Sandstone	JTRn
Alcova Limestone	TRa
Chugwater Formation	TRc
Spearfish Formation	TRPs
Goose Egg Formation	TRPg

PALEOZOIC

Phosphoria Formation	Pp
Forelle Limestone	Pf
Satanka Shale	Ps
Minnekahta Limestone	Pm
Wells Formation	Pℙw
Casper Formation	Pℙc
Hartville Formation	Pℙh
Tensleep Formation	Pℙt
Minnelusa Formation	Pℙm
Amsden Formation	ℙa
Fountain Formation	ℙf
Madison Limestone	Mm
Pahasapa Limestone	Mp
Guernsey Limestone	MDg
Devonian kimberlite	Dkim
Bighorn Dolomite	Ob
Gallatin Formation	Ꞓg
Deadwood Formation	Ꞓd
Flathead Sandstone	Ꞓf
Death Canyon Limestone	Ꞓdc

PRECAMBRIAN

Precambrian undivided	pꞒ
Amphibolite	am
Anorthosite	an
Amphibolite schist or gneiss	as
Biotite schist	bs
Felsic metavolcanic rocks	fs
Granite gneiss	gn
Granite pegmatite	gp
Granite	gr
Metagreywacke	gw
Iron formation	if
Hematite schist	is
Marble	mb
Mafic metaigneous rocks	mi
Mafic dikes	mk
Metapelitic rocks	mp
Metasedimentary rocks	ms
Metavolcanic rocks	mv
Quartz monzonite, granodiorite, etc.	qd
Quartzite and quartz pebble conglomerate	qz
Schist	sc
Ultramafic rocks	um

SCALE 1:500,000
1 inch equals approximately 8 miles

10 0 10 20 30 40 Miles
10 0 10 20 30 40 50 Kilometers

Base map modified from U.S. Geological Survey, 1966 Edition.
Cartography by Phyllis A. Ranz

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