DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MINERAL INVESTIGATIONS
FIELD STUDIES MAP MF-306

EXPLANATION

Qal — **Alluvium**
Along North Popo Agie River consists of gravel and boulders in a matrix of sand, silt, and clay; elsewhere rocks and reworked glacial deposits and a thin veneer of sand, silt, and clay; along Willow Creek chiefly clay and silt derived from Triassic and Jurassic rocks; 0–40+ feet thick

Qs — **Scree**
Angular, bouldery detritus at the bases of cliffs; shown in North Fork Canyon; 0–20+ feet thick

Qls, Qsl, Qt — **Landslide deposits, alluvial gravel, and terrace deposits**
Qls, landslide deposits; (1) slumped masses, commonly rotated by overtopping that results in antiform breccia, (2) flat by the slumps around Table Mountain; and (3) bedding-plane slide, caused by gravity sliding along incompetent strata that results in complete disruption of overlying strata (see, T. 31 N., R. 98 W.); Qsl, alluvial gravel; commonly contains abundant angular pebbles and cobbles of Paleozoic rocks; lower few feet locally cemented by calcium carbonate; 0–20+ feet thick
Qt, terraces along perennial streams consists of clay to cobble-size material; lower few feet locally cemented by calcium carbonate; 0–20+ feet thick

Qtm — **Moraine**
Unconsolidated bouldery debris derived from Pinnacle and Pre-cipice Bluffs; shown in Sawmill Gulch near mouth of North Fork Canyon; 0–200+ feet thick

Qow — **Glacial outwash**
Unconsolidated bouldery deposits derived from Pinnacle and Pre-cipice Bluffs; shown in Sawmill Gulch near the mouths of North Fork and Sinks Canyon; terraced in part below North Fork Canyon; 0–100+ feet thick

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Twr — **White River Formation**
Lithologically variable, consists chiefly of light-gray poorly indurated bouldery arkose; commonly contains Paleozoic rock fragments, and local deposits consist almost entirely of these fragments; other local deposits consist chiefly of silty light-gray volcanic ash in a matrix of partly devitrified volcanic glass; lower part, consists of the ash, sandstone rocks locally silicified where tuffaceous strata were present; 0–200+ feet thick

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KJch — **Cloverly and Morrison Formations**
Greenish-gray to gray thick-bedded to massive cliff-forming sandstone to light-gray to greenish-gray shale; lower part, Cloverly Formation, almost identical to the uppermost sandstone of the Sandstone Formation

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Jsr, Jbn, Jch, Jcn — **Sundance Formation**
Js, Sundance Formation; 210–265 feet thick
Jsr, Redwater Shale Member; 0–15 feet thick
Jbn, Belnap Shale Member; interbedded greenish-gray glauconitic sandstone, light-gray sandstone, greenish-gray shale, and brownish-gray glauconitic silty to sandy cuspinaid limestone that locally forms resistant ledges; basal beds consist of clayey siltstone or silty claystone containing numerous belemnites; about 150–200 feet thick
UNCONFORMITY
Jch, Lak Member; reddish-brown siltstone, sandy siltstone, and silty sandstone; thins northeastward; locally absent; about 25–45 feet thick
Jcn, Hulett Sandstone and Stockade Beaver Shale Members; about 35 feet thick
Hulett Sandstone Member; greenish-gray sandy limy siltstone; contains numerous belemnites; about 10 feet thick
Stockade Beaver Shale Member; interbedded gray argillaceous shale, oolitic limestone, and sandy limestone; basal bed is a gray mottled locally containing yellowish-weathered limy claystone inclusions and chert pebbles; chert pebbles are gray, banded gray and light gray, and reworked from the chert beds of the Gypsum Spring Formation and reworked from the chert beds of the Gypsum Spring Formation

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Jgs — **Gypsum Spring Formation**
White thick-bedded to massive gypsum overlain by an alternating sequence of thin-bedded gypsum, reddish-brown shale, and light-gray to gray fine-grained limestone; lower part, gypsum is in part a gypsum siltstone; locally contains algal limestone and at top thin lenses of chert; 120–130 feet thick

TRc, Tcn — **Nugget Sandstone**
TRn, upper part; salmon-pink and light-gray fine- to medium-grained thick-bedded to massive sandstone, forms cliffs; gray beds are commonly crossbedded, and differential erosion locally results in these beds resembling huge conical beehives; 310–330 feet thick
Tcn, Chinle Formation; reddish-brown and light-gray to brownish-gray fine-grained thin- to thick-bedded sandstone; contains interbeds of reddish-brown, pale-green, and purplish-maroon siltstone and shale; upper few feet locally contains thin beds of dense light-gray oolitic limestone; base contains chert grains and inclusions of other claystone and siltstone-bearing rocks; contact at base is sharp; 0–20 feet thick

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Ts, Tpc, Tc — **Popo Agie Formation and Crow Mountain Sandstone**
Ts, Popo Agie Formation:
Lagoon Drab Member; reddish-brown siltstone; locally yellowish green near top; composed of slightly calcareous angular quartz particles; contains numerous white spots of analcime; lower 12 feet consists of reddish-brown, yellowish-gray, and light-gray maroon mottled clay siltstone; locally absent; 0–40 feet thick
Bryant Draw Member; reddish-brown calcareous shaly siltstone and reddish-gray calcareous shale; contains small green and purple blotches; 15 feet thick
Tc, Crow Mountain Sandstone; reddish-brown very fine to fine-grained limy argillaceous thin- to thick-bedded and massive sandstone; interbedded with reddish-brown fissile slightly calcareous shale and sandy siltstone; about 110 feet thick
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TRr — **Alcova Limestone**
Pinkish to grayish-white recrystallized thinly laminated algalite resistant limestone; forms ledges and small dip slopes; lower part contains quartz sandstone layers with traces of mammite and microfine; sandstone and sand grains decrease in quantity upward; 2.5–7 feet thick. Formation locally shown by a contact line

Tr — **Red Peak Formation**
Reddish-brown commonly calcareous thin- to thick-bedded interbedded and interpenetrational siltstone, sandstone, and shale; top gradational into overlying formation by change to limy sandstone in upper part, lower part contains a few thin beds of dense light-gray oolitic limestone; lower locally along bedding planes in lower part; basal 0.5 feet weathers yellowish brown; 900± 35 feet thick

Tr — **Dinwoody Formation**
Gray to drab-greenish-gray thin-bedded to flaggy-marled sandy siltstone and silty sandstone; in part dolomitic to limy; shaly in upper part; top gradational into overlying formation; base locally contains small dolomite pebbles; contact at base is sharp; 20–25 feet thick

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Ppr, Ppm, Ppn, Ppp — **Phosphoria and Park City Formations**
Ppr, Rervay Member of Park City Formation and Tosi Chert and Retort Phosphatic Shale Members of Phosphoria Formation; about 100 feet thick
Rervay Member; argillaceous light-gray-weathering dolomite; resistant, forms large dip slopes; contains scattered chert lenses which are more common in lower part; 35–45 feet thick
Tosi Chert Member; gray to greenish-gray nodular massive chert; contains argillaceous partings and thin cherty glauconitic phosphatic sandstone; 0–15 feet thick
Retort Phosphatic Shale Member: Upper part, brownish-gray slightly dolomitic shale; contains a thin cherty phosphorite bed near top; lower part, dark-gray to brownish-gray shale; contains a few pelletal phosphorite; contains interbedded phosphatic dolomite and brownish-gray dolomitic shale; about 35 feet thick
Ppm, Franson Member of Park City Formation and Meade Peak Phosphatic Shale Member of Phosphoria Formation; about 150 feet thick.
Franson Member; light-gray to light-brownish-gray argillaceous dolomite; moderately resistant, locally forms small ledges; contains interbedded siltstone and locally nodular chert; about 35–50 feet thick. Meade Peak Phosphatic Shale Member; Upper part, light-gray to light-gray-weathering dolomitic claystone and siltstone; contains a few thin beds of dense argillaceous dolomite; dolomite nodules and thin beds of brown to black phosphatic chert; about 100 feet thick. Lower part, "pedal ledge" of King (1951); light-gray-weathering thick-bedded fossiliferous dolomite and dolomitic limestone; contains abundant phosphatic pellets and phosphatic residue in grapeiid, trypidellus, and rug porosita; 35–45 feet thick
g, top of pedal ledge
Meade Peak Phosphatic Shale Member; Upper part, limy and dolomitic shale; weathers light gray to light greenish gray; contains numerous thin beds of dense dolomite; lower part, dolomite; about 1.5 feet thick. Lower part; grayish-black (weathers black dark gray to gray) fossiliferous limy oolitic to pelletal phosphorite; contains interbedded dolomite and argillaceous dolomite; about 14 feet thick; thickness is variable
Ppg, Grandeur Member of Park City Formation; sandy argillaceous fossiliferous dolomitic limestone and limy dolomite; weathers light gray to brownish gray; interbedded with sandstone, minor shale, and thin dense dolomite; lower part, sandstone; contains a few thin beds within the carbonate rocks; locally the chert forms a thick bed; basal contact locally chosen arbitrarily where lower strata and the top of the Tensleep are silicified; 30–50 feet thick

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IPt — **Tensleep Sandstone**
Light-gray fine-grained calcareous crossbedded sandstone; forms cliffs; locally silicified at top

Structure contours
Drawn on top of Phosphoria Formation. Dashed where approximately located; short dashed where inferred. Contour interval 100 feet

Inferred fault trace projected to top of Phosphoria Formation

Abandoned hole, drilled for oil, gas, or water
Queried where location uncertain

Abandoned hole, show of oil

Artesian water well

Artesian water well, drilled for oil or gas, either not plugged or plug breached

Artesian water well, shut-in

Spring

Landslide slip plane
Hachures in direction of slip

Thickness of Alcova Limestone, in feet

Contact
Dashed where approximately located; short dashed where inferred; dotted where concealed

Fault
Dashed where approximately located; short dashed where inferred; dotted where concealed. U, upthrown side; D, downthrown side

Reverse or thrust fault
Dashed where approximately located; short dashed where inferred; dotted where concealed. Sawtooth on upper plate

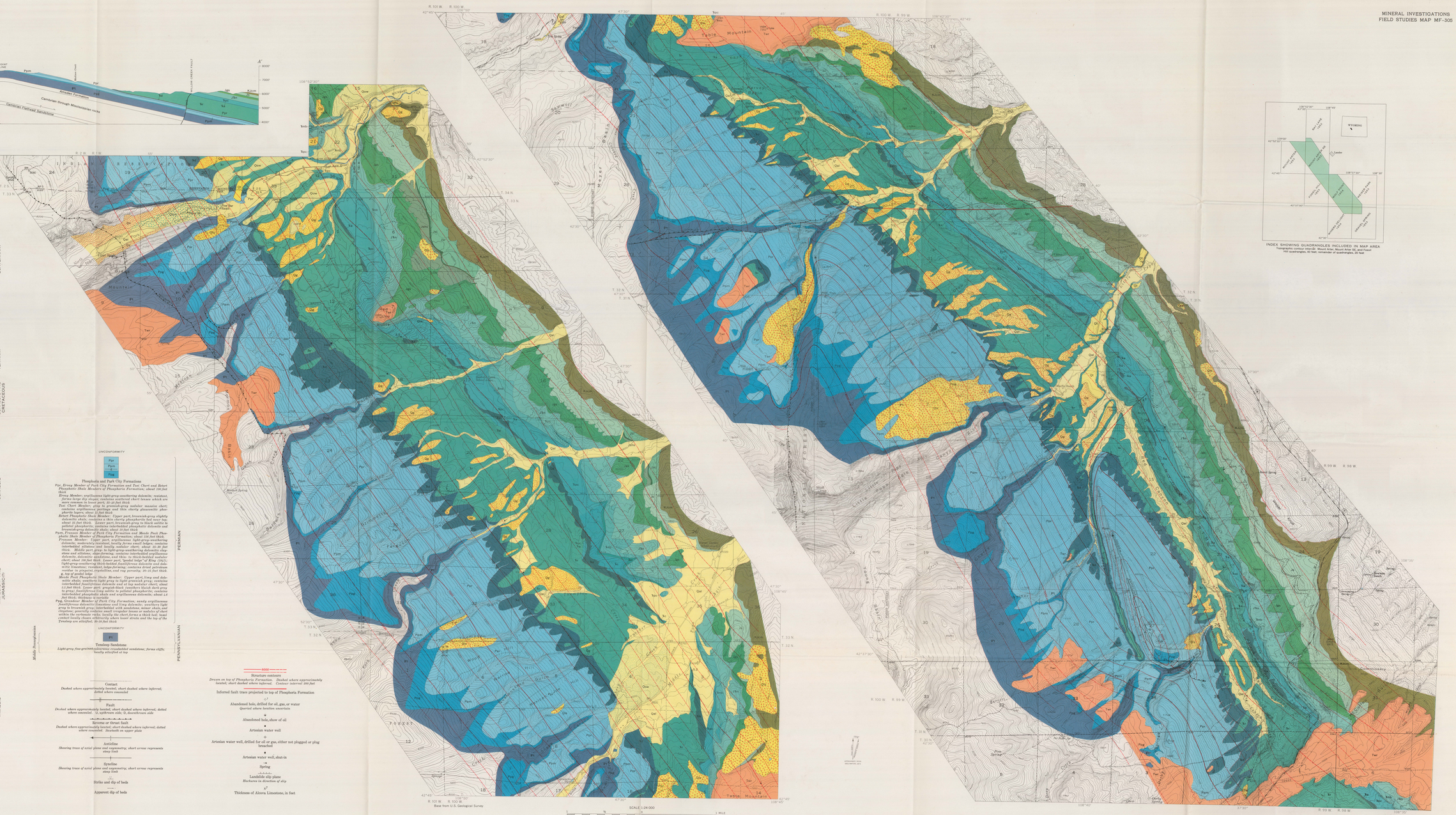
Anticline
Showing trace of axial plane and asymmetry; short arrow represents steep limb

Syncline
Showing trace of axial plane and asymmetry; short arrow represents steep limb

Strike and dip of beds

Apparent dip of beds

QUATERNARY — Holocene; Pleistocene; Bull Lake Glaciation
TERTIARY — Oligocene
JURASSIC AND CRETACEOUS — Upper Jurassic and Lower Cretaceous
JURASSIC — Upper Jurassic; Middle Jurassic
TRIASSIC AND JURASSIC
TRIASSIC — Upper Triassic Group; Lower Triassic
PERMIAN — Middle Phosphorian
PENNSYLVANIAN



Base from U.S. Geological Survey

SCALE 1:24 000

CONTOUR INTERVAL 20 AND 40 FEET
DATUM IS MEAN SEA LEVEL

INDEX SHOWING QUADRANGLES INCLUDED IN MAP AREA
Topographic contour intervals: Mount Arter, Mount Arter SE, and Fossil 100 quadrangles, 40 feet; remainder of quadrangles, 20 feet

GEOLOGIC MAP OF THE PHOSPHATE RESERVE IN THE LANDER AREA, FREMONT COUNTY, WYOMING

By
Willis L. Rohrer
1973

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Geology by W. L. Rohrer, 1968–70
assisted by S. M. Breckenridge, 1969

For sale by the U. S. Geological Survey, price 75 cents
Explanatory pamphlet accompanies map