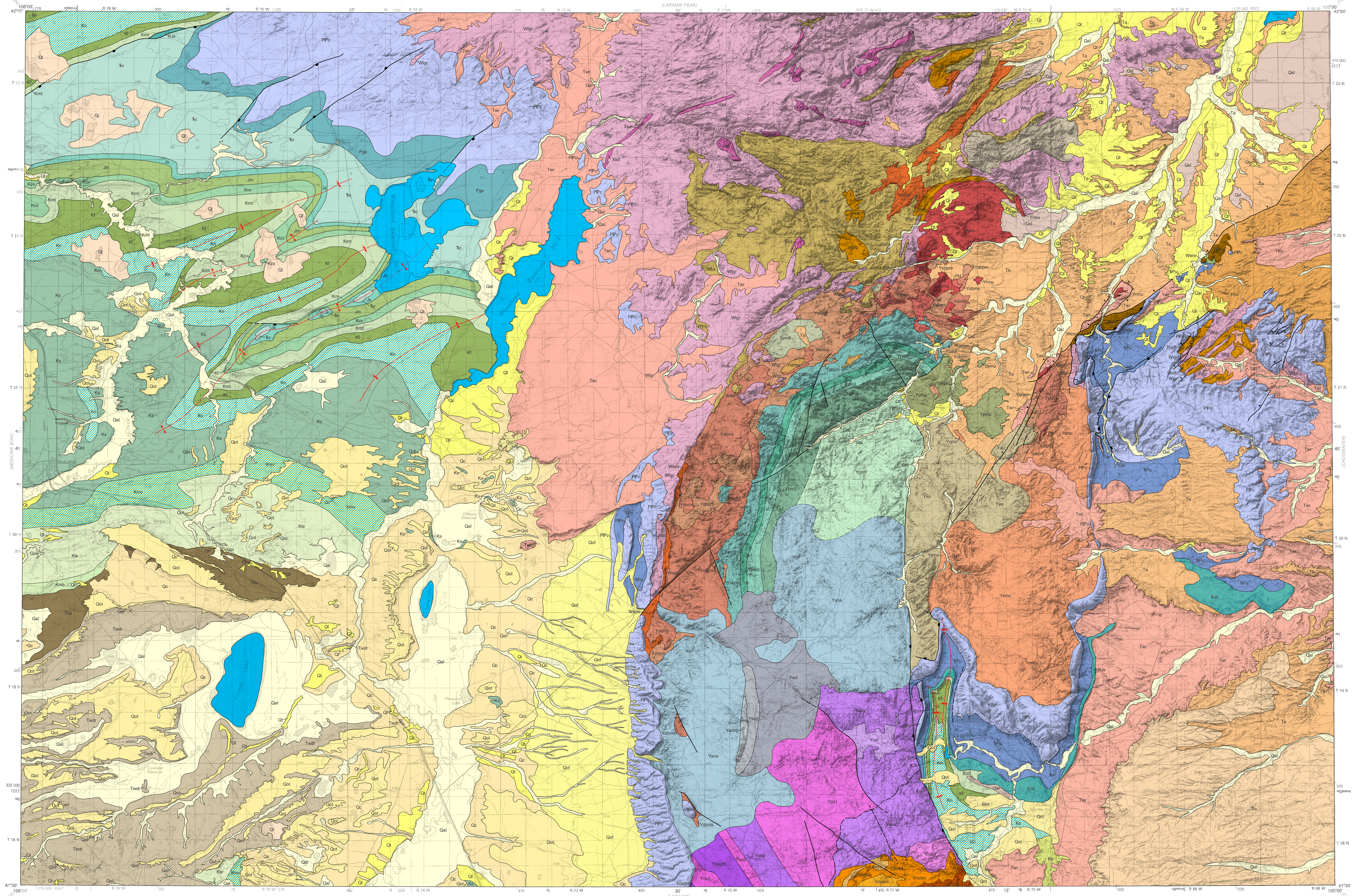
WYOMING STATE GEOLOGICAL SURVEY
Erin A. Campbell, Director and State Geologist
Laramie, Wyoming

Interpreting the past, providing for the future

OPEN FILE REPORT 2021-5
Rock River 1:100,000-scale
Bedrock Geologic Map



10,000-meter grid ticks: UTM, zone 13
25,000-foot grid ticks: Wyoming State Plane Coordinate System, east central zone

National Geodetic Vertical Datum of 1927

UTM grid and 2021 magnetic north declination at center of map, from www.ngdc.noaa.gov (diagram is approximate)

SCALE 1:100,000
Contour interval 20 meters

Digital cartography by James E. Stafford
Map edited by James A. Amato

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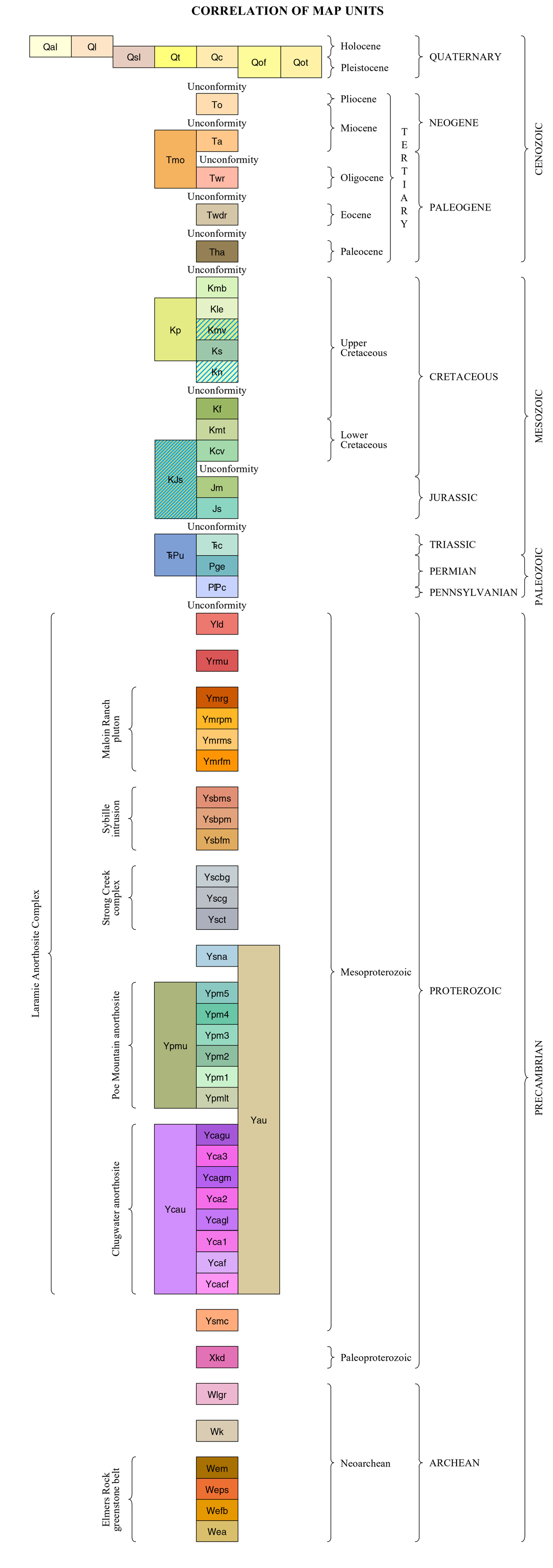
PRELIMINARY GEOLOGIC MAP OF THE ROCK RIVER 30' x 60' QUADRANGLE, ALBANY, PLATTE, AND LARAMIE COUNTIES, WYOMING

compiled and mapped by

James E. Stafford, Charles F. Hoffman, Seth J. Wittke, Patricia M. Webber, and B. Ronald Frost
2021

EXPLANATION

CORRELATION OF MAP UNITS



Cenozoic

Qal **Alluvium (Holocene)**—Unconsolidated to loosely consolidated clay, clay-rich soil, silt, sand, gravel, cobbles, and boulders within and along most drainages; locally derived

Ql **Playa lake lacustrine deposits (Holocene)**—Light gray-brown, compact expandable clay, silt, and fine sand; seasonally white from alkali salts

Qsl **Sand and loess (Holocene and Pleistocene)**—Dunes, made up of very fine to fine-grained windblown sand. Numerous unmapped small-scale locations occur within the map area; variable thickness

Qt **Terrace deposits (Holocene and Pleistocene)**—Unconsolidated to locally weakly cemented silt, sand, gravel, and cobbles, located above and between current alluvial systems; most are gently dipping. Includes areas mapped as gravel pediments and terrace gravels. Thickness generally less than 7.5 m (25 ft)

Qc **Colluvium (Holocene and Pleistocene)**—Unconsolidated clay, silt, sand, gravel, cobbles, and boulders, typically in clay-rich soil matrix; locally derived from older geological units upslope. Combined alluvial fans, minor debris flows, and slope wash, typically at or near base of steep slopes. Thickness not determined

Qof **Old fan (Holocene and Pleistocene)**—Poorly sorted clay, silt, sand, and gravel; crudely bedded to non-bedded with some debris flow component. Limestone cobbles are common. Currently inactive and dissected, often occurring as erosional remnants. Grades into older terrace deposits toward the west, in the northern part of the map area. Thickness 0–30 m (0–10 ft)

Qot **Old terrace (Holocene and Pleistocene)**—Beds of coarse sand and gravel with occasional boulders and lenses of silt and clay. Limestone cobbles are common. Often occurs as erosional remnants ranging from 7– 30 m (23–99 ft) above present stream flood plains. Some locations may be older alluvial fan remnants. Thickness 0–3 m (0–10 ft)

To **Ogallala Formation (Pliocene and Miocene)**—Tan to brown, unconsolidated to well-cemented sandstone, siltstone, volcanic ash, and conglomerate (gravel to boulder sized), interbedded with claystone and thin beds of limestone toward the east. Conglomerate clasts are primarily Precambrian igneous material, with limestone clasts predominating in some conglomerates near the base of the formation. Thickness 0–100 m (0–330 ft)

Ta **Arikaree Formation (Miocene)**—Light- to orange-gray, fine- to coarse-grained sandstone and siltstone interbedded with some thin beds of gray to yellowish-gray and green claystone, dense hard gray freshwater limestone, white to dark-gray volcanic ash, and numerous layers of light-gray to bluish-gray conglomerate. Coarse components of the conglomerate are chiefly blue-gray anorthosite. Thickness 0–100 m (0–330 ft)

Twr **White River Formation (Oligocene)**—Medium- to coarse-grained, rusty-yellow to light-brown, locally buff to light-gray arkosic conglomerate with a tuffaceous clay matrix. Clasts average less than 1 cm (0.4 in) in diameter; sparse subrounded cobbles and boulders of Precambrian granitic and anorthositic rocks up to 1.5 m (5 ft) across. Interbedded with very poorly sorted beds of similar color consisting of pebbles and cobbles averaging several centimeters in diameter. Capped by large boulders up to 5 m (16 ft) in diameter. Forms high mesa surface in secs. 20 and 29, T. 18 N., R. 70 W. Sharp disconformable contact with the underlying Pierre Shale. 3–23 m (10–75 ft) thick

Tmo **Miocene and Oligocene rocks, undivided**—Light- to orange-gray, medium- to fine-grained, poorly cemented tuffaceous sandstone, with intermittent calcareous sandstone concretions and siliceous root casts. Dark-gray sandstone and channel conglomerate with Paleozoic and Precambrian rocks in a calcareous sandstone matrix. Red conglomerate with light-red, loosely cemented conglomerate composed of pebbles, cobbles, and boulders derived from Paleozoic and Precambrian rocks in an orange-red claystone and sandstone matrix. Unit includes members of the White River Formation and may include the Arikaree Formation where undivided

Twdr **Wind River Formation (Lower Eocene)**—Upper part is greenish-gray to white, medium- to very fine grained, micaceous silty sandstone with interbedded carbonaceous shale and red- and green-banded bentonitic mudstone. Brown-weathering nodules of limy siltstone in some sandstone beds. Bone fragments present. Basal part is gray to brown, coarse- to very coarse grained, arkosic cross-bedded sandstone with interbedded thin lenticular conglomerate and siltstone beds. Thickness greater than 122 m (400 ft)

Tha **Hanna Formation (Paleocene)**—Gray to light-brown, coarse- to very coarse grained, locally arkosic, brown-weathering, massive sandstone with interbedded thin conglomerate, gray shale, carbonaceous bentonitic coaly shale, and sandy gray siltstone. Sandstone beds are cross-bedded and have local channels at base

Mesozoic

Kmb **Medicine Bow Formation (Upper Cretaceous)**—Light-gray to light-brown claystone, sandstone, and siltstone with coal and carbonaceous shale beds. Constrained to the Laramie Basin on this quadrangle. Thickness 0–122 m (0–400 ft)

Kle **Lewis Shale (Upper Cretaceous)**—Light-gray, fine- to very fine grained, cross bedded, iron-stained sandstone with interbedded dark-gray to black siltstone, shale, and carbonaceous shale; many thin stringers of coal and coaly carbonaceous shale. Thin bed of concretionary dense black ironstone in the lower part. Sandstone beds contain fossiliferous calcareous zones and spherical and ellipsoidal calcareous concretions. Thickness 670–790 m (2,200–2,600 ft)

Kmv **Mesaverde Formation (Upper Cretaceous)**

Ks **Steele Shale (Upper Cretaceous)**

Kp **Pierre Shale (Upper Cretaceous)**

Kn **Niobrara Formation (Upper Cretaceous)**

Kf **Frontier Formation (Upper Cretaceous)**

Kmt **Mowry Shale, Muddy Sandstone, and Thermopolis Shale (Upper and Lower Cretaceous)**

Kcv **Cloverly Formation (Lower Cretaceous)**

Jm **Morrison Formation (Jurassic)**

Js **Sundance Formation (Jurassic)**

KJs **Cloverly, Morrison, and Sundance formations, undivided (Lower Cretaceous and Jurassic)**

Tc **Chugwater Formation (Triassic)**

Mesozoic and Paleozoic

TRPu **Goose Egg and Chugwater formations, undivided (Triassic and Permian)**

Paleozoic

Pge **Goose Egg Formation (Permian)**

PPc **Casper Formation (Permian and Pennsylvanian)**

Precambrian

Laramie Anorthosite Complex (Mesoproterozoic)

Yld **Granite and composite dikes**

Yrmu **Red Mountain pluton, undifferentiated**

Maloin Ranch pluton

Ymrg **Granite**

Ymrpm **Porphyritic monzonite**

Ymrms **Monzosyenite**

Ymrfm **Fine-grained monzonite**

Sybille intrusion

Ysbms **Monzosyenite**

Ysbpm **Porphyritic monzonite**

Ysbfm **Ferromonzonite**

Strong Creek complex

Yscbg **Buttes granite**

Yscgi **Grenet intrusion**

Ysct **Strong Creek troctolite**

Ysna **Snow Creek anorthosite**

Poe Mountain anorthosite

Ypml3 **Upper leucogabbroic layered zone**

Ypml2 **Lower leucogabbroic layered zone**

Ypma3 **Upper anorthositic layered zone**

Ypmt2 **Middle anorthositic layered zone**

Ypma1 **Lower anorthositic layered zone**

Ypmt **Leucotroctolite**

Ypmu **Poe Mountain Anorthosite, undifferentiated**

Chugwater anorthosite

Ycagu **Upper leucogabbroic layered zone**

Yca3 **Upper anorthositic layered zone (King Mountain anorthosite)**

Ycagm **Middle leucogabbroic layered zone**

Yca2 **Middle anorthositic layered zone**

Ycagl **Lower leucogabbroic layered zone**

Yca1 **Lower anorthositic layered zone**

Ycaf **Fractured anorthosite**—Poorly exposed anorthosite with sporadic troctolite outcrops. Largely composed of white, fine-grained to sugary anorthosite that contains mostly plagioclase with minor pyroxene. Plagioclase is polygonal and shows effects of extreme grain-size reduction due to high-temperature deformation, possibly in the presence of magma. Locally, fractured appearance results from numerous intersecting structural and lithologic boundaries in medium-grained, gray, massive to foliated anorthosite composed of plagioclase, disseminated olivine, and minor magnetite and ilmenite (Newhouse and Hagner, 1957; Lindsley and others, 2010). Troctolite is medium grained to megacrystic, undeformed, composed of olivine (up to 50 percent), plagioclase, minor orthopyroxene, biotite, and accessory ilmenite and titaniferous magnetite. Troctolite commonly occurs as intrusions within the lower anorthositic layered zone; exhibits sharp boundaries when injected; forms recessive outcrops (Frost and others, 2010; Lindsley and others, 2010)

Ycacf **Coyote Flats anorthosite**—Medium- to coarse-grained, gray-black, subhedral to anhedral, recrystallized anorthosite. Quartz content does not exceed 5 percent; accessory minerals include biotite, clinopyroxene, ilmenite, and magnetite. Plagioclase laths vary widely in size, reaching 6 cm (2.6 in) in length. Weathers pink-red. Outcrops display more deformation than other units within the Chugwater anorthosite. Age constrained to 1,435.25 ± 0.6 Ma (Frost and others, 1996; Lindsley and others, 2010)

Ycau **Chugwater anorthosite, undivided**—Coarse-grained to megacrystic, dark-gray, inequigranular to semiequigranular massive anorthosite composed of labradorescent plagioclase with minor augite, low-Ca pyroxene, olivine, ilmenite, magnetite, and local quartz. Occupies lowest stratigraphic position in the Chugwater anorthosite pluton and is separated from lower anorthositic layered zone by structural boundary (Lindsley and others, 2010); both units are petrographically and compositionally identical but undivided Chugwater anorthosite lacks traceable layering and lamination and exhibits evidence of different structural and deformational history than layered anorthosite zones (Lindsley and others, 2010). Age constrained between 1,435.7 ± 1.1 Ma and 1,435.5 ± 0.3 Ma (Frost and others, 2010)

Yau **Anorthosite, undifferentiated**—Undifferentiated anorthositic, leucogabbroic, gabbroic, and troctolitic units of the Snow Creek, Poe Mountain, and Chugwater anorthosite plutons

Ysmc **Mule Creek granite, associated with Sherman batholith (Mesoproterozoic)**—Coarse-grained, orange-red granite composed of potassium feldspar, plagioclase, quartz, hornblende, ferroaugite, biotite, and fayalite. Greenish-black when fresh; commonly weathers to a deep, orange-red grus. Opaque phases include ilmenite, magnetite, chalcopyrite, and pyrrhotite; accessory phases include zircon, apatite, and local fluorite. Composed of approximately one percent ferrodiorite pods and dikes (Frost and others, 2001; Frost and others, 2002). Age constrained to 1,437.7 ± 2.4 Ma (Frost and others, 2002). Locally intruded by Devonian kimberlitic sills and dikes (Hausel and others, 2003)

Xkd **Kennedy dike swarm (Paleoproterozoic)**—Diabasic amphibolite, plagioclase porphyry amphibolite, and altered peridotite dikes of the Kennedy dike swarm. Altered peridotite dikes are dark-green, medium-grained actinolite, talc, and chlorite, locally containing carbonate. In contact aureole of Sybille intrusion, may contain the assemblage olivine, orthopyroxene, chlorite, and plagioclase. Diabase amphibolite dikes are speckled greenish-black metadiabase. In low-strain areas, original assemblage clinopyroxene, orthopyroxene, plagioclase may persist; primarily altered to hornblende and plagioclase, with small garnets that have nucleated on the boundary between hornblende and plagioclase. Within a kilometer of contact with Sybille intrusion, dikes have been altered to pyroxene-hornfels with assemblage hornblende, orthopyroxene, clinopyroxene, and plagioclase. Most abundant dike type (75–85 percent). Plagioclase porphyry amphibolite dikes are dark-greenish-black, composed of hornblende and plagioclase; plagioclase phenocrysts are 1–5 cm (0.4–2 in). Generally considered oldest dike type based on crosscutting relationships. Age constrained to 2,010 ± 10 Ma (Cox and others, 2000)

Wlgr **Granite and granite gneiss, undifferentiated (Neoarchean)**—Pink, medium- to coarse-grained, massive to highly foliated granitic gneiss. Biotite is generally prominent, and muscovite might be present locally. Includes large, partially melted inclusion within the Sybille intrusion. Age is poorly constrained. Two ages around 2.62 Ga (Verts and others, 1996; Snyder and others, 1998) suggest that some portions post-date the Elmers Rock greenstone belt, although Snyder (1984) contends the gneiss may be basement to the greenstone belt

Wk **Microcline augen granite gneiss, associated with Squaw Rock granite (Neoarchean)**—Pink, medium- to coarse-grained, porphyritic, biotite-granite augen gneiss. Microcline phenocrysts, 2.5–7.5 cm (1–3 in) in diameter, make up 10 to 30 percent of the rock; accessory sphene is present as both fine-grained, subhedral to anhedral grains parallel to the foliation, and as coarse-grained, anhedral grains crosscutting the foliation. Foliation defined by alignment of biotite. Contacts with other Archean granites and granitic gneisses are locally gradational to cross-cutting. Age constrained by U-Pb dating to 2,641 ± 1.2 to 2,618.7 ± 1.2 Ma (Verts and others, 1996)

Elmers Rock greenstone belt (Neoarchean)

Wem **Marble**—Buff-weathering to dark-brown, fine- to very coarse grained marble; possibly the youngest stratigraphic unit in Elmers Rock greenstone belt (previously called the Bluegrass Creek Metamorphic Suite). Locally grades into calc-silicate rocks. Varieties include white dolomite and tremolite-dolomite, white to gray, very coarse grained calcite marble, well-layered clear-brown calcite marble, and white-green to brown spotted dolomite-calcite marble (Snyder, 1984)

Weps **Pelitic schist**—Quartz-biotite-muscovite schist. Commonly has kayanite-sillimanite-garnet assemblage outside contact aureole of the Sybille intrusion. Within the aureole, contains andalusite and cordierite. May contain streaks of granitic melt (Snyder, 1984)

Wefb **Felsic biotite gneiss**—Speckled gray feldspar-quartz-biotite gneiss and schist, possibly derived from clay-bearing silts, sands, and gravels (Snyder, 1984)

Wea **Amphibolite**—Medium-grained, green to black, layered amphibolite. In low-strain areas, pillows may be preserved. Commonly interlayered with calc-silicate rocks. In the contact aureole of the Sybille intrusion the amphibolite has been converted to a fine-grained brown hornfels with the assemblage orthopyroxene-clinopyroxene-hornblende-plagioclase (Snyder, 1984)

MAP SYMBOLS

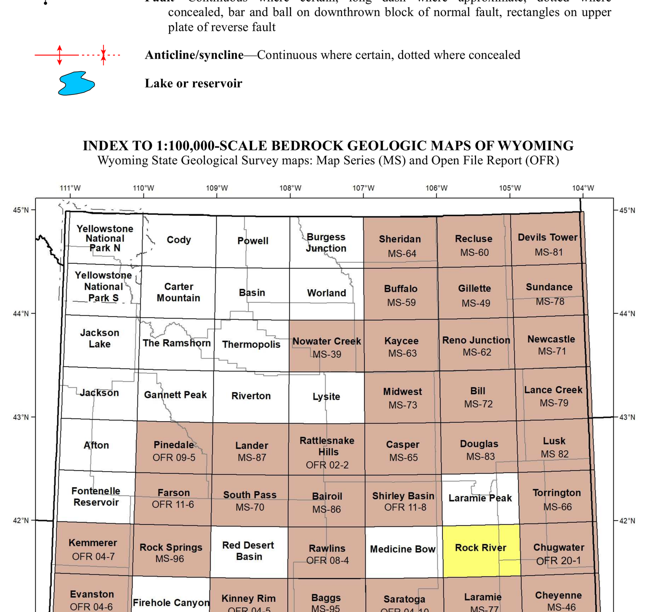
Formation contact—Continuous where certain, long dash where approximate

Fault—Continuous where certain, long dash where approximate, dotted where concealed. Bar and ball on downthrown block of normal fault, rectangles on upper plate of reverse fault

Anticline/syncline—Continuous where certain, dotted where concealed

Lake or reservoir

INDEX TO 1:100,000-SCALE BEDROCK GEOLOGIC MAPS OF WYOMING



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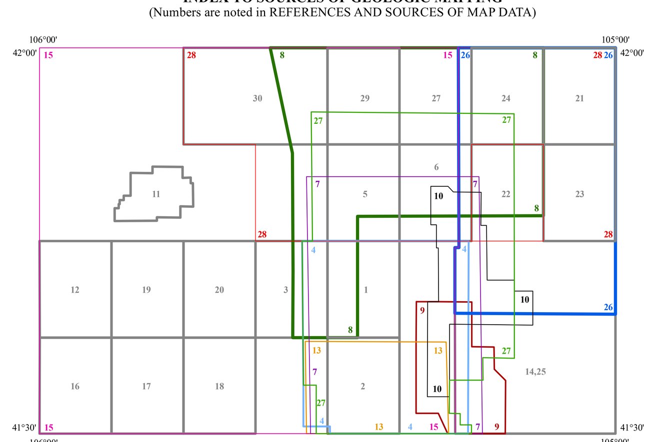
(Numbers are noted in REFERENCES AND SOURCES OF MAP DATA)



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