



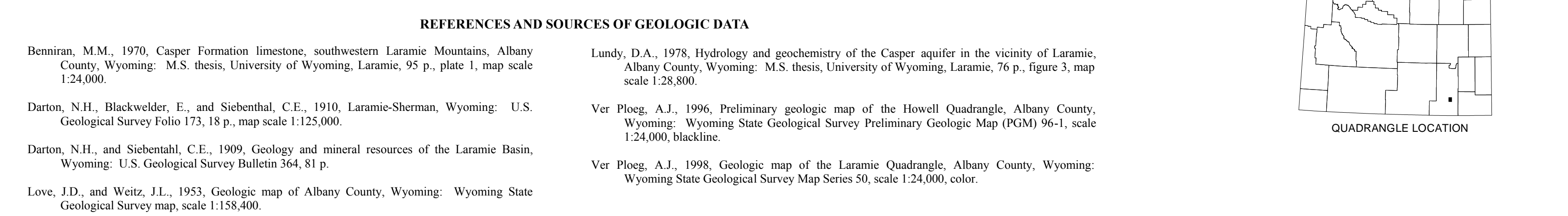
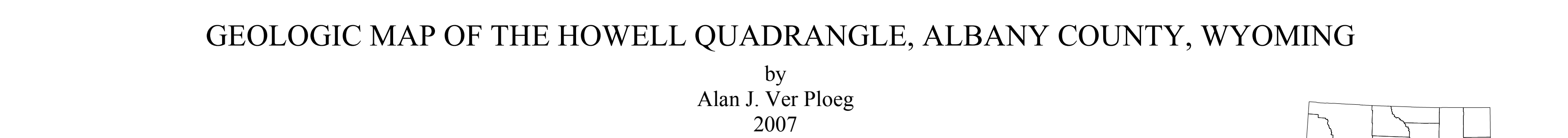
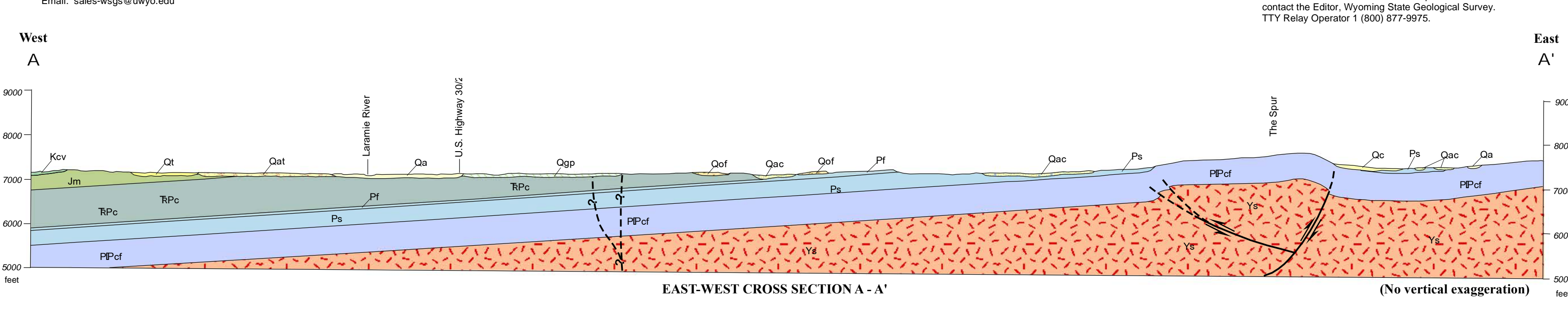
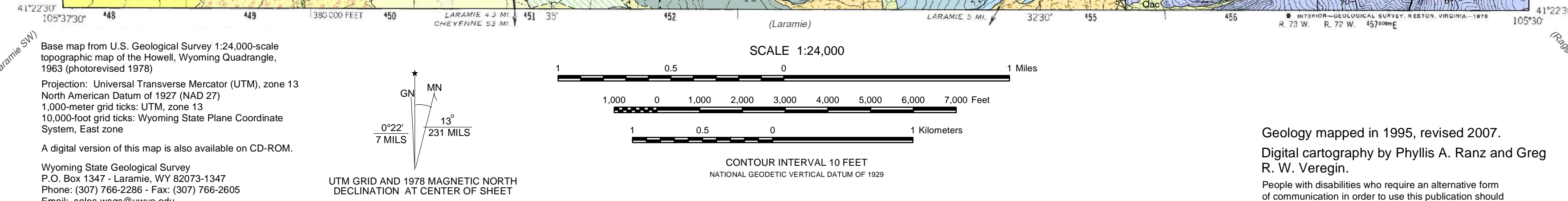
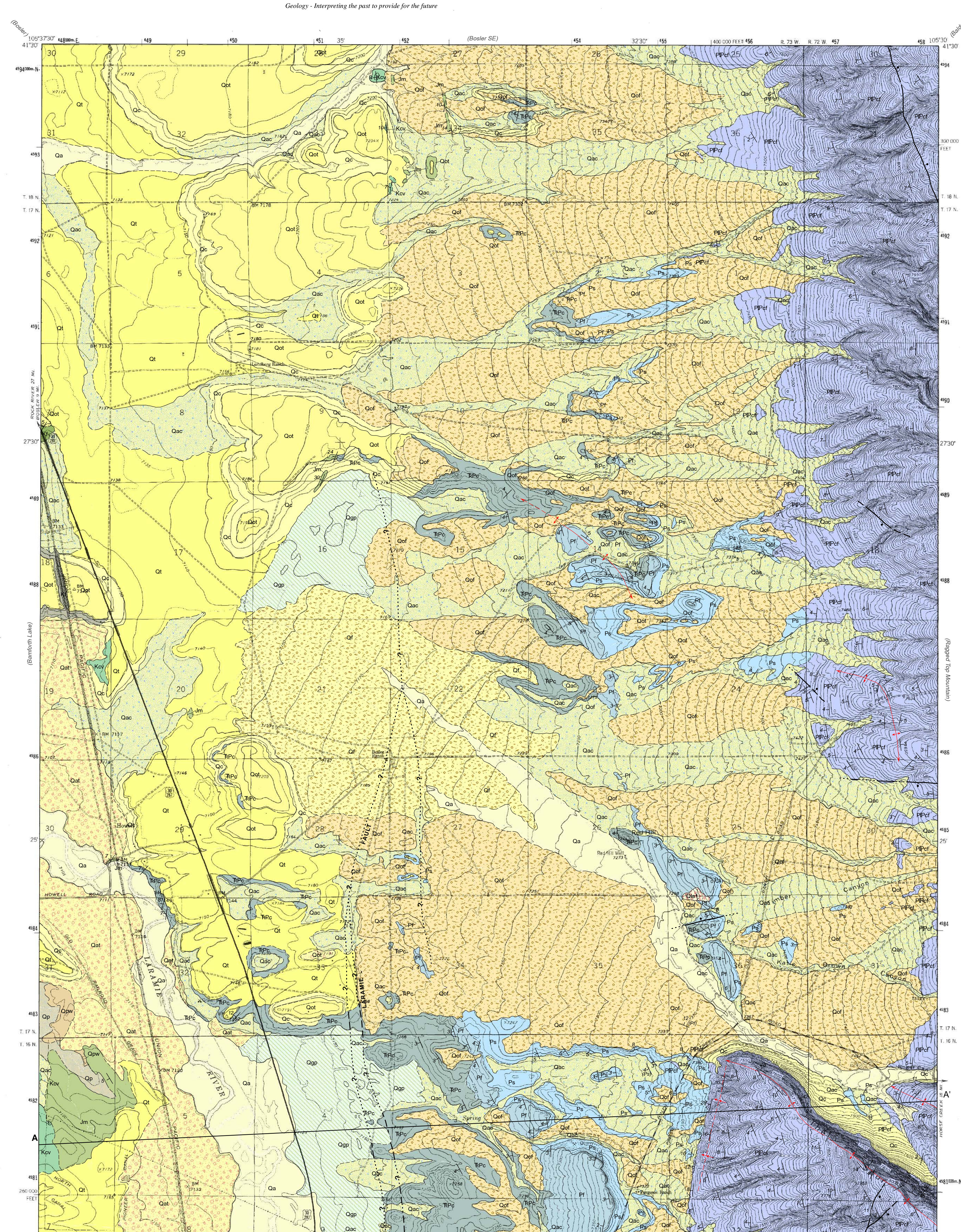
Geology - Interpreting the past to provide for the future



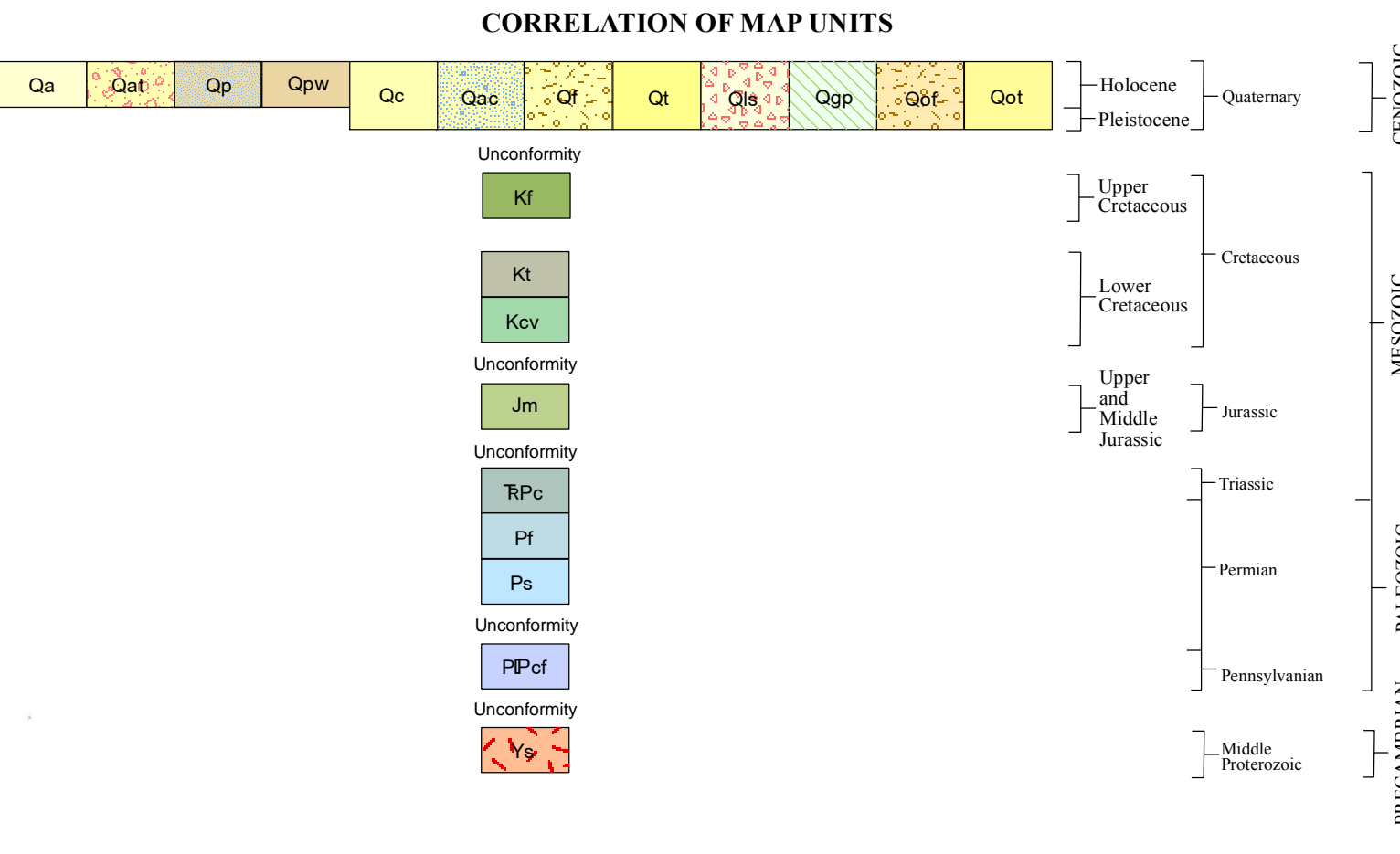
Prepared in cooperation with the
U.S. GEOLOGICAL SURVEY



MAP SERIES 75
Howell 1:24,000 - scale Geologic Map



EXPLANATION



DESCRIPTION OF MAP UNITS

- Holocene surficial deposits**
- Qa** Alluvial deposits—Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in floodplains and lowest stream terraces; thickness 0 to 20 feet (0 to 6 m)
 - Qat** Mixed alluvium and terrace deposits—Unconsolidated and poorly consolidated clay, silt, sand, and gravel, representing a transition zone between alluvium and terrace deposits, mainly adjacent to the Laramie River; thickness approximately 0 to 30 feet (0 to 9 m)
 - Qp** Playa lake deposits—Clay- to silt-sized stratified lake bed deposits; thickness generally less than 5 feet (1.5 m)
 - Qpw** Wind-blown playa lake deposits—clay- to silt-sized lake bed deposits occurring in dunes on the northeast (downwind) side of playa lake beds; thickness 0 to 15 feet (0 to 4.6 m)
- Holocene and Pleistocene surficial deposits**
- Qc** Colluvium—Unconsolidated masses of rock fragments and soil material on relatively steep slopes with the thickest accumulations at the bases of slopes
 - Qac** Mixed alluvium and colluvium—Sand, silt, clay, and gravel deposited mainly along intermittent streams; includes slope wash and smaller alluvial fan deposits that coalesce with alluvium; thickness approximately 0 to 20 feet (0 to 6 m)
 - Qf** Alluvial fan deposits—Poorly sorted clay, silt, and gravel; crudely bedded to nonbedded. Appear to be active, receiving sediments from intermittent streams flowing off the Laramie Mountains; may have some debris flow component. Grade into terrace deposits toward west, approaching the Laramie River; locally grade into alluvium and colluvium; thickness 0 to 30 feet (0 to 9 m)
 - Qt** Terrace deposits—Beds of coarse sand and gravel with occasional boulders and lenses of silt and clay. Includes fragments of weathered granite and limestone cobbles, their predominance varies depending on source of feeding stream. Occur along present drainages, a few feet (0.6 m) to over 35 feet (10.7 m) above modern flood plains; thickness approximately 0 to 10 feet (0 to 3 m)
 - Qgs** Landslide deposits—Blocks of bedrock or loose slope debris; arrows point to inferred direction of movement. Occur in Forelle Limestone, detaching at the contact with the underlying Satanka Shale
 - Qgp** Gypsiferous deposits—Unconsolidated clay-sized gypsum interbedded with red clay, sand, gravel, and limestone cobbles mostly located in stream valleys immediately west of the Laramie fault, probably sourced by solution and erosion of gypsum beds of the upper Satanka and lower Chugwater formations which were brought to the surface or near surface by faulting. These deposits were mined for cement plaster near the turn of the 20th Century. Thickness 0 to 10 feet (0 to 3 m)
 - Qof** Older alluvial fan deposits—Poorly sorted clay, silt, sand, and gravel; crudely bedded to nonbedded with some debris flow component. Limestone cobbles are common. Currently inactive and dissected, often occurring as erosional remnants. Grade into older terrace deposits toward the west, in the northern part of the map area. Thickness 0 to 10 feet (0 to 3 m)
 - Qot** Older terrace deposits—Beds of coarse sand and gravel with occasional boulders and lenses of silt and clay. Limestone cobbles are common. Often occur as erosional remnants ranging from 20 to 100 feet (6 to 30 m) above present stream floodplains. Some remnants may actually be older alluvial fan remnants. Thickness 0 to 10 feet (0 to 3 m)
- Mesozoic and Paleozoic sedimentary rocks**
- Kf** Frontier Formation (Upper Cretaceous)—Dark gray to black shale with interbedded thin, lenticular, tan to gray sandstones and thin bentonite beds. Persistent tan sandstone occurs at top of formation, locally referred to as the "Wall Creek Sandstone." Thickness approximately 550 feet (168 m)
 - Kt** Thermopolis Shale (Lower Cretaceous)—Gray to black, soft shale with some thin brown to tan sandstones locally interbedded. Ironstone concretions appear in the upper part of the formation; fossil fish fragments occur locally in the upper thin sandstones; selenite crystals are common in outcrop. Thickness 60 to 75 feet (18 to 23 m)
 - Kcv** Cloverly Formation (Lower Cretaceous)—Basal tan to white, coarse-grained sandstone and chert pebble conglomerate, locally cross-bedded and overlain by variegated buff and purple claystones interbedded with thin black shale beds, and an upper gray to buff to brown, fine- to coarse-grained sandstone, cross-bedded in lower part. Thickness 100 to 130 feet (30 to 40 m)
 - Jm** Morrison Formation (Upper and Middle Jurassic)—Pale-green, olive-green, blue-green to maroon and chalky white variegated calcareous and bentonitic claystones interbedded with thin drab limestones and buff, non-resistant sandstones. Limestone locally contains orange to brown chert inclusions. A thin section of Sundance Formation may exist in the area, but due to few and poor exposures and questionable identification, it is mapped with the Morrison. Thickness 300 to 350 feet (91 to 107 m)
 - TrPc** Chugwater Formation (Triassic and Permian)—Red shale and siltstone with interbedded red to salmon to buff, fine-grained sandstone. Lower part of section contains red shale interbedded with thin to thick gypsum beds, local solution breccia, and banded wavy gypsiferous thin limestone sometimes mistaken for part of the Forelle Limestone. This part of the Chugwater along with the underlying Forelle Limestone and Satanka Shale are mapped as Goose Egg Formation west of the Laramie Basin. Locally, some sandstone erosional outliers of possible Jelm Formation may occur, but due to their lack of persistence and questionable identification, they are mapped with the Chugwater. Thickness 650 to 800 feet (198 to 244 m)
 - Pf** Forelle Limestone (Permian)—Gray to purple, thin bedded, sparsely fossiliferous limestone locally interbedded with red siltstone and thin gypsum laminations. Wavy outcrops resembling algal structures common. Landslides are common on Forelle dip slopes with the unit detaching from the underlying Satanka Shale. Thickness 10 to 30 feet (3 to 9 m)
 - Ps** Satanka Shale (Permian)—Red siltstone and shale (often banded with white- and ochre-colored zones) with sandstone, thin limestones, and local gypsum beds, especially near the top. Buff to orange to red, fine-grained sandstone with ripple marks common near base of unit. Gypsum beds in the Satanka were mined sometime after the turn of the 20th Century in sec. 12, T. 16 N., R. 73 W. on this map. Thickness 140 to 200 feet (43 to 61 m)
 - PPcf** Casper and Fountain formations undivided—Mapped together due to the transitional nature of the contact between the Casper and the Fountain; total combined thickness 600 to 660 feet (183 to 201 m)
 - Casper Formation (Permian and Upper and Middle Pennsylvanian)**—Buff to reddish, calcareous to quartzitic, very fine- to coarse-grained, well cemented subarkosic sandstone interbedded with buff to purplish-gray limestone and dolomite beds, usually micritic and locally fossiliferous. Intertroughs with underlying Fountain Formation. Sandstone often exhibits large-scale festoon cross-bedding, increasing toward the south. As many as 10 different limestone or dolomite beds, which are locally quarried for cement or gravel uses, have been identified in the Laramie area. The Casper Formation serves as the prime aquifer in the map area
 - Fountain Formation (Pennsylvanian)**—Primarily maroon arkosic cross-bedded fine to coarse sandstone and conglomerate interbedded locally with shales and thin limestones. Less than 50 feet (15 m) thick, occurring in the subsurface only and pinching out to the north within the map area
- Precambrian crystalline rocks**
- Yp** Sherman Granite (Middle Proterozoic)—Shown on cross section only. Coarsely crystalline pink granite ranging in age from 1,414 to 1,435 Ma (Mega-annum or millions of years before present)

MAP SYMBOLS

- Formation contact**—Dashed where approximately located
- Fault**—Dashed where approximately located, queried where inferred, and dotted where concealed; bull and bar on downthrown block; arrows indicate relative horizontal movement where known
- Anticline**—Dashed where approximately located; dotted where concealed; trace of axial plane and direction of plunge determined by field dip measurements and air photo interpretation; short arrow denotes steeper dipping limb of asymmetric anticline
- Monocline**—Showing direction of plunge; dashed where approximately located; trace of axial plane determined by field dip measurements and air photo interpretation; short arrow denotes steeper dipping limb
- Strike and dip of beds**—Showing angle of dip; formation symbol in parentheses indicates attitude measured for bedding in an exposure that was too small to depict at the present map scale
- Landslide movement vector**—Shown within landslide (Qs) blocks; arrows point to inferred direction of movement
- Line of cross section**

GEOLOGIC MAP OF THE HOWELL QUADRANGLE, ALBANY COUNTY, WYOMING

by
Alan J. Ver Ploeg
2007

REFERENCES AND SOURCES OF GEOLOGIC DATA

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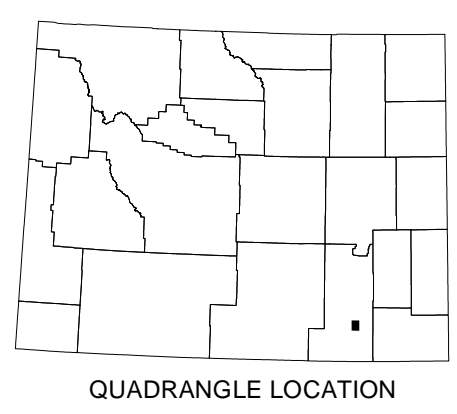
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QUADRANGLE LOCATION