WYOMING STATE GEOLOGICAL SURVEY
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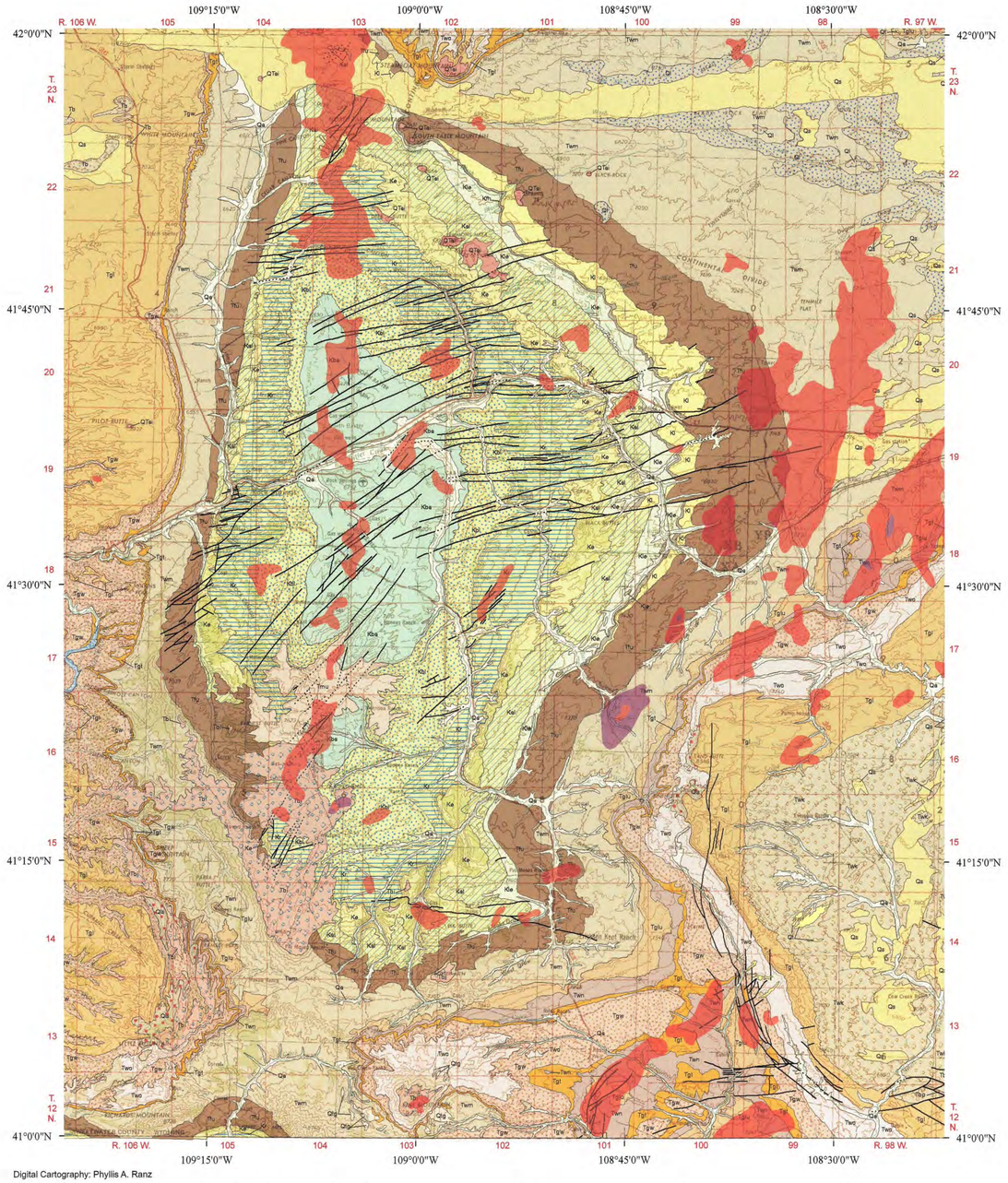
Geology - Interpreting the past to provide for the future

OPEN FILE REPORT 07-4
Geologic Map and Oil and Gas Fields of the Rock Springs Uplift Area
Plate 1



Digital Cartography: Phyllis A. Ranz

10 8 6 4 2 0 10 20 30 Miles

10 5 0 10 20 30 Kilometers

Scale 1:250,000, 1 inch equals approximately 4 miles

MAP LOCATION

N

MAP SYMBOLS

Formation contact

Fault, dotted where concealed

Mesozoic and younger oil and gas fields

Paleozoic oil and gas fields

GEOLOGIC MAP AND OIL AND GAS FIELDS OF THE ROCK SPRINGS UPLIFT AREA, SWEETWATER COUNTY, SOUTHWESTERN WYOMING

Compiled by
D.W. Lucke, J. F. McLaughlin, and R. W. Jones
2007

EXPLANATION

DESCRIPTION OF MAP UNITS

Qs — **Sand dunes** (Holocene and Pleistocene)—Wind-blown sand in active and stabilized dunes; thickness variable.

Qp — **Playa lake deposits** (Holocene and Pleistocene)—Mostly clay, silt, and fine sand; some evaporite minerals and alkali deposits; thickness variable.

Qa — **Alluvium** (Quaternary)—Alluvial deposits within and terrace deposits along major streams, may include alluvial fan deposits, landslide deposits, and colluvium; thickness up to approximately 40 feet.

Qt — **Terrace deposits** (Quaternary)—Stream deposited gravels above present stream levels; thickness variable.

Qls — **Landslide deposits** (Quaternary)—Active and inactive landslides, debris flows, and other mass earth movements; thickness variable.

Qtg — **Older gravel, pediment, and fan deposits** (Quaternary)—Mostly locally derived clasts, may include some Tertiary gravels; thickness variable.

QTai — **Alkalic volcanic rocks** (Pleistocene to Pliocene)—Ultrapotassic, mafic rocks (lamproites) of the Leucite Hills volcanic field, consisting of messa and buttes composed of flows, plugs, volcanic necks, dikes, cinder cones, volcaniclastics, and rubble zones. Erupted and intruded from approximately 3.0 to 0.89 Ma (Mega-annum, or million years before present) onto Tertiary and Cretaceous rocks on the north and northeast part of the Rocks Springs uplift.

Tmu — **Miocene(?) rocks, undivided** —Pale green to tan tuffaceous sandstone and claystone; locally conglomeratic near base (Love and Christiansen, 1985); unconformably overlies Bishop Conglomerate and older rocks in southern part of Rock Springs uplift; thickness unknown.

Tbp — **Browns Park Formation** (upper Oligocene(?) and Miocene)—White sandy tuff and white or light gray tuffaceous sandstone, clean sandstone, and sandy mudstone; locally contains thin layers and lenses of greenish-gray clayey mudstone; sandstone is conspicuously cross-bedded in some extensive areas; lower part conglomeratic (Bradley, 1964). Reported maximum thickness to southeast in Colorado is 1,200 feet (Sears, 1924), but only the lowermost part of the Browns Park is exposed in the extreme southeastern part of the map area.

Tb — **Bishop Conglomerate** (Oligocene)—Well-rounded cobbles and boulders of red quartzite, metamorphi rocks, and gray chert and limestone (Love and Christiansen, 1985) derived from Uinta Mountains and angular fragments of brown sandstone and quartzite derived from local erosion of Cretaceous rocks, all in a gray to white tuffaceous sandstone matrix; unconformably overlies all older rocks. Thickness highly variable, ranging from a maximum of 164 feet nearest the Uinta Mountain front (in the southern Green River Basin) thinning to 0 within about 35 miles to the north (Murphey and Evanoff, in preparation).

Twk — **Washakie Formation** (middle and upper Eocene)—Restricted to the Washakie Basin, correlates in part to the Bridger Formation to west; mostly reworked airfall volcanic ash deposited in fluvial (flood-plain) environments; a total of 3,177 feet thick in reference sections (Roehler, 1992a) described below:

Adobe Town Member—Gray, green, and red tuffaceous mudstone alternating with gray tuffaceous and arkosic sandstone and minor thin beds of green shale, gray and green tuff, and gray siltstone and conglomerate; unconformity at base; thickness 2,326 feet in reference section (Roehler, 1992a)

Kinney Rim Member—Gray, green, and some red mudstone and interbedded gray and gray-green sandstone, gray limestone and siltstone, and gray to white tuff; thickness 851 feet (Roehler, 1992a)

Tri — **Bridger Formation** (lower and middle Eocene)—Greenish-gray, olive drab, and white tuffaceous sandstone and claystone, derived primarily from reworked volcaniclastics and ash fall tuffs from Absaroka Range; minor lenticular marlstone beds (lacustrine) and conglomerate; maximum of 2,764 feet thick in southern Green River Basin near Cedar Mountain (Murphey and Evanoff, 2007), but only lowermost part of Bridger exposed in northwestern part of map area.

Green River Formation (lower Eocene)—Oil shale, light-colored tuffaceous marlstone, and sandstone deposited in predominantly lacustrine environments; subdivided into three major members (Laney, Wilkins Peak, and Tipton Tongue or Member) and two minor members (Luman Tongue and Godiva Rim Member). Roehler (1992a) measured a total of 2,763 feet for this formation in his Green River Basin reference section and 1,914 feet in his Washakie Basin reference section.

Tgl — **Laney Member, undivided** —Buff, chalky to platy marlstone; buff to white sandy tuff and white chalky volcanic ash; brown to light-ash-gray shale; papery, low-grade oil shale; brown muddy sandstone; thin algal-limestone beds, stromatolites, and nodular masses in some areas. Thickness variable (ranges from 400 to 1,900 feet in Washakie Basin, 600 feet near Green River, 370 feet near Twin Buttes 23 miles south of Green River) (Bradley, 1964) but average is about 1,200 feet.

Godiva Rim Member of Roehler (Not shown on geologic map)—Mostly gray mudstone and thinly bedded brown oil shale and gray sandstone; restricted to Washakie and Sand Wash basins; intertongues with Cathedral Bluffs Tongue of Wasatch Formation to north and east; thickness ranges from 0 in west to 350 feet at type area (Roehler, 1992b).

Tgw — **Wilkins Peak Member**—Green, brown, and gray tuffaceous sandstone, shale, and marlstone, with evaporites (halite, trona, nacholite, and related minerals) in subsurface sections (Love and Christiansen, 1985); deposited mostly in the Uinta Mountain trough in the deeper parts of the southern Green River and southwestern Washakie basins. Total thickness ranges from 0 to more than 1,200 feet; composed of a lower part ranging from 0 to 200 feet thick, a middle part ranging from 0 to more than 900 feet thick, and an upper part ranging from 0 to approximately 100 feet thick (Roehler, 1992 b).

Tgt — **Tipton Tongue or Member**—Dark brown and gray oil shale and marlstone, thin interbedded tan algal limestone and tan-brown dolomite; thin gray tuff beds, and thin beds of fossiliferous sandstone and interbedded carbonaceous shale near base; 158 to 183 feet thick.

Tglu — **Luman Tongue** —In the Green River Basin, composed of 293 feet of brown to gray brown oil shale, gray sandstone, gray and brown shale, dark brown carbonaceous shale, and brown mollusk-bearing limestone sandstone. In Washakie Basin, composed of 229 feet of gray, green, and red mudstone and interbedded gray and red sandstone with minor thin beds of gray shale, gray-brown oil shale, brown carbonaceous shale, and coal.

Wasatch Formation (lower Eocene)—Drab to variegated claystone and siltstone, carbonaceous shale and coal, buff sandstone, arkose, and conglomerate; divided into a lowermost main body and three equivalent or overlying members or tongues.

Twc — **Cathedral Bluffs Tongue**—Consists of: 1) a lower gray and green mudstone unit with some tan and gray siltstone, gray sandstone, brown carbonaceous shale, and tan oolitic and algal limestone of a mixed fluvial,lacustrine, and mudflat environment; 2) a middle red and maroon variegated mudstone unit with some interbedded gray, green, orange, and brown mudstone and gray claystone and sandstone deposited in a fluvial (flood-plain) environment; and 3) an upper gray and green mudstone and shale unit with thin interbedded red mudstone, tan and gray sandstone and siltstone, brown carbonaceous shale, and tan and gray oolitic and algal limestone. Mostly fluvial rocks that intertongue with and are lateral equivalents of the Wilkins Peak Member of the Green River Formation or serve to separate the Tipton Member from the Laney Member where the Wilkins Peak is absent. Thickness ranges from 0 to over 1,500 feet along the Uinta Mountain trough to over 2,000 feet in the center of the Washakie Basin.

Twn — **Niland Tongue**—Interbedded brown sandstone, carbonaceous shale, and coal form lacustrine, fluvial, and paludal (swamp) origin; occurs between Luman Tongue and the Tipton Member of the Green River Formation; where Luman Tongue is very thin or absent, the Niland Tongue is mapped with the main body of the Wasatch. Thickness ranges from 0 to over 400 feet in the southwestern part of the Rock Springs uplift, western Sand Wash Basin, and southwest Washakie Basin.

Ramsey Ranch Member of Roehler (Mapped with the main body of the Wasatch, not shown on geologic map)—Gray shale, brown or black carbonaceous shale, coal, and thin interbedded gray fossiliferous limestone and brown oil shale; mostly of paludal and lacustrine origin; more than 600 feet thick in southern Green River Basin along the Uinta Mountain trough, about 400 feet thick at the south end of the Rock Springs uplift, and approximately 800 feet thick in the axis of the Washakie Basin (Roehler, 1992b).

Twm — **Main body of Wasatch Formation**—Drab sandstone, drab to variegated claystone and siltstone interfingering with locally derived conglomerates around basin margins; interfingers primarily through changes in depositional environments with members and tongues of the Green River Formation; thickness varies from approximately 1,000 feet in outcrops in the central and northern Rock Springs uplift and at basin margins, to over 4,000 feet in the center of the southern Green River Basin along the Uinta Mountain trough, over 4,000 feet in the Washakie Basin, to over 6,000 feet in the Sand Wash Basin, and to over 9,000 feet in the northern Green River Basin (Roehler, 1992b).

Tfu — **Fort Union Formation** (Paleocene)—Brown to gray sandstone, gray to black shale, and coal beds (Love and Christiansen, 1985); thickness ranges from less than 1,000 feet to 1,900 feet (Lillegraven, 1990).

Kl — **Lance Formation** (Upper Cretaceous)—Interbedded tan and gray sandstone and siltstone, gray shale, dark-gray and dark-brown carbonaceous shale, and coal; dolomite and hematite concretions common; thickness up to 1,000 feet on east side of Rock Springs uplift, increasing eastward into Washakie and Great Divide Basins (Roehler, 1993) and thins to feather edge on northwest and southeast sides of uplift where it has been removed by post-Lance Formation erosion.

Kfh — **Fox Hills Sandstone** (Upper Cretaceous)—Tan, brown, gray, or white sandstone and some interbedded tan or brown siltstone and gray shale; local interbeds of gray dolomite, gray or brown carbonaceous shale, and coal; thickness from 75 to 225 feet on east side of Rock Springs uplift (Roehler, 1993), thins to feather edge on northwest and southeast sides of uplift where it has been removed by post-Lance Formation erosion.

Kle — **Lewis Shale** (Upper Cretaceous)—Dark gray shale and some thin, interbedded, ledge-forming tan or brown very fine- to fine-grained sandstone and siltstone; some dolomite concretions; deposited in nearshore marine environment; upper part intertongues with Fox Hills Sandstone; thickness from 600 to 700 feet (Roehler, 1993).

Mesaverde Group (Upper Cretaceous)—total thickness is approximately 3,500 feet (Roehler, 1993), ranging from less than 2,000 feet to more than 5,000 feet (Roehler, 1990). The group consists of four formations, in descending stratigraphic order:

Kal — **Almond Formation** —White and brown soft sandstone, gray sandy shale, coal, and carbonaceous shale; lower part of formation predominantly gray carbonaceous shale and thin interbedded gray shale and sandstone, with rare thin beds of coal deposited in coastal palin environment; middle of formation mostly carbonaceous shales, bay-fill shales, splay sandstones, and coal beds deposited in a barrier plain/marsh environment; upper part of formation mostly linear sheets of marine shoreline sandstones that prograde eastward into marine shales of the Lewis Shale (Roehler, 1990). Roehler (1990) measured a maximum of 623 feet of Almond Formation north of Rock Springs.

Ke — **Ericson Sandstone**—White massive sandstone, lenticular chert-grit conglomerate in upper part; 471 feet thick north of Rock Springs; 238 feet thick in east Flaming Gorge; divided into lower Trail Member, middle Rusty zone, and upper Canyon Creek Member; upper and lower members mostly fresh-water sandstones deposited in an alluvial plain, middle member is mostly non-carbonaceous, fresh-water flood plain deposits, consisting of tan or light-gray, very fine to fine-grained sandstone and medium gray to gray-green shale.

Kr — **Rock Springs Formation**—White to brown sandstone, shale, carbonaceous shale, and claystone with numerous coal beds deposited in a delta plain environment; the delta environments grade eastward into marine shoreline sandstone deposits and farther eastward into marine shelf, slope and basin environments. Thicknesses range from maximums of 1,665 feet north of Rock Springs and 1,913 feet near east Flaming Gorge to approximately 1,100 feet in the southeastern Rock Springs uplift (Roehler, 1990).

Kbr — **Blair Formation**—Shale, dark gray with thin interbedded very fine-grained tan sandstone and siltstone, and rare thin layers of rounded limy siltstone concretions; most sandstone occurs in thin parallel beds or parallel laminae, some small-scale trough cross-beds; deposited in marine shelf and slope; 1,293 feet thick north of Rock Springs, 2,005 feet thick in east Flaming Gorge (Roehler, 1990).

Kba — **Baxter Shale** (Upper Cretaceous)—Gray to black soft sandy shale and shaly sandstone; approximately 4,500 feet thick (Roehler, 1990), but base of unit not exposed in the Rock Springs uplift.

REFERENCES CITED AND SOURCES OF MAP DATA

(Asterisks indicate principal sources for geologic map)

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Lillegraven, J.A., 1990, correlation of Paleogene strata across Wyoming — a user's guide, in Snoke, A.W., Steidtmann, J.R., and Roberts, S.M., editors, Geology of Wyoming: Wyoming State Geological Survey Memoir 5, vol. 1, p. 414-477.

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Roehler, H.W., 1990, Stratigraphy of the Mesaverde Group in the central and eastern Greater Green River Basin, Wyoming, Colorado, and Utah: U.S. Geological Survey Professional Paper 1508, 52 p.

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Roehler, H.W., 1993, Stratigraphy of the Upper Cretaceous Fox Hills Sandstone and adjacent parts of the Lewis Shale and Lance Formation, east flank of the Rock Springs uplift: U.S. Geological Survey Professional Paper 1532, 57 p.

*Roehler, H.W., 2004, Geologic map of the Kinney Rim 30'x 60' Quadrangle, Sweetwater County, Wyoming and Moffat County, Colorado: Wyoming State Geological Survey Open File Report 04-5, scale 1:100,000, color, digital files.