

(See text for expanded descriptions and references to previous work in the study area.)

SEDIMENTARY AND VOLCANIC DEPOSITS AND ROCKS

Quaternary Sedimentary Deposits

- Nonglacial Deposits**
- Qla₁ Incipient landslides (Holocene)
 - Qla₂ Rock avalanche deposits (Holocene and Pleistocene)
 - Qla₃ Landslide deposits (Holocene and Pleistocene)
 - Qla₄ Mass-wasting deposits, undivided (Holocene and Pleistocene)
 - Qla₅ Talus deposits (l. small Oa polygons) (Holocene and Pleistocene)
 - Qla₆ Alluvium and mass-wasting deposits, undivided (Holocene and Pleistocene)
 - Qla₇ Older alluvium or alluvial terrace deposits (Holocene and Pleistocene)
 - Qla₈ Alluvial fan deposits (af. small Oa polygons) (Holocene and Pleistocene)
- Glacial Deposits**
- Qad Alpine glacial deposits, undivided (Holocene and Pleistocene)
- Pyroclastic Deposits**
- Qvp₁ Dacite pumice erupted from Glacier Peak volcano (Pleistocene)

Tertiary Sedimentary Rocks

- Ec₂ Chumstick Formation (Eocene)

Mesozoic Sedimentary Rocks

- Km₂ Virginian Ridge Formation, argillite and chert-pebble-rich conglomerate (Cretaceous). Locally mapped as: Kog₂ Virginian Ridge Formation, conglomerate (greater than 40%) and argillite

LOW-GRADE METAMORPHIC ROCKS

- Klm₁ North Creek Volcanics (Cretaceous and Jurassic?)

INTRUSIVE IGNEOUS ROCKS

Tertiary Intrusive Igneous Rocks

- Aphanitic and granitic dikes of diverse compositions and origins (Miocene to Eocene)
- Dikes of diverse compositions and origins (Miocene to Eocene) (mappable extent)
- Tib Intrusive breccia at Klone Creek and basaltic plugs and dikes at the Chirawa River (Tertiary)
- Mig₁ Cloudy Pass pluton, granodiorite, tonalite, quartz gabbro and granite (Miocene)
- Mig₂ Cloudy Pass pluton granite (Miocene)
- Mig₃ Cloudy Pass pluton chilled border rocks divided into:
 - Intermixed labradorite-bytownite and dacite porphyry or andesite porphyry
 - Dacite porphyry or intrusive breccia
 - Small satellite occurrences of dacite porphyry or intrusive breccia, unit Mida₁
 - Dacite and labradorite-bytownite andesite porphyry breccia
- Mix Breccias and porphyries of Lyall Ridge (Miocene?)
- ER Copper Peak and Holden Lake plutons tonalite and hornblende quartz gabbro (Eocene) (see contact complexes below)
- ER Hornblende-biotite tonalite near Holden and southeast Entiat Meadows (Eocene?)
- Eig₁ Biotite granodiorite and granite near Holden and Mirror Lake (Eocene?)
- ER₁ Duncan Hill pluton, biotite and hornblende-biotite quartz diorite, tonalite and granodiorite (Eocene) (see contact complexes below)
- Eig₂ Railroad Creek pluton, biotite and hornblende-biotite granodiorite, tonalite, quartz diorite and granite (Eocene)
- Eig₃ Rampart Mountain pluton, biotite granite and granodiorite (Eocene)
- Eig₄ Golden Horn Batholith, alkaline granite (Eocene)
- Eide₁ Dacite volcanic neck on Old Gib Mountain (Eocene)
- Eide₂ Labradorite andesite porphyry on and near Old Gib Mountain (Eocene)
- Eig₅ Larch Lakes pluton, biotite granodiorite (Eocene?) to Paleocene
- PA₁ Oval Peak pluton, biotite tonalite (Paleocene)

Mesozoic Intrusive Igneous Rocks

- TKR Unnamed stock intruding the Virginian Ridge Formation (Tertiary to Cretaceous)
- TKG Sisters meta-quartz monzonite (Tertiary to Cretaceous)

Mesozoic Intrusive Igneous Rocks

- Kit Leucocratic tonalite (trondhjemite) and granodiorite (Tertiary? Cretaceous)
- Kil₁ Seven Fingered Jack pluton, biotite-hornblende tonalite to quartz diorite (Cretaceous)
- Kil₂ Entiat pluton, hornblende-biotite tonalite (Cretaceous) (see contact complexes below)
- Kil₃ Entiat pluton, hornblende diorite and gabbro (Cretaceous) (see contact complexes below)
- Kil₄ Banded migmatitic tonalite orthogneiss and amphibolite of the Entiat pluton (Cretaceous)
- Kil₅ Cardinal Peak pluton, hornblende-biotite and biotite-hornblende tonalite and biotite granodiorite (Cretaceous) (see contact complexes below)
- Kil₆ Cardinal Peak pluton, calcic hornblende quartz diorite, diorite, and tonalite (Cretaceous)
- Kil₇ High Pass pluton, biotite granodiorite and tonalite (Cretaceous)
- Kil₈ Buck Peak pluton, biotite granodiorite and tonalite (Cretaceous)
- Kil₉ Riddle Peaks pluton, hornblende gabbro (pre-Tertiary)
- Kil₁₀ Riddle Peaks pluton, layered hornblende gabbro (pre-Tertiary)
- Kil₁₁ Clark Mountain pluton, biotite tonalite (Cretaceous)

MIXED IGNEOUS AND METAMORPHIC ROCKS OF PLUTONIC COMPLEXES

Tertiary to Mesozoic Contact Complexes

- ER₁ Duncan Hill pluton contact complex (Eocene)
- ER₂ Contact complex of the Copper and Holden Lake plutons (Eocene)
- Kil₁ Contact complexes of the Entiat plutons (Cretaceous)
- Kil₂ Cardinal Peak pluton contact complex (Cretaceous)
- Kil₃ Contact complexes of the Tenpeak and White Mountain plutons (Cretaceous)

Tertiary to Mesozoic Plutonic Complexes

- TKm₁ Skagit Gneiss Complex, undivided. Largely tonalite, quartz diorite and granodiorite orthogneisses and migmatites (middle Eocene to Cretaceous) (see Tertiary to Mesozoic Orthogneisses, below) with minor paragneiss lenses and layers of the Napoqua unit (see Mesozoic to Paleozoic Layered Rocks, below)

HIGH-GRADE METAMORPHIC ROCKS

Tertiary Orthogneiss

- PA₁ War Creek leucocratic tonalitic to trondhjemitic orthogneiss (Paleocene to Cretaceous)

GEOLOGIC UNITS

HIGH-GRADE METAMORPHIC ROCKS (continued)

Tertiary to Mesozoic Orthogneisses

- Skagit Orthogneiss Complex (Tertiary-Cretaceous) (see Tertiary or Mesozoic Plutonic Complexes, above), divided into:
- PA₁ Lake Juanita trondhjemitic to leucogranodioritic orthogneiss (Paleocene)
 - TKO₁ Boulder Creek orthogneiss
 - TKO₂ Purple Creek orthogneiss
 - TKO₃ Stehkin orthogneiss
 - TKO₄ Rainbow Mountain orthogneiss
 - TKO₅ McGregg Mountain orthogneiss
 - PA₂ Mount Benzarino orthogneiss (Paleocene to Cretaceous)

Mesozoic Orthogneisses

- KO₁ Tonalitic orthogneiss of the Leroy Creek pluton (Cretaceous)
- KO₂ Sulphur Mountain pluton, hornblende-biotite granodiorite and granodioritic orthogneiss gneiss (Cretaceous)
- KO₃ Black Peak hornblende-biotite tonalite and tonalite orthogneiss (Cretaceous)
- KO₄ Black Peak batholith, hornblende-biotite tonalite and tonalitic orthogneiss, Reynolds Peak phase (Cretaceous)
- KO₅ Black Peak batholith, hornblende-biotite tonalite and tonalitic orthogneiss, mafic phase (Cretaceous)
- KO₆ Tenpeak and White Mountains plutons, hornblende-biotite metatonalite to metagabbro and tonalitic to quartz dioritic orthogneisses (Cretaceous) (see contact complexes)
- KO₇ Hornblende and/or biotite tonalitic flaser gneiss of the Tenpeak pluton
- KO₈ Eldorado pluton, monzonitic orthogneiss (Cretaceous)
- KO₉ Eldorado pluton, flaser gneiss (Cretaceous)
- KO₁₀ Bearcat Ridge pluton, monzonitic orthogneiss and flaser gneiss (Cretaceous)
- KO₁₁ Banded tonalitic to granodioritic orthogneiss of Bench Lake (Cretaceous)

Dumbell Mountain plutons (Triassic), Marblemount plutonic belt (sub-arc plutons to the Cascade River unit, below) of the Chelan Mountains terrane

- TKO₁ Hornblende tonalite orthogneiss
- TKO₂ Hornblende-quartz diorite and tonalite augen gneiss
- TKO₃ Hornblende-quartz diorite to tonalite orthogneiss
- TKO₄ Marblemount Meta-quartz Diorite to tonalite
- TKO₅ Magic Mountain orthogneiss

LAYERED HIGH-GRADE METAMORPHIC ROCKS

Mesozoic Layered Metamorphic Rocks

- Cascade River unit (volcanic arc) of the Chelan Mountains terrane, schists, gneisses and amphibolites (Triassic), locally mapped as:
- TKm₁ Cascade River Schist, undivided
 - TKm₂ Spider Mountain Schist, undivided
 - TKm₃ Schists, gneisses and amphibolites of the younger gneissic rocks of the Holden area, undivided (See Holden assemblage in text)
 - TKm₄ Hornblende schist and gneiss of the younger gneissic rocks of the Holden area (See Holden assemblage in text)
 - TKm₅ Biotite gneiss of the younger gneissic rocks of the Holden area (See Holden assemblage in text)
 - TKm₆ Chloritopyroxene-biotite-quartz schist of the younger gneissic rocks of the Holden area (See Holden assemblage in text)
 - TKm₇ Marble
 - TKm₈ Multiple marble bodies

Mesozoic to Paleozoic Layered Metamorphic Rocks

- Napoqua unit (oceanic assemblage) of the Chelan Mountains terrane, includes amphibolites, hornblende schists and gneisses, quartzite schists (metacherts), biotite schists, metapelites, metagabbro, ultramafic, and calcareous schists (Triassic to Permian), locally mapped as:
- TKm₁ Rainbow Lake Schist, undivided
 - TKm₂ Twisp Valley Schist, undivided
 - TKm₃ Hornblende schist and gneiss (amphibolite) and biotite-hornblende schist of the rocks of the Napoqua River area
 - TKm₄ Calcic-biotite-quartz schist and gneiss of the rocks of the Napoqua River area
 - TKm₅ Mica-quartz schist and micaceous quartzite of the rocks of the Napoqua River area
 - TKm₆ Marble
 - TKm₇ Multiple marble bodies
 - TKm₈ Ultramafite pods and lenses

Precambrian Layered Metamorphic Rocks

- pGm₁ Swakane Biotite Gneiss
- pGm₂ Hornblende schist and amphibolite

EXPLANATION

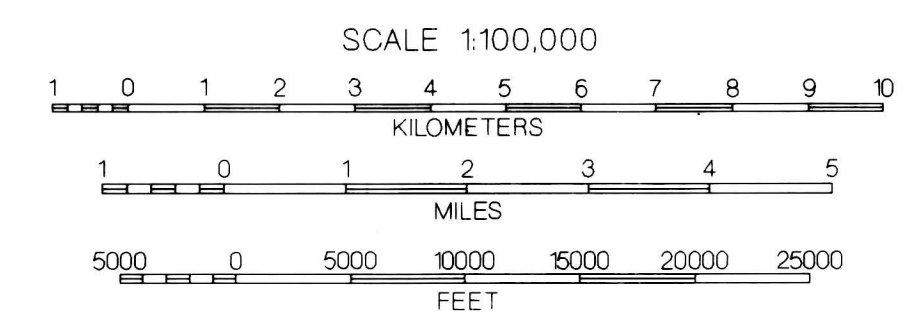
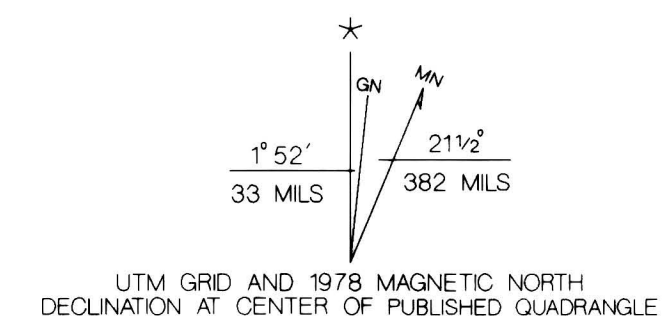
- Scratch boundary
- Contact (dotted where concealed)
- Same geologic unit
- High-angle faults (dotted where concealed)
- High-angle fault (dotted where concealed; u, upthrown block; d, downthrown block)
- Thrust fault (dotted where concealed; sawteeth on upper plate)
- Strike-slip fault (dotted where concealed; arrows indicate relative motion)
- Bearing and plunge of lineation (may be combined with other symbols)
 - Inclined
 - Horizontal
 - Strike and dip of bedding
 - Inclined
 - Overturned
 - Vertical
 - Strike and dip of foliation in igneous and metamorphic rocks
 - Inclined
 - Vertical
 - Strike and dip of secondary cleavage, trend of plunge of contemporaneous lineation
 - Fold axis (dotted where concealed)
 - Antiform
 - Synform
 - Small plunging fold in bedded rocks and foliation
 - Zone of low-temperature sheared rock
 - Landslide (arrow shows inferred direction of movement)
 - Fault intruded by dike or faulted dike
 - Brecciated country rock adjacent to Tertiary intrusive rocks, undivided

GEOLOGIC MAP OF THE WEST HALF OF THE TWISP 1:100,000 QUADRANGLE, WASHINGTON

Compiled by

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CONTOUR INTERVAL 50 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
PROJECTION AND 10,000-METER GRID, ZONE 10
UNIVERSAL TRANSVERSE MERCATOR
1927 NORTH AMERICAN DATUM
BASE MAP BY USGS
EDITED - 1978