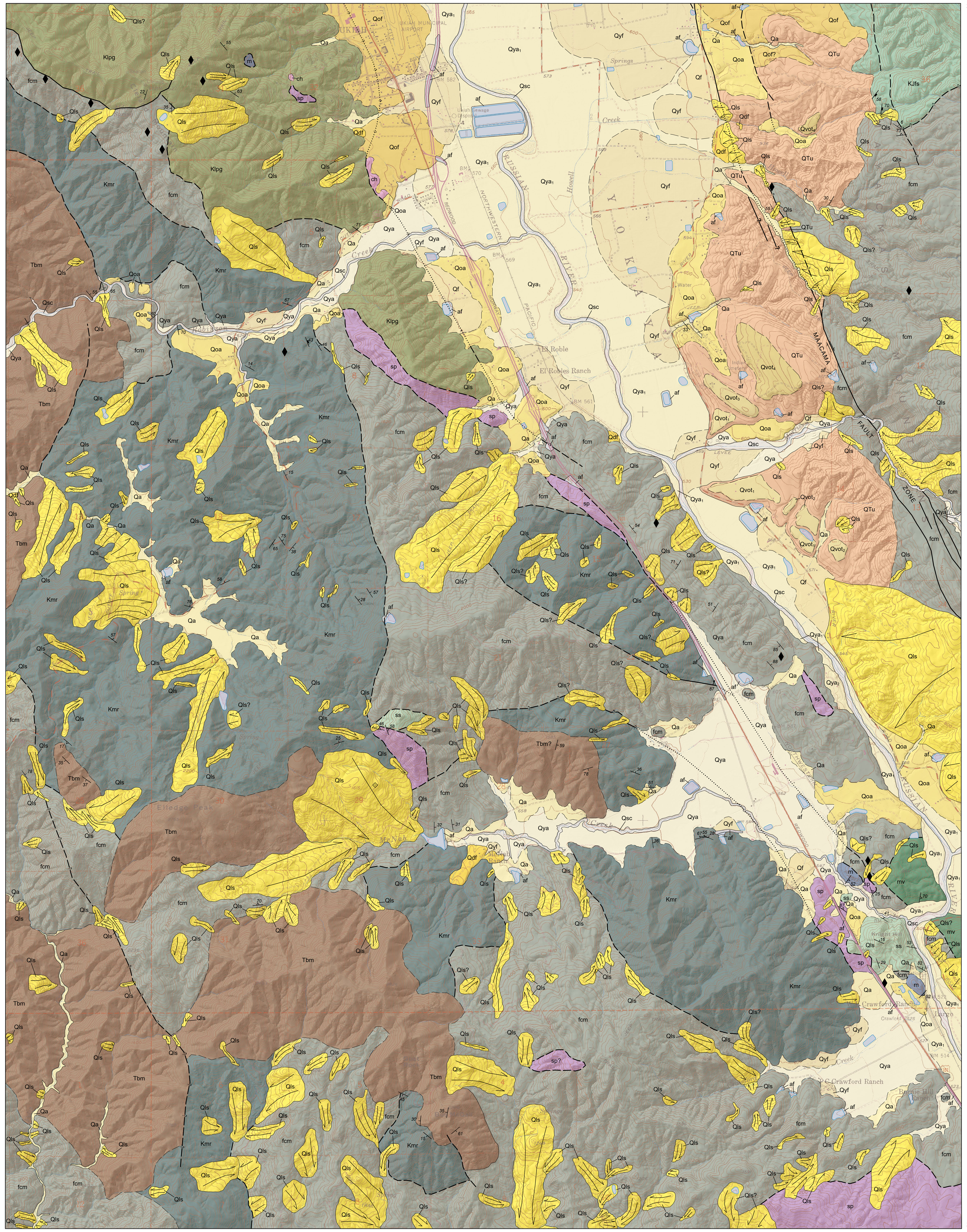

Coordinate System:
Universal Transverse Mercator, Zone 10N
North American Datum 1927

Topographic base from U.S. Geological Survey
Elledge Peak 7.5-minute Quadrangle, 1958, photo revised 1975.
Shaded relief image derived from USGS Lidar DEM, 2017

Scale 1:24,000

Contour Interval 40 Feet
Dotted Lines Represent 20-Foot Contours
Contour Interval on River Surface 5 Feet
National Geodetic Vertical Datum of 1929

13.62°
TRUE NORTH
MAGNETIC NORTH
Approximate Mean Declination, 2022

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, Statemap Award no. G21AC10701.

Professional License and Certification
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"Preliminary Geologic Map of the Elledge Peak 7.5′ Quadrangle, Mendocino County, California: California Geological Survey Preliminary Geologic Map 22-05, scale 1:24,000"

Preliminary Geologic Maps available from:
https://www.conservation.ca.gov/cgs/maps-data/rgm/preliminary

PRELIMINARY GEOLOGIC MAP OF THE ELLEDGE PEAK 7.5' QUADRANGLE MENDOCINO COUNTY, CALIFORNIA

VERSION 1.0

By
Ron S. Rubin

Digital preparation by
Ron S. Rubin and Deshawn A. Brown Jr.

2022

California Department of Conservation
California Geological Survey

DESCRIPTION OF MAP UNITS

QUATERNARY SURFICIAL DEPOSITS

af — **Artificial fill (historical)**—Consists of engineered and/or non-engineered soil materials; includes larger roadway embankments, earthen dams, and levees.

Qsc — **Modern stream channel deposits (modern to latest Holocene)**—Fluvial deposits within active, natural and constructed stream channels. Composed of loose sand, gravel, and silt. Episodes of bank-full stream flow are frequent enough to inhibit growth of vegetation.

Qya — **Young alluvial deposits (Holocene)**—Unconsolidated sand, gravel, silt and minor clay deposited in active or recently active flood plain, point bar and stream settings. Surfaces are relatively flat or gently sloping, minimally dissected except at stream-facing margins, and widely disturbed by agricultural or other human activities. Where present along the Russian River mainstem and larger tributaries, subunits (Qya_1, Qya_2) are distinguished based on topographic position above the active channel (Qsc).

Qya_1 — **Young alluvial deposits (Holocene)**—Relatively lowest subunit representing deposits on the modern flood plain between active channels (Qsc) and more elevated flood plain terrace or older deposits.

Qya_2 — **Young alluvial deposits (Holocene)**—Relatively older deposits underlying terrace level topographically above Qya_1.

Qyf — **Young alluvial fan deposits (Holocene)**—Unconsolidated, poorly sorted gravel, sand, and silt; deposited chiefly from distributary streamflow and debris flows emanating from drainages off mountain fronts and recently active channels incised through older fan deposits. Deposits display a characteristic fan-shaped morphology; surfaces show little dissection or soil profile development.

Qdf — **Debris fan deposits (Holocene)**—Unconsolidated, poorly sorted gravel, sand and silt forming relatively steep, fan-shaped deposits at the mouth of small drainages and along steep hillsides where it includes undifferentiated colluvium. Sediment is derived mainly from debris slides and debris flow events rather than fluvial processes. Limited dissection, soil development, or mature vegetation indicate relatively recent or on-going depositional processes.

Qa — **Alluvial deposits, undivided (Holocene to latest Pleistocene)**—Unconsolidated to weakly cemented sand, gravel, silt, and minor clay, mapped in small valleys and where variations in age and/or depositional settings of fan, stream terrace, and active channel not delineated at the scale of mapping.

Qf — **Alluvial fan deposits, undivided (Holocene to latest Pleistocene)**—Unconsolidated to weakly cemented, poorly sorted, gravel, sand, and silt; mapped where fan morphology suggests young or active depositions as well as local incision and soil development indicative of older deposits indistinguishable at map scale.

Qls — **Landslide deposits, undivided (Holocene to Pleistocene)**—Unconsolidated to moderately well-consolidated jumbled rock debris consisting of surficial failures resulting from soil and rock creep, and large-scale rotational rock slides. Recognizable by topographic expression or chaotic internal structure. Only larger landslides discernable at the map scale are included. Arrows indicate direction of movement; queried where landslide existence is questionable.

Qof — **Older alluvial fan deposits (early Holocene to late Pleistocene)**—Slightly- to moderately-consolidated, poorly sorted, gravel, sand, and silt deposited in alluvial fan settings; may also include undifferentiated colluvium from immediately adjacent hillsides. Moderately dissected to deeply incised at confluences with larger order truncating streams. Surfaces have brown to grayish-brown pedogenic soils that are hard when dry.

Qoa — **Older alluvial deposits (early Holocene to late Pleistocene)**—Slightly consolidated, weakly- to moderately-cemented gravelly sand, silt and clay deposited in stream and flood plain settings; locally also includes alluvial fan deposits where not mapped separately. Clasts range from rounded to angular locally. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation, preserved in terraces above recently active flood plains, typically about 40 to 50 feet above the active channel of the Russian River and major tributaries. Surfaces are dissected to varied degrees, with a moderately developed soil profile preserved locally of dark brown, organic rich silty A horizon, transitioning to grayish-brown, slightly clayey B horizon with incipient blocky to slightly prismatic soil structure that extends 2 to 3 feet below the surface. Dark yellowish-brown clay films on gravel. Deposits are yellowish-brown, brownish-yellow, and strong brown with depth.

Very old alluvial terrace deposits and surfaces (Pleistocene)—Eroded remnants of fluvial, alluvial fan, and colluvial deposits on isolated strath terrace surfaces cut into the Ukiah formation along the eastern margin of the valley. Deposits consist of deeply weathered, moderately- to well-cemented, poorly sorted silty to clayey sand and gravel; range from more than 30 feet thick to only a thin veneer where the weathering profile extends into the strath surface. Gravel content tends to increase towards the base, locally with a coarse, cobbly lag deposit on the strath terrace. Deposits are generally poorly sorted, variably rounded Franciscan Complex-derived gravels in a clast-supported framework suggestive of short-traveled material eroded from the adjacent highlands. The deposits are divided into subunits of inferred increasing age (1-youngest to 4-oldest) distinguished based on increasing topographic position above adjacent active flood plains, depth of weathering, and soil profile development. Progressive aging of the soil profile is marked by a diminishing to absent organic (A) horizon, development of the argillic (B) horizon with increasing pedogenic clay content, structure, and weathering rinds on clasts, and depth and degree of oxidation reddening (dry classified from Munsell soil color chart).

$Qvot_1$ — **Very old alluvial terrace deposits, unit 1 (Pleistocene)**—Thin organic horizon over grayish-brown weathered silty sand with scattered gravels. Relatively youngest subunit representing deposits on the lowest strath terrace.

$Qvot_2$ — **Very old alluvial terrace deposits, unit 2 (Pleistocene)**—Little to no organic horizon; weakly developed argillic horizon, weathered, brown (7.5YR 5/4) with a medium granular to slightly blocky structure extended 2 to 3 feet below the surface.

$Qvot_3$ — **Very old alluvial terrace deposits, unit 3 (Pleistocene)**—Weathered, reddish- brown (2.5 YR 5/4), transitioning to yellowish-red (5YR 5/6) with moderately developed blocky structure and thin clay films on clasts.

$Qvot_4$ — **Very old alluvial terrace deposits, unit 4 (Pleistocene)**—Weathered, red (10R 4/6) to depth of approximately 2 to 3 feet with fine- to medium-grained sand, subangular blocky structure; grades downward to weak-red (10R 5/4).

EARLY QUATERNARY—LATE NEOGENE CONTINENTAL BASIN DEPOSITS

QTu — **Ukiah formation (early Pleistocene(?) to Pliocene)**—Pebble- to cobble-conglomerate, with interbedded silty sandstone, and clayey siltstone. Deposits are well consolidated, generally moderately indurated, with occasional well cemented sections and scattered calcareous concretions up to approximately 2 feet in maximum dimension. The conglomerate typically appears clast-supported and massive or crudely stratified; cross stratification with coarse channel lag deposits and clast imbrication displayed locally. Clasts are mostly sub-rounded to well-rounded; locally includes scattered boulders to several feet in maximum dimension. Material appears entirely derived from the Franciscan Complex, dominated by sandstone, with lesser metavolcanic rock, chert, and vein quartz. Bedding is moderately tilted near the Maacama Fault. Most exposures are oxidized to pale yellowish-brown with reddish-yellow to orange staining and light-gray mottling locally. Deeper, unoxidized portions described from boreholes and exposed locally are a distinctive blue-gray, with sharp color boundaries cutting across bedding. Based on borehole data, these older valley fill deposits have an estimated maximum thickness of roughly 2,000 feet near the axis of the valley (Farrar, 1986). No dates are available from the Ukiah formation; age is inferred based on dating of basin fill deposits elsewhere in the region, relative uplift of strath terraces cut into the unit, and the degree of deformation along the Maacama Fault. Other informal names previously applied to this unit include the Ukiah Beds (Army Corps of Engineers, 1955), Continental deposits (Cardwell, 1965), and Calpella gravels (Orchard, 1979).

LATE CRETACEOUS—EARLY PALEOGENE MARINE DEPOSITS

Tbm — **Buss McGall Sandstone (Paleocene and Cretaceous (?))**—Yellowish-gray, variable induration, fine- to coarse-grained, angular to rounded, massive to well-bedded arkosic sandstone. Includes green and black lithic grains, and detrital biotite. Unit lacks metamorphic minerals. Exposed in distinctive, large cliff-forming outcrops near ridge-tops. Detrital zircons sampled from the unit near Elledge Peak indicate an early Paleocene maximum depositional age of 64 Ma (Sharman and others, 2019). The detrital zircon profile appears to be distinctive in contrast with samples from the Coastal Belt of the Franciscan Complex (R.J. McLaughlin, written commun., 2021).

MAP SYMBOLS

Contact between map units—Solid where accurately located; long dash were approximately located.

Fault—Solid where accurately located; long dash were approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain. Arrow and number indicate direction and angle of dip of fault plane. Relative horizontal movement shown by arrows parallel to fault

Thrust Fault—Barbs on lower plate; solid where accurately located; long dash where approximately located; dotted where concealed; queried where identify or existence is uncertain. Arrow and number indicate direction and angle of dip of fault plane.

Landslide—Arrows indicate principal direction of movement

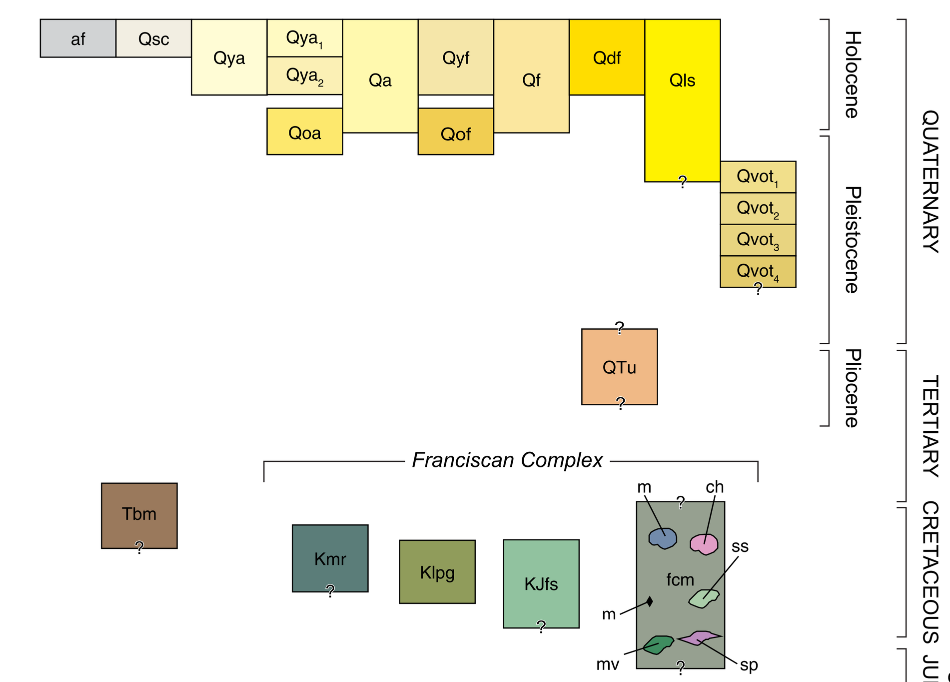
Fossil point

Mélange block—See description of Map Unit "m" for details

Strike and dip of geologic structure; number indicates dip angle in degrees.

- 25 Bedding
- 65 Overturned bedding
- Primary foliationn
- 80 Inclined joint

CORRELATION OF MAP UNITS



FRANCISCAN COMPLEX – CENTRAL BELT

fcm — **Central Belt mélange, undivided (Paleogene (?), Cretaceous and Jurassic (?))**—Pervasively sheared dark-gray to black scaly argillite, and sandstone (graywacke), which form a matrix enclosing small pods, blocks, and large slabs of more intact rock of various lithologies. The Central Belt matrix sandstone is gray- to olive-gray, yellowish-brown where oxidized, well-indurated, poorly-sorted, and arkosic; commonly consisting of approximately equal proportions of quartz, feldspar, and lithic fragments, with 5 to 20 percent of the rock being matrix (Hecht, 1970; Stanford, 1991). Coarse shale chips and detrital biotite are common lithic components in hand sample. The sandstone lacks potassium feldspar and displays textures and metamorphic mineral assemblages consistent with Central Belt mélange elsewhere (Stanford, 1991). Sandstone appears weakly recrystallized and commonly includes veins. Due to pervasive deformation and limited exposure, bedding is variable over short distances and is not traceable across a mappable area. On the west side of the quadrangle, the Central Belt includes the Robinson Creek mélange of Orchard (1979) and other mappable bodies (Klpg and Kmr) that appear enclosed by Central Belt mélange matrix regionally. The mélange underlies rolling, characteristically hummocky topography, particularly where isolated blocks within shale matrix are the dominant structure. Extensive landslides are mapped within the mélange, and the unit includes many landslide-like features not mappable as individual landslides. Mélanges are interpreted as originating from tectonic and/or depositional mixing processes. Contacts are generally interpreted as faulted, but many are of uncertain origin based on limited available exposures. In the Redwood Valley Quadrangle, chert blocks within the mélange range from Jurassic though Cretaceous in age (Stanford, 1991); however, dates from mélange matrix collected elsewhere in the region suggest tectonic and/or depositional assemblage of the mélange may have extended into the Paleogene (McLaughlin and others, 2018). Portions of undifferentiated mélange in this study may include additional distinctive mappable blocks and slabs, but wide areas were largely inaccessible in the field. Units mapped separately within the mélange include:

ss — **Sandstone**—Isolated blocks of gray to greenish-gray, poorly- to moderately-sorted, fine- to medium-grained sandstone. Mapped where unit is large enough to meet minimum map unit size, and where assignment to another map unit is uncertain.

ch — **Chert and metachert**—Red, green, and white chert, variably recrystallized. Occurs mostly in rhythmically bedded packets with dark-gray shale partings and contorted bedding; locally massive or as brecciated fragments in a silicic matrix; also present as isolated mélange blocks too small to distinguish at map scale. Chert samples from various units outside the quadrangle in Redwood Valley yielded radiolarians ranging from Toarcian (Lower Jurassic) to Albian (Lower Cretaceous) (Stanford, 1991).

mv — **Metavolcanic rock (greenstone)**—Light to dark greenish-gray, dark-brown weathering, aphanitic, variably weathered and altered mafic volcanic rock; predominately massive, broken, and locally sheared. Also present as isolated mélange blocks too small to distinguish at map scale. Weathers to a soil with distinctive red and brown colors.

m — **High-grade metamorphic rock**—Phyllitic to gneissose texture, largely blueschist grade although other highly metamorphosed Franciscan rock types are included; mapped where unit is large enough to meet minimum map unit size and indicated with black diamond symbols for mélange blocks smaller than minimum map unit size.

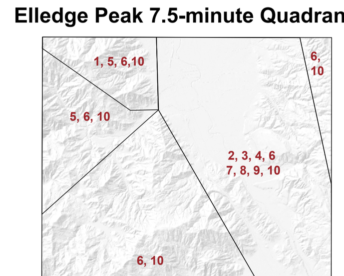
sp — **Serpentinite**—Pale-green to dark greenish-gray, highly sheared serpentinized ultramafic rocks. Weathers to regolith and soil with distinctive blue-green or reddish colors. Vegetation on serpentinite is chiefly sparse shrubs. Occurs as mappable units and isolated blocks within the mélange, also along faults. Locally may enclose blocks of other fcm lithologies. Queried where identity is questionable.

Kmr — **McNab Ranch Turbidites (Cretaceous)**— Light olive-gray to medium dark gray. Locally displays distinctive light brown oxidation and weathering. Fine to coarse grained, well-indurated, moderately-sorted sandstone. It is generally arkosic with distinctive potassium feldspar, and variable amounts of lithics, which include shale chips, volcanic and metamorphic detritus, and detrital biotite. Clear grain boundaries in this section. Contains little matrix, but includes some carbonate and quartz (?) veins, and grain replacement. Commonly well-bedded with shale in beds up to 3 inches thick, but includes massive sandstone sections, as well as conglomerate along Hwy 253 south of Robinson Creek. Includes metamorphic laumontite and possible pumpellyite. Locally broken with incoherent bedding such as on Hwy 253 near west edge of quad, also includes sections of mélange. Contains a Campanian (?) Inoceramus fossil (R.J. McLaughlin, unpub. data, 2021). Possibly correlated with Novato Quarry terrane (e.g. Blake and others, 1984; Blake and others, 2000) mapped to the south based on lithology, the Inoceramus, and the presence of potassium feldspar (R.J. McLaughlin, written commun., 2020). Portions of this unit occur in areas previously mapped as Robinson Creek mélange of Orchard (1979).

Klpg — **Lookout Peak graywacke of Orchard (1979) (Cretaceous)**—Olive-gray to grayish-olive, brown weathering, well-indurated, fine- to medium-grained sandstone. Lithic components include coarse shale chips, detrital biotite, and woody carbonaceous fragments. The unit is predominantly massive and structurally broken, but includes laterally persistent, well-bedded sections with minor interbeds of fissile black shale up to a foot thick. In thin section the sandstone is poorly-sorted with angular grains. It ranges from an immature chloritic, lithic (volcanic) to feldspathic arenite (Orchard, 1979); displays a weakly developed phyllitic metamorphic fabric with metamorphic white mica; notably lacks potassium feldspar, and includes pumpellyite, indicating metamorphism to the prehnite-pumpellyite facies consistent with other Central Belt sandstones. Detrital zircons from the unit sampled near Low Gap Road indicate a mid-Cretaceous maximum depositional age range of 107 to 85 Ma (Dumitru and others, 2015).

KJfs — **Unnamed Franciscan sandstone (Cretaceous and/or Jurassic(?))**—Medium dark gray to light olive-gray, brown-weathering, well-indurated, fine- to medium-grained sandstone. In hand-sample the sandstone appears dominantly arkosic, with variable proportions of dark lithic grains including angular shale chips and detrital biotite. Predominantly massive and structurally broken; also includes sparse, interbedded dark gray to black argillite, and rare pebble conglomerate. Weakly reconstituted, consistent with metamorphic Textural Zone 1 of Blake and others (1967). Similar in appearance to Klpg; may be equivalent in part, although mapped on opposite sides of the Maacama Fault. No age dates are available for the unit; based on similarities in lithology and metamorphic grade with Klpg and other dated sandstone bodies in the Franciscan Central belt, a Cretaceous age is likely.

Elledge Peak 7.5-minute Quadrangle



SOURCES OF MAP DATA
1. Sydnor and Sowma-Bawcom, 1991
2. Smith, 1981a
3. Upp, 1989
4. Smith, 1981b
5. Orchard, 1979
6. Durham, 1979*
7. Cardwell, 1965
8. Farrar, 1986
9. Larsen and Kelsey, 2005
10. Rubin, 2022*

*Data source covers entire quadrangle.

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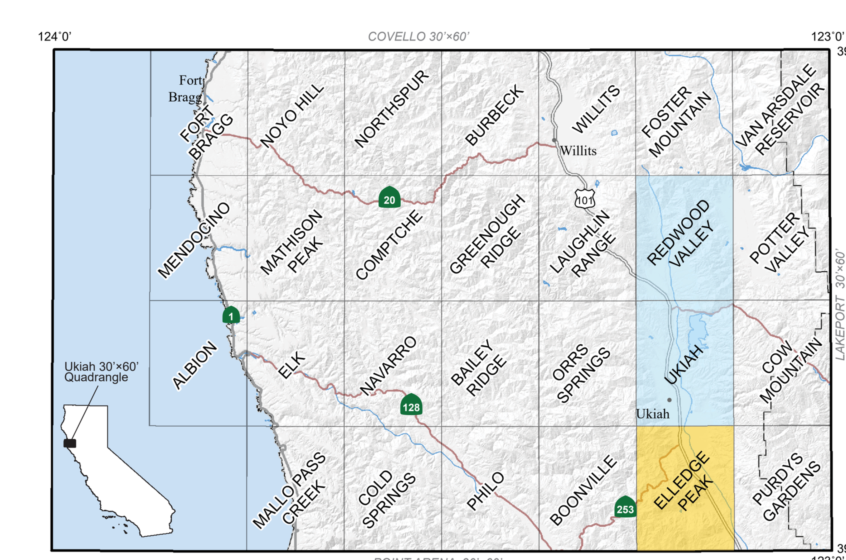

STATEMAP geologic mapping projects within the Ukiah 30'x60' Quadrangle
This project
Previously completed projects

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Preliminary Geologic Map 22-05

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Date: July 20, 2022

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