Preliminary Geologic Map of the Colfax 7.5’ Quadrangle, Placer and Nevada Counties, California

Preliminary Geologic Map 26-02

Scale 1:24,000

By
Peter J. Holland, Chris Henningfeld, Matt D. O’Neal, and Jeremy L. Altringer

2026

California
Department of Conservation
California Geological Survey

This map was funded in part by the
USGS National Cooperative Geologic Mapping Program
under Statemap award number G24AC00329, 2024

Suggested citation:
Holland, P.J., Henningfeld, C., O'Neal, M.D., and Altringer, J.L., 2026, Preliminary geologic map of the Colfax 7.5′ Quadrangle, Placer and Nevada Counties, California: California Geological Survey Preliminary Geologic Map 26-02, scale 1:24,000.



STATE OF CALIFORNIA
GAVIN NEWSOM, GOVERNOR

NATURAL RESOURCES AGENCY
WADE CROWFOOT, SECRETARY

DEPARTMENT OF CONSERVATION
JENNIFER LUCCHESI, DIRECTOR

CALIFORNIA GEOLOGICAL SURVEY
JEREMY LANCASTER, STATE GEOLOGIST

Copyright © 2026 by the California Geological Survey and Department of Conservation. All rights reserved. No part of this publication may be reproduced without written consent of the copyright owners. The California Geological Survey and the Department of Conservation make no warranties as to the suitability of this product for any given purpose.

Publications are available for free download from the California Geological Survey website (https://www.conservation.ca.gov/cgs).

Web Accessibility Statement - If you find any part of this document to be inaccessible with assistive technology, visit our Accessibility web page at conservation.ca.gov to report the issue and request alternative means of access. To help us respond to your concern, please include the following three items in your request: 1. your contact information. 2. the title of this document. 3. the web address where you obtained the document.

CONTENTS

Introduction 1
Data Sources 2
Regional Geology 3
Fault Zones 4
- “Applegate” Fault Zone 5
- Weimar Fault Zone 5
- Colfax Fault 5
- Gillis Hill Fault 5
- Big Bend Fault 6

Economic Geology 6
- Lode Gold 6
- Placer Gold 6
- Carbonates 7
- Clay 7

Geologic Sites of Interest 7
- Colfax Lime Kiln and Pritchard Quarry 7

Acknowledgements 8
Description of Map Units 9
- Quaternary Surficial Units 9
- Tertiary Units 10
- Mesozoic to Paleozoic Metamorphic and Plutonic Units 10
  - Units Between the “Applegate” and Gillis Hill Faults 11
  - Units West of the Weimar Fault Zone and Colfax Fault 13
  - Units East of the Gillis Hill Fault 15
  - Intrusive and Ultramafic Units 16

References 18
- Imagery and Lidar 20

Appendix A: Authorship Documentation and Product Limitations 21
Appendix B: Ternary Classification Plots for Plutonic and Volcanic Rocks 22

FIGURES

Figure 1. Photo of the North Fork American River canyon at Mineral Bar, looking south 1
Figure 2. Data sources index map for the Colfax 7.5’ Quadrangle 2
Figure 3. Total Alkali and Silica (TAS) plot for six samples of volcanic and meta-volcanic rocks 3
Figure 4. Photo of the Colfax Lime Kiln ruins adjacent to the Pritchard Quarry in 2023 8
Figure 5. Photo of rugose coral in limestone exposed at Pritchard Quarry 8
Figure 6. Photo of Colfax Formation conglomerate exposed along Yankee Jim Road 12
Figure 7. Photo of pillow structures preserved in the volcanic member of the phyllite and greenschist belt 16

TABLE

Table 1. Summary of samples analyzed for geochemical content 3

PLATE

Preliminary geologic map of the Colfax 7.5’ Quadrangle, Placer and Nevada Counties, California……..... SEE PDF

Preliminary Geologic Map of the Colfax 7.5' Quadrangle, Placer and Nevada Counties, California

By Peter J. Holland, Chris Henningfeld, Matt D. O'Neal, and Jeremy L. Altringer

INTRODUCTION

The Colfax Quadrangle covers approximately 147 km^2 (57 square miles) of Placer and Nevada Counties, California (see Location Map on Map Sheet). Several significant geographic and anthropogenic features cross the quadrangle along a north to northeast orientation. These features include the North Fork of the American River (Figure 1), Bear River, Interstate 80, and the Union Pacific Railroad. The town of Colfax is in the northwestern part of the quadrangle while the town of Applegate in located in the southwest. Most of the population is situated along the I-80 corridor with areas east of the American River being sparsely populated. Physiographically, the quadrangle is split between areas characterized as rolling hills and areas within rugged, steep-sided canyons reaching a depth of over 450 m (1,500 ft) along the American River.



Figure 1. Photo of the North Fork American River canyon at Mineral Bar, looking south. The steep and deeply incised canyon cuts through the Colfax Quadrangle and is the location for many of the landslides in the map area. Photo by Rebecca Marvail.

Geologic hazards in the area range from landslides in some of the weaker rock units and steeper slopes, to naturally occurring asbestos in ultramafic rocks and potential sources of radon gas in some of the bedrock units (Marquis, 2024). This geologic map is intended to illustrate the distribution of the rocks and surficial deposits of the area and their structural and stratigraphic relations to one another. It provides a regional geologic framework as an aid to better evaluate the potential for geologic resources and hazards. This new mapping also helps better define the geologic history of the northern Sierra Nevada.

DATA SOURCES

The two primary source maps that we used in the preparation of this map are Chandra (1961) and Tuminas (1983). Figure 2 shows which areas we used different sources for our map. We don't show the sources that cover the entire map (e.g. Chandra, 1961, Livingston, 1975, USGS Lidar (2024)). It is clear from the distribution of structure measurements on Chandra's (1961) map that he thoroughly covered the quadrangle. His fieldwork began in the early 1950s and was done prior to the understanding of plate tectonics and also before some of the large earthworks projects in the quadrangle (e.g. the construction of Interstate 80 that created new exposures and access). His mapping shows subunits that are extrapolated out along strike for significant distances from noted observation points. The Tuminas (1983) map was part of a regional Ph.D. thesis focused on the Grass Valley-Colfax area and includes most of the Colfax Quadrangle (except for a portion in the east and southeast). Tuminas did not map many of Chandra's thin elongated subunits and remapped others as oval-shaped blocks in some areas.

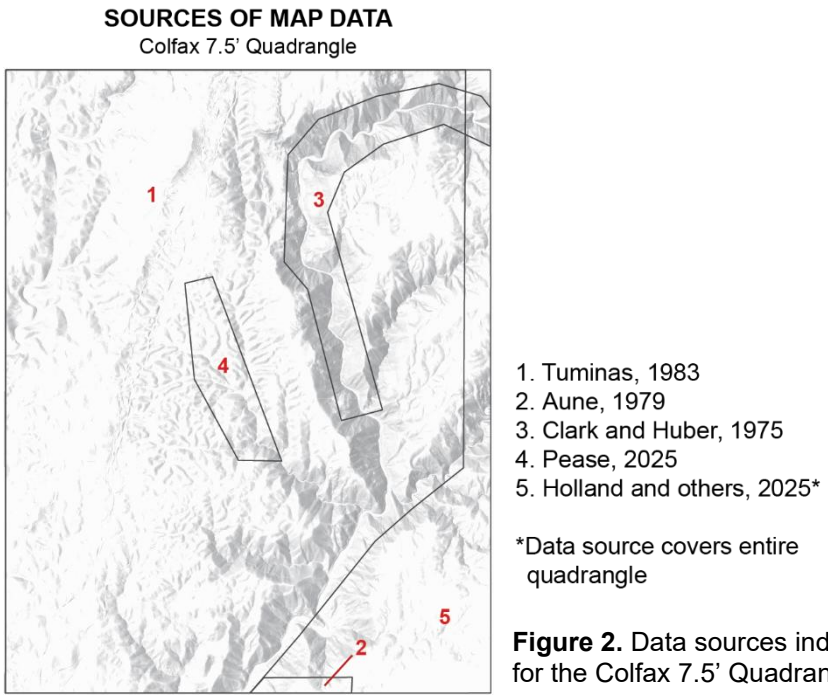


Figure 2. Data sources index map for the Colfax 7.5' Quadrangle.

Our geologic mapping also utilized a combination of local secondary published and unpublished mapping sources within and adjacent to the quadrangle. These sources included regional geologic studies, field observations, and the use of satellite and lidar imagery. Other source maps of less importance include Lindgren (1900) and Clark and Huber (1975). In addition, we used unpublished maps by Napper and Converse (1986) and Pease (2025) for small portions of the map area. Unpublished mapping by Aune (1979) in the Greenwood Quadrangle adjacent to the south and thesis map by Edward (1978) adjacent to the west were helpful. Regional studies such as Day and others (1985), Saucedo and Wagner (1992), Graymer and Jones (1994) and Schweickert (2015) helped with some tectonic framework and regional correlations. Within the last 10 years Caltrans widened Interstate 80 just to the north of the Colfax Quadrangle creating spectacular road cuts in units that continue south into the Colfax Quadrangle, and we used these exposures to help in our descriptions and interpretations. Recent and ongoing studies of this area helped with our mapping and shows the continuing interest and significance of these rocks (e.g.

Rack, 2024 and Surpless (written commun., 2025)). Neither Chandra nor Tuminas conducted extensive mapping of Quaternary deposits, but Livingston (1975) mapped a limited number of large landslides in the American River Canyon. We used satellite and lidar imagery in combination with field observations to map the landslide and other Quaternary deposits in the quadrangle. Additional aspects of the mapping included preparation and review of nine thin sections, geochemical analyses of six volcanic and meta-volcanic rock samples (Table 1 and Figure 3), and U-Pb dating of detrital zircons to assess the maximum depositional age of one sample obtained within the conglomerate member of the Colfax Formation.

Table 1. Summary of samples analyzed for geochemical content.

Sample No.	Field Sample	Latitude	Longitude	Geologic Unit	TAS Classification
1	041625x1	39.0623	-120.957	Jdb - diabase (cutting Colfax Formation)	Basaltic trachyandesite
2	012925x2	39.007	-120.921	Jlr - Logtown Ridge Formation	Picro-basalt
3	012225x1	39.1017	-120.987	Jcg - dike cutting Clipper Gap limestone block	Basaltic trachyandesite
4	020525x2	39.112	-120.991	Jlvl - Lake Combie lower volcanic	Basalt
5	042325x1	39.0945	-120.971	JTrld - Lake Combie diabase dikes	Basalt
6	012925x3	39.0363	-120.905	Jpgv - phyllite and greenschist belt	Basaltic andesite
Note: Samples 1, 4 and 6 are classified as volcanic rocks although they appear to be hypabyssal in origin.					

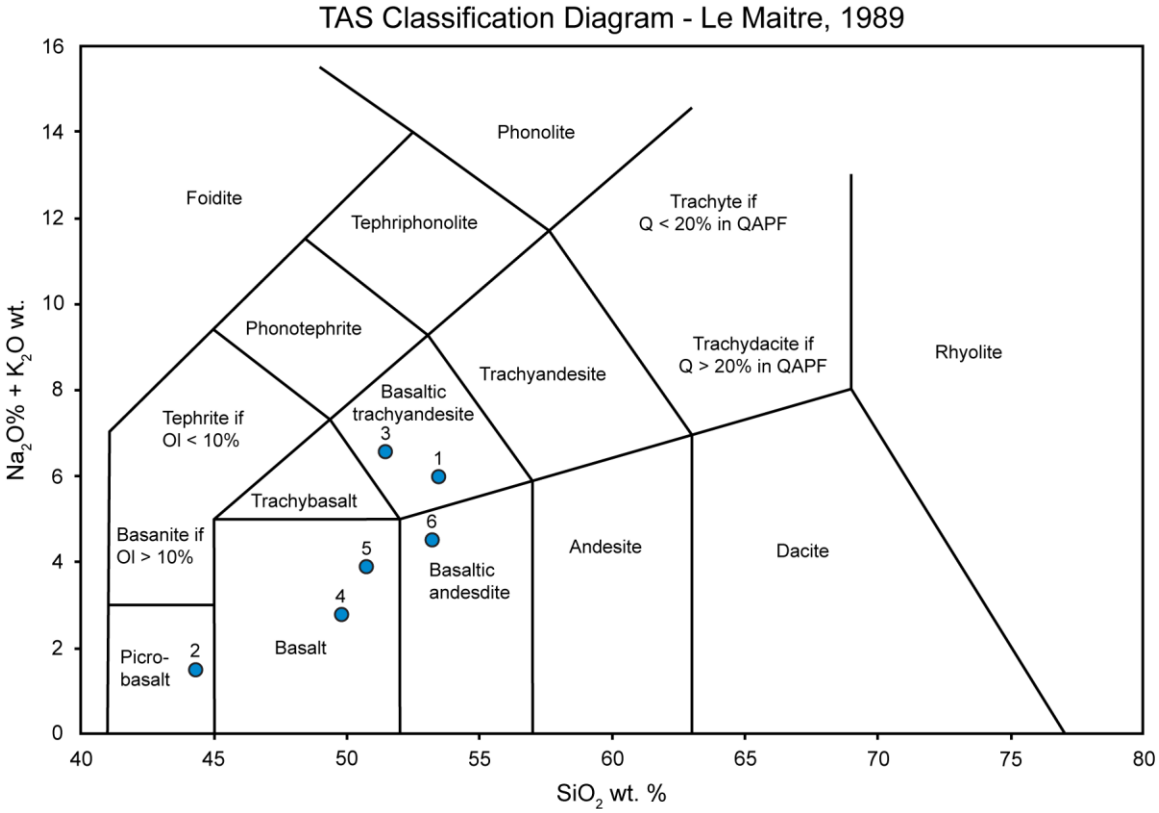


Figure 3. Total Alakli and Silica (TAS) plot for six samples of volcanic and meta-volcanic rocks in the Colfax Quadrangle classified based on normalized geochemical data and classification system of Le Maitre (1989).

REGIONAL GEOLOGY

The bedrock units exposed in the Colfax Quadrangle are part of a long, north-south-oriented belt of Triassic to Jurassic meta-igneous and meta-sedimentary rocks that are part of the Sierra Nevada foothills metamorphic belt. These rocks were initially formed within volcanic island arcs developed on ophiolitic oceanic crust that were subsequently accreted to the North American plate during the Late Jurassic (e.g., Schweickert, 2015). During accretion, the rocks were regionally metamorphosed to greenschist facies and have a dominant vertical to east-dipping foliation that is more pronounced in the meta-sedimentary units compared to the meta-igneous rocks. After the Late Jurassic accretion, a relatively stable convergent margin was established with east-dipping subduction, which resulted in continental arc magmatism that emplaced the Sierra Nevada batholith during Cretaceous time.

The transition to flat slab subduction in the Late Cretaceous shifted arc magmatism east of the Sierra Nevada and initiated a period of rapid exhumation and erosional stripping. By Eocene time the upper ~3-10 km of Mesozoic crust had been uplifted and eroded, forming a series of deep valleys cut across the range draining from east to west. Eocene to early Oligocene fluvial sediments were deposited in these paleovalleys with headwaters in central Nevada (Henry, 2008; Henry and others, 2012) and are preserved throughout the northern Sierra Nevada foothills, including a small locality within the quadrangle by Shady Glen. These sediments are referred to informally as the "auriferous gravels" (designated as "Tertiary gravels" on this map) based on the presence of significant placer gold, which was historically mined by hydraulic and drift methods.

In the Oligocene, steepening and retreat of the subducting tectonic plate ("slab rollback") produced a south-southwestward migrating wave of volcanism, which is part of a broader pulse of volcanism referred to as the "ignimbrite flareup" (Best and others, 2013; Henry and John, 2013). This period of volcanism generated voluminous rhyolitic ash-flows from a volcanic field in Nevada, which flowed down the paleovalleys and emplaced within the Sierra Nevada in what is mapped as the Valley Springs Formation. During the Miocene, the subducting slab rolled back to a stable subduction angle and established the ancestral Cascade arc along and east of the crest of the northern Sierra Nevada. This arc erupted predominantly intermediate composition (andesitic) lavas and pyroclastic deposits represented on the map as the Mehrten Formation. These deposits covered much of the quadrangle and surrounding foothills during the late Miocene and early Pliocene. Most of these volcanic rocks have since been eroded, with only isolated remnants preserved on the topographically highest hills in the quadrangle (e.g., Colfax Hill).

Continued uplift and erosion since the Pliocene has resulted in 350 m (1,500 ft) of incision in the quadrangle along the North Fork of the American River. This has generated steep canyon walls and local slope instability resulting in the occurrence of both deep-seated landslides and rock fall deposits. During the late Pleistocene, outwash associated with glacial intervals produced slugs of cobble and gravel debris that migrated down the American River, portions of which are now preserved as terrace deposits perched above the current river.

FAULT ZONES

The major faults crossing the Colfax 7.5' Quadrangle are strands of the Foothills fault system defined by Clark (1964). These structures largely represent boundaries of tectonic terranes and/or significant displacement within the terranes accreted to western North America in the Jurassic. Tuminas (1983) studied the faults in the Colfax area and classified the mapped faults into four different phases of

movement (designated as F1 through F4 from oldest to youngest) based on differing characteristics and cross-cutting relationships:

F1 – East-directed Jurassic thrust faulting placing the Lake Combie complex over the Clipper Gap and Colfax Formations.
F2 – North-northwest-trending, east-side-up reverse faults that cut the older thrust faulting.
F3 – Northeast-trending cross-faults that cut the reverse faults, which commonly exhibiting right-lateral separation.
F4 – North-northwest trending reverse faults that cut all other faults.

The F4 reverse faults may have been later reactivated as normal faults during the late Cenozoic. Reactivation of a strand of the Foothills fault system, likely induced by rapid reservoir filling and pore elastic stress affecting the fault, caused the 1975 Oroville earthquake (Hart and Rapp, 1975), which led to reexamination of many strands of the fault system for potential Quaternary activity. Major fault zones are described below from west to east.

"Applegate" Fault Zone

The north-northwest-trending, steeply east-dipping "Applegate" fault occurs along the west side of the quadrangle and typically juxtaposes Lake Combie complex rocks (JTrlc) to the west against Clipper Gap Formation (Jcg) and Colfax Formation (Jc) rocks to the east. This fault was mapped by Tuminas (1983) as the western part of the Weimar fault zone, but Aune (1979) named this the "Applegate" fault where the structure continues to the south in the adjacent Greenwood Quadrangle. The fault zone occurs as a zone 0.5 to 1.5 km (0.3 to 1 mile) wide that is classified as F2 faults by Tuminas (1983), which are truncated and segmented by northeast-trending F3 fault traces.

Weimar Fault Zone

The north-northwest-trending, steeply east-dipping Weimar fault zone was originally named by Chandra (1961) and forms a wide zone of deformation across the western portion of the quadrangle. Tuminas (1983) mapped the fault as a zone of deformation between 100 and 4,000 m (350 ft to 2.5 miles) wide that contains numerous discontinuous serpentinite bodies (sp). In the northern portion of the quadrangle where the fault occurs along the Bear River, there are two separate gouge zones of sheared and highly disrupted rocks approximately 200 m (700 ft) wide. Tuminas (1983) indicates that the Weimar fault zone (not including the "Applegate" fault which we map separately) is an F-4 fault.

Colfax Fault

The north-northeast-trending Colfax fault was originally mapped and named by Chandra (1961). Tuminas (1983) also maps this fault but does not name it and does not classify it or discuss it in his thesis. Chandra (1961) shows the Colfax fault as a steeply east-dipping reverse fault (F-2 fault?) juxtaposing the structurally lower Clipper Gap and Colfax Formation rocks on the east side against the structurally higher Lake Combie rocks on the west side.

Gillis Hill Fault

The north-northwest-trending Gillis Hill fault was named by Chandra (1961) and is mapped continuously across the central portion of the quadrangle. In general, the fault separates phyllite and

greenschist belt rocks (Jpg) to the east from Colfax Formation and Logtown Ridge Formation (Jlr) rocks to the west. Tuminas (1983) maps the Gillis Hill fault as a sharp structural break that typically occurs as one fault surface. Our new mapping is generally consistent with this interpretation, but we did identify secondary fault strands along the Gillis Hill fault based on lidar imagery.

The Gillis Hill fault dips steeply to the east (65° to 85°) and does not appear to have a significant gouge zone, although landslides were found to occur along the trace of the fault suggesting an associated zone of weak rock. Chandra (1961) and Tuminas (1983) indicate the sense of movement is reverse with the east side up and estimate 4 km (2.5 miles) of offset. Tuminas (1983) estimates the Gillis Hill fault was active primarily between 145 and 150 Ma based on cross cutting relationships. In the North Bloomfield Quadrangle approximately 15 km (9 miles) to the north there is evidence the Gillis Hill fault has been reactivated in the late Cenozoic and has displaced the Miocene – Pliocene Mehrten Formation (O’Neal, 2023; Holland and others, 2024).

Big Bend Fault

The north-northeast-trending Big Bend fault lies in the southeastern corner of the quadrangle and displaces Colfax Formation against Logtown Ridge Formation. Chandra (1961) originally named and mapped the fault, describing it as dipping steeply (70 degrees) to the east. Our observations along the North Fork of the American River at Big Bend and in poor exposures along Ponderosa Way appear to confirm this. The Big Bend fault is outside of the Tuminas (1983) field area and therefore was not included in his fault classification. Its orientation suggests it could be either an F-2 or F-4 fault, depending on whether the Big Bend fault merges with the Gillis Hill fault or is truncated by it. This relationship is unclear.

ECONOMIC GEOLOGY

The Colfax Quadrangle did not experience as much mining and mineral extraction as many other areas within the Sierra Nevada foothills. Nevertheless, the quadrangle hosts several different types of economic mineral deposits, which are summarized below. For additional information please see Chandra (1961) and Loyd (1995).

Lode Gold

The Colfax District is the principal gold district in the quadrangle (Loyd, 1995). Lode gold mining started in about 1866 at the Rising Sun Mine in the area where Colfax Elementary School and Colfax High School are now located. The Rising Sun Mine is located in the Rollins Dam gabbro and produced between 80,000 and 100,000 troy ounces of gold. The gold is associated with quartz veins between 0.3 and 1.5 m thick and was mined to a depth of about 750 ft (228 m) (Loyd, 1995).

Less productive quartz lode gold mines are located in the southern portion of the quadrangle in the Colfax and Clipper Gap Formations (Loyd, 1995).

Placer Gold

There is abundant evidence of past placer mining preserved in the quadrangle along the American River where modern stream deposits and terrace deposits perched above the river were worked, leaving many piles of cobble and boulder tailings. There was also limited hydraulic mining in the areas where Tertiary gravels are mapped adjacent to Colfax Hill and along the Foresthill Divide. Areas where the

ground surface was significantly disturbed by past mining activities are shown on the map with a stippled pattern.

Carbonates

Surface mining of a limestone block for building stone and lime has occurred at the Pritchard Quarry along the Bear River (Nappers and Converse, 1986). This is a Carboniferous limestone unit (ls) within the Clipper Gap Formation that is interpreted to be an olistolith. It has well preserved invertebrate marine fossils and has also been intruded by diabase.

Clay

Commercial quality clay material has been reported from highly weathered Colfax Formation slates (Taylor, 1985) about 1 km southeast of the town of Colfax. This is an upland area close to the paleosurface where Cenozoic units were deposited on the slates, which presumably were subjected to intense weathering that produced the clay content.

GEOLOGIC SITES OF INTEREST

Colfax Lime Kiln and Pritchard Quarry

The fossiliferous limestone block mapped within the Clipper Gap Formation initially gained a reputation in the 1860's and 70's for its attractive qualities to provide building stone and architectural ornaments for important buildings being constructed at the time in Sacramento and San Francisco. These include the state's capitol building, the federal mint building in San Francisco, and the Auburn courthouse. The quarry's location is prominently noted on early maps of Placer County. Later, the quarry became an important resource for the production of lime to supplement the market demand for lime products in Oregon and Nevada. There is a well-preserved, imposing lime kiln located just to the south of the limestone exposure (Figure 4) that was built circa 1903 and abandoned by 1910.

The limestone contains several types of marine fossils which Lindgren (1900) describes as "the best Carboniferous fossils thus far obtained from this region, and they can be unhesitatingly referred to the lower Carboniferous." The quarry face exposes the limestone well and contains relatively abundant invertebrate fossils, including rugose corals (Figure 5), crinoids, brachiopods, and foraminifera. The mixed and chaotic nature of the Clipper Gap Formation appears to have both sedimentary mélange (olistostromes) and tectonic mélange; however, there is no shearing or significant deformation apparent in the limestone block, and it is interpreted as an olistolith. Dark-gray to black diabase dikes cut the limestone but it is unknown if these dikes were emplaced before or after deposition of the olistolith. The diabase was sampled for geochemical analysis and the results are summarized in Figure 3.



Figure 4. Photo on left of the Colfax Lime Kiln ruins adjacent to the Pritchard Quarry in 2023. Photo by Peter Holland.



Figure 5. Photo above of rugose coral in limestone exposed at Pritchard Quarry. Hand for scale. Photo by Erica Key.

ACKNOWLEDGEMENTS

We thank the USGS and the STATEMAP Program for providing partial funding for this project (Grant G24AC00329). Many people assisted us during the project. Jim Wood provided access to private properties along the Bear River. Sierra Rack (UC Davis) shared rock descriptions and sample locations from her research. Rich Schweickert (University of Nevada, retired) provided discussion on the bedrock units and how they relate to his 2015 publication. Russ Graymer (USGS) discussed his interpretations on the Clipper Gap Formation and Lake Combie complex. David Shimabukuro and Steve Skinner (CSU Sacramento) spent a day in the field with us discussing the geology around Burnt Flat. Sarah Roeske (UC Davis), Kathleen Surpless (Trinity University), Devon Orme and Brandon Botha (both from Montana State University) and their students spent time in the field with us looking at clast compositions of the Colfax Formation. Many landowners provided access to their property. Brian Swanson, Rachel Beard, Carlos Gutierrez, and other staff at CGS were vital in providing scientific reviews and GIS support.

DESCRIPTION OF MAP UNITS

The arrangement of map unit descriptions below is grouped by age and by tectonic blocks bounded by the primary faults described earlier. The majority of the units on this map have been adopted from the two primary source maps (Chandra, 1961 and Tuminas, 1983) and the regional study by Schweickert (2015). Similarities and differences among rock units are incompletely reflected in the nomenclature and labeling of the rock units, which evolved from many geologic investigations over the past century.

Map labels are abbreviations that indicate age and origin of surficial deposits, or age and formally recognized names of formations and members. Where stratigraphic assignment is tentative, a query (?) is added to the label in the database.

Quaternary Surficial Units

Quaternary units are divided based on distinctive geomorphic features such as fans, floodplains, alluvial valleys, and high energy river deposits, and further subdivided by relative age based on topographic position, degree of erosional dissection, and/or soil development, with elevated and incised terraces representing older abandoned depositional environments.

af **Artificial fill (historic)**—Anthropogenic deposits of earth materials that may be engineered or non-engineered.

t **Tailings (historic)**—Gravels and cobbles, variable color, often siliceous when associated with placer mining, unconsolidated, variable thickness but generally about 5 m (15 to 20 ft) thick. Also includes large piles of bouldery debris adjacent to small mines and prospects. Tailings mapped adjacent to underground mine adits are usually spoils piles derived from both bedrock and Tertiary gravels.

Qa **Alluvial valley deposits (Holocene to Pleistocene)—**Unconsolidated gravel, sand, silt, and clay deposited along broad upland valley floors. Commonly very clay rich and reddish brown to yellow brown in color.

Qa-t **Modern alluvium with tailings (historic)—**Hydraulic-mining debris remobilized and deposited by fluvial processes, primarily along the Bear River within the quadrangle. Composed dominantly of siliceous sand, gravel, and cobbles; gravel and cobbles are well rounded and derived from Tertiary gravels and Valley Springs Formation. Commonly forms low terraces above the modern stream elevations, marking peak aggradation of hydraulic tailings before subsequent erosion.

Qac **Alluvial channel deposits (historic to late Holocene)—**Cobble and gravel deposits in a sandy matrix located predominantly adjacent to the North Fork American River. Clasts are subrounded to well rounded.

Qf **Alluvial fan deposits (Holocene to late Pleistocene)—**Cone-shaped deposits consisting of cobbles and gravel in a sandy matrix, located downgradient from the mouths of drainages.

Qra **Rock avalanche deposits (Holocene to late Pleistocene)—**Unconsolidated rocky debris composed of large, angular boulders up to 10 m in diameter, deposited downslope of the high cliffs exposed near Cape Horn. The largest boulders are from massive metavolcanic units in the phyllite and greenschist belt. At the distal end of the deposit, adjacent to the North Fork of the American River, the avalanche boulders

are distinguished from the bedrock by their predominantly metavolcanic lithology, in contrast with the in-place metaconglomerate rocks. Similar-size boulders were observed at other locations along the American River but were not concentrated enough to be mapped.

Qls **Landslide deposits (Holocene to Pleistocene)—**Mostly unconsolidated, jumbled, and chaotic fragments of bedrock material sourced from upslope geologic units, forming deposits of variable thickness; some of the larger landslides are over 30 m thick and are commonly reddish brown to yellow brown. The largest landslides occur on slopes adjacent to the North Fork of the American River.

Qtl **Talus (Holocene to late Pleistocene)**—Deposits of angular, bouldery debris that occur primarily downslope from rocky cliffs, commonly the result of rockfall. Differentiated from landslide deposits based on distinct mode of origin due to rockfall accumulated over time rather than a discrete failure.

Qt **Terrace deposits (Pleistocene)—**Cobble- and gravel-rich fluvial deposits typically 10 to 15 m (30 to 50 ft) thick that form terrace surfaces perched above the modern drainage systems. Occurs mostly along the North Fork American River, and the bottom of the unit is generally 3 to 6 m (10 to 20 ft) above the current river. These deposits are associated with late Pleistocene glacial outwash processes.

Tertiary Units

Tm **Mehrten Formation (early Pliocene to Miocene)—**Volcanic debris flow (lahar) deposits interbedded with fluvial conglomerate and sandstone. Debris flow deposits consist primarily of sandy, tuffaceous, matrix-supported breccia. Weathered surfaces are reddish brown; fresh surfaces range from light gray to dark gray. Sandstone and conglomerate facies are moderately to well sorted and breccia facies are poorly sorted. Compositionally distinct and dominated by intermediate volcanic rock types, especially andesite. The volcanic material is sourced from the ancestral Cascade Arc located to the east (Cousens and others, 2008). Within the arc, possible source rocks range from approximately 16 to 3 Ma.

Tg **Tertiary gravels (early Oligocene to Eocene)—**Quartz-rich conglomerate ("gravels"), sandstone, and siltstone deposits that are generally flat lying to gently west dipping. Fluvial deposits that filled paleovalleys during the Eocene and early Oligocene, when ancestral drainages extended far to the east, well beyond the modern crest of the Sierra Nevada (Cassel and Graham, 2011). The gravels contain variable, but commonly economically significant, amounts of placer gold, which were heavily mined during the 19th and 20th centuries.

Mesozoic to Paleozoic Metamorphic and Plutonic Units

Jdb **Diabase (Jurassic)—**Fine- to medium-grained diabase that mostly occurs as dikes and sills within the Colfax Formation. Map relationships indicate that it also appears to intrude the Phyllite and Greenschist Belt east of the Gillis Hill fault. We noted several occurrences that were not big enough to show on the map and there are some diabase bodies Chandra mapped that we did not include as we could not confirm their occurrence. Originally recognized and mapped by Chandra (1961). These rocks have

not been dated but are interpreted to be Jurassic based on lithologic similarity to dated Jurassic rocks. Geochemical analysis indicates the diabase has a basaltic trachyandesite composition (sample number 1, Table 1, Figure 3).

Units Between the "Applegate" and Gillis Hill Faults

Jcg-c **Clipper Gap–Colfax tectonically mixed zone (Jurassic parent rock)—**Originally recognized and mapped by Tuminas (1983) in an area that had previously been mapped as Clipper Gap by Chandra (1961). This is a complex gradational contact zone between Clipper Gap and Colfax Formations that is a result of tectonic/structural mixing of the two units (Tuminas, 1983).

Jc **Colfax Formation (Late to Middle Jurassic)—**Marine conglomerate, sandstone, and shale that crops out between the "Applegate" fault and Gillis Hill fault. Described as a flysch sequence by Tuminas (1983). Commonly well cemented and lithified in exposures within the North Fork American River canyon. Weathered to a yellow-brown color and poorly exposed in the upland areas of the quadrangle, except in cuts. Along the Bear River and North Fork American River, these rocks are usually weakly weathered to unweathered and gray to black in color. The sandstone is moderately sorted and lithic rich. The sandstone and conglomerate beds are locally graded. Up direction is locally discernable from scours, flame structures, and fining upward sequences.

Middle Jurassic (Callovian) ammonite fossils have been reported from locations within the quadrangle (Clark, 1976). U-Pb dating of detrital zircons grains as part of this study indicates a maximum depositional age of 167.8 +/- 0.8 (2SE) [3.5] Ma; MSWD = 1.6 for Colfax Formation conglomerate exposed near the Bear River in the northwestern corner of the quadrangle. This is consistent with the only previously known detrital zircon age for the Colfax formation, which was from a fault sliver of Colfax Formation in the Weimar fault zone, which found the two youngest detrital zircon grains are 164 and 160 Ma (Rack, 2021). During the course of our mapping, Kathleen Surpless, Devon Orme, and several of their students including Lucas Craig, conducted a study of the age and provenance of the Colfax formation in which they show that deposition may have lasted from approximately 172 Ma to 157 Ma (Craig and others, 2025).

The Colfax Formation was named by Smith (1910) but has also been referred to as Mariposa Formation by previous authors (Lindgren 1900; Chandra, 1961). It has been linked to the more widespread Mariposa Formation, which is extensive in the central Sierra Nevada (Chandra, 1961), while others have interpreted it as a separate basin (Clark, 1976; Tuminas, 1983).

Jcc **Conglomerate unit**—The conglomerate facies within the Colfax Formation is commonly interbedded with lesser amounts of sandstone and shale. Distinguished as a mappable unit where laterally extensive. Individual conglomerate beds are thickly bedded, poorly sorted, and both clast and matrix supported. Clasts range from angular and well rounded. Clast composition varies throughout the quadrangle but is often predominately siliceous (chert, vein quartz, quartzite) and includes undifferentiated volcanics, mudstone, sandstone,



Figure 6. Photo of Colfax Formation conglomerate exposed along Yankee Jim Road. Clasts are composed of chert, felsic volcanics, and vein quartz and are both rounded and angular. Hammer for scale. Photo by Peter Holland.

and carbonate clasts. The maximum clast size observed is approximately 50 cm (18 inches) (Figure 6).

Jlr **Logtown Ridge Formation (Late to Middle Jurassic)—**Slightly metamorphosed pyroclastic deposits, basaltic to andesitic lava, and associated breccia. Typically forms rocky outcrops and is dark green where fresh. Contains plagioclase and augite phenocrysts and rare olivine xenoliths. Graymer and Jones (1994) interpreted the Logtown Ridge Formation to be upper Callovian to Oxfordian (Late to Middle Jurassic) based on fossils. We performed a geochemical analysis on a sample collected from the Logtown Ridge and it indicates a picro-basalt lithology (sample number 2; Table 1, Figure 3). Named by Taliaferro (1943) with a type section designated for nearly continuous exposures along the Cosumnes River approximately 50 km (30 miles) south of the quadrangle. Behrman (1978) measured detailed stratigraphy at the type section showing the formation is at least 1,800 m (6,000 ft) thick, with the lower portion of the stratigraphy predominately tuffaceous and the upper portion predominantly breccia. He noted subordinate amounts of interbedded augite porphyry pillow lava, cobble conglomerates, and slates. The exposures of the Logtown Ridge Formation in the Colfax Quadrangle mapped by Chandra (1961) are the furthest north known occurrence of this formation.

Jcg **Clipper Gap Formation (Jurassic)**—Marine sandstone, shale, and conglomerate, with some olistolith megaclasts exceeding 100 m in diameter. Named by Lindgren (1900) and mapped in detail within the Colfax Quadrangle by Chandra (1961) and Tuminas (1983). Shimabukuro and others (2025) obtained a Jurassic maximum depositional age from detrital zircons of approximately 178 Ma from exposures of Clipper Gap within the quadrangle. Conglomerate clasts and olistoliths are predominantly chert, with subordinate clasts and olistoliths of Late Triassic amphibolite and upper Paleozoic limestone. Graymer and Jones (1994) reported that the chert olistoliths contain Triassic and Early Jurassic age radiolaria microfossils. The rocks in the Clipper Gap Formation appear to be of low metamorphic grade and are often slaty and phyllitic. The argillaceous portions of the Clipper Gap Formation appear siliceous and phyllitic, which distinguishes it from the Colfax Formation. Several mappable blocks of different lithologies are mapped within the Clipper Gap Formation, including limestone, chert, and amphibolite, as described below. These blocks are likely depositional olistoliths but may be tectonically faulted blocks, or both.

ch **Chert (Early Jurassic and Triassic)**—Massive to bedded chert is the most common olistolith block lithology within the Clipper Gap Formation. Tuminas (1983) mapped several ellipsoidal shaped blocks that typically weather to light gray but are commonly black on fresh surfaces. Graymer and Jones (1994) were able to identify Jurassic and Triassic radiolarians in some of these blocks. They note that the source of the chert blocks is unknown.

am **Amphibolite (Jurassic? To Late Triassic)**—Fine- to medium-grained, foliated amphibolite. Rack (2021) studied amphibolites within the Colfax Quadrangle (which also includes similar amphibolites within the Weimar fault zone) and described them as composed of green hornblende, plagioclase, epidote, small amounts of quartz, and titanium-phase minerals titanite, ilmenite, and rutile. The correlation of these olistolith blocks of amphibolite and the amphibolite bodies that occurs along fault zones is uncertain. We have mapped the fault zone amphibolites separately as JTram (see below).

ls **Limestone (Carboniferous)—**Massive, fossiliferous, light-bluish-gray limestone exposed at one locality along the Bear River. Contains silicified rugose corals and brachiopods. Lindgren (1900) reported an age of “Lower Carboniferous” based on crinoid stems. This locality, known as Pritchard Quarry, was mined for building stone and lime in the late 19th and early 20th centuries (Napper and Converse, 1986). The limestone is cut by mafic dikes and geochemical analysis of one of the dikes reveals basaltic trachyandesite lithology (sample number 3; Table 1, Figure 3).

Units West of the Weimar Fault Zone and Colfax Fault

Lake Combie complex (Jurassic to Late Triassic)—Metavolcanic and metasedimentary rocks previously studied and named by Tuminas (1983). Rack (2024) reexamined these rocks and obtained a few U-Pb dates. The Lake Combie complex is a volcanic arc assemblage that is comprised mostly of mafic volcanic

rocks with lesser amounts of mafic plutonic, volcaniclastic, and sedimentary rocks. Within the Colfax Quadrangle the Lake Combie complex is subdivided into eight mappable units that were originally mapped by Tuminas (1983). Five of the Lake Combie units occur west of the Weimar and "Applegate" faults, one of which occurs as a fault sliver with its relationship to the other members unknown. Three of the units are associated with the Rollins Dam gabbro and occur between the Weimar fault zone and the Colfax fault.

Lake Combie Complex Units West of the Weimar Fault Zone and "Applegate" Fault

Jlpp **Porphyritic diabase (Jurassic)**—Contains distinctive, very coarse-grained plagioclase phenocrysts, up to 25 mm (1 inch) in length, that make up approximately 25% of the rock. Generally, nonfoliated and massive, and intrudes other members of the Lake Combie complex. Outcrops are relatively large and rounded. Mapped by Tuminas (1983) as a separate unit within the Lake Combie complex. He interpreted this unit to be a later discordant stage of plutonism that cuts the main Lake Combie rocks.

Jldp **Porphyritic gabbro-diorite (Jurassic)**—Originally mapped by Tuminas (1983) as part of a discordant plutonic suite that intrudes all other Lake Combie units. Like the porphyritic diabase (Jlpp), this unit contains distinctive, very coarse-grained plagioclase phenocrysts, up to 25 mm (1 inch) in length; however, the matrix is coarser grained. Tuminas (1983) indicated this is the plutonic equivalent of the porphyritic diabase.

Jlvm **Middle volcanic member (Jurassic)**—Originally mapped by Tuminas (1983) as the "middle volcanic unit" of the Lake Combie complex. It is predominantly composed of interbedded pyroclastic tuff, tuff-breccia, volcanic flows, and epiclastic strata. These rocks appear to be located exclusively to the west of the Weimar fault.

Jlvl **Lower volcanic member (Jurassic)**—Originally mapped by Tuminas (1983) as the "lower volcanic unit" of the Lake Combie complex. It is predominantly composed of interbedded volcanic flows, flow-breccia, and pyroclastic tuff-breccia. Geochemical analysis of a sample collected in the northwestern portion of the map indicates these rocks are classified as basalt (sample number 4; Table 1, Figure 3). These rocks appear to be located exclusively to the west of the Weimar fault. Thin veins of serpentinite were observed in an abandoned aggregate quarry in the northwestern corner of the quadrangle.

JTRlvu **Undifferentiated volcanic rocks (Jurassic and Late Triassic)**—A fault sliver of undifferentiated Lake Combie complex volcanic rocks mapped by Tuminas (1983). This polygon was originally mapped as meta-andesite, amphibolite, and hornblende-schist by Chandra (1961). We were unable to field check this location.

Lake Combie Complex Units Between the Weimar Fault Zone and the Colfax Fault

This suite of igneous rocks has been mapped as completely in fault contact with surrounding younger rocks of the Clipper Gap and Colfax Formations. Tuminas (1983) interpreted these rocks as having been thrust over the younger Jurassic units. It is unclear if the faults that juxtapose the Rollins Dam gabbro and diabase dikes against the younger Jurassic rocks are thrust or transform faults, or a combination of both.

JTrlrg **Rollins Dam gabbro (Jurassic to Late Triassic)**—Mapped by Chandra (1961) and Tuminas (1983), and later informally named by Rack (2024). This pluton occurs in the northern part of the quadrangle and is best observed along Bear River. Tuminas (1983) described these rocks as a gabbro-diorite unit consisting of fine- to very coarse-grained plutonic rocks varying in composition from gabbro (An>50) to quartz diorite (An<50). Tuminas (1983) also mapped a layered portion of the pluton separately as the Rollins Dam layered gabbro (JTrlrl). Two recent U-Pb dates on zircons have been published for this pluton: 197.7 ± 0.7 Ma by Rack (2024) and 203 ± 3.2 Ma by Langenheim and others (2025).

JTrlrl **Rollins Dam layered gabbro unit (Jurassic to Late Triassic)**—Compositionally similar and genetically related to the Rollins Dam gabbro (JTrlrg) but distinguished by planar primary igneous structures such as phase layering and/or igneous lamination. Tuminas (1983) indicated that because a clear distinction between layered and massive gabbro is not always feasible; therefore, only areas that contain rocks with obvious planar igneous structures that are continuous over a span of several widely spaced outcrops are mapped as layered gabbro.

JTrld **Diabase dikes (Jurassic to Late Triassic)**—Fine- to very fine-grained mafic intrusive rocks. Tuminas (1983) mapped the diabase dikes adjacent to the Rollins Dam gabbro and indicated that the gabbro and dikes are closely related, with diabase dikes cutting the gabbro and gabbro cutting the diabase. Geochemical analysis shows that it classifies as a basalt based on major oxide content (sample number 5; Table 1, Figure 3).

Units East of the Gillis Hill Fault

Jpg **Phyllite and greenschist belt (Jurassic)**—Predominantly phyllitic with well-developed foliation. The parent rock types appear to be mostly shale, sandstone, tuff, and conglomerate, with minor lenses of mafic volcanic rock. Mapped as the Cape Horn formation of the Calaveras Group (Chandra, 1961) and as the Cape Horn unit of the central belt (Tuminas, 1983). This report adopts the "phyllite and greenschist belt" nomenclature and the general description for these rocks from Schweikert (2015). The unit exhibits ductile deformation, such as highly strained conglomerate clasts and local boudinage structures in locations such as Mineral Bar. Chandra (1961) mapped numerous volcanic beds and lenses in this unit, but we were unable to confirm their lateral extent and so did not include them on this map.



Figure 7. Photo of pillow structures preserved in the volcanic member of the phyllite and greenschist belt. 12 x 19 cm (5 x 7 inch) notebook for scale. Photo by Kathleen Surpless.

Jpgv **Volcanic member**—Greenstone, flows and breccias; well preserved pillows are exposed along the North Fork of the American River by the Yankee Jim Bridge (Chandra, 1961) (Figure 7). Geochemical analysis shows that rocks in this member are basaltic andesite (sample number 6; Table 1, Figure 3).

Jpgm **Mélange member**—Structurally chaotic unit with serpentinite, volcanic, and meta-sedimentary blocks in a slaty matrix.

Jpgt **Talc schist member**—Foliated talc-mica-quartz schist located between Cape Horn and Burnt Flat. We noted several other locations of talc schist that usually occur adjacent to serpentinite but are too small to show on the map.

Intrusive and Ultramafic Units

Jgd **Granodiorite (Jurassic?)**—Medium- to coarse-grained granodiorite, originally mapped and described by Chandra (1961). The unit is undated but probably Jurassic based on its association with Rollins Dam gabbro, although it may be a later, unrelated intrusive event. Chandra (1961) indicated the rock appears brecciated and is composed of quartz, orthoclase, myrmekite, oligoclase, hornblende (replaced by chlorite and iron ore), ilmenite, and alteration products such as epidote.

Jd **Diorite (Jurassic?)**—Fine- to coarse-grained diorite; occurs as a few small bodies within the quadrangle. In hand sample, it appears to contain plagioclase, hornblende, and biotite, with minor quartz. Light green to light gray in color. These diorite bodies occur adjacent to serpentinite but the geologic relationship between the two units is unclear.

sp **Serpentinite (Jurassic to Triassic?)**—Massive to highly foliated serpentinite; occurs at multiple locations throughout much of the quadrangle, most commonly along fault zones. Actinolite and asbestiform minerals are common. Chandra (1961) reported peridotite, pyroxenite, hornblendite, and dunite are included within this unit. The nature of the contact with adjacent units was not easily observed, although at one location at Burnt Flat it appears that chert of the phyllite and greenschist belt is in depositional contact with the serpentinite.

JTram **Amphibolite (Jurassic? to Late Triassic)**—Fine- to medium-grained, foliated amphibolite, often associated with serpentinite and located within fault zones. Rack (2021) described amphibolites within the Colfax Quadrangle as composed of green hornblende, plagioclase, epidote, small amounts of quartz, and titanium-phase minerals titanite, ilmenite, and rutile. Rack (2021) performed U-Pb dating of zircons from an amphibolite body in the southern portion of the quadrangle that is in fault contact with serpentinite and obtained an age of 203.6 +/- 0.4 Ma. Shimabukuro (written commun., 2025) indicates that this particular amphibolite body was lacking rutile and may instead be diorite. Further work is needed.

REFERENCES

Aune, Q.A., 1979, Geologic reconnaissance of the Greenwood 7½-minute Quadrangle: Unpublished field study for State Map Project, scale 1:24,000.

Behrman, P.G., 1978, Pre-Callovian rocks, west of the Melones fault zone, central Sierra Nevada Foothills, *in* Howell, D.G., and McDougall, K.A., eds., Mesozoic Paleogeography of the Western United States: Pacific Section, Society of Economic Paleontologists and Mineralogists, Pacific Coast Paleogeography Symposium 2, p. 349-360.

Best, M.G., Christiansen, E.H., and Gromme, S., 2013, Introduction: The 36-18 Ma southern Great Basin, USA, ignimbrite province and flareup: Swarms of subduction-related supervolcanoes: Geosphere, v. 9, p. 260-274.

Cassel, E.J., and Graham, S.A., 2011, Paleovalley morphology and fluvial system evolution of Eocene – Oligocene sediments ("auriferous gravels"), northern Sierra Nevada, California: Implications for climate, tectonics, and topography: Geological Society of America Bulletin, v. 123, p. 1699-1719.

Chandra, D.K., 1961, Geology and mineral deposits of the Colfax and Foresthill Quadrangles: California Division of Mines and Geology Special Paper 67, 50 p., scale 1:24,000.

Clark, L.D., and Huber, N.K., 1975, Geologic observations and sections along selected stream traverses, northern Sierra Nevada metamorphic belt, California: U.S. Geological Survey Miscellaneous Field Studies Map MF 690, scale 1:62,500.

Clark, L.D., 1976, Stratigraphy of the north half of the western Sierra Nevada metamorphic belt, California: U.S. Geological Survey Professional Paper 923, 26 p.

Cousens, B.L., Prytulak, J.J., Henry, C., Alcazar, A., and Brownrigg, T., 2008, Geology, geochronology, and geochemistry, of the Miocene-Pliocene ancestral Cascades arc, northern Sierra Nevada, California and Nevada: The roles of the upper mantle, subducting slab, and Sierra Nevada lithosphere: Geosphere, v. 4, p. 829-853.

Craig, L., Shaffer, C., Sikes, W., Surpless, K., Quigley, N., Botha, B., and Orme, D., 2025, Characterizing sediment sources of Jurassic strata in western Sierra Foothills, CA: Colfax Formation conglomerate composition and detrital zircon analysis: Geologic Society of American Connects Abstract.

Day, H.W., Moores, E.M., and Tuminas, A.C., 1985, Structure and tectonics of the northern Sierra Nevada: Geological Society of America Bulletin, v. 116, p. 1515-1528.

Edwards, J., 1978, Tectonic evolution of the western Sierra Nevada Mountains foothills belt: A case for continental accretion [Ph.D. thesis]: Rice University, Texas, 125 p.

Graymer, R.W., and Jones, D.L., 1994, Tectonic implications of radiolarian cherts from the Placerville Belt, Sierra Nevada foothills, California: Nevadan-age continental growth by accretion of multiple terranes: Geological Society of America Bulletin, v. 106, p. 531-540.

Henry, C.D., 2008, Ash-flow tuffs and paleovalleys in the northeastern Nevada: Implications for Eocene paleogeography and extension in the Sevier hinterland, northern Great Basin: Geosphere, v. 4, p. 1-35.

Henry, C.D., Hinz, N.G., Faulds, J.E., Colgan, J.P., John, D.A., Brooks, E.R., Cassel, E.J., Garside, L.J., Davis, D.A., and Castor, S.B., 2012, Eocene-early Miocene paleotopography of the Sierra Nevada-Great Basin Nevadaplano based on widespread ash-flow tuffs and paleovalleys: Geosphere, v. 8, p. 1-27.

Henry, C.D., and John, D.A., 2013, Magmatism, ash-flow tuffs, and calderas of ignimbrite flareup in the western Nevada volcanic field, Great Basin, USA: Geosphere, v. 9, p. 951-1008.

Imlay, R.W., 1961, Late Jurassic ammonites from the western Sierra Nevada, California: U.S. Geological Survey Professional Paper 374D, p. 1-30.

La Maitre, R.W., 1989, A Classification of Igneous Rocks and Glossary Terms, 2nd Edition; Blackwell Scientific Publications, Oxford, 193 p.

La Maitre, R.W., 2002, Igneous Rocks: A classification and glossary of terms: Recommendations of the International Union of Geological Sciences Subcommission on the Systematics of Igneous Rocks: International Union of Geological Sciences, eBook.

Langenheim, V.E., Vazquez, J.A., Sweetkind, D.S., Roberts, M.A., and Graymer, R.W., 2025, Tabular uranium-lead and trace-element compositional data of zircons and whole-rock geochemistry of plutonic rocks in the Sierra Nevada, California: U.S. Geological Survey data release, https://doi.org/10.5066/P13LKC5C.

Lindgren, W., 1900, Geologic atlas of the United States, Colfax Folio, California; historical geology sheet: U.S. Geological Survey Folio 66, scale 1:125,000.

Livingston, J.G., 1975, Engineering geologic map of the Colfax Quadrangle, Placer County, California: Placer County Planning Department, scale 1:24,000.

Loyd, R., 1995, Mineral land classification of Placer County, California: California Division of Mines and Geology, Open-File Report 95-10, 66 p.

Marquis, G.D., 2024, Radon potential in western Nevada County, California: California Geological Survey Special Report 258, 21 p.

Moody, C.L., 1917, The breccias of the Mariposa Formation in the vicinity of Colfax, California: University of California Publications, v. 10, p. 383-420.

Napper, J.E., and Converse, G.L., 1986, Preliminary geologic report "Old Pritchard's Marble Quarry": Unpublished consultant's report, Western Geo-Engineers, 10 p.

O'Neal, M.D., 2023, Geologic mapping, characteristics, deformation, and tilt-dependent flow paths of the ancestral south Yuba River [M.S. thesis]: California State University Sacramento, 102 p., scale 1:75,000.

Pease, B., 2025, Geologic map of a portion of the Colfax Quadrangle: Unpublished mapping, scale, 1:24,000.

Rack, S., 2021, Petrography, geochemistry, and geochronology of high-pressure and high-temperature amphibolites of the Central belt near Colfax, California [Senior Research thesis]: California State University Sacramento, 25 p.

Rack, S., 2024, Timing and crustal influences of arc volcanism in the Lake Combie Complex within the Sierra Nevada Metamorphic Province [M.S. thesis]: University of California, Davis, 91 p.

Saucedo, G.J., and Wagner, D.L., 1992, Geologic Map of the Chico Quadrangle, California: California Geological Survey Regional Geologic Map 7A, scale: 1:250,000.

Schweickert, R.A., 2015, Jurassic evolution of the western Sierra Nevada metamorphic province, *in* Anderson, T.H., Didenko, A.N., Johnson, C.L., Khanchuk, A.I., and MacDonald, J.H., Jr., eds., Late Jurassic Margin of Laurasia – A Record of Faulting Accommodating Plate Rotation: Geological Society of America Special Paper 513, p. 299-358.

Shimabukuro, D., Roeske, S., Surpless, K., Black, J., Rack, S., and Wakabayashi, J., 2025, Birth, growth, death, burial, and deformation of the Triassic-Jurassic arc system of the northern Sierra Nevada: Geological Society of America Cordilleran Section meeting guidebook, 33 p.

Smith, J.P., 1910, The geologic record of California: Journal of Geology, v. 18, p. 216-227.

Streckeisen, A.L., 1973, Plutonic rocks – Classification and nomenclature recommended by the IUGS Subcommission on Systematics of Igneous Rocks: Geotimes, v. 18, p. 26-30.

Streckeisen, A.L., 1976, To each plutonic rock a proper name: Earth Science Reviews, v. 12, p. 1-33.

Taliaferro, N.L., 1943, Manganese deposits of the Sierra Nevada, their genesis and metamorphism: California Division of Mines Bulletin 125, p. 277-332.

Taylor, G.C., 1985, Mineral land classification of the W.L. Harvey clay/shale deposit, Placer County, California: California Division of Mines and Geology Open File Report 85-22, 14 p.

Tuminas, A., 1983, Structural and stratigraphic relations in the Grass Valley-Colfax area of north Sierra Nevada foothills, California [Ph.D. thesis]: University of California, Davis, 415 p., scale 1:24,000.

Imagery and Lidar

U.S. Geological Survey, 2020, USGS Original Product Resolution CA_SierraNevada_B22, work unit 11: U.S. Geological Survey, 1-meter resolution, http://nationalmap.gov/elevation.html

U.S. Geological Survey, 2024, USGS Original Product Resolution CA NoCAL Wildfires B1 2018: U.S. Geological Survey, 0.5-meter resolution, http://nationalmap.gov/elevation.html

U.S. Department of Agriculture, 2005, Farm Service Agency–Aerial Photography Field Office, National Agriculture Imagery Program (NAIP), 1 m resolution, https://datagateway.nrcs.usda.gov.

U.S. Department of Agriculture, 2018, Farm Service Agency–Aerial Photography Field Office, National Agriculture Imagery Program (NAIP), 60 cm resolution, https://datagateway.nrcs.usda.gov.

U.S. Department of Agriculture, 2022, Farm Service Agency–Aerial Photography Field Office, National Agriculture Imagery Program (NAIP), 60 cm resolution, https://datagateway.nrcs.usda.gov.

APPENDIX A: AUTHORSHIP DOCUMENTATION AND PRODUCT LIMITATIONS

PUBLICATION TITLE: Preliminary geologic map of the Colfax 7.5′ Quadrangle, Placer and Nevada Counties, California

Preliminary Geologic Map 26-02

LIMITATIONS: This map is considered preliminary, and the California Department of Conservation makes no warranties as to the suitability of this product for any given purpose. This map should not be considered as an authoritative or comprehensive source for landslide and seismic hazard data. For landslide data, please visit the California Geological Survey Landslides web page at: https://www.conservation.ca.gov/cgs/landslides. For seismic hazards data and Zones of Required Investigation, please visit the California Geological Survey Seismic Hazards Program web page at: https://www.conservation.ca.gov/cgs/sh/program.

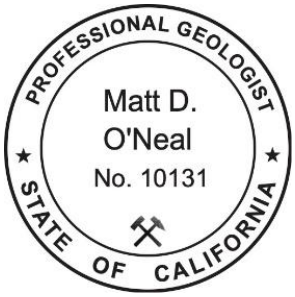
First Author – Peter J. Holland, PG 7994, CEG 2400



Date: March 19, 2026

Second Author – Chris Henningfeld, Assistant Geologist

Third Author – Matt D. O'Neal, PG 10131



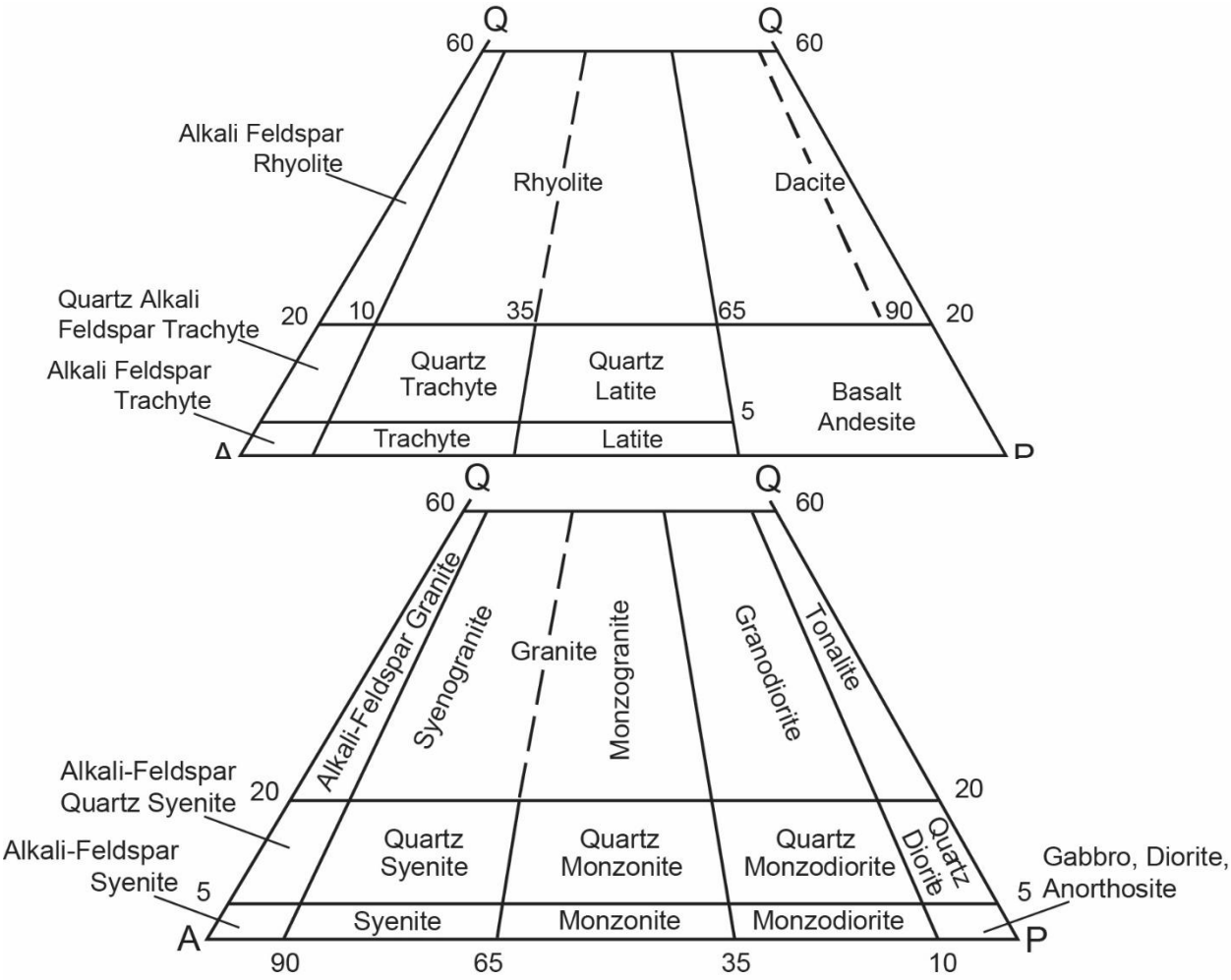
Date: March 19, 2026

Fourth Author – Jeremy L. Altringer, Lead GIS and Cartographer

This authorship document accompanies the geologic map with the following citation:

Holland, P.J., Henningfeld, C., O'Neal, M.D., and Altringer, J.L., 2026, Preliminary geologic map of the Colfax 7.5′ Quadrangle, Placer and Nevada Counties, California: California Geological Survey Preliminary Geologic Map 26-02, scale 1:24,000.

APPENDIX B: TERNARY CLASSIFICATION PLOTS FOR PLUTONIC AND VOLCANIC ROCKS



Classification of plutonic rock types (from Streckeisen, 1973; 1976).
A, alkali feldspar; P, plagioclase feldspar; Q, quartz.