

## 4.15 Paleontological Resources

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This section summarizes the potential to encounter paleontological resources in the City and Annexation Areas and analyzes the impacts on paleontological resources due to the project.

### 4.15.1 Setting

#### **a. Regional Setting**

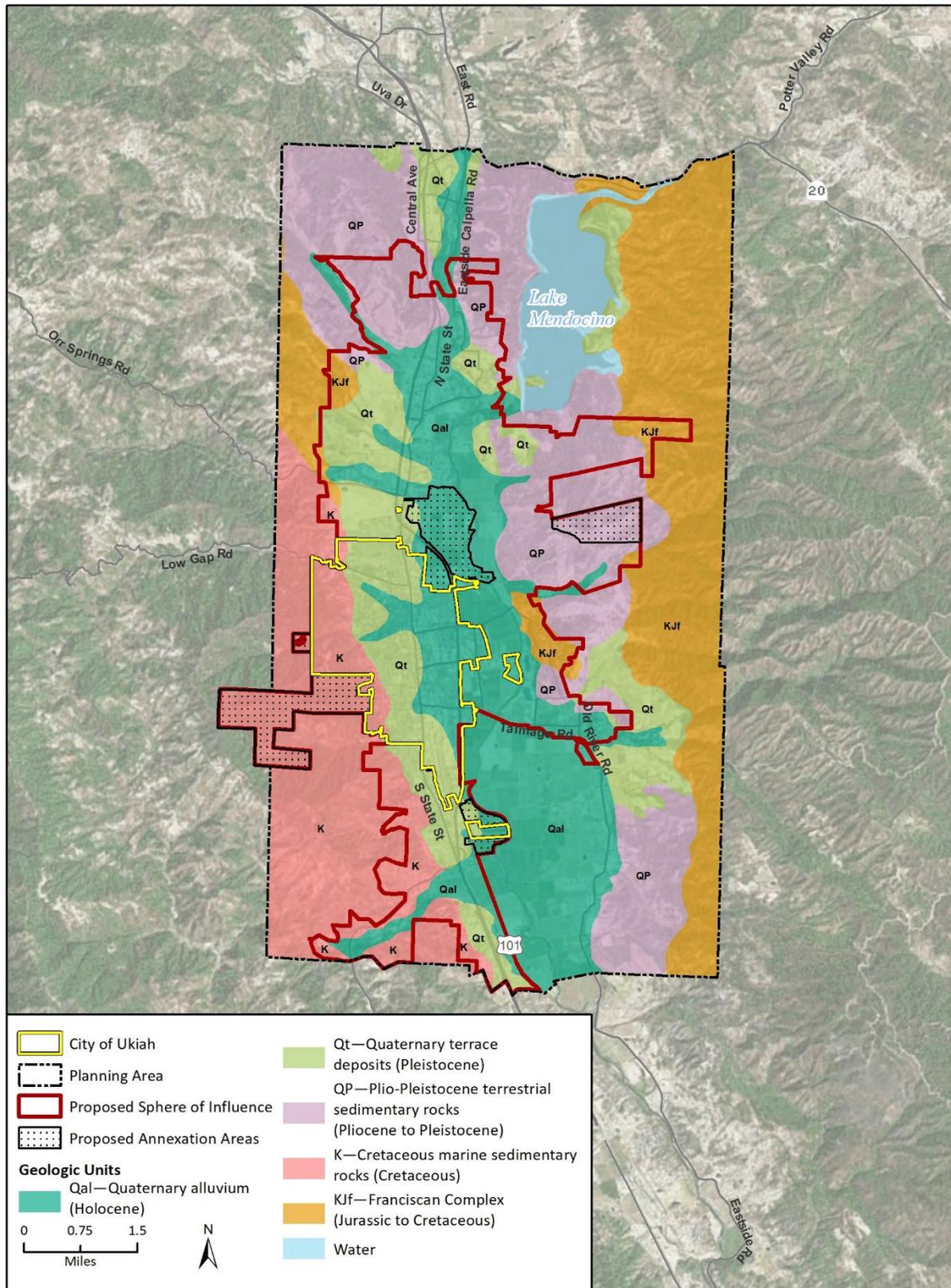
Paleontological resources, or fossils, are the evidence of once-living organisms preserved in the rock record. They include both the fossilized remains of ancient plants and animals and their traces (e.g., trackways, imprints, burrows, etc.). Paleontological resources are not found in “soil” but are contained within the geologic deposits or bedrock that underlies the soil layer. Typically, fossils are greater than 5,000 years old (i.e., older than middle Holocene in age) and are typically preserved in sedimentary rocks. Although rare, fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks under certain conditions (Society of Vertebrate Paleontology [SVP] 2010). Fossils occur in a non-continuous and often unpredictable distribution within some sedimentary units, and the potential for fossils to occur within sedimentary units depends on several factors. It is possible to evaluate the potential for geologic units to contain scientifically important paleontological resources, and therefore evaluate the potential for impacts to those resources and provide mitigation for paleontological resources if they are discovered during construction of a development project.

The City of Ukiah is in the Coast Ranges geomorphic province, one of the eleven geomorphic provinces of California (California Geological Survey 2002). The Coast Ranges extend along the majority of California’s coast from the California-Oregon border to Point Arguello in Santa Barbara County in the south and consist of northwest-trending mountain ranges and valleys. The Coast Ranges are composed of Mesozoic and Cenozoic sedimentary, igneous, and metamorphic strata. The eastern side is characterized by strike-ridges and valleys in the Upper Mesozoic strata. The Coast Ranges province runs parallel to and overlaps the San Andreas Fault in some areas of California Geological Survey 2002).

#### **b. Local Setting**

Locally, the City of Ukiah lies within the Ukiah Valley, along the Russian River in Mendocino County. The regional geology was mapped at a scale of 1:250,000 by Jennings and Strand (1960), who identified five geologic units underlying the City, Annexation Area, and proposed sphere of influence (SOI): Quaternary alluvium, Quaternary terrace deposits, Plio-Pleistocene sedimentary rocks, Cretaceous marine sedimentary rocks, and the Franciscan Complex (Figure 4.15-1). Part of area was mapped at a scale of 1:24,000 by Delattre and Rubin (2020), who provided names and subdivisions of some of the geologic units mapped by Jennings and Strand (1960). The interpretations of Delattre and Rubin (2020) are used to aid the assessment of the paleontological sensitivity when applicable.

**Figure 4.15-1 Geologic Map of the Planning Area**



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 Additional data provided by City of Ukiah, 2022 and Jennings and Strand, 1960.

Fig. X Geologic Map

## **Quaternary Alluvium**

Quaternary alluvium underlies the majority of the Planning Area, including the City and proposed SOI, in the low-lying areas along the Russian River and its tributary creeks (Figure 4.15-1). Per Delattre and Rubin (2020), Quaternary alluvium includes various Holocene-aged deposits including floodplain deposits, active stream channel deposits, alluvial fan deposits, and artificial fill. These various sediment types generally consist of loose to moderately consolidated, gravel, sand, and silt (Jennings and Strand 1960; Delattre and Rubin 2020). Due to its Holocene age, Quaternary alluvium is generally considered too young (i.e., less than 5,000 years old) to preserve paleontological resources (SVP 2010). Therefore, Quaternary alluvium has low paleontological sensitivity.

## **Quaternary Terrace Deposits**

Quaternary terrace deposits underlie portions of the Planning Area, including the City and the proposed SOI (Figure 4.15-1). Areas mapped as Quaternary terrace deposits by Jennings and Strand (1960), are divided by Delattre and Rubin (2020) into older alluvial fan deposits, older alluvial deposits, and very old alluvial terrace deposits. Older alluvial fan deposits consist of grayish brown, consolidated, poorly sorted, gravel, sand, and silt, and are early Holocene to late Pleistocene in age. Older alluvial deposits consist of slightly consolidated gravelly sand and silt representing stream and floodplain deposits that are early Holocene to late Pleistocene in age. Very old alluvial terrace deposits consist of moderately to well-cemented, poorly sorted, silty or clayey sand and gravel that are Pleistocene in age. All these sediment types represent early Holocene to Pleistocene alluvial deposits, so their paleontological potential can be assessed together. No significant fossil localities are known from Pleistocene alluvial deposits in Mendocino County, but similar sediments in nearby Lake and Sonoma Counties have produced fossils such as mastodon (*Mammut*), ground sloth (*Nothrotheriops*, *Paramylodon*), horse (*Equus*), bison (*Bison*), camel, deer, and plants (Jefferson 2010; Paleobiology Database [PBDB] 2022; University of California Museum of Paleontology [UCMP] 2022). Given the fossil-producing history of similar sediments in this region of California, Quaternary terrace deposits have high paleontological sensitivity.

## **Plio-Pleistocene Sedimentary Rocks**

Plio-Pleistocene rocks underlie portions of the Planning Area, including the proposed SOI (Figure 4.15-1). Areas mapped as Quaternary terrace deposits by Jennings and Strand (1960), are divided by Delattre and Rubin (2020) into older alluvial fan deposits, very old alluvial terrace deposits, and the Ukiah Formation. Older alluvial fan deposits consist of grayish brown, consolidated, poorly sorted, gravel, sand, and silt, and are early Holocene to late Pleistocene in age. Very old alluvial terrace deposits consist of moderately to well-cemented, poorly sorted, silty or clayey sand and gravel that are Pleistocene in age. No significant fossil localities are known from Pleistocene alluvial deposits in Mendocino County, but similar sediments in nearby Lake and Sonoma Counties have produced fossils such as mastodon (*Mammut*), ground sloth (*Nothrotheriops*, *Paramylodon*), horse (*Equus*), bison (*Bison*), camel, deer, and plants (Jefferson 2010; PBDB 2022; UCMP 2022). The Ukiah Formation consists of bluish gray (when fresh) or yellowish brown (when oxidized), well-consolidated, moderately bedded, pebble to cobble conglomerate composed of subrounded to rounded clasts with interbedded sandstone and siltstone that is early Pleistocene to Pliocene in age. No fossil localities have been reported from the Ukiah Formation (PBDB 2022; UCMP 2022), and the coarse-grained nature of the Ukiah Formation is likely not conducive to fossil preservation. However, given that the areas mapped as Plio-Pleistocene

sedimentary rocks include geologic units with a history of producing significant paleontological resources, Plio-Pleistocene sedimentary rocks are assigned high paleontological sensitivity.

### **Cretaceous Marine Sedimentary Rocks and Franciscan Complex**

Cretaceous marine sedimentary rocks underlie the western area of Planning Area, including the western areas of the City and proposed SOI. The Franciscan Complex underlies the eastern edge of the Planning Area, including the proposed SOI (Figure 4.15-1). Per Delattre and Rubin (2020), both of these geologic units represent rocks of the Franciscan Complex. The Franciscan Complex is a Jurassic to Cretaceous-aged assemblage primarily comprised of marine sedimentary, metamorphic, and volcanic rocks (Delattre and Rubin 2020; Jennings and Strand 1960). Within the proposed SOI, Franciscan Complex rocks mostly consist of sandstone, conglomerate, chert, and mélange. Invertebrate fossils (mollusks and echinoderms) are known from the sedimentary rocks of the Franciscan Complex, but vertebrate fossils are rare (Camp 1942; PBDB 2022; UCMP 2022). Due to the rarity of scientifically significant fossils in the Franciscan Complex, Cretaceous marine sedimentary rocks and the Franciscan Complex have low paleontological sensitivity.

#### **c. Geologic Units in the City and Annexation Areas**

The City and Annexation Areas contain four geologic units per Jennings and Strand (1960) (Figure 4.15-1). Two of these geologic units, Quaternary terrace deposits and Plio-Pleistocene sedimentary rocks have high paleontological sensitivity (see Table 4.15-1).

**Table 4.15-1 Geologic Units in the City and Annexation Areas and Paleontological Sensitivity**

<b>Geologic Unit (per Jennings and Strand 1960)</b>	<b>Age</b>	<b>Paleontological Sensitivity</b>
Quaternary alluvium (Qal)	Holocene	Low
Quaternary terrace deposits (Qt)	Pleistocene	High
Plio-Pleistocene sedimentary rocks (QP)	Pliocene to Pleistocene	High
Cretaceous marine sedimentary rocks (K)	Cretaceous	Low

## 4.15.2 Regulatory Setting

### **a. Federal Regulations**

#### **National Environmental Policy Act of 1969**

The National Environmental Policy Act (NEPA), as amended, directs federal agencies to “Preserve important historic, cultural, and natural aspects of our national heritage” (Section 101(b) (4)). The current interpretation of this language has included scientifically important paleontological resources among those resources that may require preservation.

#### **National Historic Preservation Act of 1966 (16 USC 470)**

The National Historic Preservation Act (NHPA) applies to paleontological resources that are found in culturally-related contexts; such related materials qualify as cultural resources. Consequently, recovery and treatment protocols included in the Project-specific Cultural Resources Management Plan should be followed for discoveries of paleontological resources in culturally-related contexts.

## **Paleontological Resources Preservation Act of 2009 (PRPA)**

The Paleontological Resources Preservation Act (PRPA) is part of the Omnibus Public Land Management Act of 2009 (PL 111-011 Subtitle D). This act directs the Secretary of the Interior or the Secretary of Agriculture to manage and protect paleontological resources on federal land and to develop plans for inventorying, monitoring, and deriving the scientific and educational use of such resources. It prohibits the removal of paleontological resources from federal land without a permit issued under this act, establishes penalties for violation of this act, and creates a program to increase public awareness about these resources. A paleontological resource use permit is required to collect paleontological resources of scientific interest. The act requires that paleontological resources collected under a permit remain United States property, preserved for the public in an approved repository, and available for scientific research and public education. The act also requires that the nature and location of paleontological resources on public lands remain confidential as a means of protecting the resources from theft and vandalism. Section 6301 of the PRPA and Departmental Proposed Rule at 43 CFR Part 49 define a paleontological resource as:

Any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth, except that the term does not include— (A) any materials associated with an archaeological resource... (B) any cultural item... (3) Resources determined in writing by the authorized officer to lack paleontological interest or not provide information about the history of life on earth, based on scientific and other management considerations.

Consistent with the definition of a paleontological resource under the PRPA, those paleontological resources that lack scientific interest (e.g., resources that are ubiquitous or do not provide information about the history of life on earth) are considered scientifically non-significant fossils.

### **b. State Regulations**

#### **California Public Resources Code**

Section 5097.5 of the Public Resources Code states the following:

No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

The term "public lands" means those owned by, or under the jurisdiction of, the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, public agencies are required to comply with Public Resources Code Section 5097.5 for their own activities, including construction and maintenance, and for permit actions (e.g., encroachment permits) undertaken by others.

### 4.15.3 Impact Analysis

#### a. Significance Thresholds and Methodology

According to Appendix G of the *CEQA Guidelines*, impacts related to paleontological resources from implementation of the project would be significant if it would:

1. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The paleontological sensitivity of the geologic units that underlie the City and Annexation Areas were evaluated to assess Ukiah 2040's potential for significant impacts to scientifically important paleontological resources. The analysis was based on the review of existing information in the scientific literature regarding known fossils within geologic units mapped in the City and Annexation Areas. According to the SVP (2010) classification system, geologic units can be assigned a high, low, undetermined, or no potential for containing scientifically significant nonrenewable paleontological resources. Following the literature review, a paleontological sensitivity classification was assigned to each geologic unit mapped within the City and Annexation Areas. This criterion is based on rock units within which vertebrate or significant invertebrate fossils have been determined by previous studies to be present or likely to be present. The potential for impacts to significant paleontological resources is based on the potential for ground disturbance to directly impact paleontologically sensitive geologic units.

#### b. Project Impacts and Mitigation Measures

**Threshold 1:** Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

**IMPACT PAL-1 DEVELOPMENT FACILITATED BY THE PROJECT HAS THE POTENTIAL TO IMPACT PALEONTOLOGICAL RESOURCES. IMPACTS WOULD BE LESS THAN SIGNIFICANT WITH MITIGATION.**

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As shown in Table 4.15-1, the City and Annexation areas are underlain by four geologic units: Quaternary alluvium (low sensitivity); Quaternary terrace deposits (high sensitivity); Plio-Pleistocene sedimentary rocks (high sensitivity); and Cretaceous marine sedimentary rocks (low sensitivity).

Ground disturbance in previously undisturbed portions of the City and Annexation areas underlain by geologic units with high paleontological sensitivity may result in potentially significant impacts to paleontological resources. Ukiah 2040 contains the following proposed goal and policies related to reducing impacts to paleontological resources.

**Goals ENV-3: To preserve and protect historic and archaeological resources in Ukiah.**

**Policy ENV-3.2:** Archaeological Resource Impact Mitigation. The City shall ensure appropriate and feasible mitigation for new development that has the potential to impact sites likely to contain archaeological, paleontological, cultural, or tribal resources.

**Policy ENV-3.3:** Protect Archaeological Resources. The City shall require any construction, grading, or other site altering activities cease if cultural, archaeological, paleontological, or cultural resources are discovered until a qualified professional has completed an evaluation of the site.

Although these proposed goal and policies would reduce impacts, potentially significant impacts to paleontological resources can only be determined once a specific project has been proposed. The potential effects of a project on paleontological resources are highly dependent on both the individual project site conditions (e.g., presence and depth of disturbed sediments or artificial fill) and the characteristics of the proposed ground-disturbing activity (i.e., depth of ground disturbance and construction activity). Therefore, ground disturbing construction activities in disturbed or developed areas may impact paleontological resources if previously undisturbed, high-sensitivity sediments are encountered below the surface.

Ground disturbing activities associated with construction facilitated by Ukiah 2040 have the potential to damage or destroy paleontological resources that may be present on or below the ground surface in areas of high paleontological sensitivity. Consequently, damage to or destruction of fossils could occur due to development from Ukiah 2040. Impacts would be potentially significant. Mitigation Measure PAL-1 would require the City to implement a new policy in Ukiah 2040, requiring that future projects be assessed for its potential to significantly impact paleontological resources.

### **Mitigation Measures**

#### *PAL-1 Retention of Qualified Professional Paleontologist*

The City shall implement the following policy into Ukiah 2040:

Prior to initial ground disturbance in areas underlain by high sensitivity geologic units (i.e., Quaternary terrace deposits and Plio-Pleistocene sedimentary rocks), the City shall require the project applicant retain a Qualified Professional Paleontologist, as defined by the Society of Vertebrate Paleontology (SVP) (2010), to determine the project's potential to significantly impact paleontological resources according to SVP (2010) standards. If necessary, the Qualified Professional Paleontologist shall recommend mitigation measures to reduce potential impacts to paleontological resources to a less than significant level.

### **Significance After Mitigation**

Implementation of Mitigation Measure PAL-1 would reduce adverse effects to paleontological resources and impacts would be less than significant with mitigation.

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