

2.11 Paleontology

2.11.1 Regulatory Setting

Paleontology is a natural science focused on the study of ancient animal and plant life as it is preserved in the geologic record as fossils.

A number of federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally authorized projects.

The Paleontological Resources Preservation Act (16 USC 470aaa) prohibits excavation, removal, or damage of any paleontological resources located on federal land under the jurisdiction of the Secretaries of the Interior or Agriculture without first obtaining an appropriate permit. The statute establishes criminal and civil penalties for fossil theft and vandalism on federal lands.

According to 23 USC 1.9(a), the use of federal-aid funds must be in conformity with federal and state law.

Appropriation and use of federal highway funds for paleontological salvage as necessary by the highway department of any state are authorized by 23 USC 305, in compliance with 16 USC 431–433 above and state law.

Under California law, paleontological resources are protected by CEQA.

2.11.2 Affected Environment

The regional and local geology of the project area are described in Section 2.10, “Geology/Soils/Seismic/Topography.” As described in that section, the geologic units immediately underlying the project site are granitic rock of the Rocklin Pluton, the Mehrten Formation, the Turlock Lake Formation, and the Riverbank Formation—and recent alluvial deposits in the shallow drainages.

2.11.2.1 Paleontological Sensitivity

The assessment of paleontological sensitivity (i.e., the potential to contain scientifically important paleontological resources) followed standard Caltrans’ criteria (California Department of Transportation 2014). Caltrans criteria use three categories to describe the likelihood that a geologic unit contains significant fossil materials—high potential, low potential, and no potential, defined as shown in Table 2.11-1. The paleontological sensitivity of the units immediately underlying the project site is shown in Table 2.11-2.

Table 2.11-1. California Department of Transportation Paleontological Sensitivity Terminology

Caltrans Sensitivity Designation	Characteristics of Geologic Units in This Category
High potential (high sensitivity)	<p>This category consists of rock units known to contain important vertebrate, invertebrate, or plant fossils anywhere within their geographic extent, including sedimentary rock units that are suitable for the preservation of fossils, as well as some volcanic and low-grade metamorphic rock units.</p> <p>This category includes rock units with the potential to contain abundant vertebrate fossils; a few significant fossils (large or small vertebrate, invertebrate, or plant fossils) that may provide new and significant taxonomic, phylogenetic, ecologic, and/or stratigraphic data; areas that may contain datable organic remains older than Recent, including <i>Neotoma</i> (sp.) middens; and areas that may contain unique new vertebrate deposits, traces, and/or trackways. Fossiliferous deposits with very limited geographic extent or an uncommon origin (e.g., tar pits and caves) are given special consideration and ranked as highly sensitive.</p>
Low potential (low sensitivity)	<p>This category includes sedimentary rock units that are potentially fossiliferous but have not yielded significant fossils in the past; have not yet yielded fossils, but have the potential to contain fossil remains; or contain common and/or widespread invertebrate fossils of species whose taxonomy, phylogeny, and ecology are well understood.</p> <p><i>Note that sedimentary rocks expected to contain vertebrate fossils are considered highly sensitive, because vertebrates are generally rare and found in more localized strata.</i></p>
No potential (no sensitivity)	<p>This category includes rock units and deposits either too young to contain fossils or are of intrusive igneous origin, most extrusive igneous rocks, and moderate- to high-grade metamorphic rocks.</p>

Table 2.11-2. Summary of Paleontological Sensitivity of Geologic Units Underlying the Project Site

Geologic Unit	Age (in years)	Paleontological Description	Paleontological Sensitivity
Granitic rock of the Rocklin Pluton	Mesozoic (65 to 250 million)	No potential to contain paleontological resources because it is a plutonic rock	None
Mehrten Formation	Miocene (5 to 20 million)	Contains significant fossils, such as extinct horse, primitive rhinoceros, camel, and tortoise (University of California Museum of Paleontology 2014a)	High
Turlock Lake Formation	Late to Middle Pleistocene (more than 150,000)	Contains significant fossils, such as extinct horse, ground sloths (Jefferson's ground sloth and Harlan's ground sloth), saber-toothed cat, Armbruster's wolf, llama, deer, camels, mammoth, smooth-tooted pocket gopher, turtle, and tortoise (Dundas et al. 1996)	High
Riverbank Formation	Late to Middle Pleistocene (more than 150,000)	Contains significant fossils, such as mammoth, bison, camel, horse, ground sloth, dire wolf, rodents, moles, and bony fish (University of California Museum of Paleontology 2014b)	High
Recent alluvial deposits	Holocene (likely less than 5,000)	Not applicable because these deposits are considered too young to contain fossils	Low

Note: See Section 2.10, "Geology/Soils/Seismic/Topography" for further information on geologic units.

2.11.3 Environmental Consequences

2.11.3.1 Build Alternatives

Paleontological Resources

If fossils are present in the project area, they could be damaged by earth-disturbing activities (i.e., excavation and grading) during construction. Several geologic units that underlie the project site have a high sensitivity for paleontological resources; therefore, fossils could be present. These units are the Mehrten Formation, the Riverbank Formation, and the Turlock Lake Formation (Table 2.12-2). Substantial damage to or destruction of significant paleontological resources, as defined by the Society of Vertebrate Paleontology (2010), would be an adverse effect. Implementation of avoidance and minimization measures would reduce this effect.

2.11.3.2 No Build Alternative

No ground disturbance would occur under the No Build Alternative; therefore, paleontological resources would not be affected.

2.11.4 Avoidance, Minimization, and/or Mitigation Measures

Educate Construction Personnel in Recognizing Fossil Material

All construction personnel receive training provided by a qualified professional paleontologist experienced in teaching non-specialists to ensure that construction personnel can recognize fossil materials in the event that any are discovered during construction.

Stop Work if Substantial Fossil Remains Are Encountered during Construction

If substantial fossil remains (particularly vertebrate remains) are discovered during earth-disturbing activities, activities will stop immediately until a State-registered professional geologist or qualified professional paleontologist can assess the nature and importance of the find and a qualified professional paleontologist can recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and may include preparation of a report for publication describing the finds. The project proponent will ensure that recommendations regarding treatment and reporting are implemented.

Resource Stewardship Measures

The following will be added to the project's standard specification.

If paleontological resources are discovered at the job site, do not disturb the material and immediately:

1. Stop all work within a 60-foot radius of the discovery
2. Protect the area

3. Notify the Resident Engineer

The project proponent investigates and modifies the dimensions of the protected area if necessary.

Do not take paleontological resources from the job site. Do not resume work within the specified radius of the discovery until authorized. A specification alerting the construction contractor that paleontological monitoring will occur during activities that will disturb native sediments will also be added to the project's specifications.

2.11.5 References Cited

- California Department of Transportation. 2014. *California Department of Transportation, Standard Environmental Reference*. Volume 1, Chapter 8, "Paleontology." Available: <<http://www.dot.ca.gov/ser/vol1/sec3/physical/Ch08Paleo/chap08paleo.htm>>. Accessed: December 5, 2014.
- Dundas, R., R. Smith, and K. Verosub. 1996. The Fairmead Landfill Locality (Pleistocene, Irvingtonian), Madera County, California: preliminary report and significance. *PaleoBios* 17(2–4):50–58. Available: <http://www.fresnostate.edu/csm/ees/documents/facstaff/dundas/publication/Dundas%20et%20al-1996.pdf>>. Accessed: December 10, 2014.
- Society of Vertebrate Paleontology. 2010. *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources*. Last revised 2010. Impact Mitigation Guidelines Revision Committee. Available: <<http://vertpaleo.org/PDFS/8f/8fe02e8f-11a9-43b7-9953-cdcfaf4d69e3.pdf>>. Accessed: November 19, 2014.
- University of California Museum of Paleontology. 2014a. Advanced Specimen Search, Mehrten Formation. Available: <<http://ucmpdb.berkeley.edu/advanced.html>>. Accessed: November 19, 2014.
- University of California Museum of Paleontology. 2014b. Advanced Specimen Search, Riverbank Formation. Available: <<http://ucmpdb.berkeley.edu/advanced.html>>. Accessed: November 19, 2014.