

A PALEONTOLOGICAL SURVEY AND ASSESSMENT  
OF THE PARADISE HILLS PROPERTY, SAN BERNARDINO  
SAN BERNARDINO COUNTY, CALIFORNIA

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## INTRODUCTION

A study of the approximately 420 acre parcel known as the Paradise Hills Property was conducted by Heritage Resource Consultants to locate and evaluate paleontological resources on the property. This study was commissioned by Yvonne Neal and Associates, in preparation for planned development of the property. The goals of the project were to determine if paleontological resources occur on the property, the significance or potential significance of such resources, and to make recommendations for the conservation of such resources if they are subject to future impacts through development. The study was performed in conformance with requirements of the County of San Bernardino and Appendix K of the California Environmental Quality Act.

This report presents the findings of the study of the project site. It is based on a field survey, survey of the professional literature on the paleontology of the region, and a check of paleontological site records held by three regional scientific institutions.

## PROJECT LOCATION AND SETTING

The study property is an irregular-shaped parcel which occupies parts of Sections 4, 5, 8, and 9 in Township 1 North, Range 4 West, immediately east of the California State University, San Bernardino campus (Figure 1). The property is bounded by open lands with some flood control features on the west side.

The property is west sloping land which and presently vacant. Most of the area consists of fields located on the alluvial fan at the mouth of Badger Canyon. The northeastern part of the property includes the lower half of Badger Canyon from the relatively narrow and steep canyon mouth to the upper portion of

the central meadow and surrounding slopes. The property is covered by inland sage scrub, dominated by buckwheat. Part of the western portion has been altered by the removal of brush near the southern edge of the property. Two settlement areas, now abandoned, are present on the property. One is the ruin of a house and outbuildings on the alluvial fan at the mouth of Badger Canyon. The other is located at the southeastern edge of the meadow within the canyon. It includes foundations, a swimming pool, trees and associated vegetation.

#### METHODS

The methods used in this study included: 1) review of the records of known paleontological sites in the region, 2) a survey of paleontological and geological publications for the project region, and 3) a sample survey of approximately ten percent of the property.

A records check was obtained from the Department of Earth Sciences at the San Bernardino County Museum. The museum maintains regional paleontological site records, supporting maps, and documents. The check was used to determine if paleontological sites had been previously identified on the property, or if the property had been previously surveyed for paleontological resources and a report filed.

The literature survey consisted of a review of the professional literature pertaining to the project region, including selected unpublished documents produced during surveys of other properties in the region. Geologic maps of the region were consulted and analyzed to make initial estimations of the potential for paleontologic resources on the property and for the purpose of planning field studies.

The field survey included the examination of most of the property. The survey was conducted as a walk over, surface examination. The walk over consisted of systematic examination of individual landforms or features (eg.- hillsides, flats, etc.). Exposed geologic outcrops were examined in detail.

### GEOLOGY

The study area is located on the east side of the lower Cajon Wash, north of the Shandon Hills. The property straddles the point where the edge of the San Bernardino Mountains dips below the alluvial deposits which fill the valley of the Santa Ana River and its tributaries (Rogers 1967). Earlier geologic studies of the area are summarized by Rogers (1967). More recent geologic mapping of the area by the U.S. Geologic Survey (Miller 1979; see also Bortugno and Spittler 1986) has provided more detailed and accurate information about the distribution of rock units on the study property. For the purposes of this study, the mapping by Miller (1979) was used to determine rock unit distributions.

The northeastern part of the property which is comprised of Badger Canyon and the western slopes of the San Bernardino Mountain Range includes igneous and metamorphic rocks. These are covered by coarse sedimentary deposits which fill the valley forming its central meadow. The valley fill is comprised of angular cobble to boulder-sized clasts, with coarse pebbly sands which cover the surface. The southwestern part of the property is covered by the alluvial fan emanating from the mouth of Badger Canyon. There are remnants of older terrace deposits along the foot of the mountain slopes at the upper edge of the fan in the northwestern part of the property. The metasediments which form Badger Hill, which bounds the southern edge of the property, probably underlay at least part of the study property.

The natural rock units are exposed in numerous outcrops and road cuts throughout the property. The igneous rocks are part of the Precambrian Igneous Complex, predominantly composed of light colored granitics. These are characterized as Precambrian, but may be younger (Rogers 1965). These are overlain by meta-limestone/dolomite deposits of the Paleozoic Marine Sedimentary and Metasedimentary Complex found throughout much of the region (Rogers 1967).

A small portion of the property contains Tertiary sediments now assigned to the Potato Formation (Miller 1979; Bortugno and Spittler 1986). These sediments are located on the hillside southeast of the mouth of Badger Canyon. They extend along the hillside to the property boundary and beyond. Fossil plants from this formation indicate that it is Late Miocene in age, perhaps belonging to the Clarendonian (Land Mammal Age) (Axelrod 1979).

The Quaternary terrace and alluvium are relatively flat lying sediments and deeply weathered gravels described as older alluvium (Rogers 1967). The Older Alluvium can be divided into three subunits (Miller 1979). These include deposits perched in the hillsides adjacent to Badger Canyon, the fan deposits at the mouth of Badger Canyon, and valley fill which outcrops in the western part of the property, and at the edge of the fan deposits in the southern part of the property.

The sediments in the different subunits of Older Alluvium are all relatively similar, being derived mostly from the San Bernardino Mountains. The terrace deposits, which are part of the valley fill, are considered to have been deposited during the Pleistocene age, and are believed to be about 50,000 years old (Hardin et al 1986). Most of the rest of the Older Alluvium is probably similar in age, excepting the perched deposits. The sediments in the Older Alluvium on the property consist of brown

to reddish silty sands with pebble to boulder-sized clasts. Many of the larger clasts are derived from local sources. The alluvium consists of sands, gravel, and larger clasts of igneous and metasedimentary rocks derived from Badger Canyon and adjacent slopes. Most of the alluvium is unconsolidated, with clasts varying from subangular to rounded.

The creek bed running out of Badger Canyon, and its subsidiary channels contain Recent Alluvium.

### RESULTS

The search of the paleontological literature, and the records which are held by the San Bernardino County Museum (Reynolds 1990) indicated that the property has not been previously surveyed for paleontological resources. There is no record of paleontological resources on or immediately adjacent to the study property. However, the Potato Formation and the Pleistocene Older Alluvium have yielded plant and vertebrate fossils. The closest occurrence is a fossil locality in the alluvium a few miles to the north in the near Cajon Pass. Both the Potato Formation and Older Alluvium are considered to be paleontologically sensitive. No paleontological resources were found during the field inspection conducted as part of this study.

### PALEONTOLOGIC SENSITIVITY

The fossil bearing potential of the rock units located on the study property is variable. Due to the mode of origin of the granitic rocks belonging to the Precambrian Igneous Complex, and the Paleozoic Marine Sedimentary and Metasedimentary Complex,

there is no possibility that paleontological remains are present in them.

The Potato Formation has yielded a variety of plant remains, including a record of a pine cone, which is unusual (Axelrod 1979). The vertebrate fauna is limited, but includes a species of extinct antelope (Reynolds 1990). The sediments of the Potato Formation on the study property are sufficiently fine grained to contain fossil remains, and are considered to be paleontologically sensitive (moderate).

Fossils have been found in terrace deposits equivalent to those on the Paradise Hills property at a site near Cajon Pass (Reynolds 1990). Similar aged deposits have yielded two paleontological sites near County Line Road, to the south east of the study property. Abundant remains of Rancholabrean animal species have been recovered from those sites including gastropods, turtle, reptiles, birds, rodents, rabbits, and mammoth elephant (Reynolds 1988). There is a possibility that these types of fossils may be discovered in the sediments on the study property, even though no fossils were observed in outcrops on the study property during the survey. The potential for encountering fossils in these sediments is considered to be low to moderate.

No fossils or sub-fossils have been recorded from the alluvium in the region. Although paleobiological remains may occur in these sediments, as they may in any other sediment, the likelihood of any being recovered from the study property is minimal.

#### RECOMMENDATIONS

The following plan of mitigation is recommended for the Paradise Hills property. Since there is a possibility that significant

paleontological resources may be impacted if grading occurs on the property, a paleontologic grading monitor should be present during grading of the Potato Formation sediments and the Older Alluvium. The monitoring of the Older Alluvium should be focused on the terrace deposits and valley fill. The following procedures should be implemented during monitoring:

1. The monitor must be empowered to temporarily halt or redirect excavation equipment while fossils are being removed. The monitor should be equipped to speedily collect specimens if they are encountered.
2. The monitor, with assistance if necessary, should collect individual fossils and/or samples of fossil-bearing sediments. If specimens of small animal species are encountered the most time and cost efficient method of recovery is to remove a selected volume of fossil-bearing earth from the grading area and stockpile it off-site for later processing.
3. Fossils recovered during earthmoving or as a result of screen-washing of sediment samples should be cleaned and prepared sufficiently to allow identification. This allows the fossils to be described in a report of findings and reduces the volume of matrix around specimens prior to storage, thus reducing storage costs.
4. A report of findings should be prepared and submitted to the public agency responsible for overseeing developments and mitigation of environmental impacts upon completion of mitigation. This report would minimally include a statement of the types of paleontologic resources found, the methods and procedures used to recover them, an inventory of the specimens recovered, and a statement of their scientific significance.

5. The paleontological specimens recovered as a result of mitigation should be donated to a qualified scientific institution where they would be afforded long term preservation and can be retrieved for further scientific study.

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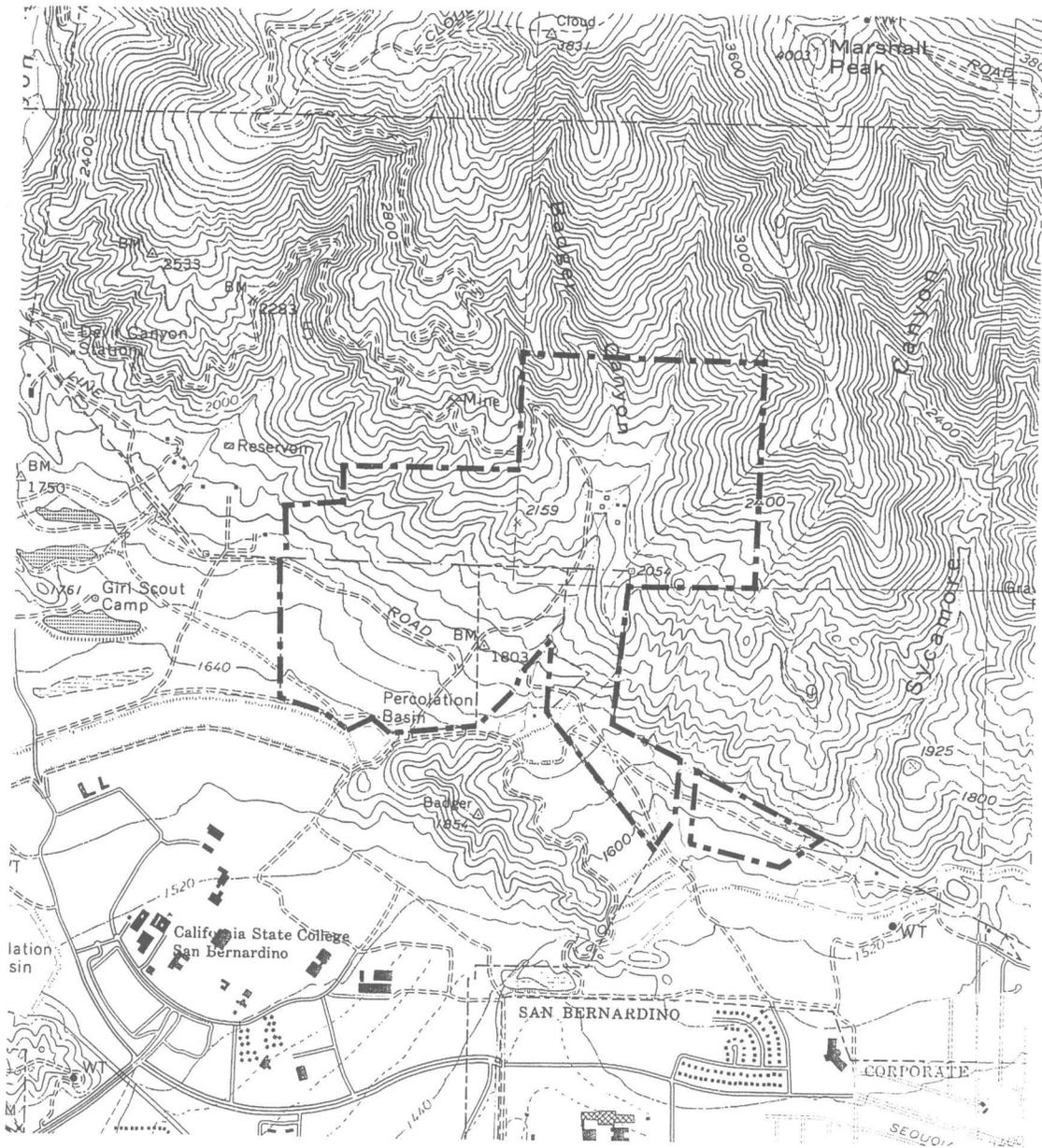


Figure 1. Location map of the Paradise Hills Property. Scale 1=24,000.

