

## MONTARA STATE BEACH, CALIFORNIA

### Introduction

In this field exercise you will examine, measure, and describe strata exposed in the beach cliffs at Montara State Beach. This succession unconformably overlies a portion of the Late Cretaceous Montara Mountain pluton (Figure 1). The unit is not formally named, but you can call it the Montara formation in your column. The discovery of the remains of a saber tooth cat (*Smilodon*) in the upper part of the succession, as well as the poorly lithified nature of these strata, suggest that these deposits are Pleistocene in age. The facies record deposition in multiple environments through time. Although this is a tectonically active area, and structurally complex, the strata are relatively young.

The ultimate objective is to identify stratigraphic units and to interpret the depositional environments that produced those units. In addition, you must construct a geologic model that explains the existence of those environments in space and time, relative to changes in base level. You should think about how to frame this as a compelling broad question, given interesting aspects of the geological setting for deposition. Since this is your final field effort for EART120, you are expected to complete this field survey and interpretation with minimal assistance.

**You are required to write a full report based upon your work today** (described more completely below). The format for the stratigraphic column is largely the same as the Pigeon Point project, except you should add a column to the right side where you will draw an interpreted base level curve and label any sequence stratigraphic surfaces and systems tracts. The size of the other columns can be adjusted as necessary to provide space. **Your report should follow the format provided on page 5.**

### Assignment

1. For this exercise you will collect the necessary information for a detailed stratigraphic column of the sedimentary section exposed at Montara State Beach. Your activities will include:
  - measuring the vertical dimensions of the succession exposed above the basement rock,
  - making detailed observations of the lithologies, sedimentary textures and structures, and paleocurrent directions (if/where possible) of each bed,
  - dividing the succession into distinct lithofacies (units), and interpreting the associated depositional environments,
  - reconstructing a base-level curve and interpreting the sequence stratigraphy of the succession.

You will eventually develop a model that explains the juxtaposition of these environments. As such, you are strongly encouraged to make sketches of unusual or

interesting parts of the section. Pay careful attention to the nature of bedding planes, and small-scale sedimentary structures, especially those not observed in our earlier field trips.

2. Your observations and interpretations will be presented in a **written report**. The format of this report should be as follows; an abstract, an introduction, and sections on methods, results (i.e., step-by-step description of each lithofacies), discussion, and a list of any references that you cite (see below).

The discussion in your report must focus on

- your **interpretations** of the depositional environment of each facies,
- your **justifications** of these interpretations, as supported by your observations,
- your **model** explaining the juxtaposition of the environments in the context of reconstructed changes in base level,
- your **description** of depositional and tectonic history of the area as it is relevant to the above three points.

Outcrop sketches may prove helpful. You must provide compelling evidence for all of your conclusions and interpretations.

3. Construct a **stratigraphic column at 1 inch = 3 m scale** that includes the entire succession. Follow the same format as the last project but also add a base level column on the right side. See eCommons for a template.

As always, each student should write his/her own report and construct his/her own column, and all interpretations must be supported by your observations.

#### **DEADLINES:**

**Your completed report is due Friday, June 3 by class at 12:30. Submit electronic documents to eCommons and any printed material at class or to my office or mailbox.**

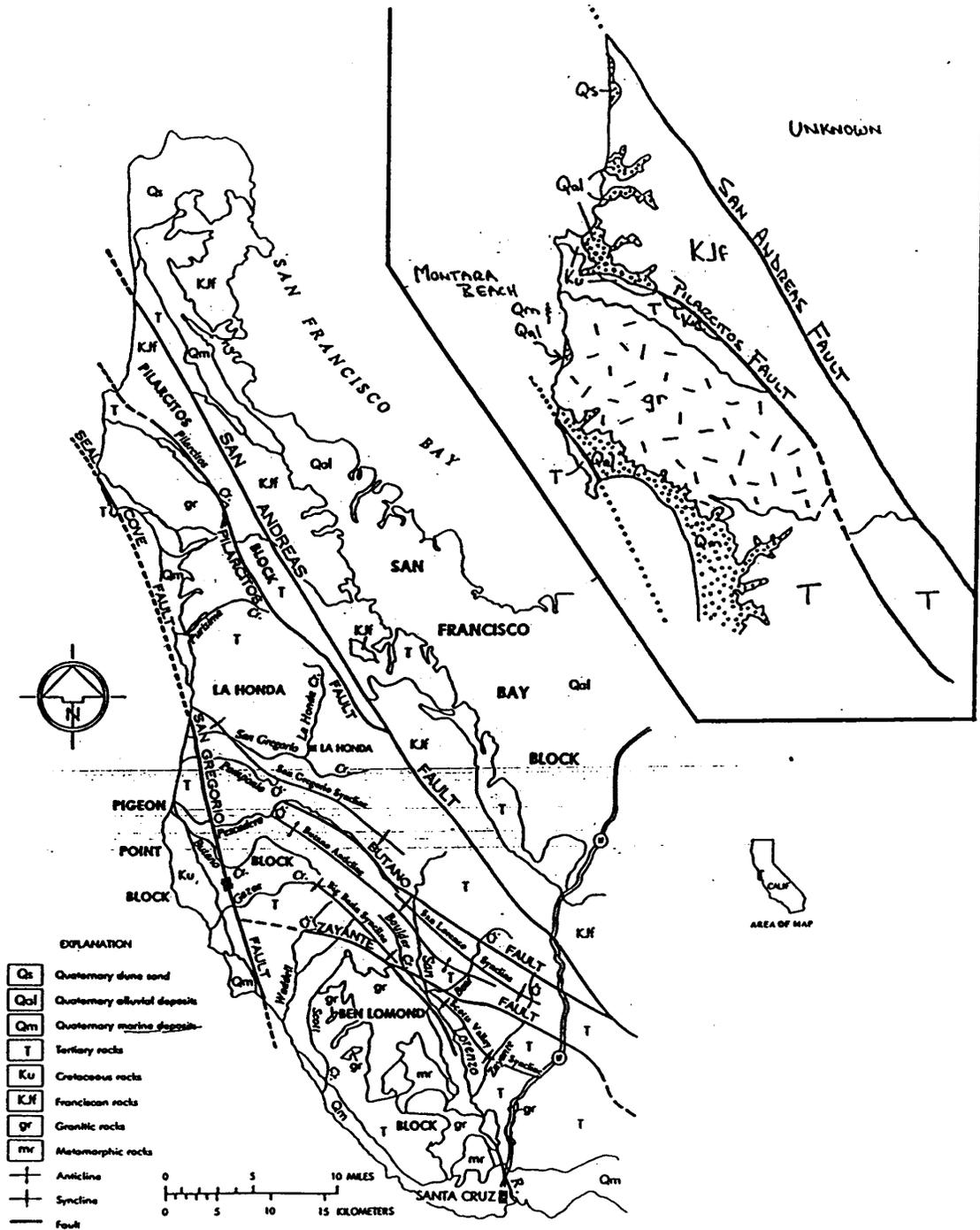


Figure 1. Simplified geologic map of central California; inset shows detailed geology of the Montara Beach area.

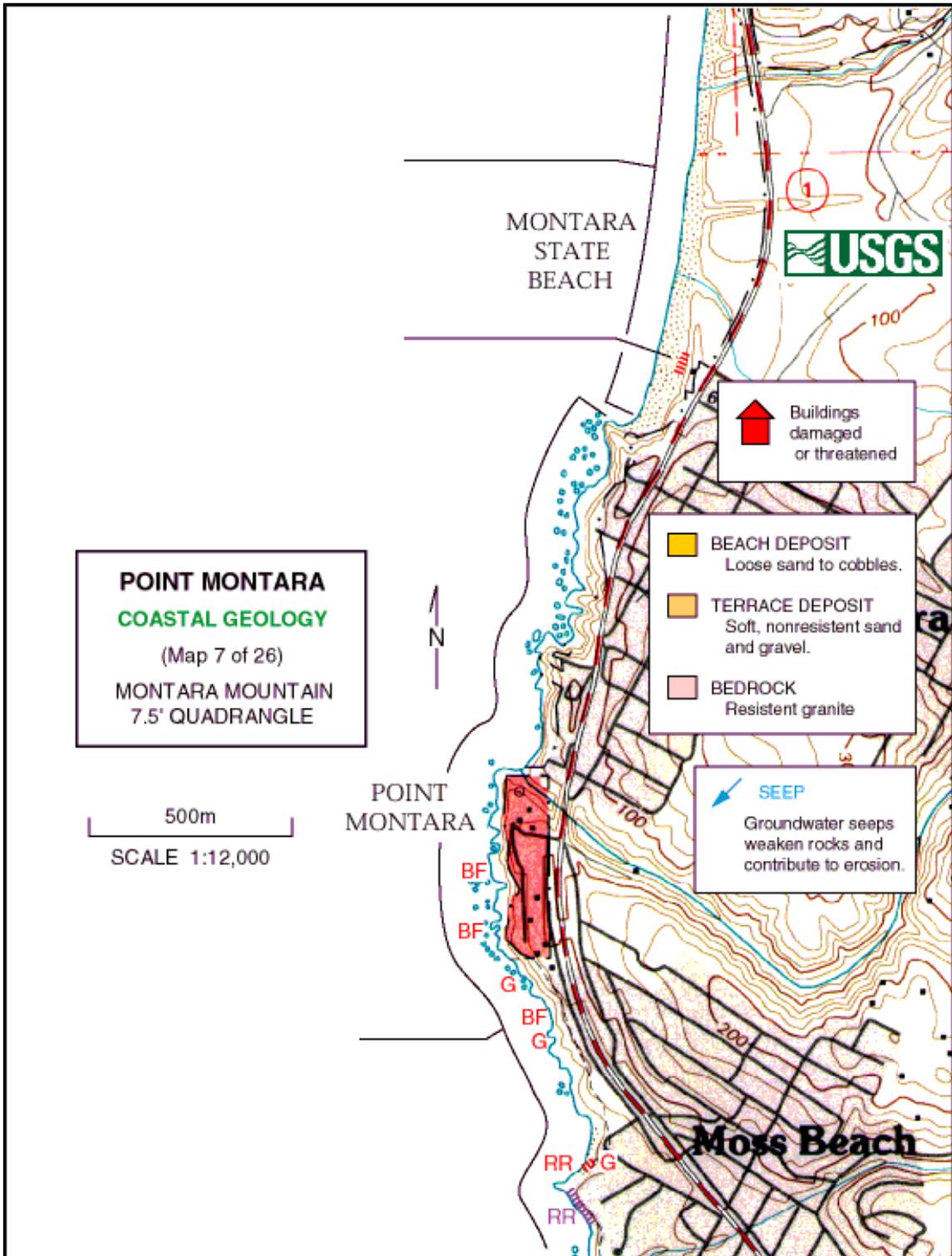


Figure 2. Location and topographic map of Point Montara.

**GUIDELINES FOR ORGANIZING YOUR WRITTEN REPORT:****TITLE:**

- **Concise but descriptive. Should accurately represent what is in the report.**

**ABSTRACT (250 words or less – firm limit):**

- **State main objectives** (What did you investigate?)
- **Summarize work** (What did you do...measured & described?)
- **Summarize the most important results.** (What did you find out...facies?)
- **State major conclusions and significance.** (What do your results mean...what happened here?)

**INTRODUCTION (<400 words, rough guideline):**

- **Summarize** relevant research and background information (age, geological setting, etc.) to provide context for your later interpretations. You may need to write this last, because your ultimate interpretation of the facies and base level changes will indicate the necessary background information.
- **Describe** the problem investigated.
- Briefly **describe** your *research question(s)* and *strategy to address this question*

**METHODS (<200 words, rough guideline):**

- Geographic location
- Very briefly explain the method of measuring the section, etc .

**RESULTS (~1000 words, rough guideline):**

- Thickness of the section
- Number of units defined, their thickness, and key criteria for placement of unit boundaries
- Character of the unit contacts and/or bedding planes (planar, wavy; sharp, erosive)
- Key distinguishing characteristics of beds/units (lithology, constituents, sedimentary textures, grain sizes/sorting, and bedding structures, anything else important)
- DON'T interpret results!!

**DISCUSSION (~1000 words, rough guideline):**

- Describe the depositional facies represented by each unit, and provide justification for this interpretation. Cite relevant sources for interpretations.
- Time dependent evolution of the facies, and genetic relationships (for example, if fluvial or marine, shallowing/deepening upward).
- Interpret changes in base level and discuss important sequence stratigraphic surfaces.
- Local processes that contributed to the changes in deposition and base level.
- Implications?

**(if appropriate) CITATIONS and CITATION LIST**

- CITATION LIST arranged alphabetically, and in a standard format (use the citation style in on page 19 of the EPS writing document online:  
[http://eps.ucsc.edu/academics/undergrad-studies/eps\\_writing\\_guidlines.pdf](http://eps.ucsc.edu/academics/undergrad-studies/eps_writing_guidlines.pdf)).

**(if desired) FIGURES AND FIGURE CAPTIONS**

- One figure and caption per page at the end of the report (like in this handout).