

GEOLOGY 21B EXERCISES

Do you have to be an expert and have taken other classes to succeed in this class? To get something out of the fieldwork? Everyone will get something different commensurate with their starting level. Relax. It's okay if some know the names of rocks and others don't. One size fits all class means some will know more than you – some less. Just enjoy. Class is designed for everyone.

SCIENCE = observation, thinking, testing, and asking WHY!!! Question everything!

What makes a good scientist? Field scientist?

A. OBSERVATION ACTIVITY:

Find a pile of rocks. Collect 6 people. Each person pick up one rock. Everyone has 5 minutes to draw and describe their rock as best one can. Be sure to include an appropriate scale. **Goal: good enough description for someone to be able to pick your rock from a pile.**

Return your rock to the pile. Place your description on the table in a pile with all the other rock descriptions for your group. Shuffle them. When all 6 rocks and descriptions are returned, each group will rotate to another pile, where now your goal is to pick one of the rock descriptions and then work as a team to match correctly the 6 rocks with their descriptions.

ALL-GROUP DISCUSSION: What makes a good description? Why is good observation and description essential for science? How can you be a better observer?

ALL-GROUP DISCUSSION: What is the difference between observation and evaluation? Were there any examples of descriptions that were actually EVALUATIONS? How could you fix?

B. San Francisco Rocks ACTIVITY:

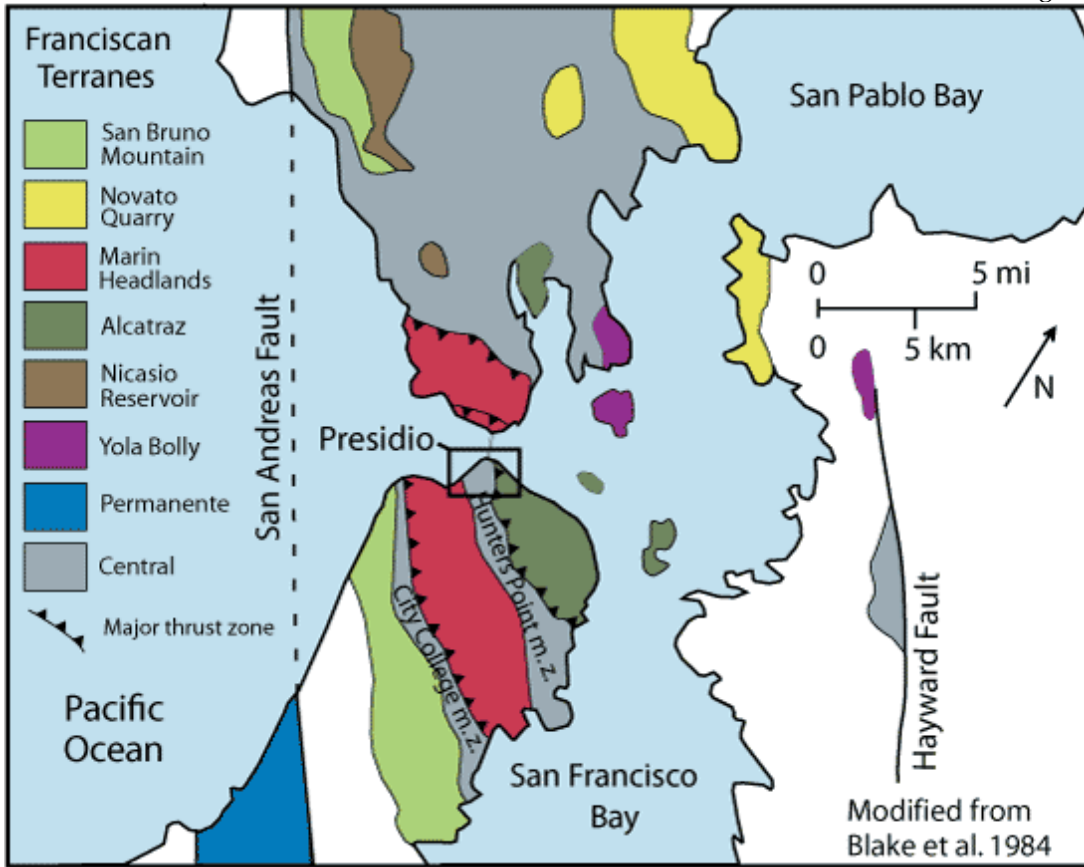
Goal: to identify these rocks during upcoming field trip. Take the rocks from each group and rearrange them into six piles across the room with similar rocks. Work as one large group to ensure that you end up matching all the similar rocks and ending up with only six piles. Match them to the names below. Then separate into six groups and on a blank sheet of paper, write the name of the rock at the top of the page and then list under it all the descriptors you think work for that rock. You have 3 minutes. Then rotate as a group to the next set of rocks. Leave your sheet of paper behind with the last group of rocks, and in the new group, review the description already provided and add more or modify it based on what your group sees. Then move onto the next group after 3 minutes, continuing until you end up where you started. Review what others have added and pick a spokesperson who will read the completed description. Each group will then share their descriptions, while everyone annotates their own notes below. Goal - have a way to recognize those rocks later in the field.

Rock name	DESCRIPTION
Sandstone	
Mudstone	
Chert	
Basalt	
Greenstone	
Serpentinite	

C. San Francisco GEOLOGY ACTIVITY:

Goal: get to know local geologic processes.

- VIDEOS on Plate Tectonics.
- DISCUSSION of previous subduction and the terrane accretion that led to SF Geology.
- DISCUSSION of Plate Tectonics and San Francisco's Location TODAY, including the San Andreas Fault System.

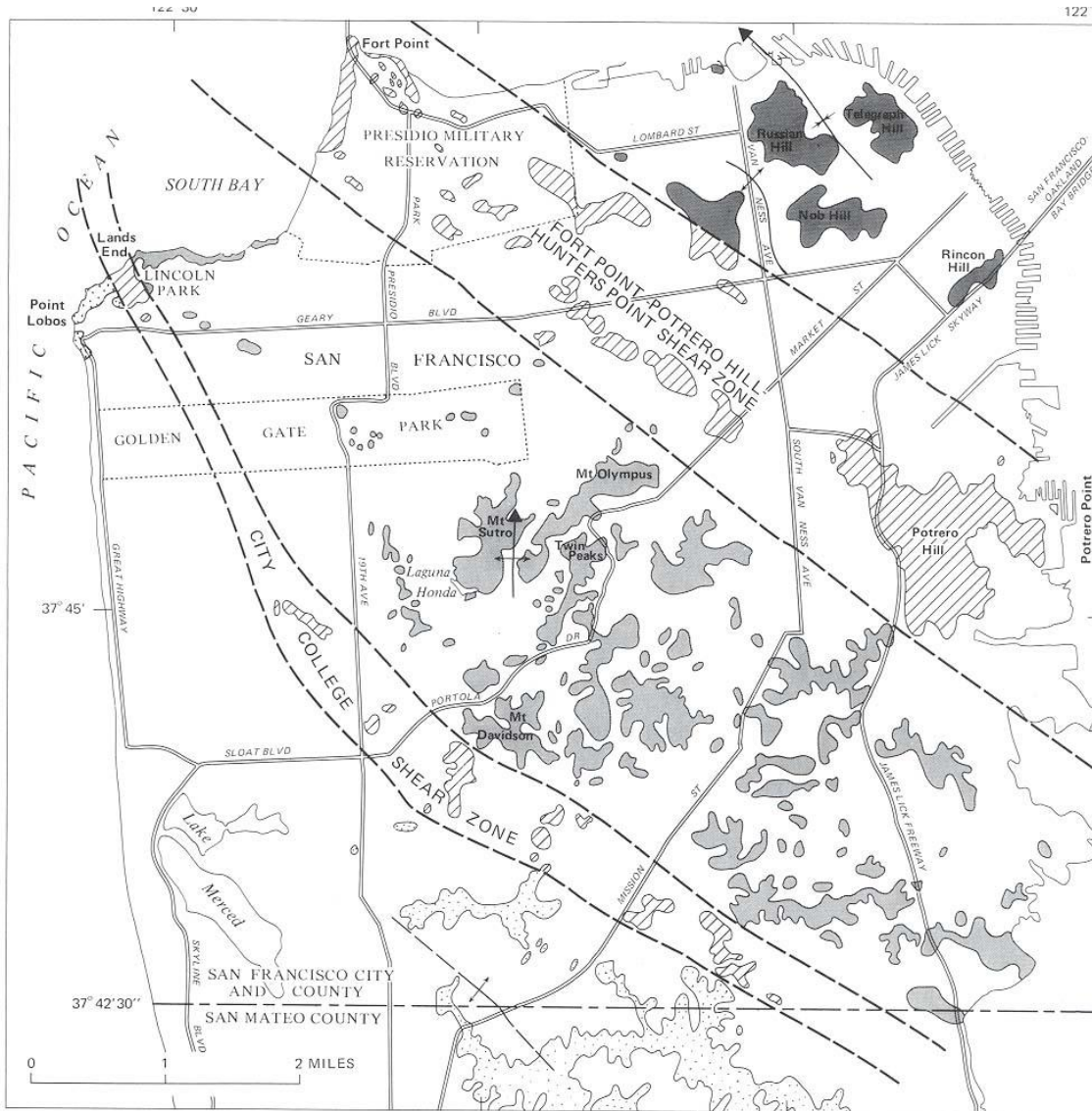


List the rocks you would expect to find within each of the following terranes:

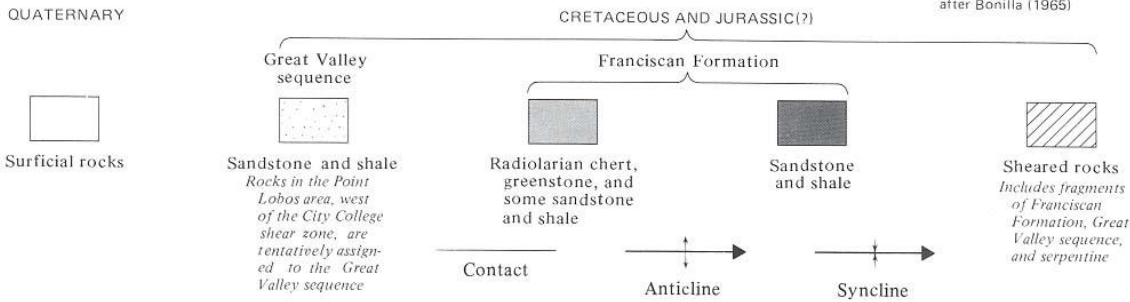
Goal: to identify these terranes during upcoming field trip.

Terrane name	ROCKS YOU WILL FIND
San Bruno Mtn.	
City College Melange	
Marin Headlands	
Hunter's Point Melange	
Alcatraz	

On the following map of SF, prior to the first field day, use colored pencils to lightly color in the boundaries between the 5 different terranes. Transfer field trip stops as best you can to this new map in order.

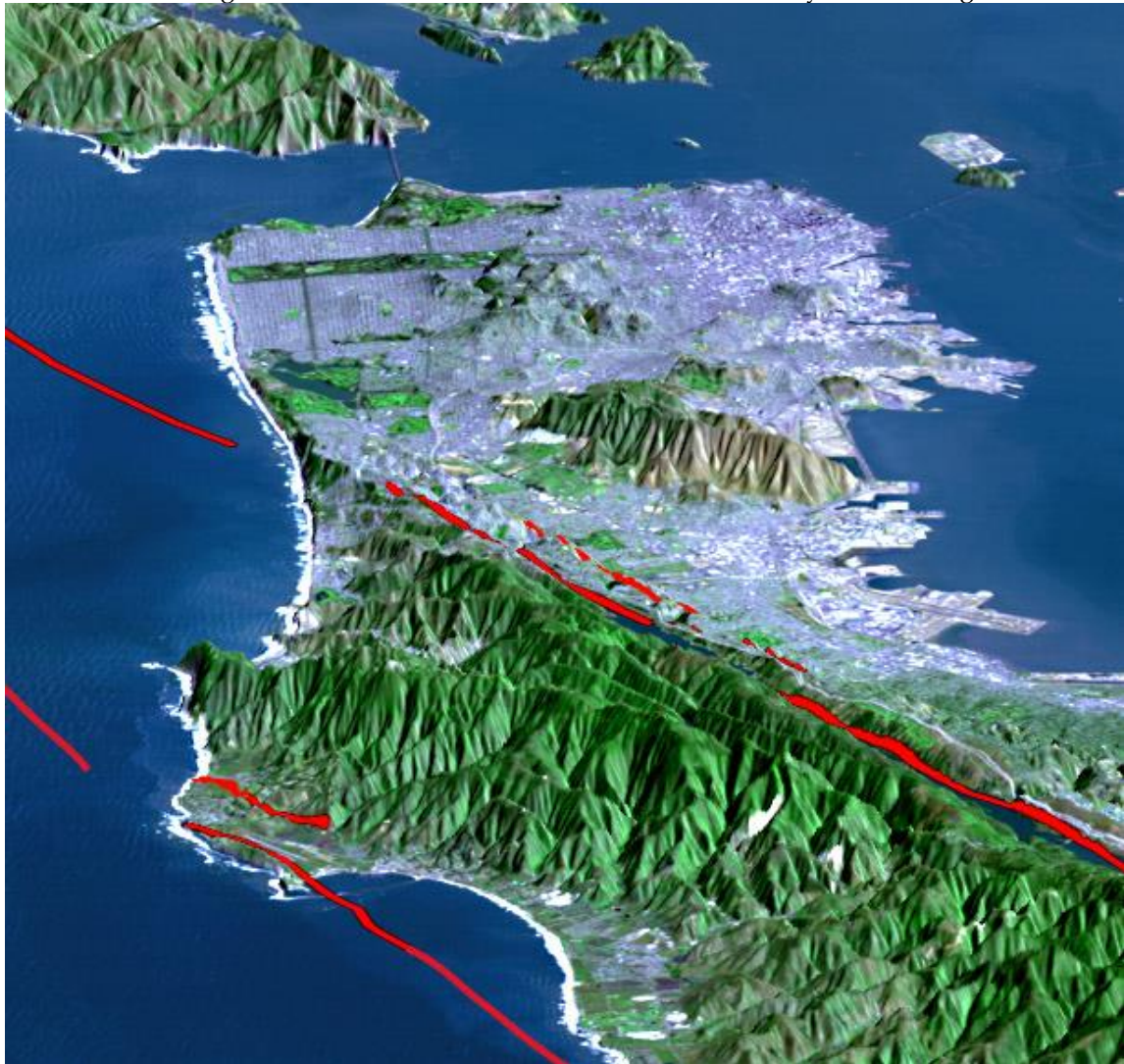


Geology in San Francisco
South quadrangle modified
after Bonilla (1965)





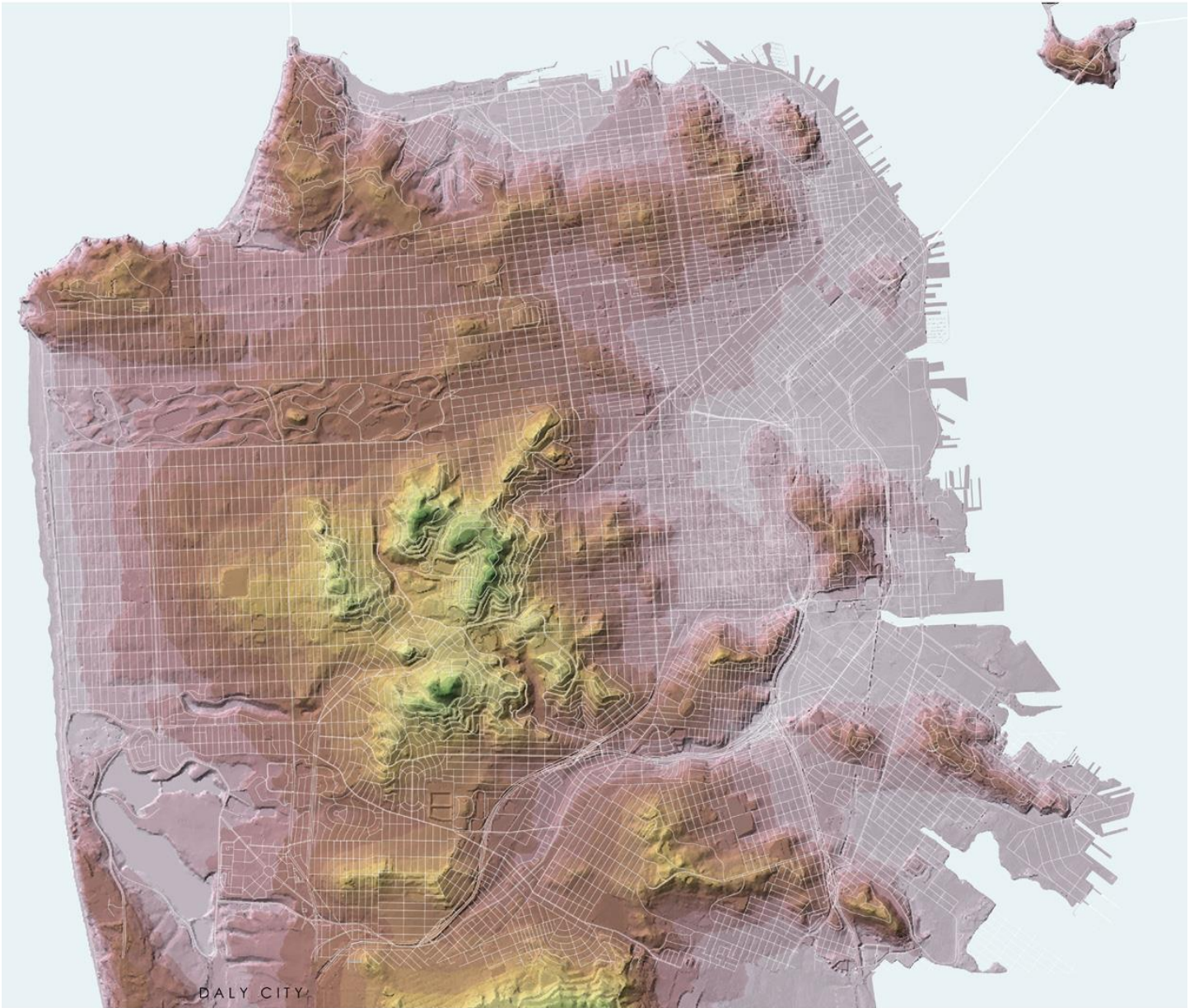
The San Andreas fault trace leaves the coast at Mussel Rock south of Fort Funston. It hits land again north in Bolinas, where it cuts across Point Reyes and then goes back to sea.



D. EROSION ACTIVITY

DISCUSSION of erosion of material (and isostatic uplift), with most resistant components remaining and creating mountains.

On the map below, draw in the San Andreas Fault where appropriate. Locate resistant mountains and group them by the terrane maps we've just reviewed (add the terrane boundaries from the previous maps). Label the terranes. These erosional remnant mountains are the locations you'd expect to find rocks of the given terrane (because they won't be covered by sediment). Use pencil!



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E. SAN FRANCISCO BAY AND ICE AGES ACTIVITY

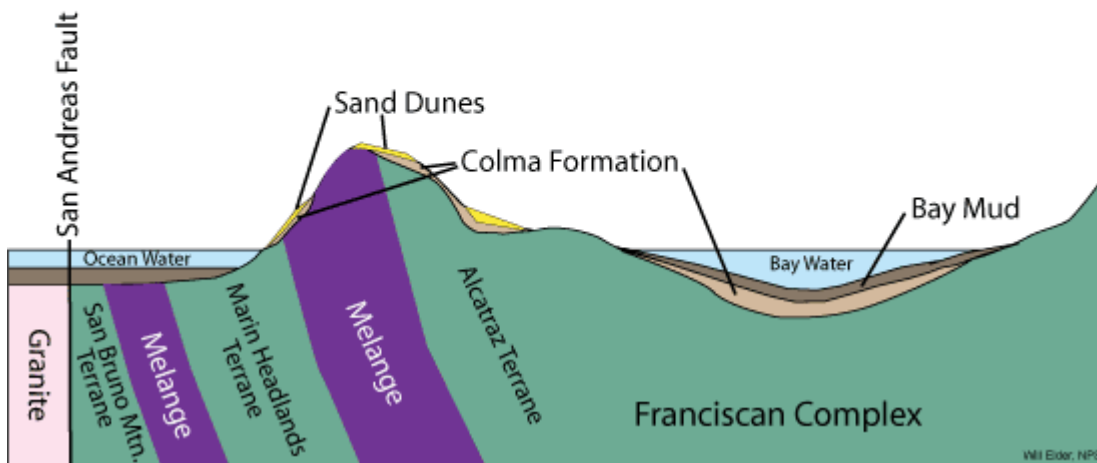
- Compare sand and mud samples and review earthquake shaking map
- DISCUSSION of ice ages causing SF Bay to alternately fill with Sand and Mud and thus sand dunes covering old material where land eroded low. ALTERNATING LEVELS OF OCEAN WATER

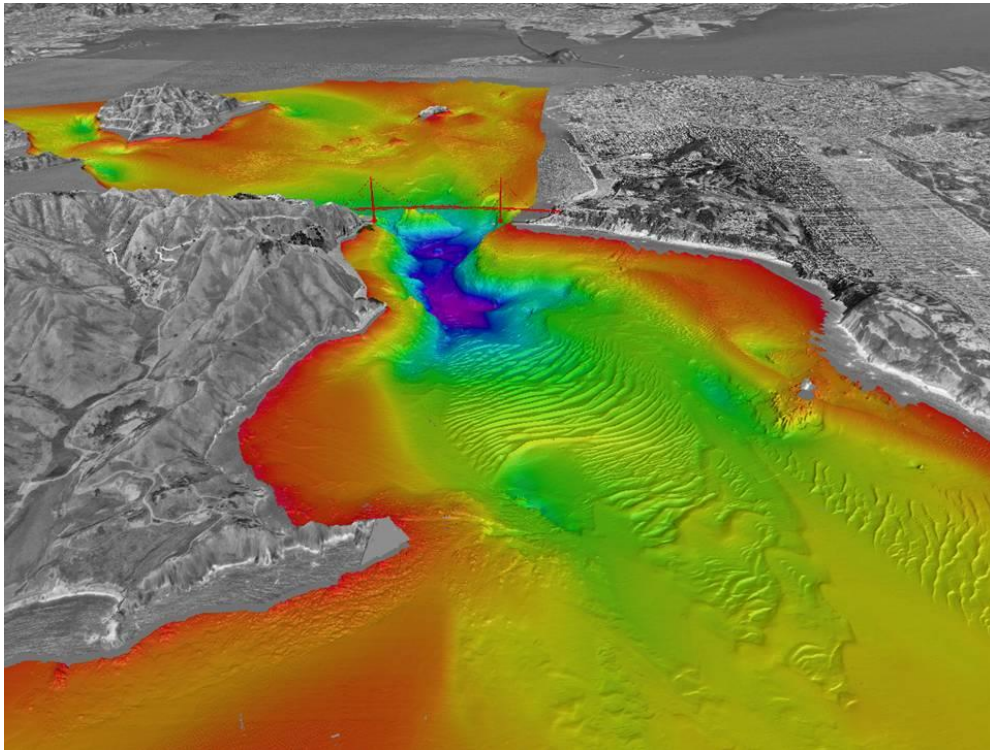
List the characteristics you would expect to see within each of the following sediment piles:

Goal: to identify these sediments during upcoming field trip.

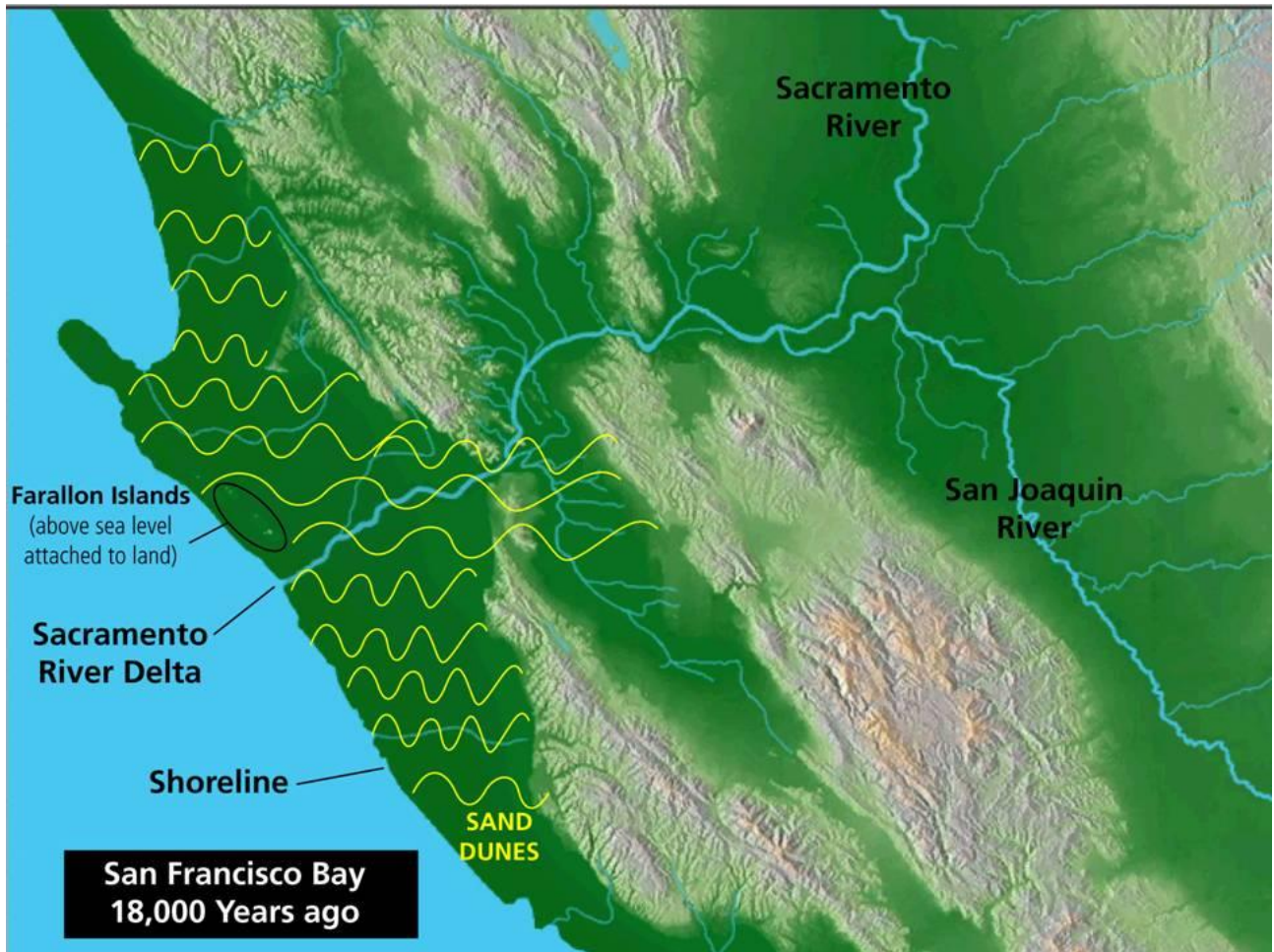
Sediment type	Sediment description	Circle appropriate glacial cycle point in which these sediments are deposited IN SF Bay.	Response during earthquake (circle)
Sand Dunes		Glacial (ice age) Interglacial	HIGH shaking Moderate shaking LOW shaking
Bay Fill		Glacial (ice age) Interglacial	HIGH shaking Moderate shaking LOW shaking

West - East X-Section Northern San Francisco Peninsula to Oakland





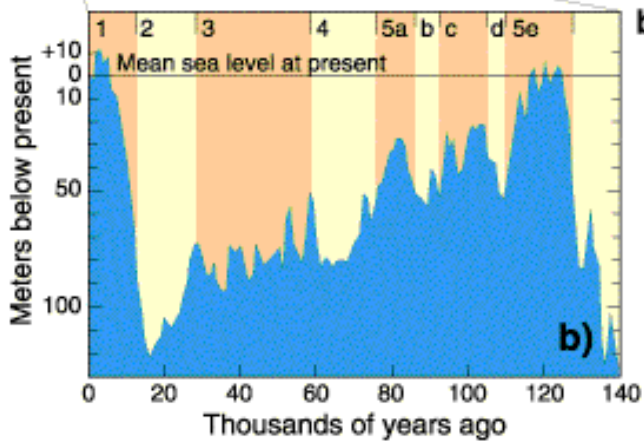
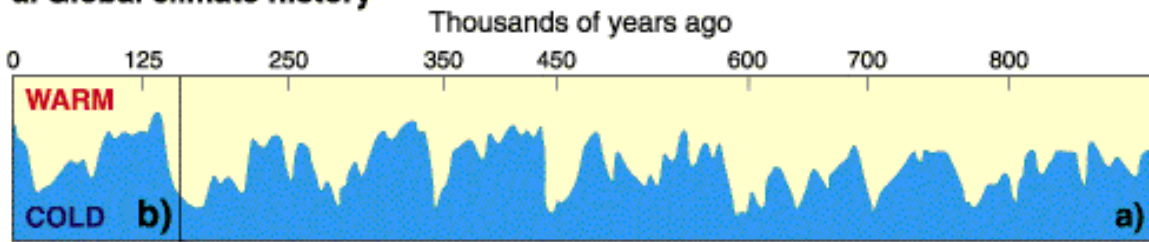
Side scan sonar view east under Golden Gate Bridge. Depth at center (under bridge) is 351 feet. Rest of image is on average 25 feet deep. Dunes represent underwater sand sculpted by incoming and outgoing tidal currents.





*Sand excavated from below a home in the Mission District.
These were the sand dunes that covered San Francisco before we built a city here.*

a. Global climate history



b. Late Quaternary sea-level history

