

ABIOTIC CONTROLS CA Central Coast

Dr. Doug Smith

School of Natural Sciences
Cal State Monterey Bay



8 November 2018



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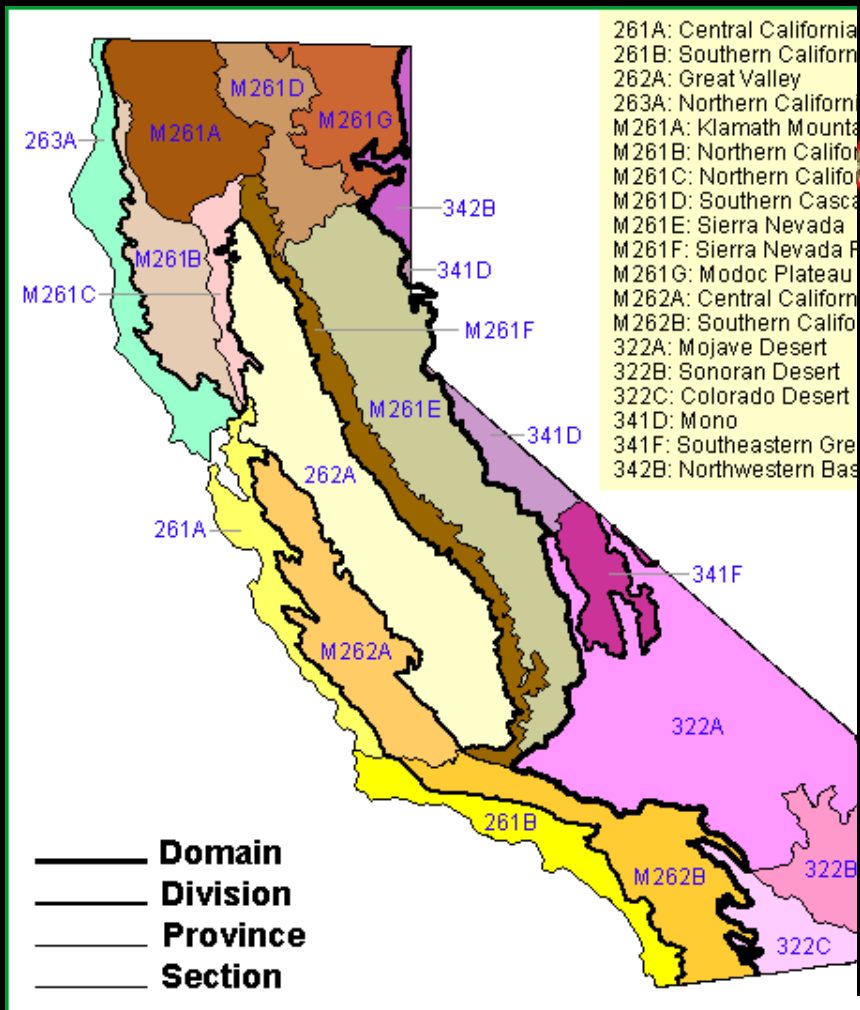
8 November 2018

Premise

The diversity and distribution of abiotic environmental factors influences the diversity and distribution of plant communities

Hyatt



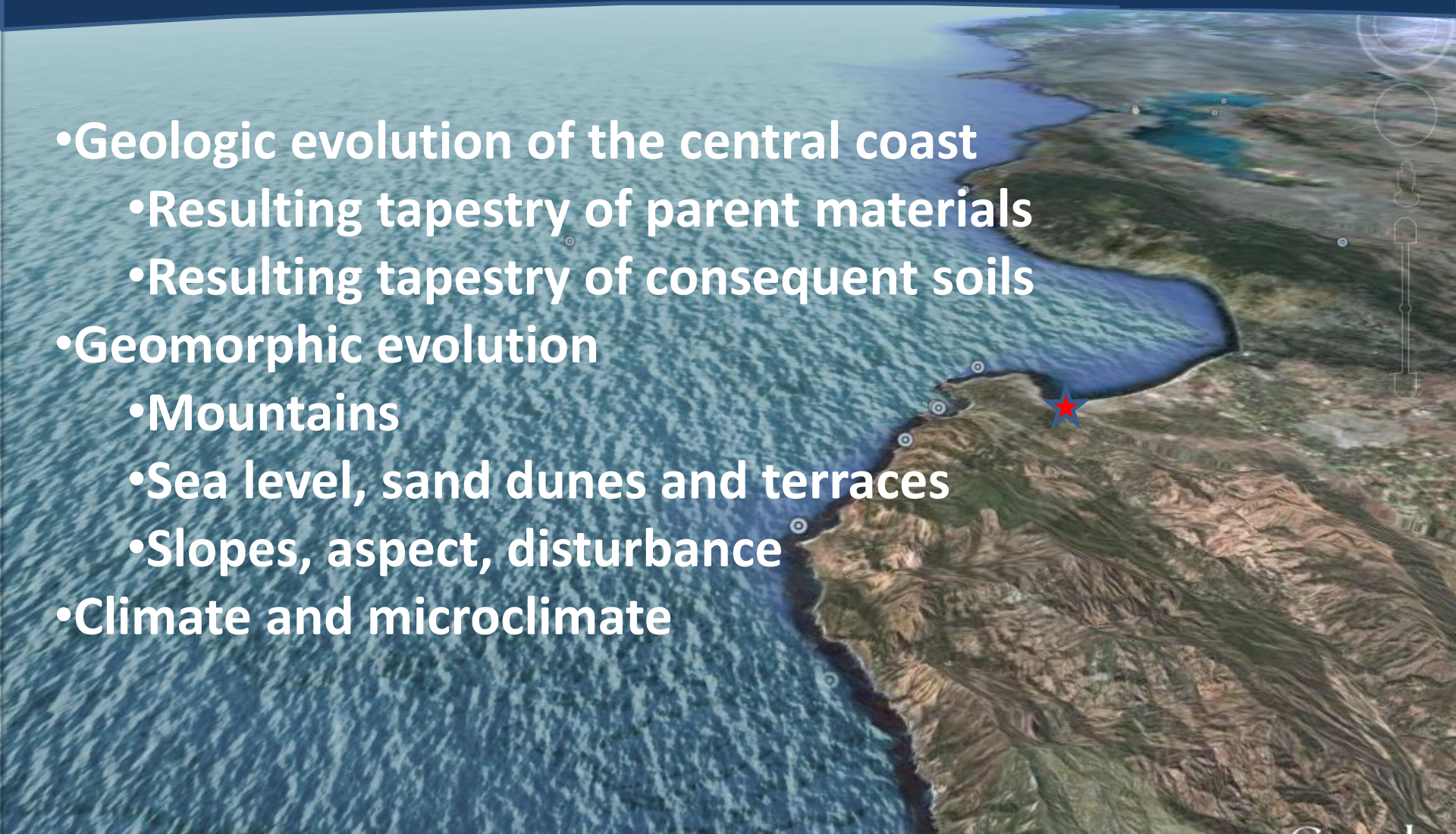


ABIOTIC CONTROLS

CA Central Coast



- Geologic evolution of the central coast
 - Resulting tapestry of parent materials
 - Resulting tapestry of consequent soils
- Geomorphic evolution
 - Mountains
 - Sea level, sand dunes and terraces
 - Slopes, aspect, disturbance
- Climate and microclimate



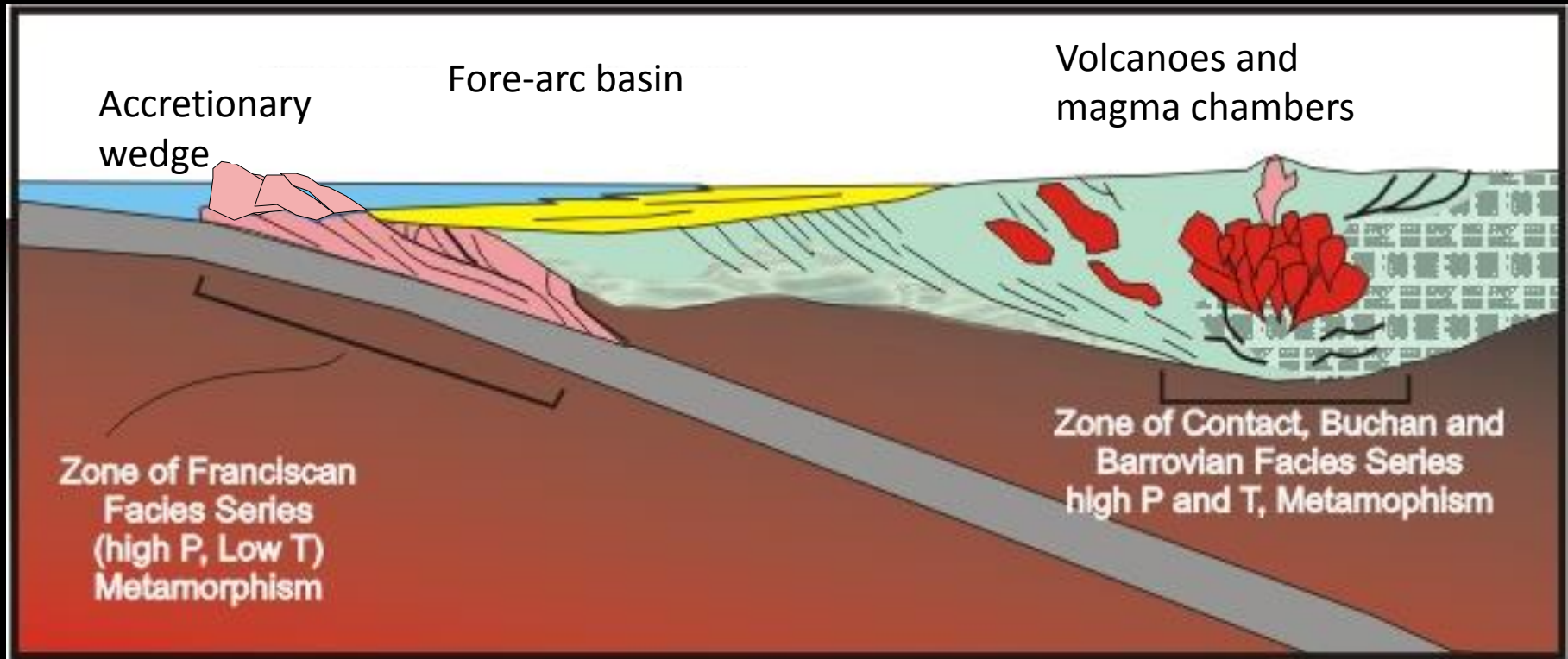
ABIOTIC CONTROLS

CA Central Coast



- Geologic evolution of the central coast
- 100 Ma Subduction
- 20 Ma northward translation 100's km
- 20 – 5 Ma Deformation, deep marine, shallow marine
- 2 Ma Mountains
- < 2 Ma Sea level, dunes and terraces

Schematic Subduction Zone



A couple of anatomical details:

Trench, **Fore-arc basin**, **accretionary wedge**



Asian Plate

Indian Plate

Indonesia

Modern example of ancient California
Subduction zone

Image IBCAO
© 2011 Cnes/Spot Image
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2011 GeoEye

48 M 322411.90 m E 9644934.50 m S elev 59 ft

©2010 Google

Eye alt 5429.24 mi

Indonesia
Analog for
California

trench

Image © 2011 TerraMetrics
© 2011 Cnes/Spot Image
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

48 M 241744.52 m E 9786241.66 m S elev 308 ft

Google

Eye alt 750.56 mi

Indonesia
Analog for
California

Volcanoes with granite roots

Fore-arc Basin
Accretionary Wedge

trench

Image © 2011 TerraMetrics
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48 M 241744.52 m E 9786241.66 m S elev 308 ft

Google

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Indonesia
Analog for
California

Sierra Nevada
Central Valley
Coast Ranges

trench

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EXPLANATION

SEDIMENTARY AND VOLCANIC ROCKS

- Cenozoic nonmarine (continental) sedimentary rocks and alluvial deposits
- Cenozoic marine sedimentary rocks
- Cenozoic volcanic rocks
- Late Mesozoic (latest Jurassic and Cretaceous) shelf and slope sedimentary rocks
- Late Mesozoic (latest Jurassic and Cretaceous) eugeoclinal rocks of the Franciscan Formation
- Mesozoic sedimentary and volcanic rocks older than the Nevadan orogeny; in places strongly metamorphosed
- Paleozoic sedimentary and volcanic rocks; in places strongly metamorphosed; includes some rocks of Triassic age in Klamath Mountains; includes some late Precambrian sedimentary rocks in Great Basin
- Precambrian rocks of all types including coarse-grained intrusives
- Pre-Cenozoic metamorphic rocks of unknown age

INTRUSIVE IGNEOUS ROCKS

- Granitic rocks chiefly of Mesozoic age
- Ultramafic rocks chiefly of Mesozoic age

Contact

Fault, dotted where concealed;
includes low-angle faults;
arrows indicate direction
of relative movement on
strike-slip faults



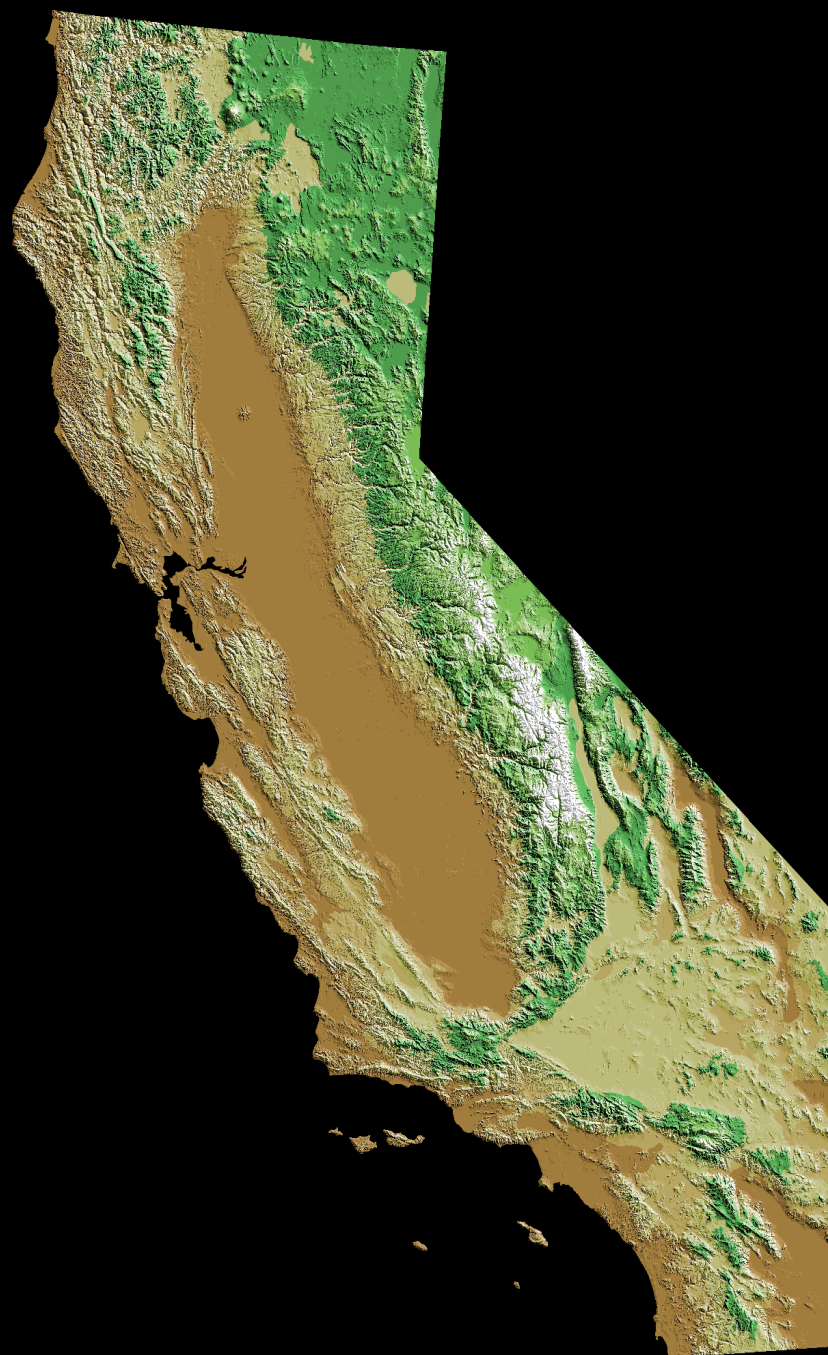
Base from U.S. Geological Survey, 1959

GEOLOGIC MAP OF CALIFORNIA

COMPILED BY U.S. GEOLOGICAL SURVEY
AND CALIFORNIA DIVISION OF MINES AND GEOLOGY










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0 50 100 MILES
SUBMARINE CONTOUR INTERVALS 500 AND
1000 FEET; DATUM IS SEA LEVEL

1966





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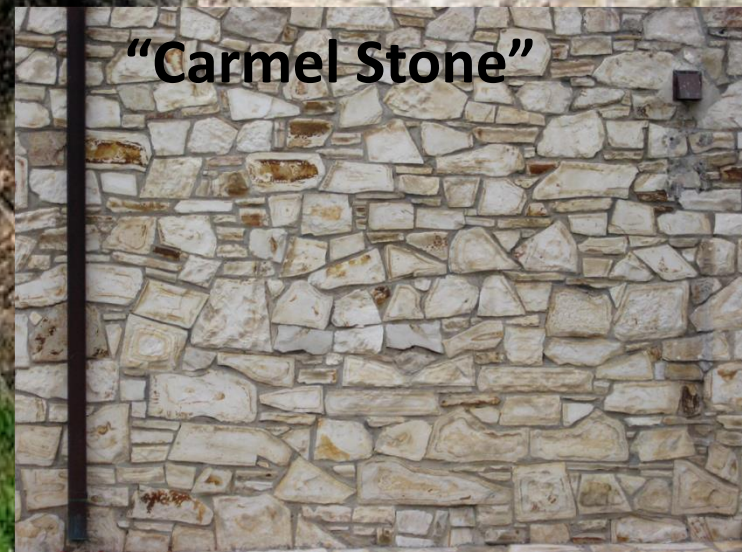
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1966

[animation](#)

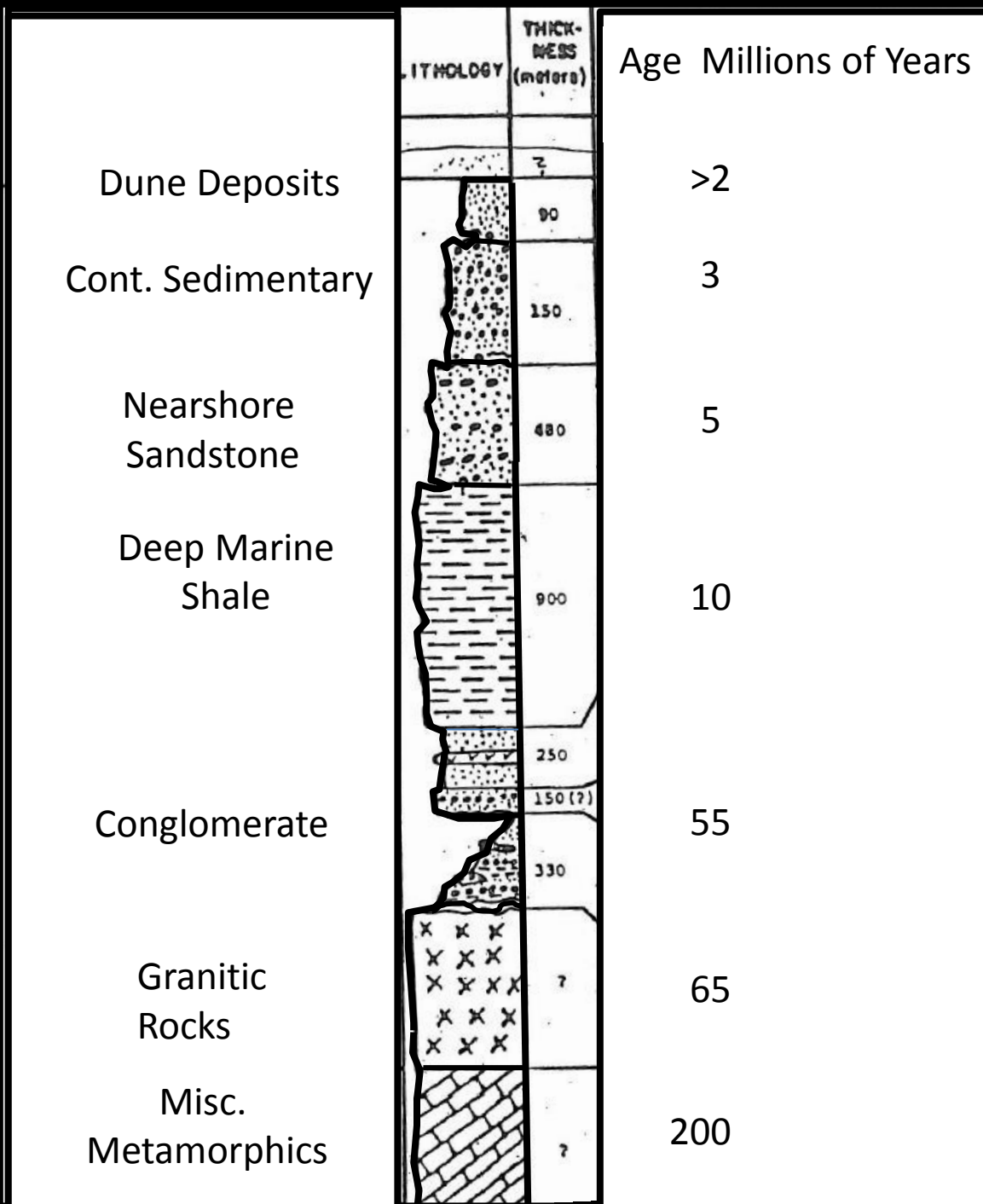


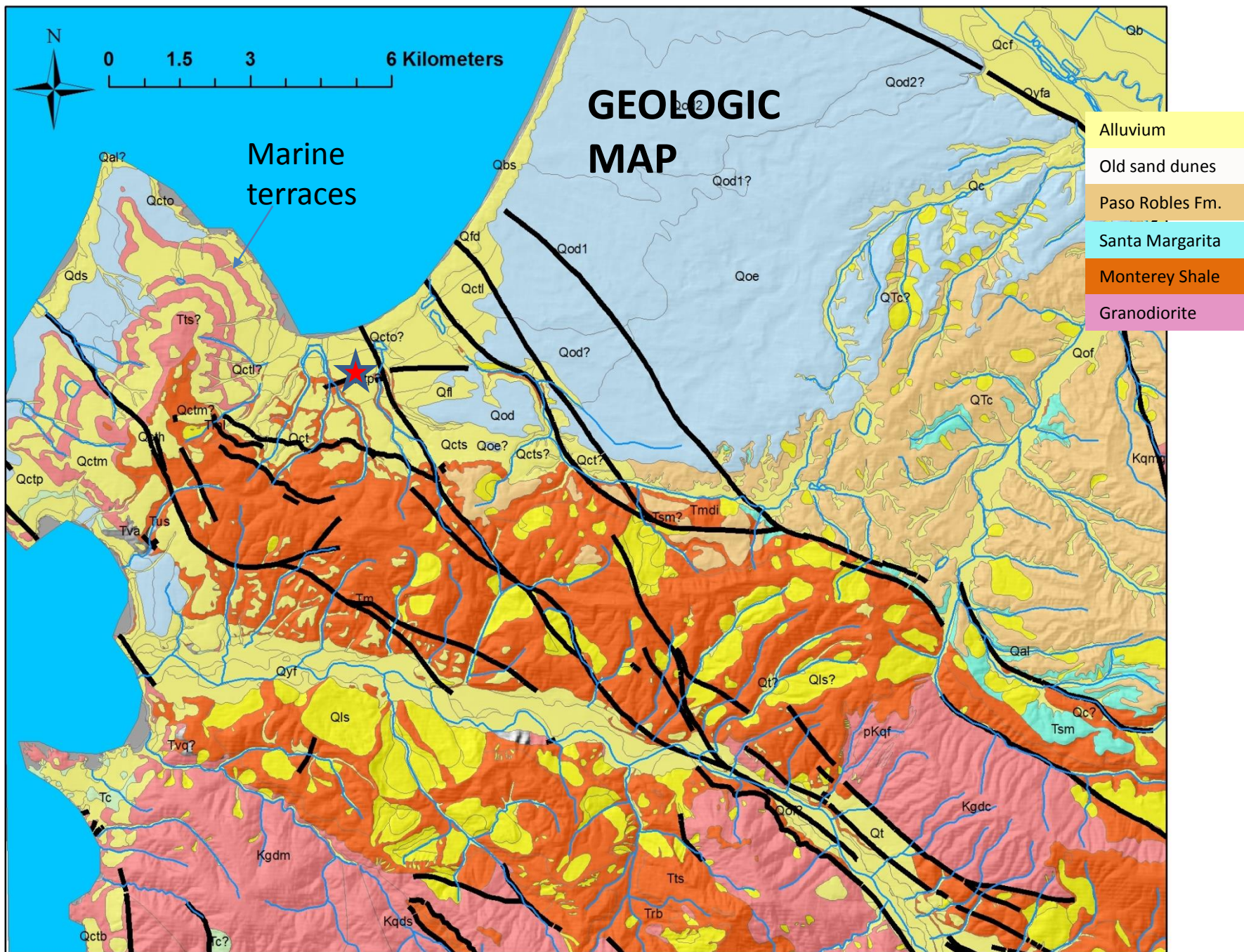
MONTEREY SHALE



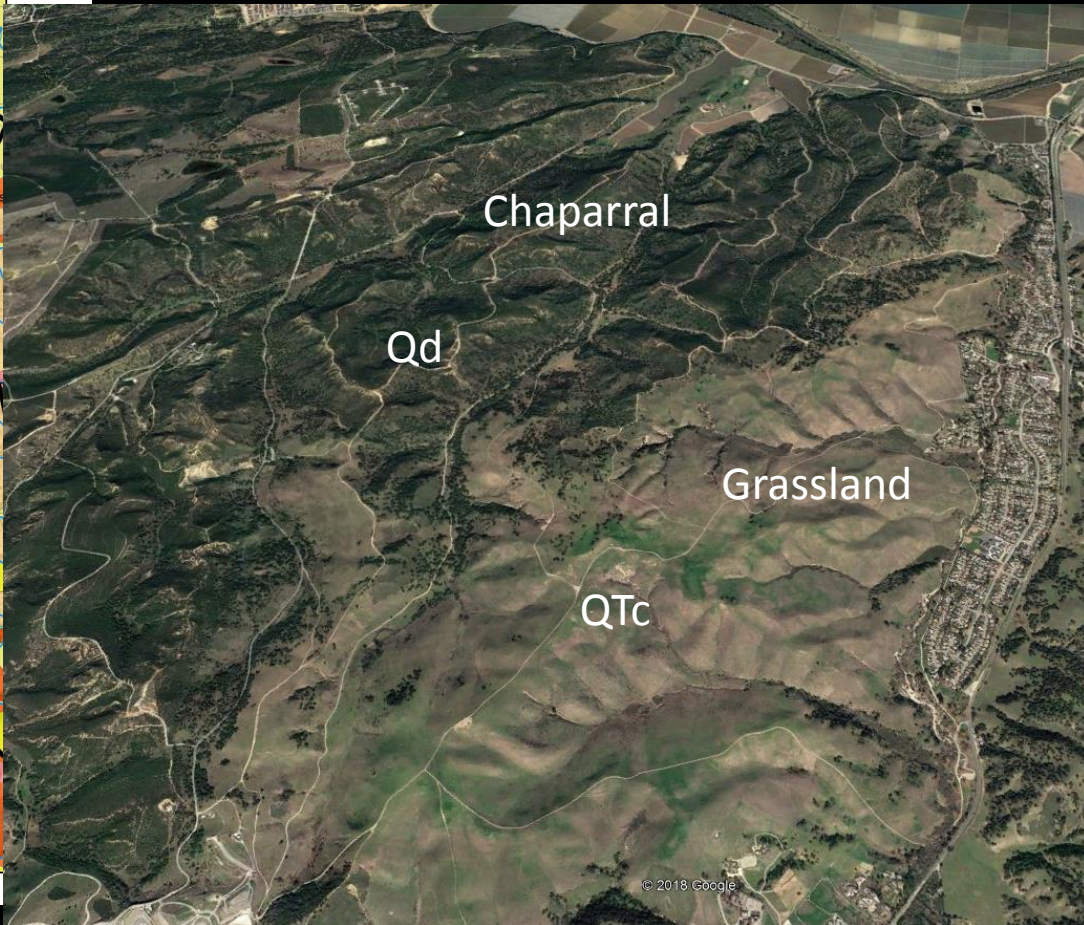
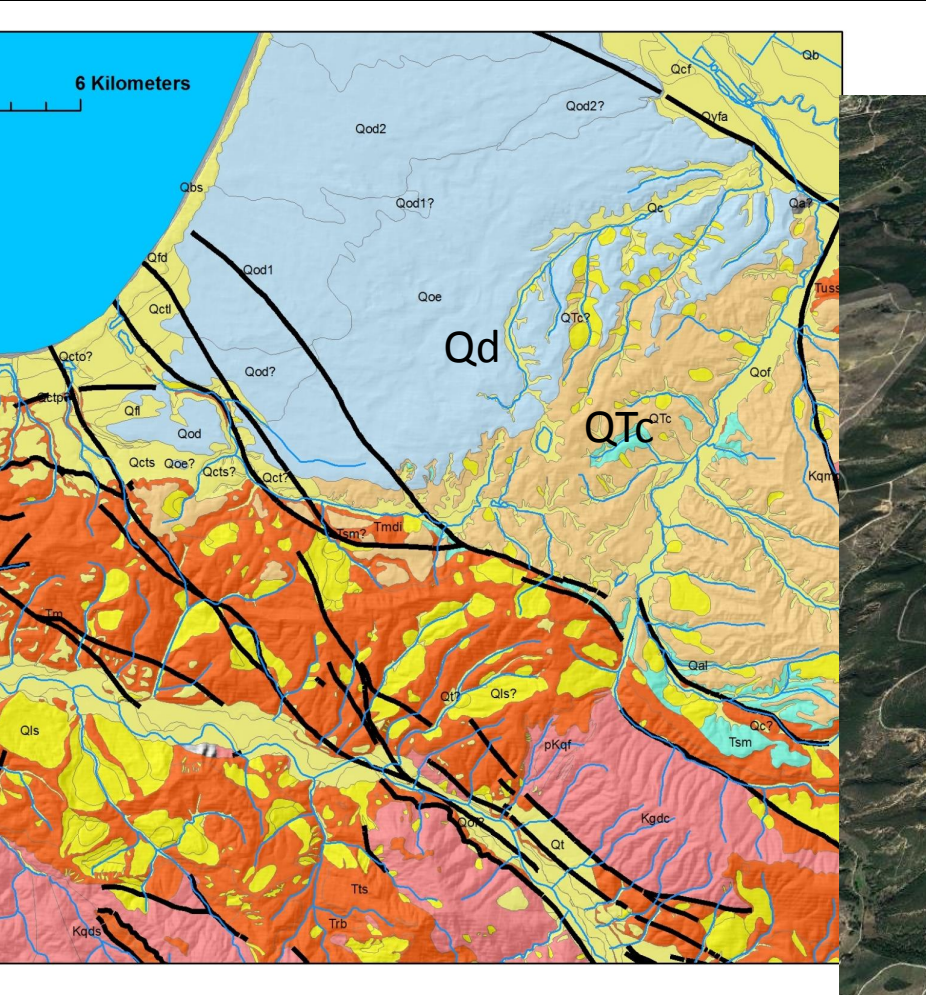
“Carmel Stone”

Clifton,
2010

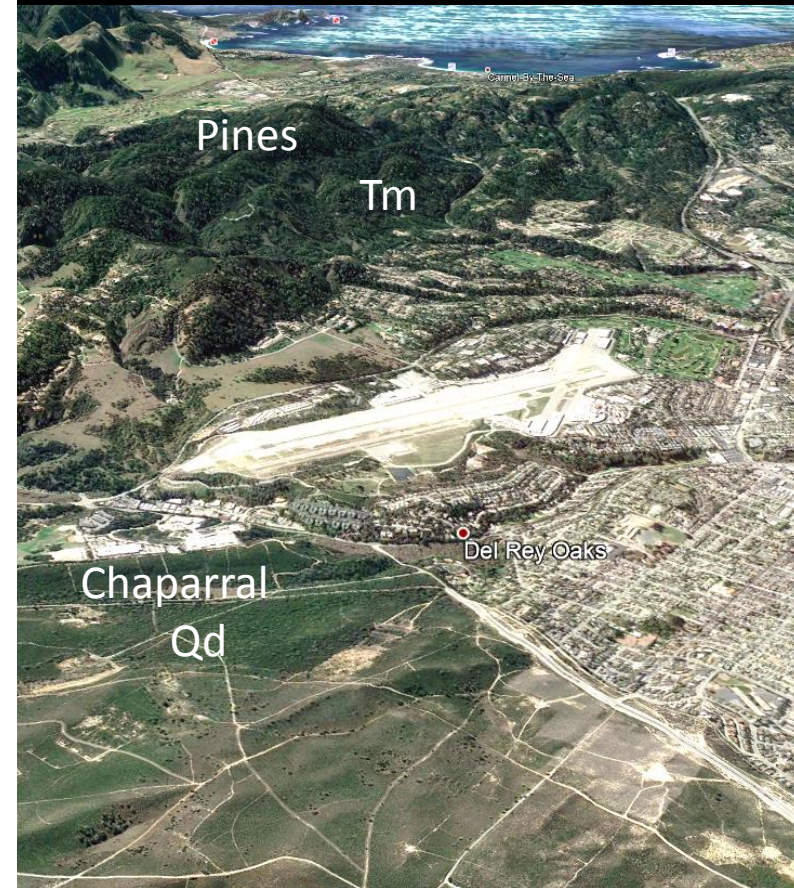
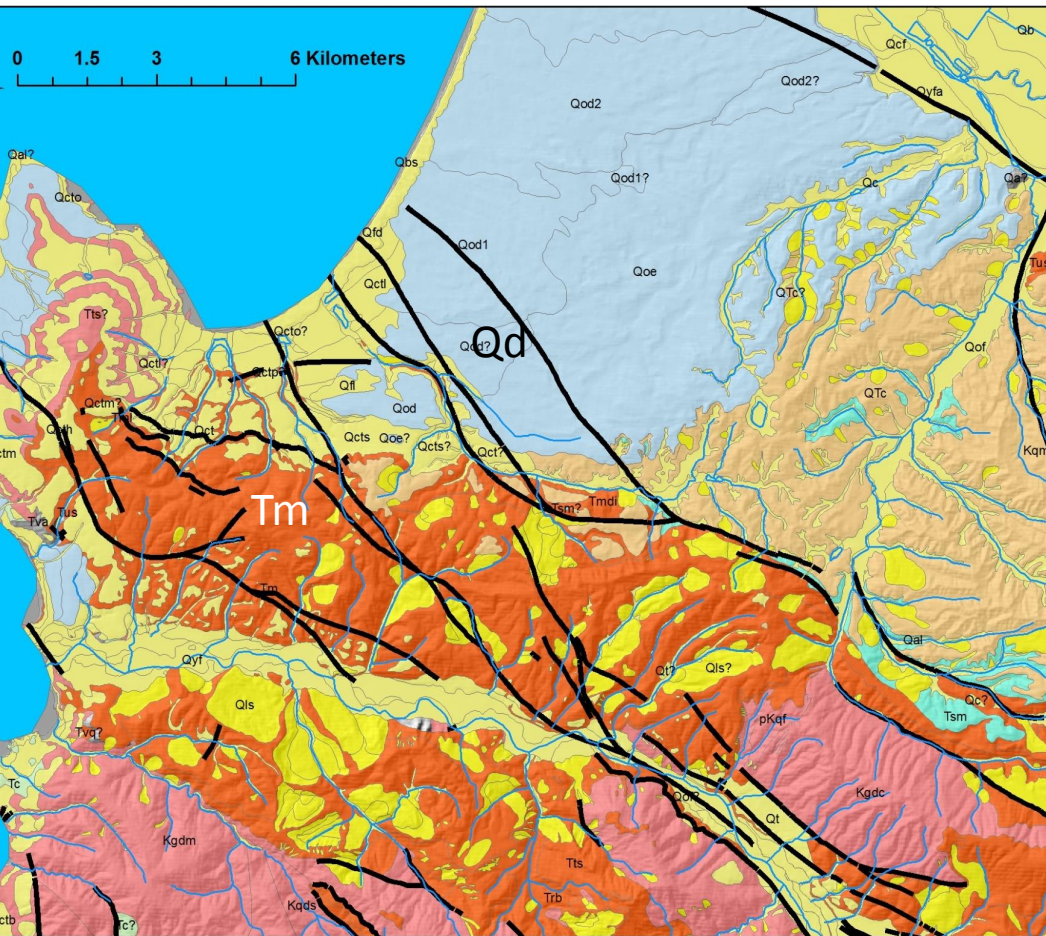




Example of abiotic control on communities



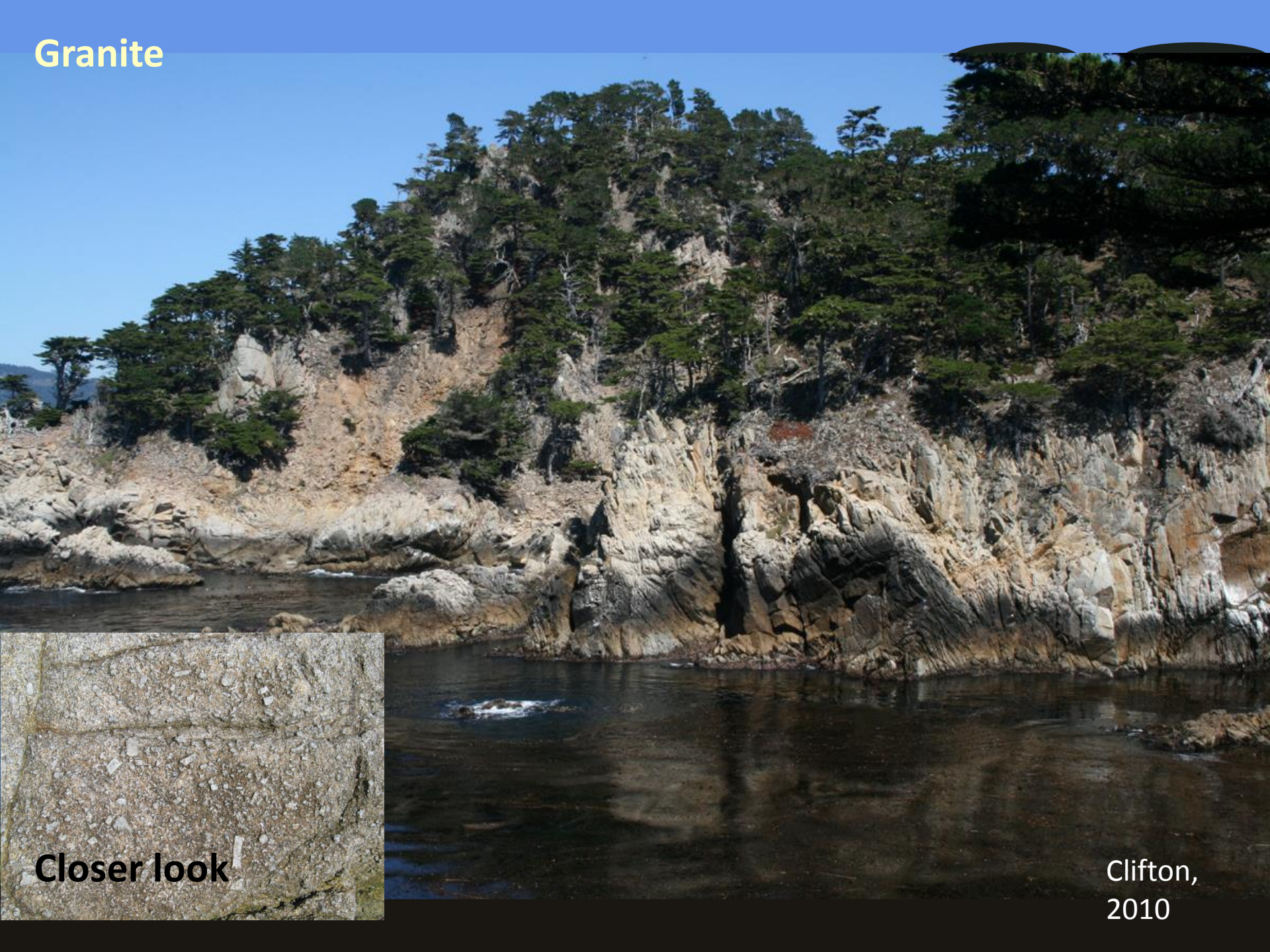
Example of abiotic control on communities



Granite



Closer look



Clifton,
2010

Accretionary wedge: Serpentinite soils
Low CA and High Mg



ABIOTIC CONTROLS

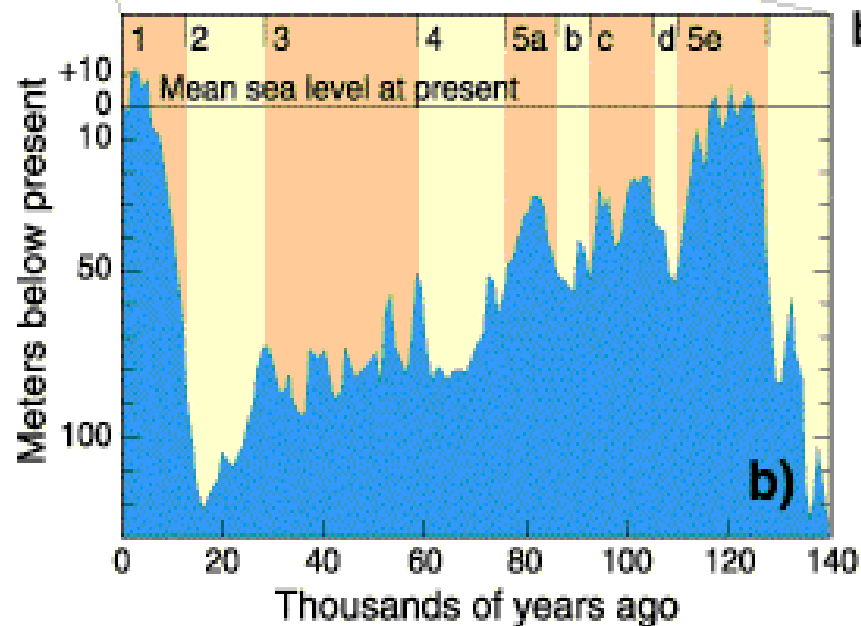
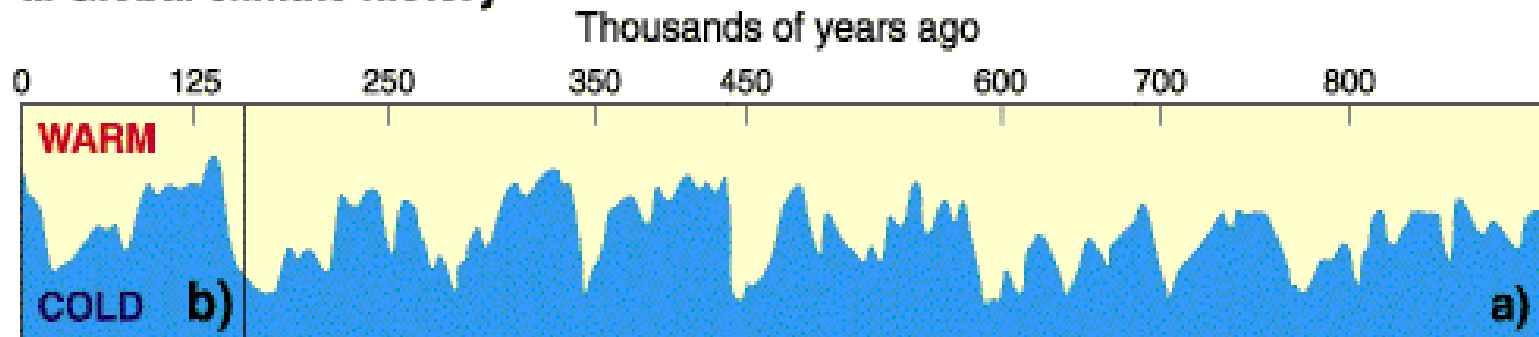
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a. Global climate history



b. Late Quaternary sea-level history

[animation](#)

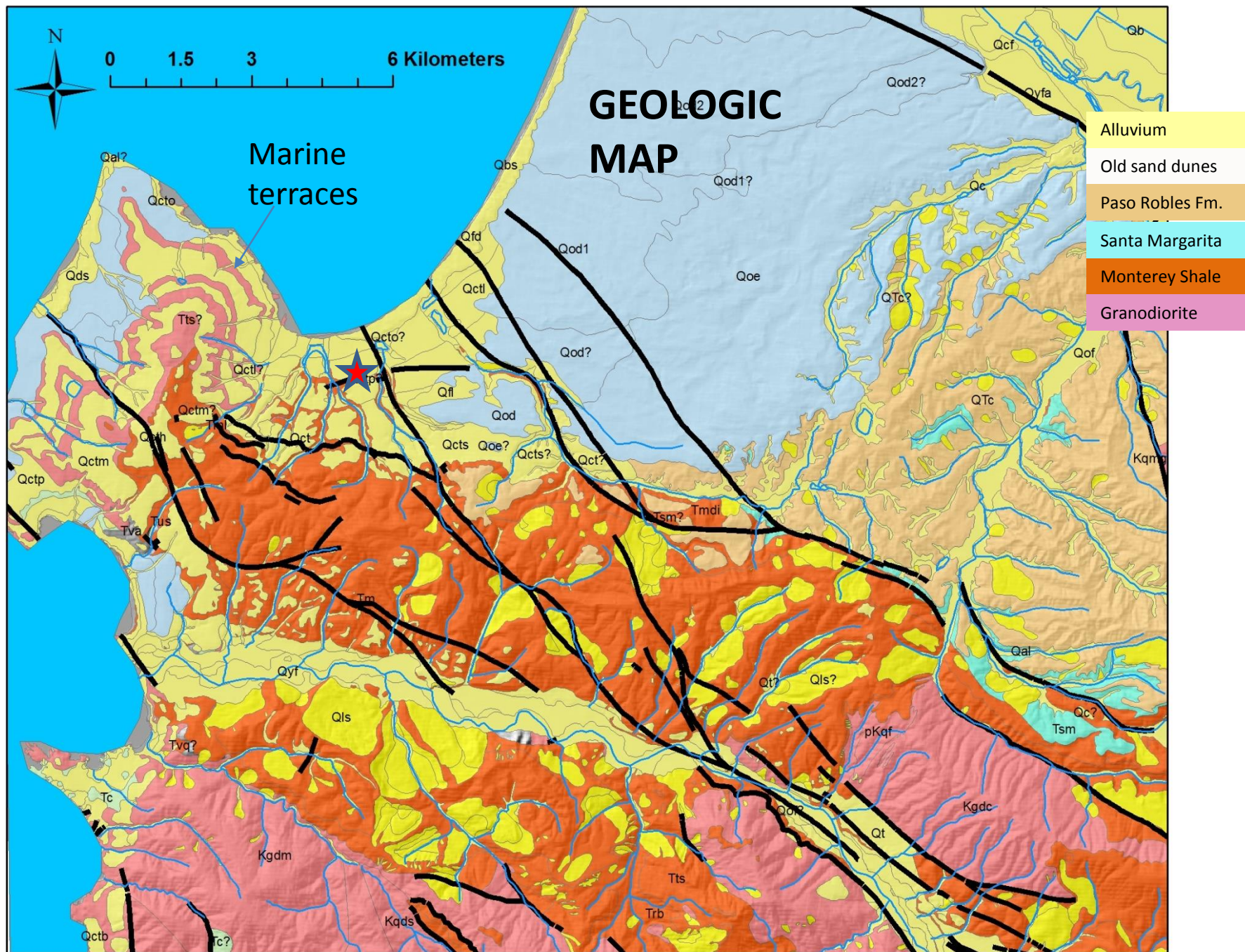


Second Marine Terrace

First Marine Terrace



[animation](#)

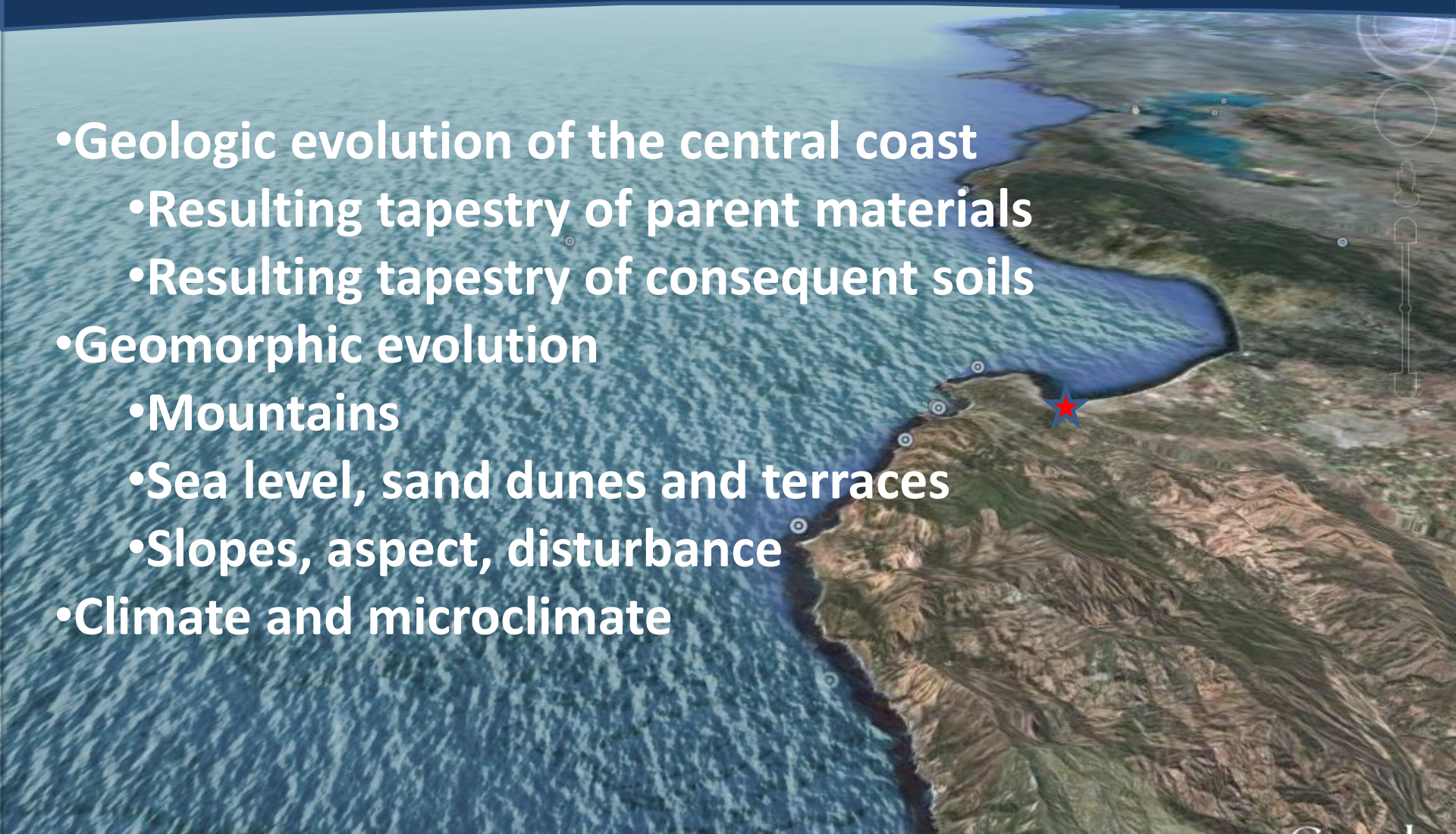


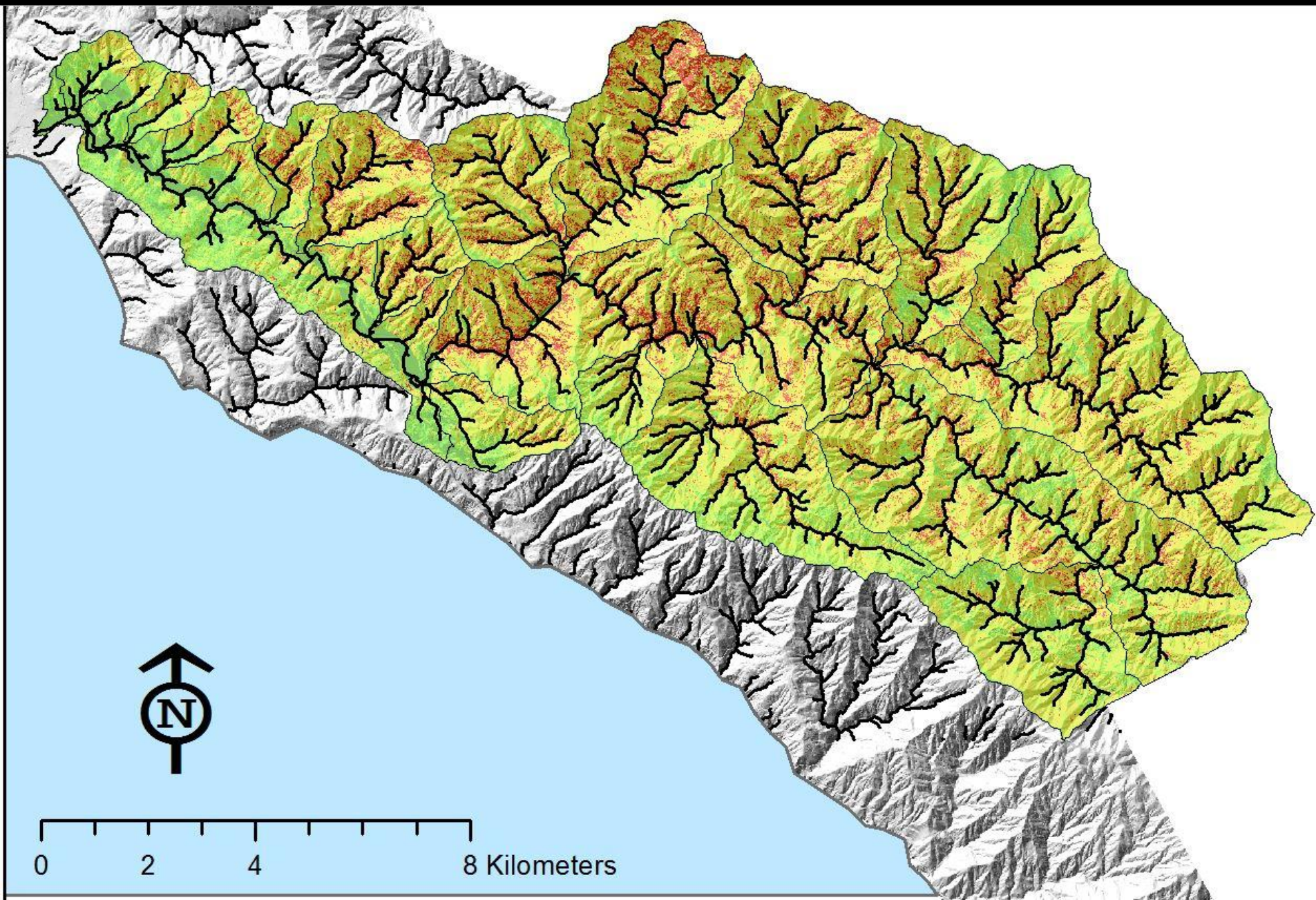
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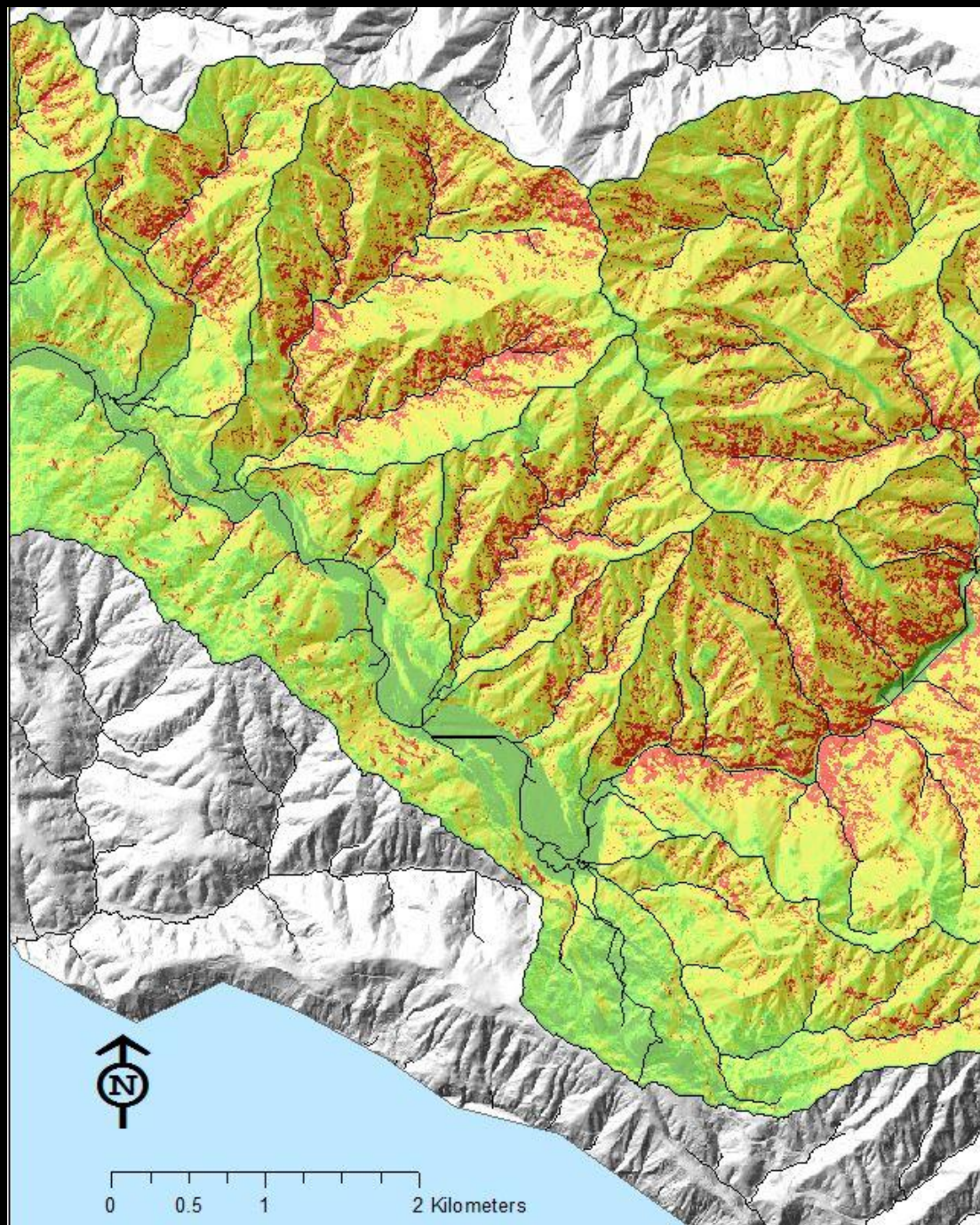
CA Central Coast



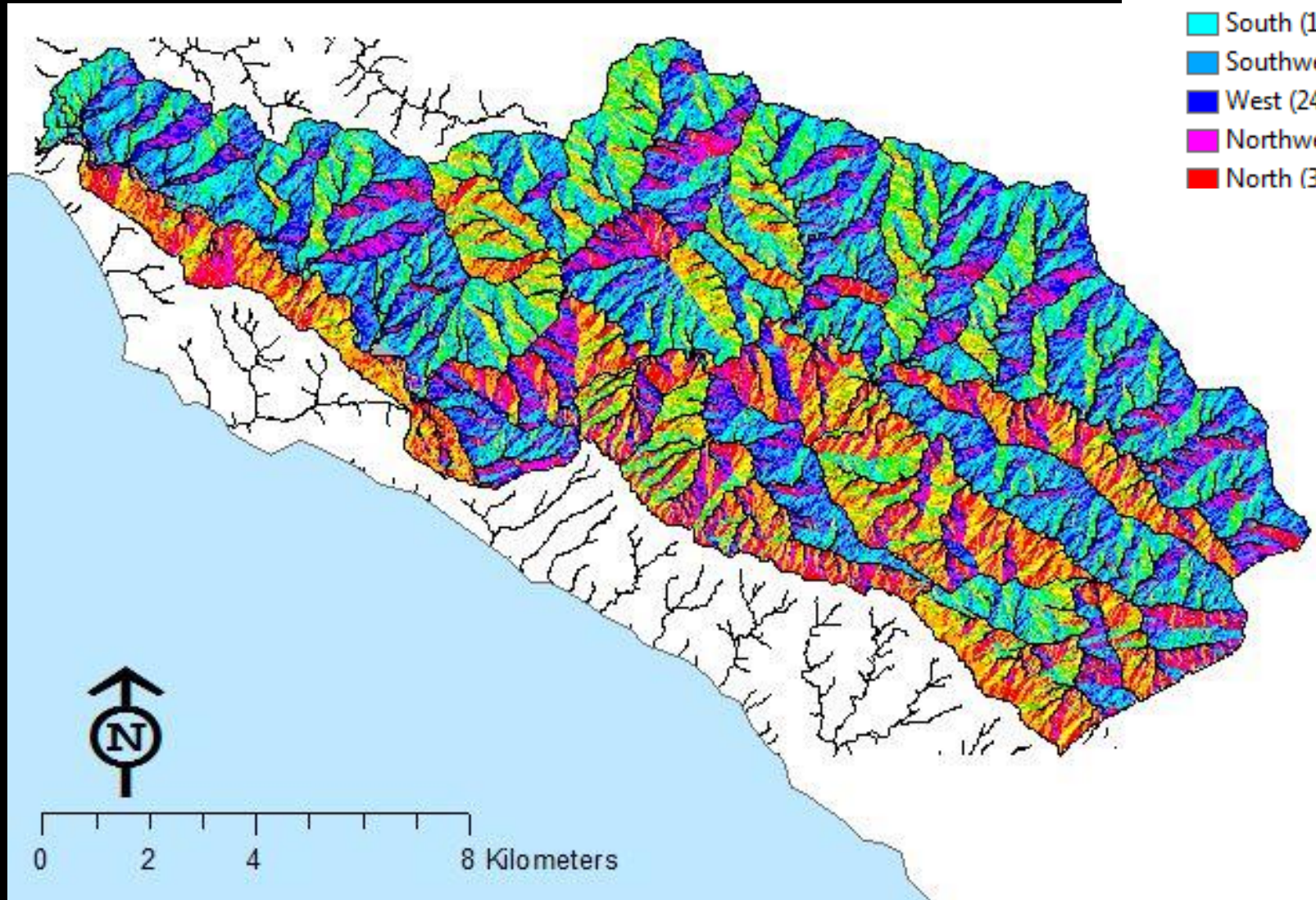
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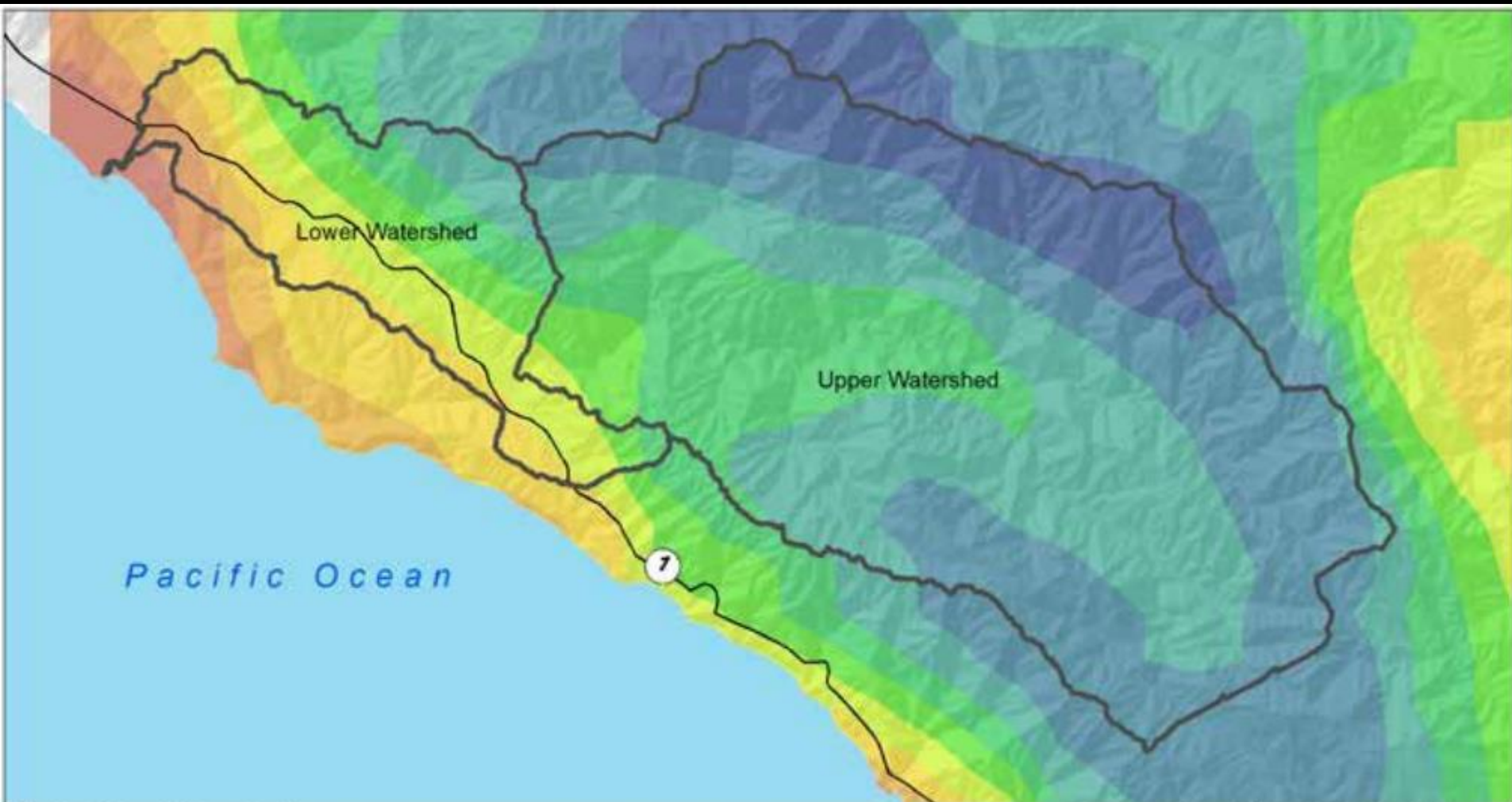




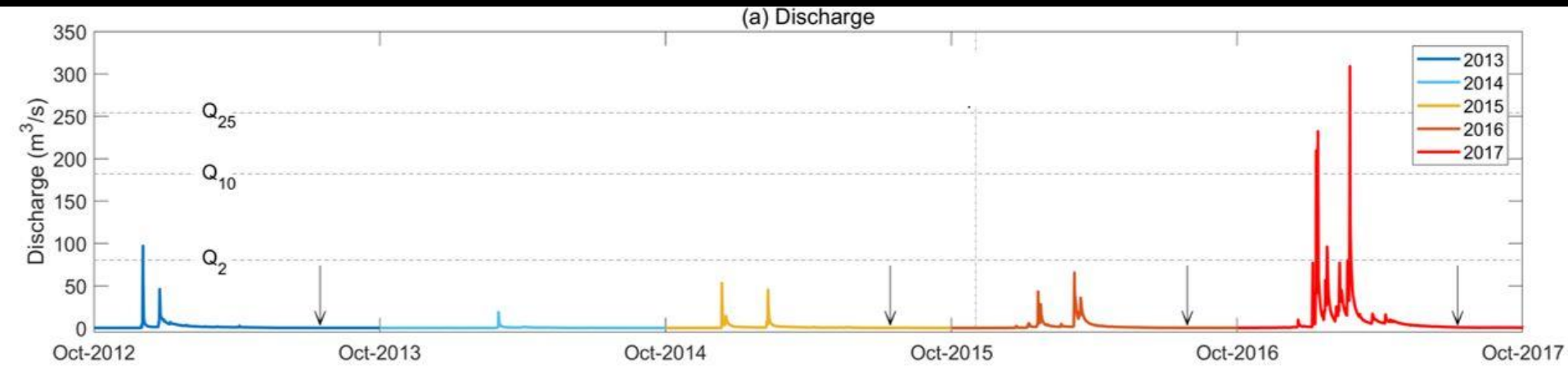


- Flat (-1)
- North (0-22.5)
- Northeast (22.5-67.5)
- East (67.5-112.5)
- Southeast (112.5-157.5)
- South (157.5-202.5)
- Southwest (202.5-247.5)
- West (247.5-292.5)
- Northwest (292.5-337.5)
- North (337.5-360)

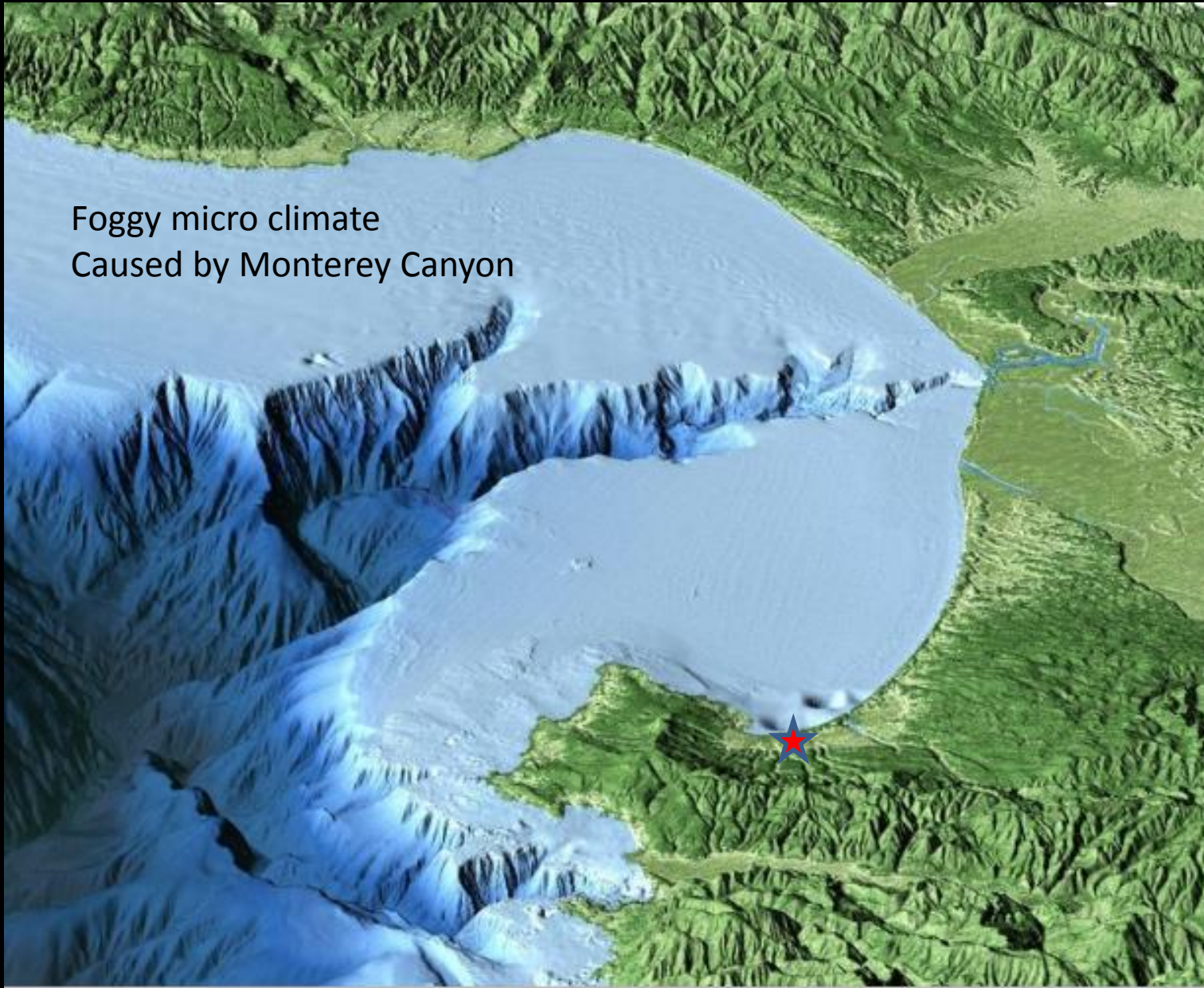




Time variability as well----Med. climate



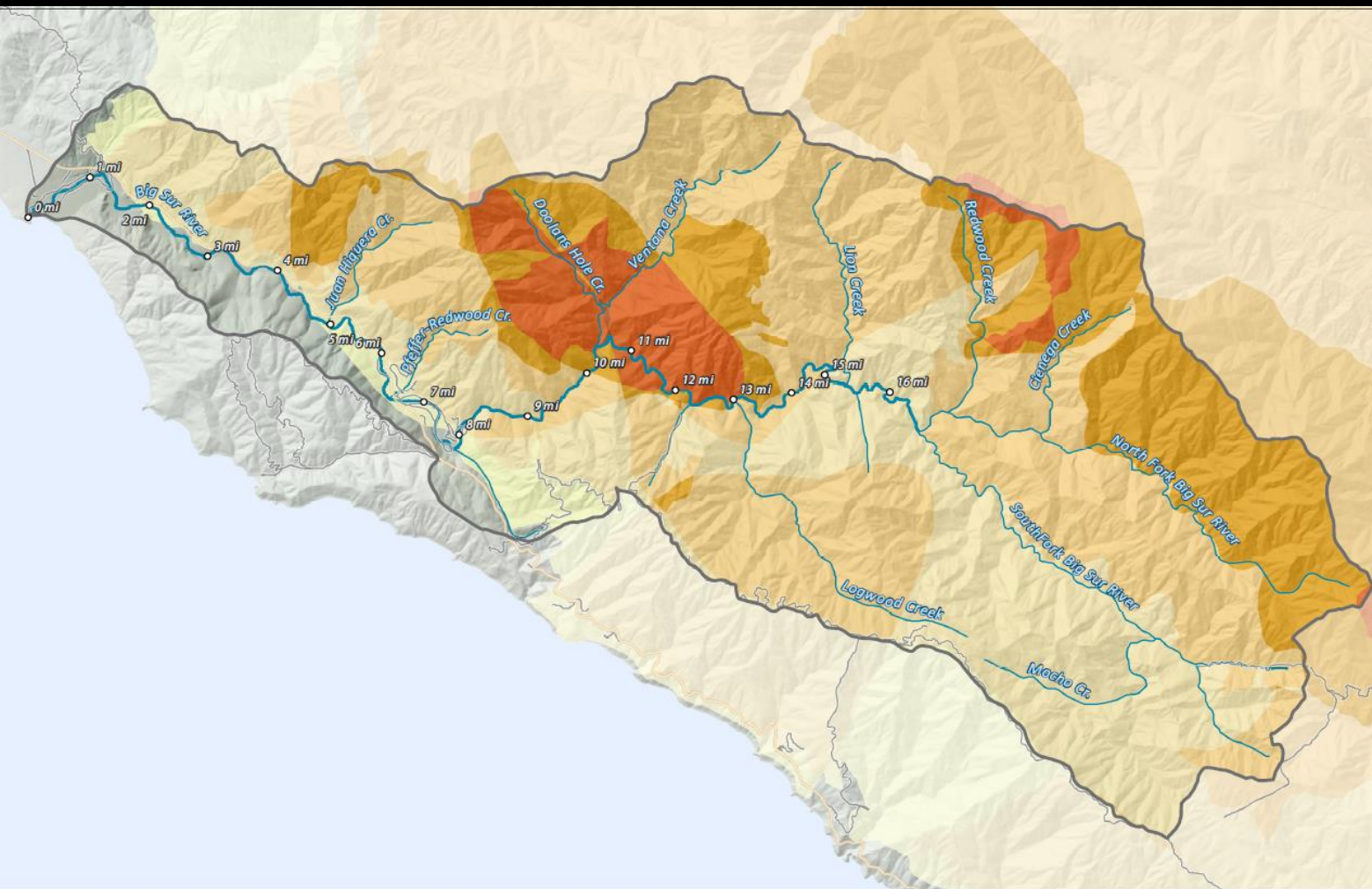
Foggy micro climate
Caused by Monterey Canyon







Redwoods love Monterey Canyon



LOWER BIG SUR RIVER, CALIFORNIA

Big Sur River Watershed

DATA SOURCES
Hillshade tint: Natural Earth 2012
Roads, streams: ESRI 2010
Historical fires: FRAP

MAP PROJECTION
NAD_1983_UTM_Zone_10N
Transverse_Mercator

Southwater Sciences
www.southwater.com

LEGEND

4 mi
○ River stations (Miles)

1916-2008 Fire frequency
(number of times burned)



D R A F T

SCALE & NORTH ARROW



1:82,000

1 in = 6,833 feet

MAP LOCATION



An aerial photograph showing a vast mountain range. The mountains are covered in dense green forest, with some rocky peaks and ridges visible. A winding road or path is visible on the slopes. In the foreground, a sandy beach meets the ocean, with waves breaking on the shore. The sky is clear and blue.

Regolith thickness 0 to 2 m

Aspect 0 359

Slope 0 to 80

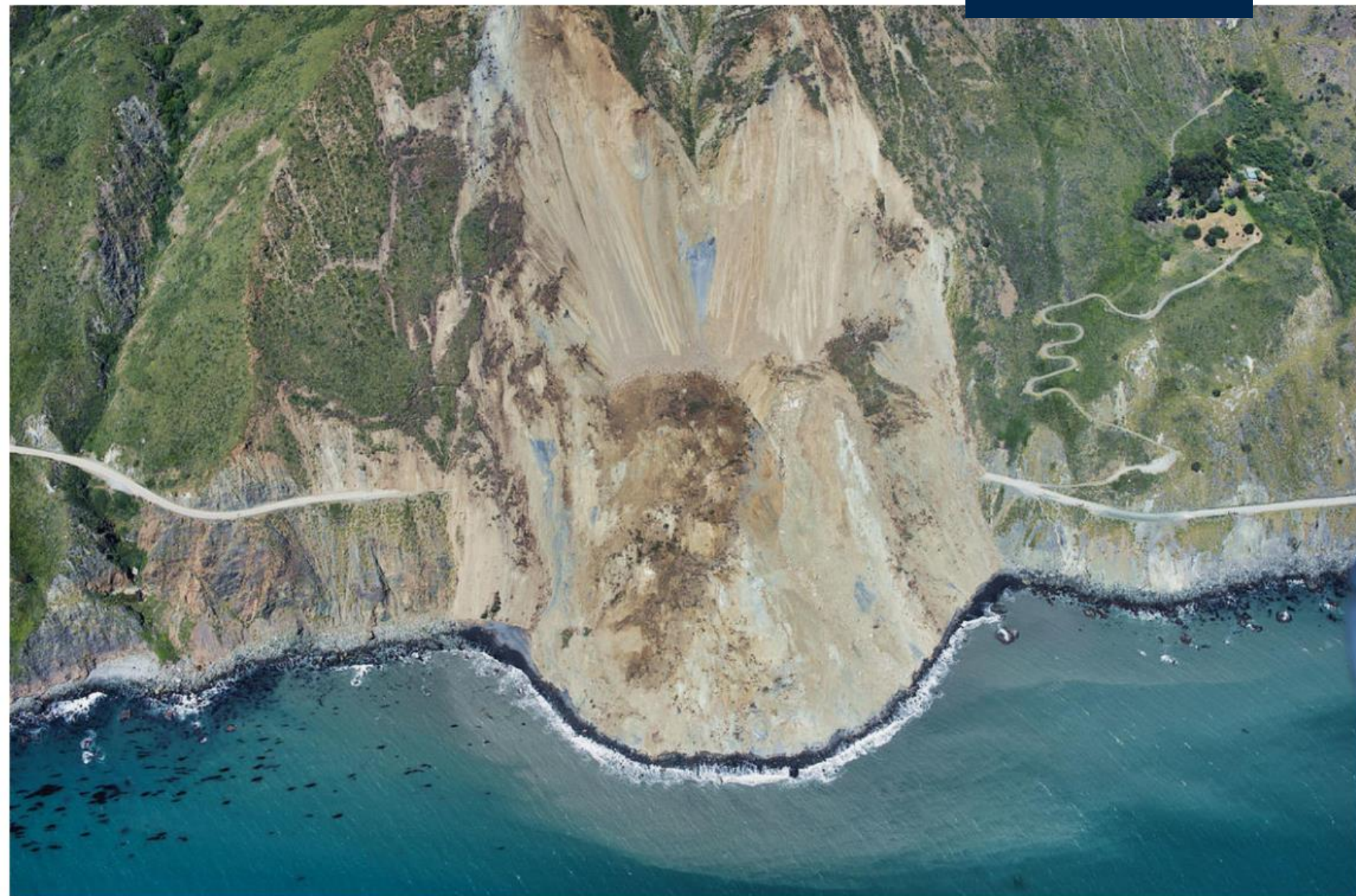
Rain 20 to 70

Fog---local influence

Parent material granite, marble, schist, other

Disturbance: Fire, landslides firebreaks

Big Sur landslide on May 20, 2017





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Premise

The diversity and distribution of abiotic environmental factors influences the diversity and distribution of plant communities

Hyatt

