Regional Sand Management: Protecting and Preserving our Beaches
Part 3

Presentation to the **Ventura Sand Summit**
May 9th, 2024

Dr. Kiki Patsch (kiki.patsch@csuci.edu)
Co-Chair, BEACON Science Advisory Committee
Chair and Associate Professor
California State University Channel Islands

Understanding Regional Sediment Management and Sediment Budgets

What we **Know**

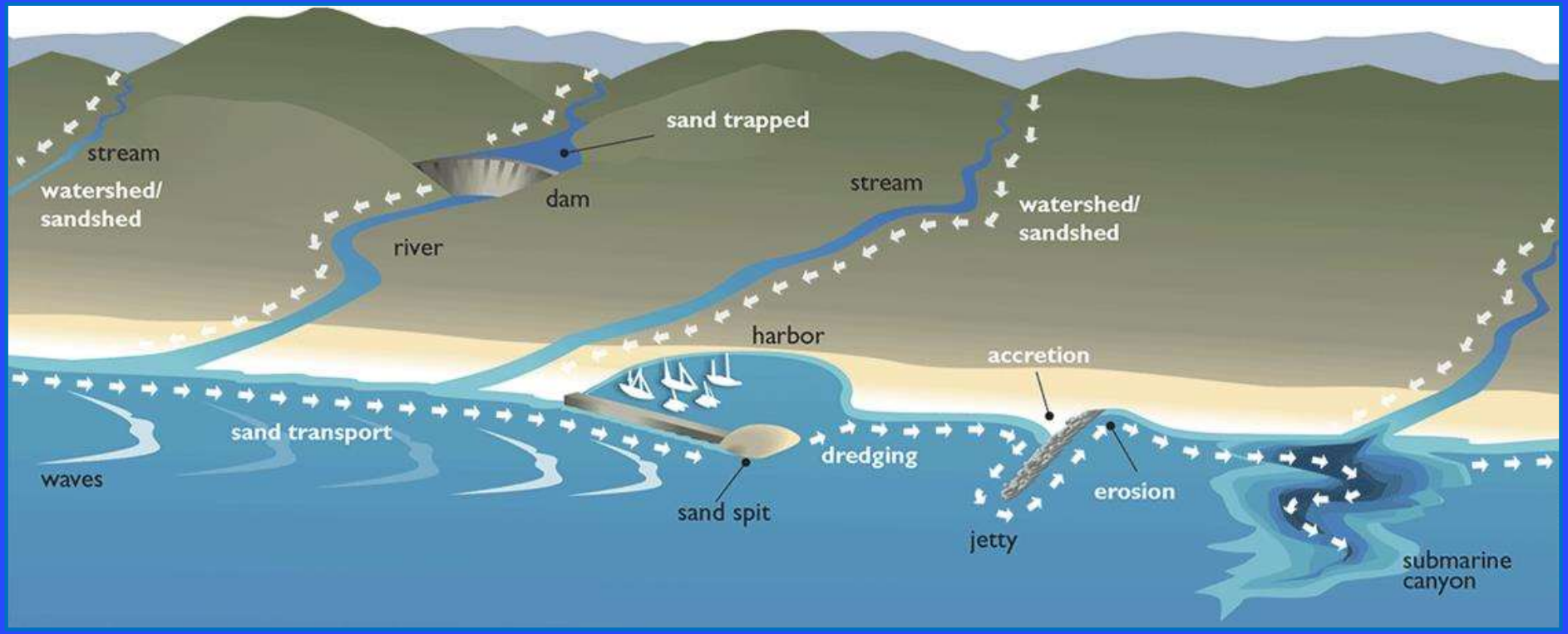
and

What we **Don’t Know**

Review

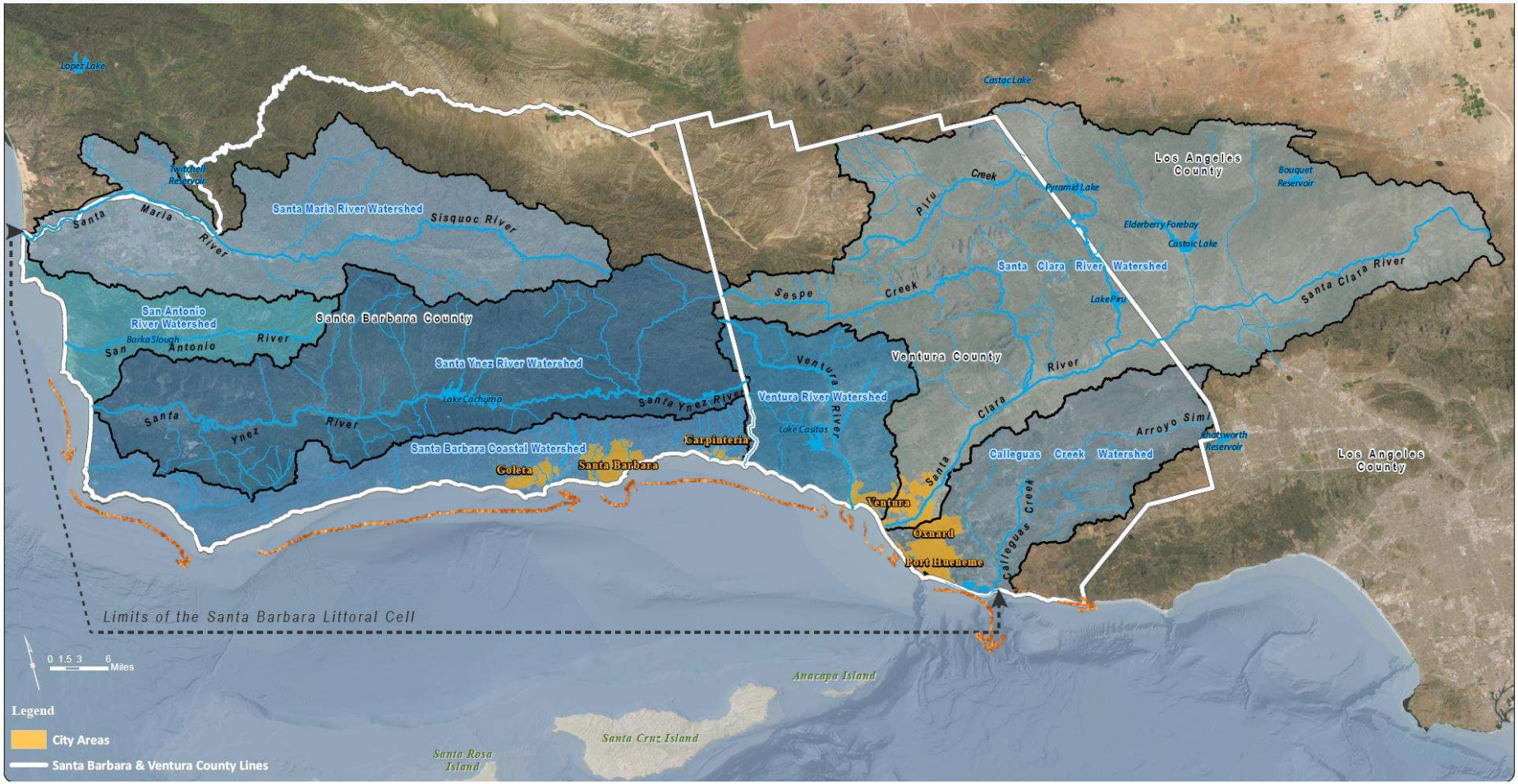
What we know…

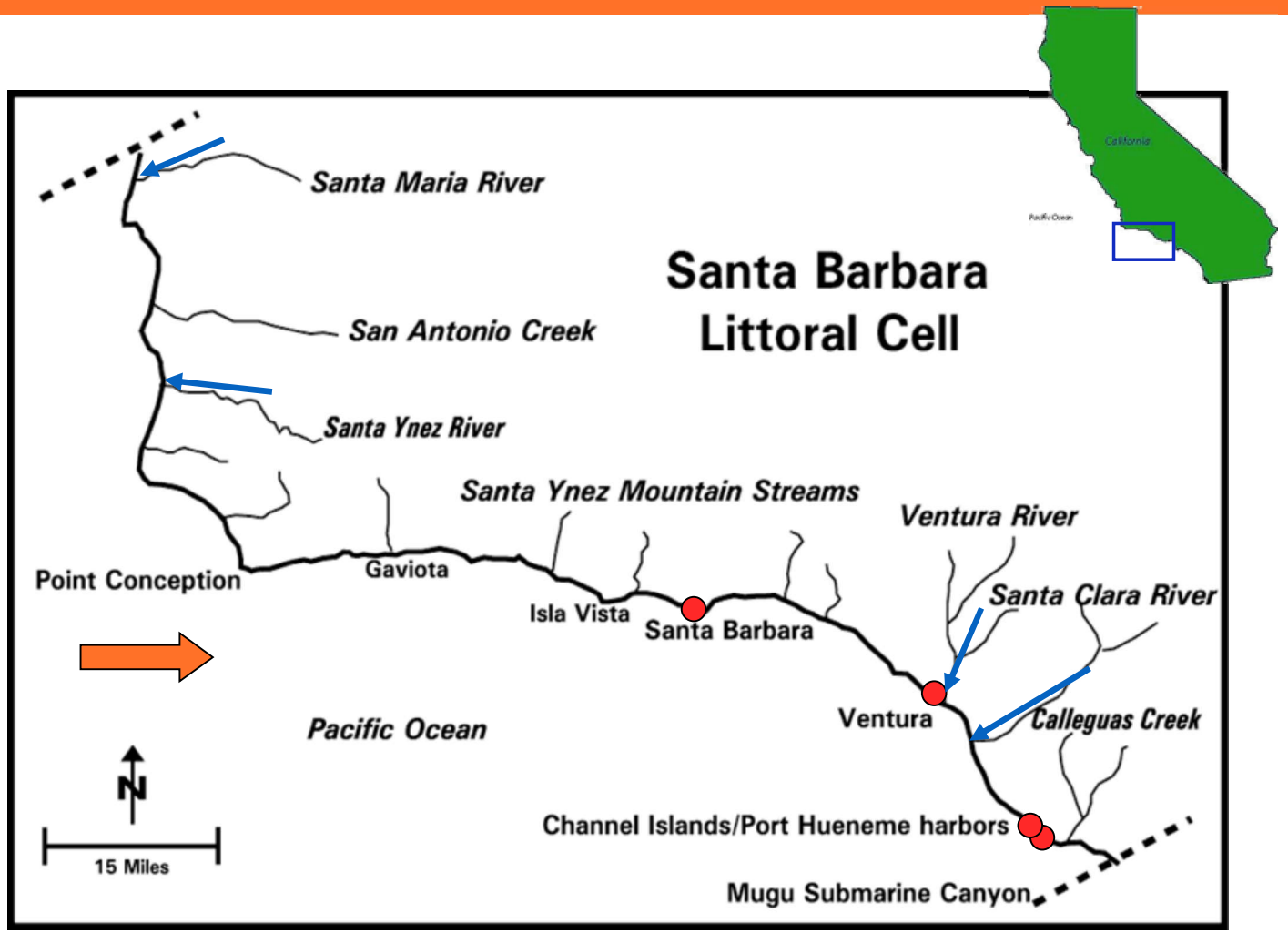
Sand Movement: The River of Sand



Explore the Beaches, MSI, UCSB

BEACON Landscape:
The Santa Barbara Littoral Cell




Santa Barbara
Littoral Cell
Santa Maria River
San Antonio Creek
Santa Ynez River
Santa Ynez Mountain Streams
Ventura River
Santa Clara River
Calleguas Creek
Point Conception
Gaviota
Isla Vista
Santa Barbara
Ventura
Channel Islands/Port Hueneme harbors
Mugu Submarine Canyon
Pacific Ocean
N
15 Miles
California
Pacific Ocean

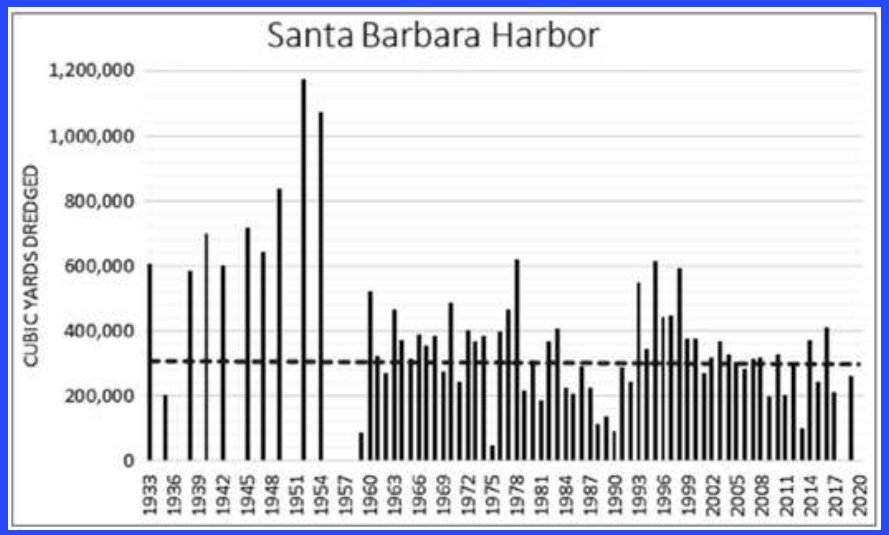
Balancing the Budget

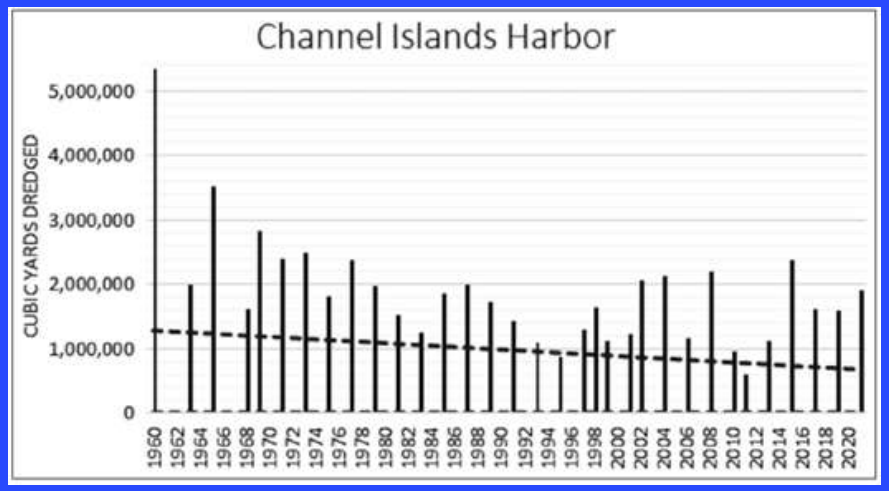
Sources = Sinks → Equilibrium

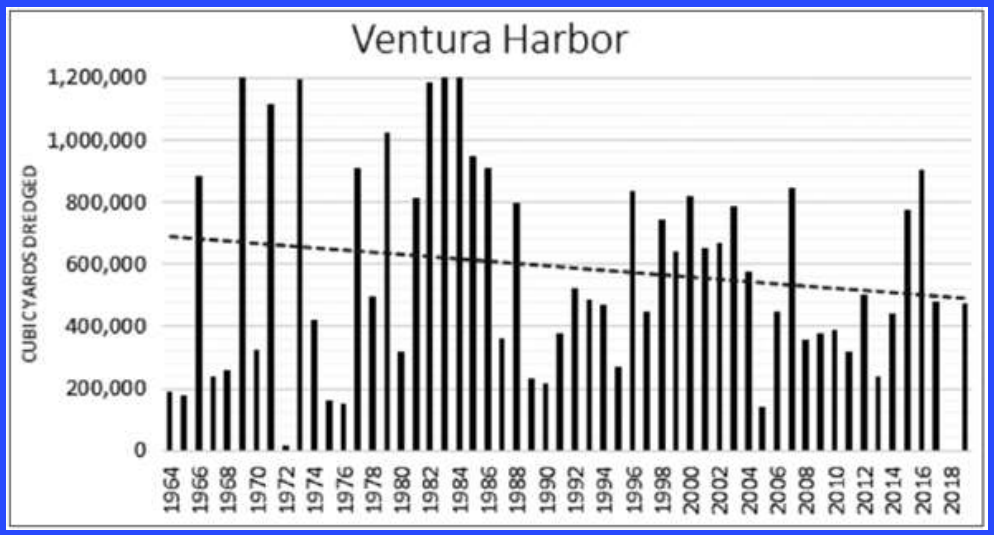
Sources > Sinks → Accretion

Sources < Sinks → Long-term Erosion

Harbor/Sand Trap Dredging







Implications of Harbor Dredging for the Santa Barbara Littoral Cell

Kiki Runyan[1]
Gary Griggs[2]

2004

California harbor dredging: History and trends

By

2021

Kiki Patsch[1] and Gary Griggs[2]

1) Department of Environmental Sciences and Resource Management, California State University, Channel Islands, Camarillo, CA 93012
2) Department of Earth and Planetary Sciences, University of California Santa Cruz, Santa Cruz, CA 95064

Now…
What we don't know and what we need to update

Collaborations with BEACON, the SAC, and hopefully many of you at the meeting

Sand Sources

Sand Source	Natural (cy/yr.)	Actual (cy/yr.)	Reduction (cy/yr)
Rivers	2,785,000 (99.6%)	1,658,000 (99.5%)	1,127,000 (49.5%)
Seacliff Erosion	10,700 (0.4%)	8,600 (0.5%)	2,100 (19.6%)
Total Input	**2,796,000**	**1,666,000**	**1,129,000 (40.3%)**

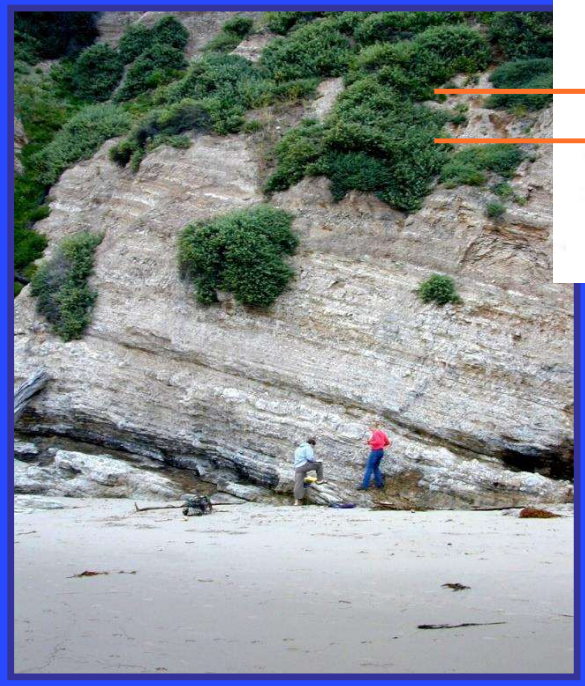
Take Away:
40% reduction in total sand supplied to the Santa Barbara Cell through the damming of rivers and armoring of sea cliffs.

Eroding bluffs in Santa Barbara

Santa Clara River Mouth, south of Ventura Harbor

Littoral cut-off diameter

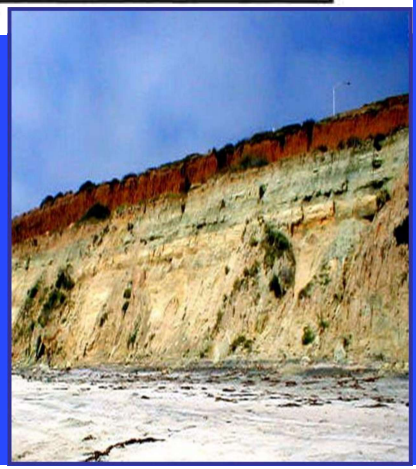
- .125mm is the littoral cut-off diameter for the Santa Barbara cell
- Bedrock: contains very little to no beach-sand size material
- Terrace Deposits: 60% sand sized material
  - The terrace deposits are the main contributing factor to the natural sand supply to the beach from cliff erosion



WENTWORTH SCALE OF ROCK PARTICLE SIZES

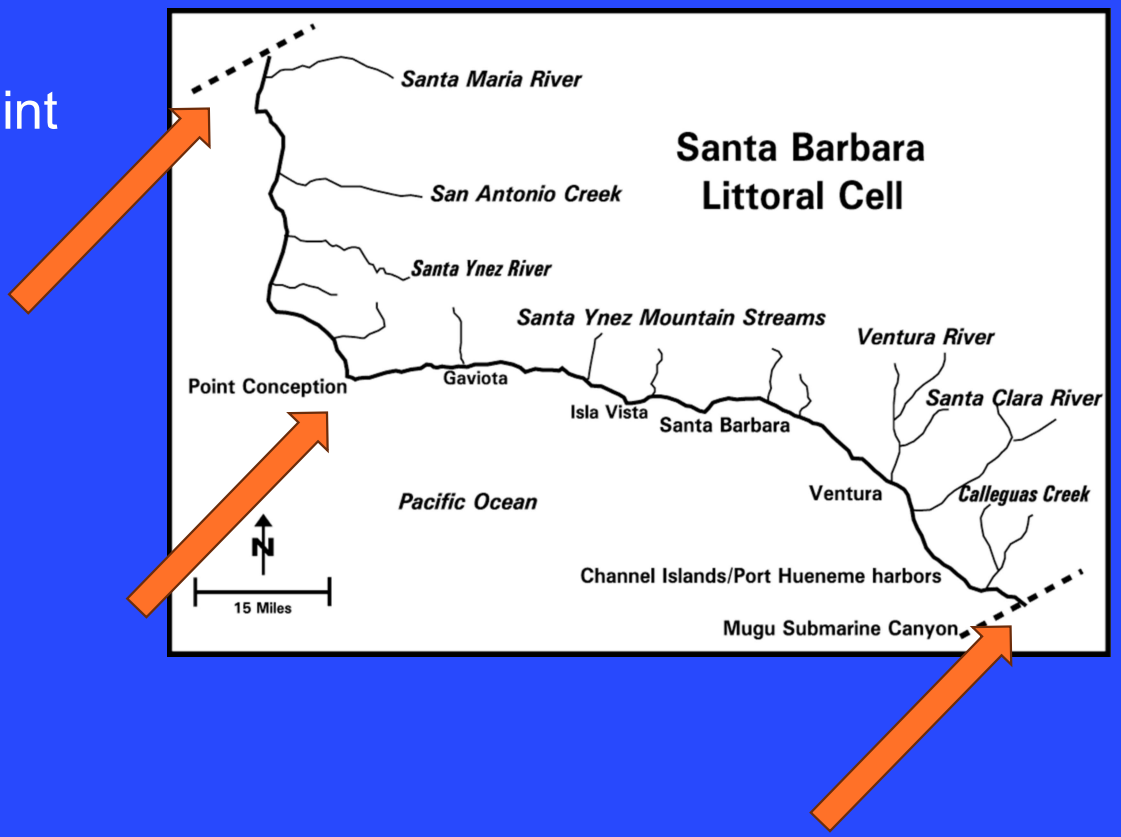
Classification	Particle size (diameter)
Boulder	Above 256 mm
Cobble	64–256 mm
Pebble	4–64 mm
Gravel (or Granule)	2–4 mm
Very coarse sand	1–2 mm
Coarse sand	0.5–1 mm
Medium sand	0.25–0.5 mm
Fine sand	0.125–0.25 mm
Very fine sand	0.062–0.125 mm
Silt	0.004–0.062 mm
Clay	Less than 0.004 mm

Monterey Formation, Santa Barbara, California



Boundaries of the Littoral Cell

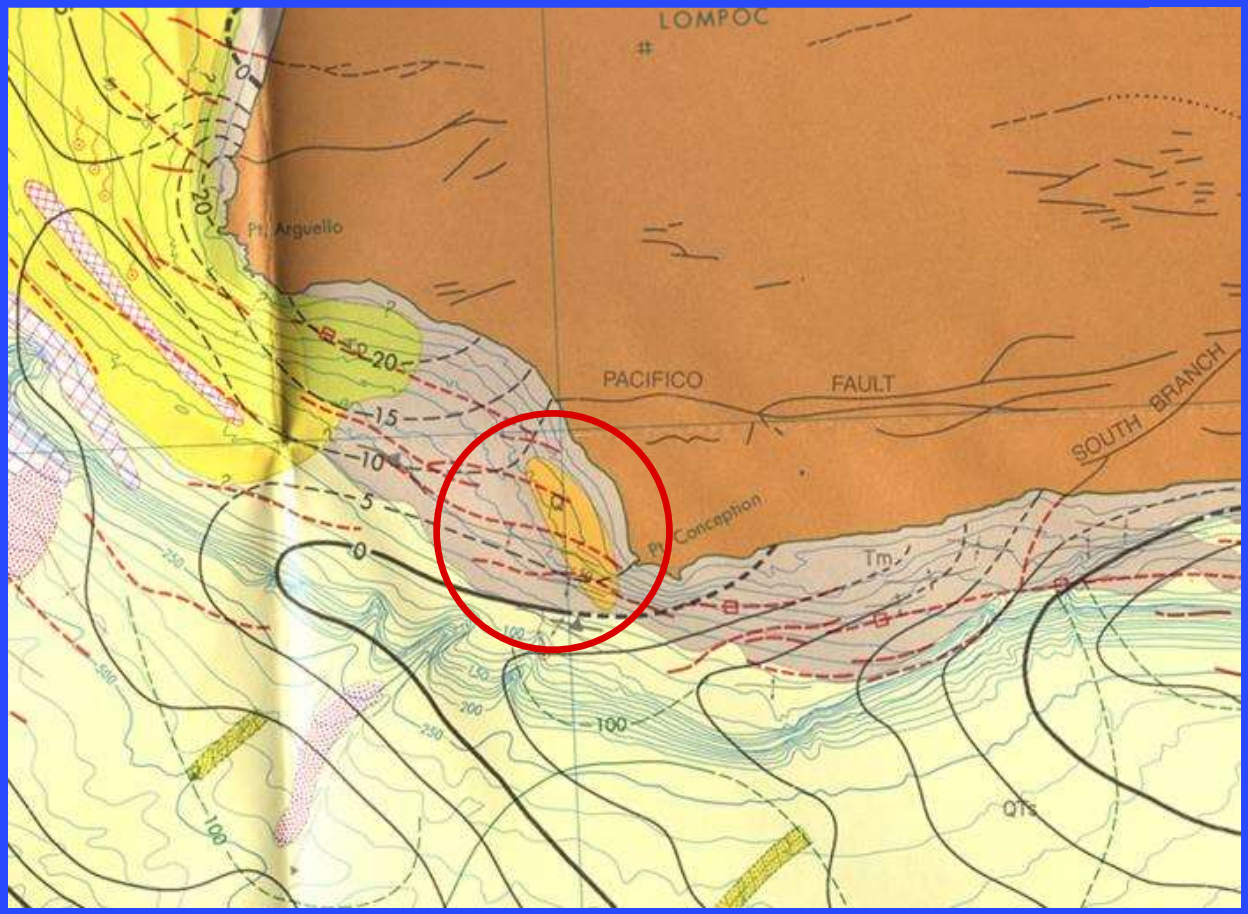
- Is sand making its way around Point conception?
  - If so, How much?
- We need to figure out the True Boundaries of the Cell
- Leaky-Cell Concept



Sand lost as it moves around Point Conception

- **6.75 mi²**=20,908,800 yd²
- 470,000 yd³/yr divided by 6.75 mi² equals
- .02 yd/yr of deposition (**0.07 ft/yr**)
- 100 years only get **7 ft** of accumulation

Sand deposit Stats:
~0.5 mile offshore
~4.5 miles long
~1.5 miles wide



(Chapman, Beyer, Youngs, 1989)

We have much better information now!

- USGS Mapping from 2018

USGS
science for a changing world

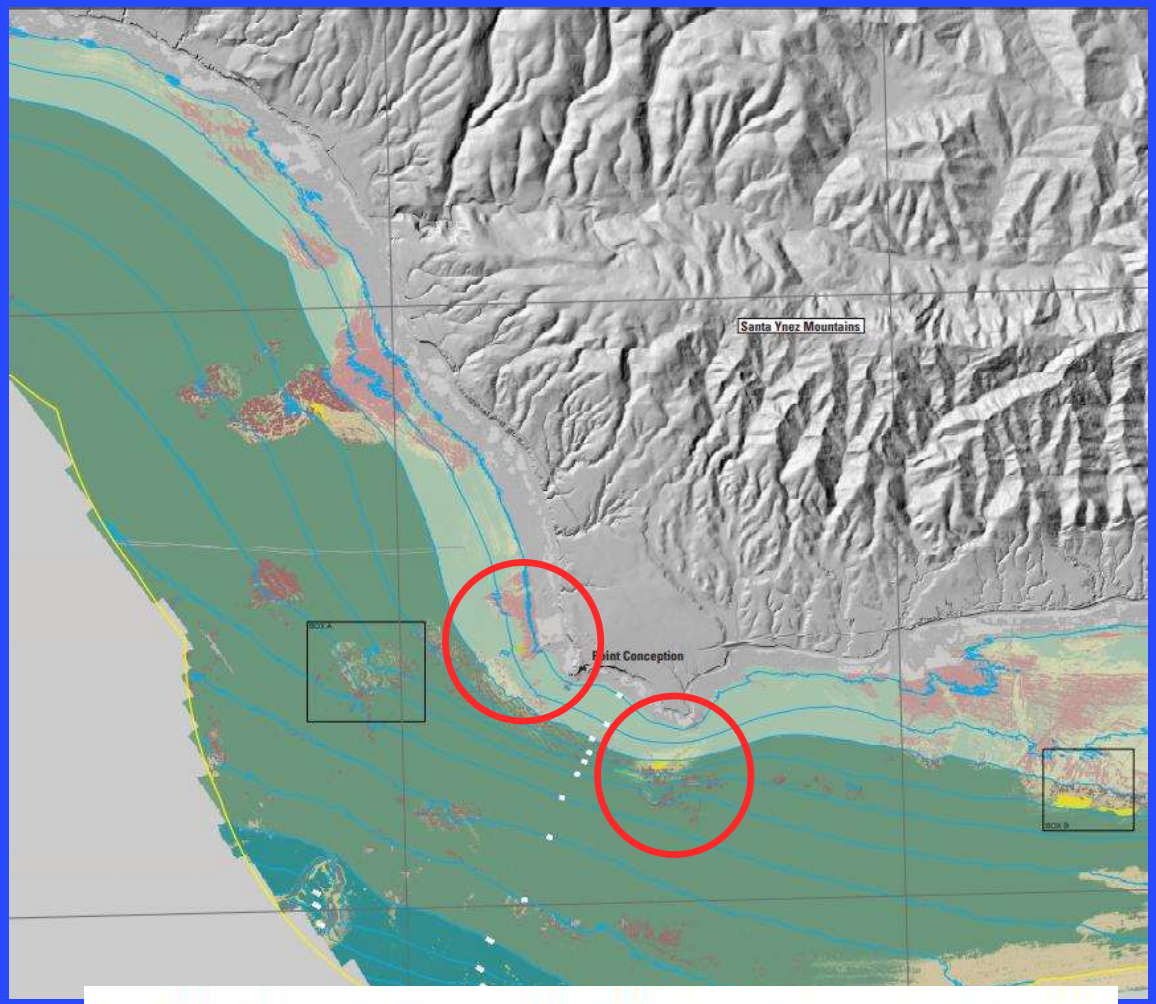
California State Waters Map Series—Offshore of Point Conception, California

By Samuel Y. Johnson, Peter Dartnell, Guy R. Cochrane, Stephen R. Hartwell, Nadine E. Golden, Rikk G. Kvitek, and Clifton W. Davenport

(Samuel Y. Johnson and Susan A. Cochran, editors)

Open-File Report 2018–1024

2018

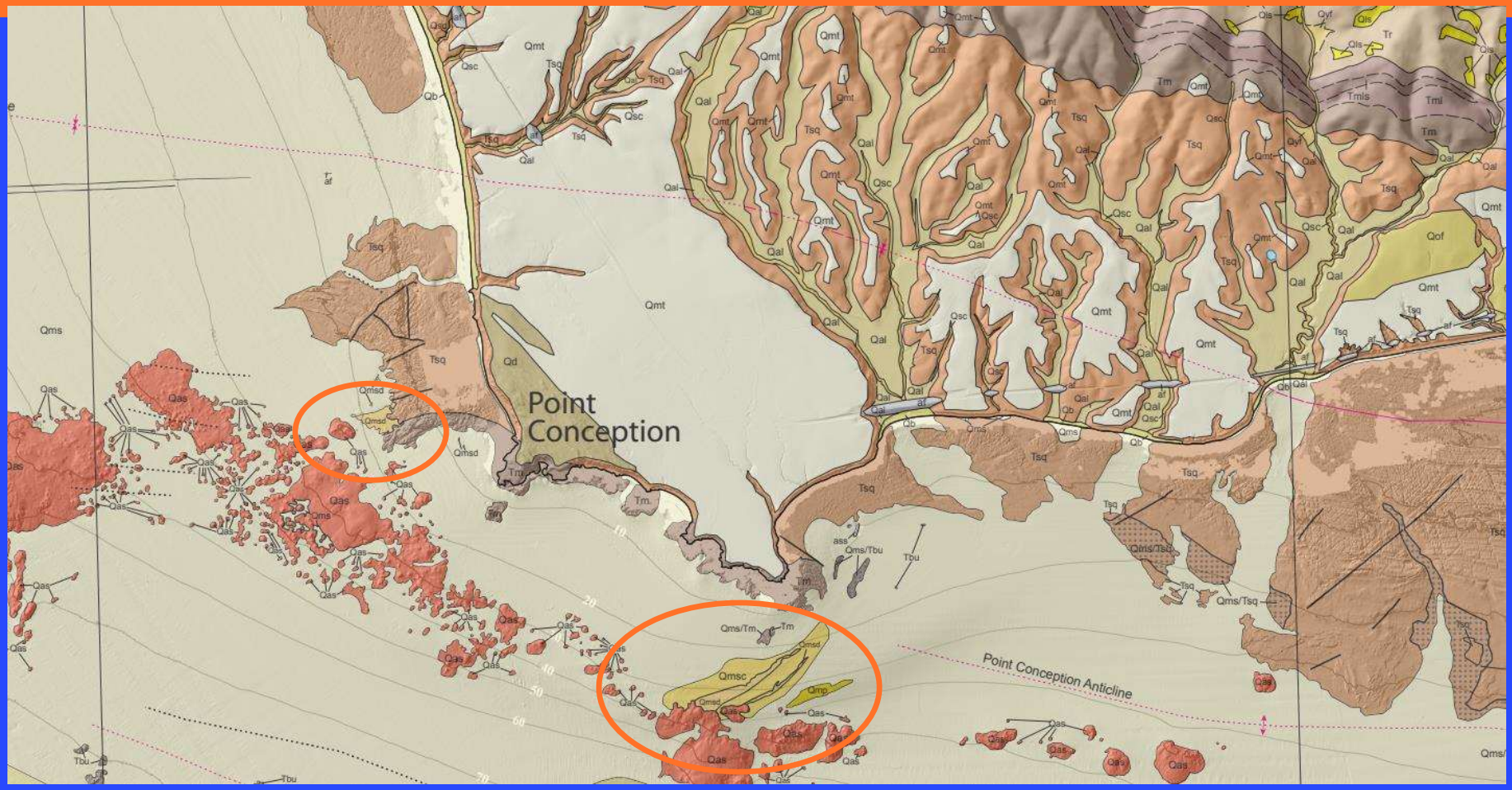


Seafloor Character, Offshore of Point Conception Map Area, California

By

Stephen R. Hartwell and Guy R. Cochrane

2018



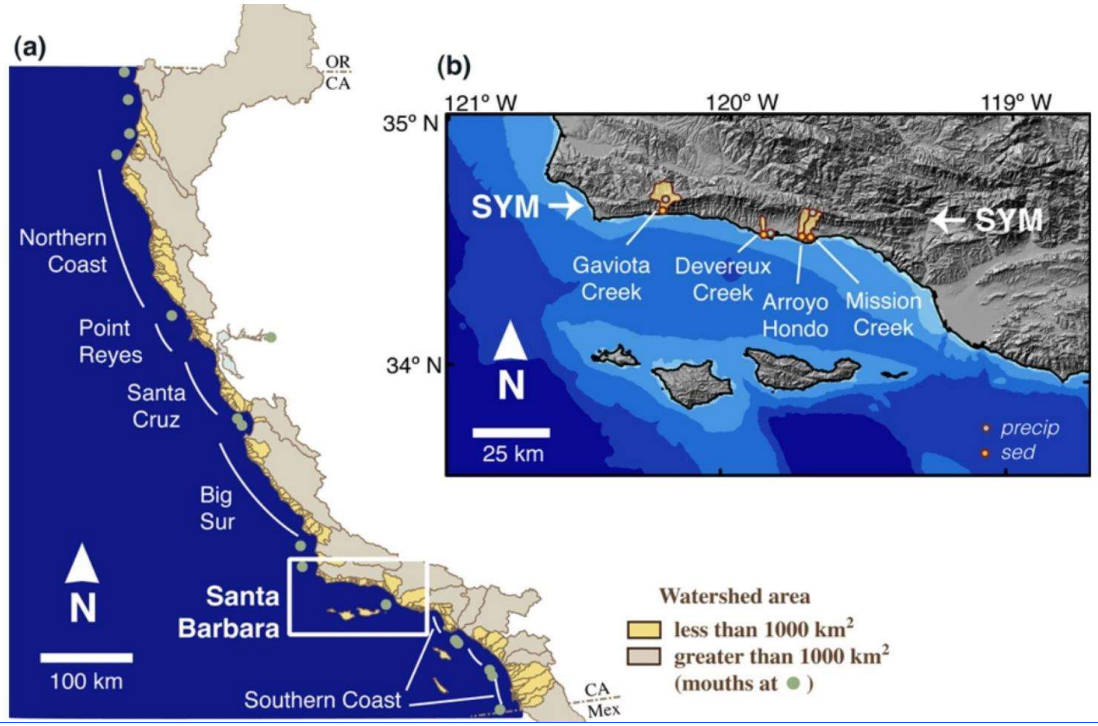
Qmsc	**Coarse-grained marine nearshore and shelf deposits (late Holocene)**—Coarse sand and gravel to boulders
Qmsf	**Fine-grained marine shelf deposits (late Holocene)**—Mostly clay, silt, and very fine sand

How much material is coming out of the streams that will stay on the beach?

Journal of Hydrology: Regional Studies
Volume 4, Part B, September 2015, Pages 516-534

Sediment yields from small, steep coastal watersheds of California

Jonathan A. Warrick [a], John M. Melack [b], Blair M. Goodridge [b c]



Half of all suspended-sediment discharged occurred during a cumulative 0.5–2 days during the year, and half of the water discharged occurred during a cumulative 3–7 days

Infrequent events produce the majority of water and sediment discharge from these watersheds.

Little information exists about sediment inputs from rivers.

Huge error bars +/- 30%

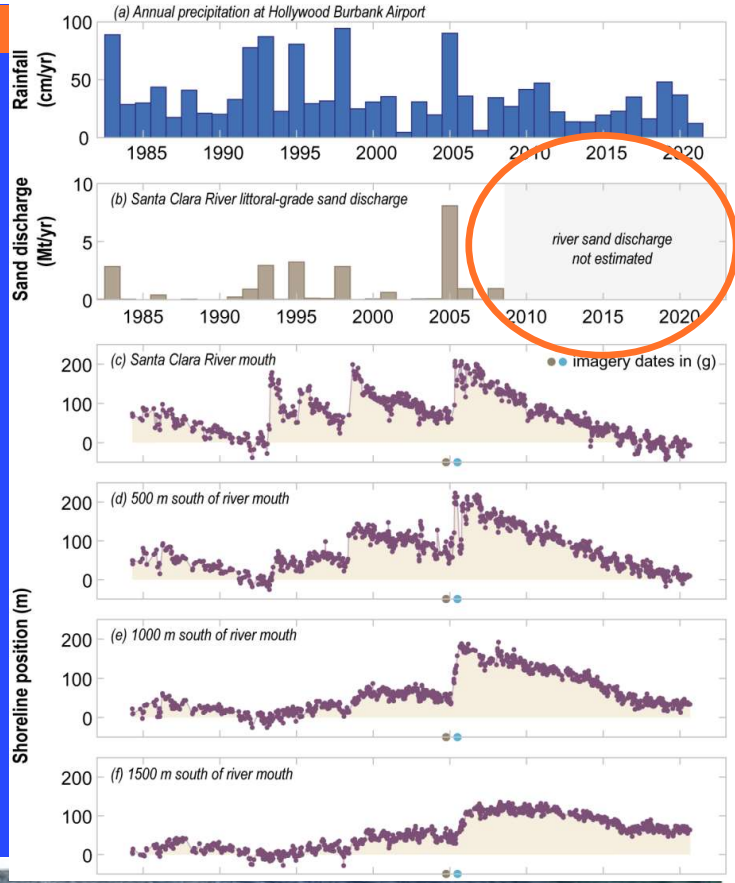
Fires, floods and other extreme events – How watershed processes under climate change will shape our coastlines

Published online by Cambridge University Press: **08 September 2022**

Jonathan A. Warrick, Amy E. East and Helen Dow

Show author details

- Infrequent, large magnitude events have a disproportionate influence on coastal landforms and littoral cells.
- Events that follow wildfires, earthquakes, volcanic eruptions, extreme precipitation or some combination of these factors can **redefine coastal sediment budgets and morphology.**
- Sediment inputs to coastal systems are highly variable with time, and that the variability and trends in sediment input are as important to characterize as long-term averages.



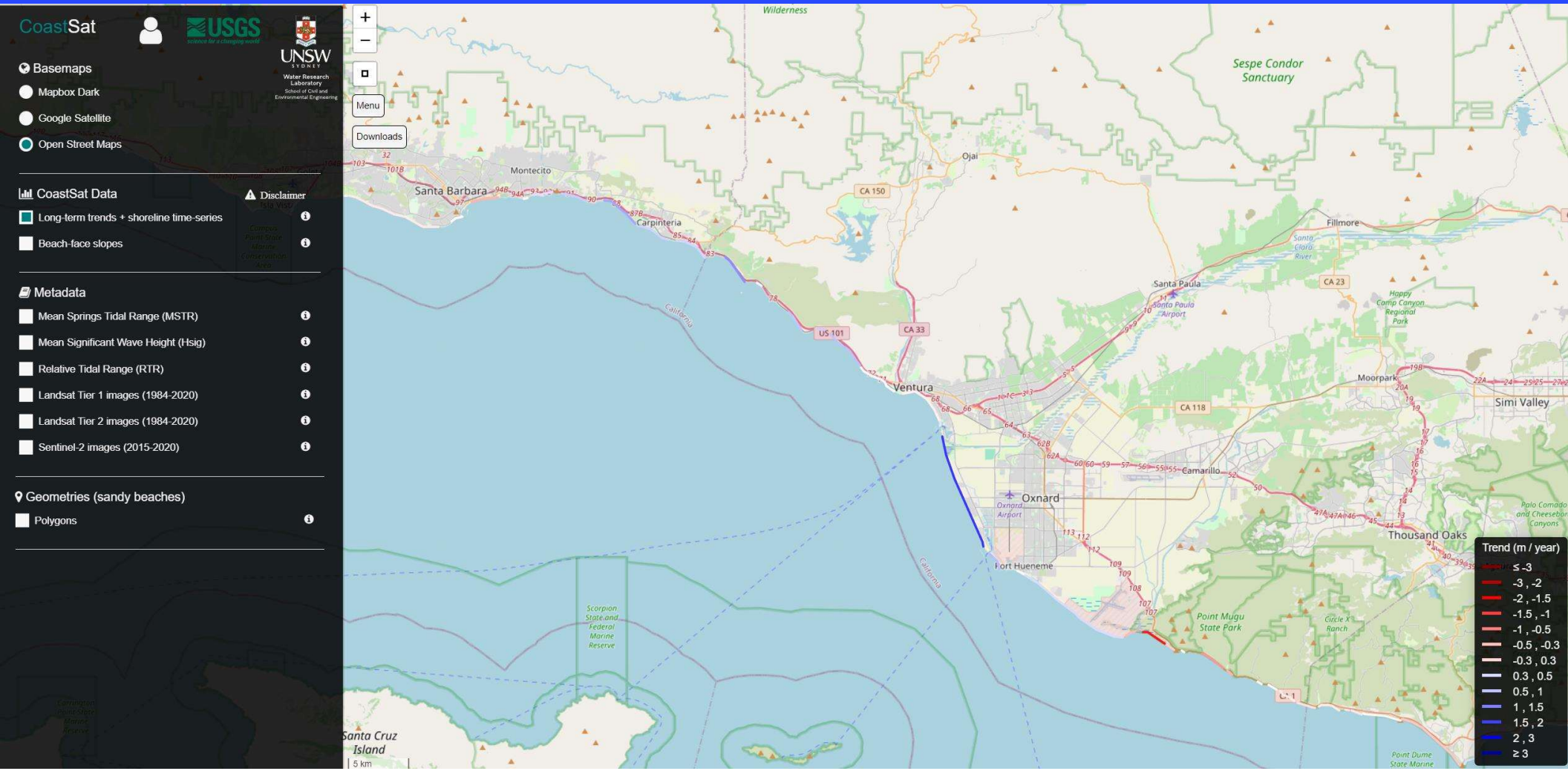
scientific reports

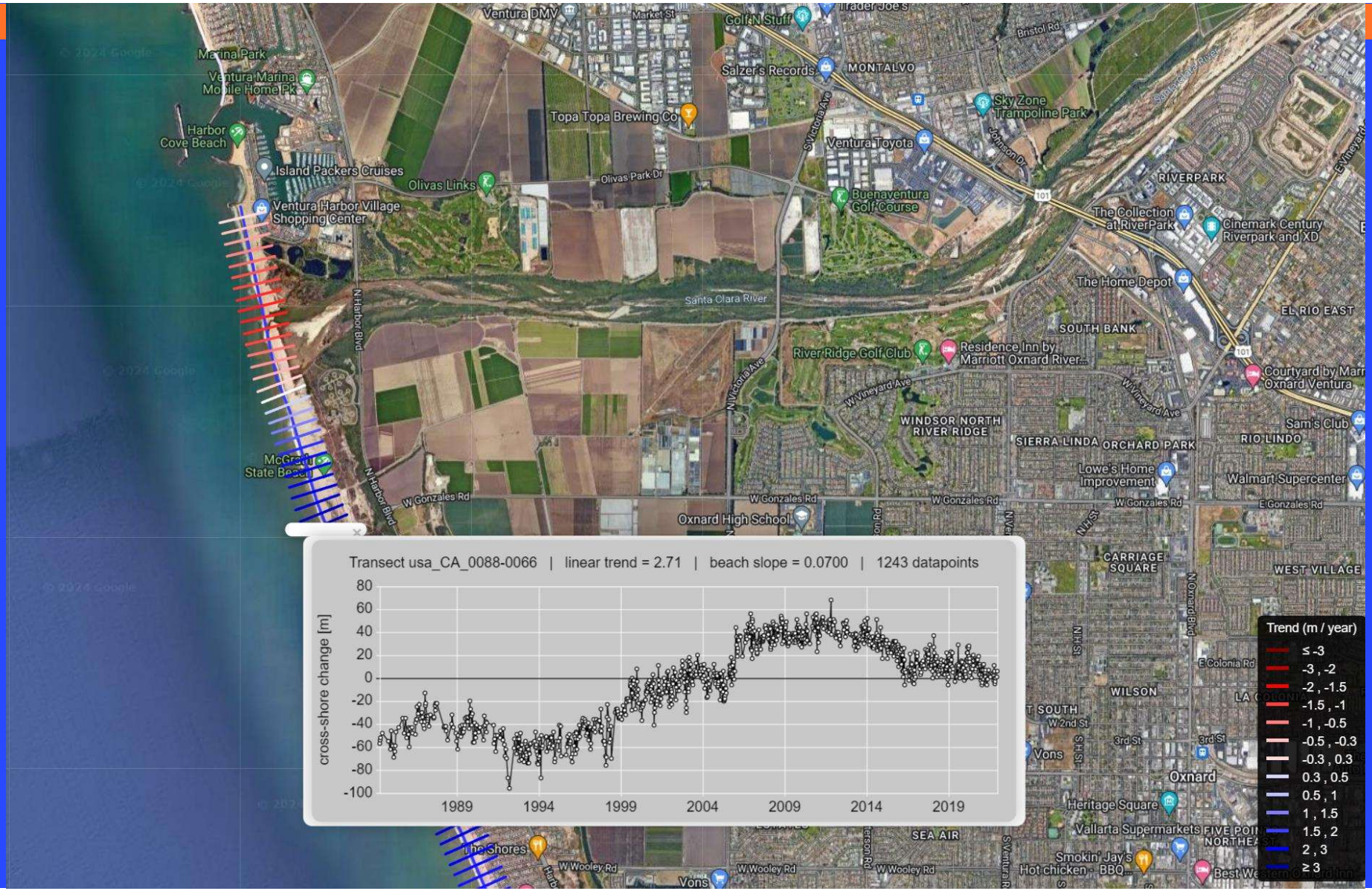
OPEN

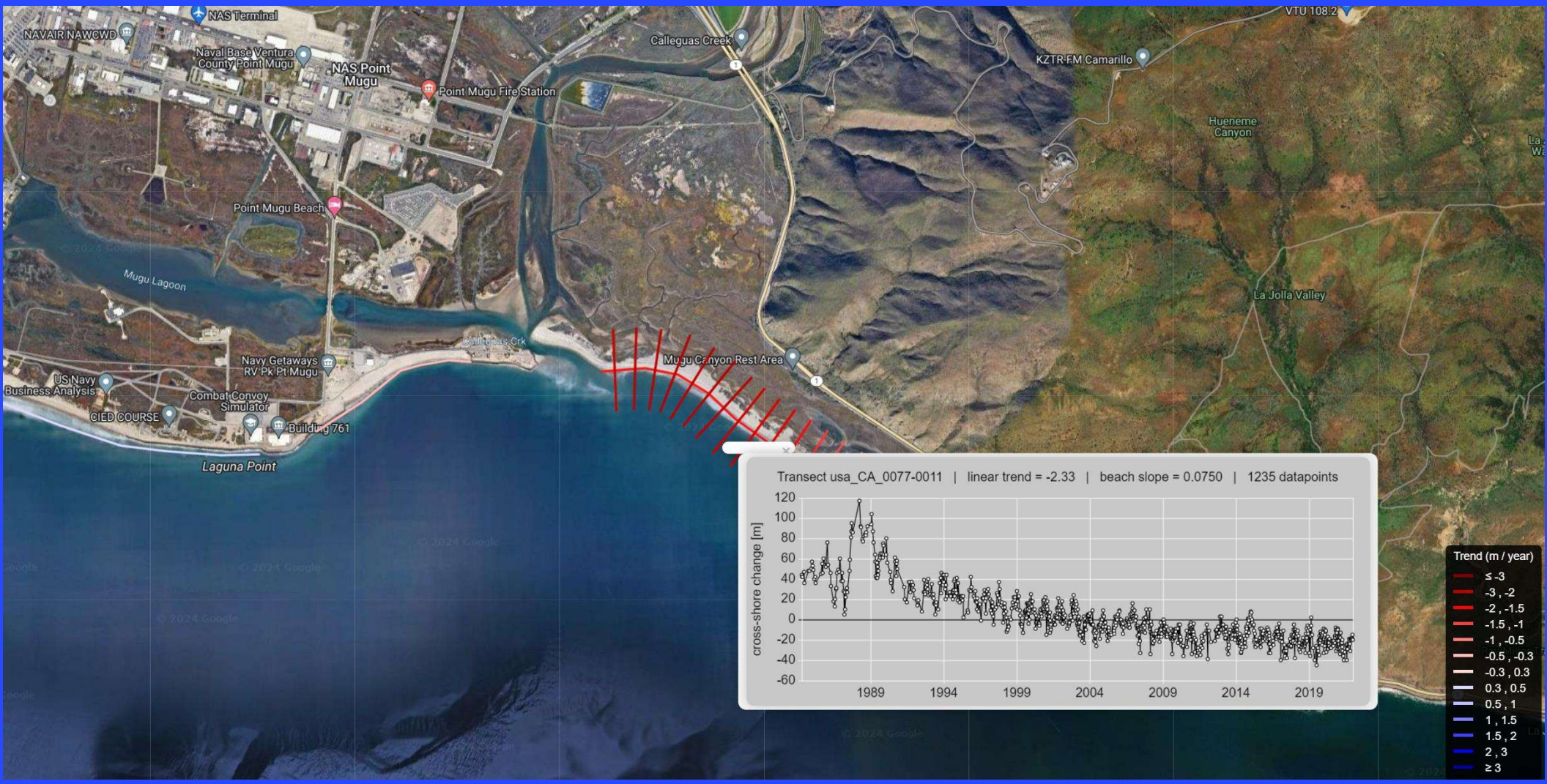
Fire (plus) flood (equals) beach: coastal response to an exceptional river sediment discharge event

Jonathan A. Warrick[1✉], Kilian Vos[2], Amy E. East[1] & Sean Vitousek[1,3]

USGS's CoastSat Tool can give us so much information about changes in beach width!




Transect usa_CA_0088-0066 | linear trend = 2.71 | beach slope = 0.0700 | 1243 datapoints
cross-shore change [m]
80
60
40
20
0
-20
-40
-60
-80
-100
1989
1994
1999
2004
2009
2014
2019
Trend (m / year)
≤ -3
-3 , -2
-2 , -1.5
-1.5 , -1
-1 , -0.5
-0.5 , -0.3
-0.3 , 0.3
0.3 , 0.5
0.5 , 1
1 , 1.5
1.5 , 2
2 , 3
≥ 3
Ventura DMV
Market St
Golf N Stuff
Trader Joe's
Bristol Rd
Marina Park
Ventura Marina Mobile Home Pk
Salzer's Records
MONTALVO
Sky Zone Trampoline Park
Topa Topa Brewing Co
Harbor Cove Beach
Ventura Toyota
Island Packers Cruises
Olivas Park Dr
Olivas Links
Buenaventura Golf Course
RIVERPARK
Ventura Harbor Village Shopping Center
The Collection at RiverPark
Cinemark Century Riverpark and XD
The Home Depot
Santa Clara River
N Harbor Blvd
SOUTH BANK
EL RIO EAST
River Ridge Golf Club
Residence Inn by Marriott Oxnard River...
Courtyard by Marr Oxnard Ventura
N Victoria Ave
W Vineyard Ave
WINDSOR NORTH RIVER RIDGE
SIERRA LINDA
ORCHARD PARK
RIO LINDO
Sam's Club
McGrath State Beach
Lowe's Home Improvement
Walmart Supercenter
W Gonzales Rd
E Gonzales Rd
Oxnard High School
CARRIAGE SQUARE
WEST VILLAGE
N H St
E Colonia Rd
WILSON
W 2nd St
3rd St
Vons
Oxnard
Heritage Square
Vallarta Supermarkets
SEA AIR
The Shores
W Wooley Rd
Smokin' Jay's Hot chicken - BBQ...



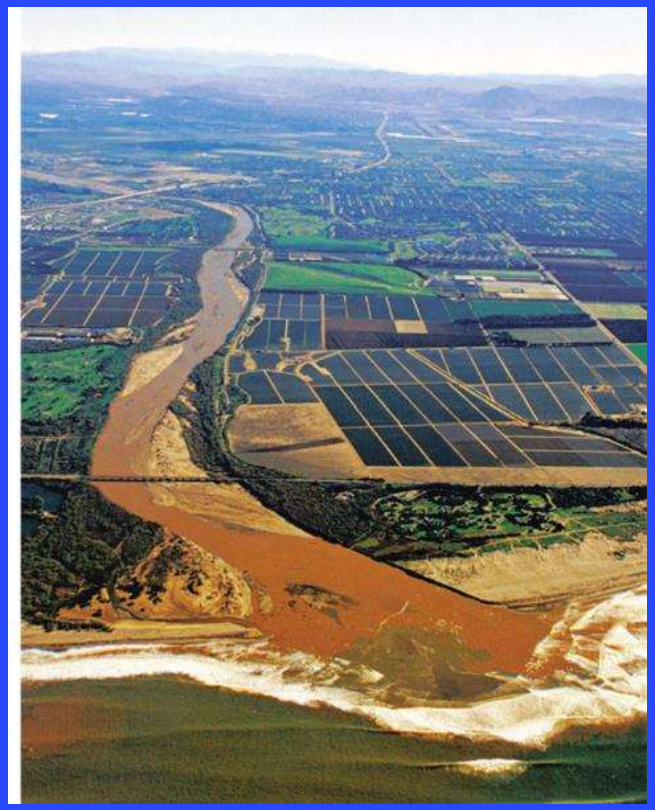
http://coastsat.wrl.unsw.edu.au/

Do we know how much fluvial sediment reaches the sea? Decreased river monitoring of U.S. coastal rivers

September 2018 · Hydrological Processes 32(23)

DOI: 10.1002/hyp.13276

Jonathan Adam Warrick · John Milliman



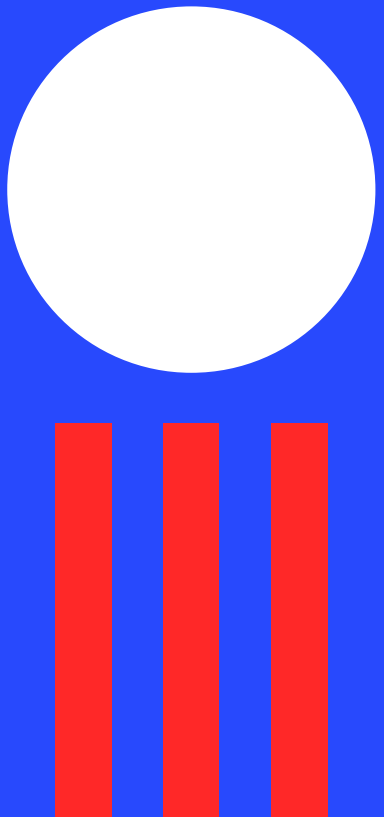
- Changes to land use and river control as well as extreme events are likely to change river sediment fluxes in the future
- To understand the changes, we need good data
  - Unfortunately, broad-scale river sediment monitoring programs established more than 50 years ago have diminished substantially and only focus on the world's largest rivers now.

Cobble Budget and Rate of Movement

Clearly a lot of cobble sized material is coming out of the Ventura river.

This needs to be **quantified and included in the sediment budget.** We also want to know how quickly it moves down coast as it appears to stabilize the shore quite well.

Summary:
It's time to modernize the sediment budget for the Santa Barbara Cell



- 1. Understand the Boundaries of the Littoral Cell
- 2. Update the sediment budget
  - Updated understanding of stream discharge and recent climate conditions (Increase in storm frequency and duration, fires, etc)
  - Updated cliff erosion rates and contributions
  - New knowledge of storage in offshore bars
  - Fate of fine material
  - Contribution of Cobbles to the budget and their rate of transport

3. Coast-Sat: Understand how the shoreline change trends are

- related to the sediment budget?

Why?

With a rising sea level and a changing climate, our regional supply of sand and its movement will change.

We need to work together on a **REGIONAL** level and figure out how to share the sand and manage it in a way that works **WITH NATURE.**

We need the data depot/information station so we can agree on what tools to use and organize and gather the best available science.

- Collect and maintain dredging records
- Collect and maintain armoring database
- Collect and maintain consulting reports and management plans
- Collect and maintain offshore sand borrow sites for nourishment
- CoSMoS or NOAA sea level rise viewer?
- CoastSat, Drones, or Transects?
- Where we draw the back beach line?
- Resilience of dune systems and beaches after storms
- Etc, etc, etc…

Thank you

Kiki Patsch
434-825-5185
Kiki.patsch@csuci.edu
www.sandshed.org