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THE EFFECTS OF ARMORING THE COASTLINE: THE CALIFORNIA EXPERIENCE

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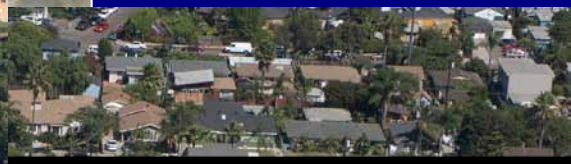
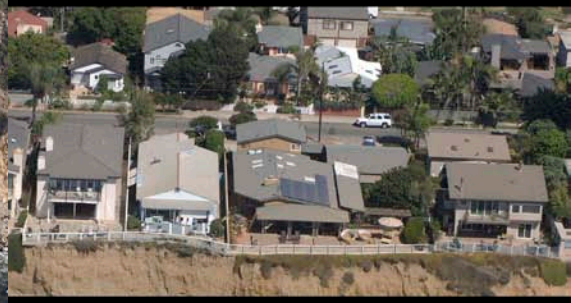
California's coast has been retreating for 18,000 years, and all evidence indicates that this is going to continue for a while longer.





Some of the state's most valuable real estate is right at the edge.

What are the potential solutions:

RETREAT OR RELOCATE

Retreat or demolish

2. Armoring: has historically been the most frequent approach in California

Hardening the California coastline

- Increasing amount of California coast armored over the past 30 years with more permit requests for new armor as a result of warm PDO cycle that began in 1978.

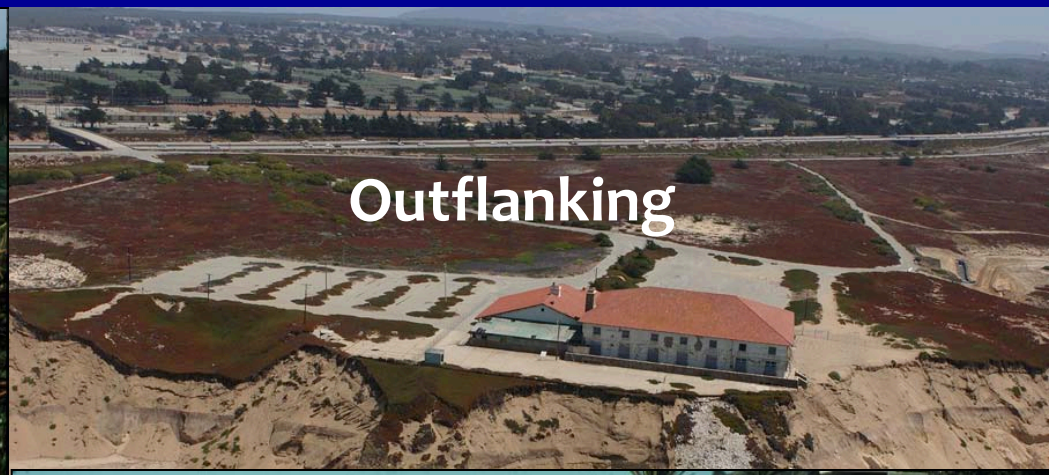
- 110 miles or 10% of entire 1100 miles of California coast now armored, a 400% increase since 1971.

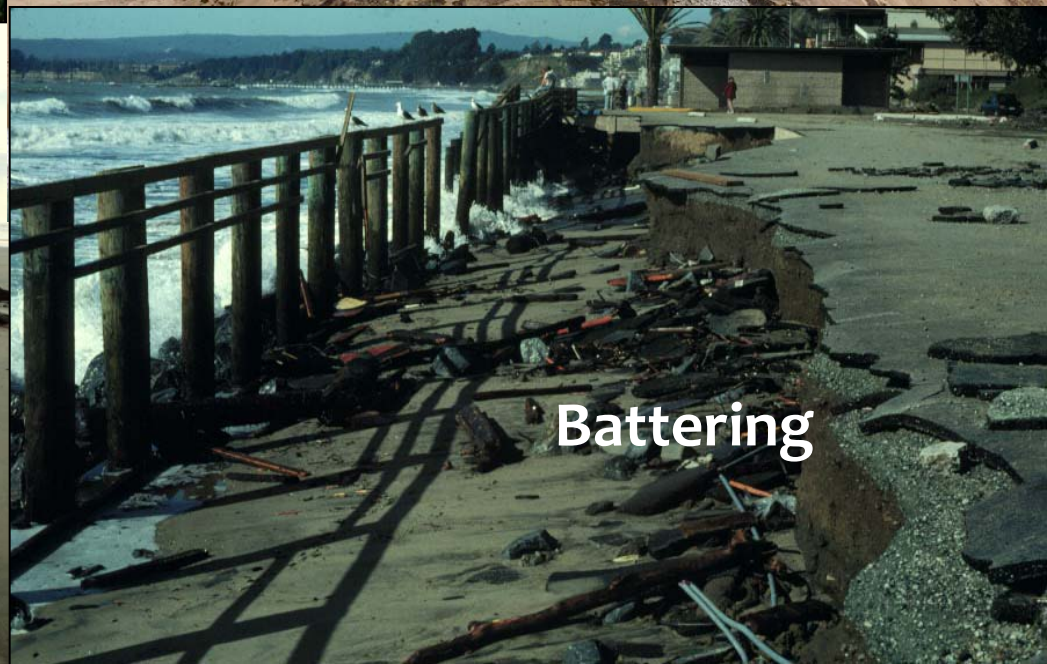
- California's four southern counties are now ~33% armored.

- Present day costs of ~$2000-$8000/ft or $10 to $40 million per mile.

- Seawalls built to protect cliffs or bluffs but not to protect beaches.

Armoring is not a permanent solution and effectiveness varies widely.





There are seawalls that have functioned effectively for over 80 years and others that didn't make it through their first 80 days

San Francisco 1928-2009

Rio del Mar 1985-86

Impacts of seawalls and revetments on the coastline

1. Access restriction
2. Visual or aesthetic impacts
3. Reduction of sand supply from eroding cliffs
4. Placement losses
5. Passive erosion
6. Effects on surfing
7. Active erosion

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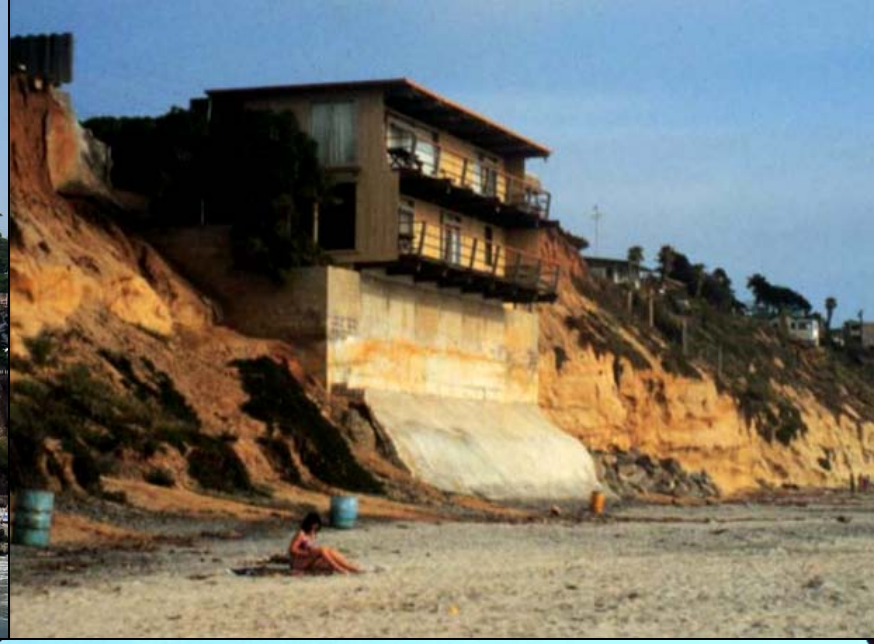
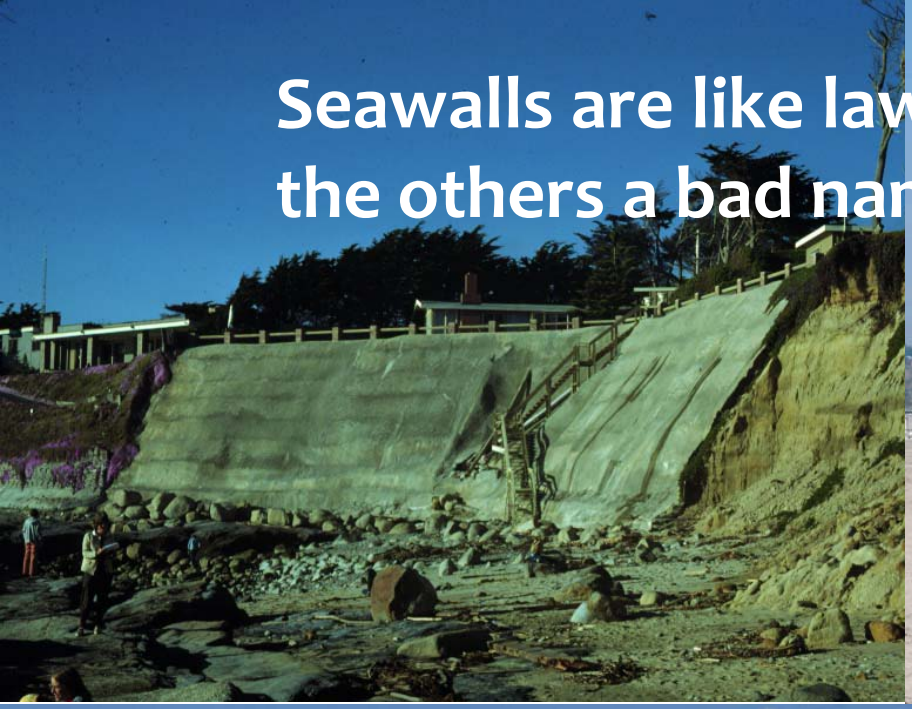
1. Access Restrictions

Malibu Beach- Access Restrictions

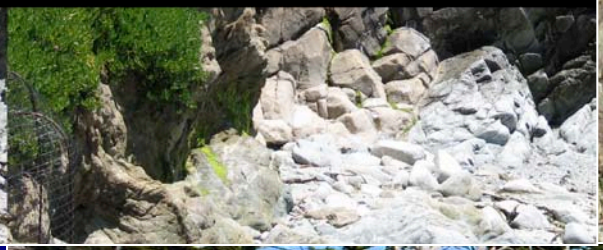
2. Visual impacts

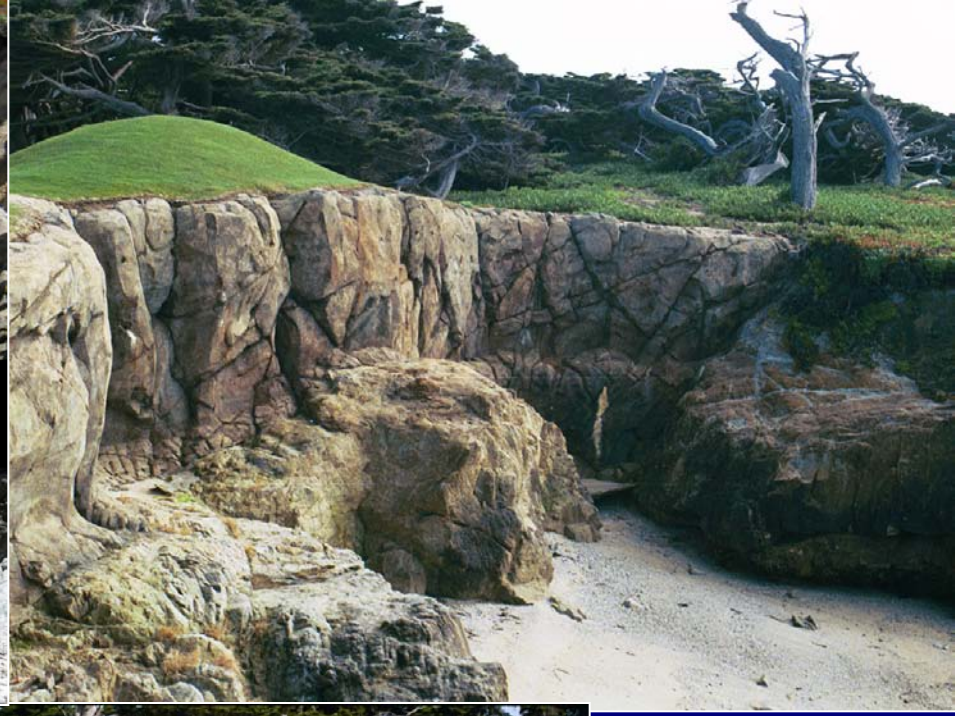


Seawalls are like lawyers, 95% of them give the others a bad name.



Soil Nail Walls





KOMATSU

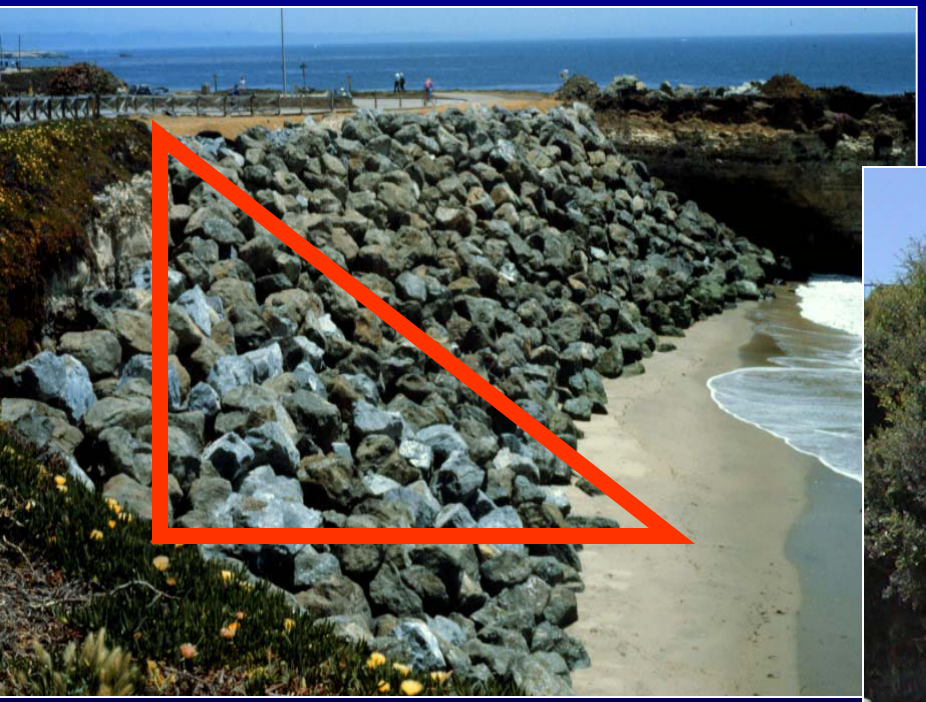
3. Sand Supply Reduction

Key elements

- Alongshore cliff length
- Cliff height
- % sand in cliff rock
- Littoral cut-off diameter
- Erosion rate

Santa Barbara Littoral Cell- Four major rivers provide ~ 2.1 million yds^3 of sand to the cell annually; cliff erosion provides only 11,000 yds^3 or 0.5% of the sand to the beaches of the cell.

4. Placement losses: or beach coverage: Riprap covers far more beach than a seawall or soil nail wall; placement loss is high



Loss of beach through placement of riprap- Is this a reason for the perceived loss or "erosion" of southern California beaches?

5. Passive Erosion

Passive Erosion

6. Effects on surfing

Steamer Lane Santa Cruz

7. Active Erosion

Do seawalls cause beach erosion?

An 8 year study to determine the effects of seawalls & rip-rap on the beach.

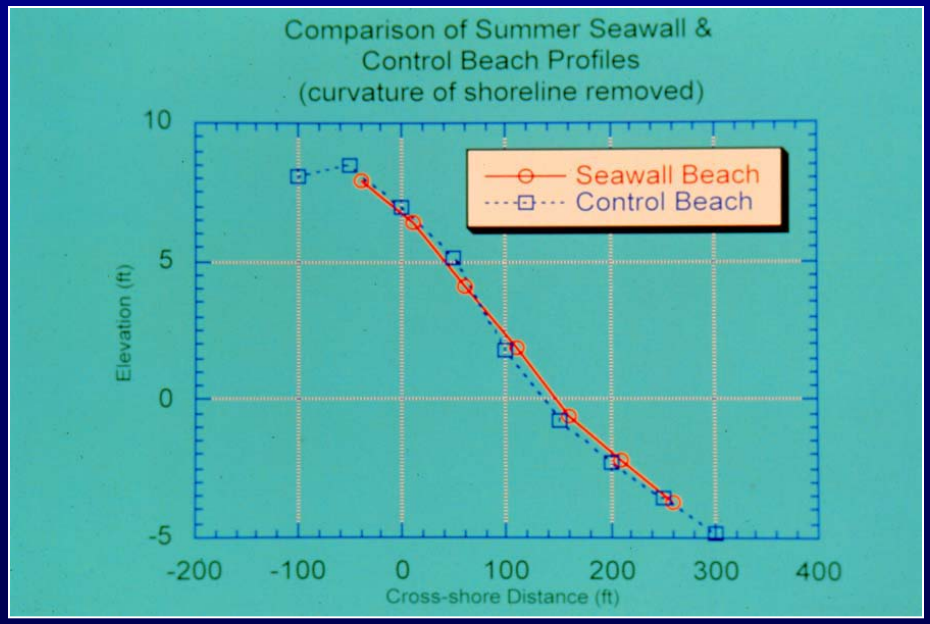
Seawalls vs. Revetments

No significant alongshore differences in beach profile

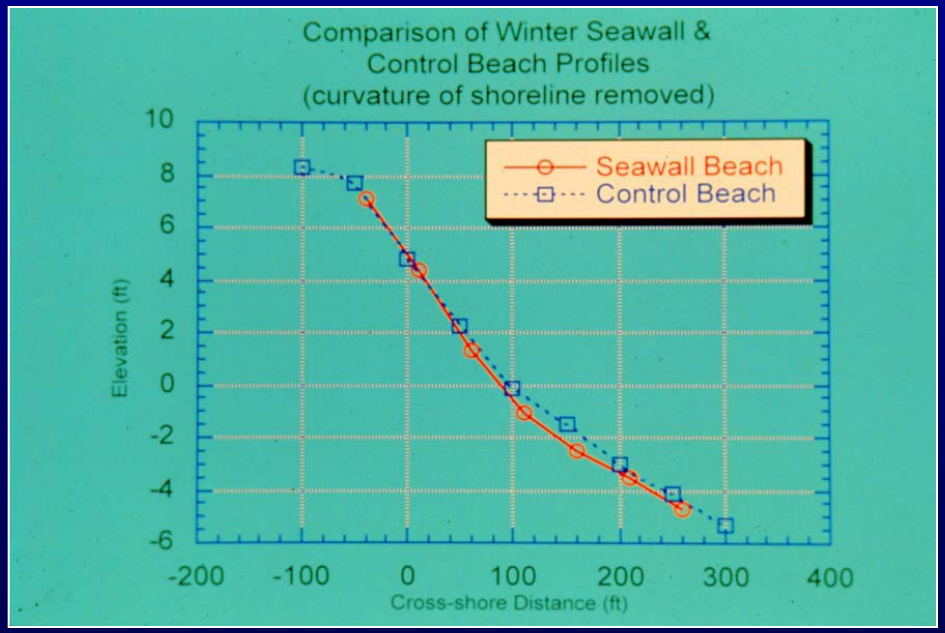
WINTER BEACH

Eight years of monthly seawall surveys

Summer



Winter



Coastal protection:

Soil nail walls can nearly eliminate 1) visual impacts, 2) access issues, and 3) placement losses.

This leaves 1) potential sand supply reduction and 2) passive erosion to contend with.

We need to think both intermediate and long-term.

PROTECTING THE COASTLINE

Who benefits? How long is it sustainable?