



Kelp wrack and reef rock monitoring at San Clemente Beach

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California Coastal Commission for the
San Onofre Nuclear Generating Station
Wheeler North Reef Mitigation Project**

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4/10/2012

Slide 1

Outline – Wrack and Rock Monitoring

- Purpose
- Setting
- Methods
- Background
- Results
- Conclusions



4/10/2012

Kelp wrack and reef rock monitoring at San Clemente – Purpose:

- Fulfill conditions of :
 - the Coastal Development Permit
 - the Army Corps Permit
 - the State Lands Lease
- Fulfill conditions in the Project EIR
 - Concerns about reef rock and kelp washing up on beach
 - Concerns about beach clean-up activities



***The study area – From San Mateo Point and 3.7 miles north
to the San Clemente Pier***

***San Clemente
Beach Study Area***

San Mateo Point

***San Onofre Nuclear
Generating Station***

***Camp Pendleton
Marine Base***



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Satellite View – the Wheeler North Reef, San Clemente Beach, San Mateo Point and SONGS discharge plume



Wrack Survey Methods

For the San Clemente study:

Phase 1 (1999-2005)

and

Phase 2 (2008-2013)



Sampling frequency:

- ***Monthly summer surveys (April – October)***
- ***Bi-weekly winter surveys (November – March)***
- ***Immediately following any large wave and storm event***

Sampling location

- ***Monitor 3.7 miles of beach (north of San Clemente Pier to San Mateo Pt.), 5 transects***

Measurements

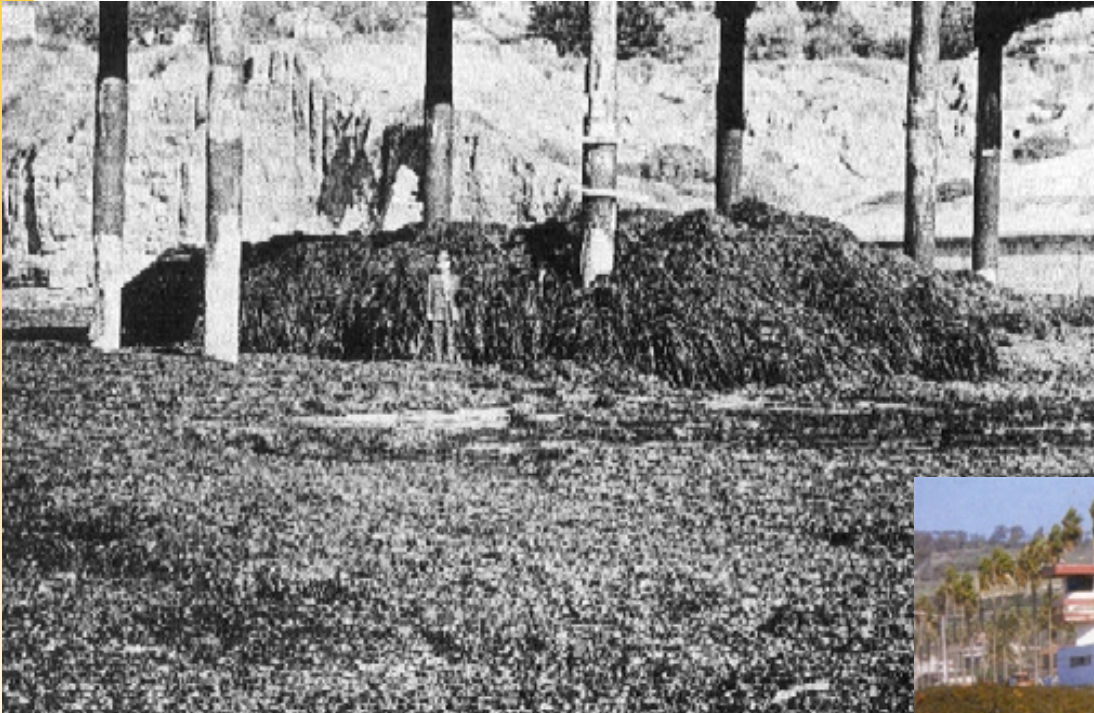
- ***Record amount of wrack, in cubic feet, along 500-foot shore-parallel beach transects***
- ***This replicates 1950's Scripp's wrack study methods used at 47 S. Cal. Beaches (ZoBell, 1959)***

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Slide 6

Beach cleanup issues

Kelp wrack has been known to collect under piers and along beaches after large storms

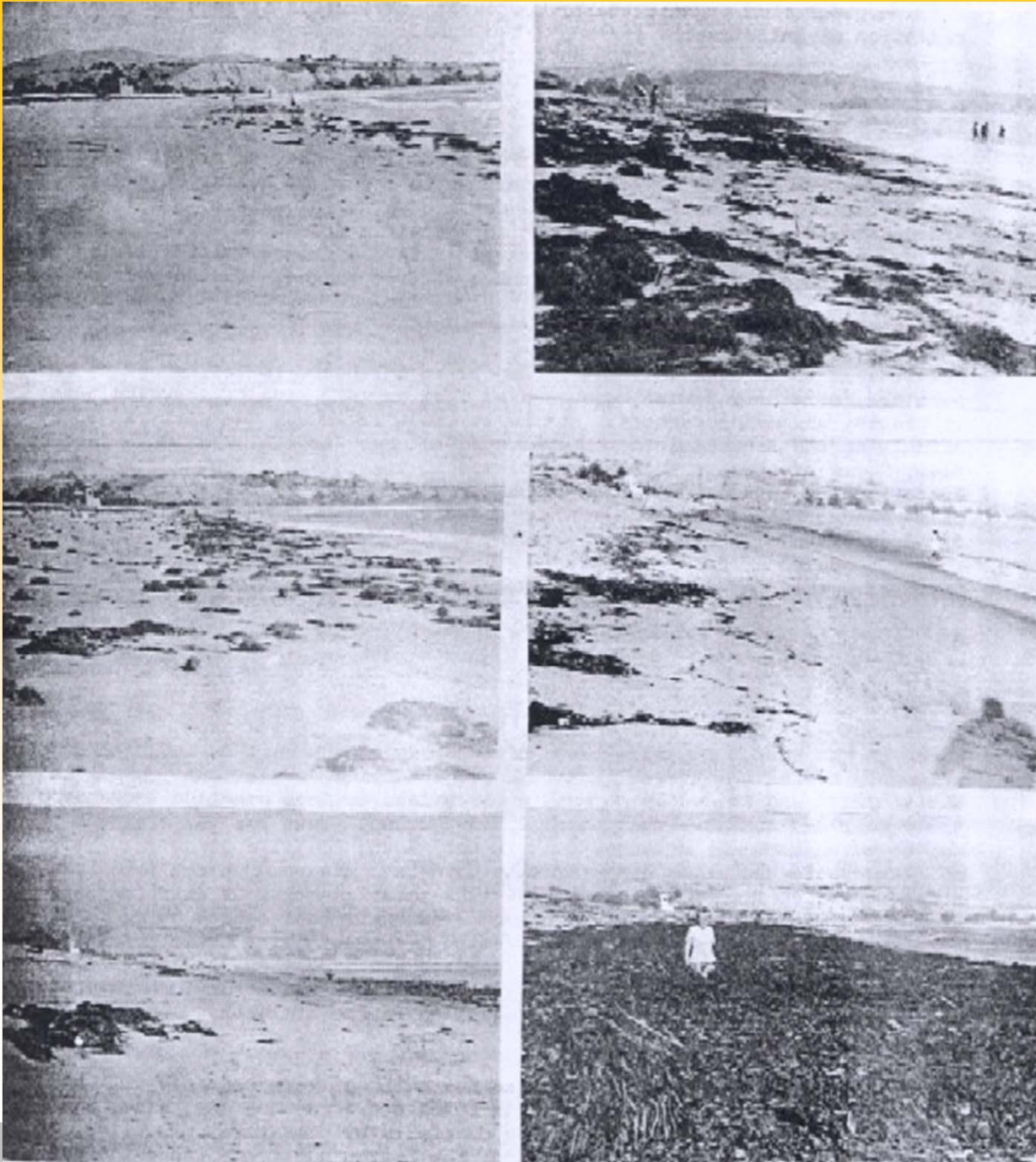


**Scripps Institute of
Oceanography Pier,
December 1945
(from ZoBell, 1959).**

**La Jolla Shores beach,
after a “severe storm”
(from McPeak, Glanz, & Shaw, 1988)**



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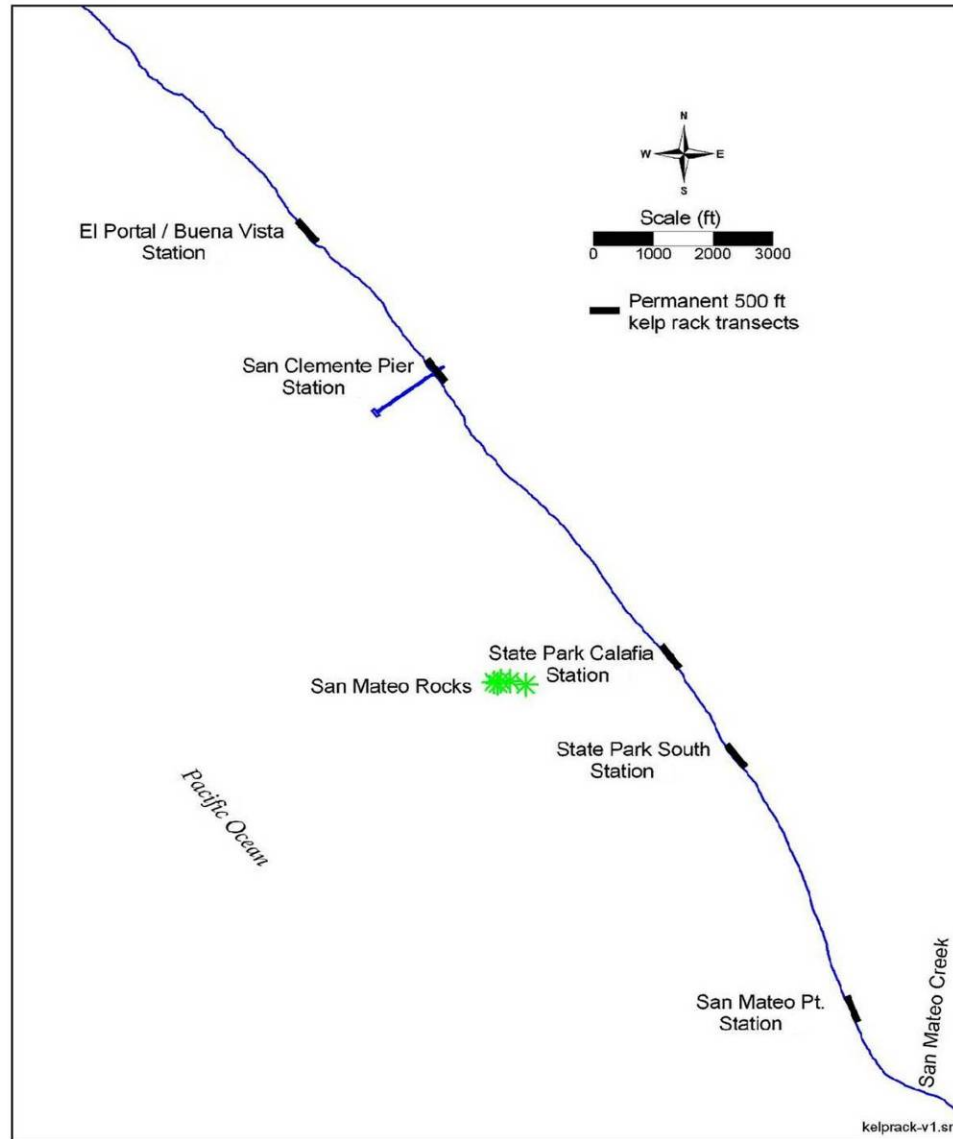
**One example from
ZoBell's (1959) kelp
wrack study:**

**Doheny State Park
(north of San Clemente)
1954-1956**

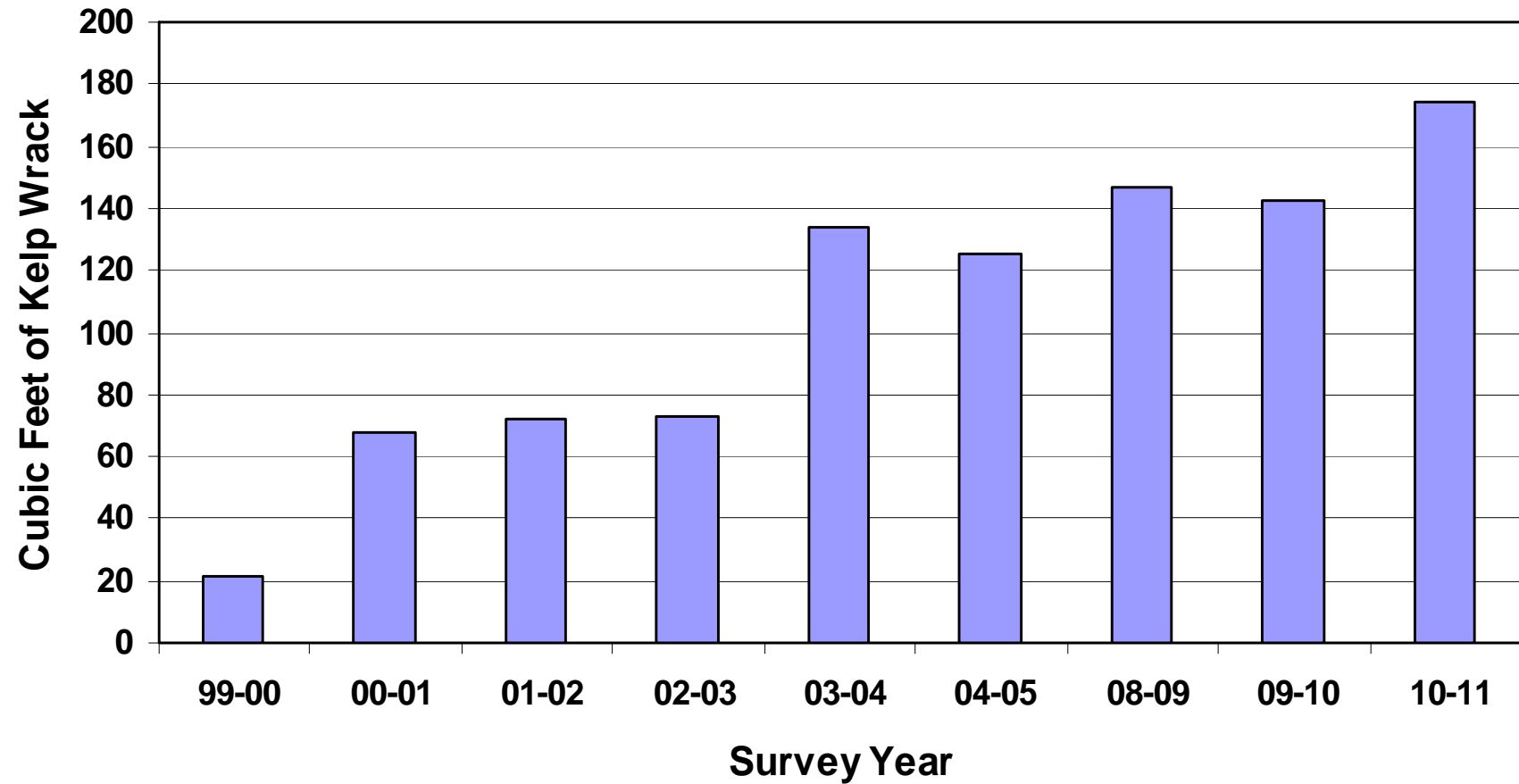
**Kelp Volume Range:
10 cubic feet
to
2,150 cubic feet
per 500-foot beach
transect**

Slide 8

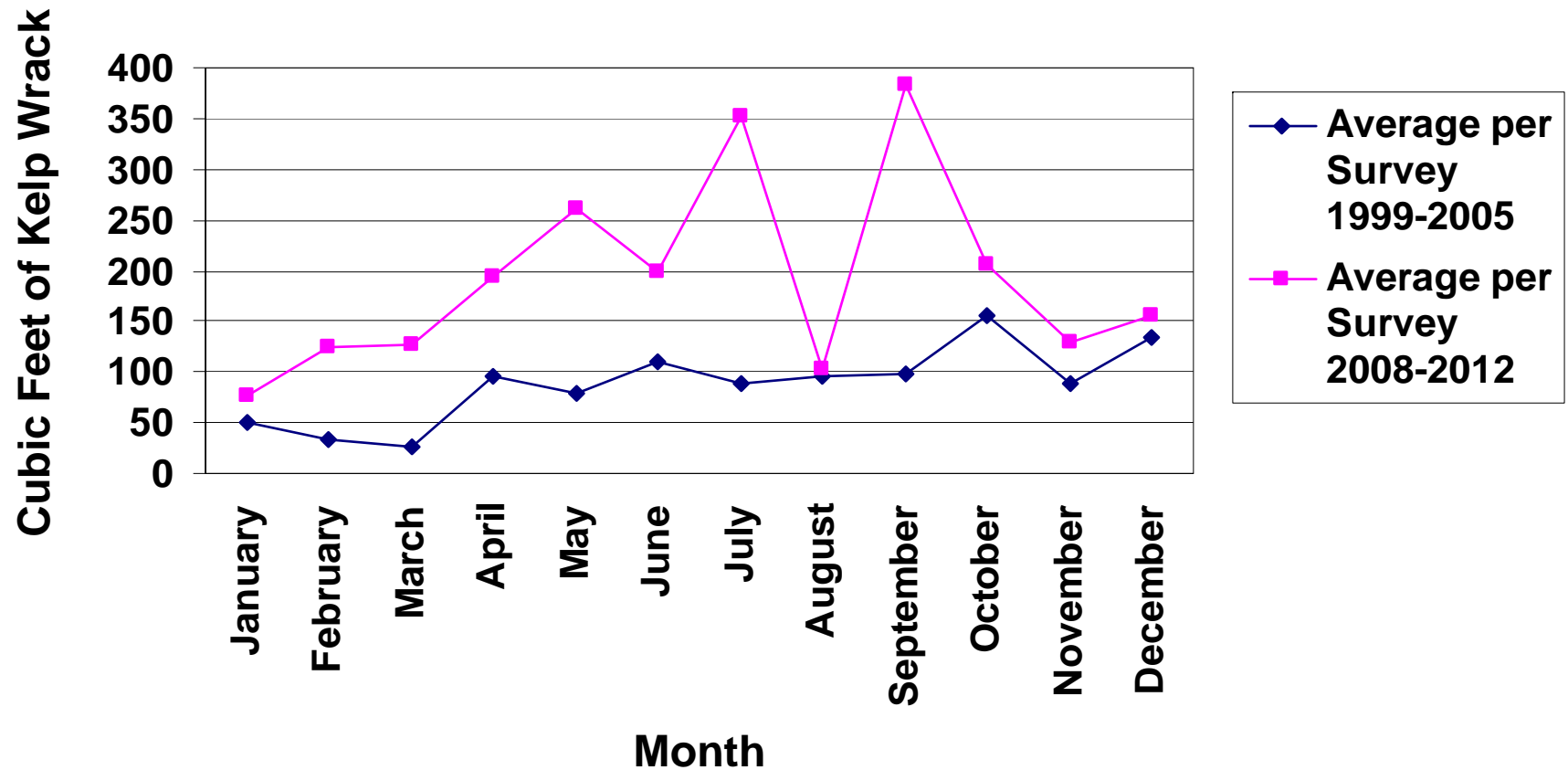
Location of 5 Permanent 500 ft. Kelp Wrack Transects



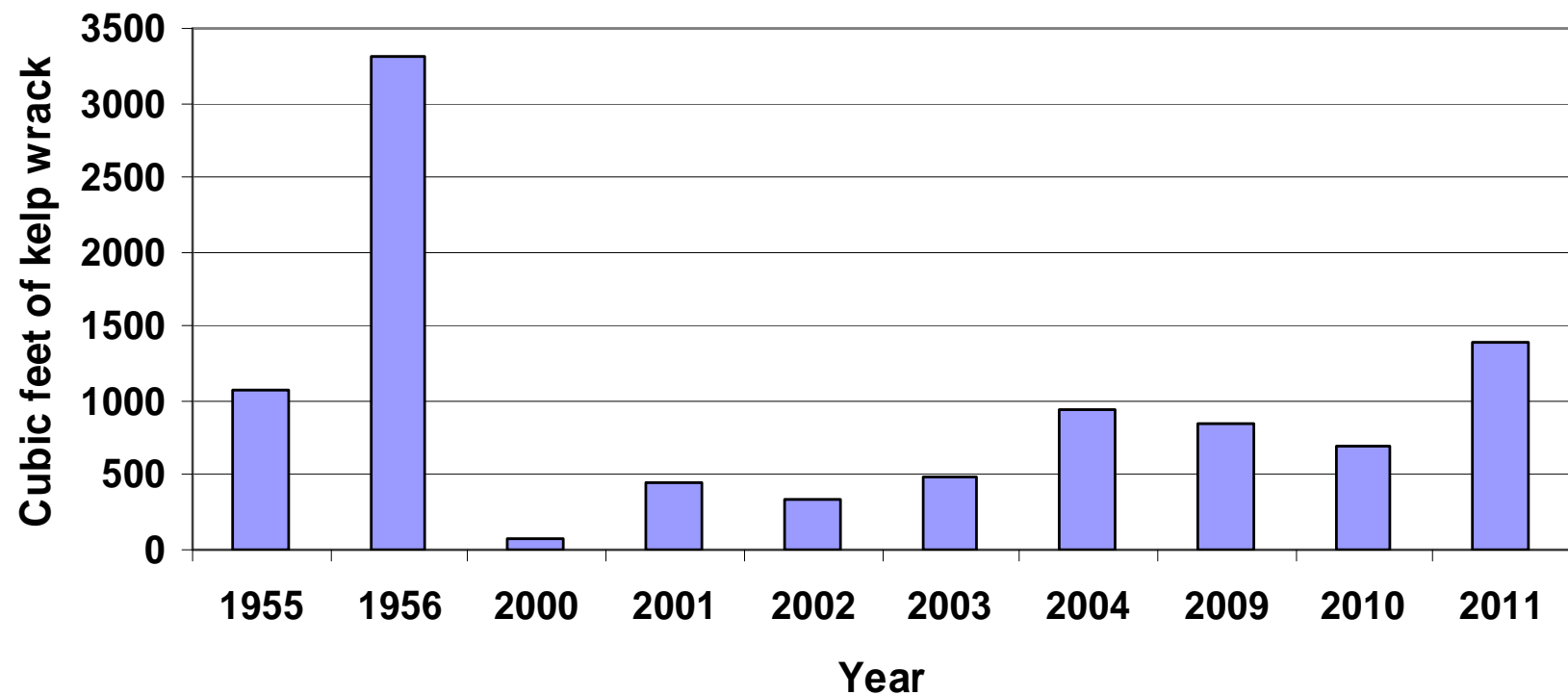
Average Annual Kelp Wrack per Survey for all 5 Transects



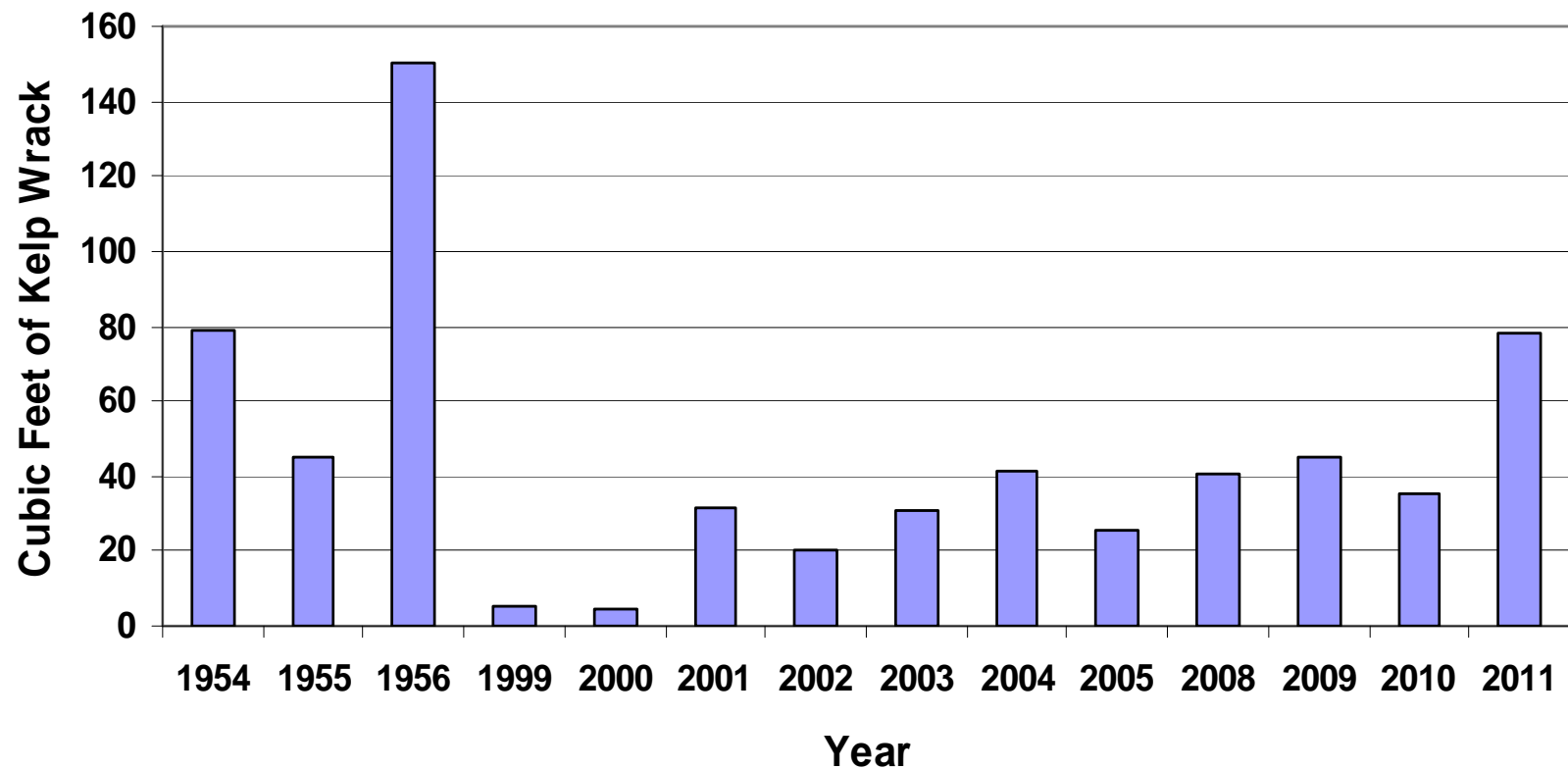
Monthly Kelp Wrack Average per Survey for all 5 Transects (1999-2005 and 2008-2012)



**Yearly Total of Kelp Wrack surveyed at
San Clemente Pier Transect**
(Only years with 12 months of surveying included)



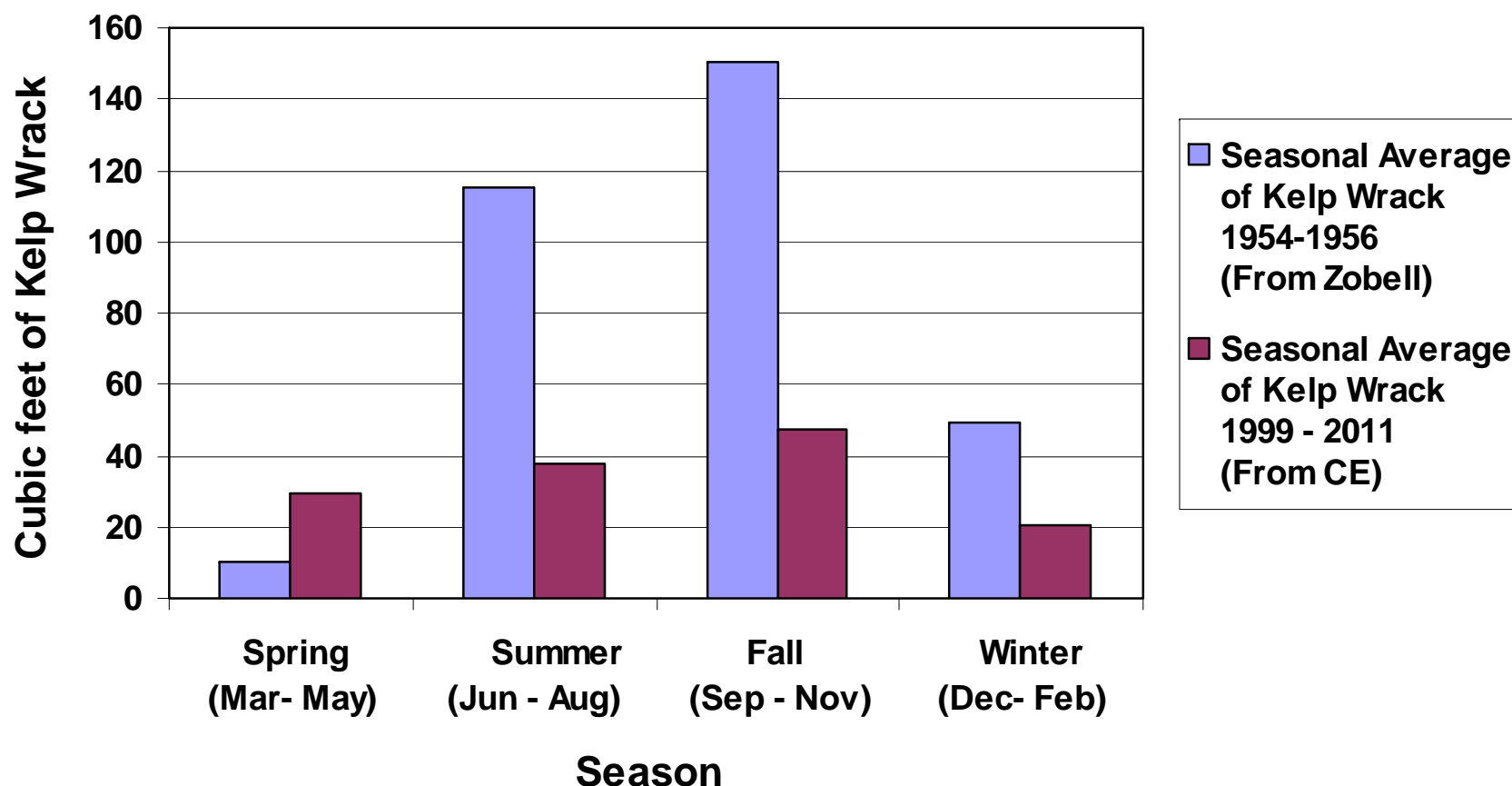
Monthly Average per Year of Kelp Wrack surveyed at San Clemente Pier Transect (1954-1956 by Zobell)



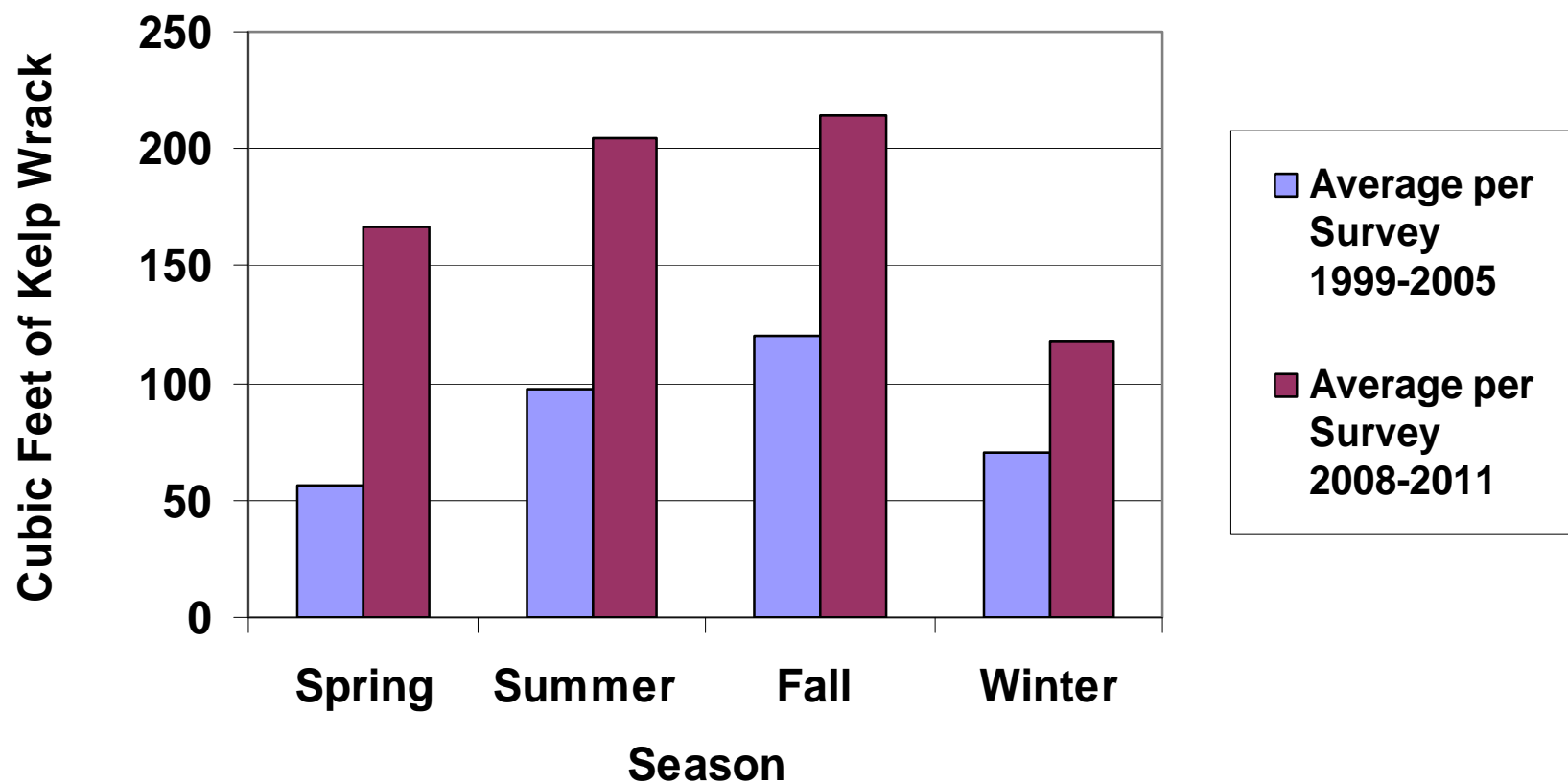
Seasonal Average of Kelp Wrack San Clemente Pier Transect

Overall average of kelp wrack found per Zobell survey was 92 ft.³

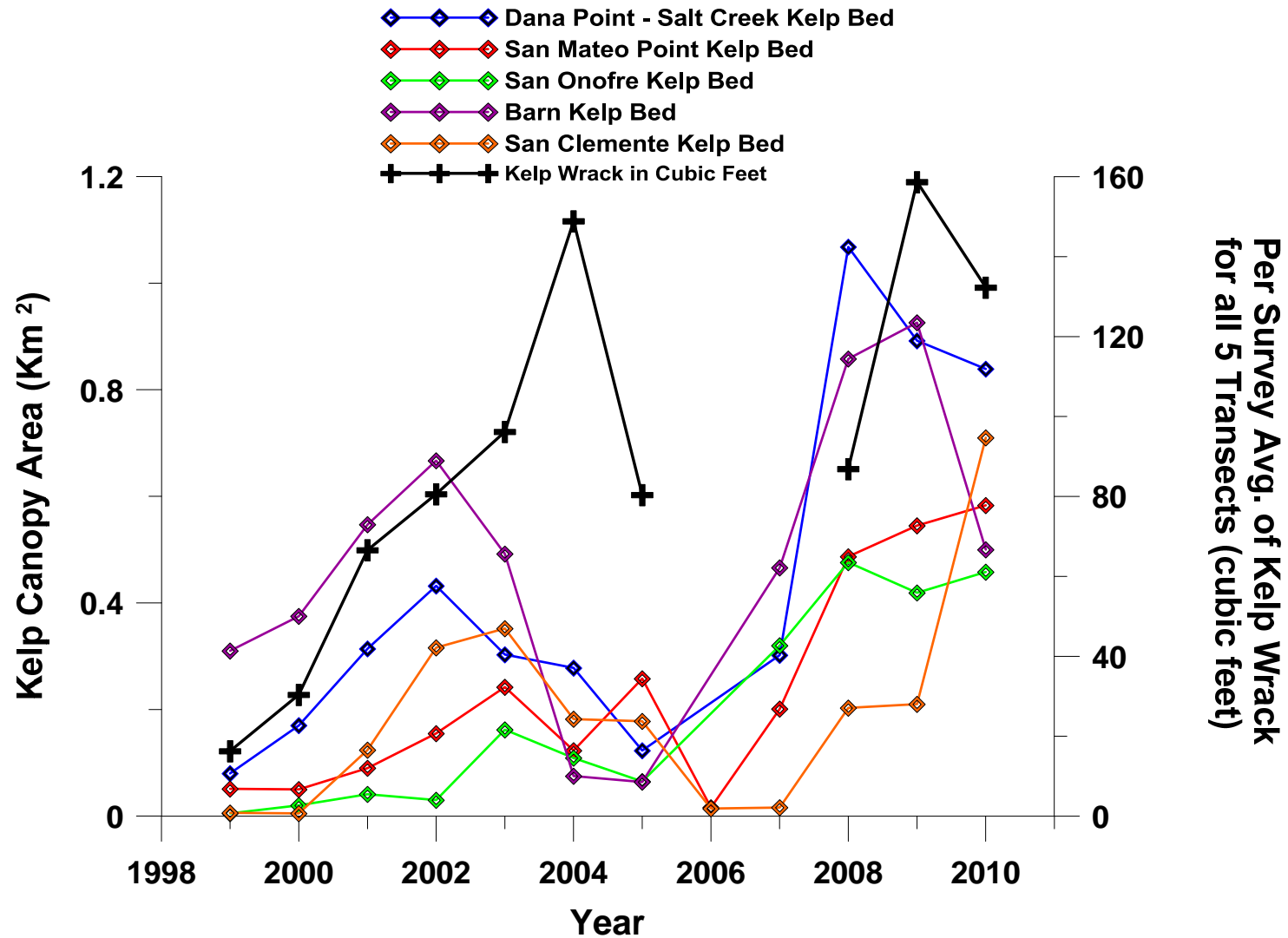
Overall average of kelp wrack found per CE survey was 32 ft.³



Seasonal Average of Kelp Wrack for all 5 Transects 1999-2011

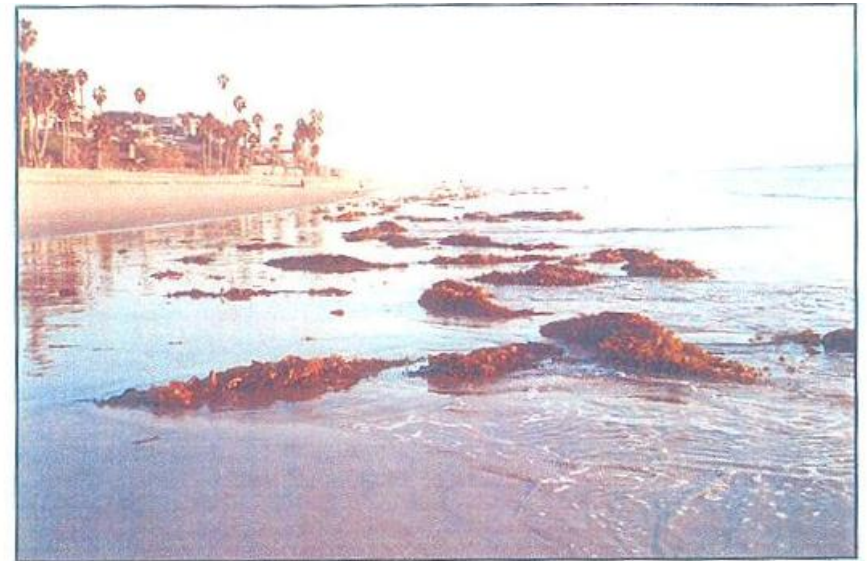


Kelp Canopy at 5 nearby Kelp Beds versus Kelp Wrack along San Clemente Beach





5: The largest amount of kelp wrack, 414 ft³ along a 500 foot stretch of beach, observed over the span of this six-year study. South of the San Clemente Pier, looking north, December 9, 2004.

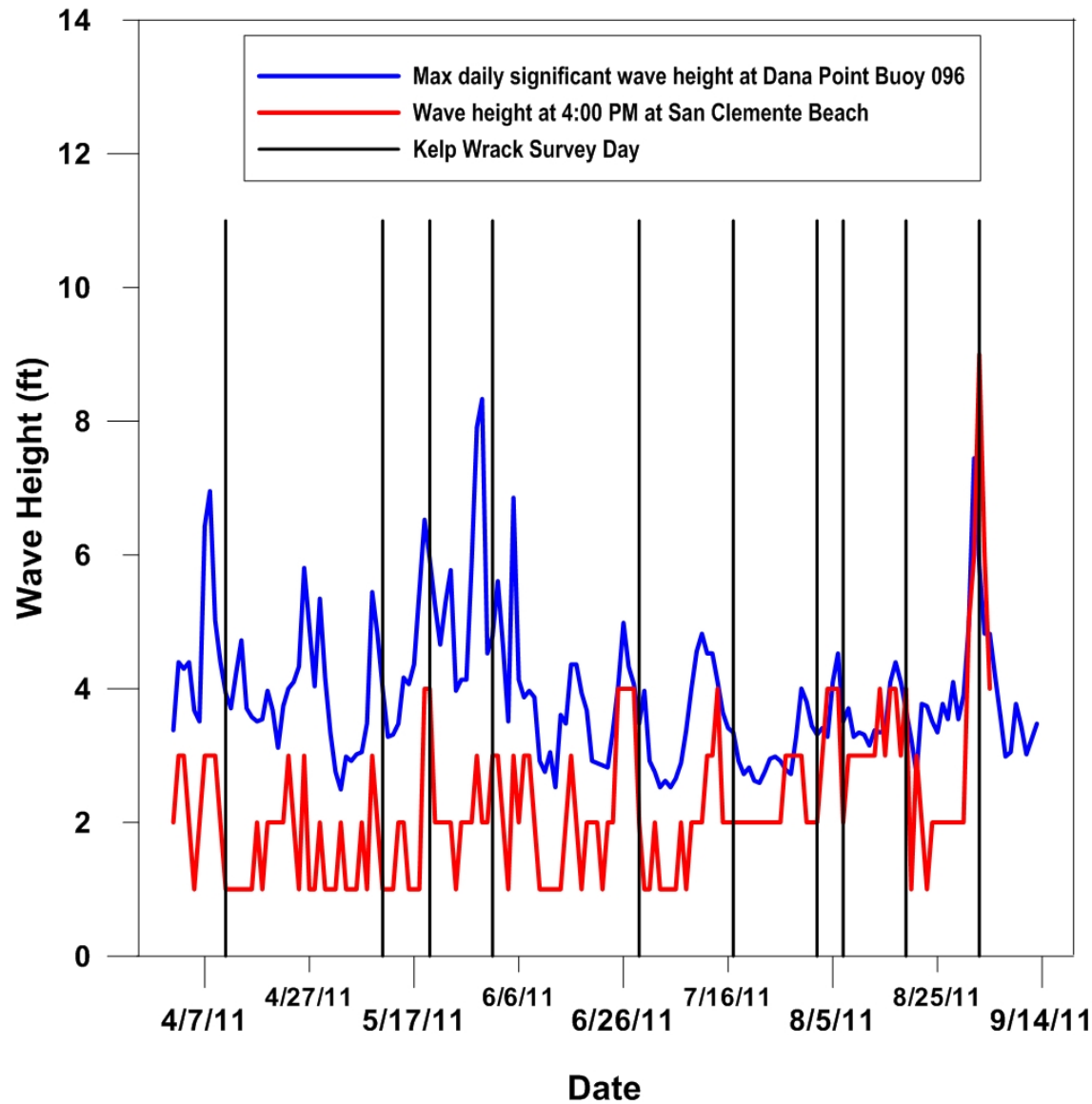


6: The second largest amount of kelp wrack, 402 ft³ along a 500 foot stretch of beach, observed over the span of this six-year study. South of the San Clemente Pier, looking south, December 9, 2004.

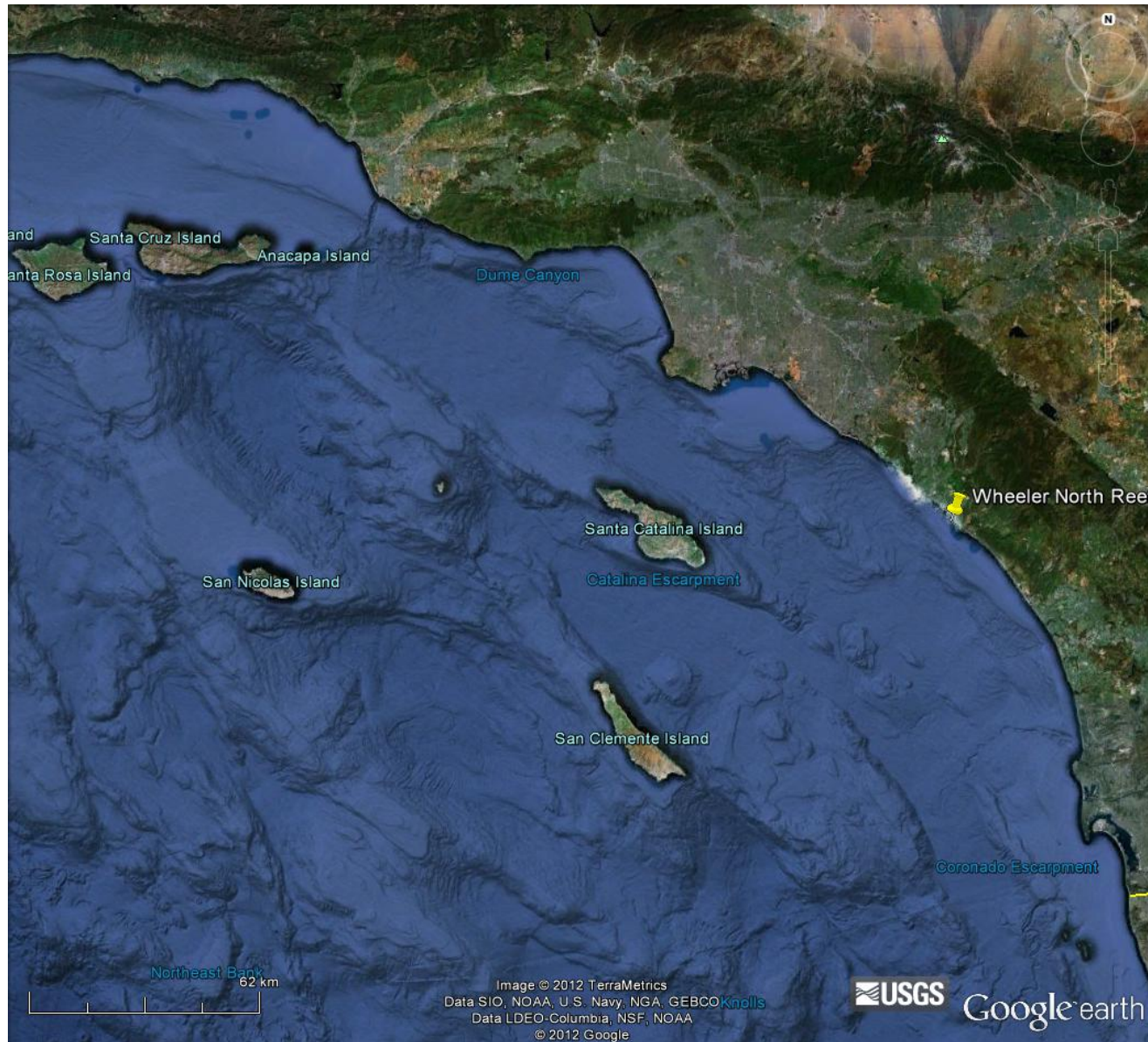
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Slide 17

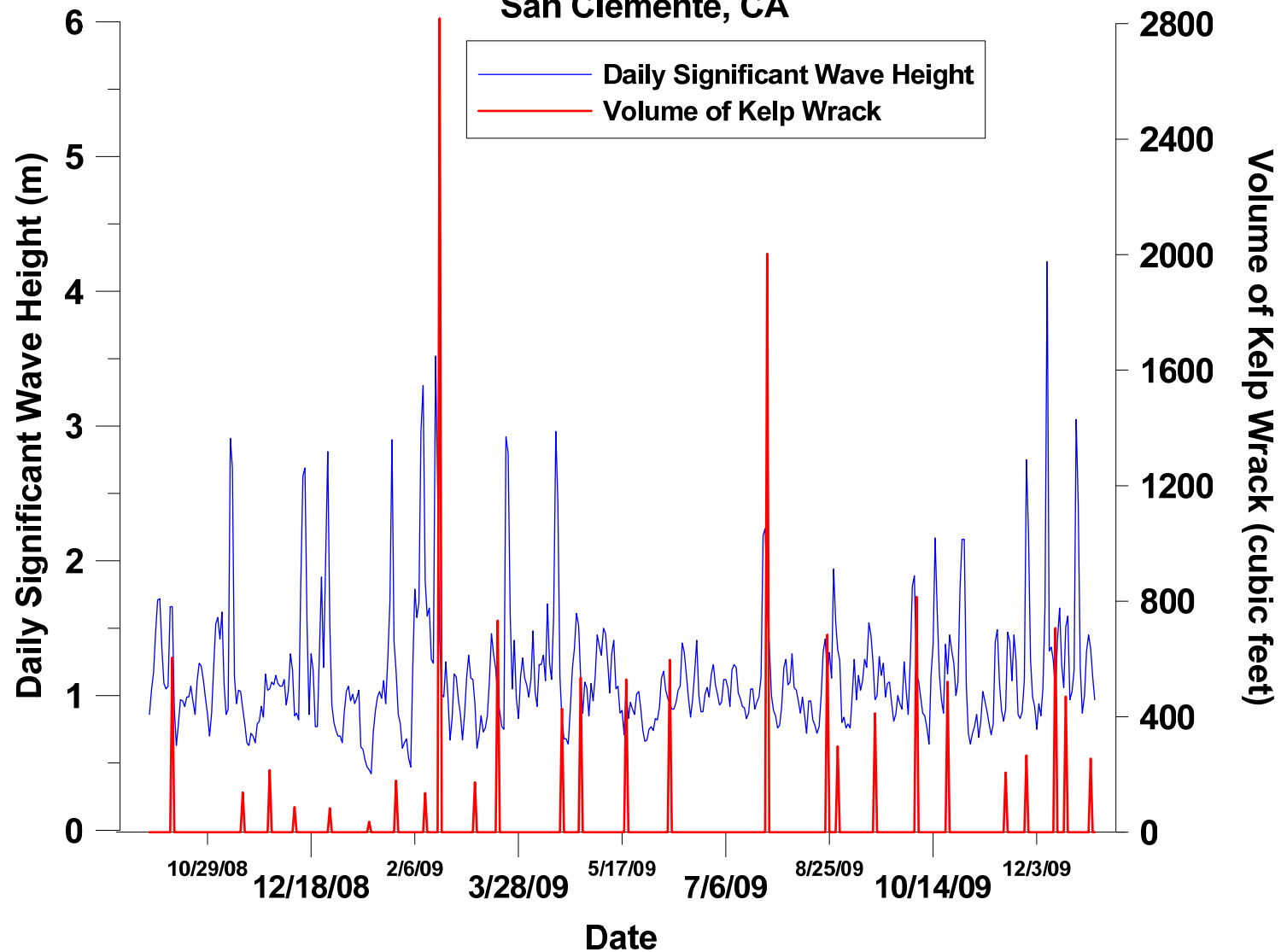
Daily Wave Height at Dana Point Buoy and San Clemente Beach April - September 2011



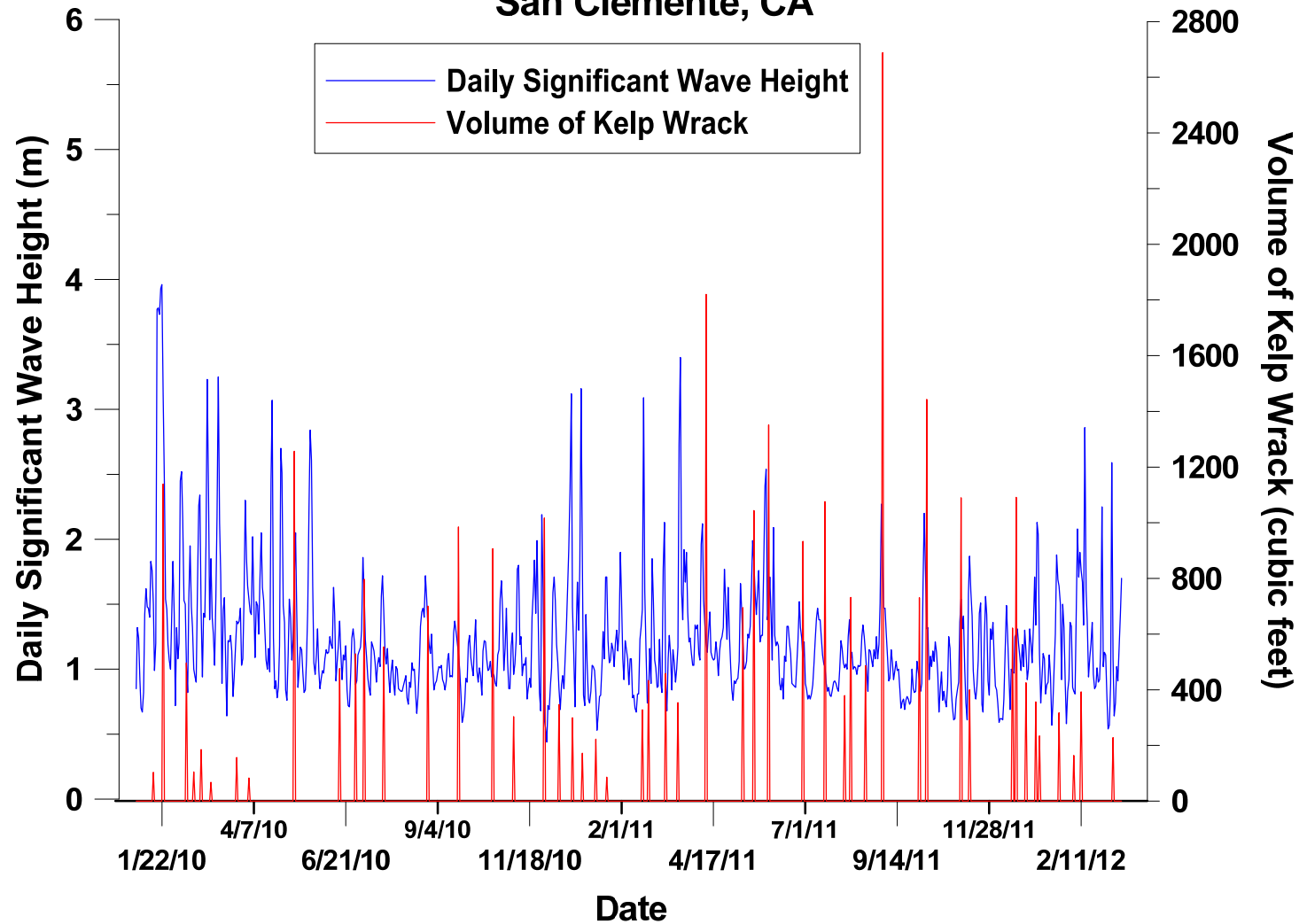
Location of Wheeler North Reef and nearby swell blocking islands



Daily Significant Wave Height versus Volume of Kelp Wrack **October 2008 - December 2009** **San Clemente, CA**



Daily Significant Wave Height versus Volume of Kelp Wrack **January 1, 2010 - March 15, 2012** **San Clemente, CA**





Photos: SCE, August 18, 2010

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Corporate EH&S

SOUTHERN CALIFORNIA EDISON

Kelp Wrack North of Pier on 02 Sept 2011





Photo: SCE, August 18, 2010

Conclusions of the 1999-2011, Kelp Wrack Study:

- Kelp wrack commonly appears at San Clemente beach proportionate to:
 - the amount of kelp in the Reef surface canopy,
 - in response to major storm events,
 - seasonally, and
 - relative to the major recruitment-life cycle events of kelp.
- More wrack is common at the Pier and the Point (San Mateo Point) than at the other three 500-foot transect areas (El Portal, Calafia, and San Clemente State Beach).
- The Phase 1 sea-surface canopy came into existence in 2000-2001, remained dense through mid-2004, was still apparent through early 2005, and disappeared in June-July 2005.
- An additional 149 acres of reef was built as Phase 2 in 2008, and a surface kelp canopy became dense by Summer, 2010. Increased wrack was seen in 2009.
- More kelp wrack is now being seen on the San Clemente beach - 2011.
- Kelp wrack at San Clemente Pier from 2001 through August 2011 is from 1/3 to 1/6 the amounts seen in the 1950's

4/10/2012

Slide 25

1999 – 2011 Beach Monitoring Study Conclusions:

- ***No artificial reef quarry rock or broken concrete was found on the San Clemente beaches.***
- ***Kelp wrack does not appear to be substantial on the San Clemente beaches.***
- ***Kelp from the artificial reef modules and polygons is not making a substantial contribution to the seaweed wrack that does routinely appear on the San Clemente beaches.***



Thank you

Questions?

