Assessment of Water Quality During Wet Weather in Areas of Special Biological Significance

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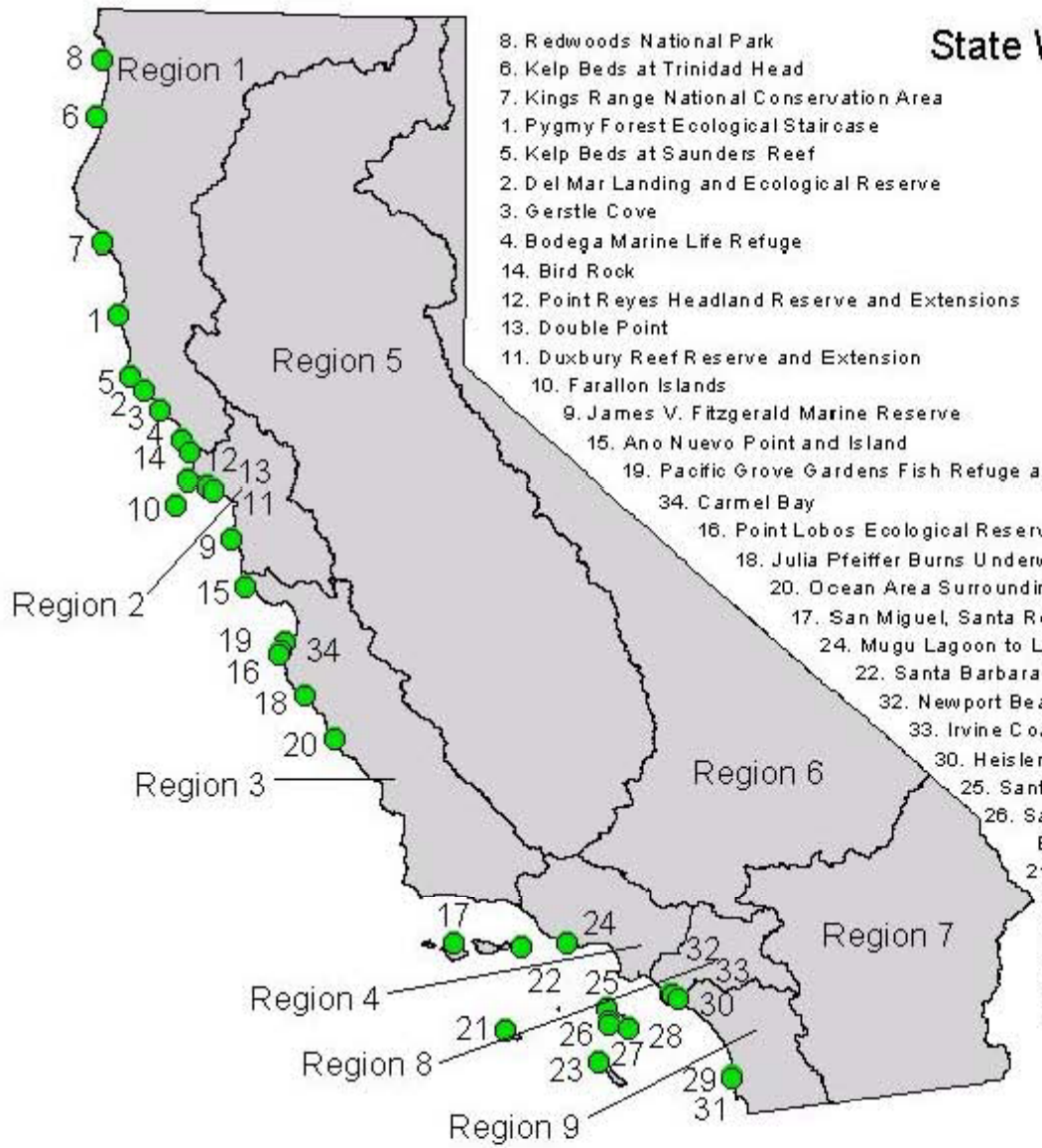
Areas of Special Biological Significance (ASBS)?

- Water quality protected areas
  - Designated in the California Ocean Plan
- 34 designated ASBS statewide
  - Nearly a third of the coastline (including islands)
- Established by the SWRCB in the mid-1970s

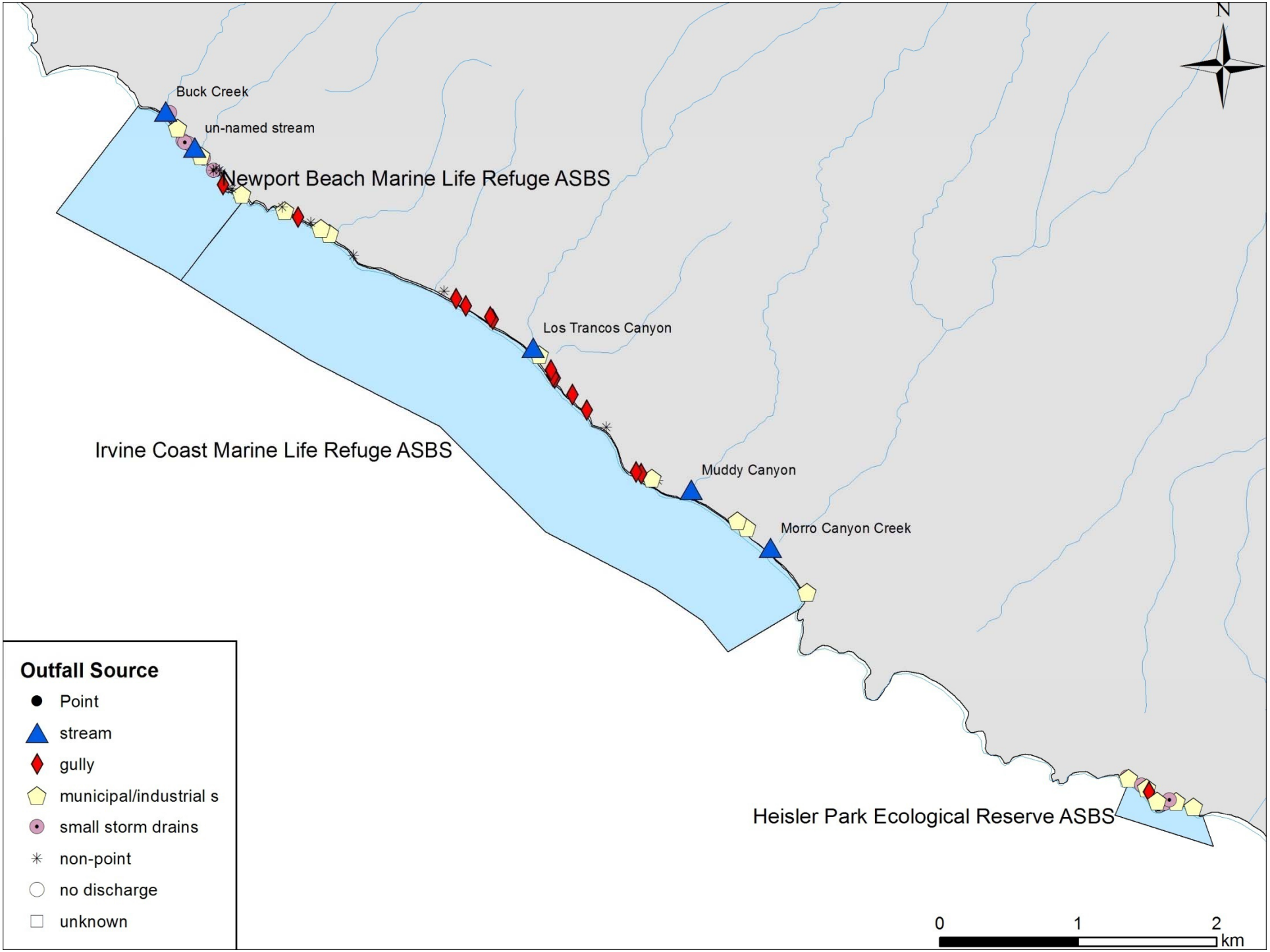
State Water Quality Protection Areas

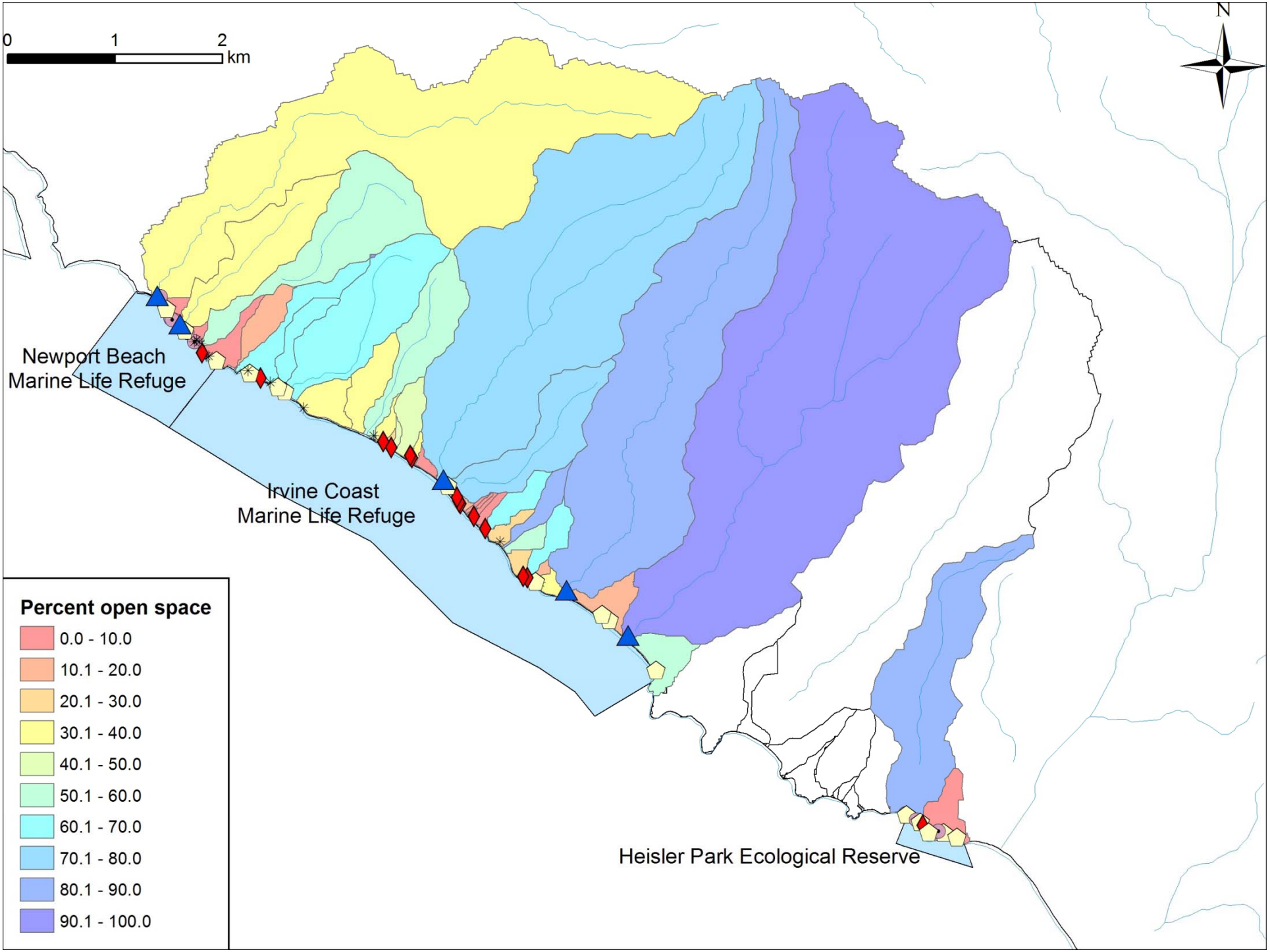


8. Redwoods National Park
6. Kelp Beds at Trinidad Head
7. Kings Range National Conservation Area
1. Pygmy Forest Ecological Staircase
5. Kelp Beds at Saunders Reef
2. Del Mar Landing and Ecological Reserve
3. Gerstle Cove
4. Bodega Marine Life Refuge
14. Bird Rock
12. Point Reyes Headland Reserve and Extensions
13. Double Point
11. Duxbury Reef Reserve and Extension
10. Farallon Islands
9. James V. Fitzgerald Marine Reserve
15. Ano Nuevo Point and Island
19. Pacific Grove Gardens Fish Refuge and Hopkins Marine Life Refuge
34. Carmel Bay
16. Point Lobos Ecological Reserve
18. Julia Pfeiffer Burns Underwater Park
20. Ocean Area Surrounding the Mouth of Salmon Creek
17. San Miguel, Santa Rosa, and Santa Cruz Islands
24. Mugu Lagoon to Latigo Point
22. Santa Barbara Island, Santa Barbara County and Anacapa Island
32. Newport Beach Marine Life Refuge
33. Irvine Coast Marine Life Refuge
30. Heisler Park Ecological Reserve
25. Santa Catalina Is.-Subarea 1, Isthmus Cove to Catalina Head
26. Santa Catalina Is.-Subarea 2, North End of Little Harbor to Ben Weston Point
21. San Nicolas Island and Begg Rock
27. Santa Catalina Is.-Subarea 3, Farnsworth Bank
28. Santa Catalina Is.-Subarea 4, Binnacle Rock to Jewfish Point
23. San Clemente Island
29. San Diego-La Jolla Ecological Reserve
31. San Diego Marine Life Refuge

Not Your Usual State Regulation

- “No discharge of waste”
- “Maintenance of natural water quality”
- Despite stringent requirements, nearly 1700 discharges identified in ASBS statewide
  - How much is waste and how much is natural?


N
Buck Creek
un-named stream
Newport Beach Marine Life Refuge ASBS
Los Trancos Canyon
Irvine Coast Marine Life Refuge ASBS
Muddy Canyon
Morro Canyon Creek
Heisler Park Ecological Reserve ASBS
Outfall Source
Point
stream
gully
municipal/industrial s
small storm drains
non-point
no discharge
unknown
0
1
2
km


0
1
2
km
N
Newport Beach
Marine Life Refuge
Irvine Coast
Marine Life Refuge
Heisler Park Ecological Reserve
Percent open space
0.0 - 10.0
10.1 - 20.0
20.1 - 30.0
30.1 - 40.0
40.1 - 50.0
50.1 - 60.0
60.1 - 70.0
70.1 - 80.0
80.1 - 90.0
90.1 - 100.0

Motivation!

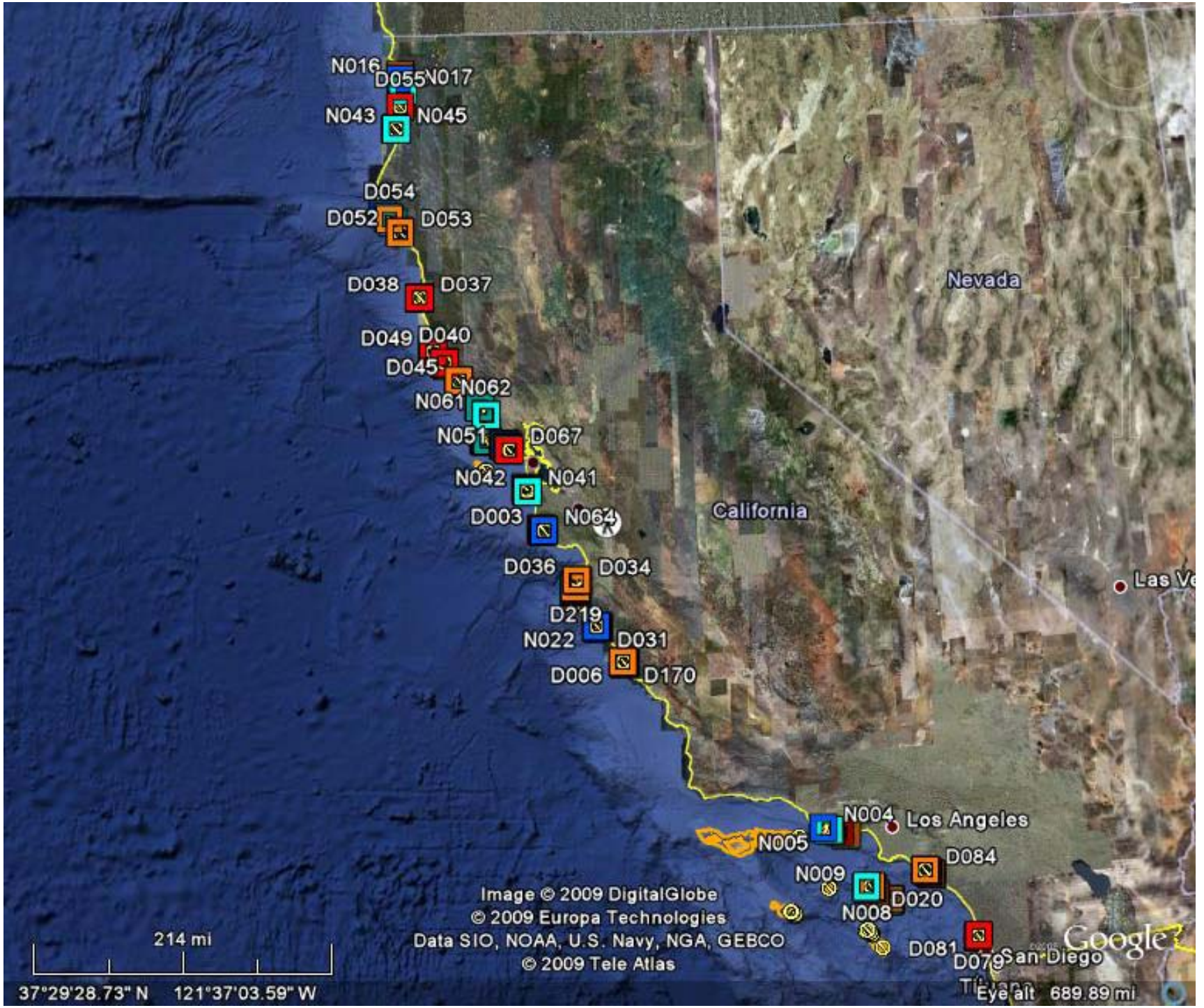
- SWRCB needs an assessment of alterations in ASBS water quality

- Large scale monitoring is the preferred approach
  - Regional reference condition
  - Context for assessing impact

- **What is the extent of impact in ASBS with and without discharges?**

Extent of Impact Design

- Emphasis on receiving water
  - All samples collected from the ocean
- Wet weather focused
  - One sample prestorm and another post storm
- Measure a long list of constituents
  - General, nutrients, metals, organics
  - Toxicity
- Randomly selected receiving water sites
  - Discharge shoreline < 500m from an outfall
  - Nondischarge shoreline > 500m


N016
D055
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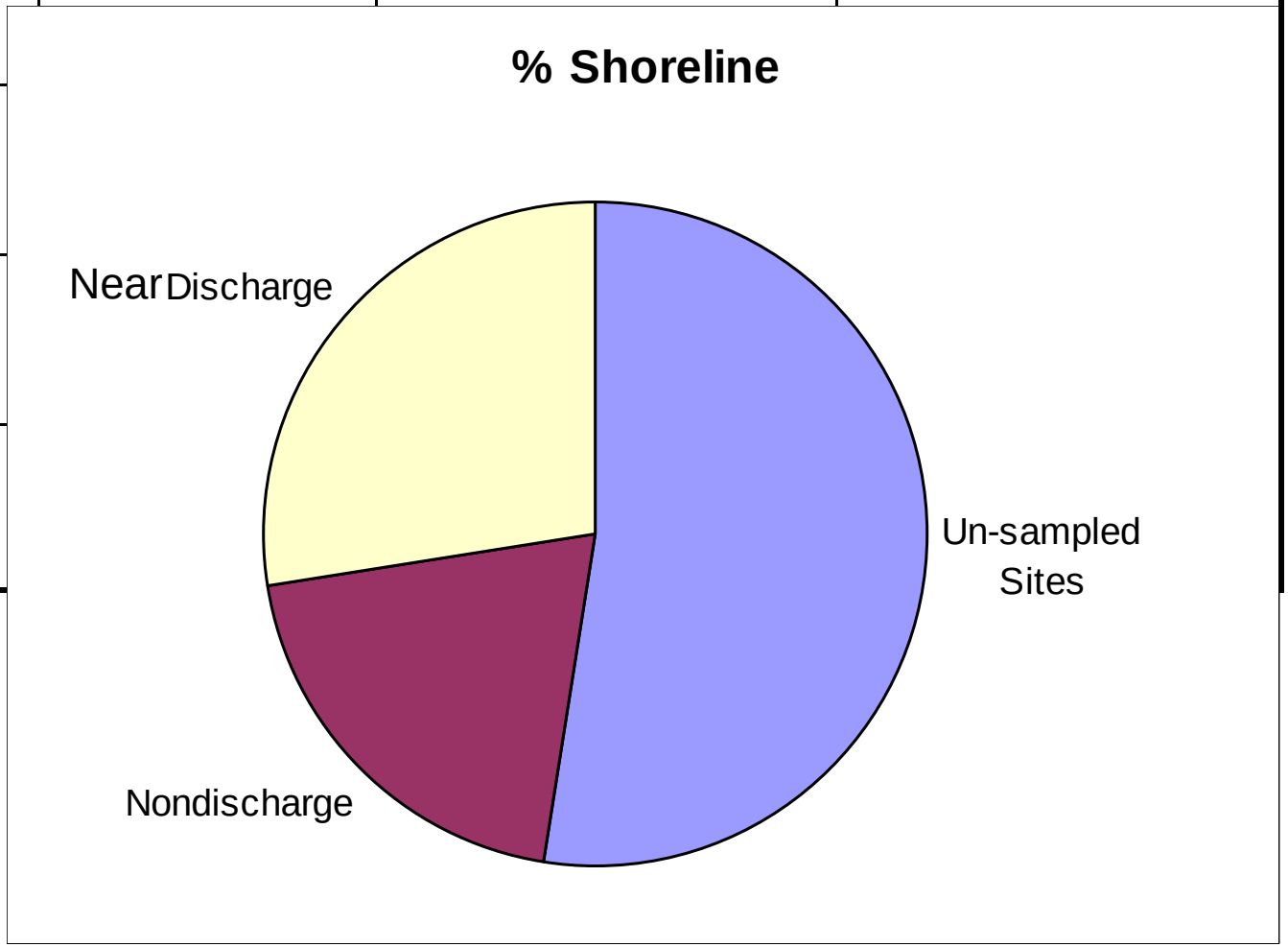
D067
N042
N041
D003
N064
D036
D034
D219
N022
D031
D006
D170
N004
Los Angeles
N005
D084
N009
D020
N008
D081
D079
San Diego
Nevada
California
Las Ve
Image © 2009 DigitalGlobe
© 2009 Europa Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 Tele Atlas
214 mi
37°29'28.73" N 121°37'03.59" W
Eye alt 689.89 mi
Google

Results Road Map

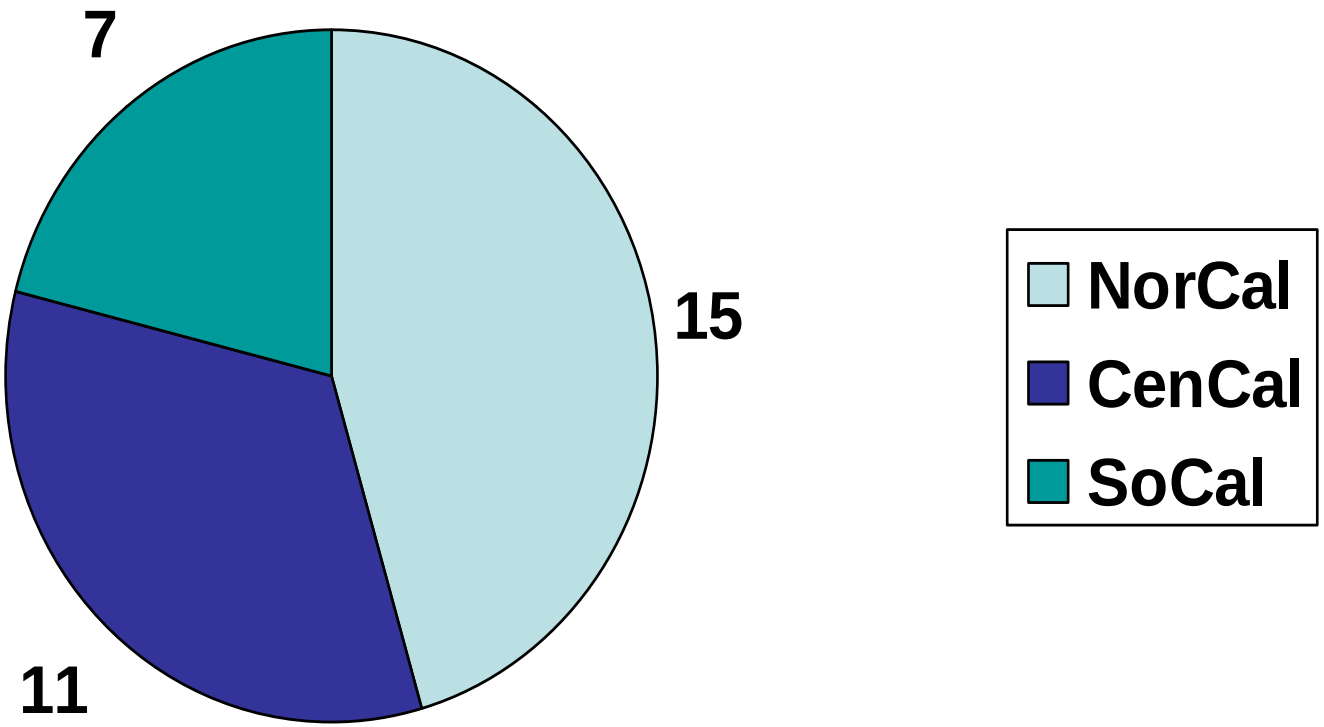
- Sampling success
- Discharge vs Nondischarge
- Comparison to existing Water Quality Standards
- Prestorm vs Post storm

Summary of Shoreline Sampling Success
2008-09 Wet Season

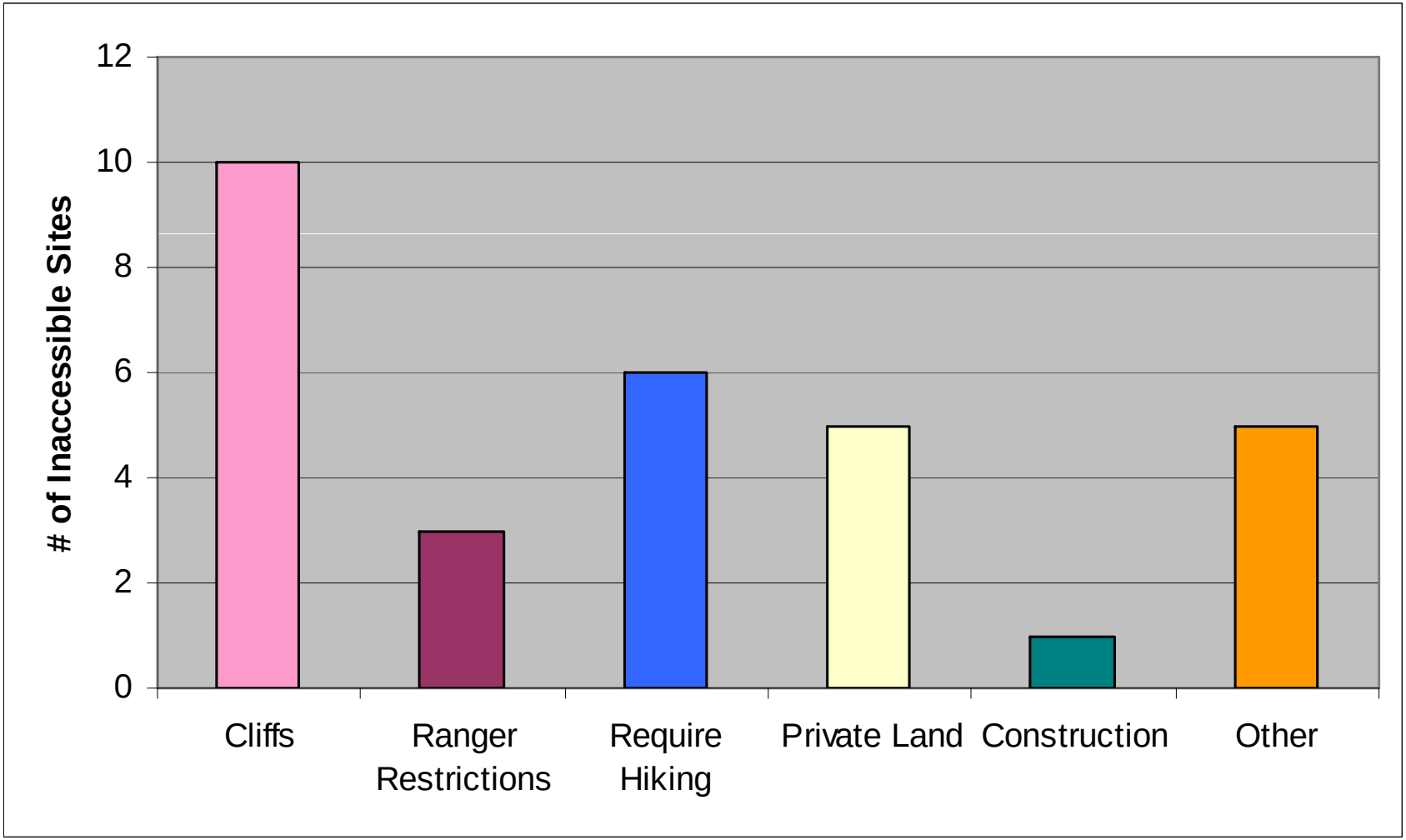
	Sampled	Unsampleable	Total
Discharge			
NonDischarge			
Total			



Spatial Distribution of Sampled Sites



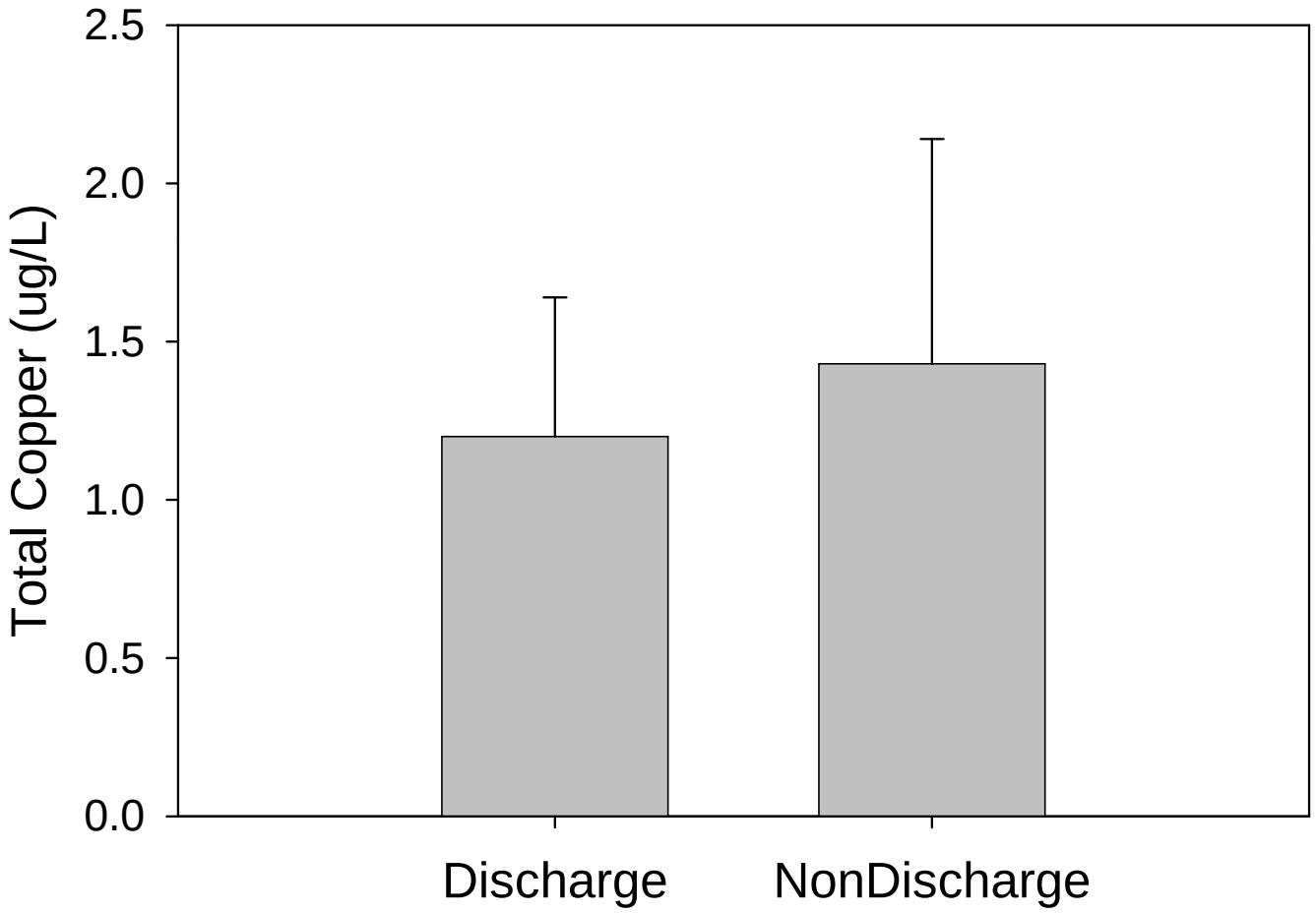
Reasons for Unsampled Sites



Results Road Map

- Sampling success
- Discharge vs Nondischarge
- Comparison to existing Water Quality Standards
- Prestorm vs Post storm

Shoreline Weighted Mean (± 95% CI)



Shoreline Weighted Mean (± 95% CI)

Parameter	Near Discharge	NonDischarge
TSS (mg/L)	95 (76)	78 (52)
Ammonia (ug/L)	9.2 (9.3)	3.9 (7.8)
Nitrate+Nitrite (ug/L)	120 (57)	140 (100)
Total P (ug/L)	69 (30)	190 (96)
Chromium (ug/L)	2.6 (1.0)	2.2 (0.8)
Copper (ug/L)	1.2 (0.4)	1.4 (0.7)
Lead (ug/L)	0.50 (0.13)	0.60 (0.50)
Nickel (ug/L)	2.9 (1.0)	2.9 (0.9)
Zinc (ug/L)	4.6 (3.0)	1.1 (1.2)
Total PAH (ng/L)	15 (5)	38 (34)
Total PCB (ng/L)	ND	ND
Total DDT (ng/L)	ND	ND

COMPARISON TO OCEAN PLAN WATER QUALITY STANDARDS

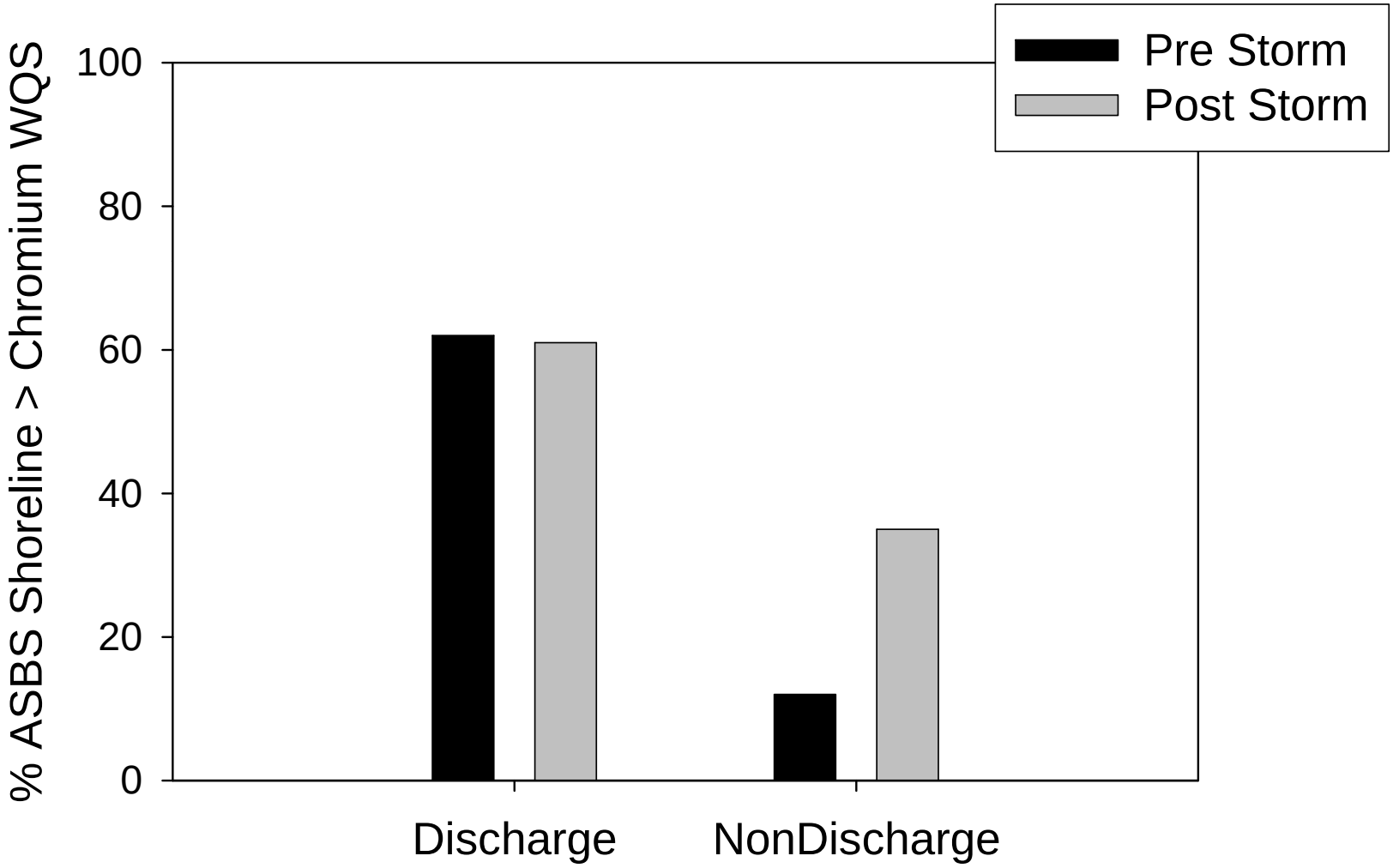
	% Shoreline Miles > WQS		
	6 Mo Median*	**Daily Max**	**Instant Max**
Ammonia-N	--	--	--
Arsenic	1.6	--	--
Cadmium	2.1	--	--
Chromium	50	1.6	--
Copper	6.9	--	--
Lead	4.8	--	--
Nickel	15	--	--
Silver	--	--	--
Zinc	3.8	--	--
HCH-lindanes	--	--	--
Chlordane	--	--	--
DDTs	--	--	--
Dieldrin	--	--	--
PAHs	87	--	--
PCBs	--	--	--

-- no shoreline exceeds WQS * 30 d average for organics

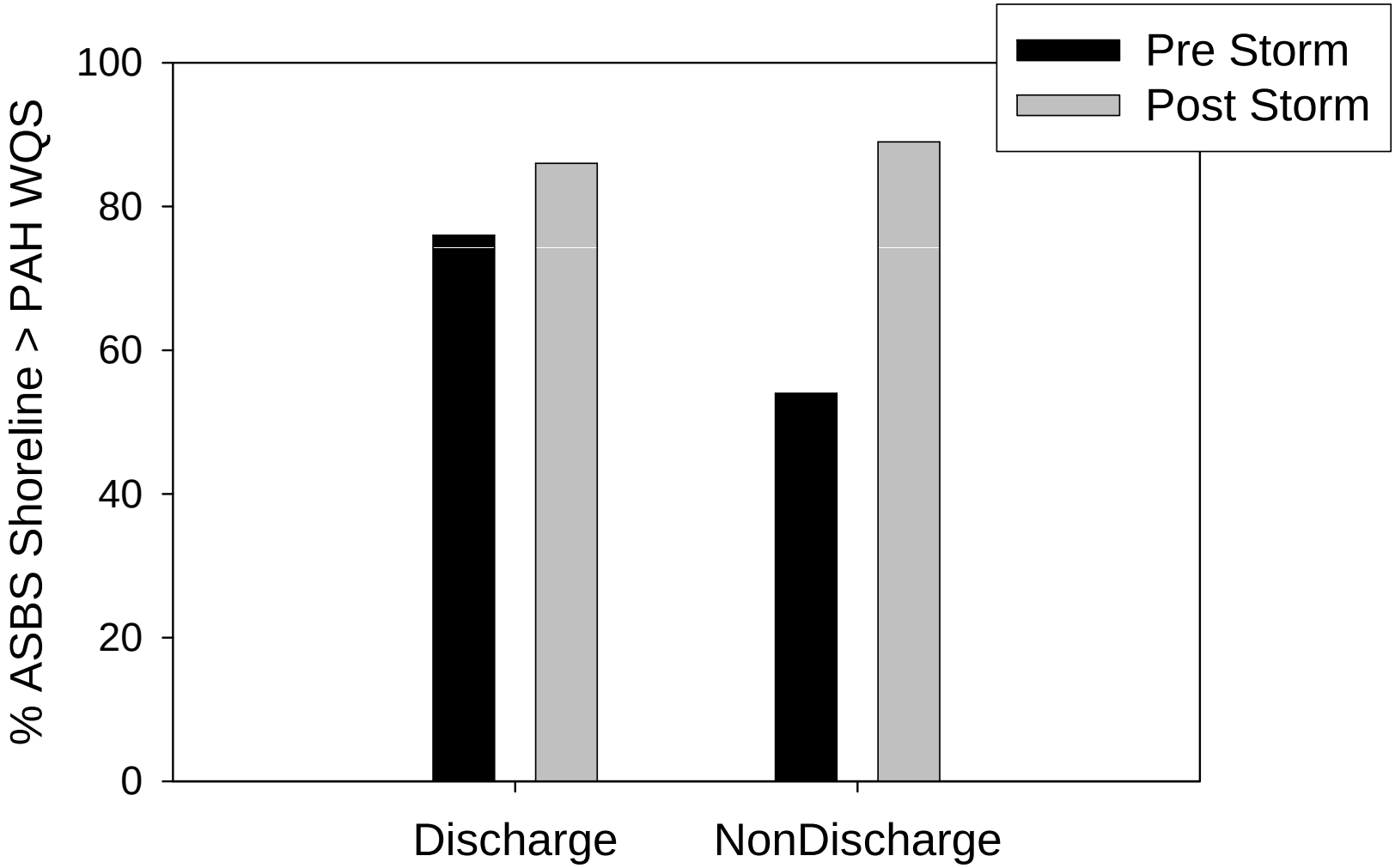
COMPARISON TO OCEAN PLAN WATER QUALITY STANDARDS

	WQS	% Shoreline > WQS		
		All ASBS	Near Discharge	NonDischarge
Ammonia-N	0.8 mg/L	--	--	--
Arsenic	8 ug/L	1.6	2.7	--
Cadmium	1 ug/L	2.1	3.6	--
Chromium	2 ug/L	50	61	35
Copper	3 ug/L	6.9	4.8	9.8
Lead	2 ug/L	4.8	--	11.5
Nickel	5 ug/L	15	24	3
Silver	0.7 ug/L	--	--	--
Zinc	20 ug/L	3.8	6.5	--
HCH-lindanes	8.0 ng/L	--	--	--
Chlordane	0.023 ng/L	--	--	--
DDTs	0.17 ng/L	--	--	--
Dieldrin	0.04 ng/L	--	--	--
PAHs	8.8 ng/L	87	85	89
PCBs	0.019 ng/L	--	--	--

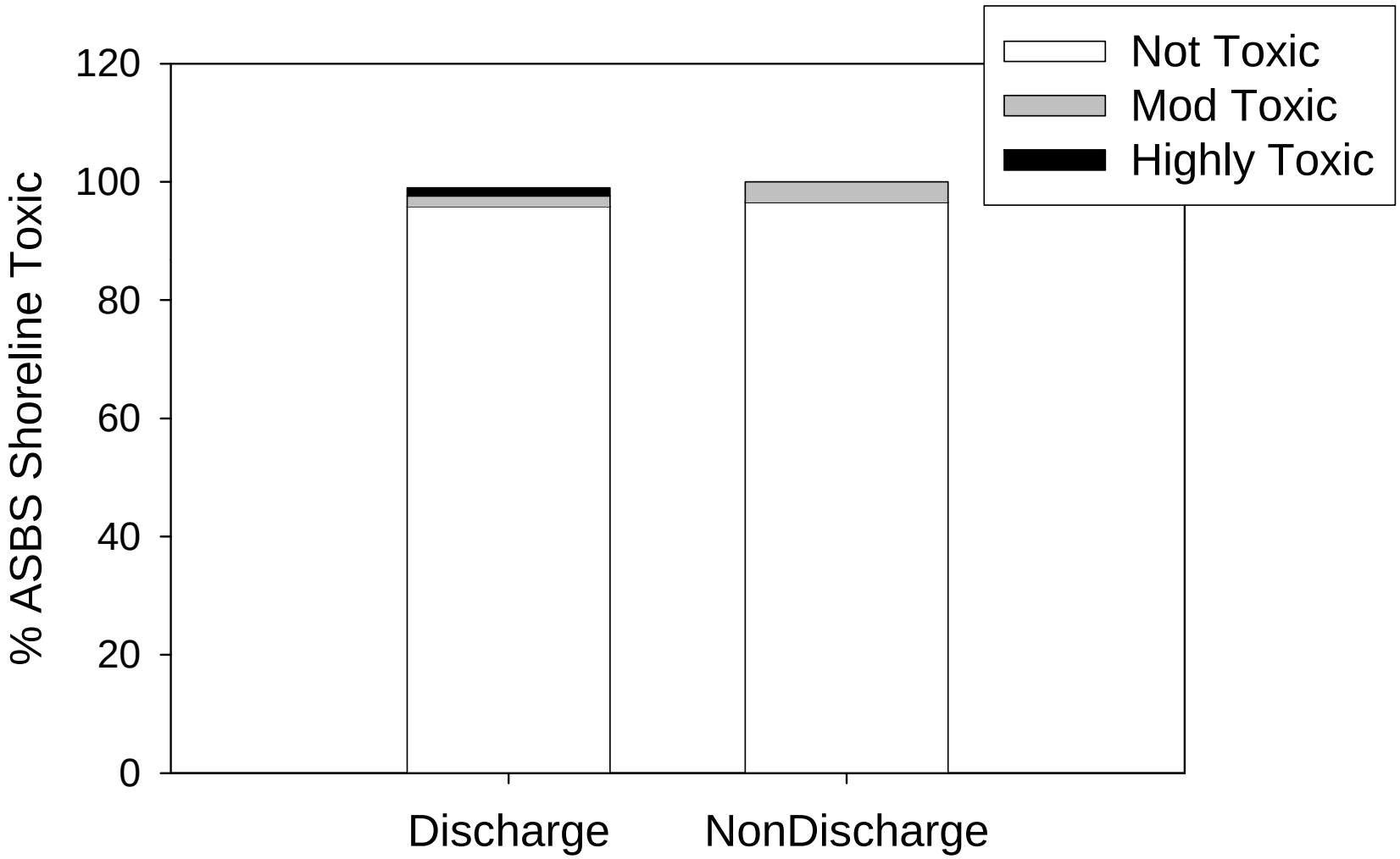
Exceedence of the Chromium Water Quality Standard



Exceedence of the PAH Water Quality Standard



Extent of Sea Urchin Toxicity



Summary of Monitoring

- Water quality in ASBS statewide following wet weather looks pretty good
  - Only Cr and PAH exceeded WQS in significant amounts
- Concentrations were generally low
  - Little signal of discharge
- Most sites were not toxic
  - Less than 5% of the ASBS shoreline indicated effects

On Deck ….. Actual Biology

- These are Areas of Special **Biological** Significance
- Community assemblages in multiple habitats
  - Rocky subtidal habitat
  - Rocky intertidal habitat
- Evaluate potential for ecological risk
  - Bioaccumulation in mussels