Long-term Monitoring of Harbor seals at Point Reyes and Golden Gate

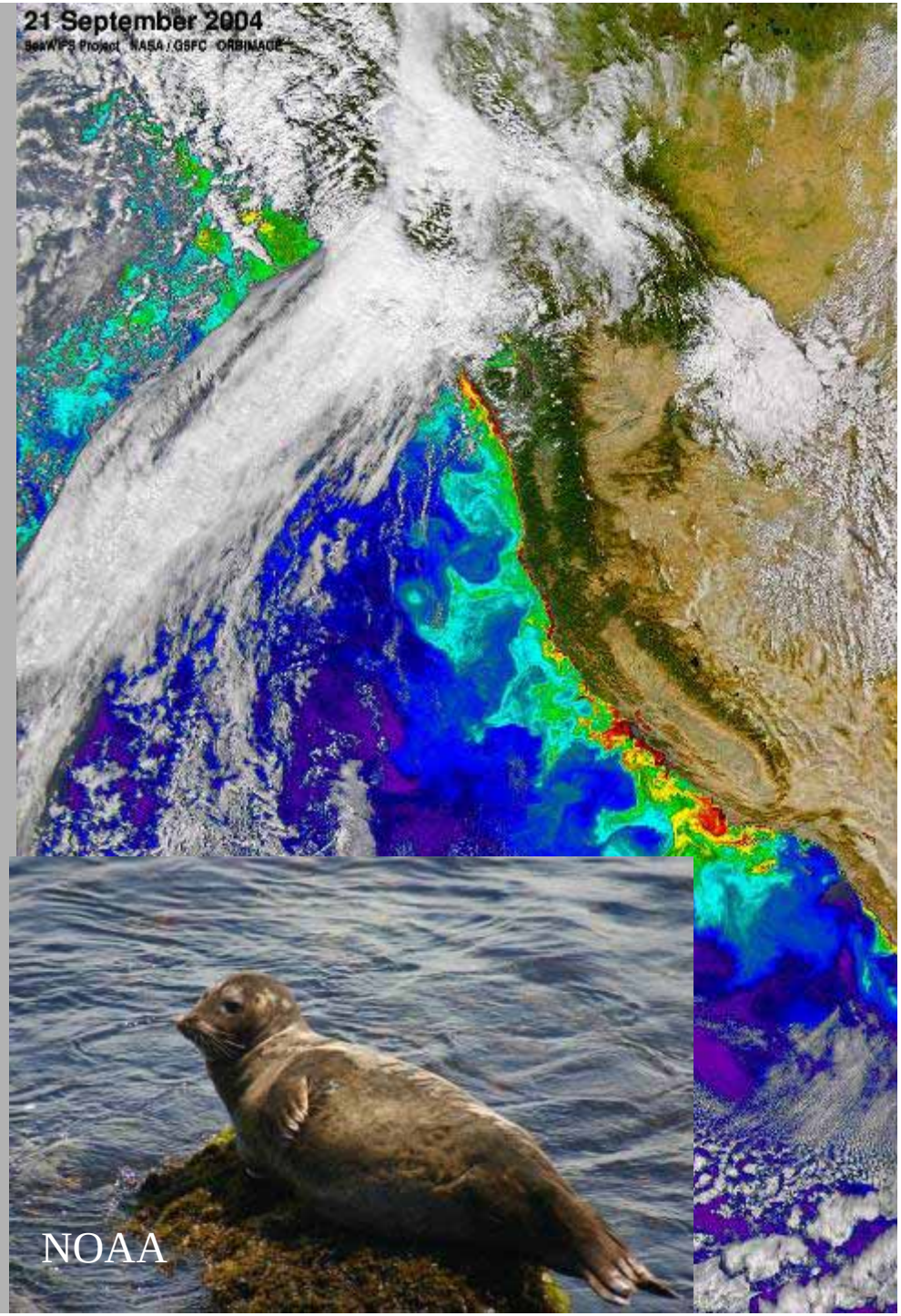
Sarah Allen
sarah_allen@nps.gov

Marine mammals are sentinels of the sea (Moore 2008)

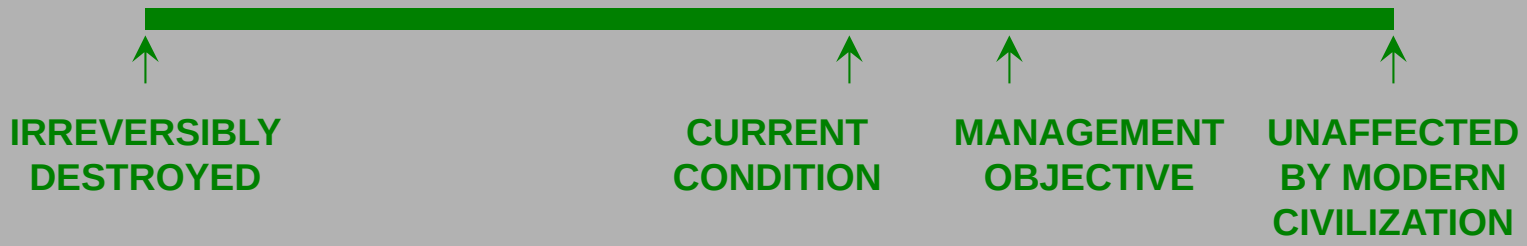
Indicators of the condition of marine ecosystems

Harbor seals selected as indicators of marine condition at Point Reyes NS and Golden Gate NRA

Pinniped Monitoring Protocol available at http://science.nature.nps.gov/im/units/sfan/vital_signs/pinnipeds/pinnipeds.cfm



Indicator of Ecosystem Condition



Objectives

- Determine population trends
- Determine natural range of variation
- Provide early detection of change
- Identify potential causes of abnormal change

Photo Sue Van Der Wal

Current Monitoring

Population trends
Distribution
Habitat
Health
Disturbance

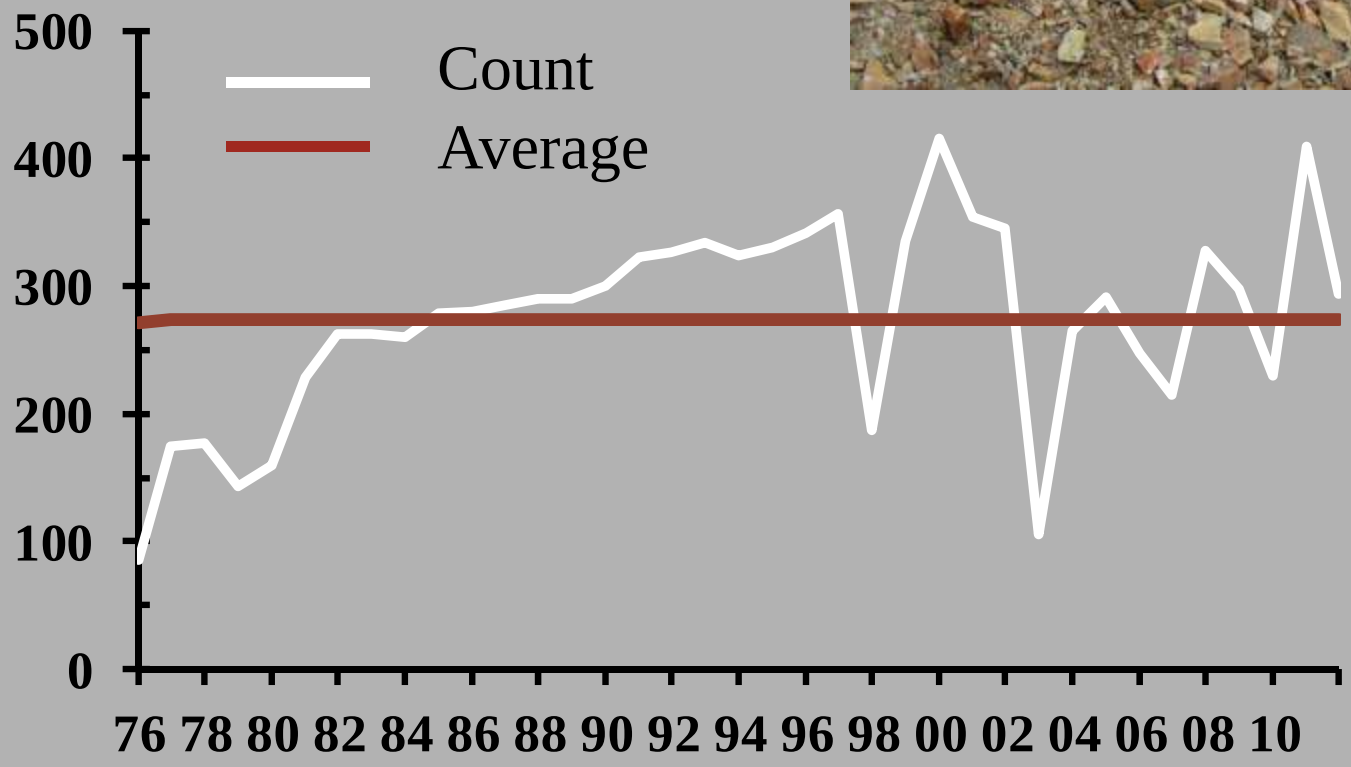
Population trends

Total adult/immature count

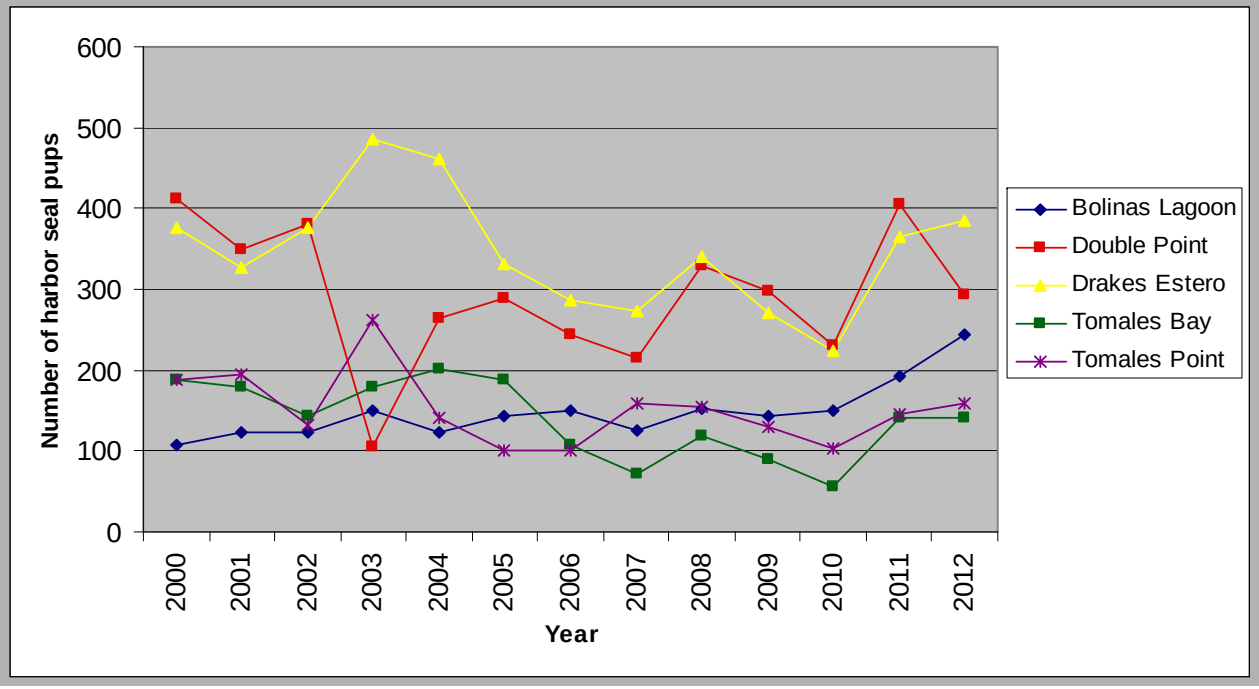
Total pup count

Mortality

Pups born over 35 yrs at one site



Population trends at multiple sites



Colonies at Point Reyes

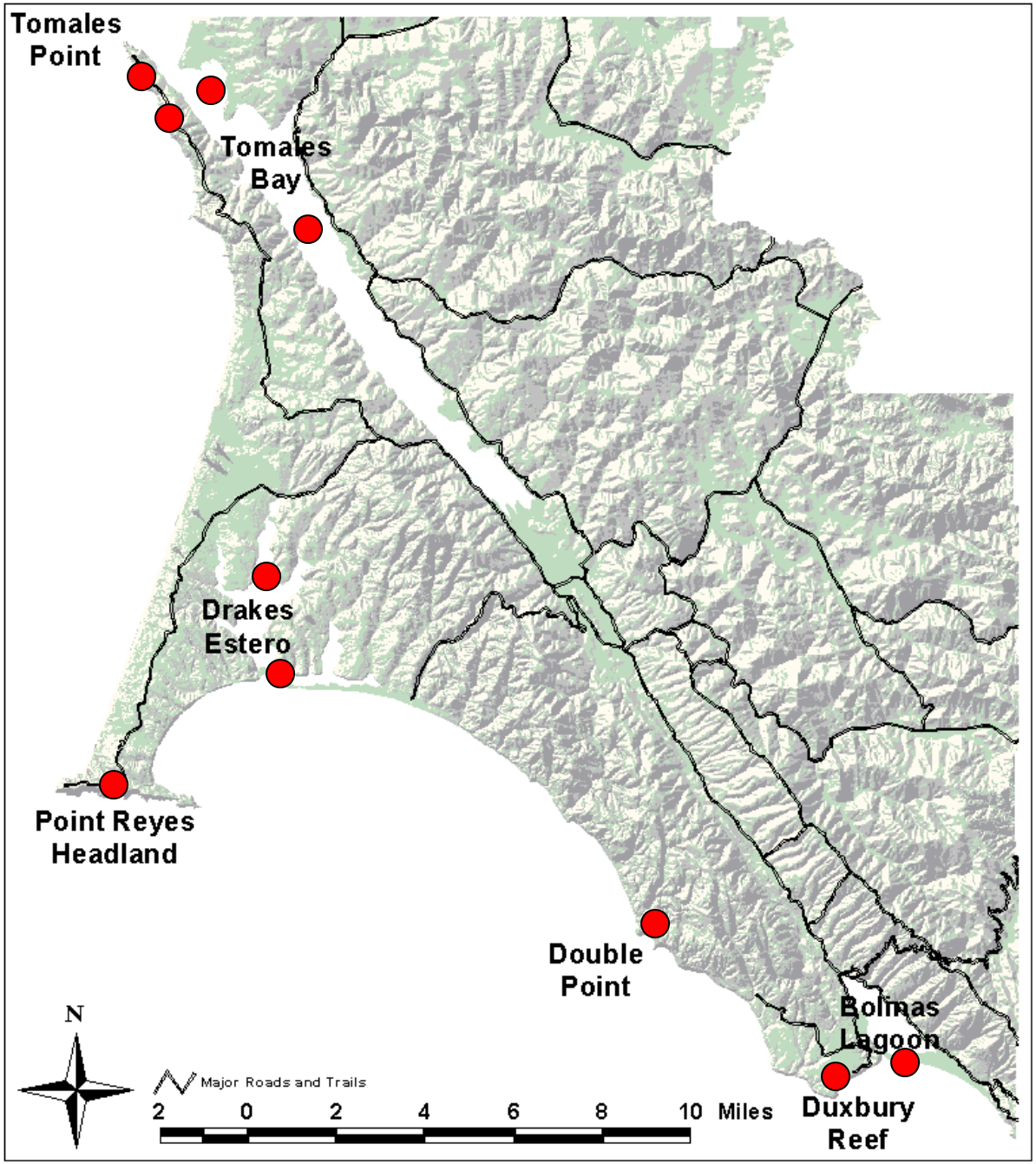
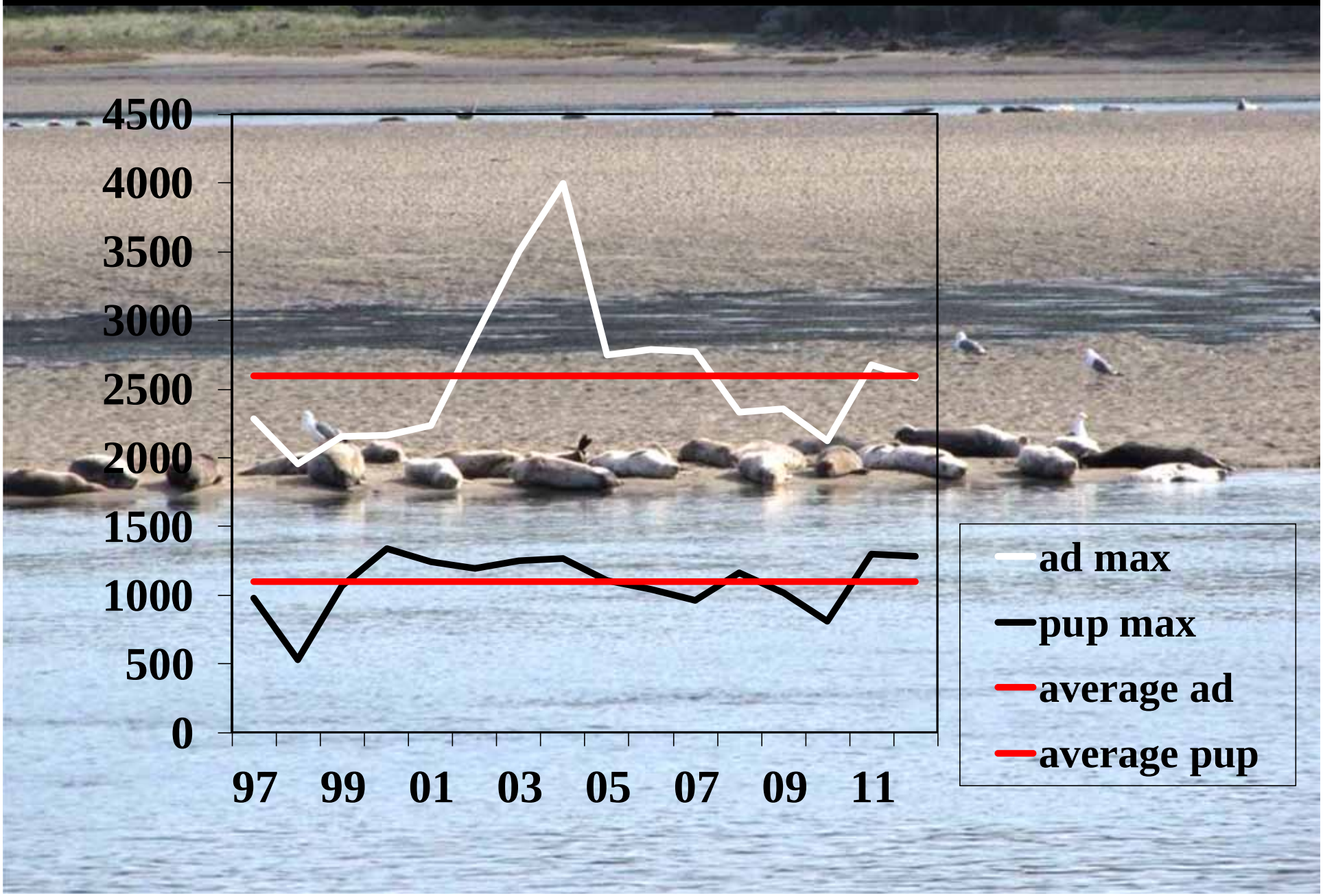
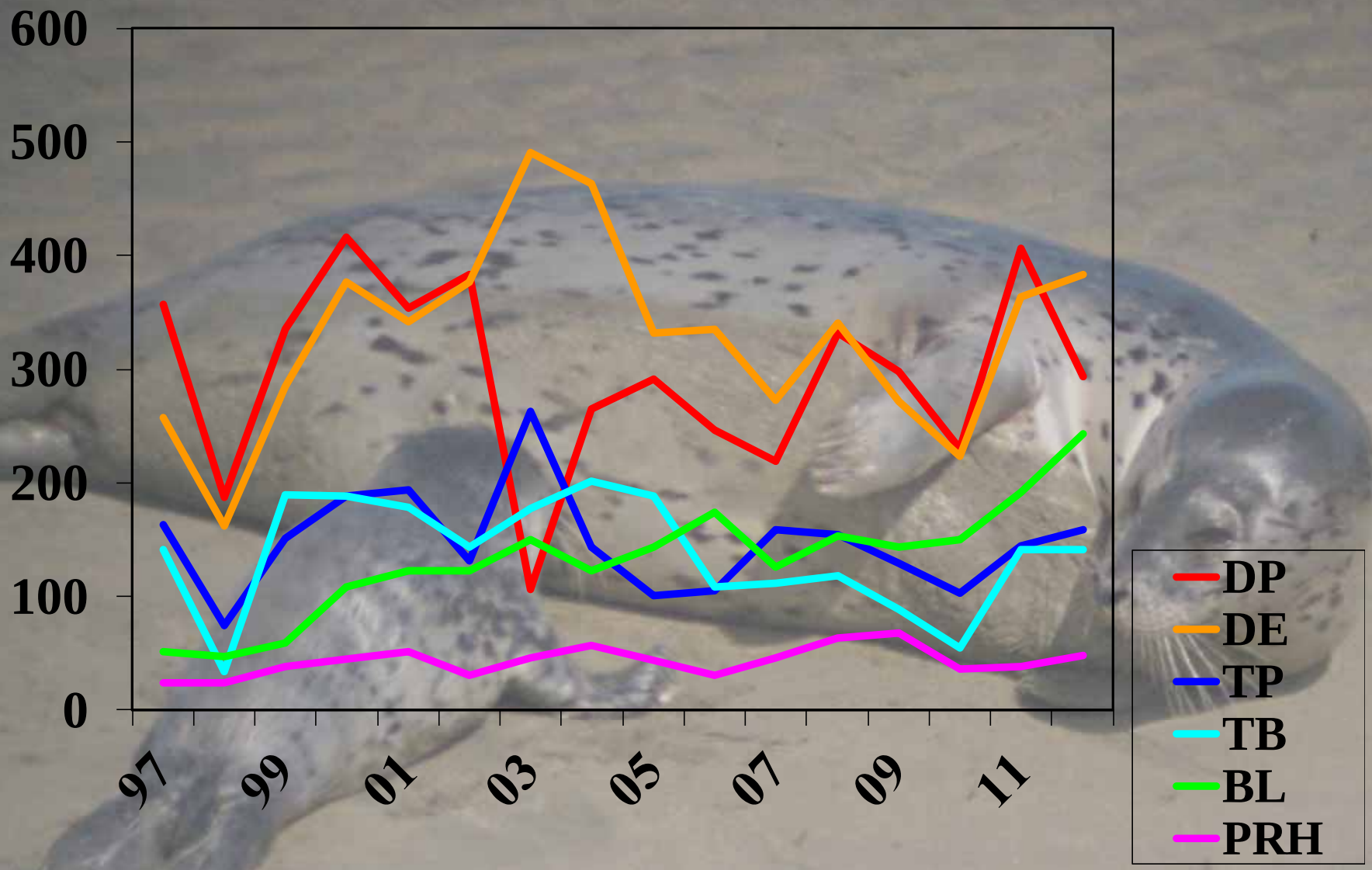


Figure 1: Map of harbor seal haul out sites at Point Reyes.

All sites – max breeding



Maximum pup count by colony



All sites maximum molt season

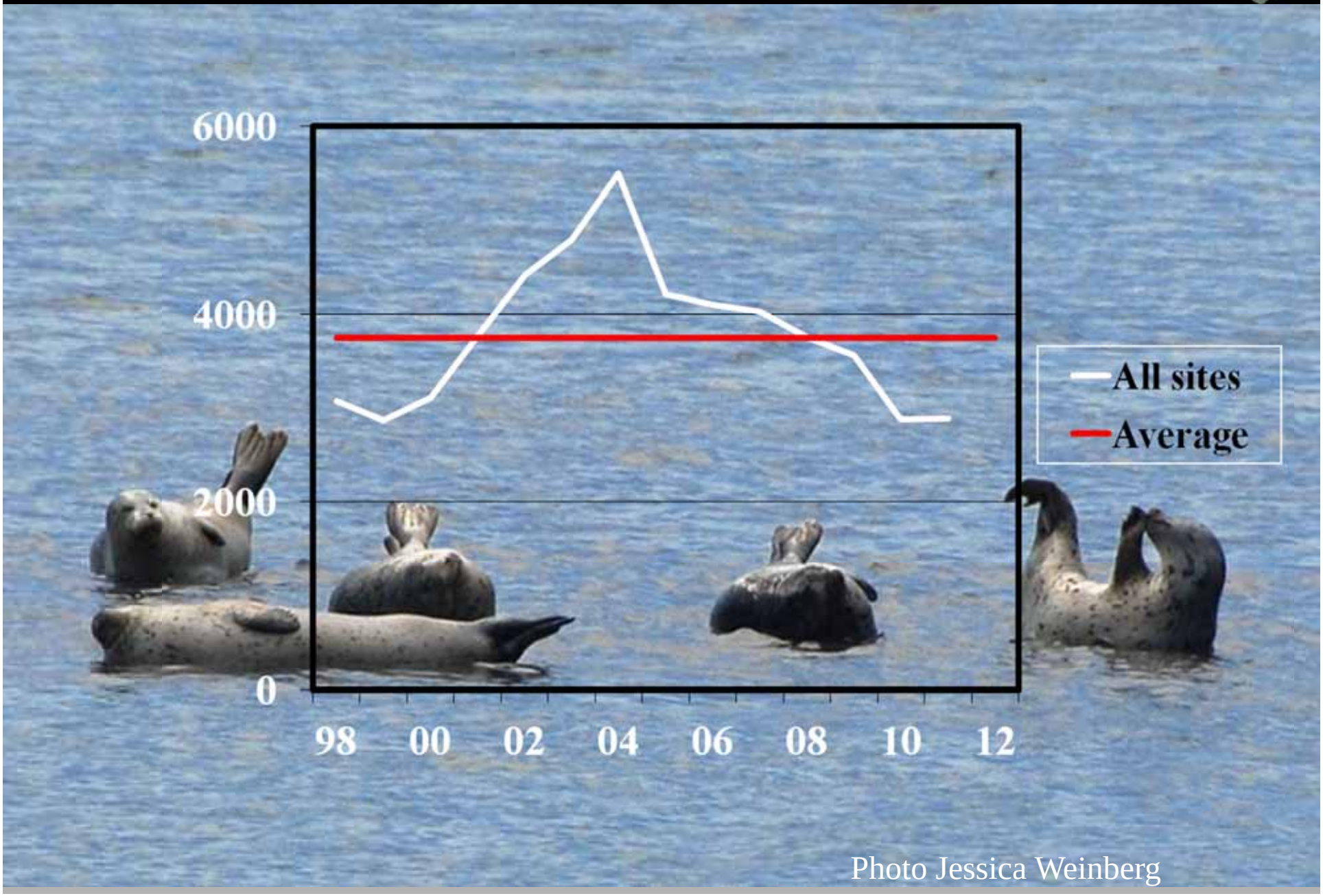
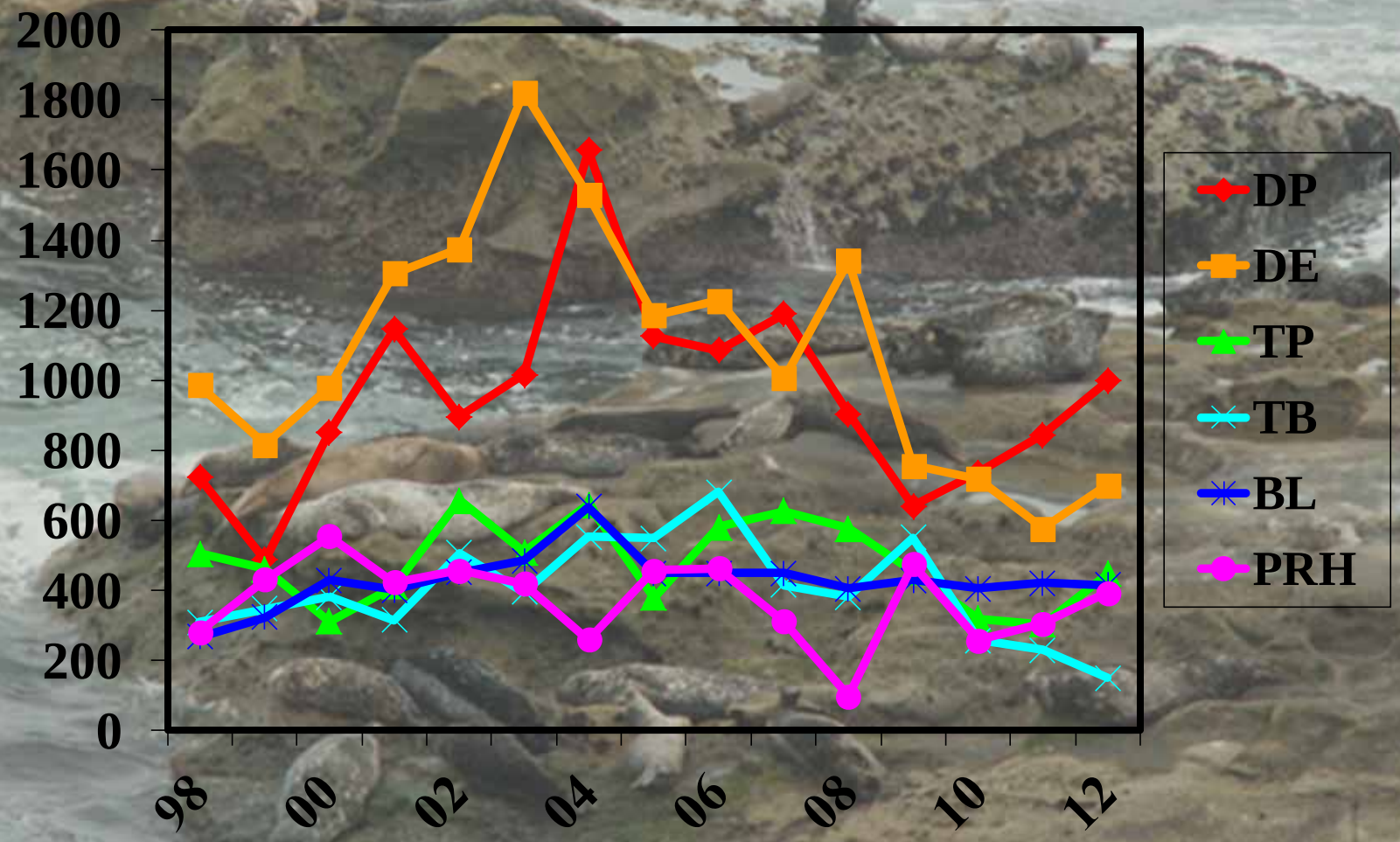


Photo Jessica Weinberg

Maximum molt count by colony



Tomales Bay

Observation Point
SI Seal Island
CI Clam Island
HI Hog Island

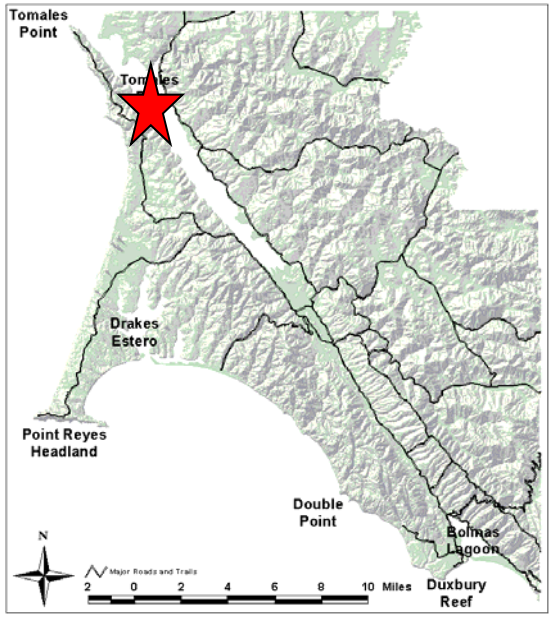
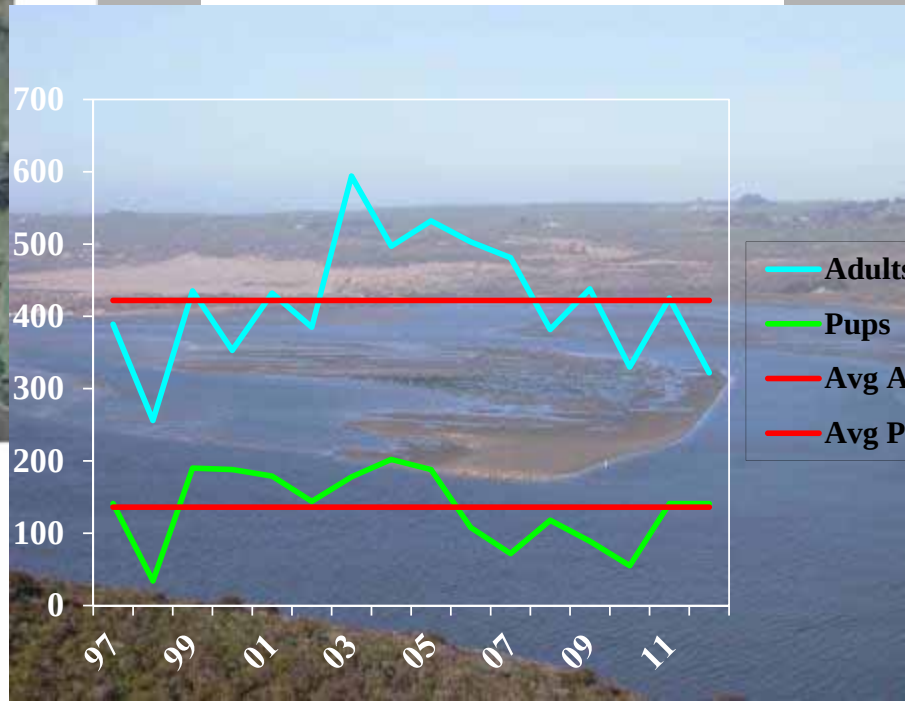


Figure 1. Map of harbor seal haul out sites at Point Reyes.



Tomales Bay

Seal Island sand bar

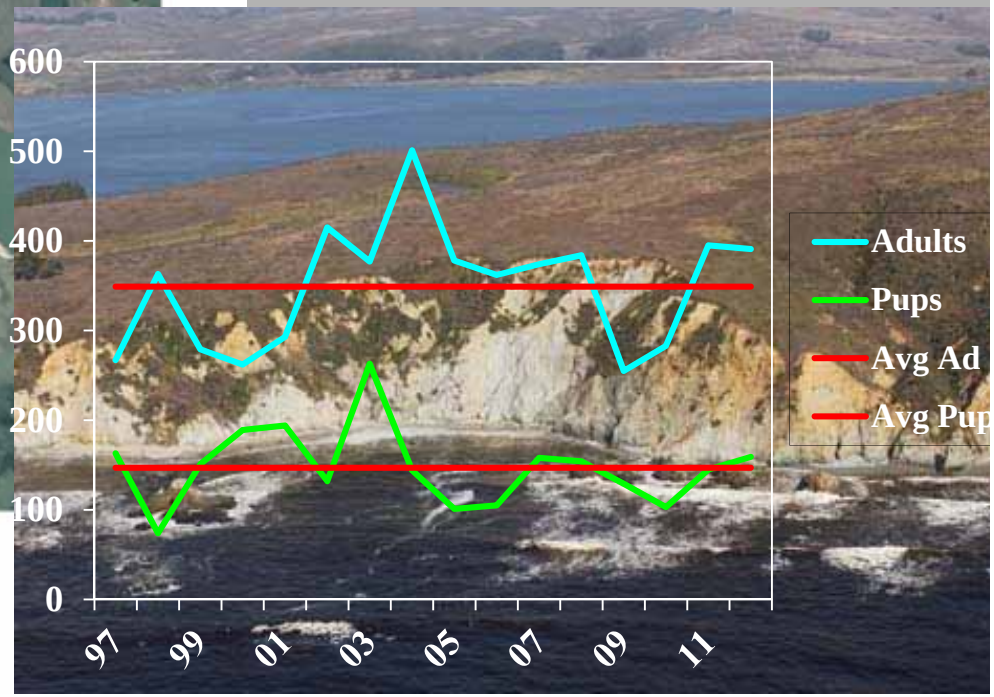
Hog Island

Tomales Point

● Observation Site — Observation Area

TRB Two Rocks Beach
RB Rope Beach

Figure 1: Map of harbor seal haul out sites at Point Reyes.



Tomales Point

Bird Rock

Intertidal on mainland

Point Reyes Headland

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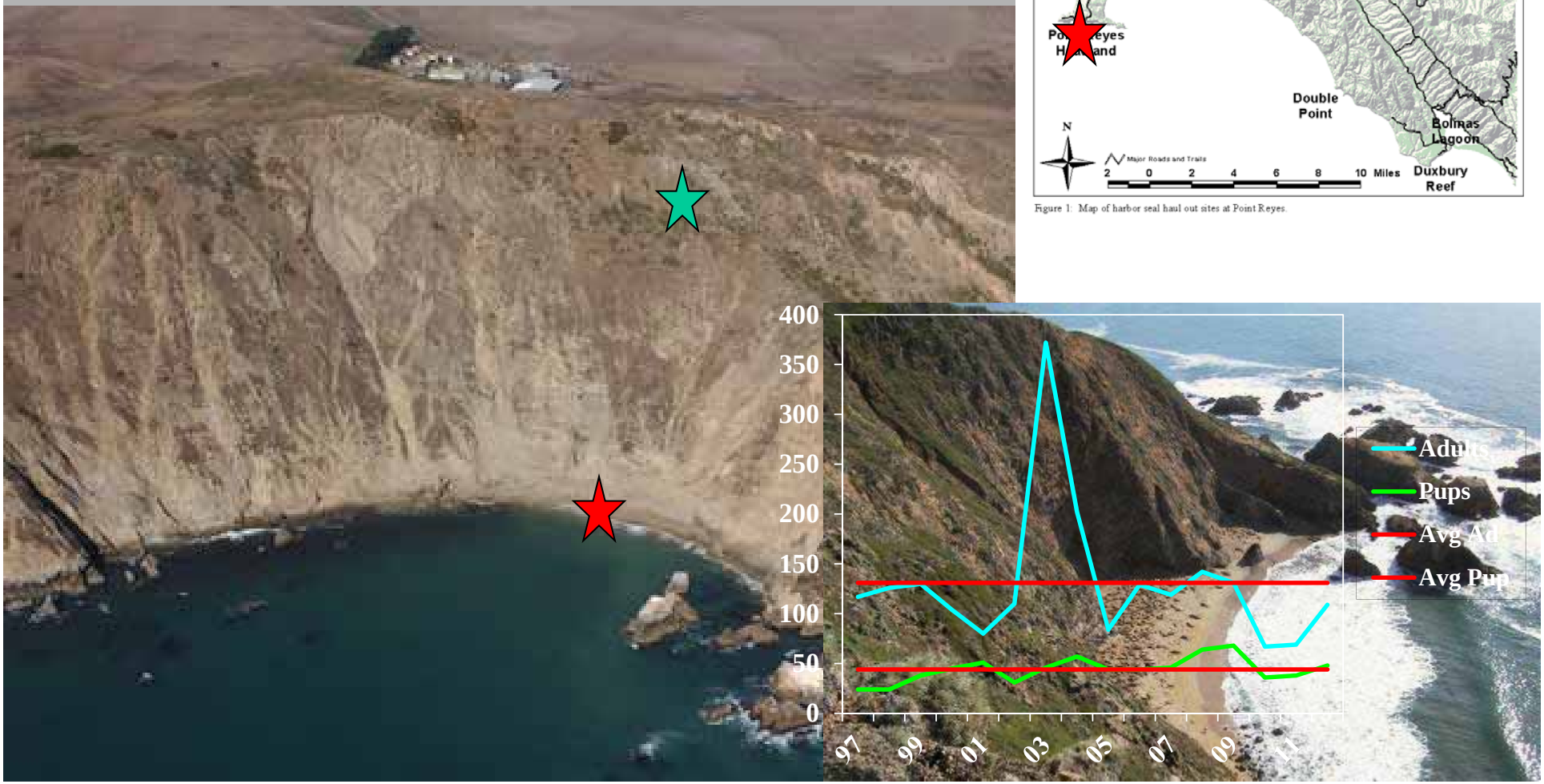
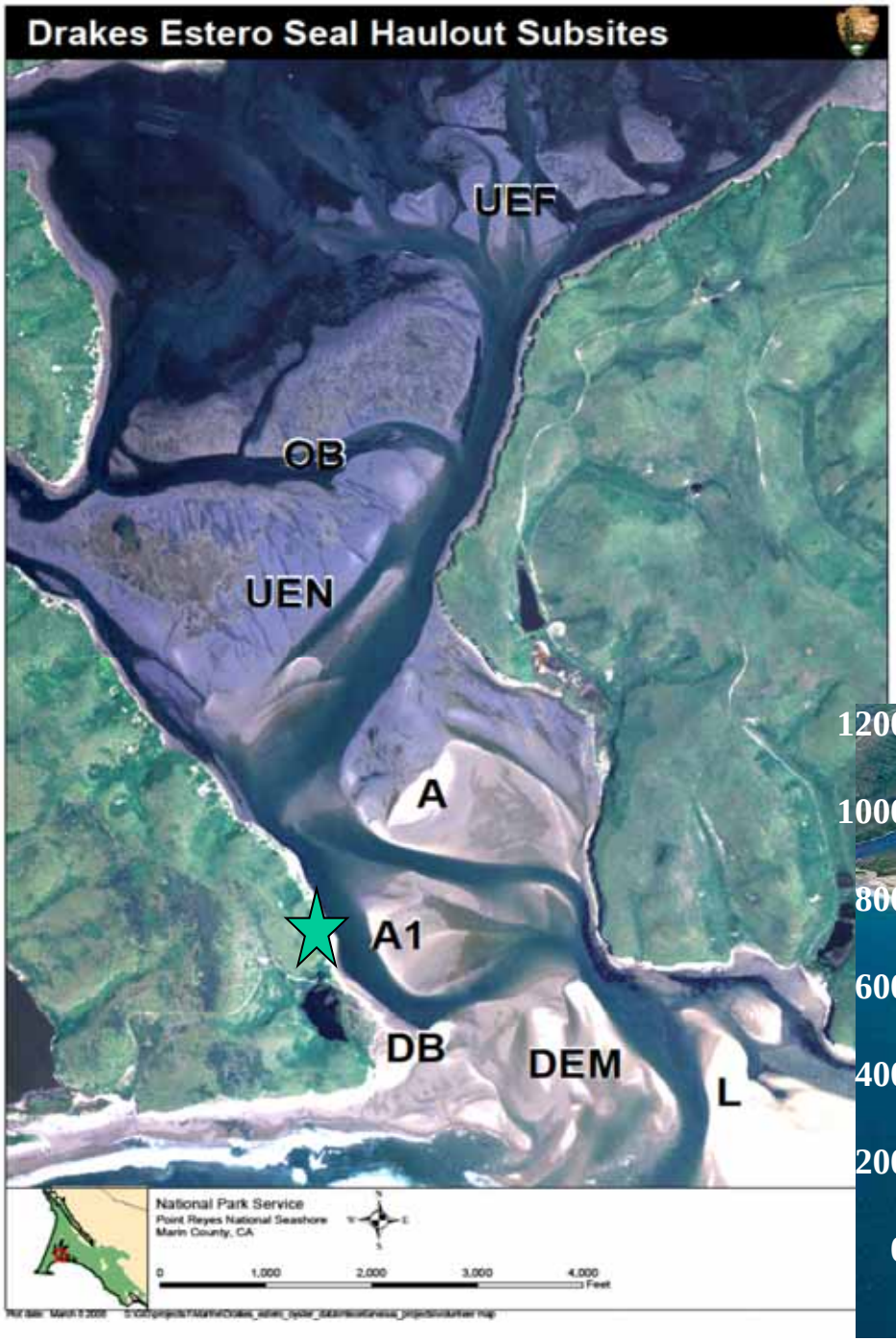


Point Reyes Headland



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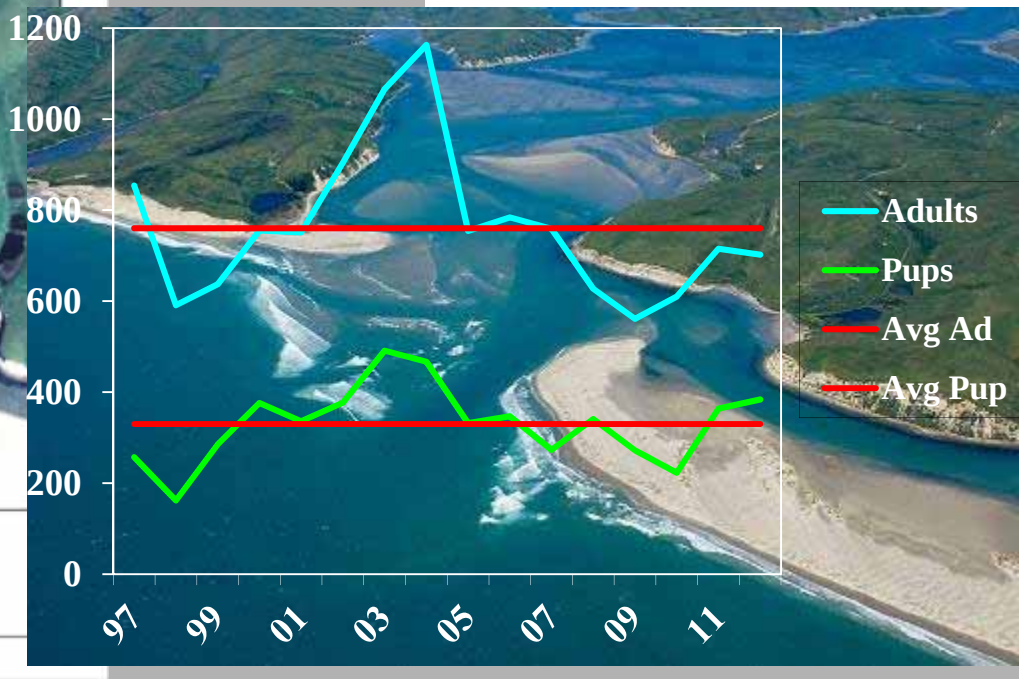
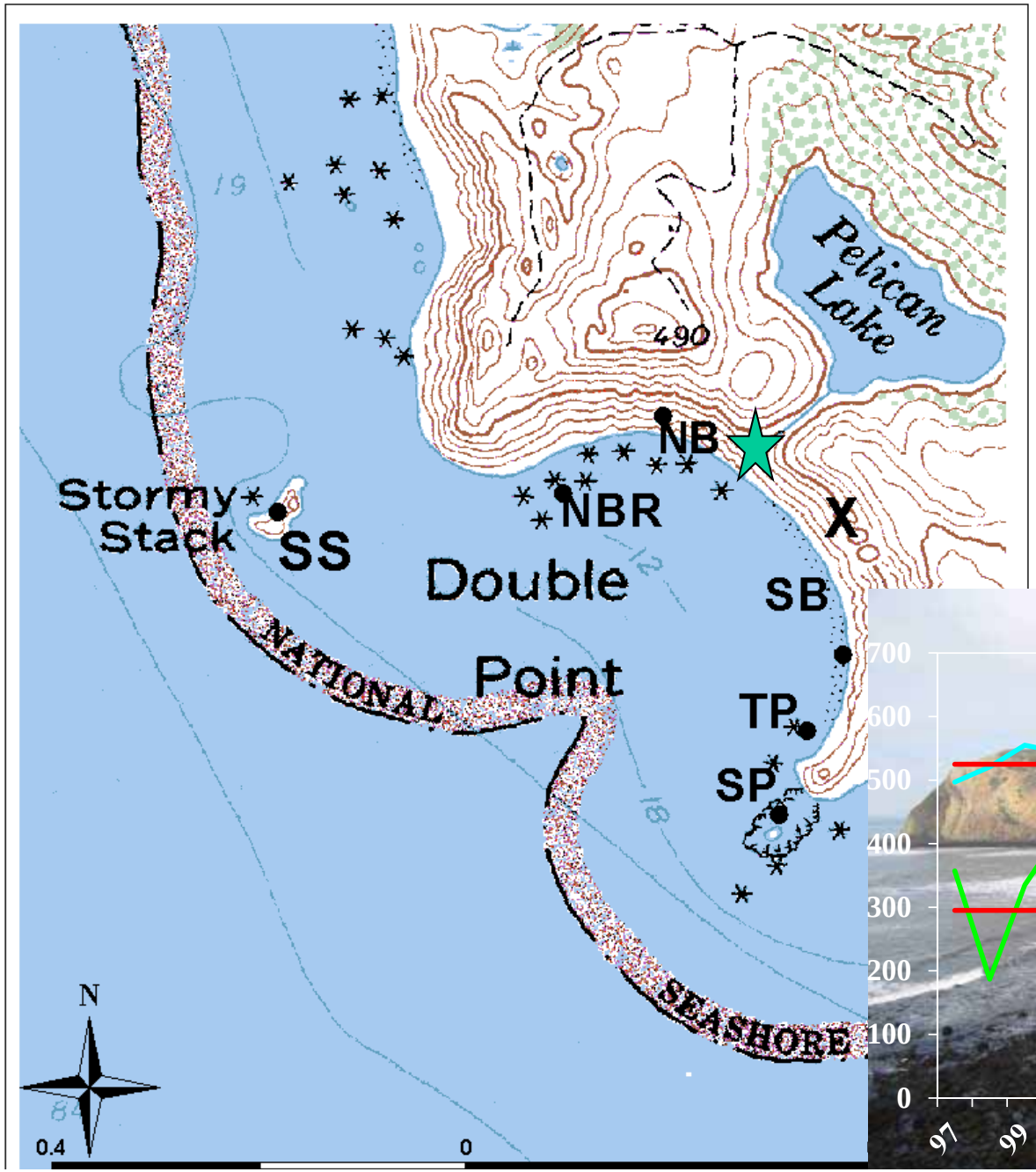


DOUBLE POINT



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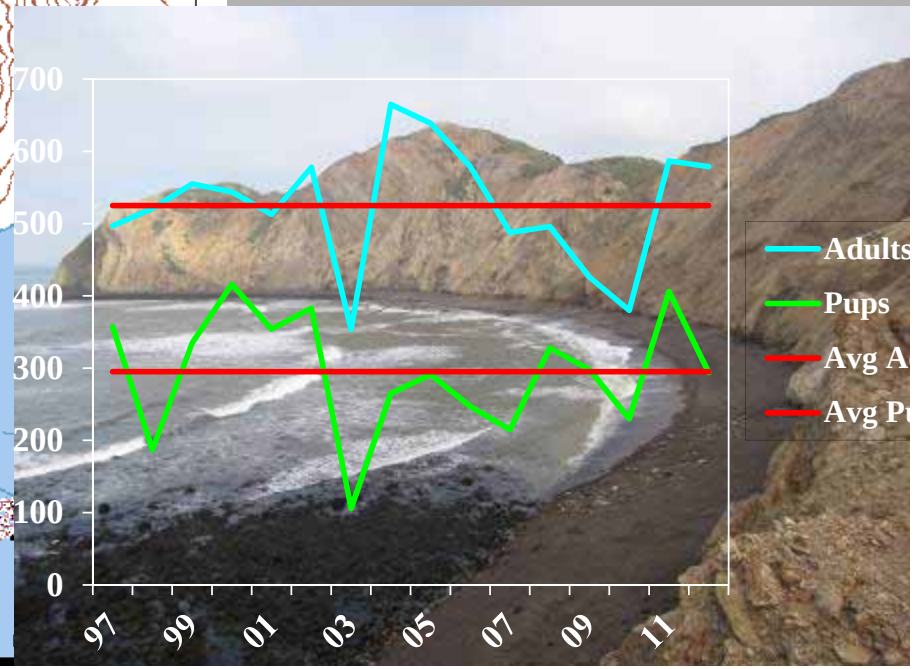

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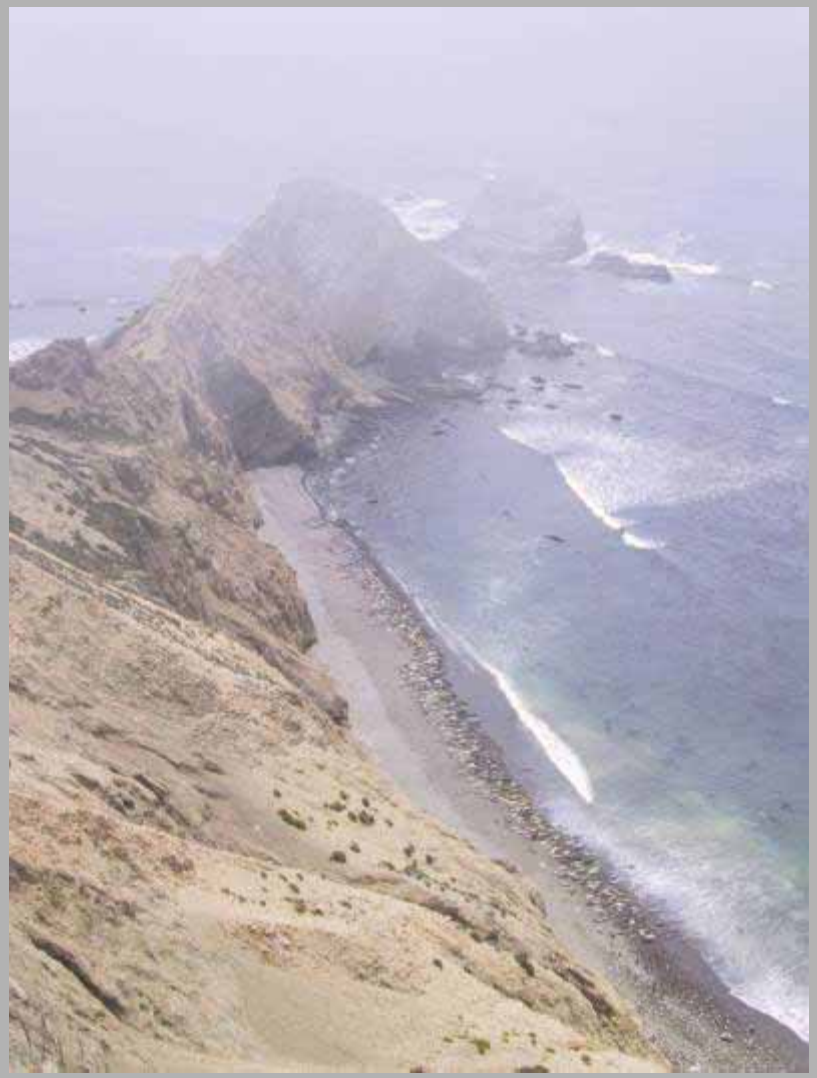


South Beach

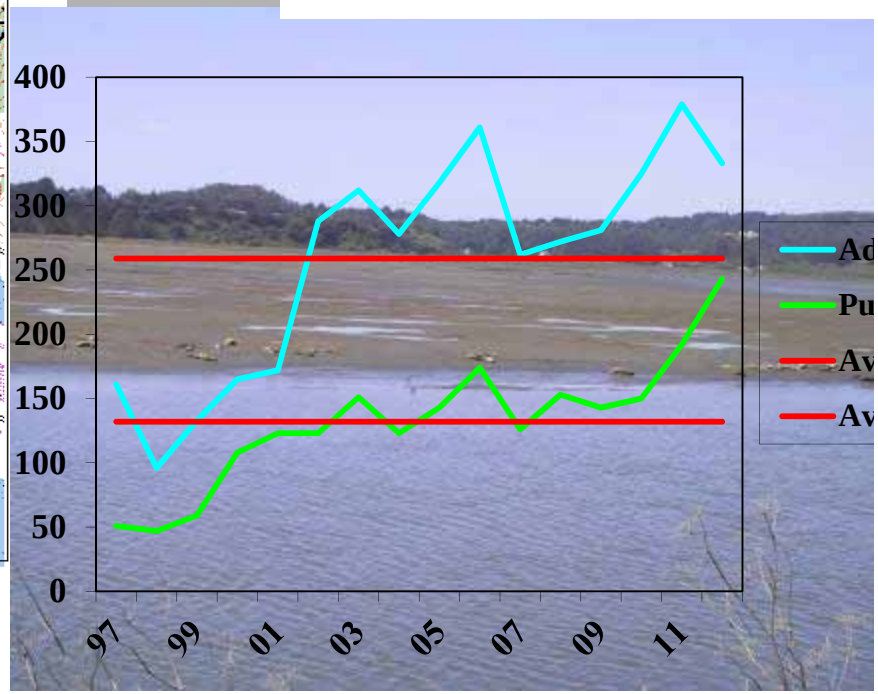
Entire cove

North Beach

BOLINAS LAGOON

Map of Bolinas Lagoon haul out sites. Sub-sites include: KI = Kent Island, HWY1 = Highway 1 sand bars, PWI = Pickle Weed Island. X= Observation Points

Figure 1: Map of harbor seal haul out sites at Point Reyes.



Bolinas Lagoon

Kent Island sand bar

Pickleweed Island sand bars

POINT BONITA

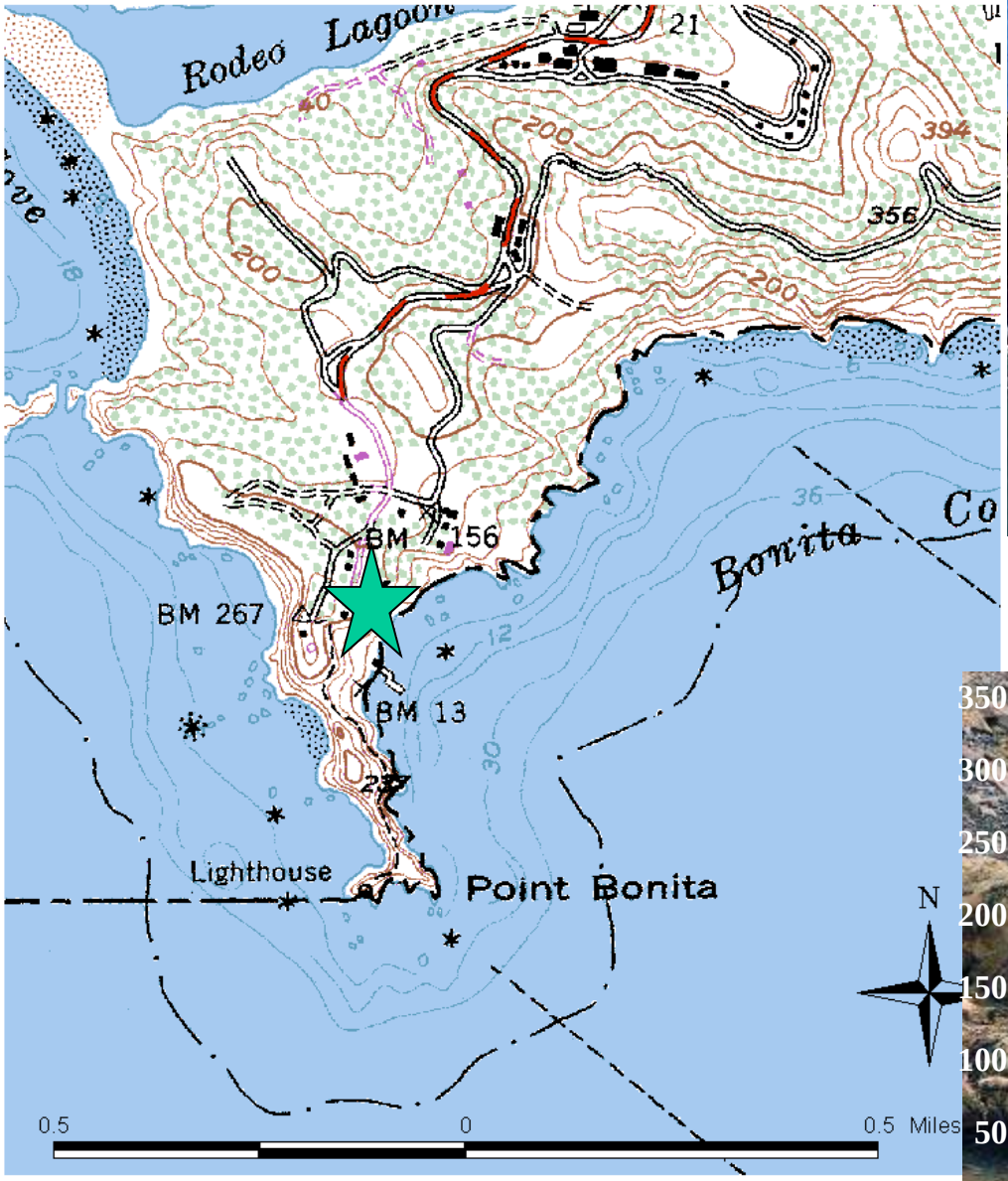
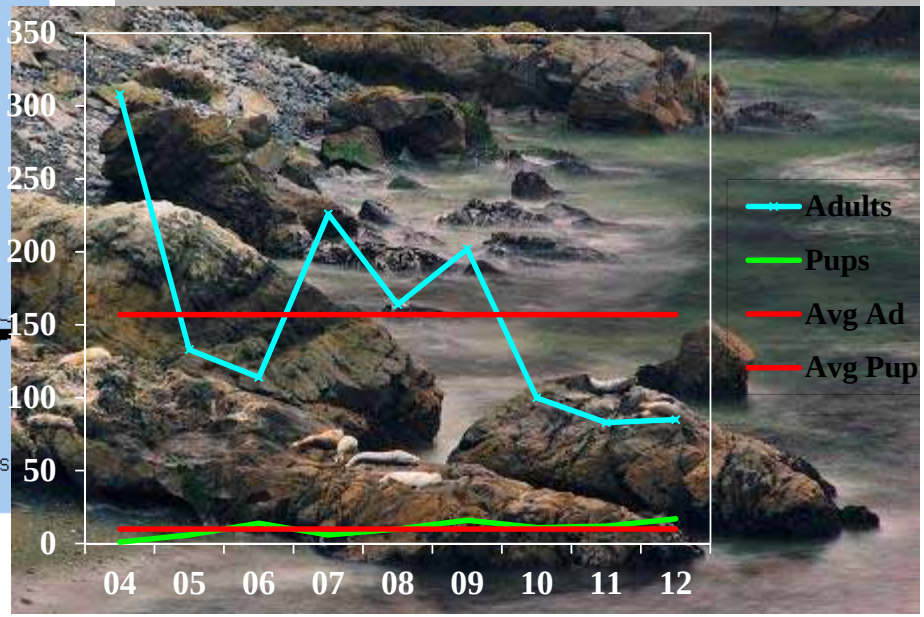
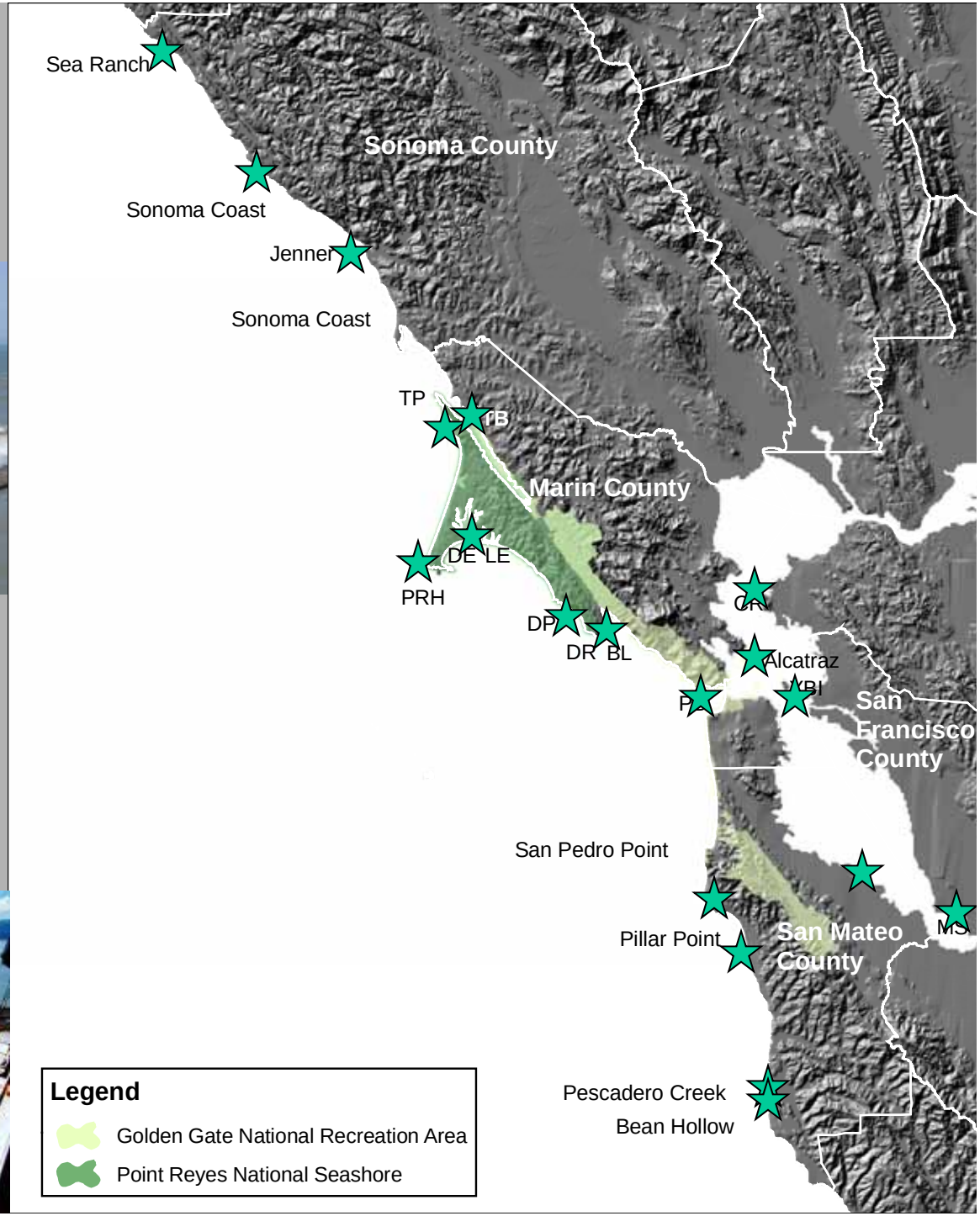


Figure _. Map of Point Bonita haul out sites.



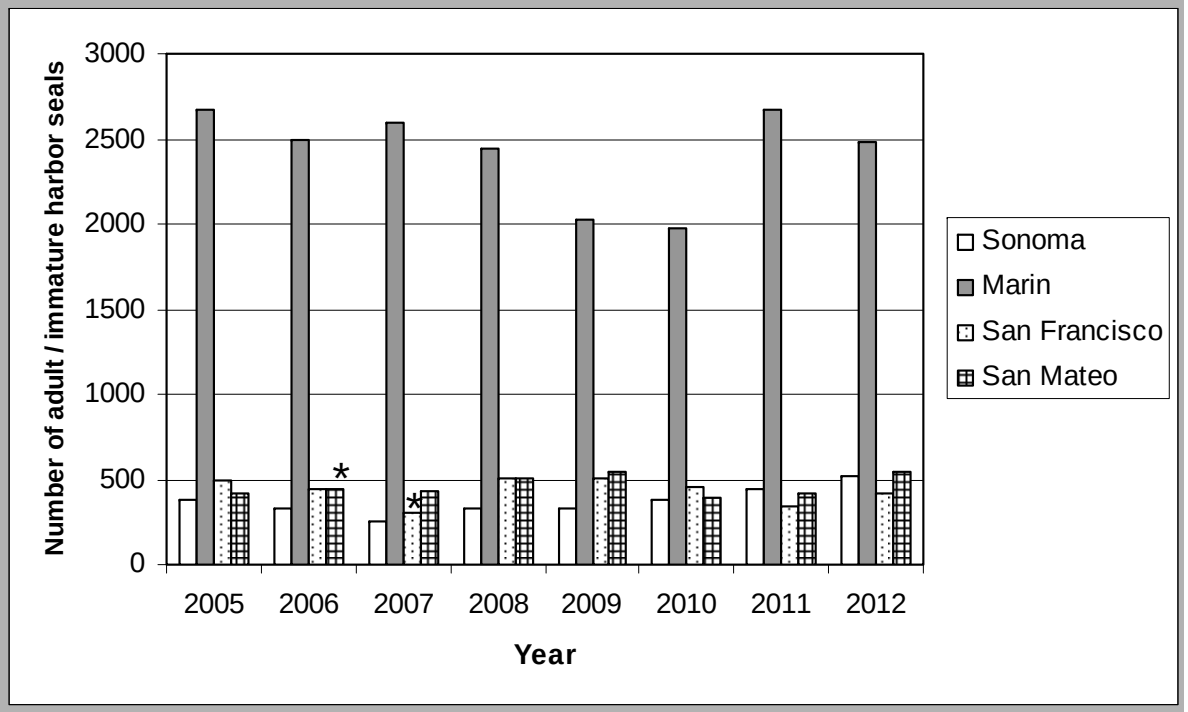
Point Bonita

Regional seal haul out sites



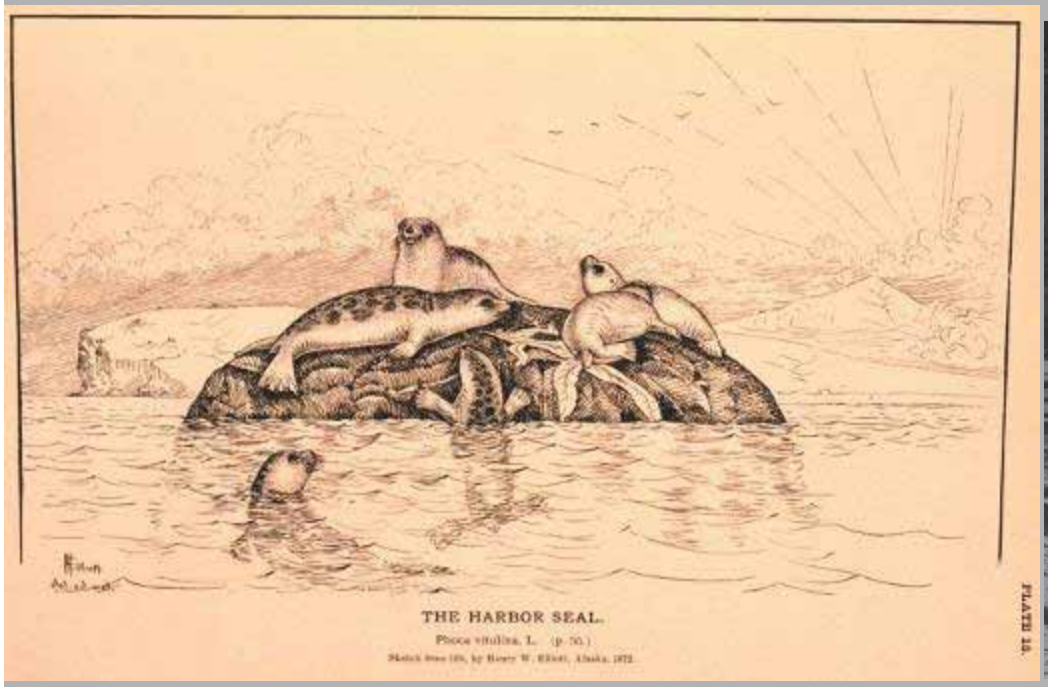
Regional surveys – 2005 -2012

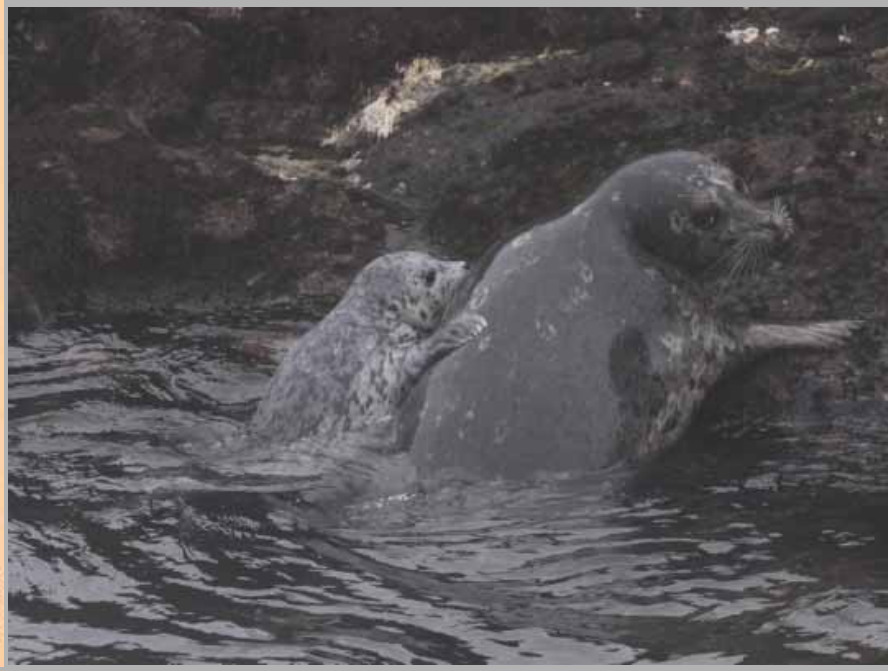
Marin - 63% adults; 76% pups



Habitat monitoring

- Haul out sites
- El Nino and weather
- Dispersal – with TMMC and MLML





Habitat changes

Drakes Estero

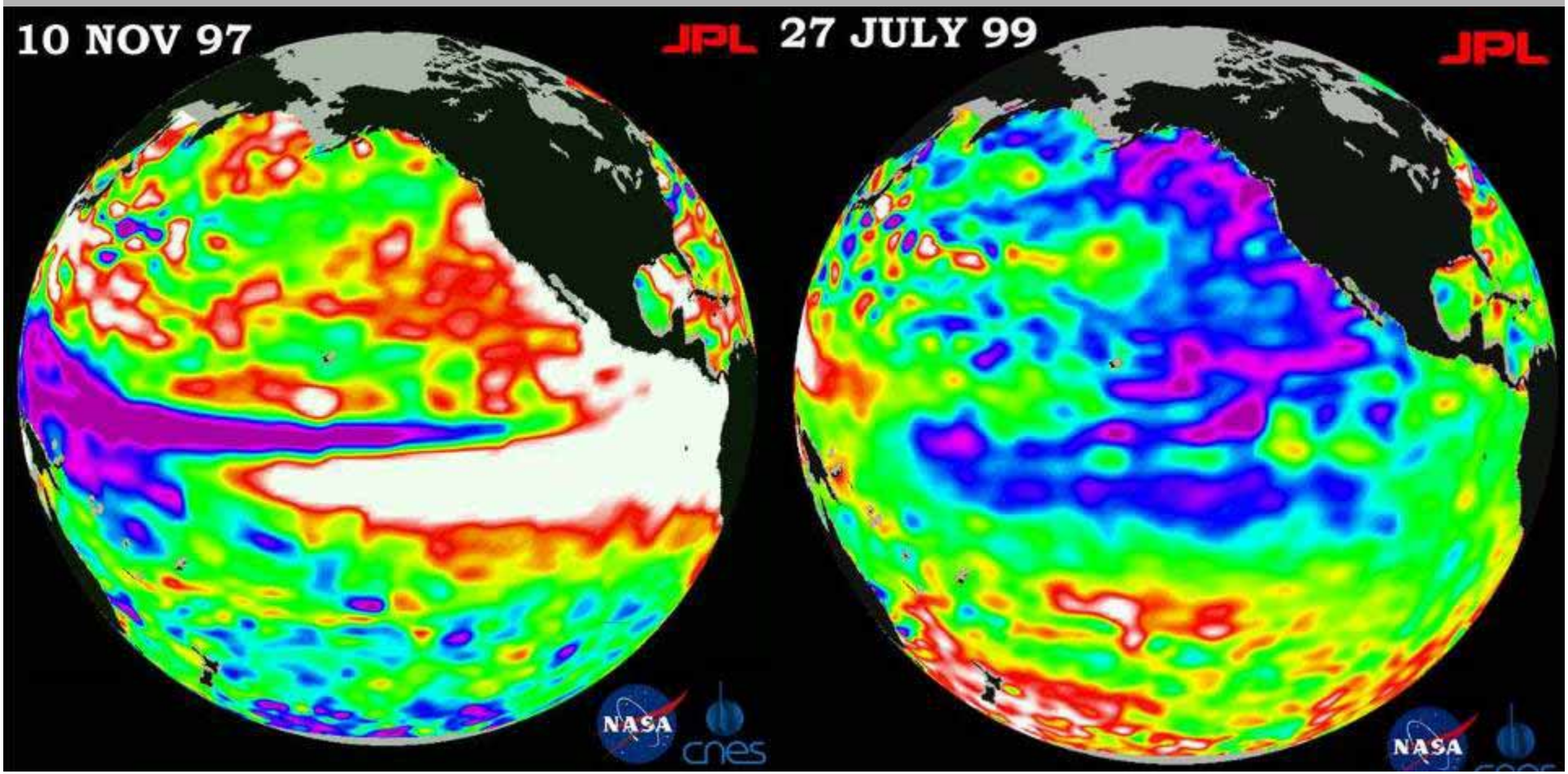
2002 Channel

2009 No Channel

Climate

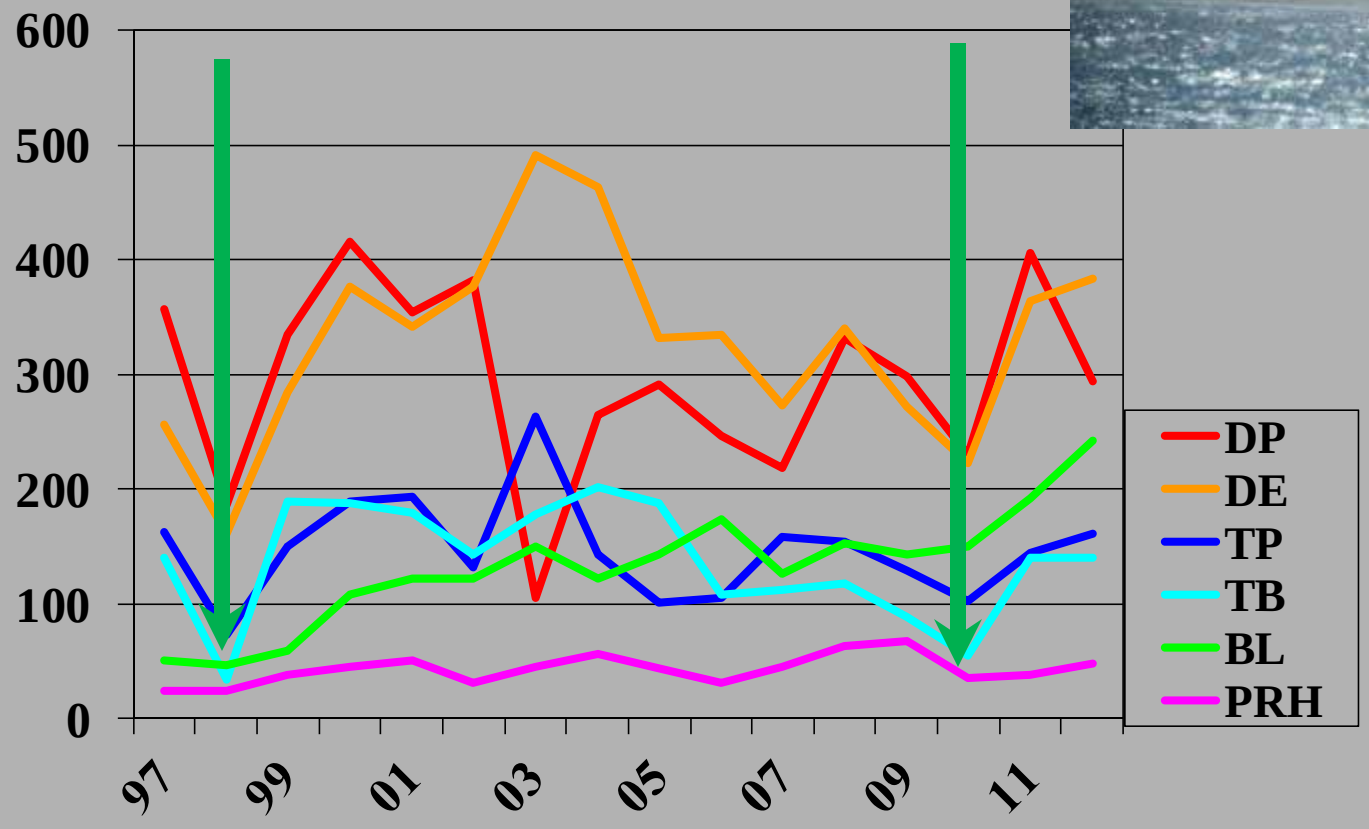
El Niño Year

La Niño Year



El Niño Effect

Maximum pup count by site



Health monitoring

Fresh shark bites

Fresh dead

Health

3 die offs in past 15 years

@100 in 1997

@ 25 in 2000

@ 15 in 2009

Disturbance monitoring

Seal Response

Head alert

Flush to water

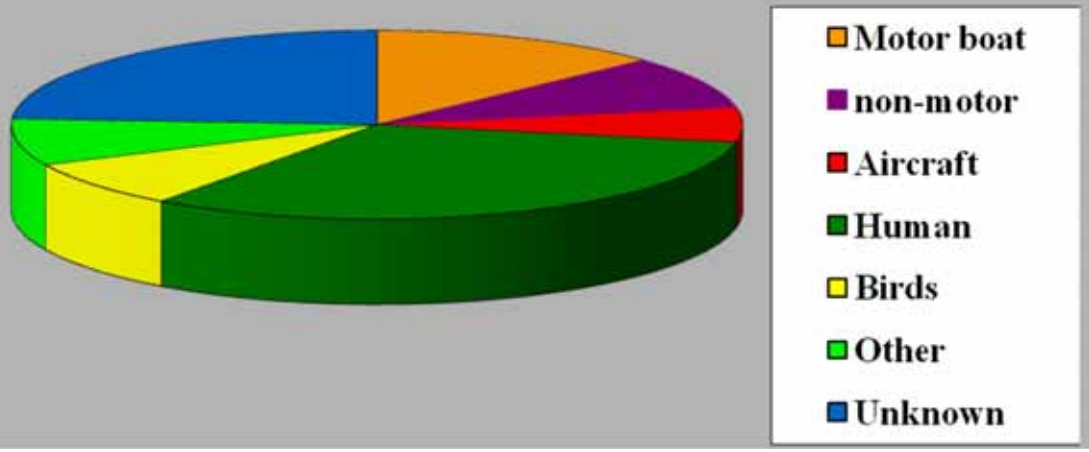
Flush into water

Measures

- **Source**
- **No. disturbance/hour**
- **No. Seals flush**
- **No. Pups separated**

Disturbances at all sites

Disturbance sources
Percent averaged for 15 years

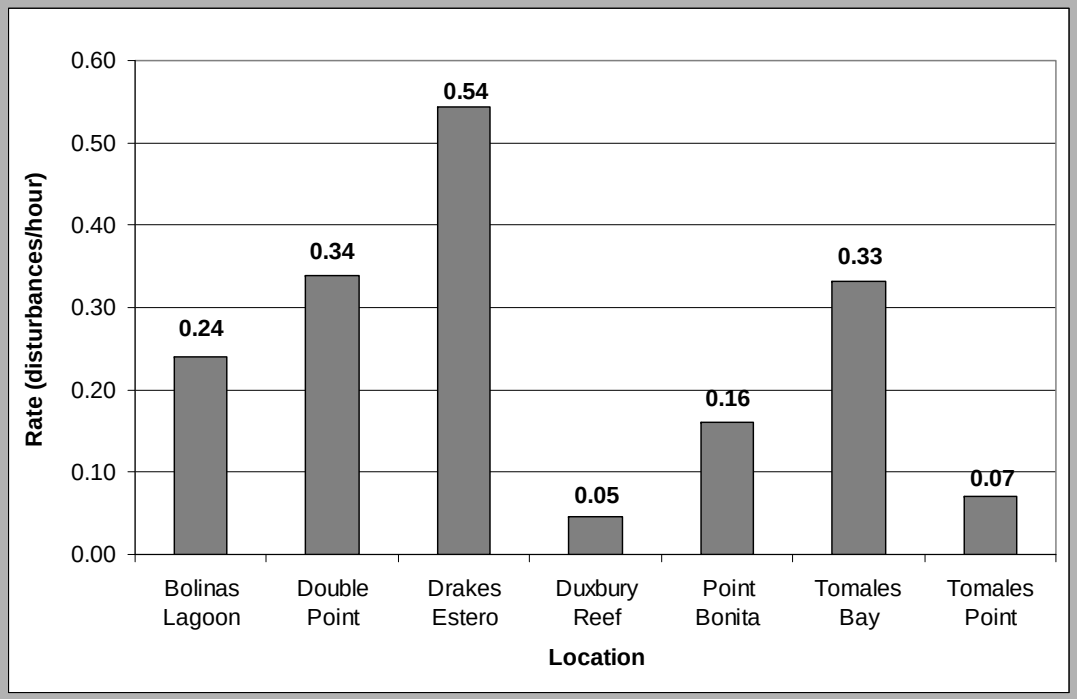


Disturbance type by year

Year	Motor boat	Non motor boat	Car	Dog	Aircraft	Human	Bird	Unk	Other
2002	19%	15%	6%	1%	6%	31%	7%	21%	5%
2003	13%	20%	2%	0%	8%	29%	8%	24%	5%
2004	2%	9%	8%	1%	2%	38%	8%	25%	8%
2005	9%	14%	1%	2%	8%	35%	8%	25%	2%
2006	14%	16%	3%	1%	5%	36%	8%	22%	5%
2007	29%	21%	7%	2%	7%	33%	7%	24%	1%
2008	11%	10%	5%	0%	4%	47%	5%	21%	4%
2009	22%	11%	2%	0%	3%	22%	6%	17%	4%
2010	27%	5%	3%	6%	5%	31%	4%	28%	2%
2011	21%	9%	3%	0%	5%	29%	12%	20%	6%
2012	13%	4%	2%	0%	3%	27%	14%	28%	7%

Disturbance measure

Disturbances per hour - 2012

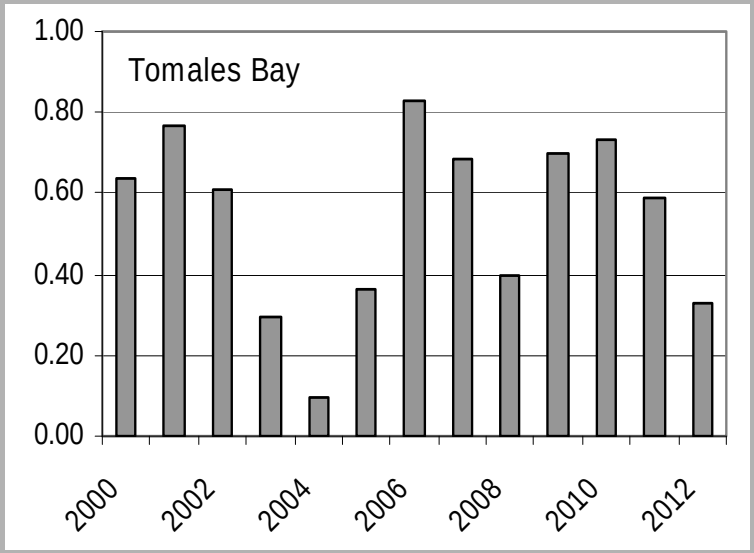


Rates of disturbances per hour from March 1st through July 31st, 2012. Only actual disturbances (head alert, flush, flush water) were used and survey time was based on observation time for all complete surveys.

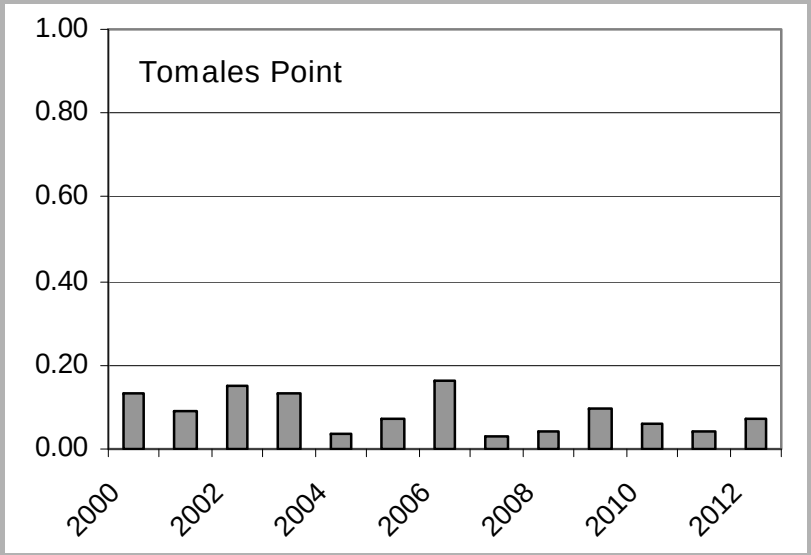
Disturbance measure

Disturbances per hour 2000-2012

High disturbance rate



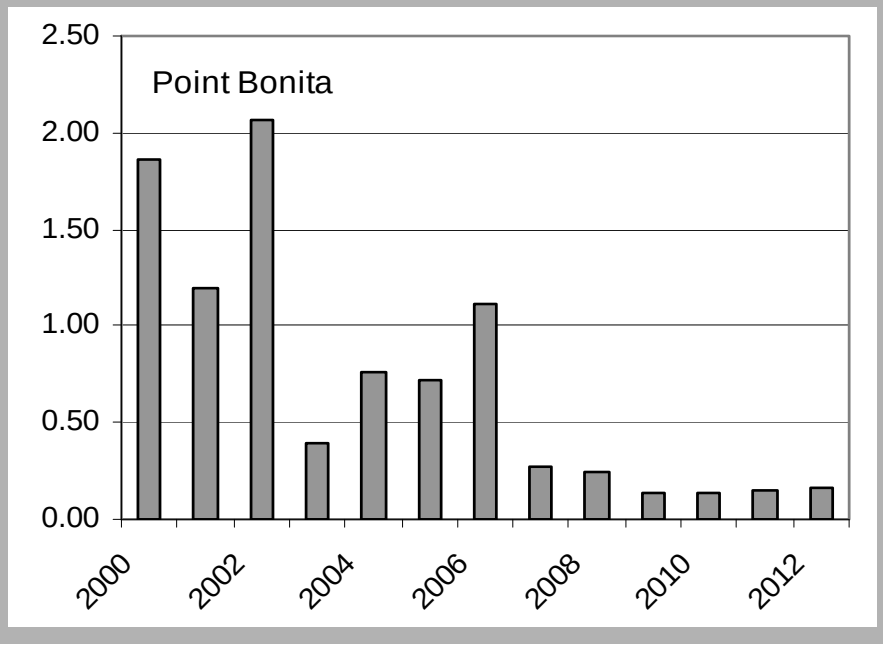
Low disturbance rate



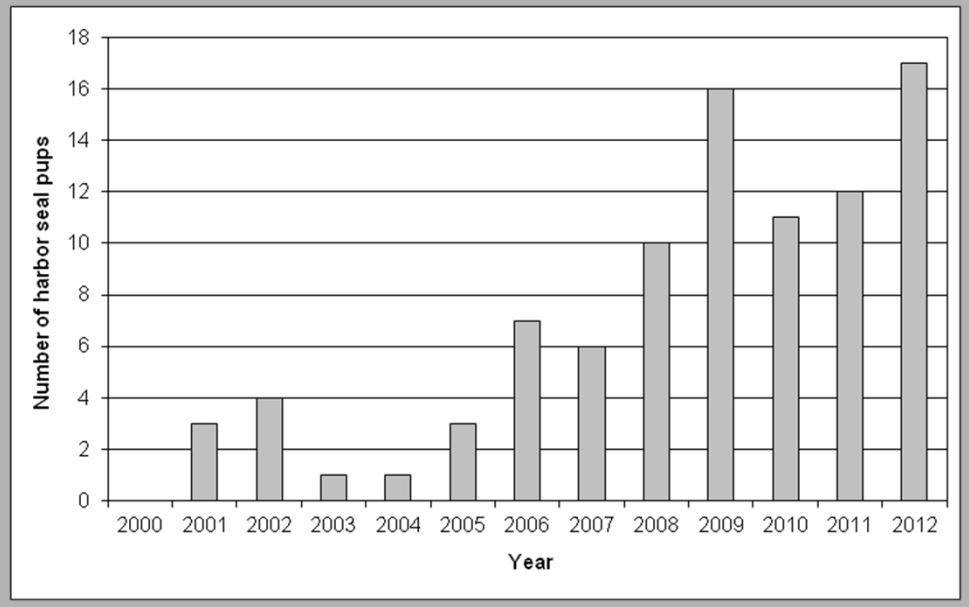
Point Bonita

GGNRA reduced access in 2006
Disturbance rate down in 2007
Seal numbers up in 2007

Disturbance Rate

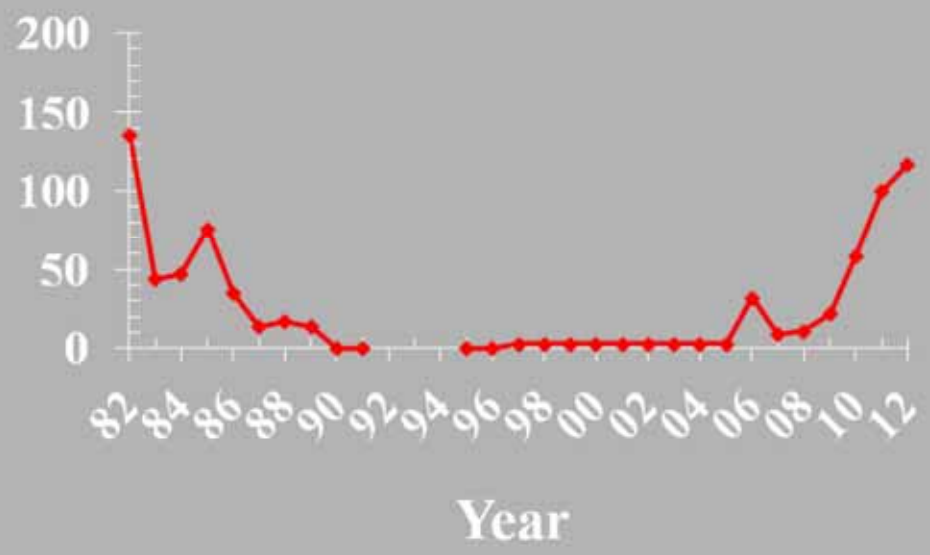


Pup counts



Hog Island

- Park limited access to island
- Seals now are present year round
- Maximum numbers in 2012
  Adults 117 Pups 9



Data various sources:
CDFG, NPS, Allen & King 1992

Emerging issue

Return of terrestrial predator - Coyotes

Emerging issue

Arrival of avian predators – Eagles

Sue Van Der Wal

Sarah Codde

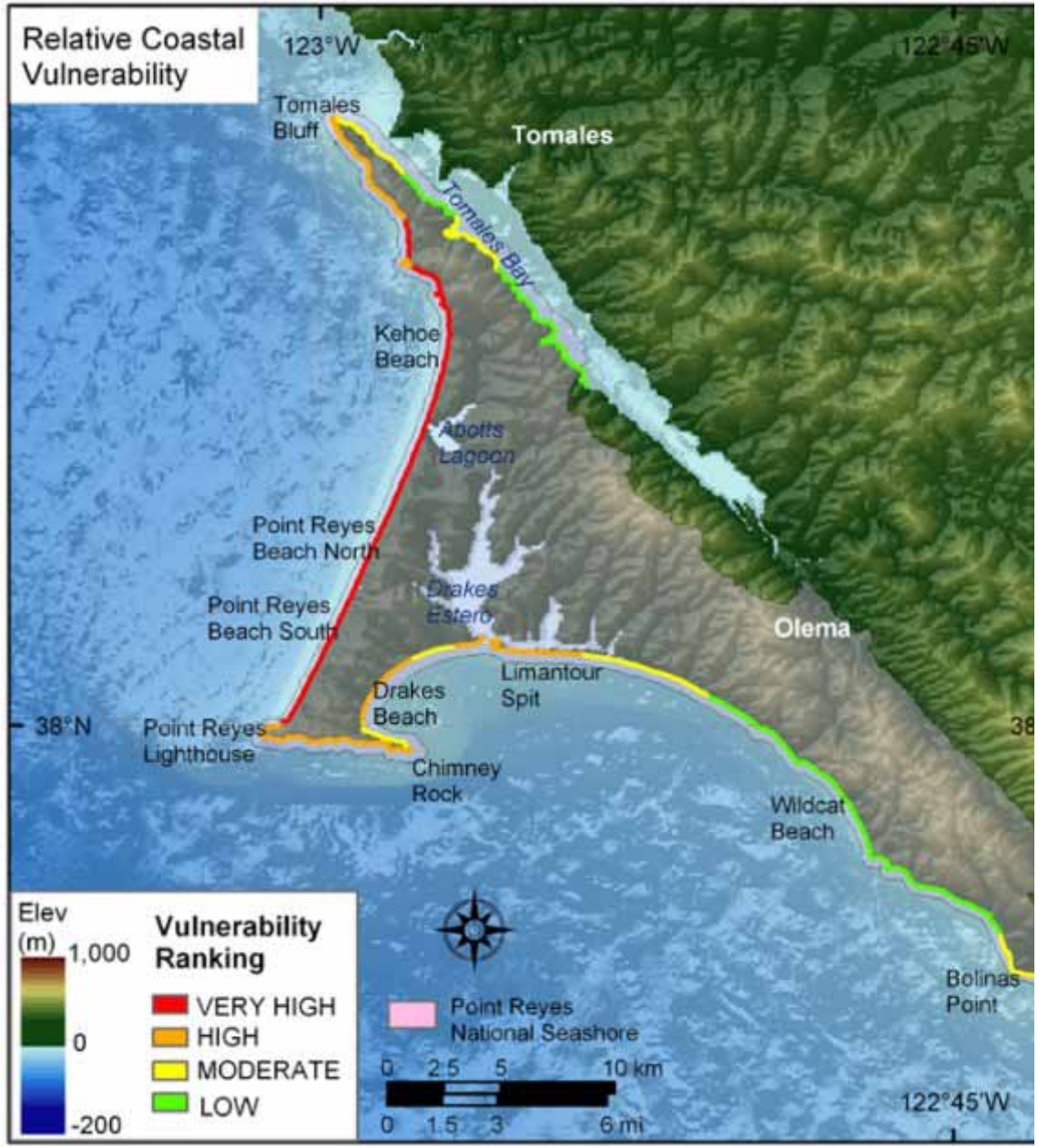
Continuing issue

Continuing issue

Emerging issue

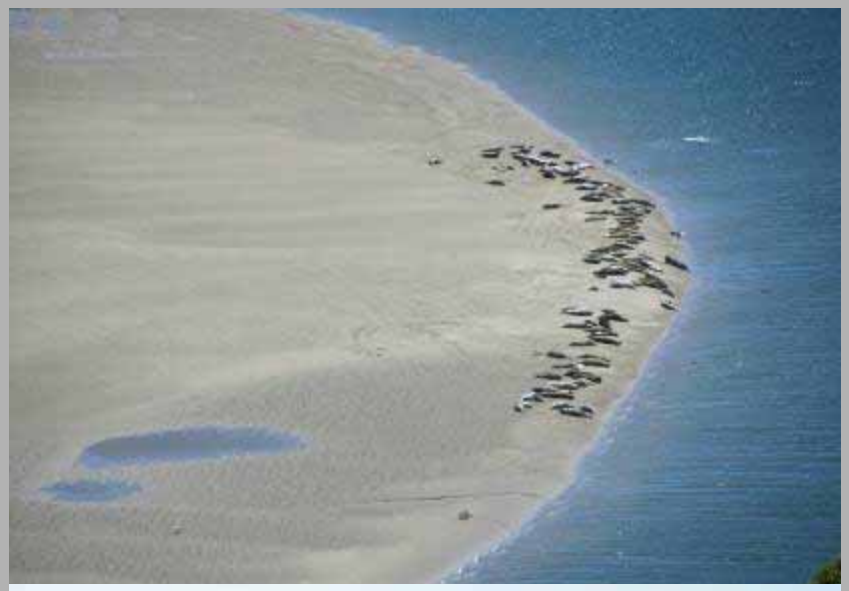
Global Climate Change effects on marine ecosystems

- **Sea Level Rise**
  - Habitat loss
  - Potential new habitat
- **Ocean condition**
  - Acidity
  - Change in upwelling
  - More frequent and more intense ENSOs



Potential climate effects

Sea Level Rise in transitional habitats



Date of first pup

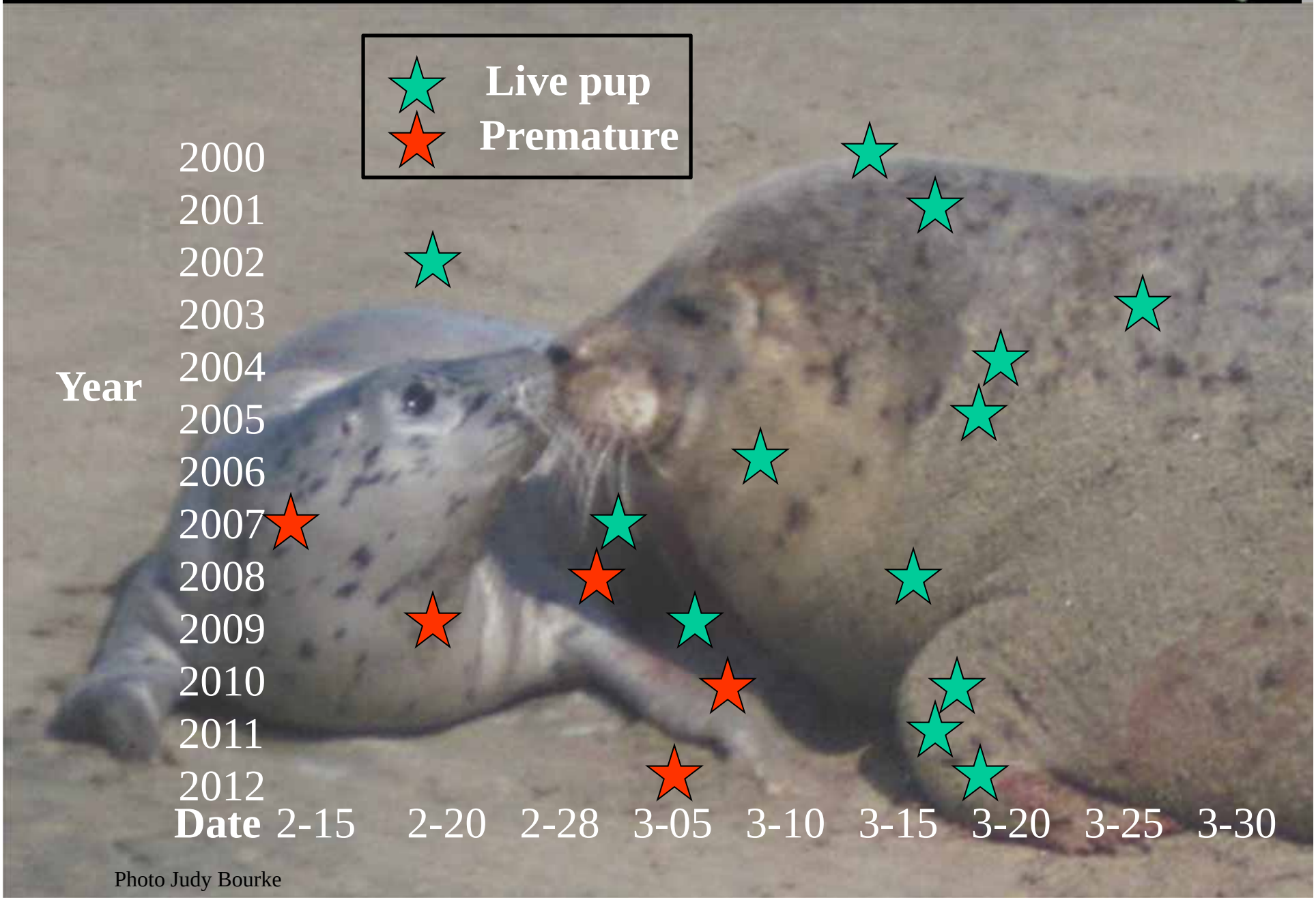
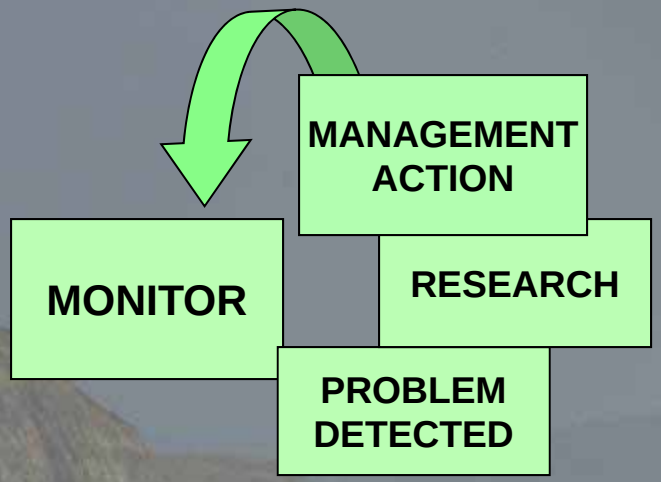


Photo Judy Bourke



Management actions =

Research

Protect habitat/species

Restoration

Education

Continue monitoring*

THANKS TO ALL OF YOU