Monitoring Western Snowy Plovers in South Bay Salt Ponds

SAN FRANCISCO BAY BIRD OBSERVATORY

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Western Snowy Plover

- Pacific Coast population (*Charadrius nivosus nivosus*) breeds from Washington State to Baja California, Mexico
- Federally listed as threatened
- Decline linked to habitat loss/degradation, beach recreation, predation (USFWS 2007)
- SF Bay = Recovery Unit 3

Management Goals

- USFWS Recovery Plan (2007)

  Support 500 breeding adults in RU3 for 10 years

  Maintain 5-year average productivity of at least 1 fledged chick/male

- SBSPRP Adaptive Management Plan (2007)

  Support 250 breeding adults within project area

  Maintain productivity level specified in Recovery Plan

- Currently estimate ~130-200 birds in SF Bay

“Window” Counts

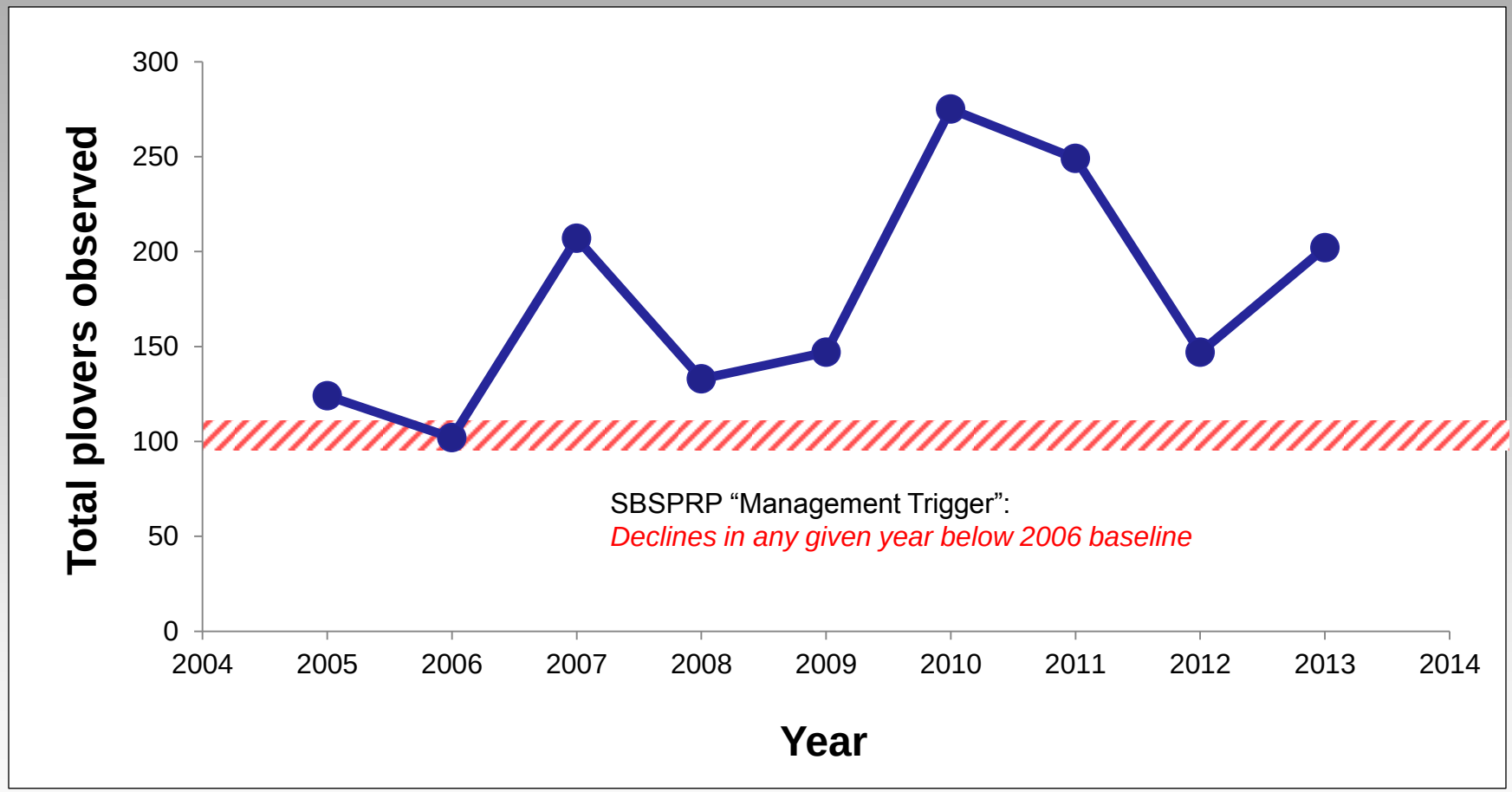
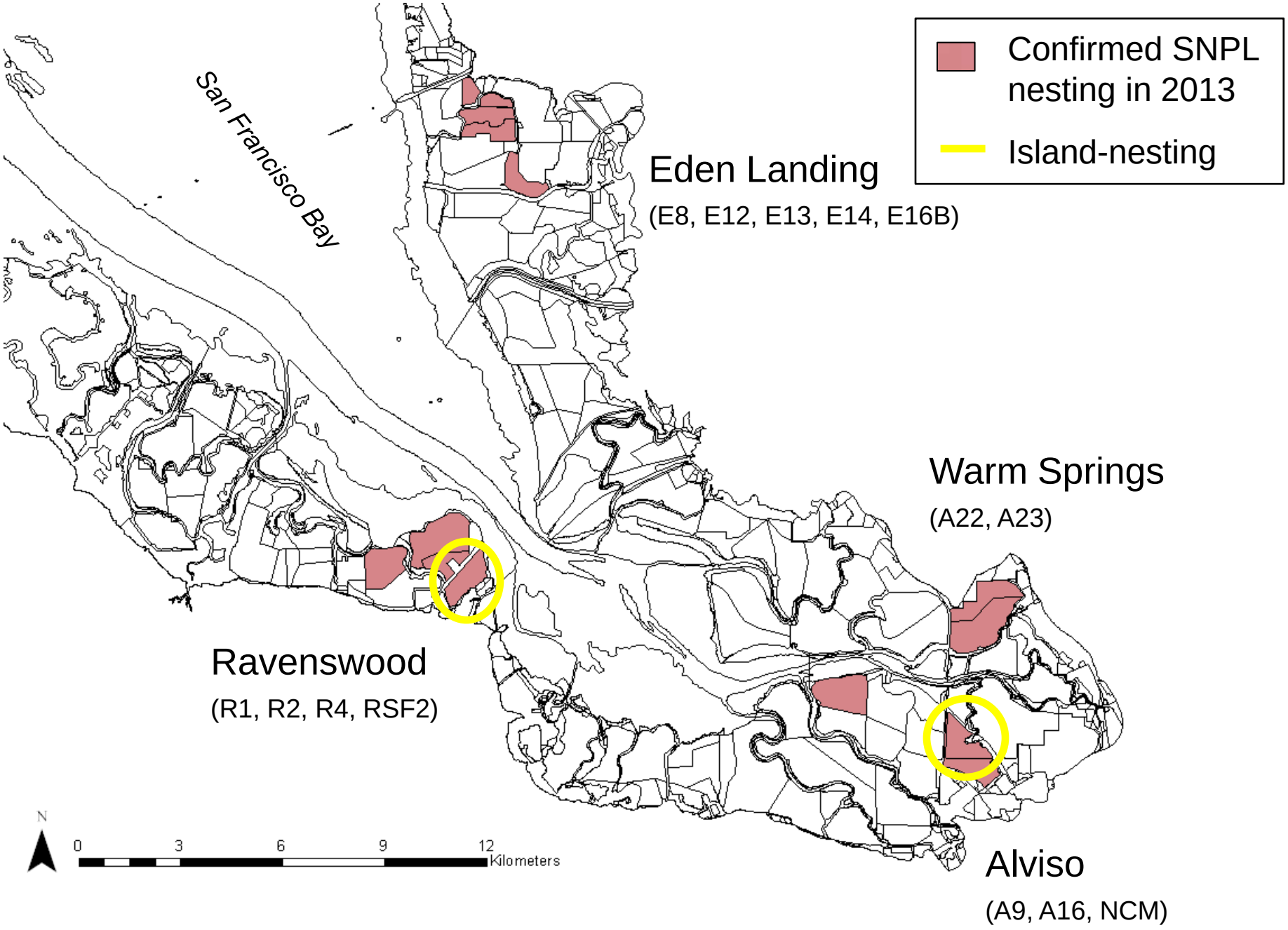


Figure 1. Total number of Snowy Plovers observed in Recovery Unit 3 (all sites) during annual breeding window surveys in May, 2005-2013. Hatched line indicates 2006 baseline.

Table 1. Number of Snowy Plovers observed in Recovery Unit 3 sites during annual breeding window surveys in May, 2009-2013.

REGION	SITE	2009	2010	2011	2012	2013
Alameda	Baumberg/Eden Landing	88	184	185	82	97
	Coyote Hills	0	0	0	0	0
	Dumbarton	0	0	0	0	0
	Hayward	4	12	8	9	32
	Warm Springs	14	27	17	3	1
Napa	Napa	12	10	1	0	3
San Mateo	Ravenswood/West Bay	21	42	27	33	59
Santa Clara	Alviso	8	0	11	20	10
Total Unit 3		**147**	**275**	**249**	**147**	**202**


Confirmed SNPL nesting in 2013
Island-nesting
San Francisco Bay
Eden Landing
(E8, E12, E13, E14, E16B)
Warm Springs
(A22, A23)
Ravenswood
(R1, R2, R4, RSF2)
Alviso
(A9, A16, NCM)
N
0
3
6
9
12
Kilometers

Nest Fates

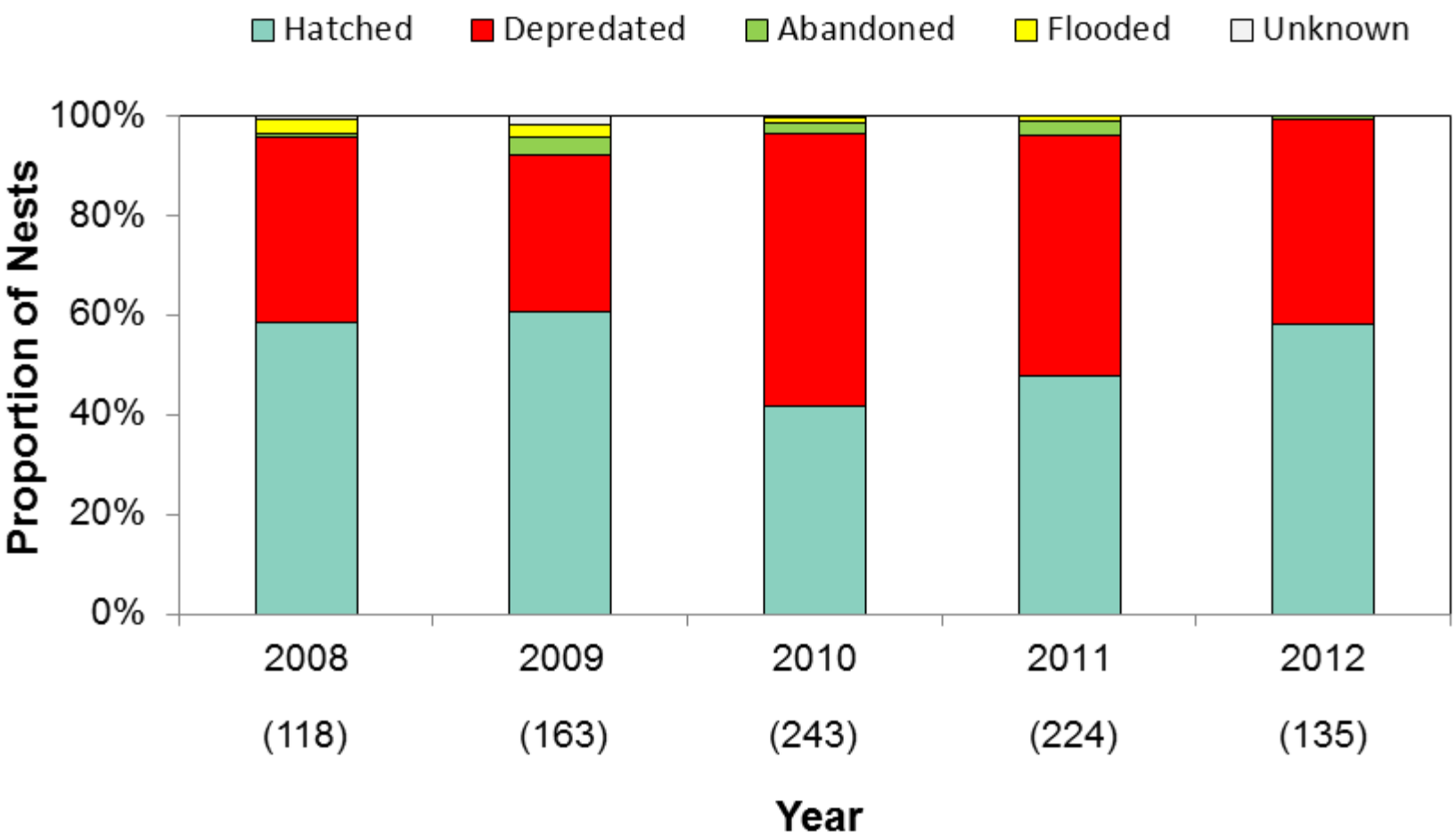


Figure 2. Annual apparent Snowy Plover nest fates in South San Francisco Bay from 2008-2012 (number of nests monitored).

Nest Cameras

Nest predators recorded with cameras

	2009	2010	2011
California Gull	2	2	2
Northern Harrier	3	0	0
Red-Tailed Hawk	2	0	1
Common Raven	1	0	1
Ruddy Turnstone	0	1	0
Grey Fox	0	1	0
Total number of nests monitored	**24**	**21**	**17**

(Robinson-Nilsen 2011, Demers & Robinson-Nilsen 2012)

Nest Success

Robinson-Nilsen et al. (2011)

- Used logistic-exposure modeling approach (after Shaffer 2004)
- Complex, year, and nest initiation date important determinants of nest success (data from 2006-2011)
- Plover nest success generally highest in Ravenswood ponds, lowest in Warm Springs ponds

  Alviso (41-53%)

  Eden Landing (20-32%)

  Ravenswood (62-69%)

  Warm Springs (15-65%)

Fledging Success

Table 2. Apparent fledging success (all sites combined) of Snowy Plover chicks in South San Francisco Bay from 2009-2012.

Year	Fledging Success[1]	N[2]
2009	25%	113
2010	41%	39
2011	14%	36
2012	50%	8

[1]*Chicks were considered fledged if they survived to 30 days.*
[2]*N is the number of chicks banded.*

Habitat Enhancement

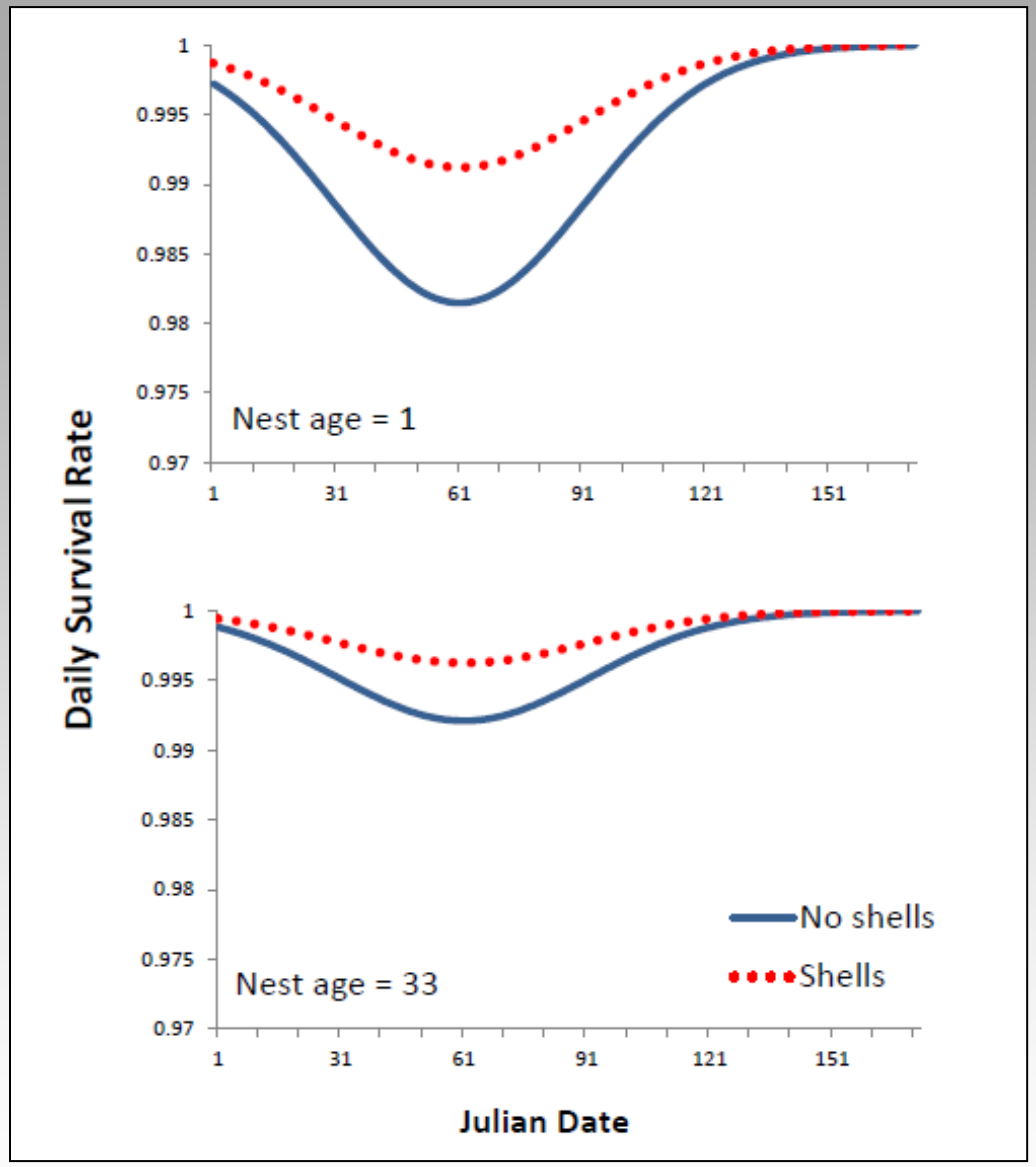
- Do oyster shell treatments enhance plover nest success?
- Established experimental 1-ha plots from 2008-2010
- Used Program MARK (White and Burnham 1999) to examine effects of shells, year, nest age, linear and quadratic time trends on DSR at Eden Landing

Habitat Enhancement

Table 3. Summary of model-selection results for factors affecting Snowy Plover nest survival at Eden Landing, 2009-2012.

Model[1]	ΔAIC_c	w_i	*K*
1) *S*(shells + year + TT + age)	0.00	0.73	8
2) *S*(shells + TT + age)	2.15	0.25	5
3) *S*(shells + year + TT)	7.49	0.02	7
4) *S*(shells + TT)	13.66	0.00	4
5) *S*(year + TT + age)	20.04	0.00	7
6) *S*(year + TT)	29.30	0.00	6
7) *S*(TT)	36.74	0.00	3
8) *S*(shells + year + T + age)	39.43	0.00	7
9) *S*(shells + T + age)	43.60	0.00	4
10) *S*(shells + year + T)	46.77	0.00	6

[1] Only the top ten models (as ranked by ΔAIC_c) are shown.



- DSR drops mid-season
- DSR increases with nest age
- DSR slightly higher in shell plots than other areas
- Similar patterns observed in all years

Figure 3. The effects of nest age (1- and 33- day-old nests) and shell enhancements on daily survival rates of Snowy Plover nests at Eden Landing in 2012. Day 1 is March 11.

Habitat Enhancement

- Multiple factors affect plover nest survival

- Some preliminary support for shells enhancing hatching success

- Many uncertainties remain:

  Long-term effects?

  Could concentrated nesting increase nest predation?

  Effects on chick or adult survival?

  Scale of enhancement?

Construction-Plover Challenges

- Many nests in active construction-for-restoration sites
- In 2013, 61 of 148 nests found (as of Jul. 4th) in SF Bay in E12-13

Right: Active nests and associated “no-work” buffers 4.29.2013

Summary & Recommendations

- Nest success highly variable between years, sites
- Preliminary evidence that shells enhance hatching success, larger-scale study needed
- Little information on fledging success, adult survival; considering alternatives to color-banding in RU3
- Population context important – range-wide PVA underway, salt ponds used for nesting as well as foraging, brood-rearing, wintering
- Continued monitoring, measures to limit human disturbance (construction coordination, careful trail design in nesting areas) essential

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