Connectivity of managed and un-managed Caspian tern breeding colonies as revealed by resightings of banded individuals

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Acknowledgments

Collaborators

- U.S. Fish and Wildlife Service
- Oregon Department of Fish and Wildlife
- Washington Department of Fish and Wildlife
- California Department of Fish and Game
- U.S. Geological Survey - Bird Banding Laboratory

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Background

Management in 2014 of Caspian tern colonies in the Columbia River basin to reduce predation on juvenile salmonids

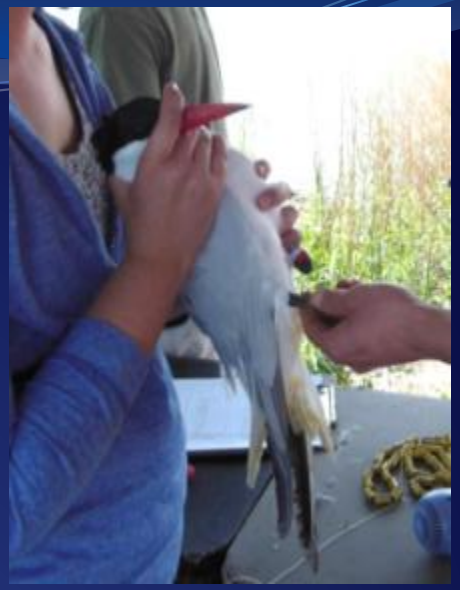
East Sand Island – Columbia River estuary

Goose Island – Potholes Reservoir

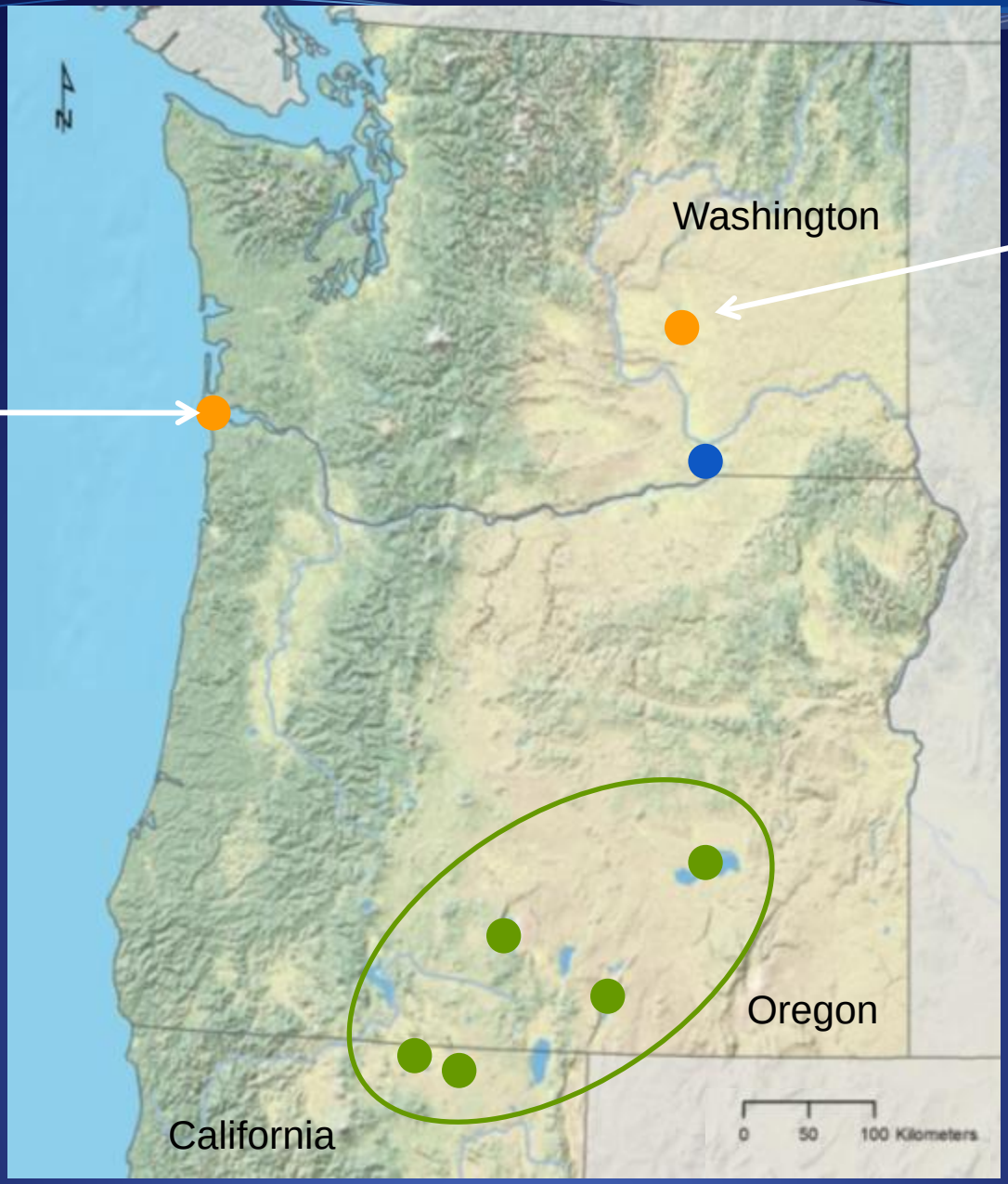
Background

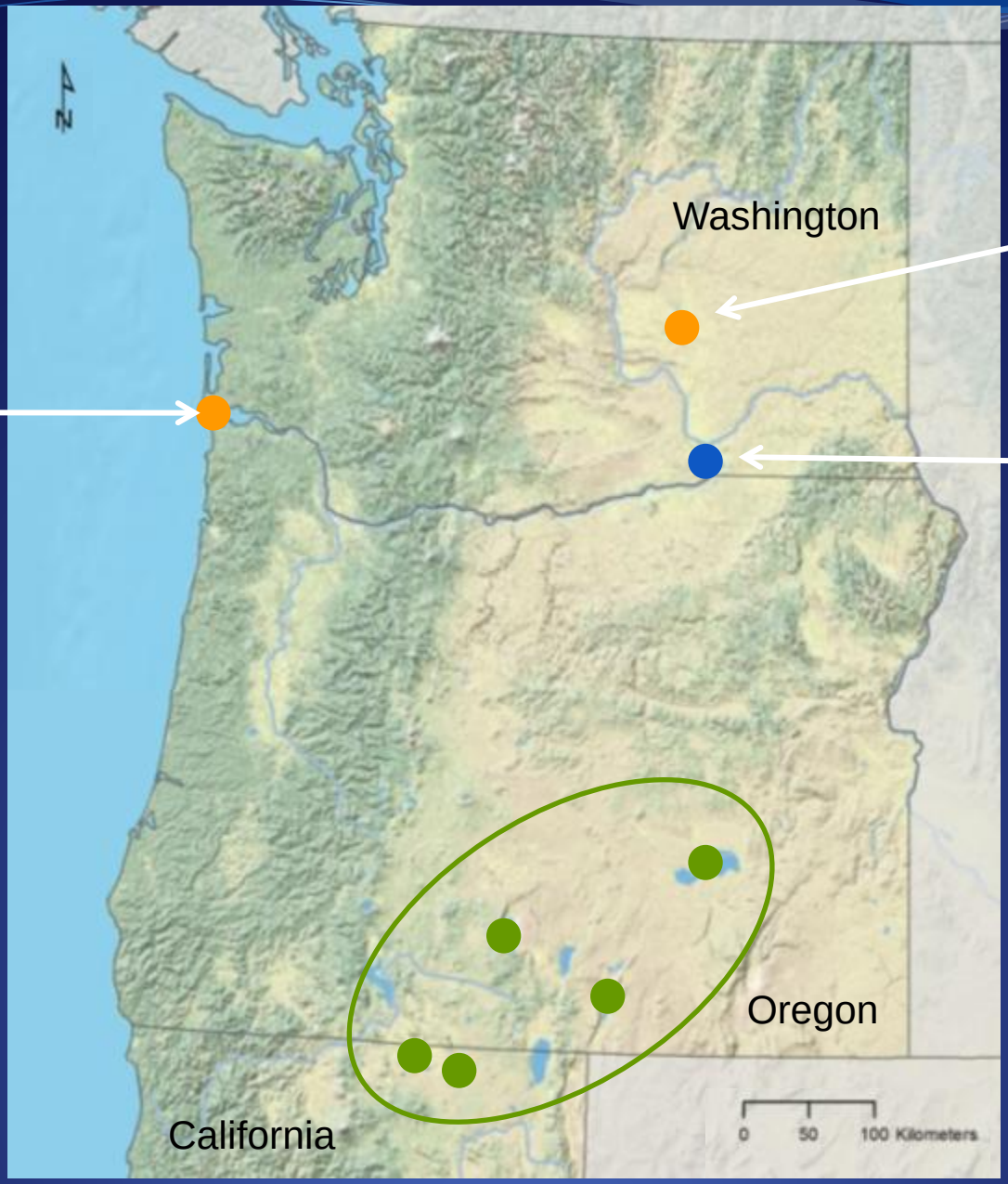
Marking Caspian terns with field-readable plastic leg bands and subsequent resighting of banded individuals to assess movements between breeding colonies and colony connectivity

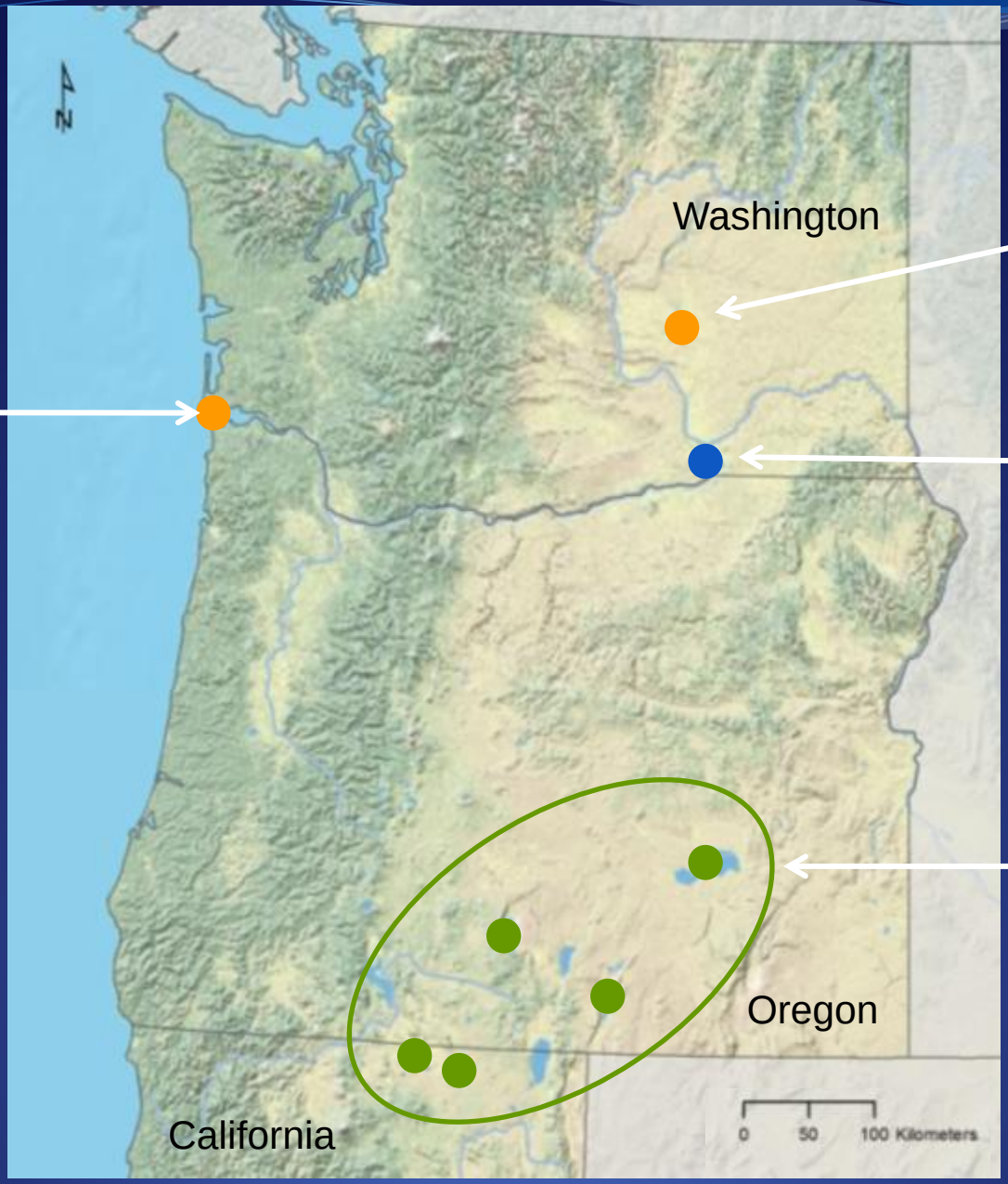
Benefits of band resighting



- Cost effective method to keep track of movements
  - Large sample size
  - Long term tracking
- Complements other methods (e.g. satellite tagging, GPS tagging) to evaluate movements of terns
- Provides additional line of information to distribution and abundance data for evaluation of management effectiveness


N
Washington
Goose Island
(managed)
East Sand Island
(managed)
Oregon
California
0
50
100 Kilometers


N
Washington
Goose Island
(managed)
East Sand Island
(managed)
Crescent Island
(un-managed)
Oregon
California
0
50
100 Kilometers



Goose Island (managed)

East Sand Island (managed)

Crescent Island (un-managed)

Corps-constructed Islands

Methods

Data collection

- Banding with field readable leg bands
  - 905 adults during 2005-2013
- Resighting during 2006-2014
  - At 8 colonies in 2014
  - 2-7 days/week during breeding season

Inter-colony movement rates

- Multi-state model in Program MARK
  - Survival and resighting probabilities accounted for
  - Model selection by AIC
- “Movement” does not always indicate emigration

Inter-colony movement estimates

Inter-annual movement probability estimated in Program MARK

X

Number of Caspian terns at the breeding colony the previous year

<u>Example</u>

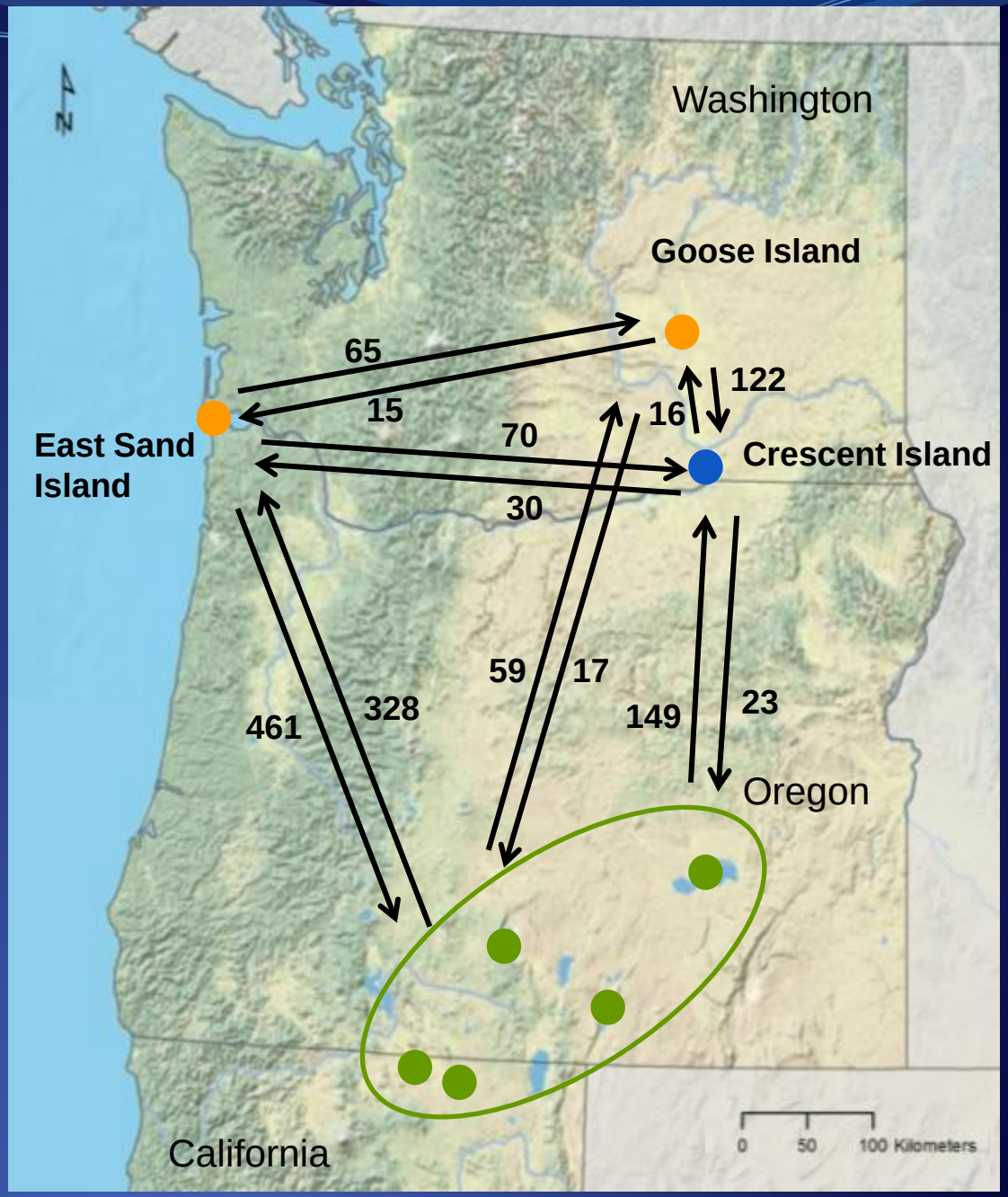
Inter-annual movement probability from colony A to colony B between year 1 and year 2 = 0.02

Number of terns at colony A in year 1 = 1,000

⬇

Estimated number of terns moved from colony A to colony B between year 1 and year 2 = 20

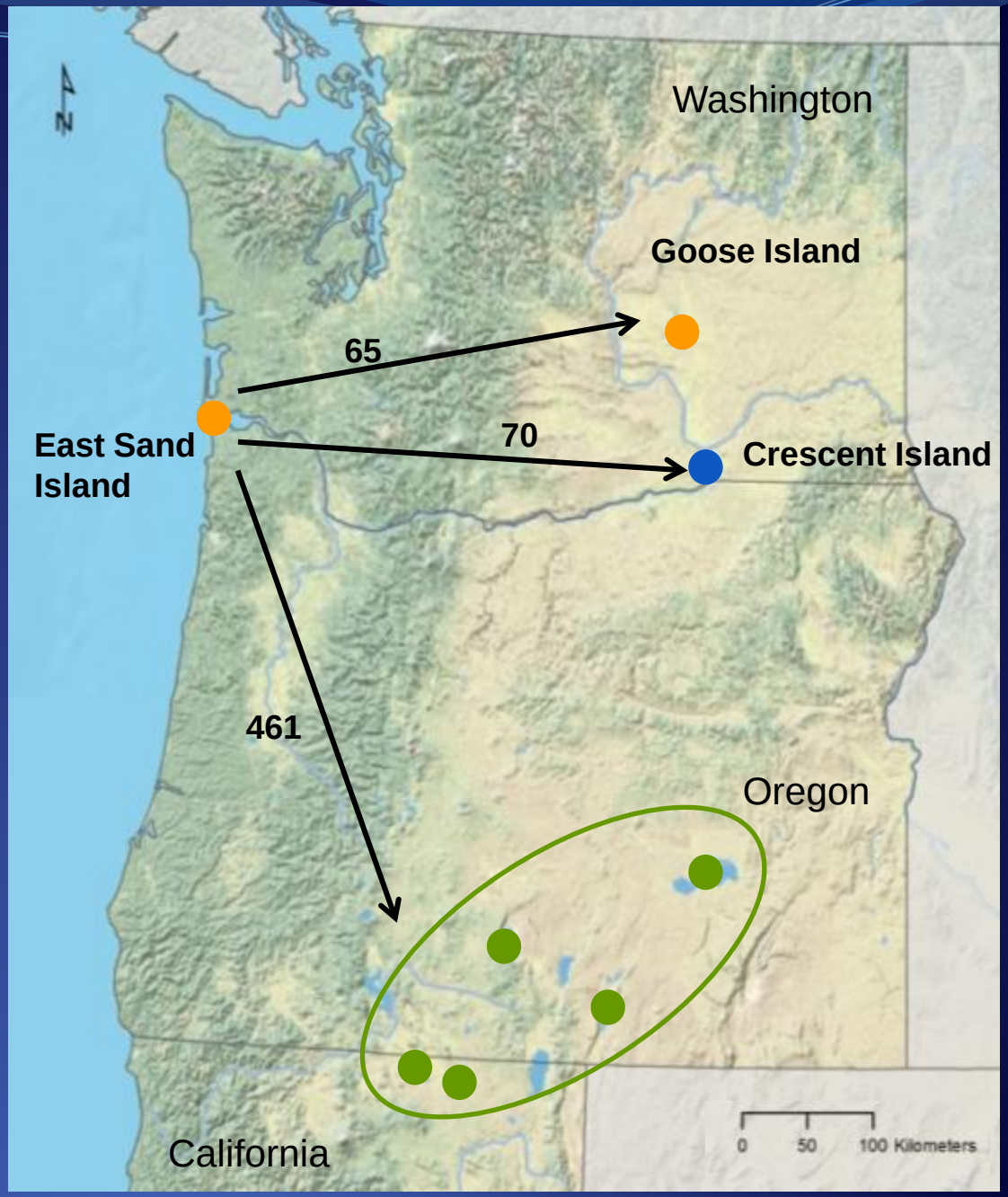
Estimated numbers of Caspian terns that moved between breeding colonies (2013-2014)



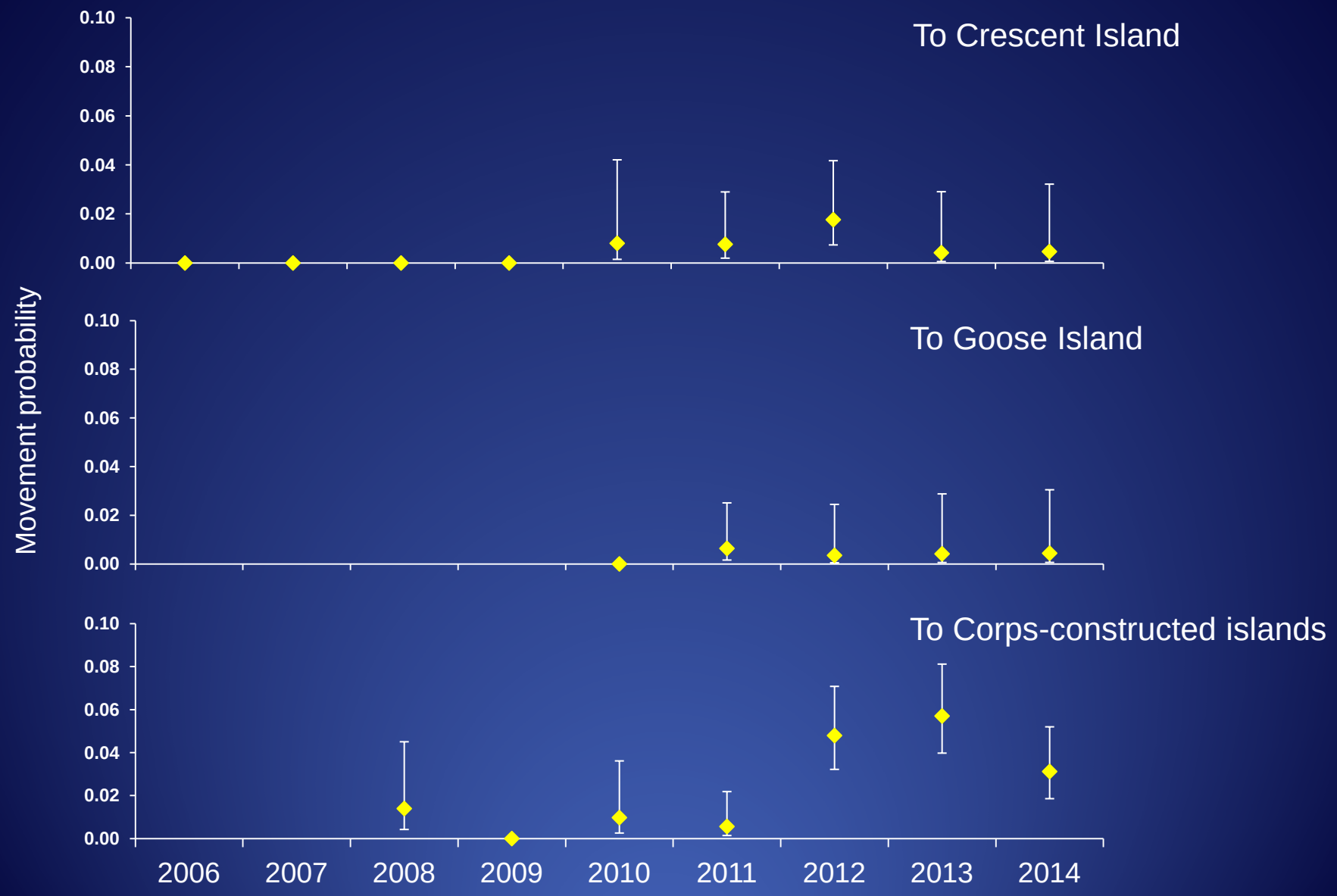
East Sand Island – Columbia River estuary

Nesting habitat restricted to 1.55 acres

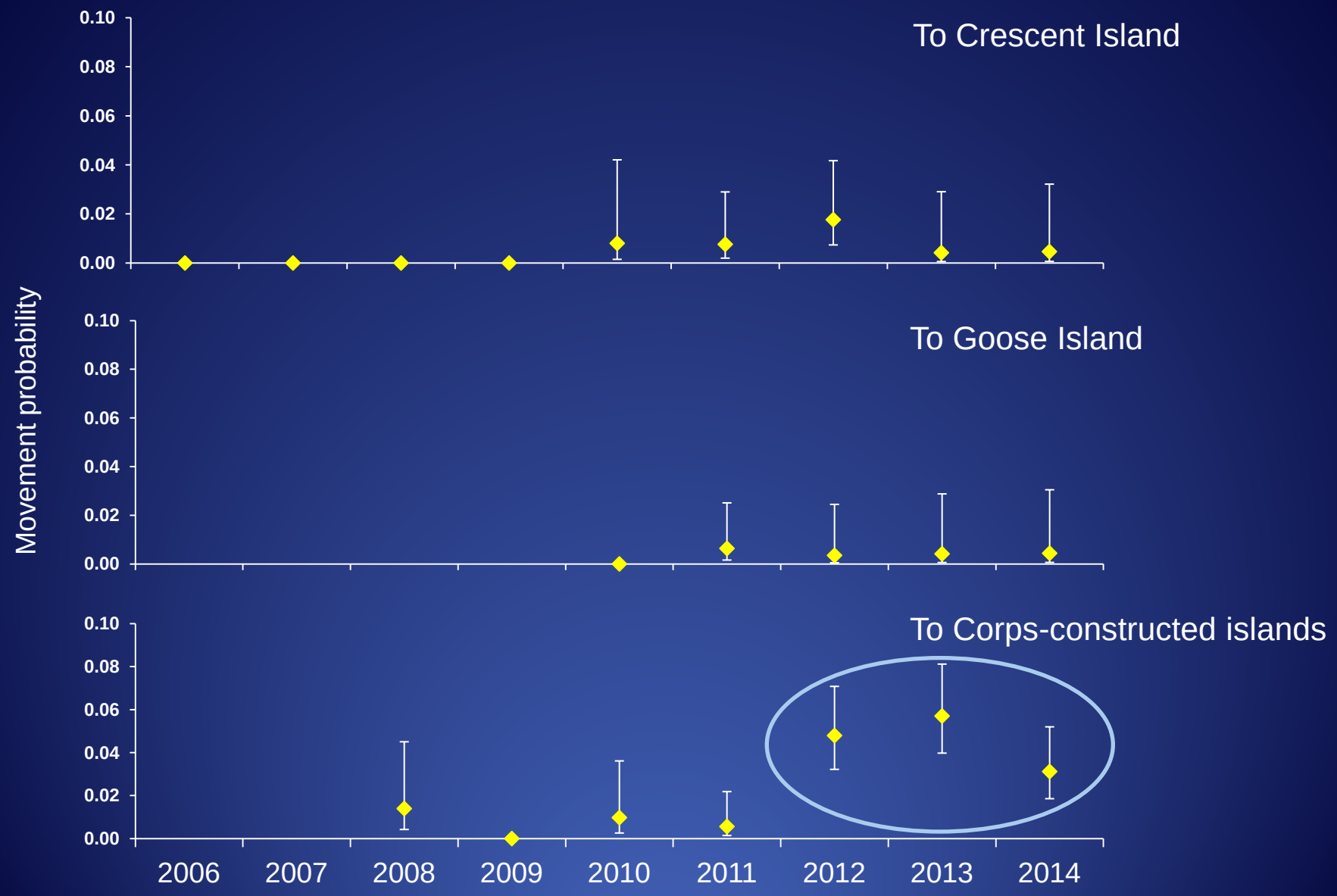
Estimated numbers of Caspian terns moved from East Sand Island (2013-2014)



Movements away from East Sand Island



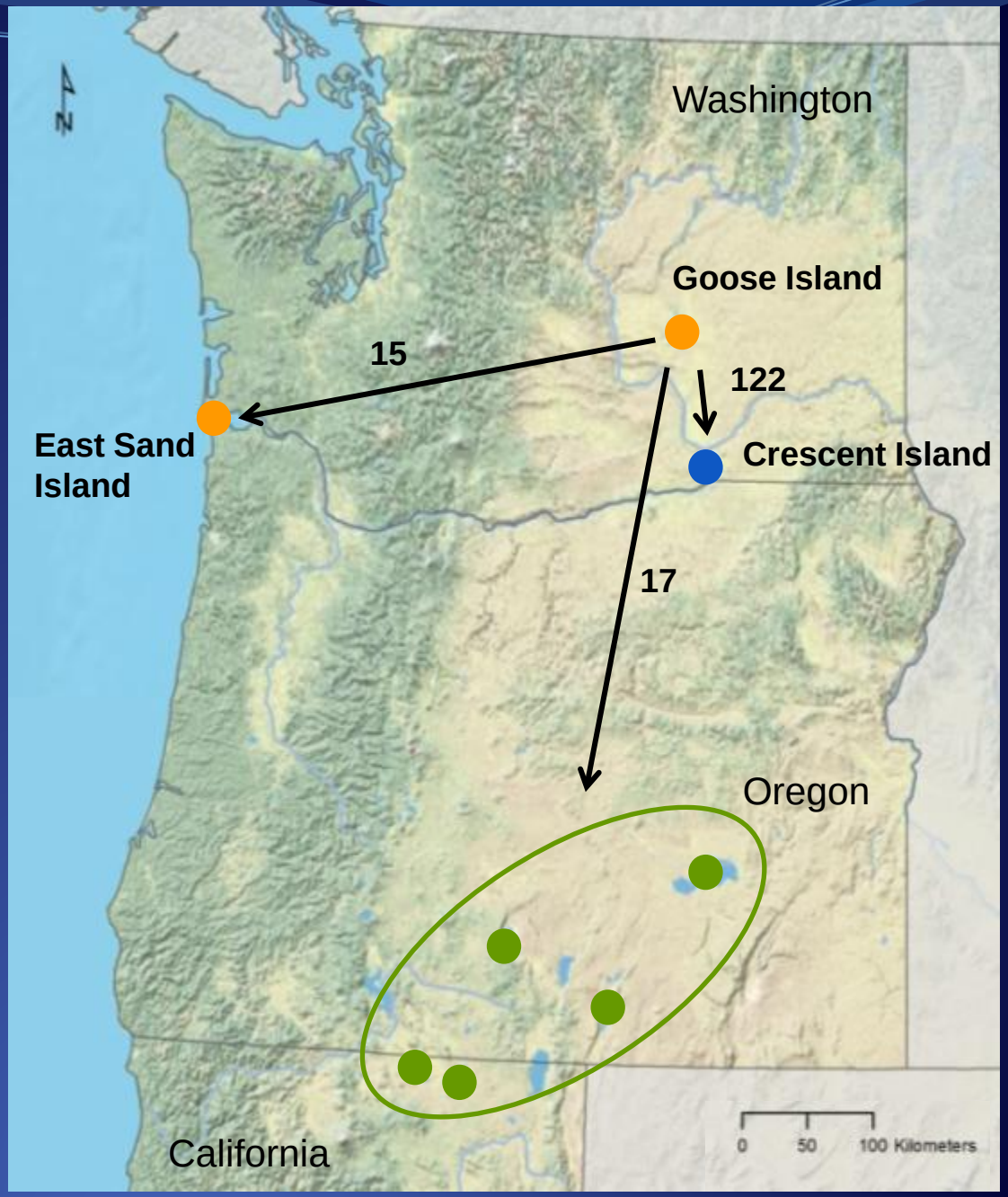
Movements away from East Sand Island



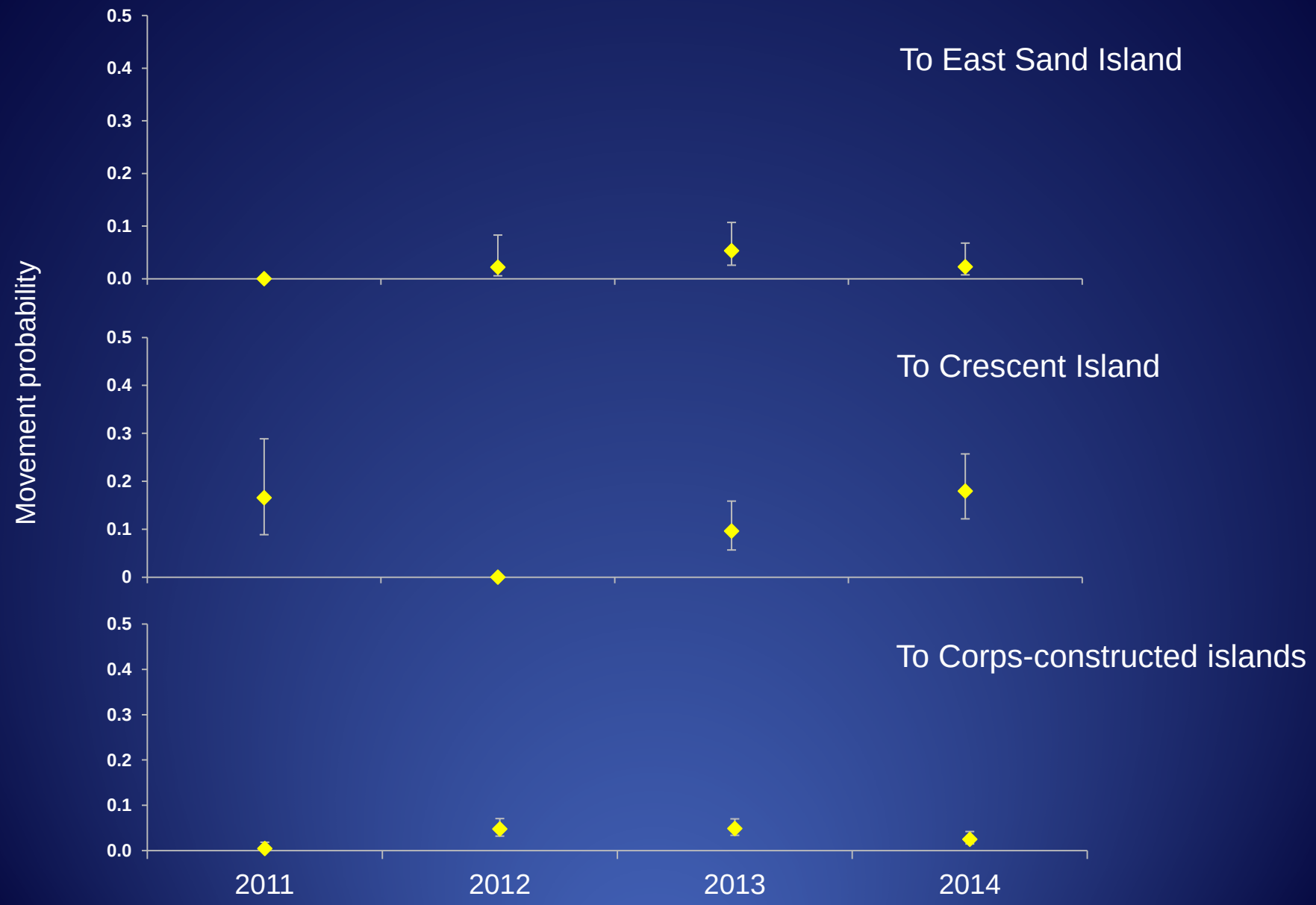
Goose Island – Potholes Reservoir

First year of management - passive dissuasion and active hazing

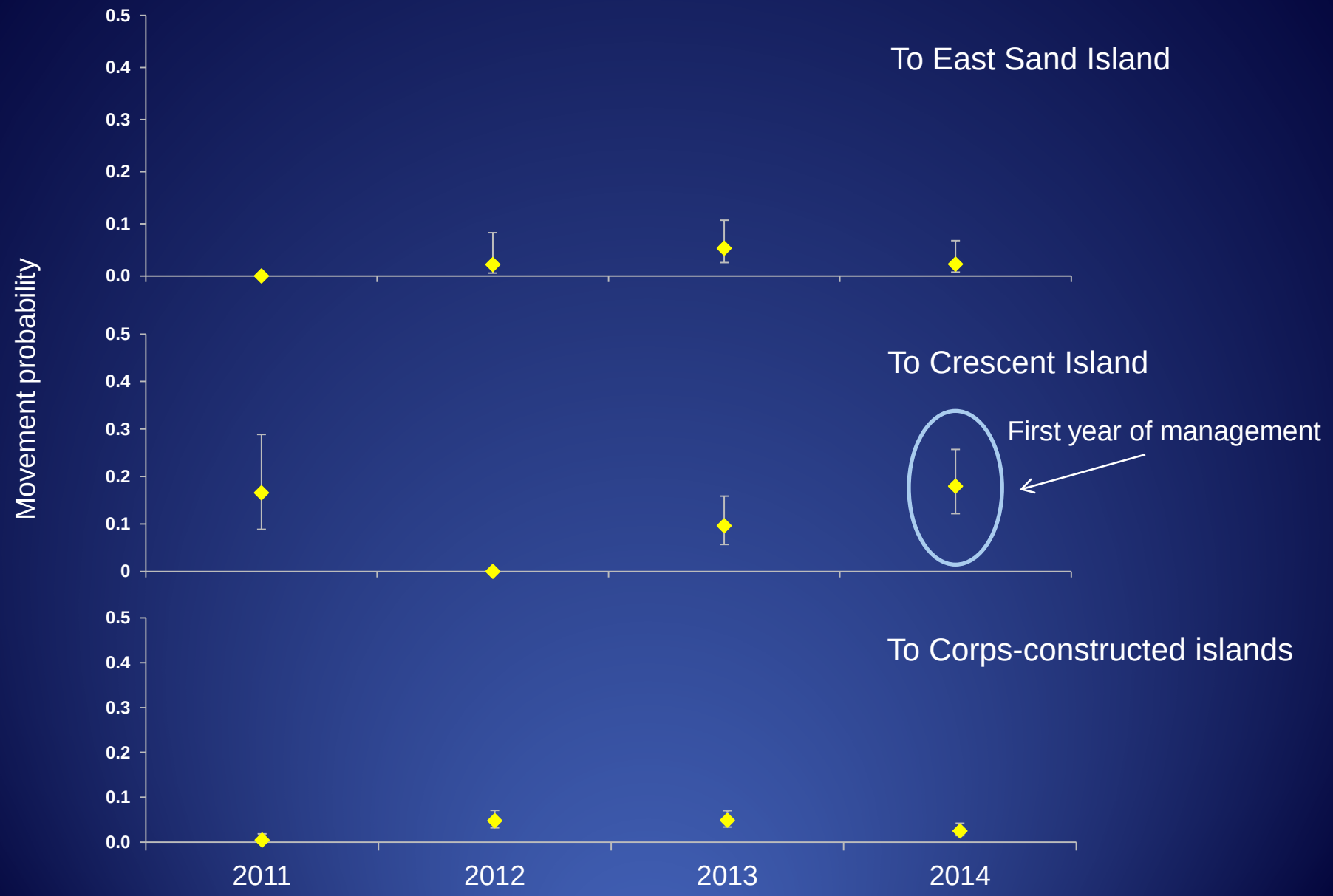
Estimated numbers of Caspian terns moved from Goose Island (2013-2014)



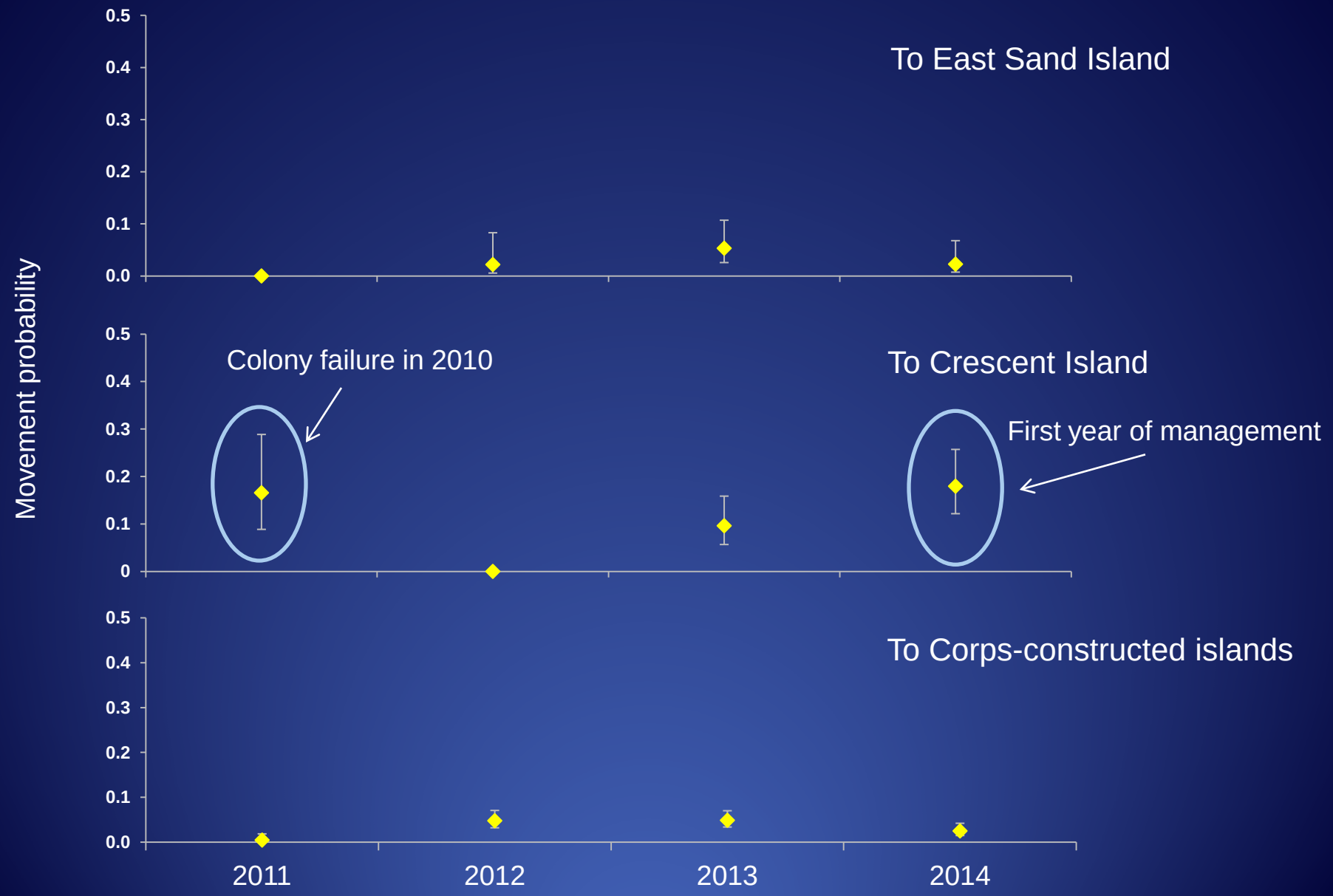
Movements away from Goose Island



Movements away from Goose Island

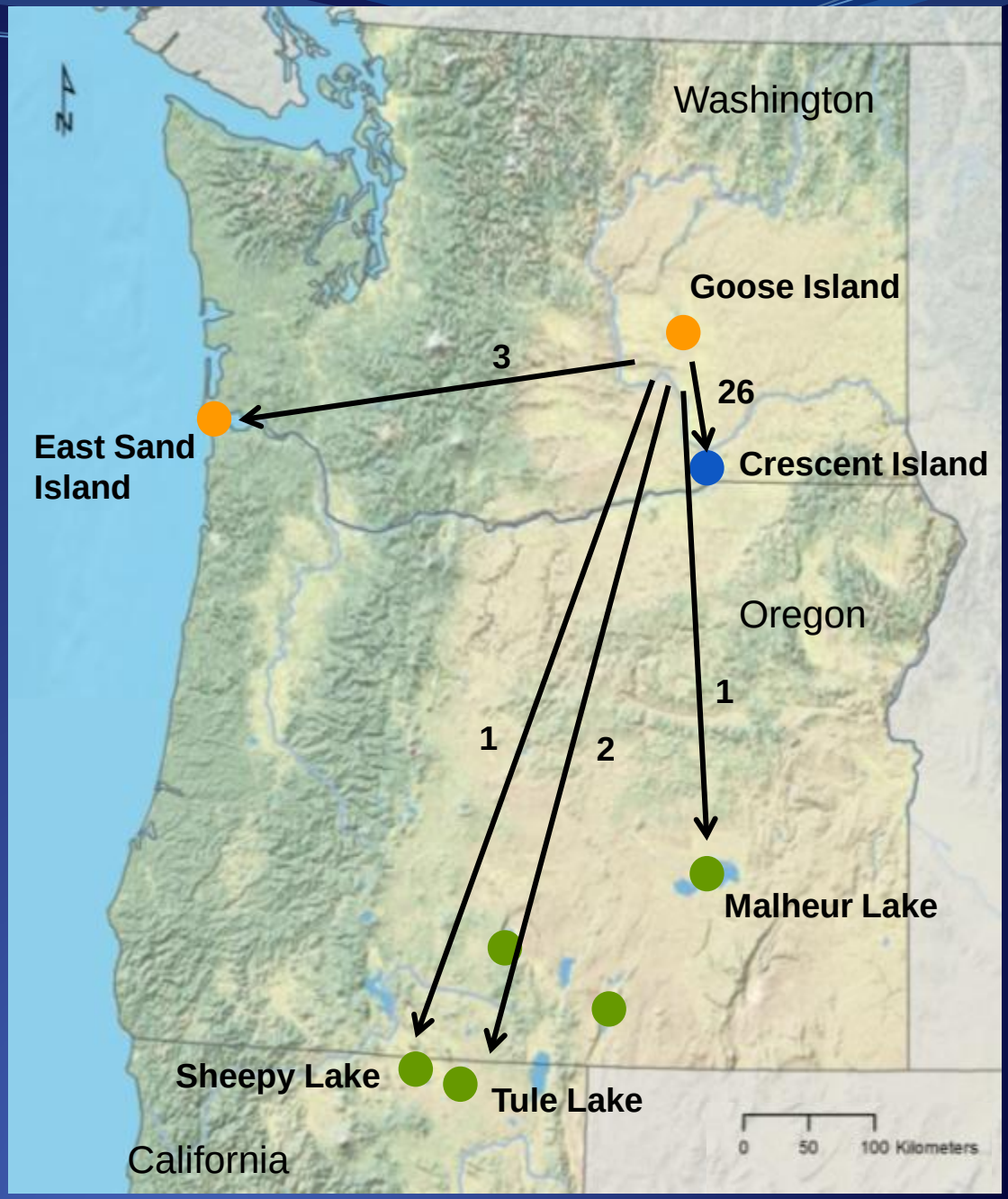


Movements away from Goose Island



Emigration from Goose Island during first year of management

33 of 198 banded terns seen at Goose Island in 2013 were confirmed breeding elsewhere in 2014



Colony site fidelity at Goose Island

27% of banded terns seen at Goose Island in 2013 were confirmed breeding at adjacent rocky islet in 2014

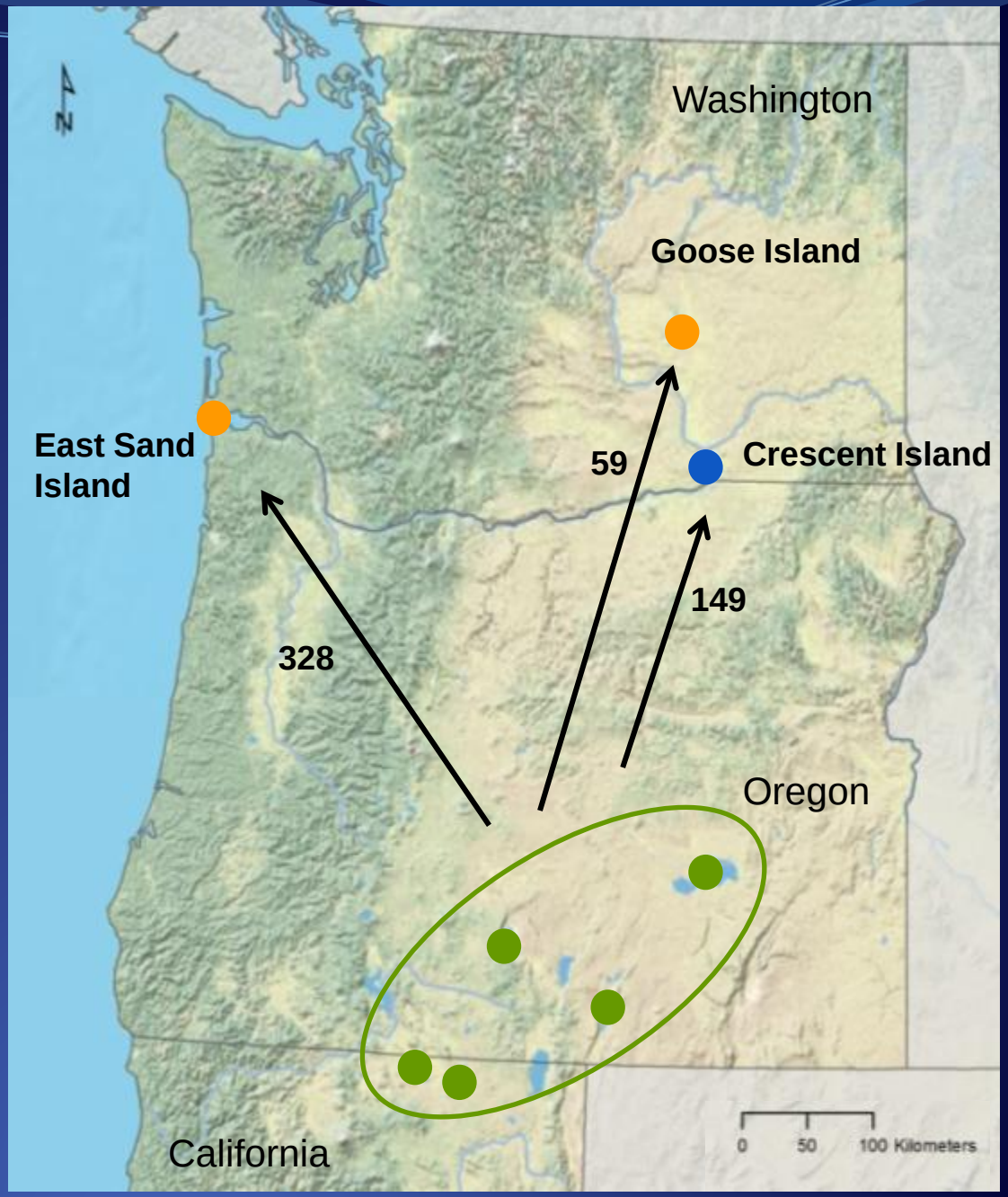
Northwest Rocks – Goose Island

Corps-constructed tern islands

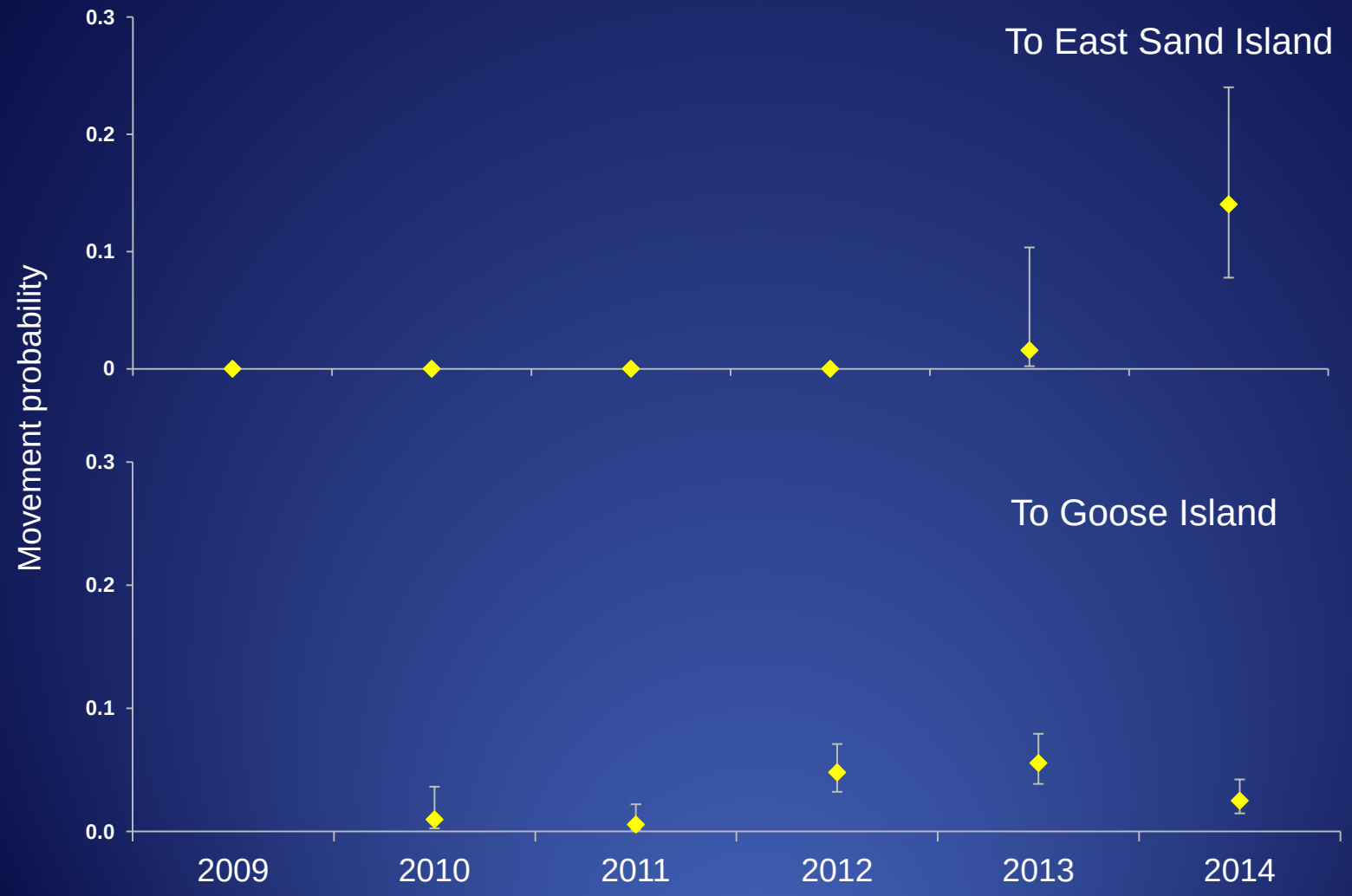
Malheur Lake tern island

Caspian terns nested at 5 Corps-constructed islands in 2014

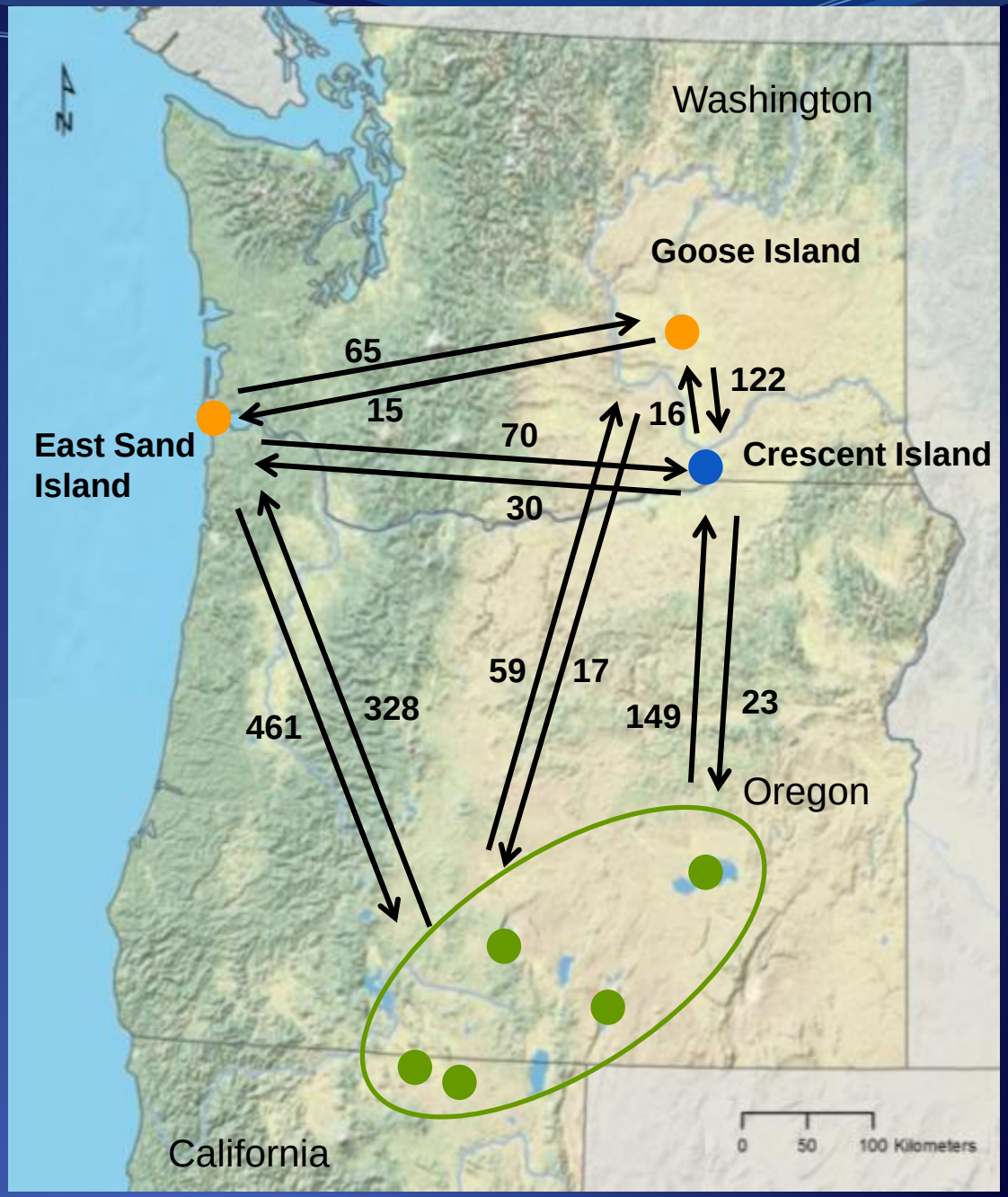
Estimated numbers of Caspian terns that moved from Corps-constructed islands (2013-2014)



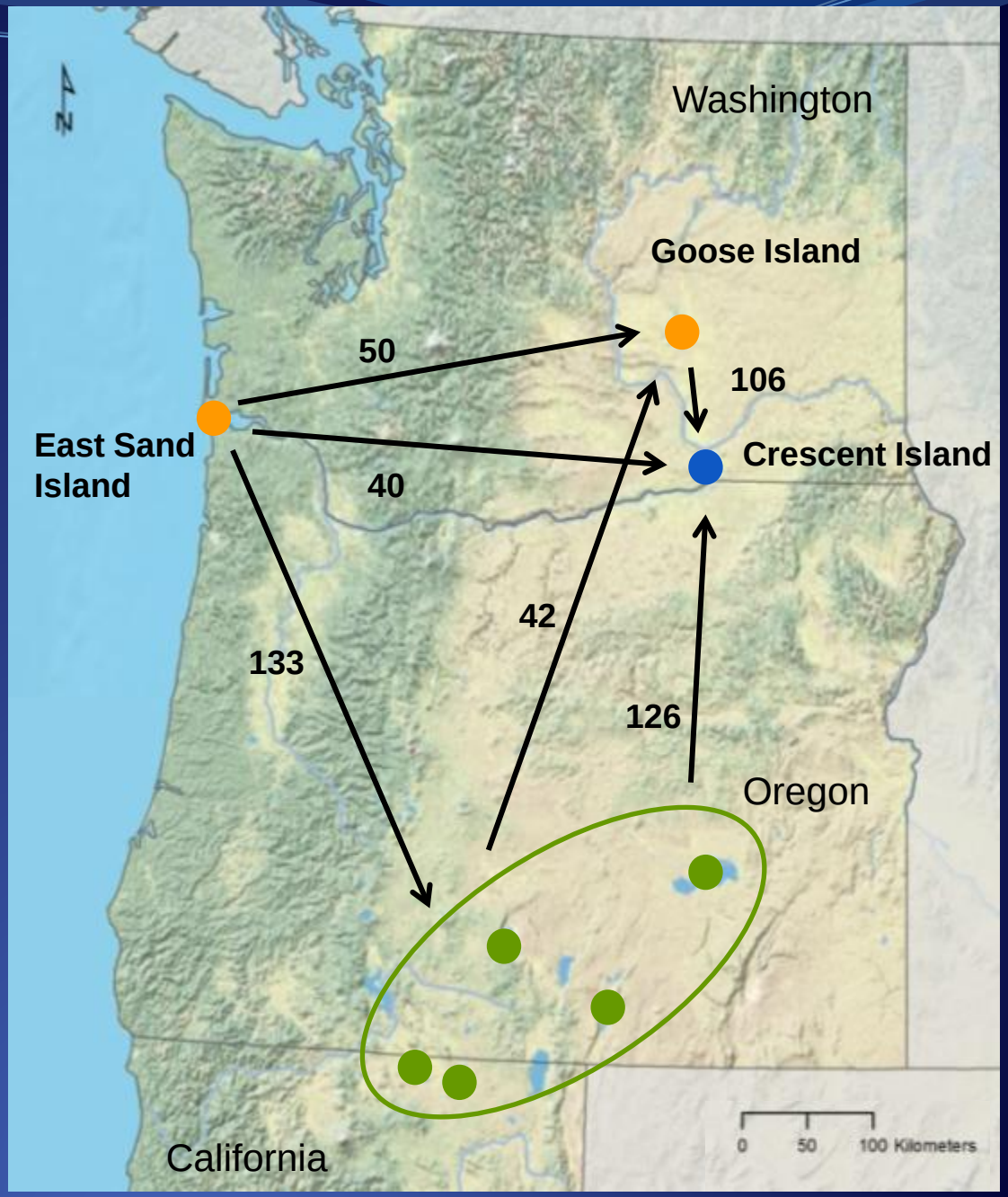
Movements from Corps-constructed islands to managed colonies



Estimated numbers of Caspian terns that moved between breeding colonies (2013-2014)



Net numbers of Caspian terns that moved between colonies (2013-2014)



Conclusions

- Caspian terns in the Pacific Northwest exhibited a high degree of connectivity among breeding colonies
- Despite high vagility of Caspian terns, many individuals displayed strong colony site fidelity, even at managed colonies where the availability of nesting habitat was restricted
- Severe weather condition resulted in greater movements of Caspian terns away from Corps-constructed islands to managed and un-managed colonies

Questions?

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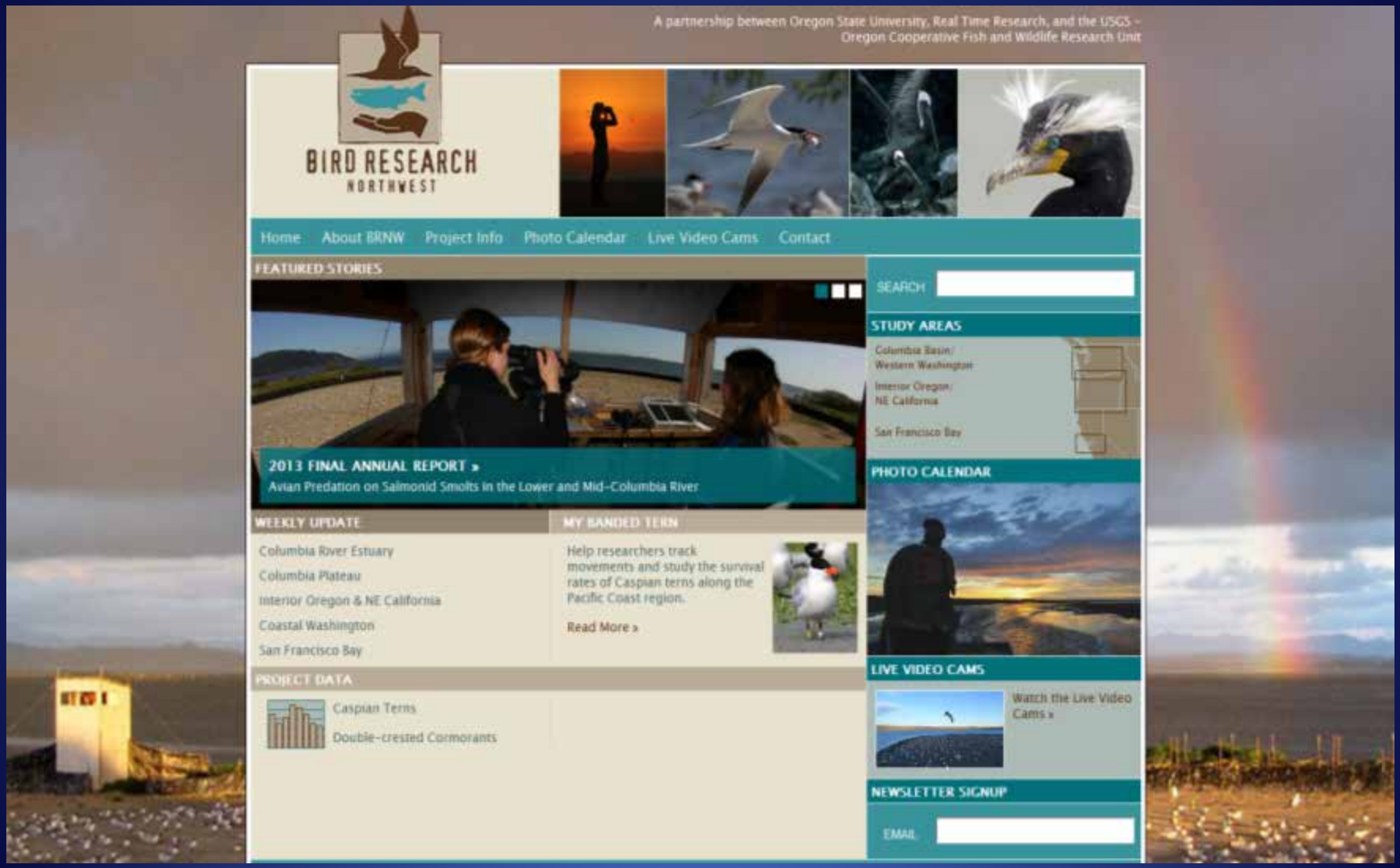

Inter-colony movements

	Movement probability between 2013 and 2014	# of CATEs at colony of origin (colony size x 2) in 2013	# of individuals moved between 2013 and 2014 (or in 2014)
East Sand to Crescent	0.0047	14774	70
East Sand to Goose	0.0044	14774	65
East Sand to alternative sites	0.0312	14774	461
Crescent to East Sand	0.0386	786	30
Crescent to Goose	0.0206	786	16
Crescent to alternative sites	0.0296	786	23
Goose to East Sand	0.0226	680	15
Goose to Crescent	0.1796	680	122
Goose to alternative sites	0.0251	680	17
Alternative sites to East Sand	0.1403	2338	328
Alternative sites to Crescent	0.0637	2338	149
Alternative sites to Goose	0.0251	2338	59