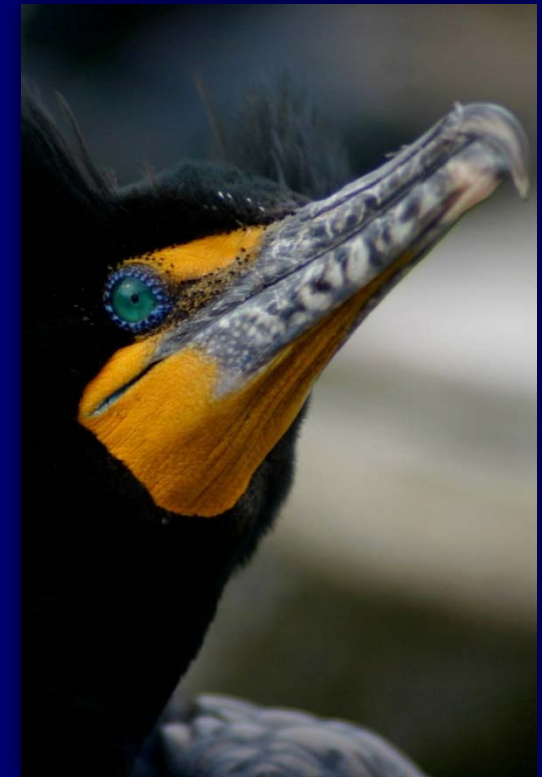


*Columbia River Estuary  
Double-crested Cormorants:  
Adaptive Research for  
Adaptive Management?*

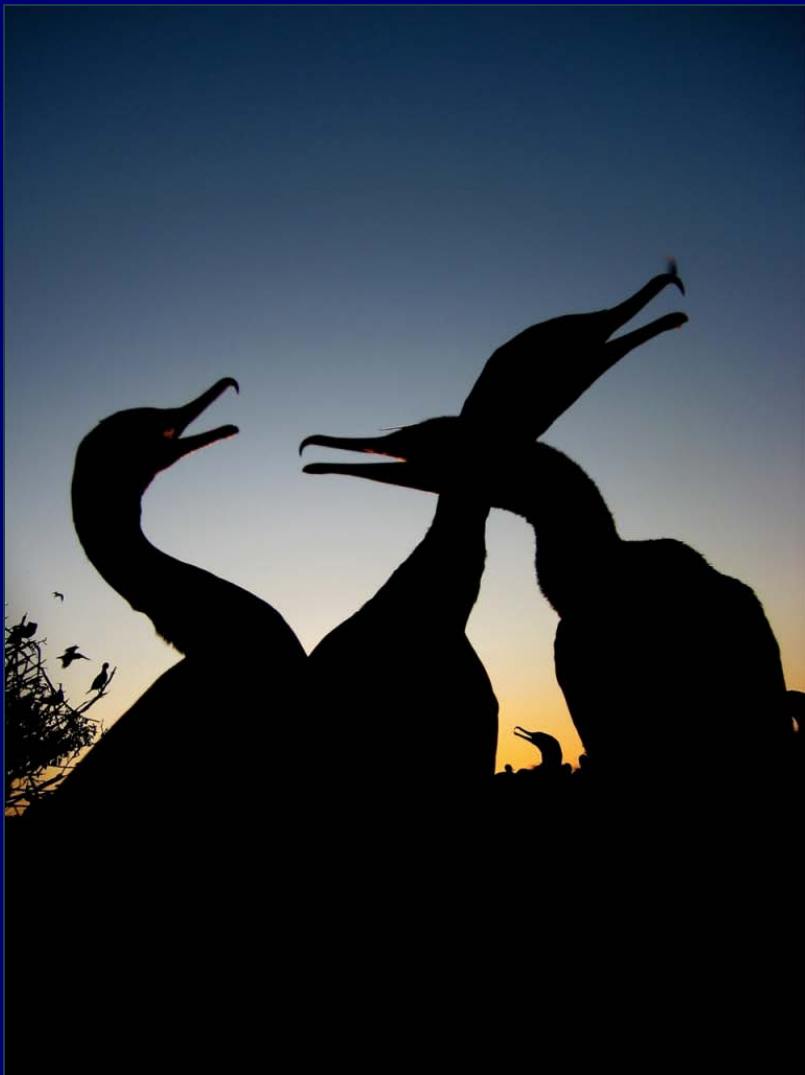


USGS - Oregon Cooperative Fish & Wildlife  
Research Unit

Oregon State University

Real Time Research, Inc.





*“The cormorant is a large black duck which feeds on fish... they increased in quantity as we descended, and formed much the greatest portion of the waterfowl which we saw on the Columbia until we reached tidewater where they also abound....”*

Meriwether Lewis  
March 7, 1806

# Species Overview

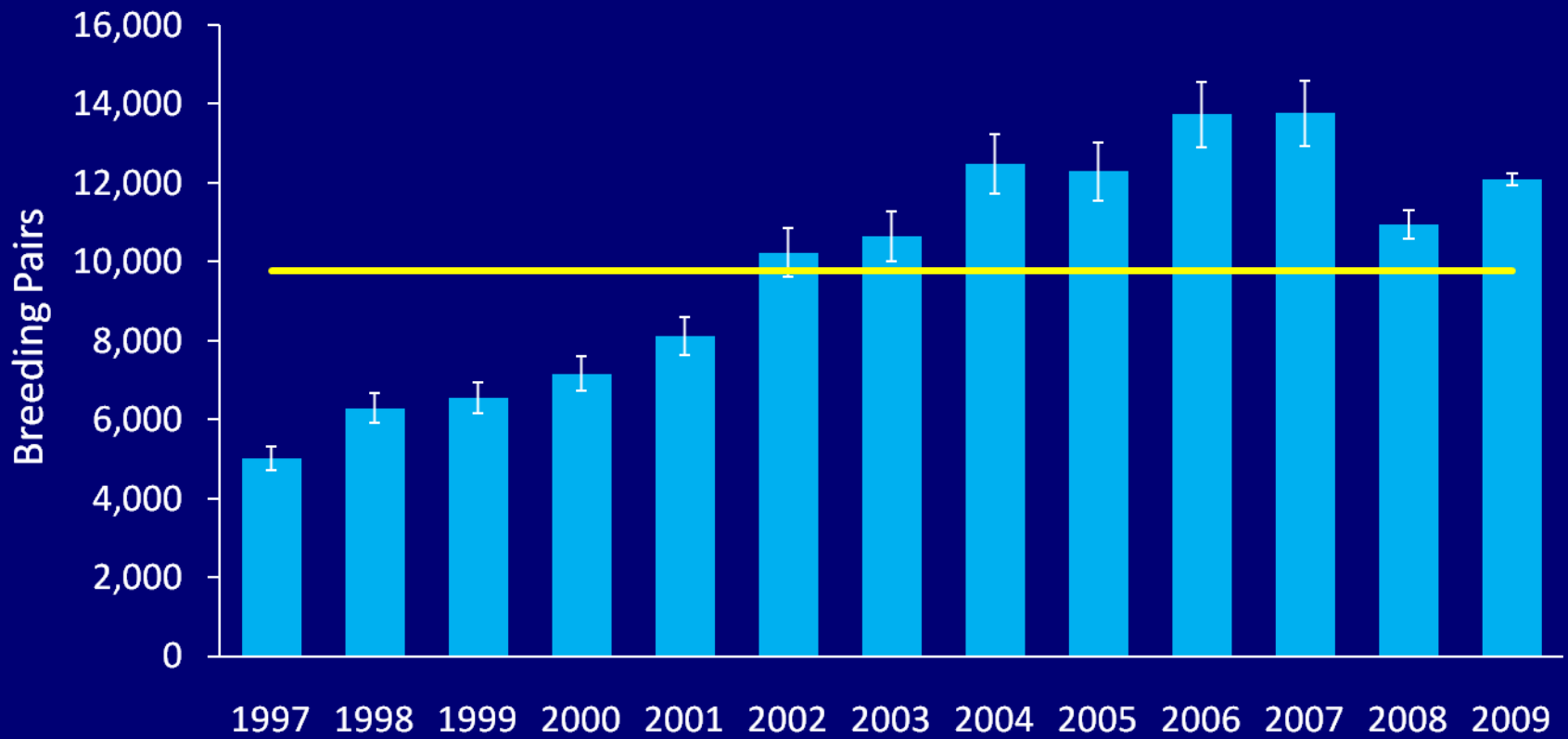
- Historically abundant across much of its range
- 20<sup>th</sup> Century declines & recoveries
- Current population recovery since 1970's
  - From DDT ban
  - Prohibition on take (MBTA listing in 1972)
- Piscivorous
- Pursuit-diver
- Relatively high reproductive potential



# Double-crested Cormorant colony, East Sand Island



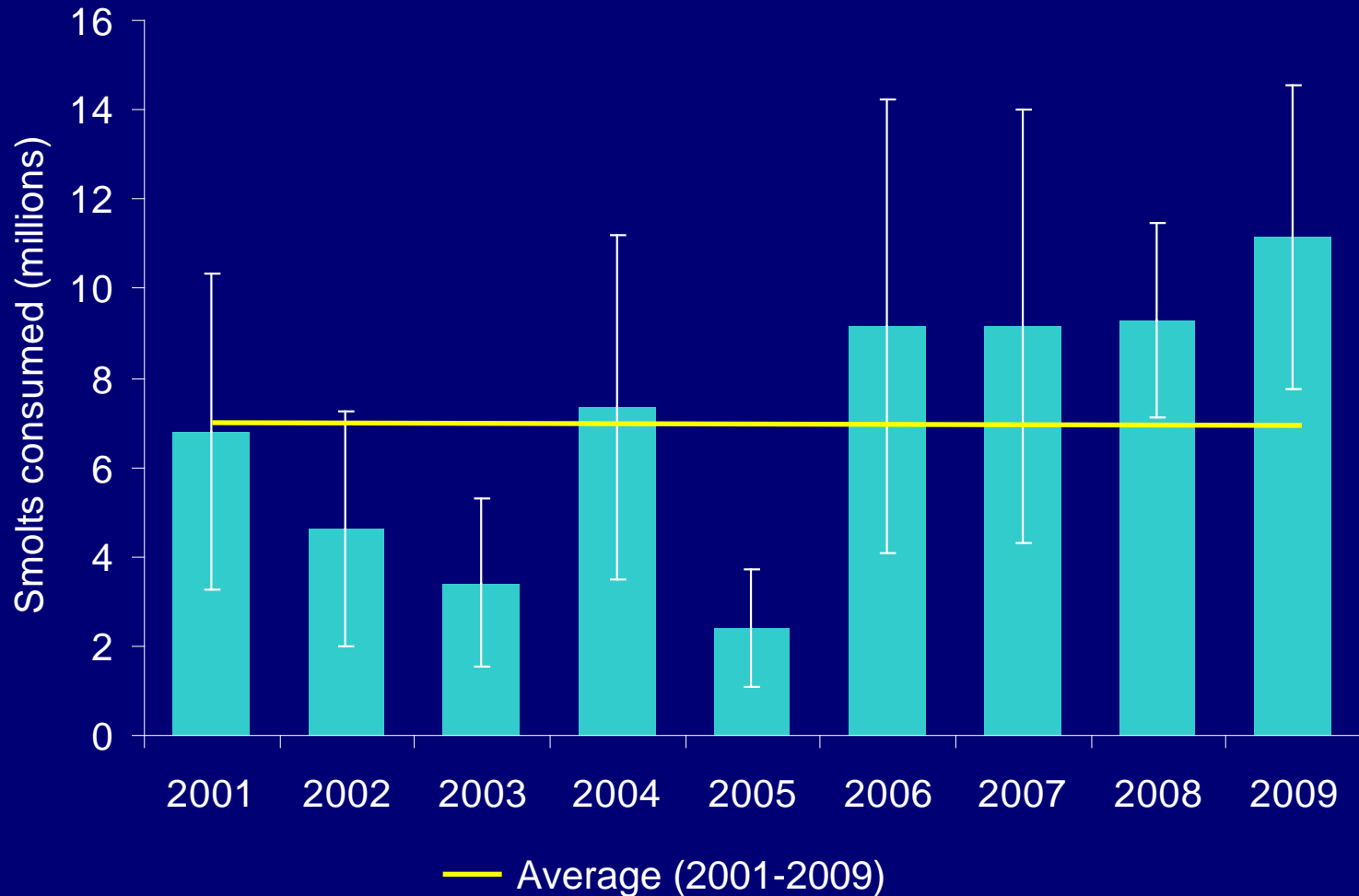
# Double-crested Cormorant Colony Size on East Sand Island



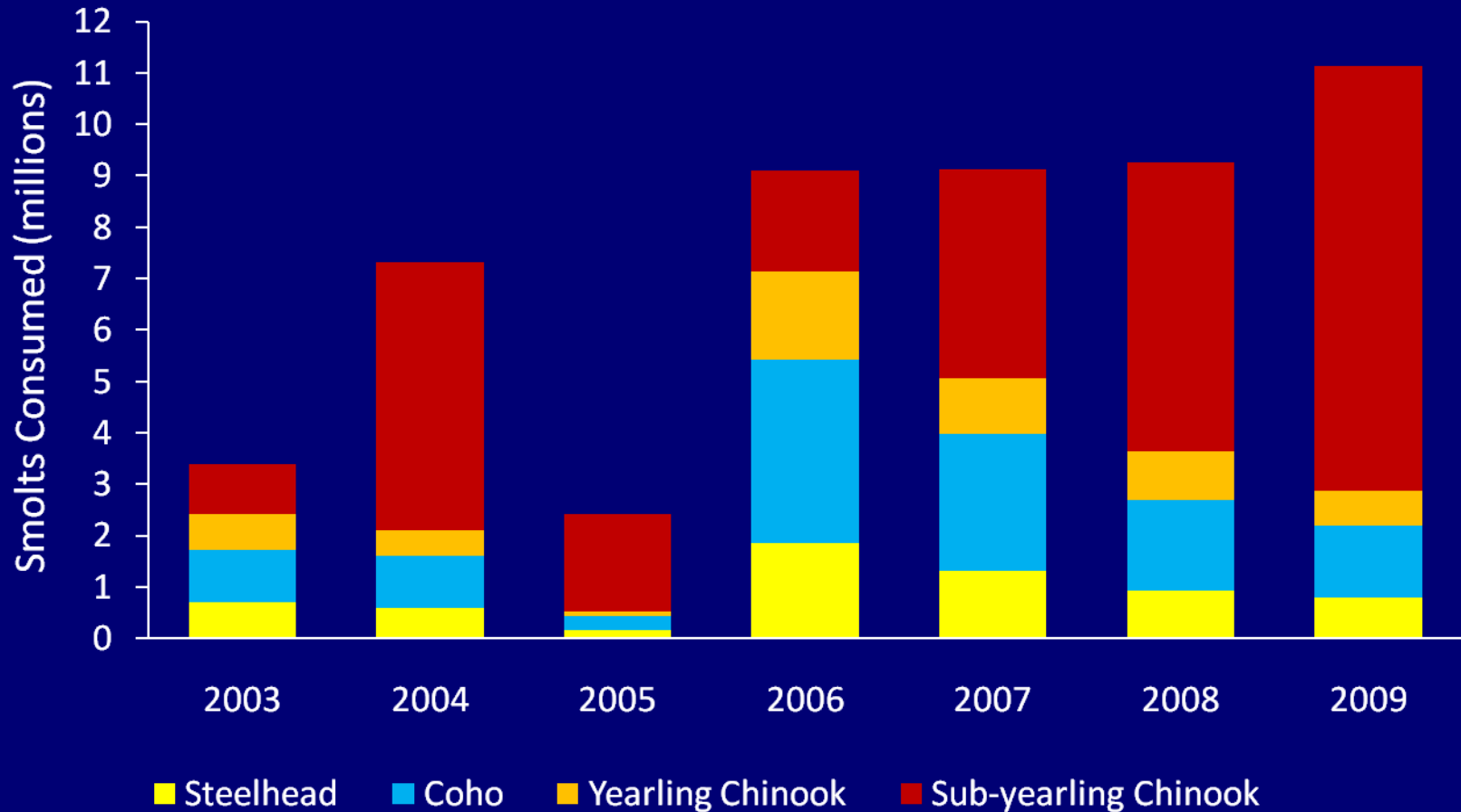
— Average (2000-2008)

# Columbia River Estuary

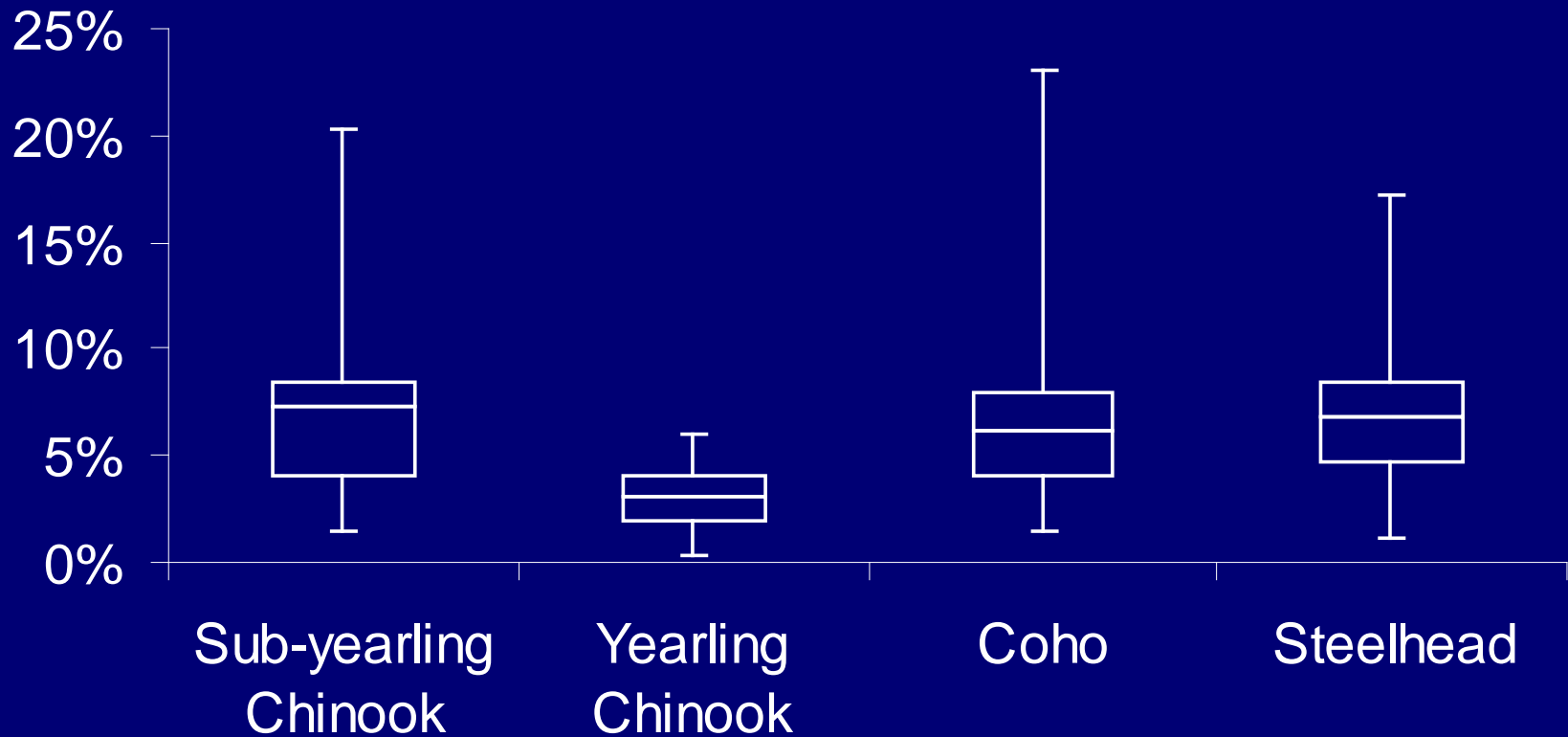
## Double-crested Cormorant Smolt Consumption



# Double-crested Cormorant Smolt Consumption by Species on East Sand Island

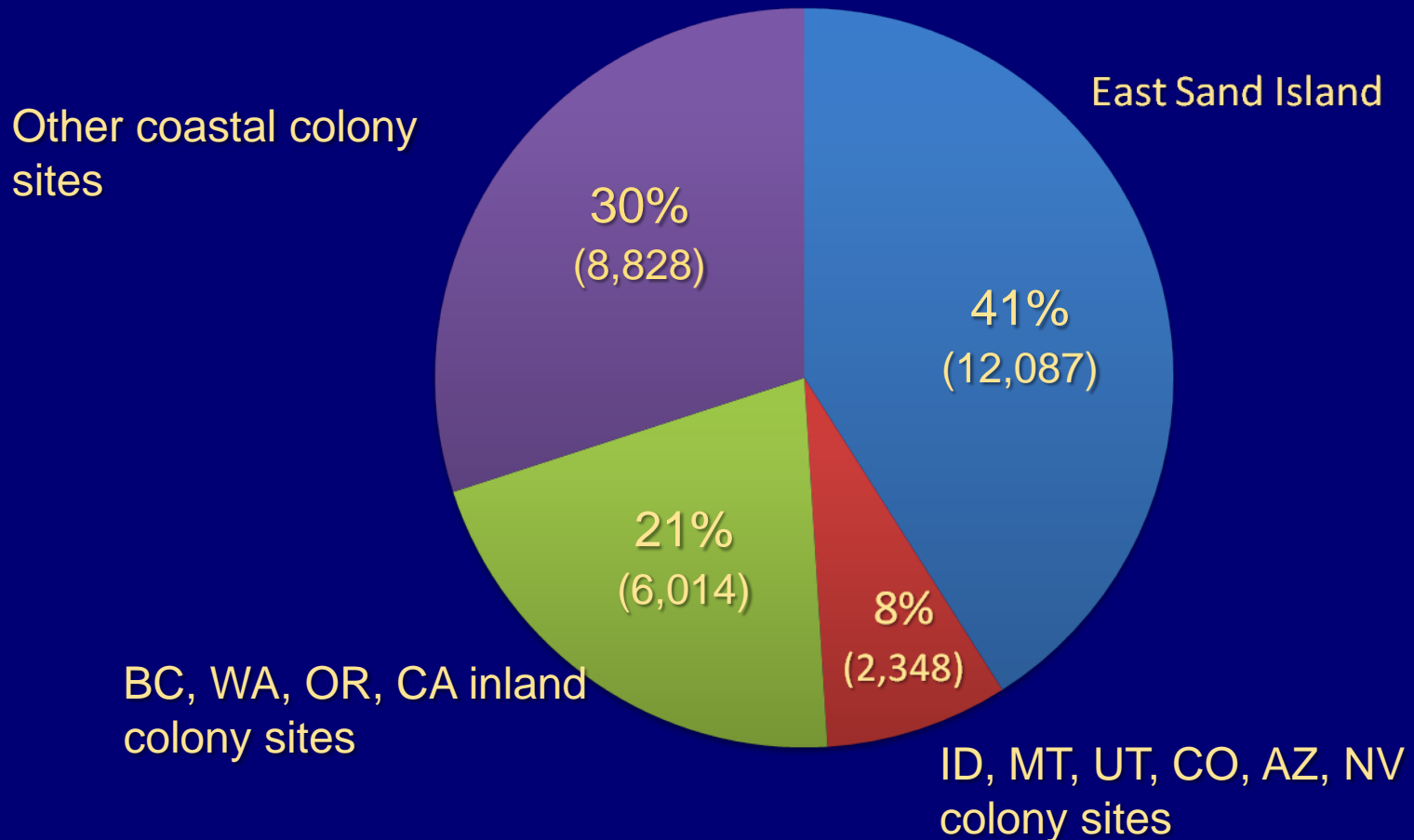


# Smolt Mortality Rates Due to Double-crested Cormorant Predation in the Columbia River Estuary





# Current Western Population $\approx$ 29,300 breeding pairs



Current Eastern Population  $>$  300,000 breeding pairs

# Number of Breeding Pairs at Marine and Estuarine Colony Sites

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	<b>1987</b> (Moul & Gebauer 2002)	<b>1989-1992</b> (Carter et al. 1995)	<b>2008-2009</b>	$\Delta$
<b>British Columbia</b>	1,981	-	403	- 80%
<b>Washington</b>	-	1,618	788	- 51%
<b>Oregon</b>	-	5,087	14,730	+ 190%
<b>California</b>	-	5,092	4,994	- 2%

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# Tagging of Double-crested Cormorants on East Sand Island

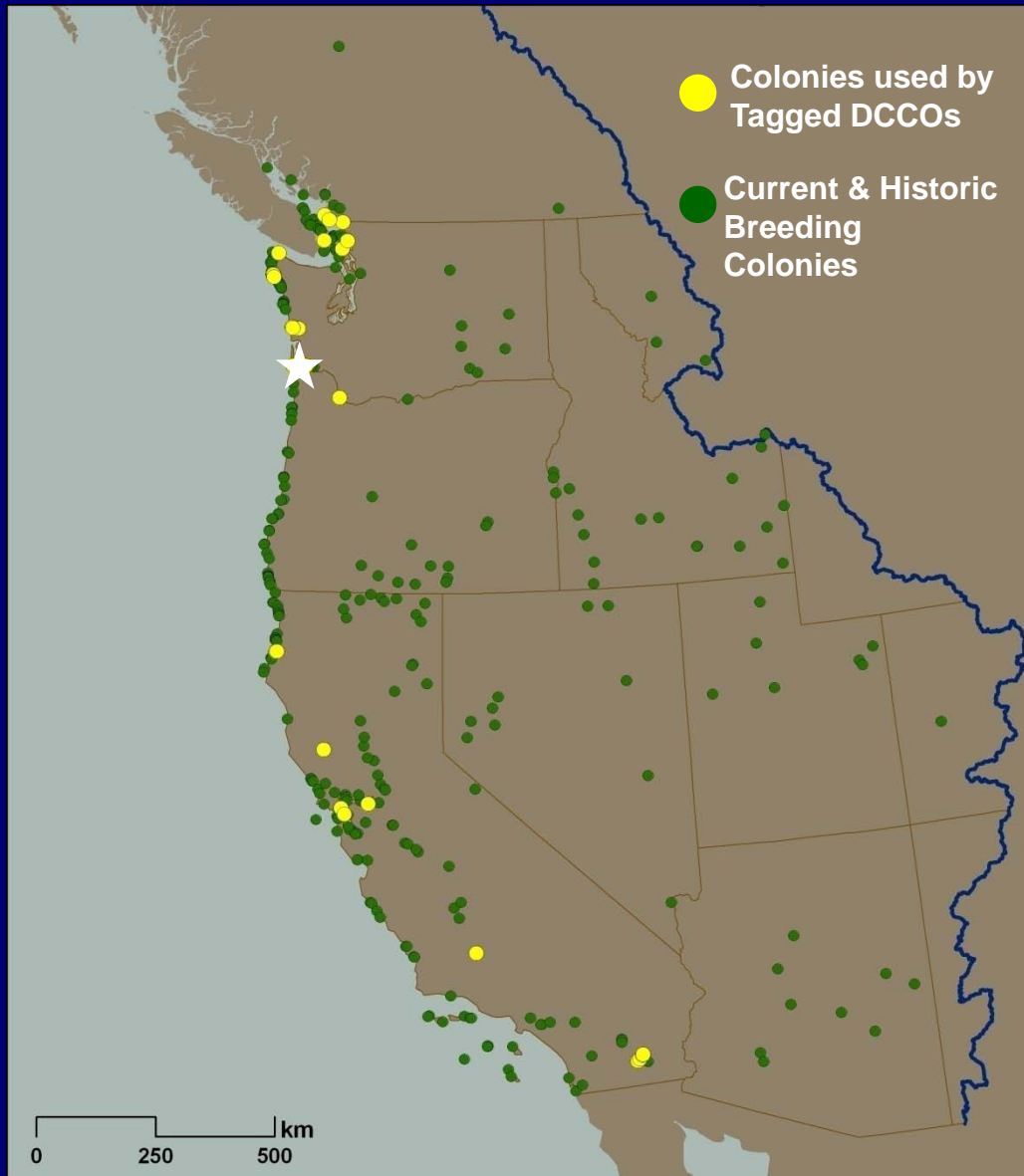


# Connections to the Pacific Region



- Roosted at locations near northern and southern extremes of breeding range of Western Population
- Remained largely coastal
- Almost no movement east of the Cascades
- No movement to interior states
- Little movement to southern California

# Connections to other Colony Sites



# Potential Management Approach: Attraction to Desired Sites

Setup:



Result:



# Potential Management Approach: Attraction to Desired Sites

Setup:



Result:



## Potential Management Approach: Dissuasion from Undesired Sites





# Conclusions

- Cormorants consume millions of juvenile salmonids annually
- Impacts of cormorants on some salmonids now exceeds that of terns
- Columbia River estuary cormorant population is stronghold for species on west coast
- Connections between Columbia River estuary and other cormorant colonies on west coast



# Conclusions

- Cormorants are potentially amenable to adaptive management techniques used for terns
  - Attraction to alternative sites may be more difficult because habitat not as limiting
  - Passive habitat modification to dissuade nesting may be more expensive than for terns
- NEPA process to evaluate potential management beginning



# Acknowledgments



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