Avian Predation on Juvenile Salmonids in the Lower Columbia River

Briefing for the Fish Committee
Northwest Power & Conservation Council

Oregon State University

Real Time Research, Inc.

USGS-Oregon Cooperative Fish & Wildlife Research Unit

Acknowledgments

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Collaborators:

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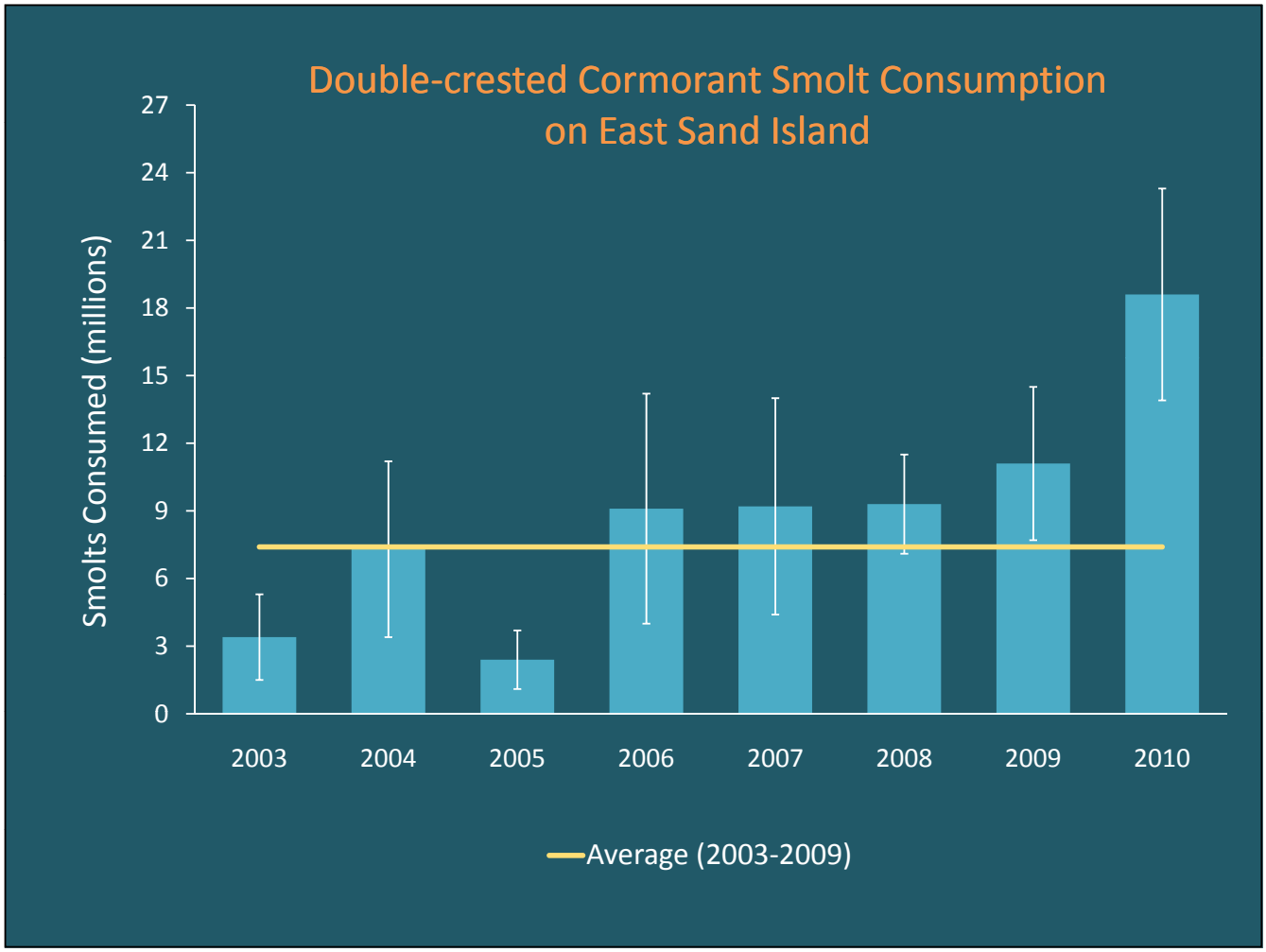
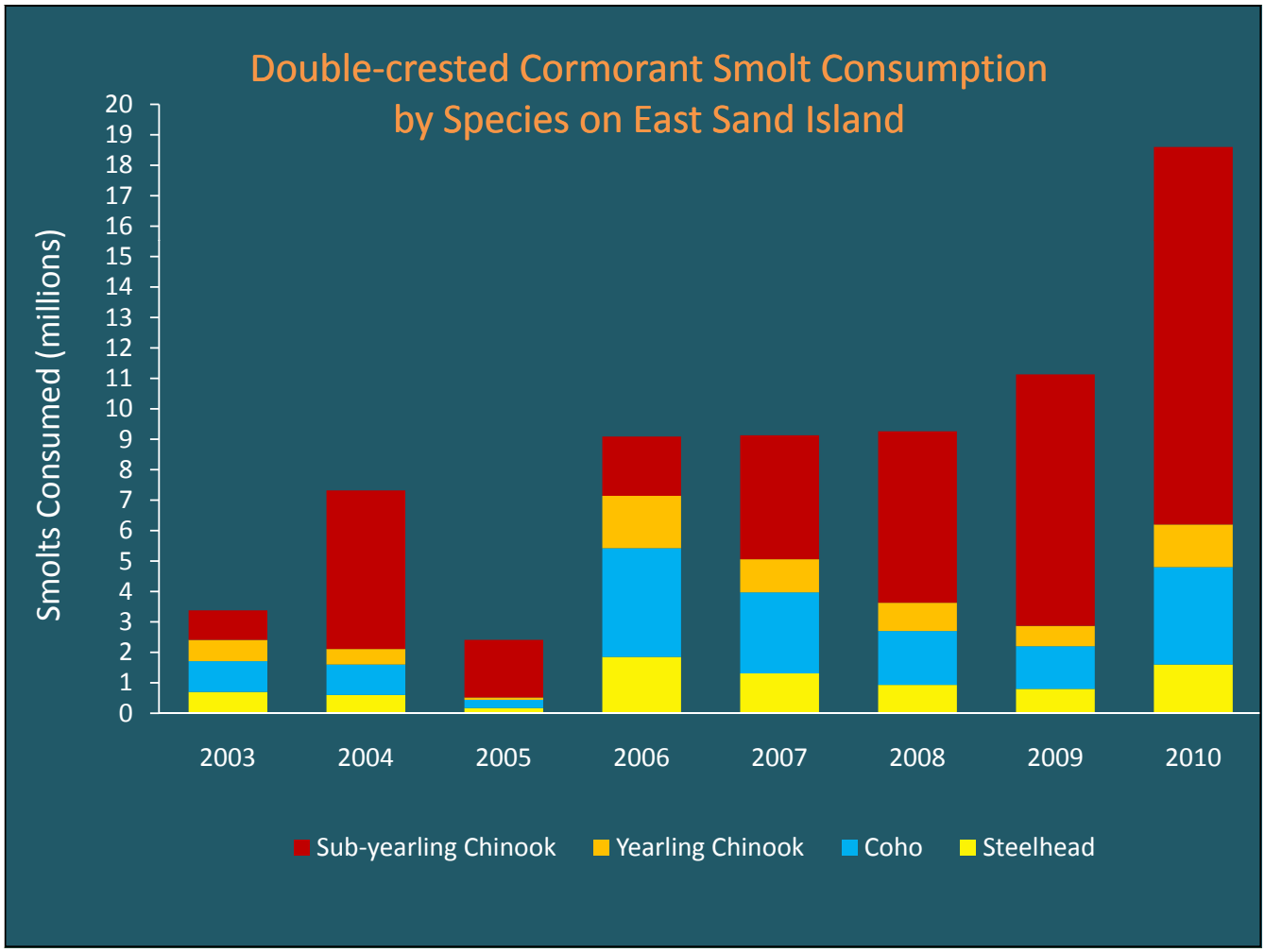
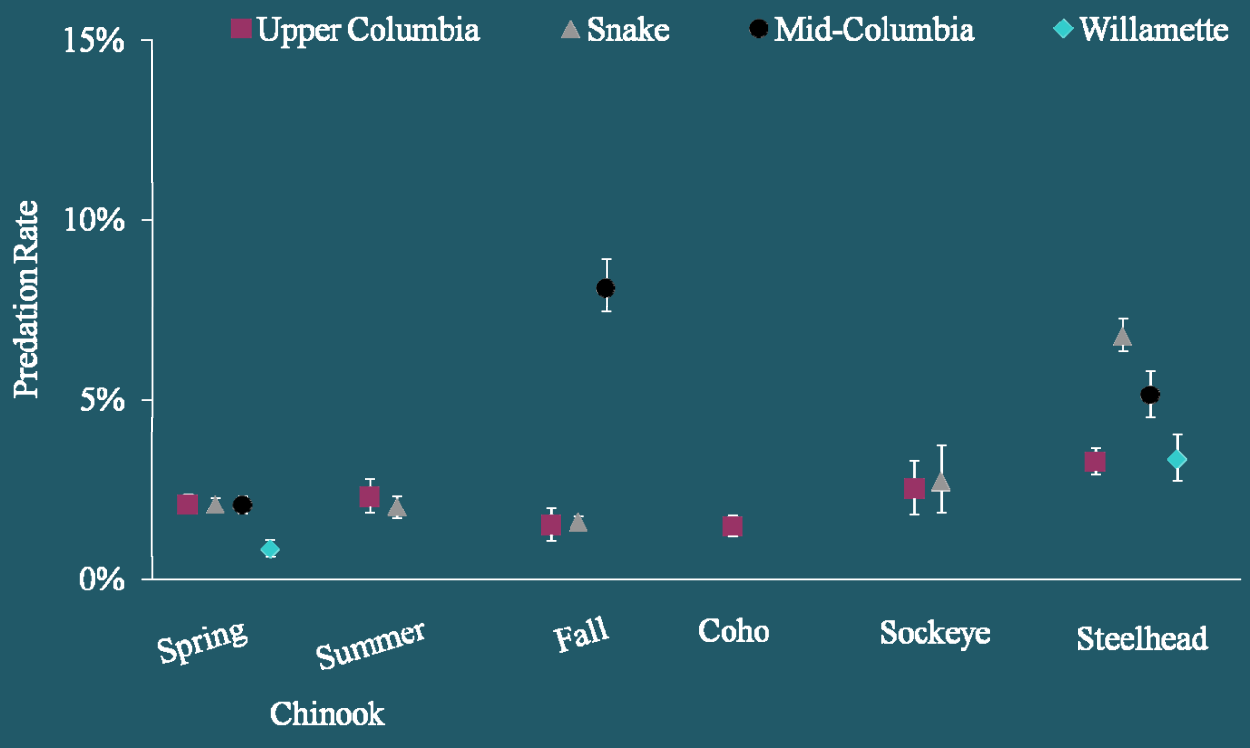

Double-crested Cormorant Smolt Consumption on East Sand Island
Smolts Consumed (millions)
0
3
6
9
12
15
18
21
24
27
2003
2004
2005
2006
2007
2008
2009
2010
Average (2003-2009)


Double-crested Cormorant Smolt Consumption by Species on East Sand Island
Smolts Consumed (millions)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
2003
2004
2005
2006
2007
2008
2009
2010
Sub-yearling Chinook
Yearling Chinook
Coho
Steelhead

Predation Rates on PIT-tagged Salmonid Stocks by Double-crested Cormorants nesting on East Sand Island, 2004-2009



Double-crested Cormorant
Predation on Salmonids in the Columbia River Estuary

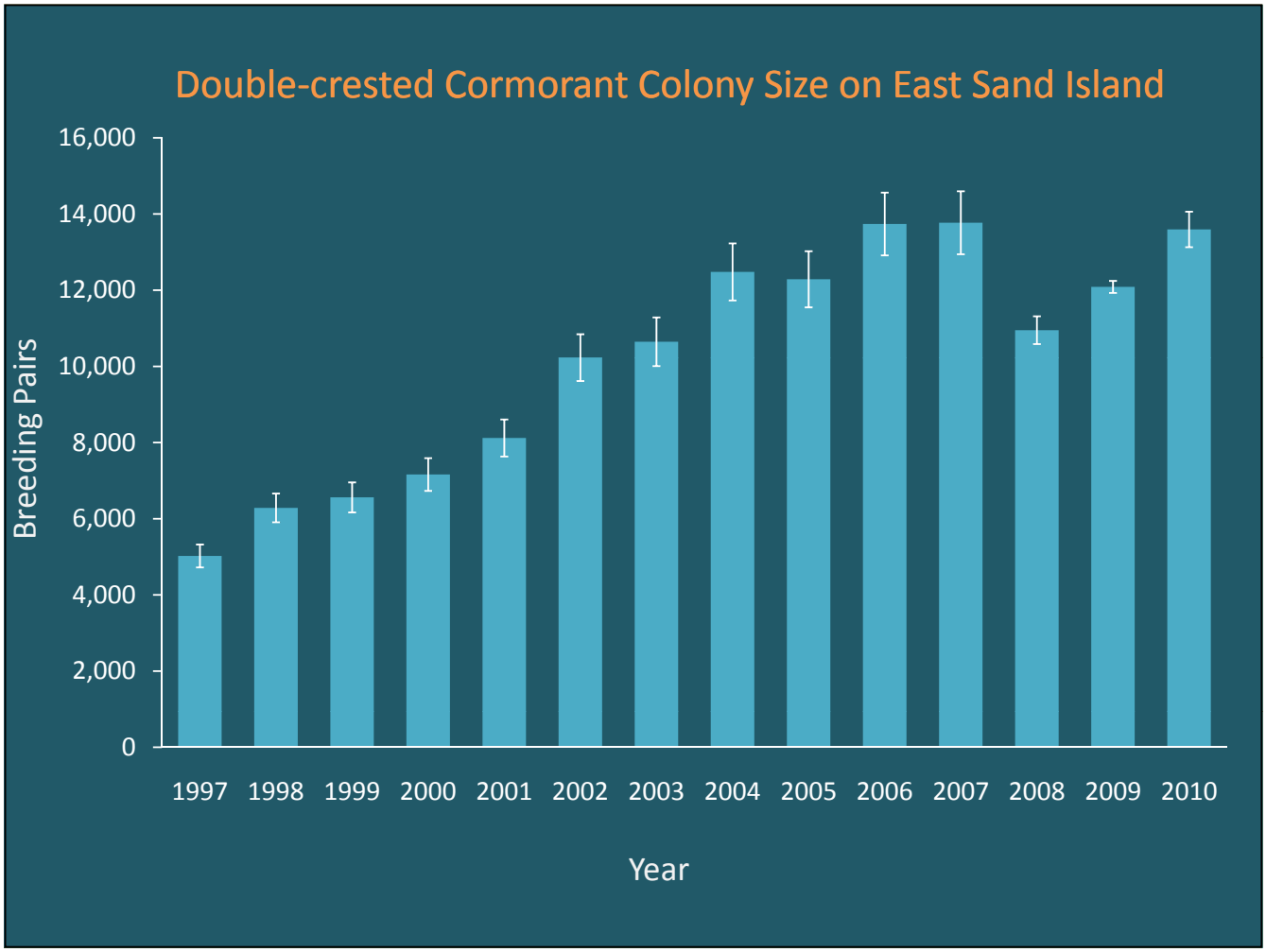
- Predation rates on PIT-tagged up-river stocks ranged from 1% to 8%
- Recent estimates of annual consumption of juvenile salmonids have ranged from 2 million smolts (2005) to 18 million smolts (2010)
- In most years, consumption of sub-yearling Chinook smolts far exceeded that of other species/run types
- In 2010, the salmonid consumption estimate for East Sand Island cormorants was higher than in any other year this decade

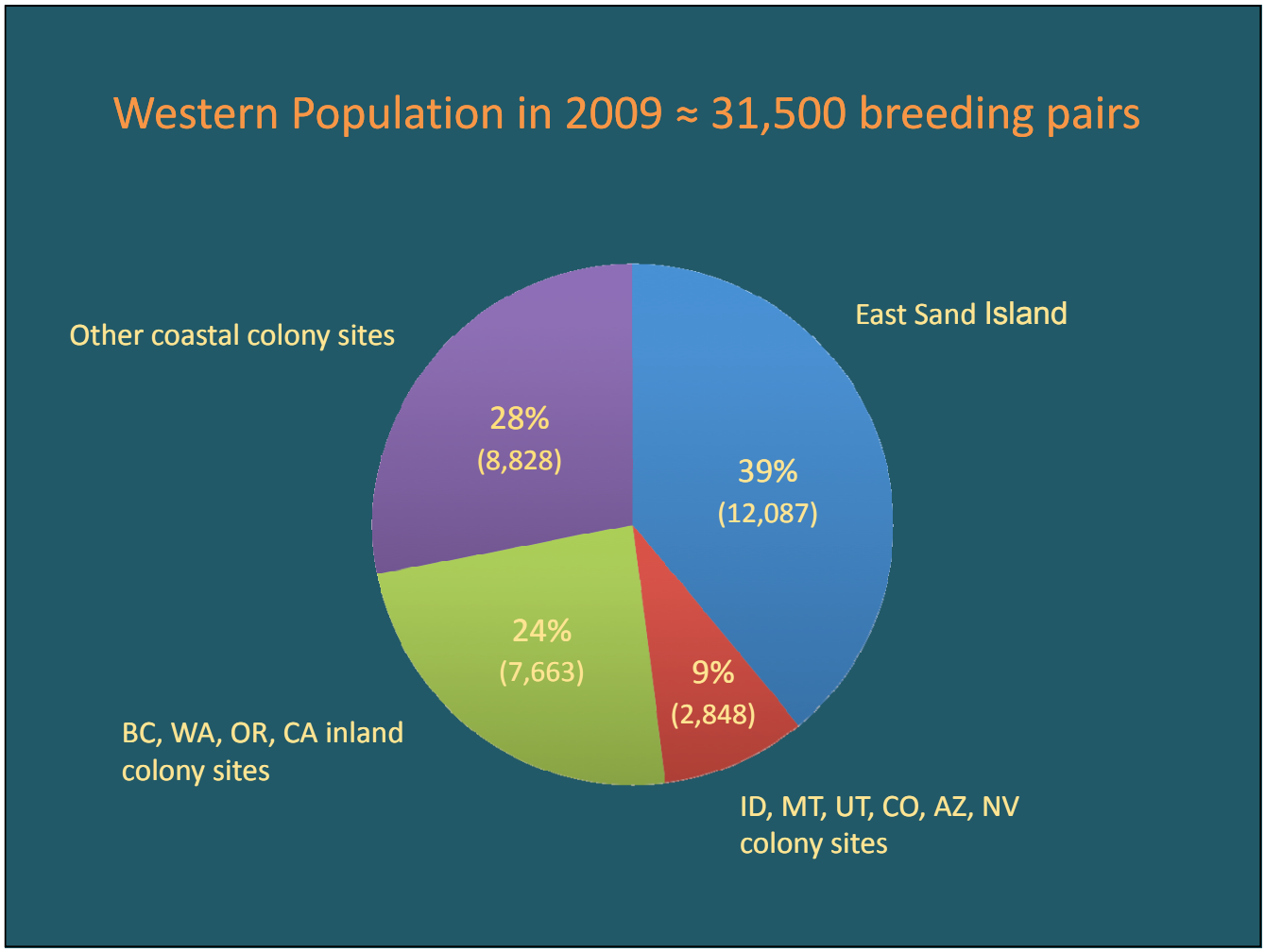
Double-crested Cormorant
Overview from Status Assessment

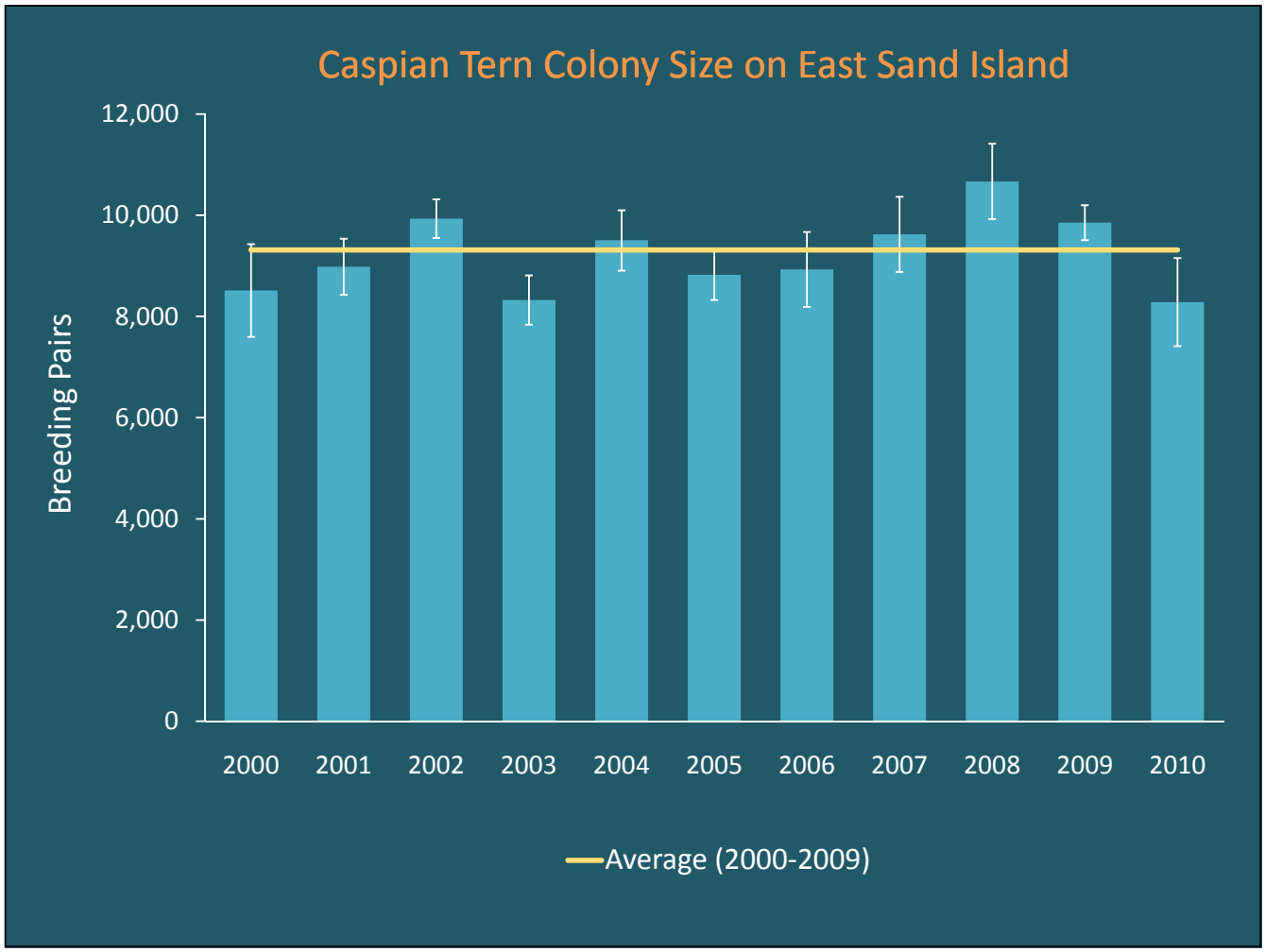
- Historically abundant across much of its range in North America
- Periods of decline & recovery since European settlement
- Current population recovery since 1970s
  - Following ban on DDT (1972)
  - Following prohibition on take (MBTA listing in 1972)
- Western North America Population small compared to population in central & eastern North America

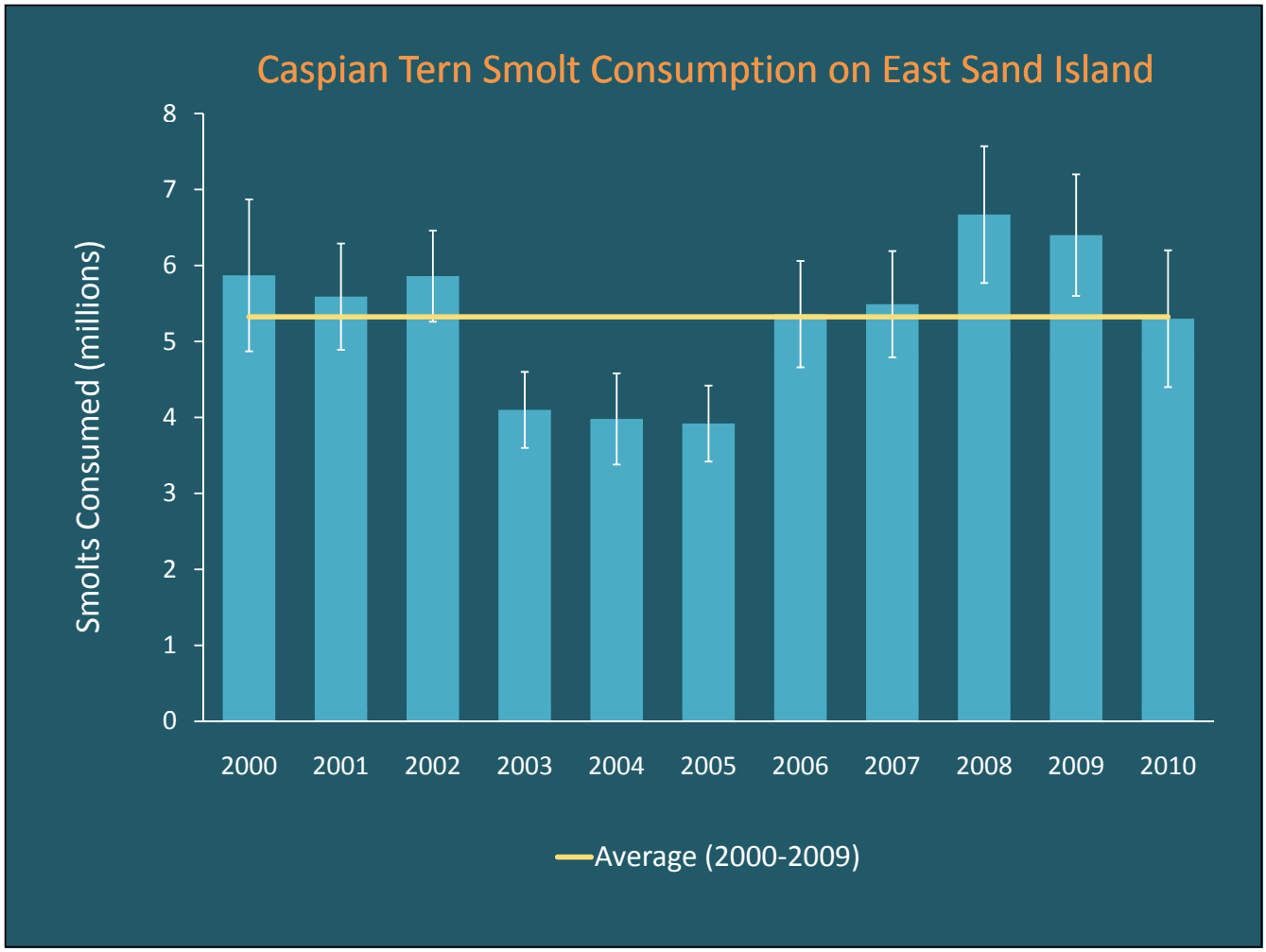
Status of Western Population of Double-crested Cormorants

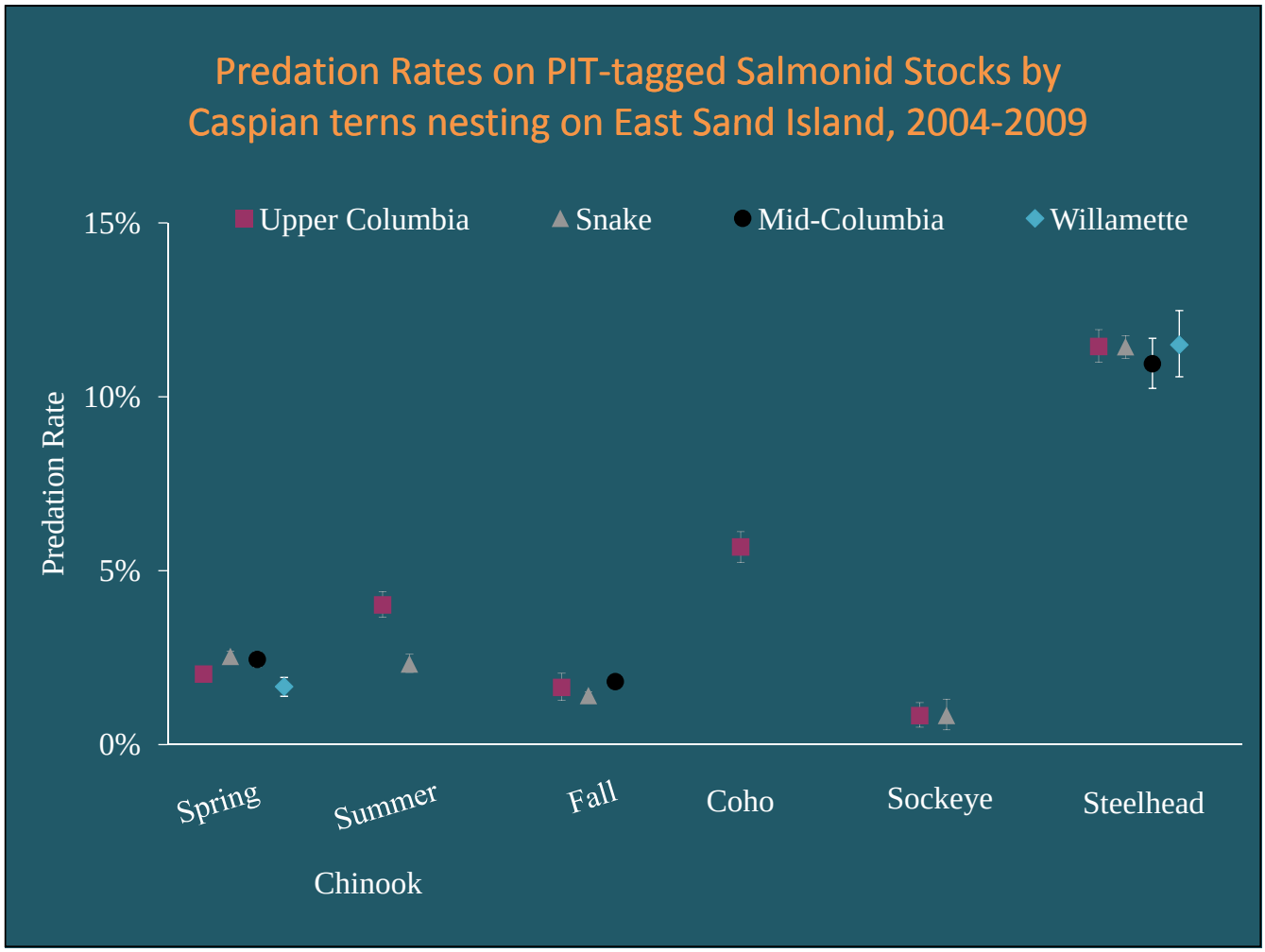
- Current Western Population ≈ 31,500 breeding pairs
- Western Population has been increasing by about 3% per year
- Western Population still an order of magnitude smaller than population in central & eastern North America
- Limited connectivity between Western Population and populations east of the Continental Divide
  - Based on leg band recoveries, molecular genetics analyses, and satellite-tracking

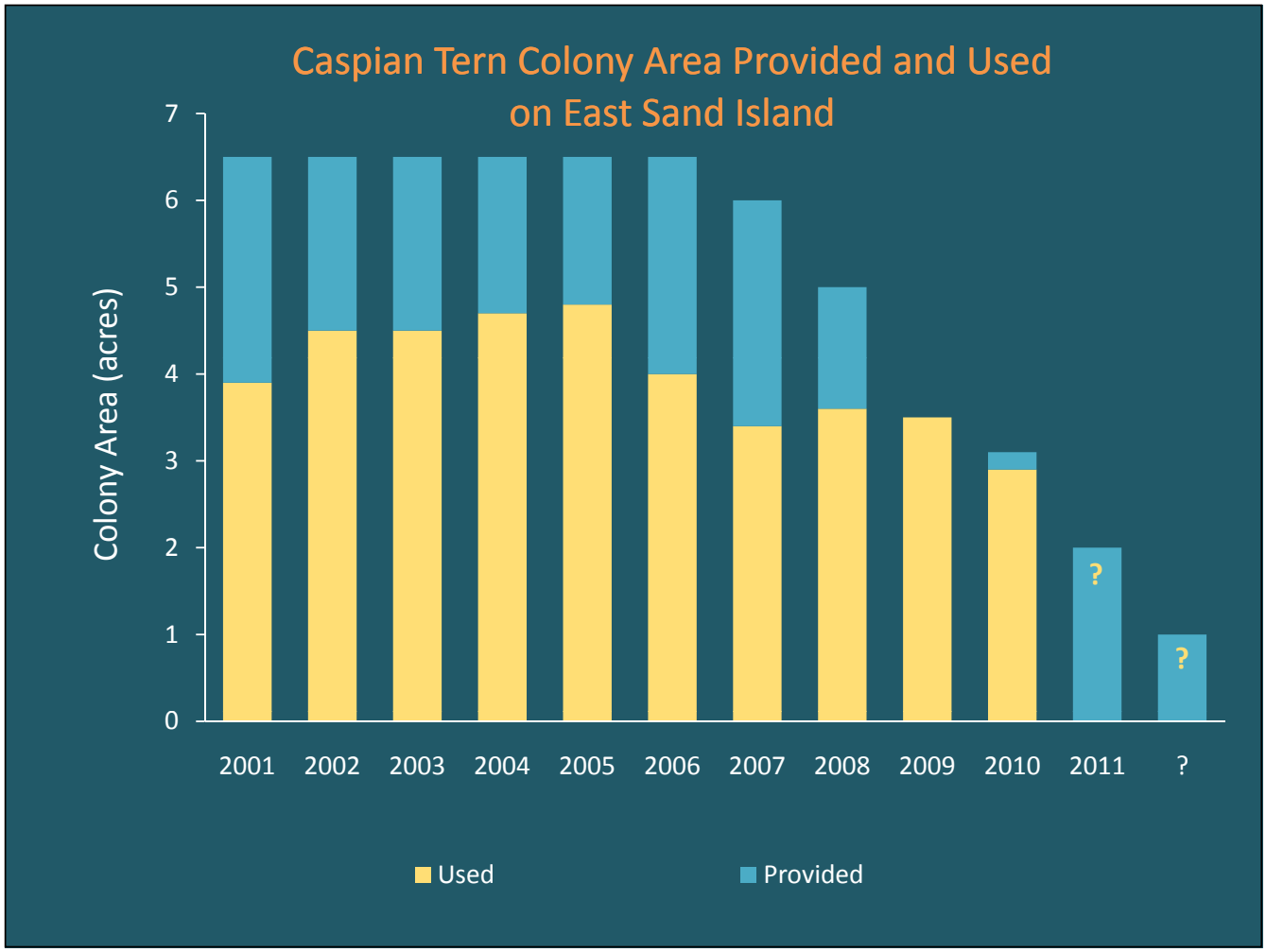

Double-crested Cormorant Colony Size on East Sand Island
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Breeding Pairs
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Year

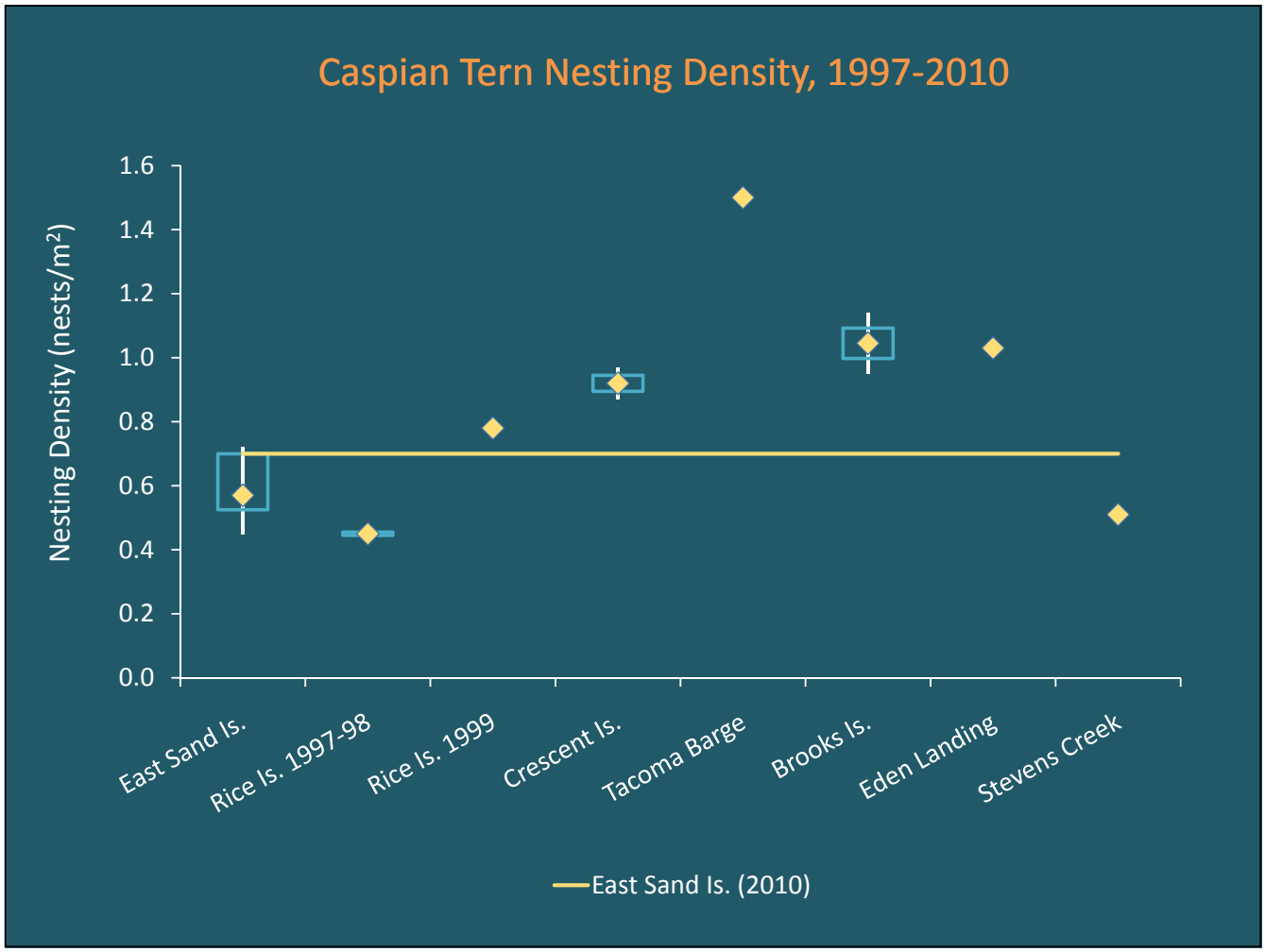

Western Population in 2009 ≈ 31,500 breeding pairs
Other coastal colony sites
East Sand Island
28%
(8,828)
39%
(12,087)
24%
(7,663)
9%
(2,848)
BC, WA, OR, CA inland colony sites
ID, MT, UT, CO, AZ, NV colony sites


Caspian Tern Colony Size on East Sand Island
Breeding Pairs
12,000
10,000
8,000
6,000
4,000
2,000
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Average (2000-2009)


Caspian Tern Smolt Consumption on East Sand Island
Smolts Consumed (millions)
0
1
2
3
4
5
6
7
8
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Average (2000-2009)


Predation Rates on PIT-tagged Salmonid Stocks by
Caspian terns nesting on East Sand Island, 2004-2009
Upper Columbia
Snake
Mid-Columbia
Willamette
Predation Rate
15%
10%
5%
0%
Spring
Summer
Fall
Coho
Sockeye
Steelhead
Chinook


Caspian Tern Colony Area Provided and Used on East Sand Island
Colony Area (acres)
0
1
2
3
4
5
6
7
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
?
?
Used
Provided


Caspian Tern Nesting Density, 1997-2010
Nesting Density (nests/m²)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
East Sand Is.
Rice Is. 1997-98
Rice Is. 1999
Crescent Is.
Tacoma Barge
Brooks Is.
Eden Landing
Stevens Creek
East Sand Is. (2010)

New Caspian Tern Nesting Islands – 2010 Breeding Status

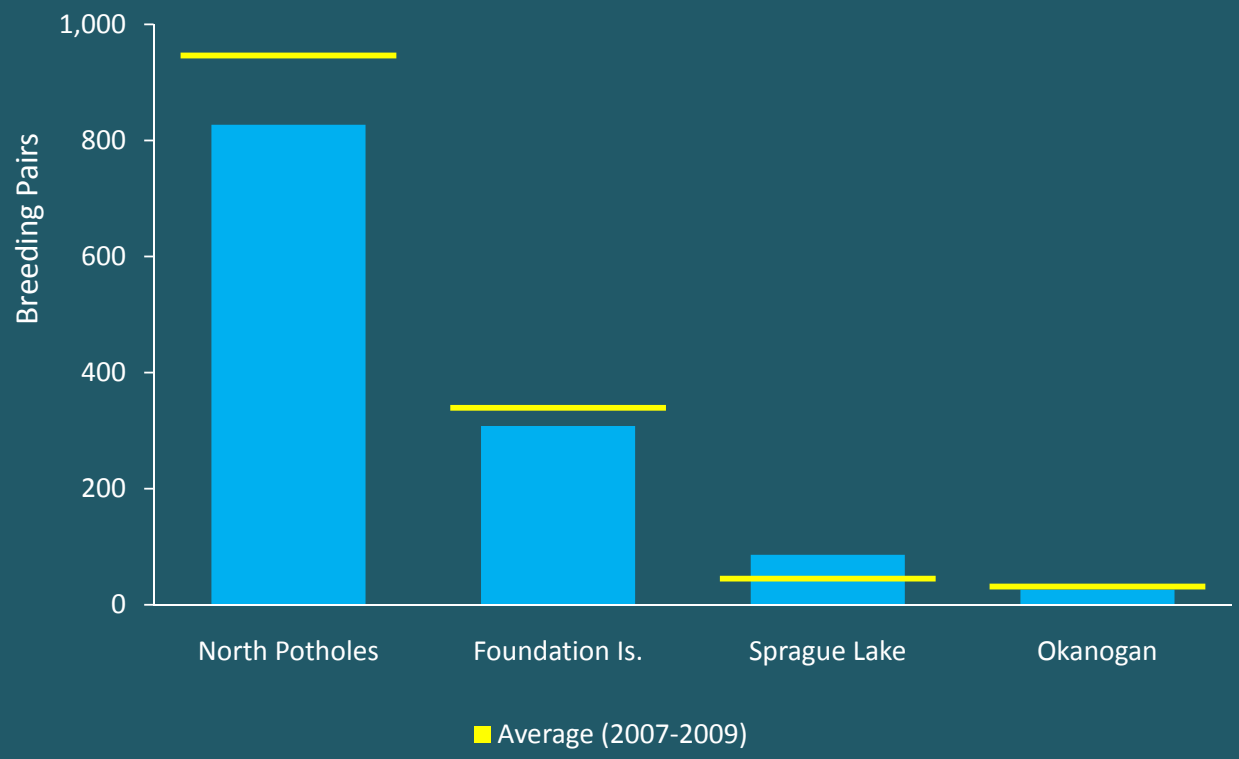
Location	Size (acres)	Social Attraction?	Watered?	Breeding Attempts	Productivity
Fern Ridge, OR	1	Yes	Yes	0	0
Crump Lake, OR	1	No	Yes	71	0
Summer Lake WA, OR East Link	0.5	Yes	Yes	29	0.1
Dutchy Lake	0.5	Yes	Yes	0	0
Gold Dike	0.5	No	No	-	-
Tule Lake NWR, CA	2	No	No	-	-
Lower Klamath NWR, CA Sheepy Unit	0.8	Yes	Yes	258	0.65
Orem's Unit	1	No	No	-	-
Malheur NWR	1	-	-	-	-
Hayward Shoreline, SFB	1	-	-	-	-

Conclusions - Estuary

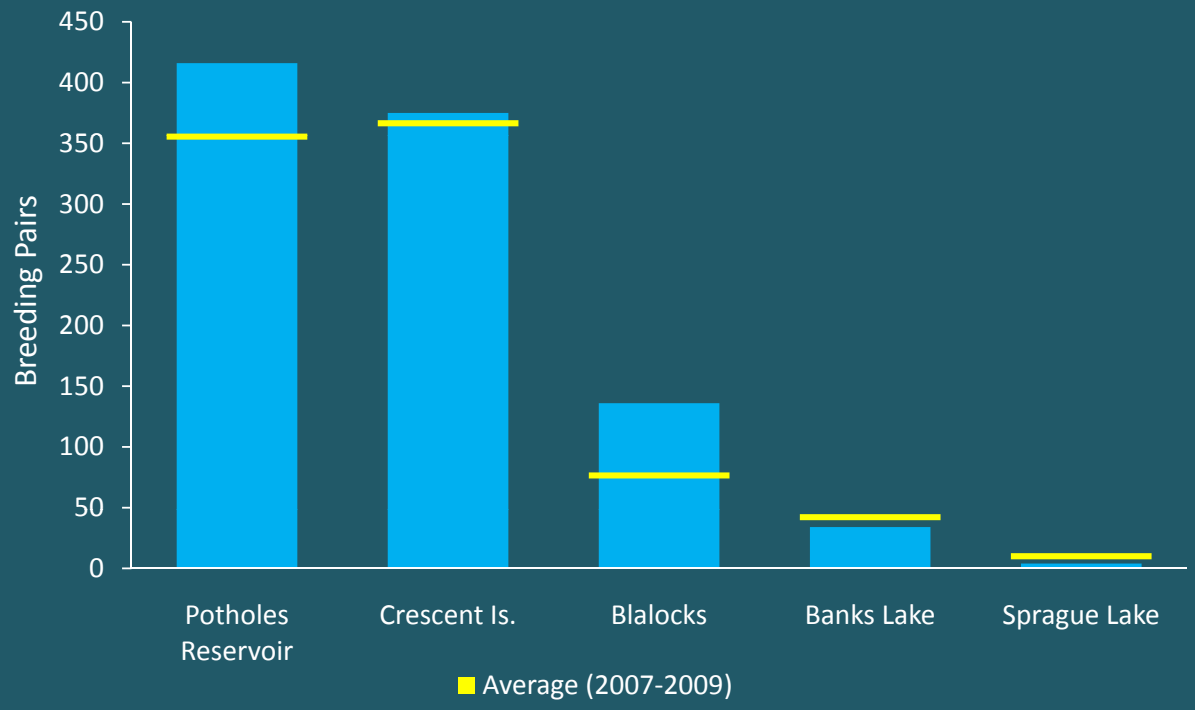
- Combined losses of juvenile salmonids to predation by Caspian terns and double-crested cormorants in the Columbia River estuary were 19 - 29 million smolts in 2010 (preliminary estimate)
- Smolt losses to double-crested cormorants far exceeded smolt losses to Caspian terns in 2010
- Habitat for Caspian terns on East Sand Island was reduced by 38% from former area, but reduction in colony size was less
- Potential redistribution of a portion of the East Sand Island cormorant colony is in planning stage

Primary Inland Colonial Waterbird Nesting Sites

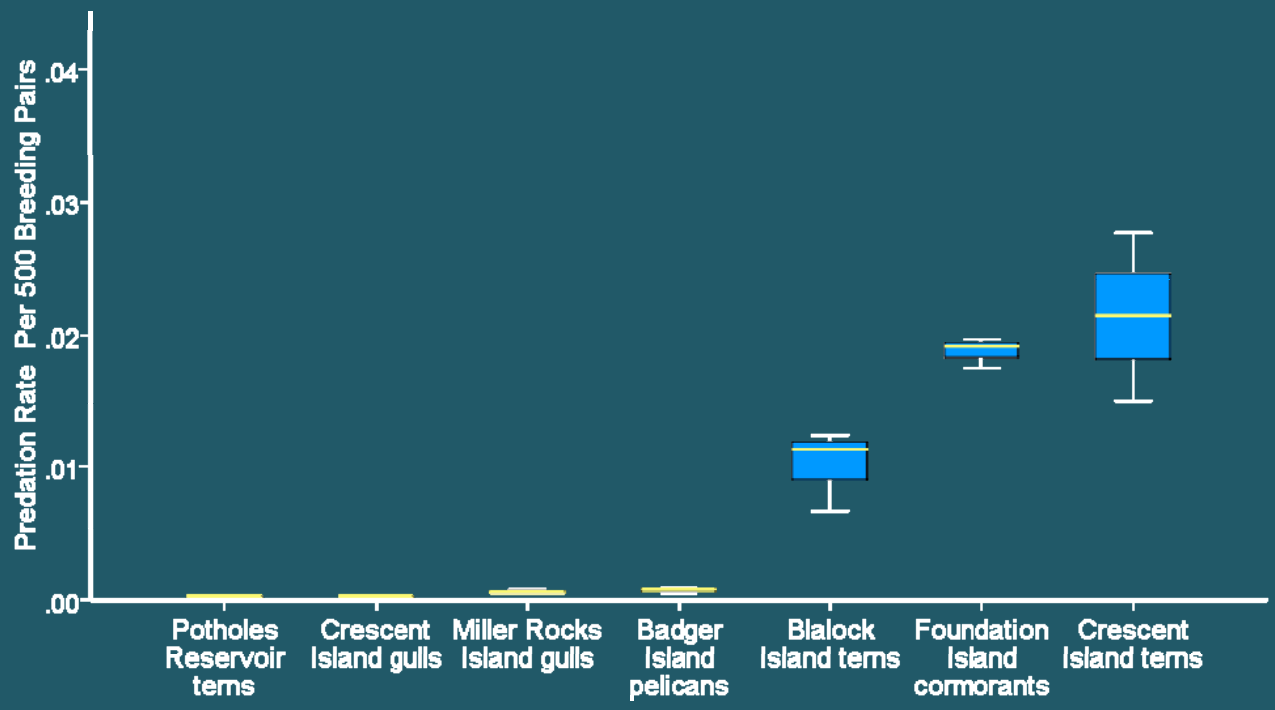
Double-crested Cormorant Colony Size on the Columbia Plateau in 2010



Caspian Tern Colony Size on the Columbia Plateau in 2010

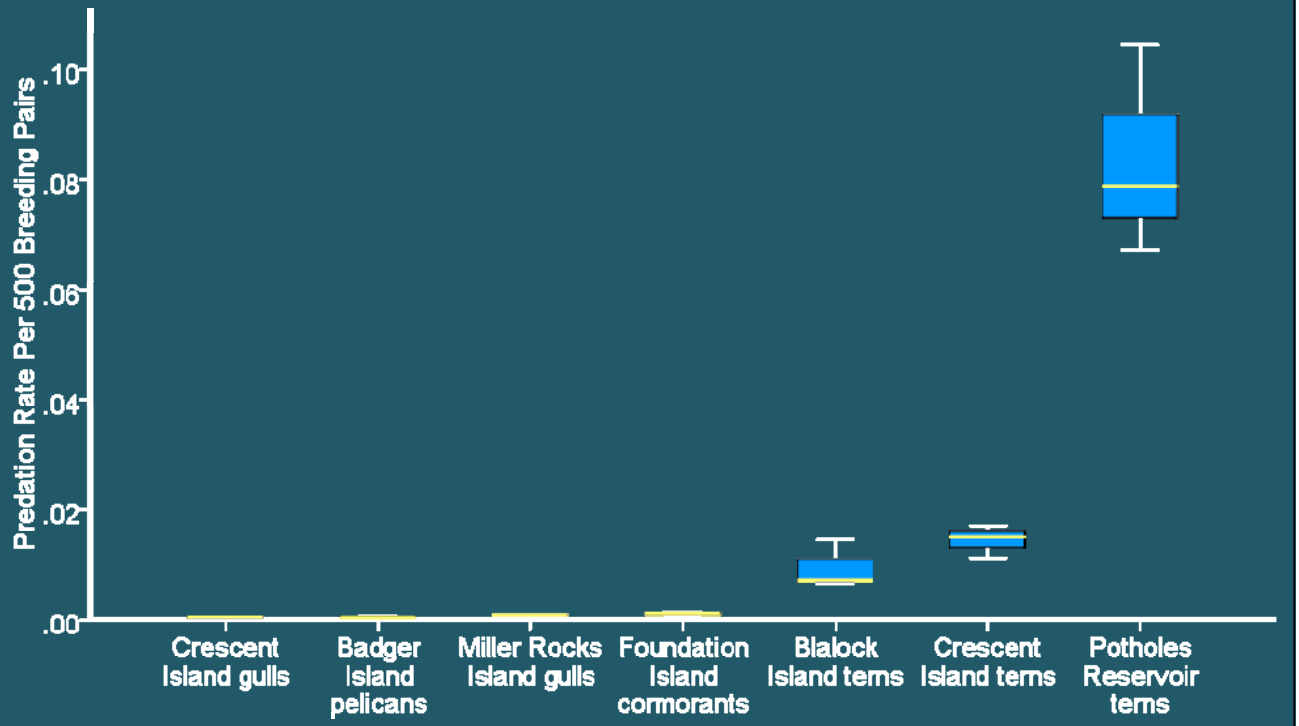


Per Capita Predation Rate Estimates on Snake River Smolts

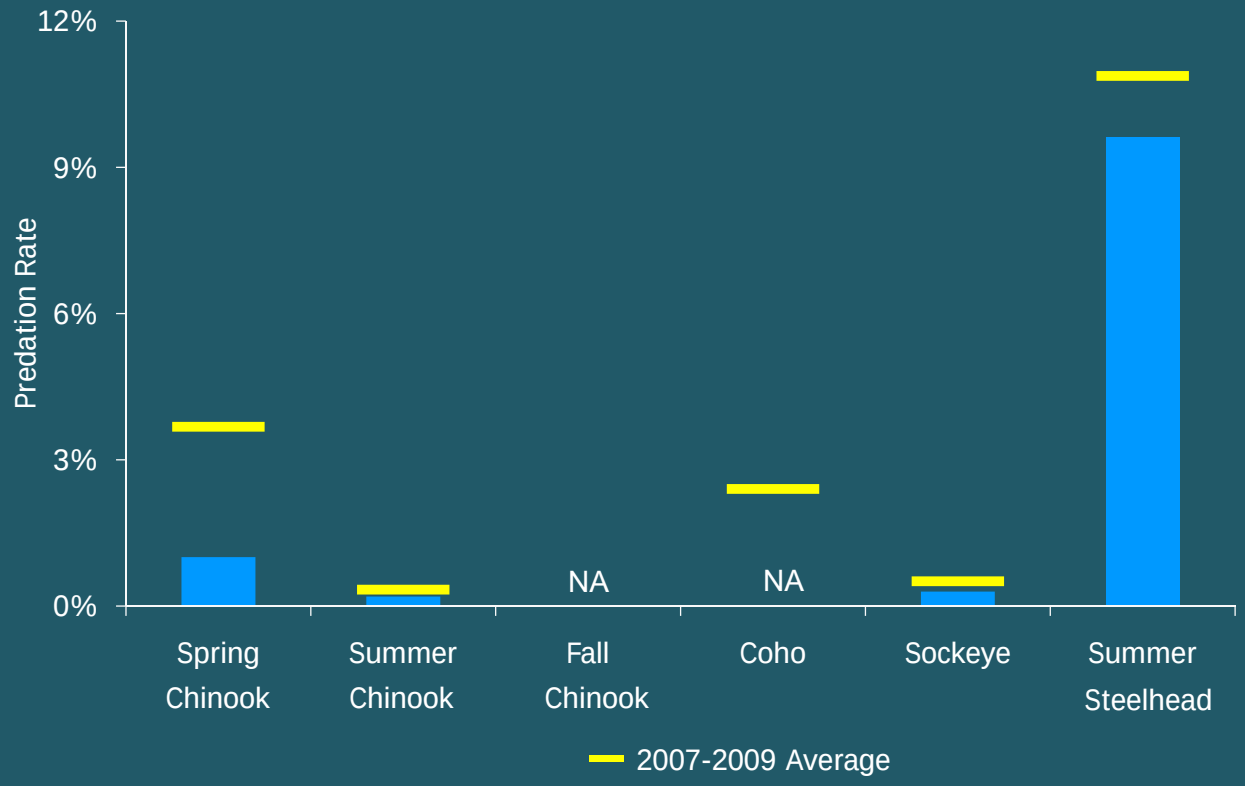


Primary Inland Colonial Waterbird Nesting Sites

Per Capita Predation Rate Estimates on Upper Columbia River Smolts



Predation Rates on Upper Columbia River Smolts by Terns in Potholes Reservoir



Conclusions – Up-river

- Data from this project are being use to evaluate the need for and scope of inland avian predation management initiatives
- Predation rates are variable based on the fish species, fish stock, avian predator species, and year
- Over-all (all colonies) predation rates in 2010 were down slightly relative to years past, with the greatest impacts on steelhead from the Snake and Upper Columbia ESUs
- Per capita predation rates indicate that management of Caspian terns (Crescent, Potholes, Blalocks) and cormorants (Foundation) would be the most beneficial to salmonid recovery efforts


Thank you!
Questions?