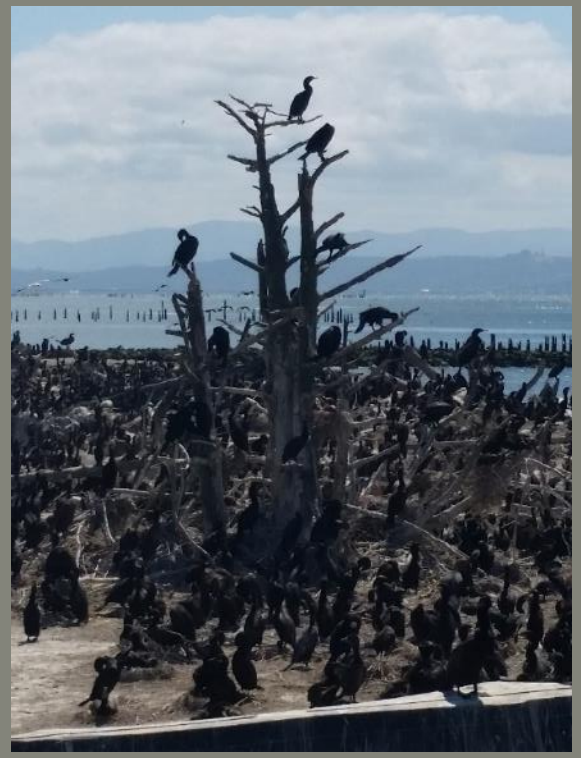
CORPS' AVIAN PREDATION MANAGEMENT IN THE COLUMBIA RIVER ESTUARY



Jacob Macdonald
U.S. Army Corps of Engineers, Portland District
Presented at: 2021 AFEP Annual Review
January 12, 2022

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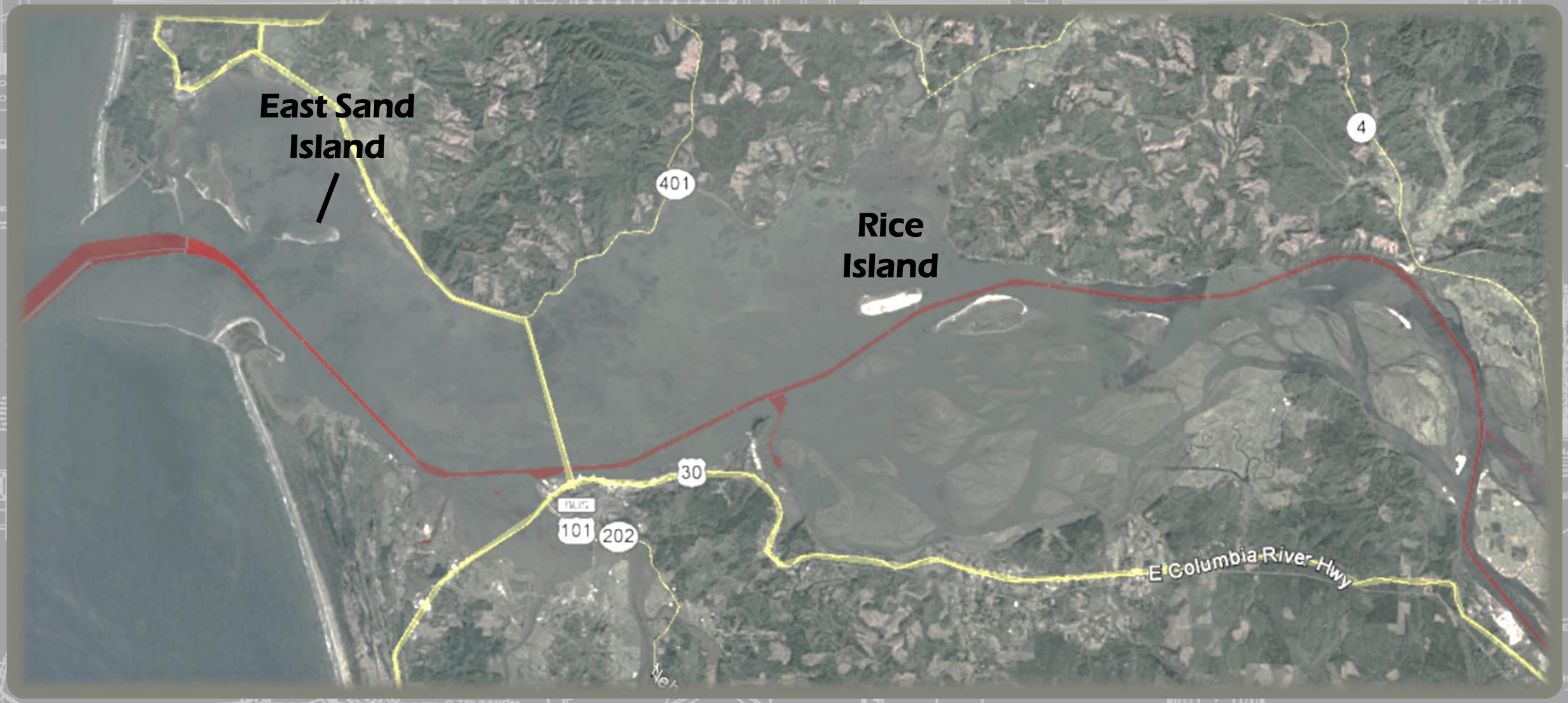

COLUMBIA RIVER ESTUARY

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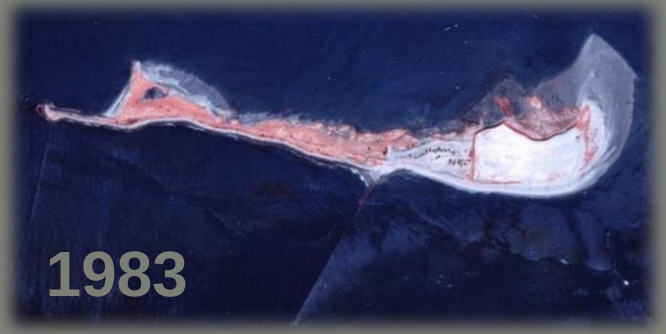
EAST SAND ISLAND

- Sand Island was a single island at the mouth of the Columbia River
- Much of its southern shore was armored and fitted with pile dikes by the late 1930's
- Sand Island was breached by storms in the winter of 1942, creating East Sand Island and West Sand Island

- Two dredged material placement events in 1978 and 1982
- Caspian terns nested on East Sand Island in 1984
- Placement area was vegetated in 1985 and by 1986, the whole colony moved itself to Rice Island



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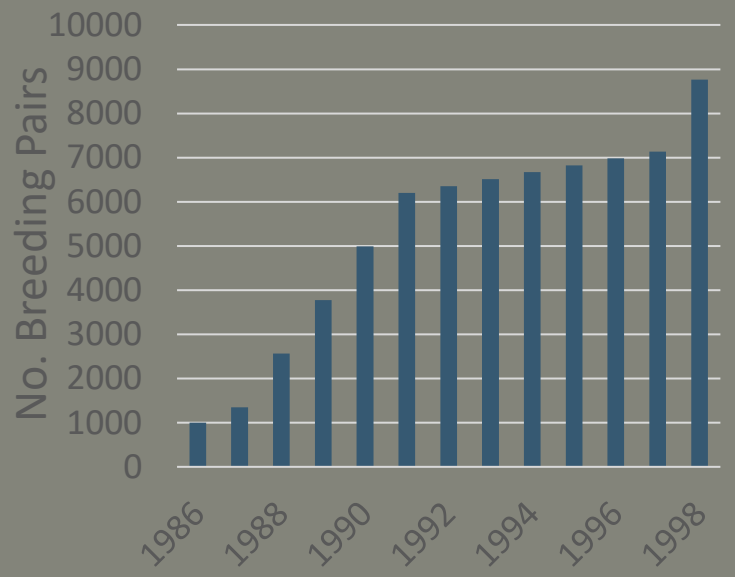
RICE ISLAND

- Heavily used dredged material placement island in the upper estuary
- About 1,000 terns nested on Rice Island in 1986
- Almost 9,000 nested in 1998



- Terns on Rice Island may consume 2-3 times more salmonids than terns on East Sand Island

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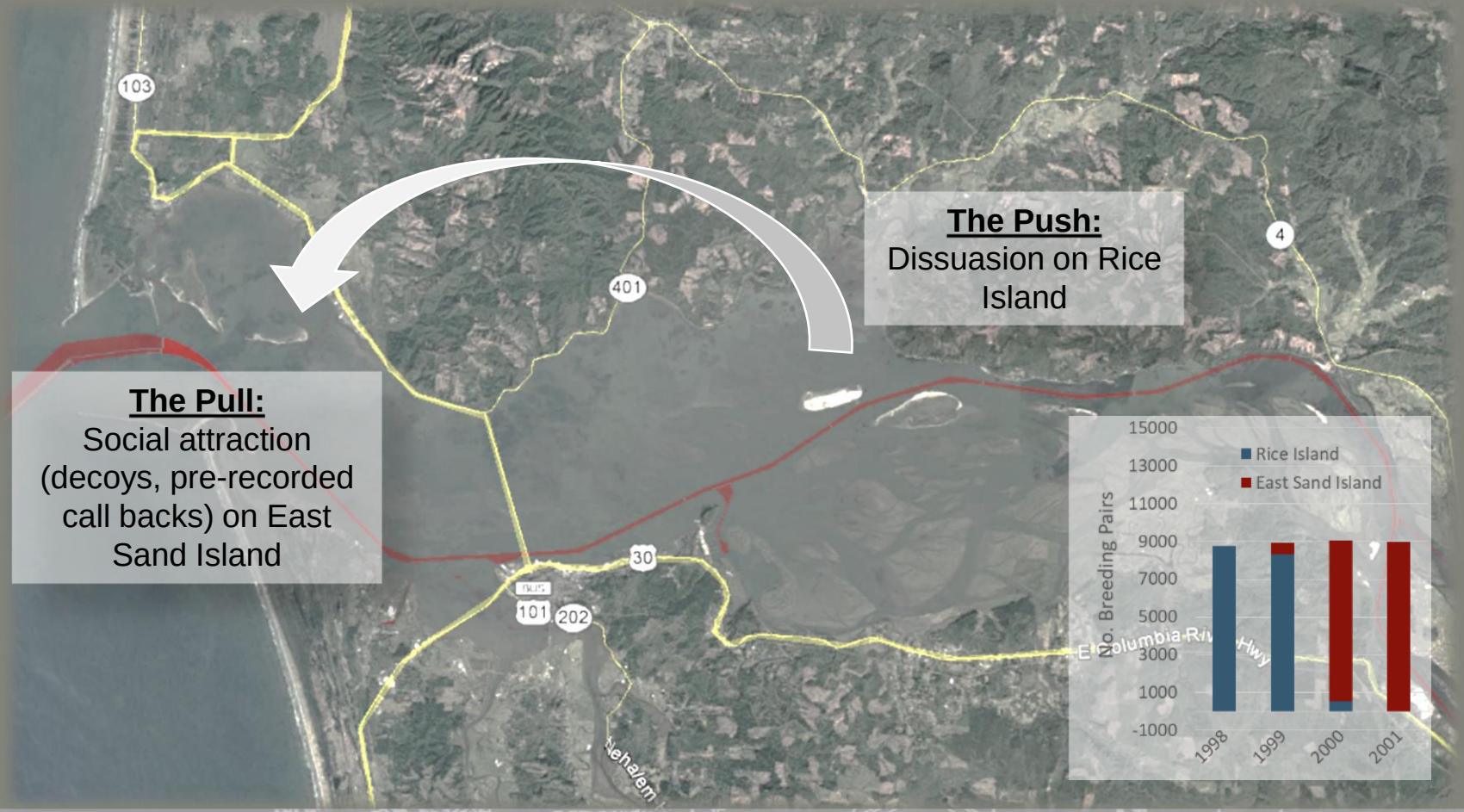
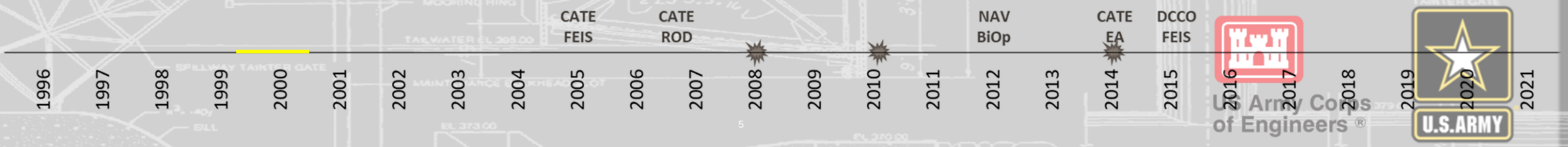
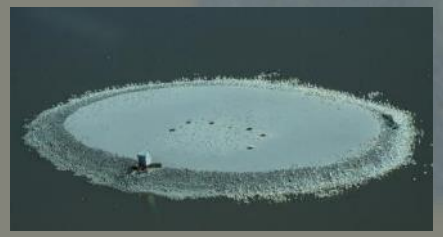
CASPIAN TERN RELOCATION 1999-2000



- Expected a reduction in predation impacts of 1/2 to 2/3 if we could move terns back to East Sand Island.
- Successfully “moved” ~9,000 breeding pairs from Rice Island to East Sand Island over 2 breeding seasons 1999-2000.
- Action was challenged under NEPA, social attraction could continue but the Corps agreed to come up with a long-term solution.



CASPIAN TERN MANAGEMENT PLAN



Reduce available habitat on ESI to support approximately 3,125 to 4,375 breeding pairs

Prevent tern nesting in the upper estuary and on ESI outside the designated nesting area

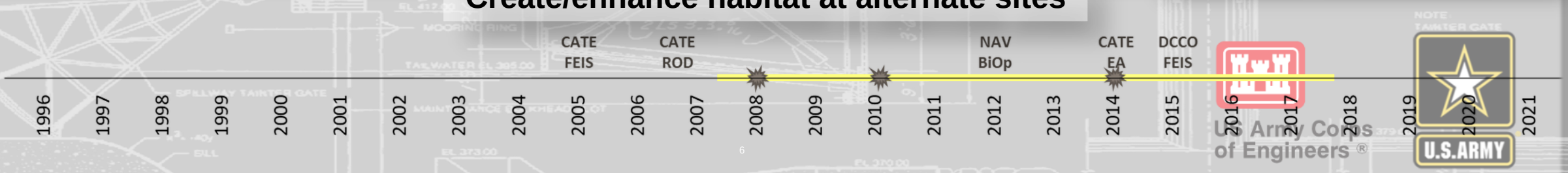
Redistribution of Columbia River estuary tern colony to locations outside the estuary

Create/enhance habitat at alternate sites

2008 (2010, 2014) FCRPS BiOP

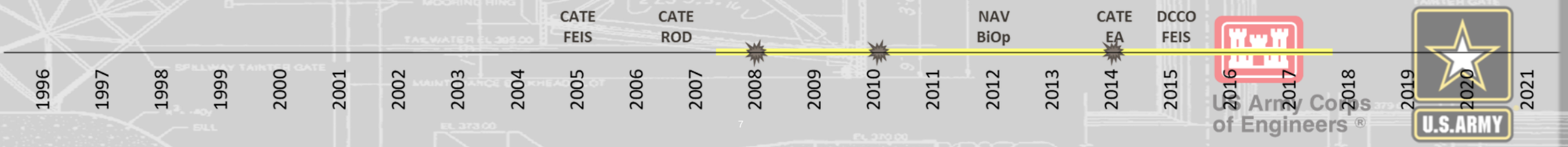
RPA 45 (2008)

"The FCRPS Action Agencies will implement the **Caspian Tern Management Plan**. East Sand Island tern habitat will be reduced from 6.5 to 1.5 to 2 acres. It is predicted that the target acreage on East Sand Island will be achieved in approximately 2010.



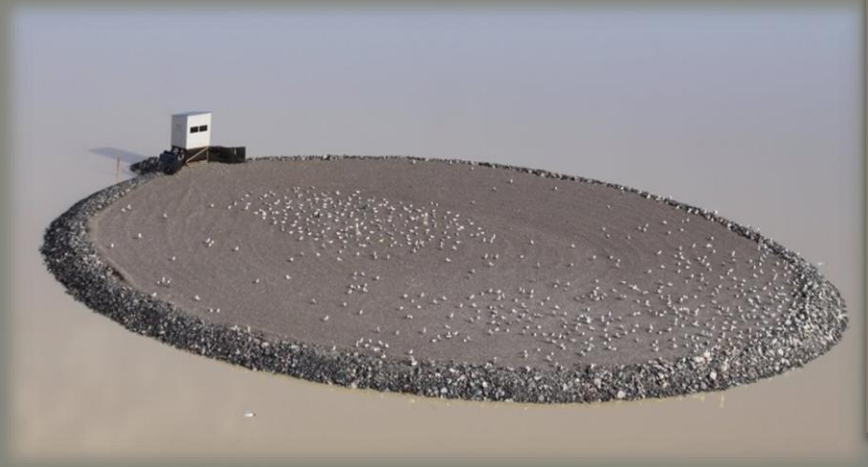
CASPIAN TERN ALTERNATE NESTING SITES

Location	Acres
Malheur NWR, OR	1.0
Crump Lake, OR	1.0
Tule Lake NWR, CA	1.4
Summer Lake, OR (East Link)	0.5
Summer Lake, OR (Gold Dike)	0.5
Sheepy Lake	1.0
Fern Ridge, OR	1.0
San Franciso Bay, CA (DENWR)	1.5
Total Acres	**7.9**

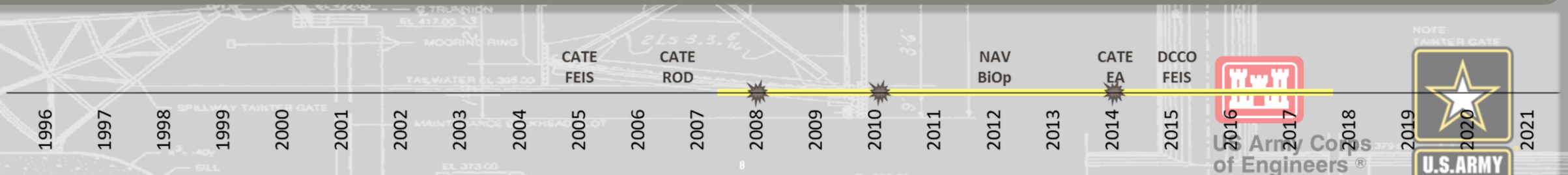


CASPIAN TERN ALTERNATE NESTING SITES

- ❑ Monitoring completed in 2018
- ❑ Transfer ownership to refuge landowners



2018 Monitoring results		
Location	Monitoring Technique	Estimated Number of Nesting Pairs
Fern Ridge	Ground Based	0
Crump Lake	Aerial	56
East Link	Aerial	71
Gold Dike	Aerial	0
Tule Lake	Ground Based	570
Sheepy Lake	Aerial	210
Malheur Lake	Aerial	200
Don Edwards	Ground Based	501
Total Pairs		**1,608**

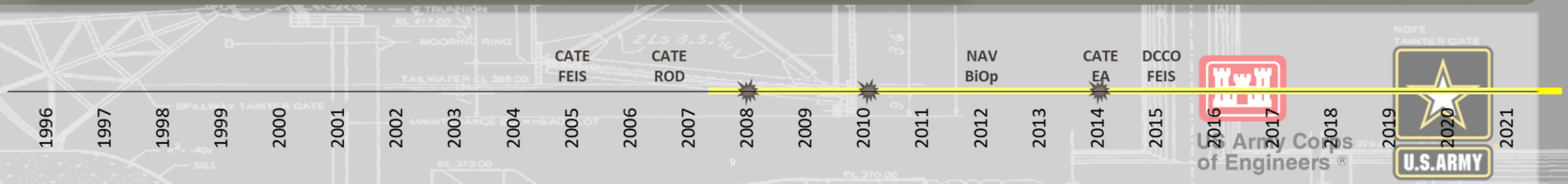


PREVENTING TERN NESTING

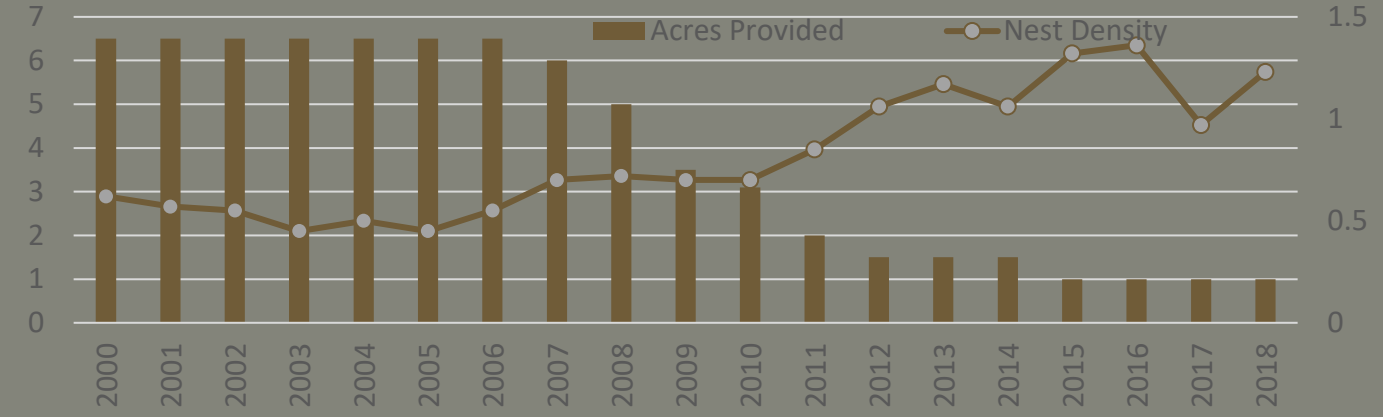
Passive dissuasion and active hazing annually on:

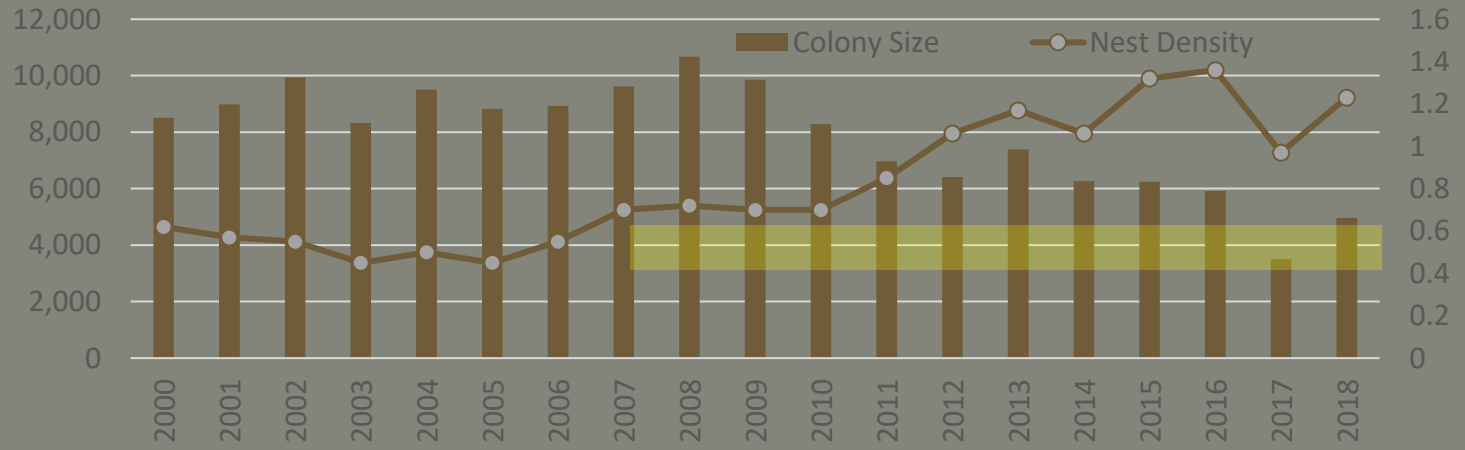
- **East Sand Island to prevent terns from nesting outside the designated colony area**
  - Some level of hazing and dissuasion at East Sand Island is likely necessary into the future to minimize the likelihood that terns may establish colonies outside of the maintained 1-acre colony area
- **Rice Island to prevent terns from nesting at all**
  - Navigation BiOp ensures terns will be prevented from nesting into the future
  - Persistent attempts to nest by 1,000's of terns
    - Requires daily active hazing and extensive passive dissuasion
    - Unsuccessful in nesting, successful in eating
    - Predation impact unknown but assumed significant

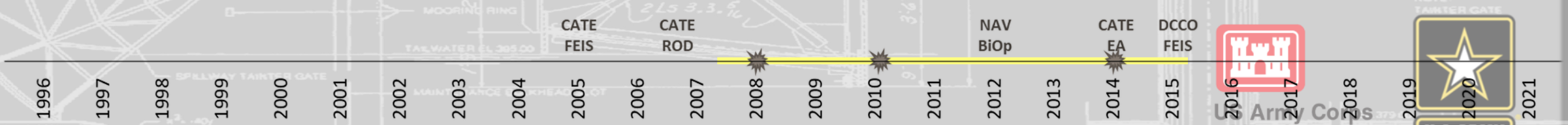
2012 BiOp for the operations and maintenance dredging program included a term and condition (1[k]) requiring the Corps to monitor upland disposal sites during the nesting season. ***Discourage any avian predators that are found <u>nesting</u> at an upland disposal site****, consistent with the Migratory Bird Act" in an attempt to decrease predation of out-migrating juvenile salmonids.*



EAST SAND ISLAND HABITAT REDUCTION







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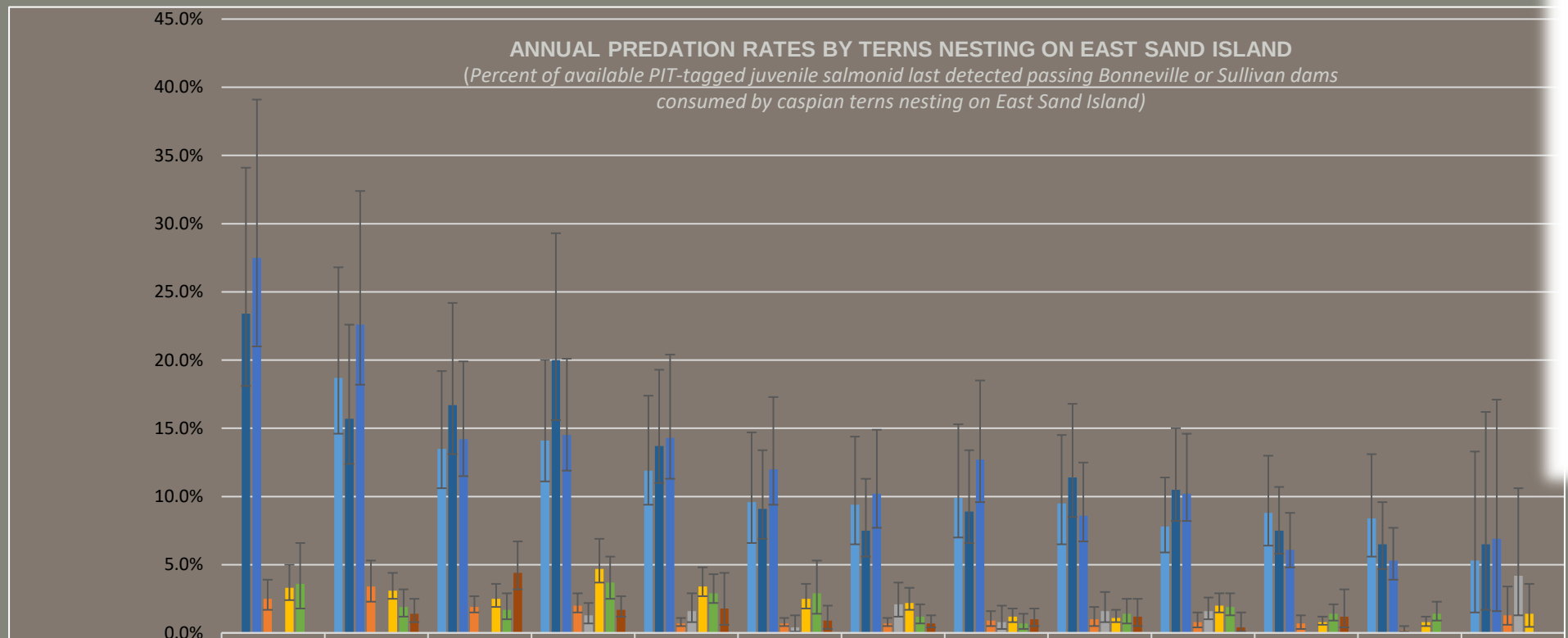
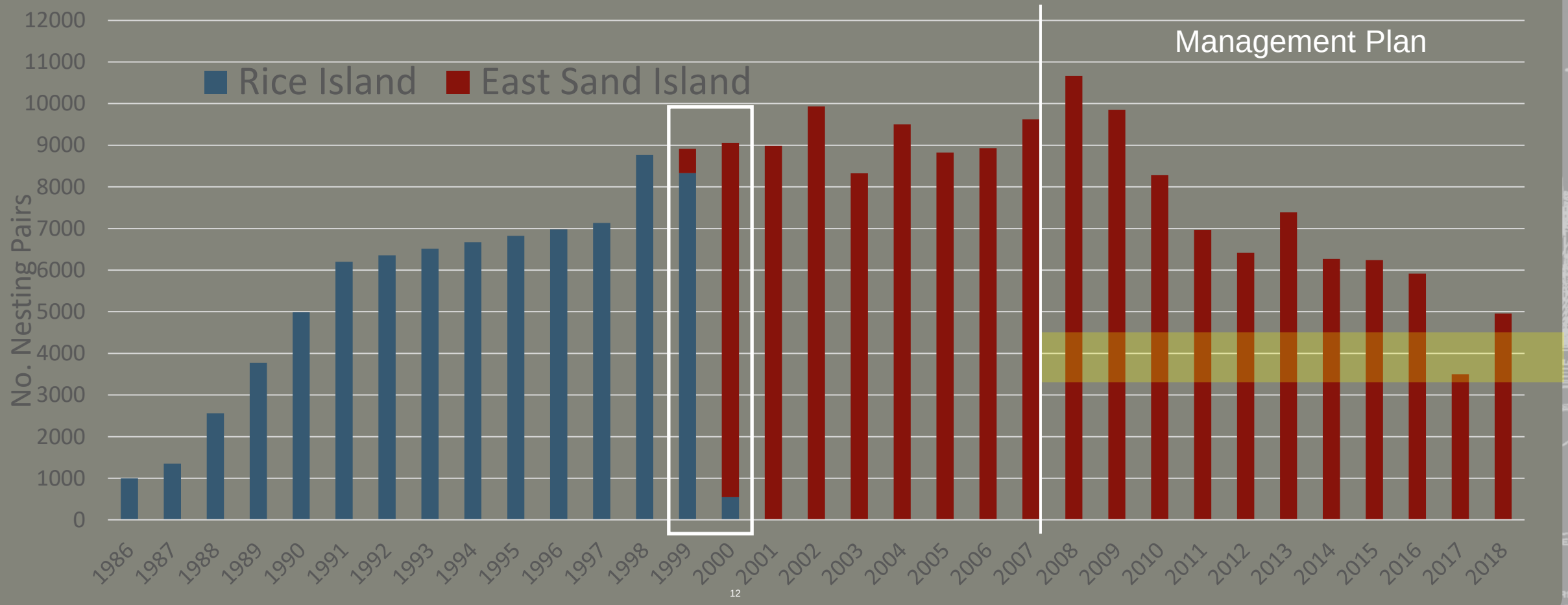
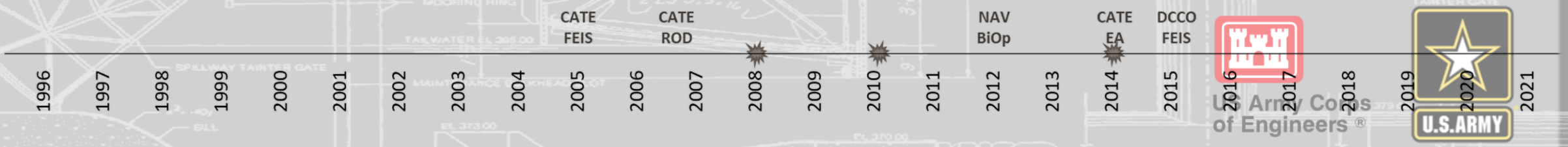
ESI TERN PREDATION RATES



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
MCR Steelhead		18.7%	13.5%	14.1%	11.9%	9.6%	9.4%	9.9%	9.5%	7.8%	8.8%	8.4%	5.3%
UCR Steelhead	23.4%	15.7%	16.7%	20.0%	13.7%	9.1%	7.5%	8.9%	11.4%	10.5%	7.5%	6.5%	6.5%
SR Steelhead	27.5%	22.6%	14.2%	14.5%	14.3%	12.0%	10.2%	12.7%	8.6%	10.2%	6.1%	5.3%	6.9%
SR Fall Chinook	2.5%	3.4%	1.9%	2.0%	0.7%	0.7%	0.7%	0.9%	1.0%	0.8%	0.7%	0.2%	1.3%
SR Sockeye				1.3%	1.6%	0.4%	2.1%	0.8%	1.6%	1.6%			4.2%
SR Sp/Su Chinook	3.3%	3.1%	2.5%	4.7%	3.4%	2.5%	2.2%	1.2%	1.1%	2.0%	0.8%	0.8%	1.4%
UCR Sp Chinook	3.6%	1.9%	1.7%	3.7%	2.9%	2.9%	1.2%	0.7%	1.4%	1.9%	1.4%	1.4%	
UWR Sp Chinook		1.4%	4.4%	1.7%	1.8%	0.9%	0.7%	1.0%	1.2%	0.4%	1.2%		

ESTUARY TERNS NESTING POPULATION





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CORMORANTS ON EAST SAND ISLAND

- Increasing double-crested cormorant population on East Sand Island leading up to the 2008 BiOp.

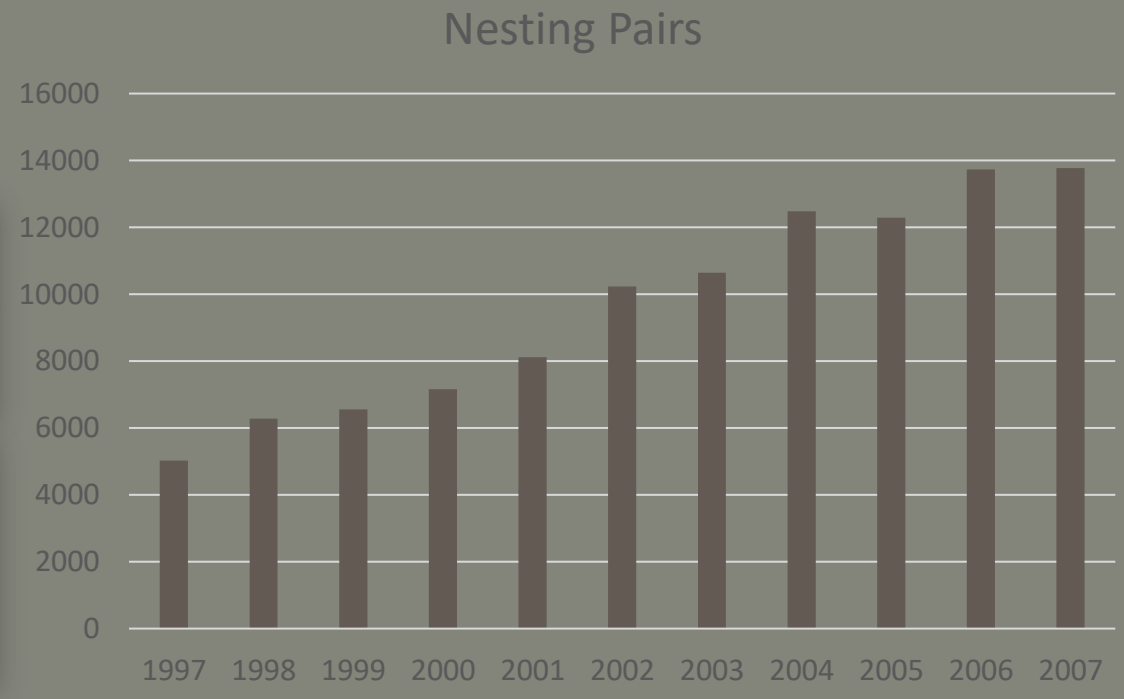
- 2008 (2010, 2014) FCRPS BiOp:

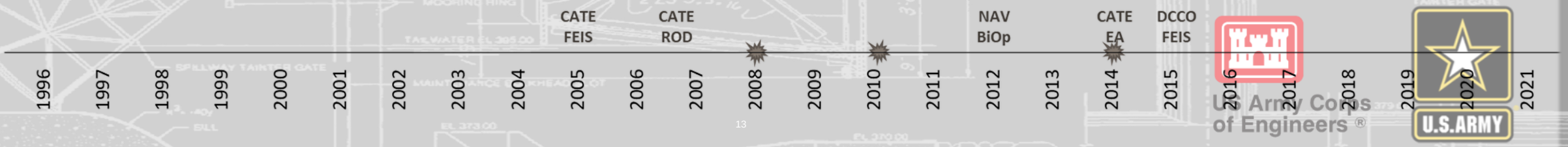
RPA 67 (2008)

"The Action Agencies will monitor the cormorant population in the estuary and its impacts on outmigrating juvenile salmonids and develop and implement a management plan to decrease predation rates, **if warranted**."

RPA 46 (2014)

"The FCRPS Action Agencies will **develop a cormorant management plan** (including necessary monitoring and research) **and implement warranted actions** to reduce cormorant predation in the estuary to Base Period levels **(no more than 5,380 to 5,939 nesting pairs on East Sand Island)**."





CORMORANT MANAGEMENT PLAN

- PHASE 1: 4-year lethal strategy to achieve a colony size of 5,380–5,939 breeding pairs
  - Colony size objective met in year 3 (2017)

TABLE 5-1. Proposed Annual Take Levels.

Year	# individuals taken[10]	Associated nests lost through culling individuals[11]	Nests lost through egg oiling	Total nests lost
1	3,489	3,489	5,879	9,368
2	3,114	3,114	5,247	8,361
3	2,408	2,408	4,058	6,466
4	1,902	1,902	0	1,902
Total	10,912	10,912	15,184	26,096

[10] Increased take could also be considered above what is stated in the proposed take levels under adaptive management. This is described in Chapter 2 and Appendix E of the FEIS.

[11] "Active nests lost" values represent the upper bound of potential egg loss that could occur indirectly from taking individuals. The period of active nesting begins after eggs are laid, typically around March 27.

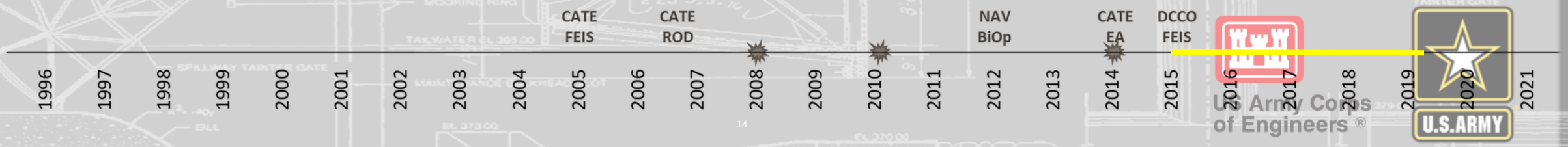
Final Environmental Impact Statement Chapter 5 - Page 2

Actual Annual Take

Year	Adult DCCO Culled	DCCO Nests Addled
2015	2,346	5,089
2016	2,982	1,092
2017	248	0
2018	0	0
TOTAL	5,576	6,181

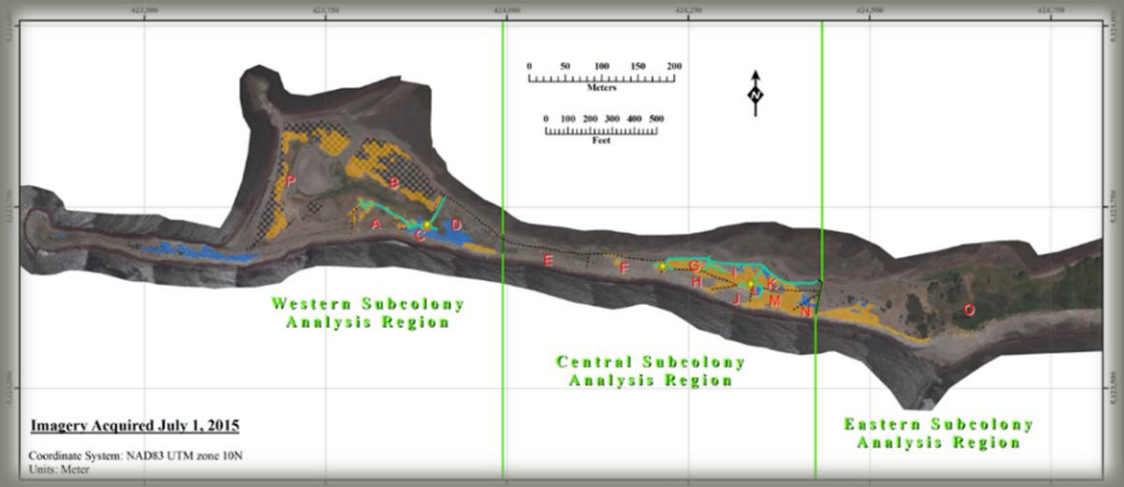
- Take levels throughout Phase 1 were far below those predicted in the FEIS.

- PHASE 2: Terrain modification and/or other habitat management supplemented with hazing as necessary

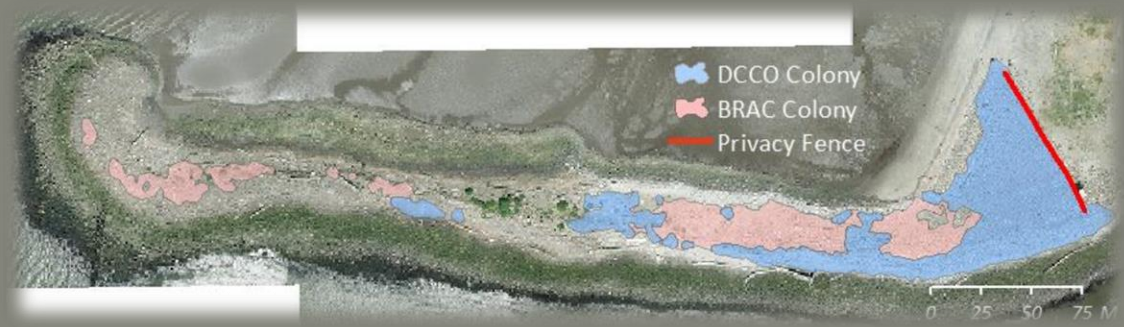


CORMORANT MANAGEMENT PLAN – PHASE 1

- When implementation began in 2015, >12,000 double-crested cormorant pairs were nesting throughout the western portion of East Sand Island.



- By 2018, through a combination of lethal control 2015-2017 and non-lethal hazing in 2018, <4,000 double-crested cormorant pairs were nesting on the westernmost tip of East Sand Island.

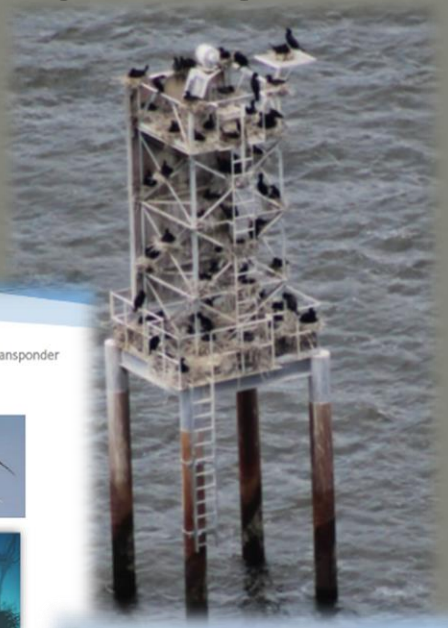


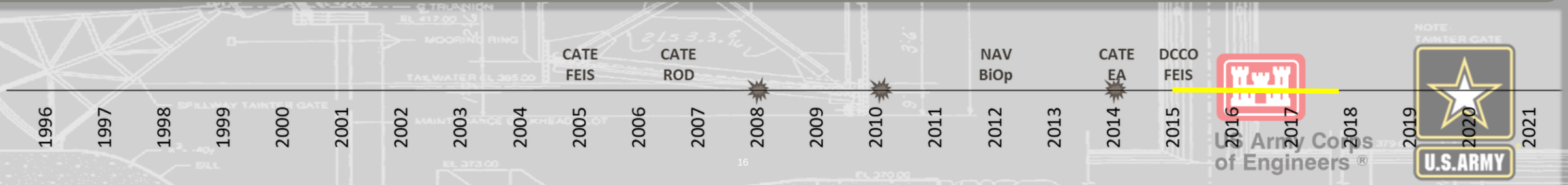
CATE FEIS 2005 · CATE ROD 2007 · NAV BiOp 2012 · CATE EA 2014 · DCCO FEIS 2015

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING

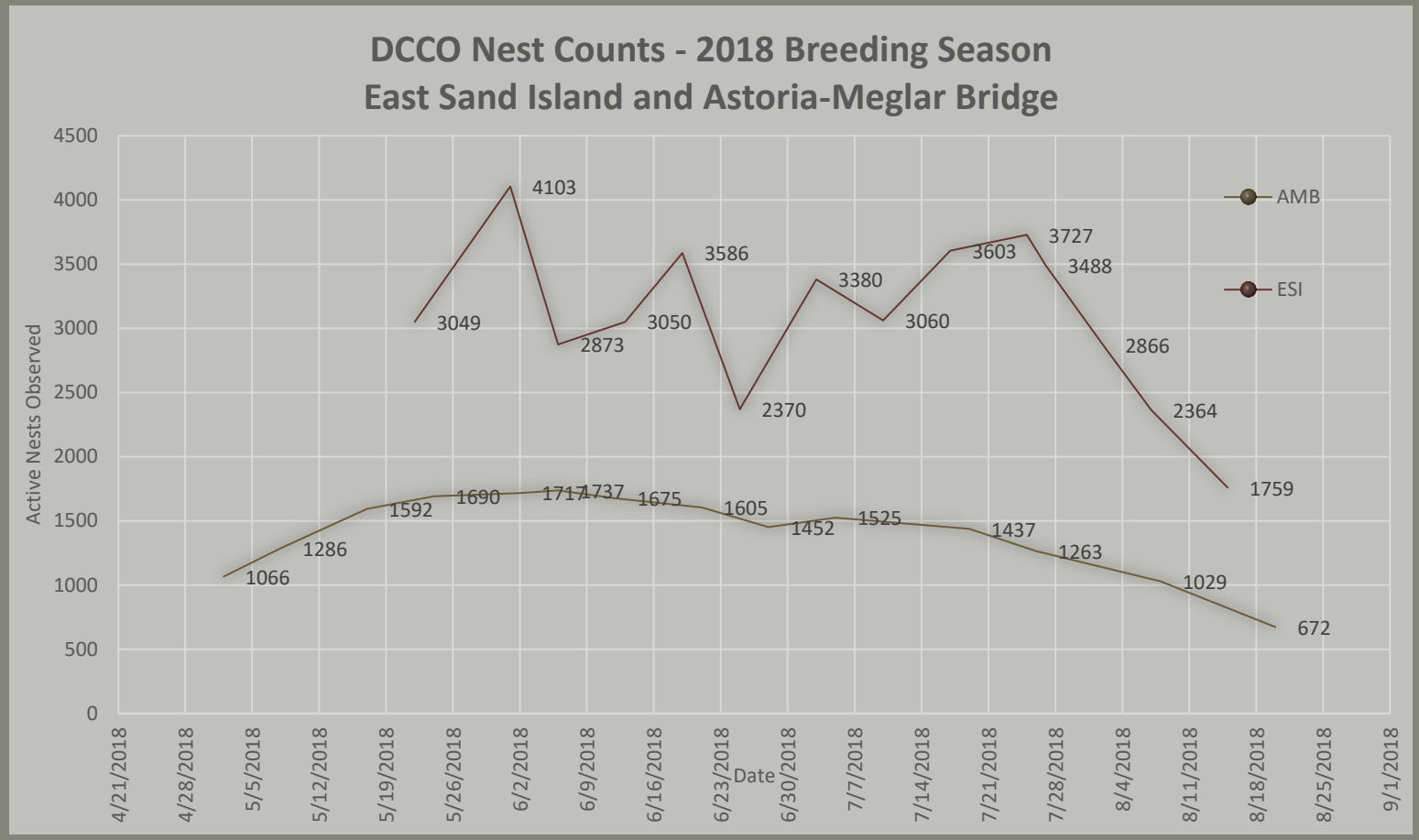
- **Cormorant Management Plan requires**
  - Monitor DCCO on **ESI** annually for colony size and response to management
  - Monitor DCCO in the Columbia River **Estuary** annually for colony size and response to management
  - Implement the Pacific Flyway Council Monitoring Strategy annually to monitor DCCO population status throughout the **Western Flyway**
  - Evaluate ESI DCCO **predation rates** of juvenile salmonids

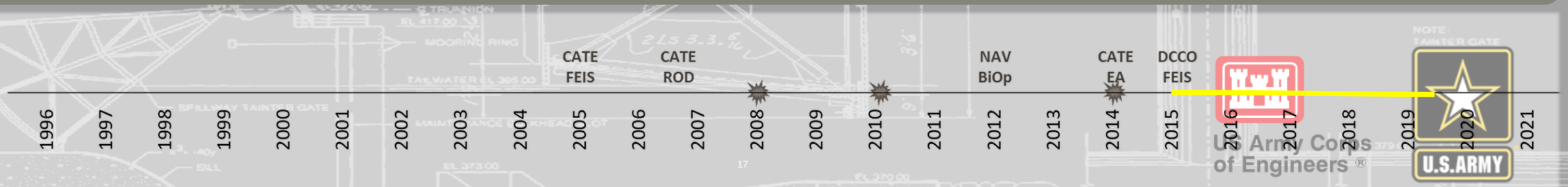




CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING EAST SAND ISLAND

- Monitor DCCO on ESI annually for colony size and response to management.



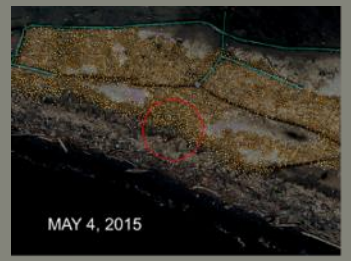


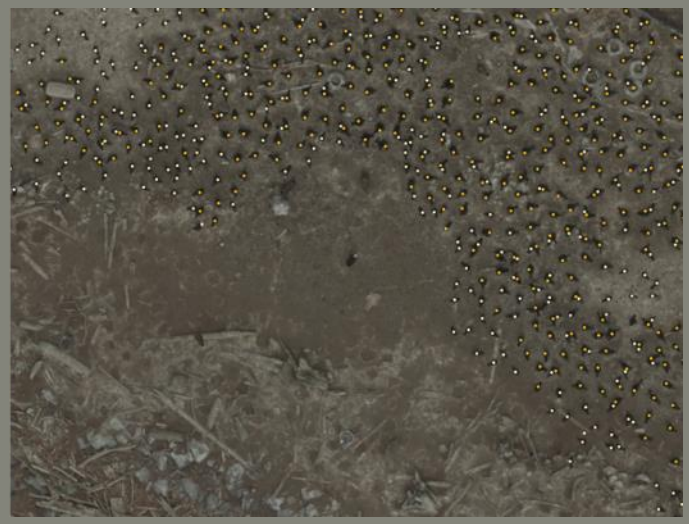
CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING EAST SAND ISLAND

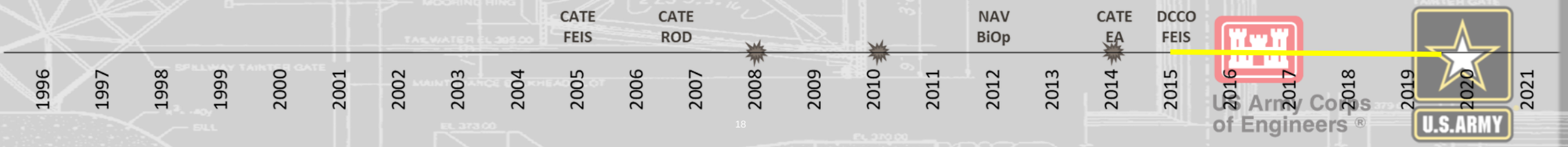
- Minor colony disturbances were observed in 2015 but without real-time monitoring the cause was unknown…until we zoomed in on the imagery.

- Significant early and mid season colony disturbances by predators and colony abandonment events occurred in 2016-2018.

- Although not a direct result of management actions, population swings due to these natural predator-prey interactions made it difficult to detect effects of management, therefore lethal management actions ceased early in the breeding seasons, per the management plan.

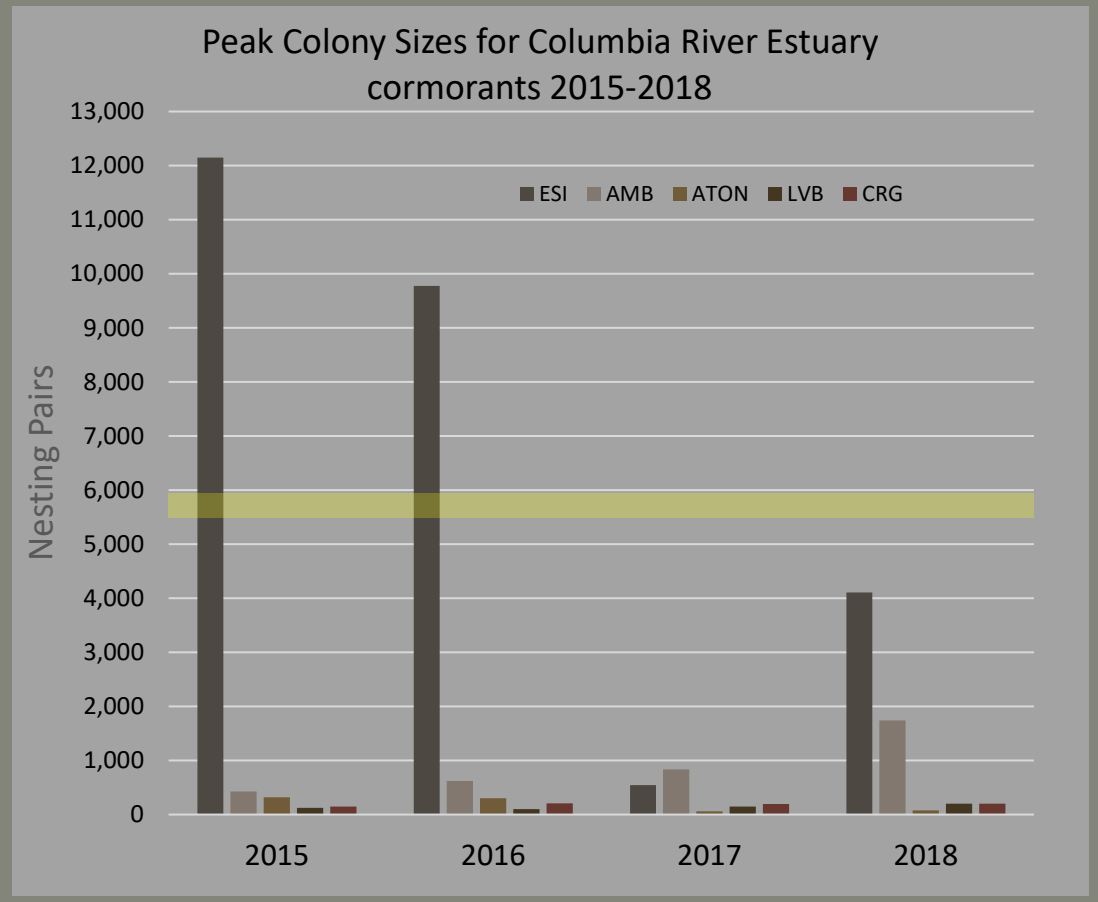


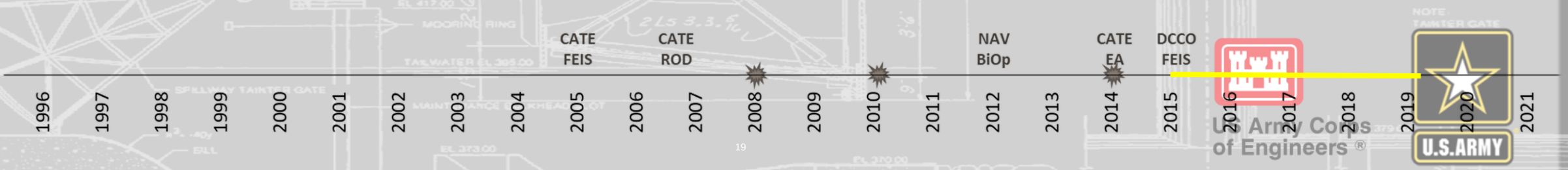




CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING EAST SAND ISLAND

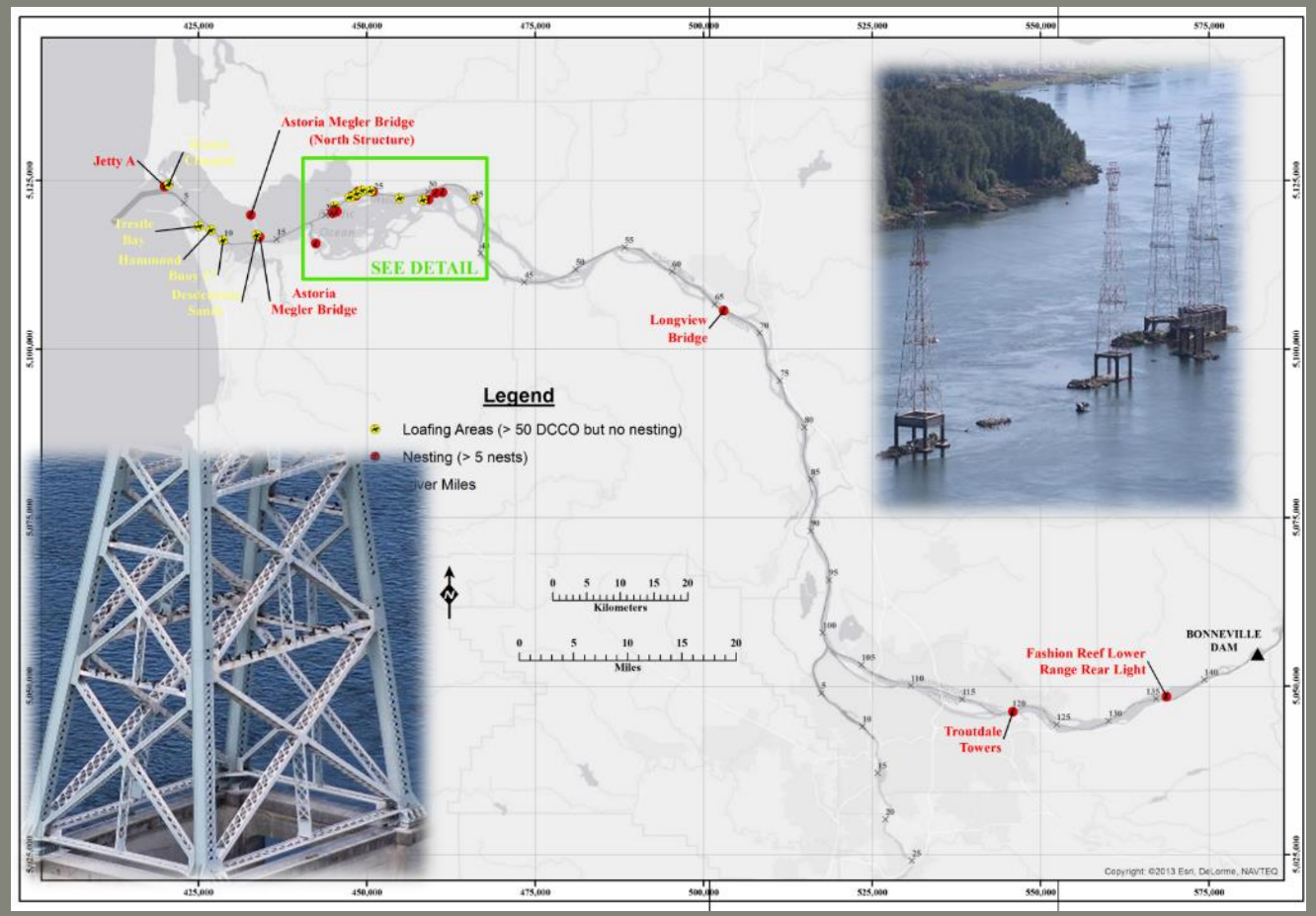
- Monitor DCCO on ESI annually for colony size and response to management.





CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING ESTUARY

- Monitor DCCO in the Columbia River Estuary annually for colony size and response to management

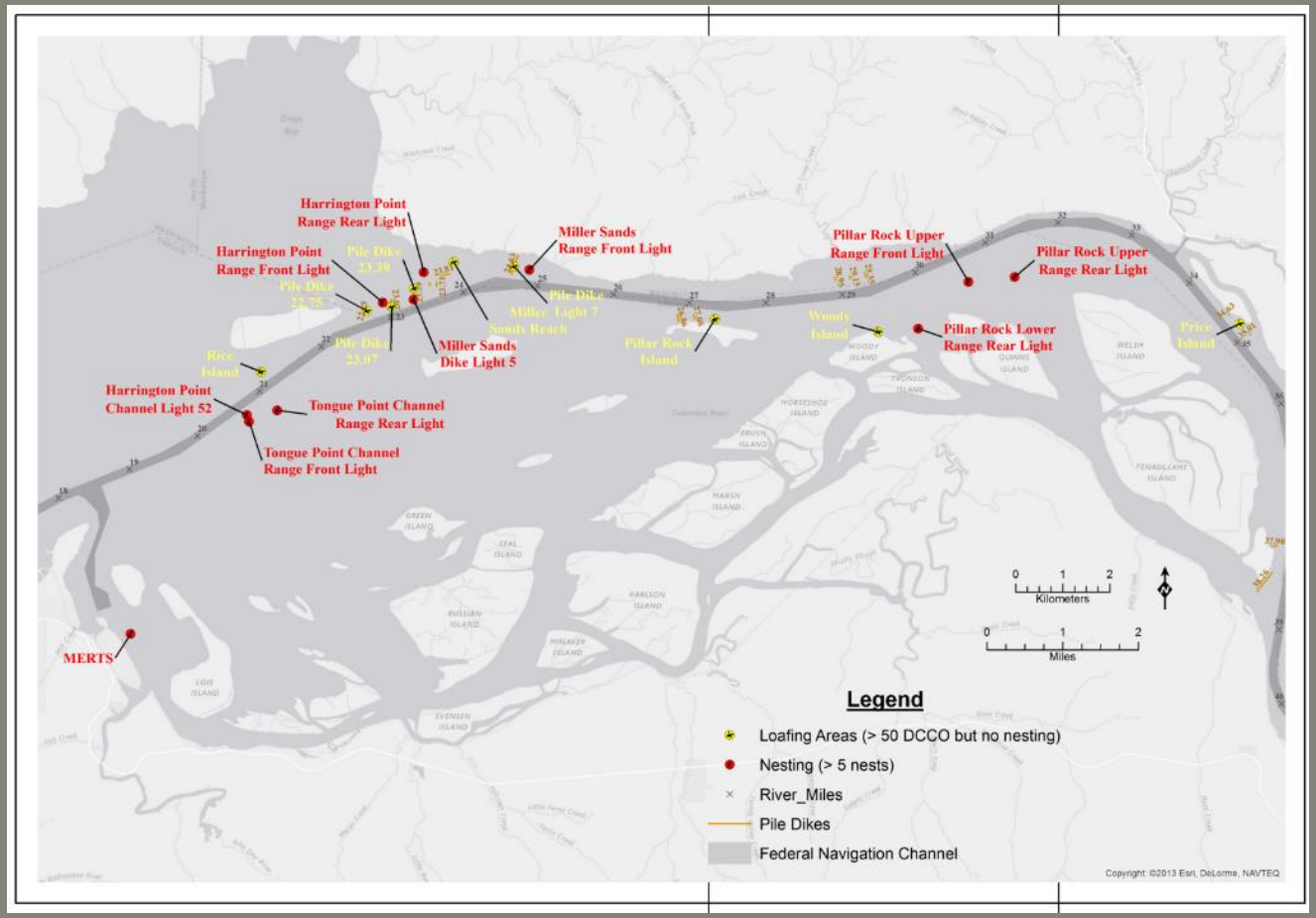


CATE FEIS 2005
CATE ROD 2007
NAV BiOp 2012
CATE EA 2014
DCCO FEIS 2015

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING ESTUARY

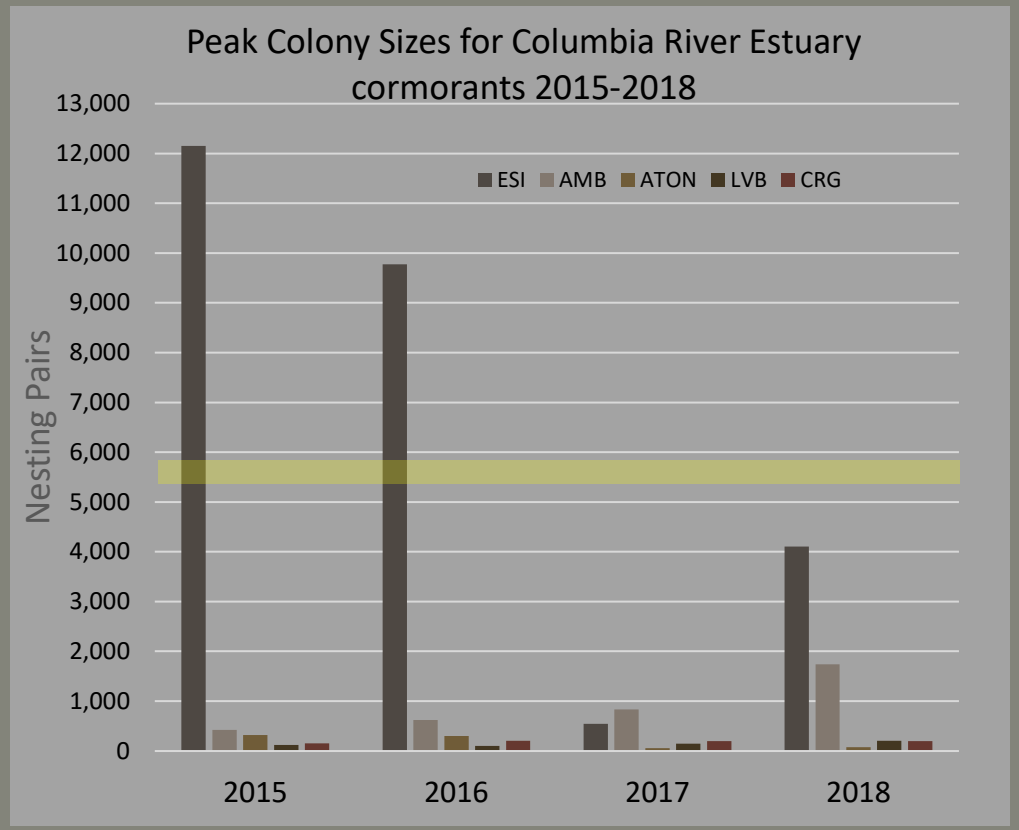
- Monitor DCCO in the Columbia River Estuary annually for colony size and response to management

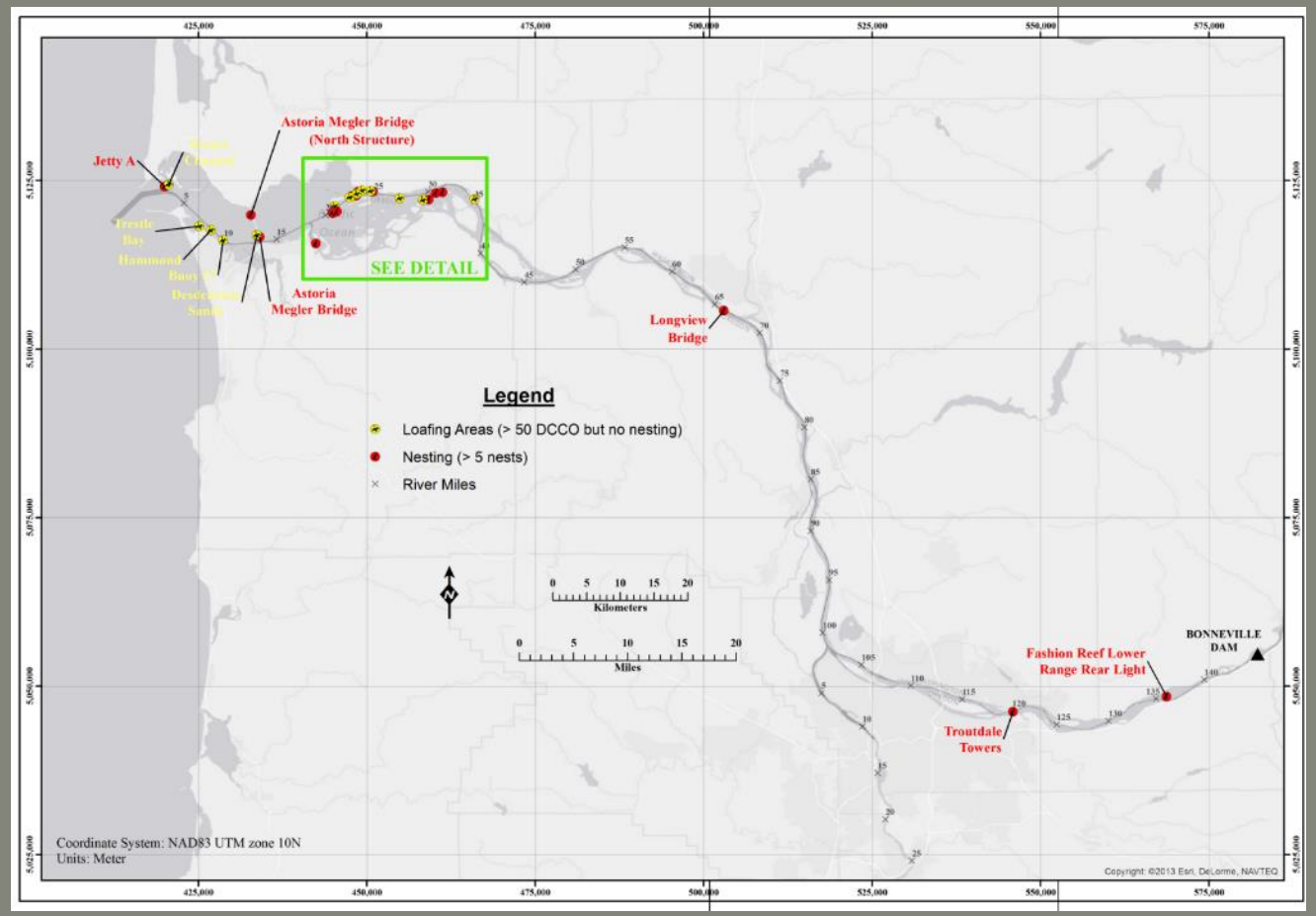


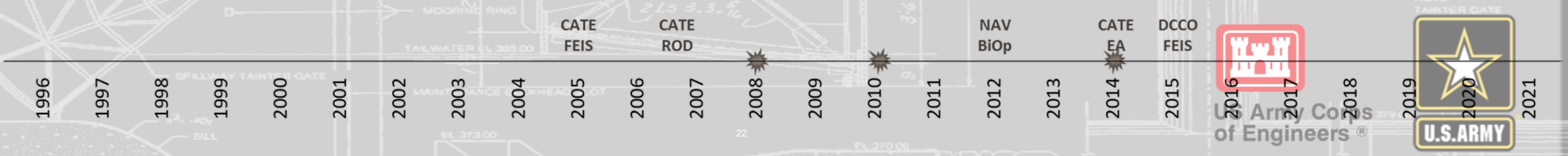
CATE FEIS
CATE ROD
NAV BiOp
CATE EA
DCCO FEIS

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING ESTUARY

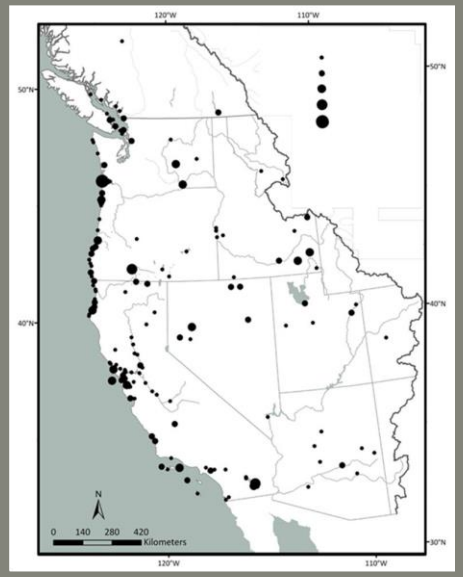






CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING WESTERN FLYWAY

- Implement the Pacific Flyway Council Monitoring Strategy annually to monitor DCCO population status throughout the Western Flyway



U.S. Fish & Wildlife Service
Double-crested Cormorant Western Population Status Evaluation
Draft Annual 2018 Report in review

- The Western Population 2018 estimate is >1 standard deviation above the predicted abundance after culling for Year 4 of the Management Plan (39,034 breeding individuals)

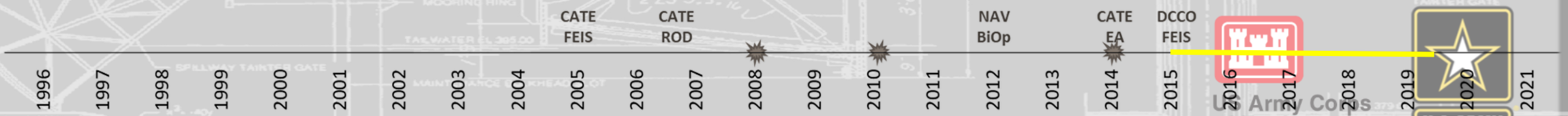
(2018 is year 4)

Variance Around Population Estimates						
		Population Estimate	Standard Error	CV %	Estimated LCL	Estimated UCL
2018	Pairs	30,815	2895	9.4%	25,141	36,489
	Individuals	61,630	5790	9.4%	50,282	72,979
*2017	Pairs	22,164	1,654	7.5%	18,921	25,406
	Individuals	44,327	3,309	7.5%	37,842	50,812
2016	Pairs	37,454	3,010	8.0%	31,555	43,353
	Individuals	74,908	6,019	8.0%	63,110	86,705
2015	Pairs	37,301	2,127	5.7%	33,132	41,469
	Individuals	74,601	4,253	5.7%	66,265	82,938
2014	Pairs	36,719	1,611	4.4%	33,562	39,875
	Individuals	73,437	3,221	4.4%	67,124	79,751

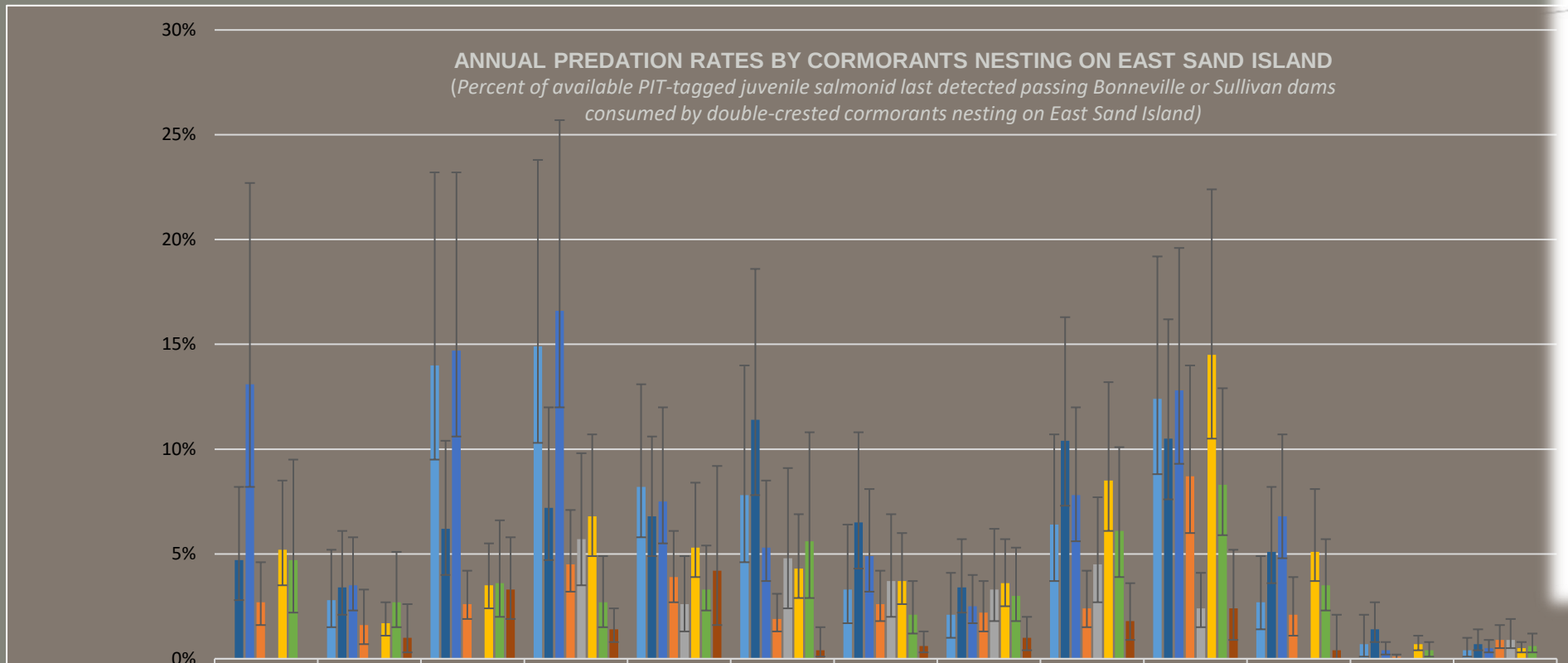
TABLE 5-4. Predicted abundance after culling and adaptive management thresholds for the East Sand Island colony and western population of DCCOs under the Proposed Management Plan.

	East Sand Island Colony				Western Population			
Year	Predicted Abundance	Standard Deviation	Lower Threshold Abundance - 1 SD	Upper Threshold Abundance + 1 SD	Predicted Abundance	Standard Deviation	Lower Threshold Abundance - 1 SD	Upper Threshold Abundance + 1 SD
1	22,353	1,775	20,579	24,128	57,975	5,817	52,158	63,792
2	19,950	1,644	18,306	21,594	51,081	5,154	45,927	56,235
3	15,428	1,492	13,936	16,920	43,980	5,504	38,476	49,484
4*	12,185	1,293	10,891	13,478	39,034	5,312	33,722	44,345

*Post-culling predicted abundance in year 4 would be after the final year of management (i.e., 4 years of management) and would be used in assessing the following year's likelihood of achieving the reduction in colony size on East Sand Island. Final evaluation of the management action would be based on the predicted abundance before culling the following year (year 5) to account for recruitment (or lack of recruitment) into the population. For Alternative C-1 in year 5, the predicted abundance before culling was 11,259 (+/- 1 SD = 10,013–12,504) for East Sand Island and 38,365 (+/- 1 SD = 32,984–43,746) for the western population.



CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING PREDATION RATES



ANNUAL PREDATION RATES BY CORMORANTS NESTING ON EAST SAND ISLAND

(Percent of available PIT-tagged juvenile salmonid last detected passing Bonneville or Sullivan dams consumed by double-crested cormorants nesting on East Sand Island)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
MCR Steelhead		2.8%	14.0%	14.9%	8.2%	7.8%	3.3%	2.1%	6.4%	12.4%	2.7%	0.7%	0.4%
UCR Steelhead	4.7%	3.4%	6.2%	7.2%	6.8%	11.4%	6.5%	3.4%	10.4%	10.5%	5.1%	1.4%	0.7%
SR Steelhead	13.1%	3.5%	14.7%	16.6%	7.5%	5.3%	4.9%	2.5%	7.8%	12.8%	6.8%	0.4%	0.5%
SR Fall Chinook	2.7%	1.6%	2.6%	4.5%	3.9%	1.9%	2.6%	2.2%	2.4%	8.7%	2.1%	0.1%	0.9%
SR Sockeye				5.7%	2.6%	4.8%	3.7%	3.3%	4.5%	2.4%			0.9%
SR Sp/Su Chinook	5.2%	1.7%	3.5%	6.8%	5.3%	4.3%	3.7%	3.6%	8.5%	14.5%	5.1%	0.7%	0.5%
UCR Sp Chinook	4.7%	2.7%	3.6%	2.7%	3.3%	5.6%	2.1%	3.0%	6.1%	8.3%	3.5%	0.4%	0.6%
UWR Sp Chinook		1.0%	3.3%	1.4%	4.2%	0.4%	0.6%	1.0%	1.8%	2.4%	0.4%		


FINAL TECHNICAL REPORT: East Sand Island Passive Integrated Transponder Tag Recovery and Avian Predation Rate Analysis, 2018

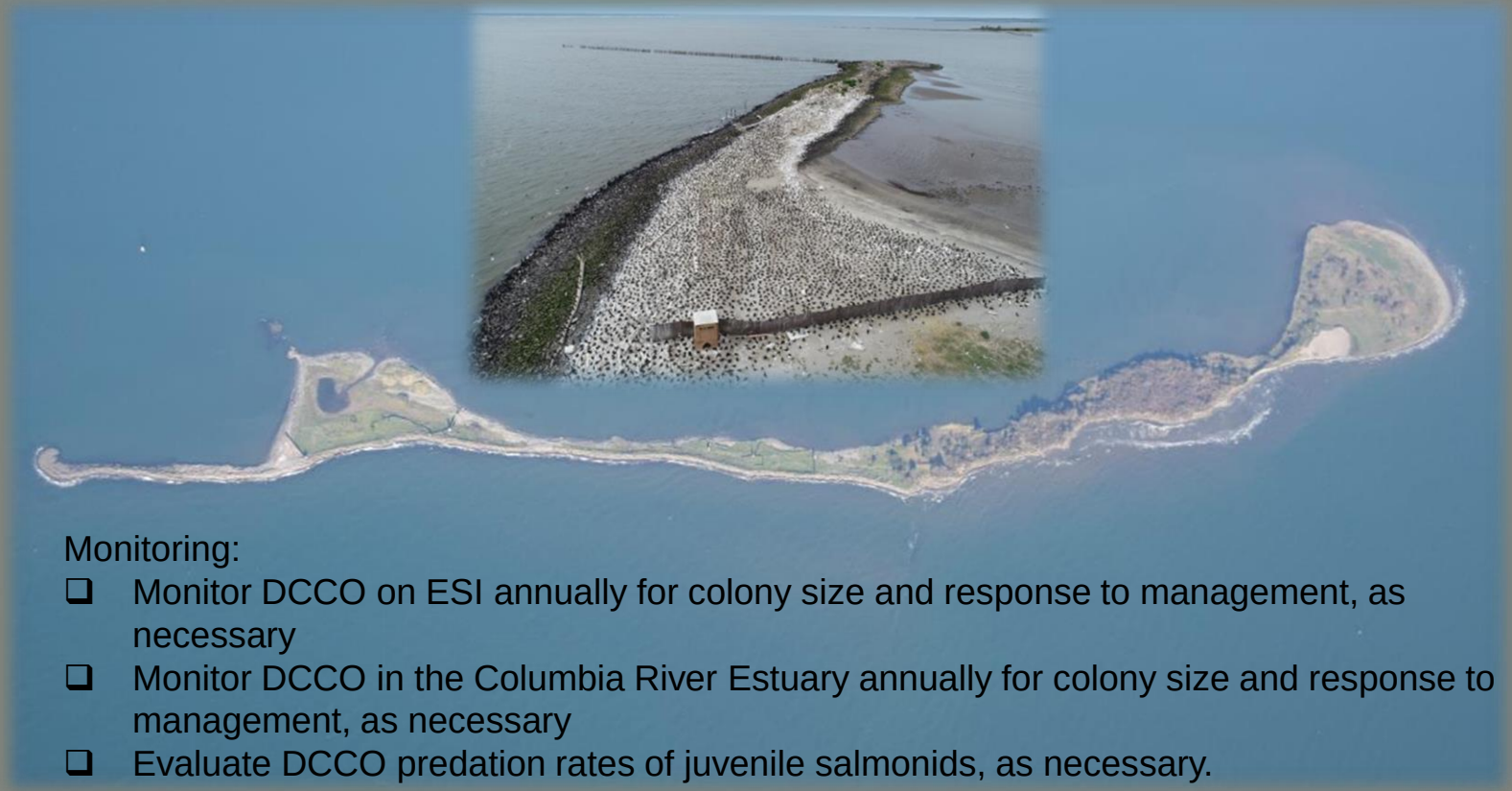
Predation Deposition Detection

IDIQ Contract No. W912EF-14-D-0004

Submitted To: U.S. Army Corps of Engineers – Portland District
Mr. Jacob Macdonald

Submitted By: Real Time Research, Inc.
1000 SW Emkay Dr.
Bend, Oregon 97702

CORMORANT MANAGEMENT PLAN – PHASE 2

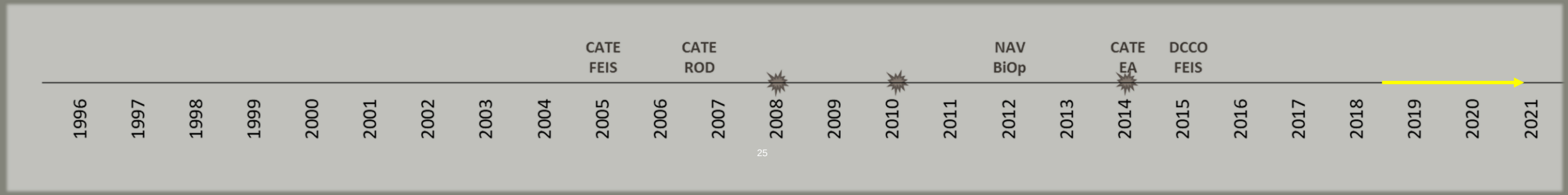


Monitoring:

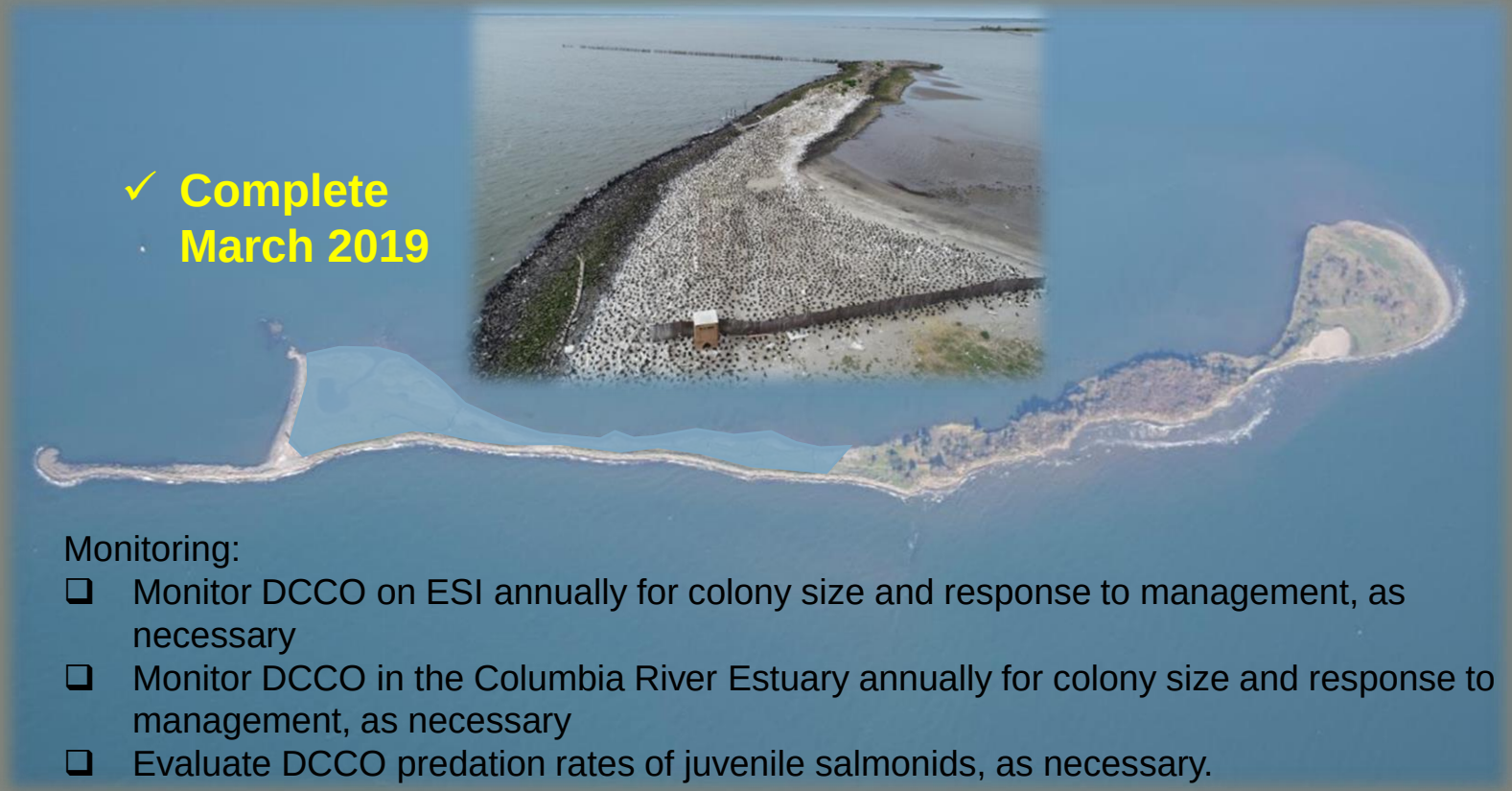
- ❑ Monitor DCCO on ESI annually for colony size and response to management, as necessary
- ❑ Monitor DCCO in the Columbia River Estuary annually for colony size and response to management, as necessary
- ❑ Evaluate DCCO predation rates of juvenile salmonids, as necessary.

The goal of Phase 2 is to transition to lower maintenance, non-lethal techniques and reduce the amount of human presence while ensuring colony size objectives are not exceeded. This would occur through terrain or habitat modification, supplemented with hazing as needed.

Modification would occur through the excavation of sand to an elevation that would be inundated at least once per week during the peak nesting season (April 1-July 15) and to a water depth of 6 inches to 1 foot to preclude nesting attempts.



CORMORANT MANAGEMENT PLAN – PHASE 2



✓ **Complete March 2019**

Monitoring:

- ❑ Monitor DCCO on ESI annually for colony size and response to management, as necessary
- ❑ Monitor DCCO in the Columbia River Estuary annually for colony size and response to management, as necessary
- ❑ Evaluate DCCO predation rates of juvenile salmonids, as necessary.

The goal of Phase 2 is to transition to lower maintenance, non-lethal techniques and reduce the amount of human presence while ensuring colony size objectives are not exceeded. This would occur through terrain or habitat modification, supplemented with hazing as needed.

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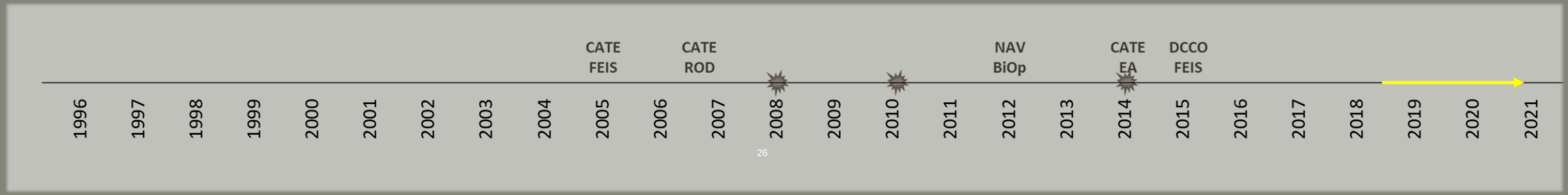
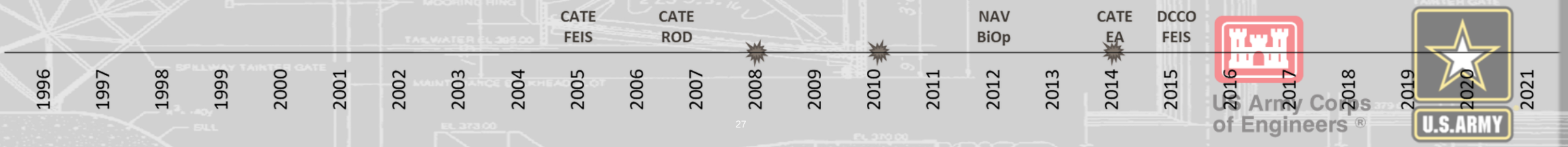


ONGOING ACTIONS - TERNS

- Corps will continue to discourage any avian predators that are found nesting at an upland disposal site (Rice Island and others as needed) per term and condition 1k of the 2012 BiOp for the operations and maintenance of the federal navigation channel
- On East Sand Island, Corps will continue to maintain no less than 1.04 acres of habitat annually to support approximately 3,125 to 4,375 breeding pairs and prevent terns from nesting outside the designated habitat
- Corps will transfer ownership of alternate nesting sites to refuge landowners.



ONGOING ACTIONS - CORMORANTS

- Corps will continue to discourage any avian predators that are found nesting at an upland disposal site (Rice Island and others as needed) per term and condition 1k of the 2012 BiOp for the operations and maintenance of the federal navigation channel

- Phase 2 monitoring

(considered complete when the 3 year average population does not exceed the FEIS objective of no more than 5,380 to 5,939 nesting pairs on East Sand Island)

  - Monitor DCCO on ESI annually for colony size and response to management, as necessary
  - Monitor DCCO in the Columbia River Estuary annually for colony size and response to management, as necessary
  - Evaluate DCCO predation rates of juvenile salmonids, as necessary

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
									CATE FEIS		CATE ROD					NAV BiOp		CATE EA	DCCO FEIS						

CONCLUSION - TERNS

Good News

Significant decrease in predation impacts from terns nesting in the Columbia River Estuary

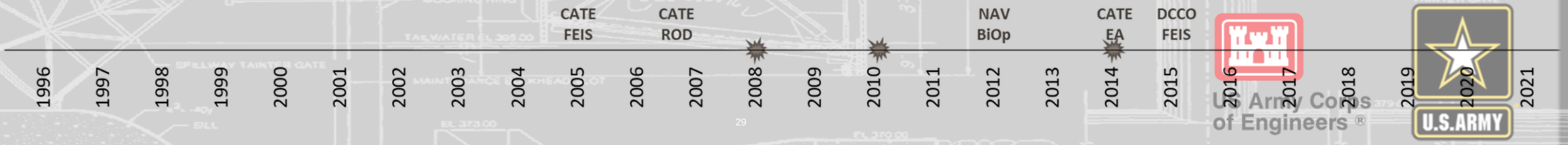
Caspian Tern Management Plan 2007-2018

- ✓ Prevent tern nesting in the upper estuary and on ESI outside the designated nesting area
  - ✓ Will continue indefinitely at Rice Island (2012 Navigation BiOp)
  - ✓ Will continue indefinitely at East Sand Island as necessary to maintain designated colony area
- ✓ Create/enhance habitat at alternate sites
  - ✓ 8 acres of alternate habitat constructed
  - ✓ Supported 1,600 nesting tern pairs in 2018
- ✓ Reduce available habitat on ESI to support approximately 3,125 to 4,375 breeding pairs
  - ✓ Available habitat ultimately reduced to 1 acre
  - ✓ Maintenance of habitat on East Sand Island will continue indefinitely

Bad News

Predation impacts from non-nesting terns in the upper estuary

- Thousands of terns roosting but prevented from nesting on Rice Island
  - May offset predation gains made at ESI to some degree
  - Predation rates currently unknown, being analyzed in 2019
  - Continue to prevent nesting and hope continued lack of reproductive success causes them to go elsewhere
  - Limited authority



CONCLUSION - CORMORANTS

Good News

Significant decrease in predation impacts from cormorants nesting on East Sand Island

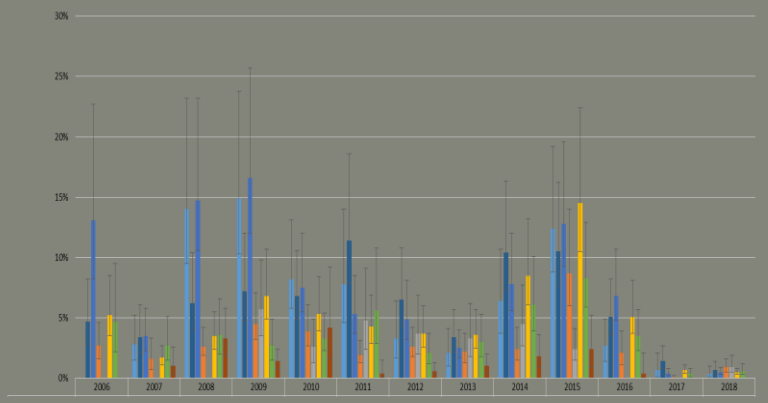
Double-crested Cormorant Management Plan 2015-present

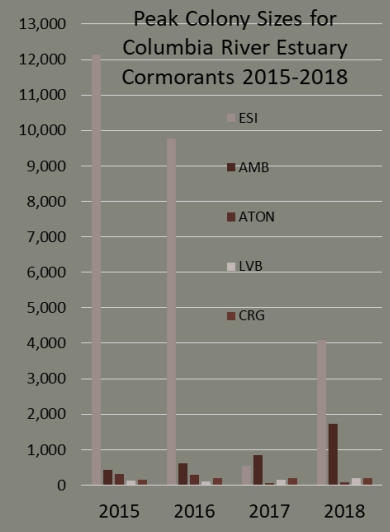
- ✓ PHASE 1: 4-year lethal strategy to achieve a colony size of 5,380–5,939 breeding pairs
  - ✓ Much less lethal than expected
  - ✓ Colony size objective achieved in the 3rd year
- ✓ PHASE 2: Terrain modification and/or other habitat management supplemented with hazing as necessary
  - ✓ Terrain modification completed before 2019 nesting season
  - ❑ Considered complete when the 3 year average population does not exceed the FEIS objective of no more than 5,380 to 5,939 nesting pairs on East Sand Island

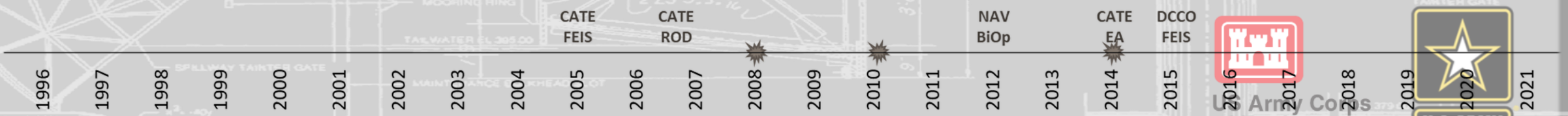
Bad News

Predation impacts from other cormorant colonies in the estuary

- Not all cormorants nest on Corps-managed lands in the estuary
  - May offset predation gains made at ESI to some degree
  - Predation rates currently unknown, being analyzed in 2019
  - Astoria-Meglar Bridge of particular regional concern
  - Limited authority







CORPS' AVIAN PREDATION MANAGEMENT IN THE COLUMBIA RIVER ESTUARY

QUESTIONS?

Jacob Macdonald
U.S. Army Corps of Engineers, Portland District
Presented at: 2021 AFEP Annual Review
January 12, 2022

US Army Corps of Engineers ®

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