

# CORPS' AVIAN PREDATION MANAGEMENT IN THE COLUMBIA RIVER BASIN



Mike Langeslay  
U.S. Army Corps of Engineers, Northwestern Division  
November 19, 2019

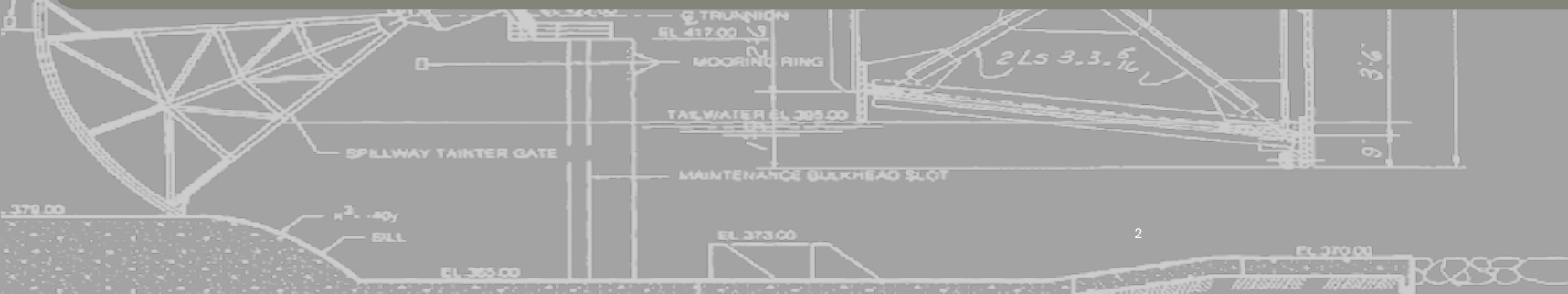


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# PRESENTATION OUTLINE

1. Authority and Funding
2. Three Management Plans:
  - a. Estuary Caspian Terns
  - b. Estuary Cormorants
  - c. Inland Caspian Terns
3. Avian predator deterrence at dams
4. Challenges



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# AUTHORITY

## Water Resources Development Act (WRDA) 1996, Section 511(c)

- Management of Avian Predators – management actions to reduce avian predation of endangered salmon at Corps dredge spoil islands in the Columbia River.
- Research and Development of Avian Predators – capped at \$10,000,000

**Original Project Authorities** – 1933 Federal Emergency Administration of Public Works; 1935, 1945 and 1950 River and Harbor Acts; 1937 Bonneville Project Act; 1938, 1948, 1950 and 1954 Flood Control Acts

- Fish and wildlife conservation – provides authority to protect fish and wildlife at Corps dams.





# FUNDING

- Columbia River Fish Mitigation Program
  - Annual appropriations for construction projects;
  - Initially 100% appropriated however power share repaid to treasury by BPA over the life of the asset once the asset is placed in service;
- Operation and Maintenance
  - Long-term funding for operation and maintenance of constructed assets.
  - Combination of appropriated and power dollars from BPA;
  - Power share paid directly by BPA through Direct Funding Agreement;

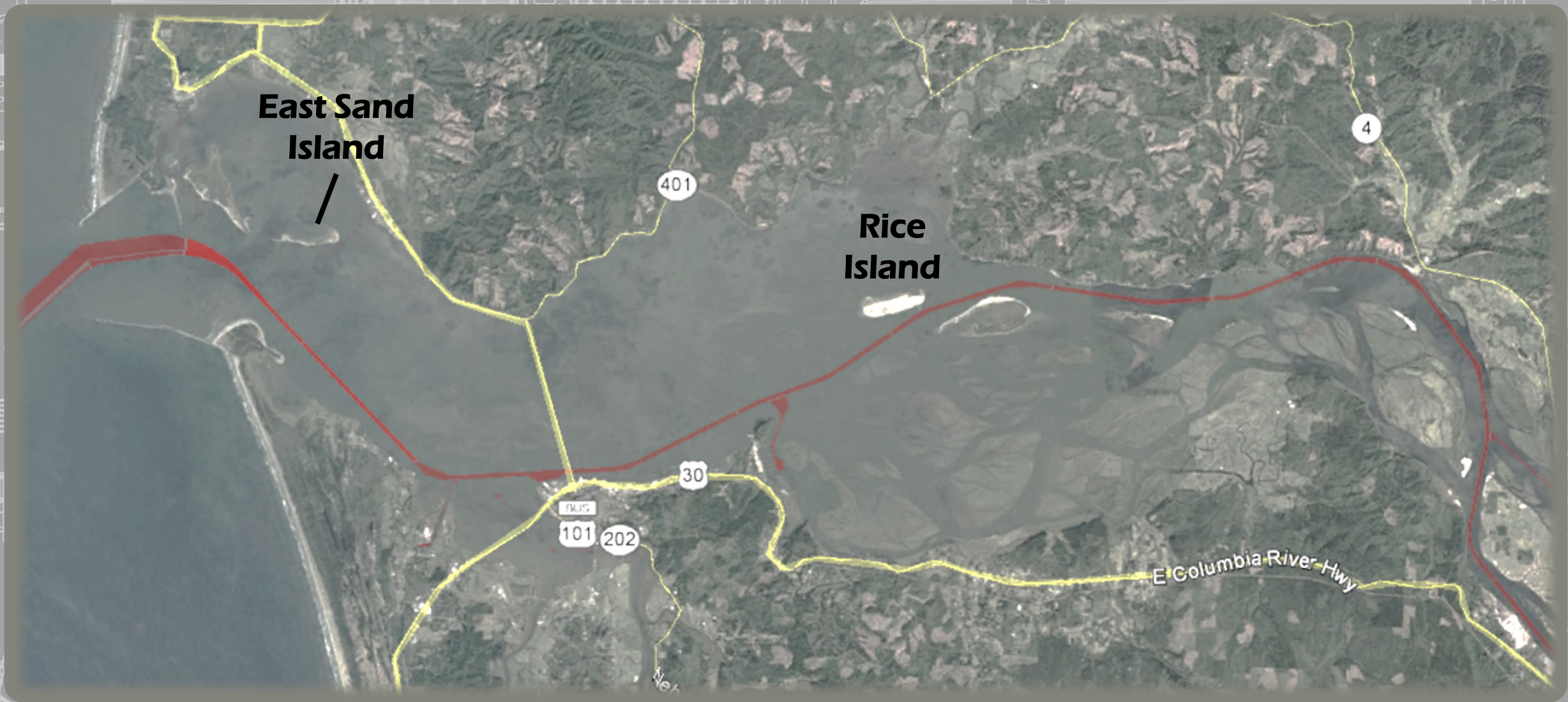


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NOTE:  
TANKER GATE





# COLUMBIA RIVER ESTUARY



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NOTE:  
TAMTER GATE



# 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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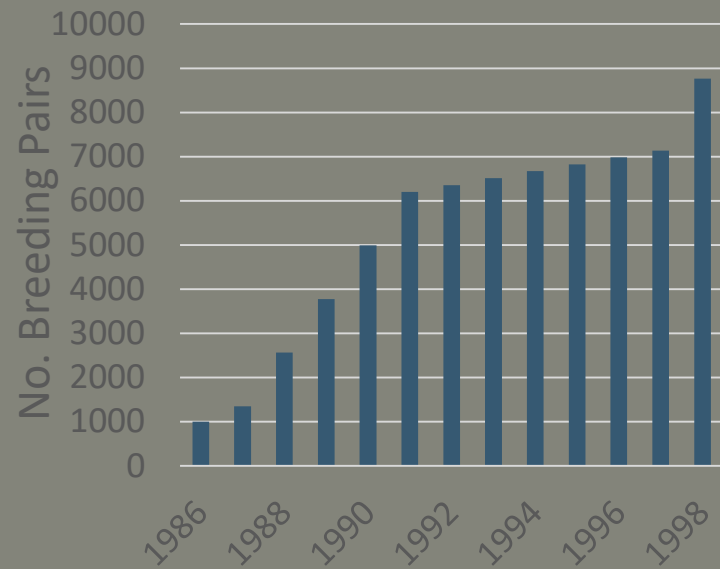


U.S. ARMY

NOTE:  
TAMPER GATE

# 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



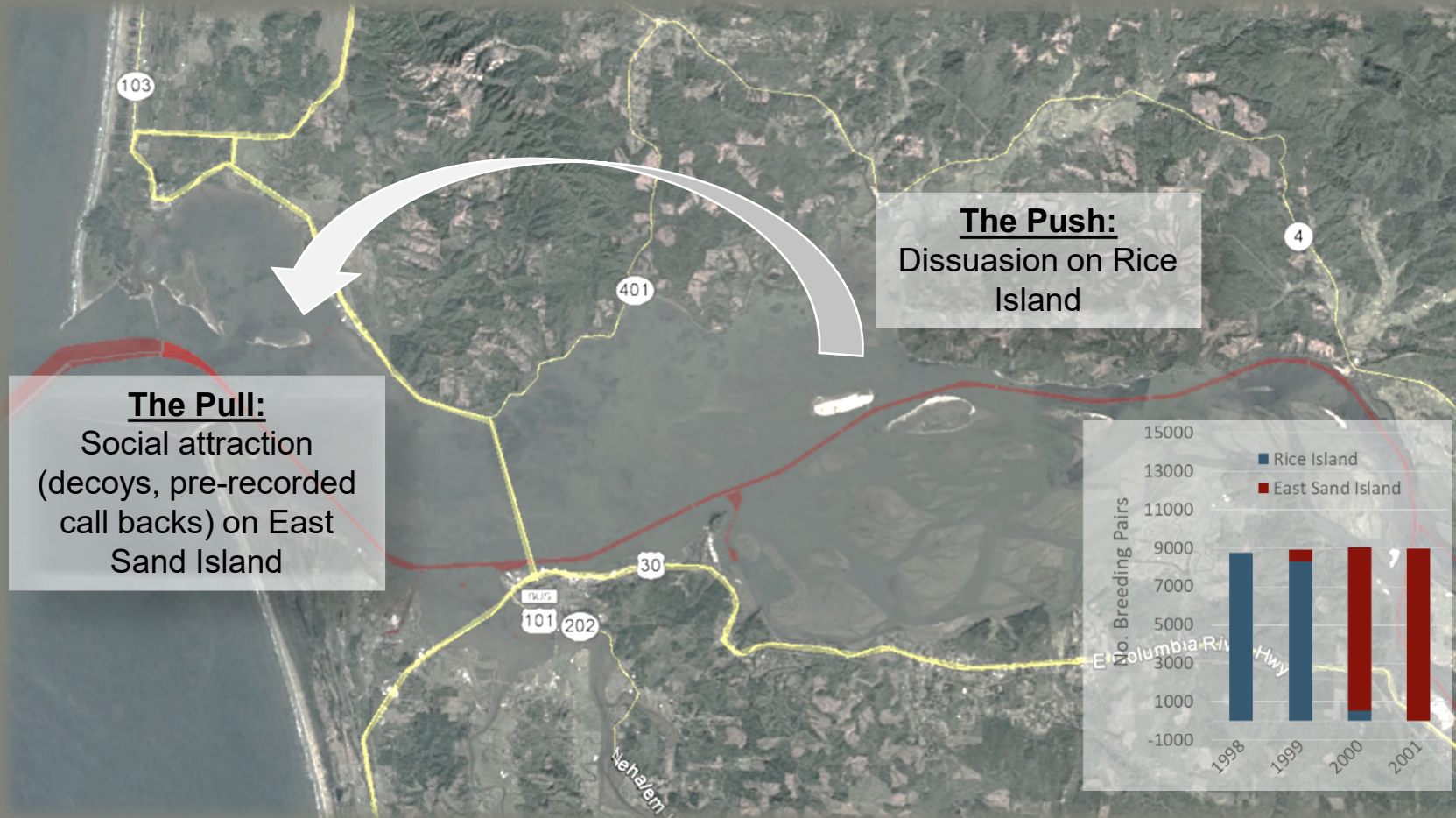
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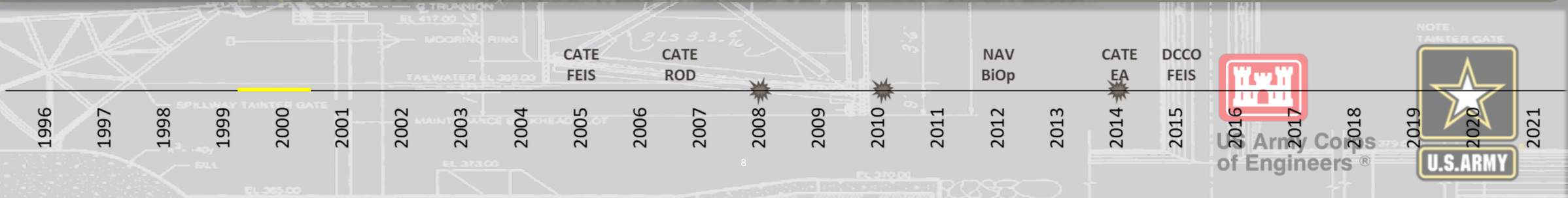
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# CASPIAN TERN RELOCATION 1999-2000



- 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.





# CASPIAN TERN MANAGEMENT PLAN

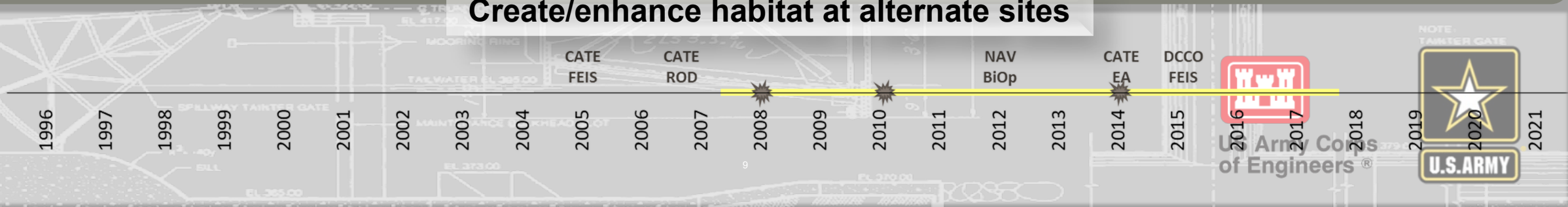
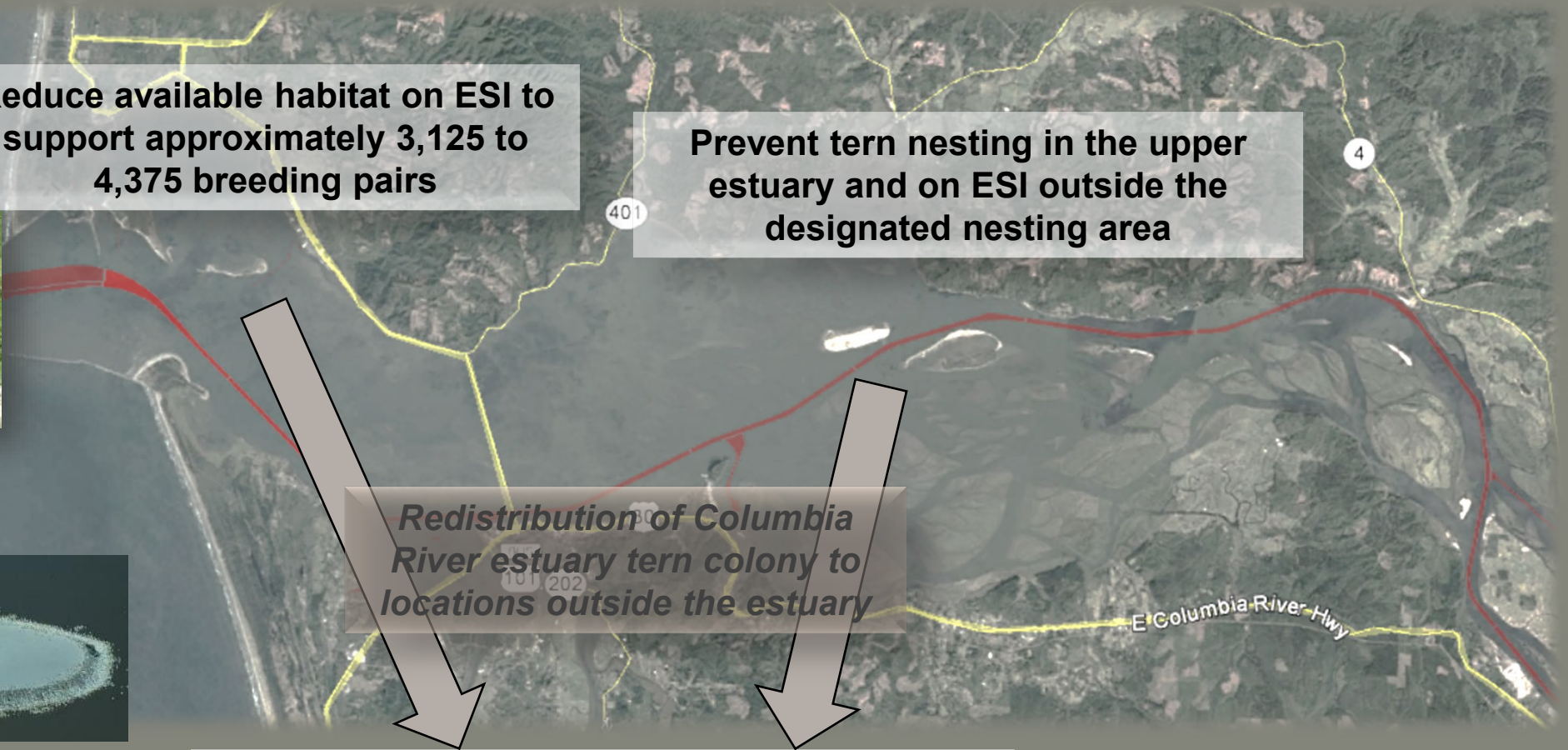


Reduce available habitat on ESI to support approximately 3,125 to 4,375 breeding pairs



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

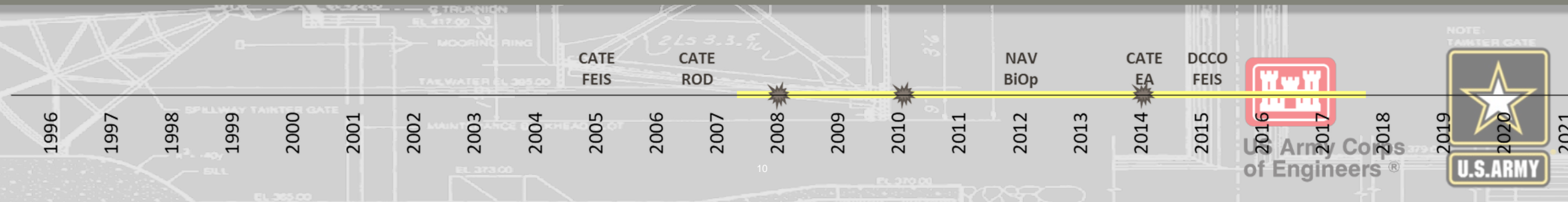


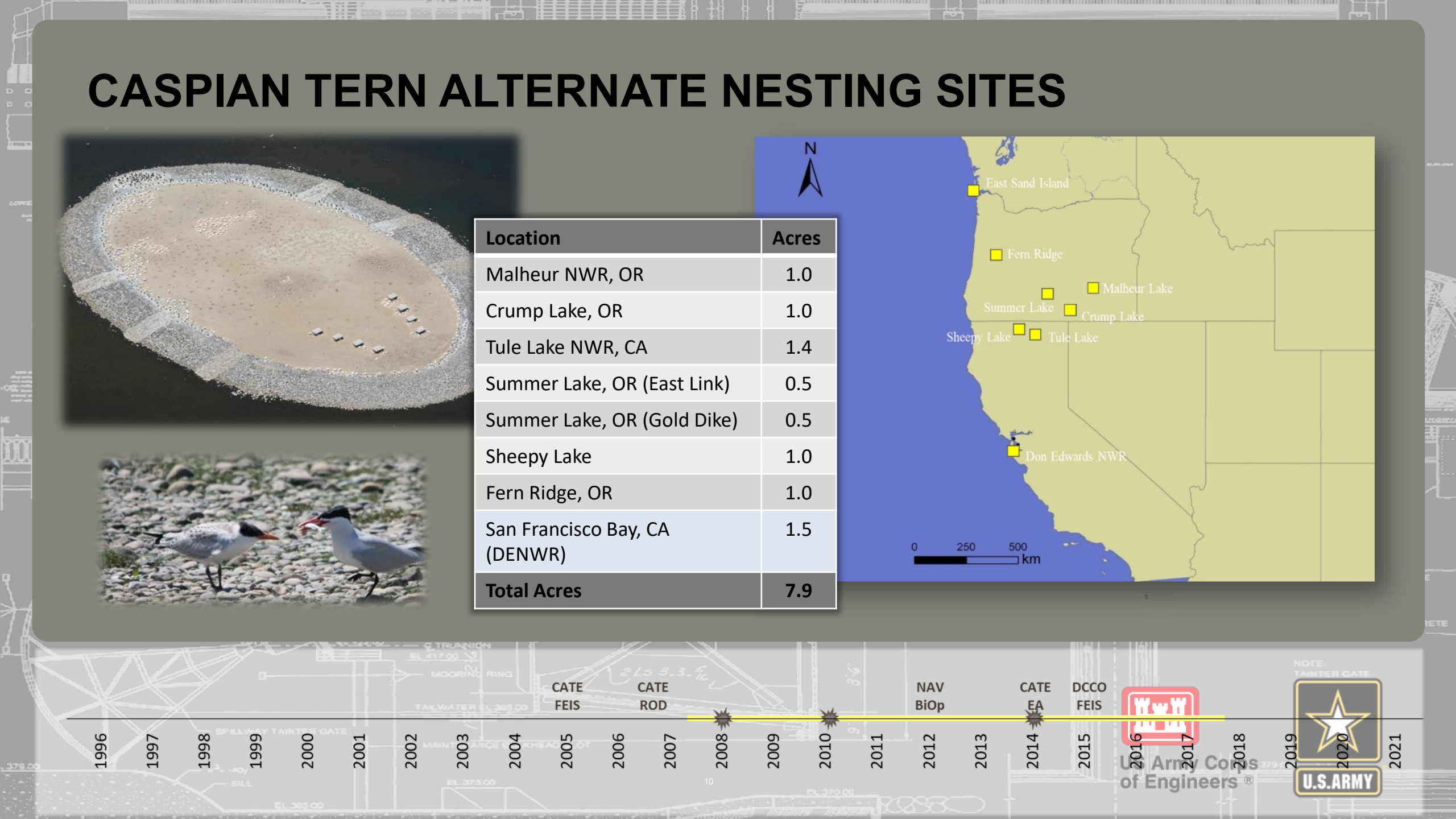
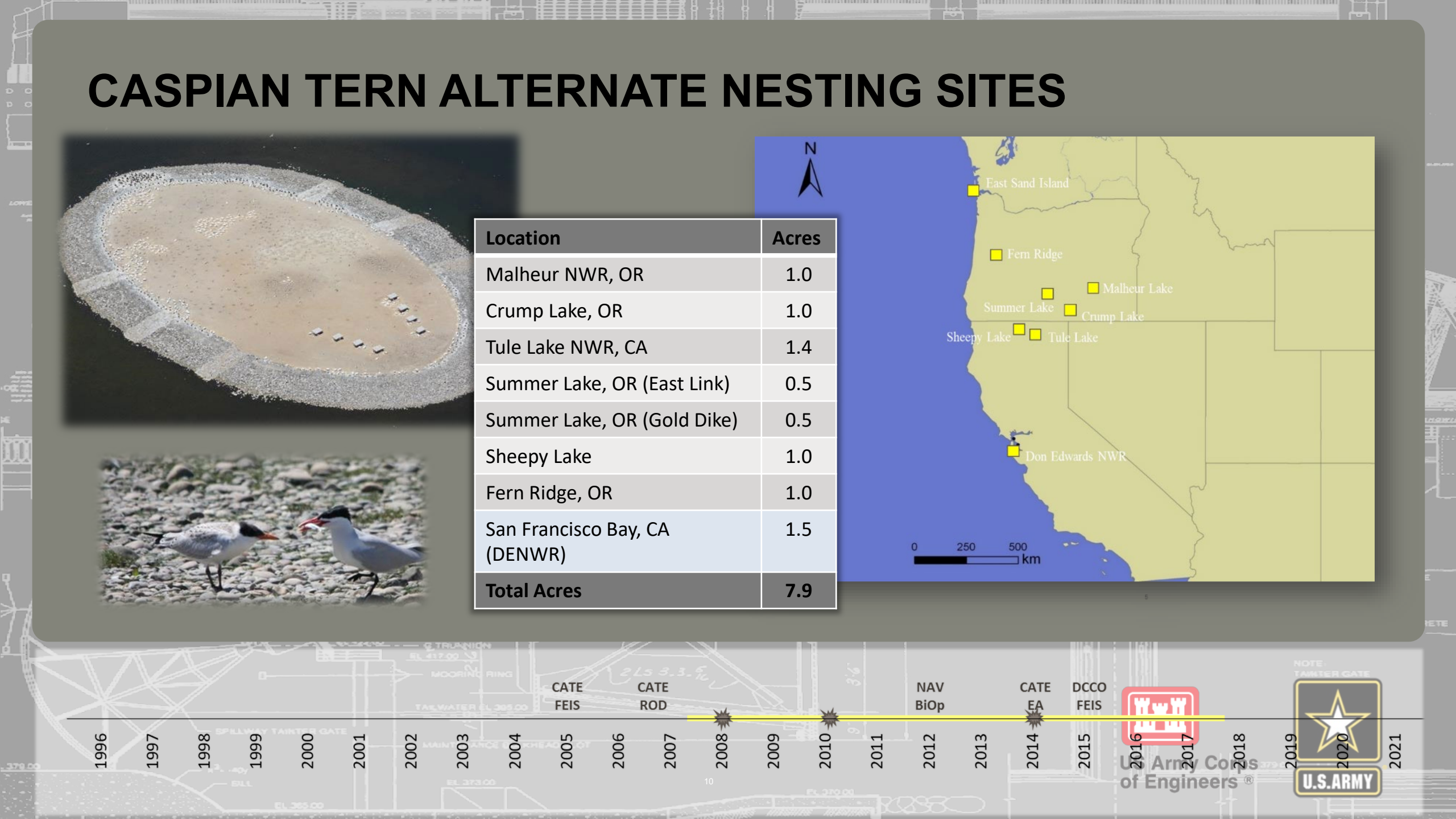
# CASPIAN TERN ALTERNATE NESTING SITES





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 Francisco Bay, CA (DENWR)	1.5
<b>Total Acres</b>	<b>7.9</b>






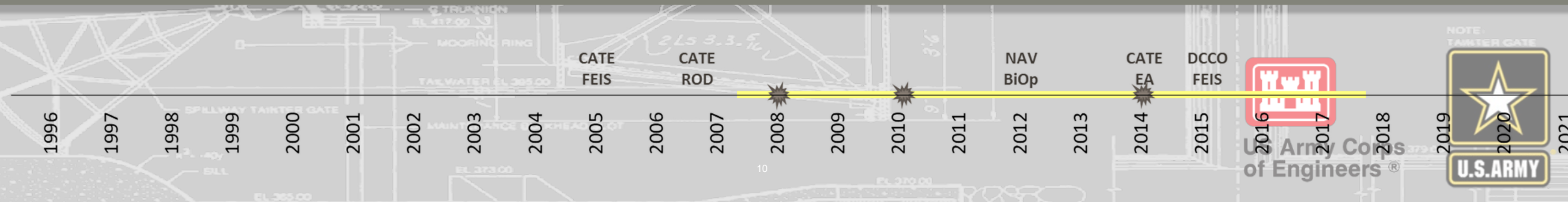


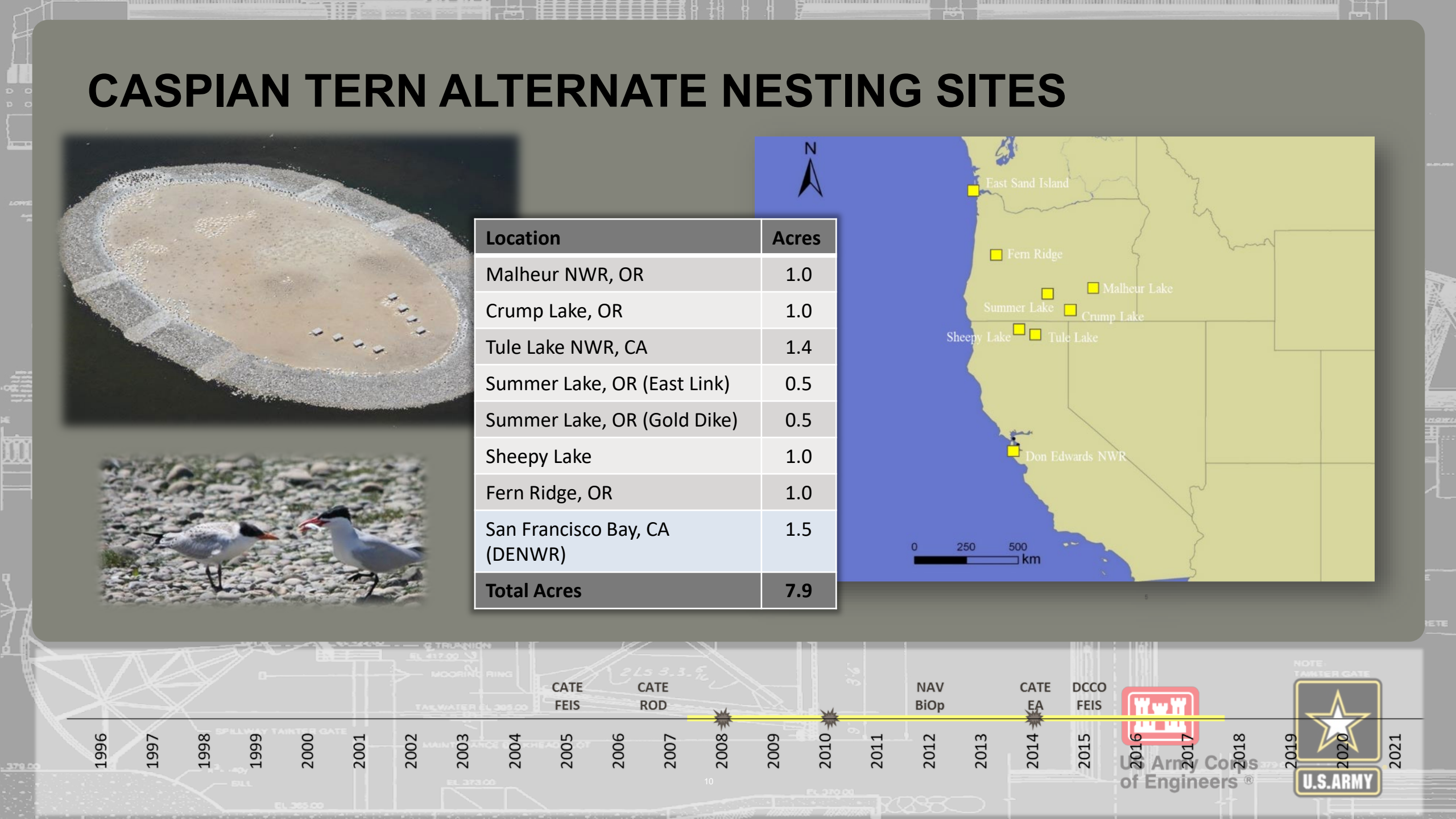
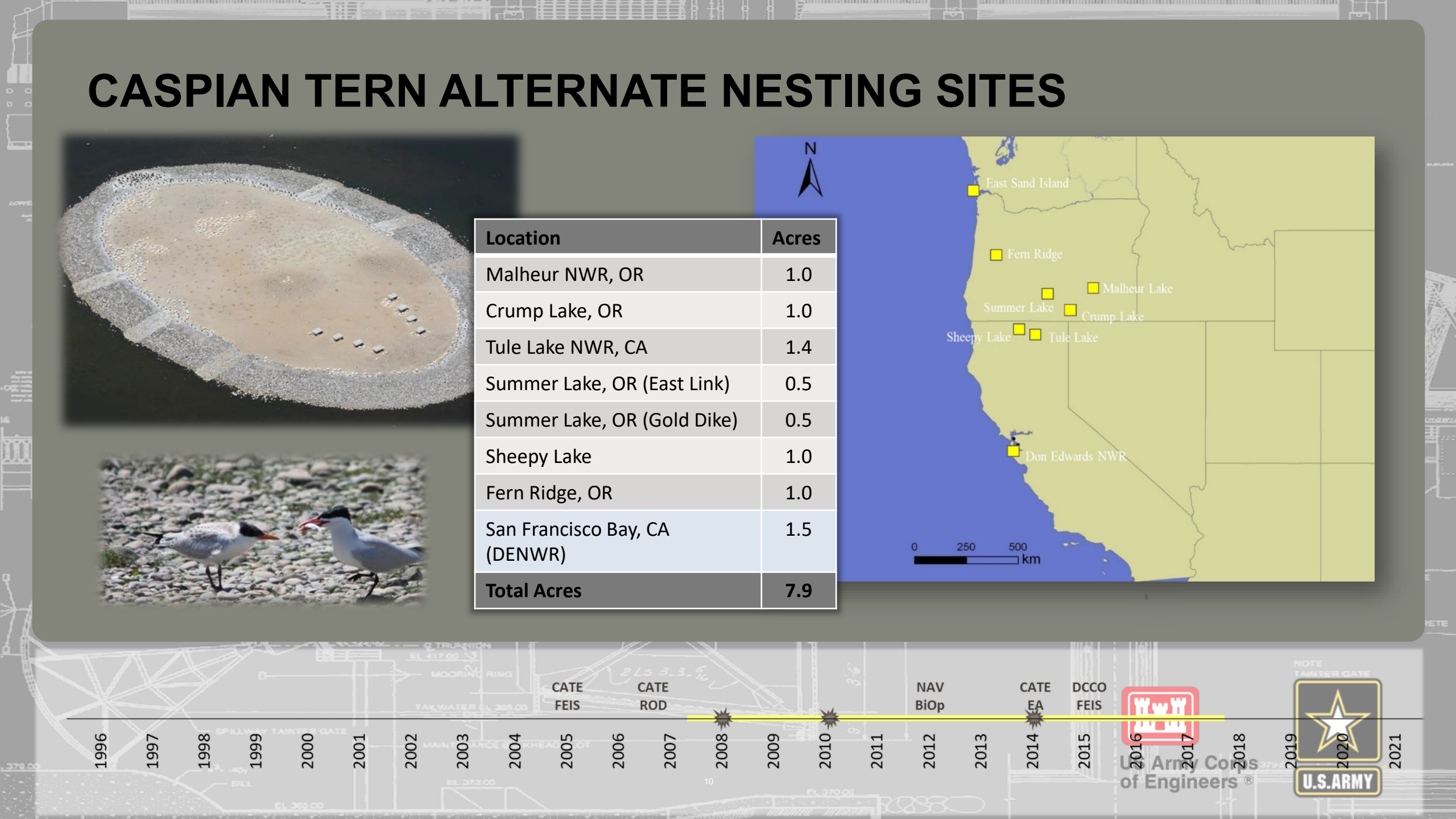
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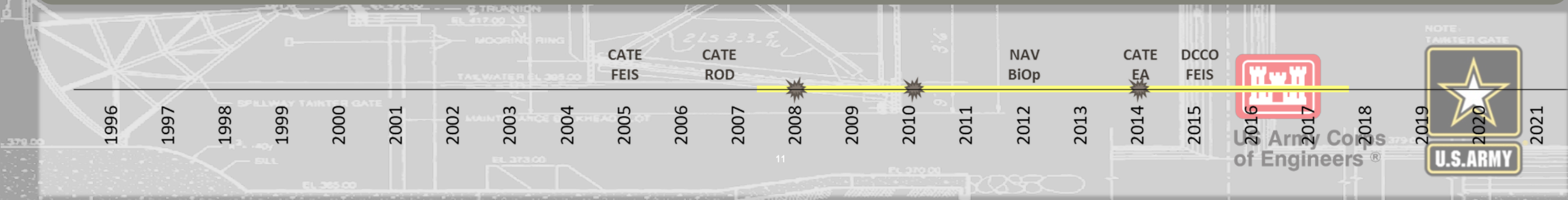
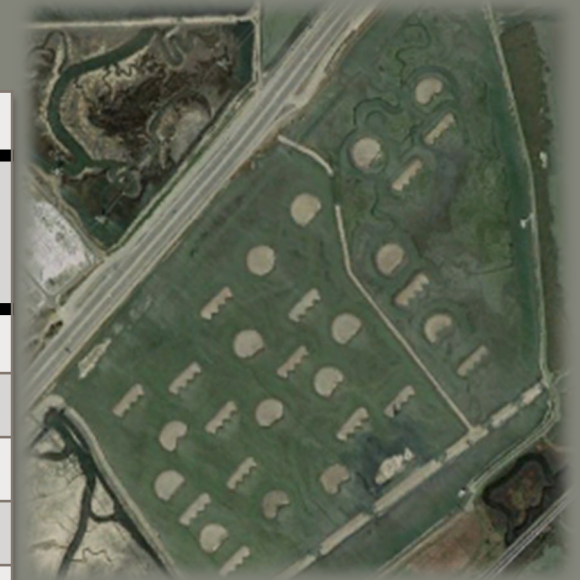




# CASPIAN TERN ALTERNATE NESTING SITES

- ❑ 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
<b>Total Pairs</b>		<b>1,608</b>



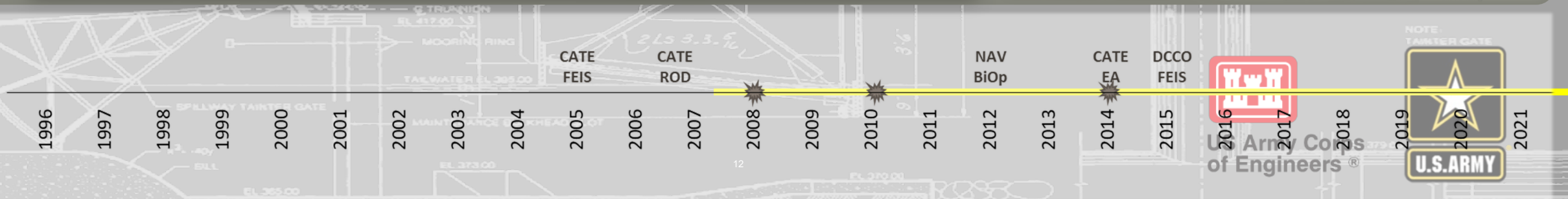
# PREVENTING TERN NESTING



Passive dissuasion and active hazing annually on:

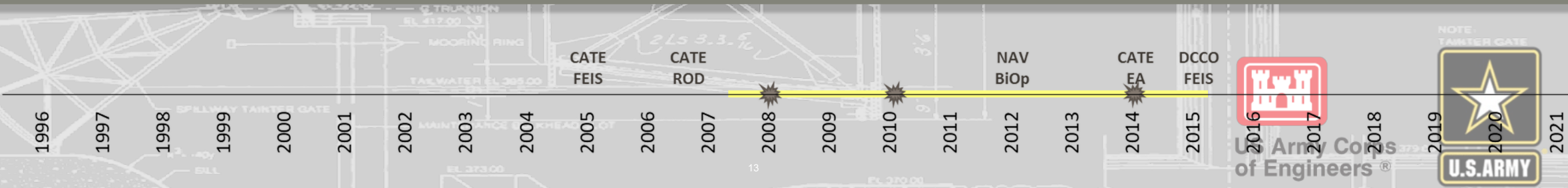
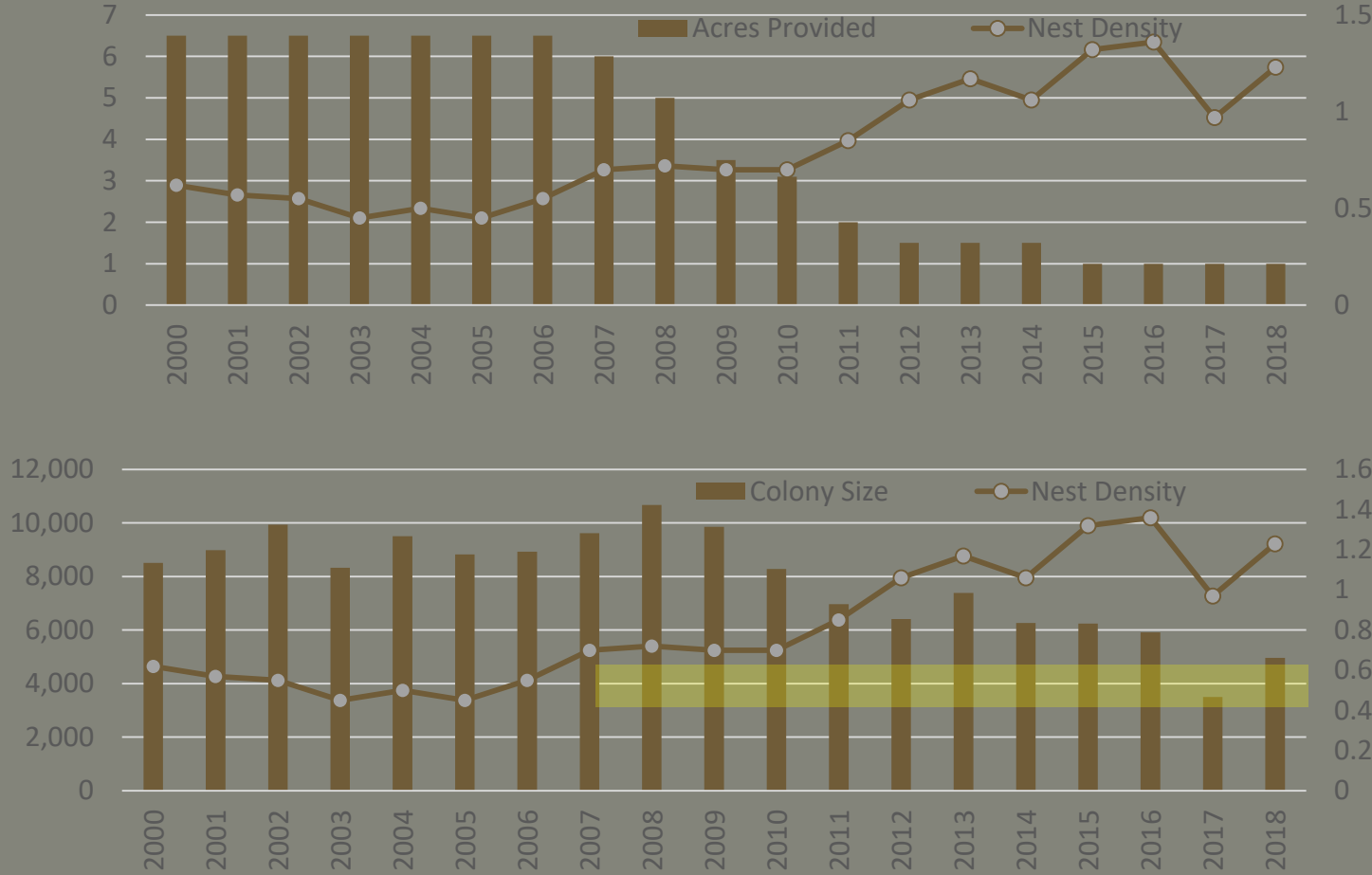
- ☐ East Sand Island to prevent terns from nesting outside the designated colony area
  - ☐ Some level of hazing and dissuasion at East Sand Island is likely necessary into the future to minimize the likelihood that terns may establish colonies outside of the maintained 1-acre colony area
- ☐ Rice Island 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 nesting at an upland disposal site, consistent with the Migratory Bird Act** in an attempt to decrease predation of out-migrating juvenile salmonids.



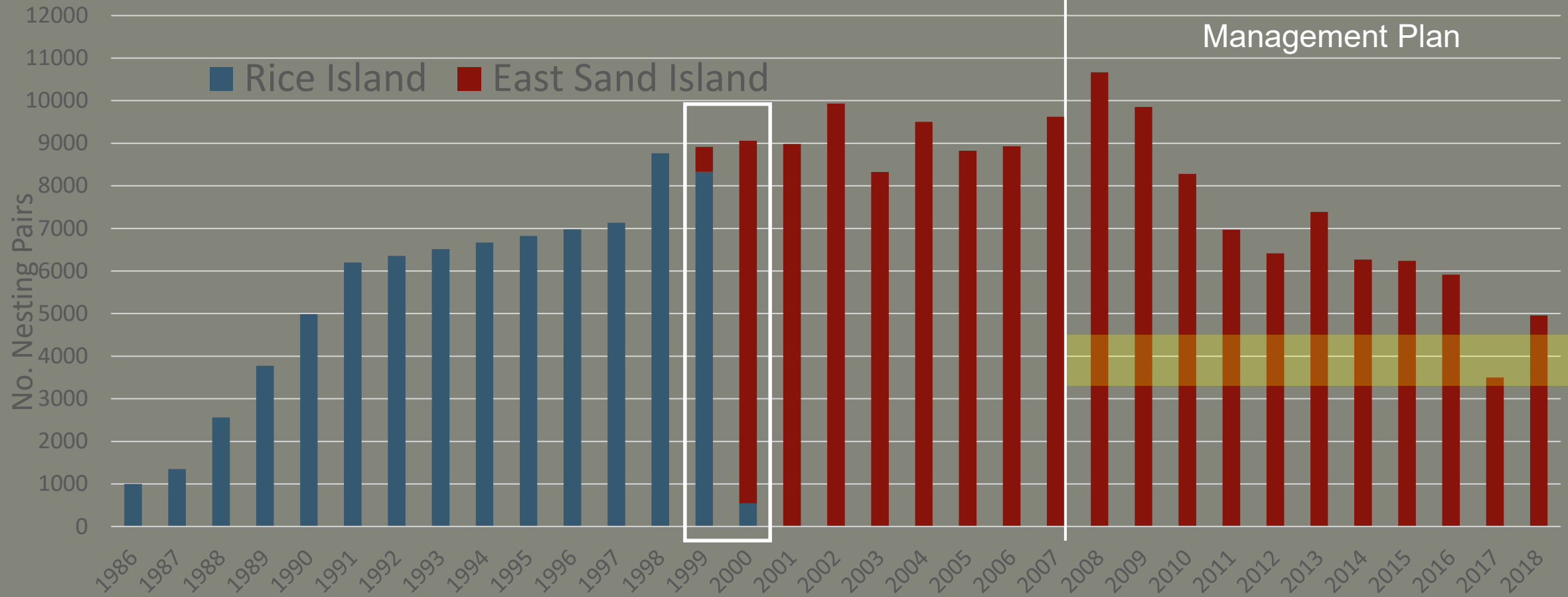


# EAST SAND ISLAND HABITAT REDUCTION

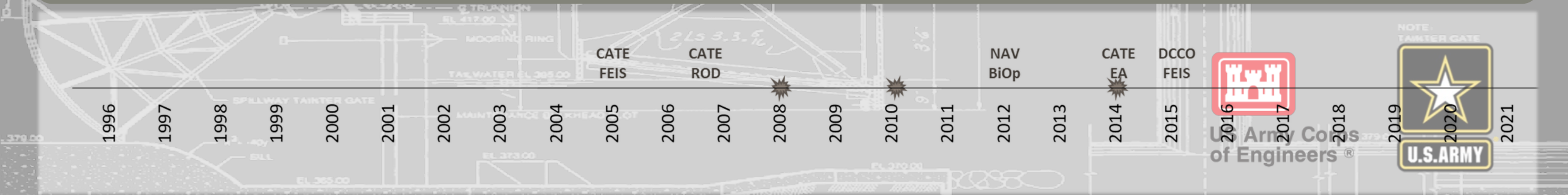




# ESTUARY TERNS NESTING POPULATION

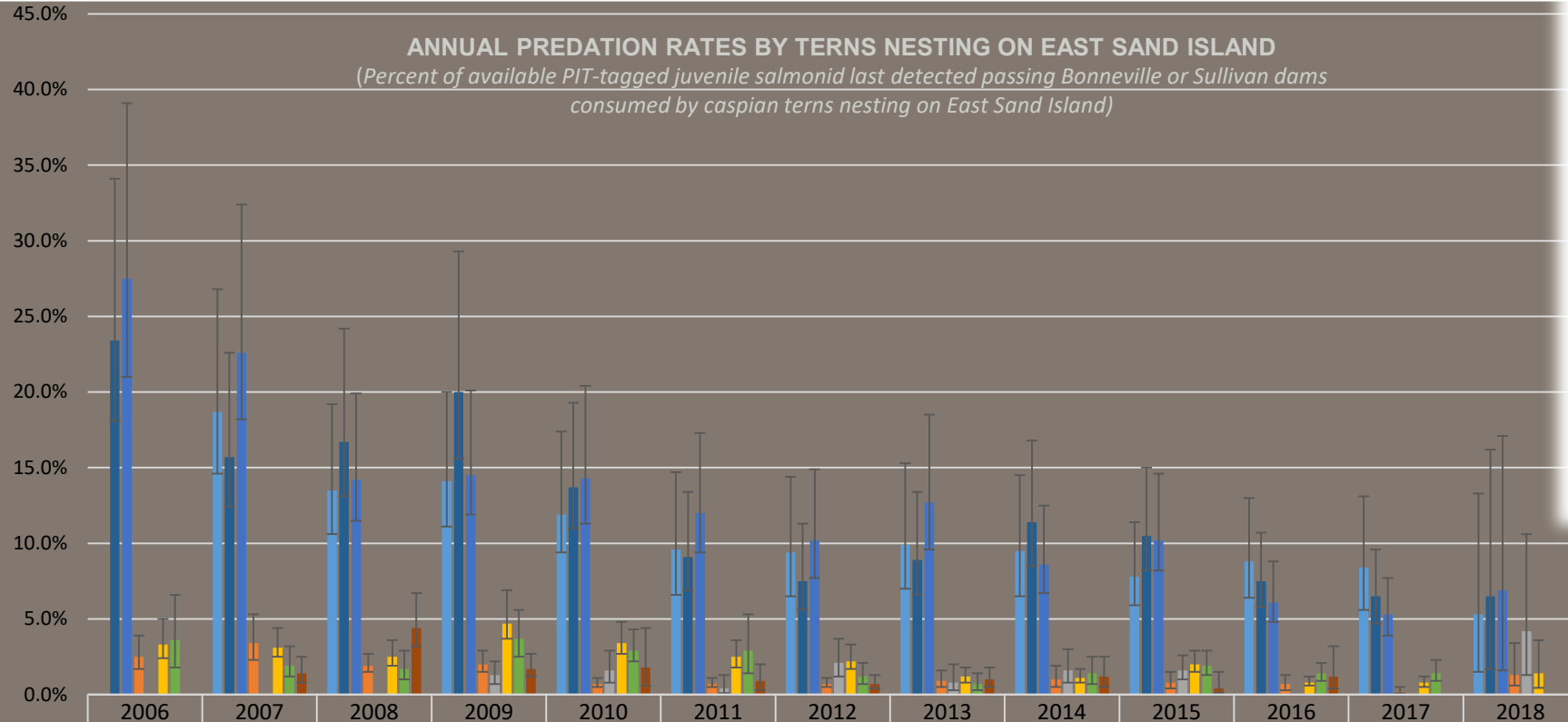


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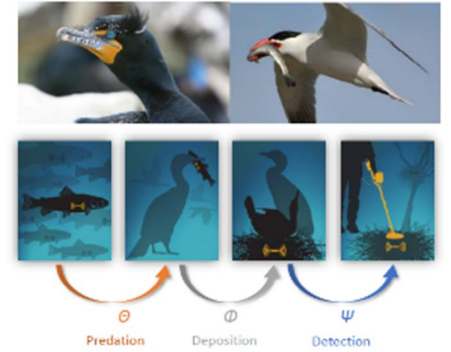
# ESI TERN PREDATION RATES

**ANNUAL PREDATION RATES BY TERNS NESTING ON EAST SAND ISLAND**  
(Percent of available PIT-tagged juvenile salmonid last detected passing Bonneville or Sullivan dams consumed by caspian terns nesting on East Sand Island)



	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%		

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



IDIQ Contract No. W912EF-14-D-0004

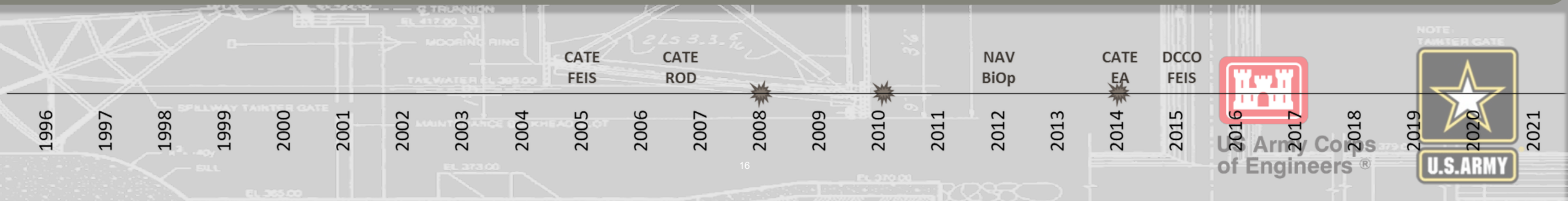
Submitted To: U.S. Army Corps of Engineers – Portland District  
Mr. Jacob Macdonald

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



# ONGOING ACTIONS – ESTUARY TERNS

- ❑ Continue to discourage any avian predators that are found nesting at upland disposal sites
- ❑ On East Sand Island, 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
- ❑ Transfer ownership of alternate nesting sites to refuge landowners.



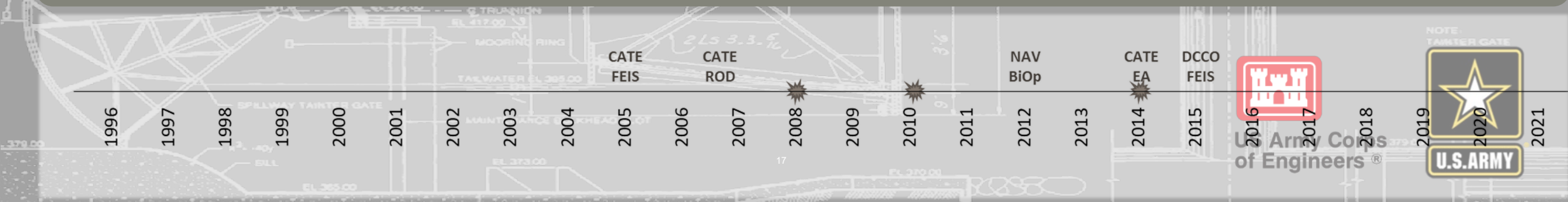
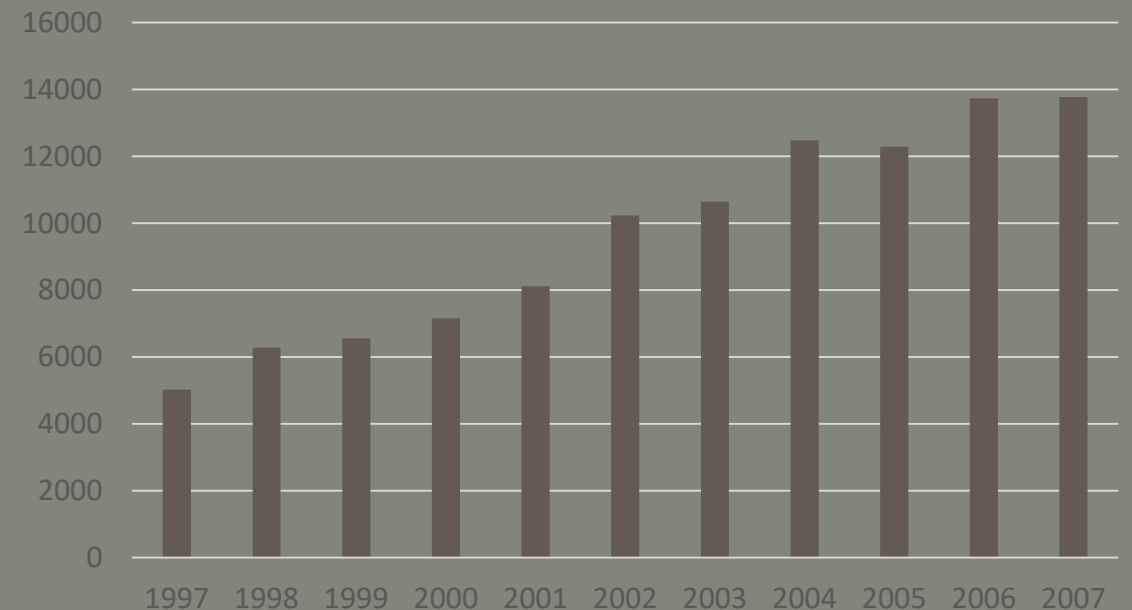


# CORMORANTS ON EAST SAND ISLAND



- ❑ Increasing double-crested cormorant population on East Sand Island leading up to the 2008 BiOp.
- ❑ 2008 (2010, 2014) FCRPS BiOp: required the Corps to develop and implement a management plan to reduce the nesting pairs on East Sand Island to no more than 5380-5939 nesting pairs.
- ❑ The EIS was Finalized and ROD was signed in 2015.

Nesting Pairs



# CORMORANT EIS / MANAGEMENT PLAN

- ❑ PHASE 1: 4-year lethal strategy to achieve a colony size of 5,380–5,939 breeding pairs

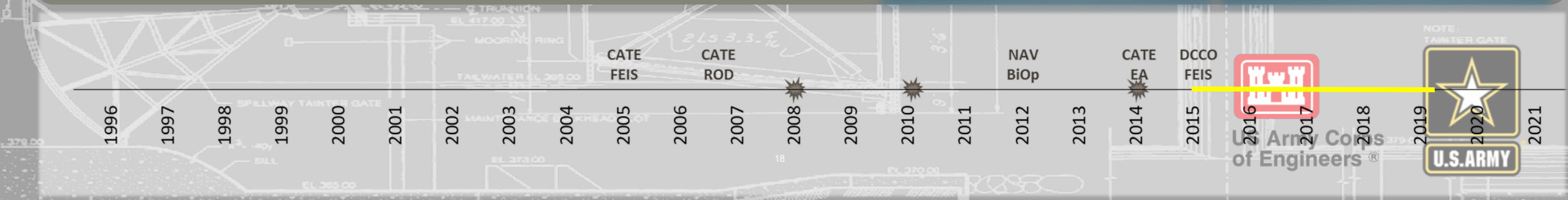
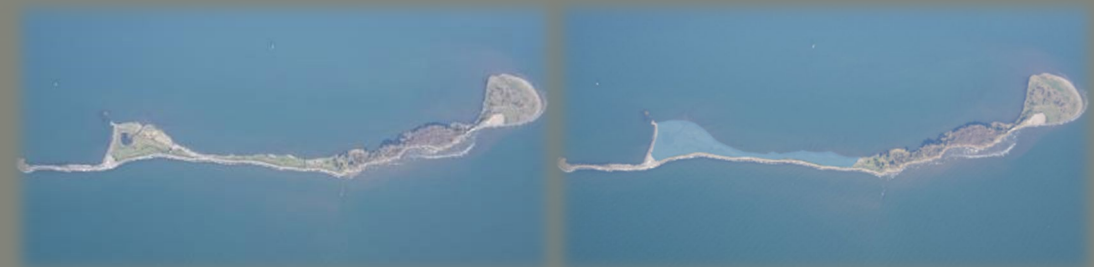
- ❑ PHASE 2: Terrain modification and/or other habitat management supplemented with hazing as necessary

TABLE 5-1. Proposed Annual Take Levels.

Year	# individuals taken <sup>10</sup>	Associated nests lost through culling individuals <sup>11</sup>	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

<sup>10</sup> 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.

<sup>11</sup> "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.

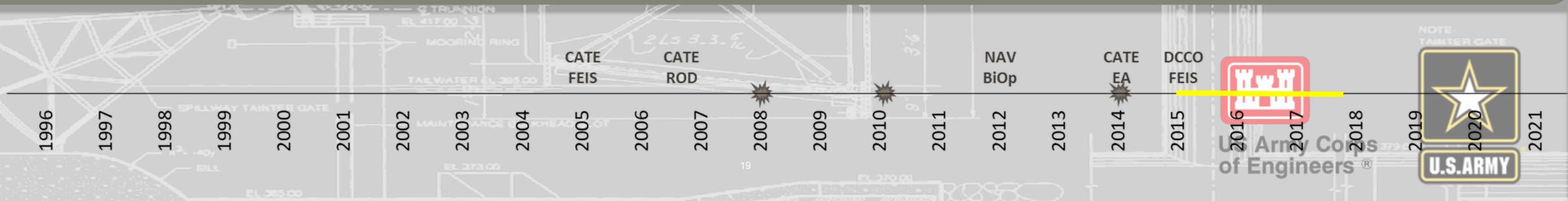




# CORMORANT MANAGEMENT PLAN – PHASE 1

- ❑ When implementation began in 2015, >12,000 double-crested cormorant pairs were nesting throughout the western portion of East Sand Island.
- ❑ By 2018, <4,000 double-crested cormorant pairs were nesting on the westernmost tip of East Sand Island.
- ❑ Take was far lower than predicted in the EIS

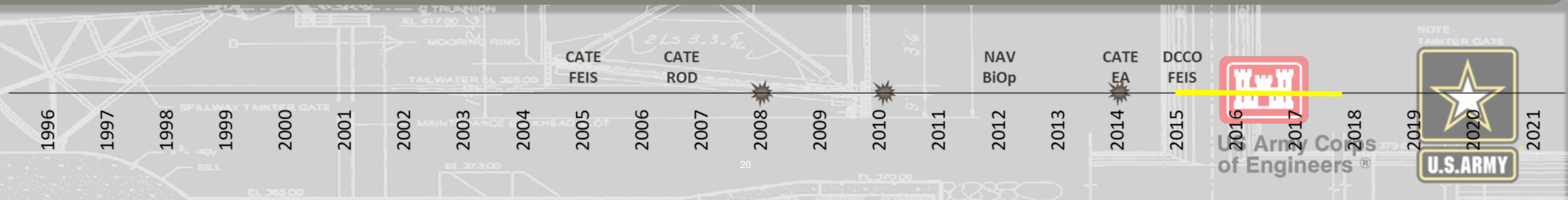
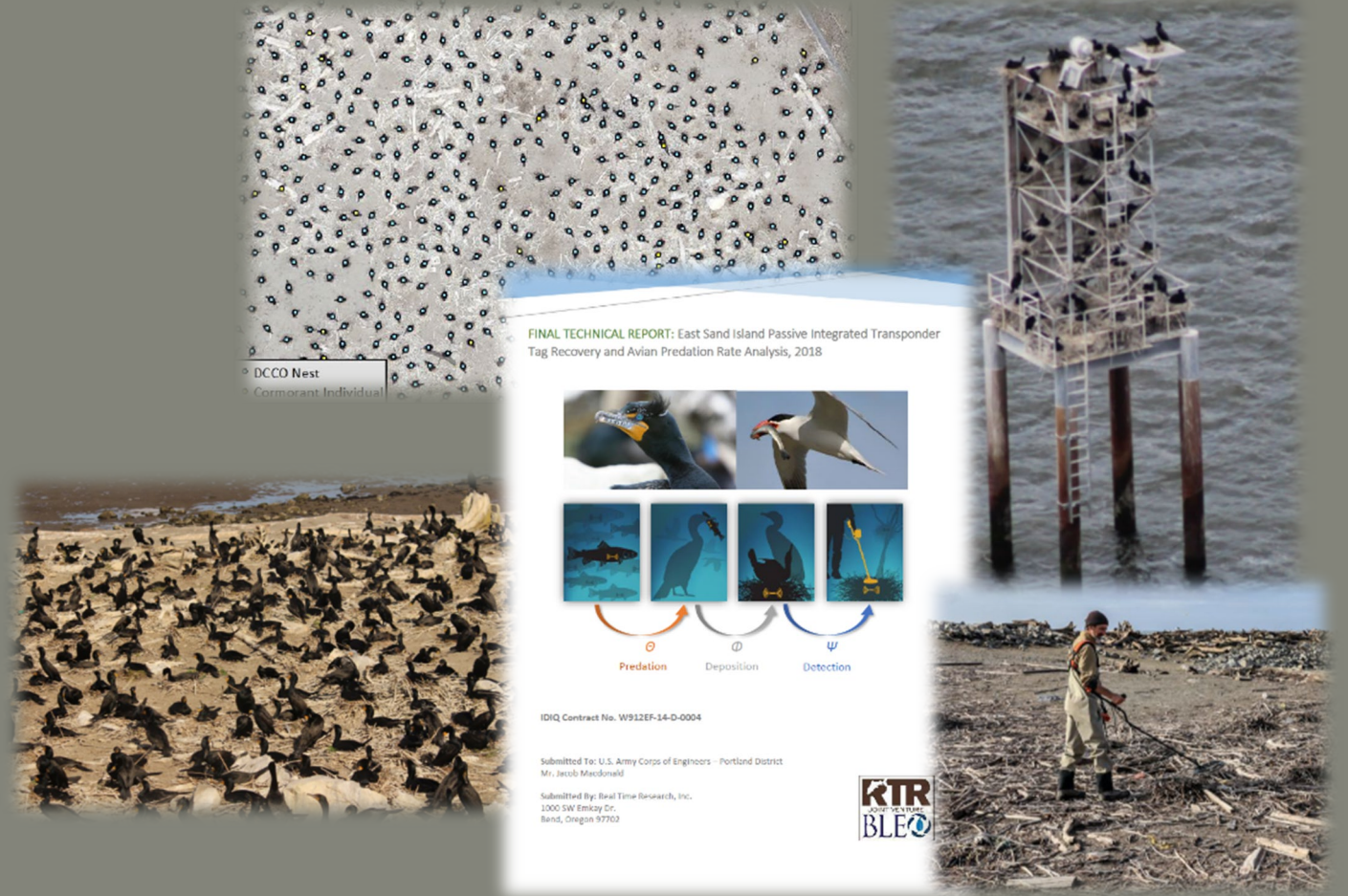
Year	Adult DCCO Culled	DCCO Nests Added
2015	2,346	5,089
2016	2,982	1,092
2017	248	0
2018	0	0
TOTAL	5,576	6,181



# 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

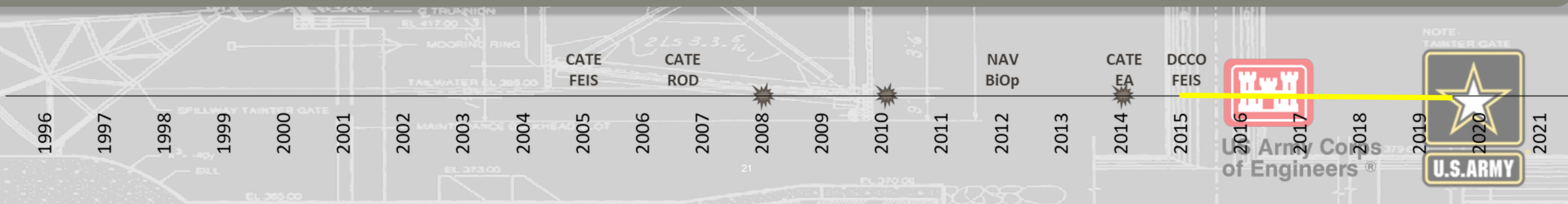




# CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING

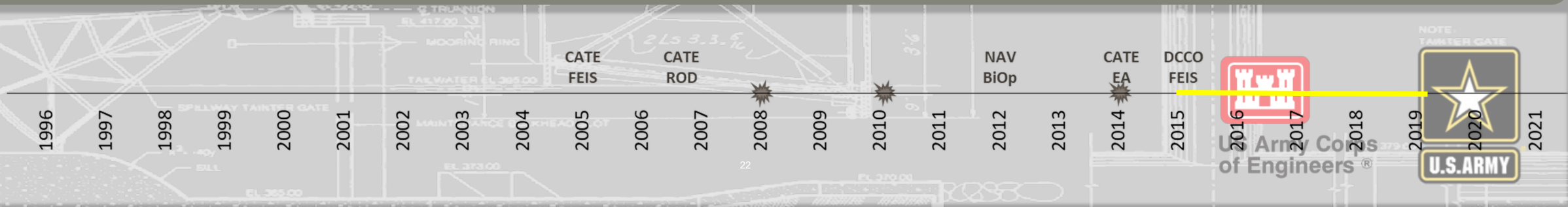
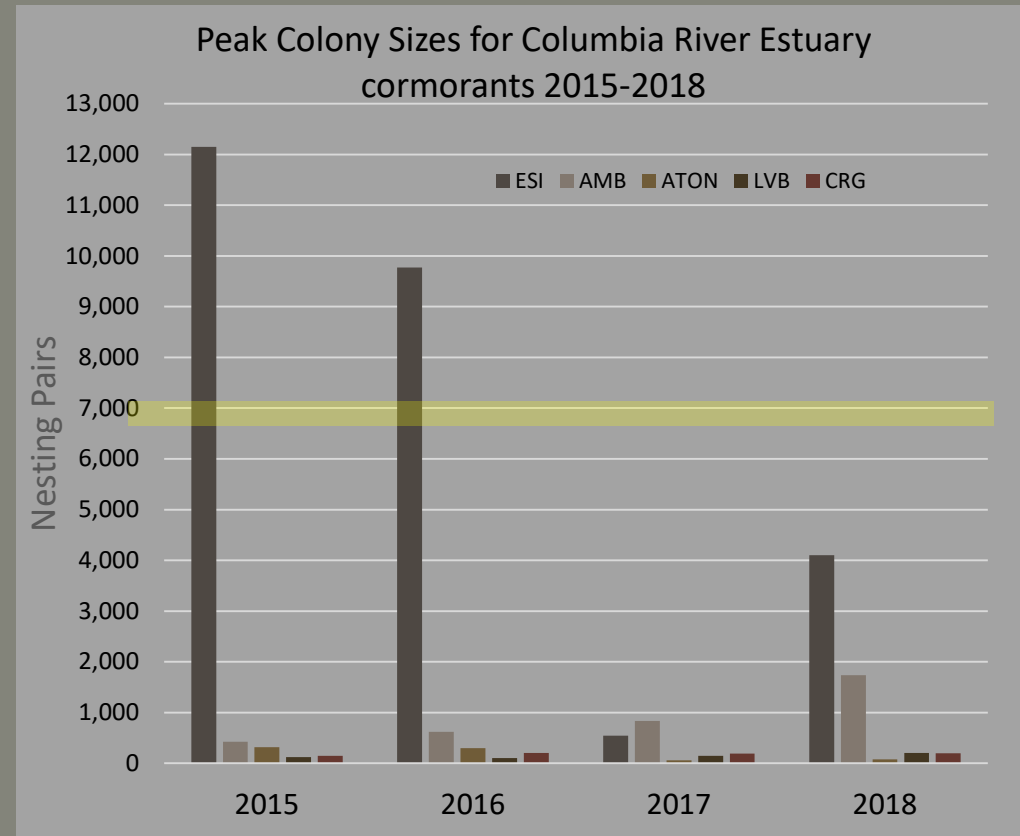
## EAST SAND ISLAND

- ❑ 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 AND ESTUARY

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

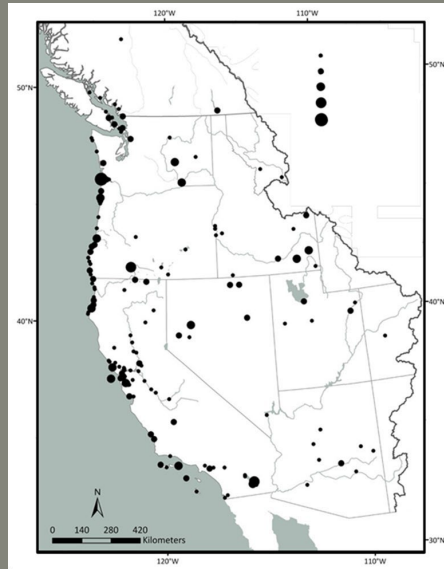




# CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING

## 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*

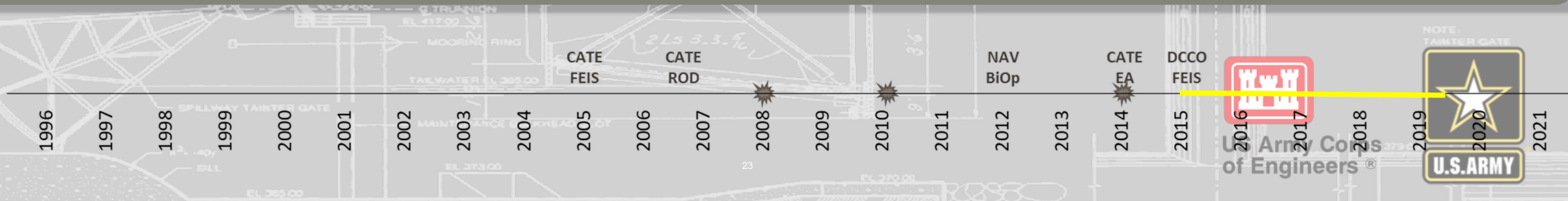
- ❖ The Western Population 2018 estimate is above the predicted abundance after culling for Year 4 of the Management Plan (39,034 breeding individuals vs 39,034 predicted)

		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

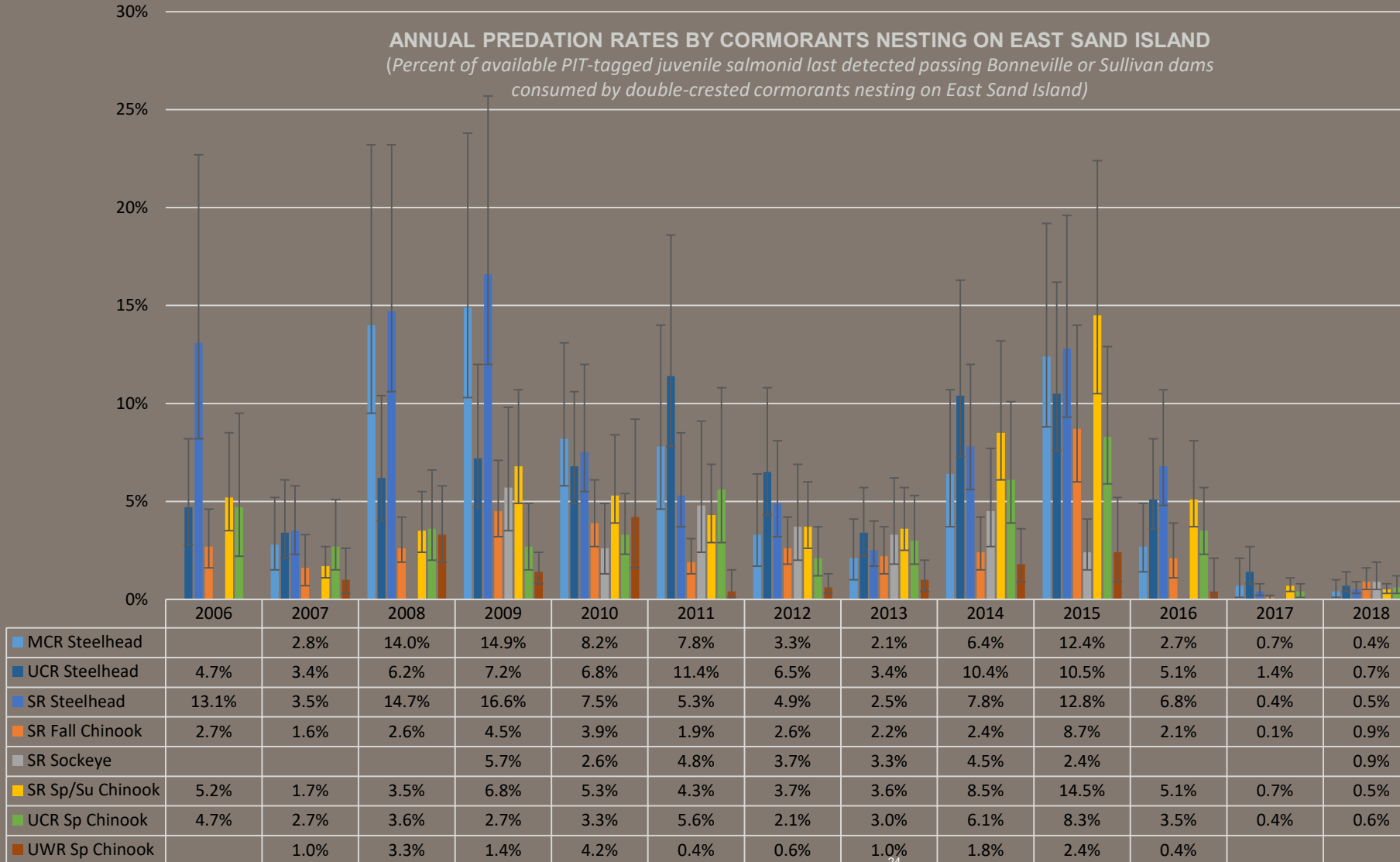
\*Post-culling predicted abundance in year 4 would be after the final year of management (i.e., 4 years of management) and would be used in assessing the following year's likelihood of achieving the reduction in colony size on East Sand Island. Final evaluation of the management action would be based 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.



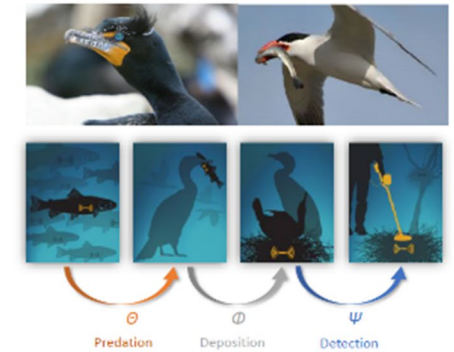
# CORMORANT MANAGEMENT PLAN – PHASE 1 MONITORING

## 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)*



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



IDIQ Contract No. W912EF-14-D-0004

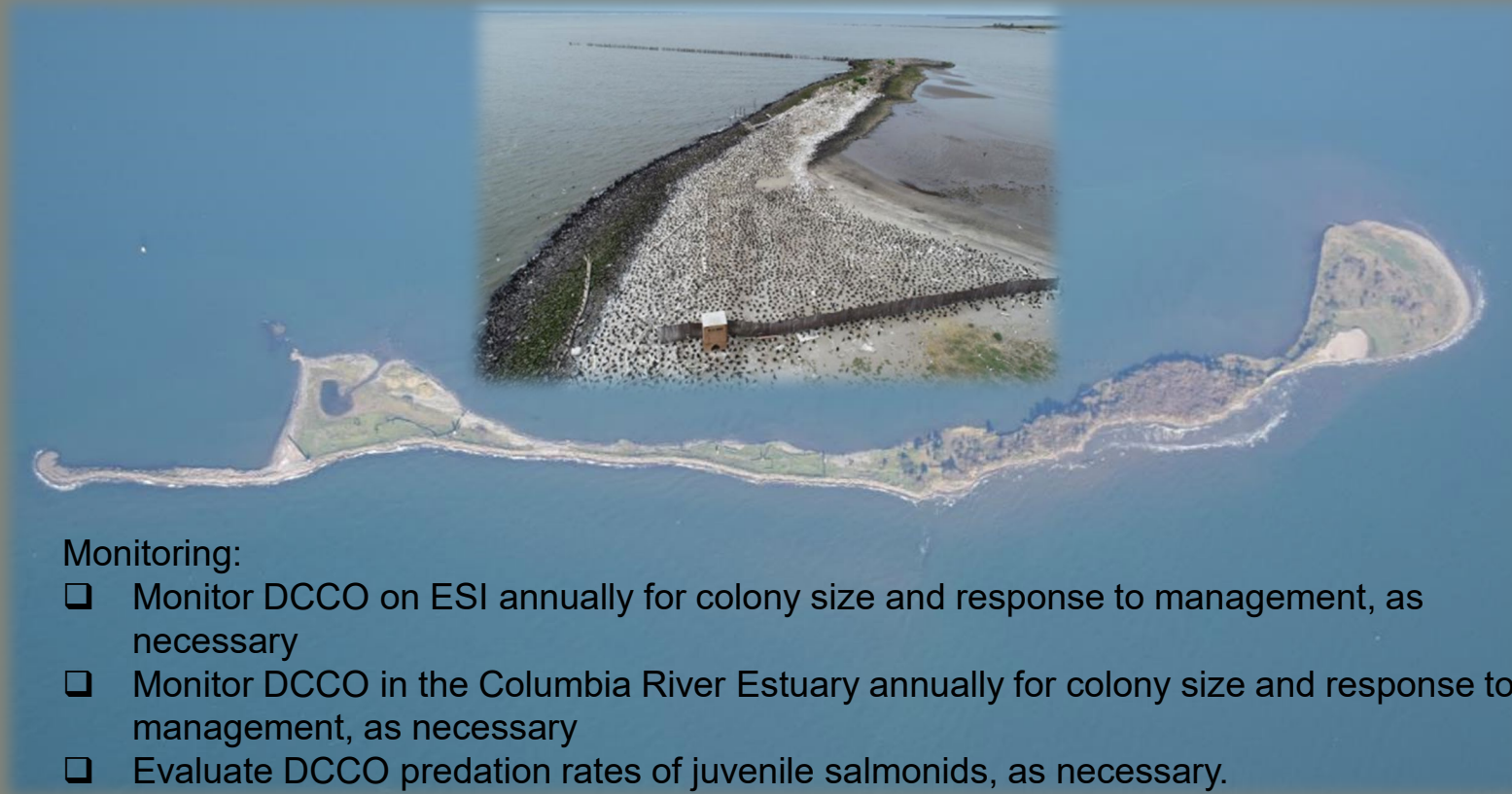
Submitted To: U.S. Army Corps of Engineers – Portland District  
 Mr. Jacob Macdonald

Submitted By: Real Time Research, Inc.  
 1000 SW Emkay Dr.  
 Bend, Oregon 97703



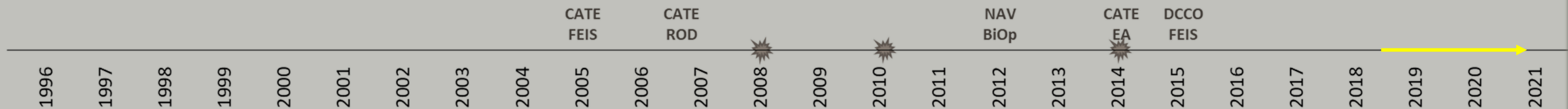


# CORMORANT MANAGEMENT PLAN – PHASE 2



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**

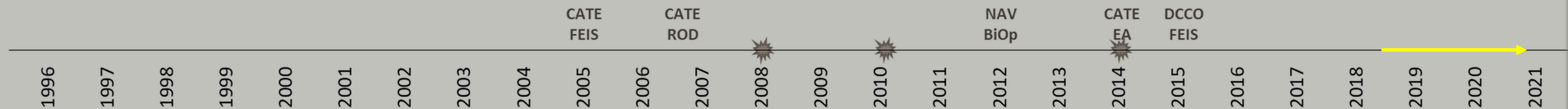


## Monitoring:

- ☐ 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.

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.





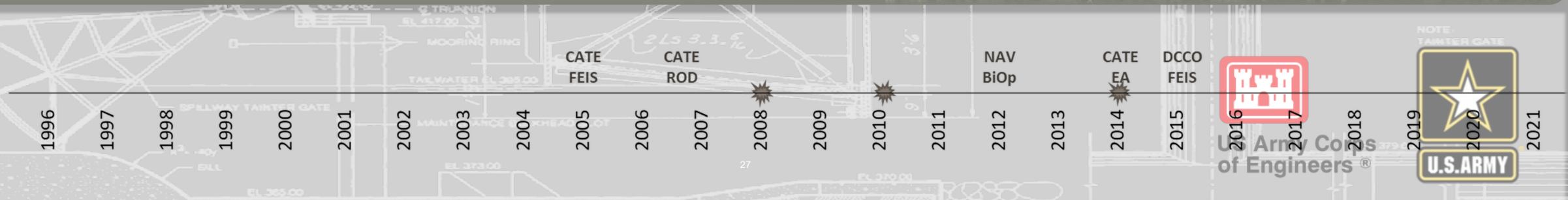
# ONGOING ACTIONS - CORMORANTS

- ❑ Corps will continue to discourage any avian predators that are found nesting at upland disposal sites

## ❑ Monitoring

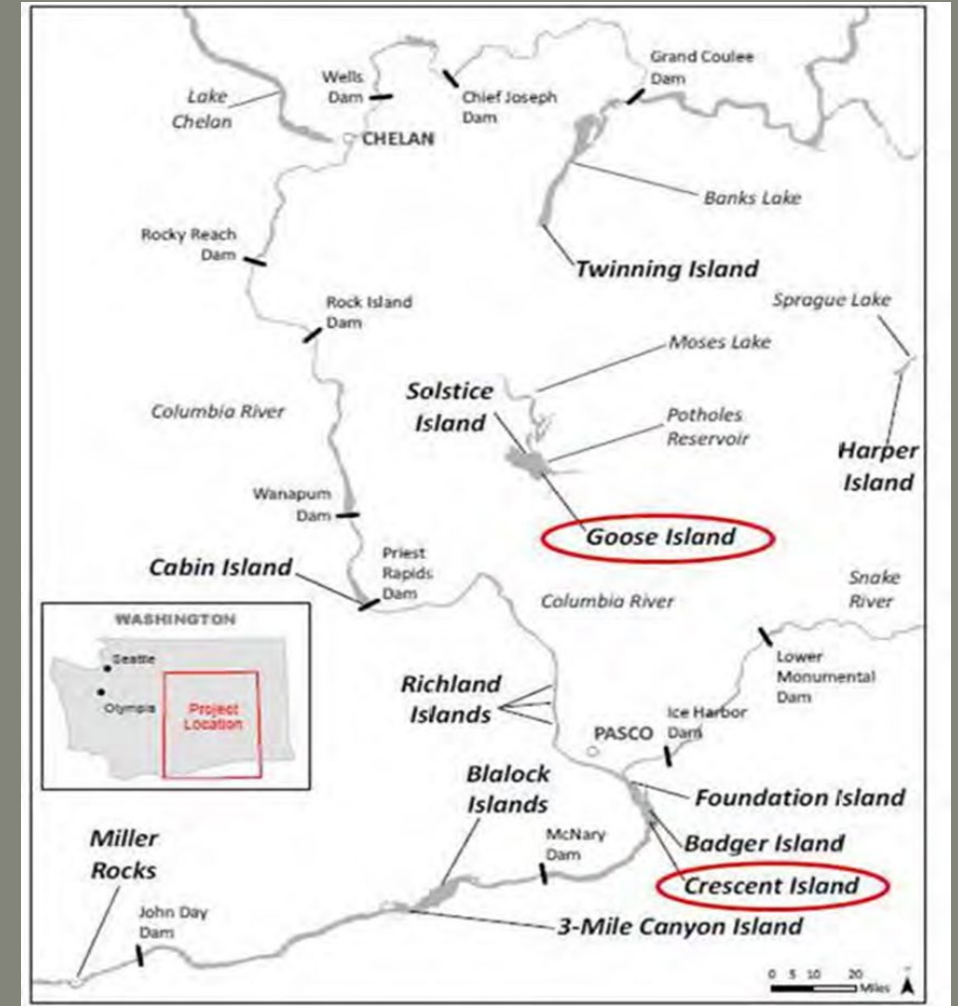
(considered complete when the 3 year average population does not exceed the FEIS objective of no more than 5,380 to 5,939 nesting pairs on East Sand Island)

- ❑ 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



# INLAND AVIAN PREDATION

- Prior to colony management, tern colonies at Goose and Crescent Islands responsible for greatest juvenile salmonid losses to avian predators in Columbia Plateau region
- Pre-management
  - 15.7% Predation Rate on Upper Columbia River Steelhead by Goose Is. Colony.
  - 3.9% Predation Rate on Snake River Steelhead by Crescent Is. Colony.





# INLAND AVIAN PREDATION: PRE VS. POST-MANAGEMENT

Colony	Pre-Mgmt (2007-2013/14)	2015-2018 Ave
Upper Columbia River Steelhead		
Goose Island	15.7%	0.1%
Crescent Island	2.4%	0.1%
Blalock Is Complex	0.6%	4.7%
Snake River Steelhead		
Crescent Island	3.9%	0.1%
Blalock Is Complex	0.6%	4.5%

\*2018 - 490 breeding pairs CR plateau-wide  
873 pre-mgmt (2005-'13)



Goose Island (2018)



Unnamed Island, Lenore Lake (2018)



Crescent Is (2018)



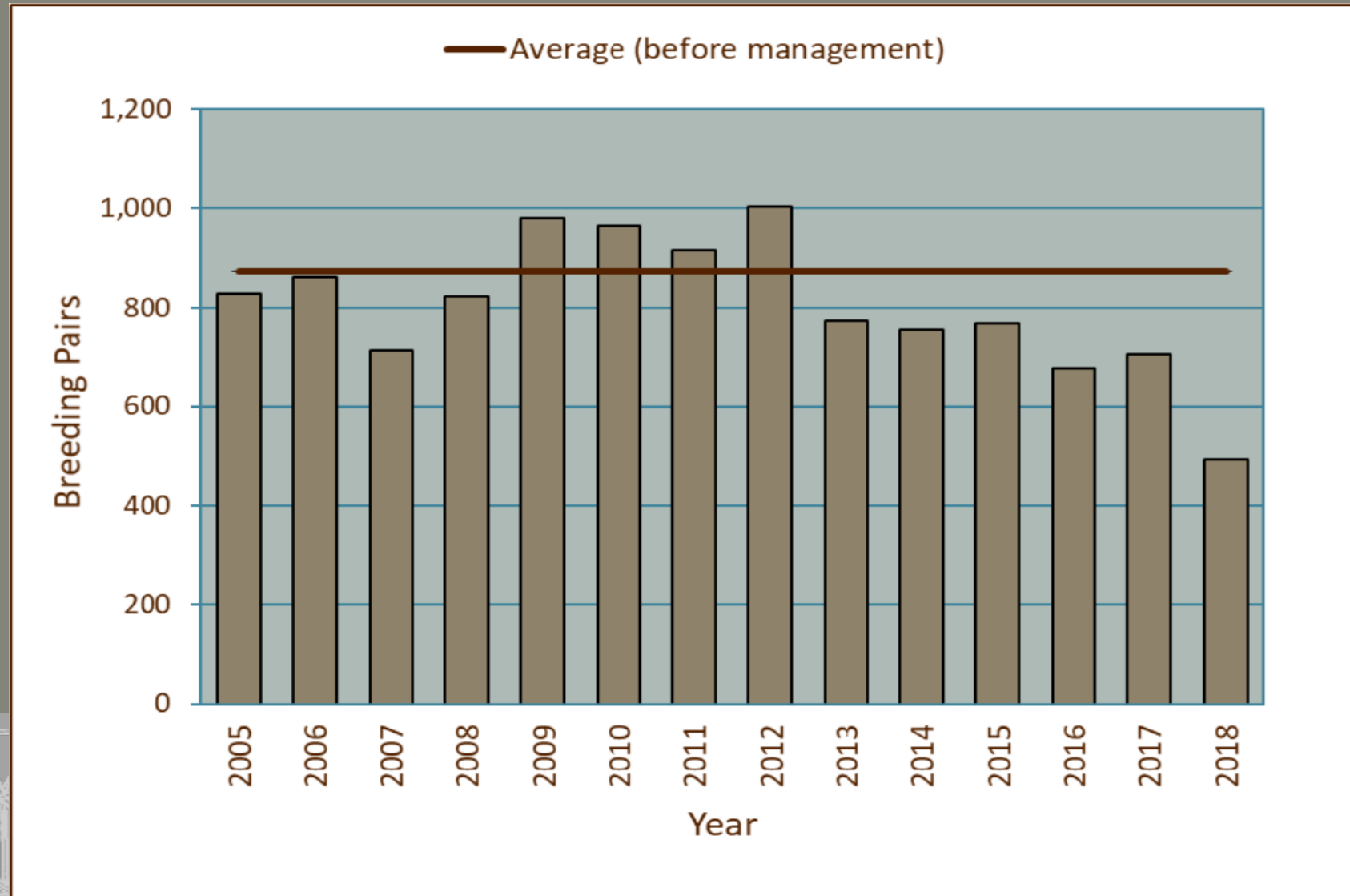
Middle Island, Blalock Island Complex



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# Total Caspian Tern Breeding Pairs Columbia River Plateau Region



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# INLAND AVIAN PREDATION ONGOING ACTIONS

- Monitoring Crescent Island to ensure terns do not return
- Analyzing operations to prevent nesting on Blalock Island in the Columbia River System Operations EIS



Middle Island, Blalock Island Complex



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# CONCLUSION - TERNS

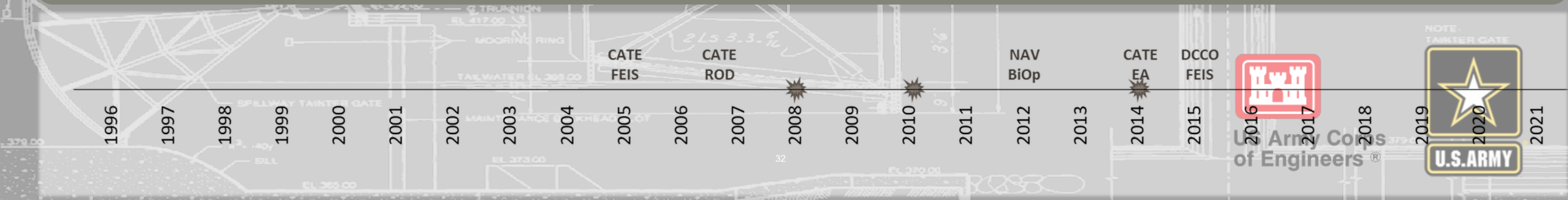


## Good News

- Habitat management in the Columbia River estuary and Plateau has reduced the number of breeding pairs in the Columbia River Basin;
- Alternative colony sites are being used by terns displaced from managed tern colonies in the Columbia Basin, and these sites have capacity for additional terns;
- Predation rates by terns on salmon and steelhead have been reduced.

## Bad News

- Thousands of terns roosting but prevented from nesting on Rice Island. This may offset predation gains made at ESI to some degree;
- Hundreds of terns displaced from inland sites have relocated to Blalock Island, also offsetting some of the predation reduction from management of Crescent and Goose Islands.





# CONCLUSION - CORMORANTS

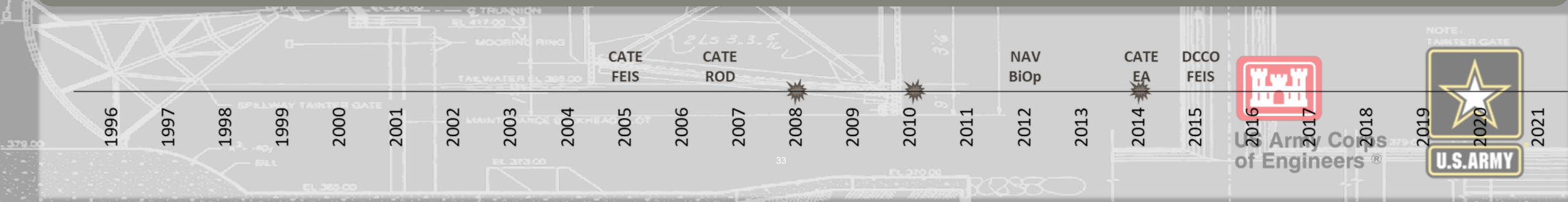


## Good News

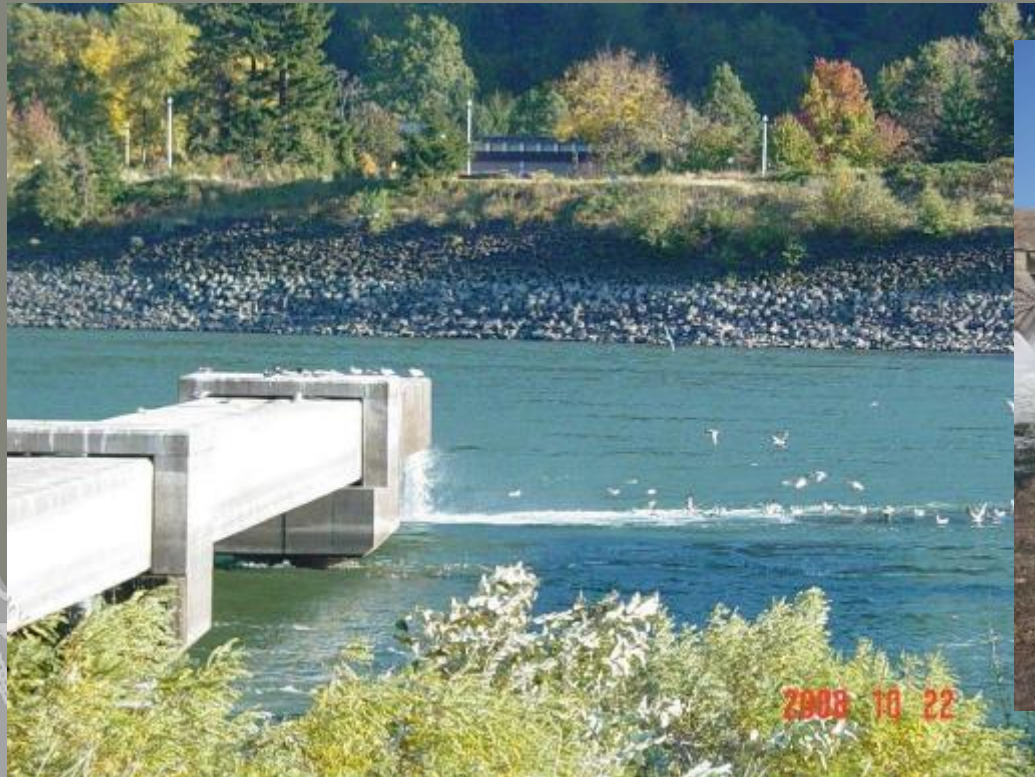
- Significant decrease in predation impacts from cormorants nesting on East Sand Island
- Substantial decrease in number of Cormorants in the Columbia River Estuary;
- West Coast population of Cormorants is higher than predicted, indicating the population was resilient to management;

## Bad News

- 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



# AVIAN PREDATION AT DAMS



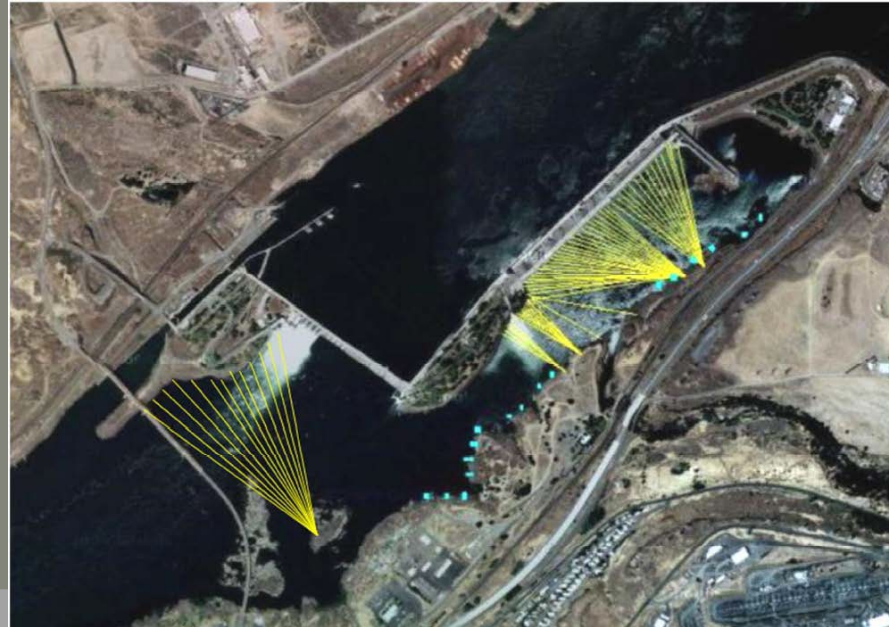
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# AVIAN PREDATION DETERRENCE AT DAMS

- Wires
- Water Cannons
- Active Hazing
- Monitoring



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NOTE:  
TAMTER GATE

# CHALLENGES

- Birds are mobile, adaptable, and unpredictable;
- Scale of problem involves multiple jurisdictions, ownership, and competing missions (i.e. MBTA vs ESA);
- Management would be more effective if ownership of the problem is shared by regional stakeholders.





# CORPS' AVIAN PREDATION MANAGEMENT IN THE COLUMBIA RIVER ESTUARY



# QUESTIONS?



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NOTE:  
TAMTER GATE