US Army Corps of Engineers ®
Portland District

Final Environmental Assessment

CASPIAN TERN NESTING HABITAT MANAGEMENT
EAST SAND ISLAND
CLATSOP COUNTY, OREGON

APRIL 17, 2015

CHAPTER 1
INTRODUCTION

Overview

Since the late 1990's the U.S Army Corps of Engineers (Corps), Portland District has been researching, monitoring, and managing Caspian terns, also referred to as "terns" on islands the Corps owns or uses to dispose of dredged material in the Columbia River Estuary (CRE). Caspian terns have a broad distribution in the world and in the United States; the Western Metapopulation nests in various locations from Alaska to southern California (Figure 1). Terns first nested on East Sand Island (ESI) in the Columbia River Estuary (CRE) in 1984 following deposition of fresh dredged material at the eastern tip of the island in 1983. By 1985, vegetation covered the ESI nesting site making it unsuitable for nesting, and by 1986 the tern colony had shifted to Rice Island, a dredged material disposal site located 16 miles upriver (Figure 2). In 1999 and 2000, the Corps socially attracted the terns, using decoys and playing pre-recorded callbacks, from Rice Island, back to ESI, which is owned and managed by the Corps. This relocation was intended to decrease the numbers of juvenile salmon and steelhead consumed by the terns to meet the Corps' commitments under the 2008 Biological Opinion on operation of the Federal Columbia River Hydropower System (FCRPS) prepared by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS).

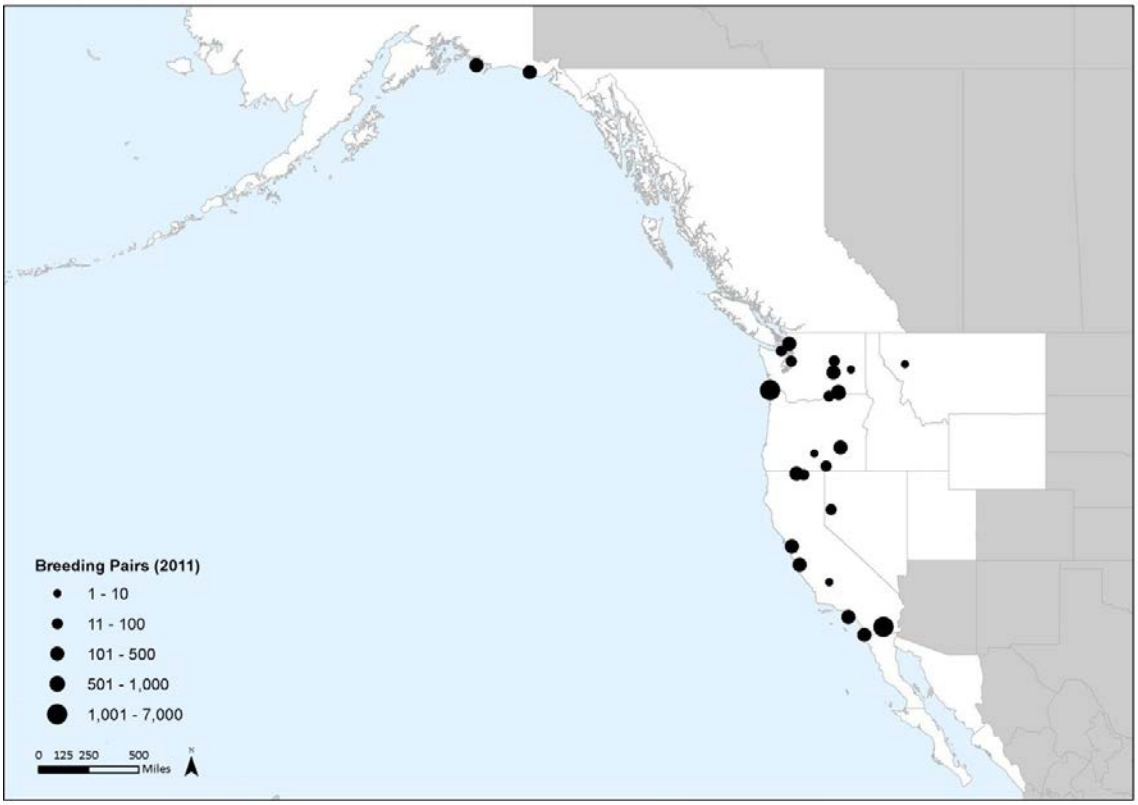

Figure 1. Distribution and relative size of Caspian tern colonies surveyed in 2011 (from Collis et al. 2012).

Figure 2. Vicinity Map of East Sand Island (river mile 5), Rice Island (river mile 21), Miller Sands Spit (river mile 23) and Pillar Rock Island (river mile 27) in the Columbia River Estuary. The Corps manages these islands for placement of dredged material.

Early studies on the diet of Caspian terns nesting on Rice Island indicated their consumption of juvenile salmonids was two to three times higher when compared to similar numbers of birds nesting on ESI (Roby et al. 2002). Based on these studies, ESI is generally considered to be the best location for piscivorous (fish-eating) water birds in the estuary in terms of their reduced impacts to juvenile salmonids. This is because ESI is closer to the Pacific Ocean in more saline waters and therefore supports greater abundance and diversity of saltwater forage fish including anchovy, herring, smelt, shad, sardine, Pacific sand lance, etc. (Roby et al. 2002). Terns prey upon these forage fish when available, thus reducing the proportion of juvenile salmonids in their diets (Figure 3).

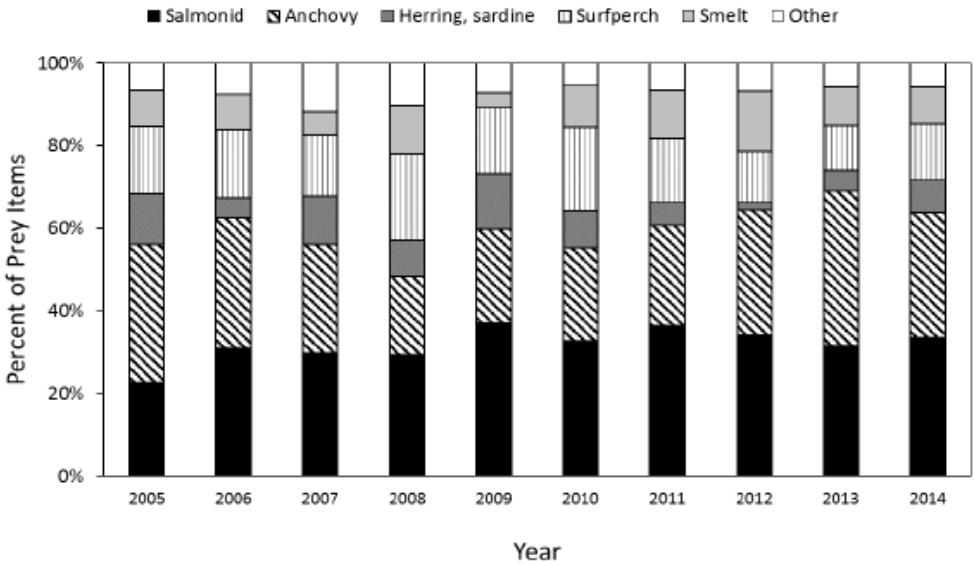

Figure 3. Annual diet composition (percent of prey items) of Caspian terns nesting on East Sand Island in the Columbia River estuary during the 2005–2014 breeding seasons. Diet composition was based on fish visually identified on-colony in Caspian tern bill-loads.

In 2000, the Corps was working to complete a project to provide habitat and socially attract Caspian terns to ESI and preclude nesting on Rice Island. This work was challenged under the National Environmental Policy Act (NEPA) by the Seattle Audubon Society, National Audubon Society, American Bird Conservancy, and Defenders of Wildlife. In 2002 the parties involved in the lawsuit reached a settlement agreement. This agreement allowed for the continuation of the efforts to socially attract the terns to ESI but also required the Corps, U.S. Fish and Wildlife Service (USFWS), and NMFS to produce an Environmental Impact Statement (EIS) to develop a plan for managing the terns in the long term with the goal of reducing predation on juvenile salmonids. Subsequently, these federal agencies completed the *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary Final Environmental Impact Statement* (USFWS et al. 2005). The USFWS and Corps each issued their own records of decision (RODs) in 2006 (USFWS 2006; Corps 2006). The Final Environmental Impact Statement and the two ROD documents are collectively referred to in this Environmental Assessment (EA) as the "Caspian Tern Plan."

Management of Caspian terns in the CRE is intrinsically challenging because of the need to satisfy competing interests: the well-being of the Caspian tern colony in the CRE and the conservation of Columbia River salmonids (including ESA-listed salmonids) upon which the terns prey. Caspian terns are of conservation concern on a global scale because the worldwide population probably does not exceed 100,000 pairs, colonies are generally small and scattered over large areas, and populations have declined over much of their former range (Collis et al. 2002). As such, the Caspian tern is presently listed as a protected species under the Migratory Bird Treaty Act (MBTA) and associated conventions. Current nesting colonies shown in Figure 1are far reduced from historical numbers and distribution of colonies in the western U.S. (Figure 4). Because of habitat

modification and water management, many colonies have been virtually eliminated from the interior western states (Collis et al. 2002).

The ESI Caspian tern colony is the largest in the world in terms of nesting pairs and is atypical in size; the colony supports the majority of the Western Metapopulation. The Caspian Tern Plan targeted approximately 3,125 to 4,375 nesting pairs on ESI with reduction of nesting habitat to between one and one-half to two acres, in order to result in a predicted one percent or greater increase in population growth rates for four Columbia River Basin steelhead ESUs. Steelhead were used in model predictions because they are most affected by Caspian tern predation in the Columbia River Basin compared to other salmonid evolutionary significant units (ESUs).

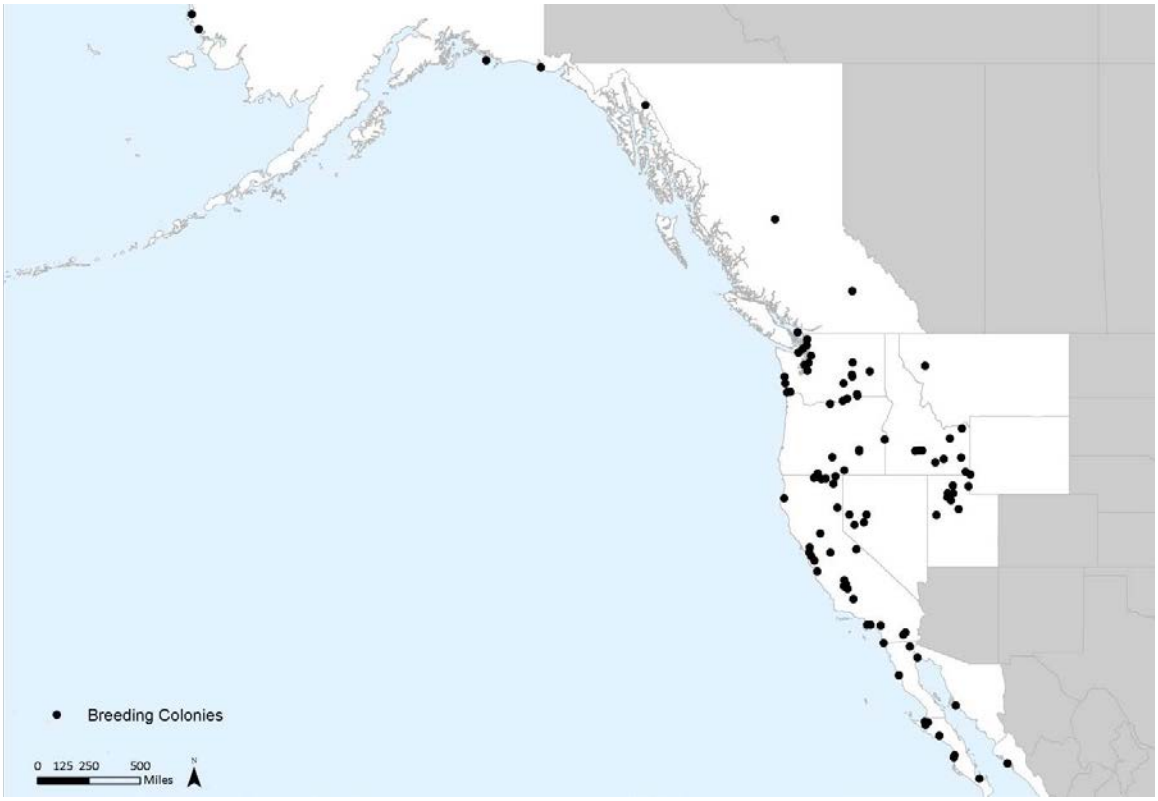

Figure 4. Distribution of current and historical Caspian tern nesting colonies in the Western Metapopulation as of 2011 (from Collis et al. 2012). A marked reduction in distribution is evident when comparing this figure to Figure 1.

The actions taken to date per the Caspian Tern Plan and Corps' ROD have not resulted in the anticipated reduction of predation of juvenile salmonids by Caspian terns. The amount of nesting habitat available to Caspian terns on ESI has been reduced since 2006 from approximately 6.5 acres to the current 1.58 acres established in 2012 (see Figure 5). The modeling employed in the Caspian Tern Plan predicted a resultant 3,125 to 4,375 nesting pairs as a result of reducing habitat to 1.5 to 2 acres. Despite incremental reductions in the amount of nesting habitat, the numbers of nesting pairs and the rate of predation on juvenile salmonids have remained fairly constant. In 2013, at 1.58 acres of nesting habitat on ESI, the number of nesting pairs was approximately 7,111 and

predation on juvenile salmonids was estimated at 4.7 million (Roby et. al. 2013). In 2014, at 1.55 acres of nesting habitat on ESI the number of nesting pairs was approximately 6,269 breeding pairs and predation on juvenile salmonids was estimated at 4.5 million (Roby et. al. 2014). The 6,269 breeding pairs represent the smallest colony size recorded at ESI since the initiation of reductions in tern nesting habitat on the island in 2008. The cumulative habitat reduction actions represent a 41% decline in Caspian tern colony size on ESI from a peak in 2008 (ca. 10,670 breeding pairs). Neither the FCRPS BiOp objectives for juvenile salmon survival nor the purpose and need of the Caspian Tern Plan have been met. Consequently, the federal agencies determined that, in addition to further reducing available habitat on ESI to 1.0 acres, the creation of additional acres of alternative habitat would be necessary to encourage the dispersal of nesting pairs to ultimately reduce predation rates on juvenile salmonids. .

In response to the need for additional acres, in February 2015, the Corps completed five new islands amounting to 2.3 acres in South San Francisco Bay on the Don Edwards National Wildlife Refuge (DENWR). This new habitat provides the Corps with the acres necessary to offset the action proposed in this EA: a final reduction of habitat at ESI to 1.0 acres as described in the Caspian Tern Plan.

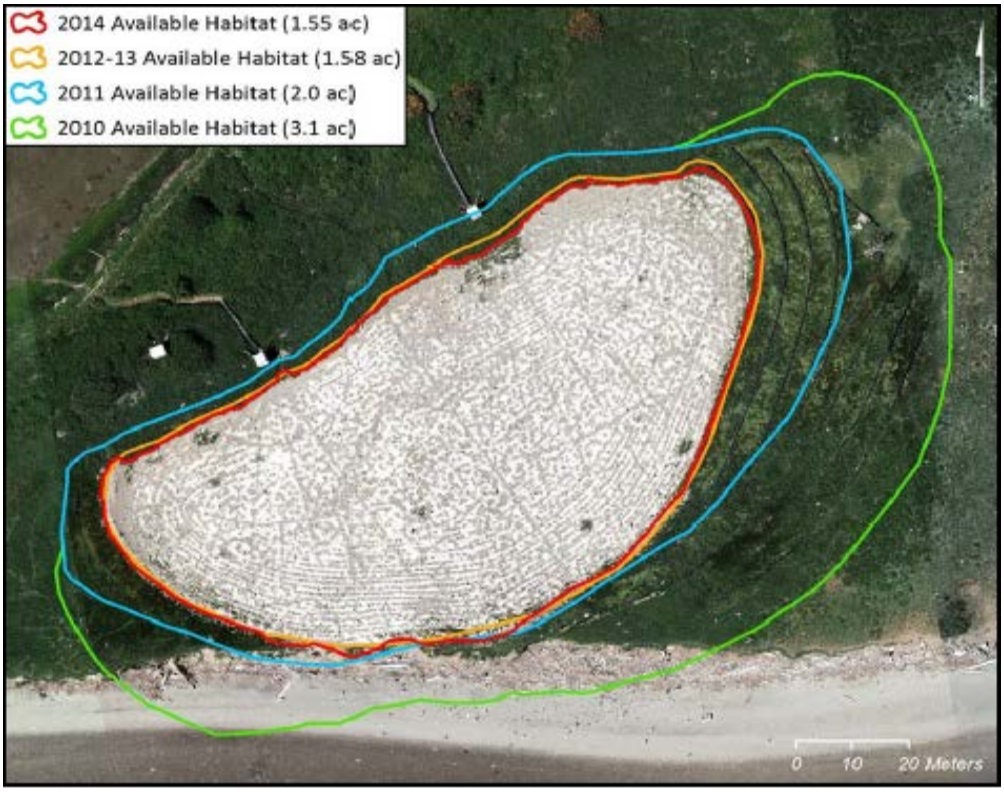

Figure 5. Nesting habitat prepared for Caspian terns on the eastern end of ESI in the Columbia River estuary during 2010–2014 (Bird Research Northwest). Silt fencing was erected in 2010–2011 on a portion of the nesting habitat used by terns to further reduce the amount of nesting habitat made available to Caspian terns during 2012–2014.

Caspian Tern Plan

The Caspian Tern Plan called for the reduction of habitat on ESI and the creation of or restoration of Caspian tern nesting habitat (alternative nesting islands) and social attraction efforts to attract Caspian terns to nest at these sites. In order to decrease predation on ESA-listed juvenile salmonids, the Caspian Tern Plan called for redistribution of approximately 60% of the ESI colony population via construction of new habitat (islands) in Oregon and California.

Because Caspian terns nested on an average of less than 5 acres from 2001 to 2004 on ESI, the Caspian Tern Plan proposed reducing habitat from the initial size of approximately 5 acres to approximately 1 to 1.5 acres (USFWS et al. 2005). Reduction of habitat on ESI was contingent upon the creation or enhancement of habitat at a ratio of 2:1. Reducing habitat on ESI to 1 acre would therefore require approximately 8 acres of replacement habitat. The Caspian Tern Plan identified the target colony size as 2,500 to 3,125 nesting pairs for 1to 1.5 acres of habitat on ESI.

Before the Corps' ROD was signed in 2006, plans for the creation of habitat in Washington State were unattainable, and a modified alternative was selected which involved constructing seven acres of new habitat and ultimately reducing ESI habitat to 1.5 to 2 acres. It was expected that reducing ESI habitat by this amount would result in an estimated colony size of 3,125 to 4,375. The Corps' ROD anticipated that through identification and creation of new habitat, the acreage on ESI could ultimately be reduced to 1 acre if other alternative sites were found, enhanced, or created. Creation and/or enhancement of site(s) along the coast would likely provide habitat for large colonies because of availability of marine forage fish, without having large concerns from the perspective of ESA.

In 2008, implementation of the Caspian Tern Management Plan began. From 2008 to 2010, the Corps constructed eight islands distributed across two states located east of the Cascade Range in southern and southeast Oregon, Fern Ridge Reservoir in the Willamette Valley in Oregon, and northern California in the Klamath Basin. Islands constructed by the Corps during this period are shown in Table 1. Implementation is funded through the Columbia River Fish Mitigation project (CRFM).

The Caspian Tern Plan called for several islands in the San Francisco Bay area but the Corps chose to delay efforts in the Bay Area to take advantage of an unplanned opportunity to build three islands in the Klamath Basin. Klamath Basin was considered in the Caspian Tern Plan because it met the criteria of a viable option for creating tern habitat as set forth in the Appendix G of the Plan, but was not selected at the time of the ROD because of unknown water availability due to water shortages in the Basin. Ten years later, more water was available in the Basin and the Corps chose to constructed three islands based on water management timing and a desire of the Lower Klamath and Tule Lake National Wildlife Refuges to partner with the Corps to create habitat that served to fulfill Refuge wildlife goals and help meet the goals of the Caspian Management Plan. The Corps implemented construction as part of the Corps' and

USFWS's RODs allowing for adaptive management using the criteria set forth in the Plan and the ROD.

Acreage of the Klamath Basin sites listed in Table 1 were not found to be fully suitable as defined in the Caspian Tern Plan and, therefore, only portions of the sites were counted. The Klamath Basin sites are located on the lands of the National Wildlife Refuge System, in which the managed wetland units are periodically drained of water to promote wetland vegetation growth. During years when vegetation management is occurring, the wetland units are drained of water and there is no water surrounding Caspian tern islands. Therefore the island acreages have been "pro-rated" by calculating a proportion based on a ten year frequency of expected inundation. This proration was developed and recommended by the adaptive management team in 2012. The proration was accepted by managers of the agencies represented in the adaptive management team (See Adaptive Management Section below).

Table 1. Corps constructed islands from the Caspian Tern Management Plan (2008–2014) with 2013 Caspian tern nesting results (Roby et al. 2013).

State and Site Name	Land Owner	Available Area (Acres) in 2015	Estimated Number of Nesting Pairs in 2013	Fledglings Produced
OREGON				
Fern Ridge Lake, Lane County	Corps	1	0	No
Gold Dike Lake, Summer Lake Wildlife Area, Lake County	ODFW	0.5	0	No
East Link Lake, Summer Lake Wildlife Area, Lake County	ODFW	0.5	21	Yes
Crump Lake, Warner Valley, Lake County	ODSL	1	223	Yes
Malheur Lake NWR, Harney County	USFWS	1	530	Yes
CALIFORNIA				
Sheepy Lake, Klamath Basin NWR, Siskiyou County	USFWS	0.8 acre (floating)	316	Yes
Orems Unit, Klamath Basin NWR, Siskiyou County	USFWS	0.2 acre (1 acre built but 0.8 acre dry)	0	No
Tule Lake, Klamath Basin NWR, Siskiyou County	USFWS	1.35 (2 acres built but 0.65 acre dry)	79	No
Totals		6.35 acres	1,169 Pairs	

Potential coastal relocation sites that had been considered in Oregon were also deemed unsuitable because of concerns over introducing predation on fish stocks that had not been historically subjected to Caspian tern predation; thus, these coastal sites were not incorporated into alternatives considered in the Caspian Tern Plan. The Oregon Department of Fish and Wildlife (ODFW) periodically inspects potential coastal sites and

has not observed Caspian terns; these locations include three sites in Coos Bay and two sites in the Umpqua River Estuary (communication with Lindsay J. Adrean, ODFW, February 21, 2014). Based on a habitat assessment from an aerial survey, USFWS (2003) determined that only these two estuaries contained sites that might serve as nesting habitat for Caspian terns.

To compensate for reduction in area of the nesting colony on ESI the Corps has constructed 13 nesting islands specifically for Caspian terns in Oregon and California (Table 2) totaling 9.63 acres. Of these 13 locations, seven are east of the Cascade Range in Lake, Klamath, and Harney Counties in Oregon and Siskiyou County, California. One location is in the Willamette Valley in Lane County, Oregon, and five new islands in Alameda County, California.

While the Klamath Basin sites were in construction, the Corps contracted diet studies on Caspian terns at Brooks Island in San Francisco Bay and determined that the nesting colony there was eating a high number of juvenile salmonids from the Sacramento River System. Additionally, management emphases by biologists at the Hayward Region Shoreline were shifting from potentially entertaining a Caspian tern island to managing their habitats for ESA-listed least terns (*Sternula antillarum*). This changed the course of action in that part of the Caspian Tern Plan where (Collis et al. 2002) the Corps intended to build or enhance Caspian tern nesting habitat in the middle and north portions of San Francisco Bay. Instead the Corps began searching for new locations in South San Francisco Bay in light of high forage fish availability and low occurrence of ESA-listed salmonids.

Caspian Tern Nesting Pairs, Density, and Acreage at East Sand Island

The Caspian Tern Plan has been implemented with many successes. To date, habitat creation and enhancement in interior Oregon and California has allowed for incremental reduction in Caspian tern nesting habitat on ESI. Nesting success has varied among sites due to habitat suitability, forage fish availability, and predation on eggs and chicks (see 2013 result in Table 1). Creation of multiple nesting colonies is desirable because it disperses the regional population and lessens the chance of potential effects of catastrophic local events on, for example, one large colony.

Predation by gulls, great horned owls, and raccoons has been an issue in causing loss of nests and influencing the size and attendance of the nesting colonies at several Corps construction islands. A depredation permit has been obtained yearly from the USFWS to conduct a limited amount of predator control at the Corps constructed islands. The depredation permit is for limited control of migratory birds (gulls and great horned owls) The measures have been successful in slowing or eliminating the rate of tern colony abandonment. Until tern colonies become self sufficient at the alternative nesting sites, predator management may be needed for several years until fidelity to the islands by terns is realized through multiple years of nesting success.

Reduction of nesting area available for terns on ESI has not produced the desired result of diminishing the tern population there, however. Numbers of nesting pairs have remained high due to an unexpected increased in nesting density. In 2014, the colony was approximately 6,269 breeding pairs and consumed an estimated 4.5 million juvenile salmonids (Roby et. al. 2014).

In 2014, the amount of nesting habitat prepared for Caspian terns on ESI were reduced slightly (1.55 acres) from what was prepared the previous two years. In response to the gradual decline in available nesting habitat for Caspian terns on ESI, there has been a general increase in nesting density, from 0.72 nests/m2 in 2008 to 1.06 nests/m2 in 2014. The increase in nest density is much high than that predicted in the Caspian Tern Plan which was 0.55 nesting pairs per square meter. Because higher nest density and higher bird numbers than expected at the current 1.55 acre area, a further reduction in the ESI tern colony area is necessary to realize the management objective of reducing the size of the tern colony to 3,125 – 4,375 breeding pairs, as prescribed in the Caspian Tern Management Plan.

It is unknown if further reduction to the size of the nesting colony on ESI would result in even greater density of nesters; no studies have attempted to determine the minimum area required for a nesting pair. Greater nesting densities on ESI are conceivable, however, because of densities recorded on the Commencement Bay tern barge in south Puget Sound, which were higher than ever recorded on ESI at approximately 1.5 pairs per square meter (Collis et al. 2002). Portions of Crescent Island in the Columbia Plateau Region had densities as high as 1.48 pairs per square meter over some of the colony. The barge is an unnatural site and it is unknown if Caspian terns would nest at this high of a density on the ESI colony even if there were enough birds there to do so. Brooks Island, a natural island (augmented by dredge material deposition) in San Francisco Bay, showed a similar nesting density to ESI in 2013 (OSU et al. 2013a). From comparing Figures 10 and 13, numbers of nesting pairs on ESI appear to be a good predictor of numbers of juvenile salmonids consumed.

Adaptive Management

Recognizing the difficult and often unpredictable situation of trying to manage the largest colony of Caspian terns in the world, the Caspian Tern Plan called for an Adaptive Management Plan. A plan has not yet been written but in 2012, an inter-agency Adaptive Management Team (AMT) began meeting to discuss the effectiveness of management actions and to make recommendations to the Corps on taking new courses of actions. The AMT's role has been in lieu of a formal written plan. The AMT recommendations are based upon the responses of Caspian terns to management efforts. Members of the AMT include USFWS, NMFS, Corps, Columbia River Inter-Tribal Fish Commission (CRITFC) and the Bonneville Power Administration (BPA); BPA annually funds the monitoring of terns on ESI.

The AMT uses the data and reports generated from years of research and monitoring to compare the results to the goals set forth in the Caspian Tern Plan. One focus point of the AMT is to advocate and seek opportunities for coastal sites to create or enhance habitat for Caspian terns. This is in response to loss opportunities that were planned for in the San Francisco Bay area after the Caspian Tern Plan was finalized but changing conditions did not allow for habitat enhancement at the three sites originally identified in the Bay area. Diet studies on the Brooks Island tern colony determined that a high portion of the tern diet was salmonids. The AMT determined that enhancing tern habitat at Brooks Island would negatively impact salmonids in the Sacramento River system. At the Hayward Regional Shoreline, managers there had concerns that managing for Caspian terns might discourage use of the wildlife area by Least terns. The third site identified for enhancement in the Bay area was the salt ponds at Don Edwards NWR. The Cargill salt company has rights to the salt ponds for commercial production of salt. Cargill expressed to the Refuge managers that creating or enhancing islands in the salt ponds might affect their ability to manage the ponds for their purposes. Thus, the Refuge then declined the Corps desire to enhance Caspian tern islands on the Refuge.

In early 2014, the AMT became aware of an opportunity to build or enhance islands for Caspian terns on the Don Edwards National Wildlife Refuge (DENWR), due to changing management of the salt ponds. The Refuge is located in the South San Francisco Bay, an area rich in marine forage fish. Recent changes in management of salt ponds located on DENWR, created an opportunity for the Corps to partner with the Refuge to enhance multiple Caspian tern islands as well has habitat for Snowy Plover and Least terns. The project involved adding nesting substrate to 5 existing islands at DENWR (3 at pond SF2 and 2 at pond A16, totaling 2.35 acres) for Caspian terns. In order to successfully establish tern colonies at the 5 islands at DENWR, it is necessary to use a combination of social attraction measures including Caspian tern decoys and birdcalls to attract terns to the newly enhanced islands. These techniques were proven successful at the other Corps constructed sites since 2008–2014 (Roby et. al. annual reports 2008-2014. Further, a program of predator management will be necessary for at least the first three years in order to ensure successful nesting and colony establishment. The Corps has contracted with the United States Geological Survey (USGS) researchers to conduct detail monitoring of the five new tern nesting islands at DENWR. These islands will be monitored for a minimum of three consecutive years beginning in March 2015, to inform implementation of Adaptive Management measures as warranted to ensure program objectives are met.

Construction of the 5 islands at DENWR was completed in February 2015. Decoys and other social attraction devices are in place and Caspian terns have arrived there and are exhibiting breeding behavior. Over the last six years, the Corps has now constructed 9.63 physical acres of new habitat (including the newly constructed islands at DENWR) to compensate for the habitat reduction at ESI which has occurred since 2008.

Habitat reduction is accomplished by installing silt fence and allowing vegetation to grow in naturally between the former colony area and the fence. Every year the designated colony area is prepared by tilling the soil and removing the encroaching vegetation to

achieve the desired bare sand nesting habitat for the terns (Figure 5). Implementation of the Caspian Tern Plan calls for the USFWS to monitor the tern's regional population to ensure the conservation goals for Caspian terns are being met. The USFWS plans to conduct a regional population survey in 2015.

To date, adaptive management has been used to create Caspian tern nesting habitat in various locations in Oregon and California, identify and address predator management issues, and evaluate and recommend additional research and monitoring needs of terns and various ESA-listed fish populations. The addition of new coastal habitat at DENWR will aid in distributing Caspian terns through their Pacific Coast Region. The new islands at DENWR will have water surrounding them year around as opposed to some of the interior islands that are either periodically dry due to natural water fluctuations or managed for vegetation purposes.

In 2014, the Corps made available an EA proposing to reduce habitat at ESI similar to this EA, in that the proposed reduction would be from 1.58 to 1.0 acres. The Corps selected the No Action Alternative in the Final EA based on drought conditions, lack of suitable nesting habitat (land-bridging etc.) at interior sites, and the concern over increased salmonid predation if displaced terns moved to the middle and upper CRE. Further, without the desired alternative habitat creation at another coastal site, terns might be less likely to leave the CRE. This has been an important consideration for success of the Caspian Tern Plan within the AMT.

Figure 6. Construction of Caspian tern nesting islands at Don Edwards National Wildlife Refuge in South San Francisco Bay, Alameda County, California in February 2015.

Following the construction of the islands at DENWR in February 2015, the AMT, with the exception of USFWS, concluded that sufficient acres of alternative habitat had been constructed to offset a reduction of ESI tern habitat from 1.58 acres to 1.0 acres. At this time, the USFWS expressed concern that drought may still be an issue in 2015 affecting the amount of available habitat at Corps constructed islands.

On April 4, 2015, the AMT discussed the issue of drought and information that Sheepy Lake Island in the Klamath has the potential to be dry by the end of June 2015. The water shortage in Klamath Basin is one of worst seen in decades, and the allocation of water to the Refuge is planned to be severely short of normal (John Beckstrand, USFWS, personal communication). The water shortage led the AMT to consider alternatives to the full reduction to 1.0 acres of habitat to ESI based on island/acres of availability for 2015. A new alternative was considered based on island availability which when calculations of acres was made resulted in an alternative reduction to 1.31 acres of tern habitat at ESI. There was no consensus among the AMT to adopt the new alternative into this EA.

New information obtained on April 14, 2014 gave new hope that Sheepy Lake would have water well into July, making the island a viable site for use by Caspian terns for the 2015 nesting season. Additionally, recent rains have fill Crump Lake with water, but there is still a question of how long water would remain in the lake during the nesting season. This information was reported to the Corps by Marty St. Louis who visited Crump Lake on April 2, 2015 (Marty St. Louis, ODFW, personal communication). It is unknown how long water will remain viable in Crump Lake but water levels seem to be sufficient currently to allow for successful nesting at Crump Lake Tern Island.

As the Corps' ROD for the 2005 Caspian tern management plan/EIS stated, "the reduction in habitat at East Sand Island is not contingent upon Caspian terns occupying the managed habitat developed for them at alternative locations." ROD at 4. The proposed action as described in the 2005 EIS contemplated that the reduction on ESI would be contingent upon "how much acreage of alternate habitat has been created to date elsewhere" and that successful breeding by terns on alternate habitat was not a prerequisite to such reduction. EIS at 2-3, J-9. Waiting for successful breeding elsewhere "could substantially delay attainment of the redistribution of terns in the region[.]" EIS at J-9. The EIS acknowledged that not every site would be expected to be available or used by nesting terns every year and that the number of sites and specific location used by the terns would vary annually. EIS at J-9, J-10, J-33, J-34, J-88. However, the nesting habitat regional network created would "provide a diverse suite of locations from which terns can select for nesting from year to year based on varying annual conditions (e.g., water levels, prey availability, and/or predator presence.)" and this regional network was "expected to provide sufficient habitat for the entire regional population." EIS at J-10.

Monitoring of the ESI colony and managed alternate sites will continue for three years following the attainment of proposed habitat acreage on ESI.

CHAPTER 2
PURPOSE AND NEED FOR ACTION

Purpose:

The purpose of the Proposed Action is to address actions called for in the 2008and supplemental 2010 and 2014 FCRPS Biological Opinions. Additionally, the purpose is to reduce the Caspian tern colony at ESI to 3,125 to 4,375 nesting pairs by reducing habitat to implement the RPA action 45 of the Biological Opinion. RPA 45 requires implementation of a Caspian Tern Management Plan and RPA action 66 requires evaluation of the effectiveness of the plan. The Proposed Action of this EA considers adaptive management towards meeting the purpose and need of the Caspian Tern Plan and fulfilling expected salmonid survival improvements per the FCRPS Biological Opinion.

Need:

Prior actions taken per the Caspian Tern Plan and Corps' ROD did not result in the anticipated reduction of consumption of juvenile salmonids by Caspian terns. The amount of nesting habitat available to Caspian terns on ESI has been reduced since 2006 from approximately 6.5 acres to the current 1.55 acres. Year 2014 marked the fourth year that Caspian tern habitat was managed between 1.55 to 2 acres. This reduction was expected to result in 3,125 to 4,375 nesting pairs as identified in the ROD (for 1.5 to 2 acres). Despite incremental reductions in the amount of nesting habitat, the numbers of nesting pairs and amount of predation on juvenile salmonids have remained fairly constant. In 2013, at 1.58 acres of nesting habitat on ESI, the number of nesting pairs was near 7,111 and predation on juvenile salmonids was estimated at 4.7 million (Roby et. al. 2013). In 2014, at 1.55 acres of nesting habitat on ESI the number of nesting pairs was near 6,269 breeding pairs and predation on juvenile salmonids was estimated at 4.5 million (Roby et. al. 2014). Neither the FCRPS Biological Opinion objectives for juvenile salmon survival nor the purpose and need of the Caspian Tern Plan have been met. This indicates that additional action by further reduction of habitat at the managed Caspian tern colony at ESI is needed.

CHAPTER 3
ALTERNATIVES

No Action Alternative: Continue Current Management

The No Action Alternative would continue the current management of Caspian terns on ESI and the constructed tern colonies in interior Oregon and Northern California as defined by the Caspian Tern Plan and as described above. Current management of terns on ESI includes the following:

- Designate colony area: Delineate 1.58 acres of Caspian tern nesting habitat (except for a portion of the habitat that is naturally eroding during winter storms which has resulted in 1.55 acres in 2014 and is currently 1.3 acres measured in April 2015).

- Habitat quality: Habitat within the designated Caspian tern colony would be prepared to provide suitable nesting habitat. Site preparation may include eliminating vegetation and using an ATV and disk to till the site and smooth the surface prior to the nesting season.

- Dissuasion on ESI: Caspian terns attempting to nest outside of the designated colony would be hazed via non-lethal methods (passive hazing involving habitat modification supplemented by active human hazing) during the peak nesting season (April through mid-June). Passive hazing (e.g. placement of stakes and flags) would not occur below mean higher high water since frequent inundation would prevent nesting. Dissuasion will be install between March 15 and April 15, prior to nesting, along the eastern shore (approximately two acres) and on the western end of the island (approximately three acres). With dropping river levels during the nesting season, additional areas along the eastern shore will become exposed and become potential nesting habitat; as much as two additional acres may need to be dissuaded during the nesting season at this location. Transport of dissuasion materials would be by ATV or hand carried.

- Monitor on ESI: Monitoring is conducted yearly on the managed Caspian tern colony at ESI by BPA. BPA contracts with Oregon State University to conduct the monitoring and report results in annual reports available on the web at the Bird Research Northwest website. Monitoring at ESI occurs from blinds constructed on the edge of the colony. Monitoring includes recording numbers of nesting pairs, estimating productivity, presence and impact of predators, and fish predation on fish via bill load observations.

- Monitor at the constructed islands: The Corps contracts annually with Oregon State University to conduct detailed monitoring at the Corps' constructed tern islands and report results in annual reports available on the web at the Bird Research Northwest website. Monitoring is conducted at Summer Lake, Malheur Lake, and three islands in the Klamath Basin in California. Monitoring includes installation of social attraction, conducting limited predator management, vegetation management, recording number of terns, estimating productivity, document predation events and fish identification.

Proposed Action: Reduce Designated Colony to 1.0 acres and Other Actions

The proposed action would continue all of the activities described above in the No Action Alternative with the following exceptions:

- Designate colony area: The designated Caspian tern colony area would be reduced from 1.58 to 1.0 acres. Habitat reduction on the designated colony at ESI would be achieved via placing barriers (either silt fencing or posts and rope with flagging streamers) prior to the nesting season. The Caspian Tern Plan specifies no end date to managing the tern habitat at ESI and is assumed to be in perpetuity. The 1.0 acre of habitat will be maintained at least through 2018 when the FCRPS Biological Opinion is due to expire and a review will be completed to evaluate the effectiveness of actions taken to recover ESA-listed salmonid populations. The exact location of the managed 1.0 acre may change slight over time to make adjustments to the island that is shifting due to erosion and sand deposition.

- Dissuade and haze on ESI: Because terns have expressed high nest fidelity over the course of management (terns that hatched or nested at ESI returning to ESI), an increased effort in hazing and habitat modification would likely be necessary on the eastern and western portions of ESI especially during the peak nesting season: April through June. This action aids in allowing for only 1.0 acre of nesting habitat availability on ESI.

CHAPTER 4
AFFECTED ENVIRONMENT

A detailed description of the affected environment is provided in the Caspian Tern Plan (USFWS et al. 2005) and incorporated by reference; additional information specifically pertinent to this EA is provided below. Nesting habitat for terns in the Pacific Coast region includes both coastal and interior sites. Colonies are located in estuarine or marine habitats or freshwater lakes, rivers, marshes, sloughs, reservoirs, irrigation canals and (low salinity) saline lakes (Cuthbert and Wires 1999). Many sites are ephemeral and their suitability for nesting varies with water levels, vegetation density, and prey availability as affected by droughts, floods, erosion, ocean conditions, or other factors (Shuford and Craig 2002).

The purpose of this EA, the affected environment is specifically ESI, the Lower Columbia River estuary, the mid-Columbia River Basin, and Corps constructed islands. A more general affected environment includes coastal waters in the States of Washington, Oregon and California and brooder areas in states where the Pacific Coast region is defined (west of the Rocky Mountains from the south Baja Peninsula to northern Alaska.

ESI is located in the CRE near the mouth of the Columbia River in Clatsop County, Oregon, approximately one mile west of Chinook, Washington and 10 miles northwest of Astoria, Oregon. The island, approximately 50 acres in size, was once connected to Sand Island, just to the northeast in Baker Bay. The islands have separated over time due to

erosion. In 1954, ESI was transferred to the Corps for the Sand Island Channel Improvement Project.

Currently a variety of breeding seabirds and water birds nest on ESI. Because of the large numbers and diversity of birds using the island, the American Bird Conservancy and the National Audubon Society recognize it as an Important Bird Area and a Western Hemisphere Shorebird Reserve.

Miller Sands Spit and Rice Island, located upriver of ESI in the CRE, are used regularly for placement of dredged material by the Corps and are characterized by large expanses of bare sandy ground with areas of sparse grasses, forbs and small shrubs. These islands are a unique, almost desert-like habitat in the estuary (USFWS 2010). Sparse vegetation and the scarcity of mammalian predators make the islands attractive nesting locations for Caspian terns and other colonial waterbirds. Control of mammalian predators has been necessary for establishment of inland Caspian tern nesting colonies, but has not been an issue with islands in the estuary. Canada geese and streaked horned lark also nest on islands in the estuary (USFWS 2010). The off-channel edges of the islands slope into shrubby willows and cottonwoods near the water's edge and then into tidal marsh and shallow flats. These shallows attract large numbers of wintering ducks, as well as migrating shorebirds and juvenile salmonids (USFWS 2010).

The Caspian terns' migration to the lower CRE has dramatically changed distribution of the Western Regional Population. Caspian tern breeding was first documented in the CRE in 1984 when approximately 1,000 terns were reported nesting on fresh dredged material disposed on ESI. Prior to 1984, the breeding status in the CRE was unknown. In 1986, possibly because of vegetation development on ESI, the colony moved to Rice Island where they nested until the Corps took an action to relocate the terns via habitat preparation and social attraction to ESI, closer to the ocean, in order to decrease the percentage of juvenile salmonids in the diet of terns.

To compensate for reduction in area of the nesting colony on ESI the Corps has constructed 13 nesting islands specifically for Caspian terns in Oregon and California (Table 2) totaling 9.63 acres. Of these 13 locations, seven are east of the Cascade Range in Lake, Klamath, and Harney Counties in Oregon and Siskiyou County, California. One location is in the Willamette Valley in Lane County, Oregon, and five new islands in Alameda County, California. Social attraction is used at the Corps constructed islands to attract terns to these sites. Social attraction included 200–250 Caspian tern decoys, and battery operated sounds systems that playback the constant sounds of a tern colony. These devices have aided in attracting terns and successfully nest at 5 of 8 islands (prior to the new islands at DENWR in 2015) from 2008 to 2014. Nesting success has varied by site and by year. The Corps has documented terns arriving at all sites, but for a variety of reasons (i.e. predation of adult terns by peregrine falcon and bald eagle) some islands have not produced successful nesters.

Table 2. Corps constructed islands from the Caspian Tern Management Plan (2008-2015) displaying the calculation of how acres of habitat are counted towards the reduction of habitat at East Sand Island.

State and Site Name	First Year Available	Size of Nesting Area Available	Acres Counted including Proration for Klamath Basin Sites	Actual Acres with sufficient water for 2015
OREGON				
Fern Ridge Lake, Lane County	2008	1	1	1
Gold Dike Lake, Summer Lake Wildlife Area, Lake County	2010	0.5	0.5	0.5
East Link Lake, Summer Lake Wildlife Area, Lake County	2009	0.5	0.5	0.5
Crump Lake, Warner Valley, Lake County	2008	1	1	1*
Malheur Lake NWR, Harney County	2012	1	1	1
CALIFORNIA				
Sheepy Lake, Klamath Basin NWR, Siskiyou County	2010	0.8 (floating)	0.8 (floating)	0.8**
Orems Unit, Klamath Basin NWR, Siskiyou County	2010	1	0.2 acre (1 acre but watered 1 out of 5 years)	0
Tule Lake, Klamath Basin NWR, Siskiyou County	2010	2	1.35 (2 acres but watered 2 out of 3 years)	2
Don Edwards NWR, Alameda County	2015	1.83	1.83	1.83
Total		9.63	8.18	8.63

* Crump Lake was dry early in the 2014 nesting season and as of April 9, 2015 water surrounds the island, but little snow pack in the surrounding mountains puts this island at risk of being land bridged during the 2015 nesting season.

** Sheepy Lake was dry late in 2014 after a successful breeding season. Then, on April 14, 2015, the Corps obtained new information from the Refuge biologist at LKNWR because of the Refuge's interest in maintaining habitat for colony nesting birds, they would attempt to maintain water in Sheepy Lake well into July, making the island a viable site for use by Caspian terns for the 2015 nesting season normal (John Beckstrand, USFWS, personal communication).

Corps Constructed Islands

All Corps constructed alternative nesting islands have been successful in attracting terns and enabling nesting on 5 of the 8 islands during the past 6 years. The Caspian Tern Plan predicted that the new islands at Summer Lake and Crump Lake would attract between 5 and 300 nesting pairs. These expectations were met with Summer Lake experiencing a high of 29 nesting pairs in 2010 and have had an average of 16 breeding pairs (2009-

2014) since the island was constructed in 2009. At Summer Lake, only moderate nesting success by Caspian terns has occurred on 1 of 2 islands. Terns attempted to nest on the Gold Dike Island in 2012 but seemed to fail due to presence of mammalian predators. Owl predation may have been a limiting factor to terns in 2013 when no nesting occurred by Caspian terns. These 2 sites are viable because water surrounds the islands every year and forage fish availability is good within the normal foraging range of the Caspian tern.

Crump Lake far exceed expectations of use when 770 nesting pairs attended the island in 2009 and have had an average of 280 breeding pairs (2008-2014) since the island was constructed. Water levels vary greatly in the Warner Valley where Crump Lake is located which creates variable forage fish availability. In 2014, Crump Lake was dry early in the nesting season which caused terns to use the island only for loafing and then left the area due to low water low nesting suitability. Because the Warner Valley experiences high variability in water resources, the viability of the island from year to year is difficult to predict. The 2014 nesting season demonstrated the extreme drought conditions that occasionally in Warner Valley but is expected to only be short term condition based on historic water variability.

The islands in Klamath Basin and at Malheur were constructed under adaptive management where expected successes of the islands were not determined. These inlands sites would likely follow the same expectations of success of 5 to 300 pairs per site because they are similar to other inland sites where variables of water levels, forage fish availability and other factors influence numbers of terns that can be successful breeders at these sites. The Klamath Basin sites (except Orems Unit Island that has not been watered since construction) and the Malheur Island have had attendance by nesting terns annually since their construction in 2009 and 2010 respectively. In 2014, Sheepy Lake in the Klamath basin had more 500 nesting pairs while Tule Lake Island had more than 100 nesting pairs. Although attendance was down in 2014 at Malheur Lake Island, there were more than 500 nesting pairs there in 2013. Water is highly managed at Tule Lake to promote vegetation and therefore is not available every year (See Table 2). Malheur Lake, similar to Crump Lake can experience high variability in water and forage fish availability.

The island at Fern Ridge Reservoir is a viable site for terns since it has water surrounding the island every year and forage fish seem to be abundant in the area. But to date, terns arriving at this site have not attempted to nest or have been predated by bald eagle or peregrine falcon. Monitoring was conducted at the Fern Ridge Island from 2008-2011. Social attraction is deployed on the island yearly but only occasional monitoring is conducted until terns are found to be using the island for nesting.

The new islands are DENWR have a very good potential for high use by Caspian terns. The Caspian Tern Plan expected a range between 100 and 1,500 pairs to occupy each location that was analyzed in the EIS. This expectation could be applied to DENWR. In early April, 2015, more than two dozen terns were seen on the new islands and DENWR and were exhibiting breeding behaviors. This is a positive early sign that terns may breed successfully and DENWR in the first year of availability. Water and forage fish

availability is expected to be good every year increasing the likelihood of successful nesting of Caspian tern every year.

East Sand Island Terns and their Consumption of Juvenile Salmonids

Caspian terns nest on the eastern portion of ESI and are separated from the cormorant colony on the western portion of the island by dense upland shrub habitat. The number of adult Caspian terns on the ESI colony peaks in mid-May (Figure 7), which corresponds to the peak period of migration of juvenile salmonids (many released from upriver hatcheries) through the estuary.

The number of breeding tern pairs on ESI peaked in 2008 and trended downward through 2014 (Figure 8) as colony size has gradually been reduced, but increased in 2013 despite nesting acreage remaining constant from 2012 to 2013. In 2011, the colony did not produce any young; this was the only time that a complete breeding failure has occurred at this colony (Roby et al. 2012 Annual Report). The breeding failure was due to frequent flushing of the colony by bald eagle and subsequent egg predation by gulls as terns were flushed off colony. In 2014, predation on terns and their nest were much less than in previous years and product rates were higher. (Roby et. al. 2014).

Nesting success (average number of young raised per breeding pair) at the East Sand Island tern colony was estimated using aerial photography taken of the colony just prior to the fledging period (July 2014). The average of 3 direct counts of all terns (adults and juveniles) on the colony in aerial photography, corrected using ground counts of the ratio of fledglings to adults on 12 different plots within the colony area, was used to estimate the number of fledglings on the colony at the time of the photography. To estimate nesting success, the total number of fledglings counted on-colony was divided by the number of breeding pairs estimated during late incubation.

The estimate that 6,269 breeding pairs of Caspian terns (95% confidence interval (or c.i.)= 5,858 – 6,680 breeding pairs) were nesting on East Sand Island at the peak of nesting activity (late May – early June) in 2014. Unlike what was observed in previous years, there was no sustained effort by Caspian terns to nest at satellite colonies located near the high tide line on the beaches to the north, east, and south of the main colony at East Sand Island in 2014. This was likely due to nest dissuasion efforts implemented, along with inundation of those sites during high tide events and intense nest predation by glaucous-winged/western gulls. The size of the Caspian tern colony on ESI in 2014 was significantly smaller than the best estimate of peak colony size in 2013 (7,387 breeding pairs, 95% c.i. = 6,776 – 7,998 breeding pairs. This is the smallest colony size recorded at ESI since the initiation of reductions in tern nesting habitat on the island in 2008. This represents a 41% decline in Caspian tern colony size on ESI from its peak in 2008 (ca. 10,670 breeding pairs).

The overall decline in colony size at the ESI tern colony during 2008–2014

can be attributed to the planned reductions in area of tern nesting habitat on ESI as part of the Caspian Tern Plan for the CRE (USFWS 2005, 2006; see above). During 2008–2012, the amount of nesting habitat prepared for terns on East Sand Island had been incrementally reduced in each year, from approximately 5 acres in 2008 to 1.58 acres in 2012 and 2013. In 2014, the amount of nesting habitat prepared for Caspian terns on ESI were reduced slightly (1.55 acres) from what was prepared the previous two years. In response to the gradual decline in available nesting habitat for Caspian terns on East Sand Island, there has been a general increase in nesting density, from 0.72 nests/m^2 in 2008 to 1.06 nests/m^2 in 2014. It is likely that suitable nesting habitat for Caspian terns on ESI limiting, particularly in the last four years. Further reductions in the area of Caspian tern nesting habitat provided on ESI will be necessary to realize the goal of reducing the size of the ESI tern colony to 3,125 – 4,375 breeding pairs, as prescribed in the Tern Plan.

Using aerial photography, taken July 14, 2014, of the Caspian tern colony, an estimate of 1,700 fledglings were produced at the colony on ESI. No tern chicks were observed at any satellite colonies on ESI in 2014. Compared to Caspian tern nesting success at ESI in previous years and at other Caspian tern colonies in the region, this is considered poor productivity, but higher than the average productivity observed at this colony during the previous four years (0.08 fledglings/breeding pair). Nesting success at the ESI Caspian tern colony peaked in 2001 and has trended downward since then. At least two factors have contributed to the decline in productivity of the Caspian tern colony at East Sand Island: (1) ocean conditions and/or high river flows as they influence the availability of marine forage fishes in the estuary and (2) predation on tern eggs and chicks by gulls, especially during tern colony disturbance events caused by bald eagles (*Haliaeetus leucocephalus*; Collar 2013).

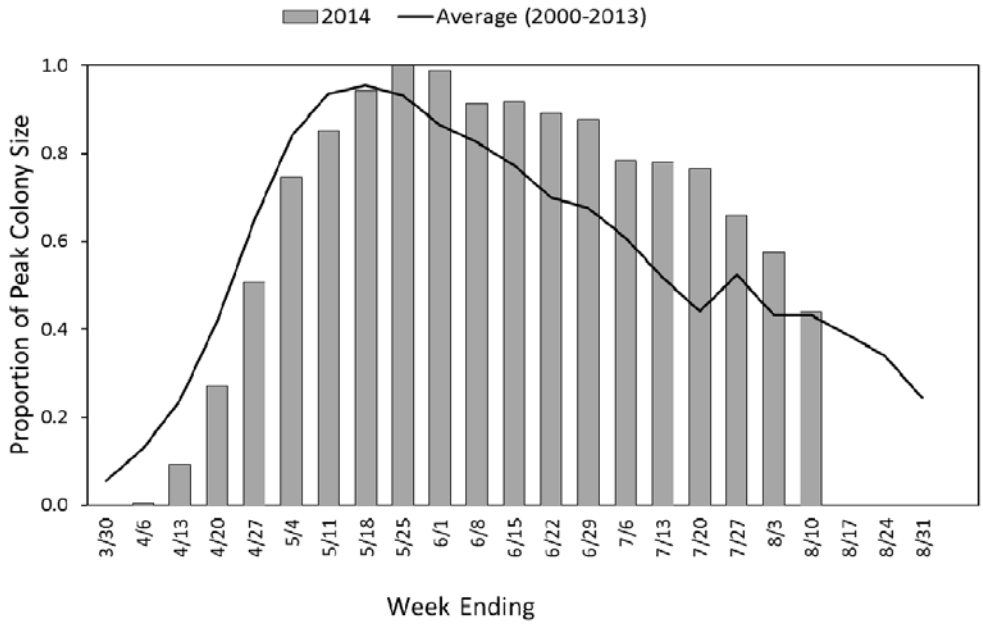

Figure 7. Weekly estimates from the ground of the number of adult Caspian terns on the East Sand Island colony during the 2014 breeding season, relative to peak colony attendance determined from counts of aerial photography taken late in the incubation period (Roby et al. 2014 Draft Annual Report).

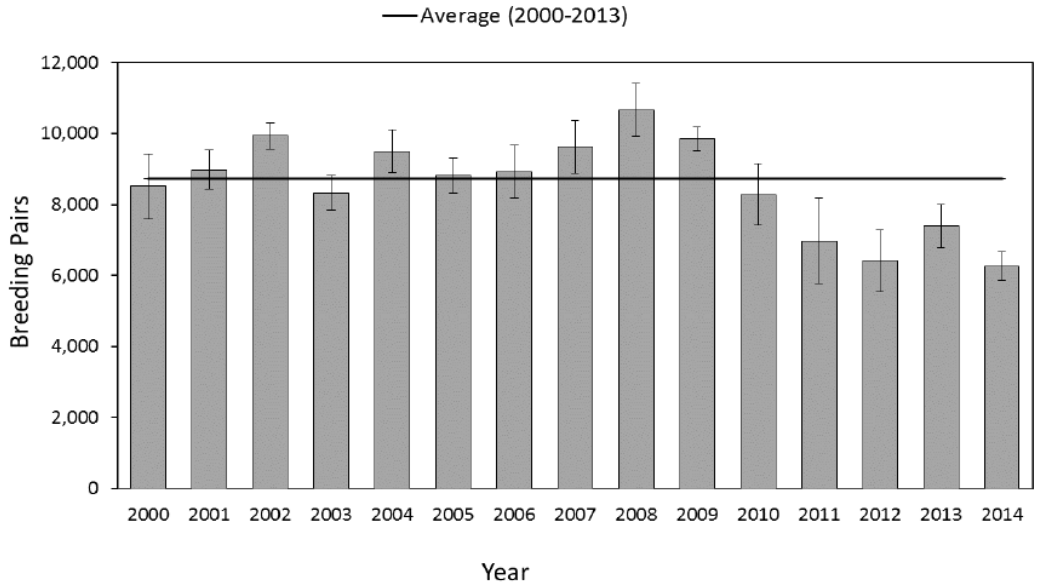

Figure 8. Number of breeding pairs of Caspian terns on East Sand Island (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

Climate conditions associated with a strong La Niña and the resultant exceptionally high river flows also apparently contributed to the lack of nesting success by affecting the availability of marine forage fish (Roby et al. 2012 Annual Report). Also, disturbance rate of Caspian terns from bald eagles on ESI has been positively related to May river discharge (Roby et al. 2013). Nesting success has been negatively related to June river discharge (Roby et al. 2013). Greater river discharge is thought to negatively affect the availability of marine forage fish (Roby et al. 2011 Annual Report) and decrease water clarity (Hostetter et al. 2012).

Thirteen ESA-listed Evolutionarily Significant Units (ESUs) comprising five species of Columbia River Basin salmonids occur in the CRE (Table 3).

Table 3. ESA statuses and juvenile migration strategy of the 13 ESUs occurring in the Columbia River Estuary.

Evolutionarily Significant Unit	Status	Juvenile Migration	ESA Listing Date
Chinook Salmon			
• Upper Columbia River Spring Run	Endangered	Yearling	3/24/1999
• Lower Columbia River	Threatened	Sub-yearling	3/24/1999
• Upper Willamette River	Threatened	Yearling	3/24/1999
• Snake River Spring/Summer Run	Threatened	Yearling	4/22/1992
• Snake River Fall Run	Threatened	Sub-yearling	4/22/1992
Coho Salmon			
• Lower Columbia River	Threatened	Yearling	3/24/1999
Chum Salmon			
• Columbia River	Threatened	Sub-yearling	3/24/1999

Sockeye Salmon			
• Snake River	Endangered	Yearling	11/2/1991
Steelhead			
• Upper Columbia River	Threatened	Yearling	8/18/1997
• Middle Columbia River	Threatened	Yearling	3/25/1999
• Lower Columbia River	Threatened	Yearling	3/19/1998
• Snake River	Threatened	Yearling	8/18/1997
• Upper Willamette River	Threatened	Yearling	3/25/1999

Predation on juvenile salmonids from avian predators is listed as one of the factors potentially limiting the recovery of Columbia Basin salmonid runs (NMFS 2008). As noted above, peak occurrence of juvenile salmonids in the CRE on their migration to the ocean occurs from April to July, which coincides with the nesting season of Caspian terns on ESI (Figure 9). Of the 5 species of ESA-listed salmonids in the CRE, steelhead, coho, and Chinook are consumed in the greatest number by the ESI tern colony based on numbers of individuals taken (Figure 9).

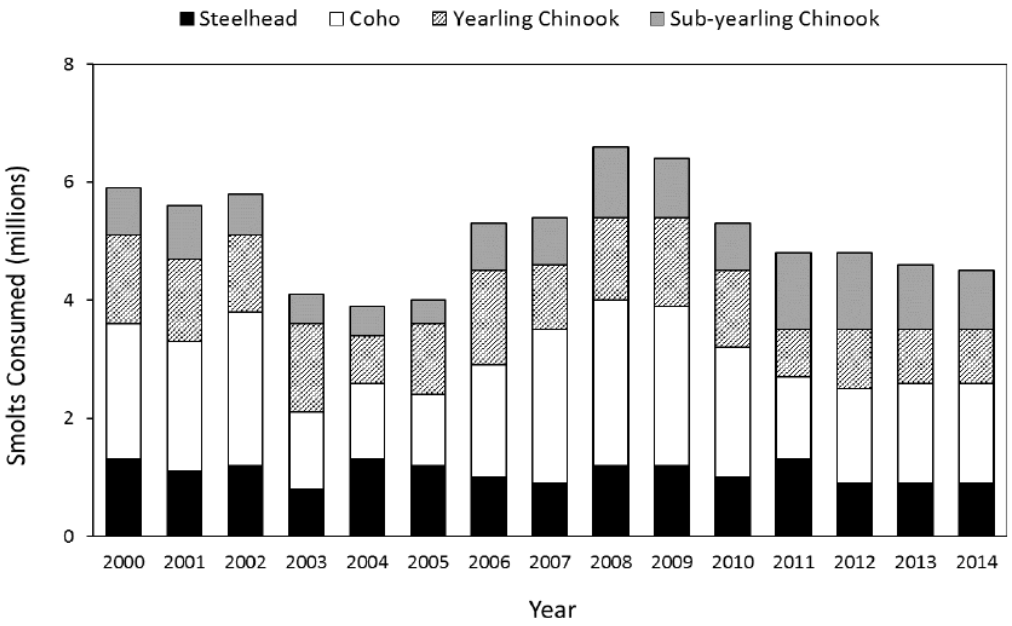

Figure 9. Estimated total annual consumption of steelhead, coho, and Chinook by Caspian terns nesting on East Sand Island during the 2000 to 2014 nesting seasons. Estimates based on fish collected from tern bill loads near the colony and bioenergetics calculations (Roby et al. 2014 Draft Annual Report).

Band Return and Resighting

In 2014, efforts were continued to band breeding adult Caspian terns and Caspian tern chicks near fledging age at several nesting colonies as part of on-going demographic studies. The banding efforts are also part of our continuing studies of movement rates

by adult Caspian terns among breeding colonies. Results track the movements of banded Caspian terns among colonies, either within or between years, to better assess the consequences of various management initiatives implemented as part of the Caspian Tern Plan for the CRE. Caspian terns that were color-banded in previous years (2005-2013) were resighted during 1-3 days per week at the Corps constructed tern islands on Crump Lake, 2-7 days per week at Summer Lake Wildlife Area (East Link and Gold Dike), 2-6 days per week at Sheepy Lake and Tule Lake Sump 1B, and 3-5 days per week on Malheur Lake throughout the 2014 breeding season.

A total of 16 color-banded Caspian terns were resighted at the Corps-constructed tern island at Crump Lake in 2014; 8 (50%) were banded at Crump Lake (1 as an adult and 7 as chicks), 3 (19%) were banded at the Sheepy Lake tern island (2 as adults and 1 as a chick), 3 (19%) were banded as chicks at Crescent Island, 1 (6%) was banded as an adult at Summer Lake, and 1 (6%) was banded as a chick at East Sand Island.

A total of 12 color-banded Caspian terns were resighted at the Corps-constructed tern islands in East Link and Gold Dike impoundments at Summer Lake Wildlife Area during 2014; 4 (33%) were banded at Sheepy Lake tern island (2 as adults and 2 as chicks), 3 (25%) were banded as chicks at Crescent Island, 3 (25%) were banded at Goose Island (1 as an adult and 2 as chicks), and 2 (17%) were banded as chicks at East Sand Island.
A total of 75 color-banded Caspian terns were resighted at the Corps-constructed tern island at Sheepy Lake in Lower Klamath NWR during 2014; 19 (25%) were banded at East Sand Island (1 as an adult and 18 as chicks), 18 (24%) were banded at the Sheepy Lake tern island (8 as adults and 10 as chicks), 10 (13%) were banded at Crump Lake tern island (3 as adults and 7 as chicks), 9 (12%) were banded as chicks at Crescent Island, 9 (12%) were banded at Goose Island-Potholes (4 as adults and 5 as chicks), 7 (9%) were banded as adults at the Tule Lake tern island, 1 (1%) was banded as an adult at Summer Lake, 1 (1%) was banded as a chick at the Port of Bellingham, and 1 (1%) was banded as a chick at Eden Landing in San Francisco Bay.

A total of 222 color-banded Caspian terns were resighted at the Corps-constructed island at Tule Lake Sump 1B in Tule Lake NWR during 2014; 53 (24%) were banded at East Sand Island (10 as adults and 43 as chicks), 39 (18%) were banded at Goose Island in Potholes Reservoir (12 as adults and 27 as chicks), 38 (17%) were banded at Crescent Island (4 as adults and 34 as chicks), 36 (16%) were banded at Sheepy Lake tern island (9 as adults and 27 as chicks), 25 (11%) were banded at Crump Lake tern island (5 as an adults and 20 as chicks), 14 (6%) were banded as chicks at the Port of Bellingham, 8 (4%) were banded as adults at Tule Lake tern island, 5 (2%) were banded as chicks at Brooks Island in San Francisco Bay, 2 (< 1%) were banded as chicks in the Copper River Delta, Alaska, 1 (< 1%) was banded as a chick at Malheur Lake tern island, and 1 (< 1%) was banded as a chick at Eden Landing, San Francisco Bay.

A total of 142 color-banded Caspian terns were resighted at the Corps-constructed tern island in Malheur Lake during 2014; 45 (32%) were banded at Goose Island in Potholes Reservoir (20 as adults and 25 as chicks), 42 (30%) were banded at Crescent Island (5 as adults, 37 as chicks), 31 (22%) were banded at Crump Lake tern island (10 as adults and

21 as chicks), 9 (6%) were banded as chicks at East Sand Island, 8 (6%) were banded at Sheepy Lake tern island (1 as an adult and 7 as chicks), 3 (2%) were banded as chicks at Malheur Lake tern island, 3 (2%) were banded as adults at Tule Lake tern island, and 1 (< 1%) was banded as a chick at the Port of Bellingham.

Resightings of banded Caspian terns at the recently established colonies on the Corps constructed islands in interior Oregon and northeastern California Lake continue to reveal high inter-colony connectivity, both among and between coastal and interior breeding colonies. Caspian terns banded at East Sand Island were resighted at five different Corps-constructed islands that were built by the Corps as alternative Caspian tern nesting habitat in interior Oregon and northeastern California as part of the Caspian Tern Plan for the CRE; all of these recently built tern islands are more than 400 km from the Caspian tern colony on ESI in the CRE. Movements of banded Caspian terns among the Corps-constructed alternative nesting islands in interior Oregon and northeastern California were also documented.

Based on the best model selected to estimate inter-colony movements, movement probabilities of Caspian terns banded as adults from alternative colony sites on the Corps-constructed tern islands in interior Oregon and northeastern California to East Sand Island ranged from < 0.01% to 1.6% prior to 2014. Movement probability increased to 14.0% in 2014, which translates into an estimated movement of 328 Caspian terns from Corps-constructed islands to ESI. Because the estimated movement from East Sand Island to Corps-constructed islands in 2014 was greater (461 individuals), the net movement of Caspian terns was still from ESI to the Corps-constructed tern islands in 2014. Movement probabilities from colonies on the Corps-constructed islands to Crescent Island increased from about 1.8% during 2012–2013 to 6.4% in 2014. Increased movement in 2014 from colonies on Corps constructed islands to ESI and Crescent Islands were apparently due to severe drought in interior Oregon and northeastern California in 2014.

CHAPTER 5
EFFECTS OF THE ALTERNATIVES

Effects of the actions described in the Caspian Tern Plan and incorporated by reference, except as noted in this text.

ESA-listed Species and Caspian Terns:

Proposed Action:
The proposed action is to reduce the managed tern habitat at ESI to 1.0 acre (a 31.6% reduction in nesting area) and to continue hazing and dissuasion actions on the beach/shoreline areas of ESI. This reduction in habitat is the maximum reduction allowed by the Caspian Tern Plan. By reducing the managed habitat area down to 1.0 acre, there will not be enough physical space for the nearly 7,000 pairs attempting to nest at ESI. A

likely outcome is that many of the displaced terns (as many as 2,000 pairs, 4,000 individuals) will seek alternative nesting areas on the beach habitat of ESI, relocated to Corps constructed islands in eastern Oregon and California, prospect new nest sites in the lower CRE (i.g. Miller, Pillar Rock and Rice Islands) and other areas where terns have attempted to nest historically throughout the Pacific Coast Population Range (i.e Washington and Alaska).

Implementation of the Proposed Action is considered in this EA to be a corrective measure to reduce predation on juvenile Columbia River Basin ESA-listed salmonids with the goal, per the Caspian tern plan, to redistribute approximately 60% of the tern population of the ESI colony. This in response to unexpected high densities of nesting Caspian terns on ESI in 2013 and was seen as a corrective measure to alleviate predation on juvenile salmonids, in the long term, and undesired expansion of the Caspian tern population in the CRE in future years. As noted above, ESI is the largest Caspian tern nesting colony in the world and is abnormally large for this species, and a 0.58-acre reduction in colony area is predicted to lower the number of nesters on ESI in 2015 compared to 2008 when implementation of the Caspian Tern Plan began through 2014.

It is assumed that the number of Caspian Terns returning to ESI in 2015 would be large enough to occupy the 1.0 acres of nesting habitat at the density observed in 2013. It is also assumed that enough Caspian terns would be present in 2015 and may nest equal to or at higher densities than observed in 2013; whether or not they would nest at higher densities on ESI than observed in 2013 is unknown; they may since even higher nesting densities of 1.5 per square meter have been observed as mentioned previously.

Caspian terns have attempted (and have had limited success in nesting) along the eastern shore of ESI outside of the designated 1.58 acre colony area (Roby et al. 2012 Annual Report). From 2012 through 2014, dissuasion activities continued on ESI. Ropes, flagging, and stakes were placed to dissuade nesting attempts in two sites: one on the southeast side of the island and the other on the western portion adjacent to the double-crested cormorant colony (DCCO). Installation of approximately three acres of dissuasion fencing was installed in early April 2014 near the DCCO colony. No nesting attempts were made by Caspian terns on the west side; however, roosting by Caspian terns was observed on sand flats north of the dissuasion area when the tide was low. Numbers of Caspian terns observed roosting on the western portion of the island peaked during May, ranging from 100 to over 300 individuals during the month. On the eastern portion of the island, near the Caspian tern colony, approximately 2.1 acres of dissuasion fencing was installed.

The density of Caspian terns nesting on ESI in 2013 was approximately 1.17 nests per square meter resulting in approximately 7,111 nests, the highest density ever observed in the CRE (Roby et al. 2013). If nesting occurs at this density in 2015 over 1.0 acres, approximately 5,200 nests would result. This is approximately 66% more pairs than the high end of the range identified in the Caspian Tern Plan of 3,125. It is expected that some of the returning Caspian terns that would not be able to nest at the ESI colony because of unavailable space would attempt to nest elsewhere in the CRE as they have done in past years; especially upriver at Rice Island, the main nesting colony site prior to

movement of terns to ESI. Terns may also attempt to nest along the eastern shore of ESI as they have done in the past and available habitat toward the western end of the island. Continued dissuasion and hazing, potentially more intense than in the past, where necessary under the Proposed Action of this EA would be expected to alleviate this problem to a large extent; this has been successful during previous years.

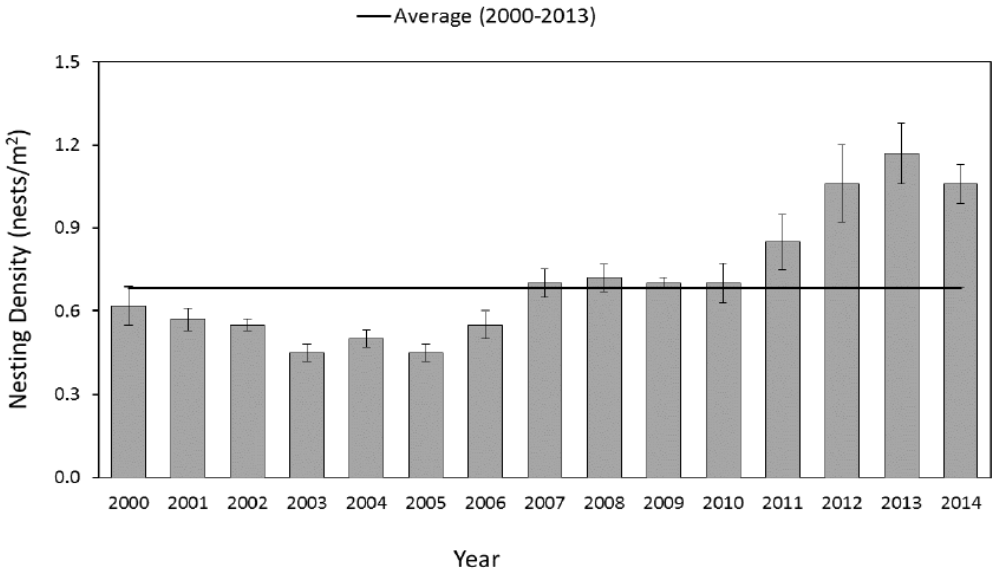

Figure 10. Nesting density of Caspian terns on East Sand Island (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

Reducing nesting area on ESI prior to the 2015 nesting season will likely cause terns to seek alternative habitat for nesting or forego nesting for the season. It is expected that due to the reduced managed habitat that not all displaced terns will leave the CRE in 2015. Therefore only minimal reduction in predation on juvenile salmonids in the CRE is expected 2015. Reduction of predation on juvenile salmonids would be expected over the long term as terns find new habitat that has been created by the Corps, move to other natural nesting areas outside the Columbia River Basin, or experience a lower population size in the Pacific Coast region. Installing silt fence on the tern colony at ESI precludes terns from nesting and is the primary method for the colony reduction. There are no impacts to terns from the presence of the silt and have nested up against the silt fence in previous years.

With reduction of the nesting area, predation on juvenile salmonids could, conceivably, increase in 2015 with implementation of the Proposed Action compared to the No Action Alternative resulting from use of upriver areas of some of the excess terns that would not be able to nest on ESI because of limited space. The diet of terns using upriver areas such as Rice Island, Pillar Rock Island, and Miller Sands Spit would tend to include greater percentages of juvenile salmonids than birds nesting at ESI and foraging closer to the island because of the scarcity of marine forage fish such as anchovy, herring, and smelt at upriver locations; intense predation on juvenile salmonids, as described earlier, was the reason for relocation of the Caspian tern colony from Rice Island to ESI. Non-nesting terns are expected to eat less, however, than nesting terns that are feeding young; but a

non-nesting tern foraging in the vicinity of Rice Island, for example, may consume more juvenile salmonids than a nesting bird at ESI. Roby et al. (2002) showed that the diet of Caspian terns nesting on Rice Island in 1999 and 2000 comprised 77% and 90% juvenile salmonids, respectively. Conversely, diets of Caspian terns nesting on ESI have been, on average since colony establishment, comprised of approximately 31% juvenile salmonids (Roby et al. 2012 Annual Report). Recent hazing efforts have been necessary on Rice Island, as terns have attempted to nest, but not on Pillar Rock Island or Miller Sands Spit (Roby et al. 2012 Annual Report). In 2012, dredged material placed on Miller Sands Spit was contoured to establish mounds to reduce sight distance of terns on the ground and prevent nesting. Use of the upriver islands, however, is not expected to be great.

Implementation of the Proposed Action is predicted to have benefits to ESA-listed salmonids in the long term by reducing predation from Caspian terns by lowering the ESI Caspian tern colony size and producing less young that could return to the estuary.

In 2014, the Corps contracted with Oregon State University to engage in efforts to band breeding adult Caspian terns and Caspian tern chicks near fledging age at several nesting colonies as part of on-going demographic studies. The banding efforts are also part of our continuing studies of movement rates
by adult Caspian terns among breeding colonies.

Based on current re-sighting data for Caspian terns banded on ESI, some terns dissuaded from nesting on ESI in 2015 would relocate and attempt to breed at the Corps' constructed tern islands located in interior Oregon and California (Bird Research Northwest 2014). Additionally, the five newly constructed islands are Don Edwards NWR in south San Francisco Bay may help to alleviate the predation on juvenile salmonids in the Columbia River Basin, even though this is the first year the island will be available. In 2008, more than 400 Caspian tern pairs utilized then newly constructed Corps Island at Crump Lake in southeast Oregon. Band recovery data documented that many of these birds had relocated from ESI to Crump Lake and were successful nesters. Since the forage fish abundance is much higher near DE NWR, there seems to be ample opportunity for terns to be success nesters there in 2015. Since the reduction of the number of nesting pairs of Caspian terns on ESI and associated reduction in predation on Columbia Basin juvenile salmonids remains the long-term goal, Don Edwards NWR could play an important role in attracting large numbers of Caspian terns away from the CRE.

Pacific Eulachon

Pacific eulachon, a species of smelt and often referred to as "smelt", migrate upriver in the Columbia River to their spawning areas mainly in the Lewis and Cowlitz Rivers of Washington and the Sandy River of Oregon. Eulachon are similar to most salmonids in that they are semelparous, dying after spawning, so any concern with respect to predation from Caspian terns would be with fish that are moving upriver.

Abundance of migrating adult eulachon in the Columbia River has historically been highly variable (Figure 14). The 2012 ESA listing of the species was in response to low numbers beginning in the early 1990s, but 2013 resulted in a strong run. Caspian terns typically arrive at Oregon colonies in late March and early April (Roby et al. 2003). Freshwater entry of eulachon from the Pacific Ocean and migration through the CRE typically occurs for the most part before Caspian terns would arrive in the CRE (Figure 15); during most years, it is expected that would be no consumption of eulachon by Caspian terns. Caspian terns in the CRE could conceivably prey upon eulachon during years when eulachon entry into the Columbia River occurs later than typical. Migratory timing of eulachon and arrival of Caspian terns in the CRE, however, typically do not overlap. Of the very large number of observations made on fish taken by Caspian terns over the years in the CRE, eulachon have not been detected in their diet (Bird Research Northwest 2014). Implementation of the Proposed Action would likely to reduce the number of Caspian terns in the CRE and since predation on eulachon has not been documented in the CRE the action would likely have *no effect* to eulachon.

Streaked Horned Lark

Streaked horned larks, a subspecies of the widely distributed horned lark, occurs west of the Cascade Range including in the CRE and was listed under ESA in 2013. Although there is anecdotal evidence of streaked horned larks occurring on ESI, no nesting has been observed. Reduction of Caspian tern nesting habitat acreage in 2015 in combination with dissuasion/hazing on ESI could conceivably result in more terns moving upriver in the CRE which may result in more prospecting and a greater chance that terns would attempt to nest on Rice Island, Miller Sands Spit, and Pillar Rock Island. Dissuasion and hazing on these islands is a requirement of the NMFS 2012 Biological Opinion and occurs annually. Recent surveys have documented nesting of streaked horned larks at Rice Island, Miller Sands Spit, and Pillar Rock Island (Pearson and Altman 2005; Anderson 2009); no nesting has been reported from ESI. Streaked horned larks also winter on islands in the lower CRE.

Streaked horned larks are known to nest in areas of dredged disposed material but not newly placed material; they typically use areas with substantial areas of bare ground with sparse, low growing vegetation composed primarily of grasses and forbs (Federal Register 2013a; Pearson and Hopey 2005), which is different than Caspian terns which prefer bare sand or very sparsely vegetated sand. Therefore, there is not an expectation that streaked horned larks and Caspian terns would use the same areas for nesting.

It is difficult to estimate how many Caspian terns displaced from ESI may need to be dissuaded in areas that overlap with the lark. It is unpredictable as to how many additional terns might try to nest on these islands resulting from implementation of the preferred alternative of reducing nesting habitat acreage on ESI. It is predicted that based on current re-sighting data for Caspian terns banded on ESI, some if not most of the terns dissuaded from nesting on ESI in 2015 would relocate and attempt to breed at the Corps-constructed tern islands located in the interior of Oregon and California. And it is

unlikely that large numbers of Caspian terns that can't find space to nest at ESI would instead remain near Rice Island/Miller Sands Spit for the entire smolt out-migration (Bird Research Northwest 2014).

Past observations on dredge material islands in the CRE have shown that Caspian terns do not show an interest in these upland areas where streaked horned larks are likely to nest. Of the three upriver islands, only Rice Island has required hazing of Caspian terns, and this has been done in low lying areas of bare sand or nearly bare sand in areas where streaked horned larks would not be expected to nest or use post-nesting. No hazing of Caspian terns on Rice Island was required in 2013, and decrease in nesting acreage in the past does not appear to have resulted in increased numbers of Caspian terns at Rice Island (Corps 2014b).

The Corps recently consulted with USFWS on the effects of navigation channel operations and maintenance on streaked horned lark (Corps 2014a), which includes dredged material (sand) disposal on Rice Island, Miller Sands Spit, and Pillar Rock Island. The 2014 Corps' Biological Opinion made an effect determination of May Affect, Likely to Adversely Affect for operation and maintenance activities on streaked horned lark. This was for all actions combined including placement of dredged material, however, not specifically hazing of Caspian terns. As mentioned above, Caspian terns prefer bare sand areas for nesting while streaked horned larks prefer sandy areas that are upland and sparsely vegetated. Streaked horned larks walk through vegetation as opposed to hopping; consequently denser vegetation can be difficult to traverse (Beason 1995). Rice Island, Miller Sands Spit, and Pillar Rock Islands were designated at critical habitat during the ESA-listing process where ESI was not considered critical habitat.

In March, 2015, the Corps prepared a Biological Assessment for continued hazing, dissuasion and habitat maintenance at ESI as well as assessment of the potential impacts of further reduction of the tern colony habitat from 1.58 to 1.0 acres. The Corps determined the Proposed Action Alternative May Affect, but is Not Likely to Adversely Affect for on streaked horned lark. On April 2, 2015, the USFWS provide a letter of concurrence agreeing with the Corps' determination.

Reduction in nesting area on ESI is expected to result in movement in future years of some terns that would have returned to ESI. In 2013, approximately 680 Caspian terns moved from ESI to some of the constructed inland sites, including Summer Lake, Malheur Lake, Crump Lake, Sheepy Lake, and Tule Lake (Roby et al. 2013).

No Action Alternative: Impacts on streaked horned larks with the No Action alternative are predicted to be the same as with the Proposed Action because of lack of overlap of terns and streaked horned larks on the upriver islands.

Because of run timing of eulachon and because none have been observed in the Caspian tern diet, the No Action alternative is predicted to have no effects on eulachon as described for the Proposed Action.

Fish and Wildlife (non-ESA-listed):

Proposed Action: Implementation of the Proposed Action would serve as a corrective measure to prevent the potential for undesired population expansion of Caspian terns in the CRE, and resultant increased predation on juvenile ESA-listed salmonids. Non-ESA-listed fish species upon which Caspian terns prey in the lower CRE in the vicinity of ESI and the ocean include anchovy, herring, surfperch, Pacific sand lance, and smelt. Longfin smelt and surf smelt are present in the estuary throughout the Caspian tern nesting season; Bottom et al. (1984) found that longfin smelt and surf smelt were represented in the estuary consistently during spring high and summer low flow periods. With implementation of the Proposed Action the aim would be to stabilize the Caspian tern nesting population in future years. This would tend to lessen predation on non-ESA-listed fish in the long term compared to the No Action Alternative, which would allow more nesters on ESI. However, Caspian tern predation on non-ESA-listed fish in the CRE, primarily marine forage fish, is not a concern from the standpoint of the health of those populations.

Bald eagles and California brown pelicans are both piscivorous and were both formerly listed under ESA; bald eagles being delisted in 2007 and California brown pelicans in 2009. Bald eagles nest and are permanent residents in the CRE. They prey primarily upon waterfowl and large fish, and frequently scavenge (Isaacs and Anthony 2003). The size of fish they take are larger than Caspian tern prey so any increases in number of juvenile salmonids and/or other forage fish in the CRE that result from implementation of the Proposed Action would have no impact on the prey base for bald eagles. There are known instances of bald eagles attempting to pirate small fish from Caspian terns (e.g. Scientific Resources Inc., 1990), but these apparently are uncommon occurrences.

California brown pelicans have become common in the CRE and ESI has been, during some if not all years since 2002, the largest night time roost for this species on the Pacific Coast with thousands present (Figure 18). Approximately 16,000 California brown pelicans were present in 2009, which is the peak year so far (Bird Research Northwest 2014b). An estimate of 22,000 pelicans on ESI was also made on a one day survey in 2009 (communication with Deborah Jaques, 2013). Wright et al. (2007) reported that less than 100 birds occurred on the island annually from 1979 to 1986. California brown pelicans typically arrive in the CRE in early May and numbers peak in August (Wright et al. 2007), but they have been arriving earlier and have been seen in March recently (Roby et al. 2012). California brown pelicans are not deterred from roosting in areas where dissuasion material has been placed; up to 1,500 individuals roosted in cormorant dissuasion areas near the west end of ESI in 2012 (Roby et al. 2012).

Wright et al. (2007) showed that land-based human disturbance was negatively associated with total roosting California brown pelican numbers, while water-based human disturbance was not. Dissuasion materials have the potential to cause continued entanglement of California brown pelicans. Dissuasion will involve installation of a perimeter of 5 ½ inch metal T-posts with interior metal U-posts at least four feet tall and connected by yellow poly rope with 4-mil flagging (yellow caution tape or similar)

secured to the rope at the mid-point between stakes (Corps 2014e). Stakes will be placed a minimum of ten feet apart. One flag is required per each mid-point between stakes and will have a length after tying of a minimum to two feet. Poly rope will be a minimum of ¼ inch in diameter. When complete, the dissuasion will have the appearance of a grid pattern. After the nesting season, dissuasion materials will be stored in non-vegetated upland areas near the colony and on the western end of the island and near the eastern shore in close proximity to the three areas where dissuasion will occur. Rope will be stored in spools and not pose a threat of entanglement of pelicans.

Prior to the nesting season, dissuasion material will be placed from March 23 to April 15 on the eastern shore of ESI (over approximately three acres) and at the western end of the island near the double-crested cormorant colony (over approximately two acres). An additional area (perhaps as much as 1.5 acres) along the eastern shore may require dissuasion because of dropping river during summer levels and exposure of suitable nesting habitat along the eastern shore. The acreage of dissuasion along the eastern shore will be similar to what has been done in the past. The western area has not been dissuaded before. Two California brown pelicans were documented as becoming entangled in dissuasion material on ESI; one in 2011 and one in 2013. Both were disentangled and released, apparently unharmed (communication with Daniel D. Roby, OSU, February 4, 2014). Although this is likely an unusual occurrence, increased dissuasion efforts involving placing more material would pose increased risk for entanglement of pelicans. The expected number of incidents would remain low, however, but the probability of entanglement may be about twice that of previous years because about twice as much area of dissuasion materials will be placed.

California brown pelicans forage on fish of similar size to Caspian tern prey. The availability of forage fish is not believed to be a limiting factor for piscivorous birds in the CRE. California brown pelicans feed primarily on northern anchovy, at least in the California Current system (Anderson and Gress 1982) but are opportunistic feeders (Anderson and Anderson 1976) and feed more during lower tides (Wright et al. 2007). Pacific herring and Pacific sand lance were found to be the most common species taken near Vancouver Island, British Columbia (Burger et al. 1998). These three species of fish often taken by California brown pelicans are typically similar in size to juvenile salmonids in the Columbia River Basin; northern anchovy (~17.8 cm, 178 mm), Pacific herring (~25 cm, 250 mm), and Pacific sand lance (~20 cm, 200 mm) (Hart 1973). California brown pelicans often take multiple fish on single dives into the water from flight and tend to concentrate on schools of fish. Therefore, it is unlikely that California brown pelicans prey heavily on juvenile salmonids when occupying ESI and PIT tag (passive internal transponder) data from Roby et al. (2012) indicates that California brown pelicans using ESI are not feeding on juvenile salmonids.

Gulls, in general, have a varied diet (e.g. Marshall et al. 2003) and are not considered a problem with predation on juvenile salmonids in the CRE. Reducing the acreage of prepared habitat and allowing encroachment of vegetation over time could possibly benefit ring-billed gulls; Hayward (1993) showed that ring-billed gulls in Washington had better nesting success when nests were located in tall grass. Ring-billed gulls have

not nested within the Caspian tern colony on ESI (Bird Research Northwest 2014). Recently a colony of about 1,700 ring-billed gulls has become established on the eastern shore of ESI. Reducing the ESI Caspian tern colony acreage by implementation of the Proposed Action would not impact ring-billed gulls. Ring-billed gulls are common and have a broad distribution in North America (Butler 2003) and do not garner much management concern. Hybrid gulls have nested in low numbers (perhaps a few dozen) within the tern colony (Bird Research Northwest 2014) but there is no conservation concern with respect to hybrid gulls.

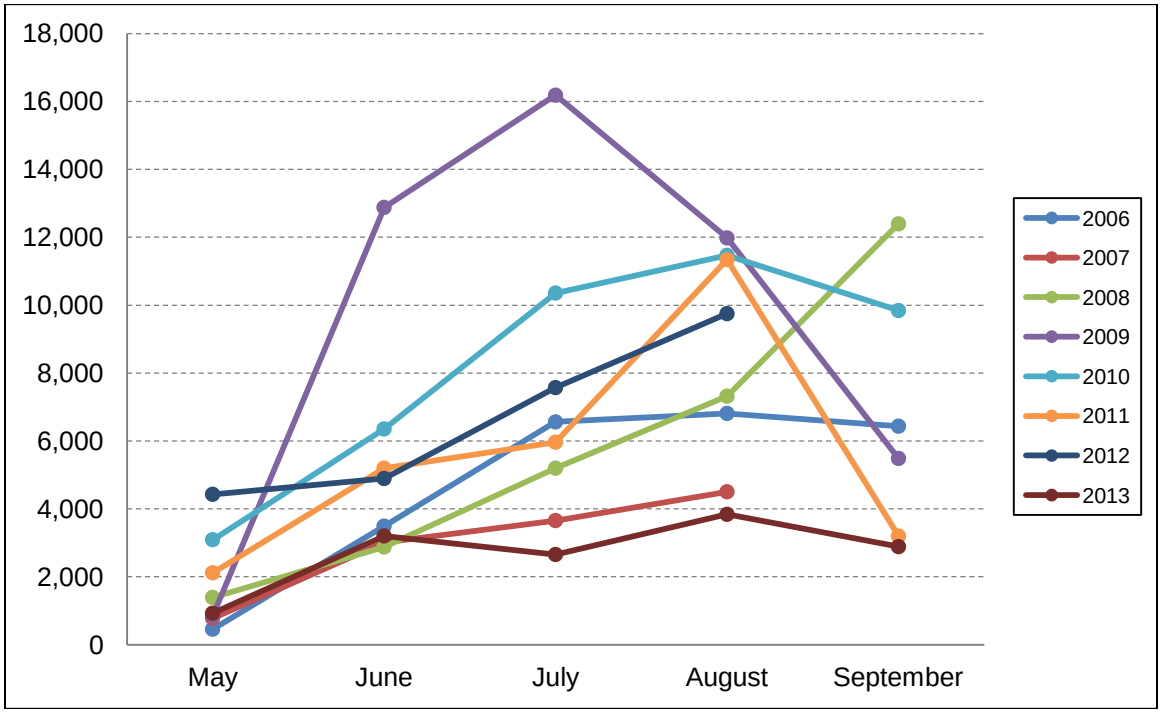

Figure 11. Monthly average number of California brown pelicans roosting on East Sand Island during evening surveys conducted from 2006 through 2013 (Bird Research Northwest 2014b).

Reducing acreage would not impact nesting of double-crested and Brandt's cormorants as these two species nest on the other side (west side) of ESI and are separated from the Caspian tern colony by dense shrubbery. While Caspian terns have attempted to nest on ESI outside of the designated colony, this has been done on the east shore of the island (near the Caspian tern colony). There is potential Caspian tern nesting habitat (about two acres) near the west end of the island near the cormorant colony, in which temporary dissuasion materials will be installed prior to cormorant nesting in2015. There would be no monitoring of terns on the west end of the island for 2015.

No Action Alternative: With the No Action Alternative, maintaining 1.58 acres of nesting habitat on ESI would tend to "keep" Caspian terns in the lower CRE. Fewer terns would be expected to move to the upriver islands of Rice, Miller Sands, and Pillar Rock. Less would also be expected to move to the interior nesting sites. If selected the No Action alternative less terns would be expected to occupy the interior areas. The diets of these relocated terns would likely consist of a greater percentage of juvenile salmonids

than terns in the vicinity of ESI because of the increased scarcity of marine forage fish with distance upriver. For these reasons, the No Action for 2015 is not desirable in an effort to "keep" more terns in the lower estuary where juvenile salmonids represent less of a percentage of the diet than farther upriver. Reduction of the number of nesting pairs on ESI and commensurate reduction in predation on Columbia Basin juvenile salmonids, however, does remain the long-term goal.

Potential effects from dissuasion on California brown pelicans for the No Action are as described for the Proposed Action because the same amount of dissuasion material is planned for ESI under both alternatives.

Vegetation:

Proposed Action: With implementation of the Proposed Action, vegetation would be allowed to grow back within the 0.58 acre of area that would be removed from the Caspian tern nesting area on ESI. It would take about three years to fully revegetate. This vegetation would consist mostly of non-native American dunegrass and European beachgrass, and would prevent nesting of Caspian terns.

No Action Alternative: With the No Action Alternative, vegetation on ESI would continue to be maintained, with 1.58 acres being disked annually to support nesting of Caspian terns.

Wetlands:

***Proposed Action*:** Jurisdictional wetlands occur on ESI (Figure 19). No disturbance to wetlands on ESI will result from the work. ATV use for hauling dissuasion materials, disking, etc. will be confined to uplands.

***No Action*:** No disturbance to wetlands on ESI will result from the work. ATV use for hauling dissuasion materials, disking, etc. will be confined to uplands.

Ground Disturbance:

Proposed Action: With implementation of the Proposed Action, the area removed from the nesting acreage (0.58 acre of previously disposed dredged material) would no longer be disked.

No Action Alternative: No changes to ground disturbance would result from the No Action Alternative. The entire current Caspian tern nesting area (1.58 acres of previously disposed dredged material) on ESI would continue to be disked annually before nesting begins in March.

Figure 12. The eastern portion of East Sand Island showing the wetlands occurring on the island (in yellow), on either side of the Caspian tern colony.

Cultural Resources:

Proposed Action:

Two sites on ESI were determined eligible for listing on the National Register of Historic Places and three sites were determined not eligible. All sites will be avoided.

The Corps has determined that the Proposed Action would result in 'no historic properties affected.' Annual ground disturbance would cease over 0.58 acre of the current ESI Caspian tern nesting colony, which is located on previously placed dredged material. Dissuasion material may be placed on the east shore of the island as in years past and near the west end of the island; this area however is low-lying and subject to erosion/deposition and not expected to yield cultural resources. A pedestrian cultural resource survey occurred during January, 2014. The Corps coordinated with the Oregon State Historic Preservation Office (SHPO) and affected Tribes. Concurrence with the Corps determination of 'no historic properties affected' was received from the SHPO on March 20, 2015.

No Action Alternative:

Two sites on ESI were determined eligible for listing on the National Register of Historic Places and three sites were determined not eligible. All sites will be avoided.

The Corps has determined that the No Action would result in 'no historic properties affected.' Annual ground disturbance would continue over 1.58 acres of the current ESI

Caspian tern nesting colony which, as noted above, is located on previously placed dredged material. Dissuasion material may be placed on the east shore of the island as in years past and near the west end of the island; this area however is low-lying and subject to erosion/deposition and not expected to yield cultural resources. A pedestrian cultural resource survey occurred during January, 2014. The Corps coordinated with Oregon SHPO and received concurrence on the no effect determination on March 20, 2015.

Land Use:

Proposed Action: With implementation of the Proposed Action, 0.58 acres of previously disposed dredged material on ESI would be allowed to revegetate and would not be used by Caspian terns for future nesting.

No Action Alternative: No changes to land use would result from the No Action Alternative. A total of 1.58 acres of nesting habitat (previously disposed dredged material) for Caspian terns would be made available on ESI annually.

Environmental Justice:

Proposed Action: No subsistence, low-income or minority communities will be affected by the proposed activities because the project area is uninhabited and therefore there will be no change in the populations, economics or other indicator of social well-being. Consequently, the proposed actions are in compliance with this Order because no environmental justice implications exist for this project area. Implementation of the Proposed Action would not adversely affect any particular group of people to a greater extent than other groups, as all work would occur on public land. No private property would be impacted from implementation of the Proposed Action.

No Action Alternative: No changes regarding environmental justice would result from the No Action Alternative. There are no issues with environmental justice with management for Caspian terns on ESI for the reasons stated under the proposed action above.

Recreation:

Proposed Action: Managed recreation doesn't occur on ESI. Occasional boaters, hunters and fishers may use the island infrequently and usually outside the nesting season of April to September. East Sand Island is closed to the public and therefore, implementation of the Proposed Action would not impact any recreation that might occur on the island.

iNo Action Alternative: Managed recreation doesn't occur on ESI. Occasional boaters, hunters and fishers may use the island infrequently and usually outside the nesting season of April to September. East Sand Island is closed to the public and therefore, the No Action Alternative would not impact any recreation that might occur on the island.

CHAPTER 6
CUMULATIVE EFFECTS

Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions (Bass et al. 2001). This EA considers the contributions of these actions, combined with the Proposed Action and the No Action Alternative, on cumulative effects to the natural resources that could affect the quality of the human environment. The area of consideration is the CRE (from the downstream end of Puget Island to the ocean and the interior constructed Caspian tern nesting sites).

Actions considered in the context of cumulative effects in this EA include the following: Dissuasion and hazing in the CRE (on Rice Island, Miller Sands Spit, and Pillar Rock Island) as needed; predator management of interior and coastal Caspian tern alternative nesting locations; management of Caspian terns in the Columbia Plateau Region by the Corps Walla Walla District and the BOR, and management of the double-crested cormorant colony in the CRE.

- Dissuasion in the CRE: Dissuasion and hazing Caspian terns from Rice Island, Pillar Rock Island, and Miller Sands Spit (all located upriver of ESI) would continue under the Corps' dredging program to exclude Caspian terns and double-crested cormorants from nesting on these islands. Passive and active non-lethal hazing methods, as described for ESI above. This work is being conducted as part of the Channels and Harbors Columbia River Channel Improvement project.

- Management at alternative nesting sites: On-going predator management will be used to aid establishment of Caspian tern colonies at Corps constructed tern islands. Predator control will be an important management tool in 2015, to ensure the displaced terns from ESI have a safe environment in which to establish new nesting areas, including the new islands at DENWR.

- Reasonably Foreseeable Future Actions: Management of Caspian terns in the Columbia Plateau Region. The Walla Walla District and BOR are implementing their plan to exclude Caspian terns from nesting on two former nesting areas at Goose and Crescent islands in the mid-Columbia River basin.

- Reasonably Foreseeable Future Actions: Reduction in numbers of nesting pairs of double-crested cormorants on ESI. A final EIS and corresponding ROD was completed April 2015. Actions proposed in the ROD may result in management of cormorants on the west end of ESI as early as April 2015, with lethal removal being the primary method of reducing the colony size. The Corps believe that human disturbance associated with individual DCCO culling and egg oiling actions on the west end of ESI will not affect the terns nesting on the east end of ESI because the distance and visual barriers between the two colonies maintain a safe environment for terns to nest on the managed tern habitat.

Caspian Tern Management in the Estuary, Upriver of East Sand Island

To address concerns about the Caspian terns' potential to go upriver and consume greater numbers of salmon, the Caspian Tern Plan called for dissuasion and hazing at Rice Island, Miller Sands Spit, and Pillar Rock Island. The Corps uses these islands on a semi-regular basis to place dredged material, thereby creating suitable temporary open sand nesting habitat for the terns. Hazing was also a requirement of the Biological Opinion for Columbia River channel operations and maintenance (NMFS 2012).

Recent efforts to dissuade and haze the terns from these islands have only been necessary on Rice Island, as the birds have not exhibited nesting behavior on Miller Sands Spit or Pillar Rock Islands (Roby et al. 2012 Annual Report). Rice Island and Miller Sands Spit are the two most likely places Caspian terns may seek out for roosting or nesting as relatively recent placement of dredged material and clearing for that placement have created some suitable habitat with little to no vegetation. Caspian terns have used Rice Island and Miller Sands Spit for roosting and adjacent waters for foraging but their use of the islands in this way, as observed by monitors and hazers, has been limited to the mud flats.

Annually, a contractor is secured by the Corps to perform boat based patrols of Miller, Pillar Rock, and Rice islands from Mid-April until late June. Human hazing and occasionally installation of dissuasion materials has been necessary to prevent terns from nesting on Rice Island. To assist in preventing the establishment of new tern colonies on Rice Island, Miller Sands Spit, and Pillar Rock Island, the USFWS (per the Caspian Tern Plan) would issue a depredation permit annually to the Corps to collect tern eggs, should hazing with non-lethal methods fail to prevent tern nesting. Since the implementation of the Caspian Tern Plan, a total of 10 eggs have been collected under permit, all from Rice Island. These methods will continue to be used to prevent terns from nesting on these three islands.

Figure 13 Wood stakes with rope and flagging used to make Caspian tern nesting habitat unsuitable on Rice Island.

Proposed Action:
Dissuasion and hazing in the CRE as needed: Implementation of the Proposed Action may result in more Caspian terns going to the upstream islands of Rice, Miller Sands, and Pillar Rock compared to the No Action. Of the three islands, Rice Island has the most potential for nesting Caspian terns. Dissuasion and hazing may be more intense under the Proposed Action. There is potential overlap in habitat use by terns and recent ESA-listed streaked horned lark, but occurrence is expected to be very low and not result in hazing actions causing take of lark nests.

No Action:
Dissuasion and hazing in the CRE as needed: Same effects as described above for the Proposed Action except that perhaps fewer terns would occupy the three upstream islands resulting in less required dissuasion and hazing. Since streaked horned larks and Caspian terns use different habitats and have not been shown in the past to overlap on these islands, there is very little concern over potential impacts to nesting streaked horned larks.

Predator Management at Corps Constructed Caspian tern Islands

Terns displaced by habitat reduction on ESI are expected to relocate to the Corps constructed tern islands in interior Oregon and northeastern California (i.e., Fern Ridge Reservoir, Crump Lake, Summer Lake Wildlife Area [2 islands], Malheur NWR Tule Lake NWR, and Lower Klamath NWR [2 islands], and the recently enhanced islands at DENWR [5 islands]. Monitoring and predator control at the Caspian tern colonies on

these new islands during implementation of the Caspian Tern Management Plan will be necessary (1) to ensure successful tern nesting at the new sites and (2) to determine whether the Plan successfully reduces smolt consumption by Caspian terns in the Columbia River estuary without causing a major decline in the size of the regional population of Caspian terns.

Predation on Caspian tern adults, eggs, or young by great horned owls, raccoons, and California and ring-billed gulls nesting adjacent to with Caspian terns has been observed in previous years, and has been identified as a limiting factor for the successful establishment and persistence of tern colonies at some of these alternative nesting islands. The two gull species arrive and initiate nesting earlier than Caspian terns. Nesting gulls can interfere with formation of a cohesive colony by Caspian terns, and may turn to predation on Caspian tern eggs and chicks to provision their own young. Fortunately, early season dissuasion of gulls can limit their ability to form a colony and initiate nesting, thus lowering their impact on Caspian terns attempting to nest at that site on a later date. Lethal take of predatory gulls during the nesting season can remove individual gulls that habitually depredate Caspian tern nests, but is a reactionary approach that usually occurs after the gull has depredated one or more Caspian tern nests.

Great horned owls not only negatively affect Caspian tern colonies through predation on Caspian tern adults and young at night, but they may also cause colony abandonment during nighttime, when young chicks are susceptible to mortality from exposure. Great horned owls typically hunt from a perch on the island, and proper placement of “bird-be-gone” spike strips can reduce the availability of owl perches. However, the removal of great horned owls through trapping may become necessary to ensure the success of a Caspian tern colony if the owl repeatedly disturbs the tern colony at night.

Similarly, raccoons and other mammalian predators (e.g., mink, fox, coyote) can also cause Caspian tern colonies to fail if these terrestrial predators swim out to the tern island and depredate Caspian tern eggs and young during the night. Like great horned owls, raccoons can cause nocturnal abandonment of Caspian tern colonies, leaving young chicks vulnerable to the elements and potentially causing the colony to fail. Preemptive trapping near tern islands can lower the density of raccoons near the tern island, and thereby reduce the chance that a raccoon makes its way out to the island. Placing live traps for raccoons around the edge of tern colonies has proven ineffective at reducing raccoon predation on tern nests at the tern island on Tule Lake Sump 1B; lethal control using firearms of any raccoons that visit the island has proven successful in the past, and may again be necessary at this tern colony site and others.

Proposed Action:
Predator management at Corps constructed islands as needed: Implementation of the Proposed Action may result in more Caspian terns going to the Corps constructed tern islands. More intense management of predator may be needed at the alternative nesting habitats because more higher tern number also attract predators such as great horned owls, gulls and mammalian predators. It is important to implement aggressive predator

control measures the first few years a new tern colony is being established to promote future use of the islands.

No Action:
Predator management at Corps constructed islands as needed: Same effects as described above for the Proposed Action except that perhaps fewer terns would leave ESI and occupy the Corps constructed alternative nesting habitat.

Caspian Tern Management Upriver on the Columbia Plateau

In January of 2014, the U.S. Army Corps of Engineers, Walla Walla District completed an Inland Avian Predation Management Plan (Inland Plan) and EA for inland avian predation (Corps 2014d). The Inland Plan aims to reduce avian predation-related loss of ESA-listed juvenile salmonids in the mid-Columbia River Basin above Bonneville Dam (the Columbia Plateau), far upriver of the CRE. The development of the Inland Plan was a requirement of the NMFS 2008 FCRPS Biological Opinion, Reasonable and Prudent Alternative (RPA) 47, as updated in the NMFS 2010 supplemental Biological Opinion.

Fish consumption by Caspian terns nesting on the Columbia Plateau is mainly juvenile salmonids (Corps 2014d); the area of course doesn't provide marine forage fish that is so effective in reducing predation on juvenile salmonids in the lower CRE. Research presented in the Inland Plan indicated that the greatest potential for increasing juvenile salmonid survival through the reduction in losses to avian predators on the Columbia Plateau would be gained by focusing management efforts on dissuading Caspian terns from nesting at Goose Island and Crescent Island. For 2015, complete dissuasion is planned at Goose and Crescent Islands, where approximately 900 pairs have nested in recent years. Management actions in the Columbia Plateau are discussed later in the Cumulative Effects section.

Table 4. Planned actions and implementation timeline of the Inland Avian Management Plan, Walla Walla District (Corps 2014d). Note (X) indicates implementation only if warranted.

Action	2014	2015	2016	2017	2018
Goose Island: Passive and active hazing of Caspian terns and gulls and, if needed, limited Caspian tern egg take.	X	X	X	(X)	(X)
Crescent Island: Passive and active hazing of Caspian terns and gulls and limited Caspian tern egg take.		(X)	(X)		
Crescent Island: Willows will be experimentally planted to evaluate survival.	X				
At-risk Islands: Dissuasion actions where there is a high risk for incipient Caspian terns to establish.		(X)	(X)		
Habitat Enhancement Sites: Research and NEPA analysis to be completed.	X	(X)			
Habitat Enhancement Sites: Habitat will be prepared to attract Caspian tern nesting.			X		

Goose Island: Modification of substrate by adding large rubble to further dissuade nesting of Caspian terns.				(X)	(X)
Crescent Island: Passive hazing involving planting vegetation and/or placement of a berm. Also, as necessary, active hazing of Caspian terns and gulls and limited egg take.				X	(X)
At-risk Islands: Caspian tern dissuasion.				(X)	(X)

Proposed Action:
Management of Caspian terns in the Columbia Plateau Region: Management actions planned by the Walla Walla District in the Columbia Plateau Region are detailed in Table 4. The year 2015 action (and future years) of completely dissuading Goose and Crescent Islands will result in approximately 900 pairs of Caspian terns looking for alternative nesting sites. This could lead to those terns seeking habitat the Corps alternative nesting sites, ESI and the other areas in the CRE. The diet of Caspian terns nesting in the Columbia Plateau Region consists primarily of salmonids. If Goose or Crescent Island terns move to the CRE as a result of dissuasion, it would be expected that less juvenile salmonids would be consumed by Caspian terns in the Columbia River Basin in 2015. Birds that nest in the interior locations, of course, would take no Columbia Basin salmonids there, but because of drought conditions may relocated back to the Columbia Plateau or the estuary. Caspian terns that were banded with a federal numbered metal leg-band and two colored plastic leg-bands on one leg and a colored plastic leg-band engraved with a unique alphanumeric code on the other leg in previous years (2005 – 2013) were resighted on the ESI tern colony by researchers using binoculars and spotting scopes during 5-7 days per week throughout the 2014 breeding season. Numbers of banded Caspian terns resighted with a complete set of color bands, thus identifying banding location and year, are presented in this report.

The substantially higher estimated movement of adult Caspian terns from ESI to the Corps-constructed tern islands, compared to that from ESI to other colonies in 2014, suggests that the on-going implementation of the Caspian Tern Plan for the CRE, which is designed to redistribute part of the ESI colony to the alternative colonies in interior Oregon and northeastern California, was effective to some extent.

No Action:
Management of Caspian terns in the Columbia Plateau Region: Same effects as described above for the Proposed Action of this EA, with relocation of terns dissuaded from Goose and Crescent Islands expected to prospect at the interior locations and/or the CRE.

Reduction in numbers of nesting pairs of double-crested cormorants on ESI.

Nesting by double-crested cormorants on ESI was first recorded in 1989, when 90 active nests were detected at the western tip of the island; since then the colony has grown to

over 13,000 breeding pairs. Amidst the double-crested cormorant colony, a colony of over 1,000 Brandt's cormorants has developed.

An FEIS and corresponding ROD was completed in March 2015. The Corps will likely implement the proposed actions of the ROD beginning in late April 2015, and would allow the Corps to manage cormorants on ESI, with the intent of reducing the number of cormorant nesters in order to benefit Columbia River Basin salmonid populations. On ESI, double-crested cormorants nest in larger numbers and consume more juvenile salmonids than do Caspian terns. Double-crested cormorants have averaged over 10,000 nesting pairs on ESI since 1997 (Figure 20) and have consumed over 18 million juvenile salmonids during recent nesting seasons (Figure 21).

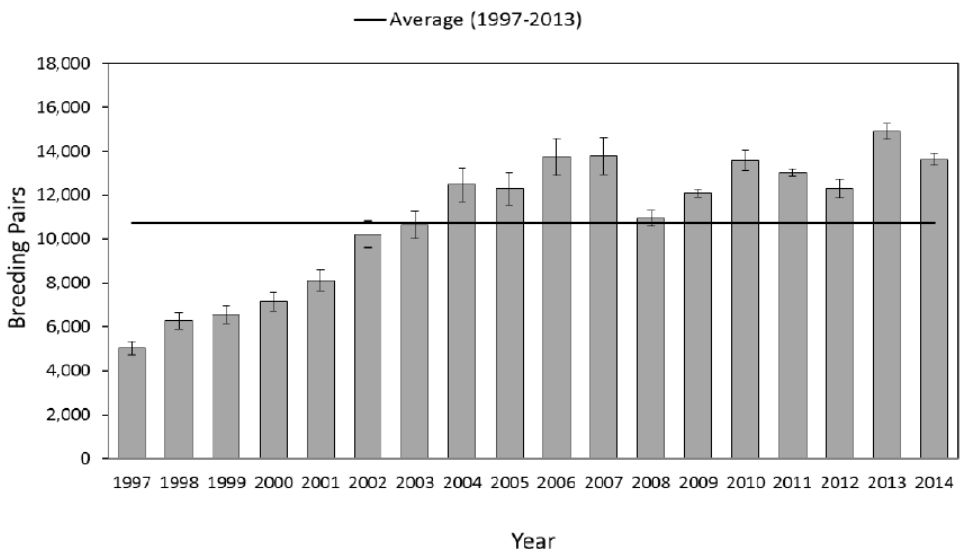

Figure 14. Number of breeding pairs of double-crested cormorants on East Sand Island (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

A noteable difference exists when comparing juvenile salmonid composition in the diets of Caspian terns to double-crested cormorants: Sub-yearling Chinook salmon are prevalent in the diets of double-crested cormorants (Figure 20) but not in the diets of Caspian terns (Figure 12); yearling Chinook salmon are more prevelent than sub-yearlings in the diets of Caspian terns. Although double-crested cormorants are larger than Caspian terns, it could be that cormorants are less size-specific with respect to prey than are Caspian terns and forage on smaller fish moreso than terns. Sub-yearling Chinook salmon tend to be smaller than prey more commonly captured by Caspian terns. Double-crested cormorants dive from a resting position on the water surface and are capable of deep diving, while Caspian terns dive into the water from flight and are only capable of capturing prey near the water surface. It is uncertain though that the difference in capture of sub-yearling Chinook salmon is attributable to depth of occurrence; Emmett et al. (2004) showed that sub-yearlings were common in surface trawl samples in the Columbia River Plume.

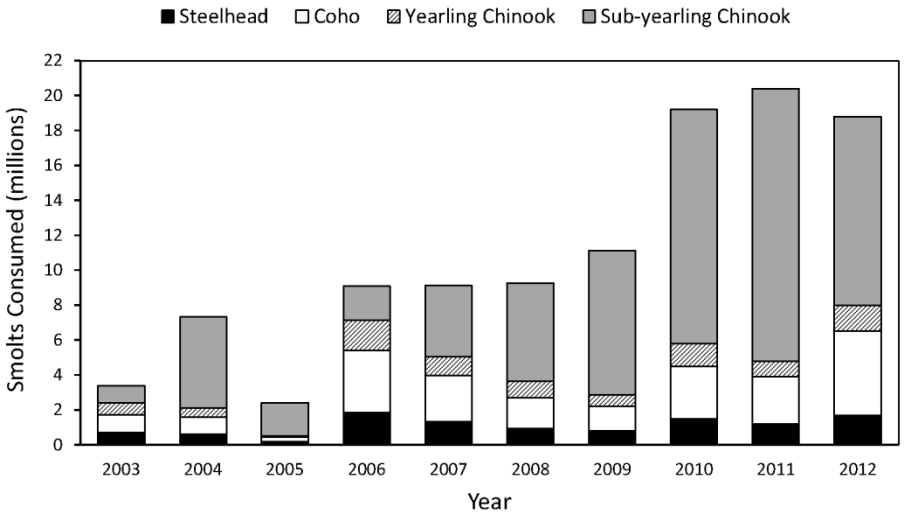

Figure 15. Estimated total annual consumption of steelhead, coho, and Chinook by double-crested cormorants nesting on East Sand Island during the 2003 to 2012 nesting seasons. Estimates based on fish identified in foregut samples and bioenergetics calculations (Roby et al. 2012 Annual Report). Data for 2013 not yet available.

Like Caspian terns, double-crested cormorants utilize a diversity of prey in the CRE (Figure 21) but appear to utilize a more diverse prey base than Caspian terns including minnow, carp, sculpin, flounder (starry flounder is common in the estuary), and stickleback (three-spine stickleback is common in the estuary). This is likely because of the ability of double-crested cormorants to use the entire water column when foraging; they are even able to take benthic species such as flounder and sculpin.

Proposed Action:

Reduction in numbers of nesting pairs of double-crested cormorants on ESI:
Implementation of the Proposed Action in conjunction with the reasonably foreseeable future actions of reducing size of the cormorant colony is predicted to result in less avian predation on salmonids in the CRE in future years. Proportions of fish species taken in general (Figure 21) and for salmonids specifically (Figures 20) would be expected to remain fairly constant and only fluctuate as relative abundances of fish fluctuate, while numbers taken for each fish species would be expected to decrease proportionately with reduction of numbers of terns and cormorants in the CRE in future years.

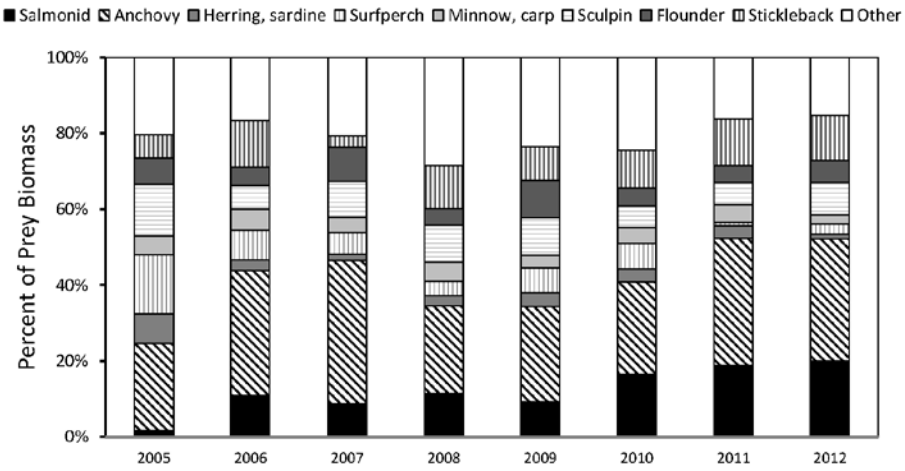

Figure 16. Annual diet composition (percent of prey items) of double-crested cormorants nesting on East Sand Island during 2005 to 2012 nesting seasons based on fish identified in foregut samples (Roby et al. 2012 Annual Report). The varied diet is attributable to the close proximity of East Sand Island to the ocean and the ability of cormorants to forage throughout the water column.

No Action

Reduction in nesting pairs of double-crested cormorants on ESI: Same effect as described for the Proposed Action except that less total numbers of Columbia Basin juvenile salmonids are expected to be consumed in 2015 (by cormorants and Caspian terns combined) because Caspian terns will be expected to occur in lesser numbers upriver (where marine forage fish are less numerous) compared to the Proposed Action.

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CHAPTER 7
REQUIREMENTS WITH LAWS AND EXECUTIVE ORDERS

a. National Environmental Policy Act: This EA is in compliance with the requirements of the National Environmental Policy Act. This EA addresses potential impacts of project alternatives and incorporates comments from the public and government agencies to aid in the determination of the significance of the action to the quality of the human environment. This EA was developed through adaptive management tiered to the programmatic FEIS and the 2006 ROD.

b. Endangered Species Act: The Proposed Action is mainly concerned with reducing Caspian tern colony size to benefit ESA-listed salmonids by reducing predation on juveniles in the long term. The Proposed Action is intended to address salmonid recovery in the Columbia River Basin in accord with the existing FCRPS Biological Opinion, Supplements and Updates. Consultation was completed April 1, 2015 with the USFWS addressing the potential direct and in-direct affects to streaked-horned

larks as a result of the proposed actions for 2015 and beyond. The Corps received a concurrence letter from USFWS agreeing that the proposed action may affect, but not likely to adversely affect streaked horned lark. The Corps is continuing to comply with terms and conditions of consultations multiple sucker species in the Warner Basin and the Klamath Basin.

c. Clean Water Act: No discharge of dredged or fill material will occur in wetlands or other waters of the United States with the Proposed Action or the No Action. All work will occur on uplands.

d. Clean Air Act: No emissions would result from implementation of the Proposed Action or the No Action.

e. Natural Historic Preservation Act: A survey of potential cultural resources was completed on ESI (Corps 2014e). A determination of No Effect will be submitted to the Oregon State Historic Preservation Office. No impacts to cultural resources are expected with implementation of the Proposed Action or the No Action. Ground disturbance (disking) will occur on the ESI Caspian tern nesting colony, which is located on previously placed dredged material. Dissuasion material will be placed near the west end of the island for the first time and on the east shore of the island as in years past; this area however is low-lying and subject to erosion/deposition. A pedestrian cultural resource survey occurred during December, 2013. The Corps coordinated with SHPO and affected Tribes and received concurrence that there will be no effect from implementation of the proposed action on March 20, 2015.

f. Native American Graves Protection and Repatriation Act: If human remains are incidentally discovered during construction, the Corps and/or contractor will be responsible for following all NAGPRA requirements.

g. Coastal Zone Management Act: Not applicable, as the project will not affect the coastal zone.

h. Fish and Wildlife Coordination Act: This is not a water-resources project and is not subject to this act.

i. Marine Protection, Research, and Sanctuaries Act: Not applicable.

j. Executive Order 11988, Flood Plain Management: No effect as floodplains in the proposed project area would not be altered with the Proposed Action or the No Action.

k. Executive Order 11990, Protection of Wetlands: No wetlands would be affected by construction of the proposed project with the Proposed Action or the No Action. All work will occur on uplands and intertidal areas.

l. Analysis of Impacts on Prime and Unique Farmlands: Not applicable, as no farmlands are present in the proposed project area.

m. Comprehensive Environmental Response, Compensation, and Liability (CERCLA) and Resource Conservation and Recovery Act (RCRA): Presence of HTRW would be responded to within the requirements of the law and Corps regulations and guidelines with the Proposed Action or the No Action.

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APPENDIX

Scientific Names of Animals and Plants Mentioned in Text

Birds

Marbled Murrelet	*Brachyramphus marmoratus*
Canada Goose	*Branta canadensis*
Great-horned Owl	*Bubo virginianus*
Streaked Horned Lark	*Eremophila alpestris strigata*
Bald Eagle	*Haliaeetus leucocephalus*
Caspian Tern	*Hydroprogne caspia*
Gull	*Larus* spp.
Ring-billed Gull	*Larus delawarensis*
Glaucous-winged/Western Gull	*Larus glaucescens* x *occidentalis*
Black-crowned Night Heron	*Nycticorax nycticorax*
California Brown Pelican	*Pelecanus occidentalis*
Double-crested Cormorant	*Phalacrocorax auritus*
Brandt's Cormorant	*Phalacrocorax penicillatus*

Fish

Pacific Sand Lance	*Ammodytes hexapterus*
Sacramento Perch	*Archoplites interuptus*
Klamath Largescale Sucker	*Catostomus snyderi*
Warner Sucker	*Catostomus warnerensis*
Bass	Centrarchidae
Pacific Herring	*Clupea pallasii*
Herring	Clupeidae
Sardine	Clupeidae
Shad	Clupeidae
Sculpin	Cottidae
Chub	Cyprinidae
Minnow	Cyprinidae
Carp	*Cyprinus carpio*
Surfperch	*Embiotoca lateralis*
Anchovy	Engraulidae
Northern Anchovy	*Engraulis mordax*
Stickleback	Gasterosteidae
Three-spine Stickleback	*Gasterosteus aculeatus*
Tui Chub	*Gila bicolor*
Surf Smelt	*Hypomesus pretiosus*
Catfish	Ictaluridae

Chum Salmon	*Oncorhynchus keta*
Coho Salmon	*Oncorhynchus kisutch*
Steelhead	*Oncorhynchus mykiss*
Rainbow Trout	*Oncorhynchus mykiss*
Sockeye Salmon	*Oncorhynchus nerka*
Chinook Salmon	*Oncorhynchus tshawytscha*
Smelt	Osmeridae
Starry Flounder	*Platichthys stellatus*
Flounder	Pleuronectidae
White Crappie	*Pomoxis annularis*
Longfin Smelt	*Spirinchus thaleichthys*
Pacific Eulachon	*Thaleichthys pacificus*

Mammals

Fox	Canidae
Coyote	*Canis latrans*
Opossum	*Didelphia virginiana*
Skunk	Mustelidae
Mink	*Neovison vison*
Raccoon	*Procyon lotor*

Plants

American Dunegrass	*Leymus mollis*
European Beachgrass	*Ammophila arenaria*

RESPONSE TO COMMENTS APPENDIX B

Commenter	Issue	Comment	Response
COMMENTS ON EA ANALYSIS			
Vicki Bucklin	Time to consider removal of the dams	Time to consider their elimination.	The consideration of dam removal is not within the scope of the proposed action in this EA.
Vicki Bucklin	Hatchery Management	Current methods create an inferior strain of fish and make hatchery salmon smolt more vulnerable to predators than wild fish.	Although an important issue in addressing salmon recovery the issue of hatchery management is not within the scope of the proposed action in this EA.
Vicki Bucklin	Ocean Conditions	The Corps should work with NOAA to learn what more can be done to improve ocean conditions and to better prepare for climate change.	The issue of ocean conditions and climate change are important to the Corps as a whole but this issue is not within the scope of the proposed action in this EA.
Vicki Bucklin	Recreational Fishing	Place a moratorium on ALL fishing during years of small returns.	The management of recreational, commercial, and tribal fisheries is conducted by other Federal, State, and Tribal agencies and is not within the scope of the proposed action in this EA, nor is it within the authority of the Corps to manage.
Vicki Bucklin	Streaked Horned Lark	The planned actions will disrupt potential habitat of the endangered lark during their nesting season.	The Corps recognizes the potential impact to the threatened larks and conducted informal consultation with the USFWS with the result that the action may affect but is not likely to adversely affect larks, due to larks' lack of presence on ESI, the unlikelihood that displaced terns would occupy suitable lark habitat on other islands in the Columbia River Estuary, and the hazing and dissuasion efforts of Caspian terns that will occur on these other islands. The USFWS concurred with the Corps' not likely to adversely affect determination by letter on April 1, 2015.

Commenter	Issue	Comment	Response
Vicki Bucklin	Consumption data of salmonids	The data relating to percentages of consumption of Salmonids by this species is skewed. It does not take into consideration the fact that our hatcheries continue to feed from the top of the water, and then release inferior fish that spend more time within view and range of predators.	There is no known significant difference in the relative susceptibility of hatchery and wild fish to predation by CATEs on ESI for the period of record, 2004–2009.
Vicki Bucklin	Tern Relocation	There is inadequate science to show it is even possible to relocate Caspian Terns to nest in human-designated alternative nesting sites. How will USACE direct the Caspian Terns to Don Edwards Reserve?	The Corps has conducted monitoring and studies on Caspian terns from 2008–2014 at East Sand Island (ESI) and Corps constructed tern islands. The annual reports of these studies can be found at the BRNW website at http://www.birdresearchnw.org. Additionally, results of terns using Corps constructed islands for 2013 are summarized in table 1 of the EA. Additionally, Caspian terns have already discovered the islands at Don Edwards NWR and breeding behaviors have already been documented
Audubon Society of Portland	Replacement habitat fails to achieve 8 acres	The Corps must also demonstrate that terns actually occupy, nest and successfully reproduce young on these islands. The ultimate goal of the tern plan is not simply to create new islands, but to actually replace the productivity that is lost on East Sand Island as a result of reductions in habitat availability. Due to the lack of use "we believe that Fern Ridge, Orems Unit, Gold Dike and Don Edwards should all be eliminated from the habitat totals counted towards the required replacement acreage."	As the Corps' 2006 ROD for the Caspian tern management plan, described in the 2005 EIS stated, "the reduction in habitat at East Sand Island is not contingent upon Caspian terns occupying the managed habitat developed for them at alternative locations." ROD page 4. As the 2005 EIS for the Caspian tern plan explained, other nesting sites in the region have not been observed to be as productive as in the Columbia River Estuary. EIS pages 4–9. Therefore, it was recognized that displaced terns may experience an overall decrease in productivity compared to that observed at ESI. *Id.* The EIS predicted that in the long-term the regional population would stabilize, "possibly at a lower number than currently observed" and that the "exponential growth that this regional population experienced since the 1960s is not expected to continue indefinitely." EIS pages 4–10. It was anticipated

Commenter	Issue	Comment	Response
			that the management of tern nesting sites would be reevaluated as part of adaptive management if the regional population trend declines toward a 50 percent decrease from current size. *Id.* As stated in the EIS, monitoring of the presence, absence, and colony size at managed alternative sites would take place and continue for 3 years after the proposed habitat acreage is attained on ESI. EIS pages 2–7. Expected success has been achieved at 5 of 8 islands to date. Because the reductions at ESI have not yet displaced the expected number of terns, it is possible that the full potential of the Corps constructed tern islands have yet to be realized. The proposed action as described in the 2005 EIS contemplated that the reduction on ESI would be contingent upon "how much acreage of alternate habitat has been created to date elsewhere" and that successful breeding by terns on alternate habitat was not a prerequisite to such reduction. EIS pages 2–3, J-9. Waiting for successful breeding elsewhere "could substantially delay attainment of the redistribution of terns in the region[.]" EIS page J-9. The EIS acknowledged that not every site would be expected to be available or used by nesting terns every year and that the number of sites and specific location used by the terns would vary annually. *Id.*, at J-10, J-33, J-34, J-88. However, the nesting habitat regional network created would "provide a diverse suite of locations from which terns can select for nesting from year to year based on varying annual conditions (e.g., water levels, prey availability, and/or predator presence)" and this regional network was "expected to provide sufficient habitat for the entire regional population." *Id*. at J-10.

Commenter	Issue	Comment	Response
Audubon Society of Portland	Low tern use at Corps Constructed Islands	To date, habitat reduction efforts on ESI have reduced the number of pairs of nesting terns from a peak of 10,670 in 2008 to 6,269 breeding pairs. In 2013, the replacement islands attracted a total combined population of 1,169 pairs of nesting terns, less than 30% of the population reduction to date on East Sand Island and less than 22% of the targeted reduction. In short, the tern islands are coming nowhere close to replacing the number of nesting turns that have actually been eliminated on East Sand Island or which are targeted for elimination on East Sand Island.	The intent of the Corps constructed islands is to provide alternative habitat with expected success between 5 and 300 pairs at some of the interior sites. This goal has been achieved at 5 of 8 islands to date. 3 of the 5 occupied islands have been attended by more than 500 nesting pairs, exceeding expectations. The FEIS and ROD did not expect a 1:1 bird transfer ratio from ESI to Corps constructed alternative habitats, especially since there are other colonies throughout the west coast region that terns could relocate to.
Audubon Society of Portland	Cumulative impacts due to Corps actions at Crescent and Goose Islands	In 2014, the Corps finalized an Inland Predator Management Plan that calls for the complete elimination of highly successful Caspian Tern Colonies at Crescent Island and Goose Island and dissuasion activities on other islands on which terns could potentially nest on the Columbia Plateau. Both of these colonies have been occupied for more than a decade and in 2014 provided nesting habitat for more than 900 pairs of Caspian Terns. In most years these sites demonstrated high nesting success rates. The proposed complete elimination of these colonies marks a significant expansion of the Corps persecution of this already at risk species. While the cumulative impacts section of the EA acknowledges this action, it fails to provide any meaningful analysis of its implications for tern populations in the Western United States.	Similarly to the goals and actions of the Caspian Tern Plan, the Corps' Walla Walla District and the BOR cooperated in building habitat at DENWR to count towards habitat reduction on the Columbia Plateau at a 2:1 ratio. Terns banded on the Columbia Plateau have been readily relocated at most of the Corps constructed islands. Although actions by Walla Walla and Portland Districts are taking action in same year, there a adequate regional network of tern nesting habitat sufficient to attract terns from sites in which they are displaced.

Commenter	Issue	Comment	Response
Audubon Society of Portland	Change in research and monitoring	In 2015, the Corps replaced Oregon State University as the principal research and management contractor at the tern replacement islands with USDA Wildlife Services. OSU represented a credible, experienced and independent evaluator of the efficacy of this highly controversial project. The decision to contract instead with another federal agency most commonly associated with lethal control of wildlife suggests that the Corps is less interested in ensuring that the tern replacement islands serve as effective replacement habitat than it is with closing ranks. It is premature for the Corps to shift from research to management given the lack of success at the majority of the tern replacement islands. The Corp's focus should be on continuing research to ensure that suitable functional replacement habitat is in fact established.	Since the comment period ended on the Draft EA, USDA Wildlife Service's declined to conduct monitoring and predator management at Corps constructed islands for the 2015 season. The Corps has now secured a contract with Real Time Research and Oregon State University to perform the monitoring and predator management for 2015.
Audubon Society of Portland	Corps has failed to assess long-term impacts of this action on western population	The EA notes that over time predation in the CRE will be reduced because terns will either relocate to nesting habitat outside the Columbia River Estuary or "experience lower population size in the Pacific Coast Region" (EA at 23). However, beyond this statement, the EA provides absolutely zero analysis of how the various management actions at ESI, other Columbia River Estuary Islands, Columbia Plateau colonies or at the tern replacement islands may impact overall western populations of Caspian Terns. The Cumulative Impacts Chapter of the EA simply catalogues a variety of management actions without any quantification, estimation or modeling of how these actions individually or cumulatively may affect Caspian Tern populations. Cumulative impacts are considered exclusively from the	Per the ROD, the USFWS will implement a regional tern population monitoring program upon initial implementation of the ROD through 3 years after the specified habitat acreage has been attained on East Sand Island. The USFWS plans to conduct a regional population survey in 2015. The 2005 EIS analyzed the impacts of this proposed action on the regional population. EIS page 4-10.The expectation in the EIS is that in the long-term, the regional population would stabilize, "possibly at a lower number than currently observed" and that the "exponential growth that this regional population experienced since the 1960s is not expected to continue indefinitely." EIS page 4-10. It was anticipated that the management of tern nesting sites would be reevaluated as part of adaptive management if the regional population trend declines toward a 50 percent decrease from the size current as of the EIS.

Commenter	Issue	Comment	Response
		perspective of their impacts on listed salmonids. While this is an important consideration, it is also critical that the Corps consider the cumulative impacts on the birds. The proposed actions individually and cumulatively affect a significant portion of the Caspian Tern populations not only in the Western United States but also at a global scale. The Corps is manipulating upwards of 10% of the total number of pairs of Caspian Terns on the plan	
Audubon Society of Portland	Proposed Action could result in no-net benefit for listed salmonids	The EA notes that the proposed actions may not reduce salmonid predation during 2015 and could in fact increase salmonid predation due to increased foraging by displaced terns foraging further up in the estuary (EA at 23). Instead the efficacy of the EA is predicated on the concept that the proposed action will lead to long term reductions in predation due to displaced terns moving out of the Columbia River Estuary or due to long-term reductions in tern population. While this hypothesis may have made sense in 2005, it would appear to be completely out of alignment with data collected over the past several seasons which shows that despite high concentrations of nesting terns on ESI, productivity has been at or close to zero. We question why given very low productivity, the Corps would embark on an effort that could potentially drive displaced terns to even more problematic locations to forage. Unless the Corps has reason to believe that displaced terns will eventually leave the estuary area entirely, an outcome that seems highly uncertain given the general lack of success at	Reduction in tern habitat on ESI in 2015 is expected to displace terns to alternative nest sites (outside of the estuary) including but not limited to the alternative site locations in SE Oregon, N California, and San Francisco Bay, California. This is the strategy set-forth and evaluated in the tern EIS and ROD. Prior and present use by terns at these alternative sites suggests this strategy is still viable.

Commenter	Issue	Comment	Response
		alternative nesting sites, the proposed action would appear to have a high probability of resulting in either no net benefit or an adverse outcome.	
Audubon Society of Portland	Predation of terns at ESI due to concentration of tern colony	The EA fails to assess whether concentrating the terns into increasingly small areas on ESI could be increasing the risk of predation by eagles and gulls. It is possible that the Corps, by Caspian terns into a very small area on ESI and eliminating all other proximal nesting opportunities has exacerbated the potential for chronic colony failure due to eagle harassment and gull predation.	Risk of depredation to terns by native eagles and gulls is considered natural phenomena. There is no documented evidence that depredation to terns by either species is above what would occur naturally (normally) regardless of nesting density.
Audubon Society of Portland	Impacts to non-target species	The Corps is proposing a massive increase in activity on and around East Sand Island during 2015. This includes not only reduction of tern habitat on East Sand Island, but also lethal control of thousands of double-crested cormorants over water surrounding East Sand Island at the cormorant colony on East Sand Island. This action also includes oiling of cormorant eggs at thousands of nests at the cormorant colony on East Sand Island. In addition, the Corps may conduct additional hazing activity on East Sand Island if terns or cormorants displaced from the existing colonies on East Sand Island attempt to nest in different locations on the island. Finally, the Corps is also potentially engaging in elevated hazing activity on other islands in the Columbia River Estuary in the event that either terns or cormorants displaced from East Sand Island attempt to nest in these locations. These actions cumulatively will result in an unprecedented level of disturbance on and around East	Effects to non-target species is addressed and updated within chapter 5 of the Final EA, including effects to brown pelicans. Further, effects to streaked horned larks were addressed through informal consultation with the USFWS in which the Service concurred that the actions at East Sand Island may affect, but would not likely adversely affect larks.

Commenter	Issue	Comment	Response
		Sand Island including extensive shooting on and around the island, increased human presence on the island, extensive management actions at both the tern and cormorant colonies and potential significant increases in hazing activities on East Sand Island and other estuary islands if either terns or cormorants relocate to undesirable locations. The Corps has done an inadequate job of analyzing how these different actions could cumulatively impact other protected avian species that utilize East Sand Island and other Columbia River Estuary islands including federally listed streaked horned larks and formerly listed brown pelicans.	
Wildlife Center of the North Coast	DEA has failed to address the stated Purpose and Need	The DEA does not fully address the stated Purpose and Need of the Caspian Tern Plan. Implementation of the Caspian Tern Plan requires protection of both ESA-listed salmonids and conservation of the regional CATE population.	Implementation of the proposed action is another step forward in meeting the stated purpose and need of the FEIS and ROD. The Pacific Coast Regional tern population can benefit from the new network of habitat built by the Corps in two states, Oregon and California, while a reduced tern colony at ESI will reduce tern predation on ESA-listed salmonids.
Wildlife Center of the North Coast	Agencies failed to fulfill obligations to provide suitable alternative habitat	The DEA does not provide the public with adequate information to fully evaluate measures taken to ensure conservation of CATE. DEA Table 1, page 8 and DEA page 9 are misleading as they only report general 2013 statistics, no fledging rates and fail to provide a true representation of deficiencies of alternate locations. It should also be noted that fledglings have a high mortality rate and a young tern must survive 5 to 6 years before becoming sexually mature.	See above response to Audubon Society of Portland on this issue "Replacement habitat fails to achieve eight acres"

RESPONSE TO COMMENTS APPENDIX B

Commenter	Issue	Comment	Response
Wildlife Center of the North Coast	Failed to provide statistics from the 2014 census	The DEA fails to provide statistics from the FWS 2014 CATE regional census.	The statement that USFWS had conducted a regional population survey was not intended. The USFWS plans to conduct a regional population survey for Caspian terns in 2015.
Wildlife Center of the North Coast	Bioenergetics modeling is flawed	As with Double-crested Cormorants and to no avail, we have made numerous requests over multiple years for release of annual baseline diet statistics for CATE in order to allow meaningful peer review of the bioenergetics modeling that determines avian predation impact on salmonids. Although bioenergetics is not the focus of this DEA, it is the basis on which management actions are determined. The premise behind management of indigenous avian piscivores is their purported impact on juvenile salmonids. If the science and methodology behind the highly publicized CATE predation calculations are flawed, then the Corps and cooperating agencies have validated the argument that the birds are merely scapegoats to deflect attention from human caused impacts.	Management actions are based on results from bioenergetics modeling (funded by the Bonneville Power Administration) and from Passive Integrated Transponder (PIT) tag recovery on ESI. Both methods and lines of analysis, as applied to CATEs have been peer reviewed: Roby et.al., 2013 and Evans et.al 2012. Results are reviewed annually by regional managers and more specifically by the tern Adaptive Management Team (AMT), the entity charged with providing programmatic recommendations to the Corps per the tern EIS and ROD.
U.S. Environmental Protection Agency	Drought and island suitability	It is unclear whether or not there is actually enough alternative habitat that would be both suitable and permissible for the Caspian terns.	The Final EA has been updated with further explanation of acres of alternative habitat built and how drought plays a natural role. Though each site is not expected to be available or used by nesting terns every year, the regional network of tern nesting habitat in various combinations is expected to provide sufficient nesting habitat for the regional population.

Commenter	Issue	Comment	Response
U.S. Environmental Protection Agency	Breeding failure and ESI	In 2011, a complete breeding failure occurred on East Sand Island for the Caspian terns – no chicks were produced. The EA does not explain why this failure occurred, whether it could potentially re-occur due to proposed management actions and, if so, what would be done in response to this situation. We recommend this information be provided in the Final EA.	Risk of depredation to terns by native eagles and gulls is considered natural phenomena. There is no documented evidence that depredation to terns by either species is above what would occur naturally (normally) regardless of nesting density. The Final EA has been updated to reflect why there was a production failure in 2011.
U.S. Environmental Protection Agency	Impacts to brown pelicans	The EA indicates there have been two incidents (in 2011 and 2013) of entanglement of California brown pelicans in dissuasion materials. In the Final EA, we recommend addressing this issue in more detail. Indicate what measures would be taken to prevent entanglement of brown pelicans (or other species), and how it would be remedied if it does occur.	See the Final EA for additional clarification of affects to non-target species, including brown pelicans. The Corps contracts monitors to haze and dissuade terns from the beach areas of ESI. The monitors also watch and record numbers of non-target species, watch for entanglements and follow a protocol to reduce impacts to non-target species.
U.S. Environmental Protection Agency	Predation	We note (p. 9) that predation by gulls, great horned owls, and raccoons has been an issue at several Corps constructed islands and that a depredation permit has been obtained from USFWS for predator control. In the Final EA we recommend including more information about the provisions of the depredation permits, predation methods used, and species covered/affected by the permits. Also, clarify whether this same information applies to predator management discussed on page 40 of the EA, which is occurring at interior sites in Oregon and California.	The final EA has been updated to clarify the need and use of predator control in managing tern colonies at Corps constructed islands. Depredation permits are for limited control of migratory birds to reduce predation of tern eggs and chicks. State permits are obtained to conduct mammalian predator control.

Commenter	Issue	Comment	Response
Gary Shugart	Acreage calculation	Why are failures or unused sites included in the total. Why are they even considered suitable nesting sites or even designated Caspian tern nesting sites. Any action in habitat reduction at ESI must wait until the authors recalculate acreage and determine if DENWR is successful.	The proposed action as described in the 2005 EIS contemplated that the reduction on ESI would be contingent upon "how much acreage of alternate habitat has been created to date elsewhere" and that successful breeding by terns on alternate habitat was not a prerequisite to such reduction. EIS pages 2-3, J-9. Waiting for successful breeding elsewhere "could substantially delay attainment of the redistribution of terns in the region [.]" EIS page J-9. As explained in the EA at page 17 (Table 2), 8.18 acres of habitat has been created or enhanced; therefore, replacement habitat has been created at the required 2:1 ratio to replace the habitat lost on ESI. As the Corps' 2006 ROD for the Caspian tern management plan, described in the 2005 EIS, stated, "the reduction in habitat at East Sand Island is not contingent upon Caspian terns occupying the managed habitat developed for them at alternative locations." ROD page 4.
Gary Shugart	Caspian tern declines	One aspect of the population biology missing from the DEA is that Caspian tern population declines will occur given repeated poor reproductive success at ESI and alternative sites.	As the 2005 EIS for the Caspian tern plan explained, other nesting sites in the region have not been observed to be as productive as in the Columbia River Estuary. EIS page 4-9. Therefore, it was recognized that displaced terns may experience an overall decrease in productivity compared to that observed at ESI. *Id.* The EIS expected that in the long-term the regional population would stabilize, "possibly at a lower number than currently observed" and that the "exponential growth that this regional population experienced since the 1960s is not expected to continue indefinitely." EIS page 4-10. It was anticipated that the management of tern nesting sites would be reevaluated as part of adaptive management if the regional population trend declines toward a 50 percent decrease from current size. *Id.* As stated in the Corps' 2006 ROD, the "proposed action includes monitoring and an adaptive management plan if Caspian tern response to the proposed management actions does not meet the specified objectives. Long-

Commenter	Issue	Comment	Response
			term monitoring of the regional Caspian tern population and short-term monitoring of the East Sand Island and managed alternative habitats will be implemented to assess the action." ROD page 10.
Gary Shugart	Bioenergetics		Management actions are based on results from bioenergetics modeling (funded by the Bonneville Power Administration) and from Passive Integrated Transponder tag recovery on ESI. Both methods and lines of analysis, as applied to CATEs have been peer reviewed: Roby et.al., 2013 and Evans et.al 2012. Results are reviewed annually by regional managers and more specifically by the Tern Adaptive Management Team, the entity charged with providing programmatic recommendations to the Corps per the tern EIS and ROD.