



**US Army Corps
of Engineers** ®
Portland District

Draft Environmental Assessment

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



MARCH 3, 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 and/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 U.S.; the Western Metapopulation nesting in various locations from Alaska to southern California (Figure 1). They first nested on East Sand Island (ESI) in the 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 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 done to decrease the numbers of juvenile salmon and steelhead consumed by the terns to meet the Corps' commitments with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service, which are detailed in a Biological Opinion (NMFS 2008).

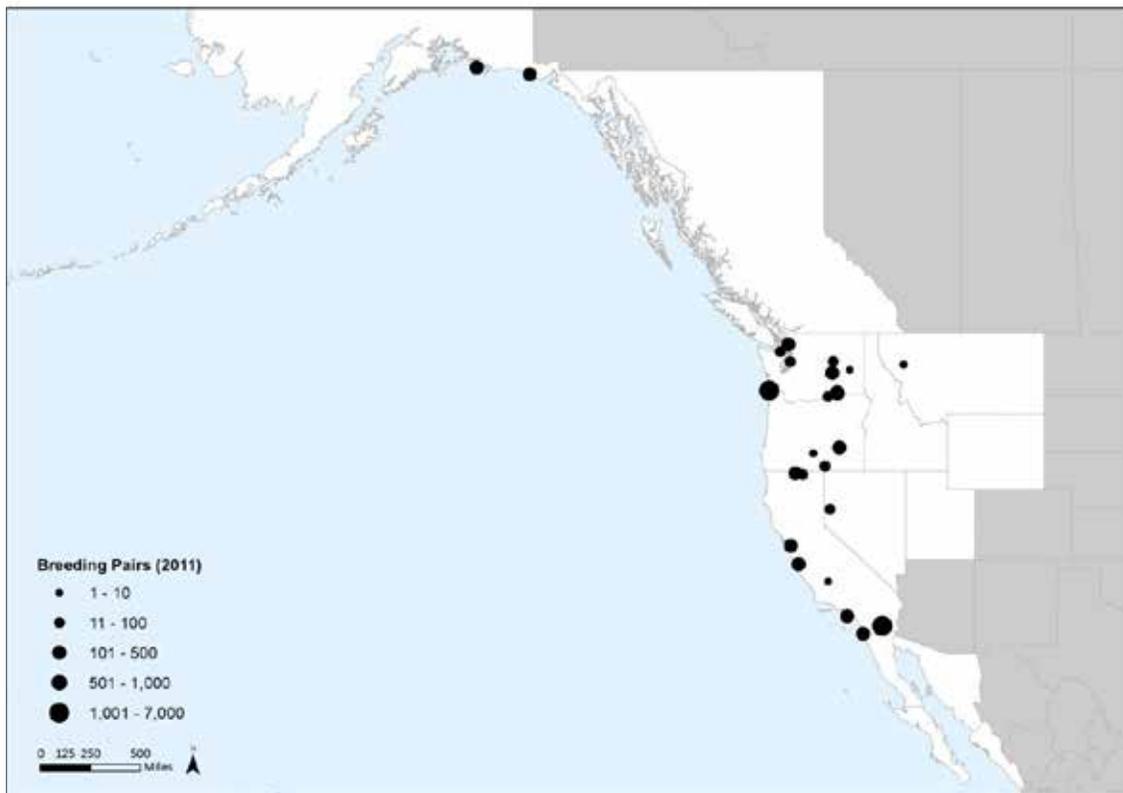


Figure 1. Nesting colonies of the Western Metapopulation of Caspian terns (from Collis et al. 2012).



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).

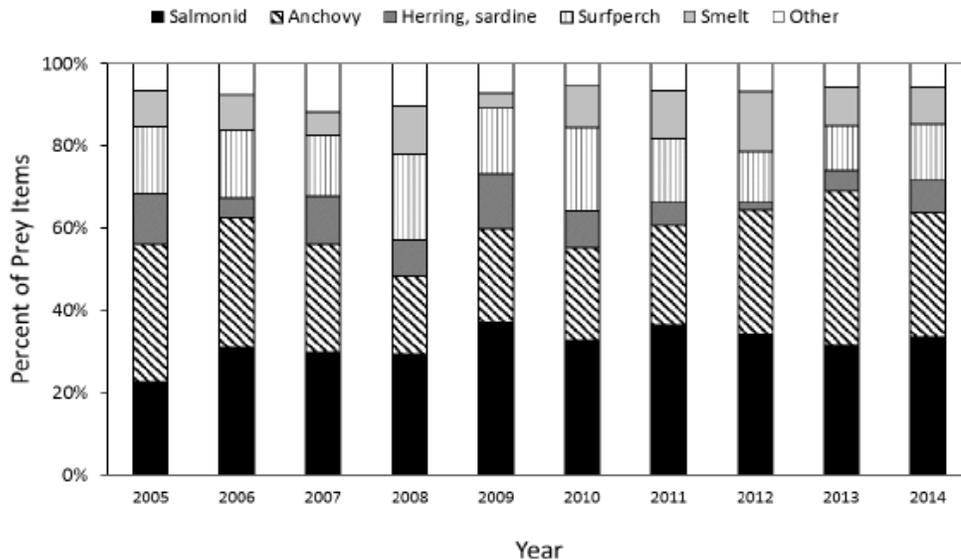


Figure 3. Annual diet composition (percent of prey items) of Caspian terns nesting on East Sand Island in the Columbia River estuary during the 2005-2014 breeding seasons. Diet composition was based on fish visually identified on-colony in Caspian tern bill-loads.

In 2000, the Corps was working to complete a project to socially attract the 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 RODs 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 ESA-listed salmonids upon which they 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). Current nesting colonies shown in Figure 1 are far reduced from historical numbers and distribution of colonies in the western U.S. (Figure 5). Because of habitat modification and water management, colonies have been virtually eliminated from the interior states of the west.

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, resulting in a predicted one percent or greater increase in population growth rates for four Columbia River Basin steelhead ESUs. Steelhead was used in model predictions because they are more susceptible to Caspian tern predation than other salmonid ESUs in the Columbia River Basin.



Figure 4. Distribution of current and historical Caspian tern nesting colonies in the Western Metapopulation (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 has not resulted 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 about 6.5 acres to the current 1.58 acres established in 2012 (see Figure 4). The reduction expected a result of 3,125 to 4,375 nesting pairs as identified in the ROD (for one and one-half to two acres). Despite incremental reductions in the amount of nesting habitat, 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 near 4.7 million (Roby et. al. 2013). In 2014, at 1.55 acres of nesting habitat on ESI the number of nesting pairs was estimated at 6,269 breeding pairs and predation on juvenile salmonids was near 4.5 million (Roby et. al. 2014). 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). Neither the FCRPS BiOp objectives for juvenile salmon survival nor the purpose and need of the Caspian Tern Plan have been met. This indicated that additional acres of alternative habitat were needed to be able to reduce the managed habitat area at ESI to 1.0 acres.

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 necessary acres needed to propose a final reduction of habitat at ESI to 1.0 acres as described in the Caspian Tern Plan, and thus the basis for action in this Draft EA.

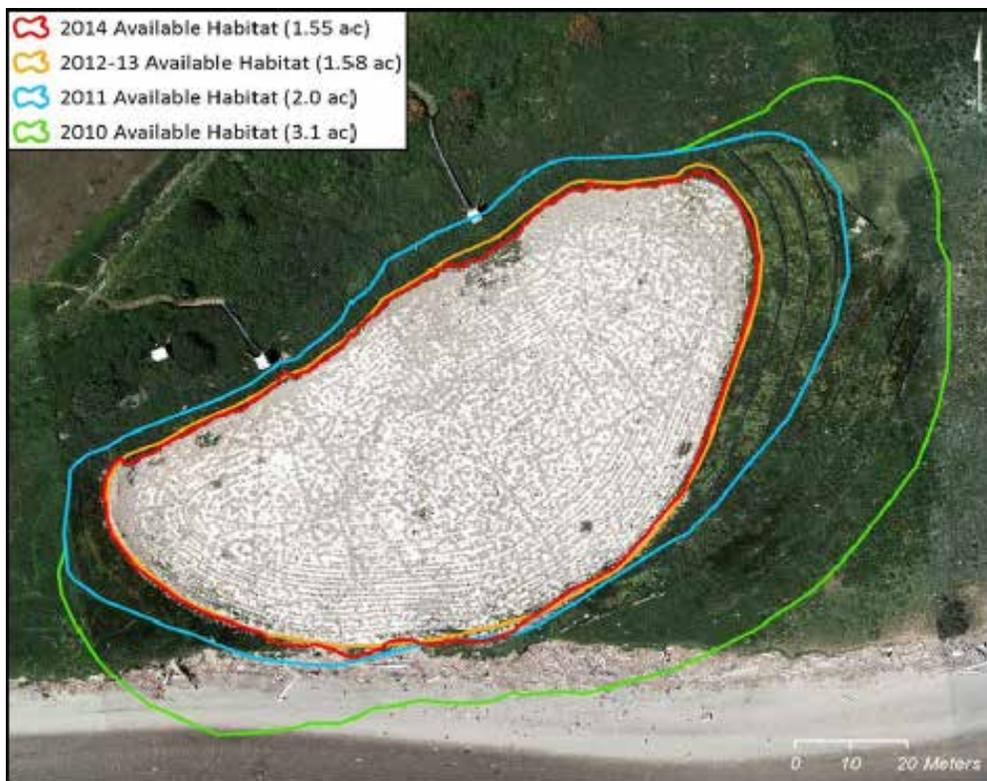


Figure 5. Nesting habitat prepared for Caspian terns on the eastern end of East Sand Island in the Columbia River estuary during 2010-2014 (Bird Research Northwest). Silt fencing was erected in 2010-2011 on a portion of the nesting habitat used by terns to further reduce the amount of nesting habitat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

Caspian Tern Plan

The Caspian Tern Plan called for the creation of or restoration of Caspian tern nesting habitat (alternative nesting islands) and to actively attract Caspian terns to nest at these sites. As alternative tern nesting habitat was created or restored outside the Columbia Basin, the available nesting habitat for Caspian terns on ESI would be reduced from its initial size (approximately 5 acres) to one and one-half to two acres. The Caspian Tern Plan also called for redistribution of approximately 60% of the ESI colony population via construction of new habitat (islands) in Oregon and California. Reduction of habitat on ESI would be contingent upon creation of the new islands at a nesting area ratio of 2:1. Because Caspian terns nested on an average of five acres from 2001 to 2004 on ESI, approximately seven to eight acres of new suitable habitat would need to be created to reduce the ESI habitat from between one and one-half to two acres (USFWS et al. 2005). The Caspian Tern Plan identified the target colony size as 3,125 to 4,375 nesting pairs over acreage of one and one-half to two acres. The Plan allows for additional acreage to be identified and constructed with the ultimate goal of reducing the managed habitat area down to one acre. The one acre is estimated to support 2,500 to 3,125 nesting pairs.

In 2008, implementation of the Caspian Tern Management Plan began. From 2008 to 2010, the Corps constructed eight islands 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 to 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 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 construction 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 being promoted there is no water surrounding Caspian tern islands. Therefore the island acreage has been "pro-rated" by calculating a proportion based on a ten year frequency of inundation.

Table 1. Corps constructed islands from the Caspian Tern Management Plan 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	

Before the Corps' ROD was signed, 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 two acres. It was expected that reducing ESI habitat by this amount would result in an estimated colony size of 3,125 to 4,375. Through identification and creation of new habitat, the acreage on ESI could ultimately be reduced to one 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.

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.

While the Klamath Basin sites were in construction the Corps contracted diets studies on Caspian terns at Brooks Island in San Francisco Bay determined that the nesting colony there was eating a high number of juvenile salmonids from Sacramento River System. Additionally, management emphasis was shifting from potentially entertaining a Caspian tern island to managing for ESA-list least terns. This changed the course of action of that part of the Caspian Tern Plan where that the Corps intended to build and/or enhancement in the middle and north area of San Francisco Bay. Instead the Corps began searching for new locations in South San Francisco Bay; one of more viable options to locate terns because of high forage fish availability and low occurrence of salmonids.

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

The Caspian Tern Plan has been implemented with some success. 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.

All Corps constructed alternative nesting islands has been successful in attracting terns and with successful nesting occurring on six of the eight 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 34 nesting pairs in 2010 and have had an average of 16 breeding pairs (2009-2014) since the island was constructed in 2009. 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. The islands in Klamath Basin and at Malheur were constructed under adaptive management where there was no determination of expected success. These inland 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 factor influence numbers of terns that can be successful breeder at these sites. The Klamath Basin sites 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 in 2013.

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. These measures have been successful in slowing or eliminating the rate of tern attendance.

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 because of the unexpected increased density of nesting pairs on the colony, which were approximately 6,269 breeding pairs and predation on juvenile salmonids was near 4.5 million (Roby et. al. 2014).

In 2014, the amount of nesting habitat prepared for Caspian terns on ESI was 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/m² in 2008 to 1.06 nests/m² in 2014 (Figure 3 and Table 1). It is likely that suitable nesting habitat for Caspian terns on the managed colony area are 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 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 in San Francisco Bay, showed a similar nesting density to ESI in 2013 (OSU et al. 2013a). From comparing Figures 10 and 14, numbers of nesting pairs on ESI appears 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 (AMT). In 2012, an inter-agency AMT began meeting to discuss the effectiveness of the plan and to make recommendations to the Corps on taking new courses of actions. These 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 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.

In early 2014, the AMT became aware of an opportunity to build or enhance islands for Caspian terns on the Don Edwards Nation Wildlife Refuge. Recent changes in management of salt ponds located on DENWR, created opportunity for Corps to partner with the Refuge to build multiple Caspian tern islands as well as habitat for Snowy Plover and Least terns. The project involves adding nesting substrate to 5 existing islands at DENWR (3 at pond SF2 and 2 at pond A16, totaling 2.35 acres) for CATEs. In order to successfully establish CATE colony sites at DENWR, it will be necessary to use a combination of social attraction measures including CATE decoys and birdcalls to attract CATEs to the enhanced islands. These techniques were proven successful at the other Corps constructed sites since 2008. Further, a program of predator management will be necessary for the first three years in order to ensure successful nesting and colony establishment. The new sites will be monitored over the next three years, to inform implementation of Adaptive Management measures as warranted to ensure program objectives are met.

The islands at DENWR were completed in February 2015 and will be online for the coming Caspian tern nesting season. Over the last six years, the Corps has now constructed a total of 10.1 total acres of new habitat (including the newly constructed islands at DENWR) to compensate for habitat reduction which has occurred over that time on ESI. In 2012, available habitat for the Caspian tern colony was reduced to 1.58 acres on ESI (Figure 5). Habitat reduction is accomplished by allowing vegetation to grow in naturally. 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 Management Plan calls for the USFWS to monitor the tern's regional population to ensure the conservation goals for Caspian terns are being met. The regional population survey was conducted in 2014.

To date, adaptive management has been used to create Caspian tern nesting habitat in various locations in Oregon and California, 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 Don Edwards NWR will aid in disturbing 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.



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.

CHAPTER 2 PURPOSE AND NEED FOR ACTION

Purpose:

The purpose of the Proposed Action is to address actions called for in the 2008/2010 FCRPS Biological Opinion and the 2014 FCRPS Biological Opinion Update. 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 66 requires evaluation of the effectiveness of the plan. The Proposed Action of this Draft 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:

The 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 about 6.5 acres to the current 1.58 acres. Year 2014 marked the fourth year that Caspian tern habitat was managed between 1.58 to two acres. This reduction was expected to result in 3,125 to 4,375 nesting pairs as identified in the ROD (for 1.5 to two acres).

Despite incremental reductions in the amount of nesting habitat, 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 near 4.7 million (Roby et. al. 2013). In 2014, at 1.55 acres of nesting habitat on ESI the number of nesting pairs was estimated at 6,269 breeding pairs and predation on juvenile salmonids was near 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 actions are 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 Management 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).
- 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 (March 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 occur from 23 – April 15, prior to nesting, along the eastern shore (approximately three acres) and toward the western end of the island (approximately two 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 1.5 additional acres may need to be dissuaded during the nesting season at this location. Transport of dissuasion materials would be by ATV.
- Monitor on ESI: Monitoring of the ESI designated colony would occur while employing previously constructed blinds. Monitoring would include numbers of nesting pairs, productivity, presence and impact of predators, and predation on fish via bill load observations.

- Monitor at the constructed islands: On the constructed islands for Caspian terns in interior Oregon and northern and coastal California, social attraction, predator management, vegetation management, and monitoring would continue until the target colony size on ESI (2,500 to 3,125 nesting pairs) is met.

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

This alternative 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 (fencing, sticks, flags, ropes, stakes, etc...) prior to the nesting season. This habitat would be maintained at least through 2018 at the 1.0 acre when the FCRPS Biological Opinion is due to expire and a review will be completed to evaluate the effectiveness of actions taken to recover populations of salmonids. The exact location of the managed 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 mid-June. Transport of dissuasion materials is by ATV.

**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 broader 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 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 species was a non-breeding summer resident of the lower Columbia River. 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 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 over the years, 13 inland nesting areas have been established for Caspian terns in Oregon and California (Table 1) totaling 8.65 acres. Of these 13 nesting locations, 5 were used in 2013 supporting a total of 1,169 nesting pairs and five have been recently constructed and will be available for the 2015 nesting season for the first time. 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.

The mid-Columbia River basin contains several Caspian tern colonies with the two largest located at Crescent Island located a few miles downstream of the mouth of the confluence of the Snake and Columbia Rivers. These two tern colonies are currently proposed for management by the Walla Walla District, Army Corps of Engineers and the Bureau of Reclamation (BOR). Regionally, there are coastal and inland populations from south Baja Peninsula to northern Alaska. Colony sizes vary from site to site and rarely occur in colonies greater than 1,000 nesting pairs Cuthbert and Wires 1999, Wires and Cuthbert 2000).

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:

Implementation of the Proposed Action is considered in this Draft 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.

The ESI Caspian tern colony is the largest in the world (Roby et al. 2012 Annual Report) and approximately 60% of the Pacific coast regional population currently nests on ESI (USFWS et al. 2005). The Western Metapopulation has increased from approximately 6,218 pairs from 1976 to 1982 to approximately 11,660 in 2011 (Spendelow and Patton 1988; Corps 2014d).

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).

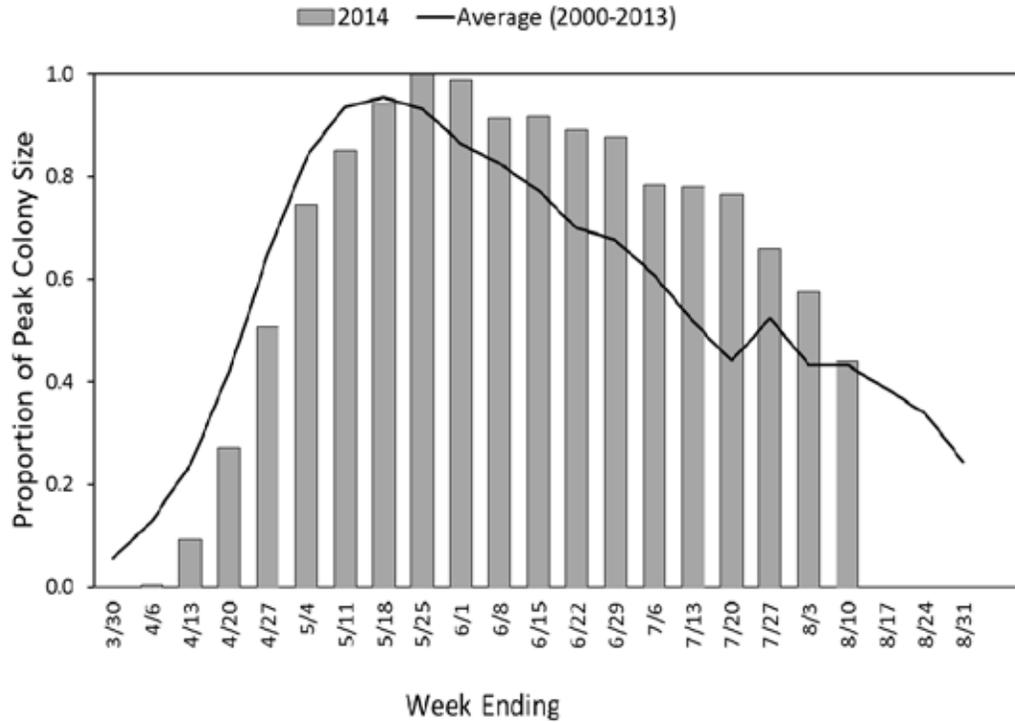


Figure 7. Weekly estimates from the ground of the number of adult Caspian terns on the East Sand Island colony during the 2014 breeding season, relative to peak colony attendance determined from counts of aerial photography taken late in the incubation period (Roby et al. 2014 Draft Annual Report).

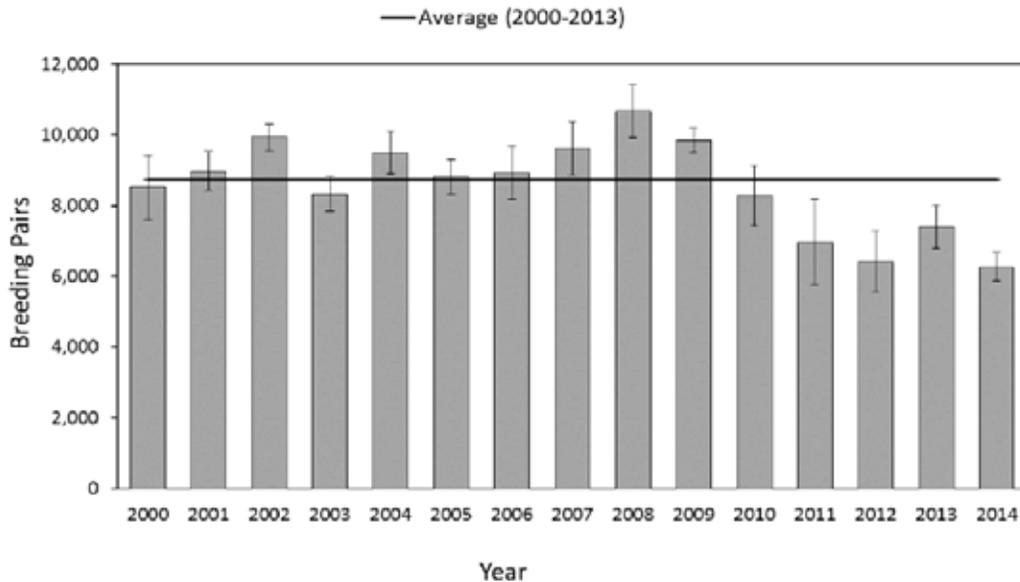


Figure 8. Number of breeding pairs of Caspian terns on East Sand Island (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

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 2).

Table 2. 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). Under the Proposed Action of this Draft EA, the acreage for the Caspian tern colony on ESI would be reduced by 0.58 acres, from 1.58 acres to 1.0 acres (a 31.6% reduction in nesting area). 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.

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 five species of ESA-listed salmonids in the CRE, steelhead, coho, and Chinook are most susceptible to predation from the ESI tern colony based on numbers of individuals taken (Figure 10).

Species		J	F	M	A	M	J	J	A	S	O	N	D
Chinook	Yearling	Light	Light	Light	Light	Dark	Dark	Dark	Light				
	Sub-yearling		Light	Light	Light	Dark	Dark	Dark	Light	Light		Light	Light
Chum				Light	Dark	Dark	Light	Light	Light				
Coho					Light	Dark	Dark	Light					
Sockeye						Light	Light	Dark	Light				
Steelhead					Light	Dark	Dark	Light					

Figure 9. Migration timing of juvenile salmon and steelhead (stock composite) in the lower Columbia River (based on Dawley et al. 1986; data gaps for sub-yearling Chinook in mid-September to mid-October and mid-December to mid-January are due to no sampling efforts). Dark shading represents peak (high abundance) migration/rearing and light shading represents non-peak (lower abundance) migration/rearing.

It is interesting that chum salmon appear to not to be susceptible to Caspian tern predation. This may be related to the small size of juveniles occurring in the estuary; chum salmon outmigrate shortly after hatching; Hostetter et al. (2012) found that size (fork length) was an important factor in susceptibility of juvenile steelhead to Caspian tern predation (Figure 13). Peak susceptibility was at a fork length of 202 mm (20.2 cm) and decreased in larger and smaller fish. Also note from Figure 12 that during most years, smaller sub-yearling Chinook salmon were less prevalent in the Caspian tern diet than the larger yearling Chinook.

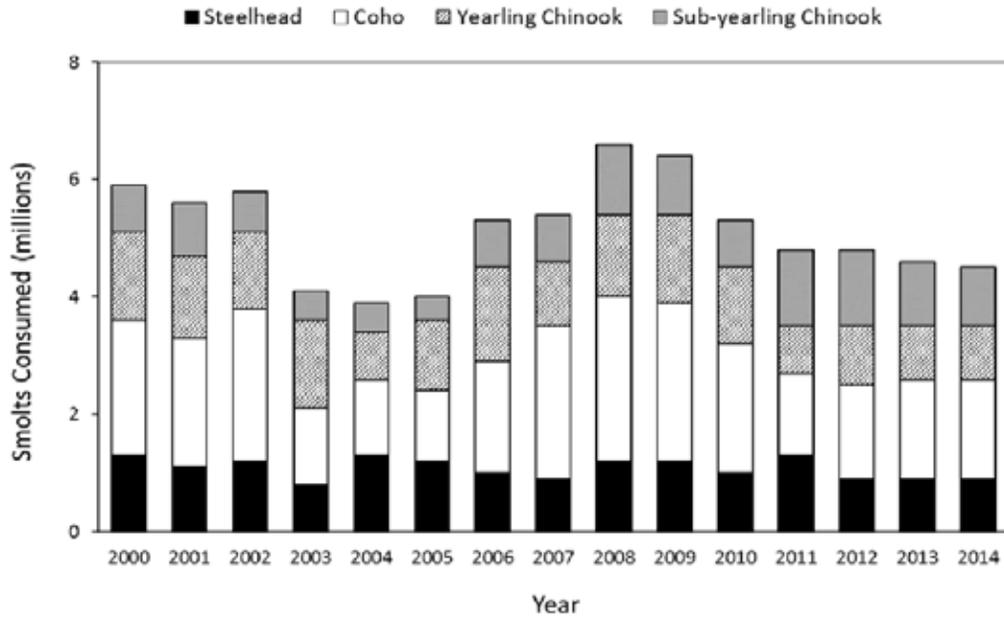


Figure 10. Estimated total annual consumption of steelhead, coho, and Chinook by Caspian terns nesting on East Sand Island during the 2000 to 2014 nesting seasons. Estimates based on fish collected from tern bill loads near the colony and bioenergetics calculations (Roby et al. 2014 Draft Annual Report).

Juvenile salmonid consumption by Caspian terns has remained fairly constant for the ESI colony since the year 2000 (Figure 10). One possible explanation for the rather static consumption totals is that nesting birds that have lost eggs or chicks remain in the estuary and use ESI for roosting; so recent years when gull predation has had a large impact on terns fledged, smolt consumption has still been high. The result of no gull predation and large numbers of terns fledged would, however, tend to increase smolt consumption because of greater amounts of food required when raising young. Consumption of juvenile salmonids, however, has been far less than pre-year 2000 when the Caspian tern colony in the estuary was located upriver at Rice Island because of greater species diversity and abundance of marine forage fish lower in the estuary. Yearly consumption of juvenile salmonids by Caspian terns averaged over 10 million when the colony was located at Rice Island and, as mentioned previously, was estimated at 4.7 million in 2013 with the colony at ESI.

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 also 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.

At Crescent Island in the Columbia Plateau Region, Antolos et al. (2006) found that nesting density (within a colony) had no effect on productivity of Caspian terns; mean density was 0.97 pairs per square meter and ranged from 0.25 to 1.48 pairs per square meter. They also found that earlier nesters tended to be more densely packed than later nesters. Cuthbert (1988) showed that Caspian terns on islands in Lake Michigan were less likely to return to a nesting colony if nesting had been unsuccessful the previous year. Recent low nesting success and complete failure of the colony in 2011 however, has not deterred Caspian terns from returning to nest at the ESI colony in large numbers.

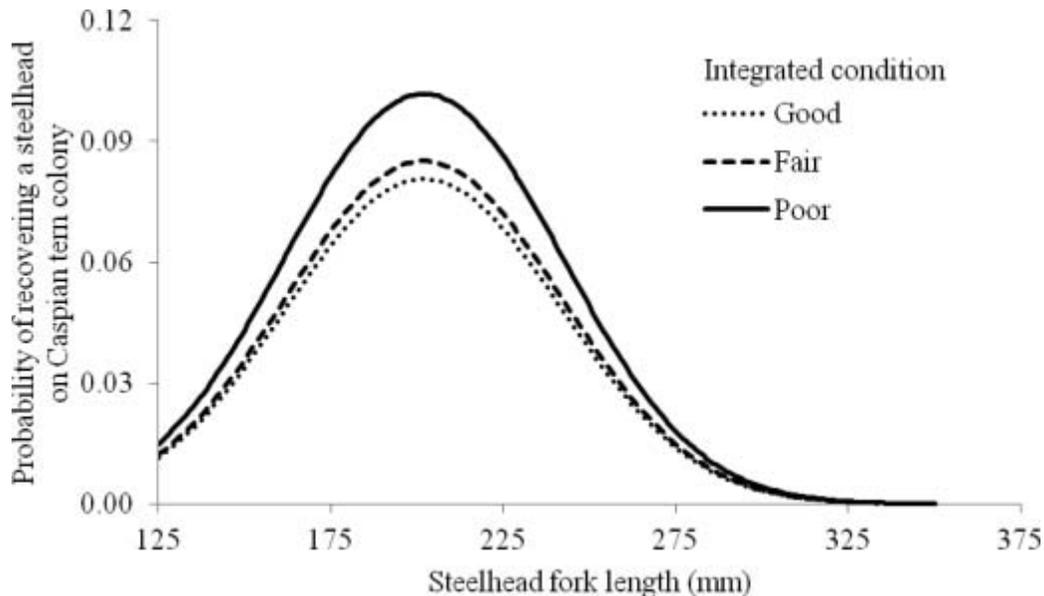


Figure 11. The effect of steelhead size on susceptibility to Caspian tern predation in the vicinity of the confluence of the Columbia and Snake Rivers (Hostetter et al. 2012).

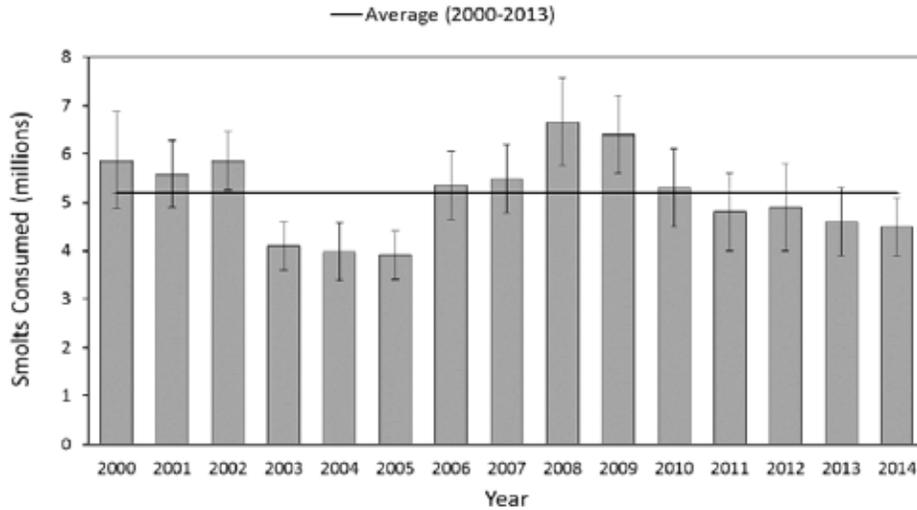


Figure 12. Estimated total annual consumption of smolts (juvenile salmonids) by Caspian terns nesting on East Sand Island in the Columbia River Estuary during the 2000 to 2012 breeding seasons. Estimates are based on fish identified in tern bill loads on-colony and bioenergetics calculations (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

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) (Figure 13). 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 Draft EA would be expected to alleviate this problem to a large extent; this has been successful during previous years.

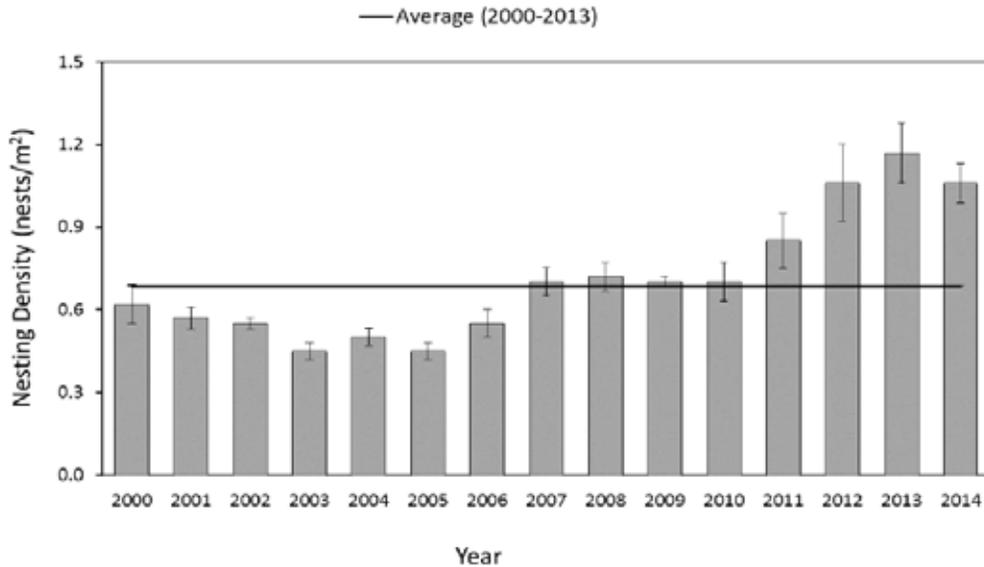


Figure 13. Nesting density of Caspian terns on East Sand Island (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

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.

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.

The goal of reducing nesting area on ESI is long term maintenance of the Caspian tern population in the CRE in order to benefit ESA-listed salmonids, and was identified as a corrective measure to account for unexpectedly high nesting density on ESI. Greater concentrations of breeding Caspian terns in response to anthropogenic factors (e.g. habitat creation) are an important conservation concern for this species (Suryan et al. 2004). This corrective measure is needed to address the guiding principles identified in the Caspian Tern Plan, specifically points three and five: “Management actions will be implemented to ensure terns remain a viable and integral part of the estuarine, coastal, and interior ecosystems of the Pacific Coast region, including the CRE, in a manner consistent with salmon recovery” (point three); and “Management actions will be implemented to ensure the recovery of ESA-listed salmonids is not impeded by tern predation” (point five). 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 adjusting the ESI Caspian tern colony size and producing less young that could return to the estuary, but would likely have benefits in this regard during 2015. This change in nesting area would be in response to unexpected high nesting densities, to an area aimed to address management objectives with respect to numbers of nesting terns, while acknowledging that compensation for Caspian tern nesting habitat loss by providing habitat elsewhere would not occur immediately.

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 elevate 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 Don Edwards 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, 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. Out-migrating eulachon occur in the larval stage and drift through the CRE typically during spring and would not be susceptible to predation from Caspian terns because of their small size. Eulachon are

the only other ESA-listed species besides salmonids that Caspian terns in the lower Columbia River could potentially impact. Eulachon migrate close to the water surface in schools and these schools are often followed by predatory birds, especially gulls, as they move 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 would be expected that there would be no Caspian tern predation on eulachon. Entry into freshwater appears to be mainly dependent on water temperature with upriver migration typically occurring during winter, often in early to mid-January (ODFW and WDFW 2009).

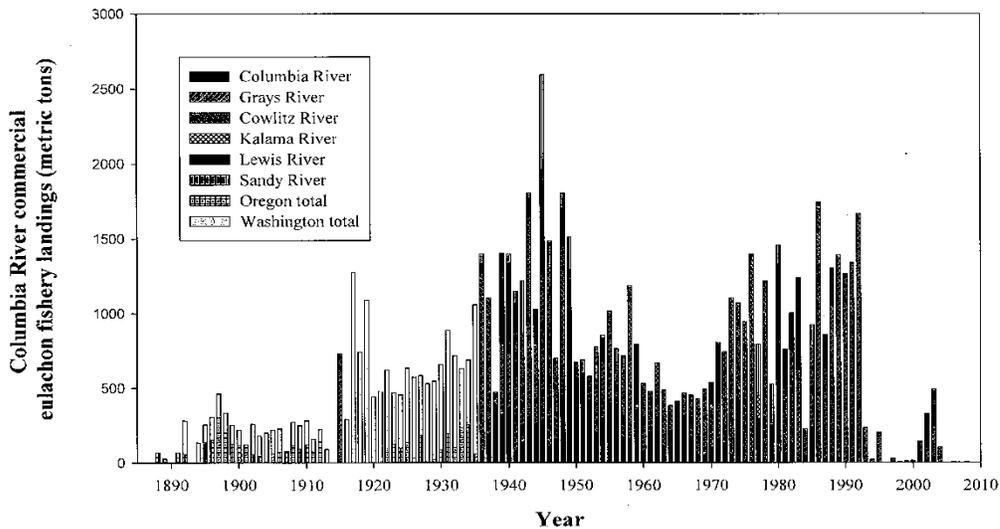


Figure 14. Eulachon commercial catch, an indicator of relative abundance among years, in the Columbia River Basin (NMFS 2010).

Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult	Present	Present	Present	Present	Present	Absent	Absent	Absent	Absent	Absent	Absent	Present
Egg	Present	Present	Present	Present	Present	Present	Absent	Absent	Absent	Absent	Absent	Absent
Larvae	Present	Present	Present	Present	Present	Present	Absent	Absent	Absent	Absent	Absent	Absent

Figure 15. Pacific eulachon presence by life stage in the lower Columbia River (Corps et al. 2013). Presence of adults during spring, however, is rare.

Adult eulachon are usually of appropriate size to be taken by Caspian terns. In San Francisco Bay, Caspian terns fed exclusively on fish that were 8 to 23 cm (80 to 230 mm) in length (Roby and Collis unpublished data cited in Strong et al. 2003) and in the Columbia River predation susceptibility peaked at 20.2 cm (202 mm) (Figure 13); adult eulachon range in size from 14 to 30 cm (140 to 300 mm) (Hart and McHugh 1944).

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.

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). Based on banding data, it is thought that Caspian terns that are not actively nesting (have not started nesting, have finished nesting, or have failed nesting) are free to move around within the year. Wandering probably plays an important role in assessing other nesting and foraging opportunities. Since Caspian terns are long-lived and have evolved with ephemeral nesting habitat, wandering to other areas is probably advantageous (communication with Donald E. Lyons, OSU, January 9, 2014). As described earlier, the Caspian Tern Plan called for redistribution of approximately 60% of the ESI colony population via construction of new habitat (islands) in Oregon, California, and Washington. Additional movement of Caspian terns out of the CRE to these inland locations in future years will aid in Columbia Basin salmonid recovery because these stocks of course do not occur at the inland lake locations.

Food habits of Caspian terns at the inland locations include crappie (including white crappie), bass, catfish, chub (including Tui chub), minnows, carp, rainbow trout, Sacramento perch, and Klamath largescale sucker, none of which are ESA-listed. Predation on ESA-listed species is not too much of a concern at the inland locations; the only ESA-listed species observed to be preyed upon by Caspian terns was an individual Warner sucker at Crump Lake in 2008 (Roby et al. 2012 Annual Report).

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.

In 2013, the streaked horned lark was listed as a threatened species under the ESA because of the following:

- 1) The streaked horned lark has disappeared from all formerly documented locations in the northern portion of its range, the Oregon coast, and the southern edge of its range.
- 2) There are currently estimated to be fewer than 1,600 streaked horned larks range wide, and population numbers are declining.
- 3) Their range is small may be continuing to contract; the south Puget Sound breeding population is estimated to be less than 170 individuals. The Washington coast and Columbia River islands breeding population is less than 140 individuals. Recent research estimates the number of streaked horned larks in Washington and 17 on the Columbia River islands is declining.
- 4) This decline considered with evidence of inbreeding depression on the south Puget Sound indicates that the lark's range may contract further in the future.
- 5) Their habitat is threatened throughout their entire range from loss of natural disturbance regimes, invasion of unsuitable vegetation that alter habitat structure, and incompatible land management practices.
- 6) Large winter congregations are limited to one region, Oregon's Willamette Valley, which may put larks at risk from stochastic weather events.
- 7) Most sites currently used by larks require some level of disturbance or management to maintain the habitat structure they need. The natural processes that previously provided this disturbance no longer operates.

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.

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.

Dissuasion and hazing at Rice Island has been funded by the Corps Portland District Columbia River Operations and Maintenance program, and will continue. The Corps is currently preparing a Biological Assessment for continued hazing, dissuasion and habitat maintenance at ESI. Preparation of this Biological Assessment was necessitated by the ESA-listing of the streaked horned lark.

The nesting season for streaked horned larks begins in early April and ends mid to late August, very similar to the nesting season of Caspian terns. Clutches range from one to five eggs, with a average of three. After the first nesting attempt in April, streaked horned larks will often re-nest in late June or early July (Pearson and Hopey 2004 and 2005; Moore 2011). Young streaked horned larks leave the nest by the end of the first week after hatching, and are cared for by the parents until they are about four weeks old when they become independent (Beason 1995). Dissuasion and hazing that will likely be necessary to prevent Caspian terns from nesting at the island sites would overlap with streaked horned lark nesting activities; hazing of Caspian terns has only been required on Rice Island, however. The Corps' Biological Opinion (Corps 2014a) allows the Corps to haze, place physical barriers, and modify habitat to prevent nesting of Caspian terns and streaked horned larks in areas slated for dredged material disposal as required by NMFS, as mentioned above.

The conservation measures that will be implemented prior to dredge material placement make it unlikely that adult larks will be killed. It is likely that in some cases, dissuasion efforts will be unsuccessful, and some larks may establish territories and nests in sites slated for placement during the breeding season. Adults will likely be disturbed out of the area; any eggs or unfledged juveniles present will be killed by the material placement. It is difficult to predict the actual amount of harassment, death or injury caused by failed dissuasion measures, but expected it to be small, for the following reasons:

- 1) Most Network sites have small populations of larks (fewer than five pairs).
- 2) Only two Network sites (Rice Island and Brown Island) have large population of larks (more than 20 pairs)
- 3) Most of the dredge material placement events that are scheduled to occur during the breeding season will occur on the sites with small populations, so if dissuasion measures are not fully successful, there will likely be few larks that will have established territories and nests in the planned placement footprint.
- 4) there are three large dredge material placement events planned for Rice Island and Brown Island, but two of these events (Brown Island in 2014, Rice Island in 2017) will occur after the breeding season, and will therefore have no chance of destroying eggs or nestlings.
- 5) Only one placement event will occur on a Network site with a large population during the breeding season, at Brown Island in 2016. If dissuasion measures are not fully successful, there is a possibility that adult larks will abandon nests or that nests will be buried by dredge materials.

For these reasons, few lark nests will be destroyed by dredge material placement events, either directly through burial or indirectly through abandonment. Given the range of

conservation measures to be implemented to prevent this occurrence, the estimated number of nests destroyed may be no more than 2 nests per year (3-5 eggs or nestlings per nest) lost to abandonment, and an additional 2 nests per year (3-5 eggs or nestlings per nest) as a result of burial by deposition of dredge material. It is expected that even though there may be more terns prospecting for nest sites upstream of ESI on dredge material islands, the level of effort to haze and dissuade them from nesting would not change from that described in the 2014 Corps' Biological Opinion for dredge material placement in the CRE. The Corps is not asking for any additional "take" in the request for informal consultation with the USFWS regarding the proposed action of this EA.

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). As a management recommendation, Pearson and Hopey (2004; 2005) recommended that most human activities within 30 m of breeding streaked horned larks be limited, and noted that activities that prevent females from returning to their nests for extended periods of time may cause nest abandonment. They also noted that larks are more likely to flush in response to pedestrian activity than vehicle activity. During the non-nesting season, streaked horned larks use habitat that is very similar to their nesting habitat (Pearson et al. 2005). Overlap of streaked horned larks and Caspian terns is not expected and it is not expected that dissuasion of Caspian terns would occur within 30 m of streaked horned lark nests, and therefore any required dissuasion of Caspian terns is not expected to adversely affect nesting streaked horned larks or larks using nearby areas.

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.

Keeping the ESI Caspian tern colony size at 1.58 acres would allow for more nesting terns than is desired. The Caspian Tern Plan targeted 3,125 to 4,375 nesting pairs on ESI for an area of 1.5 to 2 acres of nesting area (with a final goal of 2,500 to 3,125 nesting pairs). As noted earlier, acreages of nesting habitat were established based on predicted nesting density, but densities on ESI have been higher than expected; approximately 7,111 nesting pairs were present on the island in 2013. 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. For 2015 specifically, the No Action is predicted to have less impacts on juvenile salmonids than 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.

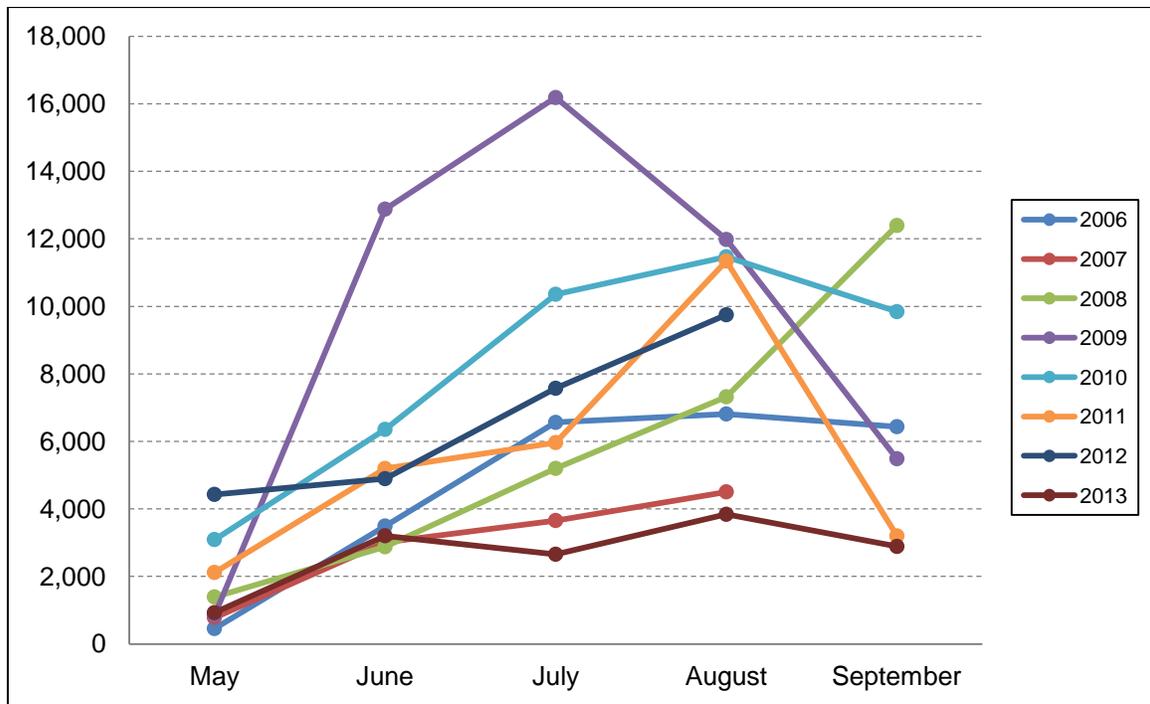


Figure 16. Monthly average number of California brown pelicans roosting on East Sand Island during evening surveys conducted from 2006 through 2013 (Bird Research Northwest 2014b).

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 in 2015. 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.

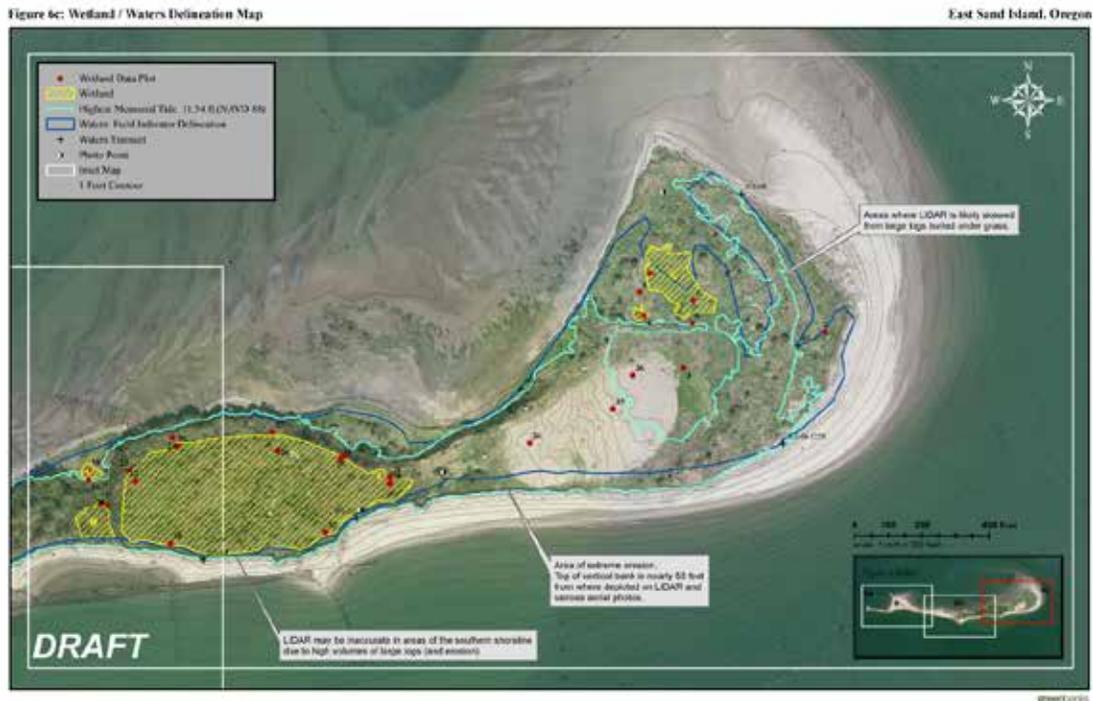


Figure 17. The eastern portion of East Sand Island showing the wetlands occurring on the island (in yellow), on either side of the Caspian tern colony.

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 waiting concurrence.

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 expects to receive concurrence on the no effect determination by 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 remain available on ESI.

Environmental Justice:

Proposed Action: 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.

Recreation:

Proposed Action: Managed recreation doesn’t occur on ESI. Occasional boaters and fishers may use the island. Implementation of the Proposed Action would not impact any recreation that might occur on the island.

No Action Alternative: Managed recreation doesn't occur on ESI. Occasional boaters and fishers may use the island. 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:

- Present Actions: Dissuasion and hazing in the CRE (on Rice Island, Miller Sands Spit, and Pillar Rock Island) as needed; management of interior Caspian tern nesting locations; reduction in nesting habitat in the CRE; and management of Caspian terns in the Columbia Plateau Region by the Walla Walla District.
- 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 and would allow for collection of up to 100 Caspian tern eggs on these islands. Caspian tern would be prevented from nesting using 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.
- Reasonably Foreseeable Future Actions: Reduction in numbers of nesting pairs of double-crested cormorants on ESI. A final environmental impact statement is currently being prepared and is waiting a final ROD. Action proposed in the ROD may result in management of DCCO on the west end of ESI.
- Reasonably Foreseeable Future Actions: Management of Caspian terns in the Columbia Plateau Region. The Walla Walla District and BOR are proposing and likely to hazing and dissuade terns from Goose and Crescent islands in the mid-Columbia River basin.

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 birds 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 only sparse 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.

Placement of material on Miller Sands Spit occurs on annual or bi-annual basis and typically only on the shore where it erodes through natural processes. In 2012, dredged material placed on Miller Sands Spit was contoured to establish mounds that were effective in making the newly created habitat less suitable for Caspian tern nesting. This was effective because it limited sight distance of terns when perched on the ground.

Methods used on Rice Island have primarily consisted of using wood stakes and flagging to modify suitable nesting habitat for terns (Figure 7). Hazing efforts also include presence of humans (hazers) to flush the birds away from the island. The Caspian Tern Plan also called for other measures to prevent terns from using these islands, such as establishing vegetation to make habitat unsuitable for nesting, using eagle kites, personnel with dogs, and all terrain vehicles (ATV) to cover distances effectively. These efforts begin April 15 and continue to June 15 each year (USFWS et al. 2005).

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 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. The Corps was issued a permit to collect 100 Caspian tern eggs each year from 2009 to 2014.



Figure 18. Wood stakes with rope and flagging used to make Caspian tern nesting habitat unsuitable on Rice Island.

Periodic boat-based and aerial surveys of Rice Island, Miller Sands Spit, and Pillar Rock Island are conducted annually during the breeding season in order to detect signs of nesting attempts by Caspian terns. In May of 2009, one year after implementation of the Caspian Tern Plan, approximately 520 Caspian terns were observed loafing on upland areas of Rice Island, and their observed behavior (courtship displays, exchange of courtship meals, copulations, and digging of nest scrapes) indicated an intention to nest (Roby et al. 2010 Annual Report). Stakes and flagging were put out in these areas, and terns were successfully dissuaded from nesting. The following year in May, approximately 75 Caspian terns were observed in an upland area east of the old colony site on Rice Island and were again effectively hazed off the island by placing stakes and flagging on the island (Roby et al. 2011 Annual Report).

In April of 2011, Caspian terns appeared interested in nesting at Rice Island near the former colony site that was used in the 1990s and on a pier at Tongue Point. Stakes with flagging were erected in the areas where terns were attempting to nest, and human hazers were on the island attempting to keep the birds off until June 15 when hazing ended. Caspian terns returned to Rice Island in late June and initiated nesting there. In July, three Caspian tern nests, with a total of four eggs, were discovered on Rice Island adjacent the old colony site and near areas that had previously been staked and flagged to prevent tern nesting. In August, approximately 460 adult Caspian terns (most were roosting) and three tern chicks were observed at the colony site on Rice Island (Roby et al. 2012 Annual Report). In 2012 through 2014, efforts to dissuade terns from nesting on Rice Island were successful.

Current Hazing Operations in the Estuary

Caspian tern hazing occurs annually on Rice Island, Pillar Rock Island, and Miller Sands Spit in the CRE upriver of ESI. Two sessions of monitoring have occurred each day of monitoring; once in the morning (beginning before 8:00 AM) and once in the afternoon (beginning after 2:00 PM). A total of 27 days of monitoring occurs from April 16 through June 15, the peak nesting season for Caspian terns. Patrols begin April 16 and occur every three days until May 1 when they are done every other day, until June 9 when they occur every three days until the 15 of June. Observation of Caspian terns are done by monitors using binoculars to scan the islands. Monitors access the island by boat.

Specific hazing actions for each island are as follows:

Monitoring on Rice Island: During both am and pm shifts of each monitoring day; monitors access Rice Island and walk from the southwest corner in a northeasterly direction to the north shore of the island while scanning for Caspian terns. The high points of Rice Island are accessed during one of the sessions per week and the island scanned for Caspian terns.

Monitoring on Pillar Rock Island: During both am and pm shifts of each monitoring day; monitoring is from boat only unless terns are seen using the upland areas of Pillar Rock Island. No terns have been seen using Pillar Rock Island in the past 10 years.

Monitoring on Miller Sands Spit: Only requires access by foot if Caspian terns are seen from the boat attempting to nest. During both am and pm shifts of each monitoring day; monitoring is from boat only unless terns are seen using the upland areas of the island. No terns have been seen using Miller Island in the past 10 years.

In addition to hazing, collection of up to 100 Caspian tern eggs may occur only under a annually issued USFWS Migratory Bird Permit. Eggs can be collected from all areas in the CRE except at ESI.

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.

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, but 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.

Management of inland Caspian tern nesting locations: On-going predator management will aid in fledging production of Caspian terns nesting at the interior sites in Oregon and California. Due to drought conditions resulting in land-bridging and low water at some sites, mammalian predation is more of a threat. Predator control will be more difficult in 2015, but may not be required at some nesting locations because of conditions that may prevent nesting in the first place. With the Proposed Action more terns would be expected at the interior sites compared to the No Action. Failed nesting because of “land-bridging” and low water at some sites discussed earlier is a strong potential. The new islands at Don Edwards NWR are expected to be used by Caspian terns in 2015 but at an undetermined number. Band return data help to make prediction of movements between colonies. A high percentage of birds banded at ESI have been found to relocate to Corps constructed islands. These studies suggest that the trend will continue for the new islands built at DENWR.

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 2. 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 extra birds at the interior sites and at ESI or the upstream islands 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.

Table 3. 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)

Reduction in 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 is currently out on public review. A record of decision is tentatively planned for March 16, 2015. A likely outcome of this effort 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).

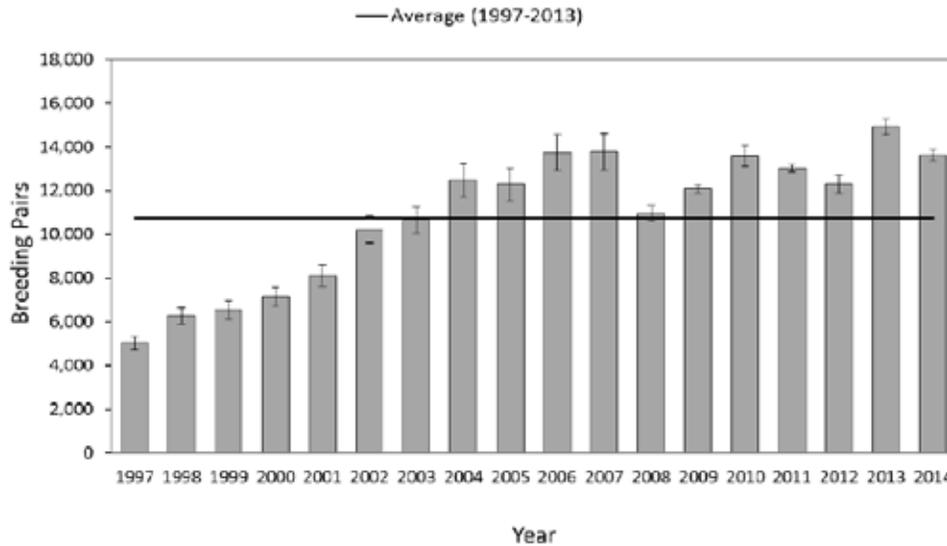


Figure 19. Number of breeding pairs of double-crested cormorants on East Sand Island (Roby et al. 2014 Draft Annual Report). The error bars represent 95% confidence intervals.

A notable 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 prevalent 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 more so 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.

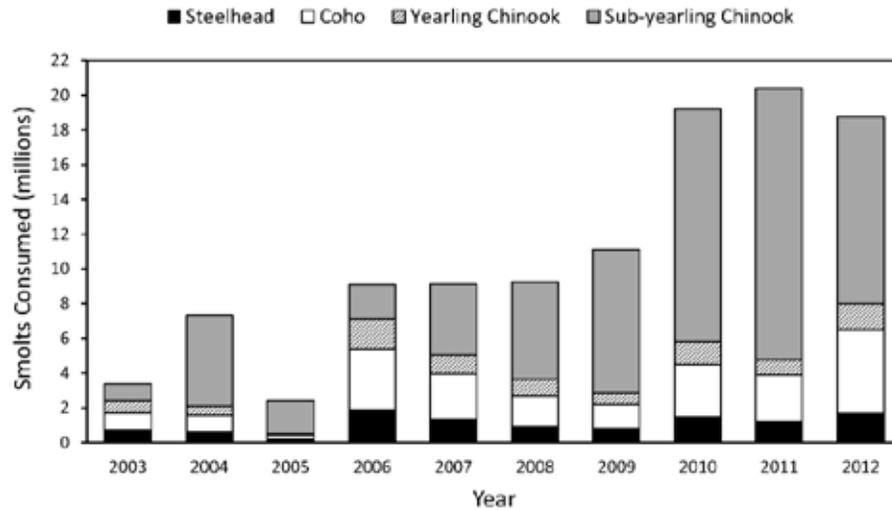


Figure 20. Estimated total annual consumption of steelhead, coho, and Chinook by double-crested cormorants nesting on East Sand Island during the 2003 to 2012 nesting seasons. Estimates based on fish identified in foregut samples and bioenergetics calculations (Roby et al. 2012 Annual Report). Data for 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.

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.

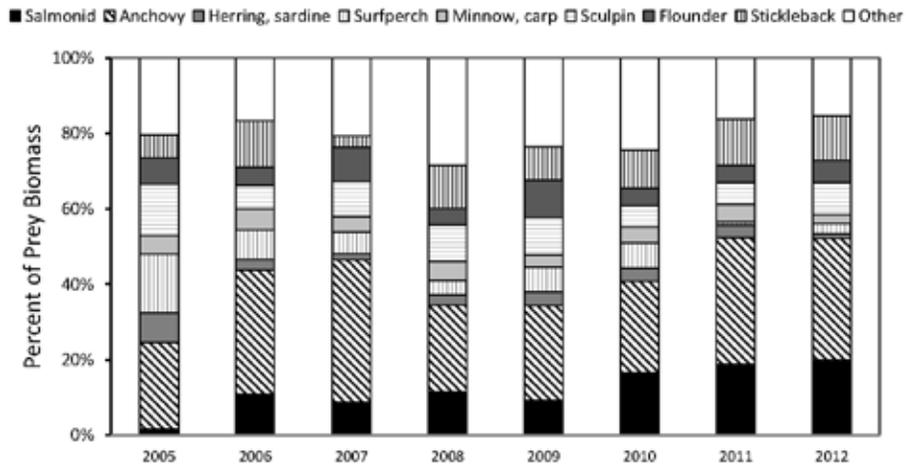


Figure 21. Annual diet composition (percent of prey items) of double-crested cormorants nesting on East Sand Island during 2005 to 2012 nesting seasons based on fish identified in foregut samples (Roby et al. 2012 Annual Report). The varied diet is attributable to the close proximity of East Sand Island to the ocean and the ability of cormorants to forage throughout the water column.

No Action

Dissuasion and hazing in the CRE as needed: Same effects as described above for the Proposed Action except that perhaps less 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.

Management of inland Caspian tern nesting locations: Same effects as described above for the Proposed Action except that less Caspian terns would be expected to attempt nesting at the interior sites with more available habitat provided at ESI.

Management of Caspian terns in the Columbia Plateau Region: Same effects as described above for the Proposed Action of the Draft EA, with relocation of terns dissuaded from Goose and Crescent Islands expected to prospect at the interior locations and/or the CRE.

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.

Creation or enhancement of potential Caspian tern nesting habitat at Don Edwards National Wildlife Refuge, south San Francisco Bay: Same effects as described above for the Proposed Action for it is difficult to determine the number of terns that might relocate from ESI to Don Edwards and the corresponding effect on juvenile salmon consumption..

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.
- 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 is being pursued with USFWS to address the potential direct and in-direct affects to streaked-horned larks as a result of the proposed actions for 2015 and beyond. 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 was 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 January, 2014. The Corps coordinated with SHPO and expects to receive concurrence by 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	<i>Brachyramphus marmoratus</i>
Canada Goose	<i>Branta canadensis</i>
Great-horned Owl	<i>Bubo virginianus</i>
Streaked Horned Lark	<i>Eremophila alpestris strigata</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Caspian Tern	<i>Hydroprogne caspia</i>
Gull	<i>Larus</i> spp.
Ring-billed Gull	<i>Larus delawarensis</i>
Glaucous-winged/Western Gull	<i>Larus glaucescens</i> x <i>occidentalis</i>
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
California Brown Pelican	<i>Pelecanus occidentalis</i>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>

Fish

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

Coho Salmon
Steelhead
Rainbow Trout
Sockeye Salmon
Chinook Salmon
Smelt
Starry Flounder
Flounder
White Crappie
Longfin Smelt
Pacific Eulachon

Oncorhynchus kisutch
Oncorhynchus mykiss
Oncorhynchus mykiss
Oncorhynchus nerka
Oncorhynchus tshawytscha
Osmeridae
Platichthys stellatus
Pleuronectidae
Pomoxis annularis
Spirinchus thaleichthys
Thaleichthys pacificus

Mammals

Fox
Coyote
Opossum
Skunk
Mink
Raccoon

Canidae
Canis latrans
Didelphia virginiana
Mustelidae
Neovison vison
Procyon lotor

Plants

American Dunegrass
European Beachgrass

Leymus mollis
Ammophila arenaria