

CASPIAN TERN RELOCATION FY 2001-2002 MANAGEMENT PLAN
and PILE DIKE MODIFICATION TO DISCOURAGE CORMORANT USE
LOWER COLUMBIA RIVER
OREGON

FINDING OF NO SIGNIFICANT IMPACT

The proposed action is to maintain relocation of the Caspian tern colony previously nesting at Rice Island, rivermile (RM) 21-22 of the Columbia River, to East Sand Island, near RM 5 of the Columbia River. East Sand Island was used by nesting Caspian terns from 1984-1986, and again in 1999. The Caspian Tern Working Group (CTWG) developed a pilot study in 1998 to determine if the tern colony could be moved, and if relocation of the colony would reduce predation on outmigrating salmonid smolts. This pilot study, implemented in 1999, was partially successful in that 1,400 pairs of Caspian terns nested on East Sand Island. Their consumption of salmonids was 44 percent of their diet versus 75 percent of that of terns that continued to nest on Rice Island. Attempts to reduce the tern colony on Rice Island to 1,000 pairs were not successful, and about 8,100 pairs of terns nested on about 2.4 acres of the island.

On September 15, 1999, the NMFS issued a Biological Opinion (BO) requiring the Corps of Engineers to prevent Caspian terns from nesting on Rice Island in 2000 and to conduct studies of ways to prevent double-crested cormorants from perching on pile dikes in the Columbia River estuary. The CTWG continued to meet and discuss relocation of the Caspian tern colony in 1999 and 2000. The result of these discussions was the FY 2000 Tern Management Plan. A draft Environmental Assessment (EA) was prepared by the Portland District on a proposed action to implement this management plan. The Corps also responded to non-discretionary requirements of the BO in preparing the EA, and included elements of the cormorant study. The Corps proposed preventing terns from nesting on Rice Island by implementing passive and active harassment, including the take of up to 300 tern eggs and maintaining approximately 4 acres of Caspian tern nesting habitat at East Sand Island. A Finding of No Significant Impact was signed on March 17, 2000. Action was begun on East Sand Island, and research activities, supported by the Bonneville Power Administration, began on Rice Island. On April 10, a temporary restraining order was issued against the Corps and the U.S. Fish and Wildlife Service, prohibiting harassment activities on Rice Island. An injunction followed, and remains in effect. Most terns did nest on East Sand Island in 2000, apparently due to habitat modification conducted on Rice and East Sand Islands prior to the injunction. About 9,100 breeding pairs of Caspian terns nested on East Sand Island, and about 580 pairs nested on Rice Island. Preliminary research data indicate that about 44 percent of the diet of East Sand Island terns was composed of salmonids, while about 91 percent of the diet of Rice Island terns was composed of salmonids. Estimated total consumption by terns nesting in the estuary in 2000 was about 7.3 million salmonid smolts, or 6.4 percent of the estimated 115 million out-migrating smolts that reached the estuary. Relocation of terns in FY 2000 resulted in about 6 million fewer smolts being consumed than would have been consumed if all Caspian terns had nested on Rice Island.

The Corps proposes to continue maintaining Caspian tern habitat on East Sand Island, to continue to use habitat modification techniques (silt fences and streamers) to discourage tern nesting on Rice Island, and to harass terns attempting to nest on Rice Island until egg-laying begins. The

Corps proposes this action for a period of 2 years, after which the U.S. Fish and Wildlife Service would assume responsibility for tern management and subsequent environmental documentation.

To accomplish relocation, the following activities are proposed:

1. Discourage Caspian terns from nesting at Rice Island. This will be principally accomplished by habitat modification (passive harassment) via silt fences and streamers. Active harassment is also proposed. Harassment will continue until initial nesting attempts. No lethal take, or other harassment requiring a Migratory Bird Treaty Act (MBTA) take permit, is proposed. The proposed activities on Rice Island cannot be accomplished until the injunction is lifted.
2. Maintain a minimum of 4 acres of previously used tern nesting habitat on East Sand Island, near Chinook, Washington. This action will entail herbicide application, site tillage and hand removal of European beachgrass plants and rhizomes, willow cuttings that have taken root and other vegetation pioneering onto the nesting habitat developed in 1999 and 2000. Decoys and a sound system will be used to attract Caspian terns to the restored habitat. No harassment of terns nesting on East Sand Island is proposed. Control of predator gulls is proposed. Research and monitoring of the relocated Caspian tern colony will be conducted to evaluate the action. The Bonneville Power Administration is preparing appropriate environmental documentation addressing research activities.
3. An extensive research and monitoring effort will be employed to evaluate Caspian tern nesting activities at East Sand Island, Rice Island, Miller Sands Spit and Pillar Rock. Attempts will be made to monitor nesting activities on other identified suitable habitat in the coastal Pacific Northwest. These activities would be performed by other Federal and State agencies, following their own procedures and regulations.
4. Selective, lethal removal of problem (predatory) gulls or other predators will be employed at East Sand Island to provide the best conditions practicable for Caspian tern colony establishment at East Sand Island.
5. Double-crested cormorants will be discouraged from perching on 6 to 12 pile dikes in the Columbia River Estuary. This action would entail the construction of features to preclude cormorants from perching on up to approximately 13,500 lineal feet of pile dike that would be fitted with bird excluders in 2001. Pile dike locations on the Columbia River from approximately river mile 4 to 51, excepting some locations where brown pelicans roost. Human disturbance at Rice Island would discourage double-crested cormorants from nesting at that location.

The following mitigative actions will be implemented:

1. In-season management of the efforts implemented under the Caspian Tern Relocation FY 2001-2002 Management Plan will be coordinated with the CTWG. There will be meetings of the CTWG open to non-Governmental conservation organizations and other interested parties.

2. Habitat modification activities on East Sand and Rice Islands would be implemented in a manner to limit impacts to non-target species, including other migratory birds and nesting waterfowl, to the extent practicable.

Research has shown that 4 acres of habitat at East Sand Island will accommodate the entire current population, plus one or two seasons of increase, of the Columbia River estuary Caspian tern colony. Populations of Caspian terns are increasing in the Pacific Northwest, and have doubled over the past 10 years. Low nesting success for one or two seasons, should that occur, will not significantly impact the number of birds comprising the colony. Birds with long life spans, like the tern, can withstand short-term reproductive failures, since the adults will produce young in future years. There are other sites with tern nesting habitat in the Pacific Northwest. Some nest sites are available now and others could be made available through habitat management by Federal and State wildlife agencies.

I have reviewed the Environmental Assessment (EA) and determined that the proposed action would not significantly affect the quality of the human environment and an Environmental Impact Statement is not required. This action is a continuation of similar actions conducted in 1999 and 2000, for which EAs were prepared and reviewed by agencies and the public. Should new information be presented during the next 30 days, I will consider revising some elements of the proposed action.



Date: 7 Feb 2001

RANDALL J. BUTLER
Colonel, EN
Commanding

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ENVIRONMENTAL ASSESSMENT

SUMMARY

This environmental assessment (EA) covers actions proposed by the U.S. Army Corps of Engineers (Corps) for the next 2 years to address requirements to prevent tern nesting on Rice Island found in the Incidental Take Statement in the National Marine Fisheries Service's Biological Opinion (Biop) on the Corps of Engineers' Columbia River Channel Operation and Maintenance Program, issued September 15, 1999. Longer-term actions, developed by the appropriate Federal agencies, will be presented in future environmental documents.

This proposed action is consistent with the action proposed and described in the EA for Fiscal Year (FY) 2000, except that no harassment of Caspian terns on Rice Island, after egg-laying begins, is proposed. Additional area for nesting on East Sand Island may be provided.

Research conducted during last year's nesting season has shown that efforts to move the Rice Island tern colony to East Sand Island is feasible with no adverse impacts on the birds. The Corps proposed action, to relocate terns from Rice Island to East Sand Island, is a short-term measure. It is the Corps opinion that a longer-term management plan to move a percentage of the Columbia River estuary Caspian tern colony outside the Columbia River Basin would be appropriate, supported with appropriate environmental documents.

In 2000, about 9,100 pairs of Caspian terns nested on the bare sand habitat that was provided on East Sand Island. The terns used 3.4 acres of the 4 acres of available habitat. On Rice Island, where about 580 pairs of terns nested, the area of the colony was 0.55 acres. (Both colony areas were measured using high-resolution aerial photographs taken near the end of the incubation period.) Consequently, the entire Caspian tern population in the Columbia River estuary nested on a total of 3.95 acres last season.

The actions proposed for FY 2001/2002 are:

- Clear and maintain a minimum of 4 acres of habitat on East Sand Island to ensure adequate nesting area for Caspian tern breeding population established in 2000. Continue to attract terns from Rice Island to East Sand Island using decoys and artificial calls.
- Provide 1) passive habitat modification, such as silt fencing, on Rice Island, to dissuade Caspian terns from nesting there and, preferably, 2) provide active harassment to discourage nesting up to initiation of egg laying. No MBTA permit is required for either 1) or 2). (Neither of these action elements can be implemented unless and until an existing preliminary injunction is lifted.)

- Add additional cormorant excluders at Corps pile dikes.

INTRODUCTION

Caspian tern breeding was first documented in the Columbia River estuary in 1984 when about 1,000 pairs were reported nesting on fresh dredged material on East Sand Island. Prior to 1984, the species was a non-breeding, summer resident of the Columbia River estuary. Most of the colony moved to Rice Island in 1986, probably because of vegetation development on East Sand Island. Rice Island originated in 1962 from dredged material disposal. The island has large, barren sandy areas due to continued disposal actions, which are attractive to nesting terns.

Because of concerns regarding avian (bird) predation on outmigrating juvenile salmonids, the March 2, 1995 National Marine Fisheries Service (NMFS) Biological Opinion on Operation of the Federal Columbia River Power System (1995 Biological Opinion) included as Incidental Take Provision #9 the requirement that the US Army, Corps of Engineers (Corps) “conduct studies to identify (a) Caspian Tern predation of juvenile salmonids, and (b) methods to discourage tern nesting.” A Biological Opinion signed September 15, 1999 on Corps of Engineers' Columbia River Channel Operation and Maintenance Program addressed both Caspian tern and cormorant concerns, and included in sub-section C. Terms and Conditions:

1a. The COE shall modify the habitat on Rice Island by April 1, 2000, so that it is no longer suitable as a nesting site for Caspian terns or provide for the hazing of terns off the island in a manner that will preclude their nesting. The COE shall ensure that any terns hazed off the island do not nest on any dredge spoil islands in the action area (other than East Sand Island). The COE shall continue to prevent nesting of Caspian terns on disposal islands within the action area for the life of the project.

1b. The COE shall work with NMFS to identify methods to prevent cormorant usage of COE maintained pile dikes. The COE shall then modify these pile dikes so that they are unable to be utilized by cormorants for resting and loafing or as feeding platforms. The COE shall modify COE maintained pile dikes located in the Columbia River Estuary around Rice Island, Miller Sands and East Sand Island by April 1, 2000. The COE shall monitor the success of the efforts in preventing cormorant usage in that area during the spring and summer of 2000. If the techniques are successful, the COE shall begin modifications on all COE maintained pile dikes throughout the action area in coordination with NMFS. If the techniques are unsuccessful, the COE shall further coordinate with NMFS to develop other methodologies of prevention.

Research on Caspian tern foraging ecology began in 1996 in response to the 1995 Biological Opinion. Research was conducted by Oregon State University (OSU), Columbia River Inter-Tribal Fish Commission (CRITFC) and Real Time Research (RTR). Research results indicated the colony has grown rapidly. The colony size was estimated to be about 6,850 breeding pairs in 1997 and about 7,950 breeding pairs in 1998. There were about 8,100 breeding pairs at Rice Island in 1999 plus 1,400 breeding pairs at East Sand Island. Some of the pairs on East Sand Island were failed breeders from Rice Island, thus the total breeding population in the Columbia River estuary in 1999 was probably about 9,000 pairs. During the nesting season, Caspian terns in the Columbia River estuary were estimated to consume large amounts of salmonid smolts in 1997 (6 to 25 million) and 1998 (7.4 – 13.2 million). Consequently, NMFS requested immediate remedial action to lessen impacts to salmonids. A multi-agency working group, the Caspian Tern

Working Group (CTWG) was formed in May 1998 to develop a short-term plan for reducing salmon predation by Caspian terns nesting at Rice Island to be implemented before the 1999 juvenile salmonid out-migration. The CTWG is an inter-agency group consisting of participants from the Corps, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, Bonneville Power Administration, Oregon Department of Fish and Wildlife, Oregon Division of State Lands, Washington Department of Fish and Wildlife, Idaho Department of Fish and Game, the Columbia River Inter-Tribal Fish Commission (CRITFC), and research staff from CRITFC, Oregon State University and Real Time Research (RTR).

A short-term “pilot” plan was developed and implemented in 1999. The plan consisted of seeding and installing silt fences on all but 1 acre of the 8-acre nesting site on Rice Island (to provide for 1,000 pairs of nesting terns) and creating nesting habitat on East Sand Island. (A little more than 8 acres were cleared of vegetation at East Sand Island.) Tern decoys and recorded calls were utilized to attract terns to nest on East Sand Island. An environmental assessment was released for public review on October 29, 1998, and a Finding of No Significant Impact (FONSI) was signed January 15, 1999.

The pilot project had some success: about 1,400 pairs of terns nested on East Sand Island in 1999. Their overall seasonal diet consisted of 44 percent salmonids, compared to 75 percent for those terns nesting on Rice Island. An estimated 8,100 pairs of terns nested on Rice Island in 1999. This was about the same number as nested there in 1998, although the nesting area was reduced to a little more than 1 acre, and the birds were harassed until nesting began. There was heavy predation on tern eggs and chicks by gulls at Rice Island in 1997 and 1998, however gull predation was reduced in 1999 as tern nesting density was increased in response to the reduced acreage available for nesting activities. Very little gull predation occurred at East Sand Island in 1999, attributable primarily to the removal of problem gulls in order to enhance successful establishment of a colony. An estimated 8.3 to 15.9 million salmonid smolts were consumed in 1999 by Caspian terns nesting in the estuary.

Based on the results from the pilot project, a FY2000 Management Plan was developed. This plan called for providing 4 acres of nesting habitat and gull control at East Sand Island, passive and active harassment of terns attempting to nest on Rice Island, and attempts to attract terns back to Grays Harbor, Washington. Local entities raised strong objection to tern relocation in Grays Harbor, and that element was also set aside. A FONSI was signed on March 17, 2000. Conservation groups sued to prevent active harassment on Rice Island, and a temporary restraining order was issued April 10, 2000. Subsequently, a preliminary injunction against the Corps and the U.S. Fish and Wildlife Service was issued, restricting active or passive harassment of Caspian terns on Rice Island.

About 580 pairs of terns successfully nested at Rice Island in 2000. Most terns did relocate to East Sand Island, however, resulting in about 9,100 pairs nesting there, for a total estuary population of 9,680 breeding pairs. This relocation resulted in an estimated 4.4 million fewer smolts being consumed by estuary terns in 2000 than in 1999. About 5.7 to 9.3 million smolts were consumed by terns in 2000. Research activities and gull control continued at East Sand Island in 2000. Bird excluders were placed on pile dikes at Miller Sands (four), Jim Crow Creek (two) and Puget-Tenasillahe Islands (three) in 2000. Two pile dikes at Pillar Rock Island served as controls. Researchers observed that bird excluders were efficient in substantially reducing cormorant presence and foraging activities at pile dikes equipped with them.

Data from 1999 and preliminary research results from 2000 were considered in developing the fiscal year (FY) 2001-02 plan, and will be considered in developing any long-term plan. Much of the data presented in this document are from the 1999 Environmental Assessment on the Caspian Tern Pilot Project; the 1997 and 1998 Annual Reports on Avian Predation on Juvenile Salmonids in the Lower Columbia River (Roby et al., 1998, Collis et al., 1999); the Environmental Assessment on Caspian Tern Relocation--FY2000 Management Plan, and from preliminary data from 2000 research efforts by OSU-CRITFC-RTR.

There is a recognition by many of the CTWG members and the agencies they represent, including the Corps, that the information obtained through the pilot project and relocation efforts would be essential information to the development of a system-wide, long-term plan to reduce predation by piscivorous (fish-eating) birds (terns, cormorants and gulls) on juvenile salmonids.

Long-Term Goals:

The location and establishment of other suitable nesting habitat for Caspian terns in the West remains a priority to many of the CTWG members and the agencies they represent. Beyond concerns over predation of juvenile salmonids, the presence of an artificial "super" colony in the lower Columbia River constitutes an anomaly and places more than 75 percent of the Pacific Coast population of Caspian terns in jeopardy of potential large scale losses from an unforeseen disastrous event, such as storm or oil spill, or from disease and predation. The re-distribution of Caspian terns to small, dispersed colonies throughout Oregon, Washington, Idaho, Nevada and California would represent a more biologically sound approach and recreate recent historic distributions. The Corps, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) have agreed in principle to an experimental effort to provide suitable habitat outside the Columbia River estuary in an attempt to lure part of the East Sand Island colony out of the estuary. The need for additional nesting sites is indicated by the recent loss of the ASARCO site in Puget Sound and the reduction in pairs or absence from known nesting sites throughout the West (Table 4). The ASARCO site, comprised of contaminated waste/borrow soil mounds covered by rubber tarp and sand, is being removed and is no longer available. An additional 1,500-2,000 birds have been displaced. Some of these birds may attempt to nest in the Columbia River estuary or Grays Harbor, having little other suitable coastal habitat, unless alternate artificial habitat, such as barges containing sand, is provided.

The Corps of Engineers, U.S. Fish and Wildlife Service and National Marine Fisheries Service have received direction from Congress in the form of language in the Senate Appropriation Committee: "The Committee directs the National Marine Fisheries Service, and the U. S. Fish and Wildlife Service to continue collaboration with the Corps to complete the relocation of the Rice Island Caspian Tern colony to East Sand Island. The Committee expects the development of a report by the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the Corps on the significance of tern predation to salmon recovery and their roles and recommendations for tern management by March 31, 2001. The agencies are directed to consider all available options for eliminating tern nesting on Rice Island to decrease tern predation." Therefore, the Federal agencies have agreed to task the Caspian Tern Working Group (CTWG) with developing the most effective means to accomplish these goals and would like to have the CTWG assist the agencies' development of their Congressional report.

NEED FOR ACTION

Of 20 evolutionarily significant units (ESU) of naturally produced anadromous salmonids in the Columbia Basin, three are listed as endangered, nine are listed as threatened, one is proposed to be listed within the year, and one is under review. Six ESUs have been determined as unwarranted for listing. Two of these six ESUs, the Wenatchee and Okanogan sockeye salmon, represent rapidly declining stocks. A large and growing colony of Caspian terns has located in the Columbia River estuary and is consuming many millions of salmonid smolts, a percentage of which are listed stocks. Terns nesting on Rice Island consume a greater percentage of salmonids in their diet than do terns nesting on East Sand Island.

Background: Presence of Caspian Terns in the Pacific Coastal States

That Caspian terns nested in the Pacific Coast states was not confirmed until 1899, though they were suspected of nesting there in the late 1800's. Nesting was first reported at Tule Lake in California (Bailey 1902 IN Gill and Mewaldt 1983). They were reported among gulls at Lower Klamath Lake, Oregon by Finley (1907 IN Ibid.) By the 1930's, Caspian terns were reported or suspected in several locations in California (Sacramento Valley, San Joaquin Valley, Goose Lake, San Francisco Bay and the Salton Sea), Baja California and southeastern Oregon (G&M 1983). Colonies tended to be small, but increasing: for example, the colony in San Francisco Bay increased from 150 pairs to 400 pairs between 1926 and 1943 (DeGroot 1931 and Miller 1943 IN G&M 1983).

A major expansion began in the Pacific Coast population in the early 1940's. Birds began nesting in Nevada, San Diego Bay and on dredged material disposal islands in coastal Washington (numerous citations IN G&M 1983). In the 1950's, populations declined at Salton Sea and Sacramento-San Joaquin Valley locations while new colonies were discovered in Humboldt Bay and Moss Landing, California in 1970. Populations underwent another expansion period in San Francisco Bay and Grays Harbor and Willapa Bay, Washington, in the 1960's and 1970's (numerous citations IN G&M 1983).

In 1980, there were about 6,000 pairs of Caspian terns nesting in 24 colonies at 20 sites along the Pacific Coast (table) (G&M 1983) No nesting colony is known to be reported prior to 1984 in the Columbia River estuary: the colony reported by Thompson and Tabor, 1981, was on Three-Mile Island in the John Day Pool. That colony had 184 pairs in 1977 and 210 in 1978 (Thompson and Tabor 1981) and had 260 pairs in 2000 (Table 4).

From 1960 to 1980 the Pacific Coast Caspian tern population increased almost 74 percent, from 3,500 to 6,000 breeding pairs, with an average annual growth of 2.7 percent. A fledging rate of 0.64 young per breeding pair is necessary for this recruitment level, a rate which is within the range of fledging rates (0.61 to 1.61) reported previously for this species (numerous citations IN G&M 1983). Current estimate for the Pacific Coast population in 2000 stands at 12,535 (USFWS 2000). About 77 percent (9,677) of the total population nested in the Columbia River estuary, whereas none of the 1960-1980 population (or prior years' populations as far as is known) nested in the estuary.

Since the mid-1960's, the tern population shifted northward from California, with the largest breeding concentration being along coastal Washington until the mid-1980's, when the population began to concentrate in the Columbia estuary. Loss of preferred habitat in Grays Harbor (actual

erosion of islands, vegetation of sandy areas, increased predation by eagles), coupled with ideal habitat in the estuary (sandy areas, copious food supply), probably led to this relocation. About 23 percent (2,858 pairs) of the Pacific Coast colony still breeds elsewhere, primarily in California (Tables 4 and 5). The northward trend is continuing, however, with a few nesting pairs reported on a small island off the Yukon Delta, in the Bering Sea, Alaska in 1996-97 (B.J. McCaffery et al. 1977) and at the head of Taku Inlet in southeastern Alaska in 2000 (D. Roby 2000, pers. comm.).

While some habitat has been lost, other habitat remains available and underutilized. Why the terns appeared in California in the 1890's, why they began moving north in the 1960's, and why present habitat outside the Columbia River estuary remain underutilized is not fully understood. What is clear is that the Pacific Coast population has increased dramatically since 1960 and continues to expand into areas it was not known to have colonized prior to 1984, with the subsequent consumption of millions of Columbia/Snake River salmonid smolts. The estuary colony continues to increase.

Present Caspian Tern Colony Salmonid Consumption:

Results of OSU-CRITFC-RTR research indicate that the nesting colony of Caspian terns located at Rice Island in the Columbia River consumed 6 to 25 million salmonid smolts in 1997. This represents about 6 to 25 percent of the 100 million out-migrating smolts that reached the estuary or 3 to 12 percent of the 200 to 250 million smolts produced basin-wide. In 1998, the estimated consumption of juvenile salmonids by Caspian terns in the Columbia River Estuary was 10.2 million (range = 7.4 to 13.2 million), or about 11 percent (range = 8-14 percent) of the estimated 95 million out-migrating smolts that reached the estuary during the 1998 migration year. In 2000, about 7.3 million smolts were consumed (range = 5.7 to 9.3 million), reflecting the lower percentage of salmonids (44 percent) in the diet of terns nesting at East Sand Island. Because the tern predation estimate is limited to the nesting period, the smolt consumption should be compared to the prey that are available during that period. Of the roughly 114 million smolts predicted to migrate through the estuary in 2000, only about 67 million were spring-migrating, yearling smolts that were likely to be available to terns during the period of the estimate. Of the 67 million spring smolts, about 9.8 million or 14.6 percent would have been listed. The estimated 5.7 to 9.3 million smolts consumed by terns represents 8.5 percent to 13.9 percent of the available smolts. The mid-point "best" estimate of 7.3 million represents 10.9 percent of the available smolts. About 1.1 million of the smolts eaten would have been listed. These estimates represent only the consumption by Caspian terns associated with the colony present in the estuary during the breeding season. Other seabirds, primarily double-crested cormorants and several species of gulls, consume several more millions of smolts in the estuary as well as at other locations and during other time periods along the Columbia River.

The peak migration period of juvenile salmonids coincides with the nesting and rearing season of the terns. Additionally, Rice Island is located near the furthest upstream intrusion of salt water into the estuary. Smolts may delay before entering salt water or may move into the fresh water lens that "floats" on the denser saltwater. Estimates in 1997 and 1998 are that the tern colony consisted of 6,850 and 7,950 nesting pairs of birds, respectively. In 1999, the tern colony on Rice Island was about 8,100 nesting pairs, with an additional 1,400 pairs diverted to East Sand Island. Salmonids comprised 75 percent of the diet composition of Caspian terns nesting at Rice Island whereas salmonids only represented 44 percent of the diet by prey item at East Sand Island. In 2000, the colony consisted of about 9,100 breeding pairs of terns on East Sand Island and 580

pairs on Rice Island. Diet of those terns nesting at Rice Island was 91 percent salmonids, while that of East Sand Island terns was 44 percent salmonids. The pilot project and the 2000 management efforts demonstrate that it is possible to shift nesting terns en masse to a different colony site and that their harvest of juvenile salmonids can be reduced by moving them to sites nearer the ocean where other prey species are available. Preliminary research indicates that had the terns nested at Rice Island in 2000 instead of East Sand Island, and consumed salmonids at the 91 percent rate, over 13 million (range = 9.5 million to 17 million) smolts would have been consumed. Thus, approximately 5.7 million fewer smolts were consumed by terns due to management actions implemented in 1999 and 2000.

Resource agencies, including the NMFS, Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), Columbia River Intertribal Fish Commission and Idaho Department of Fish and Game (IDFG), are concerned that the observed level of predation remains injurious to species and stocks of salmonids listed under the Endangered Species Act. NMFS estimates that 250,000 fish of listed stocks were taken in 1997 by Caspian terns using the “best” estimate of the number of juvenile salmonids taken by terns during that year. Further, NMFS estimates that about 5,881,000 listed fish reached the estuary in 1999; this reflects in part a greater number of listed stocks in 1999 for the Columbia River Basin. In 2000, an estimated 114,920,600 smolts reached the estuary, of which 16 percent, or 18,759,600 were listed stocks (Herb Pollard, NMFS, pers. comm.) (see Table 3) Applying the best estimate consumption rate of 15 percent observed in 1999, about 897,000 of the listed salmonids could have been taken by Caspian terns in the Columbia River estuary in 1999. Using the best estimate of 6.4 percent from 2000, 1.2 million listed smolts may have been consumed by the terns last year. Gross averages are used for lack of better detail. These estimates place the proposed action in perspective and give the reviewer and decision-makers some measure to judge the need for the project.

Certain listed stocks have been incorporated into the hatchery program to facilitate Columbia River salmonid recovery efforts. Some Upper Columbia River steelhead, nearly all Snake River sockeye, many Snake River spring-summer chinook and some Snake River fall chinook now originate from hatcheries. The hatchery components as well as the wild stocks are ESA listed. Some lower Columbia River summer and winter steelhead (Kalama, Sandy and Clackamas River) originate from hatcheries and are ESA listed. Cowlitz River re-introductions of winter steelhead and spring chinook are ESA listed. Hatchery chums (Grays and Elochoman River) are also ESA proposed stocks. Hatchery fish remain an important component of Columbia River salmonid recovery efforts.

Tens of thousands of PIT tags have been recovered from bird colonies in the estuary. Based on PIT tag recoveries on Rice Island, Caspian terns consume a higher proportion of available hatchery-raised smolts versus wild smolts in the Columbia River estuary, for some stocks in some years. PIT-tagged hatchery-reared steelhead and spring/summer chinook were over-represented on colony as compared with their wild counterparts in 1997 and 1998, respectively. Double-crested cormorants, however, foraged on hatchery and wild smolts in proportion to their availability in the estuary (Collis et al., in press). These data suggest that hatchery smolts may be more surface oriented as compared to wild fish and therefore more susceptible to tern predation (i.e., terns forage at or near the surface, while cormorants forage throughout the water column).

PIT tags were placed in smolts for research on passage and survival. Most (in the range of 90 percent) of the PIT tags recovered in the estuary were placed in fish in the Snake River basin and represent the survivors of a 625 to 940 mile migration. The avian predation research project indicates that between 5.7 and 15.9 million of these survivors are now consumed by avian predators as they complete one of the most hazardous stage of their complex life cycle.

The generally held belief of salmon managers in the northwest has been stated as: “A fundamental assumption of the Columbia River salmon restoration effort is that the number of adults recruited is a simple positive response to the number of smolts produced.” (Whitney et al 1993.) The belief that there is a direct relationship between smolt numbers and adult returns is based on a long history of research, including: “Data presented by Raymond (1988) confirm a significant ($p < 0.05$) linear relationship between spring chinook salmon and steelhead juveniles migrating during the spring 1970-1984 and the number of adults recruited for at least this portion of the Columbia and Snake River salmonid populations. ... These results suggest that smolt and adult numbers are linearly related at current low run sizes and that density dependence may be expected only at much greater numbers.” (Beamesderfer et al. 1996)

“Density dependent regulating mechanisms for salmon are generally believed to be much more important in freshwater rearing habitats than in the ocean where survival is largely density-independent. Thus, if x % of smolts are saved, x % more adults generally return” (Beamesderfer 2000). “Many of the measures taken or proposed to restore anadromous production have focused on improving the survival of juvenile migrants severely affected by construction of a series of main-stem dams. ... Simulations with various life-cycle models indicate that mortality of juveniles during migration in freshwater constrains anadromous salmonid production in the Columbia River Basin and reduces the benefits of enhancement measures upstream.” (Beamesderfer 1996). It is known, from PIT tag recoveries on the bird colonies, that many of the smolts taken by birds indeed are survivors and beneficiaries of the bypass and transportation system and other upstream efforts to improve survival.

Charles Junge, former head of fisheries research for the Oregon Fish Commission, is one of many population modelers that have come to the same conclusion. Junge states, “...a mortality preceding a compensatory process is less severe than one following it, with a reversal of this for a density-dependent process. ... a non-selective adult kill [fishery] preceding the density-dependent processes [of spawning and rearing] is generally much less severe than a non-selective smolt kill at the end of such a process.” Whereas, a reduction in spawning adults may improve survival of their progeny through compensatory mechanisms, “...a reduction of smolts by a fraction m will on the average reduce the production of returning adults also by a fraction m .” (Junge 1968).

Beamesderfer et al. (1996) discusses the biological basis for northern pikeminnow control in the Columbia Basin and concludes that the removal of relatively low numbers of predators can benefit salmon survival. Beamesderfer estimates that predatory pikeminnows may be taking up to 16 million, out of 200 million or 8 percent of the juvenile salmonids that occur within the mainstem Snake and Columbia Rivers. In his judgement, if the level of pikeminnow predation could be reduced by 50 percent through the control program, (to 4 percent) a significant benefit would be achieved. Recent reports from the northern pikeminnow control project estimate 35-40 percent reduction in predation and consider it a measure of success for the program. Throughout the 1990s, smolt-to-adult survival for all stocks of anadromous fish in the Columbia Basin averaged a little more than 1 percent (annual outmigrations of approximately 100 million

smolts have produced 0.9 to 1.4 million returning adults). Avian predation in the Columbia River estuary, at its current rate, is reducing annual returns to the Columbia by around 170,000 adults annually. Because the predation is concentrated on the spring-migrating, yearling steelhead and chinook smolts that generally have higher survival rates than the sub-yearling chinook, this is probably a conservative estimate. In the past 5 years (one salmon generation), the avian predation project estimates suggest in excess of 75 million smolts lost to avian predation in the Columbia River estuary. In the range of 750,000 fewer adults have returned as a result. Tens of thousands of the missing fish belong to ESUs that are now listed.

Retention of the former Caspian tern colony on East Sand Island (closer to the mouth of the Columbia River) and restoration eventually to other historic nesting locations, may expand the diversity of prey species available for terns, thus reducing predation on salmonids. An increased geographical distribution of Caspian terns also reduces the risk of catastrophic loss for Caspian terns to storms, oil spills, disease, etc. A wide geographical distribution of Caspian terns would represent a return to historic distribution of the species.

PROPOSED ACTION and ALTERNATIVES

The proposed Caspian tern management objectives for 2001 arose from discussions within the Caspian Tern Working Group and the action agencies (see above). The 2001 management plan proposes to locate the entire Caspian tern colony to East Sand Island, near RM 5 of the Columbia River (Figure 1). Management actions would be monitored and evaluated so that future management initiatives can be developed and improved. The FY 2001 management plan was designed to maintain the short-term goal of a substantial reduction in losses of out-migrating smolts while making progress toward the long-term goal of defining the objectives of a long-term management plan and subsequent development and implementation of such a plan. The Corps, not having the expertise, mission, or responsibility to develop migratory bird management plans, would suggest relying on the expertise of an agency with responsibility for management of wildlife.

The Corps will provide a minimum of 4 acres of habitat on East Sand Island and encourage terns to nest there by passive harassment of terns trying to nest on Rice Island for a 2-year period, 2001-2002. The Corps does not intend continuation of annual actions, and believes this time period should be adequate for the appropriate agency to develop a long-term plan and the required environmental documentation for implementation after 2002.

East Sand Island was used by nesting Caspian terns from 1984-1986, 1,400 pairs nested there in 1999 and about 9,100 pairs nested there in 2000. The Caspian Tern Working Group provided input to the 1999 action, which was developed as a pilot study to determine if the tern colony could be moved, and if relocation of the colony would reduce predation on outmigrating salmonid smolts. The outcome of that action led to the proposal to implement the FY 2000 tern management action (which was implemented on East Sand Island, but not Rice Island), and the 2001-02 action, which is presented in this draft EA. (Table 1)

Cormorant excluders were placed on nine pile dikes in 2000 with monitoring indicating that presence and foraging by double-crested cormorants at these pile dikes was substantially reduced compared to control sites and use levels observed in 1999 at these locations. For 2001, excluders

would be placed on six to twelve additional pile dikes and monitoring efforts continued to assess results of the action.

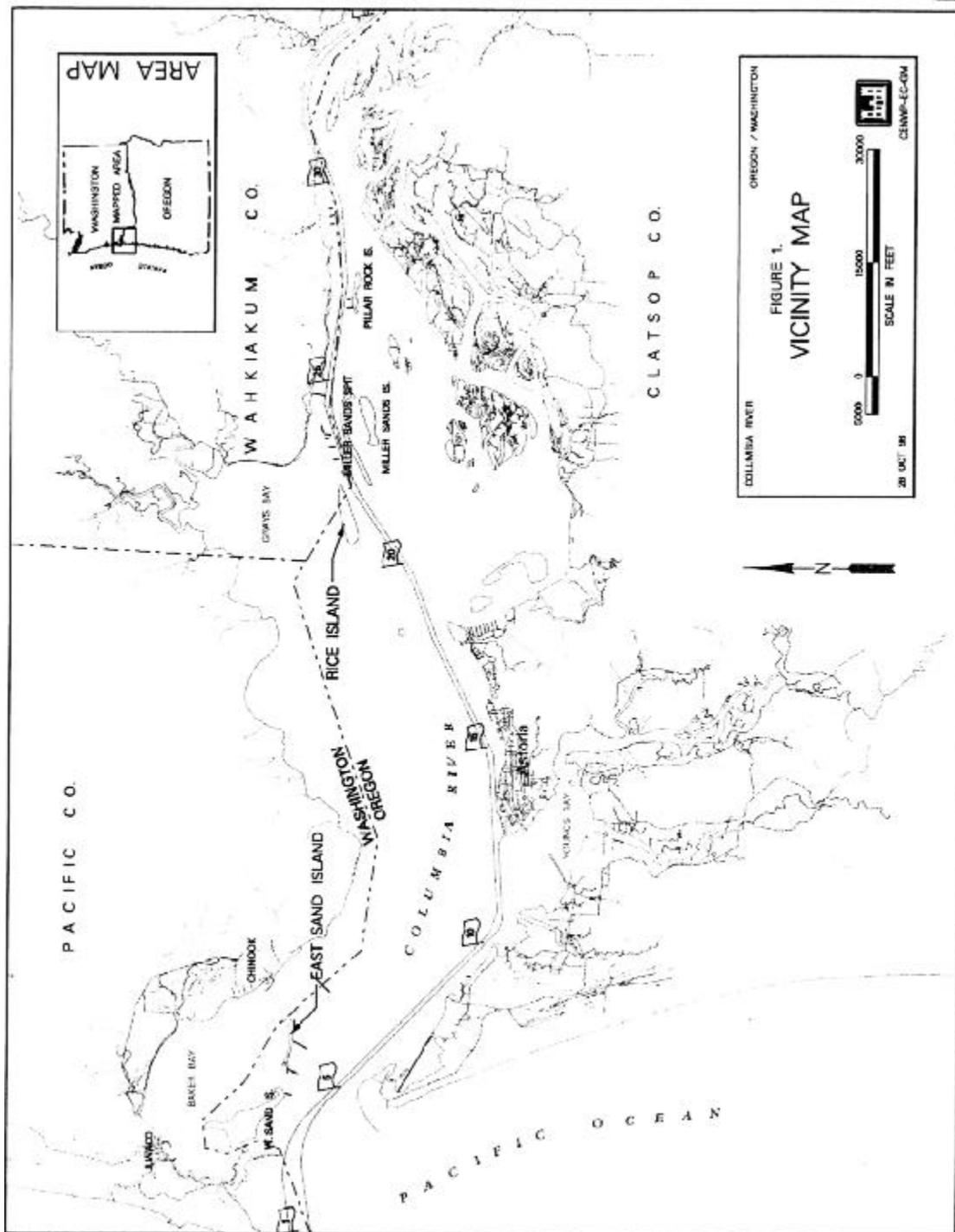


Figure 1

Table 1- Action Matrix

Proposed Action	Rice Island		East Sand Island	
Nesting Habitat Development and/or Maintenance – Tillage, Herbicides and Use of Social Attractions (Decoys and Recorded Calls).	Not Applicable		Objective: Maintain Caspian Tern Colony. Action: Till 4 acres or more at u/s tip of island to provide suitable nesting habitat for Caspian terns; lure them to site. Implementation of tillage in winter; decoys/recorded calls begin late March. Management of problem gulls occurs in spring.	
Human Disturbance, silt fencing, plastic sheeting, application of adaptive management techniques to disperse Caspian terns.	Probable timeframe April 1-egg laying. Objective: Preclude tern nesting. Action: Construct silt fencing or other features on entire 8-acre nesting site.		Adaptive management measures may be employed, e.g., gull control activities. Research activities would continue.	

Present Proposed Action

The presently proposed action would cover 2 years, after which the USFWS would be expected to assume tern management responsibilities.

To maintain the colony presence at East Sand Island, suitable nesting habitat, in conjunction with social attraction measures (e.g., decoys, recorded tern calls), will be employed. Habitat management actions at East Sand Island would entail preparation of 4 acres or more of bare sand and silty sand at the upstream tip of the island. The objective is to maintain a bare sand environment suitable for nesting Caspian terns. In 2000, about 9,100 pairs of Caspian terns nested on the bare sand habitat that was provided on East Sand Island, and the terns used 3.4 acres of the 4 acres of available habitat. On Rice Island, where about 580 pairs of terns nested, the area of the colony was 0.55 acres. (Both colony areas were measured using high-resolution aerial photographs taken near the end of the incubation period.) Consequently, the entire Caspian tern population in the Columbia River estuary nested on a total of 3.95 acres last season. The density of active nests on East Sand Island in 2000 (0.67 nests/m²) was intermediate between the nesting density at East Sand Island in 1999 (0.5 nests/m²) and the nesting density on Rice Island in 1999 (0.83 nests/m²), when colony area had been restricted by managers. The nesting density at Rice Island in 2000 (0.26 nests/m²) was much lower than has been recorded previously in the Columbia River estuary. These data taken together indicate that 4 acres of tern nesting habitat on East Sand Island will be more than adequate to accommodate the nearly 10,000 pairs of Caspian terns that

nested in the estuary last season. (Additional acreage may be tilled, but soil is silty rather than sandy and would be expected to re-vegetate more quickly.)

Nesting success of Caspian terns on East Sand Island during the 1999 and 2000 breeding seasons indicates that the East Sand Island colony is a suitable site for a large Caspian tern colony on the order of 10,000 pairs. In 1999, when 1,400 pairs of terns nested on East Sand Island, productivity averaged 1.20 young terns raised per nesting pair. In 2000, when the East Sand Island tern colony had increased to 9,100 pairs, productivity averaged 0.61 young terns raised per nesting pair. The lower productivity of the East Sand Island colony in 2000 compared to 1999 resulted in part from a severe storm that caused extensive mortality of young tern chicks (>1,000 deaths) on June 11, 2000, as well as the much larger size of the colony and associated increase in density dependent mortality among older tern chicks. In comparison, the productivity of the Rice Island tern colony averaged 0.52 young raised per nesting pair in 1999 and only 0.16 young raised per nesting pair in 2000. The low productivity of terns nesting at the Rice Island colony in 2000 was a consequence of both the small colony size (580 pairs) and the large number of predatory gulls that nested in the vicinity of the Rice Island tern colony. The available data indicate that the tern population in the Columbia River estuary would benefit should the Rice Island colony site be abandoned in 2001 and all terns instead attempted to nest on East Sand Island. If a small colony of terns persists on Rice Island in 2001, nesting success and overall productivity are likely to be low.

Nesting habitat management actions would occur on the 4 acres on East Sand Island cleared in 2000 for tern management that have since re-vegetated, and possibly on additional acreage, cleared in 1999, that quickly re-vegetated. Disking and tillage, possibly after application of herbicide, would remove the present vegetative growth. This action would occur both years, as necessary. Decoys and a sound system to play back recordings of Caspian tern colony calls would be placed at the constructed nesting site to attract terns. Maintenance actions for 4 acres of tern habitat at East Sand Island are to be conducted by the Corps and the Oregon Department of Fish and Wildlife with funds provided by the U.S. Fish and Wildlife Service. Management of predatory gulls, if necessary, would be accomplished by researchers.

The Corps' planned action includes two forms of harassment of terns on Rice Island. The first is habitat alteration, such as modifying the former 8-acre nesting area at Rice Island with silt fences to establish cover not conducive to tern nesting (i.e., passive harassment). Previous attempts to vegetate these islands have not been very successful, thus the Corps plans to use these other management techniques to discourage tern nesting. Habitat modification is not likely to completely prevent nesting on Rice Island. Therefore, in addition to passive harassment, the Corps proposes active harassment of terns until egg-laying begins. Active harassment would likely reduce the number of tern nests but would not necessarily eliminate all nesting. Action may be limited to passive harassment; however, the addition of active harassment is presented as part of the proposed action. Without active harassment that continues into early egg-laying (which would require a permit under MBTA), complete prevention of nesting by Caspian terns on Rice Island can not be assured.

Human intrusion into areas and habitats not used by Caspian terns would be minimized to the extent practicable in order to avoid disturbance to other wildlife, including bald eagles, shorebirds, and waterfowl, including nesting Canada geese. Caspian terns typically occur in open sandy uplands and/or on beaches. Thus it is not necessary, typically, for personnel to enter vegetated habitats. Under the Migratory Bird Treaty Act (MBTA), take of migratory birds is regulated by

the USFWS. MBTA permits are not required to conduct non-lethal harassment. The USFWS regulations contain requirements for lethal take of migratory birds. The Corps' action will be consistent with the Migratory Bird Treaty Act (MBTA). Since all passive/active harassment actions would cease as soon as egg-laying begins, no MBTA permit is required.

Researchers intend to continue banding efforts, including rocket netting, of terns landing on Rice Island prior to egg-laying. Any required permits for this activity would be obtained by the researchers. An EA on these activities is being prepared by Bonneville Power Administration.

Monitoring will be conducted to document tern distribution, dispersal, reproductive success and diet composition for future management decisions.

Intensive monitoring and evaluation of Caspian tern nesting success and consumption of salmonids would occur in Oregon through an on-going research effort conducted by OSU-CRITFC-RTR. Monitoring at other nesting sites may occur, depending on several factors, such as location and ownership.

Habitat modification at East Sand Island would be accomplished by the Corps in conjunction with USFWS and ODFW. Researchers associated with OSU-CRITFC-RTR would be responsible for placement of decoys and sound devices and their implementation at East Sand Island. Discouragement of Caspian tern nesting would only occur at Rice Island and would be accomplished via contract.

Excluders to preclude cormorant perching would be placed on pile dikes not previously retrofitted with these devices off Miller Sands, at Pillar Rock Island and at Eureka Bar. For 2001, the NMFS has directed the Corps to emplace bird excluders on nine additional pile dikes. These would occur at Columbia River Mile 4.01 (West Sand Island), RM 5.17 (East Sand Island: done in a manner to avoid impacts to brown pelicans), RM 6.37 (Chinook), two dikes at or near RM 24.63, two dikes at Pillar Rock Island (RM 26.86 and 27.08), and two dikes at Eureka Bar (RM 51.10 and 51.42). Approximately 13,500 lineal feet of pile dike would be fitted with bird excluders in 2001. Additional excluders may be added in 2002. Maintenance of previously placed excluders and emplacement of new ones would be accomplished by contract.

Alternatives

One alternative to the proposed action is no action. Given the natural re-vegetation of the cleared site on East Sand Island, and the strong history of nesting on Rice Island, "no action" would probably see the return of most, if not all, of the terns to nest at Rice Island as they did in 1998 and 1999, with concomitant high levels of predation on salmonids. Due to the continued loss of Caspian tern nesting habitat outside the Columbia River estuary, and the productivity in the estuary in the mid-1990's the colony has grown from 7,948 breeding pairs on Rice Island in 1998 to 9,677 breeding pairs on the two islands in 2000. Loss of habitat in Puget Sound (the ASARCO site) could result in up to an additional 1,500-2,000 birds nesting in the Columbia River estuary in 2001.

Another alternative to maintenance of East Sand Island for Caspian terns would be to eliminate all Caspian tern nesting in the Columbia Estuary in the year 2001. In addition to habitat modification and harassment at Rice Island, no vegetation removal would occur at East Sand Island, and

harassment would occur there also if any terns attempted to nest. This alternative is not considered viable for several reasons. The terns have nesting fidelity to the Columbia Estuary sites and are expected to return there, as they have for 16 years. Some will attempt to nest at Rice Island, though most now have experience at East Sand Island and will likely return to that site, provided it is not vegetated. While colonies have moved when habitat is lost, and nested at new sites (as this population has done in the 1970s and 1980s), to provide such a large colony no place to nest may lead to total reproductive failure in 2001, particularly if no other suitable nesting habitat is present in the region. Large numbers of terns might still feed on smolts in the Columbia River estuary in the absence of other suitable nesting locations. There could also be increased use of nesting sites further upstream on the lower Columbia River, including locations where the birds' presence is not desirable. In the short term, this could result in greater consumption of anadromous fish than in previous years. In the long term, however, eliminating or severely limiting tern habitat in the Columbia River estuary would lead to the terns seeking nesting sites elsewhere, thus reducing predation on Columbia River salmonids. However, this alternative should be conducted as part of a long-term habitat management study to establish impacts to Caspian terns, which cannot be done within the timeframe established by the NMFS' 1999 Biological Opinion.

Predation by Caspian terns nesting at Rice Island is believed by NMFS to be so detrimental to the listed salmonids that no action or a further delay in phased dispersal attempts would adversely affect recovery of salmonid stocks listed under the Endangered Species Act of 1973, as amended. NMFS estimated that 250,000 fish of listed stocks were taken in 1997 by Caspian terns, based upon the "best" estimate of the number of juvenile salmonids taken by terns during that year. Approximately 897,000 listed fish may have been taken in 1999 by Caspian terns and about 1.2 million listed stock may have been consumed by the terns in 2000. The estimates of avian predation are not sufficiently refined to evaluate impacts on individual stocks. With the recent listings, nearly all wild and naturally spawned steelhead and spring/summer chinook and some hatchery runs are listed. Data suggest that the larger steelhead and yearling chinook smolts seem to be the preferred targets of avian predators.

Results from the 1999 pilot study indicate that terns nesting at East Sand Island consumed about 40 percent fewer salmonids than terns nesting at the Rice Island colony. Results from 2000 indicate that terns nesting at the East Sand Island colony consumed over 50 percent fewer juvenile salmonids than terns nesting on Rice Island. While dispersing most of the colony out of the Columbia River Estuary is a long-term management goal, providing no nesting sites at all carries too great a risk that the entire colony will remain in the area, feeding on salmonids, but not nesting. This would cause loss of both terns (nesting failure) and listed salmonids.

Other Related Actions In conjunction with the Corps proposed action, members of the CTWG are proceeding with consideration of other actions. Provision of alternate habitat for Caspian terns is considered, by many members of the CTWG, desirable and deserves consideration for inclusion in a long-term tern relocation effort. Historic and some present nesting sites occur on National Wildlife Refuges and State wildlife management areas making the long-term redistribution of Caspian terns more of a viable option, particularly to sites where wildlife management is the stated objective. Habitat maintenance and/or construction of nesting islands is within the purview of the wildlife management agencies who manage these sites. Attempts to attract small numbers of terns to other sites and closely monitoring food intake would establish research results useful in

developing a long-term plan. WDFW is looking at the possibility of placing one or two sand-covered barges in Puget Sound to attract some of the ASARCO terns. This would be a research effort to determine if barges would serve as habitat and what the terns' diet is composed of. The USFWS is pursuing monitoring sites on NWRs with present tern use to see if terns banded at East Sand Island and Rice Island are resting or otherwise utilizing these sites in their northward migration.

AFFECTED ENVIRONMENT

Overview: Caspian Tern and Cormorant Populations

(The following description is excerpted from Collis et al. 1999, pp. 61-65, with 2000 data from the draft Seasonal Summary Report (Collis, et al. 2000) inserted in brackets.)

“The Caspian tern colony on Rice Island, a dredged material disposal island in the Columbia River estuary, is currently the largest of its kind in North America (about 8,000 nesting pairs), and perhaps the world (Cuthbert and Wires 1999). This colony has increased by over 600% since 1986, when nesting by Caspian terns on Rice Island was first discovered (G. Dorsey, USACE, pers. comm.); annual growth in the tern colony is currently about 15 – 20%. The colony has apparently expanded at the expense of other Caspian tern colonies formerly located in Grays Harbor, Willapa Bay, and northern Puget Sound, as well as East Sand Island near the mouth of the Columbia River.

[In 2000, this colony had increased to 9,680 breeding pairs, with the majority (9,100) nesting on East Sand Island, and 580 nesting on Rice Island.]

Breeding colonies of Caspian terns were not recorded for coastal Washington and Oregon until the late 1950s. During the first half of this century Caspian terns were known as a breeding species in the Pacific Northwest only from inland lakes, marshes, and impoundments (Gill and Mewaldt 1983). The first breeding record on the coast was a small colony discovered on Goose Island, Grays Harbor, Washington in 1957 (Alcorn 1958). This colony peaked in size at about 1,000 pairs in 1973, and had been abandoned by 1976 (Speich and Wahl 1989; E. Cummins, WDFW, unpubl. data). Beginning in 1974, a Caspian tern colony became established on Whitcomb Island, also in Grays Harbor, that increased in size to 1,240 pairs by 1976, but this colony was abandoned by 1981. Beginning in 1976, Sand Island, another island in Grays Harbor, was used by nesting Caspian terns. By 1981 over 2,000 pairs were nesting on Sand Island, the largest known Caspian tern colony anywhere along the Pacific Coast of North America (Gill and Mewaldt 1983). In 1984 the number of nesting pairs was estimated at over 2,775, but this colony in turn disappeared by 1993 (J. Smith, WDFW, pers. comm.). During the 1990s there has been no confirmed successful nesting by Caspian terns in Grays Harbor, although nesting attempts by small numbers of terns have been noted (M. Zahn, WDFW, unpubl. data).

In 1976 several hundred pairs of Caspian terns were discovered nesting on Gunpowder Island, near the mouth of Willapa Bay, Washington. By 1982 the Gunpowder Island tern colony had peaked at about 1,500 nesting pairs (Speich and Wahl 1989). Thereafter the Gunpowder Island colony declined, and the last confirmed nesting was by about 150 pairs in 1989 (E. Cummins, WDFW, unpubl. data).

In 1984 a colony of about 1,000 pairs of Caspian terns was noted breeding on East Sand Island in the Columbia River estuary (G. Dorsey, USACE, pers. comm.). This was apparently the first nesting record for Caspian terns anywhere in the Columbia River estuary. By 1987 the colony on East Sand Island had been abandoned, and all breeding pairs had apparently shifted to Rice Island, a large, sandy dredge disposal island 21 km further up-river.

The Rice Island Caspian tern colony increased rapidly from the initial estimate of 1,000 pairs in 1986 to about 6,200 pairs in 1991 (A. Clark, USFWS, pers. comm.). The current population estimate of about 8,000 nesting pairs at the Rice Island colony is larger than the estimate of the entire Pacific Coast population of Caspian terns 15 years ago (Gill and Mewaldt 1983). The initial rapid buildup of this colony in the late 1980s and early 1990s apparently was due to shifting of breeding pairs from Sand Island in Grays Harbor, Gunpowder Island in Willapa Bay, and East Sand Island near the mouth of the Columbia River to the single large colony at Rice Island. After 1991 colony

growth appeared to slow, but there was a substantial jump in the size of the Rice Island tern colony between 1995 and 1996 (Fig. 4). This increase coincided with the reported demise of a large Caspian tern colony (ca. 1,500 – 3,000 pairs) in northern Puget Sound, on the grounds of the U.S. Naval Base at Everett, WA (G. Dorsey, USACE, pers. comm.). Although details are sketchy, this colony was apparently precluded from using the former colony site in 1995 by new construction on-site. There are no subsequent reports of Caspian terns nesting in the northern Puget Sound area. This suggests that the Everett Caspian tern colony was subsumed in the Rice Island colony during the 1996 breeding season.

Other than the Rice Island colony, there were no confirmed Caspian tern breeding colonies along the coast of Washington or Oregon in 1998. Nesting was suspected, however, at a mainland site on the shores of Commencement Bay, southern Puget Sound, near Tacoma, Washington (M. Tirhi, WDFW, pers. comm.). The site is fenced off because of heavy metal contamination, and is slated for soil removal and remediation as an EPA superfund site in 1999. This site should be closely monitored to ascertain whether nesting occurs. [In 2000, between 800 and 1,000 pairs of Caspian terns nested at the Asarco superfund site on Commencement Bay.]

Some evidence from band returns supports our interpretation of the origins of the Rice Island Caspian tern colony. In 1997 and 1998, we collected a total of 10 banded adult Caspian terns on or adjacent to the Rice Island colony. All had been banded as young chicks on the Sand Island colony in Grays Harbor during the late 1970s or early 1980s. Washington Department of Fish and Wildlife banded approximately 500-1,500 Caspian tern chicks annually on Sand Island during this period (Gill and Mewaldt 1983, J. Smith, WDFW, pers. comm.). These banded adults were 17 (N = 2), 18 (N = 1), 19 (N = 3), 20 (N = 1), and 21 (N = 3) years-old at the time that they were collected on Rice Island. The number of banded adults (N = 5) in the sample of randomly collected adults for diet composition analysis (N = 304) suggests that there were several hundred banded adults on the Rice Island colony in 1997 and 1998.

In summary, the history of the Caspian tern breeding population along the Washington and Oregon coasts has been a short one (ca. 40 years) of rapid expansion, low philopatry (nest site fidelity), and large colony sizes compared with other areas of North America. This is part of a general trend for Pacific Coast Caspian terns of (1) shifting breeding colonies from inland, natural sites to coastal anthropogenic sites (dredged material disposal islands), (2) shifting from nesting in small groups within larger colonies of gulls to nesting in large, single-species colonies, (3) dramatic overall population increase, and (4) rapid northward range expansion.

Both bald eagles and glaucous-winged/western gulls have apparently played roles in the demise of former Caspian tern colonies on islands in Grays Harbor and Willapa Bay. The history of short-lived colonies and shifting breeding sites, plus observations of increasing gull and eagle disturbance at former Caspian tern colonies (J. Smith, WDFW, pers. comm.), suggests that low nest site fidelity may be related to the gradual build-up of predator populations once a colony is established. Predation by gulls and eagles is not the sole explanation, however, because some colonies have been lost primarily due to habitat degradation and loss. Caspian terns prefer to nest on bare or sparsely vegetated sand, so colony sites are frequently situated where sand accretion and erosion are persistent processes that maintain unvegetated substrate. Such sites can be washed away during winter storm tides, leaving no area above high spring tides. This was a major factor in the demise of the Gunpowder Island colony in Willapa Bay and the Whitcomb Island colony in Grays Harbor. Finally, Caspian tern colonies that become established on dredged material are usually constrained by encroaching vegetation within a few years of dredged material deposition. The demise of the East Sand Island tern colony after 1984 has been attributed to vegetation succession, combined with aerial seeding by the U.S. Army Corps of Engineers. ...

The estuary-wide population of double-crested cormorants increased in 1998 by an estimated 15% over 1997. [paragraph] This population trend is part of a continuing expansion of populations of double-crested cormorants along the Pacific coast (recently reviewed by Carter et al. 1995) and throughout North America following persecution and habitat destruction in the late 1800's and early 1900's. But the dramatic increase in the size of the East Sand Island colony over the last decade is unparalleled elsewhere in the Pacific Northwest. The East Sand Island colony was first discovered in 1987 and in 1989 there were 91 active nests (D. Bell, pers. comm. to R. Lowe, USFWS) at the site that supported about 5,250 nesting pairs during the 1998 breeding season. Thus the population of double-crested cormorants in the Columbia River estuary, like the Caspian tern population, experienced rapid growth in the early 1990s. The cormorant colony on Rice Island was first noted in 1988, soon after Caspian terns colonized the site. Again, the rapid initial build-up of these breeding colonies indicates that breeders were recruited from other colonies. Unlike Caspian terns, however, no large colonies of double-crested cormorants along the coast

of Washington or Oregon declined or disappeared concurrent with increases in the Columbia River estuary (Carter et al. 1995; R. Lowe, USFWS, pers. comm.). Instead, it appears that the rapid influx of double-crested cormorants to the estuary occurred at the expense of inland colonies (e.g., Malheur NWR), where large colonies were adversely affected by prolonged draught in the late 1980's and early 1990's, which resulted in a dramatic decline in forage fish availability (G. Ivey, USFWS, pers. comm.). The double-crested cormorant colonies at East Sand Island (ca. 5,250 pairs) and Rice Island (ca. 800 pairs) are currently the two largest known colonies of this species on the Pacific Coast of North America (Carter et al. 1995). [The Rice Island colony moved to East Sand Island in 1999 and 2000. This colony, estimated to be over 7,000 pairs in 1999, and about 6,500 in 2000, is the largest breeding colony of double-crested cormorants on the west coast of North America.] Furthermore, there have been recent dramatic increases in the number of glaucous-winged/western gulls in the Columbia River estuary. Since 1989, when 1,760 gulls were counted on East Sand Island (D. Bell, pers. comm. to R. Lowe, USFWS) the direct count of gulls on East Sand has increased by more than a factor of three by 1998. These data suggest that all populations of piscivorous colonial waterbirds have been increasing in the Columbia River estuary in the last decade."

Columbia River Estuary. The Columbia River estuary is 4 to 5 miles wide and extends upriver to around RM 38. There are two main channels, the north and south channels. The south channel is an extension of the main river channel upstream of the estuary and carries most of the river flow. This is also the main navigation channel, which is dredged annually by the Corps to maintain the presently authorized 40-foot-deep, 600-foot-wide navigation project. The north channel extends to about RM 20, near the downstream end of Rice Island. Wide, shallow intertidal and subtidal flats separate these two deep channels. Hydrology of the estuary is affected by downstream flows, which are to some extent regulated by the upriver system of dams, and ocean tides. Tidal influence extends upstream to Bonneville Dam, at RM 143. The salt wedge, however, penetrates upstream to about RM 23.

Islands in the estuary are typically intertidal in nature and most occur in Cathlamet Bay. Exceptions are East and West Sand Island in Baker Bay, Rice, Miller Sands Island and Spit and Pillar Rock (Jim Crow Sands) on the northern edge of Cathlamet Bay, and Puget and Tenasillahe Islands. Rice, Miller Sands Island and Spit, and Pillar Rock were artificially created from sandy material dredged from the Columbia River navigation channel. The Columbia River, estuary and Pacific Ocean provide habitat for a variety of aquatic flora and fauna. Plants range from phytoplankton to marsh ecosystems. Animal life ranges from zooplankton to mammals. Of significance to this Environmental Assessment (EA) are the fish species fed upon by birds for which adaptive management is proposed.

Fish. Estuarine habitats support a variety of anadromous and resident fish species. Anadromous fish are present in the river almost year-round, either as adults migrating upstream to spawn, or as juveniles, migrating downstream to the ocean or rearing in the estuary (fall chinook). Anadromous species include the following salmonids: spring, summer and fall run chinook; coho; sockeye; chum salmon; winter and summer run steelhead; searun cutthroat trout and bull trout. Other anadromous species include green and white sturgeon, Columbia River smelt, American shad and lamprey.

Resident species remain in the river and estuary throughout their life cycles. Some resident species are northern pikeminnow, common carp, small and largemouth bass, yellow perch, peamouth, large-scale sucker and white crappie.

Marine fish occur in the ocean and the estuary. Dominant marine fish in the estuary include northern anchovy, Pacific herring, Pacific sand lance, Pacific staghorn sculpin, starry flounder,

longfin smelt, surf smelt, whitebait smelt, Pacific tomcod, English sole, various species of surf perches, shiner perch, rockfish species, and sanddabs.

Run size of salmon in the river has been decreasing since the turn of the century. Further declines in wild salmon numbers in the early 1990's prompted the NMFS to list or propose for listing several Columbia Basin salmonids. Estimates, provided by NMFS, of numbers of smolts reaching the estuary in 2000 are shown below in Tables 2 and 3. The majority of the out-migrating smolts, and many of the returning adult salmonids, are hatchery fish that are produced to support important tribal, recreational and commercial fisheries, to mitigate for fish and habitat lost to the Federal Columbia River Power System (dams), and to restore threatened and endangered species. The majority of the remaining stocks of wild fish are ESA listed species. The exact proportion of wild to hatchery fish is not specifically known; however, many wild ESA stocks have been incorporated into the hatchery program.

Table 2 Numbers of anadromous smolts estimated to arrive in the Columbia River Estuary in 2000. (From a memo from Michael Schiewe, Director NMFS/NWR Fish Ecology Division to Donald Knowles, Director NMFS Office of Protected Resources, March 16, 2000)

	Spring/summer chinook	Fall chinook – subyearling	Sockeye	Steelhead	Coho
Total ¹	30,565,835	47,345,104	3,527,494	13,981,625	19,000,000 ²
Listed - wild	6,745,147	8,479,764 ³	12,326 ⁴	1,404,732	None
Listed – hatchery	1,100,987	see footnote	see footnote	566,107	None
% Listed	25.67%	17.80%	0.38%	14.10%	0%

1 Does not include 500,580 listed wild chum salmon

2 Estimated from 1999 release totals

3 Does not include Snake river Hatchery production which is essential for recovery but not listed

4 Includes hatchery production from captive broodstock Snake River Sockeye ESU

Table 3 Total number and number listed of anadromous smolts, Columbia River Estuary 2000.

	Totals	Listed
Spring/summer Chinook	30,565,835	7,846,139
Fall Chinook	47,345,104	8,429,764
Sockeye	3,527,494	12,326

Steelhead	13,981,625	1,970,839
Chum	500,580	500,580
Coho	19,000,000	None ¹
Total	114,920,638	18,759,643 (16.5%)

¹ Status of Lower Columbia River wild coho is currently under review

Wildlife. There is a great diversity of wildlife in and around the estuary. These include marine mammals, furbearers, deer, numerous small mammals (including rodents), reptiles and amphibians. However, it is primarily birds that occur in the area, which could be affected by the proposed action. Three species of loons occur as spring and fall migrants and have been observed in the estuary during the winter. Grebes occur in the estuary particularly in bays, during migration and in winter. Brown pelicans typically occur from mid-spring to late fall along the coast, with concentrations of up to 1,000 birds at the mouth of the Columbia at South Jetty and East Sand Island-Baker Bay (Briggs et al. 1992 IN Corps 1998). Pelicans have increased in numbers at East Sand Island (see below).

Double-crested, pelagic and Brandt's cormorants occur in the estuary and forage in estuary waters. Cormorants tend to perch on the numerous pile dikes in the estuary. Double-crested cormorants are the most numerous and occur year-round. East Sand Island supports a large nesting colony of double-crested cormorants. Rice Island also supported a large colony of cormorants; however, this colony apparently moved to East Sand Island in 1999. Nine gull species commonly occur off the Oregon coast, and three others are known to occur. Gull colonies are located on East Sand Island, Rice Island and Miller Sands Spit and consist of glaucous-winged/western gull hybrids. Ring-billed gulls also nest on the Spit and East Sand Island. Three species of tern occur in the river or nearshore areas. Common and Arctic terns occur off the coast from April to September, principally as migrants. Caspian terns are present from April to September and occupied a large breeding colony on the western end of Rice Island. The Caspian tern nesting population has grown from about 1,000 pairs in 1984 (on East Sand Island) to an estimated 9,000 pairs in the estuary in 1999. In 2000, about 9,100 breeding pairs nested on East Sand Island, and 580 pairs located on Rice Island. Most of the East Sand Island terns had previously nested on Rice Island, though total numbers increased by about 1,000 breeding pairs over 1999 numbers. Much of this increase appears to have occurred from colonies at other locations shifting to the Columbia River estuary, apparently due to habitat loss elsewhere, plus some increase from breeding. This colony currently represents the largest known Caspian tern colony in North America and perhaps the largest in the world. It comprises about 77 percent of the Pacific Coast population. Relocation of nesting colonies has been a repeatedly observed behavior of Caspian terns along the Pacific Coast of North America.

Waterfowl are seasonally abundant. Agricultural lands along the river and intertidal marshes in the estuary provide substantial habitat along the lower river. Mallards, northern pintails, American wigeon, green-winged teal, Canada geese, and scaup are the most abundant wintering species. Mallards and Canada geese are the principal nesting species. Islands, particularly dredged material islands, are important nesting sites for the resident populations of Canada geese and mallards. Substantial numbers of wintering Canada geese use these islands.

Raptors (hawks, owls) occur both as residents and/or wintering birds. Bald eagles are relatively abundant. Peregrine falcons are also present, as are several species of hawks and owls.

Many other nongame bird species occur throughout the estuary. Shorebirds are abundant during spring and fall migration with substantial numbers over-wintering in the estuary. Large concentrations of shorebirds use high tide roosts at the downstream tips of Rice Island and Miller Sands Spit. While riparian habitat is important to many of these nongame bird species, some prefer grassy uplands and dredged material disposal sites. Savannah and white-crowned sparrows and horned larks inhabit dredged disposal sites where the open, sparsely vegetated terrain provides preferred nesting and foraging habitat.

Human Population. Except for the Cities of Astoria, Warrenton, Hammond, Chinook and Ilwaco, human population along the estuary is sparse. Astoria is the largest population center and sustains the only deep draft port below RM 68. Clatsop County, Oregon, and Wahkiakum and Pacific County, Washington, all have relatively small populations and resource based manufacturing sectors. Forest and farmlands dominate the estuary and lower river. Fishing, and fish related industry, still have local interest and is the primary economic base of some smaller communities such as Ilwaco and Chinook, Washington, and Warrenton, Oregon. One organization, Sea Resources in Chinook, Washington, maintains a salmon hatchery at RM 4 of the Chinook River. Sea Resources is a community non-profit organization that is presently involved in watershed restoration. The hatchery is a tool to restore fish runs as part of a healthy watershed. About a million chinook, chum and coho are raised and released from the hatchery.

There are several terminal fishery rearing pens in the estuary. These are in Young's Bay, at several tributaries to the Columbia River, Tongue Point (Oregon), and Grays Bay/Deep River (Washington). Salmon are released as juveniles and then the adults are harvested near the release spot. The Youngs Bay terminal fisheries were established as part of a Clatsop County Economic Development Council program. These and other estuary terminal fishery efforts have ODFW and BPA involvement.

East Sand Island. East Sand Island, located near RM 5 of the Columbia River, was withdrawn from the public domain for military use in 1863, was utilized as a military observation post during World War II, and reassigned to the Corps in 1954. Over the years, accretion (some from dredged material disposal) and erosion have changed the size and shape of the island and caused it to shift in location north of its original position. Presently, the island mass is separated by a channel into West Sand Island and East Sand Island. The entire island mass remains within the State of Oregon, the State boundary following the channel separating the islands from Chinook and Ilwaco, Washington. (The islands remain in Oregon because of their origins on the south side of the historic Columbia River channel.) West Sand Island is occasionally used as a disposal area for maintenance dredging of material from Baker Bay West Channel. Chinook Channel material, containing silts, has gone to East Sand Island, most recently in 1983. Pile dikes were built along the island beaches to control erosion and control the river at both islands. During the 1970's, West Sand Island was leased for cattle grazing, but this activity has not occurred since 1975. The only access to the islands is by boat. Minimal recreational activity occurs on these islands, principally camping, beach combing and waterfowl hunting. The islands are not managed for any activity other than dredged material disposal.

East Sand Island is presently about 6,000 feet long by 100 to 500 feet wide and contains about 53 acres of grass-covered sandy and silty soil. Dredged material has been disposed on the eastern end and southern side several times, the most recent in 1983. The disposal location, a diked upland site, has developed wetlands on a portion of the area. Tidal marsh flats are present along the bay side of the island. The eastern end of the island is covered with herbaceous vegetation, primarily European beach grass and some American dune grass. Coast willow and red alder are also present. Woody debris left by high river flows and tides occurs at the high tide line. Central and western portions of the East Sand Island have remnants of WW II era railroad and concrete “pill boxes.” Any remaining cultural resources on the east end have been covered by dredge spoils.

Approximately 7,000 pairs of glaucous-winged/western gulls nest throughout East Sand Island. Approximately 300 pairs nested in the area at East Sand Island managed for tern nesting habitat prior to habitat management efforts in 1999. Double-crested cormorants nest in a large colony on the downstream one-half of the island. This colony, estimated to be over 7,000 pairs in 1999, and about 6,500 in 2000, is the largest breeding colony of double-crested cormorants on the west coast of North America. There is also a small colony of 30 to 40 pairs of Brandt’s cormorants nesting on the pile dike at the western end of East Sand Island. The western half of East Sand Island currently constitutes the largest brown pelican night roost site in the Pacific Northwest. USFWS recorded 1,200 pelicans here in 1998 and about 3,400 in 2000. Canada geese and mallard ducks nest to a limited extent in the project area. Nesting by Caspian terns in the Columbia River estuary was first observed in 1984 when approximately 1,100 pairs nested at East Sand Island. The 1984 colony location was within the diked disposal area used in 1983 for dredged material placement, approximately 350 feet northwest of the pipeline outfall location. The colony location in 1985 was still within the diked disposal area, north of the 1984 location and west of the outfall location. The 1986 colony location at East Sand Island was outside the diked disposal area, in a low-lying area just above the beach and amongst the driftwood. Approximately 1,000 terns were reported nesting on Rice Island in 1986 and the entire colony has located at Rice Island thereafter. Revegetation by native and exotic species within the diked disposal area apparently led to shifts in the colony location at East Sand Island and ultimately to the colony’s shift to Rice Island.

Preferred nesting habitat in Washington State apparently also was reduced in the 1980s’ and 1990’s, through erosion and invasive vegetation overrunning newly accreted sand habitat, and contributed to the shift in tern nesting location and the increase in size of the tern colony in the Columbia River estuary.

About 8 acres of East Sand Island were scarified in 1999 to provide nesting area for Caspian terns. Up to 1,400 pairs of terns did nest at the site, using about 0.7 acre of bare sand habitat. Revegetation was rapid, however, and the entire cleared area is again largely vegetated. Further efforts to re-establish the colony resulted in about 9,100 pairs nesting here in 2000 on 3.4 acres of 4 acres re-scarified to provide habitat. The island’s cormorant colony also increased in size in 1999. It is assumed these birds moved from Rice Island due to tern harassment, which also disturbed the cormorants. Slightly fewer cormorants nested on East Sand Island in 2000, apparently due to harassment of nesting cormorants by bald eagles at the west end of the colony.

Rice Island. Rice Island, located at RM 21-22 of the Columbia River north of the main navigation channel, is one of a series of dredged material disposal islands created by the Corps upstream of Astoria. Continued use of Rice Island, as a disposal site, is a significant component in maintaining the navigation channel. The Corps utilizes Rice Island for disposal approximately every other

year. All of this material comes from maintenance dredging of the existing 40-foot Federal navigation channel, whether it is pumped there directly from the channel or is rehandled there from Harrington Sump, which lies between the channel and Rice Island. The island is owned by the Oregon Division of State Lands (DSL), with right of entry held by the Port of Portland. Management of dredged material disposal at Rice Island and other nearby disposal sites includes revegetation to reduce wind erosion, provide wildlife habitat, and discourage tern nesting. Rice Island is just north and west of Miller Sands Island and Miller Sands Spit, also dredged material disposal islands. Rice Island is about 8,000 feet long by 1,800 feet wide and covers about 230 acres. It consists of sandy material dredged from the Columbia River navigation channel. Dredged material is placed on some portion of the island nearly every year. Grasses have been planted periodically in the past to reduce blowing sand. Planting has been generally unsuccessful at Rice Island, due to wind erosion of sand around seedling roots. The USFWS, Lewis and Clark National Wildlife Refuge, formerly managed Rice Island, until 1994, under a management option with Oregon DSL. The USFWS has not renewed its option to manage Rice Island.

The island has remained uncolonized by animals other than voles and birds, principally double-crested cormorants, Caspian terns, glaucous-winged/western gull hybrids, Canada geese, and horned larks and other passerines (perching songbirds) that prefer sparsely vegetated habitat. In 1986, a portion of the Caspian tern colony from East Sand Island, about 1,000 pairs, began nesting at Rice Island. Based on research, including aerial photography, there were about 8,000 pairs of Caspian terns nesting on Rice Island in 1998 and 1999, and about 580 breeding pairs in 2000.

Caspian terns first arrive on the colony in late March to early April. Egg laying takes place throughout May, with the peak of laying during the second week of May. Most young have fledged by mid-July. Caspian terns nesting on Rice Island fed entirely on fish, and mostly juvenile salmonids, during the 1997, 1998, 1999 and 2000 breeding seasons.

Roby et al. (1998) and Collis et al. (1999) reported that the diet composition (based on bill load observation and fish dropped) of terns contained the highest percentage of salmonids (73 percent of identifiable prey items in 1998) of those fish-eating birds that were studied in the estuary. For comparison (based on chick regurgitations and adult stomach contents), the salmonid diet composition for all double-crested cormorants sampled was 53 percent and 15 percent of identifiable prey items for those nesting on Rice Island and East Sand Island, respectively. The proportion of juvenile salmonids in the diet for gull hybrids was 13 percent and 6 percent of identifiable prey biomass for those nesting at Rice Island and East Sand Island, respectively (Collis et al. 1999).

For terns in 1998, chinook smolts were the most prevalent species of identifiable salmonid prey types (49 percent), followed by coho (35 percent) and steelhead (16 percent). Early in the 1998 breeding season, the diet was comprised mostly of chinook salmon and steelhead smolts, by coho smolts in the middle of the breeding season, and by chinook salmon and other species later in the season. The proportion of salmonids in the diet declined as the breeding season progressed, and by July, salmonids no longer composed the majority of prey consumed. Estimates of consumption of juvenile salmonids by terns were based on fish identified in bill loads throughout the 1998 nesting season (sample size = 1,137 fish). Foraging distribution of Caspian terns from the Rice Island colony location was investigated in 1998 by OSU-CRITFC researchers through the use of aerial surveys. They determined (Collis et al. 1999) that 25 percent of foraging terns were within

2.6 miles of Rice; 50 percent within 4.6 miles or to just downstream of Tongue Point; 75 percent were within 9.2 miles, between rivermile 11 and 30; and 90 percent within 13 miles. The 90 percent ring encompasses East Sand Island at the downstream end to just upstream of Skamokawa. The aerial survey technique used to describe spatial use of the estuary by Caspian terns could not distinguish between commuting and foraging birds, so results are biased, perhaps underestimating foraging range by as much as 30 percent (Ostrand et al., 1998). In 2000, about 580 tern pairs nested on Rice Island, and diet data indicate that 91 percent of prey items were juvenile salmonids. Tern eggs and chicks were heavily preyed upon by gulls, and productivity was relatively low (0.16 fledglings per nesting pair).

Double-crested cormorants established a nesting colony on Rice Island, arriving in 1988. There were about 1,200 nesting pairs on Rice Island in 1995 (Carter et al. 1995 IN ODFW 1998). This was the second largest colony on the west coast of North America north of Mexico. Cormorants arrive on the colony in early April and lay eggs from early May to mid-June. Fledging extends through the beginning of August. There were no cormorant nests on Rice Island in 1999 or 2000. Hazing of Caspian terns also disturbed the cormorants and they apparently moved to East Sand Island. Collis et al. (1999) notes that the cormorants nesting on East Sand Island had fewer salmonids in their diet (about 15 percent) as opposed to those nesting farther up-river at Rice Island and nearby channel markers (54 percent). Also, cormorants nesting on Rice Island had consistently poorer nesting success than those nesting on East Sand Island.

Miller Sands Spit and Pillar Rock. Miller Sands consists of two dredged material disposal sites, Miller Sands Island and Miller Sands Spit. These sites lie within the USFWS', Lewis and Clark National Wildlife Refuge. Miller Sands Island was created in the 1930's and has not been disposed on since that time. The Spit is a 2.5-mile-long curving finger of sand just south of the navigation channel, and about .5 mile north of Miller Sands Island, except where the Spit curves toward the island. It was created in 1975, is actively utilized as a disposal site, and continued use of the site for disposal is important to maintenance of the navigation channel.

Western/glaucous-winged gull hybrids and ring-billed gulls nest on the western tip of the Spit. Canada geese also nest on the Spit, as well as on nearby Miller Sands Island. There is a harbor seal haulout south of the islands. Western grebe, mallard, many other duck species, shorebirds and various species of gulls are abundant in the vicinity, particularly the embayment between the spit and the island. Nutria are abundant at Miller Sands Island and a few muskrat also inhabit this island. A pair of bald eagles nest on Miller Sands Island; the Spit is part of their home range and foraging territory. The Spit has periodically been planted with grasses following placement of dredged material. Vegetation attempts have been moderately successful on the Spit. Miller Sands Island also has Scot's broom, willow and alder habitat. The Spit was the site of an attempt to relocate some of the Caspian tern colony in 1998. A few pairs tried to nest here, lured by decoys and calls: predatory gulls and crows made nesting unsuccessful.

Pillar Rock is a dredged-material formed island upstream of Miller Sands at RM 28. The island is actively utilized as a disposal site, and continued use of the site for disposal is important to maintenance of the navigation channel. Most of the island is currently vegetated. No colonial nesting birds occur at Pillar Rock Island. Aggregations of Caspian terns do gather on the upstream beaches to loaf. Waterfowl, shorebirds, various gulls and herons make substantial use of the marsh-mudflat habitat associated with the island. Canada geese nest on the island in relatively substantial numbers, and there is considerable use by bald eagles.

Threatened and Endangered Species. The US Fish and Wildlife Service (USFWS) has identified several threatened and endangered species as occurring in or near the Columbia Estuary. These are brown pelican, bald eagle, western snowy plover and Oregon silverspot butterfly; and one plant species, *Howellia*. Brown pelicans occur at and around East Sand Island and are generally present from June to October. Wintering and resident bald eagles are known to forage along the Columbia River, and resident pairs occur in the project vicinity. One pair nests on Miller Sands Island, and previously attempted to nest on Rice Island. Another pair nests on the Washington mainland near East Sand Island. Western snowy plovers formerly occurred on Oregon beaches just south of the Columbia River and a small population is present at Leadbetter Point, Willapa Bay, Washington. Oregon silverspot butterfly requires very specific habitat and is not known to occur in the project area, nor does *Howellia*. Stellers sea lion occurs near the mouth of the estuary.

The NMFS has listed the Snake River spring, summer and fall run chinook salmon as threatened and Snake River sockeye as endangered; Lower Columbia River steelhead, Snake River steelhead, Columbia River chum salmon; Lower Columbia River, and Upper Willamette River chinook; and Middle Columbia River steelhead and Upper Willamette River steelhead as threatened; and the Upper Columbia River steelhead and Upper Columbia River chinook as endangered. The coastal cutthroat trout is proposed for listing as threatened.

State-listed or sensitive species (for Oregon) known to occur in the project vicinity include brown pelicans and bald eagles, which are also on the Federal list, peregrine falcon and Lower Columbia River coho. Horned larks nest on Rice Island; it has not been established if these are streaked horned lark, an Oregon Natural Heritage Program species of concern in the Willamette Valley. This species' State status is "critical" in the Willamette Valley and Klamath Mountains.

ENVIRONMENTAL EFFECTS

Impacts to Columbia River Estuary. Relocation of the Caspian tern colony from Rice to East Sand Island would affect the fish species that the terns would eat. More species and total numbers of fish are present in the lower estuary. Fish expected to replace salmonids in the tern's diet include American shad, northern anchovy, Pacific herring, Pacific sand lance, Pacific staghorn sculpin, starry flounder, longfin smelt, surf smelt, whitebait smelt, Pacific tomcod, English sole, various species of surf perches and shiner perch. These species are cosmopolitan in nature and serve as the prey source for most fish species in the ocean. As such, they are in high abundance and losses due to predation by the terns would not affect these populations. Results from 1999 field work on Caspian tern dietary composition indicates that terns nesting on East Sand Island ate fewer salmonids (44 percent of fish delivered) than terns at Rice Island (75 percent of fish delivered). Research from 2000 indicated that salmonids made up 44 percent of the diet of East Sand Island terns, as in 1999. Anchovies was the next most consumed fish. For the Rice Island terns, salmonids made up 91 percent of their diet. These results are consistent with the hypothesis that a more diverse array of prey is available to terns lower in the Columbia River estuary.

Impacts to the Sea Resources' hatchery are not expected to be significant. While most Sea Resources hatchery releases into the Chinook River occur outside of the tern breeding season, some increase in consumption of chinook smolt would occur. Other fish species are available for terns to feed on.

The terminal fisheries at Tongue Point and Grays Bay are not expected to be significantly negatively affected. These locations are closer to Rice Island than East Sand Island and tern predation rates on smolts from these two sites may be reduced. Releases from the net pens at Youngs Bay may be exposed to greater tern predation; however, given the availability of other fish species, this is not expected to be significant.

Impacts to Caspian terns may include successful nesting of a smaller colony within the estuary, or crowding and reduced productivity until colonies re-establish. Provision of 4 acres of nesting habitat at East Sand Island, without harassment of this core area, is expected to accommodate the entire estuary tern population for the years 2001 and 2002. In 2000, the entire Caspian tern population in the Columbia River estuary nested on a total of 3.95 acres (9,100 pairs nested on 3.4 acres of East Sand Island and 580 pairs nested on 0.55 acre of Rice Island). Thus, 4 acres would be adequate to support the entire population, even with the typical 10 percent annual increase to 10,648 pairs, at a density of 0.66 nests/sq. meter in 2001, and at a density of 0.72 in 2001, assuming another 10 percent increase to 11,713 pairs. These are lower densities than sustained by the terns on Rice Island in 1999. Other, unmanaged areas of habitat do exist within the Pacific Northwest, such as islands in Grays Harbor, which could accommodate some terns with habitat management. Caspian terns have nested, in fluctuating numbers, at several sites within five western States in recent years. (Table 4) Availability of habitat fluctuates, which accounts for some of the nesting changes. Table 5 shows locations of terns banded as nestlings or pre-fledged juveniles from 1955-1980 in western States. A comparison of nest locations from the two tables indicates the change in colony locations throughout the years. Caspian terns are long-lived colonial birds that typically change their nesting locations. (Terns have a mean breeding life expectancy of 8.6 years, according to Gill and Mewaldt 1983). This species can withstand short-term losses of nesting success, since adults will produce young in future years. Shifting the Rice Island colony to East Sand Island is not expected to have significant, long-term impacts on the terns. See specific impacts by activity site, below.

Impacts to double-crested cormorants from adding additional excluders to pile dikes includes discouragement of resting and feeding from these sites. The action in 2000 appears to have caused the birds to move upstream to sites without excluders. Monitoring of results is included in the proposed action.

Impacts to juvenile salmonids in the estuary from the proposed action's relocation to East Sand Island were predicted based on the preferred action of passive/active harassment of terns on Rice Island. Should that action be restrained by the injunction, it is expected that Caspian terns would again nest on Rice Island. Table 6 depicts the impacts in predicted salmonid consumption depending on which action the Corps is able to perform on Rice Island. It is also expected that, with no harassment activities on Rice Island, the cormorant colony eventually would return to its former location. The nesting colony would be expected to increase slightly in size since piling on which cormorants nested have been removed since the colony relocated to East Sand Island. A colony of about 1,000 nesting pairs might be expected to nest on Rice Island within 3 or 4 years of no harassment, with perhaps a larger proportion of the colony relocating in a decade or so. Consumption of salmonids would increase, since the diet of cormorants previously nesting on Rice Island was composed of 54 percent salmonids and the diet of East Sand Island cormorants was 15 percent.

Impacts to East Sand Island. Mechanical equipment and/or herbicides would be used to till approximately 4 acres of first-year successional grass-forb habitat, and possibly additional acreage with 2-year growth of grass-forb habitat. Any small mammals (rodents, such as voles) re-occupying this habitat would probably be lost unless they could move into adjacent habitat (which is generally assumed to be at capacity). This activity would occur in winter or early spring after colonial and other nesting birds would have completed nesting activities and brown pelicans have migrated. There could be some minor, short-term turbidity as the equipment is loaded off/on a barge. Based on experience during the 1999 and 2000 seasons, recorded Caspian tern calls as part of the relocation attempt are not audible to humans on the mainland. The closest residences, at Chinook, Washington, are about 1 mile distant.

Assuming the maintenance of a breeding colony site is successful, large numbers of Caspian terns would begin nesting in this area in April 2001. It is assumed that similar foraging behavior would occur around an East Sand Island colony in 2001 and 2002 as was observed in 1999 and

Table 4

A Summary of Available Data on Caspian Tern Numbers at Breeding Colonies in California, Oregon, Washington, Idaho, and Nevada 1997 to 2000. ^a

Location	1997	1998	1999	2000	Supplemental Information	Source 1997-99	Source 2000 ^e
WASHINGTON							
Commencement Bay (Asarco)	~100 ad ^b	600	~2000 ad	1998 - unconfirmed breeding		Pers. Comm. M. Tirhi A. Edwards/WDFW	
				2000 - ~400 yg, 21 July			
Banks Lake (Goose Isl.)	-	-	-	10	~15 per year, limited habitat	Pers. Comm. R. Friesz	OSU/CRITFC/RTR
Sprague Lake (Harper Isl.)	-	-	~ 50	20	~20 per year, limited habitat	Pers. Comm. M. Medona	OSU/CRITFC/RTR
Potholes Reservoir (un-named Isls.)	259	-	-	0	range 150-270prs/yr count from multiple islands	Pers. Comm. R. Friesz	
(Solstice Isl.)	0	0	0	150	118 chicks 7 July 2000; 44 banded		OSU/CRITFC/RTR
Crescent Island	990 ad	575 ad	890 ad	571	69 chicks banded		
OREGON							
Rice Island	8017	7948	8096	580	Corrected Pair Counts	OSU/CRITFC/RTR	OSU/CRITFC/RTR
East Sand Island	0	0	1400	9097		OSU/CRITFC/RTR	OSU/CRITFC/RTR
Three Mile Canyon	571 ad	339 ad	384 ad	260	complete nesting failure in 2000	OSU/CRITFC/RTR	OSU/CRITFC/RTR
Malheur Lake	65	25	30	see below	1991-1993 - 0; 1994 - 600; 1995 -650 (1995 = Peak count 1983 - 1998)	Pers. Comm. G. Ivey, M. Laws in litt. M. Laws	
Malheur NWR (Tern Island)				150 ad			M.Laws in litt.
N.Malheur Lake				~160 ad	unnamed island, private landowner		M. Laws in litt.
Crump Lake				250 ad	newly discovered colony, 50 chicks		OSU/CRITFC/RTR
Summer Lake	-	-	38	16	~20 per year; reduced water levels & possible prey reductions in 2000	M. St. Louis	M. St. Louis in litt.
SAN FRANCISCO BAY, CA							
SF Bay, South Bay	134 (2 sites)	~ 86 (6 sites)	-	see below	1990 - approx 300 (2 sites)	Pers. Comm. J. Buffa	
Baumberg Unit, Alameda Co.				79	Salt Pond #10		D. Bell/SFFBO in litt
Alviso Unit, Santa Clara Co.				118	Salt Pond A7, 4.5 km NW of Alviso		D. Bell/SFFBO in litt
SF Bay, Central Bay	285	194	-	see below	1990 - 595; 1991-1020@2 sites	Pers. Comm. J. Buffa	
Brooks Isl., Contra Costa Co.				700	358 chicks 14 June 2000		S. Bobzien in litt.
SF Bay, North Bay	400	~ 200	-	see below	1990 - 60	Pers. Comm. J. Buffa	
Knights Isl., Solano Co.				~ 200	CDFG ownership		J. Evans in litt.
NORTHERN CA							
Elkhorn Slough, Monterey, Co.				80	coastal site		J. Parkin in litt.
Meiss Lake, Butte Valley WA	41ad	16	27	19	~25 ad in 2000; CDFG ownership	D. Shuford ^c	K. Novick in litt.
Clear Lake NWR	290 ad	-	118	390 ad	Range 100-250 ad since 1978	D. Shuford ^c	J. Beckstrand, J. Hainline in lit.
Goose Lake	230 ad	-	~500 ad	4	nested on penisula in 2000	D. Shuford ^c	D. Shuford, pers obs
Big Sage Reservoir	100 ad	-	13 ad	48		D. Shuford ^c	D. Shuford, pers obs
Honey Lake (Hartson Res)	152	-	87+	82	1997- 262ad; 1999 - 176ad	D. Shuford ^c	D. Shuford, pers obs
Mono Lake (Twain Islet)				8			D. Shuford, pers obs
INTERIOR VALLEYS, CA							
Lemoore NAS sewer ponds	-	17	0	-	Best count of ad divided by 2	D. Shuford ^c	
Westlake Farms S. Evap. Ponds	0	3	0	0	No nesting for last 3 years	D. Shuford ^c	J. Seay in litt
Tulare Lakebed	-	17	-	0	Best count of ad divided by 2 ~ 9 miles E of Kettleman	D. Shuford ^c	
South Wilbur Flood Area	0	70+	27	0	Estimate of total number of nests	D. Shuford ^c	
Tulare Lake Drainage District (south evaporation basin)	0	40	0	0	Peak nest count; birds hazed due to contaminant threats	D. Shuford ^c	

Location	1997	1998	1999	2000	Supplemental Information	Source 1997-99	Source 2000 ^e
SOUTHERN CA							
Salton Sea Area							
Salton Sea NWR	800	~800	211	215	NWR Headquarters Pond D; abundant un-utilized nesting substrate SW of NWR; Imperial Irrigation District	Pers. Comm K. Molina	Pers. Comm. K. Molina
Mullet Island	~80			10		Pers. Comm K. Molina	Pers. Comm. K. Molina
Obsidian Butte	300					Pers. Comm K. Molina	Pers. Comm. K. Molina
Lake Elsinore	-	-	14	-		D. Shuford ^c	
Salt Works, S. San Diego Bay	320	198	-	329	1993 - 280 1994 - 320 1995 - 250	Pers. Comm. J. Fancher	B. Collins, in litt
Bolsa Chica, Huntington Beach	250	50	-	51	1994 - 254 1995 - 256 1996 - 250	Pers. Comm. J. Fancher	C. Collins in litt
Terminal Island, Port of LA	25	146	-	336		Pers. Comm. J. Fancher	K. Keane in litt
IDAHO							
Mormon Reservoir	-	-	-		1993 - ~25	Trost and Gerstell ^d	
Magic Reservoir	-	-	-	-	1993 - ~2	Trost and Gerstell ^d	
Blackfoot Reservoir	-	-	-	-	1993 - ~23	Trost and Gerstell ^d	
Minidoka NWR	-	-	-	1	1993 - ~2	Trost and Gerstell ^d	S. Bouffard in litt
Snake River Is. - Deer Flat NWR	-	-	-	-	1989 - ~50	D. Taylor ^e , Pers. Comm. T. Fenzl	
Bear Lake NWR	-	-	-	-	1989 - ~5	D. Taylor ^e , Pers. Comm. S. Bouffard	
NEVADA							
Carson Sink, Churchill Co.	-	-	685	0	985 young 1986 - 475	Pers. Comm. Wm G. Henry	B. Henry in litt
Anaho Island NWR	-	-	-	0	1995 - ~95	Stillwater NWR, Refuge files	
	-	-	-	-	1996 - ~12	Stillwater NWR, Refuge files	
Stillwater NWR	-	-	-	0	1996 - 4	Stillwater NWR, Refuge files	

^a Numbers are reported as nesting pairs or numbers of nests unless otherwise noted as adults (ad) or young (yg). Summary totals or comparisons of counts from various sites are not recommended. Survey dates, techniques, and observers were not standardized among all sites or within or among all years. Survey techniques included: counts of adults from aerial photographs, ground counts of nests, estimates of breeding pairs from single observations of adults attending colonies, and counts of young observed during single site visits. Although extensive contacts were conducted, particularly for historic use sites, this data set may not represent all active Caspian Tern colonies for the years 1997-1999.

^b Hundreds noted but nesting status was unconfirmed.

^c Coverage most complete in 1999, when all known colony sites were surveyed. Surveys focused on northeastern CA in 1997 and the Central Valley in 1998 as reported in: Shuford, W.D. 1998. Surveys of black terns and other inland-breeding seabirds in northeastern California in 1997. Report 98-03, Bird and Mammal Conservation Program, CA. Dept. of Fish and Game, Sacramento; and Shuford, W.D., J.M. Humphrey, and Nur, N. 1999. Surveys of nesting terns and cormorants in California's Central Valley in 1998. Final report of Point Reyes Bird Observatory.

^d Most recent survey date: 1993. Data available in Trost, C.H. and A. Gerstell. 1994. Status and distribution of colonial waterbirds in southern Idaho, 1993. Idaho Bureau of Land Management Technical Bulletin No. 94-6. Surveys conducted during the 1980's are reported in Taylor, D.M. 1990. Western Birds 21: 78-80. Pers. Comm. with Todd Fenzl, Deer Flat NWR, indicates that high water in the area of the Snake River Islands has prevented successful nesting for the past several years.

^e Data for 2000 compiled by Dave Shuford, PRBO, who must be contacted for further publication authorization.

Prepared by: Tara Zimmerman, USFWS and Dave Shuford, PRBO, as a Working Document for the Interagency Caspian Tern Working Group, November 2000.

Note: Data from CA sites may not be used for publication purposes without authorization of Dave Shuford, Point Reyes Bird Observatory; data presented for all other locations may not be used for publication purposes without authorization of Tara Zimmerman, USFWS and individual data contributors identified under Source.

Table 5. Bandings of Pacific Coast Caspian Terns, 1955-1980

Years	California							Nevada	Washington	Idaho	Total	
	San Diego	San Francisco Bay	Moss Landing	Humboldt Bay	Clear Lake	Mono Lake	Honey Lake	Pyramid Lake	Grays Harbor	Potholes Reservoir		Magic Reservoir
1955-1960	3,842	518		47			47	2				4,456
1961-1965	2,479	232		186		14		24				2,935
1966-1970	921	433		140	24							1,518
1971-1975	126	743							949	47	29	1,894
1976-1980	57	314	57						3493	269		4,190
Total	7,425	2240	57	373	24	14	47	26	4442	316	29	14,993

Source: Table 1 from Gill and Mewaldt 1983. Data from North American Bird Banding Association records.

Table 6 Predicted Juvenile Salmonid Consumption 2001 – 2002

Alternative	Island	Caspian Tern Pairs	Salmonid Consumption in Millions
Research Results	East Sand Island	9,100 (44% of Diet)	6.6
2000 ^f	Rice	580 (91% of Diet)	0.7
	Both	9,680	7.3
<hr/>			
Alternative 1			
Passive Harassment			
On Rice 2001	East Sand Island	10,000	7.25
	Rice	640	0.77
	Both	10,640	8.02
<hr/>			
Passive Harassment			
On Rice 2002	East Sand Island	11,000	7.97
	Rice	700	0.84
	Both	11,700	8.81
<hr/>			
Alternative 2*			
No Action by Corps			
On Rice 2001 (Worst case)	East Sand Island	4,650	3.4
	Rice	6,000	7.2
	Both	10,650	10.6
<hr/>			
No Action by Corps			
On Rice 2002 (Worst case)	East Sand Island	5,100	4.35
	Rice	6,600	7.97
	Both	11,700	12.32
<hr/>			
Alternative 3**			
Prevention of Caspian Tern's			
On Rice 2001	East Sand Island	10,640	7.7
	Rice	-0-	-0-
	Both	10,640	7.7
<hr/>			
Prevention of Caspian Tern's			
On Rice 2002	East Sand Island	11,700	8.5
	Rice	-0-	-0-
	Both	11,700	8.5

Notes:

Table assumes half the colony moves back to Rice Island, 10% annual increase in tern pairs and same rate of consumption as in 2000. Figures do not include Caspian Terns nesting at the ASARCO site. Including these birds would accelerate the annual increase to 15% or more with proportionate increases in salmonid consumption. Prediction is made by Corps, Portland District, staff.

Footnotes:

^fPreliminary research results indicate 44 percent of the diet on East Sand Island terns was composed of salmonid smolts, while 91 percent of the diet of Rice Island terns was composed of salmonid smolts.

*Alternative 2 is presented as “worst case”: the “best case” would be comparable to alternative 1.

**Alternative 3 requires harassment after egg laying. MBTA permit required.

2000. Tern foraging would not be precluded from the area of Rice Island by shifting the colony to East Sand Island, but the majority of their foraging activity would be expected to occur downstream of the Astoria-Megler bridge, or in offshore waters. In 2000, radio-tagged terns that nested at East Sand Island were most often (90 percent) detected below the bridge or outside the estuary, as noted by OSU-CRITFC-RTR researchers. Tern diet composition is expected to shift, and consist of a higher percentage of marine fishes such as herring, anchovy, smelt, sand lance and perch, with relocation to East Sand Island. Research results from the 2000 project indicate that Caspian terns relocated on East Sand Island consumed over 50 percent fewer salmonids than did the terns nesting on Rice Island. However, terns continued to consume many salmonids. Anchovies were the species consumed in second highest quantities.

Initially, gulls that exhibit predatory behavior toward the nesting Caspian terns would be removed. If necessary, this would be by lethal means. Forty gulls were killed in 2000. Up to 50 gulls may have to be killed to protect tern nesting efforts early in the season. This loss constitutes less than 1 percent of the gulls (7,000 pairs) presently nesting on East Sand Island. Given the many thousands of gulls in the estuary, this is not expected to be a significant loss. Gulls and Canada geese that formerly nested at the project site are expected to nest elsewhere on the island. No significant impacts to the gull population or the use of East Sand Island as an index site for Canada goose management are foreseen. The cormorant colony is located on the downstream half of the island and is not expected to be affected by activities on the upstream end. In-season management actions would be coordinated with the CTWG to avoid disturbance of cormorants. Brown pelicans also occur on the downstream end of the island. Protective measures requested by USFWS would be implemented to avoid impacts to pelicans. These include signage to preclude human access.

Provision of a harassment-free, 4-acre core nesting area on East Sand Island is expected to accommodate the entire Rice Island tern colony, depending on nesting densities, for the years 2001-2002. East Sand Island supported about 9,100 breeding pairs of terns in 2000, which exceeded the maximum number of pairs (8,000, in 1999) supported previously at Rice Island. Four acres would be adequate to support the entire population, even with the typical 10 percent annual increase to 10,648 pairs, at a density of 0.66 nests/sq. meter in 2001, and at a density of 0.72 in 2001, assuming another 10 percent increase to 11,713 pairs. East Sand Island nesting in 2000 occupied 3.4 acres, with a density of 0.67 pairs/square meter (m²) and productivity of 0.61 fledglings per breeding pair. Previously observed population growth of the Caspian tern (from 1960 to 1980 the Pacific population increased about 70 percent, to 6,000 breeding pairs) was calculated to have resulted from an average annual fledgling rate of 0.64 (Gill and Mewaldt, 1983). Thus the expected productivity of 0.61 percent at East Sand Island would not only maintain this colony, but continue its population increase. Table 7 compares nesting results from 1997-2000. Provision of more than 4 acres of nesting habitat is not expected to significantly affect tern numbers over the 2-years of the proposed action. More habitat might increase productivity, but a bad storm during the nesting season is considered to have more impact on productivity than more habitat availability. The presence of additional, but with a silty substrate, habitat may attract more terns later in the season. Terns that fail to nest elsewhere (such as the ASARCO terns) may attempt to nest in the expanded silty habitat area after the preferred sandy area is occupied. Nesting success of late-nesting terns on silty substrate is not expected to be high. Over the long term, with the expected 10-15 percent increase in population as each year's fledglings mature (it

takes 3 or more years for the terns to mature), more terns would return to East Sand Island as long as the expanded habitat was maintained and no other habitat was available. More Caspian terns in the Columbia River estuary would result in the consumption of more salmonids. This issue would need to be addressed by the USFWS in subsequent environmental documents.

Impacts to Rice Island. If the relocation is successful, there would be no Caspian terns nesting on Rice Island. Completely preventing terns from nesting on Rice Island, however, would probably require harassment after egg laying begins and could involve taking of eggs. The Corps proposes passive harassment in the form of habitat modification and active harassment that would cease once terns begin egg-laying. In 2000, the temporary restraining order prevented any kind of harassment, and about 580 breeding pairs nested on Rice Island. Productivity was low, however, due to heavy predation by gulls. (Preliminary estimates by researchers are more than 1,500 eggs and 100 chicks taken by gulls during the 2000 nesting season.) Some habitat modification (silt fences) remained from 1999 actions, restricting the available preferred nesting area. If the injunction remains in effect, no actions would occur by the Corps (or USFWS). With no harassment, substantial numbers of Caspian terns would be expected to return to Rice Island.

Table 7 Caspian Terns Population Trends, Productivity and Diet in the Columbia River Estuary

	1997	1998	1999		2000	
	Rice I.	Rice I.	Rice I.	East Sand I.	Rice I.	East Sand
I.						
# of terns on colony 12,227 in aerial photos	9,415	11,223	13,351	1,522	2,044	
# of breeding pairs 9,097	6,873	7,948	8,096	697	580	
% of breeding pairs 94% in the estuary	100%	100%	92%	8%	6%	
Colony area (acres)	4.0	4.6	2.4	0.70	0.55	3.4
Colony area (m ²) 13,608	16,000	18,620	9,715	2,779	2,213	
Nesting density (pairs/m ²)	0.43	0.43	0.83	0.50	0.26	0.67
Productivity 0.61	0.05	0.50	0.52	1.20	0.16	

(fledglings/breeding pair)

Salmonid smolts in diet	85%	73%	75%	44%	91%
44%					

If human disturbance of terns occurs (prior to egg-laying), other birds, especially cormorants and gulls, attempting to nest in that area would also be disturbed. In-season management of disturbance activities implemented in coordination with the CTWG is expected to avoid significant impacts to other wildlife species at Rice Island. A few Canada goose nests may be lost due to measures implemented at the tern colony location. These losses are not expected to compromise use of Rice Island as an index site for Canada goose management. The cormorant colony did not nest here in 1999 or 2000 and is not expected to return to Rice Island due to harassment activities. The cormorants have apparently relocated to East Sand Island. Relocation of the tern colony would reduce available prey for bald eagles in the vicinity of the island. However, relocation is typical of tern colonies and predator species have had to adjust when this occurred. Further, prey resources for bald eagles in the Columbia River estuary are not considered limiting to the population as they feed primarily on fish.

Due to the high success of relocation efforts in 2000, maintenance of the colony on East Sand Island is expected. If relocation is unsuccessful and terns do not nest successfully on East Sand Island due to vegetation encroachment, disturbance by gulls, crowding, or other factors, they may remain in the estuary, consuming juvenile salmonids but not reproducing for the 2000 nesting season. Low nesting success for one or two seasons is not expected to significantly impact the number of birds comprising the colony. Nesting success was low in 1997, when only about 400 young were successfully raised. An estimated 4,000 terns were fledged from the Rice Island colony in 1998. Information on young fledged in 1999 indicates that about 4,000 young fledged at Rice Island, and 1,700 fledged at East Sand Island. The successful fledging at East Sand Island reflects less crowded conditions and removal of predatory gulls. In 2000, about 5,500 young were fledged on East Sand Island, and about 90 on Rice Island. Birds with long life spans, like the tern, can withstand short-term losses of nesting success, since the adults will produce young in future years. Monitoring and evaluation during the proposed action will document nesting success during the 2001-2002 actions. Provision of alternate nesting habitat at East Sand Island, coupled with attraction measures and field research to be conducted on tern nesting and foraging ecology, represent measures taken to ensure colony retention and nest success. Information obtained will be used to fine-tune future dispersal efforts.

Impacts to Miller Sands Spit and Pillar Rock. Shorebirds foraging at Miller Sands Spit are within the bay, and they roost typically along the bayside beach. Placement of additional cormorant excluders nearby is not expected to affect other shorebirds. The use of Miller Sands Spit as an index site for goose management should not be compromised by proposed activities.

Impacts to Threatened and Endangered Species. The relocation of the Caspian tern colony from Rice Island to East Sand Island is expected to reduce tern predation on out-migrating Columbia and Snake River salmonid smolts, a portion of which consists of listed threatened and endangered

species. Reduction in avian predation is expected to benefit these listed species, both wild and ESA-stocks from hatcheries. NMFS estimated that about 250,000 fish of listed stocks were taken by Caspian terns in 1997, and expected this number to increase in 1999 unless predation was reduced. Based on revised estimates (Table 3), this number increased to about 897,000 estimated listed salmonids taken by Caspian terns in 1999 and 1.2 million in 2000. (The increase in consumption is related to increase in number of listed smolts in 2000.) Relocation of the tern colony is expected to substantially reduce predation of ESA stocks in the estuary in 2001 from what would be expected to occur if the tern colony nests on Rice Island, though predation will still occur. Based on 2000 predation rates from Rice Island terns (91 percent of their diet), relocation of most of the colony to East Sand Island resulted in about 6 million fewer smolts being consumed by Caspian terns, of which 960,000 (16 percent) could have been listed stocks. A similar result would be expected in 2001 and 2002, if the majority of terns continue to nest on East Sand Island rather than Rice Island. Numbers of smolts consumed would be expected to increase annually due to the increase in total tern population (see Table 6). Bull trout would be unaffected as they are adults and generally too large for predation by terns.

Relocation of the colony would shift a prey resource from an area used by one or two territorial pairs of bald eagles to the territory of another pair. Prey resources around Rice Island are sufficient for bald eagles without the presence of nesting Caspian terns. Any necessary disturbing activities on Miller Sands Spit would be greater than 3,000 feet from either nest site and visually buffered by cottonwood stands, and should not disturb the eagles at the nest sites. Any nesting attempt by Caspian terns would likely be near the western end or on recently disposed material near the upstream end. Brief disturbance actions at these localized sites are not likely to adversely affect bald eagles nesting at Miller Sands Island or their foraging in the embayment at Miller Sands. Activities associated with this project are not likely to adversely affect bald eagles.

Brown pelicans that loaf on East Sand Island would have migrated before habitat modification occurs. Brown pelicans, when present, utilize the west end of the island. The relocation of a tern colony to the east end of East Sand Island would have no effect on brown pelicans. Research activity at East Sand Island would be more intensive than previous efforts but research activities have to be discrete regardless to minimize potential for disturbance to colonial nesting birds. Thus actions implemented at East Sand Island are not likely to adversely affect brown pelicans. A site visit protocol and signage have been developed in consultation with USFWS to further protect brown pelicans. Excluders placed on pile dikes used by some brown pelicans for roosting would be done in a manner to avoid impacts to the pelicans.

Western snowy plovers, Stellers sea lions, Oregon silverspot butterfly and *Howellia* do not occur in the immediate vicinity of any of the Oregon islands where project activities are slated. The proposed actions should have no effect on these listed species.

PROJECT COORDINATION

This project has been coordinated with Federal, State and Tribal agencies via the Caspian Tern Working Group (CTWG). This working group, established in May 1998, has met periodically to discuss resolution of this issue. However, not all members of the CTWG concurred with every element of the present proposed action, which was decided on by the Federal agencies, primarily the Corps of Engineers and NMFS. In particular, the State of Idaho and CRITFC, as members of CTWG, believe that the management plan for 2001, and the present proposed action, are

inadequate to meet the conservation needs of fish. The USFWS, Pacific Regional Office, does not support the CTWG's long-term goal of reducing predation on juvenile salmonids by piscivorous birds. There also has been interagency coordination since the Biological Opinion in 1995 required research on avian predation of listed salmonids. The draft Environmental Assessment for the 1999 pilot study was circulated for agency and public review on October 29, 1998. The EA and subsequent Finding of No Significant Impact (FONSI) also were made available on the Internet. A draft EA on the FY2000 management plan was circulated for a 30-day public and agency review on January 19, 2000. A FONSI was signed March 17, 2000. That decision was challenged by the Audubon Society, Pacific Seabird Group et al., and a temporary restraining order was issued April 10, 2000, prohibiting harassment actions on Rice Island, and the Corps and USFWS were then enjoined from any form of harassment on Rice Island. Thus the 2000 action on Rice Island was limited to research activities. Actions on East Sand Island and pre-egg laying actions on Rice Island did result in most of the colony nesting on East Sand Island. A preliminary draft EA was reviewed and commented on by members of the CTWG and their agencies. The proposed action is essentially the same as that of 1999 and 2000, and those actions were extensively reviewed by Federal and State agencies, affected tribes and members of the public. The Finding of No Significant Impact has been made available for review, and comments providing new information will be considered before final action is taken. The FONSI has been provided to:

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
National Marine Fisheries Service
Columbia River Inter-Tribal Fish Commission
National Audubon Society
American Bird Conservancy
Pacific Seabird Group
Oregon
 Department of Environmental Quality
 Department of Fish and Wildlife
 Department of Land Conservation and Development
 Division of State Lands
 Oregon State University
 Clatsop County

Washington
 Department of Ecology
 Department of Fish and Wildlife
 Department of Natural Resources
 Pacific County
 City of Chinook
 Sea Resources

CONSULTATION REQUIREMENTS

a. Clean Water Act of 1977: Section 404 of the Clean Water Act will be complied with. No fill in waters of the U.S. is proposed.

b. Coastal Zone Management Act: The proposed action is within the Columbia River estuary. East Sand Island, Rice Island and Miller Sands Spit are designated Conservation shorelands in the Clatsop County Comprehensive Plan. Lands with this designation are to be managed for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources, esthetic values and recreation. East Sand Island has two areas designated Priority 1 for dredged material disposal. Disposal site CC-S-6.8, on the upstream end of East Sand Island, is noted in the 1986 Dredged Material Management Plan prepared by CREST as having a nesting colony of Caspian terns and prefers this site not be revegetated after disposal activities. All of Rice Island is designated Priority 1 for disposal. The northeast corner of Rice Island is within the State of Washington, and Rice Island also contains a disposal location designation for Wahkiakum County, Washington. No actions are proposed for the Washington portion of Rice Island. All of Miller Sands Spit is designated Priority 1 for disposal. A Coastal Zone Consistency Determination was submitted to the Oregon Department of Land Conservation and Development (DLCD) for review for the 1999 EA. DLCD concurred with the Consistency Statement in correspondence dated December 15, 1998. DLCD was advised of changes included in the FY 2000 plan, and concurred with the Corps determination that the proposed project remains consistent with the Oregon Coastal Management Program. DLCD has been advised of the FY2001-02 proposed action.

c. Endangered Species Act of 1973, as amended: Listed or proposed threatened or endangered species are not likely to be adversely affected (brown pelican, bald eagle, peregrine falcon) or are not affected (western snowy plover, Oregon silverspot butterfly, Howellia) by the proposed actions. The threatened bald eagle nests and winters in the vicinity of East Sand Island, Rice Island and Miller Sands Spit. The brown pelican is a summer resident in and around East Sand Island. Western snowy plovers, Oregon silverspot butterfly and Howellia do not occur in the project area. The biological assessment (BA) prepared in 1999, with a finding of not likely to adversely affect or no effect for listed species in the project vicinity, will be amended and submitted to USFWS for concurrence. The proposed action would increase the eagles' prey base. Bull trout would be unaffected. The USFWS concurred with the Corps' determination. The Corps will update the BA for the 2001-02 proposed action. The proposed action would have no effect on bull trout, recently listed as threatened, or cutthroat trout, proposed for listing.

Listed species of Columbia and Snake River salmonids are expected to benefit from the proposed action, and the Corps will amend the BA prepared in 1999 to that effect. Impacts to listed salmonids were addressed in the consultation with NMFS for Columbia River Channel Operation and Maintenance Program. Actions described in this EA are required under the non-discretionary terms and conditions of the NMFS' September 15, 1999, Biological Opinion. However, given that the proposed action does not include active harassment after egg-laying, the Corps does not expect that it can prevent Caspian tern nesting on Rice Island. The Corps is consulting and coordinating with NMFS on this matter.

d. Fish and Wildlife Coordination Act: The proposed action is in compliance with the requirements of this act.

e. Migratory Bird Treaty Act of 1918, as amended. This act prohibits the taking of migratory birds except as permitted through certain regulations. These regulations (50 CFR 21) authorize the taking of migratory birds through establishment of hunting seasons and issuance of various permits. Permits may be issued for "depredation control purposes," including reducing

damage to public property. Permits may be issued to wildlife management authorities for the purpose of protecting State and Federal listed plants or animals, or species of management concern from predation or competition at levels documented to jeopardize the recovery of stability of such species. Permits are not required to scare or herd depredate migratory birds, unless such hazing results in the abandonment of active nests, or the loss of eggs, nestlings or adults. No harassment of Caspian terns is proposed after egg-laying, thus no permit is required.

The United States Government continues to be bound by the international agreements (four bilateral Migratory Bird Conventions) to protect migratory birds. The USFWS continues to informally consult with other Federal agencies, to ensure those agencies conduct Federal actions in a manner that complies with the obligations of the Government under the various Migratory Bird Conventions.

e. Marine Protection, Research, and Sanctuaries Act of 1972, as amended: No marine resources covered under this Act would be affected by the proposed action.

f. Cultural Resources Acts: No cultural resources would be affected by activity at this location due to the extent of past disturbance. Historical resources (remnants of WW II military action) on East Sand Island located in the project area have been buried under dredged material and would be unaffected by removal of vegetation and surface soil. The Oregon and Washington State Historic Preservation Offices have been advised of activity in the area.

g. Executive Order 11988, Flood Plain Management, 24 May 1977: No flood plains would be affected by the proposed action.

h. Executive Order 11990, Protection of Wetlands: No wetlands would be affected by the proposed action.

i. Analysis of Impacts on Prime and Unique Farmlands: Not applicable.

j. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource conservation and Recovery Act (RCRA). No hazardous, toxic and radioactive waste (HTRW) concerns have been identified.

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