19 August 2014

Sondra Ruckwardt
U.S. Army Corps of Engineer District, Portland
Attn: CENWP-PM-E-14-08/Double-crested Cormorant draft EIS
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Comments provided electronically to: cormorant-eis@usace.army.mil

Dear Ms. Ruckwardt,

Please find attached comments from American Bird Conservancy (ABC) to the US Army Corps of Engineers, Portland District regarding the Draft Environmental Impact Statement (hereafter DEIS) for the Double-crested Cormorant Management Plan to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary (CENWP-PM-E-14-08, Public Announcement Date 12 June 2014).

We have deep concerns about the DEIS and the preferred alternative that involves the killing of nearly 16,000 Double-crested Cormorants (DCCO) on East Sand Island (ESI). The determination that the breeding population on ESI must be reduced to approximately 5,600 breeding pairs is not based on any rigorous or peer-reviewed analysis. Salmon smolt consumption by cormorants has varied from levels that are considered acceptable by NOAA Fisheries (2 million smolts in 2005) to those considered highly unacceptable (20 million smolts in 2011), despite little change in size of the ESI DCCO colony. The lack of a direct correlation between smolt consumption and DCCO colony size means that the number of smolts saved from management to reduce colony size is difficult to predict based on colony size alone.

The DEIS concludes that the lethal approach (alternative C) to reducing the numbers of DCCO is the appropriate one without adequate justification and explanation of why the same result cannot be achieved through non-lethal methods (alternative B). The expected benefits to salmon hinge not in *how* cormorant numbers are controlled (through harassment or lethal control), but in the *habitat modification* that must occur to maintain the breeding DCCO population at the target of 5,600 breeding pairs.

Furthermore, the recommended alternative would reduce the entire western DCCO population by approximately 25%, constituting a depredation control order with not merely local ramifications, but an impact to the entire western DCCO population. It is not clear if depredation permits issued under the Migratory Bird Treaty Act (MBTA) can be legally used to reduce an entire regional population of a species protected under the MBTA. Add to this that the MBTA requires that permits for lethal control not be issued until it has been demonstrated that non-lethal methods have been demonstrated to be ineffective. Even then lethal control cannot be the sole method of control and must be used in concert with no-lethal methods. We question the legality of issuing a depredation permit that apparently violates basic operating tenants of the MBTA.

Finally, the DEIS' use of scientific literature, both published in scientific peer-reviewed journals and in government reports is uneven and often contradictory. Some information has been used while other information has been ignored or apparently misinterpreted.

<u>General regulatory and other concerns</u>

1. <u>The DEIS estimates that benefits of Alternatives B and C to Endangered Species Act (ESA)-listed salmonid Distinct Population Segments (DPSs) and Evolutionarily Significant Unit (ESUs) in the Columbia River would be the same, but does not adequately explain or justify selection of Alternative C as the preferred alternative.</u>

   Alternative C, lethal take to reduce the DCCO colony on ESI to 5,600 breeding pairs, is estimated to result in 25-26% reduction of the Western population of DCCOs (Chapter 4, p. 13). The DEIS analysis indicates that Alternative C, which is the preferred alternative, does not yield any greater benefit to salmonid DPSs or ESUs than Alternative B, dispersal (Tables 4-2 and 4-3, Chapter 4, p. 33). However, the DEIS analysis of predation rates, and consequent setting of targets for DCCO management and evaluation of projected benefits to individual DPSs and ESUs), is highly problematic; see point #2 below. If these problems were rectified, the values in Tables 4-2 and 4-3, and indeed the entire effects analysis and management alternatives in the EIS, might be quite different, although the responses to Alternatives B & C likely would remain the same.

   The only sustained benefit to listed salmonids in the Columbia River lies in Phase II of Alternatives B and C, that is, the habitat manipulation that would be key to maintaining the target colony size of 5,600 pairs by removing DCCO nesting habitat. Phase II is identical in Alternatives B and C. Therefore, the rationale for choosing Alternative C (lethal take) as the preferred alternative is not clear. No well-documented, compelling, and measurable differences between B and C (i.e., in the impacts of Phase I) are described.

   Table 2-8 indicates that the estimated cost of implementing Alternative B would be significantly greater than that of implementing Alternative C. The rationale is that under Alternative B, significantly more resources would be required to monitor a potentially vast area for new colony formation wherever fish of conservation concern are found in Washington and Oregon (Table 2-8, Chapter 2, p. 39; Chapter 4, p. 59). This unsupported assumption (see point #6 below) inflates the risk and the total estimated cost associated with Alternative B and lends support to selection of Alternative C as the preferred alternative. Other potential benefits of Alternative C and risks of Alternative B are overstated or mischaracterized in the DEIS:

   - The risk of Alternative B (dispersal to reach the target colony size on ESI) resulting in birds settling on islands or human infrastructure in the upper Columbia River estuary (Chapter 4, p. 29). See point 6 below.

- The inherently higher certainty of reducing the number of DCCO nesting on ESI to the target of 5,600 pairs by lethally removing the numbers of birds described in Alternative C, rather than dispersing them, and doing so expeditiously (within two or three years, under the likely adaptive management regime) (Executive Summary, p. 21). See point #9 below.

Based on the available scientific information described in the previous section, we judge Alternative C as the far riskier option:

- To reach the target colony size of 5,600 breeding pairs of DCCO on ESI, the number of DCCOs that will have to be killed will likely exceed (by thousands of birds) the 15,955 estimated in the DEIS (see point # 9 below), necessitating additional years of resources invested in ongoing lethal take on the island and in the estuary (along with the disturbance to and incidental take of other migratory birds inherent in those activities).
- The risk is significant of killing many non-target Brandt's and Pelagic cormorants in the process of killing nearly 16,000 (or more) DCCOs (Executive Summary, p. 19; Chapter 4, pp. 27, 30-31). This is incidental take of federally protected species, and no mention is made in the DEIS of obtaining a special purpose permit under the MBTA to authorize this incidental take. Moreover, the poor justification for selecting Alternative C as the preferred alternative renders this incidental mortality of non-target migratory birds needless and wasteful.
- The risk is significant of all breeding DCCO abandoning ESI as a result of disturbance caused by gunfire, other methods used to capture and euthanize DCCO, and carcass collection. Colony abandonment could cause far more DCCO to emigrate to other cormorant colonies.
- The public is unlikely to tolerate this magnitude of lethal take of a native migratory bird.

2. <u>Alternative C does not qualify for issuance of a depredation permit (50 CFR 21.41) under the MBTA.</u>

The depredation permit application form indicates that permits for lethal take should be sought "…*only after deterrents such as hazing and habitat modification prove unsuccessful.*" Section 6 of the application itself requires documentation that non-lethal methods have not been successful:

"**6.** Nonlethal deterrents tried.

(a) Describe the hazing or harassment techniques (e.g., horns, pyrotechnics, propane cannons) you have tried to manage or eliminate the problem. How long (e.g., number of weeks, months, year(s)) and how often have you conducted these deterrents?

(b) Describe the habitat management measures (e.g., vegetative barriers, longer grass management, fencing and netting) you have taken to discourage migratory birds from using the area.

(c) Describe the cultural practices (e.g., crop selection and placement, management of pets and feeding schedules, no feeding policies) you have established to discourage migratory birds from using the area.

(d) Attach copies of any receipts, invoices, contracts, or other available records documenting the deterrent measures taken."

This documentation does not exist to support a permit application to implement Alternative C, and the DEIS does not provide an explanation or justification for circumventing this standard permit requirement.

As described below in point #4, the dissuasion feasibility studies conducted in 2010-2013 did not aim to effect a sustained reduction in the number of breeding pairs of DCCO on ESI. In fact, the stated aim of these studies was to ensure that the birds in the circumscribed colony area did not abandon ESI and attempt to nest elsewhere in those years. Therefore, these studies do not provide any results from which to conclude that dissuasion or other non-lethal methods would not be effective when implemented as a management action, at a different scale and with different goals.

Guidance provided with the USFWS depredation permit application includes the following: "*Capture or killing of birds cannot be the primary methods used to address depredation and will ONLY be authorized in conjunction with ongoing nonlethal measures*" (Form 3-200-13). How Alternative C meets this threshold is unclear; Alternative C is lethal removal to reduce the DCCO colony on ESI to 5,600 breeding pairs. The implementation of habitat modification in Phase II may not meet this threshold; if not, Alternative C contains no description of meaningful use of non-lethal methods that will be used "*in conjunction with*" killing birds to achieve the same end, as specified in the permit application guidance.

3. Alternative C constitutes population reduction and whether depredation permits can be used legally for population reduction is not clear.

The DEIS accurately describes the western population of DCCO as a distinct management population of this species (e.g., Glossary of Terms, p. xvii). This population is also geographically isolated from the rest of the species' range (Adkins and Roby 2010). The DEIS quantifies the percent reduction of the western population as 25%-26% under Alternative C, the preferred alternative (Chapter 4, p. 13). However, the DEIS does not adequately explain whether or how a depredation permit issued under the MBTA can be used for the purpose of population reduction in a migratory bird species that is otherwise federally protected. Population reduction of migratory birds is the province of depredation orders, which are federal regulations promulgated for individual species (see 50 CFR 21.42).

The "sustainable" 1990 baseline size for this population provided in the DEIS, and the judgment that reduction in the current population to a level modestly higher than that (but 25% lower than the current population) are both arbitrary determinations, as described above (see point #9 below), and do not account for the fact that this species was in the 1990s and likely still is recovering from impacts of DDT and more than a century of persecution.

4. <u>The participation of USDA-Wildlife Services as a cooperating agency in the development of this DEIS may represent a conflict of interest and a violation of the Administrative Procedure Act.</u>

   DEIS Chapter 1, p. 20 identifies USDA-Wildlife Services as a cooperating agency, and p. 20 states that "[…]the Corps would request technical assistance from USDA-WS to implement the preferred alternative…". USDA-WS conducts thousands of activities under contracts to federal, state, and municipal agencies, and to private parties that employ lethal methods to remove migratory birds and other wildlife. Given the estimated cost for implementation of Phase I of Alternative C ($760,000-$1,020,000 per year; Table 2-8, Chapter 2, p. 39), USDA-WS stands to acquire a lucrative, 2- to 4-year contract to implement the preferred alternative, Alternative C. In its role as a cooperating agency, USDA-WS certainly contributed technical expertise to the design and cost estimates of this alternative. The FEIS must provide full disclosure of USDA-WS's role in developing action alternatives and their associated costs, its role in selecting the preferred alternative, and its planned role in implementation of the preferred alternative.

<u>Summary of Scientific Comments:</u>

1. The specific management objective (~ 5,600 breeding pairs on ESI) is quantified using analyses with unknown uncertainty, large extrapolations outside the available data, and methods that apparently have never received independent peer review. These analyses do not use the best available scientific information and are substantially less rigorous than analyses identifying other salmon recovery objectives in NOAA's 2014 Supplemental Biological Opinion for the Federal Columbia River Power System.

2. The DEIS unjustifiably downplays the potential to manage cormorant dispersal from ESI under Alternative B, citing perceived high cost and logistical complexity.
   - The analysis implies that dispersal locations are unpredictable. In actuality, experiments exploring possible dispersal locations and behavioral strategies have indicated that currently active and historical colony sites are the most likely locations dispersing cormorants would attempt to nest. These sites are well known and readily monitored.
   - The potential of social attraction techniques to attract dispersing cormorants to acceptable existing or former colony sites is ignored. Experiments conducted to explore this technique were misinterpreted and the potential for successful application unjustifiably downplayed.
   - The analysis implies that sites elsewhere in the estuary and lower Columbia River would be the primary dispersal locations explored by cormorants. This conclusion ignores substantial cormorant use of sites in coastal Washington and British Columbia, areas of reduced conflict with fisheries during dispersal experiments. Additionally, active colonies elsewhere in the estuary and lower river utilize artificial structures with either limited capacity to support additional cormorant nests (e.g.,

navigational aids or transmission line towers) or are located in areas readily hazed (e.g., bridges).

- The analysis exaggerates the risk that dispersing cormorants might compete with ESA-listed Streaked Horned Larks for nesting habitat. There is little overlap in habitat preferences between cormorants (vertically structured habitats that facilitate stick nest construction such as trees, shrubs, rip-rap, driftwood piles) and Streaked Horned Larks (bare or sparsely vegetated flat sandy areas) in the lower Columbia River and estuary.
- The analysis ignores the susceptibility of cormorants to human or other disturbance, particularly during potential colony formation. Human or other disturbance is the most often cited cause of cormorant colony failure in the scientific literature. Experiments at ESI during 2010-2012 successfully dissuaded cormorants from nesting in designated portions of the island, despite a long history of cormorant nesting in those areas.
- The analysis fails to acknowledge that the management of cormorant nesting habitat to reduce fisheries conflicts (e.g., hazing to limit cormorant nesting in areas of fisheries concerns) has been successfully used elsewhere (e.g., Denmark), as an alternative to culling.
- The analysis fails to acknowledge that the Oregon Department of Fish and Wildlife (among others) has successfully administered a large-scale multi-estuary non-lethal cormorant hazing program on a modest budget.

3. The DEIS substantially downplays the uncertainty and risks associated with Alternative C (large-scale culling), the preferred alternative.
   - Proposed annual take for the ESI cormorant colony is similar to those in cormorant culling programs east of the Continental Divide in terms of the number of individuals culled. However, the effect of the proposed take level on the cormorant population west of the Continental Divide (a distinct management unit) is substantially greater. At least 1/4th of the western population is proposed to be culled at a single site, a very different scale of action than any culling program within the eastern population.
   - The DEIS proposes that an estimate of population size circa 1990 is sustainable (*sensu* the minimum viable population). Little justification for this choice is provided and the choice appears to ignore recent status and trends of major colonies in the western population. Notably, the three most significant nesting areas in the western population since the 1990 census all have uncertain, but likely negative, trajectories: ESI (the culling program outlined in the DEIS), Upper Klamath Basin (drought, water allocation issues), and the Salton Sea (reduced water allocation, drought).
   - The size of the ESI colony assumed for the beginning of the culling program is an average colony size during 2004-2013, rather than the most recent (2013) estimate. The 2013 estimate is the largest ever recorded and suggests growth from 2004-2012 levels. A larger initial colony size will require a larger cull to reach the management objective.
   - The potential for immigration to ESI is not adequately considered. Colony size trends over the last 15 years suggest substantial immigration has occurred, and could occur again. Any substantial immigration during the culling program would require a larger cull to reach the management objective.

- Experiences with major cormorant culling operations in the Upper Midwest indicate that the level of cormorant culling necessary to reach target population sizes can be several times greater than the difference between current cormorant population size and target population size after management.
- The DEIS and subsequent outreach efforts imply that a non-lethal management technique – habitat restriction to induce breeding dispersal away from ESI - has already been attempted and has not been successful. This misrepresents the scope of experiments conducted during 2011-2013 to test such a technique. Those experiments restricted habitat very successfully and induced temporary dispersal from ESI. However, sufficient nesting habitat was retained – by design – to allow all cormorants to continue nesting at ESI if they chose to, which they did. It is incorrect and misleading to imply that non-lethal management techniques have been attempted and have failed in advance of the lethal preferred alternative.

Specific Scientific Comments:

1. In the Executive Summary, Page 1, the DEIS states that "over the past 15 years, double-crested cormorants on East Sand Island consumed approximately 11 million juvenile salmon and steelhead per year." This statement fails to point out that the annual consumption of juvenile salmonids has varied widely from as few as 2 million juvenile salmonids to as many as 20 million (Lyons et al. 2014a). Thus, smolt consumption by cormorants has varied from levels that are considered acceptable by NOAA Fisheries (2 million smolts in 2005) to those considered highly unacceptable (20 million smolts in 2011), despite little change in size of the DCCO colony (12,287 breeding pairs in 2005 compared to 13,045 breeding pairs in 2011; Lyons et al. 2014b). Thus the lack of a direct correlation between smolt consumption and DCCO colony size means that the outcome with regard to the number of smolts saved from management to reduce colony size is difficult to predict based on colony size alone. Later in the Executive Summary (Page 4), the large inter-annual variability in cormorant predation rates on juvenile salmonids is acknowledged, but is dismissed as a factor in the evaluation of action alternatives and selection of the preferred alternative in the DEIS with the statement, "these factors will be considered when predicting and interpreting the success of management actions on East Sand Island within a given year and over the long-term."

2. In the Executive Summary, Page 3, the DEIS refers to the "survival gap analysis" performed by NOAA Fisheries. This analysis was used by NOAA in their 2014 Supplement to the Federal Columbia River Power System Biological Opinion (FCRPS BiOp) and concluded that reducing the DCCO colony on ESI to 5,380 to 5,939 breeding pairs (see Appendix D of DEIS) would result in acceptable smolt predation levels, levels that would allow salmonid recovery plans to continue unabated. NOAA Fisheries' analysis concluded that survival of juvenile steelhead was approximately 3.6 percent higher in the "base period" (1983-2002) compared to the "current period" (2003-2009), due to higher consumption of smolts by DCCOs nesting on ESI during the "current period" (see Appendix D of the DEIS). The "survival gap" was much smaller for yearling Chinook salmon (1.1 percent) and presumably sockeye salmon (a specific survival gap for sockeye was not reported but predation rates on sockeye were lower than those for

yearling Chinook and steelhead). To our knowledge, NOAA's "survival gap analysis" was not independently peer-reviewed and did not utilize the scientific information and analyses to measure the potential benefits to recovery rates of ESA-listed salmonids from the Columbia River basin due to reduction of the numbers of breeding cormorants in the estuary (referred to herein as the "benefits analysis;" Lyons et al. 2014a). NOAA's analysis relied instead on smolt abundance estimates that have limited (unknown) accuracy and precision, combined with estimates of smolt consumption based on bioenergetics modeling (Lyons 2010). NOAA's analysis did not use: (1) NOAA Fisheries' collected data on smolt PIT tag recoveries on the DCCO colony at ESI (used to measure stock-specific predation impacts), an alternative dataset that avoids several problematic issues presented in the "survival gap analysis"; (2) NOAA Fisheries' conservation units for salmonids commonly used in its biological opinions and recovery plans (i.e., Evolutionarily Significant Unit [ESU] or Distinct Population Segment [DPS]); (3) NOAA Fisheries' age-structured deterministic matrix population modeling procedure (or other more complex life cycle models) to compare the change in λ) in salmonid population growth rates (from different management alternatives; and (4) the "benefits analysis" (Lyons et al. 2014a), a detailed examination of the benefits to ESA-listed salmonid ESUs/DPSs from different potential management objectives for the ESI DCCO colony. The uncertain and imprecise average per capita DCCO predation rates on juvenile steelhead and yearling Chinook are then used in NOAA's "survival gap analysis," without reference to large inter-annual variability in these rates, to identify the "survival gap" for these salmonid species between the "base period" and the "current period," two arbitrary periods that correspond to the timing of NOAA Fisheries Biological Opinions on the Federal Columbia River Power System. Consequently, NOAA's projected improvement in survival (3.6%) of juvenile steelhead (the salmonid species subjected to the highest reported predation rate) by reducing the numbers of DCCOs nesting on ESI from about 29,800 individuals to about 11,200 individuals is speculative, and not based on the available peer-reviewed science.

In the sections of the DEIS entitled "Purpose and Need" and "Appendix D," as well as the referenced NOAA 2014 Supplemental FCRPS BiOp, the determination of the salmon survival objective is described and presented. Following are specific comments on the data and methodology used in this determination, which in turn drives the management objectives for DCCOs described in the DEIS.

- Annual predation rates by DCCOs on steelhead and yearling Chinook salmon were calculated using bioenergetics-based estimates of smolts consumed (i.e., number of smolts consumed by the DCCO colony on an annual basis) and NOAA-generated estimates of the number of smolts available to DCCOs in the estuary.
    - While estimates of the (1) total number of smolts consumed and (2) stock-specific smolt predation rates both include associated estimates of uncertainty (95% confidence intervals), with general methods having undergone formal (scientific journal) peer review (Roby et al. 2003, Evans et al. 2012), NOAA's estimates of smolts available in the estuary do not have associated estimates of uncertainty, nor have they undergone any formal peer review (published in internal agency memoranda or emails, not in technical reports or scientific journal articles). Estimates

of smolt availability are generally based on data-poor and imprecise inputs, and are not validated by any empirical measurements in the Columbia River estuary. Consequently, the derived estimates of DCCO predation rates are imprecise and have unknown estimation uncertainty.

- o The NOAA "survival gap analysis" was conducted at the species level for steelhead, sockeye salmon, and at a particular age-class (yearling) for Chinook salmon. For each species/age-class, the analysis combines or pools impacts to smolts of several different populations (ESUs/DPSs), rearing-types (hatchery or naturally-spawned), and includes both fish that are listed under the U.S. Endangered Species Act (ESA) and those that are not. Alternative measures of predation rates are available (collaboratively generated by NOAA's Northwest Fisheries Science Center and USGS) that are at the level of specific ESUs/DPSs, the conservation units listed under the ESA and nominally the motivation for considering management of DCCOs. These measures have advantages, in comparison to the predation rate estimates in the NOAA "survival gap analysis," of specificity to the conservation units of interest as well as explicit estimation of uncertainty (e.g., 95% confidence intervals), greater precision, and consideration of possible variation in predation rate due to rearing and migration history. These predation rates are provided in the DEIS for DCCO management, but were not used to quantify the objective for DCCO management. The rest of the NOAA 2014 Supplemental FCRPS BiOp (as well as previous BiOps) uses ESU/DPS-specific data for analyses and quantification of management objectives.

- Empirical data for smolt consumption by DCCOs and estimates of smolt availability were used for the period 1998-2012. However, the NOAA "survival gap analysis" relies on extrapolations of these data for the period 1980-1997, in combination with sparse estimates of DCCO colony size during that period. Given the high inter-annual variability in DCCO predation on smolts during the 1998-2012 period (related to climate variability and other factors), it is difficult, if not impossible, to rigorously assess the appropriateness of the extrapolation to the period 1980-1997. This uncertain extrapolation has a large effect on the derived difference in DCCO predation between the "base period" (1980-2002) and the "current period" (2003-2009), which defines the management objective for DCCOs.
- The increase in estimated DCCO predation from the base period (1980-2002) to the current period (2003-2009) is identified as the predation "gap," and used to define the management objective – how much DCCO predation should be reduced (i.e., return to 1980-2002 predation levels). There is no supporting analysis to interpret the biological meaning of this level of reduction in DCCO predation. It is not clear what the exact ramifications are for salmonid populations experiencing the current predation rate, and what the population benefit (e.g., difference in salmonid population growth rate) would be if the stated management objective were achieved (return to predation rate during base period). The analysis is substantially less complete than for other possible recovery actions for ESA-listed salmonids considered in the 2014 Supplemental FCRPS BiOp.

In summary, while the need for management action to limit DCCO predation on ESA-listed salmonids is supported by abundant peer-reviewed scientific data, the quantification of a management objective is based on analyses with unknown uncertainty, large extrapolations outside the available data, and methods that apparently have never received independent peer review. Furthermore, the development of a quantified management objective appears to be derived using a less rigorous process than other salmon recovery actions in the 2014 Supplemental FCRPS BiOp. Finally, the time period when DCCO consumption of Columbia Basin salmonids is deemed acceptable was defined by the policy framework of the 2014 Supplemental FCRPS BiOp, not by any attributes of the cormorant population, ESA- listed salmonid populations, or cormorant predation on ESA-listed salmonids.

3. In the Executive Summary-Page 5-6, the DEIS states that “social attraction techniques (setting up decoys and broadcasting audio playback of bird calls to encourage nesting) were tested within and outside the Columbia River Estuary for several years as a possible method to redistribute the East Sand Island double-crested cormorant colony.” The DEIS then goes on to state that “during 2004–2008, social attraction was employed on Miller Sands Spit and Rice Island with some success, primarily on Miller Sands Spit.” In actuality, social attraction techniques were highly successful in restoring a historical DCCO colony on Rice Island during the first year when social attraction was tried there (Suzuki 2012). Social attraction on Miller Sands Spit was successful in attracting a colony of nesting DCCOs during the third year; there had never before been a successful DCCO colony on Miller Sands Spit (Suzuki 2012).

   The DEIS continued on this topic by stating “during 2007–2012, social attraction techniques were used outside of the Columbia River Estuary at four known roosting sites in Oregon, but there were no nesting attempts made by double-crested cormorants.” It is true that for the sites where social attraction was tried outside the Columbia River estuary these efforts were unsuccessful in establishing new DCCO colonies. It is important to point out, however, that none of these social attraction sites had any previous history of DCCO nesting or roosting, and there was no concurrent effort to discourage nesting at nearby DCCO colonies to provide an incentive for DCCOs to shift to the site where social attraction was being tested.

   In Section 1.1.6 (Page 11) the DEIS states “during 2004–2008, social attraction was also employed on Miller Sands Spit and Rice Islands with limited success as a means to easily redistribute a large portion of the East Sand Island colony. Since 2009, there have been no documented DCCO nesting attempts at Miller Sands Spit or Rice Islands.” This description is misleading by implying that habitat enhancement and social attraction techniques have no potential as management techniques for redistributing DCCOs. The social attraction study on Rice Island successfully attracted DCCOs to nest in 2006, the first year that habitat enhancement and social attraction techniques were used at the site. DCCOs nesting at the restored site fledged young during the first year. The prompt restoration of the colony and good nesting success during the first year were considered highly successful. The habitat enhancement and social attraction were removed from Rice Island before the 2007 breeding season to test the cormorants’ response to the site when habitat enhancement and social attraction tools were not present. DCCOs did not return to Rice Island to nest in 2007 or thereafter, which suggests that habitat enhancement and social attraction were critically important for maintaining the colony. The research objective was to test whether habitat enhancement and social attraction could restore a breeding colony of DCCOs on Rice Island only as a means to evaluate the efficacy of the technique. It was not intended to establish a long-term DCCO colony on Rice Island.

The social attraction study on Miller Sands Spit was conducted during 2004- 2007, and DCCOs successfully fledged young from this new colony in both 2006 and 2007. Because DCCOs previously had only attempted to nest there, but with no success, the two breeding seasons when DCCOs successfully fledged young at Miller Sands Spit were considered highly successful. In 2008, habitat enhancement and decoys were deployed again, but audio playback of DCCO calls was not included as part of the social attraction. The DCCO colony on Miller Sands Spit was abandoned in June 2008, possibly due to the lack of audio playback systems at the site. Habitat enhancement and social attraction techniques were not redeployed after 2008, and no subsequent nesting by DCCOs was recorded there.

In evaluating the success of habitat enhancement and social attraction as non-lethal techniques for reducing the size of the DCCO colony on ESI, it is important to keep in mind that the feasibility studies on Rice Island and Miller Sands Spit were conducted when there was a large DCCO colony less than 25 km away on ESI, where there was ample unoccupied cormorant nesting habitat. Because there was no effort to discourage DCCOs from nesting on ESI concurrent with the attempts to attract DCCOs to nest at these other islands within the Columbia River estuary, one would expect these attraction techniques to be even more effective if paired with efforts to discourage nesting at ESI. Significantly, the unsuccessful attempts to establish DCCO colonies using habitat enhancement and social attraction were all at sites where there was no history of prior nesting by DCCOs, and where no DCCO colonies in the area were being dissuaded to induce DCCOs to seek alternative colony sites.

In summary, results of research on habitat enhancement and social attraction techniques for relocating nesting DCCOs to alternative colony sites were encouraging (Suzuki 2012). However, this research did not by itself fully investigate the potential of using these techniques to relocate DCCOs currently nesting on ESI to alternative colony sites outside the basin as a way to decrease their impacts on ESA-listed salmonids from the Columbia Basin. Testing of habitat enhancement and social attraction techniques at historical (and currently suitable) nesting sites outside the basin, while simultaneously preventing all or a portion of the DCCOs from nesting at the ESI colony, is the next logical step in developing this methodology. In the absence of such feasibility studies, this management option should not be dismissed in the DEIS as unworthy of further consideration.

4. In the Executive Summary-Page 6, the DEIS states that "despite annual reductions in the amount of available nesting habitat, double-crested cormorants nested successfully on East Sand Island every year." Elsewhere in the DEIS, the Corps claims that it has tried using non-lethal management approaches, but when it reduced habitat for nesting cormorants on ESI by 70% in 2013, the colony size increased by 15%. These misleading statements are used to both support the preferred alternative (lethal control; alternative

C), and discredit the non-lethal alternative (colony size reduction; alternative B). To the contrary, the DCCO nest dissuasion feasibility studies during 2011-2013 funded by the Corps were successful in achieving the primary goal of the studies: demonstrating the efficacy of limiting the area of nesting habitat and, therefore, the size of the cormorant colony (Roby et al. 2012, 2013, 2014), using non-lethal techniques.

The dissuasion feasibility studies consisted of using privacy fences, human hazing, and nest destruction on parts of the cormorant colony during 2011-2013, and were highly successful in preventing cormorants from nesting in specific locations on ESI, locations with a long history of DCCO nesting and productivity. While these efforts were somewhat labor intensive (requiring constant monitoring during daylight hours), they were effective over a relatively short time period (< 60 days) and were accomplished by just 3-4 technicians (Roby et al. 2012, Roby et al. 2013, Roby et al. 2014). Additionally, these studies required little to no cormorant egg take over the 3-year study period; only four DCCO eggs were observed and collected in the dissuasion study area during 2012 (Roby et al. 2013).

The DEIS, however, appears to mischaracterize these nest dissuasion feasibility studies, suggesting that large-scale and permanent emigration of DCCOs from the Columbia River estuary was a primary goal. These studies were not designed to reduce available nesting habitat for DCCOs to a level that would cause large-scale emigration from ESI and reduce colony size. It was hoped that some of the DCCOs attempting to nest in areas where nesting birds were dissuaded would prospect for alternative nest sites outside the Columbia River estuary. By satellite-tagging, radio- tagging, and banding some of these dissuaded DCCOs, some alternative colony sites were identified (Roby et al. 2014). It was determined that cormorants nested on an average of less than 3 acres of habitat during 2005-2012 ($\bar{x}$= 2.7 acres). Based on the average nest density (1.28 nests/m2) and the area of nesting habitat made available to nesting cormorants in 2013 (4 acres), more than 20,000 breeding pairs of cormorants could have nested on ESI. The actual colony size in 2013 was about 16,500 breeding pairs (DCCOs and Brandt's cormorants combined). Thus the interpretation suggested by the DEIS, that habitat reduction as a non-lethal method to reduce cormorant colony size was tried, but failed, is inaccurate.

While dissuasion feasibility studies have demonstrated that privacy fences and human hazing can be an effective method for limiting the area of nesting habitat, and therefore colony size, these techniques have never been employed in an attempt to reduce the area of DCCO nesting habitat on ESI below the amount necessary to accommodate the entire DCCO colony. USGS data indicate that if the area of suitable cormorant nesting habitat was reduced to 2.5 acres or less, permanent emigration of some DCCOs from the ESI colony to other colonies would necessarily occur. In order to achieve the target colony size of ~5,600 breeding pairs, the amount of suitable cormorant nesting habitat would need to be reduced to 1 acre or less. Alternative C, incorporating lethal culling of adult DCCOs, relies on these habitat restriction techniques to reduce the number of DCCOs coming to the ESI colony and thus reduce the level of cull required. The DEIS should address the potential success of these techniques in a consistent manner throughout the entire document (e.g., for Alternatives B, C, and D).

The Final EIS should accurately characterize the goals and results of the dissuasion feasibility studies that were conducted during 2011-2013. In addition the Final EIS should make a clear distinction between the terms "available nesting habitat," "suitable nesting habitat," and "actual nesting habitat" (habitat used by cormorants) during these studies. As used in the DEIS, these terms seem interchangeable, whereas they have very different biological interpretations.

5. In the Executive Summary-Page 7, the DEIS states that "dispersal of double-crested cormorants [from the ESI colony] has the potential to cause greater impact to juvenile salmonids if they move to upriver locations in the Columbia River Estuary where juvenile salmonids compose a higher proportion of their diet." This risk of greater impacts to the survival of juvenile salmonids is based on Roby et al. 2002, and is a primary consideration in the impact analysis of the action alternatives, including the preferred alternative. But the DEIS portrayal of risk due to dispersal fails to mention other research that demonstrates the feasibility of dissuading DCCOs from nesting at sites where they could cause unacceptable mortality to fish of conservation concern (Roby et al. 2012, 2013, 2014). Multiple studies have demonstrated that nesting DCCOs are highly sensitive to human hazing and can be easily dissuaded from nesting at sites deemed undesirable by resource managers.

   As part of a long-term cormorant management study in Denmark, Bregnballe and Eskildsen (2009) have documented the efficacy of various management approaches for limiting the formation of new colonies of Great Cormorants (closely related to the DCCO). The Danish approach to managing cormorant depredations on fish stocks of conservation concern has been recognized and adopted in other European nations. Based on the Danish experience, the skepticism expressed in the DEIS over the practicality of controlling where DCCOs are allowed to nest once dispersed from ESI seems unwarranted. Hazing cormorants that are prospecting at new colony sites is an effective and efficient means for controlling where DCCOs nest and, therefore, what they eat, including salmonids of conservation concern.

   In Chapter 2, Page 9, the DEIS describes the "placement of flags, rope, and stakes in a grid pattern" as a means to reduce DCCO nesting habitat on ESI. This method is also proposed in the DEIS for implementation at other potential colony sites within the Columbia River estuary (Chapter 2, Page 13). While similar methods have been successfully implemented to deter Caspian terns from nesting at several sites in the Columbia River basin, this method has been tested on and found to be ineffective at deterring DCCOs from nesting (Roby et al. 2007).

   In Chapter 2, Page 12, the DEIS describes hazing triggers developed by Roby et al. (2012) that the Corps intends to apply at multiple cormorant roosting and foraging sites throughout the Columbia River estuary. While these triggers were effective in preventing cormorants from nesting in a discrete location on ESI, they are entirely inappropriate for hazing DCCOs that are roosting and foraging throughout the estuary. Implementing the hazing program defined in the DEIS will require a nearly constant presence of large numbers of hazers in boats throughout the estuary during daylight hours. The DEIS fails to address the time commitment and cost of this magnitude of extensive hazing. A far more practical and demonstrated successful approach is to control where DCCOs are allowed to nest in the Columbia River estuary.

6. The DEIS claims that where DCCOs that are prevented from nesting on ESI would settle and nest cannot be predicted, and this unpredictability presents a considerable risk that DCCOs displaced from ESI might settle at sites where they would cause even greater impacts to fish species of conservation concern than if they remained at ESI. In Chapter 1, Page 14, the DEIS states that near-term dispersal of satellite-tagged DCCOs during dissuasion studies is indicative of where DCCOs could relocate upon management of the ESI colony. In Chapter 4, Page 92, however, the DEIS characterizes this dataset is “incomplete,” not applicable for determining precise locations of potential relocation, and “therefore not essential to making a reasoned choice among alternatives.” These two statements on Pages 14 and 92 appear contradictory. The passage on Page 92 minimizes the findings from Corps-funded research that used satellite telemetry and radio telemetry to investigate dispersal of DCCOs from the colony at ESI, both during the breeding season and afterwards (Courtot et al. 2012, Roby et al. 2013, Roby et al. 2014).

   In Chapter 1, Pages 14-15, the DEIS does not discuss findings of a study by Courtot et al. (2012) that 75% (38/51) of satellite-tagged DCCOs that left the Columbia River estuary after the breeding season visited 19 current and historical DCCO colonies, demonstrating clear knowledge of and connectivity to alternative breeding sites throughout the range of the DCCO along the West Coast. The DEIS should also consider findings that 43% of satellite-tagged DCCOs visited locations within the Puget Sound/Salish Sea region, demonstrating a high level of connectivity to a region that the Washington Department of Fish and Wildlife describes as of “moderate management concern and could tolerate some increase in DCCO numbers if closely monitored” (DEIS, Chapter 3, Page 49). Subsequent satellite telemetry studies of DCCOs tagged on East Sand Island during 2012-2013 confirmed these findings, even during short-term dispersal from ESI during the breeding season (Roby et al. 2013, Roby et al. 2014). Satellite-tagged DCCOs visited several active and historical colonies both in and outside the Columbia River estuary, before returning to ESI to nest.

   While the DEIS does discuss connectivity of DCCOs from ESI to the general regions where active and historical DCCO colonies exist, it does not consider published results in the scientific literature that indicate that DCCOs are far more likely to relocate to existing colonies or re-colonize historical colonies upon experiencing colony disturbance and reproductive failure. In its rejection of non-lethal alternatives, the DEIS speculates that relocation of displaced DCCOs would be unpredictable, that new colonies could spring up unexpectedly at almost any site near water, and that few data exist that would allow prediction of likely alternative nesting sites. Overall, the DEIS minimizes or ignores findings in the published literature that clearly demonstrate the connectivity of DCCOs nesting at ESI to other specific colonies (Clark et al. 2006, Courtot et al. 2012) and how this connectivity relates to potential immigration from ESI. These published findings suggest how DCCOs emigrating from ESI would disperse across the range of the western

North America population of DCCOs, if non-lethal management alternatives were implemented. The colonies with the greatest connectivity to ESI (aside from a few nearby colonies in the Columbia River estuary) are to the north, including colonies where DCCO numbers have been declining and increases in DCCO abundance may be acceptable to the Washington Department of Fish and Wildlife. The following published works should be consulted regarding inter-colony movements of DCCOs and colony site preferences: Carter et al. (1995), Clark et al. (2006), Wires and Cuthbert (2006), Duerr et al. (2007), Wire and Cuthbert (2010), Courtot et al. (2012).

In Chapter 3, "Affected Environment," Pages 1-2, the DEIS states, "during efforts to restrict DCCO nesting on ESI during the 2011–2013 breeding seasons, nearly all satellite-tagged DCCOs relocated to the Astoria-Megler Bridge or other nearby areas to East Sand Island immediately following hazing events, and there was little evidence of permanent emigration from the Columbia River Estuary (Roby et al. 2014)." This is the only statement supporting the claim in the DEIS that DCCOs deterred from nesting on ESI "would initially prospect for alternative nesting sites nearby." The DEIS does not mention that many detections of satellite-tagged DCCOs in the estuary represent typical movements among roost sites, and are not necessarily indicative of nesting at other colonies. The DEIS would benefit from a discussion regarding the commuting, roosting, and foraging behavior within the Columbia River estuary of DCCOs nesting at ESI. The Astoria-Megler Bridge, Rice Island, Miller Sands, and other locations mentioned in the DEIS fall within the known foraging range (25 km) of ESI; dispersal to these sites is expected given their proximity to ESI, and do not necessarily indicate that these DCCOs are attempting to nest at these nearby sites. The following works should be consulted regarding the typical foraging range of DCCOs within the Columbia River estuary: Anderson et al. (2004), Lyons et al. (2007).

Chapter 3, Pages 2-3, the DEIS correctly identifies the Lower Columbia River Basin and the Washington Coast as regions used by DCCOs satellite-tagged on ESI during 2012-2013. There is only a brief summary (Chapter 3, Page 20), however, of the active colonies identified within these two regions. The DEIS makes the assumption that DCCOs that disperse from ESI will primarily prospect for new colony sites in these regions, yet there is no reference to the existing or historical colonies in these regions, or the current status of these colonies.

Finally, some of the active DCCO colonies that are most proximate to ESI (i.e., Columbia Estuary channel markers, Grays Harbor channel markers) are on man-made structures (i.e., navigational aids and bridges). Consequently, these colonies are habitat-limited, and cannot grow appreciably in size. In the case of the colony closest to ESI, the Astoria-Megler Bridge, this colony is scheduled for hazing and dissuasion by the Oregon Department of Transportation, which is currently conducting periodic maintenance work on the Bridge. The DEIS should also consider long-term and cost effective management solutions mentioned elsewhere in the document (e.g., netting, wire arrays, cones, etc.) to prevent or restrict DCCOs from nesting on other artificial structures in the Columbia River estuary. Netting in particular would be effective in preventing DCCOs from re-colonizing the Astoria-Megler Bridge following completion of maintenance work.

7. Streaked Horned Larks were recently listed as a threatened species under the ESA, and this species nests on several dredged material disposal sites in the upper Columbia River estuary. The need to avoid disturbance to and take of Streaked Horned Larks during management efforts to reduce the size of the DCCO colony on ESI is mentioned repeatedly in the DEIS as a reason for preferring Alternative C (primarily lethal approach). The DEIS reasons that if DCCOs are non-lethally dissuaded from nesting on ESI, that the dispersing cormorants would start to nest on other islands in the Columbia River estuary where Streaked Horned Larks nest. Therefore, dissuading DCCOs from nesting on these dredge spoil islands would necessitate disturbance to and take of Streaked Horned Larks. But Streaked Horned Lark habitat is very different from DCCO nesting habitat. Streaked Horned Larks use sparsely vegetated habitats (recently deposited dredge spoil), whereas DCCOs select vertically structured habitats that facilitate nest construction, including trees, rocky revetment, or artificial structures. We are not aware of observations of Streaked Horned Larks in the ESI cormorant colony, even when breeding cormorants are not present, and even though cormorants have converted densely vegetated habitats (continuously covered by European beach grass) to bare sand habitat (through guano deposition). While DCCOs occasionally nest in this scarified habitat on ESI, sparsely vegetated habitat was not selected by DCCOs for nesting when other, more structured habitat was available. Consequently, there is virtually no overlap between Streaked Horned Larks and DCCOs in preferred nesting habitat, and dissuading or hazing DCCOs prospecting for nest sites on upper estuary islands would not be expected to have an effect on Streaked Horned Larks.

8. In Chapter 4, Page 12, the DEIS states that, "proposed annual take levels [of DCCOs] on East Sand Island are comparable to take levels of other culling programs in Canada and the United States that effectively reduced DCCO abundance to acceptable levels for mitigating impacts to resources in particular areas." The population of DCCOs east of the Continental Divide (to which this statement refers) is at least an order of magnitude larger than the western North America population (Hatch 1995). The eastern and western populations of DCCOs are distinct and separate management units (Adkins et al. 2014), and there is little exchange of individuals between these populations (Mercer et al. 2013). The comparisons made in this paragraph are misleading, as the ESI colony makes up a much larger proportion of the western population (more than 40%) compared to the proportion of the eastern population made up by the specific colonies referred to in Chapter 4 of the DEIS. While the annual take levels proposed for the ESI DCCO colony are similar to those in other culling programs within the range of the eastern population, the effect of the proposed take levels on the overall western population is very different.

   In Chapter 4, Page 14, the DEIS states that, "it appears that the western population of DCCOs is sustainable at approximately ca. 1990 numbers. A sustainable population is defined for this analysis as a population that is able to maintain numbers above a level that would not result in a major decline or cause a species to be threatened or endangered." The conclusion that the ca. 1990 estimate used throughout this DEIS (41,660 individuals) is a sustainable population size at which to manage the western population of DCCO is arbitrary, and was arrived at without examining (1) the current status and trends for DCCO colonies in western North America, (2) how current status and trends of DCCO colonies in western North America compare with status and trends in 1990, or (3) whether the western population is sustainable at this level with a colony of only about 5,600 breeding pairs left on ESI. ESI is currently home to more than 40% of all DCCO breeding pairs in the western population. The number of coastal DCCO colonies to the north of ESI (i.e., the Salish Sea region, Strait of Juan de Fuca, and the outer coast of Washington) has declined by approximately 50% since the early 1990s, and the numbers of DCCOs nesting at the remaining northern coastal sites have also declined, resulting in a 66% decline in numbers of breeding pairs of DCCOs within this sub-population (Adkins et al. 2014). Numbers of DCCO breeding pairs at inland sites in Oregon and northern California can experience large inter-annual variability; nesting at formerly large colonies (i.e., Malheur National Wildlife Refuge, Lower Klamath National Wildlife Refuge, Clear Lake National Wildlife Refuge) has been greatly reduced or eliminated in recent years due to severe drought and associated water allocation restrictions (Adkins and Roby 2010, Adkins et al. 2014). Current water levels in the Salton Sea in southern California are receding, causing Mullet Island to land-bridge; Mullet Island was the primary DCCO nesting site in the area and home to about 6,000 breeding pairs (13% of the western population) of DCCOs during 2009-2010. Water depth adjacent to Mullet Island is no longer sufficient to prevent access by mammalian predators (Adkins et al. 2014), and no DCCOs nested at Mullet Island in 2013 or 2014 (W.D. Shuford, pers. comm.). Given these declines and the tenuous status of a number of other DCCO colonies throughout the western population, it is unclear how sustainable the western population will be after culling at least 16,000 individuals and the reduction in size of the ESI colony to about 5,600 breeding pairs. The ESI colony has been the most productive DCCO colony in the western population for over a decade.

In Chapter 4, Page 14, the DEIS states that, "DCCOs that nest on East Sand Island typically spend half of the year away from East Sand Island; thus, the increase in abundance at the East Sand Island colony most likely cannot be solely sourced to that location alone and likely reflects beneficial environmental changes that have occurred throughout the geographic area occupied by DCCOs that nest on East Sand Island." It is not entirely evident what is being implied in this sentence, especially when no citations or references are used. If the statement is intended to mean that "beneficial environmental changes" have improved the over-winter survival of DCCOs that nest on ESI, there is no scientific evidence to support this hypothesis. Unlike the eastern population of DCCOs, which is highly migratory and a large portion of which spends most of the winter in areas of the Deep South with intensive fish aquaculture (Wires and Cuthbert 2006), most DCCOs in the western population spend the winter relatively close to their nesting areas (Courtot et al. 2012), and do not forage in aquaculture ponds during the over-winter period. Additionally, other colonies in the western population, especially colonies to the north where most DCCOs from ESI spend the non-breeding period, are much smaller, are not growing, and their overall nesting success is much lower than at the ESI colony (Adkins et al. 2014). These observations call into question the premise that "beneficial environmental changes" have increased overall population carrying capacity for the western population through enhanced over-winter survival. Instead, the increase in abundance of DCCOs at the ESI colony seems to be largely attributable to the favorable nesting conditions at that site alone. The suggestion in the DEIS that "beneficial environmental changes that have occurred throughout the geographic area" are responsible for the growth of the ESI DCCO colony is in all likelihood erroneous. The rapid growth of the ESI DCCO colony in the 1990s and early 2000s was clearly related to the concurrent failure and abandonment of DCCO colonies elsewhere, which contributed to the growth in the ESI colony through immigration (Carter et al. 1995, Anderson et al. 2004). ESI possesses a unique combination of characteristics that has allowed the site to support more than 75,000 breeding and roosting seabirds annually, including the largest colony of DCCOs anywhere. Reproductive success at the ESI colony of DCCOs shows no signs of density-dependent limitation at the current colony size (14,900 breeding pairs; Roby et al. 2014). Arguably, no other site within the range of the western population of DCCOs has the combination of forage base and protection in numbers from Bald Eagle depredation that the large ESI colony currently possesses. It is unlikely that any other site or region within the range of the western population could support such a high proportion of the breeding population as the ESI colony currently supports.

In Appendix E-2, Page 9, the DEIS states that, "for the western population of DCCOs analysis, carrying capacity was modeled as the initial abundance of the western population (62,400 breeding individuals; Adkins et al. in press), as this was determined to be the most objective value. There is uncertainty when choosing a carrying capacity value. Carrying capacity cannot be empirically known…" The estimate of 62,400 breeding individuals as the carrying capacity of the western population of DCCOs is simply the most recent estimate (ca. 2009) of the size of the western population (Adkins et al. 2014). If the generally accepted definition in population biology of "carrying capacity" is used (capacity of the environment to sustain a population's requirements for resources), it is highly unlikely that the western population of DCCOs is currently at its biological carrying capacity. The western population is recovering from over a century of overharvest, persecution, and the detrimental effects of persistent organochlorine pesticides. There is a strong likelihood that the potential carrying capacity for the western population of DCCOs is considerably higher than the current population, especially considering recent increases in the size of the ESI colony.

9. In the DEIS, the size of the DCCO colony on ESI (number of breeding pairs) is given as an average of the colony size over the 10-year period 2004-2013 (Appendix E–2, Page 2). This average colony size (25,834 breeding individuals) is used as the starting point for management to reduce the size of the DCCO colony to the target size of 10,760 to 11,878 breeding individuals (5,380 to 5,939 breeding pairs; see Appendix D of DEIS). The most recent estimate of the size of the DCCO colony on ESI is 29,800 breeding individuals (14,900 breeding pairs; 95% c.i. = 14,550 – 15,290 breeding pairs) in 2013 (Roby et al. 2014). The 2013 point estimate is 2.4 standard deviations greater than the 2004 – 2012 average, suggesting that the larger colony size seen in 2013 represents something other than natural variation around a stable population size. Given that significant difference, the 2013 colony size is a more appropriate starting point for population modeling and evaluating the magnitude of the cull necessary to reach the management objective under the preferred alternative (lethal control; Alternative C). The 2013 colony size is about 4,000 individuals greater than the starting point used in the population model to predict

number of adult DCCOs that would need to be culled in order to reach the target colony size. Thus, the DEIS understates the number of DCCOs that would need to be culled (~16,000 individuals) to reach NOAA's management objective (~5,600 breeding pairs). A more accurate estimate of the number of DCCOs that would need to be culled to reach the target colony size would be 20,000 individuals. Given this ambiguity in the appropriate starting (current) colony size for analysis, it would be appropriate to perform a sensitivity analysis to determine how dependent the number of individuals needed to be culled is on the starting colony size used. This would greatly aid the interpretation of how accurate the needed cull estimates actually are.

In addition, the Potential Biological Removal analyses in Appendix E-2 do not sufficiently consider immigrants from other DCCO colonies to the ESI colony during the 4-year Phase 1 period of the management plan. During the 25-year period since the DCCO colony on ESI first appeared, there has been a history of recruitment of large numbers of adult DCCOs from other breeding colonies in western North America. (Note: In Appendix E-2, Page 2 the initial abundance of DCCOs nesting on or near the ESI colony in 1989 was erroneously set at 3,694 individuals; this is actually the estimate of the entire DCCO breeding population throughout the coast of Oregon in 1988 [see Carter et al. 1995]. The actual number of DCCOs nesting on ESI in 1989 was less than 200 individuals [Roby et al. 2014].) In 2013 alone, the DCCO colony at ESI increased by about 5,200 individuals (21%) compared to the previous year (Roby et al. 2014). The magnitude of this recruitment of breeding adults to the ESI colony strongly suggests that significant immigration to ESI from other colonies continues, at least in some years. In 2013, for example, the large DCCO colony in the Salton Sea, southern California (over 6,000 breeding pairs in 2012) was abandoned due to falling water levels (W.D. Shuford, pers. comm.), and at least some of those displaced adult DCCOs likely immigrated to ESI.

The DCCO population model used in the DEIS (Appendix E-2) assumes that the colony at ESI is at carrying capacity, that culling of individuals near that carrying capacity would constitute nearly 100% additive mortality, and the colony size would decline in direct proportion to the number of DCCOs culled. But the large increase in the size of the DCCO colony in 2013 (21%) does not support the assumption that the colony is at carrying capacity. Therefore, a large proportion of the mortality due to culling could be compensatory, and recruitment could partially or completely offset losses due to culling. If as large of a natural increase in ESI colony size as occurred from 2012 to 2013 were to occur during any of the four years of Phase 1 of the preferred management plan described in the DEIS, the number of DCCOs that would need to be culled to reach NOAA’s management objective would necessarily increase by the thousands, perhaps requiring the culling of 20,000 – 30,000 adult DCCOs to reach the target colony size of 5,600 breeding pairs by 2018. As above with starting colony size, given the uncertainty in carrying capacity and density dependence, it would be appropriate to perform a sensitivity analysis to determine how dependent the number of individuals needed to be culled is on the assumed carrying capacity. This would greatly aid the interpretation of how precise the estimates of the numbers of DCCOs that would need to be culled actually are.

Experiences with major cormorant culling operations in the Upper Midwest indicate that the level of cormorant culling necessary to reach target population sizes can be several times greater than the difference between current cormorant population size and target population size after management. In Michigan, for example, a population reduction by 20,000 individuals required the lethal take of over 50,000 DCCOs over eight seasons. In Minnesota, a reduction in the size of one breeding colony by 4,000 individuals required the lethal take of over 20,000 DCCOs over eight seasons. The numbers of DCCOs that would need to be culled at ESI to reach the target colony size could far exceed the projected number of 16,000 culled individuals.

While the DEIS (Appendix E-2) does discuss the annual cull rate as a fraction of the western North American population of the species, it does not acknowledge the cumulative impact of the cull proposed over the course of the management plan. In total, the cull would include from a quarter to a half of all the breeding age DCCOs in the western North America population of the species. What is described in the DEIS as a local management plan to reduce the numbers of DCCOs nesting at the ESI colony would have major implications for the western population as a whole, and would constitute population control of DCCOs on a large and extensive scale.

Conclusions

American Bird Conservancy believes that the analysis presented in the DEIS is inadequate to proceed to a Final EIS and project implementation. We are concerned that there is weak scientific justification for establishing a target of 5,600 breeding pairs of DCCO for ESI in that the connection between DCCO numbers and endangered salmon smolt survival is tenuous. The Corps has gravitated to a lethal control method without adequate justification and without evidence than non-lethal control methods could achieve the stated project objectives, especially when one considers that the success of both lethal and non-lethal control methods hinges entirely on post-control habitat modification to limit the size of the DCCO breeding colony. Finally, we do not believe a depredation permit authorizing lethal control can legitimately be issued given MBTA regulations and guidance policies without verifying that non-lethal methods will not work and without considering the impacts of such a massive DCCO cull on the well-being of the entire western DCCO population.

Thank you for the opportunity to comment on the proposed Project. Should you have any questions concerning our comments, I encourage you to contact me or George E. Wallace, Vice President for Oceans and Islands (gwallace@abcbirds.org).

Sincerely,

George H. Fenwick

George H. Fenwick
President

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