US Army Corps
of Engineers®
Walla Walla District

Inland Avian Predation Management Plan
Environmental Assessment

January 2014

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ACRONYMS

AMP	Adaptive Management Plan
APD	Avian Predation Deterrent
BiOp	FCRPS 2008 Biological Opinion and 2010 Supplement
BMP	best management practice
BPA	Bonneville Power Administration
C&S	ceremonial and subsistence
CAGU	California gull
CATE	Caspian tern
CBP	Columbia Basin Project
CCP	Comprehensive Conservation Plan
cy	cubic yards
Corps	U.S. Army Corps of Engineers
DAHP	Washington Department of Archaeology and Historic Preservation
DCCO	Double-crested cormorant
DPS	Distinct Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FEIS	Final Environmental Impact Statement
fmsl	feet above mean sea level
FONSI	Finding of No Significant Impact
FPOM	Fish Passage Operations and Management
FWCA	Fish and Wildlife Coordination Act
GHG	greenhouse gasses
IAPMP	Inland Avian Predation Management Plan
IAPWG	Inland Avian Predation Working Group
IBA	Important Bird Area
ITA	Indian Trust Asset
IUCN	International Union for Conservation of Nature
LCR	Lower Columbia River

MBTA	Migratory Bird Treaty Act
MCR	Middle Columbia River
MSA	Magnuson-Stevens Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	NOAA's National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPCC	Northwest Power and Conservation Council
NWR	National Wildlife Refuge
ODFW	Oregon Department of Fish and Wildlife
OPSW	Oregon Plan for Salmon and Watersheds
PCBs	Polychlorinated Biphenyls
PIT Tag	Passive Integrated Transponder Tag
PRCC	Priest Rapids Coordinating Committee
PUD	Public Utility District
Reclamation	U.S. Bureau of Reclamation
RBGU	Ring-billed gull
RM&E	Research, Monitoring and Evaluation
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative
SHPO	State Historic Preservation Office
SPCC	spill prevention, control, and countermeasure
SR	Snake River
TCP	Traditional Cultural Property
TFAS	treaty fishing access sites
TMDL	total maximum daily load
UCR	Upper Columbia River
USDA	U.S. Department of Agriculture
USDA-WS	U.S. Department of Agriculture - Wildlife Services
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington State Department of Fish and Wildlife

SECTION 1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

This Inland Avian Predation Management Plan (IAPMP) Environmental Assessment (EA) addresses a set of proposed actions to reduce avian predation on federal Endangered Species Act (ESA)-listed salmonids in the inland Columbia River Basin above Bonneville Dam. This EA identifies a purpose and need, develops and evaluates a set of alternatives to meet the purpose and need, considers the trade-offs of the alternatives and selects a preferred alternative. The IAPMP (Appendix A) was developed as a guide for the implementation of the preferred alternative in this EA and includes detailed recommendations for implementation, monitoring, and adaptive management.

The development of an IAPMP is a requirement of the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) 2008 Federal Columbia River Power System (FCRPS) Biological Opinion as updated in the 2010 Supplemental FCRPS Biological Opinion (referred to collectively as the BiOp unless the date is specified). The EA identifies actions to reduce predation on salmonids in the inland Columbia River Basin and focuses on the management of Caspian terns (CATEs) at Goose and Crescent Islands, habitat enhancement to attract CATEs to areas outside the Columbia River Basin, and adaptive management actions to limit the formation of incipient colonies within the basin. The IAPMP and Adaptive Management Plan (AMP) are included as an appendix to this document (Appendix A) which can be referenced for additional details on implementation.

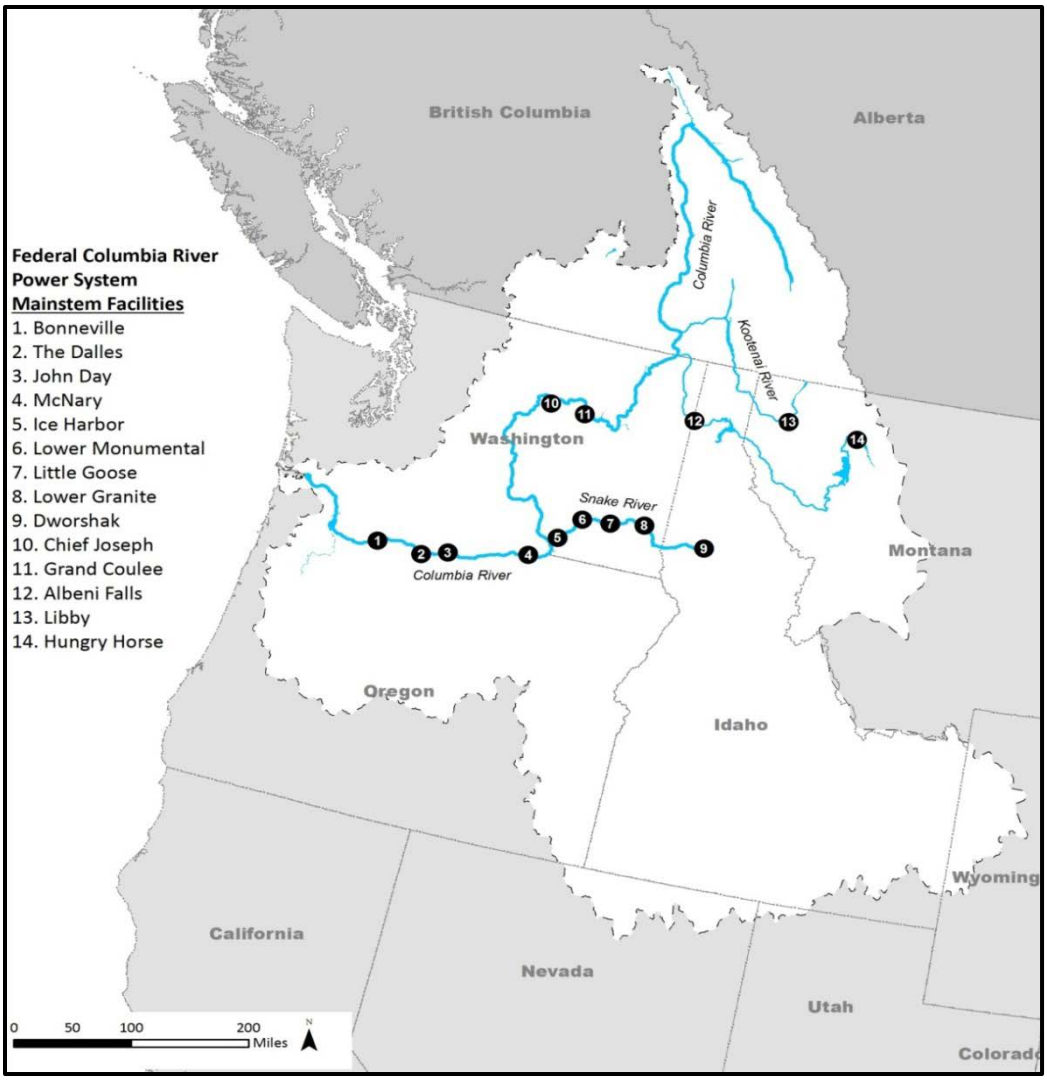
1.2 Background

1.2.1 Federal Columbia River Power System

The FCRPS comprises 14 federal multipurpose hydropower projects (Figure 1-1). The 12 projects operated and maintained by the U.S. Army Corps of Engineers (Corps) are Bonneville, The Dalles, John Day, McNary, Chief Joseph, Albeni Falls, Libby, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak Dams. The U.S. Bureau of Reclamation (Reclamation) operates and maintains the following FCRPS projects: Hungry Horse Project and the Columbia Basin Project, which includes Grand Coulee Dam. Congress authorized the construction of the FCRPS projects and directed the Corps and Reclamation to operate and maintain these projects for multiple purposes including flood control throughout the Columbia River Basin, navigation in the Columbia and Snake Rivers, hydropower generation, irrigation, fish and wildlife, water quality, municipal and industrial water supply, and recreation.

The BiOp, which covers the operation of the FCRPS through 2018, recommended a Reasonable and Prudent Alternative (RPA) to avoid jeopardizing the continued existence of the species and adverse modification of designated critical habitat for 13 species of salmon and steelhead affected by FCRPS operation. The BiOp attempts to address FCRPS operational effects on ESA listed fish through what is called an “All H approach” that addresses hydropower impacts, tributary and estuary habitat improvement, hatchery operations, and harvest techniques and includes efforts to reduce juvenile and adult salmonid losses from predation by birds, other fish, and marine mammals (FCRPS 2008).

The BiOp requires the three FCRPS Action Agencies (the Corps, Reclamation, and Bonneville Power Administration [BPA]) to ensure that their actions meet certain standards when the actions affect “endangered” or “threatened” species as defined by the ESA. The overall predation management objective for all affected salmonid evolutionarily significant units (ESUs) and distinct population segments (DPSs) is to improve the survival of juvenile and adult fish as they pass through the FCRPS.



Source: Adapted from FCRPS Biological Assessment, August 2007.

Figure 1-1. Federal Columbia River Power System Mainstem Facilities.

The RPA in the BiOp included specific actions to address inland avian predation including:

- RPA Action 47: Inland Avian Predation; the Action Agencies will develop an avian management plan for Corps-owned lands and associated shallow-water habitat.
- RPA Action 68: Monitor and Evaluate Inland Avian Predators; the Action Agencies will monitor avian predator populations in the mid-Columbia River, evaluate their impacts on outmigrating juvenile salmonids, and develop and implement a management plan to decrease predation rates, if warranted.

In accordance with the August 2, 2011, U.S. District Court for the District of Oregon Order, the BiOp was remanded to NMFS. In response, NMFS prepared the 2014

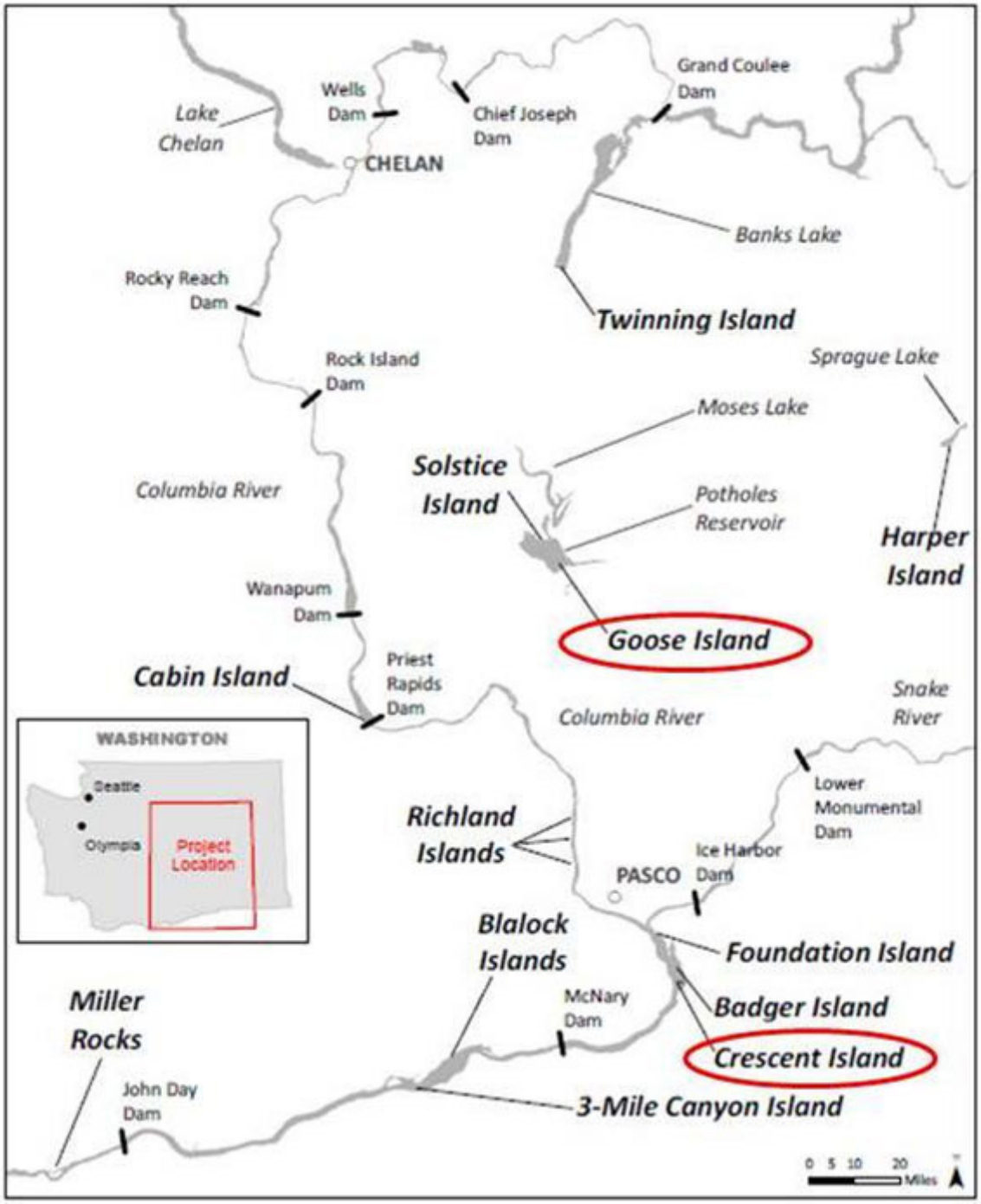
Supplemental BiOp, which was released on January 17, 2014. It contains the following reference to the IAPMP:

- The 2008 BiOp (RPA Action 47) also required the Action Agencies to develop an inland avian predator management plan. This plan and an associated Environmental Assessment are expected in early 2014, which will be in time for limited implementation prior to the 2014 nesting season. At this time, only Caspian terns nesting on Goose Island in Potholes Reservoir and Crescent Island in the Columbia River are slated for management action (e.g., reductions in nesting habitat). Survival benefits to Upper Columbia River (UCR) steelhead and spring Chinook would begin to increase once nesting dissuasion actions begin in early 2014 (up to the currently estimated survival benefits of 11.4 percent and 3.0 percent, respectively, in subsequent years). Additional benefits to Upper Columbia and Snake River ESUs/DPSs may follow once alternative tern habitat can be developed outside the Columbia River basin and nesting dissuasion actions begin at Crescent Island (expected 3 to 4 years after the Goose Island management action).

This statement is consistent with the benefits described at Goose and Crescent Islands under the proposed actions' phased approach outlined in this EA and proposed IAPMP. For the purposes of the IAPMP, Action Agencies means only the Corps and Reclamation.

1.2.2 Research and Studies

Between 2004 and 2009, up to 93,000 colonial waterbirds from five different species were documented to be nesting each year in the inland Columbia River Basin region (Lyons et al. 2011a). These species include CATEs, double-crested cormorants (DCCO), American white pelicans, California gulls (CAGU), and ring-billed gulls (RBGU), nesting at 18 different colonies at 12 geographic locations (Figure1-2). Recent research found that these waterbirds together consumed well over one million juvenile salmonids annually during that same time period (Lyons et al. 2011b). These studies stated that although inland colonies are much smaller than their Columbia River estuary counterparts, inland colonies can be much more dependent on salmonids for food and have a higher per capita impact on salmonids. The greater reliance on salmonids, in tandem with a lower diversity of salmonid stocks in comparison to the estuary, is responsible for the unexpectedly high impact on particular ESA-listed salmonid populations.



Source: Modified from Roby et al. 2013.

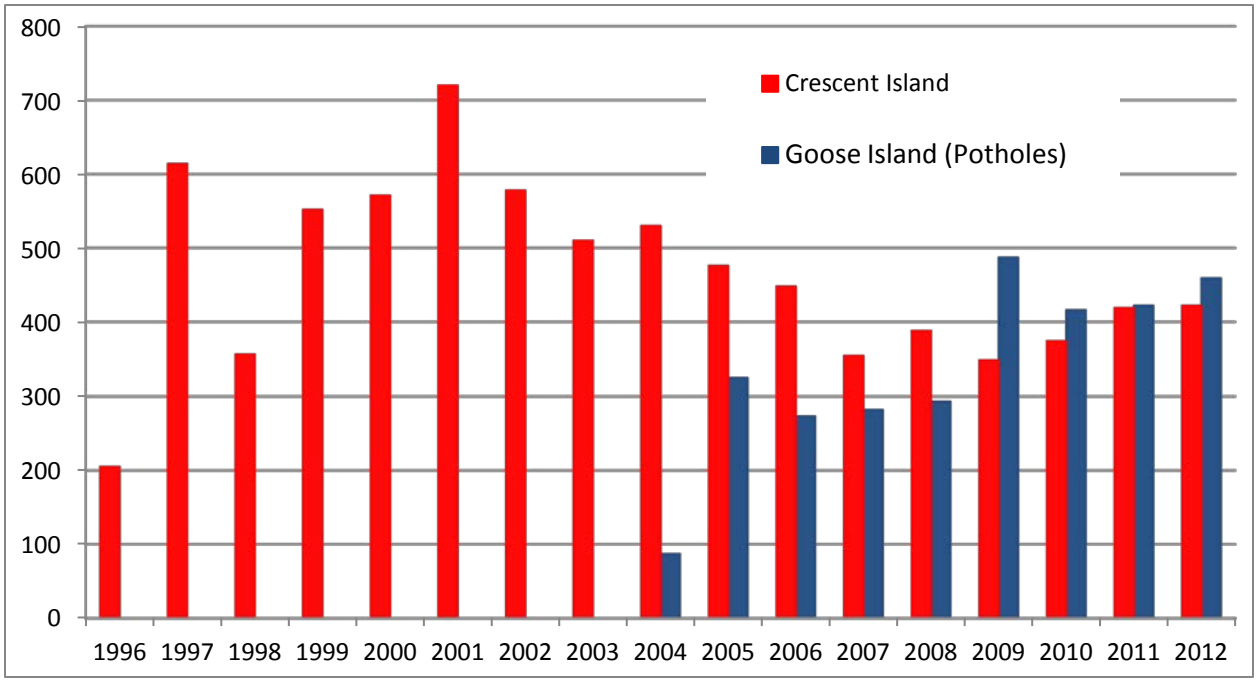
Figure 1-2. Project area in the inland Columbia River Basin showing the locations of active and former breeding colonies of piscivorous colonial waterbirds.

The Corps commissioned a study, hereinafter referred to as the Benefits Analysis, to assess the effects of potential inland avian management activities on increasing the average annual salmonid population growth rates (Lyons et al. 2011a). The Benefits Analysis became the biological basis for the development of the IAPMP, and is hereby

incorporated into this EA by reference.[1] The Benefits Analysis focused primarily on the five species of colonial waterbirds mentioned above. Data were collected from the 18 different breeding colonies used by these five species during 2004 to 2010 (Adkins et al. 2011). The goal of the Benefits Analysis was to estimate benefits to salmonid populations from potential reductions in avian predation by colonies of piscivorous waterbirds in the inland Columbia River Basin region. Using predation rate data for inland bird colonies (i.e., upstream of Bonneville Dam) and the framework of a simple deterministic population growth model, potential changes in juvenile salmonid survival due to reductions in avian predation was translated into increases in the average annual population growth rate referred to as lambda (λ).

This Benefits Analysis identified nesting colonies of CATEs at Goose and Crescent Islands as major contributors to ESA-listed salmonid predation in the inland Columbia River Basin (Lyons et al. 2011a). In 2012, these colonies had over 400 pairs of nesting CATEs each (Roby et al. 2013), and are the two largest CATE colonies in the inland region. The number of CATE pairs at Crescent Island has fluctuated between 200 in 1996 and 720 at the highest in 2001 (Adkins et al. 2011; Roby et al. 2011a; Roby et al. 2013; USFWS 2013a personal communication). At Goose Island, CATEs began nesting in 2004 when there were 191 pairs and increased to a high of 487 pairs in 2009 Adkins et al. 2011; Roby et al. 2011a; Roby et al. 2013) (Figure 1-3, Table 3-4).

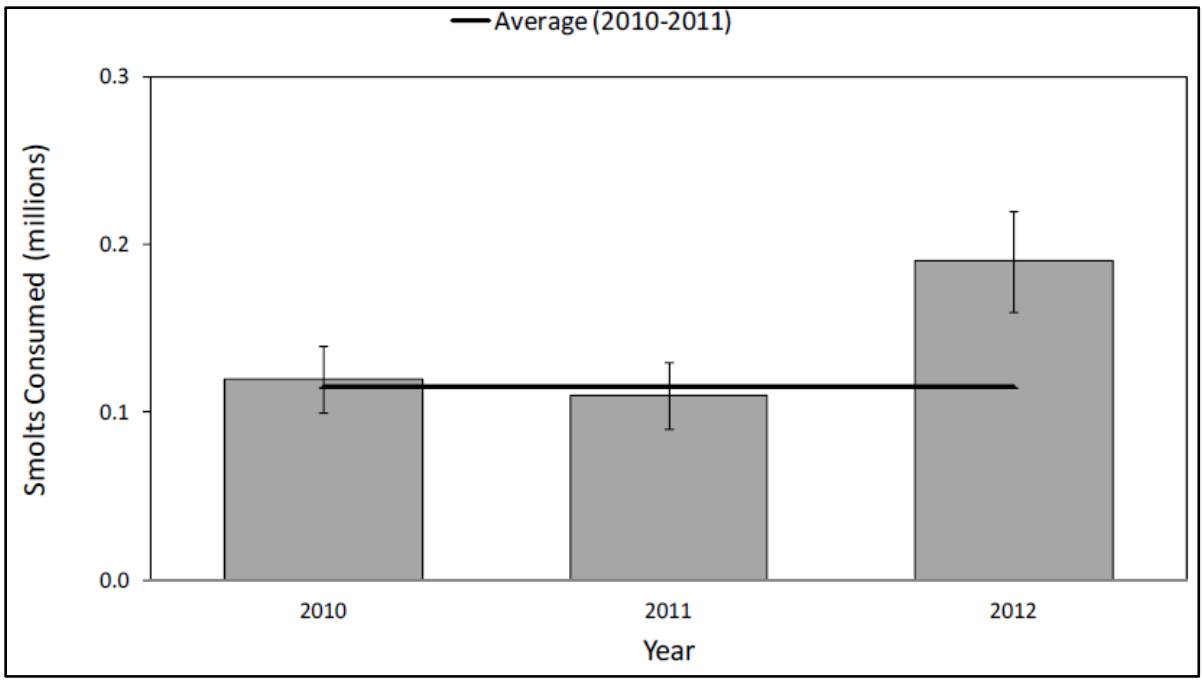
[1] http://www.salmonrecovery.gov/Files/Comprehensive%20Evaluation/Lyons-etal_2011_Benefits-Reduction-Avian-Predation-Columbia-Plateau.pdf



Source: Adkins et al. 2011; Roby et al. 2011a; Roby et al. 2013.

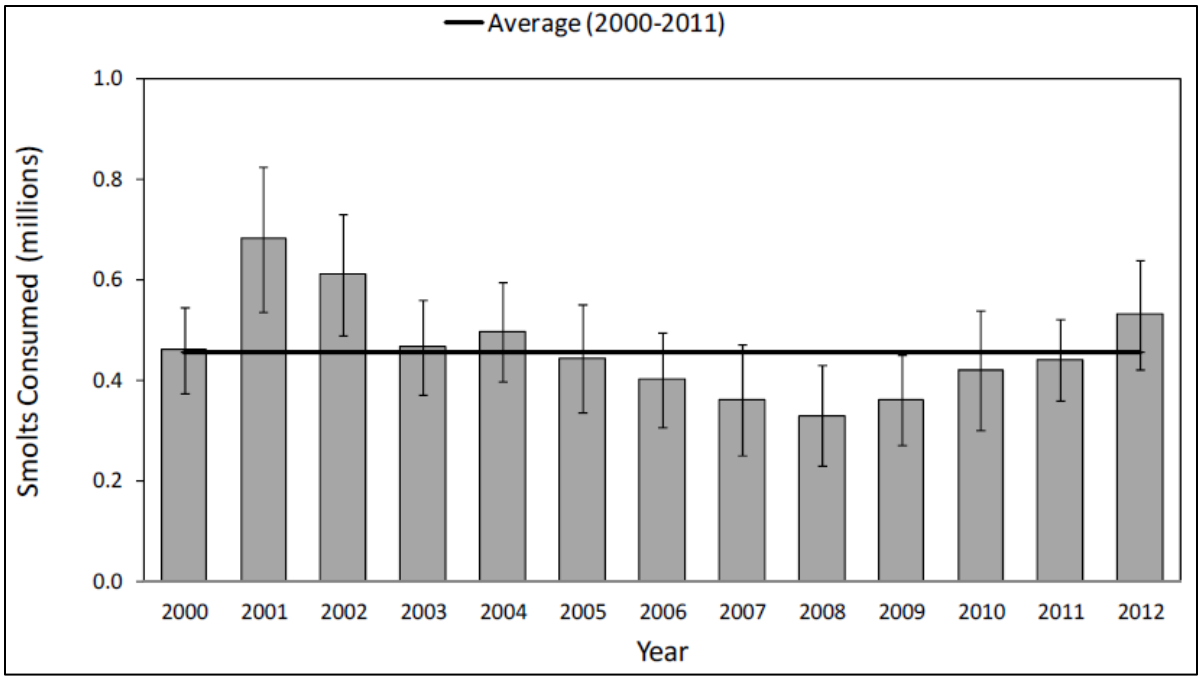
Figure 1-3. Numbers of CATE pairs at Goose and Crescent Islands, 1996 to 2012.

In 2012, the Goose Island CATE colony consumed an estimated 180,000 to 200,000 juvenile salmonids from the Columbia River (Figure 1-4). For Goose Island, this was the highest point estimate for smolt consumption since data collection started in 2010. In 2012, the Crescent Island CATE colony consumed an estimated 420,000 to 640,000 juvenile salmonids (see Figure 1-5). For Crescent Island, this was the highest point estimate for smolt consumption since 2002 (Roby et al. 2013). When CATE numbers at Crescent Island (Figure 1-3) are compared with estimated total annual consumption (Figure 1-5), a correlation can be seen between numbers of CATEs at a colony and total annual consumption; as estimated population drops from 2001 to 2007, total annual consumption also drops. This correlation between colony size and consumption rates at Goose and Crescent Islands is expected to continue for the foreseeable future, due in part to the more stable nature of the food source along interior Washington rivers than on the coast, and assuming conditions (e.g., water levels, transport of salmonids by barge around dams) on the Snake and Columbia Rivers remain similar.



Source: Roby et al. 2013

Figure 1-4. Estimated total annual consumption of juvenile salmonids by Goose Island CATEs from 2010 to 2012 based on fish identified in bill-loads on-colony and bioenergetics calculations. Error bars represent 95% confidence intervals.



Source: Roby et al. 2013

Figure 1-5. Estimated total annual consumption of juvenile salmonids by Crescent Island CATEs from 2000 to 2012 based on fish identified in bill-loads on-colony and bioenergetics calculations. Error bars represent 95% confidence intervals.

As described in Section 4.1.1 below, the estimate of predation rate by CATEs nesting at Goose Island/Potholes Reservoir in 2012 (17.0 percent) was higher than the estimate in 2011 (12.7 percent), and was the second highest estimate since this study began in 2008.

Based on PIT tag recovery data, it is estimated that Goose Island CATEs have had up to a 14.6 percent predation rate on Upper Columbia River steelhead and Crescent Island CATEs up to a 2.7 percent predation rate on Snake River steelhead (Table 1-1). Predation rates were calculated based on (1) the percentage of PIT-tagged smolts detected passing hydroelectric dams that were subsequently recovered on a downstream bird colony and (2) the probability of recovering PIT tags deposited on each bird colony" (Evans et al. 2011a). In comparison to CATEs, predation rates on salmonids by other bird species, when adjusted to account for the portion of juvenile salmonid transported around the inland Columbia River Basin waterbird colonies, appear to be much lower (less than 2 percent) (Lyons et al. 2011b).

Table 1-1. Predation rates on ESA-listed salmonid populations by select avian colonies from 2007 to 2010, adjusted to account for fraction of the ESU transported around the Columbia Plateau waterbird colonies as part of the Corps juvenile salmonid transportation program

		Chinook (%)			Sockeye	Steelhead (%)	
Bird	Island	SR[b] (sp/su)	SR[b] (fall)	UCR[c] (sp)	SR[b]	SR[b]	UCR[c]
CATE	Goose	-	-	3.0	-	-	14.6/11.4[a]
CATE	Crescent	0.6	0.6	0.4	0.6	2.8	2.7/2.3[a]
CATE	Blalock	0.1	<0.1	0.1	≤0.1	<0.4	0.7
DCCO	Foundation	0.8	0.4	<0.1	1.1	1.6/1.4[a]	0.1
Gulls[d]	Miller Rocks	0.3	0.3	0.4	0.6	1.2	1.6

Source: Lyons et al., 2011a.

Notes:

a Hatchery reared fish/wild fish where there was a significant difference

b SR=Snake River

c UCR=Upper Columbia River

d Both ring-billed and CAGU

The Benefits Analysis concluded the greatest benefits to ESA-listed salmonids (steelhead populations in particular) would result from reducing predation by CATEs at the Goose and Crescent Island colonies. The largest potential benefits in reducing predation by a single colony is at Goose Island, with up to a 4.2 percent increase in λ for UCR steelhead and a 0.7 percent increase in λ for UCR Chinook (see Benefits Analysis, Table 8 [Lyons et al. 2011a]). The maximum λ benefits for Crescent Island is 0.7 percent for Upper Columbia River steelhead and 0.5 percent for Snake River steelhead. The potential benefits to Snake River steelhead were lower, in part, because large

portions of juvenile salmonids are transported downstream in barges and are therefore unavailable to avian predators in the mid-Columbia River. Furthermore, there is a broader array of salmonid ESUs within the foraging range of CATE nesting at Crescent Island such that CATE consumption rates by individual ESU are generally lower than predation rates on UCR steelhead for CATE nesting at Goose Island. These reductions in predation rates and increase to λ assume the entire colony would be dissuaded from Goose Island and not relocate elsewhere within the foraging range of the Columbia River Basin. The Benefits Analysis also identified that λ may be influenced by the hypothesis that avian predators disproportionately consume smolts that are less likely to survive to adulthood, indicating that smolt mortality from avian predation is partly compensatory (i.e., avian predators consume smolts that would likely die anyway due to another cause such as non-avian predation or disease) and not fully additive (i.e., smolt mortality is only due to avian predation). If this is the case, the population growth rates (λ) identified above would be reduced. At this time, there are no specific studies published that help quantify the level of compensatory mortality associated with avian predation in the Columbia River Basin. Therefore, due to this uncertainty, the benefits used for comparison of alternatives in this EA assumed zero compensatory mortality similar to other comparative analyses made within the BiOp.

In comparison to CATE nesting at Goose Island and Crescent Island, the incremental benefits to ESA-listed salmonids are expected to be substantially lower through reductions in predation by other avian predators within the inland Columbia River Basin including CATEs at Blalock Islands, DCCOs at Foundation Island, and gulls nesting on Miller Rocks. Based on the best available data and information identified above and further described below in this EA, the management of these other inland waterbird colonies appears to provide only marginal or undetectable reductions in predation and population growth rate increases.

Based on these results, it was determined that the greatest potential for increasing juvenile salmonid survival by managing inland avian predators would be gained by focusing management efforts on CATEs at Goose and Crescent Islands. Efforts to reduce predation by other existing or incipient piscivorous waterbird colonies may warrant consideration in the future based on data obtained through the adaptive management portion of the IAPMP or through other data sources and appropriate supplemental/tiered NEPA analysis.

1.3 Purpose and Need

The purpose of the proposed action is to increase survival of ESA-listed juvenile salmonids by reducing predation-related losses from CATE colonies at Crescent and Goose islands through development and implementation of an IAPMP, in accordance with the BiOp. The effectiveness of CATE dissuasion at Goose and Crescent Islands

would be enhanced by actions to limit CATEs from forming new colonies and/or expanding existing colonies within the Columbia River Basin. The IAPMP should include habitat enhancement measures to attract CATEs to areas outside the basin, and adaptive management dissuasion actions to limit the formation or expansion of incipient colonies within the basin. In addition to providing substantial and achievable benefits to ESA-listed salmonids, the IAPMP actions should minimize impacts to CATEs, which are protected under the Migratory Bird Treaty Act (MBTA), as well as other resources and species of concern, in compliance with all applicable laws. The IAPMP should make use of adaptive management and a phased approach to implementation to allow for a major portion of the benefits to be realized early during implementation (consistent with the Draft 2013 Supplemental BiOp described in Section 1.2.1), while additional information is garnered and uncertainties are resolved through adaptive management. The need for action is based on the Action Agencies' requirement to avoid jeopardizing the listed species pursuant to the BiOp. Additional benefits for ESA-listed salmonids would be achieved in later years of implementation and may involve appropriate supplemental/tiered NEPA analysis.

1.4 Project Authority and Responsibility

1.4.1 U.S. Army Corps of Engineers

The Corps is responsible for the implementation of actions of the BiOp that pertain to the operation and/or maintenance of Corps civil works projects that may affect ESA-listed species. The responsibility of the Corps regarding management of inland avian predation in the Columbia River arises from implementation of the BiOp. Specifically, RPA Action 47 states: "The FCRPS Action Agencies will develop an avian management plan (for double-crested cormorants, Caspian terns, and other avian species as determined by research, monitoring, and evaluation [RM&E]) for Corps-owned lands and associated shallow water habitat." Although the BiOp required the IAPMP to address predation by "other avian species," the 2014 Supplemental FCRPS BiOp (released January 17, 2014) acknowledges that "no reductions in avian-caused mortality rates were assumed" in the 2008 analysis and "only Caspian terns nesting on Goose Island in Potholes Reservoir and Crescent Island in the Columbia River are slated for management action (e.g., reductions in nesting habitat)" through 2018. Initial analyses were conducted on numerous avian species to determine potential benefits, CATE colonies in the inland basin were found to have the highest rates of predation and the highest potential for achieving benefits to salmonids. The Corps and Reclamation intend to carry out inland avian predator management actions, as analyzed in this EA, by addressing CATE predation on ESA-listed salmonids from colonies at Goose and Crescent Islands. The Corps's authority for the proposed action is Section 511(c) of the Water Resources Development Act of 1996, as amended. This provides the authority for the Corps to implement the results of research and development activities to reduce

nesting populations of avian predators on and in the vicinity of dredge spoil islands in the Columbia River Basin. Funding for the implementation of specific actions at Crescent Island, new nesting habitat outside the basin, and at-risk islands by the Corps, to reduce avian predation, is subject to Congressional appropriation.

1.4.2 U.S. Bureau of Reclamation

Reclamation, as an FCRPS Action Agency, is cooperating in the scoping and development of the IAPMP and regulatory documentation, and is responsible for the implementation of RPA actions of the BiOp that pertain to the operation and/or maintenance of Reclamation Project facilities. The BiOp, (specifically RPA Action 68, see Section 1.2.1) requires the Action Agencies to monitor and evaluate avian predators on mid-Columbia River salmonids, as well as develop a management plan to be implemented as warranted. Through monitoring, the Goose Island CATE colony was identified as contributing to predation-related losses of ESA-listed Columbia River salmonids. Therefore, action by Reclamation would be undertaken in conjunction with the Corps's management plan under RPA Action 47.

The Reclamation authority for management action comes from Section 14 of the Reclamation Project Act of August 1939 (43 USC 389), and specific authority for action at Goose Island which is within the Columbia Basin Project is provided by the Columbia Basin Project Act of March 10, 1943 (57 Stat. 14, 15 USC 835). Funding for the implementation of specific actions by Reclamation to reduce avian predation is subject to Congressional appropriation.

1.5 Scope of Analysis

The scope of effects analysis for IAPMP alternatives includes areas within the inland Columbia River Basin, from Bonneville Dam to Chief Joseph Dam and including related adjacent inland areas in Oregon and Washington. As identified in the Purpose and Need, the focus of initial management actions is on Goose and Crescent Islands. However, the geographic scope also includes at-risk islands where there is a probability of incipient CATE colony expansion or new establishment within the inland Columbia River Basin. This EA involves site-specific evaluation of potential environmental effects for the actions that can be defined at this time. The potential effects associated with dissuasion at both Goose and Crescent Islands and potential adaptive management actions at ten at-risk islands are evaluated at a site-specific level. Evaluation of potential effects associated with development of new nesting habitat outside the basin and actions to limit the formation of incipient colonies at inland locations other than the at-risk sites are addressed in this EA to a level possible at this time (see Section 4). Given potential sites where these actions may occur are wide-ranging from southern California to Alaska and the potential effects could differ widely depending on the site(s) that are

selected, these actions will also require a subsequent supplemental/tiered NEPA analysis prior to implementation.

Crescent Island and several other at-risk islands are managed by the U.S. Fish and Wildlife Service (USFWS) as part of the McNary National Wildlife Refuge. Crescent Island was transferred to the USFWS from the Corps in 2007 as documented in Public Law 110-114. However, by this law, the Corps maintains the ability to carry out management of avian predation management on juvenile salmonids at these locations.

SECTION 2.0 ALTERNATIVES

2.1 Alternative Development

The Corps and Reclamation considered a broad range of potential avian predator management actions throughout the inland basin area in the preparation of this EA. The array of potential actions considered under the BiOp (RPA Action Nos. 47 and 68) were broken down largely by nesting colony, with each one typically having a range of specific actions.

Ultimately, as identified in Section 1 above, the Corps and Reclamation decided to focus on developing an IAPMP to manage CATEs at Goose and Crescent Islands. The IAPMP has four objectives:

- Reduce CATE consumption of ESA-listed salmonids including Upper Columbia and Snake River steelhead, Chinook salmon, and sockeye salmon in the inland basin.
- Dissuade CATEs nesting on Goose and Crescent Islands and at-risk islands if necessary.
- Preclude the establishment of incipient CATE nesting colonies on Crescent Island during Phase 1.
- Provide conditions suitable for CATE colony establishment outside of the inland basin.

These management actions presented the most robust benefits to salmonids (primarily Upper Columbia River [UCR] steelhead, UCR spring Chinook and Snake River [SR] steelhead) in the inland Columbia River Basin region. This conclusion was based primarily upon the potential to positively affect salmonid population growth rate estimates presented in the Benefits Analysis (Lyons et al. 2011a).

2.2 Description of Alternatives

Three action alternatives were identified as potentially satisfying the stated purpose and need. A “No Action” alternative (although not satisfying the stated purpose and need) is included as required by NEPA to provide a baseline to compare other reasonable alternatives. The following four alternatives are analyzed in this EA:

- Alternative A – no action.
- Alternative B – passive hazing (habitat modification) to dissuade CATE nesting on Goose and Crescent Islands including: adaptive management actions to limit CATEs from forming new colonies and/or expanding existing colonies within the Columbia River Basin; development of new nesting or improvement to existing CATE habitat (called “habitat enhancement”) to attract CATEs to areas outside

the basin; and, a phased approach due to the uncertainty associated with how CATEs would respond to passive hazing.

- Alternative C – passive hazing (Alternative B) combined with active hazing to prevent CATEs from nesting on Goose and Crescent Islands.
- Alternative D – passive and active CATE hazing (Alternative C) combined with limited CATE egg removal in support of non-lethal measures (Preferred Alternative).

2.2.1 Alternative A: No Action

Under the No Action Alternative an IAPMP would not be developed for the inland Columbia River Basin and no new actions to reduce avian predation would take place. The current range of avian predation management actions would continue for the foreseeable future.[2] No habitat-related management actions for avian predation in the project area would be implemented under this alternative. The CATE colonies at Goose and Crescent Islands would likely continue at their current population numbers. No habitat management or other dissuasion methods would be implemented on CATEs within the inland basin by the Action Agencies. Nesting habitat would likely continue to be present for CATEs at these locations similar to what currently exists. It is likely that these CATE colonies would continue to consume salmonids present in the Columbia River Basin following existing trends. Additionally, the potential for members of extant CATE colonies at Goose and Crescent Islands, as well as other locations such as East Sand Island, to relocate to other locations, including those designated in this EA as at-risk islands, would not be hindered by Action Agency management actions directed at CATEs in the inland Columbia River Basin.

2.2.2 Alternative B: Habitat Modifications to Dissuade CATE Nesting

Actions in Alternative B consist of habitat alterations to create unfavorable nesting conditions for CATEs at Goose and Crescent Islands. This alternative also includes adaptive management actions to limit CATEs from forming new colonies and/or expanding existing colonies within the Columbia River Basin as well as development of new or improvement to existing CATE nesting habitat (called “habitat enhancement”) to

[2] Current (ongoing) dam-based avian predation control actions including hazing efforts (both lethal and non-lethal) and bird deterrent installations are related, but separate, actions and outside the scope of this EA. New/future dam-based actions (if any) would be identified in coordination with the Fish Passage Operations and Management (FPOM) team and separate supplemental/tiered NEPA analysis (if required).

attract CATEs to areas outside the basin. Due to the uncertainty associated with how CATEs would respond to habitat modifications, these actions would be implemented in a phased approach, which includes:

- Phase 1 Actions
  - On Goose Island, place a network of rope and flagging to prevent CATE nesting.
  - If needed, formation of incipient CATE colonies on Crescent Island will be prevented by using a network of rope and flagging.
  - Willows will be experimentally planted on Crescent Island to evaluate their survival.
  - If necessary, dissuasion actions (i.e., rope and flagging) will be implemented on at-risk islands where incipient CATE colonies attempt to establish.
  - CATE habitat enhancement site research and supplemental/tiered NEPA analysis will be completed.
- Phase 2 Actions
  - Habitat enhancement site(s) will be prepared to attract CATE nesting.
  - If determined to be appropriate by U.S. Bureau of Reclamation, Goose Island substrate may be modified by adding dissuasion material such as large cobble to act as a as a longer-term, more sustainable dissuasion method.
  - In order to dissuade the primary CATE colony on Crescent Island, vegetation will be planted and/or a berm may be constructed (passive hazing).
  - CATE dissuasion will be performed as needed on at-risk islands.

The phased approach has the following benefits that support the purpose and need for action (i.e., to reduce avian predation on ESA-listed salmonids in the inland Columbia River Basin):

- Allows the project to be implemented in an adaptive management context that acknowledges and addresses uncertainties associated with the proposed actions.
- Promotes flexible decision making through regular monitoring and assessment of data related to the anticipated outcomes of proposed actions and the potential to alter activities to better achieve the stated objectives.
- Allows for a major portion of the project benefits to salmonids to be achieved in Phase 1, while Phase 2 actions are either tested or more fully defined or while uncertainties are resolved through monitoring.

- Allows for cessation or reversal of Phase 1 actions, if necessary, through adaptive management.

As noted in the rationale, this phased approach is tied to the AMP described in the IAPMP (Appendix A). Through the use of adaptive management, uncertainties associated with the outcomes of the proposed actions will be monitored and actions may be adjusted to better achieve the desired outcomes. The phased approach allows for the potential to cease Phase 1 actions if impacts are different than anticipated in the EA or to alter Phase 1 or Phase 2 actions based on new information gathered through monitoring and analyses. While the EA discloses the impacts of potential adaptive management actions that are fully defined at this time, some actions may require future supplemental/tiered NEPA analysis. For additional information on monitoring plans and targets to be used for adaptive management, see the IAPMP (Appendix A).

The implementation timeline for these habitat modification phases is shown on Table 2-1. This table identifies the implementation sequence for the various actions in Phases 1 and 2. These actions would be initiated between the months of August and early March to fall outside of the CATE nesting season. It is anticipated that Year 1 would occur as early as 2014. The year these actions are actually initiated, however, would dependent on the availability of funding and the timing of planning efforts for Phase 2 activities and may occur earlier or later than indicated in the table.

The implementation of Phase 2 habitat modifications at Crescent Island and Goose Island would occur after the identification and development of habitat enhancement at location(s) outside the Columbia River Basin, which would require a follow-on supplemental/tiered NEPA process once appropriate site(s) are identified. If habitat enhancement efforts are not implemented, reversal of Phase 1 actions would be considered within the adaptive management framework of the IAPMP (see Appendix A).

It is anticipated that habitat enhancement would likely be implemented in Year 3. If the Action Agencies were able to accomplish this a year earlier, then the remaining Phase 2 actions could be implemented a year earlier. Following this logic, if habitat enhancement is delayed a year or more, so would the remaining Phase 2 actions such that Phase 2 actions would not be implemented until habitat enhancement efforts are ready for implementation.

Table 2-1. Estimated Phases and Actions Timeline for Alternative B

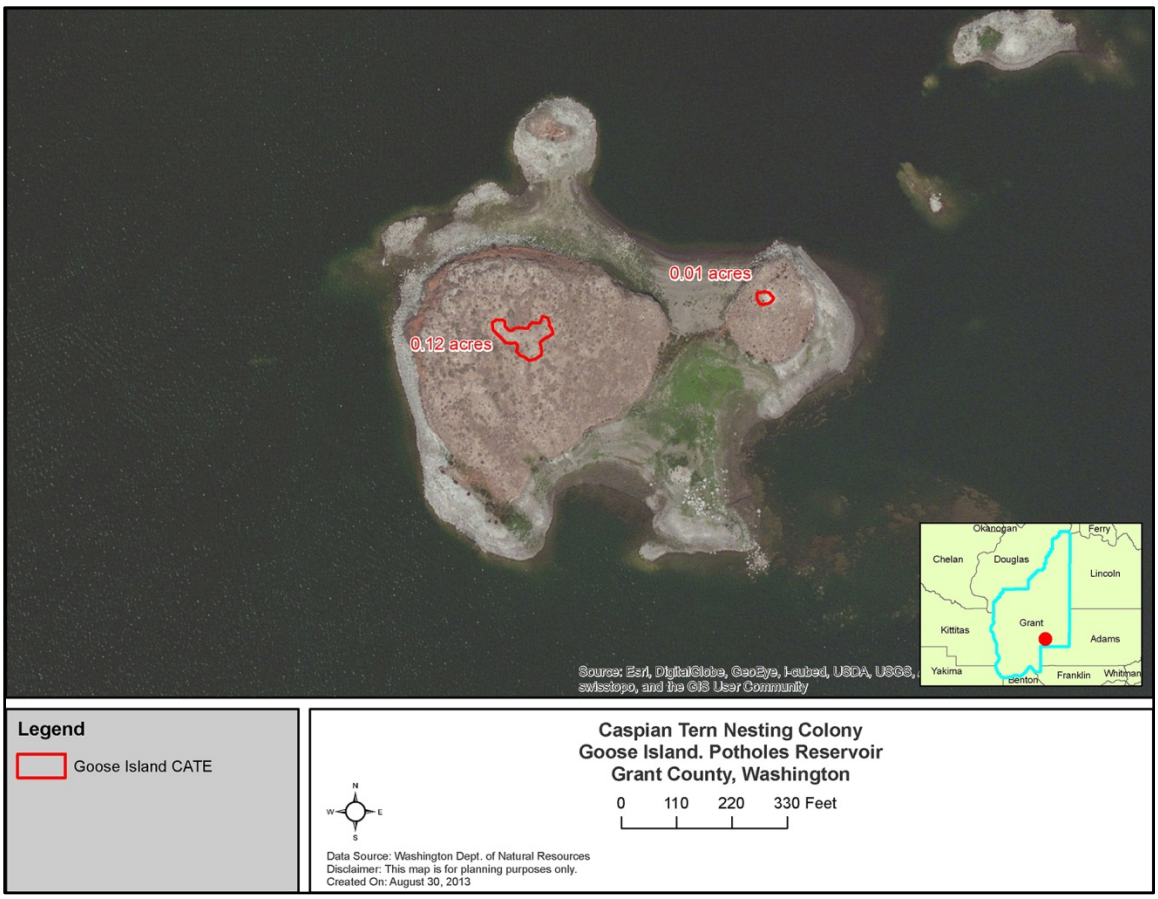
Action	Year 1	Year 2	Year 3	Year 4	Year 5
Phase 1					
On Goose Island, passive hazing of CATEs through modification of nesting areas with network of ropes and flagging.	X	X	X	(X)	(X)

Action	Year 1	Year 2	Year 3	Year 4	Year 5
If needed, formation of incipient CATE colonies on Crescent Island will be prevented by using passive hazing (ropes and flagging).		(X)	(X)		
Willows will be experimentally planted on Crescent Island to evaluate survival.	X				
CATE habitat enhancement site research and supplemental/tiered NEPA analysis will be completed.	X	(X)			
Phase 2					
Habitat enhancement site(s) will be prepared to attract CATE nesting.			X		
If necessary, Goose Island substrate may be modified by adding material such as large cobble as a lower maintenance dissuasion method.				(X)	(X)
To dissuade the primary CATE colony on Crescent Island, vegetation may be planted and/or a berm may be constructed (passive hazing).				X	(X)
Passive dissuasion for nesting CATEs will be performed as needed on at-risk islands in coordination with landowners.				(X)	(X)

Note: Parentheses indicate that action is implemented only if warranted.

2.2.2.1 Goose Island Habitat Modification Actions

Goose Island is approximately 4.9 acres and is sparsely vegetated with a plant community dominated by sagebrush. The CATE colony consists of two distinct colony areas in most years, nesting on elevated portions of the island consisting of bare sand in areas that, while surrounded by sagebrush, are locally sparsely vegetated (Figure 2-1). The west colony covers an area of 0.12 acre, and the east colony (which is not present in all years) covers an area of 0.01 acre. Throughout the island, surrounding the CATE nesting areas and occupying the majority of the island are nesting CAGU and RBGU, which nest at lower densities than CATEs and are more flexible in their nesting habits. Both gull species often nest on steeper slopes than CATEs and among and immediately adjacent to thicker and taller vegetation such as the sagebrush plants.

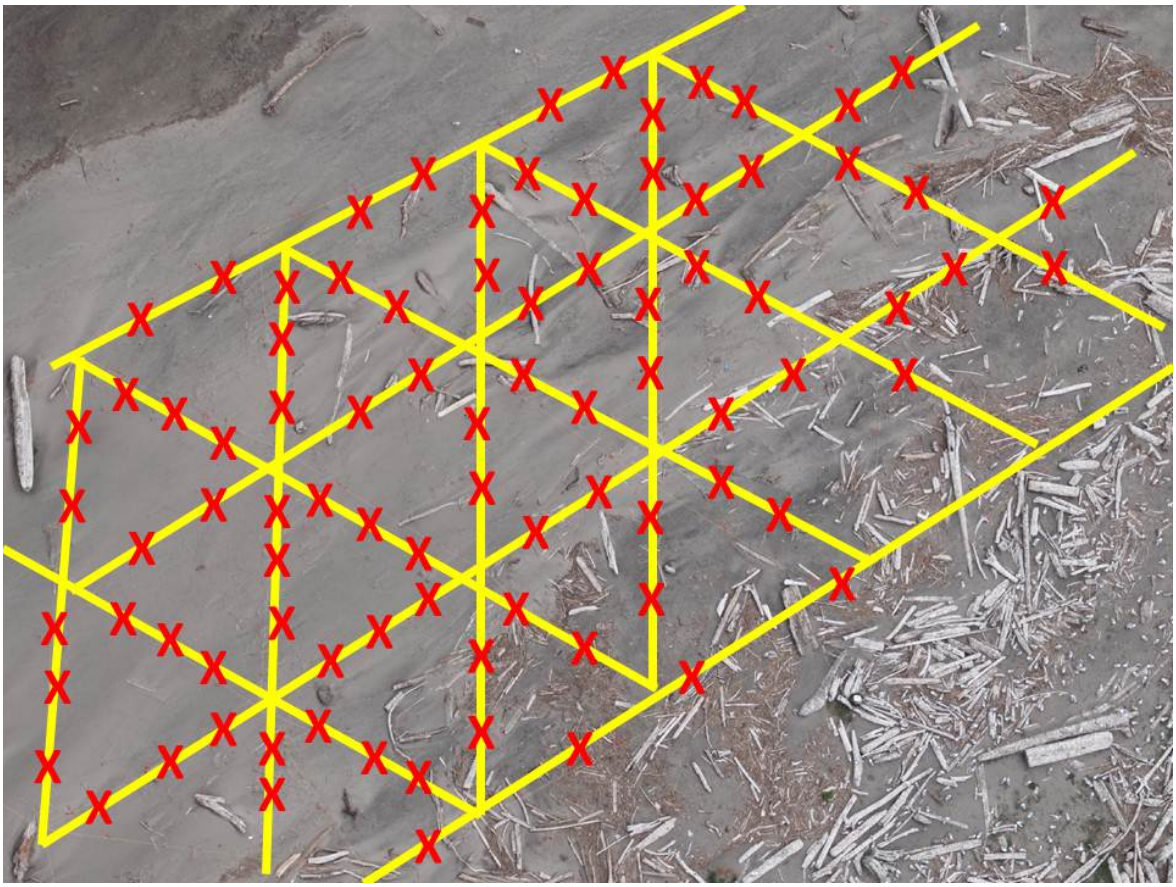


Source: BRNW 2011.

Figure 2-1. Locations of the CATE colonies on Goose Island, Potholes Reservoir.

Phase 1 – Rope and Flagging

In Phase 1, a network of rope and flagging supported by upright structures (e.g. posts) would be installed to dissuade CATEs from their existing nesting areas. Posts would be spaced at 10-foot intervals. Rope, approximately 0.25- to 0.5-inch in diameter, would be strung between the posts and elevated approximately 2 to 4 feet above the ground. Flagging material would then be inserted into the rope between each post so the flagging pieces hang down and flutter in the wind to act as a visual deterrent. Figure 2-2 shows a similar effective concept used for dissuasion of CATEs at East Sand Island (Columbia River estuary).



Source: BRNW 2012.

Figure 2-2. Layout of posts and flagging in the Columbia River estuary. Yellow lines designate yellow rope and a red "X" represents a length of flagging tied to the rope.

Covering the dissuasion areas on Goose Island with ropes and flagging was selected for use as part of Phase 1 as a proven and effective solution where soil characteristics and slope limit available options such as planting vegetation. In an attempt to prevent CATEs from expanding their nesting into areas immediately beyond their present colony location on Goose Island (into areas currently used by nesting gulls and other small plots where CATEs have attempted to nest in the past), the dissuasion area would be expanded to cover all likely potential nesting areas on the west (approximately 1.2 acres) and east (approximately 0.3 acre) colonies. The total dissuasion area of the east and west colonies would be approximately 1.5 acres.

If CATEs begin nesting beyond this initial installation area, additional dissuasion measures (e.g., rope and flagging) would be necessary. Locations would be determined based on reconnaissance efforts with additional, post, rope, and flagging expected to cover up to an additional 1.0 acre.

Phase 1 rope and flagging would occur in Year 1 and continue until determined to be unnecessary or until more permanent substrate modifications are implemented.

Phase 2 – Substrate Modifications

In Phase 2, Reclamation may consider the option to implement a more permanent and less maintenance-intensive dissuasion method for Goose Island: placement of baseball-size (or larger) cobble or boulders to create an unsuitable nesting substrate for the CATEs. This new substrate would cover the same area where rope and flagging was deployed in Phase 1 and may be implemented in Years 4 and 5.

The cobble/boulder material would come from an established and cleared pit near Potholes Reservoir and would be hauled to Goose Island by helicopter or boat and then be spread across the nesting area by a labor crew of up to 10 people.

As an adaptive management strategy, if monitoring indicated that CATE nesting continued along the fringes of the new substrate, substrate modification would be broadened to include these new nesting areas. It is anticipated that this additional adaptive management action could add an additional acre of habitat dissuasion beyond areas covered in Phase 1.

2.2.2.2 Crescent Island Habitat Modification Actions

Crescent Island is approximately 7.5 acres with a mix of dense upland shrub habitat, some trees, and bare ground. The island currently contains one CATE colony nesting on approximately 0.1 acre on the northeast side of the island (Figures 2-3, 2-4, and 2-5). CATEs nest in areas that are unvegetated, surrounded by CAGU and RBGU which typically nest at lower densities than CATEs, including immediately adjacent to and amongst shrubs and herbaceous plants.

Source: BRNW 2011.

Figure 2-3. Crescent Island. Location of primary CATE colony (red outline). Location of 2012 failed incipient colony (dotted white outline).

Source: Normandeau Associates, 15 August 2012.

Figure 2-4. Crescent Island showing CATE nesting area (white area) in the northeast part of the island.

Source: BRNW 2011.

Figure 2-5. CATE nesting area on the northeastern part of Crescent Island. Nesting gulls surround the CATEs.

Phase 1 Actions

Rope and Flagging to Preclude Development of Incipient Colonies

The Crescent Island Colony would be monitored during nesting seasons to ascertain whether CATEs and gulls dissuaded from other nesting locations such as Goose Island attempt to relocate to Crescent Island. Monitoring of CATEs at Crescent Island will include observation of nesting behavior. If CATEs attempt to nest in areas outside the existing colony, temporary dissuasion measures (e.g., a network of rope and flagging as described above) would be installed to dissuade CATEs and limit this expansion. For example, monitoring of nesting activities during Year 2 will provide the basis for determining whether dissuasion activities are necessary within season or during to the following nesting season (i.e., Year 3). Actual dissuasion locations would be determined based on on-site monitoring efforts. Rope and flagging would be expected to cover no more than 0.5 acre away from the primary CATE colony. No dissuasion activities within the primary CATE colony (e.g., current 0.1 acre area as depicted in Figure 2-3) would occur during Phase 1 activities.

Vegetation Test Planting

In Year 1, as part of Phase 1, a small patch of willow whips (*Salix exigua* or similar native species) would be planted on the northeast end of the island, at least 100 feet from the existing CATE colony. The purpose of this test would be to determine if the

whips can be planted with a high probability of rooting success without the need for soil excavation (i.e., to a depth close enough to the water table). Soil excavation in this area may be needed to facilitate establishment of vegetation by decreasing the distance between the root zone and the water table. An estimated 75 willow whips would be planted, approximately 1 foot apart to a depth of up to 4 to 6 feet to facilitate this test. Experimental planting techniques may include planting whips at different depths, using different sizes, using different watering schemes, or other methods yet to be determined. The Phase 1 experimental plantings are designed to assess the effectiveness of planting techniques with potential ancillary benefits of precluding the formation of incipient CATE colonies. The results of this test action will inform adaptive management efforts and actions taken as part of Phase 2 including soil excavation and berm creation.

Phase 2 Actions

Unlike Goose Island, Crescent Island hosts abundant trees, shrubs, and herbaceous plants on parts of the island due to the soil profile and proximity of the ground surface elevation to the existing water table. Use of vegetation as a deterrent measure is anticipated to provide a more robust, cost-effective, long-term deterrent to nesting than posts, rope, flags, or other passive hazing actions (e.g., silt fencing) alone.

Phase 2 actions at Crescent Island would include additional measures to support vegetation planting including silt fencing (which will help with vegetation establishment) and the placement of large woody debris to improve dissuasion efforts while vegetation becomes established. Phase 2 habitat modifications would take place on both the CATE nesting area and less intensely on areas currently occupied by gulls where CATEs have previously attempted to nest in small numbers. Overall, these habitat modifications are designed to prevent CATEs from nesting on Crescent Island by providing visual barriers and reducing the amount of large open patches of bare ground preferred by CATEs for nesting.

Berm Creation

If the test willow plantings (Phase 1) are not successful, approximately 800 cubic yards (cy) of soil would be removed to a depth of up to 2 feet over approximately 15,000 square feet using small earthmoving equipment. Excavation of soil would facilitate establishment of vegetation by decreasing the distance between the root zone and the water table.

Rather than being removed from the island, the excavated soil would be used to create a 4-foot-tall berm, which would provide a visual barrier to the water for CATEs that might attempt to nest along the northeast edge of the island (Figure 2-6). Furthermore, the berm would provide an immediate visual barrier to CATEs before the planted

vegetation could become established. To deter CATEs and other piscivorous waterbirds such as DCCO from nesting on the berm, it would be armored with rock, such as cobble or riprap, using an in-house source (Reclamation has some nearby rock pits) or a commercial source from a preapproved facility. If the test willow plantings are successful, soil excavation and berm construction would not be necessary and willow plantings, as described below, extending over the berm footprint.

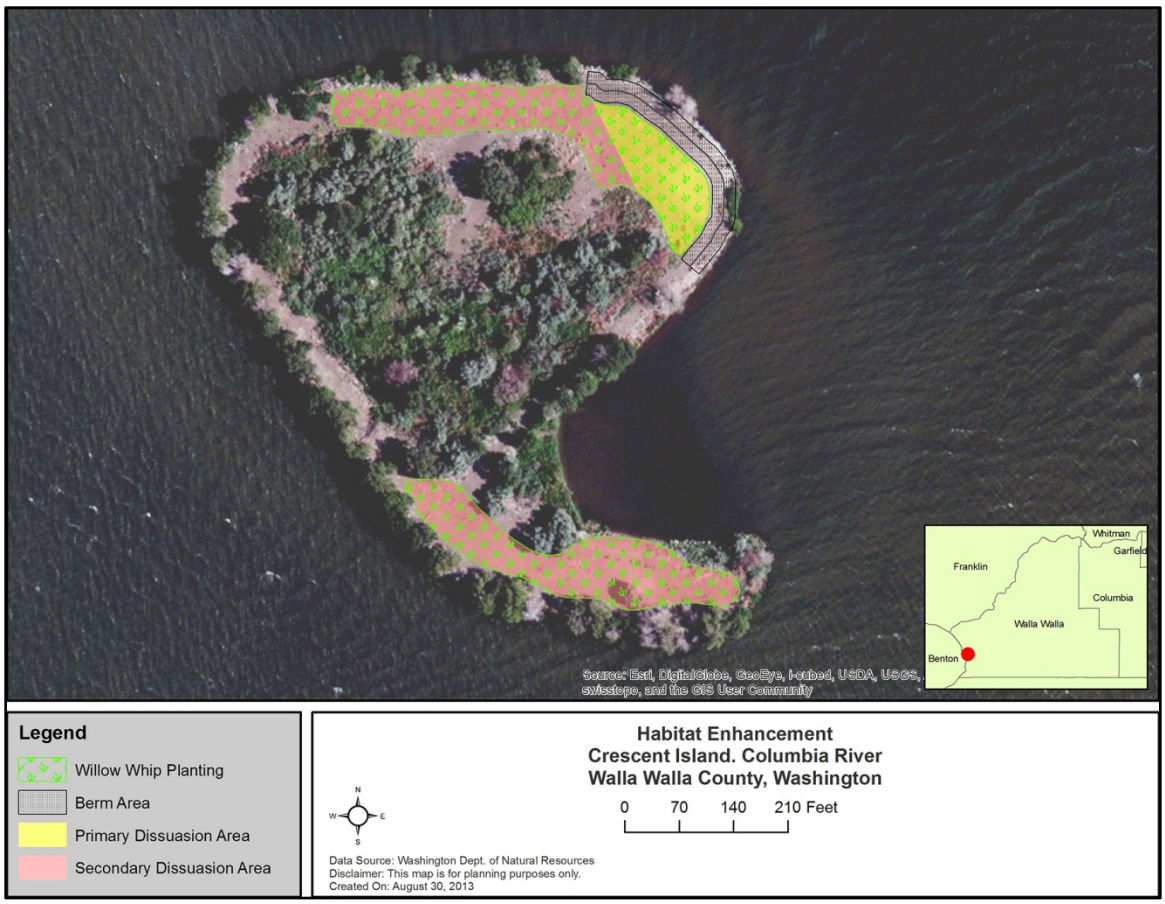
Vegetation Plantings

Coyote (narrowleaf) willow (*Salix exigua*), or another suitable native willow species, would be planted in rows across the primary and secondary dissuasion areas approximately 1 foot apart, to a depth of up to approximately 4 feet to facilitate access to groundwater. Willows would be planted in rows 10 feet apart at the primary dissuasion area and 15 feet apart in the secondary dissuasion areas (other open areas of the island where gulls and a few CATEs nest). The 15-foot separation of rows is anticipated to allow gulls to continue to nest while discouraging CATEs from nesting.

As noted above, excavation and berm creation in the primary dissuasion area is dependent on test results during Phase 1. If excavation of soil and berm creation is determined to not be necessary, willow planting will be expanded to cover the berm footprint identified in Figure 2-6. Excavation would not be required in the secondary dissuasion areas due to the slightly lower ground elevations in these areas and tolerance for slightly lower planting success.

Holes for willow whips would be dug up to 4 feet deep using equipment such as a water jet stinger. Willow whips would generally be at least 7 feet long, but likely 8 feet long or longer so that they project at least 4 feet above the ground.

Rows of approximately 4-foot-high mesh wire fencing would be placed around the perimeter of the primary dissuasion area and around the water-facing side of the secondary dissuasion area (Figure 2-6) and/or protective tubing would be placed around individual plants to prevent damage from beaver or other animals. The exact amount of wire fencing and/or protective tubing would be determined based on final site layout including the positions of the willows and the silt fences. Maintenance and replacement of plant protection would continue for 5 years after planting, or as necessary, to ensure a high survival rate of willows. Willow whips would generally be planted in February when willows are dormant to maximize successful establishment. Also, hunters often use the island until the end of January, but would be gone in February and there is no danger of disturbing bird species of concern because nesting begins in March (Glass 2012 personal communication).



Source: BRNW 2011.

Figure 2-6. Sketch of berm and planting in the primary dissuasion area (northeast corner of island) and planting in secondary dissuasion areas.

Silt Fence and Large Woody Debris

Silt fence has been very effective at dissuading CATEs from nesting on dredge spoil islands in the Columbia River estuary (Figure 2-7) (Roby et al. 2002). After a nesting area becomes so obstructed that visibility significantly declines, CATEs abandon the site (Roby et al. 2002). Silt fencing accomplishes this goal, but is only effective for as long as the fencing lasts. In addition, silt fence is beneficial in encouraging the establishment of native vegetation by providing protection for the soil from wind and trapping rainwater for emerging vegetation.

Source: USFWS 2005a. Photograph credit: Tim Jewett.

Figure 2-7. CATE colony on Rice Island (2000) with silt fencing used to prevent CATE nesting. Prior to 2000 and before the fencing was installed, nesting terns occupied the entire area shown in this photograph.

Silt fence would be erected in rows 10 feet apart at the primary dissuasion area and less densely (15 feet apart) in secondary dissuasion areas. Silt fences would be placed between planted rows of willow. The more conservative 10-foot spacing is denser than the minimum 15-foot spacing previously used to dissuade CATEs from nesting at Rice Island (Roby et al. 2002). This closer spacing would be used due to potential for repetitive efforts by CATEs to nest in this area, combined with the potential for some willow plantings to fail. In the secondary dissuasion areas, the 15-foot intervals would dissuade CATE nesting while still allowing gull nesting (Roby et al. 2002).

To minimize maintenance, high quality materials would be used to construct silt fencing. Landscape fabric would typically be used for silt fencing because it is more resistant to weathering by wind, rain, and sun. The silt fence would generally have a minimum height of 3 feet and would be attached to fencing posts.

In addition to silt fence, woody debris collected on the island would be placed in piles, 3 to 5 feet tall and several feet wide, around the perimeter of the island and between silt fences on the secondary dissuasion areas (Figure 2-6). This would create a visual barrier that would make the island less favorable for nesting CATEs. The actual height, width, and distribution of woody debris piles would depend on the final amount of debris available on site at the time of construction. Currently there is downed woody debris at several locations around the island, particularly along the western side. Most of this

downed debris could be moved or realigned on the southern part of the island. Standing dead trees along the perimeter of the island would remain standing for use as perches for bald eagles and other raptors. In addition to this existing source of dead woody vegetation, live Russian olive trees (*Elaeagnus angustifolia)* or shrubs are extensive on the island and could be cut and utilized for these debris piles. Debris piles are anticipated to be created in Year 4 or 5 as part of Phase 2 activities and would not be an ongoing maintenance activity. Silt fences are anticipated to be installed in Year 3 and would only be required until vegetation is established, after which they will be removed.

Plantings and silt fencing would be monitored for success in meeting overall project objectives. No additional planting is anticipated unless substantial (greater than 75 percent) plant failure occurs and overall project objectives (e.g., CATE dissuasion objectives) are not being met. If this occurs, then willow whips (or another native species as approved by Corps and USFWS) would be planted to restore the original plant density. If silt fencing becomes damaged, it would be repaired or replaced as needed. Both additional willow plantings and silt fence repairs would generally occur before CATEs begin to nest on the island.

As an adaptive management strategy, if monitoring indicated that CATE nesting continues along the fringes of or within the treated areas, additional habitat-related dissuasion measures would be implemented in future years. These could include more intensive planting of vegetation or placement of larger cobble or boulder substrate. It is anticipated that these contingency actions would occur on the fringes of the existing modified areas and would total less than an additional 0.5 acre.

2.2.2.3 At-Risk Islands (Incipient Colonies) Habitat Modifications

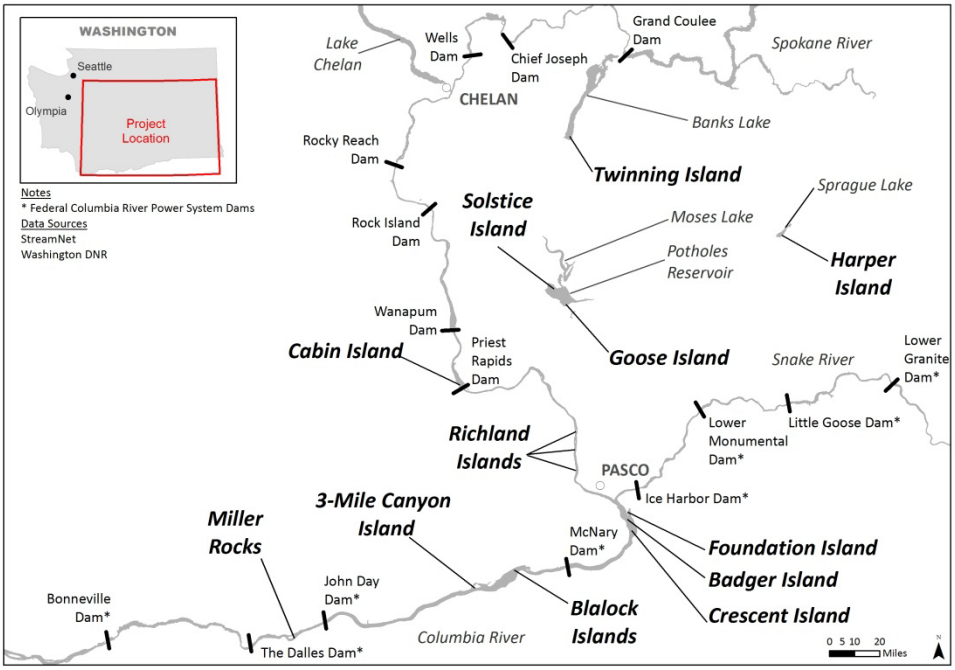
As a result of dissuasion activities at Goose and Crescent Islands, it is possible that existing small CATE colonies may expand or new CATE colonies may develop. These colonies could grow to a size that would reduce the benefits gained at Goose and Crescent Islands and would continue to have a sizeable impact on ESA-listed salmonids. As an adaptive management strategy, ten islands have been identified which have the highest risk for incipient colonies to develop. These ten at-risk islands include Blalock Islands, Badger Island, Three-mile Canyon Island, Richland Islands (18 and 20), Foundation Island, Miller Rocks, Twinning Island, Solstice Island, and Cabin Island (Figure 2-8).

Cabin Island is currently owned by WDFW, and through a 25-year agreement with Reclamation, which began in 2003, WDFW has management responsibilities for wildlife resources on Reclamation lands in the Columbia Basin that include parts of Potholes Reservoir and Banks Lake including Goose, Solstice, and Twinning islands.

Harper Island, located within Sprague Lake, was identified as a potential at-risk island. This island is privately owned and WDFW has specific fishing regulations to reduce human disturbance around the island. The Action Agencies may inform the owner about dissuasion actions that would be appropriate and encourage them to consider the implementation of these actions. For all other at-risk islands, where necessary, the Corps and Reclamation would coordinate with the land management agency as soon as possible to obtain clearance and agreements for any and all potential adaptive management actions on their properties.

If CATE colonies at any of these at-risk locations grow to a size of 40 nesting pairs, the predation impacts would be reevaluated and, if warranted, landowners would be notified and dissuasion measures (rope and flagging similar to Goose Island) would be implemented (see the IAPMP for additional information on AMP targets). The earliest these actions could be initiated would be Year 2 (proposed to be 2015) and would be continued until determined unnecessary.

Aerial images for each of these at-risk islands are shown in Appendix E.



Source: Modified from Roby et al. 2013.

Figure 2-8. Location of at-risk Islands along the mid-Columbia River and in the Columbia and inland basin.

2.2.2.4 Out-of-Basin Habitat Enhancement

The effectiveness of actions developed as part of the IAPMP to increase salmonid smolt survival depends not only on successful dissuasion of CATEs at Goose and Crescent

Islands but also on the ability to prevent CATEs from forming new colonies on the Columbia and Snake rivers of such a size as would reduce those benefits. For example, a colony of approximately 40 pairs on an island within the inland basin would initiate an investigation into the potential effects of the colony on ESA-listed salmonids. The development of new CATE nesting habitat or enhancement of existing nesting habitat (referred to as habitat enhancement sites) to attract CATEs to areas outside the basin, therefore, would be an important component of CATE management within the Columbia River Basin. Site identification and completion of the necessary planning requirements would occur as part of Phase 1 activities (e.g., plans and specs, supplemental/tiered NEPA, ESA consultation as appropriate,) while implementing of habitat enhancement activities would occur as soon as feasible as part of Phase 2.

Habitat Enhancement Metrics

Metrics for success of habitat enhancement conducted as part of this proposed management effort would be similar to measures taken by the Corps for the Columbia River estuary CATE dissuasion plan (USFWS 2005a) and in Seto et al. (2003). The criteria for this plan, as modified from the estuary plan, Seto et al. (2003) and Collis et al. (2012), are as follows:

- Contains sufficiently available, suitable nesting habitat to support approximately 1,000 nesting CATE pairs, does not experience frequent flooding or drought events, and has suitable base substrates.
- Has no long-term expensive operations and maintenance requirements.
- Is in sufficient proximity to a relatively stable and abundant prey source for CATEs.
- Is located in an area with minimal potential conflicts with ESA-listed fish (and other) species.
- Potential mammalian and avian predators and human disturbances are absent, not a limiting factor, or controllable.

To provide adequate nesting habitat for the number of CATEs dissuaded from Goose and Crescent Islands, as well as room for nesting gulls that may nest around the periphery of a new CATE colony, a 2:1 habitat creation to removal ratio was established for the IAPMP. This 2:1 ratio would create new nesting habitat covering an area of approximately 0.5 acre, roughly twice the size of the colony areas at Goose and Crescent Islands. This habitat would also be available for CATEs from other locations to utilize for nesting outside the Columbia River Basin.

Implementation of Phase 2 habitat modification at Crescent Island and possible additional habitat modification at Goose Island would occur after the identification and

implementation of a suitable habitat enhancement site(s) outside the Columbia River Basin. As noted in the following section, numerous potential sites have been investigated to date but a suitable and implementable site has been yet to be identified. At this time, potential sites are geographically dispersed ranging from southern California to Utah to the Puget Sound and many places in between. The affected environment of these locations and thus the potential resources that could be affected differ substantially amongst sites. As such, until a site can be identified, potential site-specific effects of developing habitat enhancement site(s) cannot be evaluated. This EA, therefore, addresses only potential general effects based on available information (see Section 4). Additional supplemental/tiered NEPA documentation would be prepared prior to the implementation of habitat enhancement in Phase 2. Implementation of this habitat enhancement is currently scheduled to occur in Year 3. The actual implementation year, however, would be subject to how quickly a new habitat site could be identified, when supplemental/tiered NEPA documentation is completed, and the availability of funding.

Site Assessment Study

To assist the Action Agencies in development of the IAPMP, Oregon State University conducted a habitat enhancement site assessment study using existing information on biological factors throughout the breeding range of CATEs in western North America to assess potential locations alternative nesting sites for CATEs currently nesting within the inland Columbia River Basin region (Collis et al. 2012).

A total of 145 current, former, or potential CATE colony sites were identified in western North America (Alaska to northwestern Mexico, west of the Continental Divide). Movement data of CATEs banded throughout the Columbia River Basin, including Crescent Island and Goose Island during 2005-2011, indicated connectivity across an extensive array of sites throughout coastal and interior western North America. Specifically, CATEs banded at Crescent Island or Goose Island were re-sighted at nesting or roosting locations in Alaska, British Columbia, Washington, Oregon, California, Idaho, Utah, and northwestern Mexico.

Of these 145 sites, many would not be available to be used as habitat enhancement sites due to conflicts with ESA-listed fish species (Table 2-2). Future studies for habitat enhancement sites will evaluate effects on ESA-listed species, both fish and other animals and plants.

Table 2-2. Potential locations of alternative nesting sites that will not be considered for development of habitat enhancement sites due to ESA-listed fish conflicts

Region/Colony or Roost	ESA-listed fish conflict	Lat.	Long.
Coastal Washington			
Bellingham Bay - Port of Bellingham	Likely[a]	48.747	-122.488
Padilla Bay - Unnamed Island	Likely	48.475	-122.532
Strait of Juan de Fuca - Smith and Minor islands	Likely	48.323	-122.822
Strait of Juan de Fuca - Dungeness Spit	Likely	48.166	-123.137
Strait of Juan de Fuca - Protection Island	Likely	48.128	-122.925
Puget Sound - Jetty Island	Likely	48.007	-122.228
Puget Sound - Seattle Waterfront (Pier 90)	Likely	47.636	-122.382
Puget Sound - Bremerton (Sinclair Inlet)	Likely	47.548	-122.652
Puget Sound - Tacoma Waterfront	Likely	47.254	-122.422
Grays Harbor - Unnamed Island	Likely	46.967	-124.003
Grays Harbor - Sand Island	Likely	46.963	-124.063
Grays Harbor - No Name Island	Likely	46.954	-124.045
Willapa Bay - Snag islands	Possible[b]	46.669	-123.968
Willapa Bay - Gunpowder Sands	Possible	46.683	-124.033
Interior Washington			
Banks Lake - Goose Island	Possible	47.647	-119.291
Banks Lake - Twinning Island	Possible	47.625	-119.303
Sprague Lake - Harper Island	Possible	47.248	-118.086
Coastal Oregon			
Tillamook Bay	Likely	45.516	-123.919
Coos Bay - Unnamed Island	Likely	43.386	-124.298
Interior Oregon			
Upper Klamath Lake - Williamson River Delta	Likely	42.465	-121.957
Upper Klamath Lake - Upper Klamath NWR	Likely	42.515	-122.058
Idaho			
Island Park Reservoir		44.406	-111.536
Minidoka NWR - Tern Island		42.664	-113.451
Bear Lake NWR - Unnamed Island		42.160	-111.296
Utah			
Great Salt Lake - Minerals Complex		41.314	-112.302
Great Salt Lake - Bear River Migratory Bird Refuge		41.429	-112.213
Neponset Reservoir		41.380	-111.130
Utah Lake - Rock Island	Likely	40.176	-111.801
Coastal California (North)			
Humboldt Bay - Sand Island	Likely	40.840	-124.124
San Francisco Bay - Brooks Island	Likely	37.900	-122.361
San Francisco Bay - Waterfront (Agua Vista Park)	Likely	37.768	-122.384

Region/Colony or Roost	ESA-listed fish conflict	Lat.	Long.
San Francisco Bay - Hayward Regional Shoreline	Likely	37.629	-122.144
Monterey Bay - Elkhorn Slough	Likely	36.814	-121.743
Coastal California (South)			
Los Angeles Harbor - Terminal Island (Pier 400)	Possible	33.717	-118.248
Huntington Beach - Bolsa Chica Ecological Reserve	Possible	33.695	-118.042
Newport Beach - Upper Newport Bay Ecological Reserve	Possible	33.648	-117.886
San Diego Bay - San Diego Bay NWR (Salt works)		32.600	-117.106
Interior California (North)			
Clear Lake - Clear Lake NWR	Likely	41.860	-121.170
Meiss Lake - Butte Valley Wildlife Area	Possible	41.859	-122.049
Goose Lake	Possible	41.962	-120.486

Source: Collis et al. 2012

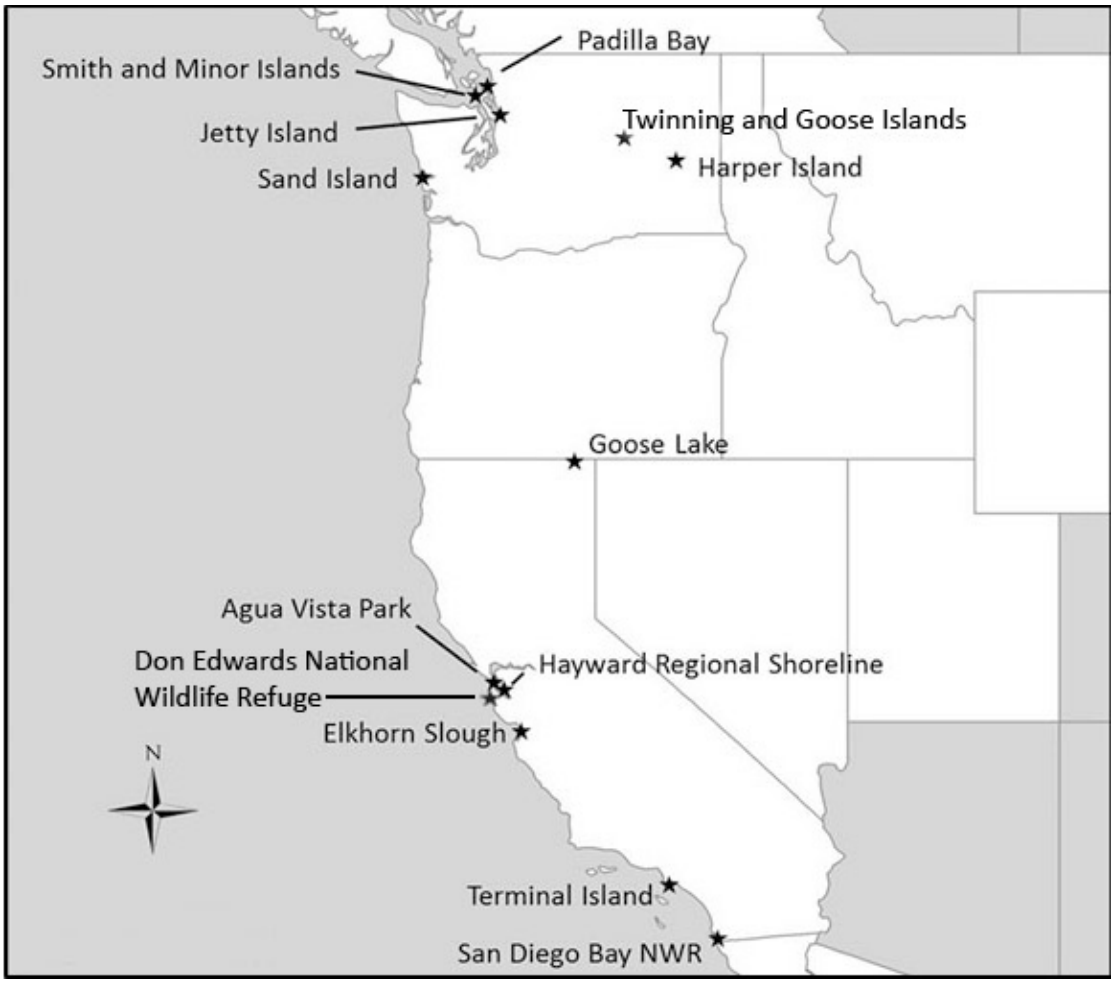
a ESA-listed fish prey species are present at the site.

b ESA-listed fish prey species are present within the potential foraging range of the site.

Evaluations of the 145 potential alternative nesting sites for CATEs identified by the study were conducted via literature review, colonial waterbird atlases, online databases, and extensive discussions with academic, federal, state, non-governmental, and provincial biologists across western North America (Collis et al. 2012). Results suggested that during the time the site assessment report was prepared in 2011 and 2012, 41 of these sites (28 percent) had management potential (Collis et al. 2012).

Biological characteristics for the 41 sites with apparent management potential were then used to assess the suitability of each site to attract CATEs to nest, the potential constraints at the site for sustaining a CATE colony, and considerations for enhancing the site to accommodate a CATE breeding colony. Of the 41 sites that were considered to have management potential, 13 were considered to have high overall suitability as alternative CATE colony sites (Figure 2-9).

Each of these 13 sites, however, ranked poorly in at least one suitability criterion, indicating that some biological conflicts or constraints exist at even the most suitable management sites. For instance, at some of the 13 highly suitable sites there is potential geographic overlap between a new or expanded CATE breeding colony and ESA-listed fish species. CATE diet data were generally lacking at the majority of these potential colony sites; thus, potential conflicts were evaluated based on spatial overlap alone.



Source: Modified from Roby et al. 2012.

Figure 2-9. Location of high-suitability CATE habitat enhancement sites between southern California and northern Washington.

Additional Habitat Enhancement Studies

Preliminary evaluations of these sites were conducted by the Action Agencies and members of the IAPWG Based on these evaluations, each site demonstrated one or more concerns, leading to the need for further analysis and consideration of a wider array of potential sites within the western North America metapopulation. These concerns are identified in Table 2-3.

Table 2-3. Results of Additional Evaluations on High-Suitable Habitat Enhancement Sites

Site Location	Concern
Padilla Bay - Unnamed Island	Privately owned island - Corps and Reclamation have no authority to purchase real estate or fund others to develop enhanced habitat. The island is connected to the mainland during low tide and would require costly site improvements to improve long-term CATE nesting success. Potential conflicts with ESA-listed salmonids.
Strait of Juan de Fuca - Smith and Minor Island	Formation of CATE colony at top of island conflicts with Coast Guard-required helipad use. Documented predator (bald eagle) concerns. Harbor seal haulout and pupping site limiting beach access during certain portions of the year. Site access is limited such that predator management efforts would be limited; monitoring of CATE colony would have to be done remotely (e.g., aerial surveys and video cameras).
Puget Sound - Jetty Island	High human use area. Potential for mammalian predation. Also, possible conflicts with ESA-listed salmonids (close proximity to the Snohomish River).
Grays Harbor - Sand Island	Conflicts with bald eagle disturbance. Site erosion problems. Conflicts with harbor seals and other waterbird species.
Banks Lake - Goose Island	High use area. Potential for mammalian predation. Insufficient foraging available. Potential for continued foraging on ESA-listed salmonids.
Banks Lake - Twinning Island	Same concerns as for Banks Lake Goose Island.
Sprague Lake - Harper Island	Concern on potential impacts to Snake River ESA-listed salmonid species and insufficient forage for 1000 pair CATE colony. Island is privately owned - Corps and Reclamation have no authority to purchase real estate or fund others to develop enhanced habitat. The lake is a high use area. Potential for mammalian predation.
Goose Lake, CA	Significant site preparation efforts would be required. Fluctuating water levels would likely result in created island being present in only certain years. Predators documented in the area.
San Francisco Bay - Agua Vista	High use area, possible human disturbance. Significant site preparation required.
San Francisco Bay - Hayward Regional Shoreline	Possible conflicts with existing conservation plans for other tern species.
Monterey Bay - Elkhorn Slough	Documented predator impacts causing previous nesting failures. Significant site preparation would be required. Contaminants documented at this site. Potential conflicts with ESA-listed fish and snowy plovers.
Los Angeles Harbor - Terminal Island (Pier 400)	Conflicts with conservation plans for least terns. Possible conflicts with ESA-listed fish.
San Diego Bay - San Diego Bay NWR (Salt works)	Significant site preparation required. Potential impacts to conservation plans for other waterbird species (snowy plover and least terns).
Don Edwards National Wildlife Refuge	High potential for CATE habitat. Mixed-use area may cause potential conflicts. Additional consultation with landowner is needed to determine potential resource concerns.

2.2.3 Alternative C: Habitat Modification (Alternative B) Combined with Active Hazing

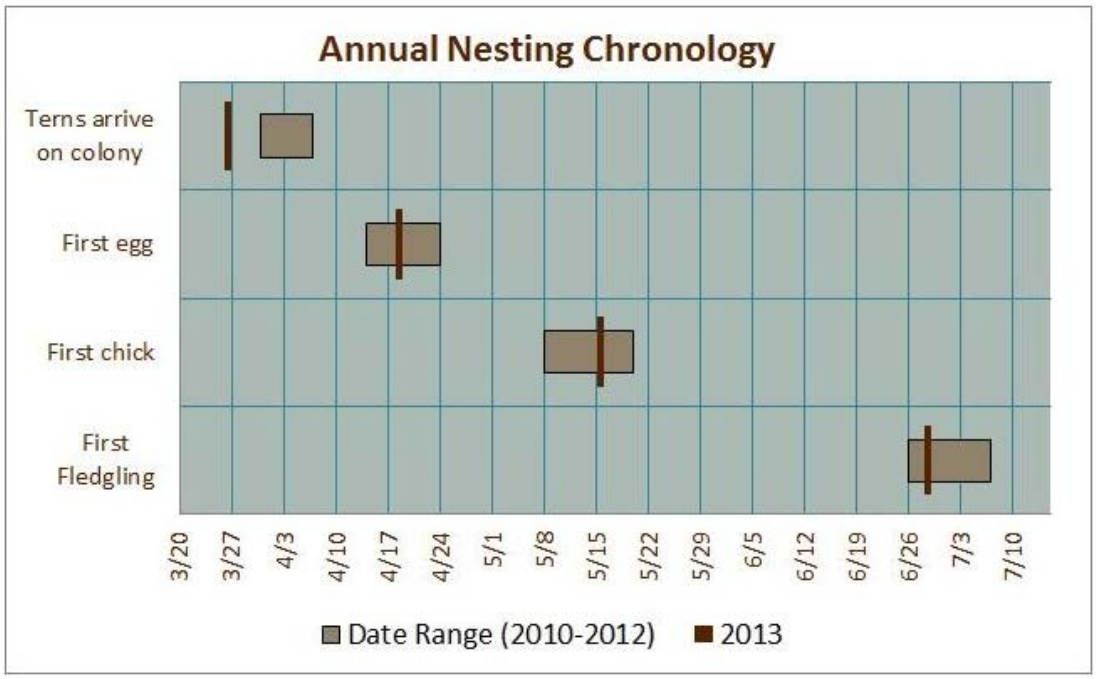
This alternative would comprise all habitat modification elements described in Alternative B combined with a program of daily active hazing to physically discourage CATEs and gulls from nesting on Goose, Crescent and the at-risk islands. In Alternative C, active hazing actions would occur prior to and during the gull and CATE nesting

season. Active hazing would be done in coordination with the respective landowner of each property.

Active daily hazing at Goose and Crescent Islands and the at-risk islands would commence upon the arrival of gulls and CATEs (Figures 2-10 and 2-11) and continue until first CATE or gull eggs are laid or early July if no eggs are laid. Active hazing would be discontinued if eggs from CATEs, gulls or any other birds are discovered in the vicinity of the hazing activity. During active hazing, all waterbirds that could potentially nest on the islands would be dissuaded from nesting if they are in areas potentially occupied by gulls or CATEs.

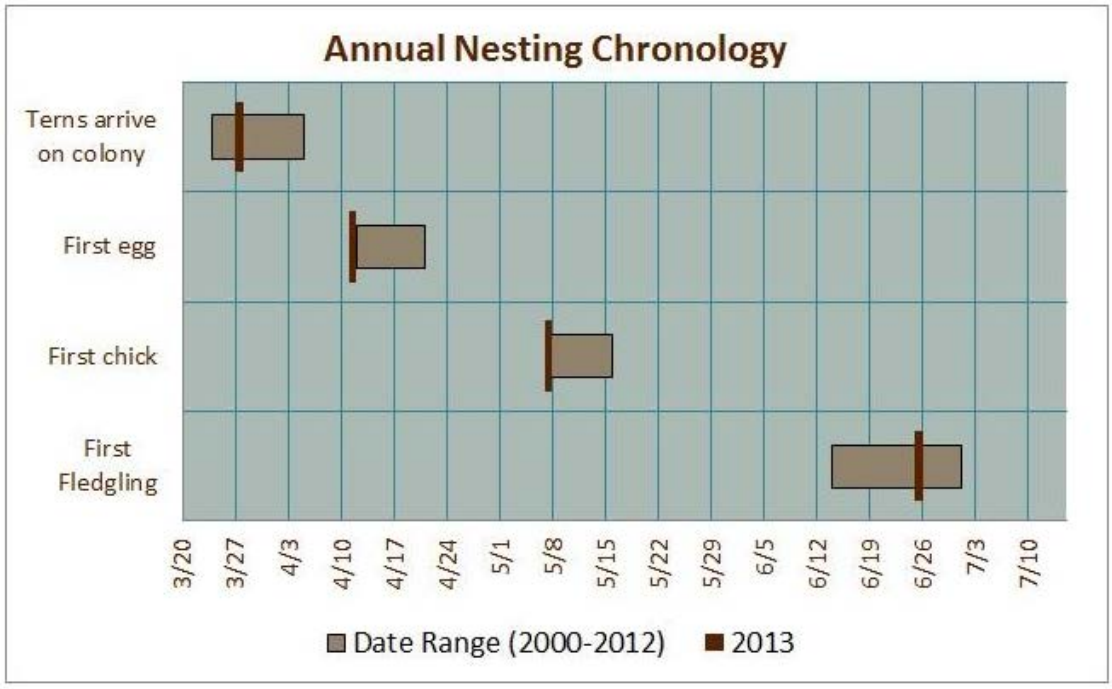
Active daily hazing would typically be conducted by two or more observers/hazers on foot to minimize disturbance to other species and to maximize coverage and effectiveness of the operation. Two or more people are recommended for hazing due to safety concerns associated with boating and field work. Hazers would cover all areas of each island where CATEs and gulls might be expected to occur (i.e., open and semi-open areas where nests were previously located). Observers would walk through the CATE and gull colony to disturb CATEs and gulls away from potential or actual nesting sites and to prevent nesting activities from initiating. In addition to hazing birds away from potential nest scrapes during hazing, hazers would fill in any scrapes that had been started by CATEs. Most CATEs lay eggs early in the morning (Roby 2012a personal communication), but hazing would be conducted throughout the day as necessary to minimize the likelihood that eggs may be laid.

To ensure maximum success of dissuasion actions, hazing would be conducted 7 days a week to ensure no new nests are started. As the presence of a person at a colony site may cause CATEs to abandon the area (Cuthbert and Wires 1999) and hazing levels are expected to be frequent enough to also discourage gulls, it is anticipated that frequent coverage of all areas potentially occupied by CATEs would discourage nesting. Hazing could be initiated in Year 1 and continue until the Action Agencies determine it is unnecessary. For example, hazing could be discontinued after Crescent Island Phase 2 habitat modifications appear to be sufficient to dissuade CATEs from nesting.



Source: BRNW 2013.

Figure 2-10. Annual nesting chronology of CATEs on the Goose Island breeding colony in Potholes Reservoir shown in 2013 relative to the 2010-2012 breeding season.



Source: BRNW, 2013.

Figure 2-11. Annual nesting chronology of CATEs on the Crescent Island breeding colony on the mid-Columbia River shown in 2013 relative to the 2010-2012 breeding season.

2.2.3.1 Island-Specific Implementation Considerations

Goose Island

Hazing would be initiated in Year 1 and would likely continue for a minimum of 3 years or until deemed unnecessary. For example, permanent substrate modifications could eliminate the need for hazing at Goose Island.

Crescent Island

Active Hazing would be as early as Year 2 as a tool to limit the formation of incipient CATE colonies. It would be expanded to cover all open areas of the island during Phase 2 as warranted to improve success of habitat modification efforts. Following the implementation of Phase 2, active hazing would likely take place for 2-3 years as vegetation becomes established. It is anticipated that vegetation would establish quickly due to climatic conditions, and CATEs would be persuaded not to nest by the presence of vegetation once it has become established. After that, the need for hazing would be reevaluated and would only continue if deemed warranted by agency personnel and subject to availability of funds.

At-Risk Islands (Incipient Colonies)

Daily active hazing would occur at any of the islands starting in Year 1, if warranted, and continue until deemed unnecessary.

2.2.4 Alternative D: Habitat Modification and Active Hazing (Alternative C) Combined with Limited Egg Removal (Preferred Alternative)

This alternative would comprise all habitat modification and active hazing elements described in Alternative C combined with limited CATE egg removal. A USFWS depredation permit for up to a maximum of 200 CATE eggs (from Goose, Crescent, and the at-risk islands combined) per year would be requested under this option, though it is possible that no egg collection would be necessary with daily hazing (Roby 2012b personal communication). Nest abandonment by other species would not be covered under the egg take permit so that once a gull or other bird lays an egg in the vicinity of the CATE hazing areas, all hazing activities would stop. The basis for the proposed management action of taking up to 200 CATE eggs per breeding season is based on recent Portland District Corps actions. Through the breeding season of 2012, fewer than nine eggs per year have been collected in support of Portland District hazing actions in the Columbia River estuary (Roby et al. 2013).

Egg removal would only be used after all other options have been exhausted. As eggs may potentially be laid throughout the nesting season, egg take could occur throughout the nesting season of any given year of the project. As staff conducts hazing activities

on the islands, they would also search for and remove CATE eggs. The goal of this action, along with removing scrapes and nests, is to prevent the reestablishment of the colonies. Eggs would be collected and disposed of in a manner in compliance with the applicable USFWS permit.

The implementation timeline for the preferred alternative is shown on Table 2-4. This table identifies the implementation sequence for the various habitat modifications, hazing, and egg take actions in Phases 1 and 2. The habitat modifications would be implemented between the months of August and early March to fall outside of the CATE nesting season. It is anticipated that Year 1 would occur as early as 2014. The year these actions are actually initiated, however, would depend on a variety of factors including items such as the availability of funding, permits, and monitoring and evaluation results (particularly with respect to adaptive management actions).

The implementation of Phase 2 habitat modifications at Crescent Island and Goose Island would occur after the implementation of habitat enhancement at location(s) outside the Columbia River Basin, which would require a follow-on supplemental/tiered NEPA process. If habitat enhancement is not implemented, a decision to terminate and reverse Phase 1 action would be considered.

Table 2-4. Implementation Timeline for Alternative D (Preferred Alternative)

Action	Year 1	Year 2	Year 3	Year 4	Year 5
Phase 1					
On Goose Island, passive hazing will be combined with active hazing of CATEs and gulls, and, if needed, limited CATE egg take.	X	X	X	(X)	(X)
If needed, formation of incipient CATE colonies on Crescent Island will be prevented by using passive hazing and active hazing of CATEs and gulls, and, if needed, limited CATE egg take.		(X)	(X)		
Willows will be experimentally planted on Crescent Island to evaluate survival.	X				
Dissuasion will be performed as needed on at-risk islands in coordination with landowners.		(X)	(X)		
CATE habitat enhancement site research and supplemental/tiered NEPA analysis will be completed.	X	(X)			
Phase 2					
Habitat enhancement site(s) will be prepared to attract CATE nesting.			X		
If necessary, Goose Island substrate may be modified by adding material such as large cobble as a lower maintenance dissuasion method.				(X)	(X)
To dissuade the primary CATE colony on Crescent Island, vegetation may be planted and/or a berm may be constructed (passive hazing). As necessary, active hazing of CATEs and gulls, and, if needed, limited CATE egg take may be conducted.				X	(X)

Action	Year 1	Year 2	Year 3	Year 4	Year 5
CATE dissuasion will be performed as needed on at-risk islands in coordination with landowners.				(X)	(X)

Note: (X) is implemented only if warranted.

Monitoring is not included in the above timeline but is important for addressing uncertainties and determining progress towards objectives during implementation of the IAPMP. As part of the IAPMP, dissuasion islands would be monitored daily, or as warranted, for CATE nesting activity during the nesting season concurrently with hazing activities. At-risk islands would be monitored less frequently but at least twice during the nesting season for evidence of nesting CATEs. Once the CATE habitat enhancement sites have been identified (after the appropriate supplemental/tiered NEPA analysis has been completed) and prepared to receive nesting CATEs, it would be monitored during the ensuing CATE nesting season to assess the success of the habitat enhancement effort. Other Columbia River Basin islands not considered at-risk and but within the inland basin would be monitored by the Action Agencies or other partners. Areas outside the inland Columbia River Basin may be monitored by other entities not affiliated with this project. More details on implementation, monitoring and adaptive management are contained in the IAPMP (Appendix A).

2.2.4.1 Island-Specific Considerations

Goose Island

Egg removal and daily active hazing would occur simultaneously. It would be initiated in Year 1 for a minimum of 3 years due to the large potential CATE nesting area and type of dissuasion measures.

Crescent Island

Egg removal would occur simultaneously with daily active hazing. It would start as early as Year 2 (e.g., 2015). Daily hazing plus egg removal is recommended as a precautionary measure, although it is anticipated that silt fencing and willow plantings combined with hazing would minimize egg removal frequency within Phase 2. It is expected that vegetation would be established 3 years after the implementation of the Phase 2 habitat modifications, and frequent hazing/egg removal visits to the island could be greatly reduced in frequency or no longer be necessary.

At-Risk Islands (Incipient Colonies)

If action at any of the identified locations is deemed necessary, egg removal in addition to daily active hazing could occur simultaneously for up to 5 years, or until deemed unnecessary.

2.3 Comparison of Alternatives

Alternative D was selected as the preferred alternative as it best meets the projects purpose and need. It provides the most comprehensive set of actions for CATE management with the highest probability of successful CATE dissuasion at Goose and Crescent Islands, which would result in the largest reduction in avian predation losses of ESA-listed salmonids. The habitat modifications, combined with active hazing, would provide a high probability of success, while limited egg take would provide a contingency for unforeseen events. Table 2-5 shows a comparison of the alternatives considered.

Table 2-5. Comparison of Alternatives

ACTIONS TAKEN UNDER EACH ALTERNATIVE

	Alternative A	Alternative B	Alternative C	Alternative D
Action	**No Action**	**Habitat Modifications to Alter CATE Nesting Areas. Phase 1 and Phase 2**	**Alternative B, Habitat Modification, Combined with CATE Hazing**	**Alternative C Habitat Modification and Hazing Combined with Egg Removal**
Temporary Passive Dissuasion (Rope and Flagging)	No	Yes, Phase 1 includes the placement of a network of rope and flagging to deter use of nesting habitat at Goose Island. Dissuasion activities (i.e., rope and flagging) will take place at Crescent Island if necessary to prevent colony expansion. Phase 1 includes the implementation of dissuasion actions (rope and flagging) for at-risk islands (if necessary).	Yes, as described under Alternative B.	Yes, as described under Alternative B.
Habitat Enhancement	No	Habitat enhancement would occur prior to implementation of permanent Phase 2 actions at Goose and Crescent Islands. Additional studies will be required to identify suitable sites and a supplemental/tiered NEPA process will be completed prior to implementation.	Yes, as described under Alternative B.	Yes, as described under Alternative B.
Habitat Modification	No	Yes, Phase 1 includes test willow planting at Crescent Island. Phase 2 actions include additional planting of native vegetation as well as the potential construction of a low berm, installation of a silt fence and the addition of large woody debris to create a visual barrier and deter use of CATE nesting habitat at Crescent Island. As an adaptive management action in Phase 2, cobble/boulder substrate modification may occur if other habitat modification actions are unsuccessful. If warranted, a new substrate of cobble/boulder may be placed on Goose Island in the same area where rope and flagging was earlier deployed.	Yes, as described under Alternative B.	Yes, as described under Alternative B.

Action	Alternative A No Action	Alternative B Habitat Modifications to Alter CATE Nesting Areas. Phase 1 and Phase 2	Alternative C Alternative B, Habitat Modification, Combined with CATE Hazing	Alternative D Alternative C Habitat Modification and Hazing Combined with Egg Removal
Active Hazing	No	No	Active daily hazing at Goose and Crescent Islands and the at-risk islands would commence with the arrival of nesting birds (e.g., gulls and CATEs) and continue until first CATE or gull eggs are laid or early July if no eggs are laid. Active daily hazing would typically be conducted by two or more observers/hazers on foot to minimize disturbance to other species and to maximize coverage and effectiveness of the operation. To improve success of dissuasion actions, active hazing would be conducted 7 days a week to reduce the chance new nests are initiated. Active hazing would be discontinued if eggs from any birds are discovered in the vicinity of the hazing activity.	Yes, as described under Alternative C. Daily active hazing would occur simultaneously with limited egg removal.
CATE Egg Collection	No	No	No	Yes, up to 200 CATE eggs may be collected under a MBTA permit at Goose, Crescent and the at-risk islands combined. Egg removal would occur simultaneously with daily active hazing.

	Alternative A	Alternative B	Alternative C	Alternative D
Action	**No Action**	**Habitat Modifications to Alter CATE Nesting Areas. Phase 1 and Phase 2**	**Alternative B, Habitat Modification, Combined with CATE Hazing**	**Alternative C Habitat Modification and Hazing Combined with Egg Removal**
Monitoring and Timing	No monitoring of CATE colonies would be performed by the Action Agencies	See Table 2-1 for phased implementation timeline. Rope and flagging will begin in Year 1 at Goose Island while Crescent Island is monitored to ascertain whether CATEs attempt to relocate to Crescent Island. If CATEs attempt to relocate to Crescent Island, rope and flagging will be implemented at Crescent Island to dissuade CATEs and limit the development of incipient satellite colonies. In Year 1, 75 willow whips will be test-planted on Crescent Island and monitored to see if existing conditions will promote successful willow growth suitable for CATE dissuasion activities in Phase 2. During Phase 2, Habitat modifications on Crescent Island will take place on both the CATE nesting area and where CATEs have formed incipient colonies. Plantings and silt fencing would be monitored upon deployment. No additional planting at Crescent Island is anticipated unless substantial (e.g., greater than 50%) plant failure occurs in the first 3 years. If silt fencing becomes damaged, it would be repaired or replaced as needed. All habitat and substrate changes will occur out of season. If monitoring indicates that CATE nesting continues along the fringes of the treated areas, additional habitat-related dissuasion measures would be implemented in future years. In Phase 2, Implementation of the Phase 2 habitat modifications at Crescent and Goose Islands are contingent upon	Hazing would be initiated in Year 1 at Goose Island and at Crescent Island in Year 2. Active hazing actions would occur prior to and during the gull and CATE nesting season. Active hazing would be discontinued if eggs from CATEs, gulls or any other birds are discovered in the vicinity of the hazing activity. Hazing at Goose Island would likely continue for a minimum of 5 years or until deemed unnecessary. For example, permanent substrate modifications could eliminate the need for hazing at Goose Island. At Crescent Island, hazing would be used as a tool to dissuade the formation of incipient colonies away from the primary CATE colony during Phase 1. Active hazing measures would be expanded as necessary at Crescent Island during Phase 2 to dissuade CATE from nesting on the island after implementation of Phase 2 habitat modification. Following the implementation of Phase 2, hazing on Crescent Island would likely take place for 3 years as vegetation is anticipated to	Egg removal and daily active hazing would occur simultaneously at both Goose and Crescent Islands during the CATE nesting season. It would be initiated in Year 1 at Goose Island and Year 2 at Crescent Island. At Goose Island, egg removal and daily active hazing would occur for a minimum of 5 years or until deemed unnecessary. During implementation of Phase 2, hazing and egg take may be implemented for 3 years or as warranted at Crescent Island as it is expected that the combination of passive and active dissuasion measures would minimize the need for egg removal. If action at any of the at-risk islands is deemed necessary, egg removal in addition to daily active hazing could occur simultaneously until deemed unnecessary.

	Alternative A	Alternative B	Alternative C	Alternative D
Action	**No Action**	**Habitat Modifications to Alter CATE Nesting Areas. Phase 1 and Phase 2**	**Alternative B, Habitat Modification, Combined with CATE Hazing**	**Alternative C Habitat Modification and Hazing Combined with Egg Removal**
		identifying and implementing suitable new nesting habitat outside the Columbia River Basin. If CATE colonies on at-risk locations grow to a size of 40 nesting pairs or CATE numbers grow to greater than 200 pairs within the inland basin, predation impacts will be further evaluated and, if warranted, efforts to work with the respective landowners to implement dissuasion measures (rope and flagging similar to Goose Island) will be implemented.	establish quickly due to climatic conditions, and CATEs would be persuaded not to nest by the presence of vegetation. After that, the need for hazing would be reevaluated and would only continue if deemed warranted by agency personnel and subject to availability of funds. Daily active hazing would occur at any at-risk island starting in Year 2, if warranted, and continue until deemed unnecessary.	

2.4 Alternative Actions/Measures Considered Including those Eliminated from Further Study

The alternative development process required by NEPA is designed to allow consideration of the widest possible range of solutions and potential management approaches. During the alternative development process, many different actions/measures were considered. Table 2-6 shows the potential alternative actions/measures considered and how they compared against the purpose and need criteria: benefits to ESA-listed salmonids; minimize/avoid impacts to CATEs and other species of concern (i.e., other MBTA birds and other ESA-listed species). While this table includes all actions/measures considered (including those that were developed into the alternatives for this plan), actions/measures that did not meet (at least in part) all the purpose and need criteria were eliminated from further consideration.

Based on this evaluation, habitat modifications, active hazing and egg take for the entire CATE colonies at Goose and Crescent Islands, along with habitat enhancement, were identified as the actions/measures that satisfied (at least in part) the purpose and need criteria. This evaluation of the potential alternative actions/measures was used to develop the alternatives fully evaluated in this EA.

Subsequent paragraphs describe, in more detail, the alternative actions/measures that were eliminated from further consideration.

Table 2-6. Actions Initially Considered for Alternative Development

Potential Alternative Actions	Benefits to ESA-listed Salmonids	Minimize Impacts To CATEs	Minimize Impacts To Other MBTA Birds	Minimal Impacts To Other ESA Species
Goose Island Actions				
Modify habitat to remove entire CATE colony (passive)	+	+	+	+
Modify habitat to remove partial CATE colony (passive)	-	+	+	+
Active management (hazing and egg take) to discourage all CATE nesting	+	+	+	+
Active management to discourage partial CATE nesting	-	+	+	+
Predator introduction (e.g., terrestrial predators)	+	-	-	+
Predator encouragement (avian predator structures)	-	-	-	+
Lethal take (CATE)	+	-	+	+
Alternative food source (e.g., net pen or wetland cell)	-	+	+	+

Potential Alternative Actions	Benefits to ESA-listed Salmonids	Minimize Impacts To CATEs	Minimize Impacts To Other MBTA Birds	Minimal Impacts To Other ESA Species
Crescent Island Actions				
Modify habitat to remove entire CATE colony (passive)	+	+	+	+
Modify habitat to remove partial CATE colony (passive)	-	+	+	+
Active management (hazing and egg take) to discourage all CATE nesting	+	+	+	+
Active management to discourage partial CATE nesting	-	+	+	+
Predator introduction (e.g., terrestrial predators)	+	-	-	+
Predator encouragement (avian predator structures)	-	-	-	+
Lethal take (CATE)	+	-	+	+
Alternative food source (e.g., net pen)	-	+	+	+
Net pens and wetland cells	-	+	+	+
CATE Habitat Enhancement out of basin	+	+	+	+
CATE Habitat Enhancement in the inland basin	-	+	+	+
Maximize juvenile transport	-	+	+	-
Increased hatchery production	-	+	+	+

Notes:

"+" = Meets purpose and need.

"-" = Does not meet purpose and need.

2.4.1 Lethal Take of Adult CATEs

The lethal take of adult CATEs as a sole dissuasion method would likely not meet the purpose and need of the EA, as CATEs would likely continue to colonize the site and prey upon ESA-listed salmonids if nesting habitat is still available. In addition, over time, this could potentially have a significant impact on CATE metapopulations. Lethal take via killing juvenile and adult CATEs was eliminated from consideration under this EA due to the availability of less obtrusive measures. Similarly, predator introduction and predator encouragement were eliminated on the grounds that these methods constituted indiscriminate lethal take that could have negative impacts on other non-targeted species in the area, including other bird species covered under the MBTA.

2.4.2 Partial Colony Reduction at Goose Island

The Benefits Analysis analyzed the reduction of the CATE colony at Goose Island at levels of 33, 67, and 100 percent dissuasion for their respective effects on the average

annual growth rate (λ) of selected salmonid ESUs. For all ESA-listed salmonids considered, substantial avian predator reduction benefits (identified in the Benefits Analysis as having a $\Delta\lambda$ of 0.5 percent or greater) were only seen in UCR steelhead and UCR spring Chinook at 100 percent dissuasion. With no compensatory mortality, reducing 33 percent of the CATE colony at Goose Island could result in a $\Delta\lambda$ of 1.5 percent hatchery population and 1.1 percent wild population of UCR steelhead. A reduction of 67 percent of the same CATE colony could result in a $\Delta\lambda$ of 2.9 percent hatchery population and 2.2 percent wild population of UCR steelhead. Reduction of 100 percent of the same CATE colony could accrue a $\Delta\lambda$ of 4.2 percent hatchery population and 3.2 percent wild population of UCR steelhead and 0.7 percent for UCR spring Chinook (Lyons et al. 2011a).

All of the actions at Goose Island, with the exception of entire habitat modification and active management to discourage all CATE nesting (with and without lethal take), were eliminated from further consideration. Due to the small area of actual CATE habitat on Goose Island (0.13 acre), habitat modification for partial colony removal was considered to have insufficient biological benefit to salmonids (based on reduction in predation rates and $\Delta\lambda$ calculated in the Benefits Analysis). From an economic efficiency perspective, partial habitat management would not be substantially less expensive than full habitat modification. Active management to discourage partial nesting was similarly eliminated due to no substantial biological benefit to salmonids or substantial reduction in cost versus active management to discourage all nesting. Furthermore, reducing the size of small CATE colonies (e.g., < 500 nesting pairs) through directed management actions has not been done to date and may be difficult to successfully implement without unintentionally causing full colony failure.

Finally, alternative food sources (e.g., in net pens or wetland cells) were eliminated from consideration due to having limited known biological effectiveness and potentially high long-term operations and maintenance costs. The following biological concerns have also been raised about the use of net pens (BRNW, personal communication):

- Use of alternative food sources (e.g., net pens or modified wetland cells) by non-target species.
    - Other piscivorous waterbirds (e.g., American white pelicans, cormorants, herons, night-herons, gulls, etc.) would likely also utilize the net pens and could increase in numbers near the pen.
    - Cooperatively foraging waterbirds (e.g., gulls and cormorants) would likely find the net pen before CATEs and would potentially interfere with the foraging of CATEs at the pen. There are far more gulls and cormorants than CATEs in the region, and both readily take advantage of new foraging

opportunities, while CATEs would likely take more time to change their foraging habitat and utilize the pens.

  - Mammals (especially river otters) would also likely be attracted to the pen.

- Questionable effect of alternative food sources (e.g., net pens or modified wetland cells) on CATE foraging behavior. Recent unpublished data (BRNW, unpublished data) indicate CATEs are somewhat site-faithful with regard to foraging areas so the majority of birds in a CATE colony might continue to forage at traditional locations.
- Potential to attract more CATEs to an area. The presence an abundant food source in a net pen, for example, could attract more CATEs to an area and might counterbalance the intended benefits of the pen.

2.4.3 Partial Colony Reduction at Crescent Island

The Benefits Analysis also analyzed the reduction of the CATE colony at Crescent Island at levels of 33, 67, and 100 percent dissuasion for their respective effects on the average annual growth rate (λ) of selected salmonid ESUs. For all salmonids considered, substantial avian predator reduction benefits were only seen in UCR steelhead and SR steelhead only at 100 percent dissuasion. With no compensatory mortality, reducing 33 percent of the CATE colony at Crescent Island could result in a $\Delta\lambda$ of 0.2 percent hatchery population and 0.2 percent wild population of UCR steelhead. A reduction of 67 percent of the same CATE colony could result in a $\Delta\lambda$ of 0.5 percent hatchery population and 0.4 percent wild population of UCR steelhead. Reduction of 100 percent of the same CATE colony could accrue a $\Delta\lambda$ of 0.7 percent hatchery population and 0.6 percent wild population of UCR steelhead and 0.5 percent for SR steelhead (Lyons et al. 2011a).

Elimination of actions for further study at Crescent Island followed similar reasoning as with Goose Island. All of the actions at Crescent Island, with the exception of entire habitat modification and active management to discourage all CATE nesting (with egg take), were eliminated from further consideration. Because of the small area of actual CATE habitat on Crescent Island (0.09 acre), habitat modification for partial colony removal was considered to have insufficient biological benefit to salmonids (based on reduction in predation rates and $\Delta\lambda$ calculated in the Benefits Analysis). From a financial perspective, partial habitat management would not be substantially cheaper than full habitat modification. Active management to discourage partial nesting was similarly eliminated due to no substantial biological benefit to salmonids or substantial reduction in cost versus active management to discourage all nesting. Furthermore, reducing the size of small CATE colonies (e.g., < 500 nesting pairs) through directed management actions has not been done to date and may be difficult to successfully implement without unintentionally causing full colony failure. Finally, alternative food sources (i.e.,

net pens and wetland cells) were eliminated due to having very limited known biological effectiveness, as well as potentially high and long-term operations and maintenance costs.

2.4.4 Additional Juvenile Transport Action

An action initially considered was additional juvenile transport to minimize avian predation-related mortality during downstream migration. The Corps's juvenile salmonid transportation program collects juvenile salmonids from collector projects (Lower Granite Dam, Little Goose Dam, Lower Monumental Dam, McNary Dam) and transports them via barge or truck to release sites below Bonneville Dam. The majority of the predation by CATE's nesting at Goose Island occur within the Columbia River upstream of McNary Dam before juvenile salmonids could be collected for transport. Therefore, changes to the Corps's juvenile transport program would not reduce the impacts of CATEs nesting on Goose Island on Upper Columbia River salmonid ESU's. Due to operational constraints within the FCRPS, such as court mandated spill levels, the abilities to reduce avian predation on outmigrating Snake River and mid-Columbia River ESU's smolts through changes to the juvenile transportation program are currently limited. For example, the current spill regime limits the ability of the Corps to dramatically increase the number of ESA-listed salmonids collected for transport around Crescent Island during the periods of highest avian predation (i.e., May through June). This action was therefore eliminated from further consideration as changes to the juvenile transport program are anticipated to only provide minor improvements to ESA-listed salmonids survival at this time.

2.4.5 Increased Hatchery Production

Increased hatchery production was eliminated from further consideration primarily because it did not meet the purpose and need to reduce avian predation. Increased hatchery production could have the opposite effect, resulting in an increase in predation over time. An increase in fish available for foraging could lead to an increase in avian predators in the inland Columbia River Basin region.

SECTION 3.0 AFFECTED ENVIRONMENT

The following sections provide a description of the affected environment relating to proposed project actions. To simplify the description of the affected environment, several of the resources are grouped into general categories or areas:

- Columbia River – Includes Crescent, Badger, Blalock, Foundation, Miller Rocks, Three-mile Canyon, Richland (Islands 18 and 20), and Cabin Islands all located within the Columbia River between The Dalles Dam and Priest Rapids Dam.
- Potholes Reservoir – Solstice Island and Goose Island are both located within Potholes Reservoir.
- Banks Lake – Goose (Banks) and Twinning Islands are both located within Banks Lake.

3.1 Biological Environment

The following subsections provide a description of the relevant fish, wildlife, and plants that occur within the project area. Fish are presented in two categories: ESA-listed and other fishes. CATEs are presented in their own subsection, with other piscivorous birds presented in a separate subsection.

3.1.1 Federally Endangered and Threatened Fish

Thirteen species of salmonids in the project area are listed as threatened or endangered under the ESA. Anadromous fish species spend most of their lives in the ocean and return to fresh water to spawn. Salmon are semelparous meaning that they spawn once before dying. Steelhead are the anadromous form of rainbow trout and do not necessarily migrate to sea at a specific age. They are also iteroparous, meaning that they may spawn more than once.

Salmonids typically exhibit two types of principal life history cycles: stream-type and ocean-type. Stream-types usually remain in or near their natal stream for at least one year before traveling to saltwater. Ocean-type groups typically migrate to saltwater in their first year.

3.1.1.1 Chinook

Chinook (*Oncorhynchus tshawytscha*) are the largest of the Pacific salmon species and are found in the larger river systems and some smaller coastal river drainages from the Ventura River in California to Point Hope, Alaska (Healey 1991). Chinook can exhibit either stream-type or ocean-type life history cycles. Migration distance, stream flows and temperatures, and the productivity of streams and estuaries appear to be the strongest environmental factors affecting specific emigration timing (Myers et al. 1998).

Peak spawning for Chinook salmon within the project area occurs from August to September, although the timing is highly dependent upon water temperature. The egg incubation/alevin stage goes from August into December, and emergence extends from that point into March. The juveniles typically spend 1 year in freshwater before migrating downstream—primarily in May and June. Most adults return after spending 2 years in the ocean, although 20 to 40 percent return after 3 years at sea.

Four listed Chinook ESUs occur in the project area: Lower Columbia River, Upper Columbia River, SR Spring/summer run, and SR fall run.

Lower Columbia River Chinook ESU

Chinook salmon in the Lower Columbia River generally follow an ocean-type life history cycle. Late, fall-run (ocean-maturing) Chinook enter fresh water at an advanced stage of maturity, move rapidly to their spawning areas in the mainstem Columbia River and lower reaches of tributaries, and spawn within a few days or weeks of freshwater entry. Fall-run Chinook are the most abundant run in this ESU and are dominated by hatchery production.

Fall-run Chinook adults typically enter freshwater in August through October to spawn in large river mainstems and juveniles emigrate from freshwater as subyearlings (ocean-type).

Upper Columbia River Chinook ESU

Spring-run Chinook in this ESU have a stream-type life history, which means that juveniles enter marine waters during their second year and return to fresh water as subadults, maturing during their upriver spawning run. Adults returning to the Wenatchee River enter fresh water from late March through early May, while those returning to the Entiat and Methow Rivers enter fresh water from late March through June. Their arrival times tend to be earlier in low flow years and later in high flow years. Spring-run Chinook generally emigrate from freshwater as yearlings (stream-type).

The complex life cycle of Chinook in this ESU is closely associated with complex habitat needs, particularly during the freshwater phase (Spence et al. 1996).

Snake River Spring/Summer-Run Chinook ESU

Spring/summer-run Chinook from the Snake River Basin exhibit a stream-type life history cycle (Healey 1983). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, overwinter, and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or

overwintering areas (Good et al. 2005). SRS/S Chinook adults return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old “jacks,” heavily dominated by males. Returning fish hold in deep mainstem and tributary pools until late summer, when they migrate into tributary areas to spawn. In general, spring-run type Chinook tend to spawn in higher-elevation reaches of major Snake River tributaries from mid- through late August; summer-run fish spawn approximately 1 month later than spring-run fish. Summer-run Chinook tend to spawn lower in the Snake River drainages, although their spawning areas often overlap with spring-run spawners (Good et al. 2005).

Snake River Fall-Run Chinook ESU

The SR component of the Chinook fall run migrates past the lower Snake River mainstem dams from August through November.SR fall-run Chinook adults enter the Columbia River in July and August. Chinook in this ESU generally exhibit an ocean-type life history, with juveniles migrating downstream from their natal spawning and rearing areas from June through early fall (Good et al. 2005). Natural spawning is currently limited to the area from the upper end of Lower Granite Reservoir to Hells Canyon Dam, the lower reaches of the Imnaha, Grande Ronde, Clearwater, and Tucannon Rivers, and small mainstem sections in the tailraces of the lower Snake River hydroelectric dams.

3.1.1.2 Steelhead

The present distribution of steelhead (*O. mykiss*) extends from the Kamchatka Peninsula in Asia, east to Alaska, and south to southern California (NMFS 1999, as cited in Good et al. 2005), although their historical range extended at least to the Mexico border (Busby et al. 1996). Steelhead exhibit highly complex life history cycles—more so than other species of Pacific salmonids. Steelhead exhibit both anadromous and freshwater resident life histories and may produce offspring that take on the opposite life history cycle than their parents. The anadromous form may spend up to 7 years in fresh water before entering the smolt life stage, and then may spend up to 3 years in saltwater prior to first spawning (Good et al. 2005).

Non-anadromous (i.e., resident) forms are typically referred to as rainbow trout, or in some inland portions of the Columbia River Basin, as redband trout. Although the anadromous and resident forms are considered to be the same species, the exact relationship between the two forms is not well understood, and little data are available on the interactions between the two forms (Kostow 2003, as cited in Good et al. 2005).

Steelhead inhabiting upper portions of the Columbia River Basin, particularly the Snake River Subbasin, are referred to as either A-run or B-run fish. A-run steelhead are believed to occur throughout the Snake River Basin and the inland Columbia River,

while B-run steelhead are thought to occur only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers.

Four listed steelhead DPSs occur in the project area: Lower Columbia River, Middle Columbia River, Upper Columbia River, and SR steelhead.

Lower Columbia River Steelhead DPS

LCR steelhead include both summer- and winter-run steelhead and use the project area for migration, holding, and rearing. Summer steelhead adults return to fresh water from May to October in a sexually immature condition and require several months in fresh water to reach sexual maturity and spawn. Winter-run steelhead adults enter fresh water from November to April as sexually mature individuals that spawn shortly thereafter (NMFS 2005). Rearing winter-run steelhead use the Lower Columbia River year-round (CRC 2009). Rearing habitat is limited in the project area but is present in off-channel areas (e.g., accessible areas of small tributaries, backwater areas, and other low-velocity refugia).

Middle Columbia River Steelhead DPS

MCR steelhead are predominantly summer-run steelhead, but winter-run fish are found in the Klickitat River, Washington, and Fifteenmile Creek, Oregon. MCR steelhead use the Columbia River within the project area for migration and holding. Most fish in this DPS smolt at 2 years and spend 1 to 2 years in salt water before re-entering fresh water, where they may remain for up to a year before spawning. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the DPS. Parr usually undergo a smolt transformation as 2-year-olds, at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean before returning to spawn in their natal streams (NMFS 2005).

Upper Columbia River Steelhead DPS

The UCR steelhead DPS consists entirely of summer-run steelhead. Adults enter fresh water between May and October. During summer and fall before spawning, they hold in cool, deep pools. They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration to natal streams in early spring, and then spawn. Spawning occurs in the late spring of the calendar year following entry into the river (Good et al. 2005). In general, adults in this DPS spawn later than in most downstream populations, often remaining in fresh water for a year before spawning (NMFS 2005). Although the life history of this DPS is similar to that of other inland steelhead, smolt ages are some of the oldest on the west coast (up to 7 years old), probably due to the area’s cold water temperatures (Good et al. 2005, NMFS 2005). UCR steelhead use the Columbia River within the project area for migration and holding (NMFS 2005).

Snake River Steelhead DPS

The SR steelhead DPS includes all anadromous populations that spawn and rear in the mainstem Snake River and its tributaries between Ice Harbor and the Hells Canyon Dam complex. SR steelhead migrate a substantial distance from the ocean (up to 930 miles) and use high elevation tributaries (typically 3,300 to 6,600 feet above sea level) for spawning and juvenile rearing. Steelhead in this DPS occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead DPSs. Snake River Basin steelhead are generally classified as summer-run, based on their adult run timing patterns. Summer steelhead enter the Columbia River from late June to October, hold over the winter, then spawn during the following spring (March to May) (NMFS 2005). Adults use the Columbia River within the project area for migration and holding, and are present between June and October. Emergence from gravel occurs by early June in low elevation streams and as late as mid-July at higher elevations. SR steelhead usually rear in the natal tributaries for 2 to 3 years before outmigrating (NMFS 2008).

3.1.1.3 Snake River Sockeye ESU

SR sockeye (*O. nerka*) are distinctive in that they spawn at a higher elevation (approximately 6,000 feet) and have a longer freshwater migration (900 miles) than any other sockeye population in the world (Waples et al. 1991). SR sockeye spend 2 to 3 years in the ocean before returning to their natal lake to spawn (Good et al. 2005). Adult SR sockeye are present in the Columbia River during upstream migration between June and September. Sockeye juveniles rear in freshwater lakes for 1 to 3 years prior to migrating to the ocean, and primarily use the Columbia River as a migration corridor (Burgner 1991 and Gustafson et al. 1997, as cited in Carter et al. 2009). Juvenile outmigration occurs from April to mid-September, with the peak outmigration occurring between late April and May (NMFS 2001).

3.1.1.4 Lower Columbia River Coho ESU

Coho do not have the major life-history variation seen in some of the other listed salmonid species occurring in the Lower Columbia River (e.g., steelhead or Chinook) (Good et al. 2005). The Lower Columbia River coho ESU includes two distinct runs: early returning (Type S) and late returning (Type N). Type S coho salmon generally migrate south of the Columbia once they reach the ocean, returning to fresh water in mid-August and to the spawning tributaries in early September. Spawning peaks from mid-October to early November. Type N coho have a northern distribution in the ocean, return to the Columbia River from late September through December, and enter the tributaries from October through January. Most Type N spawning occurs from

November through January, but some spawning occurs in February and as late as March (LCFRB 2004, as cited in Good et al. 2005).

LCR coho use the Columbia River within the project area for migration, holding, and rearing. Upstream migrating adults are present from approximately mid-August to mid-February (NMFS 2005, CRC 2009). Rearing habitat is limited in the project area, but is present in off-channel areas (e.g., accessible areas of small tributaries, backwater areas, and other low-velocity refugia). Coho spawn downstream of the project area in the Lower Columbia River near Ives Island and Hamilton Creek, at river mile 143, 3 miles downstream from Bonneville Dam (FPC 2008). Spawning occurs approximately from December to February (ODFW and WDFW 2008). Rearing juveniles of this ESU are present in the project area year-round (Carter et al. 2009, CRC 2009). Outmigrating juveniles are present in the project area from mid-February to mid-September (CRC 2009), with peak juvenile outmigration occurring between April and June (Carter et al. 2009).

Coho salmon were declared extinct in the Snake River Basin in 1986; however, through reintroduction efforts coho now return in numbers that support a fishery in a number of rivers and streams within the state (CRITFC 2013).Coho salmon are not listed under the federal ESA within the middle and upper portions of the Columbia River or Snake River, and are discussed in more detail in Section 3.1.2.3.

3.1.1.5 Columbia River Bull Trout DPS

Bull trout (*Salvelinus confluentus*) are members of the salmon family known as char. Bull trout exhibit both resident and migratory life history cycles (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form) or river (fluvial form) (Fraley and Shepard 1989, Goetz 1989). The size and age of bull trout at maturity depends upon life-history strategy. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs (Fraley and Shepard 1989, Goetz 1989). Bull trout normally reach sexual maturity in 4 to 7 years. Spawning typically occurs from August to November. Eggs hatch in late winter or early spring. Fry may remain in the stream gravels for up to 3 weeks before emerging (USFWS 2002).

Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, substrate for spawning and rearing, and migratory corridors. Bull trout are found in colder streams and require colder water than most other salmonids for incubation, juvenile rearing, and spawning. Bull trout of all life stages require complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Bull trout require loose, clean gravel relatively free of fine

sediments for spawning and rearing. Bull trout use migratory corridors to move from spawning and rearing habitats to foraging and overwintering habitats and back (USFWS 2002).

The habitat within the mainstem Columbia River within the project area is considered essential to conservation of mid-Columbia River populations and for maintaining connectivity and providing for the expression of historic migratory life history forms throughout the lower and mid-Columbia River Basins (USFWS 2009).

Historically, the mainstem Snake and Columbia Rivers were likely used as migration corridors, foraging areas, and overwintering habitat by fluvial bull trout that originated in tributary streams throughout the basins. Presently, mainstem habitat may or may not be used by bull trout depending on the strength of their populations in tributary streams and the availability of migration corridors that connect to the Columbia and Snake Rivers. Bull trout have been observed passing the fish ladders at numerous mainstem Columbia River dams (e.g., Bonneville, Wells, Rocky Reach, and Rock Island Dams) (USFWS 2002), confirming potential presence in the project area. Bull trout in one study of habitat use of the mainstem mid-Columbia River were documented utilizing the mainstem for migration and, in general, entered mainstem tributaries by mid-June (Chelan PUD 2002).

A significant gap of knowledge exists regarding migratory bull trout life history and their use of the mainstem Columbia and Snake Rivers. Few data are available regarding movements within the mainstem, the use of various mainstem habitats, or bull trout presence and passage at mainstem dams (USFWS 2012).

Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin and currently occur in 45 percent of the estimated historical range. The Columbia River bull trout DPS comprises 141 bull trout sub-populations in four geographic areas of the Columbia River Basin. The current distribution of bull trout in the Lower Columbia River Basin is less than the historical range (USFWS 2005a).

3.1.2 Other Fishes

This section addresses those fish species that are not currently listed under the federal ESA. As mentioned in Section 3.0, the affected environment was broken down into three general areas: (1) Potholes Reservoir, (2) Banks Lake, and (3) Columbia River.

3.1.2.1 Potholes Reservoir

Fish species found at the Potholes Reservoir included carp (*Cyprinus carpio*), largemouth (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu*), perch (*Perca flavescens*), bluegill (*Lepomis macrochirus*), long-nose sucker (*Catostomus*

catostomus), black crappie (*Pomoxis nigromaculatus*), pumpkinseed (*Lepomis gibbosus*), sculpin (*Cottus* spp.), rainbow trout, brown bullhead (*Ameiurus nebulosus*) and walleye (*Sander vitreus*) (Reclamation 2002, WDFW 2013).

3.1.2.2 Banks Lake

Within Banks Lake, fish species include smallmouth bass, largemouth bass, carp, yellow perch, rainbow trout, walleye, kokanee (*O. nerka*), black crappie, bullhead, lake whitefish (*Coregonus clupeaformis*), bluegill (Polacek and Shipley 2007) and burbot (*Lota lota*) (WDFW 2006a).

3.1.2.3 Columbia River

Snake River Coho Salmon

Historically, coho salmon were abundant in the lower Snake River Basin and were known to spawn in several Snake River tributaries, including the Clearwater River. Snake River coho are not considered part of the LCR coho ESU, and were never listed under the federal ESA. In 1986, the last wild coho migrated back to the Snake River system, and the run was considered extinct after that time (Harrison 2008). In 1995, the Nez Perce Tribe began coho reintroduction efforts in the Clearwater River Subbasin through the transfer of fish reared at the Eagle Creek National Fish Hatchery. For context, in 2009, 550,000 hatchery-reared smolts are transferred from the Dworshak, Kooskia, and Eagle Creek hatcheries to several streams in the Clearwater River Subbasin (HSRG 2009). Annual adult returns at Lower Granite Dam between 2003 and 2012, have ranged from 1,135 to 5,060 with the 2012 total being 2,433, not including jacks. Several hundred jacks have been observed at Lower Granite Dam annually (FPC 2013). In 2004, 35 redds were observed within the Potlatch River, Lapwai Creek, Lolo Creek, Clear Creek, and the South Fork Clearwater River, indicating wild propagation is occurring (HSRG 2009).

Lamprey

Three species of lamprey have been identified in the Columbia River: Pacific (*Entosphenus tridentatus*), river (*Lampetra ayresi*), and western brook lamprey (*L. richardsoni*). Pacific and river lamprey are anadromous and parasitic. Western brook lamprey are freshwater residents that do not migrate to the ocean and are nonparasitic. Of the three lamprey species in the Columbia River Basin, the Pacific lamprey is currently designated as a federal Species of Concern by USFWS. Pacific lampreys spend 1 to 3 years maturing in the ocean environment before migrating as adults to freshwater systems. Adults enter the mainstem Columbia River between approximately February and June and complete migration into streams by September (Kostow 2002). Adults are thought to overwinter in freshwater habitat for approximately one year before

spawning (USFWS 2008a). Spawning occurs between March and July in gravel-bottomed streams, at the upstream end of riffle habitat, and often near habitat suitable for ammocoetes (e.g., silty pools and banks) (Kostow 2002, Moyle 2002). After the eggs are deposited and fertilized, the adults usually die within 3 to 36 days (Kostow 2002).

Ammocoetes (larvae) drift downstream to areas of low velocity and silt or sand substrate, where they burrow and remain for 3 to 7 years. After reaching approximately 6 inches (15 cm) in length, ammocoetes metamorphose into macropthalmia (Moyle 2002). Downstream migrating macropthalmia have weak swimming ability (USFWS 2008a) and tend to move at night (USFWS 2010). Metamorphism is reported to occur between July and November, followed by outmigration to the ocean from November through June (peaking in the spring) (Kostow 2002).

Pacific lampreys migrate primarily at night, possibly in response to temperature cues or an aversion to light (Kostow 2002, USFWS 2008, USFWS 2010). Unlike most fishes, lampreys do not have swim bladders and are therefore not able to maintain neutral buoyancy; they must swim constantly or attach to objects to maintain their position in the water column (USFWS 2008a). Lampreys may travel deeper in the water column compared to salmonids (USFWS 2008a) (however, some dam passage studies have found juvenile lamprey much higher in the water column [CRITFC 2008]).

No population estimates are available for Pacific lamprey in the Columbia River Basin. Dam counts are unreliable for absolute abundance for several reasons, including lampreys migrate at night and pass counting windows when no counts are being taken; lampreys also pass via routes that bypass the counting stations; and there are large gaps in the years counts have been taken (Moser and Close 2003). However, dam passage counts can be a useful metric to describe changes in relative abundance over time, and are a clear indication of the decline of this species from historical conditions (Moser and Close 2003). For example, lamprey counts at Bonneville Dam prior to 1970 were regularly at least 50,000 adults; only about 25,000 adults have passed Bonneville Dam in recent annual counts (Kostow 2002). Passage counts show an even sharper decline at the furthest upstream dams: two hundred lampreys have been observed annually at the upper Snake River dams (Kostow 2002).

Primary factors for decline appear to be passage issues due to dams, loss of spawning and rearing habitat, poor water quality, and impacts of climate change. The USFWS currently has a strategy, “The Pacific Lamprey Conservation Initiative,” which seeks to improve the status of Pacific lamprey throughout its ranges via research and conservation actions (USFWS 2011). Besides their ecological value, lamprey historically played a very important role in the cultural traditions of Northwest Indian tribes, where they were used for subsistence, ceremonial, and medicinal purposes (NPCC 2010b).

Predation on juvenile Pacific lamprey by avian predators is well documented at Columbia River hydroelectric dams and other structures that concentrate and disorient out-migrants (Zorich et al. 2012). Gull consumption of lamprey macropthalmia had been reported as early as 1959, but this impact has not been quantified.

White Sturgeon

White sturgeon (*Acipenser transmontanus*) are known to utilize both shallow- and deep-water habitat in the Columbia River. In the Columbia River, adult white sturgeon have been observed at a mean water depth of 36 feet (Counihan et al. 1999), although they are also known to utilize habitat in the Columbia River of less than 23 feet in depth (Parsley et al. 1993). Adult white sturgeon have been observed in waters approximately 7 to 98 feet in depth (Counihan et al. 1999) and are likely to use deep-water habitat for foraging, resting, breeding, and spawning (Moyle 2002). Juvenile white sturgeon prefer deep-water habitat (median water depths of 52 to 62 feet [Parsley et al. 1993]) and are often observed in the deepest part of the channel; however, they have been observed in water as shallow as 6 feet (Parsley et al. 1993). White sturgeon often congregate in deep holes in the Columbia River (Brannon and Sutter 1992). Adult and subadult white sturgeon are primarily benthic feeders and are likely to use shallow water for foraging (Moyle 2002).

Other Columbia River Fish

Other native fish that occur in Columbia River in the project area include the kokanee salmon (*Oncorhynchus nerka* – a land-locked sockeye salmon that is not an ESA-listed fish), northern pikeminnow (*Ptychocheilus oregonensis*), redband rainbow trout (*O. mykiss*), westlope cutthroat trout (*O. clarki lewisi*), mountain whitefish *(Prosopioum williamsoni*), largescale sucker (*Catastomus macrocheilus*), bridgelip sucker (*C. columbianus*), longnose dace (*Rhinichthys cataractae*), speckled dace (*R. osculus*), redside shiner (*Richardsonius balteatus*), and sculpin spp. (*Cottus* spp.) (USFWS 2010).

3.1.3 Caspian Terns

3.1.3.1 Species Range

CATEs are widely distributed around the world, occurring on five of seven continents, but areas of occurrence are localized within their range (Figure 3-1). They breed locally across Eurasia, Africa, Australia and New Zealand (Cuthbert and Wires 1999). The global CATE population is estimated to be between 240,000 and 420,000 individuals. Their population trend is increasing and is currently classified as “Least Concern” by the International Union for Conservation of Nature (IUCN) Red List (BirdLife International 2012a) as the species does not meet the criteria for “Vulnerable” under the population

trend or population size criteria. The increasing population trend appears to be especially pronounced in North American breeding areas where Breeding Bird Surveys have shown increases between 55 and 85 percent over the last several decades (Cuthbert and Wires 1999) with estimates ranging from approximately 33,000 to 35,000 breeding pairs (Cuthbert and Wires 1999) to 66,000 to 70,000 “breeders” (Kushlan et al. 2002). The CATE western metapopulation has increased since the 1960s, likely driven by anthropogenic nesting sites along with abundant fish forage (USFWS 2005b).

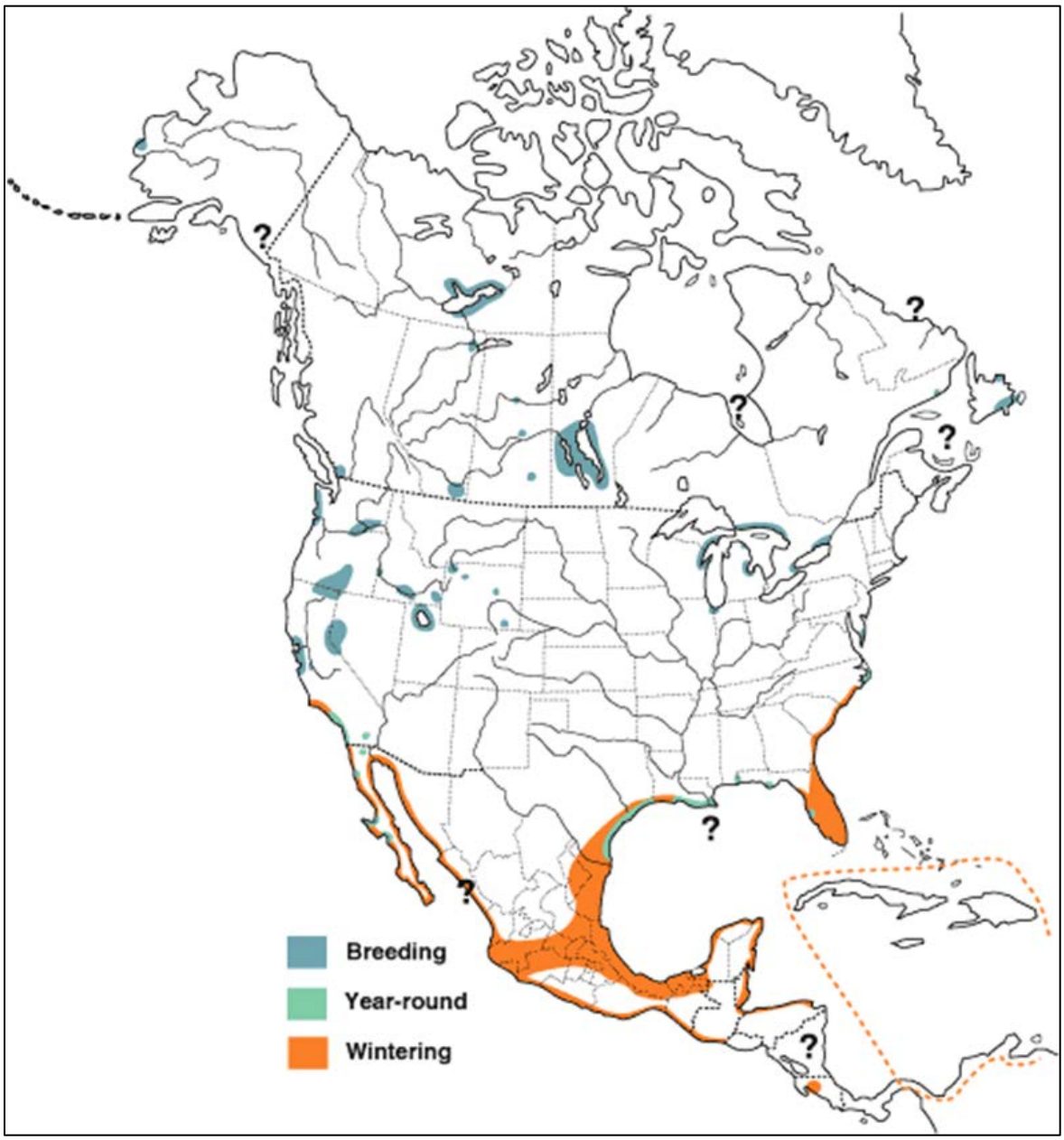
The decline in use of chemicals such as polychlorinated biphenyls (PCBs) may have contributed to the increase in nesting CATEs in North America. Buck (2004) noted that CATE eggs contained traces of several chemicals known to be harmful to nesting birds that prey on fish. As use of these chemicals has declined, several bird species (e.g., bald eagles) have experienced population increases.

Table 3-1. Estimated Number of CATE nests or breeding pairs in western metapopulation, 1996 to 2011[a]

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AK	3	3	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	130	39	209	443	498	491
BC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	5	0	1
CA	1790	3602	2558	1607	2740	2438	2309	2394	2365	2132	2047	3655	4111	5154	2577	2366
ID	0	0	0	0	1	2	84	40	0	28	105	128	151	90	0	0
MT	32	5	0	2	7	60	68	11	12	0	6	2	N/A	13	112	67
MX	82	30	34	N/A	0	0	143	151	216	160	7	183	N/A	N/A	N/A	107
NV	12	1	5	685	0	0	0	5	30	9	20	42	0	4	2	16
OR	8346	7570	8981	9181	9785	8949	9938	8428	9502	8825	9201	9900	11096	10559	8382	7159
UT	0	0	240	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	0
WA	239	908	542	1310	1354	1417	1043	922	1025	1643	2159	1947	1706	2605	2914	1453
WY	6	4	5	4	0	3	5	6	4	3	0	0	0	0	0	0
Total	**10510**	**12123**	**12365**	**12789**	**13891**	**12869**	**13590**	**11957**	**13154**	**12800**	**13675**	**15896**	**17274**	**18873**	**14486**	**11660**

Source: USFWS 2013a personal communication.

a Numbers used in USFWS 2013a personal communication may reflect more recently compiled information than in Collis et al. 2012.

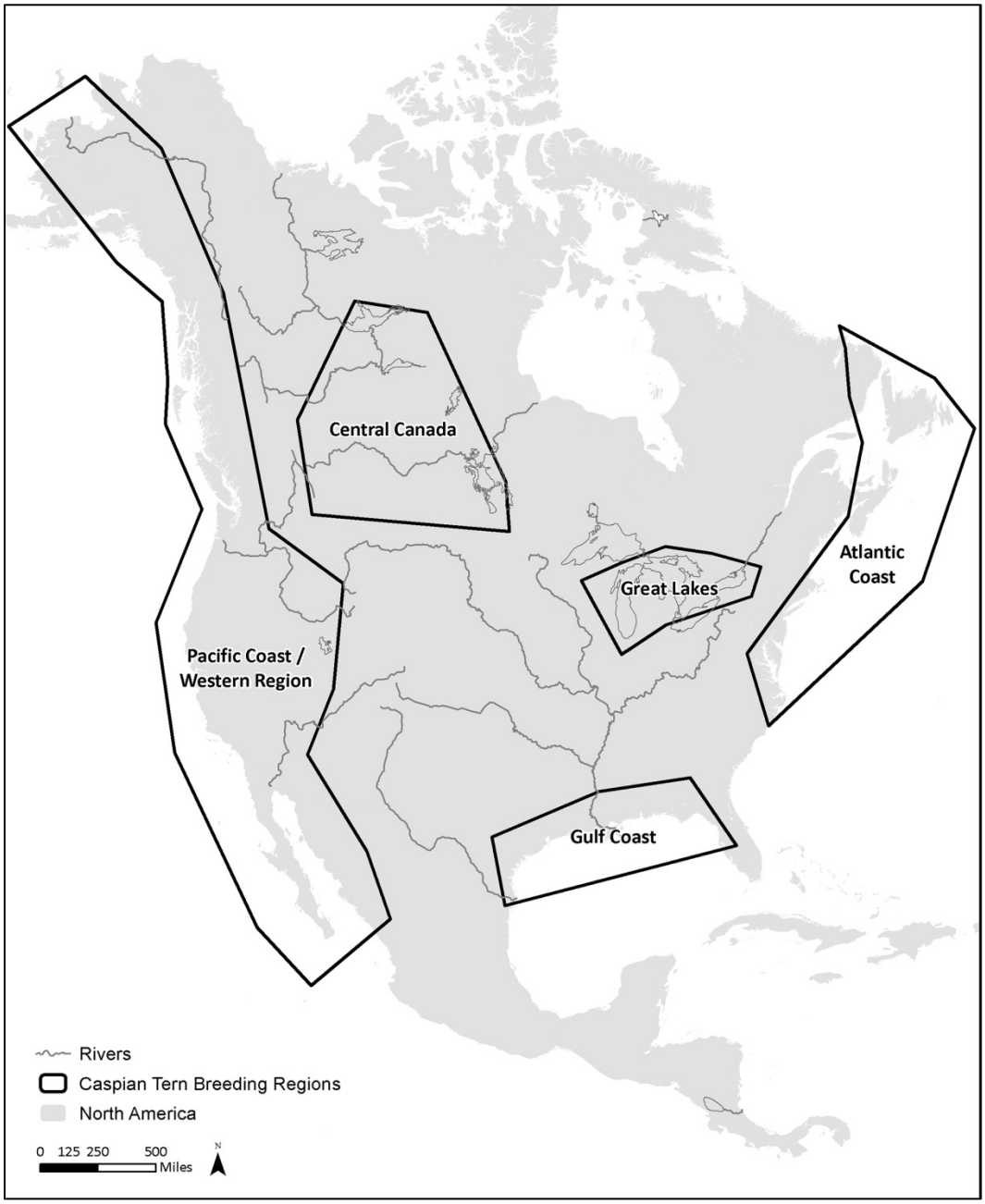


Source: Cuthbert and Wires 1999.

Figure 3-1. Location of CATE range in North American including breeding, wintering, and year-round areas. The western breeding range stretches from central California through the Pacific Northwest/Intermountain West to Alaska. Wintering range is central and coastal Mexico and Florida.

In North America, the CATE breeding range can be separated into five distinct breeding regions (Wires and Cuthbert 2000), by far the largest of these being the Pacific Coast/Western Region (Figure 3-2). The Pacific Coast/Western Region stretches from western Alaska through Baja California and Sinaloa, Mexico. The Pacific Coast/Western

Region also encompasses non-coastal sites from southern Idaho to northern Utah including the inland Columbia River Basin.

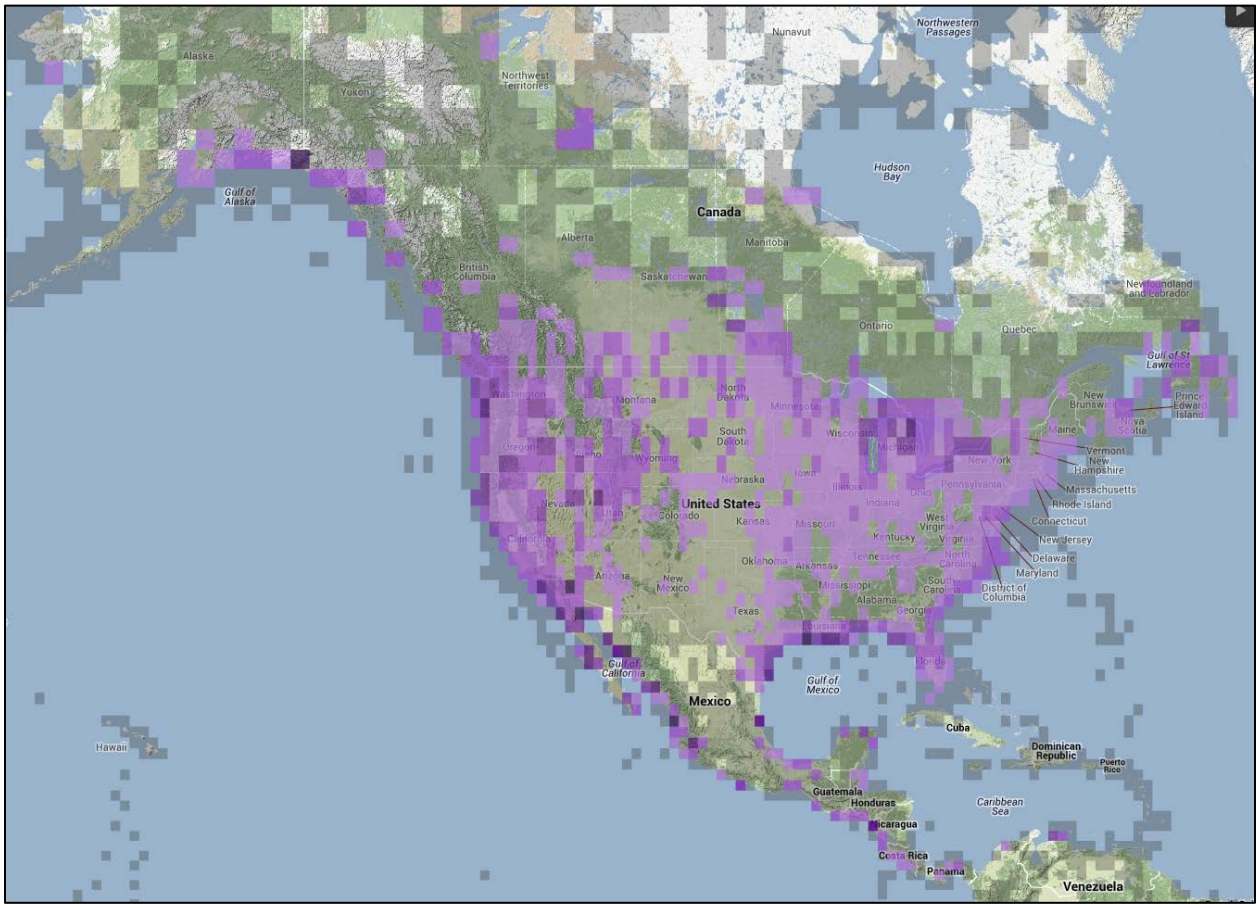


Source: Wires and Cuthbert 2000.

Figure 3-2. Location of CATE breeding regions in North America: Pacific Coast/Western Region, Central Canada, Gulf Coast, Great Lakes, and Atlantic Coast.

In addition to these five regions, there are isolated instances of CATEs breeding in parts of the Midwest and East Coast (Cuthbert and Wires 1999). Analysis of eBird, an online database repository of citizen science bird reporting from North America and around the

world, implies that some CATEs are also found during the CATE breeding season from May to June (Figure 3-3) outside of the five regions referred to above, though the presence of these birds at this time does not equate breeding (Cornell 2013).



Source: eBird 2013.

Figure 3-3. Frequency of eBird reports containing CATEs in North and Central America from May to June over multiple years. Darker shades represent more frequent reports. Areas with no shading (e.g., central Mexico) have no eBird reports for these months. Many of these reports are of only an individual CATE, not multiple birds.

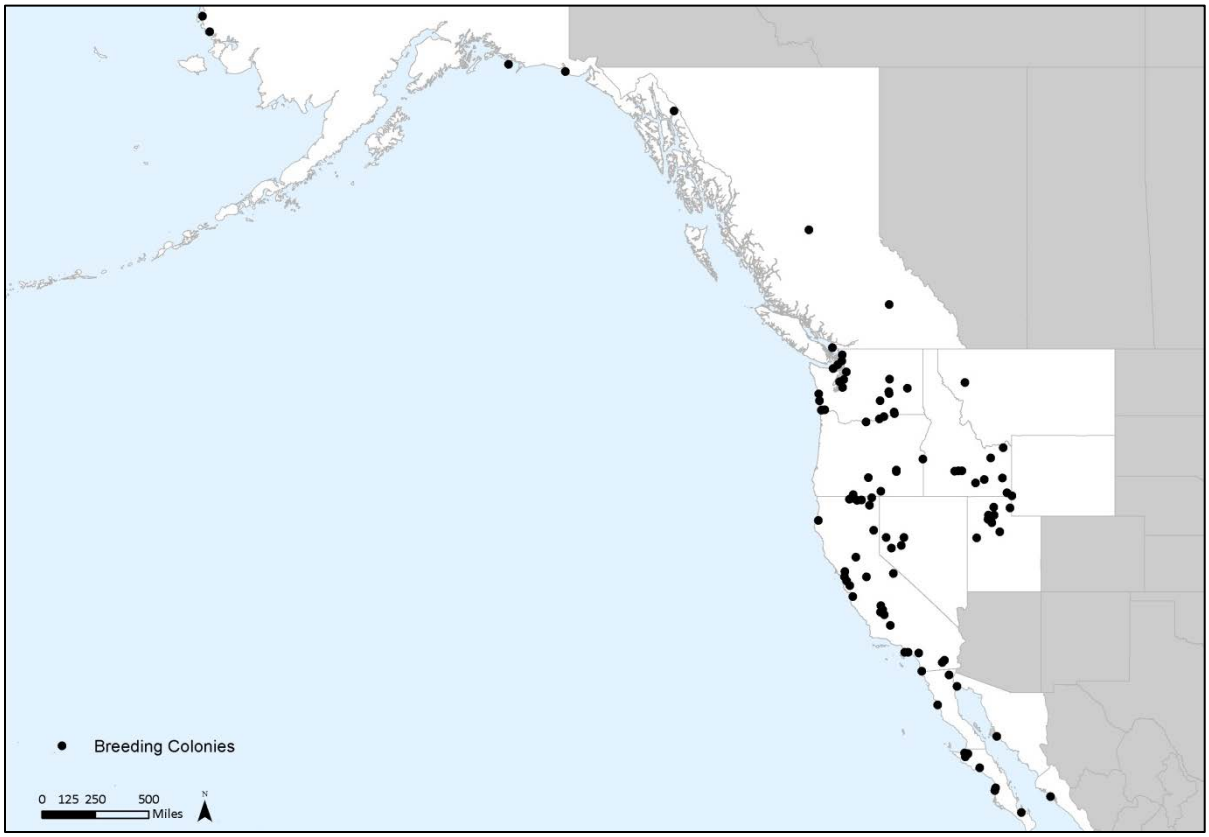
CATEs breeding in North America winter primarily along the coasts, from southern California to Central American on the Pacific, and from North Carolina to Nicaragua on the Atlantic and Gulf coasts, but also in non-coastal Mexico and Florida and sparsely throughout the Caribbean (Cuthbert and Wires 1999).

Outside North America, the range of the CATE has decreased, including in parts of Europe where it formerly bred. In areas of Tunisia, Romania, Denmark, and Germany, where the species bred regularly, the species is either rare or extirpated (Cramp 1985). Despite these declines, the species still breeds on the coasts of Sweden, Finland, Estonia within Europe. The Asian breeding range includes the Caspian and Aral Seas,

northern Mongolia, south Siberia, and coastal eastern China. The species also breeds in coastal Australia and New Zealand and scattered locations in coastal Africa (Cuthbert and Wires 1999).

3.1.3.2 Western Metapopulation Overview

The Pacific Coast/Western Region, including non-coastal sites, is also known as the western North America metapopulation (Figure 3-4). CATEs from this region have separate breeding and wintering areas from CATE populations east of the Continental Divide (Gill and Mewaldt 1983). Since the 1970s the western (Pacific Coast) North America CATE metapopulation has been the largest in the United States (Table 3-2). Knowledge of CATE populations and efforts to estimate numbers have improved over time and current CATE population estimates are likely much better than previous estimates.



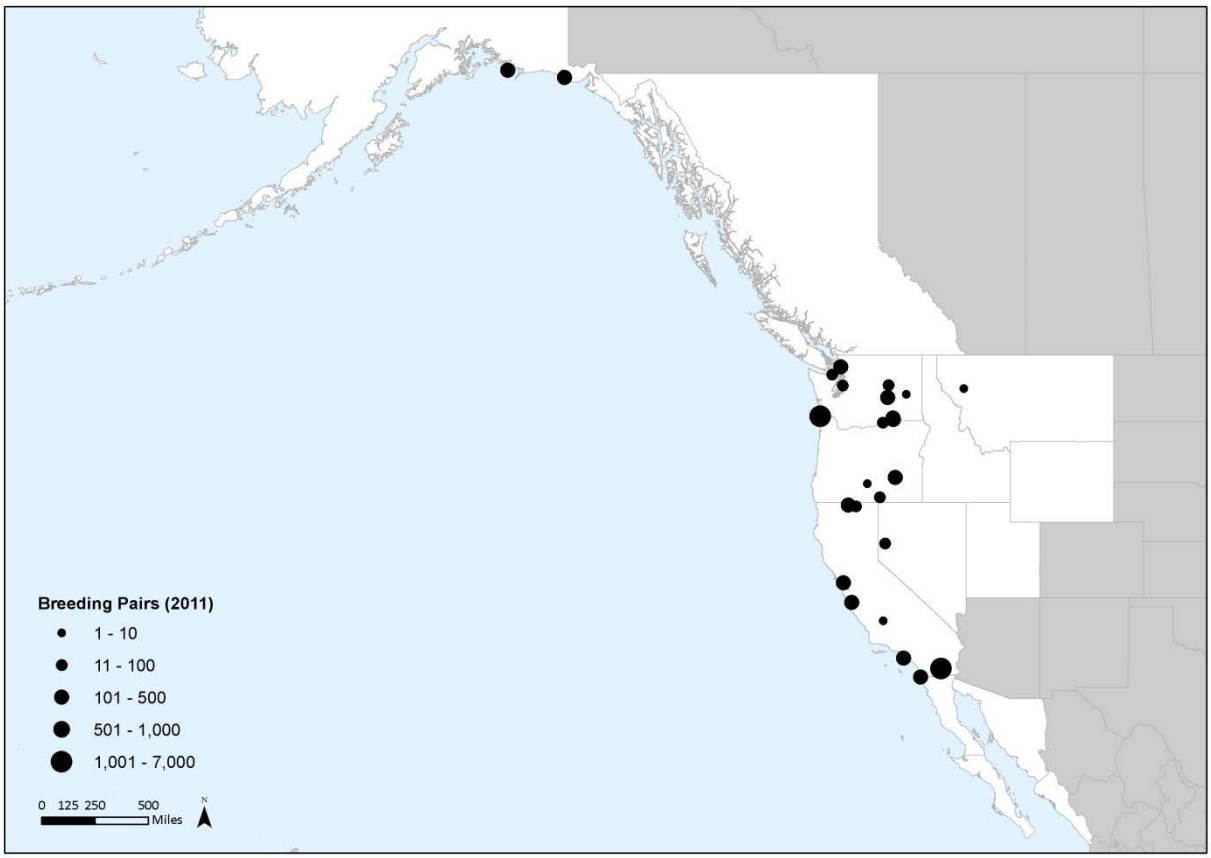
Source: Collis et al. 2012.

Figure 3-4. Distribution of current and historical CATE breeding colonies in western metapopulation.

While the western metapopulation does not extend east of the Continental Divide, it is possible that even during the breeding season from May to July CATEs could wander outside the metapopulation as indicated in Figure 3-3. At least one CATE from the

western metapopulation has been observed to the east of the divide - a single individual CATE was observed in Pierre, South Dakota (latitude 44.36804, longitude -100.36405) on May 2, 2013. This individual CATE was banded as a chick at East Sand Island in 2003. Before this South Dakota sighting, the furthest east a CATE from the western metapopulation had been sighted was in Montana (Suzuki 2013 personal communication).

Nesting habitat limits CATE colony location while prey abundance can influence colony size. CATE nesting locations are rarely permanent but instead come and go with storms, droughts and other factors (e.g., predation) that improve or diminish the quality of nesting sites. Due principally to the unstable nature of their nesting habitat, CATEs have developed a rather nomadic approach to locating suitable nest sites (Cuthbert 1985, Roby et al. 2002). By 1930, CATEs in the western metapopulation had shifted their population from primarily smaller non-coastal colonies to larger coastal colonies at human-created sites with abundant food sources (Gill and Mewaldt 1983). On the Pacific Coast specifically, this shift from non-coastal colonies to coastal has been occurring since the 1970s, with new colonies forming in British Columbia and Alaska in the 1980s (Cuthbert and Wires 1999), and spreading as far north as western Alaska by 1996 (McCaffery et al. 1997). By 2011, many of the largest CATE colonies in the western North American metapopulation were located in coastal areas (Figure 3-5). This dynamic nature of their nesting sites adds to the uncertainty of predictions of where dissuaded CATEs will go and the value of nest habitat enhancement.



Source: Collis et al. 2012.

Figure 3-5. Distribution and relative size of CATE breeding colonies in western metapopulation surveyed in 2011.

Table 3-2. Estimates of the U.S. CATE breeding population by region (does not include estimate of Mexico and Canada CATE breeding population and may include "floaters" – non-breeding CATEs that commonly occur in suitable foraging areas)

	1976-1982[a]		1997-1998[b]		2011[c]
	Estimated Pairs	**% U.S. Population**	**Estimated Pairs**	**% U.S. Population**	**Estimated Pairs**
Pacific Coast	6,218	66.4	14,534	69.4	11,660
Great Lakes	1,682	18.0	3,979	19.0	--
Gulf Coast	1,456	15.5	2,303	11.0	--
Atlantic Coast	10	0.12	122	0.6	--
Total	**9,366**	**100.00**	**20,938**	**100.00**	**--**

Notes:

a Spendelow and Patton 1988. Numbers of adults are divided by two to estimate nesting pairs. Likely an underestimate due to frequent absence of one member of breeding pair.

b Shuford and Craig 2002.

c USFWS 2013a personal communication.

Colonies within the western metapopulation are linked with each other such that CATEs breeding at one colony may disperse to any other colony within the metapopulation. Analysis of band re-sighting data shows that there is connectivity between Goose and Crescent Islands (birds from one island were resighted at the other), at East Sand Island, and in Interior Oregon and California, including at Crump Lake in Warner Valley, Oregon, and Lower Klamath and Tule Lake National Wildlife Refuges (NWRs) (Collis et al. 2012) (Figure 3-8). Colony sites often vary in habitat quality over time so that in years with poor nesting conditions at one colony CATEs will often shift to attempt to nest at another colony. Coastal sites tend to have more s food resources (Seto et al. 2003). Interior sites in Washington State have less stable food availability and often higher per capita levels of predation on ESA-listed salmonids.

Of 134 known historical and active CATE colonies in the western metapopulation, approximately 100 received some degree of monitoring in 2011 (Collis et al. 2012). Of the 100 colonies monitored in 2011, 33 had at least one confirmed CATE breeding pair (Table 3-3). Of the 14 colonies with more than 100 CATE pairs, nine sites were coastal and five (Goose and Crescent Islands, Salton Sea, Malheur and Sheepy Lake) were non-coastal. In addition to Goose Island, Crescent Island, and Salton Sea, only two other CATE colonies had more than 400 pairs: Padilla Bay's Unnamed Island (424 pairs) in Coastal Washington and, by far the largest colony in the metapopulation, Coastal Oregon's East Sand Island with almost 7,000 CATE pairs.

Table 3-3. Monitored CATE colonies with at least one confirmed breeding pair in 2011

State/Region/Site	2011 Colony Size (Breeding Pairs)
ALASKA	
Copper River Delta - Kokinhenik Bar	241
Icy Bay - Gull Island	250
WASHINGTON	
Coastal Washington	
Padilla Bay - Unnamed Island	424
Strait of Juan de Fuca - Smith and Minor islands	5
Strait of Juan de Fuca - Dungeness Spit	42
Puget Sound - Seattle Waterfront (Pier 90)	60
Interior Washington	
Banks Lake - Twinning Island	19
Sprague Lake - Harper Island	4
Potholes Reservoir - Goose Island	422
Columbia River - Blalock Islands ("Anvil" Island)	20
Columbia River - Crescent Island	419
Columbia River - Badger Island	31
Columbia River - Foundation Island	5

State/Region/Site	2011 Colony Size (Breeding Pairs)
OREGON	
Coastal Oregon	
Columbia River estuary - East Sand Island	6,969
Columbia River estuary - Rice Island	3
Interior Oregon	
Malheur Lake - Singhus Ranch	150
Summer Lake Wildlife Area, East Link Impoundment (tern island)	2
Warner Valley, Crump Lake (tern island)	35
NEVADA	
Pyramid Lake - Anaho Island	16
MONTANA	
Ninepipe Reservoir	3
CALIFORNIA	
Coastal California (North)	
San Francisco Bay - Brooks Island	306
San Francisco Bay - San Francisco Waterfront (Agua Vista Park)	8
Monterey Bay - Elkhorn Slough ("Boomerang" Island)	4
Monterey Bay - Salinas River mouth (NWR)	261
Coastal California (South)	
Los Angeles Harbor - Terminal Island (Pier 400)	112
Huntington Beach - Bolsa Chica Ecological Reserve (North Tern Island)	65
San Diego Bay - San Diego Bay NWR (Salt works)	260
Interior California (North)	
Lower Klamath NWR, Sheepy Lake (tern island)	188
Lower Klamath NWR, Orems Unit (tern island)	2
Tule Lake NWR, Tule Lake (tern island)	34
Clear Lake - Clear Lake NWR	12
Interior California (South)	
Salton Sea - Headquarters Unit “D”	1,114
MEXICO	
Baja California	
Cerro Prieto	107
Total for all sites	**11,593**[a]

Source: Collis et al. 2012.

a Numbers used in USFWS, unpublished data may reflect more recent information than in Collis et al. 2012.

3.1.3.3 Western Metapopulation Population Trends

In the early twentieth century, CATE in the western metapopulation nested almost exclusively at non-coastal lakes and marshes (Wetmore 1919, Willett 1919). Coastal

habitats were not used for nesting until the late 1920s and 1930s. By the 1950s, there was a major range expansion northward in coastal Washington which continued through 1980 (Suryan et al. 2004). Between the early 1960s and early 1980s the number of CATEs in the western metapopulation has increased by more than 70 percent but numbers have stabilized since 1997 (Gill and Mewaldt 1983) (Table 3-1). In 1983, 77 percent of CATEs were found in three areas: Grays Harbor, Washington, and San Francisco and San Diego Bays, California (Gill and Mewaldt 1983). Since the mid-1990s, the number of CATEs in the western metapopulation has remained relatively stable, with population shifts between states especially evident in some regions such as Alaska, California, and Washington (Table 3-4).

Abandonment of breeding sites in natural conditions is often a result of natural changes in conditions such as drought, erosion, flooding, vegetation encroachment, colony disturbance, nest predation, and changes in prey abundance (Suryan et al. 2004). Anthropogenic causes in habitat modification have been one of the most influential sources of changes in CATE breeding distribution (Shuford and Craig 2002). Artificial sites (e.g., dredge disposal areas) that are maintained either through vegetation management or through controlled water levels during droughts or floods are often well suited to CATE breeding. Prey abundance at artificial sites on the Columbia River is often more stable than at other sites due to the release of fish from nearby hatcheries (Suryan et al. 2004).

From the early 1980 population estimate of approximately 6,000 CATE pairs (Gill and Mewaldt 1983), the metapopulation has doubled to 11,593 pairs at monitored sites (Collis et al. 2012). The western metapopulation peaked in 2009 at almost 19,000 pairs and has declined since (Table 3-1). This western metapopulation decline corresponds to a decrease in the East Sand Island colony from more than 10,500 pairs in 2008 to fewer than 7,000 pairs in 2011 (USFWS 2013a personal communication). Despite the decline in the last several years, the western metapopulation shows an overall increase since the 1970s and early 1980s (Table 3-2). The large population increase can be primarily attributed to the increase in CATEs within the Columbia River estuary between 1984 and 2002 (USFWS 2005b).

During this time many breeding CATE shifted from traditional nesting in small non-coastal colonies and natural sites to large coastal colonies at anthropogenic sites (Suryan et al. 2004). In Washington, large coastal colonies in Grays Harbor and Willapa Bay were abandoned in 1989 while new colonies were established in the Columbia River estuary and collectively grew to over 9,000 pairs by 2000 (Suryan et al. 2004). These colonies moved to Rice Island and nested there until they were pushed off the island by the Corps and its partners to East Sand Island.

Table 3-4. Number of CATEs nesting at select islands in Washington and Oregon, 1996 to 2011

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Interior Washington																
Goose Island (Banks Lake)					10	19		21	41	4	0	0	0	0	0	0
Twinning Island[a]					0	0				12	24	30	27	61	34	19
Badger Island																33
Anvil Island										0	0	0	0	0	135	20
Rock Island[b]										6	110	16	104	80	0	0
Crescent Island	205	614	357	552	571	720	578	510	530	476	448	355	388	349	375	419
Foundation Island																5
Miller Rocks	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Goose Island (Potholes)					0	0			87	325	273	282	293	487	416	422
Solstice Island (Potholes)					130	250			0	0	0	0	0	0	0	0
Harper Island		20	20	50	23	20				10	7	0	11	4	4	4
Coastal Oregon																
East Sand Island	0	0	0	547	8513	8896	9933	8352	9502	8822	9201	9900	10668	9854	8283	6969
Miller Sands Island (Spit)		0	17	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Island	8149	7151	8691	8328	588	0	0	0	0	0	0	0	0	0	0	3

Source: Adkins et al. 2011; USFWS, unpublished data.

3.1.3.4 Habitat Requirements

CATEs typically prefer open, sparsely vegetated areas but accommodate a variety of substrates. For example, nests are known on islands with sand-gravel or limestone substrate, on soft, spongy, marshy soil and on hard soil (Ludwig 1965, Degroot 1931, Miller 1943). CATEs have also been known to nest on non-natural substrate such as rooftops and barges (USFWS 2005a). Within the Columbia River, CATEs have nested on spoil-dredge islands and other islands with a bare sand substrate free of vegetative cover. A key aspects of CATE nest sites are that the substrate has an open vista and be vegetation-free, or nearly so.

Typically, a CATE nest is a depression large enough to hold two to three eggs, usually elevated more than 2 to 3 meters above the water and is occasionally lined with dried vegetation, small pebbles or bits of broken clam shells, and debris (Bent 1921, Penland 1976). Sometimes the nest is built up elaborately like a gull nest, others are piled masses of wood and stick debris while others appear primitive, with eggs merely lying on shells or in slight hollows that are already present or built by other birds (Bent 1921, Hayward 1935, Miller 1943; Quinn 1990).

Within the Columbia River, CATEs sometimes dig nest scrapes near the high water line. Because of this habit, nests occasionally fail during periods of high water events when they are prone to flooding (Roby et al. 2011a).

3.1.3.5 Diet

CATEs are piscivorous in nature (Harrison 1984), primarily or exclusively feeding on fish, but occasionally taking crayfish and insects (Cuthbert and Wires 1999). They require about 220 grams (roughly one-third of their body weight) of fish per day during the nesting season (Harrison 1984). A more in-depth analysis of the diet of CATEs shows that the total metabolized energy requirement for breeding adult CATEs is roughly 1040 kJ/day, and chick energy requirement from hatching to fledging averaging 450 kJ/day, translating to an approximate average of 215.32 grams of mixed fish diet a day for an adult, and an approximate average 93.2 grams of mixed fish diet a day for a growing chick (Roby et al. 2003). CATEs catch a diverse array of species with shallow plunge dives, usually managing to completely submerge themselves underwater, but rarely feeding any deeper (Cuthbert and Wires 1999). The sizes of fish caught and species composition of the diet are largely determined by geography and annual and seasonal prey availability, but most fish consumed are between 5 and 25 cm in length, and occur near the surface of the water (Collis et al. 2001, Roby et al. 2011b, Ryan et al. 2003,USFWS 2005a). The timing of courtship, nesting and chick rearing usually corresponds with prey availability.

Within the Columbia River, CATE diet studies have been carried out with the primary focus of systematically evaluating predation on salmonids by colonial nesting birds in the Columbia Basin in 1997 and 1998 (Collis et al. 2002a). Diet variation between colonies and seasonal changes in the proportion of salmonids that occur in CATE diet in the Columbia River probably reflects differences in availability of prey (Roby et al. 2011b). Bill load identifications (Collis et al. 2002a, Roby et al. 2002), bio-energetics modeling (Roby et al. 2003, Antolos et al. 2005, Maranto et al. 2010), and smolt PIT-tag recovery (Ryan et al. 2001a, Collis et al. 2001, Ryan et al. 2003, Evans et al. 2012) have all been used to assess CATE diet composition and smolt impacts in the Columbia River Basin. From 1999 to 2003, the tern diet on East Sand Island, close to the mouth of the Columbia River, was primarily marine forage fish (non-salmonids) including northern anchovy, herring, shiner perch, sand lance, smelt, and flatfish, while only 33 (17 to 47) percent was juvenile salmonids (Roby et al. 2002, Collis et al. 2002c, 2003a). Further from the ocean, but still within the Columbia River estuary, diet studies between 1999 and 2000 of the tern colony on Rice Island documented an average of 83 (77 to 90) percent juvenile salmonids in their diet (Roby et al. 2002). This variation reinforces the opportunistic nature of the prey selection of CATEs.

In the UCR, juvenile salmonids are a significant part of CATE diet during salmonid out-migration to the Pacific Ocean, with up to 71 percent of prey items at some colonies consisting of salmonid smolts (steelhead, Chinook, sockeye, rainbow trout [*O. mykiss*] and bull trout [*Salvelinus confluentus*]) (Lyons et al. 2011a, Roby et al. 2011b). The remainder of the diet consists partially of centrarchids (bass and sunfish, 15 percent) and cyprinids (carp and minnows, 9 percent) (Roby et al. 2011b). A more detailed discussion of salmonid consumption estimates and predation rates by CATE located at Goose and Crescent Islands is presented below in Section 3.1.3.8.

3.1.3.6 Migration

In general, the CATE is a partial, medium-distance migrant, though large numbers of CATEs do migrate to wintering ground in Mexico (Cuthbert and Wires 1999). During the winter the majority of the CATEs from the western metapopulation winter from California to Mexico. In the western metapopulation, band re-sighting data have shown that CATE range from 1,000 to almost 1,600 miles (n = 118 band recoveries from CATEs banded in San Diego and San Francisco, California, and Grays Harbor, Washington). However, they may travel much farther distances (Gill and Mewaldt 1983). CATEs from the inland Columbia River Basin likely follow the Columbia River to the Pacific Coast, then follow the coast south (Cuthbert and Wires 1999).

Migrant CATE generally arrive at breeding colony sites in the inland Columbia Basin in early April and depart colonies in early to mid-July (Figure 3-6). This trend is similar for both Goose Island and Crescent Island. Starting in early April number of adult birds on

colonies increases dramatically and peaks around mid-May. Numbers begin to decline in late-May and this trend continues until the end of June. Few birds occur on the colonies in July though fall movements continue between mid-July and mid-September along the Pacific Coast (Shuford and Craig 2002). Fall departure of CATEs from breeding grounds is typically preceded by a gathering of adults and juveniles at staging areas by breeding areas (Cuthbert and Wires 1999).

Trends in seasonal adult colony attendance can vary in other locations from what occurs in the inland Columbia River Basin. For example, at East Sand Island, CATEs start arriving on colonies in early April and peak in mid-May, but abundance declines more gradually to the point where birds can still be observed on colonies in mid-August (Roby et al. 2013). At Tern Island at Crump Lake, birds arrive in late-April, peak in late-June and can still be found on the colonies as late as early-September. At smaller colonies such as on East Link Impoundment, Gold Dike Impoundment, and Dutchy Lake, abundance is fairly consistent throughout the breeding season with no distinct peaks (Roby et al. 2013). Abundance trends from Tule Lake in California were inconsistent between 2011 and 2012 during the time when they were monitored. In 2011, CATEs began arriving on colonies at Tule Lake in early-April and increases stopped in mid-May. From mid-May to early-September, abundance was fairly consistent throughout this time. In contrast, during 2012 on Tule Lake, birds did not begin arriving on colonies until late-April increase sharply until mid-June when abundance peaked. Abundance declined sharply afterward, and by mid-July no adult CATEs were observed on colonies (Roby et al. 2013).

3.1.3.7 Colony Sizes and Growth Rates at Sites in the Inland Columbia River Basin

Beginning in 2009 and continuing through 2012 (year of latest data), the CATE colony located on Goose Island was the largest CATE colony in the inland Columbia River Basin region with a population of 459 CATE breeding pairs in 2012 (Roby et al. 2013) (Table 3-5).

Until 2009 the CATE colony on Crescent Island was the largest of its kind within the inland Columbia River Basin. Overall, the CATE colony size at Crescent Island trended downward from 2001 to 2007 but has remained relatively stable since 2007 with a population of 422 breeding pairs in 2012 (Roby et al. 2011a) (Table 3-5).

Table 3-5. Numbers of CATE breeding pairs on Goose and Crescent Islands

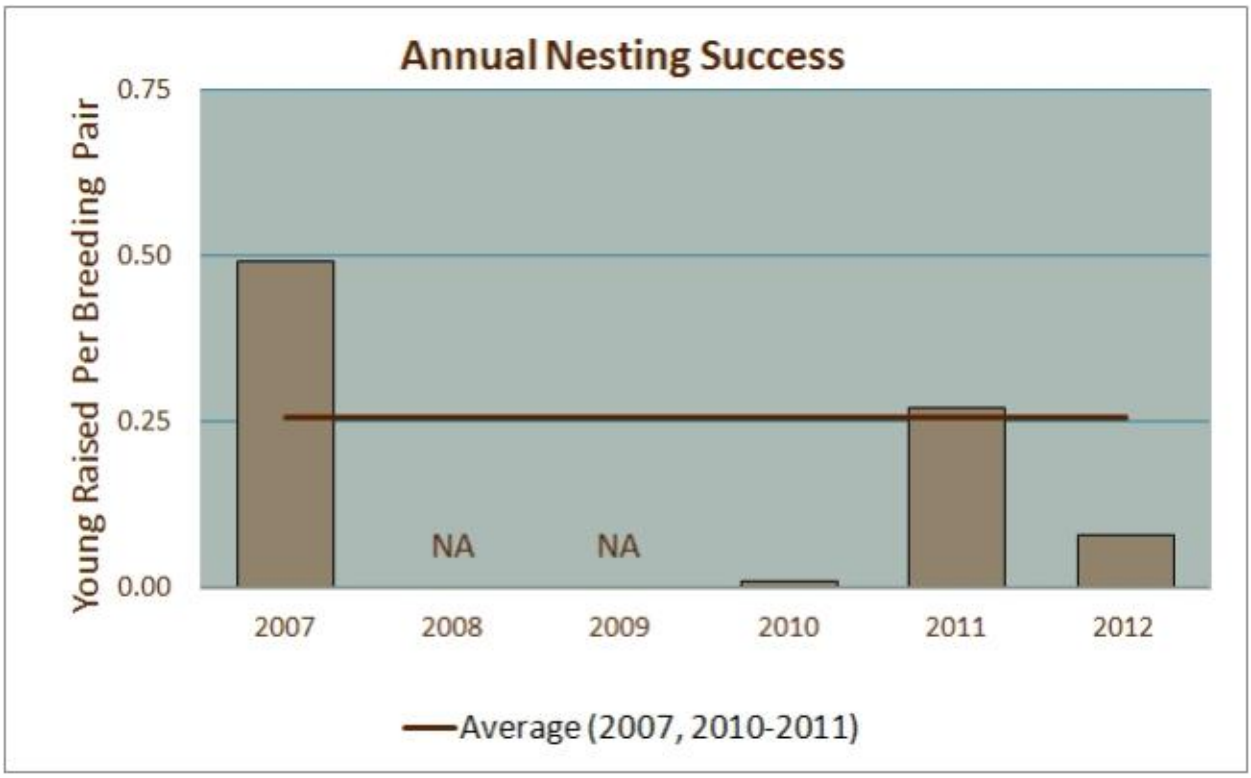
Island	2004	2005	2006	2007	2008	2009	2010	2011	2012
Crescent Island	530	476	448	355	388	349	375	419	422
Goose Island (Potholes)	87	325	273	282	293	487	416	422	459

Sources: Adkins et al. 2011, Roby et al. 2011a, Roby et al. 2013.

Within the Columbia River at-risk islands the first documentation of CATEs on the Blalock Islands was in 2005 when six breeding pairs attempted to nest on Rock Island. The breeding pairs grew from six in 2005 to 110 pairs in 2006 and 80 breeding pairs in 2009, however no CATE have nested on the Rock Island colony since 2009 (USFWS 2013a personal communication). In 2005, CATEs began nesting on Twinning Island within Banks Lake and continue to in all years through 2011 (USFWS 2013a personal communication). The colony at Twinning Island has grown from 12 breeding pairs in 2005 to 61 breeding pairs in 2008, but fell back to 19 pairs in 2011 (USFWS 2013a personal communication) (Table 3-5). CATEs have intermittently attempted to nest on Miller Rocks, and in 2001, 20 breeding pairs of CATEs nested on the island (USFWS 2013). The first documentation of CATEs nesting on Three-mile Canyon Island was in 1977 (184 breeding pairs), and the colony grew to 260 breeding pairs by 2000 (USFWS 2013a personal communication). In 2000, and again in 2001, no chicks were fledged from the island potentially due to mink (*Neovison vison*) predation. The site was abandoned by nesting CATEs in 2002, and they have not nested there since, presumably because of the disturbance associated with mink activities on the island (BRNW 2012).

Populations of CATEs in the inland Columbia River Basin have historically been dynamic in nature. CATEs were first recorded nesting in this region in 1929 at a single nest at Moses Lake (Kitchen 1930, as cited in Antolos et al. 2004). Three years later a colony of approximately 50 pairs nested on an unnamed island in the Columbia River in Benton County (Decker and Bowles 1932). Johnsgard (1954) regarded CATEs as rare summer residents at Potholes Reservoir with no successful nesting in 1953 or 1954. Populations increased during the 1980s but increases began to slow in the 1990s (Table 3-4). From 1996 to 2001, Antolos et al. (2004) did not find significant population trends within the area for six CATE colonies in the inland Columbia River Basin. The same number of colonies was reported by Roby et al. (2013) which included approximately 1000 breeding pairs and no population trends were apparent from 2008 to 2012, but the total number of birds is slightly higher compared to what was recorded from 2005 to 2008 (Table 3-5).

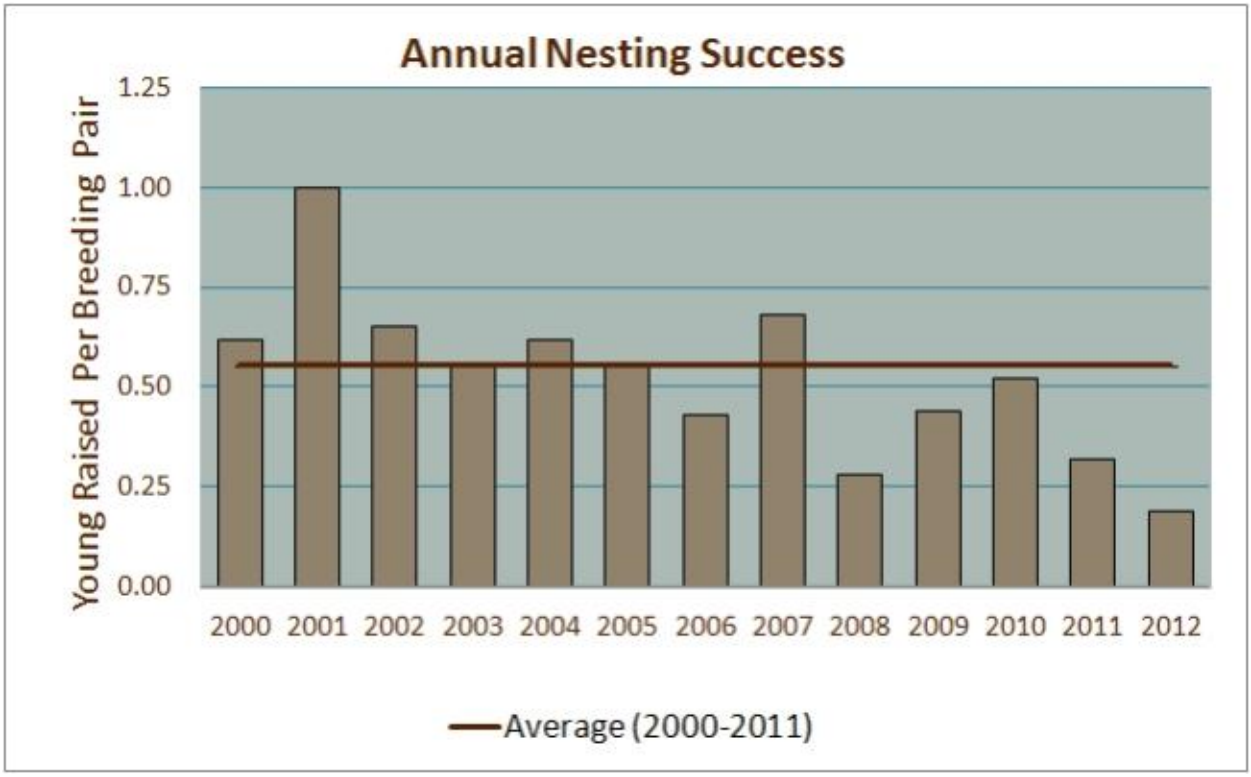
In general, fledging success rates on Goose and Crescent Islands vary greatly from year to year. On Goose Island, nesting success rates were not measured in 2008 and 2009, but in general were low (Figure 3-6). The number of young raised per breeding pair dropped from an average of 0.5 in 2007 to almost no young fledged in 2010. Nesting success rose to about 0.25 young per pair in 2011, but dropped to less than half of that in 2012 (BRNW 2013).



Source: BRNW 2013.

Figure 3-6. Annual nesting success of Goose Island CATEs, 2007, 2010 to 2012.

In general, Crescent Island had much better fledgling success rates than Goose Island (Figure 3-7). The number of young raised per breeding pair between 2000 and 2012 varied from a high of one chick per pair in 2001 to a low of approximately 0.2 chicks per pair in 2012 (BRNW 2013). Crescent Island CATEs averaged slightly more than-0.5 chicks per pair from 2000 to 2012 (BRNW 2013).

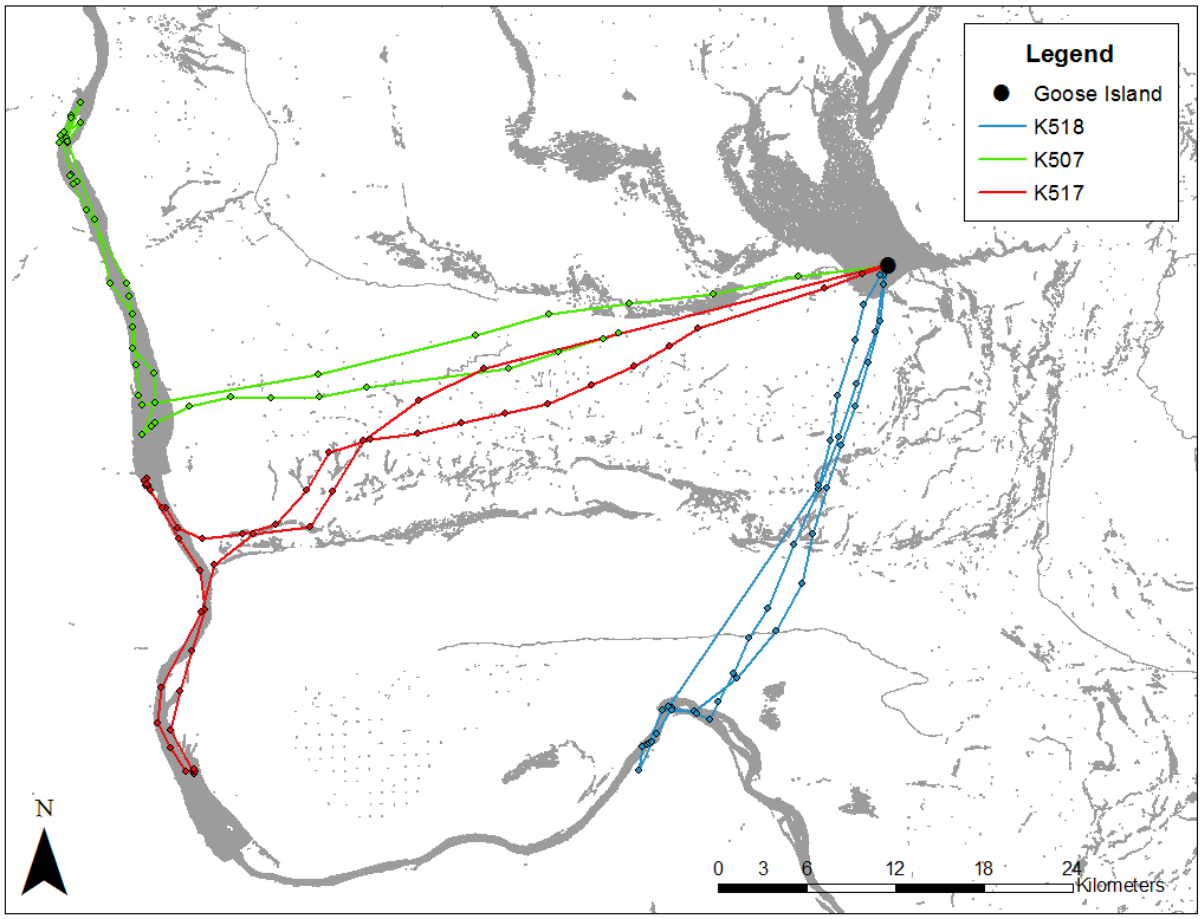


Source: BRNW 2013.

Figure 3-7. Annual nesting success of Crescent Island CATEs, 2000 to 2012.

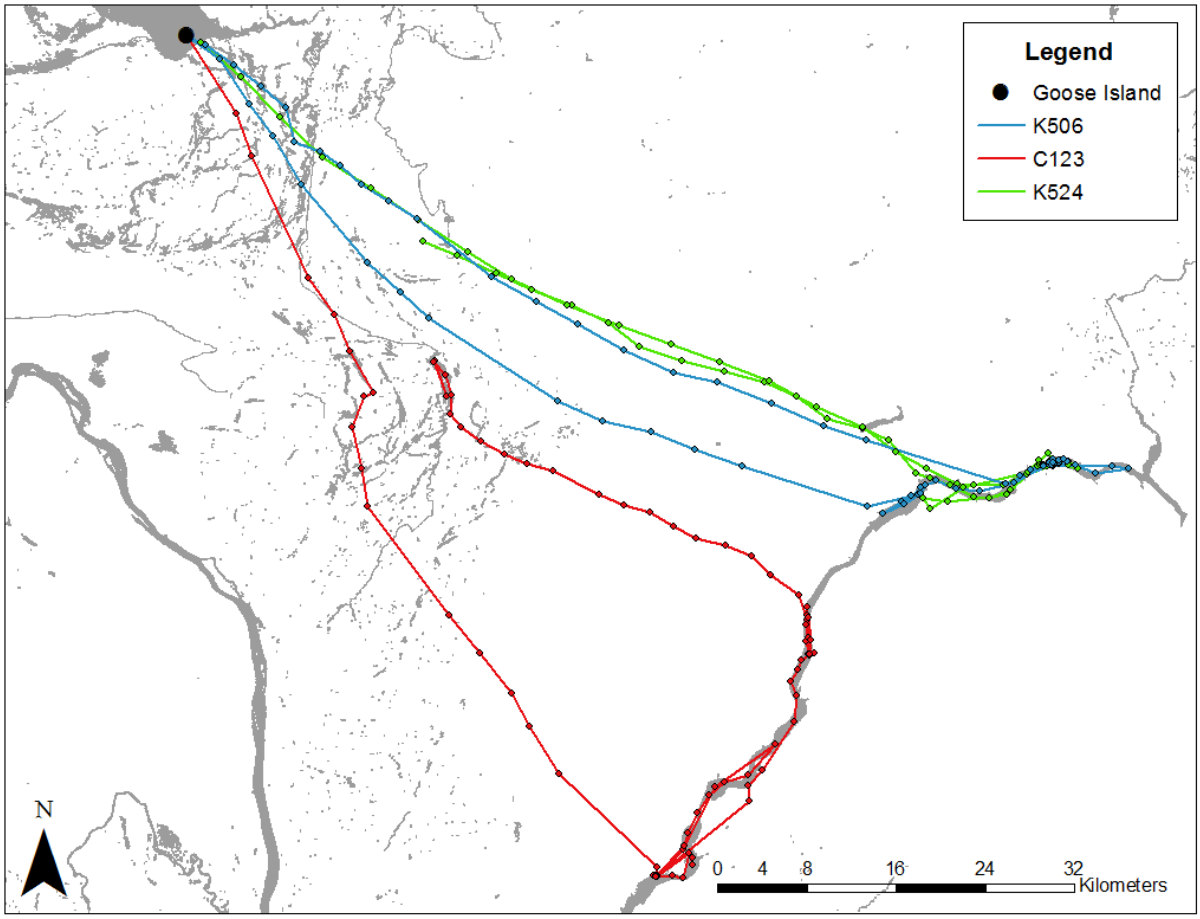
Limitations on colony size usually relate to habitat and food. Antolos et al. (2004) postulated that colonies at Crescent Island and Three-mile Canyon Islands were limited by mammalian disturbance and predation (mink), but that the Solstice Island Colony was limited by food availability. Limitations on nesting success and concomitant population growth are often affected by nest predators.

Suitable CATE nesting areas free from predators may not be located close to foraging areas. For example, GPS transmitters were placed on CATEs nesting on Goose Island in 2013 (BRNW 2013, unpublished data). Preliminary data show movement of CATEs as far as 93 km away from a nesting site. Figures 3-8 and 3-9 show examples of CATE foraging trips from Goose Island to sites on the Columbia and Snake Rivers (BRNW 2013, unpublished data).



Source: BRNW 2013, unpublished data.

Figure 3-8. Foraging trip of three GPS-tagged CATEs from Goose Island to the Columbia River.



Source: BRNW 2013, unpublished data.

Figure 3-9. Foraging trip of three GPS-tagged CATEs from Goose Island to the Snake River.

3.1.3.8 Colony Connectivity

The inland Columbia River Basin includes areas around the Columbia River above the Bonneville Dam and along the Snake River. The two largest colonies of CATEs present in the inland Columbia River Basin are Goose Island, and Crescent Island. CATEs breeding on Goose and Crescent Islands are part of the western metapopulation and have been observed from as far away as British Columbia and Mexico (Collis et al. 2012) (Table 3-6). Data indicate colony connectivity between Goose and Crescent Islands and roosts in southeast Alaska, Utah, and Idaho (Collis et al. 2012).

Table 3-6. Connectivity of monitored CATE colonies and other sites in the western metapopulation in 2005 to 2011 based on re-sightings of CATEs banded with alphanumeric leg bands on Goose and Crescent Islands. Re-sighting efforts varied between sites

Region/Colony or Roost	Crescent Island	Goose Island	Total
British Columbia			
Fraser River Delta (roost)	>10	>10	>20
Total			>20
Coastal Washington			
Bellingham Bay-Port of Bellingham	5	6	11
Strait of Juan de Fuca - Dungeness Spit	1	0	1
Padilla Bay - Unnamed Island	0	1	1
Total			13
Interior Washington			
Potholes Reservoir - Goose Island	25	--	25
Columbia River - Crescent Island	--	16	16
Total			41
Coastal Oregon			
Columbia River estuary - East Sand Island	19	12	31
Joaquin Miller State Park (roost near Florence)	0	1	1
Total			32
Interior Oregon			
Malheur Lake - Singhus Ranch	3	5	8
Summer Lake Wildlife Area - Dutchy Lake	0	1	1
Summer Lake Wildlife Area - East Link Impoundment	5	3	8
Warner Valley - Crump Lake	18	13	31
Total			48
Idaho			
American Falls Reservoir - Gull Island	0	1	1
Total			1
Coastal California (North)			
San Francisco Bay - Brooks Island	1	0	1
Total			1
Coastal California (South)			
Huntington Beach - Bolsa Chica Ecol. Reserve	0	1	1
Mouth of Sand Diego River (roost)	0	1	1
Oceano (roost)	1	0	
Total			3
Interior California (North)			
Lower Klamath NWR - Sheepy Lake	8	12	20
Lower Klamath NWR - Orems Unit	5	1	6

Region/Colony or Roost	Crescent Island	Goose Island	Total
Tule Lake NWR - Tule Lake	15	9	24
Total			50
Interior California (South)			
Salton Sea - Headquarters Unit “D”	3	3	6
Total			6
Mexico			
Shrimp Farm near Mazatlan (roost)	1	1	2
Total			2

Source: Collis et al. 2012 (site assessment report).

Salmonid Consumption Estimates

Salmonid consumption estimates in this section focus on Goose and Crescent Islands in accordance with the results of the Benefits Analysis, which indicates that CATE colonies at these two islands have the highest salmonid consumption measurements of any other CATE colony locations in the inland Columbia River Basin.

For the Goose Island CATE colony in 2010, it was estimated that between 110,000 to 134,000 juvenile salmonids were consumed. On average, approximately 21 percent of colony diet was composed of juvenile salmonids (bass and sunfish comprised approximately 63 percent). At least 73 percent of the salmonids consumed at the colony were determined to be anadromous fish (steelhead or salmon) from the Columbia River based on morphological characteristics, with the rest being resident fish (rainbow trout) from the Potholes Reservoir or nearby lakes and reservoirs (Roby et al. 2011a). At Crescent Island the percentage of juvenile salmonids as prey items was much higher, averaging around 68 percent. Interannual variation in the percentage of juvenile salmonids as prey items was fairly consistent between 2000 and 2010, ranging from 60-70 percent. In 2011 and 2012, the percentage of juvenile salmonids as prey items increased to around 85 percent which was the highest amounts observed during the 12-year timeframe of the study (Roby et al. 2013).

Based on bioenergetic modeling, salmonid estimated consumption rates by CATEs on Crescent Island were relatively stable between 2009 and 2010. CATEs nesting there consumed approximately 360,000 juvenile salmonids in 2009 and an additional estimated 420,000 juvenile salmonids in 2010 from the Columbia and Snake Rivers. The average percentage of juvenile salmonids in the Crescent Island CATE diet was approximately 68 percent from 2000 to 2012 (bass and sunfish comprised the majority of the dietary remainder), although the percentage was higher (approximately 85 percent) in 2011 and 2012. In comparison, this is substantially higher than the East Sand Island CATE colony in the Columbia River estuary, which was estimated to derive

35 percent of colony diet from juvenile salmonids in 2012 and approximately 30 percent of colony diet from juvenile salmonids in the 2000 to 2012 period (Roby et al. 2013).

ESU Specific Predation Rates

Predation rates in this section focus on Goose and Crescent Islands in accordance with the results of the Benefits Analysis, which indicates that CATE colonies at both Goose Island and Crescent Island have an overall higher impact on salmonids than other islands located within the inland Columbia River Basin.

Steelhead

In-river migrating Columbia and Snake River steelhead are particularly vulnerable to CATE predation, especially during low flow years and periods outside the peak migration period (Roby et al. 2006). Based on PIT tag recovery data collected between 2004 and 2010, CATEs at Goose Island had an average predation rate of approximately 14.6 percent and 11.4 percent on the in-river migrating hatchery and wild UCR steelhead, respectively, based on steelhead smolts last detected at Rock Island Dam.

In comparison, CATEs at Crescent Island during the same time period had a predation rate of approximately 2.7 percent and 2.3 percent on the in-river migration populations of hatchery and wild UCR steelhead, respectively. Similarly, the predation rate on non-transported SR steelhead by CATEs at Crescent Island was approximately 5.1 percent of the in-river migrating population during this time period based on smolts interrogated at Lower Monumental Dam (Lyons et al. 2011a).

Salmon

Between 2004 and 2010, Goose Island CATEs had a predation rate of approximately 3 percent on the UCR Sp Chinook based on smolts tagged at and above Rock Island Dam. At Crescent Island, CATEs had a predation rate of approximately 1.2 percent on the non-transported SR Fall Chinook, less than 1.0 percent on non-transported SRS/S Chinook runs, and approximately 1.3 percent on non-transported SR sockeye based on smolts interrogated at Lower Monumental Dam (Lyons et al. 2011a).

3.1.4 Other Piscivorous Colonial Waterbirds

3.1.4.1 Double-Crested Cormorants

DCCO is a widespread common cormorant across both coasts and the interior of the U.S. Breeding occurs in the north central U.S. and south central Canada and along both the Atlantic and Pacific coasts. Its nonbreeding range is along both coasts of the U.S. and Mexico, and in the southeastern U.S. (Figure 3-10).

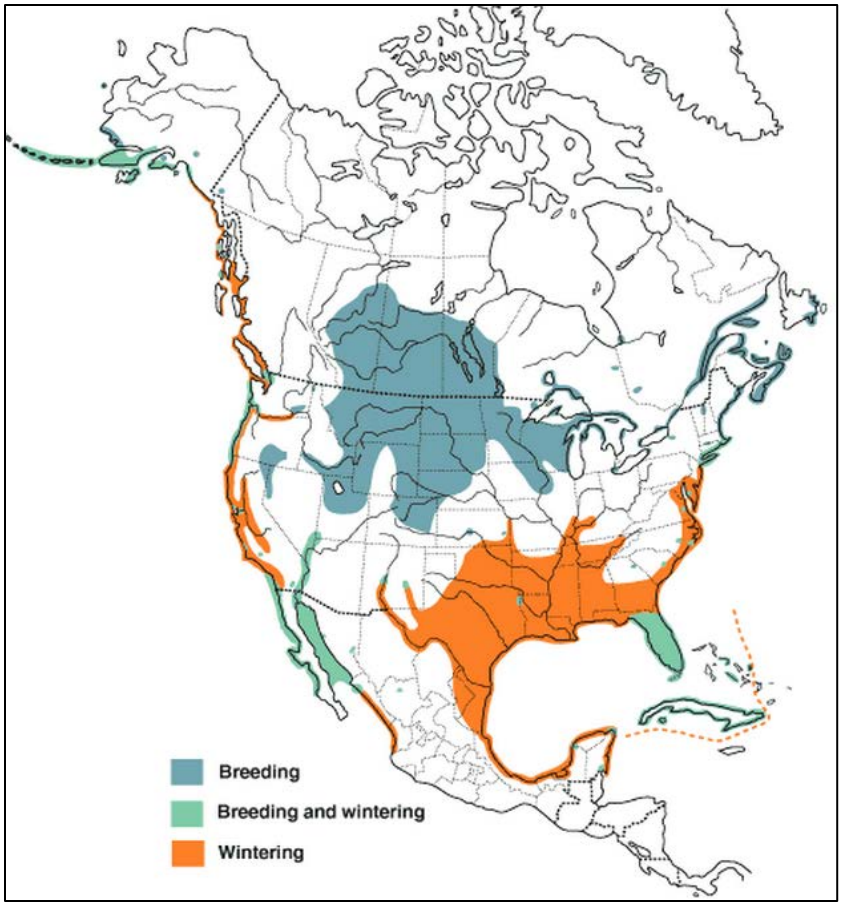


Figure 3-10. DCCO range map.

The DCCO colony on Foundation Island is the largest colony of its kind on the mid-Columbia River. The colony is located below the confluence of the Snake and Columbia Rivers near Crescent Island in the McNary Reservoir. In 2010, the colony consisted of a minimum of 308 breeding pairs. During 2003 to 2006, the number of breeding pairs at Foundation Island grew from approximately 250 breeding pairs to around 360 breeding pairs. This number declined to about 310 breeding pairs in 2009 to 2010 (Roby et al. 2011a).

The largest breeding colony of DCCOs within the inland Columbia River Basin in 2010 was located at the north end of the Potholes Reservoir in the North Potholes Reserve. The colony has gradually diminished in size from approximately 1,150 breeding pairs in 2006 to just over 800 breeding pairs in 2009 to 2010. DCCOs here nest in trees that remain flooded for much of the nesting season. Based on scarcity of salmonid PIT tags near the colony, there is little evidence that these birds forage on juvenile salmonids in the Columbia River (Roby et al. 2011b).

Additional colonies of DCCOs are present at the Okanogan Colony on the Upper Columbia River and on Harper Island in Sprague Lake. In 2010, it was estimated that there was a minimum of 26 breeding pairs of DCCOs at the Okanogan Colony, smaller than the 2009 estimate of 36 breeding pairs. At Harper Island, 86 breeding pairs of DCCOs were estimated in 2010, more than doubling the 2009 estimate of 42 breeding pairs (Roby et al. 2011a).

Overall, these four active DCCO colonies within the inland Columbia River Basin totaled approximately 1,250 nesting breeding pairs. This estimate seems to indicate that the number of total breeding pairs of DCCOs in the Columbia River Basin has remained relatively stable since 2005, when an estimate of 1,150 breeding pairs was counted (Roby et al. 2011b).

In recent years, an increase in the abundance of overwintering DCCOs on the lower Snake River has been reported. In 2007, a pilot study was initiated to determine whether overwintering DCCOs prey primarily on holdover Snake River fall (SR) Chinook salmon, which are known to substantially contribute to adult returns. Data collected between 2007 and 2010 suggest that some predation by DCCOs on overwintering SR fall Chinook salmon is occurring in the Snake River, but the numbers of overwintering DCCOs are small (fewer than 400 individuals) as is the proportion of fall Chinook in the diet of overwintering DCCOs (Cramer et al. 2011). Locations of DCCO colonies within the inland Columbia River Basin are shown in Figure 1-2.

Salmonid Consumption Estimates

Salmonid consumption estimates in this section focus on Foundation Island in accordance with the results of the Benefits Analysis, which indicates that the DCCO colony at this island has the highest salmonid consumption measurement of any other DCCO colony location in the inland Columbia River Basin.

Based on pooled data collected between 2005 and 2009, it is estimated that DCCOs at Foundation Island consumed from 470,000 to 880,000 smolts annually (Lyons et al. 2011a). Between 2005 and 2010, juvenile salmonids comprised 21.9 percent of the diet of the Foundation Island DCCO colony (Roby et al. 2011b). Evidence suggests smolts from the Upper Columbia ESU are not a targeted prey of Foundation Island DCCOs.

PIT tags from bull trout were found on the Foundation Island DCCO colony grounds following the 2011 nesting season, the fourth consecutive year bull trout PIT tags have been found on the Foundation Island DCCO colony grounds. From 2008 to 2011, a total of 32 PIT tags from bull trout (most originating from the Walla Walla River Basin) have been recovered on the Foundation Island DCCO colony grounds (Roby et al. 2011b).

ESU Specific Predation Rates

Predation rate estimates in this section focus on Foundation Island in accordance with the results of the Benefits Analysis, which indicates that the DCCO colony at this island has the highest predation rates of any other DCCO colony location in the inland Columbia River Basin.

Steelhead

Based on PIT tag recovery data collected between 2004 and 2010, the average annual predation rate on non-transported hatchery and wild SR steelhead by DCCOs nesting on Foundation Island was estimated at 2.9 percent and 2.5 percent, respectively, of the available in-river migrating population. In contrast, during the same time period, DCCOs nesting on Foundation Island had an estimated average annual predation rate of approximately 0.1 percent (wild and hatchery combined) of the available in-river migrating population of wild UCR steelhead (Lyons et al. 2011a).

Salmon

With regard to salmon species, DCCOs at Foundation Island had predation rates of approximately 1.2 percent on SRS/S Chinook, approximately 2.3 percent of SR sockeye, less than 1 percent of SRF Chinook, and less than 0.1 percent of the of UCRSp Chinook based on smolts interrogated at the Lower Monumental Dam on the Snake River and the upper Hanford Reach on the Columbia River, respectively (Lyons et al. 2011a).

3.1.4.2 California and Ring-Billed Gulls

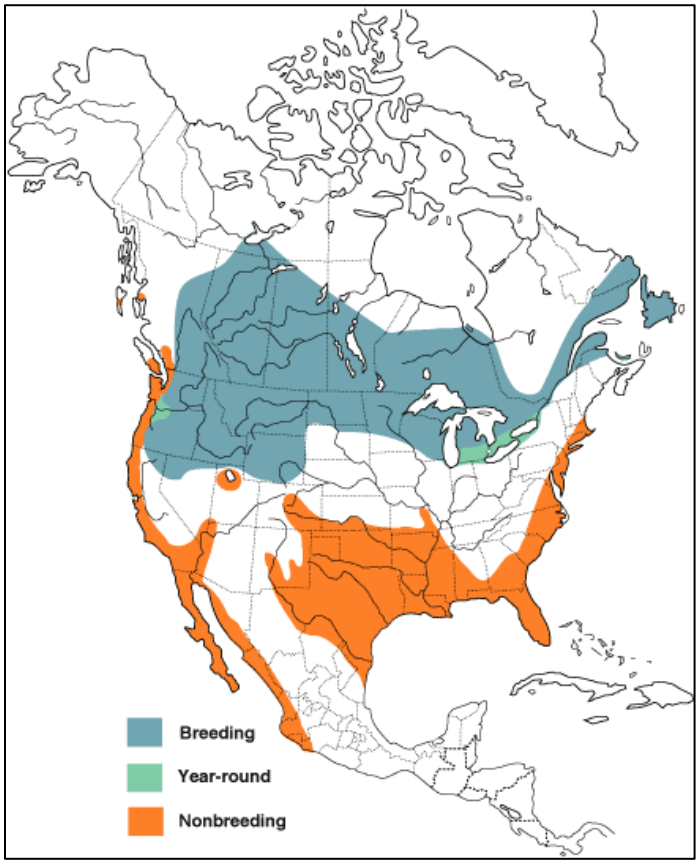
CAGU (*L. californicus*) and RBGU (*L. delawarensis*) gulls are known to nest throughout the inland Columbia River Basin at multiple sites. Confirmed nesting sites on the Columbia River between Bonneville Dam and Rock Island Dam have typically included Miller Rocks, Three-mile Canyon Island, Anvil Island (one of the Blalock islands), Crescent Island, and Island 20. As of 2009 when the last comprehensive survey of nesting gull colonies was conducted on the inland Columbia Basin (i.e., Middle and Upper Columbia River) it was estimated that approximately 41,700 adult CAGU and RBGU were present in colonies on the Columbia River between Bonneville and Rock Island Dams (Roby et al. 2011b). This represents a 22 percent decrease in overall gull numbers since the previous comprehensive survey was completed in 1998, with an estimate of 53,200 gulls present in the same area. In 2010, gulls were also confirmed to be nesting on Goose Island in the Potholes Reservoir, on Harper Island in Sprague Lake, and on Twinning Island in Banks Lake. Although 2010 estimates of these gull colonies' sizes are not available, 2009 data estimated these off-river colonies to total

approximately 21,500. Locations of gull colonies within the inland Columbia River Basin are shown in Figure 1-2.

Although the overall numbers of gulls in this area appear to have decreased, three colonies have increased in size between 1998 to 2009 including Miller Rocks (approximately 2,200 gulls and 6,000 gulls, in 1998 and 2009, respectively), Blalock Islands (approximately 0 and 1,600 gulls, in 1998 and 2009, respectively) and Crescent Island (approximately 4,600 and 8,600, in 1998 and 2009, respectively). The gull colonies' populations in the Middle Columbia River were almost evenly divided in number between CAGU and RBGU. No gull colonies or breeding has been observed on the lower Snake River since 1997 when regular monitoring of piscivorous waterbirds on the inland Columbia River Basin began (Roby et al. 2011b, Roby et al. 2013).

Ring-Billed Gull

RBGU is a widespread common gull. It breeds across the northern United States and Canada and winters on the Pacific coast from British Columbia south to central, Mexico and in the southeastern United States (Figure 3-11).



Source: Pollet et al. 2012.

Figure 3-11. RBGU range map.

This species is currently increasing in population and listed as of “Least Concern” by the IUCN Red List as the species does not meet the criteria for “Vulnerable” under the population trend or population size criteria (BirdLife International 2012b). The current world population is estimated at 2.55 million birds (Pollet et al. 2012). RBGUs are increasing in many areas, though this trend is not consistent throughout their range. The North American Breeding Bird Survey between 1999 and 2009 showed a 3.3 percent annual increase across the range, but there were decreases in population during certain periods in that time frame in the Great Lakes region (Pollet et al. 2012). Despite these increases, populations of western RBGUs may have leveled out starting in the early 2000s because of changes in dumping practices which affects food accessibility (USFWS 2005b).

Approximately 10,500 RBGUs were found nesting across the Potholes Reservoir during 2009 and none on Crescent Island (Roby et al. 2010). This number is approximately 19 percent of the total number (56,462) of RBGUs across five western states (Washington, Oregon, California, Idaho, and Nevada) in 2009 but does not include population numbers from other states or Canada (USFWS 2013b personal communication) (Table 3-7).

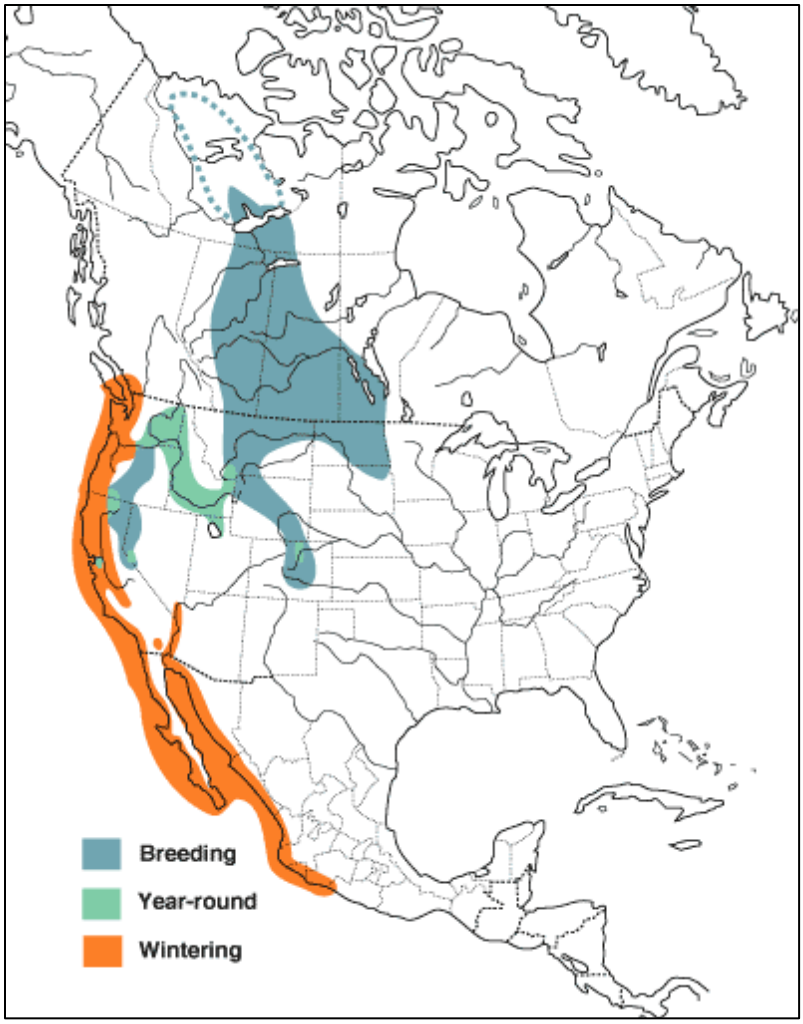
Table 3-7. RBGU population survey results in select western states, 2002 to 2009

RBGU	2002	2003	2004	2005	2006	2007	2008	2009
WA	2500	N/A	N/A	5000	N/A	N/A	N/A	28062
OR	2600	11346	3664	694	1889	530	N/A	2905
CA	N/A	1476	1528	N/A	N/A	N/A	N/A	13800
ID	N/A	N/A	N/A	N/A	5336	12442	N/A	11378
NV	N/A	N/A	N/A	N/A	N/A	N/A	N/A	317
Total	**5100**	**12822**	**5192**	**5694**	**7225**	**12972**	**0**	**56462**

Source: USFWS 2013b personal communication.

California Gull

CAGU occurs in western North America from Canada south into southwest Mexico (Figure 3-12). The westernmost breeding and year-round ranges stretch along the east side of the Cascade Mountains and Snake and mid-Columbia Rivers, respectively. The wintering range is along the Pacific coast from central Mexico to southwest Canada.



Source: Winkler 1996.

Figure 3-12. CAGU range map.

The population trend of the CAGU appears to be decreasing but the declines are not rapid enough to warrant listing as vulnerable in the IUCN Red List (BirdLife International 2012c) (Table 3-8). In addition, the population size is very large and therefore the CAGU is classified as Least Concern (BirdLife International 2012c). Population sizes of CAGUs are estimated to be between 500,000 and 1 million individuals (Winkler 1996). Despite the current decreasing trend, current populations are likely larger than they were at the beginning of the twentieth century due to increasing farm area, more island nesting sites, decreased harvesting, and increase food availability from landfills (Conover 1983; Winkler 1996).

Approximately 11,000 CAGUs were found nesting across the Potholes Reservoir and Crescent Island during 2009 (Roby et al. 2012). This number is approximately 8 percent of the total number (136,928) of CAGUs across five western states (Washington, Oregon, California, Idaho, and Nevada) in 2009 but does not include population

numbers from Canada or other western states (USFWS 2013b personal communication).

Table 3-8. CAGU population survey results in select western states, 2002 to 2009

CAGU	2002	2003	2004	2005	2006	2007	2008	2009
WA	13500	N/A	N/A	5000	5000	5000	21000	31811
OR	9000	N/A	N/A	N/A	N/A	N/A	N/A	6548
CA	45716	42194	53310	43882	42480	43398	N/A	64382
ID	N/A	N/A	N/A	N/A	29906	N/A	N/A	26080
NV	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8107
Total	**68216**	**42194**	**53310**	**48882**	**77386**	**48398**	**21000**	**136928**

Source: USFWS 2013b personal communication.

Salmonid Consumption Estimates

Research has indicated that, in general, the diet of gulls typically consists of limited numbers of salmonids, except for specific colonies within the Columbia River Basin (Roby et al. 2011b) and at specific foraging areas such as at certain hydroelectric dams (Zorich et al. 2011). From data collected in the late 1990s, the diet of CAGUs at Miller Rocks was composed of juvenile salmonids as 3 percent of total biomass from stomach contents (Roby et al. 2011b). Estimates of per-capita consumption of smolt PIT tags were twice as high for gulls nesting on Miller Rocks compared to gulls nesting on Crescent Island (Evans et al. 2011b). For gulls nesting at locations away from the Columbia River, estimated salmonid consumptions rates are very low. For example, gulls nesting at Goose Island (Potholes Reservoir) appear to consume very limited numbers of salmonids and of those consumed, some are kleptoparasitized from other species such as CATEs.

In 2012, kleptoparasitism rates by gulls on CATEs averaged 19 percent at Goose Island. A total of 164 kleptoparasitized PIT-tagged smolts (Chinook, coho, sockeye, and steelhead, combined) were recovered on the gull colony at Goose Island, a colony that consists of both ring-billed and CAGU. Control tags sown on the colony prior to and after the nesting season (n = 100) indicated that detection efficiency ranged from 16 percent to 64 percent for tags deposited between 1 April and 31 July (Roby et al. 2013).

Predation rates by gulls nesting at Goose Island were < 0.1 percent for all salmonid ESUs, except Upper Columbia River steelhead. Estimated predation rate by gulls nesting at Goose Island on Upper Columbia River steelhead were 2.8 percent (95 percent c.i. = 1.1 – 5.6 percent). The much higher predation rates on steelhead smolts, compared to smolts of other salmonid ESUs, by gulls nesting at Goose Island were similar to results from the Crescent Island gull colony. At both of these gull colonies,

higher predation rates on steelhead ESUs compared to salmon ESUs could be related to gulls disproportionately kleptoparasitizing steelhead smolts compared to salmon smolts (Roby et al. 2013).

Salmonid ESU-Specific Predation Rates

In general, reducing predation by gulls and other piscivorous waterbirds would have a much lower benefit rate to ESU-listed salmonids (Lyons et al. 2011a). Predation rates in this section focus on Miller Rocks in accordance with the results of the Benefits Analysis, which indicates that the gull colony at this island has the highest predation rates of any gull colony location in the inland Columbia River Basin.

Predation rate estimates indicate that approximately 4 percent of available Snake River steelhead and approximately 6 percent of available Upper Columbia River steelhead were consumed by gulls nesting on Miller Rocks in 2012. Predation rates on most populations of salmon by gulls nesting at the Miller Rocks colonies were, however, generally less than 1.0 percent, with the exception of the predation rate on Snake River sockeye salmon by gulls nesting on Miller Rocks (approximately 5 percent).

Steelhead

Based on PIT tag recovery data collected between 2004 and 2010, the predation rate on non-transported wild SR steelhead by gulls at Miller Rocks was approximately 2.0 percent of the in-river migrating population based on smolts interrogated at McNary Dam. Similarly, these gulls during the same time period had a predation rate of approximately 1.6 percent on the in-river migration population of wild UCR steelhead (Lyons et al. 2011a).

Salmon

Gulls at Miller Rocks had predation rates of less than 1.0 percent on all runs of SR Chinook, less than 1.0 percent of the UCRSp Chinook, and approximately 1.4 percent of SR sockeye based on smolts tagged at McNary Dam (Lyons et al. 2011a).

3.1.4.3 American White Pelicans

A breeding colony of American White Pelicans is present at Badger Island. This colony relocated to Badger Island from Crescent Island in 1997 and is the only known nesting colony of American White Pelicans in the State of Washington. It is estimated that an average of 2,083 adult pelicans were present at Badger Island in 2012, down from 2,177 counted in 2011 (Roby et al. 2013). Little information exists on smolt consumption at dams in the Columbia River Basin by American White Pelicans. Based on PIT tag recovery at Badger Island, smolt predation rates by pelicans between 2004 and 2009 were found to be much lower than those of other piscivorous waterbirds (e.g., CATEs),

at less than 0.1 percent of PIT-tagged salmonid smolts passing through Lake Wallulla (McNary Pool) (Roby et al. 2011). The location of the Badger Island pelican colony is shown in Figure 1-2.

Three PIT tags from bull trout tagged in the Walla Walla River Basin were detected on the Badger Island pelican colony grounds in 2010, providing for a total of six bull trout PIT tags recovered on the colony through 2010 since scanning began in 2005 (Roby et al. 2011b).

3.1.4.4 Other Bird Species Present

For this section, the affected environment was broken down into two general areas: (1) Potholes Reservoir/Banks Lake and (2) Columbia River.

Potholes Reservoir/Banks Lake

Around the Potholes Reservoir area and Banks Lake upland, game birds include ring-neck pheasant (*Phasianus colchicus*), California quail, mourning dove (*Zenaida macroura*) and gray partridge (*Perdix perdix*). Waterfowl in the reservoir area include Canada goose and various duck species. Colonial waterbird species include black-crowned night heron, Forster's tern (*Sterna forsteri*), American white pelican, great blue heron, great egret (*Ardea alba*) and DCCO. Other non-colonial species include peregrine falcon, sandhill crane (*Grus canadensis*), bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk, common loon (*Gavia immer*), western burrowing owl (*Athene cunicularia hypugaea*), prairie falcon (*Falco mexicanus*), grasshopper sparrow, western grebe, Clark's grebe (*Aechmophorus clarkii*), sora (*Porzana carolina*), Virginia rail (*Rallus limicola*), American coot (*Fulica americana*), killdeer (*Charadrius vociferus*), long-billed curlew (*Numenius americanus*), Wilson's snipe (*Gallinago delicata*), and spotted sandpiper (*Actitis macularius*) (Reclamation 2002).

Columbia and Snake Rivers

Other bird species that may be present in the project area include great blue heron, western grebe, black-crowned night heron (*Nycticorax nycticorax*), Canada goose (*Branta canadensis*), wood duck (*Aix sponsa*), mallard (*Anas platyrhynchos*), northern pintail (*A. acuta*), blue-winged teal (*A. discors*), common merganser (*Mergus merganser*), turkey vulture (*Cathartes aura*), bald eagle, red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*B. regalis*), golden eagle (*Aquila chrysaetos*), American kestrel (*Falco sparverius*), peregrine falcon (*F. peregrinus*), California quail (*Callipepla californica*), great horned owl (*Bubo virginianus*), common nighthawk (*Chordeiles minor*), cliff swallow (*Petrochelidon pyrrhonota*), common raven (*Corvus corax*), red-winged blackbird (*Agelaius phoeniceus*), American goldfinch (*Carduelis tristis*) (Csuti et al. 1997), greater sage-grouse (*Centrocercus urophasianus*), sage thrasher

(*Oreoscoptes montanus*), Brewer's sparrow (*Spizella breweri*), savannah sparrow (*Passerculus sandwichensis*), horned larks (*Eremophila alpestris*), grasshopper sparrow (*Ammodramus savannarum*), vesper sparrow (*Pooecetes gramineus*), and western meadowlark (*Sturnella neglecta*) (WDFW 2006b).

3.1.5 Mammals

Based on general similarities in habitat, prey source and mammals generally present, this section was broken down into two general areas: (1) Potholes Reservoir/Banks Lake and (2) Columbia River.

3.1.5.1 Potholes Reservoir/Banks Lake

Mink have been documented at Goose Island and are known to prey primarily on gulls with some limited depredation of CATEs as well (Hostetter 2012 personal communication). Several other mammal species are located around the Potholes Reservoir area. Species include mule/black-tailed deer, North American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), long-tailed weasel (*Mustela frenata*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), black-tailed jackrabbit (*Lepus californicus*), and Nuttall's cottontail rabbit (*Silvilagus nuttallii*).

Mammals within the vicinity of Banks Lake are anticipated to be similar to those of Potholes Reservoir.

At the potential habitat enhancement sites, mammal species may include potential CATE predators such as coyote, gray fox (*Urocyon cinereoargenteus*), western spotted skunk (*Spilogale gracilis*), striped skunk, opossum (*Didelphis virginiana*), badger, raccoon, nonnative rats (e.g., black rat, *Rattus rattus*), and domestic dogs and cats. Non-CATE-predators may include beaver and muskrat, and at coastal sites, harbor seals (*Phoca vitulina*).

3.1.5.2 Columbia River

North American beaver were documented to be feeding on vegetation at Crescent Island in August of 2012 (Parametrix staff field observation, August 15, 2012). Other mammals that may be present in the project area include mink, California myotis (bat) (*Myotis californicus*), Yuma myotis (bat) (*M. yumanensis*), little brown myotis (bat) (*M. lucifugus*), big brown bat (*Eptesicus fuscus*), white-tailed jackrabbit (*Lepus townsendii*), Townsend's ground squirrel (*Spermophilus townsendii*), deer mouse (*Peromyscus maniculatus*), bushy-tailed woodrat (*Neotoma cinerea*), common porcupine (*Erethizon dorsatum*), coyote, common raccoon, long-tailed weasel, badger, western spotted

skunk, striped skunk, northern river otter (*Lutra canadensis*), bobcat (*Lynx rufus*), and mule/black-tailed deer (Csuti et al. 1997).

3.1.6 Federally Endangered and Threatened Plants and Wildlife

For this section, information on federally endangered and threatened plants and wildlife was obtained for the following counties: Benton, Klickitat, Grant, Franklin, Walla Walla, and Morrow (Oregon).

Two federally listed threatened plant species may occur within the project area (including the at-risk islands): the Ute ladies'-tresses (*Spiranthes diluvialis*) and Spalding's catchfly (*Silene spaldingii*). Two candidate species occur within the project area, Wormskiold's northern wormwood (*Artemisia borealis* var. *wormskioldii*) and whitebark pine (*Pinus albicaulis*) (WDNR 2012). According to WDFW, these species are not present at, or within 1 mile of, Goose Island (WDFW 2012b). Several state-listed species occur within the project area. However, records do not indicate that any of these plant species are present at or adjacent to Goose or Crescent islands (WDFW 2012b). In field visits to both Goose and Crescent Islands in August 2012 as part of developing this EA, none of these plant species was observed at either location.

With regard to federally listed threatened and endangered wildlife, three candidate species are listed as potentially occurring within the project area including the greater sage-grouse *(Centrocercus urophasianus)*, the yellow-billed cuckoo (*Coccyzus americanus*), and the Washington ground squirrel *(Spermophilus washingtoni)*. Two endangered species, the pygmy rabbit (*Brachylagus idahoensis*) and the gray wolf (*Canis lupus)*, are listed as potentially occurring within the project area. In addition, three federally listed threatened species may occur within the project area, and bull trout.

Regular concentrations of Washington ground squirrel occur landward of Potholes Reservoirs and within Morrow County; there have been no observations of this species on Goose Island. No records or observations indicate that any of these other species occur at or adjacent to Goose or Crescent islands (WDFW 2012b).

Listed wildlife species are not anticipated to be present on the at-risk islands. Suitable habitat does not occur on the islands, and/or given the current range of the species and lack of documented detections, it is extremely unlikely that the species would be present.

The streaked horned lark (*Eremophila alpestris strigata*) is a subspecies of horned lark proposed for listing as threatened under the ESA. These larks may be found in areas where habitat enhancement may be conducted as part of this project. This lark occurs mainly on open, sandy islands in the Lower Columbia River, the southern Washington

coast, south of Tacoma, and south of Portland (Pearson and Altman 2005). Actions separate from but similar to those in this EA are currently being undertaken by other agencies in areas where these larks could occur (e.g., Lower Columbia River and estuary).

3.1.7 Vegetation

3.1.7.1 Goose Island

Goose Island is approximately 4.9 acres and is largely open ground with sparse shrub cover. Goose Island is comprised of a larger western island and a smaller eastern island. Shrub cover on both island consists primarily of sagebrush (*Artemisia* spp.), although some Russian thistle (*Salsola tragus*) is present and some broadheaded buckwheat (*Eriogonum sphaerocephalum*) was noted on the east island. During a field visit in August 2012, in the area between the west and east islands that is underwater for the majority of the year, willow (*Salix* spp.) was present as well. A detailed list of vegetation present at Goose Island is listed in Table 3-9.

3.1.7.2 Crescent Island

Crescent Island is approximately 7.5 acres in area with a mix of dense upland shrub habitat, some trees, and bare ground. The island is covered by a variety of species, including many nonnative and noxious ones. Predominant groundcover species include lamb's quarters (*Chenopodium album*), Russian thistle, and perennial pepperweed (*Lepidium latifolium*). Dominant tree species located on the island include Russian olive, Chinese elm (*Ulmus parvifolia*), willow (*Salix* spp.), and locust (*Robinia* spp.). Russian olive is largely located in the interior portion of the island while locust, willow, and Chinese elm are both in the interior and adjacent to water. Several dead trees and "girdled" trees were noted in a field visit to the site in August 2012 (Parametrix field visit observations). These dead and damaged trees appear to be due largely to beaver. A detailed list of vegetation present at Crescent Island is listed in Table 3-9.

Table 3-9. Vegetation Presence at Project Sites

Common Name	Scientific Name	Potholes Reservoir (Goose Island)		Crescent Island
		Goose West	Goose East	
Russian olive	*Elaeagnus angustifolia*			X
Chinese Elm	*Ulmus parvifolia*			X
Cottonwood	*Populus trichocarpa*			X
Locust	*Robinia pseudoacacia*			X
Willow	*Salix* spp.	X		X
Alder	*Alnus* spp.			X
Lamb's quarters	*Chenopodium album*	X		X

Common Name	Scientific Name	Potholes Reservoir (Goose Island)		Crescent Island
		Goose West	Goose East	
Diffuse knapweed	*Centaurea diffusa*			X
Goldenrod	*Solidago* spp.			X
Hogwort	*Croton capitatus*			X
Kochia	*Kochia scoparia*			X
Sagebrush	*Artemisia* spp.	X	X	X
Perennial pepperweed	*Lepidium latifolium*	X		X
Common cocklebur	*Xanthium strumarium*	X		
Bull thistle	*Cirsium vulgare*			X
Puncture vine	*Tribulus terrestris*	X	X	
Russian thistle	*Salsola tragus*	X	X	X
Broadheaded buckwheat	*Eriogonum sphaerocephalum*		X	
Salt heliotrope	*Heliotropium curassavicum*	X		X
Purple loosestrife	*Lythrum salicaria*	X		X

3.1.7.3 At-Risk Islands

Because of the geographic range and close proximity of the at-risk islands with the dissuasion islands, it is anticipated that the vegetation regime for the at-risk islands would be similar to either Goose or Crescent Island, whichever is nearest.

3.2 Physical Environment

This section of the EA discusses the physical environment of the sites being analyzed.

3.2.1 Geology and Soils

The colony sites and at-risk islands are within an area geologically known as the Columbia Plateau, which is typified by the presence of Columbia River basalts stemming from lava flows that occurred between 6 million and 17 million years ago. These lava flows eventually resulted in a subsidence of the crust in the area creating a slightly depressed lava plain that is now called the Columbia Plateau. During the last ice age, glaciation dammed rivers and created lakes in Washington, Idaho, and Montana. Glacial Lake Missoula a very large lake that formed in Montana, and over a course of thousands of years, its ice dam failed repeatedly and released catastrophic floods through the Columbia River drainage that stripped away soils and cut deep canyons, “coulees,” into the underlying bedrock creating the channeled scablands that are characteristic of eastern Washington (USGS 2011). Most of the at-risk islands including Miller Rocks, Three-mile Canyon Island, Blalock Islands, Badger Island, Foundation Island, Richland Islands, and Cabin Island are located within the Columbia River and have geology and soil types derived from Columbia River basalts.

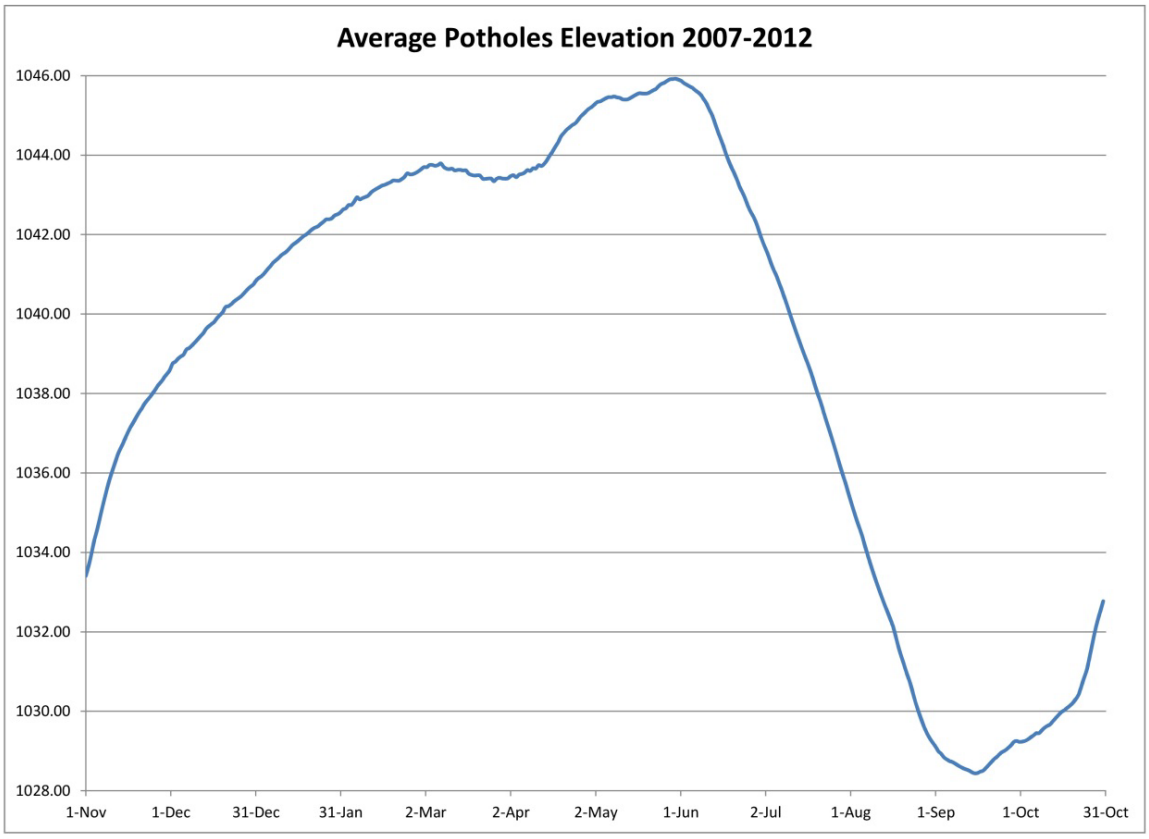
Goose Island and Solstice Island are located within the Potholes Reservoir near Moses Lake, Washington. Goose Island is approximately 4.9 acres, rocky and steep-sided. The reservoir receives a continuous inflow of suspended sediment from contributing waterways. As with the majority of soils on the Columbia Plateau and in the Columbia drainage basin, the soils in this area have formed under grassland or shrub-grassland vegetation. These soils derive from parent material including basalt, volcanic ash, sedimentary deposits, glacial outwash, and alluvial, fluvial, and colluvial deposits (Reclamation 2002). Soils on Goose Island are mapped as Schawana complex. These soils are developed in eolian (wind-formed) deposits derived from weathered basalt parent material. Structurally, the soil consists of approximately 0 to 12 inches of sand and sandy loam overlaying unweathered bedrock (NRCS 2012).

Crescent Island was created in 1985 with materials dredged from the approach to the Boise paper mill. Soils are primarily sandy in nature and covered by a mix of vegetation as described in Section 3.1.6. At the existing CATE nesting site, soils are largely devoid of vegetation due to bird presence and are covered with a hardpan. Environmental sampling of CATE eggs at Crescent Island in the 1990s revealed the presence of polychlorinated biphenyls (PCBs) and organic pesticides above detection limits (Buck 2004). Although PCBs and organic pesticides were banned in the 1970s, the chemicals persist in the sediments of the Columbia River. Because Crescent Island was created from dredge spoils, there is a possibility that these types of contaminants may be present in soils on the islands.

Twinning Island is located in Banks Lake. Banks Lake contains basalt cliffs and talus slopes with shallow soils and rocky outcrops (WDFW 2013b).

3.2.2 Floodplain/Water Elevation

Goose Island and Solstice Island are located within the Potholes Reservoir. The Potholes Reservoir has a full pool elevation of 1,046 feet, which covers an estimated 27,800 acres with a total storage capacity of 511,700 acre-feet. During September to October, when water levels are lowest, the reservoir elevation is approximately 18 feet below full pool (Figure 3-13). The main objective of the operation of Potholes Reservoir is to supply irrigation water. Reclamation operates the reservoir within established constraints for surface water elevation to meet contractual obligations, to assure public safety, and to protect property; other resource needs are viewed as secondary within existing operational constraints. The 25-year management agreement and the Potholes Resource Management Plan support this key purpose of the Columbia Basin Project (Reclamation 2001). During this period, many of the dunes and sand islands in the northern half of the reservoir become exposed and difficult to access due to reduced water levels.



Source: Lesky 2013 personal communication.

Figure 3-13. Potholes Reservoir average water elevation chart. Maximum water elevations occur in early summer with minimums in September after irrigation demand ends.

Crescent, Badger, Richland and Foundation Islands are located upstream of McNary Dam in Lake Wallula on the Columbia River. The reservoir's water surface elevation is typically held between 335 feet above mean sea level (fmsl) and 338 fmsl, however the maximum pool elevation is 357.0 fmsl, and minimum pool elevation is 335.5 fmsl.

Miller Rocks Island is located upstream from The Dalles Dam within Lake Celilo on the Columbia River. The capacity for Lake Celilo is 330,000 acre-feet. The lake elevation at maximum pool is 182.3 fmsl, full pool elevation is 160.0 feet, and at minimum the pool elevation is 155.0 feet.

Blalock and Three-mile Canyon Islands are located upstream from the John Day Dam, within Lake Umatilla on the Columbia River. The capacity for Lake Umatilla is 2,530,000 acre-feet. The lake elevation at maximum pool is 276.5 feet, full pool elevation is 268.0 feet, and at minimum the pool elevation is 257.0 feet.

Cabin Island is located upstream from the Priest Rapids Dam within Priest Rapids Lake on the Columbia River. The capacity for Priest Rapids Lake is 237,100 acre-feet. The normal full pool elevation is 486.0 feet and the normal low pool elevation is 481.5 feet.

Banks Lake is a human-made impoundment for irrigation water in the Columbia Basin Irrigation Project. The lake is formed by the North Dam near Grand Coulee and the Dry Falls Dam near Coulee City and is filled with water from Franklin D. Roosevelt Reservoir (Lake Roosevelt) (WDFW 2013b).

3.2.3 Water Quality

3.2.3.1 Potholes Reservoir

Created by O'Sullivan Dam, Potholes Reservoir lies immediately downstream of Moses Lake in the Lower Crab Creek Basin. Built as part of the Columbia Basin Project (CBP), which provides irrigation water to land of the Columbia Plateau, the reservoir's main water supply is operational waste and irrigation return flow from northern CBP lands irrigated from the East Low and West Canals. This water supply is supplemented by natural flows in Crab Creek, Rocky Coulee, Weber Coulee, and Lind Coulee. Reservoir inflows originate from Moses Lake through the Crab Creek channel on the north side, from the Lind Coulee Wasteway on the east side, and from the Winchester and Frenchman Hills Wasteways on the west side. Shallow groundwater seepage is also a water source entering Potholes Reservoir. Irrigation water for the southern part of the CBP is distributed via the Potholes East Canal, which begins at O'Sullivan Dam (Reclamation 2002).

The Potholes Reservoir is listed under Section 303(d) for presence of dieldrin, a chlorinated pesticide. During 2007 and 2008, dieldrin was only detected during the non-irrigation season where groundwater dominates as the major water source contributing to the reservoir. Because no major current sources of Dieldrin were identified in the study, it is suggested that Dieldrin is recycling internally in the Potholes Reservoir fish food chain and accumulating in the larger, fattier and longer-lived species. Additionally, sediment samples at the reservoir detected 4,4'-DDE, a breakdown product of the now-banned pesticide, DDT. These samples, however, did not exceed state sediment quality guidelines (Ecology 2011).

3.2.3.2 Banks Lake

Banks Lake is currently not listed under Section 303(d) (water medium) nor are any maximum contaminant levels exceeded from the Drinking Water Regulations. However, Banks Lake is listed under Section 303(d) for multiple toxins, such as mercury, PCB, etc., based on tissue samples (Ecology 2011).

3.2.3.3 Columbia River

The Columbia River mainstem and Snake River are listed under Section 303(d) of the federal Clean Water Act (CWA). Section 303(d) identifies surface waters that are

impaired as defined by accepting water quality standards for criteria pollutants. Impaired water bodies require the creation of a total maximum daily load (TMDL). A TMDL is a cleanup plan that identifies the amount of a pollutant that a water body can receive and still meet water quality standards (EPA 2011). TMDLs for the Columbia River mainstem and Snake River that are currently in place include:

- TMDL for total dissolved gas in the Middle Columbia River and Lake Roosevelt, EPA approved 7/21/04
- Columbia River dioxin TMDL (Idaho, Oregon, and Washington), Issued by EPA 2/25/91
- Lower Snake River total dissolved gas TMDL (Washington State Department of Ecology)

3.3 Greenhouse Gas Emissions

While greenhouse gases (GHGs) are produced locally where people live, work, and recreate, the impacts are global in nature. Energy consumption and associated GHG emissions adversely affect the environment by contributing to climate change. In turn, climate change results in environmental impacts such as changes in precipitation and water quantity. These changes can impact the built environment as well as impact natural resources.

While impacts will vary by location, the Washington Climate Change Impacts Assessment (UW 2013) and other published works provide useful information about the region's climate trends. Washington State is likely to experience:

- Higher temperatures
  - Increases in average annual temperature of 2.0°F (range: 1.1°F to 3.4°F) by the 2020s, 3.2°F (range: 1.6°F to 5.2°F) by the 2040s, and 5.3°F (range: +2.8°F to +9.7°F) by the 2080s (compared to 1970–1999) are projected. There is an increasing likelihood of extreme heat events (heat waves) that can stress energy, water, and transportation infrastructure.
- Enhanced seasonal precipitation patterns
  - Wetter autumns and winters, drier summers, and small overall increases in annual precipitation in Washington (+1 to +2 percent by the 2040s) are projected. Increases in extreme high precipitation in western Washington are also possible.
- Declining snowpack
  - Spring snowpack is projected to decline, on average, by approximately 28 percent by the 2020s, 40 percent by the 2040s, and 59 percent by the 2080s (relative to 1916–2006).

- Seasonal changes in streamflow
  - Increases in winter streamflow, shifts in the timing of peak streamflow in snow-dominant and rain/snow mix basins, and decreases in summer streamflow are expected. In addition, the risk of extreme high and low flows is expected to increase.
- Sea level rise
  - Medium projections of sea level rise for the 2100s are 2 to 13 inches (depending on location) in Washington State. Higher increases (up to 50 inches depending on location) are possible depending on trends in ice loss from the Greenland ice sheet, among other factors.

3.4 Cultural Resources

The following sections provide precontact, historic, and ethnographic context for cultural resources within the area of potential effect, and a summary of the general character and condition of cultural resources. Cultural resource laws require the Action Agencies, in consultation with the public, Tribal governments, and other interested parties to take into account the effects of the project on cultural resources. The prehistoric, historic, and ethnographic context and information on the general character and condition of known resources provide a basis for assessing the potential for proposed actions to affect cultural resources.

3.4.1 Cultural Resources Property Types

Cultural resources within the area of potential effect are composed of precontact (i.e., pre-EuroAmerican contact and settlement) and historical period archaeological sites, elements of the historical built environment (historic buildings and structures), cultural landscapes, and traditional cultural properties. These can be individual sites, districts, landscapes, buildings, structures or objects. Archaeological resources, historic buildings and structures, and traditional cultural properties that have been evaluated on the basis of specific criteria and found eligible for the National Register of Historic Places are all included under the heading cultural resources.

3.4.1.1 Archaeology

Archaeological resources are the locations of the tangible, physical remains of human activity. The age of these resources within the area of potential effect ranges from thousands of years to recent time. Precontact resources date from the post-glacial arrival of humans in the area approximately 12,000 years ago, up until the *protohistoric* period when the first European explorers documented their forays into the region, and into the historic period characterized by intensive immigration and settlement by Europeans.

Precontact archaeological sites include occupation sites (pit house villages, caves, rock shelters, and open campsites). Storage activities may be represented at these sites or in areas related to specific resource procurement locations. Sites related to resource procurement activities include hunting stations, fishing stations, butchering sites, rock alignments, quarry sites, and resource-specific task areas such as *camas* (edible plant) fields and nut-gathering camps. Site types related to resource processing include *lithic*/tool scatters, fire pits and hearths, and shell *middens*.

Historical archaeological resources are related to a number of different historic themes during and following post-contact settlement and development of the area, such as exploration, industry (mining and logging), settlement and community development, commerce, transportation, agriculture and stock-raising, public lands management, and recreation.

3.4.1.2 Traditional Cultural Properties

A traditional cultural property (TCP) is a type of cultural resource that is associated with cultural practices or beliefs of a living community that are rooted in that community's history, and plays an important role in maintaining the continuing cultural identity of the community. A TCP may be an archaeological site but may also be represented by non-archaeological features such as distinctive shapes in the natural landscape, named features in local geography, natural habitat for significant faunal and floral resources, traditional fisheries and sacred religious sites. Although most TCPs in the project area are associated with Native American groups, they can also be related to other ethnic communities, e.g., African American, Chinese, or Japanese groups. Other types of TCPs include those of importance to maintaining the cultural identity of rural communities. Because a TCP is defined in relation to a specific group, the intangible qualities associated with such resources may be known only to that group or a subset of their members. This property type may also be referred to as a historic property of cultural or religious significance to an Indian tribe.

3.4.1.3 Built Environment

Historic buildings and structures refer to elements of the aboveground built environment typically related to historical themes identified in the area of potential effect: exploration, missions and settlement, industry (mining and logging), transportation (trail systems, railway systems, road systems), agriculture and stock raising, and modern land use (dam projects, irrigation projects and federal land management).

3.4.1.4 Islands as Cultural Resources

Much of the work would take place on islands, and some discussion of the significance of Islands as cultural resources is warranted here. During pre-contact times the

Columbia and Snake rivers were major travel routes connecting bands and villages in the southern Plateau (Shawley 1984) creating extensive socio-economic interaction networks (Anastasio 1972). Certain islands were used for crossing rivers, and some of these crossings were associated with pre-contact overland trails (Ray 1975). As noted by the Lewis and Clark Expedition (Moulton 1983), islands were useful occupation and harvest platforms, and may also have served as natural buffers against hostile parties. The expedition noted homes, fishing scaffolds and drying racks, sweat houses and cemeteries on islands. Many islands are also recognized as traditional cultural properties.

3.4.2 Cultural Resources in the Area of Potential Effect

The proposed project involves modifying approximately 4 acres of habitat on two islands within the Columbia River Basin in eastern Washington, Goose Island (up to 2.5 acres) and Crescent Island (up to 2 acres). The IAPMP also contains an expanded adaptive management component that may extend well outside this area to other areas within the interior Columbia Basin. Currently 10 additional islands of interest have been identified for monitoring, and future adaptive management activities. Specific information is provided for both Goose Island and Crescent Island while general information about the character and condition of cultural resources within the larger area of potential effect is summarized.

3.4.2.1 Goose Island

Reclamation (2007) provides a succinct summary of the cultural context around Goose Island:

> "Aboriginal groups known to have occupied or utilized the project area include a variety of Plateau groups: the San Poil, Nespelem, Middle Columbia Salish, Wanapum, Yakama, Lower Spokane, as well as others who frequented the Columbia and Snake River confluence…..However, the Columbia people were indigenous to the area, with settlements on and surrounding Moses Lake. The general area, including Moses lake, provided excellent resource gathering opportunities including root corps, fish, turtles, and waterfowl, among other resources….Euro American exploration prior to 1870 included fur traders, road and railroad surveyors, miners, freighters, and stockmen. Early settlers attempted raising livestock including cattle and horses; however, the lack of water and overgrazing caused the industry to decline. Dryland farming proved equally short-lived and unsuccessful…"

The area is closely linked to Chief Moses, an important member and leader of the Sinkiuse-Columbia tribe during the turbulent years between the 1850's and 1880's. Hurley (personal communication 2012) reports that this fact, as well as substantial

archaeological and oral history data from recently ongoing cultural resources work in the Lake Moses and Crab Creek basins, strongly suggests that the general area within and near Goose Island has a high probability of containing archaeological and/or TCP historic properties. The resources discovered in the area range from semi-permanent habitation sites, temporary camp-sites and limited resource capture/processing sites to TCP features such as rock cairns (Bruce et al. 2001).

To date archaeological surveys in the vicinity of Goose Island and Potholes Reservoir have been limited. Prior to the construction of O'Sullivan Dam, Goose Island would have been an upland rise located approximately one mile to the west of Crab Creek. The island was part of a fairly high ridge that overlooked a tributary of crab creek and parts of the series of ponds known as "The Potholes". No sites have been recorded on the island, but sites within an approximate one mile radius of the island consist of one pre-contact lithic scatter and three sites associated with late 19th to early 20th century agrarian activities.

3.4.2.2 Crescent Island

Crescent Island exists because of the hydroelectric dam and modern maritime commerce along the Columbia River. The island was created in 1985 from dredge spoils. The material used to construct Crescent Island is derived from dredging within the Boise-Cascade paper plant barge channel. For a number of years the plant maintained a barge approach that ran from the Federal navigation channel to the plant. The channel ran southwest to northeast toward the plant and passed right by the island.

Crescent Island is within the area of the Columbia River known as the Pasco Basin, which is the topographic low point within the Columbia River Basalt Plateau. Within a few miles of each other the Snake, Yakima, and Walla Walla rivers all drain into the Columbia River (Hall 2012). The confluence of so many significant drainages has attracted people to the region since the beginning, and continues to attract them today. When Lewis and Clark passed through the area in 1805 the Palouse, Umatilla, Walla Walla, Wanapum and Yakama were the primary residents, but the Nez Perce and Cayuse also made use of the area (Hicks 2000). This pattern of interaction characterizes much of the interior Columbia Basin where inter-group contact commonly occurred between bands that shared common language, religion, and culture.

Just to the south of Crescent Island the Northwest Company established Fort Walla Walla in 1811 near the mouth of the Walla Walla River. The discovery of gold to the north and east of the area began a steady increase of immigration into the area. In 1855 tribes in the region including the Yakama, Nez Perce and Umatilla signed treaties that established reservations but also reserved rights to fish, hunt, and graze stock on open and unclaimed ceded lands. The initial influx of gold seekers was followed by farmers

and ranchers who established many of the modern towns and cities in the region. The arrival of railroads and the expansion of irrigation networks allowed for more farms, and more development of the area.

In contrast to Goose Island a number of surveys have occurred, and a number of sites have been recorded, near Crescent Island. However, Crescent Island is not a natural island. The potential for artifacts to be present within the dredge fill that composes the island exists, but this material would not be in a primary context and would not be considered a cultural resource requiring consideration under Federal cultural resources laws.

3.4.2.3 Larger Area of Potential Effect

The EA provides for specific actions at Goose and Crescent Island. It also provides for future expansion of predation management activities outside of these two locations. Specifically, ten additional islands are discussed in the plan as at-risk islands. These islands stretch from the Miller Rocks located just above where the Deschutes River flows into the Columbia River, northward to Twinning Island in Banks Lake, and eastward to Harper Island in the privately owned Sprague Lake. More generally, the EA recognizes that predation management activities may need to be expanded to additional at-risk islands within the Columbia River Basin that have not yet been identified through monitoring and adaptive management measures. Some of these islands are known to have cultural resources representing a diverse range of ages and types, some of which have been found eligible for listing on both National and State site registers. Some of these islands also represent historic properties of cultural and religious significance to an Indian tribe. Some of the islands also occur within known National Register of Historic Places listed archaeological districts, and some have never been surveyed to identify the presence or absence of cultural resources.

The EA also identifies a habitat enhancement site (or sites) that would be developed outside the Columbia River Basin as part of Phase 2 actions. Any additional areas, once identified, also have the potential of containing any number of cultural resources types and will require further research.

3.5 Built Environment and Socioeconomics

3.5.1 Built Environment

Goose and Crescent Islands, as well as the at-risk islands, are undeveloped. Other than structures used seasonally for bird observation, no human-made structures are present on the islands. No human-made structures are present within 0.5 mile of the vicinity of either Goose or Crescent islands. For Goose Island, the closest human-made structure is O’Sullivan Dam, which is over 0.6 mile to the southeast. Other built environment

features in the area include resort areas (Mar Don Resort, Perch Point Resort) and limited residential and agricultural buildings. All of these are over 1 mile from Goose Island.

With regard to Crescent Island, the nearest built structure is the Boise Cascade mill in Wallula, Washington, which is over 0.6 mile to the northeast. Residential and commercial buildings are present in Wallula, over 1 mile from the island. Various agricultural facilities are present in the area over 1 mile from the island, as well.

Badger Island is closed to both the public and researchers in order to avoid human disturbance to nesting pelicans that may cause abandonment of the colony. Blalock and Foundation islands are both closed to recreational activities, in part due to the Blalock Islands containing significant cultural resources.

Three-mile Canyon Island is near the town of Boardman, Oregon, and is owned and managed by the Corps. Three-mile Canyon Island is a 17-acre island that was created by the John Day Dam impoundment. A dike-like barrier built from dredged material along its length protects an adjacent bay and boat launch.

Twinning Island is located near Coulee City, Washington, and is situated directly across from a popular boat launch, thus human use and disturbance is evident.

3.5.2 Socioeconomic

3.5.2.1 Commercial and Recreational Fisheries

Commercial salmon fishing by European settlers began in the late 1830s and peaked during the 1860s with the advent of canning technology, and again during World War I with annual catches of more than 40 million pounds. Annual catches declined over time with catches in the 1990s of less than 3 million pounds (World Wildlife 2012). Commercial fishing on the Columbia River is managed by the Columbia River Compact (compact), which has congressional and statutory authority to adopt seasons and rules. The compact consists of agency directors, or their delegates, acting on behalf of the Oregon Fish and Wildlife Commission and the Washington Fish and Wildlife Commission. The Columbia River Treaty tribes also have authority to regulate treaty Indian fisheries. The compact is required to consider the effect of commercial fishery on the escapement, treaty rights, and recreational fisheries, as well as impact to species listed under ESA, when addressing commercial fishing seasons for salmonids and sturgeon (WDFW 2012a). A discussion of policies related to fisheries in the Columbia River Basin is in Section 6.3.

Five commercial zones are open downstream of the Bonneville Dam to drift gill net fishery. Above the Bonneville Dam, extending to McNary Dam, commercial fishing is

only open to Treaty Indian set net fishery (WDFW 2012a). Tribal fisheries are described in more detail below in Section 4.4.3. Besides anadromous fish species, white sturgeon, shad, and smelt are other species that contribute to the commercial fish industry in the Columbia River Basin. However, comprehensive data on these other resident fish do not exist in abundance as they do for anadromous fish species (IEAB 2005).

Recreational fishing exists throughout the Columbia River Basin, including Banks Lake and Potholes Reservoir. Recreational fishing in concurrent waters is managed under joint state action between Oregon and Washington. Fisheries that occur within individual state waters (tributaries) are regulated by the home state (ODFW 2012). Aside from anadromous fish species, other principal species that are of importance in recreational fishing in the Columbia River Basin include white sturgeon, bass, shad (*Alosa sapidissima*), smelt (*Thaleichthys pacificus*), walleye, northern pikeminnow, and rainbow trout (IEAB 2005).

In the last century, several factors have contributed to more stringent policies regarding commercial and recreational fisheries in the Columbia River Basin, including listings of various salmonids under ESA; human environmental impacts; and changing policies on hatchery fish-rearing (NPCC 2010a). However, fishing remains an important economic and cultural fixture in the lower-Columbia and Indian communities. In a study conducted by the Independent Economic Analysis Board (IEAB) at the request of the Northwest Power and Conservation Council (NPCC), the economic value of commercial, tribal, and recreational fisheries of salmon and steelhead in the Columbia River Basin based on early 2000s conditions, was estimated to range up to $142 million. This translates to up to 3,633 jobs related to the industry spread over Washington, Oregon, and Idaho (IEAB 2005).

3.5.2.2 Tribal Fisheries

Native Americans have been fishing on the Columbia River since before the arrival of Europeans in the Pacific Northwest. After settlement of the area by non-Native Americans, many of the historic Native American fishing sites along the Columbia River were lost due to encroachment by settlers. Additionally, with the construction of the Columbia River dams, traditional tribal fishing sites were flooded. In order to replace these lost tribal fishing sites, “in lieu” or treaty fishing access sites (TFAS) were set aside. These TFAS are exclusively for the use of Columbia River Treaty tribes, which include Yakama, Umatilla, Warm Springs, and Nez Perce tribal members. Between the Bonneville Dam and McNary Dam, 18 in-lieu TFAS or shared-use (treaty fishing and public access) fishing sites are present. Above Priest Rapids Dam, non-treaty tribal fishing occurs for Wanapum and Colville Tribes.

Tribal Management Authority

Each of the four Columbia River treaty tribes manages their fisheries, including ceremonial and subsistence (C&S) fisheries, individually. Each tribe has retained its authority to regulate its fisheries and issues fishery regulations upon its approval, through its respective governing bodies. Tribal fishery regulations authorize tribal fisheries and describe lawful gear, fishing area, notice restrictions, and other miscellaneous regulations for tribal fisheries enforcement purposes (WDFW 2012a).

All fisheries are monitored by tribal fishery programs to provide accurate in-season accounting of harvest. Commercial fisheries and portions of the C&S fisheries are sampled for biological and stock composition purposes. The tribes are represented by their staff on the Columbia River Compact's Technical Advisory Committee for fishery management coordination and participate in data sharing with the other parties.

Importance of Fisheries

Treaty fisheries serve an important role in the religious, cultural, and economic lives of tribal members. An economic value cannot be put on the religious and cultural use of the fishery resource. Fish harvested for subsistence use have both a cultural and economic component as the fish provide food that would otherwise have to be purchased. Tribal commercial fisheries are of critical economic importance for tribal communities that often suffer from chronic unemployment and under-employment. Many tribal members earn a substantial portion of their annual income through participation in tribal commercial fisheries. Tribal commercial fisheries also provide economic benefits to communities both on Indian reservations and communities along the Columbia River where tribal members purchase supplies and equipment, sell fish, and spend the income they earn. According to the 2005 IEAB report, tribal commercial fisheries based on early 2000s numbers could provide as much as $32.6 million to the local economy.

SECTION 4.0 IMPACT ASSESSMENT

This section of the EA analyzes the impacts associated with each of the four alternatives presented in Section 2 upon the affected environment. The effects of each of the four alternatives follow the same order presented in Section 3. The general effects of CATE habitat enhancement sites, and dissuasion at potential inland basin CATE nesting sites as part of adaptive management (other than the identified at-risk sites) are described in this section, as appropriate and based on available information. Once the specific sites are identified and potential site specific effects can be more fully defined, the effects of these actions will covered in a subsequent supplemental/tiered NEPA analysis (as appropriate) prior to implementation of Phase 2.

4.1 Biological Environment

4.1.1 Federally Endangered and Threatened Fish

4.1.1.1 Alternative A

Under Alternative A, impacts to threatened and endangered salmonids by CATE predation in the inland Columbia River Basin are anticipated to continue in similar trends to those currently present.

As determined by Roby et al. (2011), it is estimated CATEs at Goose Island consumed between 110,000 to 134,000 anadromous juvenile salmonids from the Columbia River in 2010. Of this, an estimated 9 percent to 26 percent were steelhead. Lyons et al, (2011a) determined that CATEs at Goose Island had the following predation rates on salmonids in the Columbia River Basin: 14.6 percent and 11.4 percent of in-river migrating populations of hatchery and wild UCR steelhead, respectively, and 3 percent of the spring run of UCR Chinook (Lyons et al. 2011a).

The 2012 estimated predation rate by CATEs nesting at Goose Island (17.0 percent) was higher than the 2011 estimate (12.7 percent), and was the second highest estimate since this study began in 2008.

CATEs at Crescent Island consumed approximately 420,000 juvenile salmonids in 2010. Of this, an estimated 13 percent were steelhead. Based on the Lyons et al. (2011a) Benefits Analysis, the Crescent Island CATE colony had the following predation rates on salmonids in the Columbia River Basin: 5.1 percent of in-river non-transported SR steelhead; 2.7 percent and 2.3 percent on the in-river migration populations of hatchery and wild UCR steelhead, respectively; 1.2 percent of the non-transported SRF Chinook; less than 1 percent on non-transported SRS/S Chinook runs; and 1.3 percent of non-transported SR sockeye.

From 2008 to 2011, a total of 32 PIT tags from bull trout (most originating from the Walla Walla River Basin) have been recovered on the Foundation Island DCCO colony grounds (Roby et al. 2011b). Three PIT tags from bull trout tagged in the Walla Walla River Basin were detected on the Badger Island pelican colony grounds in 2010, providing for a total of six bull trout PIT tags recovered on colony grounds through 2010 since scanning began in 2005 (Roby et al. 2011b). Although PIT tags from bull trout have been recovered within DCCO and pelican colonies, specific predation rates on bull trout by CATEs is unknown (Evans 2013 personal communication).[3]

4.1.1.2 Alternative B

Using the consumption estimates discussed in Section 3 and in Alternative A above as rough indicators, if 100 percent dissuasion of CATEs nesting at Goose and Crescent Islands was achieved due to actions under Alternative B, approximately 530,000 - 554,000 juvenile salmonids annually would no longer be consumed (Roby et al. 2011b).

At 100 percent dissuasion, relocation of the Goose Island CATE colony could result in an approximate increase of 14.6 percent and 11.4 percent of in-river migrating populations of hatchery and wild UCR steelhead, respectively, and 3 percent of UCRSp Chinook (Lyons et al. 2011a). With regard to effects on annual average growth rate (λ), of selected salmonid ESUs, 100 percent dissuasion could result in a $\Delta\lambda$ of 4.2 percent hatchery population/3.2 percent wild population of UCR steelhead and 0.7 percent UCRSp Chinook.

At 100 percent dissuasion, relocation of the Crescent Island CATE colony could realize an increase of up to 5.1 percent of in-river non-transported SR steelhead; 2.7 percent and 2.3 percent on the in-river migration populations of hatchery and wild UCR steelhead, respectively; 1.2 percent of non-transported SRF Chinook; less than 1 percent on non-transported SRS/S Chinook runs; and 1.3 percent of non-transported SR sockeye (Lyons et al. 2011a). With regard to λ, 100 percent dissuasion could result in a $\Delta\lambda$ of 0.7 percent hatchery population/0.6 percent wild population of UCR steelhead and 0.5 percent for SR steelhead (Lyons et al. 2011a).

As stated above, specific predation rates on bull trout by CATEs is unknown. In addition, a significant gap of knowledge exists regarding migratory bull trout life history and their use of the mainstem Columbia and Snake Rivers. However, if dissuasion of CATEs nesting at Goose and Crescent Islands was achieved due to actions under

[3] To date, there has been only one confirmed PIT-tagged bull trout consumed by an inland nesting CATE.

Alternative B, it is anticipated that the potential for the consumption of juvenile salmonids would decrease, including bull trout. The Corps has consulted with USFWS to address potential impacts to bull trout as described in Section 6.0 below.

Alternative B would have positive impacts to threatened and endangered salmonids in the Columbia River Basin.

4.1.1.3 Alternative C

With the addition of hazing for CATE dissuasion, Alternative C is anticipated to have higher potential for success with regards to increasing positive impacts to threatened and endangered salmonids in the Columbia River Basin than Alternative B with the use of habitat modification alone (i.e., predation related losses of salmonids would be reduced). The addition of hazing in Alternative C would further ensure that CATEs are effectively dissuaded at Goose and Crescent Islands so that greater reduction in predation rates and potential increases in the annual average growth rates of ESA-listed salmonids in the Columbia River Basin can be achieved. The incremental impacts of hazing in addition to habitat modifications are assumed to be negligible and temporary. Hazing would be employed as a method of reinforcing the anticipated effects of habitat modifications (dissuasion of nesting birds). No additional negative effects to hazed birds are anticipated.

4.1.1.4 Alternative D

With the ability to conduct egg take, Alternative D would have the highest potential for success with regards to increasing positive biological effect to threatened and endangered salmonids in the Columbia River Basin of all the alternatives considered in this EA. Moreover, this alternative is similar to CATE dissuasion efforts conducted in the Lower Columbia River estuary where limited egg take has found to be necessary to most effectively dissuade CATEs.

4.1.2 Other Fishes

4.1.2.1 Alternative A

Current effects to non-ESA-listed salmonids and other fish from CATEs are not expected to change from current conditions under this alternative. At Goose Island in 2010, Roby et al. (2011) determined that juvenile salmonids (ESA- and non-ESA-listed) made up an average of 21 percent of the CATE diet, centrarchids (bass and sunfish) comprised 63 percent, and other fish, such as yellow perch, carp and minnows, made up the remaining 16 percent. Roby et al. (2011) determined that salmonids (ESA- and non-ESA-listed) comprised 71 percent of the CATE diet at Crescent Island in 2010,

followed by centrarchids (bass and sunfish, 15 percent) and cyprinids (carps and minnows, 9 percent).

4.1.2.2 Alternative B

Negative effects to non-ESA-listed salmonids and other fish would likely increase with dissuasion of CATEs from Goose and Crescent Islands. It is anticipated that CATE fish consumption would shift to that of non-ESA-listed salmonids and other fish that are locally available at CATE nesting sites. This is supported by data from the relocation of CATEs from Rice Island to East Sand Island (approximately 26 km [16 miles] closer to the ocean than Rice Island) in the Lower Columbia River estuary where it was found that the diet of CATEs relocated to East Sand Island averaged between 31 percent and 47 percent salmonids during the years 1999 to 2002, compared to the diet of Rice Island CATEs which consisted of 77 percent and 90 percent salmonids in 1999 and 2000, respectively (Collis et al. 2002a).

It is anticipated that negative impacts to non-ESA-listed salmonids and other fish species would not be significant under Alternative B. Within the context of a such a wide geographical area, the relatively small quantity of CATEs relocated from Goose and Crescent Islands would not be anticipated to have measurable effects to these fish species. Some CATEs would likely disperse to various locations outside of the inland Columbia River Basin along the western portion of North America or to an enhancement site(s) which would be selected based on availability of an adequate, sustainable food supply.

Impacts to non-ESA-listed salmonids and other fish species at incipient colony dissuasion sites identified during adaptive management (non-at- risk islands) are anticipated to be very similar to those relocated from Goose and Crescent Islands and the at-risk islands. At habitat enhancement sites, CATEs could have increased predation upon non-ESA-listed salmonids and other fish similar to that detailed above for Rice Island. Site-specific evaluations of potential impacts at these dissuasion and enhancement sites on non-ESA-listed salmonids and other fish will be performed during supplemental/tiered NEPA analysis.

4.1.2.3 Alternative C

Effects to non-ESA-listed salmonids and other fish for Alternative C are anticipated to be similar to those of Alternative B. Alternative C would have no significant impacts to non-ESA-listed salmonids and other fish species.

4.1.2.4 Alternative D

Effects to non-ESA-listed salmonids and other fish for Alternative D are anticipated to be similar to those of Alternatives B and C. Alternative D would have no significant impacts to non-ESA-listed salmonids and other fish species.

4.1.3 Caspian Terns

4.1.3.1 Alternative A

Under Alternative A, no significant negative effect would be expected to be seen on CATEs from Goose and Crescent Islands. The CATE colonies at Goose and Crescent Islands would likely continue at their current population numbers (Table 3-6). No habitat management or other dissuasion methods would be enacted on CATEs within the inland basin by the Action Agencies, and, therefore, no direct impacts would occur due to management actions directed at CATEs. Nesting habitat would likely continue to be present for CATEs at these locations similar to what currently exists. It is likely that these CATE colonies would continue to consume salmonids present in the Columbia River Basin following trends similar to those presented in Section 3. Additionally, the potential for members of extant CATE colonies at Goose and Crescent Islands, as well as other locations such as East Sand Island, to relocate to other locations, including those designated in this EA as at-risk islands, would not be hindered by Action Agency management actions directed at CATEs in the inland Columbia River Basin.

CATE colonies at Goose and Crescent Islands under Alternative A would continue to be impacted by causes such as predation, disease, changes in interspecies competition and climate change. Climate change could indirectly affect CATEs via causes such as changes in prey base, predation pressure, disease and interspecies competition. The occurrence and magnitude of the potential direct and indirect effects upon CATEs due to these types of causes are unknown and are not part of this analysis.

4.1.3.2 Alternative B

Under this alternative, existing CATE nesting sites and potential relocation sites at Goose and Crescent Islands would be modified to discourage CATE nesting in Phases 1 and 2. In Phase 1 the approximately 459 CATE pairs nesting on Goose Island would be dissuaded using ropes and flagging. Dissuasion of CATEs from Crescent Island in Phase 2 would affect approximately an additional 422 CATE pairs. If CATEs relocate to other inland Columbia River Basin sites as a result of Alternative B actions, dissuasion actions would be implemented at these at-risk sites to encourage CATEs to nest at locations outside of the basin. The collective dissuasion activities on Goose and Crescent Islands and at at-risk sites if warranted would have the potential to dissuade approximately 900 CATE pairs from nesting within the inland Columbia River Basin,

approximately 7.5 percent of the western North America metapopulation, an estimated 11,660 pairs in 2012 (USFWS 2013a personal communication), and roughly 0.4 to 0.7 percent of the worldwide population of between 240,000 to 420,000 individuals (Birdlife International 2012a).

CATEs are long-lived migratory birds with nesting locations that are rarely permanent. Consequently, they have developed nomadic tendencies for movement to new areas for nesting (Cuthbert 1985, Roby et al. 2002). In Alternative B, it is likely there would be a lag between the time the CATEs are dissuaded from Goose and Crescent Islands and when they find new nesting areas, but it is expected to be temporary and of short duration. During the time that dissuaded CATEs are searching for new nesting sites, there could be a temporary reduction in the regional population of CATEs due to loss of productivity at the dissuasion colonies. Based on the most recent estimates of productivity from the two islands given in the Affected Environment section, minimal loss of overall metapopulation productivity is anticipated due to dissuasion of birds from Crescent and Goose Islands. Losses in productivity are expected to be temporary in nature. It should be noted that the western North America metapopulation has experienced significant growth since the 1960s (Table 3-2), and that the potential temporary loss of productivity in the population is not expected to result in a decline in the overall metapopulation.

It is likely that dissuaded CATEs would find other suitable nesting areas in the western metapopulation including at sites identified in Table 2-1 and Figure 3-4. CATE's nomadic approach to locating suitable nest sites has led birds from the western metapopulation, including those from Goose and Crescent Islands, to be re-sighted at nesting sites from Mexico and Alaska and east into Utah and Idaho (Collis et al. 2012, Roby et al. 2002). CATEs tend to be attracted to existing colonies when searching for new nesting areas (Kildaw et al. 2005) such that existing CATE colonies would likely provide nesting space for CATEs dissuaded from Goose and Crescent Island colonies. This includes habitat enhancement sites created by the Corps Portland District outside the Columbia River estuary for the purposes of attracting CATE to alternative nesting sites. Furthermore, CATE are known to nest with similar colonial waterbirds such as gulls, and, as such, extant gull colonies may attract new nesting CATEs at higher numbers than sites without any nesting seabirds. Currently unoccupied sites with ideal nesting CATE habitat conditions, i.e., open sandy ground with few trees, may also attract dissuaded CATEs prospecting for new nest sites. Ultimately, CATEs dissuaded from the inland Columbia Basin, as part of this alternative, would be able to select from a wide range of currently available (whether natural or managed) as well underutilized existing habitat throughout the region of the western metapopulation.

Overall, many known CATE nesting sites vary in suitability on an annual basis, due to fluctuation water levels, exposure of nesting islands, prey resources, and predators,

contributing to changes in colony locations and sizes throughout the region on an annual basis. As suitable nesting sites may at times be a limiting factor for the western North America metapopulation (Roby et al. 2013), the identification and development of new nesting areas (enhancement sites) outside the basin would benefit CATEs dissuaded from Goose and Crescent Islands as well as the overall metapopulation. As part of Phase 1 of this alternative, potential habitat enhancement sites identified in 2012 (Collis et al. 2012) as well as other areas meeting the criteria identified in Section 2.1, would be evaluated for implementation. Supplemental/tiered NEPA analysis as described in Section 2.2 would occur for these sites. As part of Phase 2 of this Alternative, habitat enhancement efforts would be implemented in accordance with Phase 1 planning efforts and prior to dissuasion of the primary CATE colony at Crescent Island.

Alternative B actions would be expected to reduce habitat for CATEs nesting in the inland Columbia River Basin, as well as significantly reduce predation on ESA-listed salmonids. CATEs displaced from Goose and Crescent Islands have a high potential to find new nesting areas outside the inland basin, including possible use of one or more habitat enhancement sites that would be implemented as part of this proposal, based on their propensity to travel over large distances to find nesting sites. The dissuasion of CATEs from Goose and Crescent Islands associated with Alternative B actions would not be expected to have a significant negative impact on CATEs populations. CATEs that would be dissuaded from Goose and Crescent Islands represent approximately 7.5 percent of the estimated western metapopulation, 2.5 percent of the estimated North American population, and 0.4 to 0.7 percent of the estimated global population.

4.1.3.3 Alternative C

Effects to CATEs under this alternative would be similar to those under Alternative B for habitat modification actions. Hazing at the CATE colonies at Goose and Crescent Islands would provide an additional means of dissuading CATEs from nesting at these sites. Hazing would supplement habitat modification efforts to dissuade CATEs from nesting at Crescent and Goose Islands by providing a means of deterring CATEs attempting to nest at these sites despite the habitat modifications. This would support the intended effects of Alternative B by further dissuading CATEs attempting to nest at these sites. This alternative is anticipated to have similar long-term results regarding the number of CATEs dissuaded, relocation of displaced CATEs, and positive benefits to salmonid consumption rates as Alternative B because in the long-term most CATE habitat on dissuasion islands would be modified resulting in a similar effect as if the birds had been hazed from the area. Hazing is expected to have non-lethal effects on CATEs (USFWS 2005a). Based on the above discussion, Alternative C would have no significant negative impacts on CATE populations.

Effects to CATEs under this alternative would be similar to those in Alternative B for habitat modification actions. Hazing at the CATE colonies at Goose and Crescent Islands would provide an additional means of dissuading CATEs from nesting at these sites and ultimately may be expected to result in the dissuasion of approximately 900 breeding pairs of CATEs at the two sites collectively. Hazing would augment habitat modification to dissuade CATEs from nesting at Crescent and Goose Islands by initially providing a means of deterring CATE nesting at these locations until habitat modifications are in place. This alternative is anticipated to have similar long-term results regarding the number of CATEs dissuaded, relocation of displaced CATEs, and positive benefits to salmonid consumption rates as Alternative B because in the long-term most CATE habitat on dissuasion islands would be modified resulting in a similar effect as if the birds had been hazed from the area. Hazing is expected to have non-lethal effects on CATEs (USFWS 2005a). Based on the above discussion, Alternative C would have no significant negative impacts on CATE populations.

4.1.3.4 Alternative D

Alternative D differs from Alternative C only in that Alternative D includes the removal of up to 200 CATE eggs per year at Goose and Crescent Islands and the at-risk islands combined. This alternative includes a modified version of lethal take (egg removal). However, the goal of this alternative is not to manage or affect the overall CATE population in the Columbia River Basin, but rather to serve as an additional means of dissuasion to the specific CATE colonies at Goose and Crescent Islands if non-lethal measures are found to be ineffective. As discussed in Section 2, any egg take would be conducted in accordance with a MBTA depredation permit requested from USFWS. As with Alternatives B and C, Alternative D is anticipated to have similar results regarding the number of CATEs dissuaded, relocation of displaced CATEs, and positive benefits to salmonid consumption rates. Moreover, Alternative D represents the most effective potential for dissuading CATEs from Goose and Crescent Islands. While it is anticipated that habitat modification and hazing would be effective methods for dissuading CATEs at Goose and Crescent and the at-risk islands, limited egg take provides an additional level of dissuasion. Action Agencies anticipate that passive and active hazing efforts at Goose and Crescent Islands would result in very few to no CATE breeding pairs remaining on the islands, thus it is expected that far fewer than 100 eggs per year per island (200 eggs total per year) would be laid. Due to the extent of the passive hazing actions, frequency of active hazing actions, and adaptive management options, it is anticipated that only a limited number of CATE eggs would need to be taken from Goose, Crescent, and the at-risk islands (no more than 200 per year on all islands combined). It is in line with recent Corps CATE management actions in the Columbia River estuary where limited egg take has been necessary for effective CATE dissuasion at targeted nesting locations. The Portland District Corps has an active hazing and non-

lethal deterrent program in the Columbia River estuary for Rice Island, Miller Sand Spit, and Pillar Rock Sands Island. In support of the non-lethal dissuasion program, USFWS has issued depredation permits annually from 2009 to 2012 for the collection of up to 100 CATE eggs to prevent CATE colonies from reestablishing on sites with documented salmonid consumption rates higher than those for East Sand Island (USFWS 2005). These permits are valid for 1 year and must be renewed each year. Through the breeding season of 2012, fewer than nine eggs per year have been collected in support of hazing actions associated with implementation of estuary CATE management efforts (Roby et al. 2013). Despite the potential temporary loss of productivity resulting from limited egg take, the dissuaded CATEs are anticipated to find new nesting sites as they are long-lived, nomadic birds with a propensity to travel long distances to find nesting areas (see discussion in Section 3.1.1). Based on the above discussion, Alternative D would have no significant negative impacts on CATE populations.

4.1.4 Other Birds

Goose Island lies within the Potholes Reservoir Important Bird Area (IBA) as designated by the Audubon Washington report *Important Bird Areas of Washington* (Audubon 2001). The description of Birds and Habitat for this IBA is as follows, “the shallow open water and wetlands provide a rich foraging area for fish-eating birds, and the small islands provide ideal nesting sites for colonial nesting birds, grebes, ducks, and geese. The reservoir is also important as a migration staging area for waterfowl, and as a wintering area for bald eagles.” Potholes Reservoir was designated based on the following the IBA criteria (Audubon 2001):

- CATEGORY 1: Site for endangered or threatened species, or species of special concern in Washington.
- CATEGORY 5: Site where birds regularly concentrate in significant numbers.
  - 5a. Over a short period of time during any season: at least 2,000 waterfowl in fresh water habitats; or 5,000 waterfowl in marine/estuarine habitats.
  - 5b. Over a short period of time during any season: at least 50 seabirds, in either marine or terrestrial nesting areas; or 1,000 gulls at inland sites or 5,000 gulls at coastal sites; or 50 terns.
  - 5d. At least 50 great blue heron nests; or any nesting pelicans, egrets, or black-crowned night herons during breeding season; or 30 brown pelicans at any time of the year.

Based on these criteria, dissuasion of nesting CATEs or gulls from Goose Island has the most potential to affect Category 5b. While CATEs may still occupy Potholes Reservoir following implementation, there is the potential that less than 50 pairs of CATEs may remain within this IBA. However, it is likely that well over 1,000 gulls will

continue to nest within Potholes Reservoir following implementation. Therefore, the criteria for which this IBA was designated should not be violated due to the proposed action, and no significant effect to the IBA is anticipated.

4.1.4.1 Alternative A

Alternative A represents no change in existing management activities for non-CATE bird species in the inland Columbia River Basin. No avian predation management or habitat modification actions under the proposed IAPMP, which could affect non-CATE bird species. Nesting habitat would likely continue to be present for non-CATE bird species at these locations similar to what currently exists. It is likely that colonies of non-CATE birds would continue to consume salmonids in the Columbia River Basin following trends similar to those presented in Section 3.

4.1.4.2 Alternative B

In this alternative, habitat modification in Phases 1 and 2 would have a direct impact on gull species at Goose and Crescent Islands. The species most likely to be impacted by actions described herein are RBGU and CAGU. These two gull species are widespread in the western United States, and are highly adaptable to a variety of food sources. Hazing of gulls would occur to avoid potential gull egg take during CATE hazing. The negative effects of dissuading these gulls would be temporary in nature and gulls would be allowed to return to both islands once CATE hazing activities are concluded. For more information on the biology of these two gull species, see Section 3.1.4.1.

RBGUs are widely distributed across the United States and Canada with a total estimated population of 2.55 million gulls in North America (Pollet et al. 2012). In 2009, RBGUs were restricted to Goose Island and did not nest on Crescent Island. If 100 percent dissuasion were to occur on both Goose Island, with an estimated RBGU population of 10,541 in 2009, (Roby et al. 2010) and all the RBGUs were unable to locate to alternate nesting sites, this would potentially result in a 0.4 percent decrease in the number of breeding RBGUs range-wide. Moreover, due to RBGUs high adaptability to habitat and prey sources, the likelihood of 100 percent of the gulls being unable to relocate to suitable nesting sites is highly unlikely.

CAGUs nest in many western states as well as the potholes region of Canada with an estimated population of 500,000 birds in North America (Winkler 1996). CAGUs nested on both dissuasion islands, with 8,575 CATEs on Crescent Island and 2,481 in Potholes Reservoir in 2009 (Roby et al. 2010). If 100 percent dissuasion were to occur on both Goose and Crescent Islands (with an estimated combined population of 11,056 CAGUs) (Roby et al. 2010) and all of the birds were unable to locate to alternate nesting sites, this would potentially result in an approximately 2.2 percent decrease in the number of breeding CAGUs range-wide.

The actions to dissuade CATE at both islands would modify some or most portions of the islands where gulls nest on the periphery of CATE nesting sites. Based on gull survey numbers from 2009, it is anticipated that this could displace as many as 21,597 total adult gulls (not pairs) at both dissuasion islands (Roby et al. 2010, also see Section 3.1.4.2 for more gull population numbers). Additionally, potential modification of habitat at at-risk islands with extant gull populations, such as Miller Rocks, may also displace gulls. However, these individual colony displacements are not anticipated to impact regional population levels of gulls, because adequate habitat is present throughout the Columbia River Basin and gulls are more flexible in their habitat requirements than are CATEs.

Live Russian olive or other nonnative trees on Crescent Island may be cut to be used for coarse woody debris as a visual barrier for CATEs. This may have some small impact on nesting locations for Black-crowned Night Herons and Great Blue Heron, which nest in trees in the interior of the island. However, the potential cutting of Russian olive or other trees is likely to be minimal, and several other trees are present on the island that would provide similar habitat. Additionally, prior to any field activities, survey of existing trees would be performed to ascertain if any nesting is occurring. Any trees discovered to support active nesting would not be cut.

Habitat modification at Crescent Island may also include the use of dead woody debris on site as a visual barrier for CATEs. The majority of the dead trees on the island would be left standing because they may provide perches for Bald Eagles and Ospreys or other raptors in the winter. As with live trees, any dead trees observed to support active nesting or favored raptor perching would not be cut down.

Potential habitat modification (rope and flagging) at at-risk islands with DCCO populations, such as Foundation Island, are not anticipated to have direct negative effects on DCCOs due to their ability to use different habitat from CATEs (e.g., nesting in trees and bushes versus only using ground habitat). Any habitat modification at these islands would be done outside of the nesting season and in a manner approved by USFWS.

No actions would be taken on Badger Island that could disturb American white pelicans, due to their status as a state endangered species (WDFW 2012c). If CATEs attempt to nest on Badger Island before pelicans arrive, these CATEs would be dissuaded and their nest scrapes flattened. If CATEs attempt to nest on Badger Island after pelicans have arrived, no actions would be taken until the following early spring when temporary dissuasion material (ropes and flagging) would be placed over the areas where the CATEs nested in the previous year. All CATE dissuasion actions on Badger Island would be coordinated with McNary National Wildlife Refuge staff.

No actions as part of the IAPMP are anticipated to occur in areas designated as critical habitat or areas with other potential conflicts with ESA-listed birds such as the western snowy plover and the California least tern. Actions Agencies (Corps and Reclamation) will coordinate with USFWS to ensure that these species and others (e.g., streaked horned lark) are not subject to adverse effects (e.g., disruption of nesting activities) as part of habitat enhancement actions. As appropriate, the Action Agencies will further coordinate actions with other federal agencies including other districts such as Portland District, Seattle District, and San Francisco District as well as BPA. Actions as part of this plan (primarily enhancement site efforts) may occur within the habitat range of the western snowy plover and California least tern. If the Action Agencies propose to develop habitat enhancement sites within these areas, coordination would occur with the appropriate agencies (USFWS, CENWP, BPA, and other local or regional agencies) and appropriate consideration to these species would be given under NEPA, the ESA, and other applicable laws as the situation dictates.

Impacts to other birds at incipient colony dissuasion sites identified during adaptive management (non-at-risk islands) are anticipated to be very similar to those at Goose and Crescent Islands and the at-risk islands. At habitat enhancement sites, the creation of CATE habitat could result in potential impacts to other birds including competition for prey and habitat displacement. Site-specific examination of potential impacts to other birds at these dissuasion and enhancement sites will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would have no significant negative impacts to non-CATE bird species.

4.1.4.3 Alternative C

Alternative C would have the same potential impacts as Alternative B with regard to habitat modification for non-CATE bird species. The addition of hazing under Alternative C would also disturb other birds, especially gulls at Goose and Crescent Islands. Due to the colocation of CATE and gulls on these islands, it is possible that all gulls would have to be dissuaded from both islands to successfully accomplish CATE dissuasion without incurring any gull take (i.e., preventing gulls from nesting and laying eggs and later disrupting gull nesting during CATE hazing which would be a form of a gull take). Hazing would be conducted on foot, and hazers would pass through areas with CATEs to scare them away while dissuading gulls and potentially other waterbird species. It should be noted that American White Pelicans, a Washington state protected species, are not located on Goose or Crescent islands and hazing activities would therefore not impact these birds. Other bird species such as small songbirds or Canada goose may be temporarily disturbed or flushed when field staff is on the islands as they walk by nests or foraging areas but impacts would be negligible because hazing actions would

be conducted away from areas where these birds nest (e.g., thicker brushy areas). Alternative C would have no significant negative impacts to non-CATE bird species.

4.1.4.4 Alternative D

Alternative D has the same potential impacts as Alternatives B and C. CATE egg removal would occur during the hazing activities described in Alternative C. As with Alternative C, CATE hazers would also haze gulls. It is not anticipated that CATE egg removal activities would disturb non-CATE bird species any more than hazing by itself. No non-CATE bird eggs would be disturbed or taken as a result of this alternative. Alternative D would have no significant negative impacts to non-CATE bird species.

4.1.5 Mammals

4.1.5.1 Alternative A

Under Alternative A, mammal use of Goose and Crescent Islands, as well as of potential habitat restoration areas, would likely continue at their current levels and fluctuate naturally with annual year-to-year variation. No habitat management or other dissuasion methods would be enacted by the Action Agencies, and, therefore, no direct or indirect impacts would occur due to Action Agency management actions.

4.1.5.2 Alternative B

The passive dissuasion activities would have no or negligible impacts to mammals on Goose and Crescent Islands or the at-risk islands. Although CATEs would be dissuaded from these areas (reducing their availability as prey), gulls would still be at these sites in abundance to provide an adequate prey base.

Impacts to mammals at incipient colony dissuasion sites identified during adaptive management (non—at-risk islands) are anticipated to be very similar to those at Goose and Crescent Islands and the at-risk islands. At potential habitat enhancement sites, some active management may include increased visits by field staff to implement control of predators that pose a risk to CATEs. Predators may include coyotes, gray fox, skunk, badger, river otter, mink, marmot, opossum, raccoon and nonnative rats. Goose, Crescent, and the at-risk islands are all small islands with occasional use by most mammal species. The direct impacts could include reducing or eliminating the usage of those sites by those predators. Direct impacts could also include mortality associated with lethal controls if they were necessary to maintain healthy CATE colonies. Site-specific examination of potential impacts to mammals at dissuasion sites identified as part of adaptive management or enhancement sites will be performed during supplemental/tiered NEPA analysis.

None of the controls would have significant population impacts to any of the affected species. Alternative B would have no significant negative impacts to mammals.

4.1.5.3 Alternative C

Effects to mammals under Alternative C are similar to those under Alternative B. The presence of hazers at Goose and Crescent Islands could potentially cause periodic disturbance to any mammals present at these locations. These impacts are also expected to be negligible. Alternative C would have no significant impacts to mammals.

4.1.5.4 Alternative D

Effects to mammals under Alternative D are expected to be very similar to those under Alternative C. Alternative D would have no significant impacts to mammals.

As part of the habitat enhancement site selection and planning process, proposed predator control techniques for each site will be fully evaluated as to minimize impacts to non-target species. In addition, each predator-control action will be coordinated with applicable state and federal agencies prior to and during implementation. Furthermore, supplemental/tiered NEPA documentation will address all site-specific effects associated with the development of new habitat enhancement activities including predator control, which will be tailored to prevent potential impacts to mammals.

4.1.6 Federally Endangered and Threatened Wildlife and Plants

4.1.6.1 Alternative A

No federally endangered and threatened wildlife or plant species are known to occur at the project sites, so no effect to these species would occur.

4.1.6.2 Alternative B

No federally endangered and threatened wildlife or plant species are known at Goose or Crescent islands or are anticipated to occur at the at-risk islands, so no effects to these species are expected. CATE dissuasion at incipient colony sites identified for adaptive management (non-at-risk islands) or the creation of habitat enhancement sites for CATE habitat could result in potential impacts to federally endangered and threatened wildlife or plant species if these species are present there, e.g., loss of habitat and changes in predator/prey relationships. Site-specific examination of potential impacts to federally endangered and threatened wildlife or plant species at these dissuasion and enhancement sites will be performed during supplemental/tiered NEPA analysis.

4.1.6.3 Alternative C

No federally endangered and threatened wildlife or plant species are known at Goose or Crescent islands or anticipated to occur at the at-risk islands, so no effect to these species are expected would occur.

4.1.6.4 Alternative D

No federally endangered and threatened wildlife or plant species are known at Goose or Crescent islands or anticipated to occur at the at-risk islands, so no effects to these species are expected.

4.1.7 Vegetation

4.1.7.1 Alternative A

Under this alternative no impacts to vegetation would occur on at-risk islands, as no management action would be performed. On Goose and Crescent Islands, vegetation would continue to be influenced by the presence of CATEs and gulls.

4.1.7.2 Alternative B

Alternative B includes modification of vegetation as an action. At Goose Island, rope and flagging and the placement of related support structures would likely have small (incidental damage to plants by workers and equipment) to insignificant impacts on vegetation on site due to the widely spaced sagebrush-dominated plant communities on site and the ability to place support structures in between these plants. If the use of rope and flagging is unsuccessful for CATE dissuasion at Goose Island, cobble material from an approved source may be used to modify the island. The potential emplacement of cobble may have some impact on these plant communities. However, the cobble material would be placed in a manner to avoid individual plants as much as possible, so minimal impacts to vegetation at Goose Island would occur.

Effects to plant species on the island during both construction and maintenance of the modified habitat on Crescent Island would occur during Phase 2. Construction activities at the existing CATE nesting site would include excavating soil, planting willows, placing silt fencing, creating a berm along the outside water edge of the nesting site, and potentially placing woody debris either from nonnative live trees present on the island, such as Russian olive, or the use of dead trees. Additionally, other potential relocation areas on the island would be covered with woody debris from either nonnative live trees present on the island or with dead trees. All of these actions have the potential to impact plants present in the area.

As a potential adaptive management action for CATE dissuasion at Crescent Island, cobble material from an approved source may be used to modify portions of the island. The potential emplacement of cobble may have some impact on plant communities. However, the cobble material would be placed primarily in areas devoid of vegetation. In locations with vegetation present, cobble would be placed in a manner to avoid individual plants so that any impacts to vegetation would be minimal.

Modification of vegetation would also have direct positive effects. Most of the excavation area is devoid of vegetation due to surface scratching by CATEs to create nest scrapes and potentially due to excessive amounts of ammonia from concentrated CATE and gull guano. The excavation of this area and the planting of native willow species would provide a greater presence of native plant assemblages on the island. Moreover, vegetated areas around the existing CATE nesting site and at other potential relocation areas around the island have large communities of nonnative noxious weeds such as perennial pepperweed, diffuse knapweed, and kochia. Removing these nonnative plant species would augment the succession of native vegetation on the island. Additionally, cutting down and using Russian olive as woody debris reduces the presence of nonnative species on the island, as these trees are nonnative species. To avoid excessive impacts on native vegetation near the northeast side of the excavation area, the berm would be offset ten feet from the waterline.

Any rope and flagging at the at-risk islands is also anticipated to have very small to insignificant impacts to vegetation, as installation related to support structures such as pier blocks and posts can be placed around plant communities on these islands.

Potential impacts to vegetation at incipient colony dissuasion sites identified during adaptive management (non-at-risk islands) or the creation of CATE habitat at potential enhancement sites could result depending on the level of disturbance. These impacts could be similar to those at Goose, Crescent and the at-risk islands such as weed and tree removal. Site-specific examination of potential impacts to vegetation at these locations will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would have no significant impacts to vegetation.

4.1.7.3 Alternative C

Alternative C is anticipated to have effects similar to those of Alternative B. Alternative C would have no significant impacts to vegetation.

4.1.7.4 Alternative D

Alternative D is anticipated to have effects similar to those of Alternatives B and C. Alternative D would have no significant impacts to vegetation.

4.2 Physical Environment

4.2.1 Geology and Soils

4.2.1.1 Alternative A

As the No Action Alternative, Alternative A would maintain existing geology and soil site conditions. In areas with concentrated CATE and gull nesting, CATE nest scrapes and CATE and gull guano would continue to impact soils in a manner similar to what exists currently.

4.2.1.2 Alternative B

Under this alternative, the installation of roping and flagging at Goose Island at the existing CATE nesting sites would not cause any significant disturbance of soils. Installation of support structures for rope and flagging would be placed directly on the ground surface. If CATE dissuasion is not successful using roping and flagging, the potential emplacement of cobbles on the site, in Phase 2, may cause some soil disturbance and related dust issues. However, this would be temporary in nature and is not likely to generate significant quantities of dust. If dust does become as issue as determined by Reclamation staff, dust suppression could be used at Goose Island. If water spray is used, it could act to cement loose materials into a more erosion-resistant crust. Water spray would likely be applied using a backpack sprayer or similar equipment. Any materials with loose fines that are stockpiled on site would be covered to prevent wind erosion.

As discussed in Section 2, during Phase 1 at Crescent Island limited soil excavation may be needed to facilitate establishment of willow at the test site. Phase 2 may include excavation of the existing CATE nesting site as well as an area around the periphery of the nesting area. Due to the potential presence of contaminants identified in Section 3.2.1, soil testing may be necessary to determine the concentrations of any contamination at the island prior to any soil-disturbing activities. Material from the CATE nesting site excavation would be utilized to create an approximately 4-foot-tall berm along the northeast limits of the existing nesting area as a visual deterrent for CATE nesting. The berm would be armored with a rocky substrate such as riprap or cobbles from a pre-approved source.

During Phase 1 and 2 habitat modification activities, there is a risk of wind erosion occurring. At the test willow planting site in Phase 1, it is anticipated that the willows

themselves will act as a windbreak so that any loose soil materials are protected from wind erosion. The presence of the rooted willows will also provide soil stability limiting the potential for erosion during rainfall events. In Phase 2, the berm may have willow plantings at its base to provide additional CATE dissuasion and to act as windbreak and provide soil stability. Armoring the berm would protect it from erosion due to wind and rain events. During construction, if significant time exists between berm construction and berm armoring, loose materials would be covered to minimize the possibility of erosion. Additionally, cobble material may be used as a potential adaptive management action for CATE dissuasion at Crescent Island and may cause some minor soil disturbance and dust issues. For all phases of construction, best management practices (BMPs) would be utilized. As with Goose Island, dust suppression would be used if dust becomes as issue as determined by the Corps, USFWS, or contractor staff on site during construction; a backpack sprayer or similar equipment would be used for suppression.

Offsetting the berm by ten feet from the edge of the waterline would also minimize native vegetation disturbance, thereby retaining existing windbreaks and minimizing exposure of additional loose soil materials. Additionally, silt fencing used for CATE dissuasion during willow recruitment would also provide a windbreak. Post-habitat modification, the presence of armoring on the berm, the willow plantings, and coarse woody debris would minimize the potential for soil impact from wind erosion.

With regard to the at-risk islands, the installation of roping and flagging at identified CATE nesting sites would not cause any significant disturbance of soils, because the pier blocks used for supporting the posts would be placed directly on the ground surface.

Activities at incipient colony dissuasion sites identified as part of adaptive management (non-at-risk islands) and the creation of enhancement sites for CATE habitat could result in potential impacts to geology and soils depending on the level of disturbance caused by site creation. Soil disturbance such as excavation could contribute to wind erosion and dust issues. Site-specific examination of potential impacts to geology and soils at these locations will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would not have any significant impacts to geology or soils.

4.2.1.3 Alternative C

. Under this alternative, some minor additional soil disturbance activities such as scrape flattening by hazers would occur. However any effects to soils from these activities are anticipated to be minimal. Alternative C would not have any significant impacts to geology or soils.

4.2.1.4 Alternative D

Alternative D is anticipated to have effects similar to those of Alternatives B and C. Alternative D would not have any significant impacts to geology or soils.

4.2.2 Floodplain/Water Elevation

4.2.2.1 Alternative A

As the No Action Alternative, Alternative A would have no effects to floodplain/water elevation.

4.2.2.2 Alternative B

Although Goose and Crescent Islands and the at-risk islands are all located in floodways, any habitat modifications being performed at these islands would have no impacts on floodplains or on water elevations. All work at the islands would be performed above the ordinary high water mark and would occur on the surface of the islands.

Impacts to floodplains and water elevation at incipient colony dissuasion sites (non-at-risk islands) identified as part of adaptive management are anticipated to be similar to those at Goose and Crescent Islands and the at-risk islands. The creation of habitat enhancement sites for CATE habitat could result in potential impacts to floodplains or water elevation depending on the type of activity needed, e.g., the addition of fill material or excavation within a floodplain. However, site-specific examination of potential impacts to floodplains and water elevation at these locations will be performed during supplemental/tiered NEPA analysis.

Alternative B would have not have any significant impacts to floodplains or water elevations.

4.2.2.3 Alternative C

Alternative C is anticipated to have effects similar to those of Alternative B. Alternative C would not have any significant impacts to floodplains or water elevations.

4.2.2.4 Alternative D

Alternative D is anticipated to have effects similar to those of Alternatives B and C. Alternative D would not have any significant impacts to floodplains or water elevations.

4.2.3 Water Quality

4.2.3.1 Alternative A

As the No Action Alternative, Alternative A would have no effects to water quality.

4.2.3.2 Alternative B

Due to the arid climate surrounding both Goose and Crescent Islands and the at-risk islands, as well as the nature and location of all potential actions to be performed under Phase 1 and 2 (i.e., no in-water work, all work above ordinary high water), impacts to water quality are not anticipated. However, the BMPs implemented at the project sites for wind erosion would also provide protection for any potential water quality impacts, which, if they do occur, would primarily be due to sediment in stormwater runoff.

At Goose Island, the installation of roping and flagging at the existing CATE nesting sites would not cause any significant disturbance of soils. If CATE dissuasion is not successful using roping and flagging, the potential emplacement of cobbles on the site, in Phase 2, could cause some soil disturbance and related dust issues. However, this would be temporary in nature and would not likely generate significant quantities of loose materials. If dust became an issue, dust suppression could be used at Goose Island. If water spray is used, it could act to cement loose materials into a more erosion-resistant crust. The spray would be applied in quantities sufficient only to control dust and not in large enough quantities to create runoff. Any materials with loose fines that are stockpiled on site would be covered to prevent potential stormwater runoff and impacts to water quality.

At Crescent Island, during Phase 1, the willow plantings at the test site would minimize the potential for stormwater runoff in that area by promoting soil stability. During Phase 2, armoring the berm would protect it from water erosion by protecting the sandy substrate used for the berm. During construction, if significant time exists between berm construction and berm armoring, loose materials would be covered to minimize the possibility of stormwater runoff. The potential emplacement of cobbles on the site as an adaptive management issue could cause some soil disturbance and related dust issues. If dust becomes an issue, dust suppression could be used. It is likely that if water spray is used, it could act to cement loose materials into a more erosion-resistant crust. The spray would be applied in quantities sufficient only to control dust and not in large enough quantities to create runoff. Offsetting the berm by 10 feet from the edge of the waterline would minimize the possibility of materials entering the water during construction and would also minimize native vegetation disturbance, thereby minimizing exposure of additional loose soil materials which could end up in stormwater. Additionally, silt fencing used for CATE dissuasion during willow recruitment would also detain stormwater. Post-habitat modification, the presence of armoring on the berm, the

berm itself, the depth of the excavated area, the willow plantings, and coarse woody debris would protect soils and trap loose materials and would minimize the potential for sediment-laden stormwater runoff.

With regard to the at-risk islands, the installation of roping and flagging at identified CATE nesting sites would not cause any significant disturbance of soils. Therefore, sediment impacts from stormwater are not anticipated.

Impacts to water quality at incipient colony dissuasion sites (non-at-risk islands) identified as part of adaptive management are anticipated to be similar to those at Goose and Crescent Islands and the at-risk islands. The creation of enhancement sites for CATE habitat could result in potential impacts water quality depending on the type of activity needed, e.g., the addition of fill material or excavation below the ordinary highwater mark. However, site-specific examination of potential impacts to water quality at these locations will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would have not have any significant impacts to water quality.

4.2.3.3 Alternative C

Alternative C is anticipated to have effects similar to those of Alternative B. Alternative C would not have any significant impacts to water quality.

4.2.3.4 Alternative D

Alternative D is anticipated to have effects similar to those of Alternatives B and C. Alternative D would not have any significant impacts to water quality.

4.2.4 Greenhouse Gas Emissions

4.2.4.1 Alternative A

As the No Action Alternative, Alternative A would have no effects to GHG emissions.

4.2.4.2 Alternative B

Impacts to GHG emissions from Alternative B would likely be limited primarily to construction activities for habitat modifications at Goose, Crescent and the at-risk islands in Phases 1 and 2. At Goose Island, motor boat transportation to and from the island in Phase 1 and the potential use of a helicopter for substrate modification in Phase 2 would cause limited and ephemeral emissions. Additionally, motor boat trips to the island to maintain habitat modification structures would similarly be limited and of short duration. Due to the very minor amount and the transitory nature of these emissions, no significant impacts to GHG are expected at Goose Island.

At Crescent Island, motor boat transportation to and from the island in Phase 1 for test willow planting and the potential use of small earthmoving equipment and related construction equipment in Phase 2 would cause limited and ephemeral emissions. Additionally, motor boat trips to the island to maintain habitat modification structures would similarly be limited and of short duration. Due to the very minor amount and the transitory nature of these emissions, no significant impacts to GHG are expected at Crescent Island.

For the at-risk islands, any emissions would be related to motor boat transportation to and from the islands for construction and maintenance of habitat modification structures. Due to the very minor amount and the transitory nature of these emissions, no significant impacts to GHGs are expected at the at-risk islands.

Impacts related to greenhouse gas emissions at incipient colony dissuasion sites (non-at-risk islands) identified as part of adaptive management and in the creation of habitat enhancement sites are anticipated to be similar to those at Goose and Crescent Islands and the at-risk islands. However, site-specific examination of potential impacts to water quality at these locations will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would not have any significant impacts to GHG emissions.

4.2.4.3 Alternative C

Alternative C is anticipated to have effects similar to those of Alternative B. Although periodic motor boats trips to Goose and Crescent Islands for hazing would be required, these trips would likely be coupled with other activities, such as habitat modification maintenance, so that hazing activities under this alternative do not represent a significant addition of boat-related emissions. Therefore, Alternative C would have no significant impacts to GHG emissions.

4.2.4.4 Alternative D

Alternative D is anticipated to have effects similar to those of Alternatives B and C. Alternative D would have no significant impacts to GHG emissions.

4.3 Cultural Resources

4.3.1 Alternative A

As the No Action Alternative, Alternative A would have no significant impacts to cultural resources.

4.3.2 Alternative B

Under Alternative B both Goose and Crescent Islands would be subjected to the type of ground disturbing activities with the potential to affect cultural resources. With regard to Goose Island, archaeological survey documented by archaeologists from the Corps (Hall 2013) confirmed that no archaeological sites were present. Consultation required under Section 106 of the NHPA also confirmed that no Indian Trust Assets or historic properties of cultural or religious significance to Indian tribes were present at Goose Island. Therefore, all of the proposed dissuasion activities at Goose Island would not have an impact on cultural resources.

Crescent Island in a non-historic, human-made island created with dredge spoils in 1985. All of the proposed CATE dissuasion activities here would not have impacts on cultural resources.

Alternative B calls for potential adaptive management actions at adjacent islands found throughout the interior Columbia Basin if levels of CATE predation increase in these areas. While only some adaptive management actions are specifically defined at this time and are contingent upon monitoring activities and coordination with the respective land managers, these actions do have the potential to cause impacts to cultural resources. As noted in Section 3.4.2.3 some of these potential adaptive management locations are known to have cultural resources. The plan discusses similar actions at some of these at-risk islands including the use of rope and flagging or the manipulation of substrates on the islands to dissuade birds. As noted in the NHPA Section 106 consultation report (Hall 2013), no specific actions associated with these at-risk sites, or any actions not specifically occurring at Goose and Crescent Islands, would occur without additional Section 106 consultation. Predation reduction activities including those at dissuasion sites identified for adaptive management (non-at-risk islands) or the creation of habitat enhancement sites would have to be evaluated on a site-by-site basis via supplemental/tiered NEPA analysis and a Section 106 determination of effect would be a contributing factor in decision-making for all future actions. It would be necessary to either avoid impacts or develop acceptable mitigation prior to the implementation of any actions that would result in significant impacts.

4.3.3 Alternative C

Alternative C is anticipated to have effects similar to Alternative B.

4.3.4 Alternative D

Alternative D is anticipated to have effects similar to Alternatives B and C.

4.4 Built Environment and Socioeconomics

4.4.1 Built Environment

4.4.1.1 Alternative A

As the No Action Alternative, Alternative A would have no effects to the built environment.

4.4.1.2 Alternative B

Since no built structures are at or immediately adjacent to Goose or Crescent islands or the at-risk islands, Alternative B would not have any significant impacts on the built environment. It is unknown at this time if socioeconomic impacts would be associated with activities at incipient colony dissuasion sites (non-at-risk islands) identified as part of adaptive management or habitat enhancement sites. Site-specific examination of potential impacts to the built environment and socioeconomics at these locations will be performed during supplemental/tiered NEPA analysis.

4.4.1.3 Alternative C

Since no built structures are at or immediately adjacent to Goose or Crescent islands or the at-risk islands, Alternative C would not have any significant impacts on the built environment.

4.4.1.4 Alternative D

Since no built structures are at or immediately adjacent to Goose or Crescent islands, or the at-risk islands, Alternative D would not have any significant impacts on the built environment.

4.4.2 Socioeconomic

4.4.2.1 Commercial and Recreational Fisheries

Alternative A

As the No Action Alternative, Alternative A would have no effects to commercial and recreational fisheries over those that currently exist. CATEs consume commercially and recreationally harvested fish species such as salmonids. In Alternative A, CATEs would likely continue to have the same impacts to commercially and recreationally available fish as currently exist.

Alternative B

With dissuasion of CATEs at Crescent and Goose Islands, the at-risk islands, sites identified during adaptive management (non-at-risk islands) and enhancement sites, benefits to salmonids could accrue as discussed in Section 4.1.3. The decrease in salmonid consumption by CATEs could result in beneficial effects to commercial and recreational fisheries if reduction of CATE predation aids overall salmon recovery in the Columbia River Basin.

Some minor effects to commercial and recreational fisheries related to non-ESA-listed salmonids and other fishes could occur. It is not anticipated that impacts to fisheries related to non-ESA-listed salmonids and other fish species would be significant under Alternative B. Within the context of a such a wide geographical area, the relatively small quantity of CATEs relocated from Goose and Crescent Islands and the at-risk islands would not be anticipated to have measurable effects to commercial and recreational fish species. Some CATEs would likely disperse to various locations outside of the inland Columbia River Basin along the western portion of North America or to an enhancement site (s) which would be selected based on availability of an adequate, sustainable food supply.

Impacts to commercial and recreational fisheries from birds dissuaded from incipient colony sites identified during adaptive management (non-at-risk islands) are anticipated to be very similar to those relocated from Goose and Crescent Islands and the at-risk islands. At habitat enhancement sites, CATEs could have increased predation upon non-ESA-listed salmonids and other fish related to commercial and recreational fisheries. However, site-specific examination of potential impacts at dissuasion sites identified as part of adaptive management or enhancement sites to commercial and recreational fisheries will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would have no significant impacts to commercial and recreational fisheries related to non-ESA-listed salmonids and other fish species.

Alternative C

The effects of this alternative to commercial and recreational fisheries are anticipated to be similar to those of Alternative B.

Alternative D

The effects of this alternative to commercial and recreational fisheries are anticipated to be similar to those of Alternatives B and C.

4.4.2.2 Tribal Fisheries

Alternative A

Effects are anticipated to be similar to those described above in Commercial and Recreational Fisheries. As the No Action Alternative, Alternative A would have no effects to tribal fisheries over those that currently exist. CATEs consume tribally harvested fish species such as salmonids. In Alternative A, CATEs would likely continue to have the same impacts to tribally available fish as currently exist.

Alternative B

With dissuasion of CATEs at Crescent and Goose Islands, the at-risk islands, incipient colony dissuasion sites identified as part of adaptive management (non-at-risk islands) and habitat enhancement sites, benefits to salmonids could accrue as discussed in Section 4.1.3. The decrease in salmonid consumption by CATEs could result in beneficial effects to tribal fisheries if reduction of CATE predation aids overall salmon recovery in the Columbia River Basin.

Some minor effects to tribal fisheries related to non-ESA-listed salmonids and other fishes could occur. It is not anticipated that impacts to fisheries related to non-ESA-listed salmonids and other fish species would be significant under Alternative B Within the context of a such a wide geographical area, the relatively small quantity of CATEs relocated from Goose and Crescent Islands would not be anticipated to have measurable effects to the availability of these fish species for tribal fisheries. Some CATEs would likely disperse to various locations outside of the inland Columbia River Basin along the western portion of North America or to an enhancement site (s) which would be selected based on availability of an adequate, sustainable food supply.

Impacts to tribal fisheries from birds dissuaded from incipient colony sites identified during adaptive management (non-at-risk islands) are anticipated to be very similar to those relocated from Goose and Crescent Islands and the at-risk islands. At habitat enhancement sites, CATEs could have increased predation upon non-ESA-listed salmonids and other fish related to tribal fisheries. However, site-specific examination of potential impacts at dissuasion sites identified as part of adaptive management or enhancement sites to tribal fisheries will be performed during supplemental/tiered NEPA analysis.

Based on the above discussion, Alternative B would have no significant impacts to tribal fisheries related to non-ESA-listed salmonids and other fish species.

Alternative C

The effects of this alternative to tribal fisheries are anticipated to be similar to those of Alternative B.

Alternative D

The effects of this alternative to tribal fisheries are anticipated to be similar to those of Alternatives B and C.

4.4.2.3 Incipient Colonies

Alternative A

Under the No Action Alternative, it is possible that incipient CATE colonies would develop throughout the inland Columbia River Basin. Although the distribution of CATEs may change, the overall inland population would likely not change. Because CATEs are currently not intensively managed, it is assumed that this lack of intensive CATE management would continue, even with the development of new incipient colonies. Therefore, Alternative A would have no socioeconomic effects over those that currently exist.

Alternative B

If incipient colonies develop in areas where the Action Agencies have no authority to act, and it is determined that these colonies are impacting salmonids or other resources, this could potentially result in a socioeconomic impact to other entities (states, PUDs, British Columbia, etc.). If dissuasion actions (e.g., visual deterrents) are necessary and implemented by these other entities while incipient colonies are still small (40 to 100 pairs), the economic impacts are also anticipated to be small. As a result, Alternative B would have no significant socioeconomic effects.

Alternative C

The effects of this alternative are anticipated to be similar to those of Alternative B.

Alternative D

The effects of this alternative are anticipated to be similar to those of Alternatives B and C.

Table 4-1. Summary of Effects

ANTICIPATED ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES[a]

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	**Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2**	**Alternative B, Habitat Modification Combined with CATE Hazing**	**Alternative C Habitat Modification and Hazing Combined with Egg Removal**
BIOLOGICAL ENVIRONMENT				
Federally Endangered and Threatened Fish	Impacts to threatened and endangered salmonids by CATE predation in the inland Columbia River Basin are anticipated to continue in similar trends to those currently present.	Alternative B would have positive impacts to threatened and endangered salmonids in the Columbia River Basin. Achieving 100% dissuasion at both sites would potentially save up to approximately 530,000 juvenile salmonids, both wild and hatchery, annually.	Alternative C is anticipated to have the same direct effects to Columbia River Basin salmonids as Alternative B but with an improved likelihood of success. Alternative C would have positive impacts to threatened and endangered salmonids in the Columbia River Basin.	Alternative D is anticipated to have the same direct effects to Columbia River Basin salmonids as Alternative B and C but with the highest potential for success. Alternative D would have positive impacts to threatened and endangered salmonids in the Columbia River Basin.
Other Fishes	Impacts to non-ESA-listed salmonids and other fish by CATE predation in the inland Columbia River Basin are anticipated to continue in similar trends to those currently present.	Effects to non-ESA-listed salmonids and other fish would likely increase with relocation of CATEs from Goose and Crescent Islands. It is anticipated that CATE fish consumption would shift to that of non-ESA-listed salmonids and other fish that are locally available at the dispersed sites over the wide geographical area that the CATEs would disperse over for nesting. Alternative B would not have significant impacts to non-ESA-listed salmonids and other fish species.	Effects to non-ESA-listed salmonids and other fish for Alternative C are anticipated to be similar to those of Alternative B. Alternative C would have no significant impacts to non-ESA-listed salmonids and other fish species.	Effects to non-ESA-listed salmonids and other fish for Alternative D are anticipated to be similar to those of Alternatives B and C. Alternative D would have no significant impacts to non-ESA-listed salmonids and other fish species.
Caspian Terns	No significant impacts to CATE.	This alternative has the potential to dissuade over 800 breeding pairs of CATEs from Goose and Crescent Islands collectively. Dissuaded CATE are anticipated to find new nesting sites because they are long-lived and nomadic and have a	Impacts are similar to Alternative B. Alternative C would not have significant impacts to CATE.	Alternative D includes the yearly removal of up to 200 CATE eggs at Goose and Crescent Islands and the at-risk islands combined. Alternative D impacts are similar to Alternatives B and C. Alternative D represents the most effective potential for

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2	Alternative B, Habitat Modification Combined with CATE Hazing	Alternative C Habitat Modification and Hazing Combined with Egg Removal
		propensity to travel long distances to find nesting areas. The dissuasion of CATEs from Goose and Crescent Islands is not expected to have a significant impact on the western metapopulation of CATEs because they represent a small percentage of this population. Alternative B would not have significant impacts to CATE.		dissuading CATEs from Goose and Crescent Islands. Under Alternative D, no significant impacts to CATEs are expected.
Other Birds	No significant impacts to non-CATE bird species.	Gull nesting sites may be reduced due to CATE habitat modification with the potential of displacing 21,600 gulls (total adults, not pairs) at the two islands collectively. However, this is not anticipated to impact regional population levels because additional habitat is available throughout the Columbia River Basin and gulls are more flexible in their habitat requirements than are CATEs. Cutting live Russian olive or other nonnative trees on Crescent Island to create woody debris for visual barriers may have some small impact on nesting locations for Black-crowned Night Herons and Great Blue Heron, However, prior to any field activities, survey of existing trees would be performed to ascertain which trees may be supporting arboreal nesting. Any Trees supporting nest avian species would not be cut or utilized for placement of visual barriers.	Alternative C would have the same potential impacts as Alternative B with regard to habitat modification for non-CATE bird species. Because Alternative C also includes hazing activities, there is the potential that these hazing activities would disturb other birds, especially gulls, at Goose and Crescent Islands. Due to the co-location of CATE and gulls on these islands, it is anticipated that all gulls would have to be dissuaded from both islands to successfully accomplish CATE dissuasion without incurring any gull take. Hazing would be conducted on foot, and hazers would pass through areas with CATEs to scare them away while dissuading gulls and potentially other waterbird species. Alternative C would not have significant impacts to non-CATE bird species.	Alternative D has the same potential impacts as Alternatives B and C. As with Alternative C, CATE hazers would also haze gulls. CATE egg removal activities would not disturb non-CATE bird species any more than hazing by itself. No non-CATE bird eggs would be disturbed or taken. Alternative D would not have significant impacts to non-CATE bird species.

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2	Alternative B, Habitat Modification Combined with CATE Hazing	Alternative C Habitat Modification and Hazing Combined with Egg Removal
		Alternative B would not have significant impacts to non-CATE bird species.		
Mammals	No significant impacts to mammals.	The passive dissuasion activities would have no or negligible impacts to mammals on Goose and Crescent Islands or the at-risk islands. Although CATE would be dissuaded from these areas (reducing their availability as prey), gulls would be still be at these sites in abundance to provide an adequate prey base. Some active management at the potential habitat enhancement sites may include increased visits by field staff to implement predator control. None of the controls would have population impacts to any of the affected species. Alternative B would not have significant impacts to mammals.	Effects to mammals under Alternative C are similar to those under Alternative B. The presence of hazers could potentially cause periodic disturbance to any mammals present at these locations but impacts are expected to be negligible. Alternative C would not have significant impacts to mammals.	Effects to mammals under Alternative D are expected to be very similar to those under Alternative C. Alternative D would not have significant impacts to mammals
Federally Endangered and Threatened Wildlife and Plants	No federally endangered and threatened wildlife or plant species are known to occur at the project sites so no effect to these species would occur.	No federally endangered and threatened wildlife or plant species are known to occur at Goose or Crescent islands or anticipated to occur at the at-risk islands, so no effects to these species are expected	No federally endangered and threatened wildlife or plant species are known to occur at Goose or Crescent islands or anticipated to occur at the at-risk islands, so no effects to these species are expected	No federally endangered and threatened wildlife or plant species are known to occur at Goose or Crescent islands or anticipated to occur at the at-risk islands, so no effects to these species are expected
Vegetation	No significant impacts to vegetation.	Roping and flagging would have negligible impacts on vegetation (e.g., sagebrush) on site. The potential emplacement of cobble may have some impact on these plant communities. However, the cobble material would be placed in a manner to avoid these plant communities so that	Alternative C is anticipated to have effects similar to Alternative B. Alternative C would not have significant impacts to vegetation.	Alternative D is anticipated to have effects similar to Alternatives B and C. Alternative D would not have significant impacts to vegetation.

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	**Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2**	**Alternative B, Habitat Modification Combined with CATE Hazing**	**Alternative C Habitat Modification and Hazing Combined with Egg Removal**
		minimal impacts to vegetation at Goose Island would occur. Cobble material from an approved source may be used to modify portions of Crescent Island. The potential emplacement of cobble may have some impact on plant communities. However, the cobble material would be placed primarily in areas devoid of vegetation In locations with vegetation present, cobble would be placed in a manner to avoid these plant communities so that any impacts to vegetation would be minimal. Planting native willow species would be a positive impact. Native plants would replace invasive species which is a positive impact. Alternative B would not have significant impacts to vegetation.		
PHYSICAL ENVIRONMENT				
Geology and Soils	No significant impacts to geology and soils.	Earth moving and soil disturbance would occur at Goose and Crescent Islands. However, this would be temporary in nature and BMPs would be used to reduce any dust or potential erosion that may be generated. Alternative B would not have any significant impacts to geology or soils.	Alternative C is anticipated to have effects similar to Alternative B. Alternative C would not have any significant impacts to geology or soils.	Alternative D is anticipated to have effects similar to Alternatives B and C. Alternative D would not have any significant impacts to geology or soils.
Floodplain / Water Elevation	No significant impacts to floodplain or water elevation.	Any habitat modifications being performed at these islands would not have impacts on floodplains or on water	Alternative C is anticipated to have effects similar to Alternative B. Alternative C would not have any significant	Alternative D is anticipated to have effects similar to Alternatives B and C. Alternative D would not have any significant

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2	Alternative B, Habitat Modification Combined with CATE Hazing	Alternative C Habitat Modification and Hazing Combined with Egg Removal
		elevations as all work is being performed above the ordinary high water mark and occurring on the surface of the islands.	impacts to floodplains or water elevations.	impacts to floodplains or water elevations.
Water Quality	No significant impacts to water quality.	Due to the arid climate surrounding both Goose and Crescent Islands and the at-risk islands, as well as the nature and location of all potential actions to be performed under Phases 1 and 2 (i.e., no in-water work, all work above ordinary high water), impacts to water quality are not anticipated. BMPs would address potential for any potential water quality impacts. Alternative B would not have any significant impacts to water quality.	Alternative C is anticipated to have effects similar to Alternative B. Alternative C would not have any significant impacts to water quality.	Alternative D is anticipated to have effects similar to Alternatives B and C. Alternative D would not have any significant impacts to water quality.
Greenhouse Gas Emissions	No significant impacts to greenhouse gas emissions.	Minor amounts of emissions would be released under this alternative due to motor boat trips to the islands for habitat modification, helicopter use for substrate modification, and limited construction equipment used to construct berms or move earth. Due to the minor amount and the transitory nature of these emissions, Alternative B would not have any significant impacts to GHGs.	Alternative C is anticipated to have effects similar to Alternative B. Periodic trips to the islands would be necessary for hazing, but these trips would only take place during the nesting period. Alternative C would not have significant impacts to GHG emissions.	Alternative D is anticipated to have effects similar to Alternatives B and C. Alternative D would not have significant impacts to GHG emissions.
CULTURAL RESOURCES				
Cultural Resources	No significant impacts to cultural resources.	Under Alternative B both Goose and Crescent Islands would be subjected to the type of ground disturbing activities with the potential to affect cultural	Alternative C is anticipated to have effects similar to Alternative B. Alternative C would not have significant impacts to cultural or historic	Alternative D is anticipated to have effects similar to Alternatives B and C. Alternative D would not have significant impacts to cultural or historic

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2	Alternative B, Habitat Modification Combined with CATE Hazing	Alternative C Habitat Modification and Hazing Combined with Egg Removal
		resources. With regard to Goose Island, archaeological survey documented by Corps archaeologists confirmed that no archaeological sites were present. Consultation confirmed that no Indian Trust Sites or historic properties of cultural or religious significance to Indian tribes were present at Goose Island. All of the proposed dissuasion activities at Goose Island would not have an impact on cultural resources. Crescent Island is a non-historic, human-made island created with dredge spoils in 1985. All of the proposed CATE dissuasion activities here would not have impacts on cultural resources. No specific actions associated with at-risk islands, or any actions not specifically occurring at Goose and Crescent Islands would occur without additional Section 106 consultation. Alternative B would not have significant impacts to cultural or historic resources.	resources.	resources.
BUILT ENVIRONMENT AND SOCIOECONOMICS				
Built Environment	No significant impacts to the built environment.	No built structures are at or immediately adjacent to the dissuasion or at-risk islands. Alternative B would not have any significant impacts on the built environment.	No built structures are at or immediately adjacent to the dissuasion or at-risk islands. Alternative C would not have any significant impacts on the built environment.	No built structures are at or immediately adjacent to the dissuasion or at-risk islands. Alternative D would not have any significant impacts on the built environment.
Commercial and Recreational	CATEs would likely continue to have the same impacts to	100% dissuasion of CATE at Crescent and Goose Islands	The effects of this alternative to commercial and recreational	The effects of this alternative to commercial and recreational

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2	Alternative B, Habitat Modification Combined with CATE Hazing	Alternative C Habitat Modification and Hazing Combined with Egg Removal
Fisheries	commercially and recreationally available fish as currently exist.	would increase the number of salmonids in the Columbia River Basin. The decrease in salmonid consumption by CATE could result in beneficial effects to commercial and recreational fisheries if reduction of CATE predation aids overall salmon recovery in the Columbia River Basin. Some minor effects to commercial and recreational fisheries related to non-ESA-listed salmonids and other fishes could occur. However, within the context of a such a wide geographical area, the relatively small quantity of CATEs relocated from Goose and Crescent Islands would not be anticipated to have measurable effects to the availability of these fish species for commercial and recreational fisheries. Alternative B would have no significant impacts to commercial and recreational fisheries related to non-ESA-listed salmonids and other fish species.	fisheries are anticipated to be similar to those of Alternative B.	fisheries are anticipated to be similar to those of Alternatives B and C.
Tribal Fisheries	CATEs would likely continue to have the same impacts to Tribally available fish as currently exist.	100% dissuasion of CATE at Crescent and Goose Islands would increase the number of salmonids in the Columbia River Basin. The decrease in salmonid consumption by CATE could result in beneficial effects to Tribal fisheries if reduction of CATE predation aids overall salmon recovery in the	The effects of this alternative to Tribal fisheries are anticipated to be similar to those of Alternative B.	The effects of this alternative to Tribal fisheries are anticipated to be similar to those of Alternatives B and C.

	Alternative A	Alternative B	Alternative C	Alternative D
	No Action	Habitat Modifications to Alter CATE Nesting Areas, Phase 1 and Phase 2	Alternative B, Habitat Modification Combined with CATE Hazing	Alternative C Habitat Modification and Hazing Combined with Egg Removal
		Columbia River Basin. Some minor effects to commercial and recreational fisheries related to non-ESA-listed salmonids and other fishes could occur. However, within the context of a such a wide geographical area, the relatively small quantity of CATEs relocated from Goose and Crescent Islands would not be anticipated to have measurable effects to the availability of these fish species for commercial and recreational fisheries. Alternative B would have no significant impacts to commercial and recreational fisheries related to non-ESA-listed salmonids and other fish species.		

a This only lists potential impacts related to activities at Goose and Crescent Islands and the at-risk islands and does not cover potential impacts that will be addressed under supplemental/tiered NEPA analysis for dissuasion sites identified during adaptive management or for enhancement sites.

SECTION 5.0 CUMULATIVE IMPACT

A cumulative impact is the impact on the environment that results from the incremental impacts or effects of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). Input from resource agencies, Native American tribes, the IAPWG, and the public helped define the scope and scale of the cumulative impact analysis.

Actions that could potentially cause a cumulative impact when taken into consideration with the actions proposed under the alternatives evaluated in this EA are those past, present, and reasonably foreseeable future activities that may have an effect, either adverse or beneficial, on the human environment. These include, but are not limited to:

- Piscivorous bird dissuasion actions currently ongoing in the Columbia River estuary
- Avian predation activities at the FCRPS dams in the Columbia River Basin
- Habitat enhancement implemented for the Columbia River (Estuary) Tern Plan
- Operation of the FCRPS
- Other actions associated with implementation of the BiOp
- Other anthropogenic uses of the river including subsistence, commerce, transportation, and recreation
- Other programs aimed at conservation and/or recovery of federally listed fish or MBTA birds

The evaluation of cumulative effects was only conducted on the preferred alternative. This decision was based on the fact that the preferred alternative includes a combination of the actions considered for the other alternatives in this EA and therefore represents the maximum extent possible of the overall cumulative effects.

In addition to the FCRPS, there are many other federal and regional programs and plans to protect and restore salmonids in the Columbia River system. The activities under the proposed action would potentially have cumulative effects on resources also addressed by these plans via management actions aimed at CATEs and ESA-listed salmonids, as well other piscivorous birds such as DCCOs and gulls.

The cumulative effects analysis focuses on those resources that may be affected by the proposed action/alternatives and that lend themselves to truly meaningful analysis. Because the actions associated with IAPMP focus on reducing CATE predation of ESA-

listed fish, this cumulative impacts analysis is likewise focused on potential effects to birds and fish.

5.1 Birds (CATEs and Other Birds)

5.1.1 Past, Present and Reasonably Foreseeable Future Actions

5.1.1.1 Corps Programs and Plans

The Corps maintains an annual Avian Predation Deterrent (APD) program at eight of its dams on the Lower Columbia and Lower Snake Rivers during the juvenile salmonid outmigration season as approved in the September 2005 FONSI for Avian Predation Deterrent Program, Lower Columbia and Lower Snake Rivers (Corps 2005). These dams include Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams on the Lower Snake River and McNary, Bonneville, The Dalles, and John Day on the Lower Columbia River.

The goal of the APD program is to implement the most practical and effective solutions for reducing piscivorous bird usage in areas near the dams where juvenile salmonids are susceptible to predation. The program entails implementing and maintaining an effective means of discouraging piscivorous bird predation at all forebay, tailrace, and bypass outfall locations at the Corps's dams on the Lower Columbia and Lower Snake Rivers. Currently, the U.S. Department of Agriculture Animal and Plant Health Inspection Service assists the Corps in implementation of the APD program primarily by conducting the hazing component of the Corps's program. While the APD is currently comprised solely of non-lethal measures, the Corps is considering implementing limited lethal take of gulls and DCCOs at McNary Dam on the Columbia River, and at Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams on the Lower Snake River in Washington. This action could annually include take of up to 650 RBGUs, 1,200 CAGUs, and 150 DCCOs, if implemented.

Dam operations are generally focused on gull and DCCO species and rely primarily upon passive dissuasion measures (such as wires and spikes to discourage roosting and/or nesting) and active hazing measures (such as propane cannons and pyrotechnics). These activities affect very few CATEs and few, if any, CATEs are lethally taken as part of dam operations within the Columbia River Basin. Temporary disturbance of CATEs that attempt to feed at dams may occur as a result of these actions. As a result, the past, present, and foreseeable future actions, which are part of the APD program, will not have a measurable effect on CATEs.

The Corps is currently conducting CATE management activities in the Lower Columbia River estuary including dissuasion at East Sand Island which is included under the Estuary Caspian Tern Management Plan. One objective of the plan is to reduce the

number of East Sand Island CATE nesting pairs to between 3,125 to 4,375 pairs by limiting habitat availability (USFWS 2005a). Additionally, CATE hazing and limited CATE egg take occur annually on Rice Island, Pillar Rock Island, and Miller Sands Spit in the Columbia River estuary upstream of East Sand Island to preclude establishment of CATE colonies on these islands. The impacts associated with these efforts were disclosed as part of an earlier environmental impact statement (EIS) and record of decision (ROD) which committed to implementation of CATE habitat enhancement as part of the plan. Implementation monitoring of this plan has been conducted annually to inform continued implementation of management actions. Subsequent environmental review, including NEPA analysis, has been conducted prior to implementation of actions associated with East Sand Island that were not originally anticipated within the EIS and ROD including development of alternate habitat enhancement sites and implementation of East Sand Island dissuasion measures that were not proposed as part of the EIS.

Per the Estuary Caspian Tern Management Plan, reduction of habitat in the estuary, at East Sand Island, was contingent upon creation of the new nesting habitat outside the basin, at a 2:1 ratio. During implementation of the Caspian Tern Plan, the response from CATEs was somewhat unexpected, particularly with respect to how many nesting pairs occupy available habitat. In 2012, nesting density at the East Sand Island tern colony increased to 1.06 nests per square meter, which is the highest nesting density ever observed at this colony (Roby et al. 2013). In 2012 approximately 6,400 nesting pairs occupied the space that was intended for 3,125 to 4,375 pairs (Roby et al. 2013). As part of adaptive management efforts, future NEPA analyses may consider further reductions of available CATE nesting habitat by approximately 0.5 acre on East Sand Island without constructing or enhancing additional nesting sites prior to reduction in habitat. This further reduction is being considered as a means to reduce the amount of predation on ESA-listed juvenile salmonids while addressing unexpected increased nesting density of CATEs since management efforts began.

Currently, 8.3 acres of habitat have been created on nine islands in Oregon and California with approximately 6.8 acres available in 2012 (Roby et al. 2013). To attract CATEs to newly created islands, a combination of social attraction methods (decoys and playback) as well as limited predator (gull) control have been used (Roby et al. 2013). Of the nine islands that were created as part of the Estuary Caspian Tern Management Plan, six had nesting CATEs in 2012, with the majority of the CATEs nesting on Malheur Lake, Sheepy Lake, Tule Lake, and Crump Lake and very few CATE pairs on East Link and Gold Dike (Roby et al. 2012). Low CATE nesting success on some newly created islands was due in part to predation (both mammalian and avian) and possibly low prey availability at two sites (Crump Lake and Summer Lake Wildlife Area) (Roby et al. 2013). The Portland District is currently using or planning to use a combination of social attraction and predator control as needed at some of these

newly created islands to make them more attractive to nesting CATEs (Carlsen 2014 personal communication).

In addition to CATE hazing activities in the Columbia River estuary, hazing occurred at the Port of Bellingham in 2011 and 2012 (Roby et al. 2013). The Bellingham CATE colony was first noted in 2009 when 200 adult CATEs, some with young, were counted in early July. In 2010 this colony contained an estimated 1,400 to 2,000 CATE pairs and had limited nest predation, fledging an estimated 900 to 1,400 young CATEs (Roby et al. 2013). Based on band re-sightings, some of the Bellingham CATEs were determined to be from the inland Columbia River Basin (Roby et al. 2013).

5.1.1.2 Fish and Wildlife Service Plans, Policies, and Programs

Management and conservation measures for CATEs are described in the Status Assessment and Conservation Recommendations for the CATE in North America (Shuford and Craig 2002) and are intended for use by USFWS and other partners interested in CATE conservation. CATE conservation needs are also included in the Regional Seabird Conservation Plan (USFWS 2005b). The purpose of this plan is to identify USFWS goals and priorities for seabird conservation in the Pacific Region, including specific objectives and strategies to achieve these goals. The plan serves to direct and coordinate USFWS activities towards seabird conservation in the future.

Crescent Island is located within the McNary National Wildlife Refuge. USFWS's Comprehensive Conservation Plan (CCP) for the McNary National Wildlife Refuge provides management guidance for the refuge for the years 2007 to 2022. The CCP provides guidance for improving shrub-steppe, riparian, wetland, and cliff-talus habitats for the long-term conservation of native plants and animals and migratory birds. Objective 6a of the CCP is to maintain water bird populations, including those on Crescent Island. Strategies to achieve this goal include managing island substrate and vegetation to ensure that a diversity of nesting habitats for colonial waterbirds is available. It also includes the following:

> "In response to Endangered Species Act requirements for federally listed salmon stocks, consider a range of options to limit piscivorous waterbird depredation, if scientifically sound data demonstrates a critical need to limit depredation due to significant impacts on salmon survival. If controls are deemed appropriate, a written step-down plan and NEPA documentation shall be developed with evaluation of the effects to fish and waterbird populations. Actions shall be planned and implemented using a multi-agency approach and multiple funding sources." (CCP pg. 2-21)

Thus, while the CCP aims to protect CATE and other waterbird populations at Crescent Island, it also recognizes the need for CATE management for salmon protection.

The proposed action is unlikely to cause a significant adverse impact to the western North American CATE metapopulation. When viewed in the context of these USFWS plans that have the potential to affect this species, the proposed action is not anticipated to result in increased cumulative adverse effects to CATEs. The proposed action is anticipated to have beneficial cumulative impacts to ESA-listed salmonids in the Columbia River Basin when considered within the context of these USFWS plans.

5.1.1.3 Northwest Power and Conservation Council Subbasin Plans

The Northwest Power Act of 1980 directs the Northwest Power and Conservation Council (NPCC) to develop a program for the protection, mitigation, and enhancement of fish and wildlife of the Columbia River Basin and make annual funding recommendations to BPA for projects to implement the program. Subbasin plans are being developed and contain strategies that will drive the implementation of NPCC's Columbia River Basin Fish and Wildlife Program at the subbasin level.

The Draft Lower Mid-Columbia Mainstem Subbasin Plan (NPCC 2004a) describes the presence of the following avian predators to salmonids: CATEs, gulls, DCCOs, and pelicans. Strategies to reduce and eliminate the increased presence of avian predators or improve and maintain the abundance of salmonid populations include improving flow, covering available habitat, and increasing habitat diversity to reduce potential for predation.

The Upper Middle Mainstem Subbasin Plan (NPCC 2004b) describes the immigration of CATEs, DCCOs, and gulls in the upper middle mainstem and that their presence may be a limiting factor on juvenile salmonid survival. This plan cites the WDFW mission, statewide strategies, a wild salmonid policy, and management plans for steelhead and salmon as frameworks for protection of anadromous salmonids, but the plan does not specify protection of salmonids from avian predation.

The proposed action is unlikely to cause a significant adverse impact to the western North American CATE metapopulation or to other piscivorous birds such as DCCO and gulls. When viewed in the context of NPCC plans that have the potential to affect these species, the proposed action is not anticipated to result in increased cumulative adverse effects to CATEs or other piscivorous bird species. The proposed action is anticipated to have beneficial cumulative impacts to ESA-listed salmonids in the Columbia River Basin when considered within the context of these NPCC plans.

5.1.1.4 State of Washington

Through a 25-year agreement with Reclamation, WDFW has management responsibilities for wildlife resources on Reclamation lands in the Columbia Basin that include parts of Potholes Reservoir and Banks Lake. In addition, WDFW owns Cabin

Island and has specific fishing regulations to reduce human disturbance around the privately owned Harper Island.

The WDFW Columbia Basin Wildlife Area Management Plan prepared in 2006 includes descriptions of the management units, the management priorities and challenges, and goals designed to support the priorities. There is no specific information regarding Goose Island or CATEs in the management plan; however, the management plan recognizes that a few of the management units provide nesting habitat for colonial nesting birds, including CATEs. The management plan notes that the increasing DCCO population has caused concern regarding recreational fish availability.

5.1.2 Cumulative Effects

5.1.2.1 Caspian Terns

CATEs are not currently intensively managed on Goose and Crescent Islands, though they are highly managed elsewhere in the western metapopulation (e.g., East Sand Island). Their strict habitat requirements for nesting (open areas with bare sand and minimal predator access) make them less adaptable to habitat loss than are many other species of birds. When dissuasion activities are implemented on Goose and Crescent Islands, the CATE regional population may experience temporary declines while displaced CATEs search for new nesting sites.

Approximately 84 percent of the western North American metapopulation occurs on the coast and 16 percent away from the coast (Shuford and Craig 2002). Other colonies are scattered throughout the coastal states and provinces ranging from Alaska to Mexico. As of 2011, the current estimate of the CATE western metapopulation is approximately 11,600 breeding pairs with over half of those birds occurring on East Sand Island in coastal Oregon (USFWS 2013a personal communication) (Table 3-3).

Other ongoing actions that may affect the regional CATE population include dam operations to control or reduce avian predation, the ongoing activities at East Sand Island, and the creation of other habitat enhancement sites.

While an overall decline in the CATE nesting population has occurred since 2008, it is unclear if this is indicative of a long-term trend in the population or whether this disturbance is temporary in nature due to dissuaded CATEs continuing to seek new nesting sites.

The numbers of CATE breeding pairs on Goose Island (Potholes Reservoir) and Crescent Island in 2012 were 459 and 422, respectively (Table 3-6) for a total of 881 breeding pairs (USFWS 2013a personal communication). The two-island total represents approximately 7.5 percent of the total number of breeding pairs in the

western metapopulation and 0.4 percent to 0.7 percent of the global CATE population. Consequently, the proposed dissuasion actions on Goose and Crescent Islands would affect a relatively small proportion of the population of the western North America CATE metapopulation and overall worldwide population.

As stated in Section 4 of this document, the proposed action is unlikely to cause a significant adverse impact to the western North American CATE metapopulation or the global CATE population. While a short-term decrease in productivity could be expected due to the temporary loss of nesting habitat on Goose Island and Crescent Island, the proposed action is not anticipated to result in increased long-term adverse effects to CATEs due to the phased approach and use of adaptive management to ensure flexibility in both dissuasion measures and creation of additional habitat. As a result, when considered within the context of the other past, present, or reasonably foreseeable actions in the inland Columbia River Basin and the Lower Columbia River estuary under the FCRPS and the other programs described in Section 5.1.1, the proposed action and alternatives are not anticipated to have a significant cumulative negative impact to CATEs.

5.1.2.2 Other Birds

The key activities that should be considered in terms of cumulative impacts to other bird species are the other piscivorous bird dissuasion actions currently ongoing in the Columbia River estuary directed at CATEs and DCCOs and the gull management activities at dams in the Columbia River Basin under the ADP (as discussed above). The Corps is currently undertaking a NEPA analysis to consider limited lethal take of gull species as part of the ADP. These activities may have some local impacts to species such as gulls but would not likely impact the overall populations. The proposed management activities at the Goose and Crescent Islands, as well as the potential actions at habitat restoration sites, would not have an effect on the overall cumulative impacts.

The Corps's Portland District obtained a depredation permit from USFWS to allow for the take of CAGU, RBGU, great horned owls and black-crowned night herons to protect incipient CATE colonies related to the CATE management activities in the Lower Columbia River estuary. It is likely that any enhancement site(s) developed during Phase 2 of the preferred alternative would require a similar depredation permit. Analysis to support the need for a depredation permit, however, would be part of the supplemental/tiered NEPA evaluation that would be performed for the enhancement sites, and the depredation permitting process would be initiated as necessary at that time. Any control actions directed at avian predator species would only affect a few individuals and would have no impact on overall populations of the species. As a result, when considered within the context of the other past, present, or reasonably

foreseeable actions in the inland Columbia River Basin and the Lower Columbia River estuary under the FCRPS and the other programs described in Section 5.1.1, the proposed action and alternatives are not anticipated to have a significant cumulative negative impact to these species.

The proposed action is unlikely to cause a significant adverse impact to the western North American CATE metapopulation or to other piscivorous birds such as DCCO and gulls. When viewed in the context of the other past, present, or reasonably foreseeable actions in the inland Columbia River Basin and the Lower Columbia River estuary under the FCRPS and the other programs described in Section 5.1.1, the proposed action and alternatives are not anticipated to have a significant cumulative negative impact to other piscivorous bird species.

5.2 Fish (Threatened and Endangered Species and Other Fish)

5.2.1 Past, Present and Reasonably Foreseeable Future Actions

5.2.1.1 Corps Other FCRPS Programs

Actions to protect and improve survival of listed salmonids within the FCRPS have been ongoing since the 1950s. However, more recent actions (since 2008) are prescribed in the BiOp RPAs, with a premise on adaptive management. The Action Agencies use the best available scientific information to make decisions on the implementation of these actions, achieve established performance standards, and make adjustments so that actions meet the BiOp goals. As previously mentioned, the BiOp RPAs follow an All-H Approach that includes improvements in the areas of the hydropower system, tributary and estuary habitat, hatchery reform, harvest, and predator management.

Hydropower actions benefit all listed species. Hydrosystem strategies to provide juvenile and adult survival improvements include water management, dam passage improvements (e.g., bypass, turbine, surface spill for juveniles and fish ladders for adults), spill operations, and juvenile fish transportation. Specific performance standards (such as 96 percent and 93 percent dam survival for spring and summer migrating juvenile fish, respectively) and metrics guide the priorities for action.

Habitat actions benefit all listed species. Habitat actions under the BiOp are targeted at biological needs, addressing priority populations and limiting factors. The habitat strategies involve protecting and improving tributary and estuary habitat, respectively, to increase fish survival. The Action Agencies are currently and will continue to improve habitat quality, improve in-stream flows on tributaries, remove stream fish passage barriers, and monitor and manage watersheds.

Predator management actions are designed to improve the survival of juvenile and adult fish as they pass through the hydrosystem. Implementation strategies focus on three areas: piscine predation control measures to increase survival of juvenile fish; avian predation control measures to increase survival of juvenile fish; *and marine mammal control.*

Hatchery actions involve funding FCRPS mitigation hatchery programs in a way that contributes to reversing the decline of downward-trending species. There are two strategies to meet this overall objective: (1) ensuring that hatchery programs funded by the Action Agencies as mitigation for the FCRPS are not impeding recovery, and (2) preserving and rebuilding genetic resources through safety-net and conservation actions to reduce short-term extinction risk and promote recovery.

Harvest actions are not a primary responsibility of the Action Agencies, but the agencies are encouraging research into improved harvest techniques that can increase the survival of naturally spawning fish.

Research, monitoring, and evaluation (RM&E) provide information to support planning and adaptive management and demonstrate accountability related to the implementation of hydropower and offsite actions for all species. RM&E encompasses project implementation, compliance monitoring, fish status monitoring, action effectiveness research, and critical uncertainties research.

Regional efforts to protect and recover threatened and endangered fish in the Columbia River Basin are comprehensive and reflect the complex life cycles of the fish themselves. Progress has been made each year by building step by step on each preceding year's successful effort. The Action Agencies work with regional interests to implement actions to strengthen Columbia River Basin salmon and steelhead stocks. The Action Agencies work closely with the region through the federal-state-tribal Regional Implementation Oversight Group, the Columbia Basin Fish Accords, and the Northwest Power and Conservation Council's Fish and Wildlife Program.

5.2.1.2 State of Oregon

The Oregon Plan is designed to restore the healthy function of Oregon's natural aquatic systems. It represents commitments on behalf of governments, interest groups, and private citizens from all sectors of the state. While the plan originated as an effort to address declining populations of coho salmon, in the 2 years since its initiation, the plan has engaged new participants, addressed new fish species, attained regional significance, and promoted unique approaches to natural resource issues on a state-wide basis (OPSW 2013).

The proposed action is unlikely to cause a significant adverse impact to the western North American CATE metapopulation or to other piscivorous birds such as DCCO and gulls. When viewed in the context of the Oregon Plan, the proposed action is not anticipated to result in increased cumulative adverse effects to CATEs or other piscivorous bird species. The proposed action is anticipated to have beneficial cumulative impacts to ESA-listed salmonids in the Columbia River Basin when considered within the context of the Oregon Plan.

5.2.1.3 Tribal Governments

The Wy-Kan-Ush-Mi Wa-Kish-Wit, or Spirit of the Salmon, plan is a joint restoration plan for anadromous fish in the Columbia River Basin prepared by the Nez Perce Tribe, Confederated Tribes of the Umatilla Reservation, Confederated Tribes of the Warm Springs Reservation, and the Confederated Tribes and Bands of the Yakama Indian Nation. It provides a framework for restoring anadromous fish stocks, specifically salmonids, Pacific lamprey (eels), and white sturgeon in upriver areas above Bonneville Dam. These tribal governments are now seeking to implement this plan and salmon restoration in conjunction with the states, other tribes, and the federal government, as well as in cooperation with their neighbors throughout the basin's local watersheds and with other citizens of the Northwest. The proposed action is anticipated to have beneficial cumulative impacts to ESA-listed salmonids in the Columbia River Basin when considered within the context of the Spirit of the Salmon plan.

Additionally, the Columbia Basin Fish Accords are a tribal partnership between the Confederated Tribes of the Umatilla Reservation, Confederated Tribes of the Warm Springs Reservation, Confederated Tribes and Bands of the Yakama Indian Nation, the Shoshone Bannock Tribes, the Columbia River Intertribal Fish Commission, BPA, the Corps, and Reclamation. The fish accords commit the agencies responsible for the FCRPS to 10 years of funding to continue existing fish programs and to implement new priority fish projects managed by the tribes and states. The accords began in 2008 and currently run until 2018. The proposed action is anticipated to have beneficial cumulative impacts to ESA-listed salmonids in the Columbia River Basin when considered within the context of the fish accords.

5.2.1.4 Public Utility Districts

Chelan County and Douglas County PUDs worked cooperatively with state and federal fisheries agencies and tribes to develop hydropower habitat conservation plans for anadromous salmon and steelhead. The plans commit the two utilities to a 50-year program to ensure that their hydro projects (Chelan PUD Rocky Beach and Rock Island Hydro Projects and Douglas PUD Wells Hydro Project) have no net impact on mid-Columbia salmon and steelhead runs. The plans include a combination of fish bypass

systems, spill at the hydro projects, off-site hatchery programs and evaluations, and habitat restoration work conducted in mid-Columbia tributary systems (Chelan PUD 2013).

Grant PUD operates Wanapum and Priest Rapids Dam and performs fish protection activity related to the operation of these dams. As part of the Biological Opinion for the Priest Rapids Project, Grant PUD established and participates in the Priest Rapids Coordinating Committee (PRCC) to oversee the implementation of the anadromous fish activities. The PRCC also coordinates the implementation of the adaptive management program contained in the Salmon and Steelhead Settlement Agreement for species affected by the Priest Rapids Project not covered under the Biological Opinion (Grant PUD 2013). Additionally, Grant PUD conducts a variety of activities for anadromous fish conservation related to operation of the Wanapum and Priest Rapids Dams including fish passage, fish counts, predator control, and hatchery operation.

When viewed in the context of past, present, and reasonable foreseeable future activities related to Chelan, Douglas, or Grant PUDs, the proposed action is not anticipated to result in increased cumulative adverse effects to CATEs or other piscivorous bird species. Because the PUDs are currently involved in activities that promote salmonid conservation and restoration, the proposed action will be complimentary to these. The proposed action is therefore anticipated to have beneficial cumulative impacts to ESA-listed salmonids in the Columbia River Basin when considered within the context of PUD fish conservation and restoration activities.

5.2.2 Cumulative Effects

Reduction of avian predation on federally listed endangered and threatened salmonids in the inland Columbia River Basin is one additional action for improving juvenile salmonid survival. This action is considered to be an integral part of a comprehensive All-H Approach, as prescribed for in the BiOp RPA. As indicated in the BiOp analysis, avian predation actions compliment the array of hydropower, habitat, harvest, hatchery and other predation actions which are part of the RPA, and assist in the recovery of listed salmon and steelhead.

As a result, when considered within the context of the other past, present, or reasonably foreseeable actions in the inland Columbia River Basin and the Lower Columbia River estuary under the FCRPS and the other programs described in Section 5.2.1, the reduction of predation by CATEs is anticipated to have a positive direct impact on salmonid survival and population growth rates and, therefore, no adverse cumulative impact on salmonid survival and population growth rates.

With regard to other threatened and endangered or other fish species, the impacts of CATE colonization at potential habitat enhancement sites would be assessed in

supplemental/tiered NEPA analysis. The choice of enhancement sites would include a robust analysis of biological resources, especially the presence of listed and sensitive species, to avoid significant conflicts between colonizing CATEs and these species. Therefore, the proposed action considered in this EA is anticipated to have no significant cumulative impacts.

SECTION 6.0 COMPLIANCE WITH LAWS AND REGULATIONS

This section provides a brief discussion of relevant laws and regulations that apply to the EA's preferred alternative and describes how the preferred alternative is or would be in compliance with these regulations. Unless stated otherwise, compliance in this section pertains to both Crescent and Goose Island, and the Corps's actions regarding consultation are on behalf of the Action Agencies.

Treaties with Native American Tribes.

Treaties between the United States and regional tribes document agreements reached between the federal government and the tribes. In exchange for the tribes ceding much of their ancestral land, the federal government established reservation lands and guaranteed that the government would respect the treaty rights including fishing and hunting rights. These treaties, as well as statutes, regulations, and national policy statements originating from the executive branch of the federal government, provide direction to federal agencies on how to formulate relations with Native American tribes and people. Treaties with area tribes explicitly reserved unto the tribes certain rights, including the exclusive right to take fish in streams running through or bordering reservations, the right to take fish at all usual and accustomed places in common with citizens of the territory, and the right of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed lands. These reserved rights include the right to fish within the project area identified in the EA.

NEPA, as amended, 42 USC §§ 4321 *et seq.*; 40 CFR Parts 1500-1508.

NEPA was enacted in 1969 to establish a national policy for the protection of the environment. The Council on Environmental Quality was established to advise the president and to carry out certain other responsibilities relating to implementation of NEPA by federal agencies. Federal agencies are obligated to comply with the NEPA implementing regulations promulgated by the Council on Environmental Quality (40 CFR Parts 1500-1508). These regulations outline the responsibilities of federal agencies under NEPA and provide specific procedures for preparing environmental documentation to comply with NEPA.

This EA was prepared to analyze and disclose whether the proposed action and alternatives would have a significant effect on the quality of the human environment. The signing of a Finding of no Significant Impact (FONSI), if appropriate, will satisfy supplemental/tiered NEPA requirements. Otherwise, an EIS/ROD will be prepared.

Clean Water Act (Federal Water Pollution Control Act), 33 USC §§ 1251 *et seq.*

The Clean Water Act is the principal law governing pollution control and water quality of the nation's waterways. It requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to waters of the United States. Discharges of material into navigable waters are regulated under Sections 401 and 404 of the Clean Water Act. The Corps has the primary responsibility for administering the Section 404 permit program. Under Section 401, projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards. Under Section 402, construction projects that exceed 1 acre of clearing activities and that have the potential to discharge to surface water bodies are required to obtain a permit prior to construction activities.

The proposed action will not involve the discharge of dredged or fill materials into waters of the U.S. Sections 401 and 404 are, therefore, not applicable. Based on the nature of the likely actions proposed under the preferred alternative (i.e., roping and flagging, vegetation planting and modification), it is not anticipated that a National Pollutant Discharge Elimination System (NPDES) stormwater permit regulated under Section 402 be necessary. However, if substrate modification activities exceed an acre in area at Goose Island (e.g., emplacement of cobble) or Crescent Island (e.g., berm creation) Reclamation or the Corps, respectively, will obtain an NPDES stormwater permit, as necessary, in compliance with Section 402.

Rivers and Harbors Act, 33 USC §§ 401 *et seq.*

This act regulates the development and use of the nation's navigable waterways. Section 10 of the act prohibits unauthorized obstruction or alteration of navigable waters and vests the Corps with the authority to regulate discharges of fill and other materials into such waters. Actions that require Section 404 Clean Water Act permits are also likely to require permits under Section 10 of this act.

No obstruction or alteration of navigable waters would occur as a result of the preferred alternative, so Section 10 is not applicable.

ESA of 1973, 16 USC 1531 §§ *et seq.*, 50 CFR Parts 17, 222, 224.

The ESA directs all federal agencies to conserve endangered and threatened species and their habitats and encourages such agencies to utilize their authorities to further these purposes. Section 7 of the act requires that federal agencies consult with NMFS and USFWS to ensure their actions, which may affect listed species, are not likely to jeopardize these species or result in destruction or adverse modification of designated critical habitat.

The Corps coordinated with NMFS on potential effects to ESA-listed anadromous fish species. The Corps and NMFS agree the proposed actions in the preferred alternative are adequately addressed in the 2008 FCRPS biological opinion and 2010 supplement and no further Section 7 consultation is required.

The Corps consulted with USFWS on potential effects to bull trout. The Corps has prepared a Biological Assessment (BA) and determined the proposed action "may affect, but is not likely to adversely affect" bull trout or their designated critical habitat. The Corps received concurrence from the USFWS on that determination on January 6, 2014 (Appendix G).

Finally the Corps has determined there will be "no effect" on other ESA-listed species in the project area. These species include Canada lynx, pygmy rabbit, gray wolf, northern spotted owl, Ute ladies'-tresses, Umtanum desert buckwheat, and White Bluffs bladderpod. No consultation with USFWS is required for "no effect" determination.

Magnuson-Stevens Act (MSA) (formerly Magnuson-Stevens Fishery Conservation and Management Act, MSFCMA), 16 USC §§ 1801 *et seq.*, 50 CFR Part 600.

In 1996, the act was reauthorized and changed by amendments to require that fisheries be managed at maximum sustainable levels and that new approaches be taken in habitat conservation. EFH is defined broadly to include "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (62 Fed. Reg. 66551, § 600.10 Definitions). The act requires consultation for all federal agency actions that may adversely affect EFH. Under Section 305(b)(4) of the act, NMFS is required to provide advisory conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. Where federal agency actions are subject to ESA Section 7 consultations, such consultations may be combined to accommodate the substantive requirements of both ESA and MSA.

The actions being evaluated in this EA would not affect EFH. No consultation under the MSA is required.

Fish and Wildlife Coordination Act (FWCA), 16 USC §§ 661 *et seq.*

The FWCA requires that federal agencies consult with USFWS and state wildlife agencies whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage. These consultations are generally incorporated into Section 404 of the Clean Water Act, NEPA, or other federal permit, license, or review requirements.

The proposed actions would not alter any stream or body of water. No coordination under the FWCA is required.

Migratory Bird Treaty Act (MBTA) of 1918, 16 USC §§ 703 *et seq.*

The MBTA (16 USC §§ 703-712, as amended) prohibits the taking of and commerce in migratory birds (live or dead), any parts of migratory birds, their feathers, eggs, or nests. Take is defined in the MBTA as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" any migratory bird, nest, egg, or part thereof.

Much of the work being proposed in the proposed action would occur outside the migratory bird nesting season. Therefore there would be no impacts to nests or eggs from that work. A permit from the USFWS for take of up to 200 CATE eggs from Goose and Crescent Islands and the at-risk islands combined will be requested if the preferred alternative is implemented.

National Historic Preservation Act (NHPA), 16 USC §§ 470 et seq.

Section 106 of the NHPA of 1966, as amended and implemented primarily through 36 CFR Part 800, provides the legislative and regulatory basis for much of the nation's historic preservation efforts. These regulations require the identification, evaluation, protection, and management of historic properties in federal undertakings. Protection is achieved by implementing deliberative and consultative processes that ensure that the consideration of effects to historic properties occurs for all federal undertakings. Consultation is required between the project's federal lead agency, in this current case the Corps, the Oregon State Historic Preservation Office (SHPO) (or Washington Department of Archaeology and Historic Preservation [DAHP]), appropriate tribal governments, the public and other interested parties.

The Corps initiated consultation with the Oregon SHPO, Washington DAHP and relevant tribal governments regarding cultural and historical resources on September 12 and 13, 2013. No impacts to these resources in related to the preferred alternative are anticipated. The Corps received concurrence from the DAHP (Appendix H) on October 30, 2013, which covers dissuasion actions at Goose and Crescent Island. Separate consultation will be completed for habitat enhancement and, if necessary, the at-risk islands prior to implementation.

Indian Trust Assets 25 Code of Federal Regulations Chapter 1, Part 115, Subsection 115.002 (2001).

Indian Trust Assets (ITAs) are defined as "trust lands, natural resources, trust funds, or other assets held by the federal government in trust for Indian tribes and individual Indians. Trust land(s) means any tract or interest therein that the United States holds in

trust status for the benefit of a tribe or an individual Indian" (United States 2001: 343). Examples of ITAs include land, minerals, instream flows, water rights, and hunting and fishing rights. A defining characteristic of an ITA is that these assets cannot be alienated, sold, leased, or used for easements without approval from the United States.

The United States has a trust responsibility to protect and maintain rights reserved to Indian Tribes or individuals originating from treaties, statutes, and executive orders. This trust responsibility requires that federal agencies take reasonable actions to protect trust assets when administering programs under their control.

Historically, the government and the Tribes have offered varied opinions as to what constitutes an ITA, and which tribe holds title to those ITAs. This document neither judges the validity of, nor defines the rights claimed by any Tribal government or member.

While the majority of ITAs are located on-reservation, ITAs also occur off reservation. Consequently, several American Indian Tribes and bands have interests in the project area. The majority of the area in and surrounding the project area is within lands ceded in the Yakama Treaty of June 9, 1855. The treaty established the Yakama Reservation and reserved rights and privileges to hunt, fish, and gather roots and berries on open and unclaimed lands to the 14 signatory Tribes and bands.

In addition to the Yakama Nation, the Spokane Tribe of Indians, Wanapum, the Nez Perce Tribe, Confederated Tribes of Warm Spring, Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Colville Indian Reservation may also have interests in the project area.

In a review of the Crescent and Goose Island project areas the Action Agencies identified no ITAs.

Executive Order 11514 (35 FR 4247; March 7, 1970): Protection and Enhancement of Environmental Quality, as amended.

This executive order directs federal agencies to monitor, evaluate, and control their activities in order to protect and enhance the quality of the nation's environment, to inform and seek the views of the public about these activities, to share data gathered on existing or potential environmental problems or control methods, and cooperate with other governmental agencies.

The preferred alternative would have the result of protecting and enhancing endangered populations of salmonids in the Columbia River Basin and is, therefore, in compliance with this executive order.

Executive Order 11988 (42 FR 26951; May 25, 1977): Floodplain Management.

On May 24, 1977, President Carter issued Executive Order 11988, Floodplain Management. This executive order requires each federal agency to provide the opportunity for early public review of any plans or proposals for actions in floodplains in accordance with Section 2(b) of Executive Order 11514, as amended, including the development of procedures to accomplish this objective.

The actions in the preferred alternative would occur above the ordinary high water mark and would have no effects to floodplains. It is, therefore, in compliance with this executive order.

Executive Order 12898 (59 FR 7629, February 16, 1994): Environmental Justice.

This executive order instructs federal agencies to make achieving environmental justice part of its mission. Agencies must address disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Environmental justice means the fair treatment of people of all races, incomes, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of negative environmental impacts resulting from the execution of environmental programs.

The preferred alternative would not have a disproportionate effect on minority or low income populations and is, therefore, in compliance with this executive order.

Executive Order 12962 (60 FR 30769; June 9, 1995): Recreational Fisheries.

This executive order directs federal agencies to, among other things, foster and promote restoration that benefits and supports viable, healthy, and sustainable recreational fisheries.

The preferred alternative would have beneficial effects to threatened and endangered populations of salmonids and therefore benefits and supports sustainable recreational fisheries. The preferred alternative would have no significant impact to fisheries and is, therefore, in compliance with this executive order.

Executive Order 13007 (61 FR 26771; May 29, 1996): Indian Sacred Sites and Executive Order 13175 65 FR 67249, November 9, 2000): Consultation and Coordination with Indian Tribal Governments.

Executive Order 13007 describes federal policy for accommodating sacred Indian sites. This executive order requires federal agencies with statutory or administrative responsibility for managing federal lands to (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religions practitioners, (2) avoid adversely affecting

the physical integrity of such sacred sites where appropriate, and (3) maintain the confidentiality of these sacred sites.

Executive Order 13175 exists to (1) promote regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, (2) strengthen the United States government-to-government relationships with Indian tribes, and (3) reduce the imposition of unfounded mandates upon Indian tribes.

The Corps initiated consultation with relevant tribal governments regarding Indian sacred sites and other tribal resources on September 12 and 13, 2013, and is, therefore, in compliance with this executive order. No impacts to these sites or resources related to the preferred alternative are anticipated.

Executive Order 13112 (64 FR 6183, February 8, 1999): Invasive Species.

The purpose of Executive Order 13112 is to prevent the introduction of invasive species and provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

The preferred alternative would not introduce invasive species and would have beneficial effects to promoting native species at Crescent Island if vegetation planting is performed. The preferred alternative is in compliance with this executive order.

SECTION 7.0 AGENCIES CONSULTED AND PUBLIC INVOLVEMENT

7.1 Coordination with Other Agencies and Tribal Governments

This EA and IAPMP was created with input from the Inland Avian Predation Working Group (IAPWG). The IAPWG is composed of multiple agencies, with a core membership of representatives from the Corps, Reclamation, BPA, USFWS, NMFS, Washington, Oregon, Idaho, USDA-WS, Chelan County PUD, Grant County PUD, Douglas County PUD, Columbia River Inter-Tribal Fish Commission, Confederated Tribes and Bands of the Yakama Nation, the Colville Tribe, and mid-Columbia River Basin tribes. During the development of the EA, the IAPWG held regular meetings to provide input on the development of the IAPMP and EA. The IAPWG will likely form the basis of an adaptive management working group that will include tribes.

7.2 Scoping and Public Outreach

The Corps and Reclamation have worked together closely to create a scope for this EA that fulfills NEPA requirements, complies with the BiOp, and analyzes inland avian predation management actions that have the greatest potential to positively impact salmonid growth rates in the Columbia River Basin, while remaining within the authority of the Action Agencies and taking into account cost and biological effectiveness.

As part of the scoping process, the IAPWG met regularly to discuss research and studies on inland avian predation and development of an IAPMP. To further define the scope of the analysis, the Corps hosted a public meeting at the Three Rivers Convention Center in Kennewick, Washington, on Wednesday, March 14, 2012. Attendees were encouraged to share their ideas and concerns related to development of the draft EA, either in writing at the scoping meeting or before the end of a 30-day comment period that ended on April 14, 2012. A summary of the scoping meeting and comments received is located in Appendix F. All comments received were addressed by the Corps, as necessary, during the development period of the EA.

7.3 Agency Consultation and Coordination

Coordination was conducted with the following agencies during the preparation of this draft EA:

7.3.1 Federal

- U.S. Fish and Wildlife Service
- National Oceanic and Atmospheric Administration National Marine Fisheries Service
- U.S. Department of Agriculture Wildlife Services

7.3.2 Tribal

- Columbia River Inter-Tribal Fish Commission
- Confederated Tribes and Bands of the Yakama Nation
- The Confederated Tribes of the Umatilla Indian Reservation
- Nez Perce Tribe
- The Confederated Tribes of Warm Springs Reservation of Oregon
- The Confederated Tribes of the Colville Reservation
- The Wanapum Tribe
- The Spokane Tribe

7.3.3 State

- Washington Department of Fish and Wildlife
- Oregon Department of Fish and Wildlife
- Washington Department of Archaeology and Historic Preservation
- Oregon State Historic Preservation Office

7.3.4 Local

- Chelan County PUD
- Grant County PUD
- Douglas County PUD

7.4 Public Involvement

A public scoping meeting was held in Pasco, Washington on March 14, 2012.

In compliance with NEPA rules and regulations, letters were sent to resource agencies and interested residents who identified themselves, and notifications of availability of this draft EA were published in the form of three (3) column by 5-inch newspaper ad displays in the following newspapers between October 31 and November 3, 2013, announcing the public comment period for the draft FONSI and EA. Public notices of availability are also posted at public libraries within the project vicinity. Public comments will be accepted and incorporated into the final decision.

- La Voz-Pasco -- Thursday, October 31, 2013
- Columbia Basin Herald -- Friday, November 1, 2013
- Hermiston Herald -- Saturday, November 2, 2013

- The Dalles Chronicle -- Sunday, November 3, 2013
- Lewiston Tribune -- Sunday, November 3, 2013
- Spokesman Review -- Sunday, November 3, 2013
- Tri-City Herald -- Sunday, November 3, 2013

SECTION 8.0 IMPACT AVOIDANCE AND MINIMIZATION MEASURES

This section describes the impact avoidance and minimization measures, including BMPs that would be conducted as part of the proposed action, to avoid and minimize impacts to species and associated critical habitat.

- No in-water work would occur as part of the proposed project.
- The alteration of habitat on the islands would be conducted away from the waterline and in a manner that would not allow for materials to enter the water and affect water quality.
- All work would be performed according to the requirements and conditions of any permits issued by federal, state, and local governments.
- All equipment to be used for proposed project activities would be cleaned and inspected prior to arriving at the project site to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly.
- If necessary, a temporary erosion and sediment control plan would be developed prior to excavation, vegetation removal, grading, berm construction, and/or other substrate alteration activities.
- A spill prevention, control, and countermeasures (SPCC) plan would be developed prior to beginning project activities involving the use of machinery. The SPCC Plan would identify the appropriate spill containment materials, as well as the method of implementation. All elements of the SPCC Plan would be available at the project site at all times.
- Both additional willow plantings and silt fence repairs would occur outside CATEs nesting periods.

All work occurring at locations other than Goose and Crescent Island, with the exception of visits to other locations for the purpose of monitoring or active hazing, will require additional review under Section 106 of the National Historic Preservation Act.

APPENDIX A

Inland Avian Predation Management Plan

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APPENDIX B

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APPENDIX C

Agency and Public Comments and Responses

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APPENDIX D

Fish Species List

Appendix Table D-1. Threatened and Endangered Salmonid Species List

Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS)	Federal Status	Critical Habitat Present
Chinook Salmon (*Oncorhynchus tshawytscha*)		
• Snake River Fall Chinook ESU	Threatened	Yes
• Snake River Spring/Summer Chinook ESU	Threatened	Yes
• Upper Columbia River Spring Chinook ESU	Endangered	Yes
• Lower Columbia River Chinook ESU	Threatened	Yes
Steelhead (O. mykiss)		
• Snake River Steelhead DPS	Threatened	Yes
• Upper Columbia River Steelhead DPS	Threatened	Yes
• Middle Columbia River Steelhead DPS	Threatened	Yes
• Lower Columbia River Steelhead DPS	Threatened	Yes
Coho Salmon (*O. kisutch*)		
• Lower Columbia River Coho ESU	Threatened	Proposed
Sockeye Salmon (O. nerka)		
• Snake River Sockeye ESU	Endangered	Yes
Bull Trout (*Salvelinus confluentus*)		
• Columbia River Bull Trout DPS	Threatened	Yes

APPENDIX E

At-Risk Island Aerial Imagery

APPENDIX F

Scoping Meeting Summary and Responses

APPENDIX G

USFWS ESA Section 7 Concurrence Letter and Biological Assessment

APPENDIX H

Section 106 Correspondence