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September 10, 2019

MEMORANDUM

TO: Council Members

FROM: Laura Robinson

SUBJECT: Update on avian predation in the Columbia River Basin

BACKGROUND:

Presenter: Dr. Dan Roby, Oregon State University

Summary: Dr. Roby has been involved in research on the impact of avian predation on recovery of ESA-listed salmonids in the Columbia River Basin and non-lethal methods to mitigate those impacts for over two decades. At the September Council meeting, Dr. Roby will provide a brief history of the avian predation RM&E that Oregon State University, Real Time Research, and U.S. Geological Survey have conducted; briefly summarize the three avian predation management plans in the Columbia Basin that were an outgrowth of RM&E; assess the efficacy of each management plan in achieving management goals; and provide possible next steps to fully accomplishing the goals of each management plan.

Relevance: 2014 Fish and Wildlife Program emerging priority #3: *preserve program effectiveness by supporting expanded management of predators and aggressively addressing non-native and invasive species.*

Background: Avian predation on out-migrating smolts has been identified as a factor that limits the survival of juvenile salmonids (*Oncorhynchus* spp.) in the Columbia River Basin; addressing avian predation concerns is a component of Biological Opinions and Reasonable and Prudent Alternatives (RPAs) associated with the management of the Federal

Columbia River Power System. Over the last 23 years, numerous avian predation RM&E studies have been conducted to assess the impacts on smolt survival of consumption by Caspian terns (*Hydroprogne caspia*), double-crested cormorants (*Phalacrocorax auritus*), California and ring-billed gulls (*Larus californicus* and *L. delawarensis*), and American white pelicans (*Pelecanus erythrorhynchos*) in the Columbia River Basin. As part of this work, over 50 technical reports and 40 peer-reviewed scientific publications have been written regarding avian predation on juvenile salmonids in the basin and elsewhere, covering a wide range of topics (see birdresearchnw.org).

To address concerns about the impact of avian predation on the survival of smolts, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers (USACE), and their management partners developed and implemented three separate management plans to reduce predation rates on smolts by piscivorous waterbirds nesting at four breeding colonies in the Columbia River basin: the largest Caspian tern and double-crested cormorant breeding colonies in the world (those on East Sand Island in the Columbia River estuary), and the two largest Caspian tern colonies in the Columbia Plateau region (those on Crescent Island in McNary Reservoir and on Goose Island in Potholes Reservoir).

The primary goal of these management initiatives was to reduce predation rates (proportion of available smolts consumed) on ESA-listed salmonid populations by reducing the size of or eliminating the breeding colonies at each of these four colony sites. Management initiatives implemented at these four colony sites have been primarily non-lethal strategies for Caspian terns (i.e. passive and active nest dissuasion) and primarily lethal strategies for double-crested cormorants (i.e. culling and egg-oiling). As part of the management plans for Caspian terns, the USACE created alternative nesting habitat for terns at various locations outside the Columbia River Basin (i.e. northeastern California, southern Oregon, and San Francisco Bay) to compensate for reductions in tern nesting habitat on East Sand Island and elimination of tern nesting habitat on Crescent and Goose islands.

As part of [Project No. 199702400](#), and with cost sharing from the USACE's Portland District, the team:

- (1) collected monitoring data and helped implement, adaptively manage, and evaluate the Caspian Tern Management Plan for the Columbia River Estuary (2011-2018) and
- (2) collected data used to develop the Double-crested Cormorant Management Plan for the Columbia River Estuary (2011-2014).

As part of the work for the Caspian Tern Management Plan, the team:

- (1) helped reduce the amount of suitable Caspian tern nesting habitat on East Sand Island from six acres to just one acre, the management target for designated colony area,

- (2) restricted Caspian tern nesting on East Sand Island to just the designated colony area using a combination of passive and active tern nest dissuasion techniques, and
- (3) monitored the effectiveness of these efforts in
 - (a) reducing Caspian tern colony size on East Sand Island from approximately 10,600 breeding pairs in 2008 to approximately 5,000 breeding pairs in 2018;
 - (b) increasing emigration rates of Caspian terns from the Columbia River estuary to colony sites located outside the Columbia River basin, including the USACE-constructed colony sites; and
 - (c) reducing predation rates on ESA-listed juvenile salmonids by Caspian terns nesting on East Sand Island to some of the lowest rates ever recorded for that colony in 2017.

Despite these successes, a number of critical uncertainties remain (below), and recent developments suggest that predation impacts from piscivorous colonial waterbirds in the Columbia River Basin may be increasing at a time when funding for avian predation RM&E in the Basin is either being eliminated (USACE) or sharply reduced (BPA).

- The Caspian tern colony on East Sand Island, which consisted of about 5,000 breeding pairs in 2018, remains much larger than the target colony size of 3,125 breeding pairs deemed acceptable by NOAA Fisheries
- Caspian terns are returning to nest on Rice Island in increasing numbers; Rice Island was the site of a large Caspian tern colony in the late 1990s, before the colony was relocated to East Sand Island to reduce its impact on smolt survival
- Double-crested cormorants abandoned the East Sand Island colony site in 2017 and again in 2019, and cormorants are now nesting by the thousands on the Astoria-Megler Bridge, where impacts to survival of out-migrating smolts are likely higher
- Caspian terns that have been dissuaded from nesting at Crescent and Goose islands in the Columbia Plateau region have mostly remained in the region, and many are nesting at new sites where predation impacts may be as high or higher than at the original managed colony sites
- USACE-constructed tern islands in interior Oregon and northeastern California have been subject to drought, resulting in underutilization by Caspian terns displaced from managed colony sites
- Continued monitoring and management are needed at Caspian tern colony sites outside the Basin to maximize their potential as alternative colony sites for terns displaced from East Sand Island and the Columbia Plateau region
- System-wide evaluation of the impact of predation by Caspian terns and other piscivorous colonial waterbirds on salmonid survival is needed to assess the efficacy of bird management to restore ESA-listed salmonids

Taken together, these uncertainties indicate that continued system-wide monitoring and evaluation of management implemented during the last decade to reduce impacts of avian predation is warranted if adaptive management is to be implemented and the intended benefits to survival of juvenile salmonids realized.

More Info: Dan Roby's September 2018 presentation to the Council: [packet memo](#) and [presentation](#).

[Caspian Tern Management Plan](#)

[Double Crested Cormorant Management Plan](#)

[Inland Avian Predation Management Plan](#)

Avian Predation on Juvenile Salmonids in the Columbia River Basin

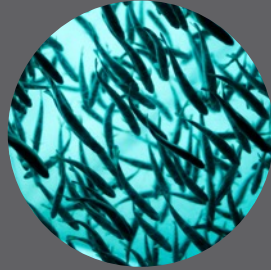
Northwest Power and Conservation Council

September 17, 2019

Corvallis, Oregon



BACKGROUND



AVIAN PREDATION RESEARCH IN THE COLUMBIA BASIN



Avian predation research program began in 1997



Breeding colonies of fish-eating waterbirds are widespread in the Basin, and their nesting season largely overlaps with the smolt out-migration period



Smolt consumption rates vary widely by bird species, breeding colony, and year



AVIAN PREDATION RESEARCH IN THE COLUMBIA BASIN



Avian predation is a major source of smolt mortality for multiple ESA-listed salmonid populations in the Columbia Basin



Caspian terns and double-crested cormorants have the highest per capita impacts on smolt survival of all the bird species studied



Juvenile steelhead and fall Chinook salmon are particularly susceptible to predation by terns and cormorants, respectively



AVIAN PREDATION RESEARCH IN THE COLUMBIA BASIN



Caspian terns and double-crested cormorants nesting on East Sand Island depredated up to 25 million smolts annually, or roughly 15% of the surviving out-migrants to the estuary



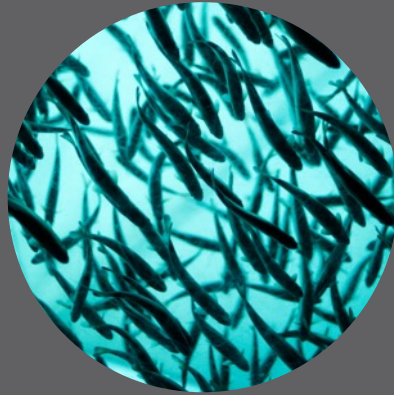
Caspian terns nesting on Crescent and Goose islands in the Columbia Plateau region consumed annually from 5% to 30% of out-migrating smolts from some listed steelhead populations



Management of terns and cormorants to reduce their impacts on smolts was called for in regional planning documents (e.g., FCRPS BiOp)



MANAGEMENT PLANS



AVIAN PREDATION MANAGEMENT PLANS



CASPIAN TERNS

East Sand Island, Columbia River Estuary



DOUBLE-CRESTED CORMORANTS

East Sand Island, Columbia River Estuary



CASPIAN TERNS

Goose and Crescent islands, Columbia Plateau Region



TERN MANAGEMENT PLAN FOR THE COLUMBIA RIVER ESTUARY



REDUCE SIZE OF ESI COLONY

From about 10,000 to 3,125 breeding pairs using passive & active nest dissuasion



PREVENT NESTING ELSEWHERE

Outside of main colony on East Sand Island and elsewhere in estuary



CREATE ALTERNATIVE HABITAT

For tern nesting outside Columbia Basin and attract terns to nest there



CONDUCT MONITORING

To measure action effectiveness and inform adaptive management decisions



CORMORANT MANAGEMENT PLAN FOR THE COLUMBIA RIVER ESTUARY



REDUCE SIZE OF ESI COLONY

From 14,900 to 5,600 breeding pairs nesting on East Sand Island



CULLING AND EGG OILING

Culling up to 11,000 adults and oiling eggs in up to 26,000 nests



REDUCE NESTING HABITAT

By converting nesting habitat to intertidal wetland



CONDUCT MONITORING

To measure action effectiveness and inform adaptive management decisions



TERN MANAGEMENT PLAN FOR THE COLUMBIA PLATEAU



ELIMINATE TERN COLONIES

At Goose and Crescent islands using passive and active nest dissuasion



CREATE ALTERNATIVE TERN HABITAT

For tern nesting outside Columbia Basin and attract terns to nest there



CONDUCT MONITORING

To measure action effectiveness and inform adaptive management decisions

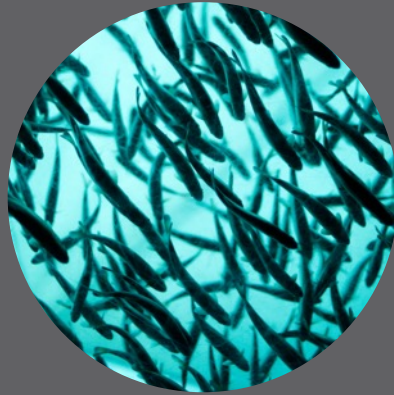


ADAPTIVE MANAGEMENT

If terns relocate to other colonies in the Columbia Plateau, manage as necessary



ACTION EFFECTIVENESS



TERN MANAGEMENT PLAN FOR THE COLUMBIA RIVER ESTUARY



COLONY SIZE REDUCED

From 10,000 breeding pairs to 3,800 pairs (2019), but target (3,125 pairs) not reached



ALTERNATIVE HABITAT USED

Terns relocated to nesting sites outside Columbia Basin, but sites under-utilized



PREDATION IMPACTS REDUCED

Roughly 50% reduction in impacts on steelhead smolt survival



HIGH FIDELITY TO ESTUARY

Persistent nesting attempts by terns elsewhere in the estuary, impacts unknown; adaptive management needed



CORMORANT MANAGEMENT PLAN FOR THE COLUMBIA RIVER ESTUARY



CULLING AND EGG OILING

Over 5,000 adult cormorants culled and eggs from 7,000 nests oiled



HABITAT MODIFICATIONS

Amount of available nesting habitat on East Sand Island was reduced in 2019



COLONY MOSTLY ABANDONED

Large dispersal events from East Sand Island occurred in each of the last 3 years



DISPERSAL TO UPPER ESTUARY

Astoria-Megler Bridge colony has grown more than 10-fold, from 300 breeding pairs to over 3,500 pairs; impacts to smolt survival likely increasing



TERN MANAGEMENT PLAN FOR THE COLUMBIA PLATEAU



TERN COLONIES ELIMINATED

No nesting at Goose or Crescent islands during the last 4 years of management



DECLINE IN TERN POPULATION

44% decline in the regional breeding population of terns



HIGH FIDELITY TO REGION

Persistent nesting attempts at Goose Island and relocation to the Blalock Islands

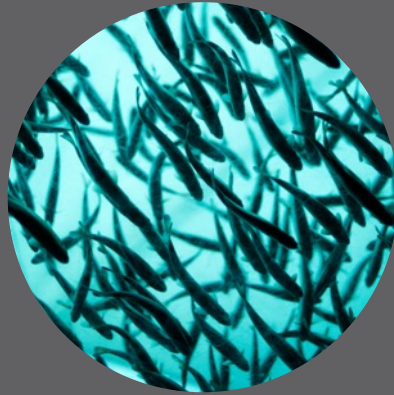


PREDATION IMPACTS REDUCED

But benefits offset by increases in predation impacts elsewhere (Blalocks); adaptive management needed



CONCLUSIONS



CRITICAL UNCERTAINTIES REMAIN



STRONG FIDELITY TO REGION

Managed terns and cormorants continue to attempt to nest in the Columbia Basin



SMOLT IMPACTS SIGNIFICANT

Avian predation remains one of the most significant mortality factors for some smolts



ADAPTIVE MANAGEMENT NEEDED

To reach management objectives and to maximize the benefits to smolts from managing avian predators



ACKNOWLEDGEMENTS



FUNDING

BPA, GPUD, PRCC, ODFW, and USFWS (currently); USACE and BOR (previously)



COOPERATORS

USFWS, ODFW, WDFW, and NOAA Fisheries



THANK YOU

QUESTIONS?



SYSTEM-WIDE EFFECTS OF AVIAN PREDATION ON SALMONIDS



Many salmonid populations are subject to predation by multiple avian predator species (terns, cormorants, gulls, and pelicans) from several different breeding colonies during out-migration



The cumulative effects of avian predation on smolt survival can be substantial, with avian predation accounting for more than 50% of all smolt losses during out-migration



System-wide predation monitoring is needed to fully evaluate the effects of avian predation on smolt survival and to evaluate the efficacy of bird management actions to reduce predation