

Priest Rapids Coordinating Committee Conference Call

Microsoft Teams
Wednesday, January 14, 2026
2:30 p.m. to 4:00 p.m.

Conference Call Minutes

PRCC Representatives, Alternates, and Facilitation

Tom Dresser, Rod O'Connor (Alt),	Keely Murdoch, Brandon Rogers (Alt), YN
Tim Taylor (Alt) GPUD	Tom Lorz, Pete McHugh (Alt), CRITFC for CTUIR
Scott Carlon, Emi Melton (Alt), NMFS	Clayton Buck, Wanapum
Bill Gale, USFWS	Larissa Rohrbach, Anchor QEA, Facilitator
Chad Jackson, Andrew Murdoch (Alt), WDFW	Kristi Geris, Anchor QEA, Technical Support
Kirk Truscott, Casey Baldwin (Alt), CTCR	

Meeting Attendees

Tom Dresser, GPUD	Tom Lorz, CTUIR
Rod O'Connor, GPUD	Pete McHugh, CRITFC (CTUIR)
Tim Taylor, GPUD	Larissa Rohrbach, Anchor QEA, Facilitator
Emi Melton, NOAA	Molly Van Dam, Anchor QEA, Technical Support
Bill Gale, USFWS	Allen Evans, RTR
Chad Jackson, WDFW	Quinn Payton, RTR
Andrew Murdoch, WDFW	Katie Adase, RTR
	Nate Banet, RTR

A special meeting of the PRCC was held to hear a presentation from Real Time Research (RTR) on avian predation monitoring in the Columbia Plateau Region (CPR), supported in part by Grant PUD's No Net Impact fund.

I. Avian Predation in the Columbia Plateau Region

L. Rohrbach welcomed the PRCC and the presentation team including A. Evans (RTR Fisheries Scientist), Q. Payton (RTR Statistician), K. Adase (RTR Data Analyst), and N. Banet (RTR Wildlife Biologist). In preparation for today's meeting, RTR's proposal for 2026 work (Attachment A) was distributed to the PRCC on January 5. Today's

presentation focused on 2025 work but also set up approval of the proposal for 2026 work, which will be discussed during this month's PRCC meeting on January 27.

A. Evans shared the presentation *Avian Predation on ESA-Listed Salmonids in the Middle Columbia River, 2025* (Attachment B), which was distributed to the PRCC by K. Geris following the meeting on January 16. Discussions were as follows.

Slides 1 to 21

- Evans said that results are preliminary. The draft report is due to the PRCC and Bonneville Power Administration at the end of the month. However, Evans does not expect the results to change much between now and when the draft is due. He presented basic background information on predator and prey interactions, the efficacy of the tern management plan to reduce predation, information on the location of piscivorous waterbird colonies, the size of those colonies during the peak breeding period, and a focus on steelhead in the Upper Columbia River (UCR).
- Evans provided a background on Caspian terns (CATE). They have high per capita predation effects on salmonids, which often make up about 70% to 80% of their diets. CATE are sight predators and plunge-dive foragers that are able to dive to approximately a meter below the water surface. CATE disproportionately consume steelhead relative to salmon. Prior to 2014, when avian management began, there were up to seven different historical CATE breeding sites in the region. Those written in green are by far the largest, on Goose Island and Crescent Island. The goal for the avian predation management plan was to use passive and active dissuasion techniques to prevent CATE nesting on Goose and Crescent Islands. The plan identified triggers for active management, such as colony size and a predation rates metric. The goal for colony sizes was to reduce each colony to less than 40 breeding pairs, and basin-wide, less than 200 breeding pairs. The goal for predation rates was less than 2% per colony and on aggregate, less than 5% combined.
- The presentation also focused on other piscivorous waterbird species that forage on smolts, including double-crested cormorants (DCCO), California gulls and ring-bill gulls, American white pelicans (AWPE), great blue herons, and great egrets.
 - DCCO have high per capita predation effects, but unlike CATE, they consume smolts in proportion to their availability, so salmon are just as susceptible to consumption as steelhead are.
 - Gulls are the most numerically abundant piscivorous waterbirds in the region. They are omnivores, but also plunge divers, so they tend to disproportionately consume steelhead.

- AWPE had one historical colony in the CPR at Badger Island, just upstream of Crescent Island. That changed in 2025 when pelicans relocated to Crescent Island. Pelicans consume adult fish in addition to juvenile fish, including adult salmonids, and particularly adult Sockeye Salmon.
- There are limited data on great blue herons and great egrets, but they are shallow foragers.
- There are other piscivorous waterbirds, both semi-colonial and colonial in the region, including grebes, mergansers, and osprey. They are generally less numerous and often tend to consume smaller-sized fishes.
- There are five objectives that were funded by PRCC in 2025. RTR assessed the efficacy of tern management, assessed changes in colony sizes, assessed changes in predation rates, provided technical assistance for adaptive management, and worked on Mid-Columbia River predation and survival modeling schemes. The funding for Objective 4.1, to compare predation and survival between tag groups, was received a little late, so the data for that objective in particular are still preliminary. Objective 5 was not implemented in 2025 because of the postponement of Grant PUD's salmonid survival study to 2026.
- Evans presented a map of the entire 2025 study area throughout the Columbia Basin. Many colonies co-nest on the same islands because they prefer predator-free areas that are in close proximity to a prey base. Crescent Island had the highest diversity of avian predators. Evans said that he will mostly be talking about colonies that are capable of foraging on fish in Priest Rapids projects.
- Evans presented a histogram showing the size of CATE colonies. Crescent Island was the largest, followed by Banks Lake. There were four colonies with 30 or fewer breeding pairs, and the goal was for colonies to remain under 40 pairs per colony. He will be focusing on the management at Goose Island and Crescent Island, but the other colonies will be discussed in the report to be distributed.
- At Goose Island (which is in the Potholes Reservoir), there was a peak count of 30 breeding pairs in 2025. CATE show high fidelity to Goose Island and other sites in the Potholes Reservoir. In 2025, PRCC paid for an additional early season reconnaissance flight of North Potholes on April 27, 2025. During that aerial survey, a waterbird colony was observed in North Potholes. It was followed up with a boat survey, where a small incipient CATE colony was found nesting among gulls. The U.S. Bureau of Reclamation was notified, and within 48 hours, they passively dissuaded terns from the island for the remainder of the year. A similar situation happened in 2024, but that year had no early season reconnaissance flights, so by the time it was discovered, there were already 15 breeding pairs. The 2025 early season

- reconnaissance flight was considered to be very successful at identifying the incipient colony, and the subsequent passive management was also successful. Historically, management commenced in 2014, and since then, management has been largely successful at maintaining colonies below 40 breeding pairs.
- 2015 was the first year of passive and active management at Crescent Island. Silt fencing and flagging were installed, and there was an effort to plant a substantial amount of willows and other native vegetation. Management was completely successful for 6 years, and when that passive dissuasion was removed in 2019, an incipient colony of gulls established around 2020, and CATE returned in 2022. From 2022 through 2025, Crescent Island has exceeded the target threshold of 40 breeding pairs of CATE. In 2024, the U.S. Army Corps of Engineers and the Tribes went to Crescent Island prior to the breeding season and placed woody debris in the hopes that would help dissuade avian predators. Evans displayed an image of Crescent Island in 2016, the year after dissuasion material and willow plantings were implemented. The image to the right shows what the island looks like in 2025, with most vegetation eliminated, and more open habitat now than there was prior to management. Due to the removal of the passive nest dissuasion, gulls arrived. A beaver exclusion fence was also removed, and the beavers decimated the willow plantings. In 2024, a pelican colony established on Crescent Island, which essentially eliminated the ground vegetation, leaving a lot of open habitat for future ground nesting.
 - Overall, with management, there has been an average of 500 total breeding pairs across all the colonies. In 2025, piscivorous waterbird colonies were the second smallest to date.
 - Details on other colonial waterbirds, including gulls, cormorants, pelicans, and herons, will be in the report. The gulls are most numerous, followed by pelicans. The Badger Island birds relocated to Crescent Island, so there was no waterbird nesting on Badger Island in 2024. There were cormorant colonies present on several islands, with the largest on Crescent Island. A few heron colonies are monitored, and they are mostly on the river where there is more access to shallow water.
 - Overall, terns have a strong fidelity to the region. The Crescent Island colony has now been re-established, and due to a loss of native vegetation, there is quite a lot of habitat available. Adaptive management has been very successful in most years.

Slides 22 to 36

- Evans displayed a graph that showed predation rates by combined tern colonies. Prior to management, rates of predation averaged 20%, which has declined to approximately 5% during the post-management phase. There has been tractable success in terms of reducing predation rates in the river reach between Rock Island and McNary Dam. On average, smolt survival increased from 60% to 70%.
- There are gull colonies on Island 20, Crescent Island, and Miller Rocks, and they consume primarily UCR steelhead.
- The table of the 2025 cormorant predation showed the highest estimate from the increasing (and large) cormorant colony on Crescent Island. The impacts on Snake River steelhead and Sockeye Salmon were much higher. There is evidence that cormorants nesting on islands below the confluence of the Columbia with the Snake, disproportionately forage in the Snake River. The Snake River tends to be more turbid and have more abundant fish.
- The table of the 2025 pelican predation data shows that in general, there are low impacts on predation. Pelicans also consume adult salmonids, and the evidence is that pelicans pose little threat to actively migrating UCR smolts.
- The 2025 heron predation data show relatively small colonies. Similar to the pelicans, impacts were low on active migrating UCR and Snake smolts. The highest estimate was 0.2% from the Hanford colony. There is some evidence that herons are traveling to the Yakima River where there is a lot of shallow water habitat and foraging on Yakima River smolts. Of all smolts recovered from the Island 20 heron colony, 87% of those were Yakima River salmonids.
- For the system-wide predation rates, RTR took estimates all the way down to the Columbia estuary and looked at the cumulative effects of avian predation. Each color corresponds to a predator species. Green depicts gulls, orange depicts cormorants, blue depicts terns, and the pelicans and heron rates were so small that they were not rendered in the histograms. Predation rates were high on steelhead and Sockeye Salmon in 2025, and much of that predation was gulls consuming smolts, with estimates of 20% for Snake River steelhead. They routinely saw predation rates in excess of 10% for steelhead and salmon.
- The next graph focuses on UCR steelhead cumulative predation and survival. In 2025, an estimated 25% of steelhead were consumed by colonies included in this study, which is about half of the total mortality. There is a similar pattern where birds make up the substantial total of all mortality in most years. The last graph looks at cumulative predation from Rock Island Dam to the Pacific Ocean.
- A graph showing predation rate by rear-type from Rock Island Dam to Bonneville Dam was shown. A. Evans said that in most cases, but not all, there was evidence that hatchery-origin steelhead were consumed at a higher rate than

wild steelhead. This is often seen at gull and tern colonies, but less so at cormorant colonies. The 2025 data look very similar to trends from past years.

- R. O'Connor said, when looking at the bars for "All Mortality" combined, it does not appear that hatchery-origin fish were consumed at a higher rate, and he asked about the error bars and how that informs this conclusion. Evans said that it is important to point out that error bars represent 90% credible intervals (CIs) using a Bayesian statistical approach, which indicates we can be certain that the result falls somewhere within that range 90% of the time. The 90% CI bars are large because there was a relatively small sample size of wild fish, with low numbers of recaptures at McNary and other locations. He said that he would not put a lot of interpretation into those relative differences. In most years there is a higher mortality for hatchery fish. There is a lot of uncertainty in total mortality, but estimates of predation are more precise.
- The summary of predation results shows that there have been lower levels of tern predation since management began, and 2025 was the second lowest estimate since management commenced in 2014. System-wide predation levels remain substantial and are upwards of 40% of all smolts in some years, so avian predation continues to be one of the greatest mortality sources during outmigration. There is evidence that predation on hatchery steelhead can be higher than that, but it varies by species and colony.
- P. McHugh said that it looked like total mortality was a record high (at least from Rock Island to McNary Dam), and he asked whether there were any thoughts on what was driving the other portion of that, if half of mortality was due to avian predation. Evans said that he wished he could give a better answer, but RTR only quantified avian predation, and many other sources of mortality are not quantified. Some mortality could be to other avian predators, and probably a whole host of other factors, such as losses at dams, disease, and other piscine predators. In many cases, there are not good estimates of that.

Slides 37 to 42

- K. Adase said she will be presenting different modeling frameworks to try to get predation, and survival estimates of steelhead and yearling Chinook Salmon based on the Hydrologic Unit Code (HUC) of origin. She discussed data and preliminary results.
- The Rocky Reach juvenile bypass detection demographics are dominated by hatchery-origin fish (over 90%), with much smaller sample sizes of wild fish overall. Watersheds of origin included primarily the Methow Basin, as well as Chief Joseph, Upper Columbia-Entiat, Okanogan, and Similkameen. The Lower Wenatchee Barge demographics had much lower sample sizes overall. It is a relatively new detection site, with yearling Chinook sample sizes in the thousands

and steelhead sample sizes in the low hundreds, both dominated by hatchery-origin fish.

- The first image of the model results on the left shows independent recapture rates for each HUC group, with all groups treated independently of each other. The image of the model results on the right is the shared recapture rate, assuming all the groups have recapture rate in common. When there are independent recapture rates with low sample sizes, there is a potential for loss of precision, indicated by larger error bars. It is important to note the demographic ratios between hatchery and wild fish, with an overall high percentage of hatchery fish even among different demographic groups. The Methow has more of a mixture of hatchery and wild. The final steps are to finalize different models for different reaches, and then RTR will work on creating a discussion on the sampling design, as well as model tradeoffs, and recommendations.
- McHugh said that he is looking forward to seeing what is next. He asked, regarding a data aggregation topic in the November 2025 PRCC meeting, what the target minimum number of tags for deciding the grouping would be and whether that was for estimating cumulative predation rates for the whole system, or just to McNary Dam. Evans said that when they met in November, there was dialogue about whether analysis should begin at release or at the Rocky Reach bypass and Lower Wenatchee Barge where there was a known number of fish. The feedback was to start at Rocky Reach and the Lower Wenatchee Barge. For the second question, RTR will estimate predation and survival to Bonneville Dam and predation to the Pacific Ocean. Each reach will be partitioned, from Rock Island to McNary Dam, McNary Dam to John Day, John Day to Bonneville, and Bonneville to the Columbia estuary. McHugh asked whether they are anticipating that this objective will be fully completed for the 2025 report. Evans said they are pushing to have this included in the draft report at the end of January, but if it does not make that deadline, it will be in an appendix. Some of their recommendations may require additional steps.
- Evans said that Bonneville Power Administration (BPA) has committed funds for 2026, so system-wide studies that rely on funding from BPA would be an option. L. Rohrbach said that the PRCC will discuss and make a decision about whether to fund RTR's 2026 proposal in their upcoming meeting on January 27. Evans said that the structure of this proposal is very similar to last year's proposal. Objective 5 was described in 2025, and there was an objective to do analysis on double-tagged fish, which would allow estimation of predation at finer spatial scales. This study was postponed, so even though it was approved in 2025, it was included again in the 2026 proposal. T. Dresser reminded the PRCC that they will need to come prepared to vote to approve or not on January 27, 2026. Grant PUD will need the time to ensure necessary contractual obligations are in

place, and RTR will need to hire their field crews. Evans added that RTR will need to acquire permits, which is a process that can take up to 90 days.

- McHugh asked whether the passive integrated transponder (PIT) tags used as part of double tagging study fish are part of the total number of PIT tags or whether they are additional PIT tags. Evans said they will be in addition to RTR's target number to PIT tag. Double-tagged fish will have their own statistical model structure. Single-tagged fish will be independent, but all fish can be used as part of the analysis. McHugh asked whether they would all be tagged on a similar timeline. Evans said that is the goal and they will continue to tag fish in proportion to the run at large. PIT tagging will take place a week or two before double tagging. They will tag the same number of fish every day of the week.

Next Steps

- Dresser said that he wanted to thank RTR for the quality presentation and that this is a lot of great information for the PRCC to consider. Grant PUD's pitch for this program is that this is very important to regional co-managers as well; without a program like this, it would be very hard to adaptively manage the populations in the basin. Rohrbach said that if there are any additional questions, please send them to RTR as soon as possible, and that this vote will be a decision item on January 27.

II. Next Meetings

The next regularly scheduled PRCC meeting will be on Tuesday, January 27, 2026, from 9:00 a.m. to 11:00 a.m., to be held virtually. A joint session with the HCP Coordination Committee for a Subyearling Chinook Salmon Workshop Recap will be held after the PRCC meeting.

III. Attachments

Attachment A – PROPOSAL: Avian Predation on ESA-listed Juvenile Salmonids on the Middle Columbia River, 2026

Attachment B – *Avian Predation on ESA-Listed Salmonids in the Middle Columbia River, 2026*



PROPOSAL: Avian Predation on ESA-listed Juvenile Salmonids in the Middle Columbia River, 2026

Submitted To: Priest Rapids Coordinating Committee/Grant County PUD

Submitted By: Real Time Research, Inc. (RTR)

Submitted On: January 5, 2026

Project Duration: Date of award – March 31, 2027

TECHNICAL PROPOSAL

PROJECT BACKGROUND

Grant County Public Utility District (GPUD) and the Priest Rapids Coordinating Committee (PRCC), with cost sharing from federal partners (U.S. Army Corps of Engineers {USACE}, Bonneville Power Administration {BPA}, and the Bureau of Reclamation {BOR}), have conducted a system-wide assessment of avian predation in the Columbia River basin since 2020. Work funded by GPUD/PRCC has focused on (1) evaluating the efficacy of the Inland Avian Predation Management Plan (IAPMP), (2) providing in-season data for adaptive management decisions to reduce avian predation, and (3) helping to identify emerging predation concerns in the middle Columbia River. The goal of the IAPMP is to reduce predation on ESA-listed juvenile salmonids by Caspian terns nesting at colonies in the Columbia River Plateau (CRP) region (USACE 2014). The Plan targeted the two largest historical tern colony breeding sites in the region, Crescent Island on the lower Columbia River and Goose Island in Potholes Reservoir adjacent to the middle Columbia River. The objectives of the Plan were to use passive nest dissuasion techniques (e.g., fencing, flagging, woody debris, and vegetation plantings) to eliminate tern nesting habitat and to use active nest dissuasion techniques (human hazing and egg collection) as an adaptive management tool to ensure terns were not able to establish colonies and raise young at either site. Concomitant with management implemented as part of the IAPMP, the Plan called for monitoring and evaluating the efficacy of those management components and actions at both the colony- and system-wide level (with cost sharing from the BOR, BPA, and USACE), including measuring changes in colony size and predation impacts of terns and other piscivorous waterbirds (e.g., double-crested cormorants, American white pelicans, California gulls) on ESA-listed juvenile salmonids.

To-date, results from studies funded by GPUD/PRCC have helped evaluate the outcome of on-going management, provide near real-time data to inform adaptive management decisions and actions, and have identified several new concerns involving avian predation in and around the middle Columbia River. Work has included close coordination with the BOR to help ensure management actions at Goose Island and elsewhere in Potholes Reservoir were effective during the breeding season. For instance, in both 2024 and 2025, with GPUD/PRCC funding, an incipient tern colony was discovered on an unnamed island in North Potholes Reservoir during aerial surveys. The BOR was immediately notified of the colony and within 48 hours active and passive nest dissuasion techniques were deployed to successfully prevent tern nesting at the site. The project has also worked closely with the Columbia River Inter-Tribal Fish Commission, the U.S. Fish and Wildlife Service, Yakama Nation, and the USACE to guide efforts in dissuading terns from nesting on islands in the middle and lower Columbia River where management authority exists. This research has also helped to identify several emerging predation concerns, like predation by American white pelicans on adult Sockeye Salmon, predation by double-crested cormorants on juvenile Chinook Salmon and steelhead nesting on Hanford Island, Island 20 (a new colony in 2024), and Crescent Island (a rapidly growing colony); all colonies that are capable of foraging on juvenile salmonids in the middle Columbia River. Although both colony size and smolt predation rates by Caspian terns nesting at managed colony sites have, on average, been reduced since implementation of the IAPMP, displaced terns have also recruited to extant or incipient colony sites in the CRP region (Roby et al. 2021, Evans et al. 2025). For example, terns have re-established the colony sites on Crescent Island and Goose Island, and terns have nested on islands in Banks Lake (a growing colony), Lenore Lake,

and on Finley Island (new colony in 2025); all islands within forage range of smolts in the middle Columbia River.

Preliminary results from 2025 indicate that the IAPMP Caspian tern colony size target of less than 40 breeding pairs was achieved at Goose Island colony (30 breeding pairs) but was exceeded at the Banks Lake (44 pairs) and the Crescent Island (147 pairs) colony sites. The overall target goal of less than 200 Caspian tern pairs at all CRP colonies combined was also exceeded, with an estimated 264 breeding pairs in 2025. The predation rate target goal of less than 2.0% per salmonid ESU/DPS, per colony was achieved at all colonies, except for the colony on Banks Lake, where terns consume an estimated 2.2% (1.5–3.3%) of Upper Columbia River steelhead. Predation at all other colonies was estimated to be < 1.0% per salmonid ESU/DPS in 2025. The rapid identification and subsequent dissuasion of terns on the unnamed island in North Potholes Reservoir in 2025 was successful, with terns consuming just 0.1% of available Upper Columbia River steelhead in the few days that colony existed. Preliminary data indicates that the cumulative predation rate on Upper Columbia River steelhead by all tern colonies in CRP region combined during smolt passage from Rock Island Dam to McNary Dam was 4.2% (3.2–5.7%), amongst the lowest observed since management commenced in 2014, and significantly lower than the average prior to management of 20.0% (17.3–23.0%).

Despite measurable success in reducing predation rates by tern colonies in recent years, predation by other colonial waterbird species (double-crested cormorants, American white pelicans, California and ring-billed gulls) have been similar to, and some cases substantially higher than, those of tern colonies. For example, preliminary results estimated the cumulative effects of consumption by Island 20 and Crescent Island gulls on Upper Columbia River steelhead during passage from Rock Island Dam to McNary Dam was 17.9% (13.5–23.5%) in 2025, amongst the highest levels observed since 2008. These results indicate the need for ongoing adaptive management to maximize and sustain the benefits to smolt survival associated with managing piscivorous waterbirds in the middle Columbia River. The rapidly growing colony of double-crested cormorants on Crescent Island (a colony that now the largest cormorant colony in the CRP region) has also resulted in higher levels of predation on juvenile salmonids, particularly on Chinook ESUs. Finally, several critical uncertainties remain, including a better understanding of the environmental and biological factors that influence smolt susceptibility to colonial waterbird predation in the middle Columbia River and how best to adaptively manage predators across large spatial scales.

PROJECT OVERVIEW

Work proposed here would be part of a system-wide effort to monitor, evaluate, and adaptively manage avian predation in the Columbia River basin with a focus on predation in the middle Columbia River. In 2026, BPA and USACE are funding research, monitoring, and evaluation studies focused on avian predation downstream of the confluence of the Snake and Columbia rivers (i.e., lower Columbia River). Work proposed here will include aerial and ground-based surveys needed to assess colony size and smolt predation rates (using smolt PIT tags detected/recovered on bird colonies) of both managed and unmanaged piscivorous waterbirds that forage on smolts in the middle Columbia River. Aerial surveys generally provide information on colony location and size at the time of the survey, while ground-based monitoring provides information on nesting chronology, nesting success, and factors

that influence nesting success. As was the case in previous years, the USACE and BOR will be funding ongoing management actions in the Columbia River estuary (USACE) and in Potholes Reservoir (BOR) in 2026. The USACE is planning to maintain elevated water levels in the John Day Reservoir to flood upland nesting habitat on the Blalock Islands to prevent tern nesting at this historical nesting site. The Confederated Tribes and Bands of the Yakama Nation are also planning to continue to dissuade gulls from nesting on Miller Rocks Island in The Dalles Reservoir in 2026.

Funding approval from the PRCC in 2026 would support avian predation studies for those colonies that are within foraging distance of the middle Columbia River, to include Potholes Reservoir, Lenore Lake, Banks Lake, Island 20, Hanford Island, and any incipient colonies that form in the region above the Snake River confluence. Funding from the PRCC would also supplement funding received from BPA to conduct a system-wide assessment of avian predation on ESA-listed salmonids and will produce information needed to adaptively manage ongoing avian predation management plans to maximize their benefits in increasing smolt survival (see [Table 1](#) for cost sharing). Specifically, this funding would allow us to (1) evaluate the response of Caspian terns and other piscivorous waterbirds to nest dissuasion activities, (2) determine changes in distribution and size of piscivorous colonial waterbirds nesting on or near the middle Columbia River, (3) determine relative changes in predation rates on salmonid smolts by piscivorous colonial waterbirds nesting on or near the middle Columbia River, and (4) provide technical assistance to the PRCC and regional partners in the development, and adaptive management, of short- and long-term plans to reduce predation on smolts during passage through the middle Columbia River. Finally, we propose to (5) estimate spatially- and temporally explicit avian predation rates on steelhead and yearling Chinook that are tagged as part of survival studies in the Priest Rapids Project (Wanapum and Priest Rapids dams and reservoirs) in 2026 (work that was approved by the PRCC in 2025, but was postponed until 2026). Because survival study smolts will be double-tagged (PIT, acoustic), precise and accurate estimates of colony-specific and cumulative predation can be generated within the Priest Rapids Project based on the acoustic array configuration used to estimate fish survival and the number of PIT tags from double-tagged fish that are recovered on bird colonies as part of this project (see [below](#) for additional details). The higher spatial resolution of these results can also be used to investigate environmental and biological factors associated with variation in predation and survival probabilities in the Priest Rapids Project.

Table 1. Proposed cost sharing for avian predation RM&E in the Columbia River basin in 2026. RM&E at colonies marked in (1) green would be completed with funding from BPA (approved), (2) yellow would be completed by USACE (if approved), and (3) blue would be completed with cost sharing from the PRCC (if approved). A system-wide assessment of avian predation would depend on receiving funding for all the work elements listed below. Avian predator species are Caspian terns (CATE), double-crested cormorants (DCCO), American white pelicans (AWPE), and California and ring-billed gulls (GULL). Research at select heron rookeries, those within foraging distance of the Middle Columbia River would also occur with funding from the PRCC (if approved).

System-wide Assessment of Avian Predation on the Survival of Juvenile Salmonids in the Columbia River basin, 2026

	Colony Census				PIT	Recovery	Predation Rates
	Flight 1	Flight 2	Flight 3	Ground			
Estuary							
East Sand CATE	X	X		X	X		X
East Sand DCCO	X	X		X	X		X
PIERs CATE	X	X		X	X		
Astoria/Megler Bridge DCCO	X	X		X	X		X
Channel Markers DCCO	X	X		X	X		
Rice Island CATE	X	X		X	X		X
Miller Sands Spit AWPE	X	X		X	X		X
Troutdale Towers DCCO	X	X		X	X		X
Incipient CATE/DCCO/AWPE	X	X		X	X		X
Loafing Sites (~1-2)	X	X		X	X		
Lower Columbia							
Miller Rocks GULL	X	X	X	X	X		X
Blalocks CATE/GULL	X	X	X	X	X		X
Crescent CATE/GULL/DCCO	X	X	X	X	X		X
Badger CATE/GULL/AWPE	X	X	X	X	X		X
Foundation DCCO	X	X	X	X	X		X
Incipient CATE/DCCO/AWPE	X	X	X	X	X		X
Mid-Columbia							
Island 20 GULL	X	X	X	X	X		X
Hanford Reach DCCO	X	X	X	X	X		X
Potholes CATE	X	X	X	X	X		X
Sprague CATE/DCCO	X	X	X	X	X		X
Lenore CATE	X	X	X	X	X		X
Banks CATE	X	X	X	X	X		X
Incipient CATE/DCCO/AWPE	X	X	X	X	X		X

PROJECT OBJECTIVES & TASKS

This work is part of a comprehensive program to implement avian predation management plans (including adaptive management), evaluate action effectiveness of those plans, and identify emerging predation concerns. Cost sharing provided by other agencies in 2026 (i.e., BPA, USACE, and BOR) greatly reduces the cost of the work proposed herein (i.e., an economy of scale).

Objective 1. Evaluate response of Caspian terns and other piscivorous colonial waterbirds to nest dissuasion activities on Goose Island and elsewhere in Potholes Reservoir.

As has been the case in years past, we anticipate that Caspian terns will attempt to nest on Goose Island and elsewhere in Potholes Reservoir in 2026. For instance, in both 2024 and 2025, a tern colony was on Goose Island and an incipient colony formed on an unnamed island in North Potholes Reservoir. In 2025, early detection of the North Potholes colony site was made possible by conducting a reconnaissance flight in April, followed by boat-based survey to confirm breeding behaviors. As part of adaptive management and under permit, the BOR then successfully dissuaded terns from the colony site. In 2026, we propose to conduct another early breeding season (April) aerial survey of Potholes Reservoir and of other tern nesting sites within foraging range of the middle Columbia River (e.g., islands in Banks Lake, Lenore Lake, and islands in Hanford Reach). We would then periodically (bi-weekly) monitor terns throughout the smolt out-migration period (April to June) to evaluate the efficacy of management actions aimed at reducing the size of tern colonies in 2026. A combination of boat-based and aerial surveys would be used to assess tern colony attendance (i.e., number of adults) and colony size (i.e., number of breeding pairs). Similar to years past, we would share in-season results with BOR and other action agencies in near real-time, information that will be used to adaptively manage tern dissuasion activities in 2026. Data collection methodologies used as part of this objective would follow established protocols (Antolos et al. 2004; Roby et al. 2014; Adkins et al. 2014; Collis et al. 2015, 2016, 2017; Evans et al. 2022, 2023, 2025) such that the data collected in 2026 could be compared with data collected in previous years.

Objective 2. Determine changes in nesting distribution and colony size of Caspian terns and other piscivorous colonial waterbirds on or near the mid-Columbia River

Periodic monitoring (bi-weekly or monthly, depending on the colony) would be conducted at colony sites within foraging range of the middle Columbia River to help evaluate the consequences of management actions implemented as part of the IAPMP. We would assess whether reductions in tern colony size associated with nest dissuasion actions in the Potholes Reservoir area, Crescent Island, and the Blalock Islands as part of the IAPMP were offset by increases in tern colony sizes elsewhere in the region. Specifically, we would examine whether occupancy or size of tern colonies increased at unmanaged sites such as Lenore Lake, Banks Lake, and potentially other colonies that may consume substantial numbers of juvenile salmonids (see [Objective 3](#)). In addition to Caspian terns, the location and size of double-crested cormorant, American white pelican, California and ring-billed gull, and great blue heron and great egret colonies would also be investigated as part of this objective, with the goal of evaluating changes in colony size and to identify new or emerging predation concerns in the middle Columbia River. Data collection methodologies used as part of this objective would follow established protocols (Antolos et al. 2004; Roby et al. 2014; Adkins et al. 2014; Collis et al. 2015, 2016, 2017; Evans et al. 2022, 2023) such that the data collected in 2026 could be compared with data collected in previous years. Finally, data on colony location and size collected as part of this objective

would also be used to determine which colony sites to scan for smolt PIT tags after the breeding season to estimate predation rates (see [Objective 3](#)).

Objective 3. Determine changes in survival and predation rates on salmonid smolts by Caspian terns and other piscivorous colonial waterbirds nesting on or near the mid-Columbia River.

Previous established methods would be used to estimate predation rates (percentage of available fish consumed by birds) on salmonid smolts by Caspian terns and other piscivorous colonial waterbird species in the CRP region that nest and forage upstream of the Snake River confluence on the middle Columbia River. Predation rates would be based on releases of PIT-tagged steelhead and, new for 2026, yearling Chinook at Rock Island Dam (RIS; see details [below](#)), as well as releases/detections of PIT-tagged fish from other locations (as part of other tagging studies in the region), to the extent adequate data exists. Data would be used to evaluate the relative susceptibility of salmonid populations to colonial waterbird predation by predator species (tern, cormorant, pelican, and gull) on both a weekly and annual basis during the smolt out-migration period (April – June). In 2024 and 2025, smolt PIT tags were also recovered from two newly formed great blue heron and great egret colonies or rookeries in the middle Columbia River, those on Hanford Island and Island 20. As a potential emerging predation concern, these sites would be scanned in 2026 if colonies form there again. Predation rates would also be estimated separately for wild- and hatchery-origin fish to the extent adequate data exists (see also [below](#)). Predation rates from 2026 would be compared and contrasted to results from previous years and management periods (pre- versus post-management) to evaluate the efficacy of management actions in the region to reduce predation.

With cost sharing from BPA, estimates of predation rates would also include estimates of the cumulative effects of avian predation (i.e., consumption by all avian predator species and colonies combined) during smolt passage from RIS to McNary Dam (McN), McN to Bonneville Dam (BON), and BON to the Pacific Ocean (see also Evans et al. 2019). Collectively, these analyses would address several system-wide, management-relevant questions and would update and maintain a standardized, multi-year avian predation dataset (2008–2026). In addition to estimates of avian predation, estimates of smolt survival or total mortality ($1 - \text{survival}$) within these same temporal- and spatial-scales would be generated as part of this Objective, providing data to evaluate relative changes in survival and how those changes are associated with changes in predation by piscivorous colonial waterbirds (see also Payton et al. 2020 for details). This work would follow established protocols and methods so that the results obtained in 2026 are directly comparable to those generated in previous years. A description of the methods used to tag, recover, and analyze smolt PIT tags from bird colonies to estimate predation and survival rates are provided below:

Task 3.1.a. RIS Steelhead PIT-tagging: In collaboration with Chelan County PUD, we propose to continue to PIT tag ~ 7,000 Upper Columbia River steelhead at Rock Island Dam in 2026. This is a critical dataset to determine relative changes in predation and survival using a long-term, standardized dataset for smolts last seen alive entering the Priest Rapids Project. Based on the run-timing of steelhead smolts at RIS in years past, we anticipate daily tagging would commence in mid-April and end in mid-June. Steelhead would be randomly selected for tagging (i.e., tagged regardless of their condition, origin, and size) and tagged in concert with, and in proportion to, the run at-large (tagged and untagged; see Evans et al. 2014). The sampling approach used at RIS ensures that steelhead from all natural spawning stocks (Entiat, Methow, Okanogan, and Wenatchee rivers) that enter the Priest Rapids Project are included in the sample and that smolts of all sizes, conditions, and

rear-types are included in the sample in proportion to their relative abundance; criteria that allows us to make credible inferences about the entire ESA-listed UCR steelhead population within the Priest Rapids Project. To assess rear-type more accurately, all presumed wild steelhead (fish with completely intact fins) would also be scanned for the presence of a coded wire tag.

Task 3.1.b. RIS Yearling Chinook PIT-tagging: In collaboration with Chelan County PUD, we propose to also PIT tag ~ 5,000 Upper Columbia River yearling Chinook at Rock Island Dam in 2026. Adequate sample sizes of yearling Chinook to estimate predation in the Priest Rapids Project have not been available since 2016. The investigation of yearling Chinook survival in the Priest Rapids Project in 2026 (see *below*), coupled with evidence that predation by gulls and double-crested cormorants are increasing, make 2026 a good year to tag both steelhead and yearling Chinook at RIS as part of this project. Similar to steelhead, weekly and annual estimates of yearling Chinook predation and survival during out-migration from RIS to the Pacific Ocean would be generated as part of this study in 2026. The sample size of ~ 5,000 yearling Chinook, as opposed to ~ 7,000 steelhead, is based on the minimum number needed in years past to generate precise estimates of both predation and survival and is smaller for Chinook due to anticipated lower rates of predation compared with steelhead. The same sampling scheme and methods used to PIT-tag steelhead at RIS (see [Task 3.2.a above](#)) would be used to tag yearling Chinook in 2026.

Note: In 2026, yearling Chinook and steelhead from RIS will also be double-tagged (acoustic, PIT; see [Objective 5 below](#)) to estimate survival through the Priest Rapids Project. The PIT-tagging of fish as part of this study will augment the tagging and release of double-tagged smolts by increasing sample sizes for use in predation studies and by having a random sample that is tagged in proportion to, and in concert with, the run at-large in the Priest Rapids Project.

Task 3.2. PIT tag recovery: Using previously established methods (see Evans et al. 2012), we would scan piscivorous waterbird colonies for smolt PIT tags and calculate colony-specific and ESU/DPS-specific predation rates. Portable pole-mounted antennas would be used to detect PIT tags *in situ* as soon as birds disperse from their breeding colonies, generally beginning in late-July or early-August. PIT tags would be detected at each colony site by systematically scanning the entire area occupied by birds during the breeding season (referred to as a “pass”) with multiple passes conducted at each colony. The area scanned by researchers would be determined based on aerial photography of the colony site and visits to the colony by researchers during the breeding season as part of [Objective 2](#) (see *above*).

Task 3.3. Survival and predation rate analyses: Following previously established methods (Hostetter et al. 2015; Payton et al. 2019), we would estimate predation rates and survival rates based on recoveries of smolt PIT tags on bird colonies and detections of live tagged fish during outmigration to the Pacific Ocean. Predation rates will be derived using the proportion of PIT tags found on each colony from the available population of PIT-tagged fish (i.e., smolt availability based on releases/detections of tagged fish upstream of the colony of interest), and then adjusting by the probability that a consumed PIT tag was subsequently deposited on-colony (i.e., deposition probability) and detected by researchers following the breeding season (i.e., detection probability). The mark-recapture-recovery model also incorporates live detections of tagged fish (e.g., at downstream in-river PIT tag arrays) in space and time, providing a way to jointly estimate predation and survival probabilities (see Payton et al. 2019). Results will be used to compare smolt losses amongst colonies and across years, data critical to determining the overall efficacy avian management plans. Use of these well-established methods will ensure that estimates of predation rates generated as part of this study are directly comparable to estimates from years past.

We will also estimate predation and survival rates based on a fish's rear-type (hatchery, wild) for steelhead and yearling Chinook smolts, to the extent adequate sample sizes exist. To evaluate if one group of fish (hatchery, wild) is more susceptible to bird predation than the other group, comparisons of rates will be made on a weekly and annual basis and then analyzed across the study period (year). This approach uses a standardized model with a common estimate of deposition and detection across categories, which facilitates increased precision (i.e., smaller bounds around the estimate; see also Evans et al. 2019). Finally, as part of this objective we will also estimate predation and survival of yearling Chinook and steelhead last recaptured (passive detections) at the Rocky Reach Dam juvenile bypass facility and Wenatchee River PIT-tag barge, to extent adequate data exists. These estimates will provide additional information on predation and survival in other groups of PIT-tagged fish and will add the population-specific (Wenatchee, Entiat, Methow, Okanogan) and aggregate predation and survival that was conducted by this project in 2025. Collectively, these analyses will provide management-relevant results from multiple salmonid species, at multiple spatial and temporal scales in the middle Columbia River.

Note: Funding from BPA will be used to evaluate the system-wide or cumulative effects of avian predation on PIT-tagged smolts, thereby reducing the analytical cost of this objective. Funding from BPA would also be used to quantify to what degree reductions in avian predation rates on steelhead and other ESA-listed species and populations result in higher rates of fish survival (i.e., to what degree predation is an additive source of fish mortality); a question that is paramount to understanding the potential efficacy of management aimed at reducing avian predation in the CRB (see also Payton et al. 2020).

Objective 4. Provide technical assistance to GPUD/PRCC in developing and adaptively managing short- and long-term plans to reduce avian predation on juvenile salmonids.

As part of this objective, we would continue to serve as technical advisors to GPUD/PRCC and other regional managers on issues concerning avian predation. This assistance would include, but is not limited to, (1) attending meetings with regional stakeholders, (2) providing requested in-season information/data, (3) giving presentations of research results, and (4) providing recommendations regarding emerging issues and adaptive management strategies.

Objective 5. Conduct an analysis of avian predation on double-tagged steelhead and yearling Chinook in the Priest Rapids Project.

Recoveries of PIT tags from fish that were double-tagged (acoustic, PIT), coupled with the last known detections of live fish passing telemetry arrays, can be used to estimate predation and survival at precise spatial and temporal scales (Evans et al. 2016). Data can also be used to quantify the foraging range of birds from specific colonies, to identify foraging hotspots, and determine what proportion of all smolt losses were due to avian predation in space and time. In 2026, survival studies that utilize double-tagged steelhead in the Priest Rapids Project are scheduled to commence, providing a unique opportunity to estimate avian predation at much finer spatial and temporal scales than what is possible with PIT-tagged only fish. Detections of single-tagged (PIT-tagged only) fish are generally limited to dams with bypass facilities or in-river PIT tag arrays, sites where detection probabilities are often low, like at the McNary Dam juvenile bypass facility. Conversely, extremely high detection probabilities (e.g., 1.0 or 100%) of acoustic tags at in-river arrays result in the ability to generate precise estimates of predation and

survival (Evans et al. 2016).

We propose to use the previously published methods of Evans et al. (2016) to estimate colony-specific and cumulative predation of double-tagged steelhead and yearling Chinook, including an analysis of predation hotspots and high-resolution estimates of where, spatially, and when, temporally, smolts were consumed by specific avian predator species and colonies that foraged in the Priest Rapids Project in 2026. Analyses will extend to river reaches outside of the Project, to the extent telemetry arrays and tag life allow. [Appendix A, Table A.1](#) and [A2 \(below\)](#) provide examples of results from Evans et al. (2016). Analyses on double-tagged smolts in the Priest Rapids Project were also conducted in 2016 (Roby et al. 2017). Several new colonies in the middle Columbia River have formed since 2016, including the Lenore Lake tern colony and the Hanford Island cormorant colony. Results of this project can also be used to quantify to what degree avian predation limited the survival of steelhead and yearling Chinook within the Priest Rapids Project relative to other, non-avian sources of mortality in the Project. Finally, as part of the project, we will investigate if weekly variation in predation and survival was associated with environmental and biological conditions experienced by smolts during outmigration through the telemetry array system, to the extent adequate data exists.

Note: This analysis was originally proposed and approved by the PRCC for funding in 2025. The analysis, however, could not occur in 2025 because the study was postponed until 2026. The task description herein is unchanged from 2025, with the exception that we added an analysis of predation on double-tagged yearling Chinook in 2026. The analysis of yearling Chinook would be conducted at no additional cost. These analyses, however, rely on detections (recoveries) of PIT tags on bird colonies in 2026, data that would be collected as part of Objective 3.

SCHEDULE

Feb – Mar 2026	Hire field crew & submit research permit applications (WDFW, USFWS, BOR)
Apr – Jul 2026	Colony monitoring
Apr – Jun 2026	PIT-tagging of steelhead and yearling Chinook at Rock Island Dam
Jul – Oct 2026	PIT tag recovery on bird colonies
Jan 2027	Submit draft Annual Report
Mar 2027	Submit final Annual Report

DELIVERABLES

Research results would be presented in (1) an Annual Report, (2) periodic in season reports, (3) peer-reviewed journal articles, and (4) presentations at regional planning meetings and other professional meetings.

LITERATURE CITED

- Adkins, J.Y., D.E. Lyons, P.J. Loschl, D.D. Roby, K. Collis, A.F. Evans, and N.J. Hostetter. 2014. Demographics of piscivorous colonial waterbirds and management implications for ESA-listed salmonids on the Columbia Plateau. *Northwest Science* 88:344-359.
- Antolos, M., D.D. Roby, and K. Collis. 2004. Breeding ecology of Caspian terns at colonies on the Columbia Plateau. *Northwest Science* 78:303-312.

- Collis, K., D.D. Roby, P.J. Loschl, Y. Suzuki, A. Munes, J. Mulligan, E. Schniedermeyer, A.F. Evans, B. Cramer, A. Turecek, and Q. Payton. 2015. Implementation of the Inland Avian Predation Management Plan, 2015. 2015 Final Report. Submitted to the U.S. Army Corps of Engineers – WallaWalla District and the U.S. Bureau of Reclamation.
- Collis, K., D.D. Roby, P.J. Loschl, Y. Suzuki, K. Kelly, E. Schniedermeyer, A.F. Evans, B. Cramer, A. Turecek, and Q. Payton. 2016. Implementation of the Inland Avian Predation Management Plan, 2016. 2016 Final Report. Submitted to the U.S. Army Corps of Engineers – Walla Walla District and the U.S. Bureau of Reclamation.
- Collis, K., A.F. Evans, B. Cramer, A. Turecek, Q. Payton, K. Kelly, F. Stetler, S. Fitzmaurice, and P.J. Loschl. 2017. Implementation of the Inland Avian Predation Management Plan, 2017. 2017 Final Report. Submitted to the U.S. Army Corps of Engineers – Walla Walla District and the U.S. Bureau of Reclamation.
- Evans, A.F., N.J. Hostetter, D.D. Roby, K. Collis, D.E. Lyons, B.P. Sandford, R.D. Ledgerwood, and S. Sebring. 2012. Systemwide evaluation of avian predation on juvenile salmonids from the Columbia River based on recoveries of passive integrated transponder tags. *Transactions of the American Fisheries Society* 141: 975-989.
- Evans A.F., N.J. Hostetter, K. Collis, D.D. Roby, and F.J. Loge. 2014. Relationship between juvenile fish condition and survival to adulthood in steelhead. *Transactions of the American Fisheries Society* 143:899–909.
- Evans, A.F., Q. Payton, A. Turecek, B. Cramer, K. Collis, D.D. Roby, P.J. Loschl, L. Sullivan, J. Skalski, M. Weiland, and C. Dotson. 2016. Avian Predation on Juvenile Salmonids: Spatial and Temporal Analysis Based on Acoustic and Passive Integrated Transponder Tags. *Transactions of the American Fisheries Society* 145: 860-877.
- Evans, A.F., Q. Payton, B.M. Cramer, K. Collis, N.J. Hostetter, D.D. Roby, and C. Dotson. 2019. Cumulative effects of avian predation on Upper Columbia River Steelhead. *Transactions of the American Fisheries Society* 148:896-913.
- Evans, A. F., K. Collis, D. D. Roby, N. V. Banet, A. Turecek, Q. Payton, B. Cramer, and T. J. Lawes. 2022. Avian Predation in the Columbia River basin: 2021 Final Annual Report. Submitted to the Bonneville Power Administration, Portland, Oregon and the Grant County Public Utility District/Priest Rapids Coordinating Committee, Ephrata, Washington. 128 pp.
- Evans, A. F., K. Collis, N. V. Banet, J. Marchiani, E. Casey, Q. Payton, B. Cramer, D.D. Roby, and T. J. Lawes. 2023. Avian Predation in the Columbia River basin: 2022 Final Annual Report. Submitted to the Bonneville Power Administration, Portland, Oregon and the Grant County Public Utility District/Priest Rapids Coordinating Committee, Ephrata, Washington. 128 pp.
- Evans, A. F., N. V. Banet, Q. Payton, H. Krueger, K. Adase, D. Devincenzi, A. Peck-Richardson, A. R. Piggott, W. Kennerley, and R. A. Orben. 2025. Avian Predation in the Columbia River basin: 2024 Final Annual Report. Submitted to the Bonneville Power Administration, Portland, Oregon and the Grant County Public Utility District/Priest Rapids Coordinating Committee, Ephrata, Washington. 130 pp.

- Hostetter, N.J., A.F. Evans, B.M. Cramer, K. Collis, D.E. Lyons, D.D. Roby. 2015. Quantifying avian predation on fish populations: Integrating predator-specific deposition probabilities in tag-recovery studies. *Transactions of the American Fisheries Society* 144:410-422.
- Payton, Q., N.J. Hostetter, and A.F. Evans. 2019. Jointly estimating survival and mortality: Integrating recapture and recovery data from complex multiple predator systems. *Environmental and Ecological Statistics* 26:107-125.
- Payton, Q., A.F. Evans, N.J. Hostetter, D. D. Roby, B. Cramer, and K. Collis. 2020. Measuring the additive effects of predation on prey survival across spatial scales. *Ecological Applications* 30 (8):e02193.
- Roby, D.D, K. Collis, P.J. Loschl, J. Tennyson, Y. Suzuki, A. Munes, S. Toomey, A.F. Evans, B. Cramer, A. Turecek, and Q. Payton. 2014. Implementation of the Inland Avian Predation Management Plan, 2014. 2014 Final Report. Submitted to the U.S. Army Corps of Engineers – Walla Walla District.
- Roby D. D, A. F. Evans, and K. Collis (editors). 2021. Avian Predation on Salmonids in the Columbia River Basin: A Synopsis of Ecology and Management. A synthesis report submitted to the U.S Army Corps of Engineers, Walla Walla, Washington; the Bonneville Power Administration, Portland, Oregon; the Grant County Public Utility District/Priest Rapids Coordinating Committee, Ephrata, Washington; and the Oregon Department of Fish and Wildlife, Salem, Oregon. 788 pp.
- USACE (U.S. Army Corps of Engineers). 2014. Inland Avian Predation Management Plan: Environmental Assessment, January 2014. U.S. Army Corps of Engineers, Walla Walla District, Northwestern Division, Walla Walla, Washington.

COST BY OBJECTIVE

Estimated cost of the work proposed to the GPUD/PRCC in 2026 are provided by objective (see *below*). As was the case in previous years, most of the funding for avian predation RM&E in the Columbia River Basin in 2026 will come from other sources (e.g., BPA).

Objective	Description	Estimated Cost
1	Evaluate response of Caspian terns and other piscivorous colonial waterbirds to nest dissuasion activities on Goose Island and elsewhere in Potholes Reservoir	\$48,866
2	Determine changes in the nesting distribution and colony size of Caspian terns and other piscivorous colonial waterbirds on or near the mid-Columbia River	\$90,755
3	Determine changes in survival and predation rates on PIT-tagged salmonid smolts by Caspian terns and other piscivorous colonial waterbirds nesting on or near the mid-Columbia River	\$206,486
4	Provide technical assistance to GPUD/PRCC in developing and adaptively managing short- and long-term plans to reduce avian predation on juvenile salmonids	\$13,775
	Total Cost (newly proposed)	\$359,882
5	Conduct an analysis of avian predation on double-tagged steelhead and yearling Chinook in the Priest Rapids Project	\$36,549 (previously approved)

APPENDIX A: Examples of avian predation results from double-tagged smolts in 2014

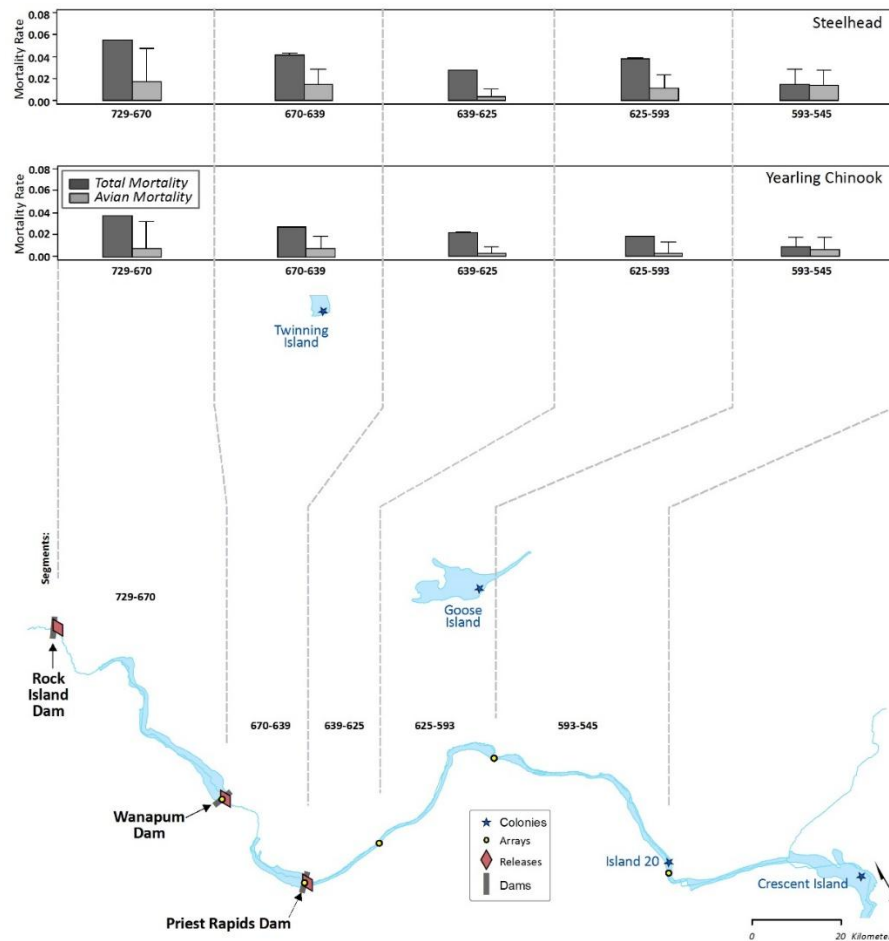


Figure A.1 Estimated total mortality and mortality due to predation by birds from four breeding colonies on tagged smolts in a section of the middle Columbia River in 2014. Locations of smolt release sites (red diamonds), acoustic arrays (yellow dots), bird colony sites (blue stars), and hydroelectric dams (grey bars) are shown. Figure from Evans et al. (2016).

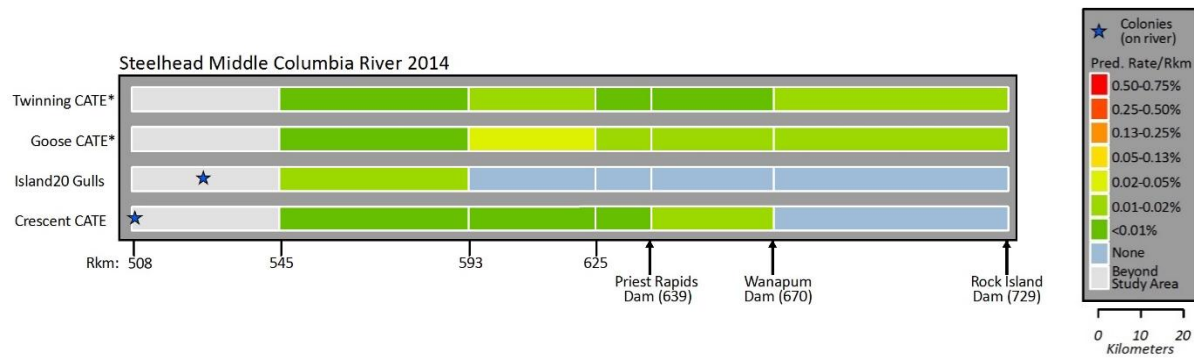


Figure A.2. Bird colony-specific locations of predation on tagged juvenile steelhead in the middle Columbia River in 2014. Results are depicted as predation rates per river kilometer (Rkm). Species of fish-eating colonial waterbirds evaluated include Caspian terns (CATE), double-crested cormorants (DCCO), California and ring-billed gulls (Gulls), and American white pelicans (AWPE). An asterisk next to a colony site denotes that the colony is located off-river. Figure from Evans et al. (2016).

AVIAN PREDATION ON ESA-LISTED SALMONIDS IN THE MIDDLE COLUMBIA RIVER, 2025

**PRESENTATION TO THE PRIEST RAPIDS
COORDINATING COMMITTEE**

January 14, 2026



PRESENTATION OUTLINE



BACKGROUND

Inland Avian (tern) Predation Management Plan
Predation by other avian predator species



STUDY OBJECTIVES

Evaluate the efficacy of IAPMP
Document colony locations and sizes
Estimate predation rates
Mid-C predation and survival modelling schemes



PRELIMINARY RESULTS

Tern colony locations and size
Other piscivorous waterbird colony locations/sizes
Colony-specific and cumulative predation rates
An update on modelling schemes



BACKGROUND: CASPIAN TERNS

- High per capita predation effects
- Plunge-diving foragers
- Disproportionally consume steelhead
 - Predation rates on UCR steelhead > 20% prior to management in some years

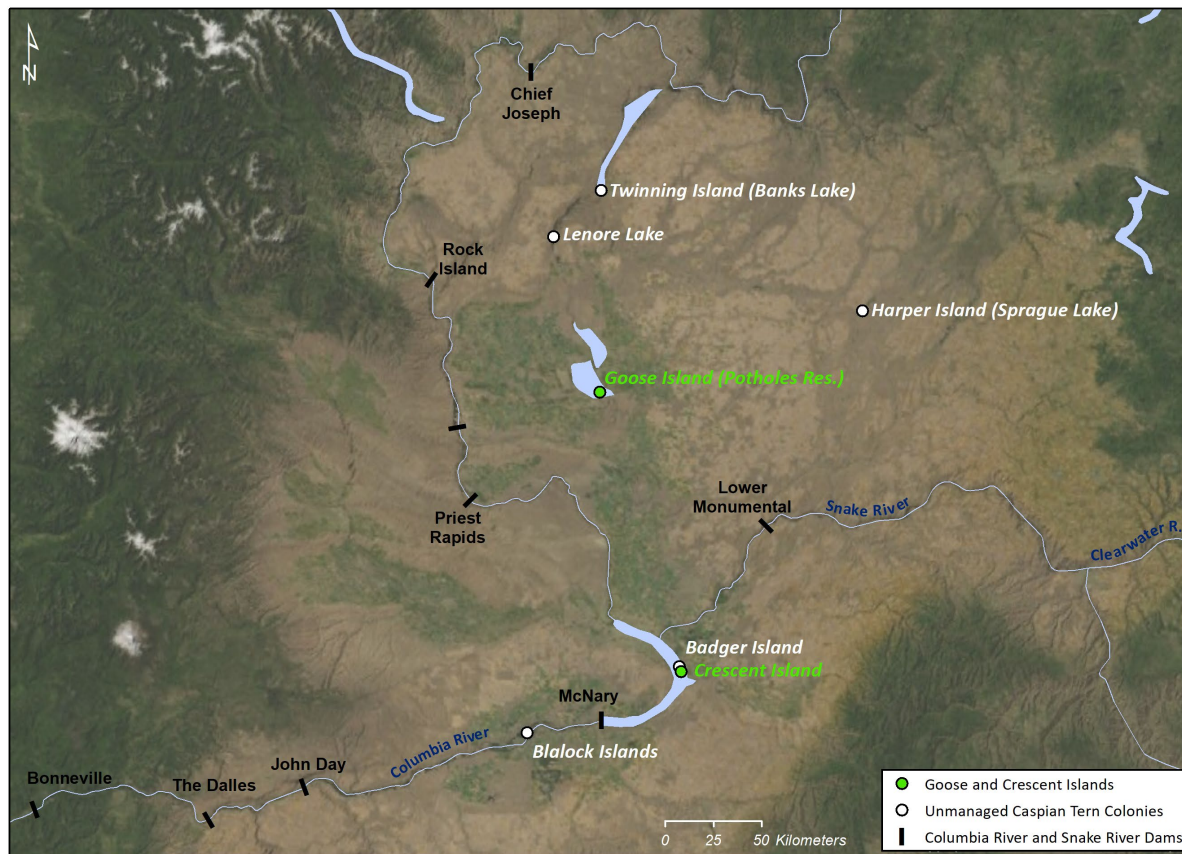


BACKGROUND

Inland Avian Predation Management Plan



HISTORICAL TERN COLONY LOCATIONS (CPR)



INLAND AVIAN PREDATION MANAGEMENT PLAN



NEST DISSUASION

Passive & active dissuasion to prevent tern nesting on Goose and Crescent islands



COLONY & PREDATION MONITORING

Changes in tern nesting distribution, colony sizes, and predation rates in the CPR



ADAPTIVE MANAGEMENT

At both managed and unmanaged tern colonies in the CPR



Tern Colony Size

- < 40 breeding pairs - per colony
- < 200 breeding pairs - regionwide

Tern Predation Rates

- < 2% predation rate - per colony
- < 5% predation rate - regionwide



OTHER PISCIVOROUS WATERBIRD SPECIES

- **Double-crested Cormorants**
 - High per capita predation effects
 - Consume smolts in proportion to availability
- **California and Ring-bill gulls**
 - Most numeric but not strictly piscivorous
 - Steelhead most susceptible
- **American White Pelicans**
 - Historically one colony in CPR (Badger Island)
 - Consumes both juvenile and adult salmonids
- **Great Blue Herons and Great Egrets**
 - Limited but increasing amount of data
 - Shallow-water foragers
- **Other species (e.g., grebes, mergansers)**
 - Less numeric, limited data
 - Often consume smaller-sized fishes



2025 PRCC FUNDED PROJECT GOALS

OBJECTIVE 1

Assess efficacy of
tern management

OBJECTIVE 2

Assess changes in
colony size (terns and
other predator
species)

OBJECTIVE 3

Assess changes in
predation rates
(terns and other
predator species)

OBJECTIVE 4

Provide technical
assistance for
adaptive management
(terns and other
predator species)

OBJECTIVE 5

Mid-C predation
and survival
modelling schemes

- PRCC funding was for colonies within foraging distance of the Priest Rapids Project and the lower sections of the Mid-C to the confluence of the Snake River.
- BPA funding was for colonies within foraging distance of the Lower Snake River, Lower Columbia River, and Columbia River Estuary

2025 STUDY AREA

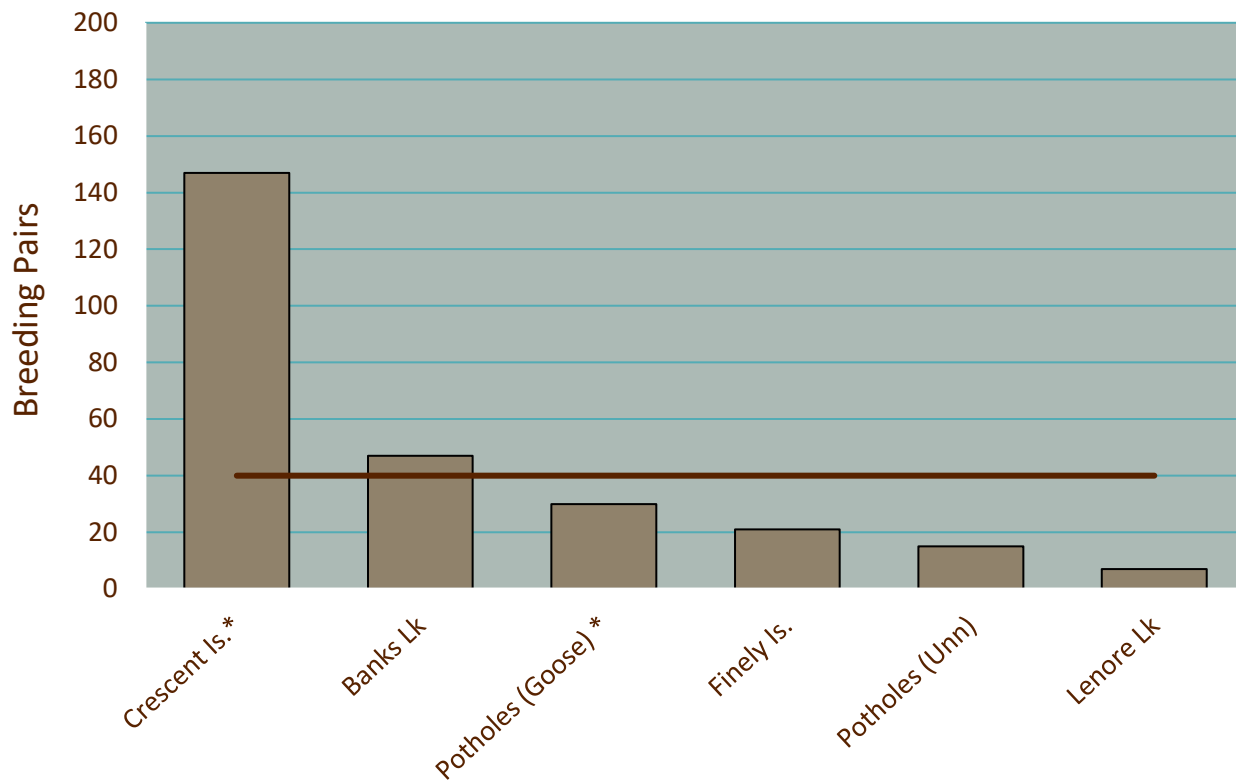


2025 PRELIMINARY RESULTS

Colony Sizes



2025 Caspian Tern Colony Sizes



Preliminary

BOR – APHIS

- Limited tern nesting to < 40 pairs, with a peak count of 30 pairs in 2025
- Continued high fidelity to Goose Island, with prospecting terns observed throughout the breeding season
- Report from BOR in-prep.



ADAPTIVE MANAGEMENT (North Potholes)

PRCC FUNDED RM&E DISCOVERS NEW COLONY

RTR aerial survey located a gull colony in North Potholes Reservoir on 27 April 2025

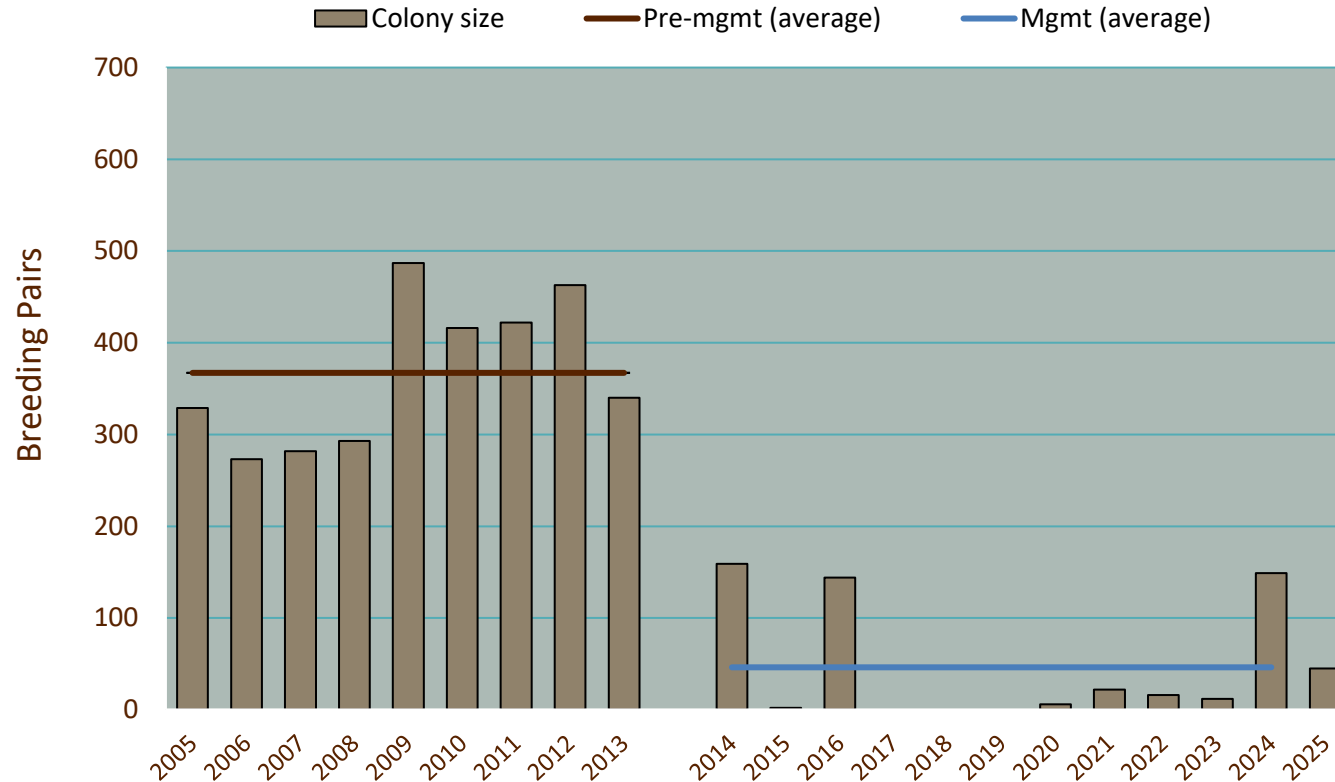
RTR boat-based survey confirmed small numbers of nesting terns (~ 15 pair) amongst gulls; BOR notified

ADAPTIVE MANAGEMENT IMPLEMENTED

BOR via APHIS passively dissuaded terns from the island within 48 hours



TERN COLONY SIZE (Goose & surrounding islands)

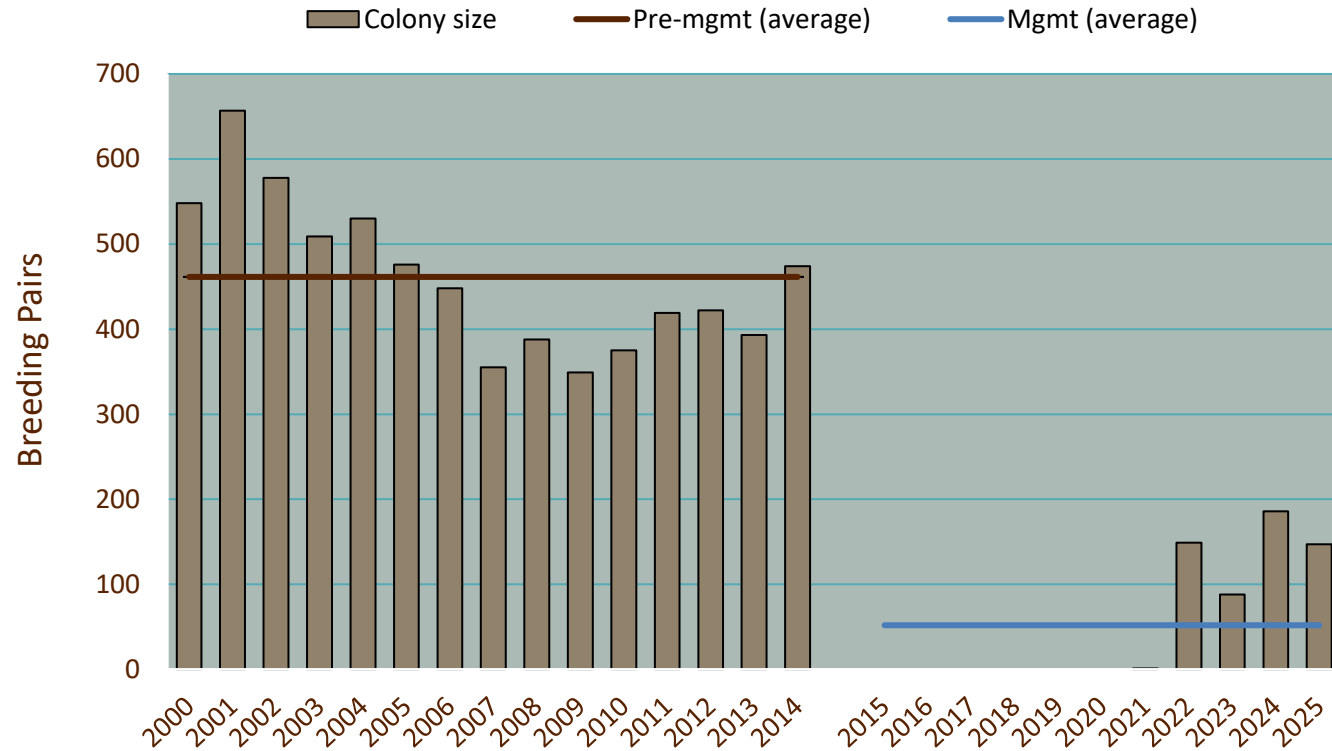


Preliminary

MANAGEMENT (Crescent Island)



TERN COLONY SIZE (Crescent Island)

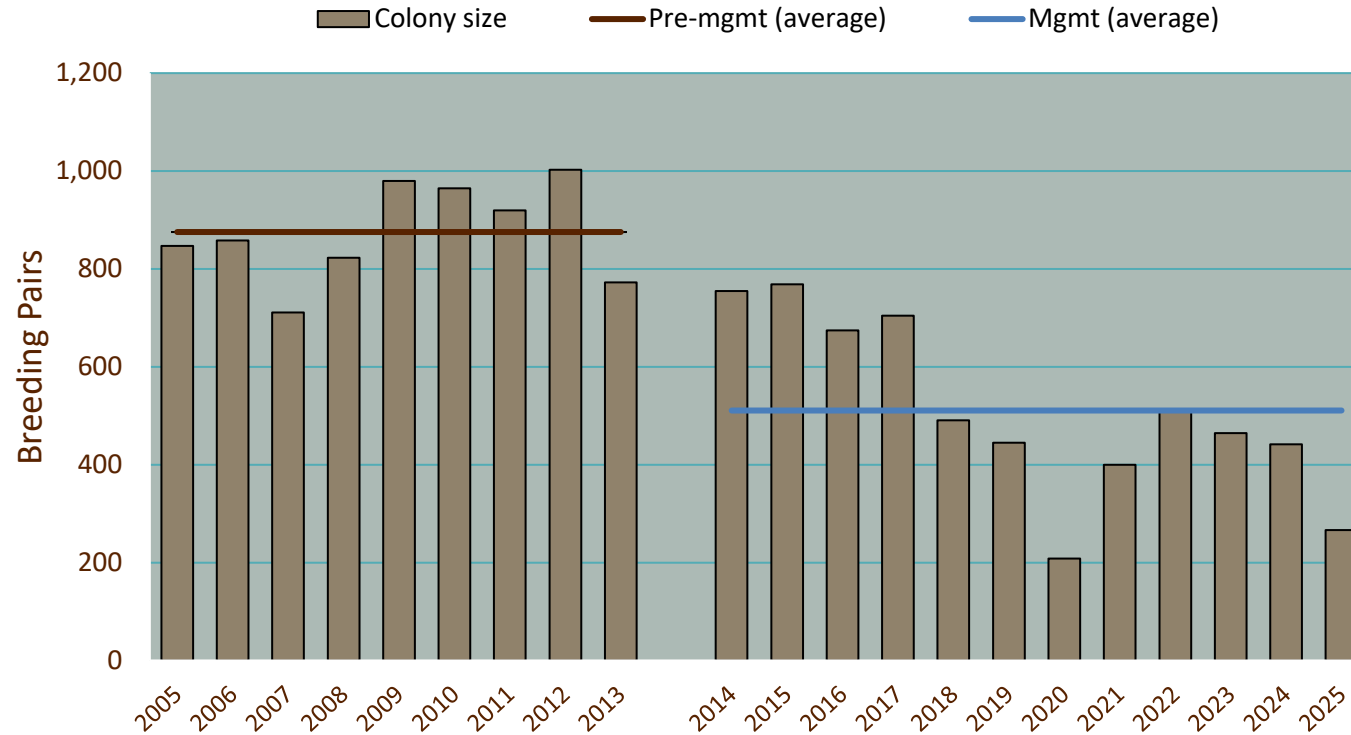


Preliminary

TERN COLONY SIZE (Crescent Island)



TERN COLONY SIZE (All CRP)



Preliminary

2025 COLONY SIZE (Other Avian Species)

Colony *	Gulls	Cormorants	Pelicans	Hérons
Murdock Towers		66		
Miller Rocks (CR)	4,915 ↑			
Crescent Is. (CR)	3,217	545	2,815 ↑	
<i>Badger Is. (CR)</i>	0 ↓		0 ↓	
Island 20 (MC)	9,271 ↑			114 ↑
Hanford Is. (MC)		87		21
Goose Is. (Off-river)	11,150	91 ↑		54
Okanogan (MC)		34 ↓		

Arrow indicates > 10% increase or decrease relative to 2024

* Partial list of monitored colonies; complete list provided in the 2025 Annual Report to BPA/PRCC



Preliminary

SUMMARY OF RESULTS (Colony Monitoring)



CONTINUED FIDELITY OF TERNS TO REGION

Terns attempting to nest on islands in Potholes Reservoir and the Crescent Island colony is now re-established and nesting habitat for future colony expansion exists.



ADAPTIVE MANAGEMENT UNDERWAY

Occurring at Potholes R. and Blalocks, and to a lesser degree Crescent. Efforts largely successful at Potholes and Blalock but not Crescent.



69% DECLINE IN REGIONAL TERN POP (2025)

Breeding population declined as much as 76% in 2020; average of 42% during management periods. Total number of terns remains above target of 200 pairs (267 pairs in 2025)



OTHER AVIAN PREDATORS MORE NUMEROUS

Gulls most numerous, followed by pelicans. Cormorant colony at Crescent now largest in CRP for two consecutive years.



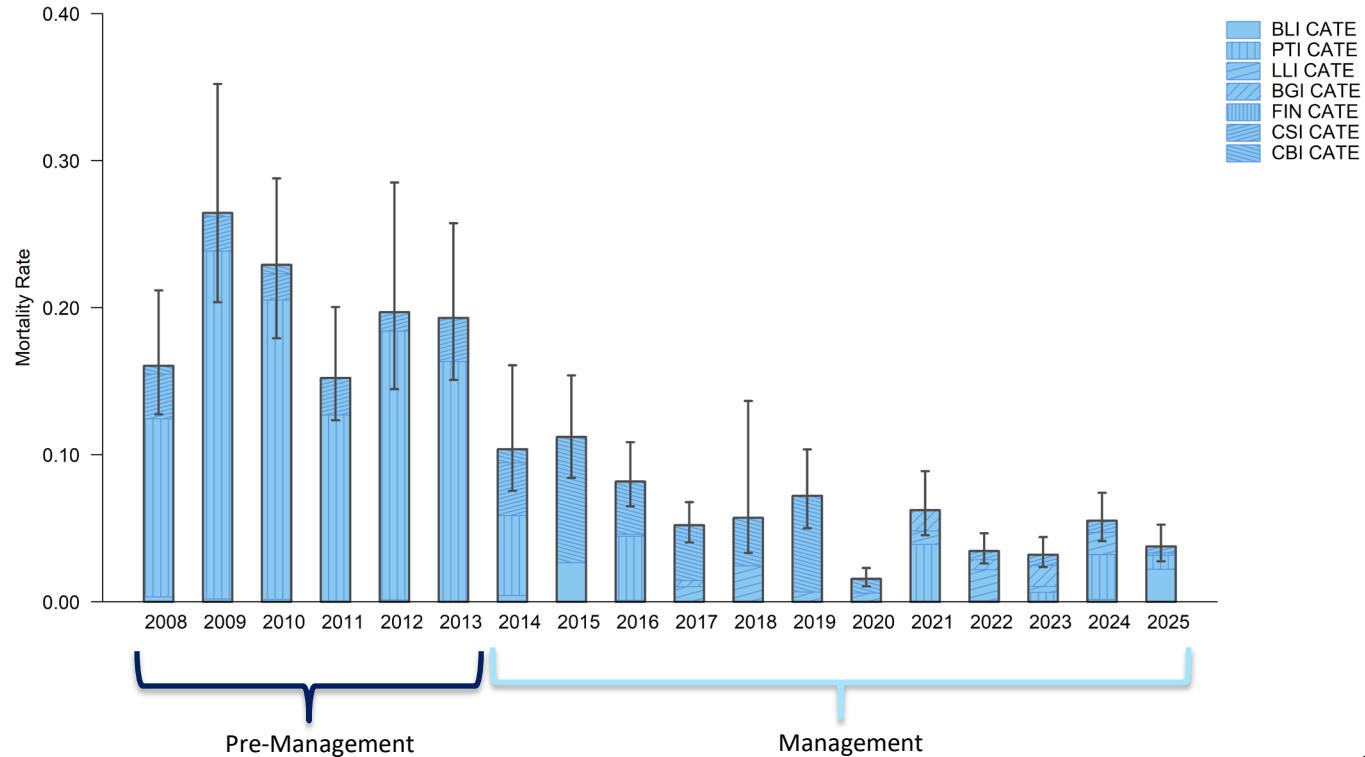
2025 PRELIMINARY RESULTS

Predation Rates



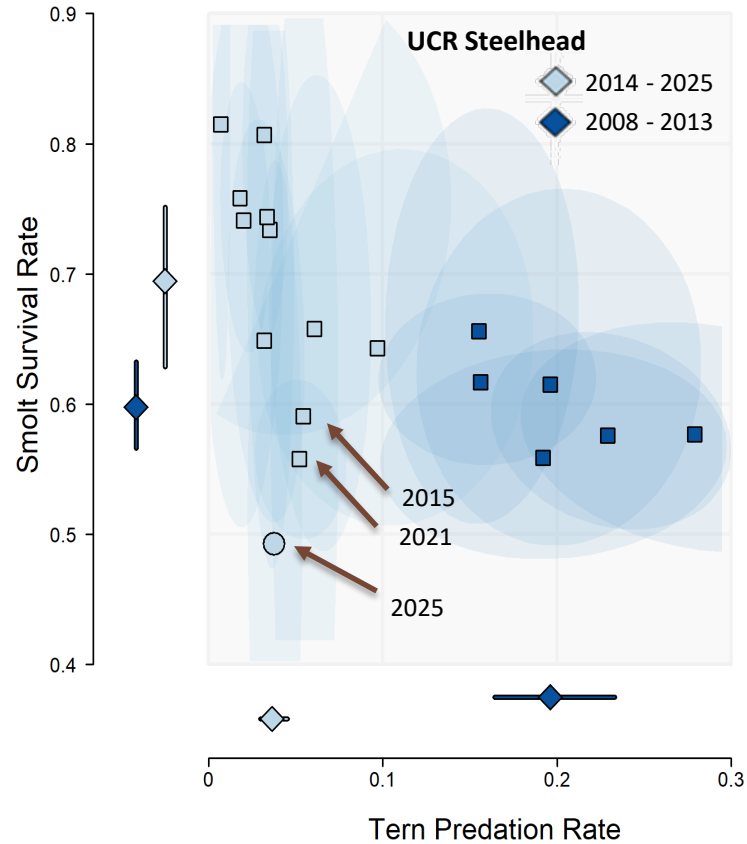
TERN PREDATION RATES (CPR)

UCR Steelhead



Preliminary

TERN PREDATION RATES AND SURVIVAL (RIS TO MCN)



Preliminary

2025 GULL CONSUMPTION (CPR)

ESU/DPS	Island 20	Crescent Is.	Miller Rocks Is.
UCR Steelhead	9.4% (6.8–13.8)	8.4% (5.8–12.1)	11.3% (6.2–19.9)
UCR Sp Chinook	NA	NA	NA
SR Steelhead	2.8% (2.0–4.1)	8.1% (2.9–11.33)	9.8% (6.8–14.2)
SR Sockeye	0.9% (0.5–1.9)	11.0% (7.4–18.4)	6.0% (2.8–12.0)
SR Sp/Su Chinook	0.4% (0.2–0.6)	0.7% (0.1–1.7)	1.4% (0.9–2.3)
SR Fall Chinook	0.2% (0.1–0.4)	2.5% (1.0–5.8)	2.3% (1.3–7.1)

- Estimates in 2025 were amongst the highest observed to-date. Similar to, or higher than, those in 2015 and 2021 (other years of elevated gull consumption rates).

Preliminary

2025 CORMORANT PREDATION (CPR)

ESU/DPS	Handford Is.	Island 20	Crescent Is.	Murdock Towers
UCR Steelhead	0.2% (0.1–0.6)	< 0.1%	1.5% (0.8–2.6)	0.6% (0.3–1.5)
UCR Sp Chinook	NA	NA	NA	0.8% (0.2–2.2)
SR Steelhead	< 0.1%	< 0.1%	5.7% (3.5–9.6%)	0.4% (0.3–0.6)
SR Sockeye	< 0.1%	< 0.1%	4.9% (3.3–8.2%)	1.9% (0.8–4.5%)
SR Sp/Su Chinook	< 0.1%	< 0.1%	2.6% (1.7–4.1%)	0.3% (0.2–2.2%)
SR Fall Chinook	< 0.1%	< 0.1%	1.5% (0.9–2.6%)	1.2% (0.9–3.2%)

Preliminary

2025 PELICAN PREDATION (CPR)

ESU/DPS	Crescent Island
UCR Steelhead	0.2% (0.1–1.8)
UCR Sp Chinook	NA
SR Steelhead	0.2% (0.1–1.5)
SR Sockeye	0.3% (0.1–1.2)
SR Sp/Su Chinook	0.2% (0.1–1.6)
SR Fall Chinook	0.2% (0.1–1.2)

- Impacts on select stocks (e.g., Yakima, Umatilla, and URB Chinook) are consistently higher than on UCR & SR smolts (Evans et al. 2024)
- Consume adult-sized salmonids, especially sockeye, and impacts were substantial in some years (upwards of 8% of upstream migrants, 47,000 adults annually {Payton et al. 2025})

Preliminary

2025 HERON PREDATION (CPR)

ESU/DPS	Goose Is.	Hanford Is	Island 20
UCR Steelhead	< 0.1%	0.2% (0.1-0.5)	< 0.1%
UCR Sp Chinook	NA	NA	NA
SR Steelhead	< 0.1%	< 0.1%	< 0.1%
SR Sockeye	< 0.1%	< 0.1%	< 0.1%
SR Sp/Su Chinook	< 0.1%	< 0.1%	< 0.1%
SR Fall Chinook	< 0.1%	< 0.1%	< 0.1%

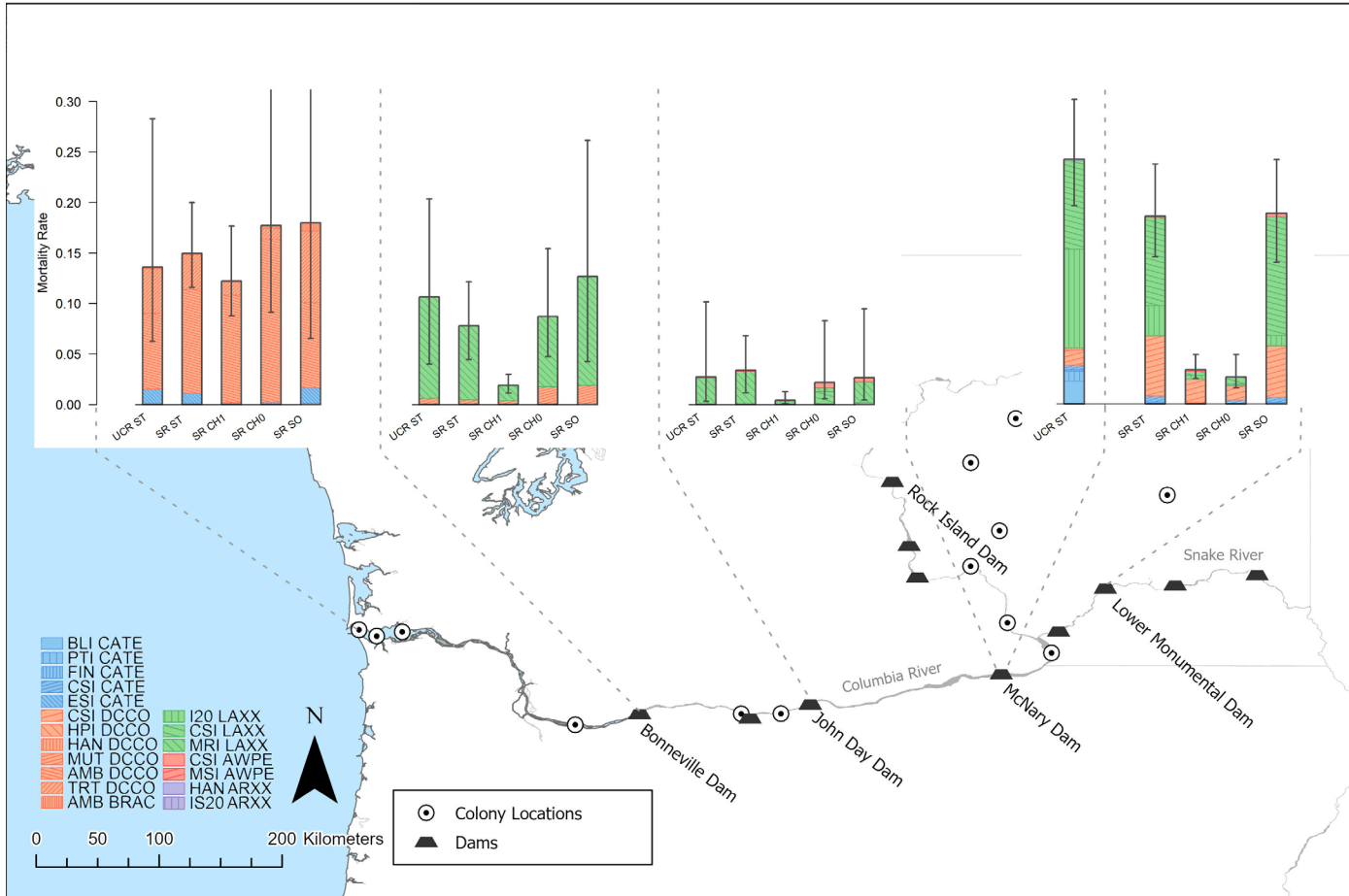
- Impacts on actively migrating UCR & SR smolts were low to non-existent
- Potential impacts by Island 20 herons on smolts released downstream the Yakima River, however, may be more substantial, with 87% of all tags recovered coming from MCR salmonids.

Preliminary

SYSTEM-WIDE PREDATION RATES (CRB)



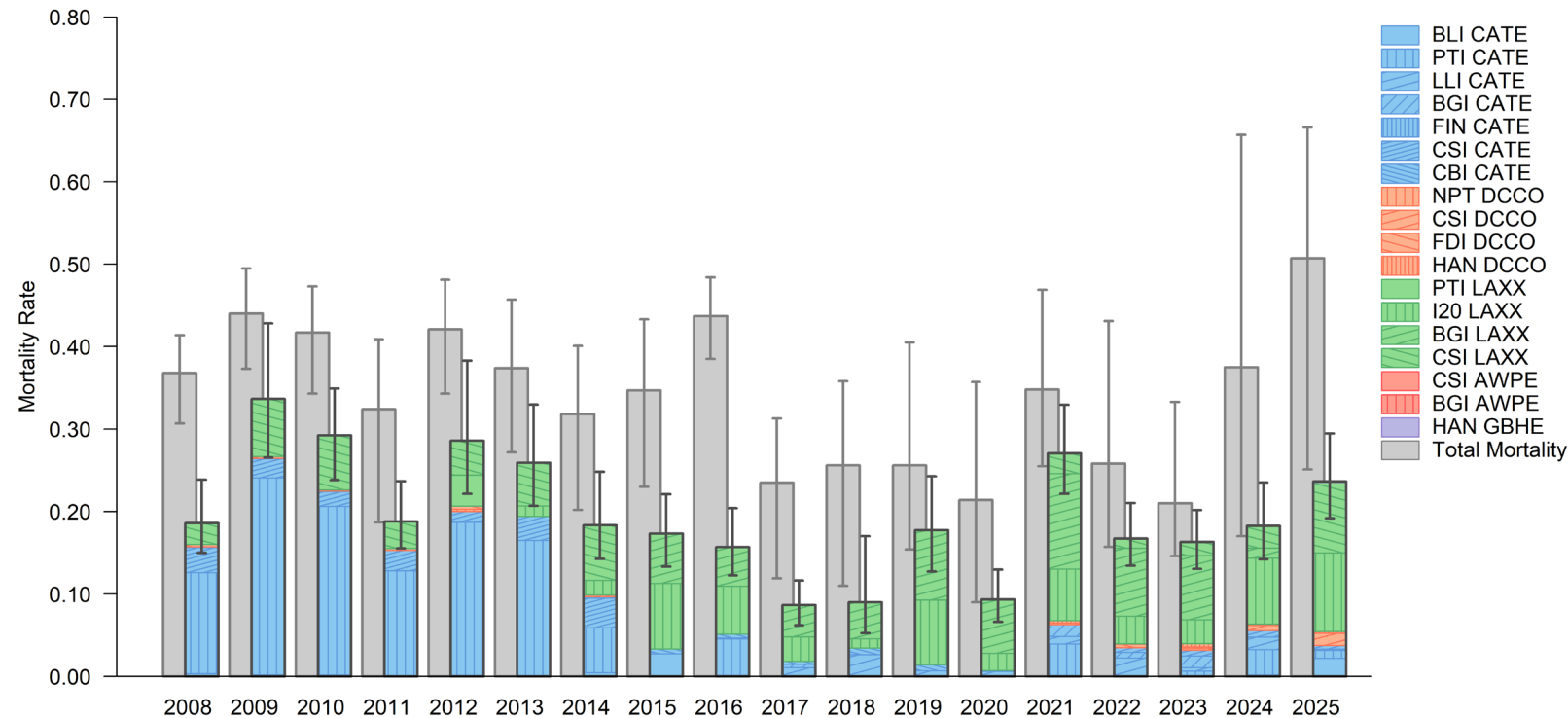
2025 REACH-SPECIFIC PREDATION RATES (System-wide)



Preliminary

CUMULATIVE PREDATION & SURVIVAL (RIS TO McN)

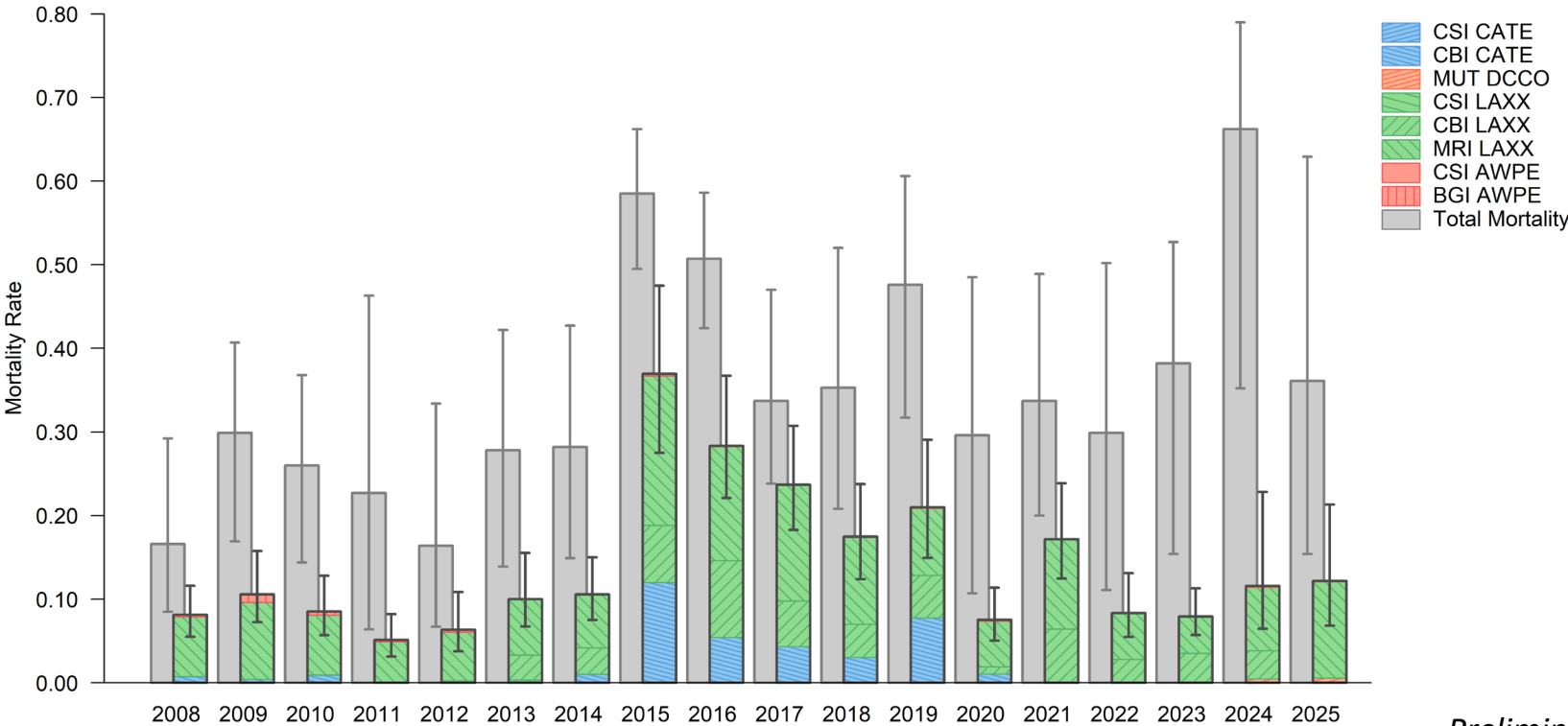
Upper Columbia River Steelhead



Preliminary

CUMULATIVE PREDATION & SURVIVAL (McN to BON)

Upper Columbia River Steelhead

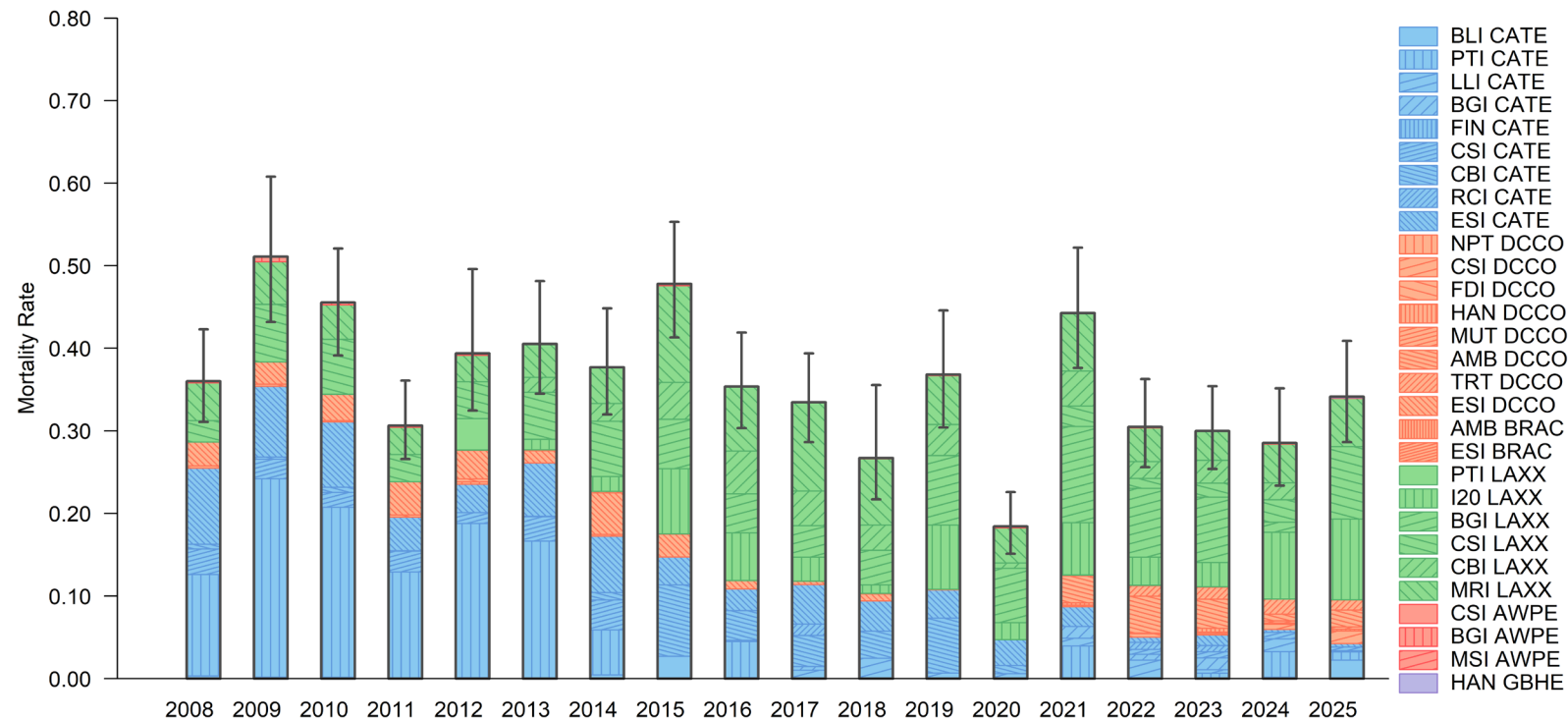


Preliminary

CUMULATIVE PREDATION (RIS to PACIFIC OCEAN)

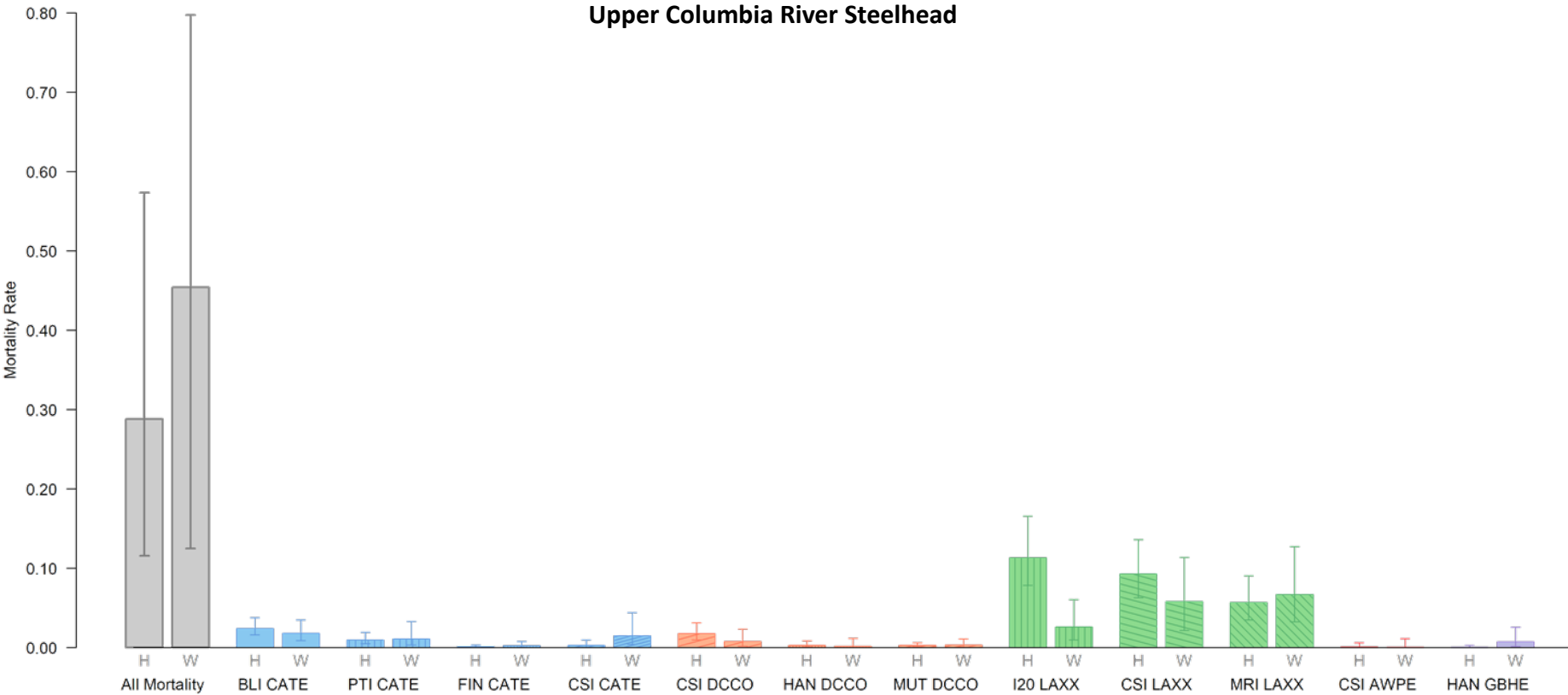


Upper Columbia River Steelhead



Preliminary

2025 PREDATION BY REAR-TYPE (RIS_BON)



Preliminary

SUMMARY OF RESULTS (Tern Predation Rates)



LOWER LEVELS OF TERN PREDATION SINCE MANAGEMENT

Predation lower, on average, following tern management in CPR. 2025 IAPMP predation goals achieved.



SYSTEM-WIDE PREDATION LEVELS SUBSTANTIAL

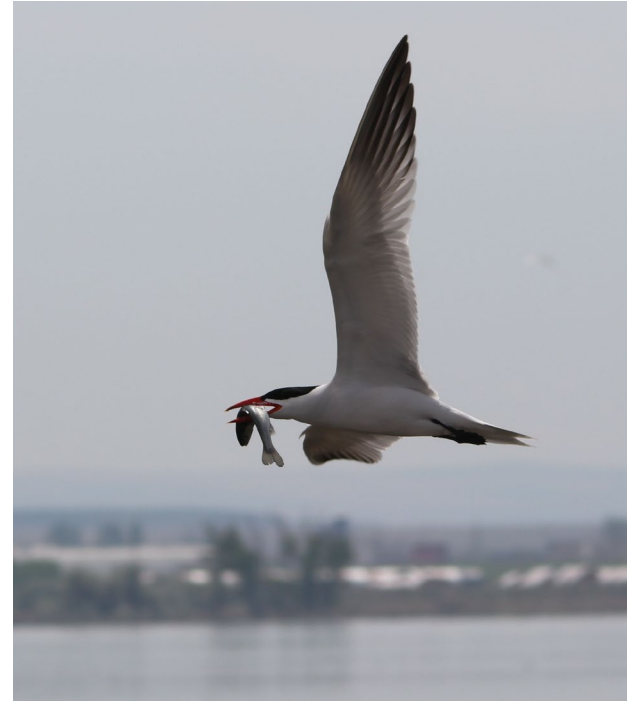
Rates consistently highest on steelhead, upwards 40% of all smolts in some years; continues to be one of the greatest mortality source during outmigration



PREDATION ON HATCHERY STEELHEAD VARIES BY PREDATOR SPECIES AND COLONY

Predation generally higher on hatchery fish upstream of Bonneville due to tern and gull predation.

Little to no difference in predation by rear-type in the CRE due to predation by cormorants (indiscriminately consume smolts).



SUMMARY OF RESULTS (Other Predation Rates)



PREDATION BY OTHER AVIAN SPECIES SUBSTANTIAL

Rates often comparable to or greater than those of terns, especially on steelhead by gulls.



SYSTEM-WIDE PREDATION LEVELS SUBSTANTIAL

Rates consistently highest on steelhead, greater than 40% of all smolts in some years (34% in 2025); continues to be one of the greatest mortality sources during outmigration.



REACH-SPECIFIC PREDATION LEVELS VARY

Highest estimates in 2025 were from gull colonies upstream of Bonneville and cormorants in the CRE.



MIDDLE COLUMBIA PREDATION AND SURVIVAL MODELLING

- Explore modelling framework that incorporates passive detections at Rocky Reach Juvenile Bypass and the Lower Wenatchee Barge
- Compare predation and survival estimates of steelhead and yearling Chinook based on HUC of origin
- Multiple modelling approaches demonstrate the tradeoffs of modelling assumptions (such as independent recapture rates) and precision and interpretation of results



RRJ Demographics - HUC

Average percent of yearling Chinook (CH1) and steelhead (ST) detections at Rocky Reach juvenile bypass by release HUC from 2021-2025.

Species	Release HUC	Watershed	Average % of Detections
CH1	17020008	Methow	87.1%
CH1	17020005	Chief Joseph	10.8%
CH1	17020010	Upper Columbia-Entiat	2.1%
ST	17020008	Methow	58.2%
ST	17020006	Okanogan	24.5%
ST	17020005	Chief Joseph	11.3%
ST	17020007	Similkameen	3.7%
ST	17020010	Upper Columbia-Entiat	2.3%

RRJ Demographics – Hatchery Wild

Counts (N) and percentages of wild and hatchery reared yearling Chinook (CH1) and steelhead (ST) detected alive at Rocky Reach juvenile bypass from 2021-2025.

Year	Species	N Total	N Wild	N Hatchery	% Hatchery
2021	CH1	13,357	593	12,764	95.6%
2022	CH1	11,401	348	11,053	96.9%
2023	CH1	7,539	647	6,892	91.4%
2024	CH1	9,571	708	8,863	92.6%
2025	CH1	6,213	165	6,049	97.4%
2021	ST	25,020	798	24,222	96.8%
2022	ST	24,202	798	23,404	96.7%
2023	ST	21,153	704	20,449	96.7%
2024	ST	19,348	1,658	17,690	91.4%
2025	ST	17,539	479	17,060	97.3%

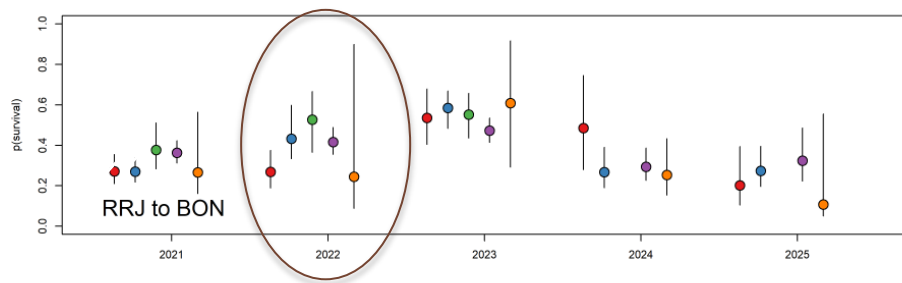
LWB Demographics – Hatchery Wild

Counts (N) and percentages of wild and hatchery reared yearling Chinook (CH1) and steelhead (ST) detected alive at the Lower Wenatchee Barge from 2024-2025.

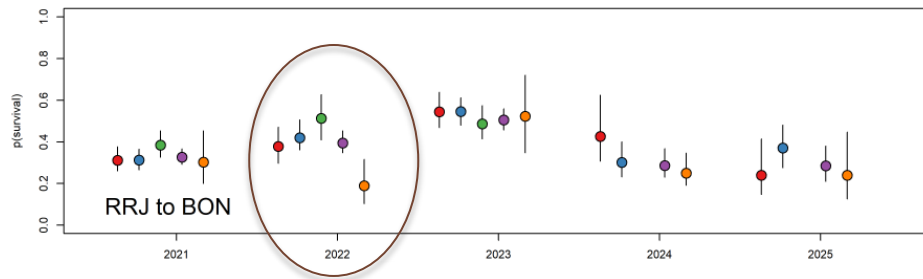
Year	Species	N Total	N Wild	N Hatchery	% Hatchery
2024	CH1	4,146	571	3,575	86.2%
2025	CH1	1,825	118	1,707	93.5%
2024	ST	561	21	540	96.3%
2025	ST	323	6	317	98.1%

Preliminary Results – Comparing Models

Independent Recapture Rates



Shared Recapture Rates



- 17020005
- 17020006
- 17020007
- 17020008
- 17020010

Next steps

- Finalizing all models
- Crafting discussion on:
 - Sampling design
 - Model tradeoffs
 - Recommendations



2026 PRCC PROPOSAL

With Cost Share from BPA

OBJECTIVE 1

Assess efficacy of
tern management

OBJECTIVE 2

Assess changes in
colony size (terns and
other predator
species)

OBJECTIVE 3

Assess changes in
predation rates
(terns and other
predator species)

OBJECTIVE 4

Provide technical
assistance for
adaptive management
(terns and other
predator species)

OBJECTIVE 5

Predation on double-
tagged (acoustic, PIT)
steelhead and yearling
Chinook in the Priest
Rapids Project

➤ *Cost sharing with BPA for 2026 has been secured*

THANK YOU

QUESTIONS?

