

Staff summary of Issues & Recommendations

Predation and Food Webs

*Preliminary draft, please refer to full recommendations for complete review

10/29/2013 10:07 AM

2009 Fish and Wildlife Program Section

Section VI. D. 2. Control of Predators (pg 52)

Summary of Recommendations on Predator Control and Food Webs

Specific Language Changes

NOAA Fisheries recommends the following new language in the Habitat Strategies-Emerging Habitat Issues on p. 16:

*Explicitly address ISAB recommendations on habitat threats to sustainability including: loss of biological diversity; climate change; proliferation of chemicals and contaminants; novel hybrid communities: non-native species and **predation** and uncertainty about carrying capacity.*

NOAA Fisheries also recommends amending the following language as indicated:

“...Specific measures to deal with these emerging issues are included in the mainstem plan and in many of the subbasin plans [Insert] **and in recovery plans** [End Insert].”

NOAA Fisheries recommends the following new language in the Mainstem section-Control of Predators on page 52:

The Program should strive to measure the effects of predation and express them in common terms, such as salmon adult equivalents, to facilitate comparison and evaluation against other limiting factors. Predator evaluations should include salmon adult equivalent metrics in their reports.

Implement Predator Control Actions

Measures for page 52 in Mainstem section, Piscivorous predator control proposed by: ODFW, WDFW, LCFRB [measures 1 and 2], COLVILLES [measure 2 only], SALISH-KOOTENAI [measures 2 and 3], GRANDE RONDE, COWLITZ, USRT and NOAA Fisheries.

Measure 1: BPA should continue to implement annually the base piscivorous predator-control program and *expand northern pikeminnow (*Ptychocheilus oregonensis*) removals to other mainstem dams in the lower Columbia River, i.e., expand the program to include northern pikeminnow removals at McNary and Bonneville dams.* The action agencies should evaluate the effectiveness of focused pikeminnow removals *for these expanded efforts and implement as warranted.* [Proposed new language is shown in italics.]

Measure 2: BPA (and action agencies) should work cooperatively with NOAA Fisheries, USFWS, states, tribes and the Council to develop and implement *systemwide strategies to manage and reduce non-native fishes that compete and feed on native fish (both anadromous and resident) in the mainstem and in tributaries.* [Proposed new language is shown in italics.]
[Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Measure 3: *The Program should support, and BPA should fund, additional research into the overall magnitude of the impacts of non-native predators including abundance, diel and temporal distributions, and food web interactions in order to help guide improved management of non-native species.* [Proposed new language is shown in italics.]
[Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Measure for page 52 in Mainstem section, Piscivorous predator control proposed by BPA:

Measure 4: *Encourage collaborative policies and efforts to address the adverse effects of non-native species, including BPA's longstanding pikeminnow reduction efforts.*
[Proposed new language is shown in italics.]
[Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Measure for page 52 in Mainstem section, Avian predator control proposed by ODFW, LCFRB, CRITFC, GRANDE RONDE, COWLITZ and USRT:

Measure: *BPA and the action agencies should fund the management plans that have been developed through USACE and other processes for piscivorous avian species in the Columbia Basin and estuary. Incorporate any management plans that have been developed for double-crested cormorants, Caspian terns, and other avian species in the mid-Columbia River area and prioritize actions for implementation.*

Measure for page 52 in Mainstem section, Avian predator control proposed by NOAA Fisheries:

Measure: *The Council should adopt into the Program the management plans that have been developed through USACE and other processes for piscivorous avian species in the Columbia Basin and estuary. Incorporate any management plans that have been developed for double-crested cormorants, Caspian terns, and other avian species in the mid-Columbia River area and prioritize actions for implementation.* [Proposed new language is shown in italics.]

Measure for page 52 in Mainstem section, Avian predator control proposed by USFWS:

Measure: *A comprehensive regional, multi-species management approach should be developed by the States, Tribes, and appropriate Federal agencies to address avian predation while also ensuring the long-term sustainability of migratory bird populations.* [Proposed new language is shown in italics.]

Measure for page 52 in Mainstem section, Avian predator control proposed by GRANT PUD:

Measure: *The Council should fully endorse and advocate for the removal of the Caspian tern colonies on Goose Island (Potholes Reservoir) and Crescent Island (Columbia River), as outlined in the Inland Avian Predation Management Plan. [Proposed new language is shown in italics.]*

Measures for pp. 52-53 in Mainstem section, Pinniped predator control proposed by ODFW, LCFRB, CRITFC [measure 2 only], GRANDE RONDE [measure 1 only], COWLITZ and USRT:

Existing Program language should be revised to establish funding responsibility:

Measure 1: *“The Corps [or Bonneville] should fund federal, tribal and state agencies to evaluate the extent of pinniped predation on salmonids, sturgeon, and Pacific lamprey in the lower Columbia River from Bonneville Dam to the mouth of the river. The Corps should take action to improve the exclusion of sea lions at all main adult fish ladder entrances and locks at Bonneville Dam.” [Proposed new language is shown in italics.]*

Measure 2: *Identify opportunities to reduce fish losses through pinniped predator management in the lower Columbia River. [Proposed new language is shown in italics.]*

Measure 3: *Fund federal, tribal and state agencies to implement strategies resulting from the evaluation above to manage and reduce pinniped predation on salmonids, sturgeon and lamprey. [Proposed new language is shown in italics.]*

Food Web Research

New measure to Understand the Food Webs of the Columbia Basin proposed by USFWS:

Measure: *The Program should incorporate the priorities of understanding food webs in the Columbia River Basin as outlined by the Independent Scientific Advisory Board (ISAB 2011). Investigate how the Columbia River Basin food web supports the growth and survival of Pacific salmon and other native fishes. [Proposed new language is shown in italics.]*

Specific Recommendations on Predator Control by Group or Entity

State Fish and Wildlife Agencies, other State-Supported Agencies, and Tribes

Implement Predator Control Actions

Proposed measures for page 52 in Mainstem section, Piscivorous predator control: ODFW (3), WDFW (4), LCFRB (6) [measures 1 and 2], COLVILLES (15) [measure 2 only], SALISH-KOOTENAI (16) [measures 2 and 3], GRANDE RONDE (18), COWLITZ (22), USRT (28),

Measure 1: BPA should continue to implement annually the base piscivorous predator-control program and *expand northern pikeminnow (Ptychocheilus oregonensis) removals to other mainstem dams in the lower Columbia River, i.e., expand the program to include northern*

pikeminnow removals at McNary and Bonneville dams. The action agencies should evaluate the effectiveness of focused pikeminnow removals for these expanded efforts and implement as warranted. [Proposed new language is shown in italics.]

Rationale: The construction and operation of the hydrosystem has altered historical habitats and have created habitats more suitable for native and non-native piscivorous fish species. Disorientated salmonids that pass over or through the hydrosystem are easy prey for native northern pikeminnow in dam tailraces. The northern pikeminnow angler reward program has been successful in reducing the prey rates on native salmonids, but public access in boat restricted zones at hydropower projects is not feasible. The Predator Control Program's dam angling effort by contracted fishers should be expanded in all tailraces where elevated northern pikeminnow predation rates are known to occur.

- Predation by northern pikeminnow and their relative abundance are assessed annually throughout the lower Columbia and Snake rivers and continue to remain lower than those observed prior to the implementation of the Predator Control program
- To date, it is not evident that compensation in predation, growth, or reproduction by surviving northern pikeminnow, or by other resident fish predators has occurred system-wide in response to Predator Control program fisheries, however, continued implementation emphasizes the need for continued evaluation efforts to monitor piscivore community dynamics and locally occurring compensatory mechanisms.
- Relative abundance of smallmouth bass has nearly doubled in areas of John Day Reservoir in recent years and may indirectly influence juvenile salmonid predation. Competitive interactions with northern pikeminnow, which may shift their diets and habitat selection in the presence of smallmouth bass, could exacerbate juvenile salmonid predation
- From 1990-2012, Predator Control fisheries have harvested more than 4 million northern pikeminnow, with annual exploitation for fish > 250 mm averaging 13.7% (range: 8.5 to 19.5%) since 1991. The minimum goal of 10% exploitation has been exceeded every year since 1998 with a mean of 17.2%. Modeling efforts to describe northern pikeminnow annual exploitation, while assuming all other variables are constant, suggest a reduction in median percent predation by northern pikeminnow on juvenile salmon of 28% to 40%, as compared to pre-program levels since 1996. On average, the reduction of slightly over 5 million consumption events (minimum, 1.6 million; maximum, 8.5 million) annually could be attributed to predator removals

Measure 2: BPA (and action agencies) should work cooperatively with NOAA Fisheries, USFWS, states, tribes and the Council to develop and implement *systemwide* strategies to *manage and reduce non-native fishes that compete and feed on native fish (both anadromous and resident) in the mainstem and in tributaries.* [Proposed new language is shown in italics.]
[Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Measure 3: *The Program should support, and BPA should fund, additional research into the overall magnitude of the impacts of non-native predators including abundance, diel and temporal distributions, and food web interactions in order to help guide improved management of non-native species.* [Proposed new language is shown in italics.]
[Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Rationale: The Program, as currently implemented by BPA, is anadromous fish-centric and should more strongly consider impacts to native resident fish. The program seems to call out or emphasize focus on several non-native species, but this focus should not de-emphasize the need to address other non-native species (i.e., northern pike, white crappie, yellow perch, etc.) in the Basin that have an effect on native fish populations, including redband trout and white sturgeon.

- Non-native fish have significant impact to native resident fish species
- Northern pike have greatly reduced native fish populations in the Pend Oreille system
- Walleye and smallmouth bass have reduced native resident populations in Lake Roosevelt
- Relative abundance of smallmouth bass have nearly doubled in areas of John Day Reservoir in recent years and may indirectly influence juvenile salmonid predation
- Competitive interactions with northern pikeminnow, which may shift their diets and habitat selection in the presence of smallmouth bass, could exacerbate juvenile salmonid predation
- The decades of emphasis on northern pikeminnow control has narrowed piscivorous predation to a singular focus with very little emphasis on baseline studies on populations, habitat use, and diets in the mainstem and major tributaries
- White crappie predation on juvenile spring Chinook salmon in Lookout and Hills Creek reservoirs may significantly increase mortality rates
- Lake trout threaten bull trout and other native trout in areas where lake trout have been introduced into native trout habitat

Proposed measure for page 52 in Mainstem section, Avian predator control: ODFW (3), LCFRB (6), CRITFC (14), GRANDE RONDE (18), COWLITZ (22) and USRT (28)

Measure: *BPA and the action agencies should fund the management plans that have been developed through USACE and other processes for piscivorous avian species in the Columbia Basin and estuary. Incorporate any management plans that have been developed for double-crested cormorants, Caspian terns, and other avian species in the mid-Columbia River area and prioritize actions for implementation.*

Rationale: The 2009 Program called for the development of management plans for avian populations that have significant effect to native fish populations. The results of these efforts need to be included in the next iteration of the Program. Avian predators in the basin must be reduced in number and held to a level that promotes a greater survival of listed and non-listed salmonids and Pacific lamprey.

- Annual combined losses of out-migrating juvenile salmonids from Caspian terns and double-crested cormorants nesting at East Sand Island have exceeded 15 million smolts since 2009. It is estimated these losses equate to 15-20% of the basin's entire annual juvenile outmigration.
- East Sand Island is host to the largest colony of Caspian terns in world, and despite efforts to reduce the overall size of the colony to a management goal of ~3,355 nesting pairs, the population in 2012 was double this goal.

- Double-crested cormorants on East Sand Island form the largest colony in North America. Since 2003 it has exceeded the 1997-2011 average of about 10,000 breeding pairs. Annually since 2010, the colony has consumed a minimum of 19 million smolts.
- A relatively small colony (~300 pairs) of Caspian terns nesting on Goose Island in the Potholes Reservoir travel over 30 miles to the Columbia River to prey on out-migrating Upper Columbia steelhead. Impacts in recent years average 10-15% of the entire outmigration.

Proposed measures for pp. 52-53 in Mainstem section, Pinniped predator control: ODFW (3), LCFRB (6), CRITFC (14) [measure 2 only], GRANDE RONDE (18) [measure 1 only], COWLITZ (22) and USRT (28)

Existing Program language should be revised to establish funding responsibility:

Measure 1: *“The Corps [or Bonneville] should fund federal, tribal and state agencies to evaluate the extent of pinniped predation on salmonids, sturgeon, and Pacific lamprey in the lower Columbia River from Bonneville Dam to the mouth of the river. The Corps should take action to improve the exclusion of sea lions at all main adult fish ladder entrances and locks at Bonneville Dam.”* [Proposed new language is shown in italics.]

Measure 2: *Identify opportunities to reduce fish losses through pinniped predator management in the lower Columbia River.* [Proposed new language is shown in italics.]

Rationale: Pinnipeds residing upstream of Bonneville Dam are of particular concern. Multiple pinnipeds are residing in the Bonneville pool and some of these animals have been in this area for over three years. These animals cannot complete their natural migration to reproduction areas and are severely impacting anadromous fish and fishers. The Corps should take action to improve the exclusion of sea lions at all main adult fish ladder entrances and locks at Bonneville Dam. Action agencies must make pinniped control and removal in areas upstream of Bonneville Dam a priority.

Measure 3: *Fund federal, tribal and state agencies to implement strategies resulting from the evaluation above to manage and reduce pinniped predation on salmonids, sturgeon and lamprey.* [Proposed new language is shown in italics.]

Rationale: The current program identifies a need for a river-wide assessment of pinniped predation, but it does not identify BPA or the Corps as having a funding responsibility for implementation of management strategies.

Federal Fish and Wildlife and Other Federal Agencies

Specific Language Changes

NOAA Fisheries (30) recommends the following new language in the Habitat Strategies-Emerging Habitat Issues (p. 16):

Explicitly address ISAB recommendations on habitat threats to sustainability including: loss of

*biological diversity; climate change; proliferation of chemicals and contaminants; novel hybrid communities: non-native species and **predation** and uncertainty about carrying capacity.*

Amend the following language as indicated:

“...Specific measures to deal with these emerging issues are included in the mainstem plan and in many of the subbasin plans [Insert] *and in recovery plans* [End Insert].”

Rationale:

Recovery plans are an important source for actions that address climate change and toxics that may affect threatened and endangered species.

NOAA Fisheries (30) recommends the following new language in the Mainstem section-Control of Predators (p. 52):

The Program should strive to measure the effects of predation and express them in common terms, such as salmon adult equivalents, to facilitate comparison and evaluation against other limiting factors. Predator evaluations should include salmon adult equivalent metrics in their reports.

Implement Predator Control Actions

Proposed measures for page 52 in Mainstem section, Piscivorous predator control:
NOAA Fisheries (30)

Measure 1: BPA should continue to implement annually the base piscivorous predator-control program and *expand northern pikeminnow (*Ptychocheilus oregonensis*) removals to other mainstem dams in the lower Columbia River, i.e., expand the program to include northern pikeminnow removals at McNary and Bonneville dams.* The action agencies should evaluate the effectiveness of focused pikeminnow removals *for these expanded efforts and implement as warranted.* [Proposed new language is shown in italics.]

Rationale: The construction and operation of the hydrosystem has altered historical habitats and have created habitats more suitable for native and non-native piscivorous fish species.

Disorientated salmonids that pass over or through the hydrosystem are easy prey for native northern pikeminnow in dam tailraces. The northern pikeminnow angler reward program has been successful in reducing the prey rates on native salmonids, but public access in boat restricted zones at hydropower projects is not feasible. The Predator Control Program’s dam angling effort by contracted fishers should be expanded in all tailraces where elevated northern pikeminnow predation rates are known to occur.

- Predation by northern pikeminnow and their relative abundance are assessed annually throughout the lower Columbia and Snake rivers and continue to remain lower than those observed prior to the implementation of the Predator Control program
- To date, it is not evident that compensation in predation, growth, or reproduction by surviving northern pikeminnow, or by other resident fish predators has occurred system-wide in response to Predator Control program fisheries, however, continued implementation emphasizes the need for continued evaluation efforts to monitor piscivore community dynamics and locally occurring compensatory mechanisms.

- Relative abundance of smallmouth bass has nearly doubled in areas of John Day Reservoir in recent years and may indirectly influence juvenile salmonid predation. Competitive interactions with northern pikeminnow, which may shift their diets and habitat selection in the presence of smallmouth bass, could exacerbate juvenile salmonid predation
- From 1990-2012, Predator Control fisheries have harvested more than 4 million northern pikeminnow, with annual exploitation for fish > 250 mm averaging 13.7% (range: 8.5 to 19.5%) since 1991. The minimum goal of 10% exploitation has been exceeded every year since 1998 with a mean of 17.2%. Modeling efforts to describe northern pikeminnow annual exploitation, while assuming all other variables are constant, suggest a reduction in median percent predation by northern pikeminnow on juvenile salmon of 28% to 40%, as compared to pre-program levels since 1996. On average, the reduction of slightly over 5 million consumption events (minimum, 1.6 million; maximum, 8.5 million) annually could be attributed to predator removals

Measure 2: BPA (and action agencies) should work cooperatively with NOAA Fisheries, USFWS, states, tribes and the Council to develop and implement *systemwide strategies to manage and reduce non-native fishes that compete and feed on native fish (both anadromous and resident) in the mainstem and in tributaries.* [Proposed new language is shown in italics.]
 [Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Measure 3: *The Program should support, and BPA should fund, additional research into the overall magnitude of the impacts of non-native predators including abundance, diel and temporal distributions, and food web interactions in order to help guide improved management of non-native species.* [Proposed new language is shown in italics.]
 [Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Rationale:

- White crappie predation on juvenile spring Chinook salmon in Lookout and Hills Creek reservoirs may significantly increase mortality rates
- Lake trout threaten bull trout and other native trout in areas where lake trout have been introduced into native trout habitat

Proposed new measure for page 52 in Mainstem section, Avian predator control:
 NOAA Fisheries (30)

Measure: *The Council should adopt into the Program the management plans that have been developed through USACE and other processes for piscivorous avian species in the Columbia Basin and estuary. Incorporate any management plans that have been developed for double-crested cormorants, Caspian terns, and other avian species in the mid-Columbia River area and prioritize actions for implementation.* [Proposed new language is shown in italics.]

Rationale: The 2009 Program called for the development of management plans for avian populations that have significant effect to native fish populations. The results of these efforts need to be included in the next iteration of the Program. Avian predators in the basin must be

reduced in number and held to a level that promotes a greater survival of listed and non-listed salmonids and Pacific lamprey.

- Annual combined losses of out-migrating juvenile salmonids from Caspian terns and double-crested cormorants nesting at East Sand Island have exceeded 15 million smolts since 2009. It is estimated these losses equate to 15-20% of the basin's entire annual juvenile outmigration.
- East Sand Island is host to the largest colony of Caspian terns in world, and despite efforts to reduce the overall size of the colony to a management goal of ~3,355 nesting pairs, the population in 2012 was double this goal.
- Double-crested cormorants on East Sand Island form the largest colony in North America. Since 2003 it has exceeded the 1997-2011 average of about 10,000 breeding pairs. Annually since 2010, the colony has consumed a minimum of 19 million smolts.
- A relatively small colony (~300 pairs) of Caspian terns nesting on Goose Island in the Potholes Reservoir travel over 30 miles to the Columbia River to prey on out-migrating Upper Columbia steelhead. Impacts in recent years average 10-15% of the entire outmigration.

Proposed new measure for page 52 in Mainstem section, Avian predator control:
USFWS (33)

Measure: *A comprehensive regional, multi-species management approach should be developed by the States, Tribes, and appropriate Federal agencies to address avian predation while also ensuring the long-term sustainability of migratory bird populations. [Proposed new language is shown in italics.]*

Rationale: The U.S. Fish and Wildlife Service recognizes the impacts of avian predation on Pacific salmon in the Columbia Basin, particularly in the estuary, and the overall effects on salmon recovery. There is a strong regional interest in active management of avian predators to lessen their effects on juvenile Pacific salmon. However, we are equally concerned about how management actions, such as dissuasion and depredation, could potentially affect the sustainability of double-crested cormorants, Caspian terns, and other migratory birds on a regional/flyway level. Pacific salmon, cormorants, and terns are all native to the Pacific Northwest ecosystem. As such, we believe avian predation is a source of natural mortality, and should be viewed in the context of the many mortality factors facing Pacific salmon throughout their life history. Further, we believe that management actions to reduce avian predation and promote Pacific salmon recovery must not place significant risk to migratory bird populations.

Understanding Food Webs

Proposed new measure related to Understanding the Food Webs of the Columbia Basin:
USFWS (33)

Measure: *The Program should incorporate the priorities of understanding food webs in the Columbia River Basin as outlined by the Independent Scientific Advisory Board (ISAB 2011). Investigate how the Columbia River Basin food web supports the growth and survival of Pacific salmon and other native fishes. [Proposed new language is shown in italics.]*

Rationale: Building upon existing data and expertise would be more effective at moving toward a more holistic understanding of food web function. This would also support decisions of the Fish and Wildlife Program to help sustain an abundant, productive, and diverse community of fish and wildlife in the Columbia River Basin. The role the food web plays in supporting juvenile salmon and native fishes should be better understood given the constant threat of new biological invasions and anthropogenic habitat alterations. The proposed research will move the Program toward an ecosystem management approach to provide salmon with their total life cycle needs, including an adequate food web, to support growth and improve their survival.

The Council should also build on and expand existing Fish and Wildlife Program projects that have collected food web data to incorporate concepts and research needs identified as ISAB priorities. Continue to support work under species-specific project whose results would be applicable to other related species. Although the ISAB report was comprehensive, the Council should remain flexible to support projects that address new and emerging challenges regarding changes to Columbia Basin food webs, such as invasive species.

Fall Chinook salmon in Lower Granite Reservoir are an ideal species/habitat coupling for evaluating the food web relationships, as some historical invertebrate work has been conducted (Dorband 1980; Curet 1993; Haskell et al. 2006; Tiffan et al. 2013), growth and body size of ESA-listed juvenile fall Chinook salmon has declined over the past decade (Connor et al., in press), and an understanding of the food web has been identified as a key information need in salmon recovery plans.

Proposed measure for page 52 in Mainstem section, Piscivorous predator control:
BPA (35)

Measure: *Encourage collaborative policies and efforts to address the adverse effects of non-native species, including BPA's longstanding pikeminnow reduction efforts.*

[Proposed new language is shown in italics.]

[Note: This also applies to section II.D.2 Non-Native Species Strategies on page 18.]

Rationale: Non-native resident fish pose many challenges to resource planners and managers. The mainstem supports 60 resident fish species. Of those species, 31 are natives and the remaining 29 are mostly warm water exotic species. Many of these exotic species receive protection through regulations that limit their harvest, yet they prey on native anadromous fish and thwart the Program's mitigation and recovery efforts. Added together, exotic species may have a biomass near that of historic salmon runs, yet their competitive effects on native listed species remain unknown.

BPA Customers, Other Utilities and River Users

Proposed new measure for page 52 in Mainstem section, Avian predator control:
GRANT PUD (46)

Measure: *The Council should fully endorse and advocate for the removal of the*

Caspian tern colonies on Goose Island (Potholes Reservoir) and Crescent Island (Columbia River), as outlined in the Inland Avian Predation Management Plan. [Proposed new language is shown in italics.]

Rationale: This action would aid in the recovery of ESA-listed species (such as UCR steelhead), meet regional recovery goals, and protect, enhance and restore salmon and steelhead in the mid- and upper Columbia Basin. Avian predation is a potential limiting factor in the recovery of ESA-listed salmonid populations from the Columbia River (Collis et al. 2002). Caspian terns, double-crested cormorants, American white pelicans and several species of gull have all been reported as having the highest per capita (per bird) predation rates on juvenile salmonids, especially impacts on steelhead (Collis et al. 2002, Ryan et al., Antolos et al., Evans et al. 2012). One of the largest Caspian tern colonies on the Columbia Plateau resides on Goose Island in the Potholes Reservoir in Washington, with an average colony size of 399 breeding pairs during 2008-2010 (BRNW 2012).

Recent publications by Evans et al. (2013) suggest a significant impact on the survival of UCR steelhead of up to 21% that is occurring by Caspian terns nesting at Goose Island and foraging in the mid-Columbia River on juvenile steelhead. Based on recent (mandated) studies conducted by Grant County PUD during 2008-2010, the survival performance standards for juvenile steelhead were not met as they migrated through the Priest Rapids Project (Thompson et al. 2012). A portion of that UCR steelhead mortality through the Priest Rapids Project can be directly attributed to tern predation, as evidenced by the detection of survival study tags on the Goose Island tern colony.

Evans et al. (2013) estimated that Caspian terns consumed between 12.8% (2008) and 20.8% (2009) of all PIT-tagged juvenile steelhead released from Rock Island Dam in years 2008-2010. It was estimated that Caspian terns consumed 15.1% of all tagged juvenile steelhead released from Rock Island in 2010. Grant PUD estimates that, with tern predation removed, it would achieve its Project performance standards for UCR juvenile steelhead. Lyons et al. (2011) estimated that UCR steelhead would likely accrue the greatest incremental benefit from plans to manage avian predators on the Columbia Plateau; in particular, management of Caspian terns nesting at Goose Island.

The Corps of Engineers, along with the Bureau of Reclamation and USFWS, are presently working on an Inland Avian Predation Management Plan and Environmental Assessment (EA) for the Caspian terns of the Columbia Plateau. This proposed management plan would focus on Goose and Crescent Islands (in McNary Dam forebay), and be implemented as a two-phased plan, with four objectives: 1) reduce Caspian tern consumption of UCR and Snake River stocks of Chinook salmon and steelhead and Snake River sockeye salmon; 2) successful dissuasion of Caspian terns at Goose Island in Phase 1 and Crescent Island in Phase 2; 3) limit expansion of Caspian tern colony at Crescent Island in Phase 1; and 4) facilitate Caspian tern colony establishment at alternate nesting sites outside of the Columbia River Basin by providing conditions suitable for nesting. This proposed management plan and EA are scheduled to go out for public review and comment on September 25, 2013.

Note: ODFW, WDFW, LCFRB, GRANDE RONDE, COWLITZ, SPOKANE, USRTs and USFWS also included recommendations to address piscivorous predation on Pacific lamprey and white sturgeon that are included in the species-specific summaries.

