

2021 Fish Passage Plan

Appendix L

**US Army Corps of Engineers Predator Monitoring & Deterrence
Action Plans at Lower Columbia & Lower Snake River Dams**

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1. OVERVIEW

1.1. This Appendix includes the avian monitoring and deterrence action plans implemented at Corps hydropower projects on the lower Columbia and lower Snake rivers, and pinniped monitoring and deterrence action plans at Bonneville Dam, in accordance with current and applicable Biological Opinions under the Endangered Species Act Section 7.¹ These plans were coordinated with regional Federal, State, and Tribal fish agencies in the Fish Passage Operations & Maintenance (FPOM) coordination team.

1.2. Hazing techniques are defined in the approved *Operating Plans*. The program objective is to reduce piscivorous bird predation on juvenile salmonids and lamprey, and pinniped predation on adult salmonids, sturgeon and lamprey, by hazing in a manner that impedes their ability to forage on fish and/or forces them to leave the area.

1.3. Hazing activities are implemented by the U.S. Department of Agriculture's Animal & Plant Health Inspection Service (USDA APHIS) and USACE Fisheries Field Unit employees.

1.4. Avian wires shall be installed each year at Lower Snake River projects prior to April 3 and at Lower Columbia River projects prior to April 10.

1.5. Avian hazing shall occur primarily near dam locations where predation risk is high (e.g., tailrace areas where fish may be disoriented after passing the project and/or forebay areas where fish may be delayed from passing the project).

1.6. Birds shall be hazed near spillway and powerhouse discharge areas, juvenile bypass outfall(s) and where birds congregate or feed, ranging up to approximately 2,000 feet downstream of the dam and outfall site. Roosting and actively foraging birds shall also be hazed within the forebay boat restricted zones (BRZ).

1.7. During juvenile lamprey outmigration, hazers may be requested to focus hazing at specific areas of the project where juvenile lamprey are known to pass.

1.8. Avian activities in the estuary are summarized in **Table 1** and described in **section 2**.

1.9. Hazing dates and methods for the eight lower Columbia River and lower Snake River projects are summarized in **Table 2** and described in **sections 3-10**.

¹ Available at: <https://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx>

Table 1. Estuary Avian Activities by all Regional Partners (as of January 2021) – see Section 2 below for more information.

Objective	Activity	Location
Monitor avian predators in the estuary and discourage any avian predators that are found nesting at an upland disposal site.	Reconnaissance flights to detect avian predators on upland disposal sites	Disposal sites (estuary-wide)
	Passive and active dissuasion	Rice, Miller Sands, and Pillar Rocks Islands
Maintain no less than 1 acre of Caspian tern habitat on ESI annually to support approximately 3,125 to 4,375 breeding pairs and prevent terns from nesting on ESI outside the designated habitat.	Pre-season site preparation	ESI
	Colony size monitoring (annual peak abundance estimates every three years)	ESI
	Passive and active dissuasion (outside designated habitat)	ESI
Monitor DCCO on ESI and in the Columbia River Estuary annually for colony size and response to management, as necessary in support of the DCCO FEIS.	Weekly reconnaissance flights and aerial photography of DCCO colonies in the estuary	ESI, Astoria-Megler Bridge, Channel Markers, Longview Bridge, Troutdale Towers
	Colony size monitoring	ESI, Astoria-Megler Bridge, Channel Markers, Longview Bridge, Troutdale Towers
	On-island management and response monitoring	ESI
Monitor DCCO on ESI annually to estimate DCCO abundance and nesting density.	Colony size monitoring	ESI
Estimate and assess ESI DCCO and CATE annual predation rates (impacts) on juvenile salmonids in support of the DCCO FEIS and the 2020 CRS BiOp.	Physical recovery of CATE PIT tags	ESI
	Physical recovery of DCCO PIT tags	ESI
	Statistical modeling of DCCO and CATE annual predation rates	ESI

Table 2. Hazing Dates & Methods at Lower Columbia and Lower Snake River Projects (as of January 2021). See Sections 3-10 below for project-specific descriptions.

Dam	Passive Deterrents	Hazing Dates	Location	Hazing hours/day	Hazing Methods	Action Trigger
BON	Avian wires, sprinklers	April 1 – July 31 (Avian)	Shore	8	Pyrotechnics, sound, propane cannon (if necessary)	150 birds in a single zone
TDA	Avian wires	April 15 – July 31	Shore, Boat	14 (Apr/Jul) 16 (May/Jun)	Pyrotechnics	50% of 5-yr average
JDA	Avian wires	April 10 – July 31	Boat	8	Pyrotechnics	N/A
MCN	Avian wires, needle strips	April 25 – July 24	Shore, Boat	Shore: 12 (Apr 25-Jul 10, 6 days/wk) Shore: 8 (Jul 11-24 and Sundays) Boat: 10 (May 2-Jul 10, 3 days/wk except Sundays)	Pyrotechnics, sound, lasers, lethal take (if necessary)	N/A
IHR	Avian wires, wire spikes, sprinklers	April 1 – June 30	Shore, Boat	Shore: 8 (Apr 1-3, Jun 6-30) Shore: 16 (Apr 4-Jun 5) Boat: 3 days/wk (Apr 4-17, May 23-Jun 5) Boat: 5 days/wk (Apr 18-May 22)	Pyrotechnics, sound, laser, lethal take (if necessary)	Daily count twice 3-yr average; unresponsive to hazing.
LMN	Avian wires, sprinklers	April 1 – June 2 (to July 1 if needed)	Shore	8 (Apr 1-May 2) 16 (May 3-Jun 2)	Pyrotechnics, sound, lethal take (if necessary)	86 gulls, 43 terns, 15 cormorants
LGS	Avian wires, needle strips, sprinklers, visual	March 29 – June 19	Shore, Boat	Shore: 8 (Mar 29-Apr 10, May 23-Jun 19) Shore: 16 (Apr 11-May 22) Boat: 8 (Mar 29-Jun 19, 3 days/wk)	Pyrotechnics, sound, lethal take (if necessary)	100 gulls &/or terns, 50 cormorants
LWG	Avian wires, needle strips, sprinklers	April 1 – June 30	Shore	8 (Apr 1-19, Jun 2-30) 16 (Apr 20-Jun 1)	Pyrotechnics, sound, lethal take (if necessary)	57 gulls, 110 cormorants

2. ESTUARY

2.1. Estuary-Wide Efforts. Monitor avian predators in the estuary to support the Caspian Tern (CATE) and Double Crested Cormorant (DCCO) monitoring plans and fulfill Term and Condition 1k of the 2012 BiOp² for operations and maintenance of federal navigation channels and RPM #3 and T&C #3 of the 2020 CRS BiOp for the maintenance of the Columbia River System. Collectively these requirements direct avian predators to be monitored and dissuaded from select locations in the estuary.

2.2. East Sand Island (ESI) Caspian Terns (CATE) Monitoring and Hazing Plan.

- (a) Maintain no less than 1 acre of CATE habitat on ESI annually to support approximately 3,125 to 4,375 breeding pairs. Prevent CATE from nesting on ESI outside the designated colony.
- (b) The Corps Fish Field Unit will conduct the colony counts of CATE on ESI March through August and provide estimates of the number of birds off-colony but on ESI.
- (c) PIT-tag recovery, reporting, and analysis will occur in 2021.

2.3. Double Crested Cormorants (DCCO) Monitoring Plan.

- (a) Monitor DCCO on ESI and in the Columbia River estuary annually for colony size and response to management, as necessary in support of the DCCO FEIS.
- (b) PIT-tag recovery, reporting, and analysis will occur in 2021.

2.4. Rice, Miller Sands, and Pillar Rocks Islands.

- (a) Monitor avian predators in the estuary and discourage any avian predators that are found nesting at an upland disposal site per the 2012 BiOp for the operations and maintenance of the federal navigation channel and the 2020 CRS BiOp.
- (b) Under the directing documents of the 2012 and 2020 BiOps, avian predators (i.e., CATE and DCCO) must be monitored for presence and breeding attempts on dredge material placement sites. If observed, a combination of non-lethal dissuasion and lethal egg take must be used to discourage and stop birds from using these sites.
- (c) FFU will conduct reconnaissance surveys to Rice, Miller Sands, and Pillar Rocks Islands on a weekly basis between March and August to detect CATE and DCCO interest in the sites. On Rice Island, a passive green laser will be beta tested for efficacy in 2021 and ropes, stakes, and flagging will be used to dissuade birds from using western-most area of historical CATE interest. Miller and Pillar Rocks Islands will be monitored and, if necessary, dissuaded.

² NMFS. July 11, 2012. ESA Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington. (NMFS No: 2011/02095).

3. BONNEVILLE DAM

3.1. Avian Monitoring. Bird numbers are accessed daily during fishway inspections by a Project Biologist. Due to low bird populations at the dam during winter months, bird numbers are recorded 7 days a week from April 1 through October 31. Avian monitoring occurs as often as possible outside of these dates and during the non-fish passage season. Piscivorous birds of interest are gulls & cormorants, though other birds such as mergansers, grebes, osprey and eagles may occasionally be noted. Demarcated zones are Powerhouse (PH) 1 forebay, PH1 tailrace, Spillway forebay, Spillway tailrace, B2CC outfall, PH2 forebay, PH2 tailrace, and Juvenile Monitoring Facility (JMF) outfall.

3.2. Avian Action Plan. Measures for avian deterrence at BON are listed below. While gulls and cormorants are present to a significant degree during peak summer months, relative avian abundance is low and no further actions are being considered at this time.

- (a) Avian wires are installed each year prior to April 10 in the tailrace of PH1, PH2, spillway and B2CC outfall.
- (b) Avian hazers are present at the dam April 1 through July 31, 8 hours per day, 7 days a week, between 0800 and 2000 hours. Hours of hazing vary so birds do not acclimate to long periods of no hazing.
- (c) A hydro-cannon operates continuously on the top JBS outfall flume.
- (d) A propane cannon was tested for use during fish transport releases at the JBS and may be considered for use if avian predation risk is found to exist during truck releases of juveniles.

3.3. Avian Incident Response. The trigger for additional action is 150 piscivorous birds in a single zone during a single observation. When the trigger is met, hazing efforts will be increased in those areas and increase the number of long-range pyrotechnic devices. A propane cannon may be useful in some zones (e.g., JBS outfall, B2CC, PH2 tailrace) but application must be limited to avoid impacting project visitors and nearby public areas and towns. Lethal removal would likely work but is not approved and would require additional funding. The trigger is only reached a few times a year, usually between mid-September and early October. Hazing concludes on July 31. If the trigger is consistently being met in September and October, adjustment of hazing dates could be pursued.

3.4. Avian Reporting. Avian predation by species and zone will be in the Project Weekly Report. If warranted, a summary could also be included in the Annual Report.

3.5. Pinnipeds.

- (a) California Sea Lions and Steller Sea Lions shall be hazed at Bonneville Dam daily **across daylight hours** from March 31 through May 31 **and from August 15 through October 31**. Hours should vary so that pinnipeds do not acclimate to long periods with no hazing, unless otherwise coordinated with the POC.

- (b) Pinniped hazing techniques are defined in the approved *Operating Plan* and in accordance with the *Marine Mammal Protection Act of 1972, Section 109 h.1.c.*
- (c) Pinnipeds hazing shall occur in the tailrace of the dam and spillway, Tanner Creek, and areas where pinnipeds haul out (unless otherwise coordinated for trapping efforts), ranging to approximately 1,500 feet downstream of the dam and outfall site.
- (d) Special activities will be coordinated each year as necessary with Federal, State and Tribal boat hazing, trap/take efforts and/or special evaluations or tests.
- (e) Sea Lion Exclusion Devices (SLEDs) will be installed at all adult fishway entrances and floating orifice gates (FOGs). All SLEDs may be left in year-round.
- (f) The downstream navigation lock gates will be kept closed until necessary to open for a vessel locking through.

4. THE DALLES DAM

4.1. Monitoring. Project Fisheries staff will monitor daily April 1–September 30 and record numbers of piscivorous birds foraging and non-foraging on a standardized form. Data will be provided in the weekly and annual fishway status reports. Observation zones include forebay, powerhouse tailrace, sluiceway outfall tailrace, spillway tailrace outside of the spillwall, spillway tailrace inside the spillwall, spillway tailrace upstream of bridge, and spillway tailrace downstream of bridge.

4.2. Action Plan.

- (a) Avian hazing will be contracted to USDA as in prior years. Corps NWP employees are not allowed to haze gulls as was successfully done in the past.
- (b) Contracted hazing will occur April 15–July 31, 7 days per week, 14-16 hours/day to cover most daylight hours.
- (c) Hazing will consist of launching pyrotechnics when gulls are present.
- (d) Almost all hazing occurs in SW4 immediately downstream of the bridge. Hazing will not occur from the Navigation Lock peninsula when barge traffic is present.
- (e) Avian lines are not in place downstream of the bridge where predation is most prevalent. However, 13 avian lines are upstream of the bridge which tends to keep gull numbers low in that area and 61 avian lines are across the entire powerhouse tailrace as well as half of the channel over the ice/trash sluiceway outfall. Any gulls within the avian line grid are immediately hazed.
- (f) From August through mid-April, there will be no avian abatement measures other than avian lines. Lines will be repaired and/or reinstalled as soon as possible following damage or removal. New lines will be installed and maintained in locations determined to have significant avian predation.
- (g) Avian abatement measures shall be in place by April 1 unless delayed by inclement weather, in which case work will be completed as soon as weather permits.

4.3. Incident Response. The trigger for additional action is 50% of the 5-year average. Lethal removal is being pursued as an option but is not approved by NWP at this time. If for some reason hazing is not available, propane cannon, distress calls, and other recent bird replant technology will be tried in attempts to abate gulls. Handheld lasers are being tested by COE employees and will be used if shown beneficial.

4.4. Discussion. Fish Field Unit (FFU) studies have shown that gulls are not highly efficient predators when looking at the entire juvenile salmonid run as a whole. Predation rates were calculated at an average 0.75 fish/gull/hour in the zone (SW4) in 2010 and 0.58 fish/gull/hour in 2011. The zones upstream of the bridge have a much higher predation success rate per gull, but gull numbers are effectively held lower due to avian lines. More recent data from PIT-tag recovery indicates a very high number of ESA-listed species consumed by gulls on the Miller

Island colony. These gulls feed primarily below The Dalles and John Day dams. This area is not COE property and this population should be managed by associated wildlife management agencies. This has increased the need for improving avian abatement at the dam.

5. JOHN DAY DAM

5.1. Monitoring. Avian monitoring is done throughout the year at JDA. During the adult and juvenile fish passage seasons inspections are made twice daily. These numbers for the week are included in the weekly status report to the region, along with a brief assessment of the effectiveness of the avian deterrent program. During the winter months bird numbers are collected once daily due to only one inspection needed during the maintenance season. An annual summary will be provided in the fish facility annual report. Birds most commonly observed at JDA are gulls, cormorants, grebes, and American white pelicans. Their presence and distribution differ from each other throughout the season. Their foraging and non-foraging numbers along with Caspian terns will be monitored. There are 3 powerhouse tailrace zones and 3 spillway tailrace zones along with a forebay zone for both the powerhouse and spillway. Birds are counted in each of these zones during the fisheries inspections at 0800 and 1600.

5.2. Action Plan. Measures for avian deterrence at JDA are listed below. With the current configuration of the avian abatement array and boat hazing, JDA project fisheries believes this is sufficient for deterring gulls, the primary predator at JDA, from feeding in the tailrace.

- (a) Avian array: 125 lines stretched across the tailrace expanding 2,200' below the dam.
- (b) Boat hazing: April 10–July 31, 7 days per week, 8-hour shifts. In the event weather and/or other conditions preclude safe boat operation, hazing shall occur from dam structures and/or adjacent shorelines.

5.3. Incident Response. The trigger for additional action is 50% of the 5-year average. Lethal removal is being pursued as an option but is not approved by NWP at this time. If for some reason hazing is not available, propane cannon, distress calls, and other recent bird replant technology will be tried in attempts to abate gulls. Handheld lasers are being tested by COE employees and will be used if shown beneficial.

6. MCNARY DAM

6.1. Introduction.

McNary Lock & Dam has one of the largest piscivorous bird populations on the Columbia River due to the number of juvenile fish descending on McNary from both the Snake and upper Columbia rivers and due to the project's close proximity to several significant bird nesting colonies.

McNary has a large mix of piscivorous bird species, including California and ring-billed gulls, western grebes, Caspian terns, white pelicans, double-crested cormorants, mergansers and other piscivorous waterfowl. The most numerous and troublesome are the two gull species and they typically are found in the spillway tailrace, which is the most difficult area to reach with shore-based pyrotechnic devices, propane cannons and electronic bird alarm calls.

Much of what the McNary project does to control predatory birds is determined months in advance, when the project helps establish the predatory bird control contract with APHIS, so there is very little additional that the project can do during times of unusually high avian predation, other than to shift hazers around to different spots around the project. Early in the season, we will have already deployed the appropriate number of propane cannons and bird alarms, so more would not be appropriate. In addition to adding boat hazing, the project will continue with the two-shift hazing effort during the busiest months of the year.

Propane cannons, electronic bird alarms and other noisemakers are problematic, because they disturb nearby homeowners, fishers, park users and tugboat crews, so they must be used with discretion. They are of limited effectiveness and propane cannons in particular must be restricted to near-dam areas and away from recreational and navigational traffic.

6.2. Monitoring.

McNary biologists and biological technicians monitor the dam populations of gulls, grebes, Caspian terns, white pelicans, and double-crested cormorants at least once per day, seven days a week, from April 1 through September 30, the juvenile fish bypass season at McNary. The project may monitor populations more frequently, as needed, during bird population surges or outside this time window. We will include observations of hazing activity, hazing hours, boat hazing, monitoring times, foraging/non-foraging activity, etc.

6.3. Action Plan.

- (a) Bird hazing occurs April 25 through July 24.
- (b) Double shifts (12 hours per day) are used during the period of the greatest bird activity, April 25 through July 10, 6 days per week.
- (c) Boat hazing is also used from May 2 through July 10, for 10 hours per day, 3 days per week (except Sundays).

- (d) Hazing crews may at their discretion deploy limited lethal take of gulls and cormorants, particularly if hazing by itself loses its effectiveness.
- (e) Project personnel may deploy a limited number of propane cannons and electronic bird alarms from time-to-time, typically early in the season.
- (f) Overhead avian deterrent wires are located along the powerhouse tailrace.
- (g) The sprinkler system on the juvenile fish bypass outfall and associated plumbing and electrical supply were lost during higher flows in 2019. Deterrent lasers and bird calls are currently being used to reduce avian predators at the outfall pipe.

6.4. Incident Response. When surges of predatory birds become apparent, the project will conduct the following actions based on the number of birds present:

- (a) When predacious bird numbers at any particular location exceed 50-100 foraging birds, focus hazers on those locations;
- (b) When predacious bird numbers at any particular location (most usually the spillway outfall) exceed 100 - 200 foraging birds, increase hazing efforts in those areas and increase the number of long-range pyrotechnic devices. Focus boat hazing in those areas. If hazers have not already initiated lethal take, deploy limited lethal take;
- (c) When predacious bird numbers at any particular location exceed 200-300 foraging birds, increase hazing efforts. Continue to focus boat hazing in those areas. Place more emphasis on lethal take. Lethal take is a critical part of these predatory bird control efforts. Without it, hazing will likely have only a limited effect on local bird congregations.

6.5. Reporting. As noted in the “Monitoring” section above, McNary biologists and technicians monitor birds from April 1 through September 30, the juvenile fish bypass season at McNary. Records of this monitoring are maintained on an Excel spreadsheet. Regular updates will be provided in a table in the fish facility weekly report, along with a brief statement on the effectiveness of the bird deterrent program for that week. A summary of seasonal bird abundance and the overall effectiveness of the bird deterrent program will be provided in the fish facility annual report. Reporting is by zone, with the project divided into the following zones: Forebay (FB1); Juvenile Bypass Outfall (JFOF); Powerhouse Tailrace (PHT1); and Spillway Tailrace (SWT1). Reporting is by bird species, when clear identification is possible. There is no differentiation between gull species due to the difficulty in determining gull species from a distance. Data are also provided by contract hazing personnel working on the project. During the hazing season, Wildlife Service personnel also turn in daily and monthly reports.

7. ICE HARBOR DAM

7.1. Monitoring. Bird monitoring dates are April 1 to July 31. Gull, cormorant, Caspian tern, grebe and pelican numbers are counted once per day, 6 or 7 days a week from April 1 to June 30, and 4 days (Monday through Thursday) a week from July 1 to July 31.

7.2. Hazing. Ice Harbor Dam utilizes the U.S. Department of Agriculture's Animal & Plant Health Inspection Service (APHIS) for hazing of piscivorous birds to reduce predation on ESA-listed fish passing the dam. Bird hazing occurs from April 1 through June 30, 7 days per week, and is focused on gulls, terns and cormorants observed to be feeding on passing fish. Land-based hazing is conducted by a Wildlife Specialist 8 hours per day April 1–3 and June 6–30, and 16 hours per day April 4–June 5. Boat-based hazing is conducted 3 days per week April 4–17 and May 23–June 5, and 5 days per week April 18–May 22.

7.3. Action Plan.

- (a) Birds are actively hazed in the immediate forebay of the dam to the Boat Restrictive Zone (BRZ) and from the immediate tailrace downstream to Eagle Island.
- (b) Birds are hazed daily using propane cannons, bird distress calls, pyrotechnics, and lasers.
- (c) Data that are noted are the time, avian zone, bird species, number of birds, if they are foraging or not foraging, and control action taken.
- (d) Bird wires are in place across the turbine discharge area and the spillway area below the dam.
- (e) A water cannon is located on the juvenile fish bypass pipe terminus.
- (f) Wire spikes are installed on light poles, forebay buoys, and other bird perching areas.

7.4. Incident Response. If the daily count of gulls, cormorants, and terns increases to twice the most recent 3-year average daily count for the same week, Corps personnel will assist in hazing. If a gull or cormorant becomes unresponsive to hazing and is leading other birds to feed on juvenile fish (instigator bird) who are also unresponsive to hazing, lethal take of the instigator bird or a bird in the group of unresponsive birds will occur at the discretion of the hazing contractor. This action will occur most sparingly after all other efforts have failed to move the birds.

7.5. Reporting. Bird observations will be reported weekly on the Project's ESA Weekly Report and will include a brief statement on the effectiveness of the bird deterrent program for that week. A summary of the season will be included in the Annual Fish Report.

8. LOWER MONUMENTAL DAM

8.1. Monitoring. Bird monitoring as part of standard fish ladder inspections will occur from March 1 to September 30. Fish ladder inspections will be conducted 4 days per week, once per day at random times from April 1 to June 30 (crew size permitting, 3 inspections per week minimum if crew size is compromised). Additionally, Wildlife Services (APHIS) will collect these data on the three days per week not covered by COE. This will cover 97% of the typical juvenile salmonid outmigration. Fish ladder inspections will continue (July 1 to December 31) to collect these data at the required rate of 3 inspections per week.

8.1.1. Bird hazing effectiveness inspections will take place once daily from April 1 through June 30. These will consist of flying gull and tern counts and floating cormorant counts in the tailrace and at the juvenile fish bypass outfall. These inspections will be conducted from the river end of the raceway structure and will occur between 1100 and 1300 hours.

8.1.2. Data collected during fish ladder inspection will be recorded in a standardized Excel spreadsheet and will be limited to gulls, cormorants, terns, grebes and pelicans. There will be five zones monitored including: Forebay (FB1), Spillway (SWT1), Powerhouse outflow under bird wires (PH1), Powerhouse outflow downstream of bird wires (PH2) and the juvenile bypass outfall (JFOF). There will be two bird activities monitored: Foraging (flying, diving or feeding) and Non-foraging (resting in/on water, on debris, structures or land, or while scavenging).

8.1.3. Data collected during bird hazing effectiveness inspections will be recorded in a standardized Excel spreadsheet and will be limited to: gulls, cormorants and terns.

8.2. Action Plan.

- (a) Lower Monumental Dam will have an active hazing program consisting of one 8-hour shift per day from April 1 through May 2 and two 8-hour shifts (non-concurrent) from May 3 through June 2. Gulls, cormorants and terns will be the major focus of this hazing effort.
- (b) Hazing shifts and zones to be emphasized will be adjusted to maximize deterrent effect on feeding bird populations.
- (c) Lethal take may occur as part of the hazing program and would exclusively be performed and regulated by licensed agencies and/or companies.
- (d) Bird wires will be maintained across the turbine discharge area (see zone photo). The addition of bird wires across the spillway is not practical or safe as the fish transport barge and tug would run through them.
- (e) Bird aversion water cannons will be in operation from April 1 through October 1 at the bypass outfall.
- (f) Boat hazing is not needed at Lower Monumental as the river is sufficiently narrow to allow effective hazing from the dam structure and shore.

8.3. Incident Response. In response to operational trigger numbers observed during bird hazing effectiveness inspections, the following action toolbox items will be utilized. The timing of the introduction of these additional hazing methods will be dependent on available trained staff:

(a) Propane cannon placement.

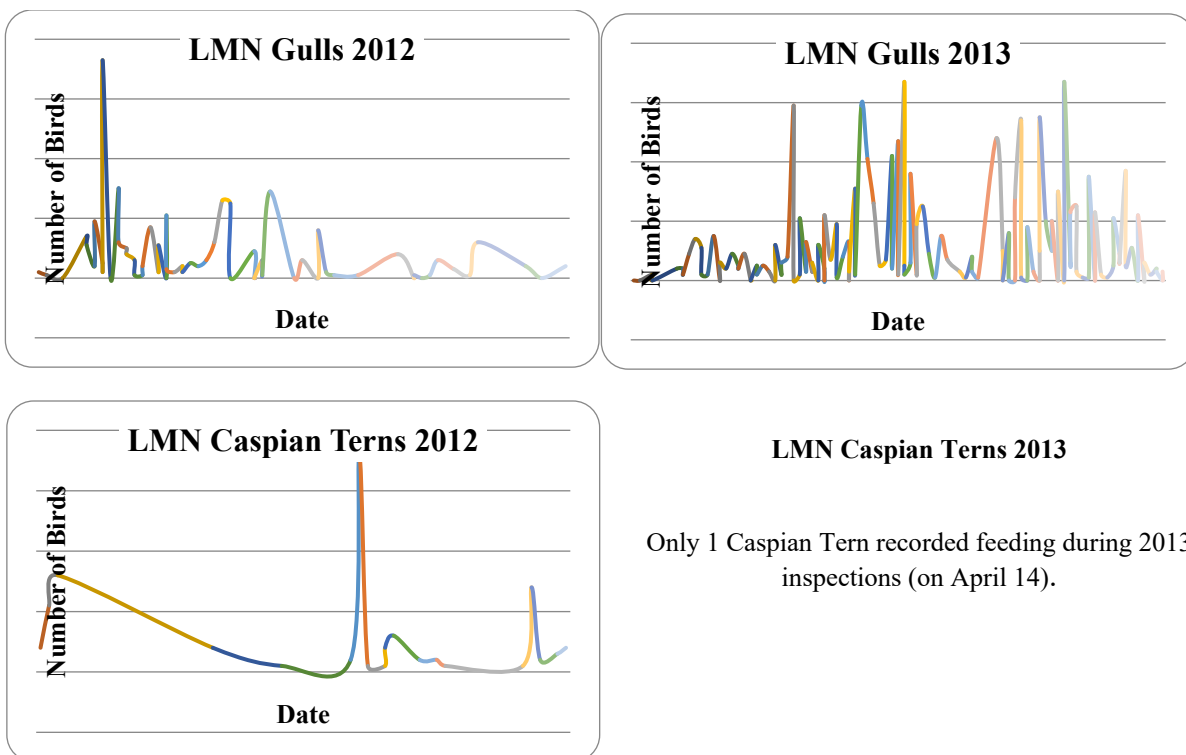
(b) COE employee (added) hazing with screamers and poppers fired from shore.

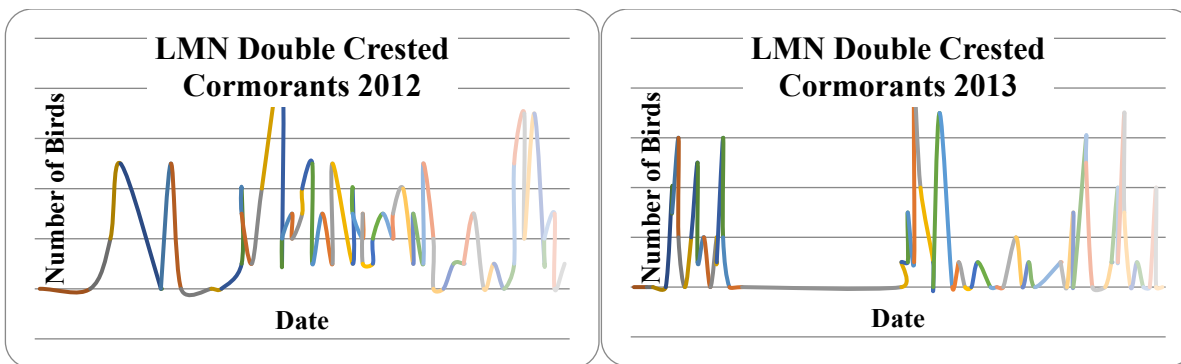
8.3.1. When the following operational trigger criteria are met (depending on the conditions), one of the toolbox items will be put into service. Available staff will likely be a factor in which item is selected. Re-evaluation of the item causing the action will occur daily in regard to stepping up, terminating, or randomizing use of the operations from the Action Toolbox. Items will be added to the toolbox as they are tested and proved effective.

8.3.2. The following action point numbers based on foraging birds are proposed as a starting point for this process. As more years of data are collected with the benefit of binoculars then these action points will be adjusted accordingly.

- a. Action point Gulls = 86.
- b. Action point Terns = 43.
- c. Action point Cormorants = 15.

8.3.3. The graphs below show the average daily foraging bird numbers by species for the 2012 and 2013 operating year. Foraging bird numbers can be highly variable during the juvenile fish outmigration. The high foraging gull numbers, tern numbers and cormorant numbers for these two years were 72, 37 and 9, respectively.





8.4. Reporting. Annual Reporting of fish ladder inspection bird monitoring results will be included in the “*Adult and Juvenile Fish Facility Monitoring Report*” focusing on bird activities from April 1 through June 30. Weekly Reporting of bird hazing effectiveness inspections and occurrence of trigger points and resulting action will be added to the standard Fish Facility Weekly Report in its own section and summary table labeled, “Table 2. LMO Tailrace Counts of Foraging Piscivorous Birds”, from April 1 through June 30.

9. LITTLE GOOSE DAM

9.1. Monitoring. Little Goose will monitor and collect daily data on gulls, cormorants, and terns from April 1 – October 31. Bird monitoring will occur 2 to 3 times per day in two zones: the forebay and tailrace. There will be two bird activities monitored: foraging and non-foraging.

9.2. Action Plan.

- (a) Little Goose will perform bird hazing March 29 through June 19, 7 days per week, which includes at least 8 hours per day of contracted services.
- (b) During the peak period for bird abundance, April 11 – May 22, up to 16 hours of hazing will occur.
- (c) Boat hazing will occur March 29 – June 19, 8 hours per day, three days per week.
- (d) Gulls, cormorants, and terns will be hazed as needed during juvenile fish passage season.
- (e) Hazing will be performed using scare products, including consumer fireworks, scare cannons, bird bangers, and bird screamers.
- (f) Passive deterrents will be used, including needle strips, an overhead bird wire array composed of 12 wires across the turbine discharge area, visual scare devices, and a hydro-cannon located at the juvenile fish bypass outfall.
- (g) Limited lethal take may occur at the discretion of qualified APHIS Wildlife Services personnel.

9.3. Incident Response. If gulls and/or tern numbers reach an average of 100 per day or cormorants reach an average of 50 per day during the April 1 to August 31 period the project will commence into action one or more of the following toolbox control measures, in any combination, to best achieve reduced bird predation to an acceptable level.

- a. Deploy additional remotely activated propane canon(s);
- b. Increase hazing with pyrotechnics and other bird scare devices;
- c. Initiate limited lethal take by Wildlife Services personnel if not already started.

9.4. Reporting. Bird management data will be recorded into computer spreadsheets, assimilated and reported weekly and annually. A brief statement assessing the effectiveness of the avian deterrent program for that week will be included in the weekly report, with an overall summary provided in the annual report.

10. LOWER GRANITE DAM

10.1. Monitoring. Monitoring at Lower Granite Dam will be done by COE biologists April 1 through October 31 and by control agents of the USDA conducting bird hazing work at the dam April 1 through June 30. The agencies will conduct independent counts. Hazers will usually be counting birds once daily in all zones, in conjunction with their normal hazing activities. Binoculars will be utilized to make the counts and the normal count area will be from the base of the dam downstream to a buoy approximately 1/2 mile below the dam. The tailrace area of the dam has been divided into zones and the technicians will count the birds in each zone and record foraging or non-foraging behavior. Bird count data will be limited to gulls (California and ring-billed), cormorants, and Caspian terns. American white pelicans will be recorded on an incidental basis in attempt to monitor their increasing abundance.

10.2. Action Plan.

- (a) Base actions will include the array of methods in long-time use by the USDA APHIS and will also include limited lethal control when the other methods prove ineffective.
- (b) Hazing activities will take place 8 hours per day April 1 through April 19 and June 2 through June 30. Hazing will take place 16 hours per day April 20 through June 1 when the maximum numbers of juvenile salmonids are normally passing the dam.
- (c) Agents will haze birds on both side of the river and will work as far as two miles downstream of the dam.
- (d) Nonlethal control measures will include 15mm pyrotechnics and Dominator rocket pyrotechnics.
- (e) Passive avian deterrent structures include the overhead array of 34 wires spanning the tailrace downstream to the end of the navigation lock wall and across the river to the pole located just upstream of the visitor center overlook.
- (f) Limited lethal control of gulls and cormorants will be at the discretion of the agents working on site. Lethal take will be conducted with a shotgun in accordance with the USFWS-issued permit. Powerhouse operators and persons conducting tours will be notified before any lethal take activities take place. No lethal take will be allowed when schools or other tour groups are on site.

10.3. Incident Response. A trigger for additional control measures is listed below. The trigger level is presently set at an order of magnitude above the average gull counts for the previous 5-year period. It might be wise to consider lowering this number somewhat, but it appears gulls are being effectively controlled at Lower Granite at the present time using the available techniques. The addition of limited lethal take in 2014 should help keep the numbers at reasonable numbers. If the numbers do significantly increase over time, possible control measures would include: remote-activated propane canons, biotech hazing with pyrotechnics (in addition to APHIS), playing remotely activated gull distress sounds and emergency call-out of off-duty JFF personnel to assist with hazing activities.

10.3.1. Avian Predation Trigger Level and Proposed Toolbox Control Measures. Gull numbers were obtained from daily counts off the Lower Granite JFF separator platform. At the present time, terns are not very abundant at Lower Granite and the project does not have count data. Cormorants are certainly present but much more difficult to count (and haze) than gulls. At this time, I recommend that a trigger level be calculated and utilized for gulls (both species combined) only. Below are the average gull numbers for each of five years running from April 1 through June 30 each year (APHIS hazing was being conducted):

Year	Gulls/Day (April 1 – June 30)
2013	9.36
2012	6.03
2011	6.43
2010	14.09
2009	11.5
2009-2013 Average	9.48 (st dev 3.05)

10.3.2. If gull numbers reach an average of 95 per day during the April 1 to June 30 time period (10x the 5-year average), the following project toolbox measures would be utilized in combination with APHIS hazing activities. In order to achieve the best control, it is likely a combination of measures would need to be utilized:

- a. Remotely activated propane cannon(s);
- b. Biological Technician hazing with pyrotechnics;
- c. Emergency call of off-duty separator technicians for hazing;
- d. Play audible gull distress sounds (*Bird Chase "Super Sonic" Player, Bird-B-Gone Catalog PN #1B50-PCOM*);
- e. Others to consider in combination with above: visual deterrent devices (e.g., raptor effigies, scare-eye balloons, etc.).

10.4. Reporting. Reporting of bird numbers will consist of a table of average daily bird counts that will be included in each weekly ESA report April 1 through October 31, along with a brief statement assessing the effectiveness of the avian deterrent program for that week. In addition, a section on bird predation control work will be included in the annual "Adult and Juvenile Fish Monitoring Report".