Appendix L

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

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1. OVERVIEW – ALL PROJECTS

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, in accordance with NOAA Fisheries' 2014 Supplemental FCRPS Biological Opinion RPA Action 48[1]. Also included are actions implemented at Bonneville Dam to monitor and deter pinnipeds, in accordance with RPA Action 49. 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).

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.

2. BONNEVILLE DAM

2.1. 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.

2.1.1. Piscivorous birds of interest: gulls & cormorants, though other birds such as mergansers, grebes, osprey and eagles may occasionally be denoted.

[1] See pg 39 of 2014 Supplemental FCRPS BiOp at: www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx

2.1.2. Zones demarcated: Powerhouse (PH) 1 forebay, PH1 tailrace, Spillway forebay, Spillway tailrace, B2CC outfall, PH2 forebay, PH2 tailrace and smolt monitoring facility (SMF) outfall.

2.2. 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.

2.2.1. Avian wires are installed each year prior to April 10 in the tailrace areas of PH1, PH2, Spillway and B2CC outfall.

2.2.2. Avian hazers are present at the dam from April 1 through July 31, 8 hours per day, 7 days per week from 0800 to 2000 hours. Hours of hazing vary so birds do not acclimate to long periods of no hazing.

2.2.3. A hydro-cannon operates continuously on the top JBS outfall flume.

2.2.4. 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.

2.3. Incident Response. A trigger for additional action is 150 piscivorous birds in a single zone during a single observation.

2.3.1. When the trigger is met, increase USDA APHIS hazing efforts 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. Lethal removal would require approval and additional funding.

2.3.2. The trigger is only reached a few times a year, usually from mid-September through early October. Unfortunately, USDA APHIS hazing concludes on 31 July. If the trigger is consistently being met in September and October, adjustment of hazing dates could be pursued.

2.4. Reporting. Avian predation will be documented in the Project Weekly Report, including daily predation by species and zone. If warranted, a summary could be included in the Annual Report as well.

2.5. Pinnipeds. California Sea Lions and Stellar Sea Lions shall be hazed at Bonneville Dam March 31–May 31 daily (7 days/week) for 8 hours/day between the hours of 0600–2000. Hours should vary so that pinnipeds do not acclimate to long periods with no hazing, unless otherwise coordinated with the POC.

2.5.1. 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*.

2.5.2. 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.

2.5.3. 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.

2.5.4. Sea Lion Exclusion Devices (SLEDs) will be installed at all adult fishway entrances no earlier than October 1 and no later than February 1 and will be removed by August 1 each year. All floating orifice gates (FOGs) can be left installed year-round.

3. THE DALLES DAM

3.1. Monitoring. Monitoring will be done by Project Fisheries staff daily April 1–September 30, 7 days per week. The standardized form provided by the Avian Task Group will be used to record numbers of gulls, terns and cormorants foraging and non-foraging. A database will be used at the project and can be shared as the Avian Task Group determines.

3.1.1. Zones include forebay, powerhouse tailrace, sluiceway outfall tailrace and spillway tailrace outside of the spillwall, spillway tailrace inside the spillwall, spillway tailrace upstream of bridge and spillway tailrace downstream of bridge.

3.2. Action Plan. 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.

3.2.1. Contracted hazing will occur April 15–July 31, 7 days per week, 14 hours/day between the hours of 0600–2000 to cover most daylight hours.

3.2.2. Hazing will consist of launching pyrotechnics as gull numbers increase within any of the zones.

3.2.3. 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.

3.2.4. 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.

3.3. Incident Response. A trigger for additional action should be around 250 gulls, based on recent numbers. This number is reached once to twice per year. Unfortunately NWP has few options available if gull numbers reach a trigger. Lethal removal at this trigger would likely work, but unlike NWW district, is not approved by NWP district. Lethal removal would require a boat crew and additional funding. 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.

Investigation of cost savings for Corps NWP employee hazing program should also be investigated.

3.4. Discussion. Fish Field Unit studies have shown that gulls are not highly efficient predators. 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. This zone requires almost all of the hazing. The zones upstream of the bridge have a much higher predation success rate per gull, but gull numbers are effectively held low due to avian lines. If funding is limited, a cost benefit analysis should be made for the hazing program relative to other fish passage improvements and maintenance.

4. JOHN DAY DAM

4.1. 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.

4.1.1. 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.

4.1.2. 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.

4.2. 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 feels this is sufficient for deterring gulls, the primary predator at JDA, from feeding in the tailrace.

4.2.1. Avian Array: 125 lines stretched across the tailrace below JDA expanding 2,200' below the dam.

4.2.2. Boat Hazing: 8-hour shift, 7 days per week during fish passage season Apr 10–July 31. In the event weather and/or other conditions preclude safe boat operation, hazing shall occur from dam structures and/or adjacent shorelines.

5. MCNARY DAM

5.1. 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.

5.1.1. 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.

5.1.2. In addition to regular USDA APHIS hazing activities, APHIS will be conducting experimental boat hazing, 3 days a week, in the powerhouse tailrace during the busiest months of the bird predation season. If this effort is successful, it may be expanded in future years, depending on funding levels.

5.1.3. 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 USDA 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.

5.1.4. Propane cannons, electronic bird alarms and other noise-makers 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.

5.2. 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/nonforaging activity, etc.

5.3. Action Plan. USDA APHIS bird hazers typically start on the last Sunday in March and continue to haze birds through the first Saturday in August. Double shifts (16 hours per day) are used during the period of the greatest bird activity, typically beginning on the third Sunday in April and ending the second Saturday in July. Boat hazing is also used during that same period, typically 3 days per week, initially. APHIS crews may at their discretion deploy limited lethal take of gulls and cormorants, particularly if hazing by itself loses its effectiveness. Project personnel may deploy a limited number of propane cannons and electronic bird alarms from time-to-time, typically early in the season. Overhead avian deterrent wires are located along the powerhouse tailrace. A hydrocannon is situated at the juvenile fish bypass outfall.

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

5.4.1. When predacious bird numbers at any particular location exceed 50-100 foraging birds, focus APHIS hazers on those locations;

5.4.2. When predacious bird numbers at any particular location (most usually the spillway outfall) exceed 100 - 200 foraging birds, increase APHIS hazing efforts in those areas and increase the number of long-range pyrotechnic devices. Focus boat hazing in those areas. If APHIS has not already initiated lethal take, deploy limited lethal take;

5.4.3. 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.

5.5. 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. We maintain records of this monitoring 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; Bypass Pipe Outfall; Powerhouse Tailrace; Spillway Tailrace. Reporting is by bird species, when clear identification is possible. We do not differentiate between gull species, due to the difficulty in determining gull species from a distance. We also have hazing data from APHIS personnel working on the project.

6. ICE HARBOR DAM

6.1. 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.

6.2. 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 1–11 and June 21–30, and 16 hours per day April 12–June 20. Boat-based hazing is conducted 3 days per week April 12–25 and May 31–June 20, and 5 days per week April 26–May 30.

6.3. Action Plan. Birds are actively hazed in the immediate forebay of the dam to the Boat Restrictive Zone (BRZ). In the tailrace, birds are actively hazed from the immediate tailrace of the dam downstream to Eagle Island. Data that are noted are the time, avian zone, the species of the bird, number of birds, if they are foraging or not foraging and control action taken.

6.3.1. Birds are hazed daily using propane cannons, bird distress calls, pyrotechnics and lasers. In addition, there are bird wires across the turbine discharge area and the spillway area below the Dam. A water cannon is located on the juvenile fish bypass pipe terminus. Wire spikes are installed on light poles, forebay buoys, and other bird perching areas.

6.4. Incident Response. When a bird (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 APHIS agent. This action will occur most sparingly after all other efforts have failed to move the birds. In the event that 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 APHIS agents in hazing.

6.5. 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.

7. LOWER MONUMENTAL DAM

7.1. Monitoring. Bird monitoring as part of standard fish ladder inspections will occur from March 1 to December 31. 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 this 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 this data at the required rate of 3 inspections per week.

7.1.1. The annual high daily bird numbers by species including resting, flyby and foraging birds for the past ten years are as follows. For years 2004 through 2008 only gull numbers were required so the records are so limited. Also of note, is the fact that binoculars were not used on these inspections until 2012. Numbers prior to 2012 should be considered as reduced by some factor relating to the visual acuity of the inspector conducting the inspection.

Species	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Gull	74	155	86	360	445	37	59	101	104	247
Terns	N/A	N/A	N/A	N/A	N/A	2	1	6	37	1
Cormorants	N/A	N/A	N/A	N/A	N/A	29	3	9	44	22

7.1.2. Additionally, 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.

7.1.3. 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), Power house outflow under birdwires (PH1), Power house outflow downstream of birdwires (PH2) and the juvenile bypass outfall (JFOF). There will be two bird activities monitored; Act of Foraging

(flying, diving or feeding) and Act of Non-foraging (resting in/on water, on debris, structures or land or while scavenging).

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

7.2. Action Plan. Lower Monumental Dam will have an active hazing program consisting of one 8-hour shift per day from April 2 through May 5 and two 8-hour shifts (non-concurrent) from May 6 through June 2. Gulls, Cormorants and Terns will be the major focus of this hazing effort.

7.2.1. Hazing shifts and zones to be emphasized will be adjusted to maximize deterrent effect on feeding bird populations.

7.2.2. Lethal take may occur as part of the hazing program and would exclusively be performed and regulated by licensed agencies and/or companies.

7.2.3. 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.

7.2.4. Bird aversion water cannons will be in operation from April 1 through October 1 at the bypass outfall.

7.2.5. Boat hazing is not needed at Lower Monumental as the river is sufficiently narrow to allow effective hazing from the dam structure and shore.

7.3. 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 to carry them out:

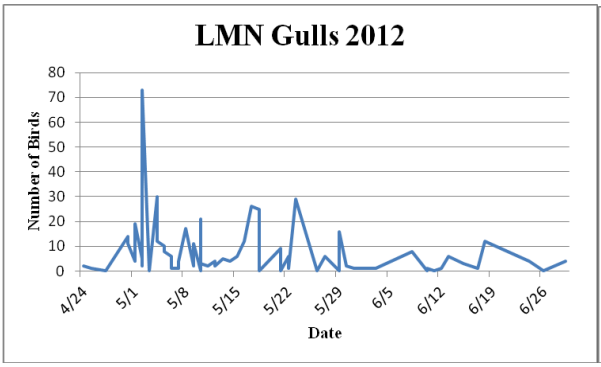
- **a.** Propane cannon placement.
- **b.** COE employee (added) hazing with screamers and poppers fired from shore.

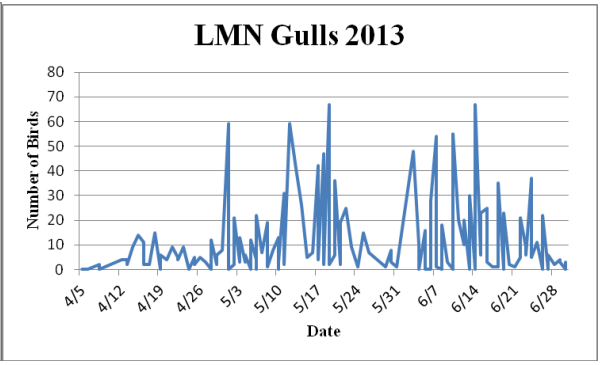
7.3.1. Operational Trigger Numbers. When the following operational trigger criteria are met then (depending on the conditions) one of the toolbox items will be put into service. Available staff will likely be a factor in which item is selected. Re-evaluation of the item causing the action will occur 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.

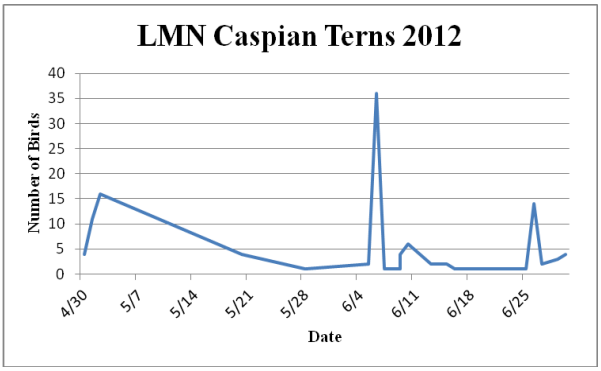
7.3.2. The following action point numbers based on foraging birds are proposed as a starting point for this process. As more years of data are collected with the benefit of binoculars then these action points will be adjusted accordingly.

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

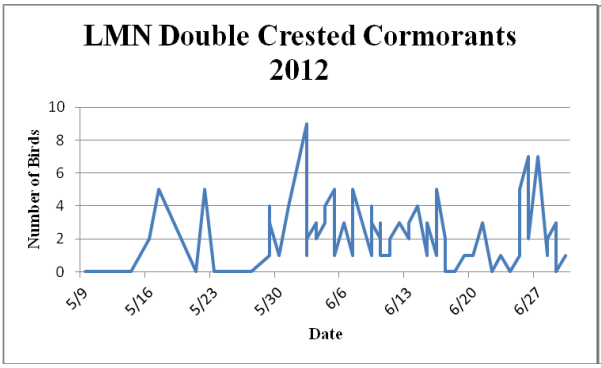
7.3.3. The graphs below show the average daily foraging bird numbers by species for the 2012 and 2013 operating year. Foraging bird numbers can be highly variable during the juvenile fish outmigration. The high foraging gull numbers, tern numbers and cormorant numbers for these two years were 72, 37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

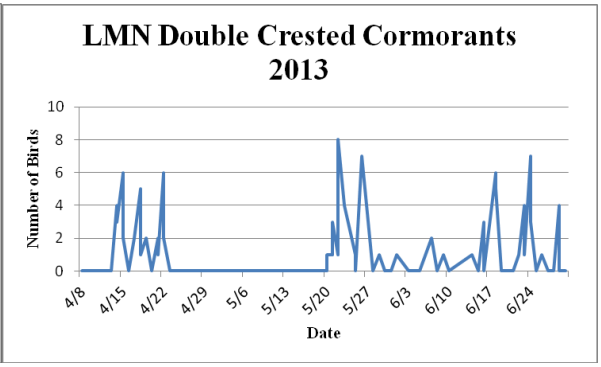






LMN Caspian Terns 2013 – There was only 1 Caspian Tern recorded feeding during 2013 inspections on April 14, 2013.





7.4. Reporting.

7.4.1. 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.

7.4.2. 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.

8. LITTLE GOOSE DAM

8.1. Monitoring. Little Goose will monitor and collect daily data on gulls, cormorants and terns from April 1 – August 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.

8.2. Action Plan. Little Goose will perform bird hazing, which includes at least 8 hours per day, 5 days per week of contracted services from April 7 to June 20. Gulls, cormorants and terns will be hazed as needed during the juvenile fish passage season. Hazing will be performed using scare products. These include consumer fireworks, scare cannons, bird bangers and bird screamers.

8.2.1. Passive deterrents will be used. These include; needle strips, an overhead bird wire array, visual scare devices and a hydrocannon located at the juvenile fish bypass outfall. The wire array is composed of 12 wires across the turbine discharge area.

8.2.2. Limited lethal take may occur at the discretion of qualified APHIS Wildlife Services personnel.

8.3. 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.

8.4. 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.

9. LOWER GRANITE DAM

9.1. Monitoring. Monitoring work at Lower Granite Dam will be done by COE biological technicians and by control agents of the USDA conducting bird hazing work at the dam. The agencies will conduct independent counts. USDA will usually be counting birds once daily in all zones, in conjunction with their normal hazing activities. Their work will be limited to April 1-June 30 each year. Biological technicians working at the Lower Granite separator will conduct counts twice daily (morning, evening) from approximately April 1 until separator operations end in early to mid December. 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.

9.2. Action Plan. Base actions will be include the array of methods in long-time use by theUSDA/APHIS and will also include limited lethal control when the other methods prove ineffective. Passive avian deterrent structures include the overhead array of 26 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. Nonlethal control measures will include 15 mm pyrotechnics and Dominator rocket pyrotechnics. Agents will haze birds on both side of the river and will work as far as two miles below the dam. 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. Hazing activities will take place 8 hours per day from April 1 through April 20 and from June 2 through June 30. Hazing will take place 16 hours per day from April 21 through June 1 when the maximum numbers of juvenile salmonids are normally passing the dam.

9.3. 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 five-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. In the event the numbers do significantly increase over time, possible control measures would include: remotely activated propane canons, biotech hazing with pyrotechnics (in addition to USDA/APHIS), playing remotely activated gull distress sounds and emergency call-out of off-duty JFF personnel to assist with hazing activities.

9.3.1. 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)

9.3.2. 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 (or other contractor) 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.).

9.4. Reporting. Reporting of bird numbers will consist of a table of average daily bird counts that will be included in each weekly ESA report, 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".