U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA DISTRICT
FISH FACILITIES WEEKLY REPORT
#31-2015

Project: McNary
Biologist: Bobby Johnson
Dates: September 25 – October 1, 2015

Turbine Operation

McNary had units 12 to 14 units available (of 14 units total) for power generation. The hard 1 percent constraint continued. No turbine units ran outside the constraint. Turbine unit outages are recorded in Table 1 below.

Table 1. Unit Outages at McNary Project.

Units	Outage Dates	Outage Length	Reason
2	Sep 28–Oct 1	3.4 days.	High pressure oil injection system (HPOIS) (thrust bearing oil pump) installed.
10	Sep 28–Oct 1	3.3 days.	HPOIS installed.
13 & 14	Sep 29	2.2 hours.	Tripped breaker, transmission line 6 at Bonneville Power Administration (BPA) substation.
12	Sep 30	10.0 hours.	High Kaplan oil temperature. Repacked Kaplan.

Adult Fish Passage Facilities

The McNary fisheries biologist performed measured inspections of the adult fishways on September 25, 27 and October 1. Visual adult fish counts continued. On September 30, video tape reviews for adult lamprey counts and exit temperature monitoring concluded.

Fish Ladder Exits: Criteria at both exits are 1.0 to 1.3 feet for head over weir and 0.0 to 0.5 feet differential at the count stations. Both ladder exits met all criteria. Picketed leads were cleaned at both exits as required, including weekends.

At the Washington ladder exit, on September 25, the operators reset one regulating weir alarm and adjusted the tilting weir set point. On September 27, the operators adjusted the regulating weir set point. Aquatic vegetation quantities were minimal in the exit area.

At the Oregon ladder exit, on September 27, the operators adjusted the regulating weir and tilting weir set points. On October 1, the operators adjusted the regulating weir set point. Debris loads remained light to moderate in the area of the Oregon exit.

Fishway Entrances and Collection Channel: Criteria for all entrances are pool differentials measuring between 1.0 and 2.0 feet, and weir depths measuring 8.0 feet or deeper.

At the Washington entrance, all entrance inspection points met criteria.

At the Oregon ladder, all entrance inspection points met criteria. On October 1, the electrical staff installed a new encoder at weir NFEW3.

Collection channel surface velocities averaged 1.5 feet per second.

Auxiliary Water Supply System: The Wasco County Public Utility District (PUD) turbine unit in the Washington ladder had one interruption in service. On September 29, from 1632 to 1912 hours, the unit was out of service for the transmission line 6 breaker trippage mentioned above in Table 1. During the outage, the bypass system functioned satisfactorily.

Two of the three Oregon ladder fish pumps operated satisfactorily with blade angles of 25 to 30 degrees with no interruptions in service. Early in the week, exciter alarms were repeatedly triggered by fish pump 1. No cause has yet been determined. On September 29, the operators reduced both fish pumps blade angles to 25 degrees. This action eliminated the exciter alarms and the ladder remained in criteria. Fish pump 2 is currently under contract for major overhaul with completion scheduled for April, 2016.

The juvenile facility continued to supply 450 cubic feet per second to the north powerhouse pool.

Juvenile Fish Passage Facility

The fish passage season, which consisted of alternating days of primary and secondary bypass modes, concluded on September 30 at 0700 hours, with the start of fall primary bypass season. There were no deviations from the schedule. Secondary bypass occurred on September 25, 27 and 29. This week, four juvenile lamprey and 20 smolts were bypassed. Juvenile shad were the predominant species sampled.

Forebay Debris/Gatewell Debris/Oil: The forebay debris load was minimal to light and scattered across the powerhouse face and along the Oregon shore. New debris was minimal.

No high trash rack differentials were recorded and no trash racks were cleaned.

No problems were observed in the gatewell slots.

ESBSs/VBSs: All turbine units have extended-length submersible bar screens (ESBSs) installed. The screens in slots 1A, 3B, 11C and 12C remained in timer mode. ESBS camera inspections did not occur this week.

No high VBS (vertical barrier screen) differentials were recorded. On September 26, 30 and October 1, a total of 12 screens were cleaned, including a scheduled VBS inspection in unit 8 on October 1. No fish mortalities were observed. VBS rehabilitations continued.

Orifices, Collection Channel, Dewatering Structure, and Bypass Pipe: Forty two orifices were in use. During VBS cleaning, orifices in the affected slots were closed, with makeup water coming from orifices in adjacent slots.

All systems functioned satisfactorily in automatic mode. The fisheries staff continued to monitor the north side dewatering valve and observed no new problems.

Bypass Facility: On September 30, at 0700 hours, the bypass season concluded. All systems functioned satisfactorily. Passive integrated transponder (PIT) tag detection will now occur only in the full flow pipe during the fall season. Light maintenance and partial facility winterization will begin.

Smolt monitoring concluded on September 30.

River Conditions

River conditions during the week are outlined in Table 2 below as provided by the McNary control room. The data period runs from 0000 to 2400 hours each day. Flows and spill are recorded in one-thousand cubic feet per second. Temperature is recorded in degrees Fahrenheit. Scheduled spillway hoist maintenance has begun. On September 26, bays 1 and 20 were opened one foot each for six minutes total in order to test the two spillway cranes.

Table 2. River Conditions at McNary Dam.

Daily Average River Flow		Daily Average Spill		Water Temperature (Unit 1 scroll case)		Water Clarity (Secchi disk - feet)	
High	Low	High	Low	High	Low	High	Low
112.2	75.8	0.0	0.0	66.0	65.0	6.0	6.0

Other

Inline Cooling Water Strainers: The next cooling water strainer examinations will occur on October 6.

Invasive Species: The next zebra mussel station examinations will occur in late October.

Avian Activity: Avian counts concluded on September 30. Observations are recorded in Table 3 below. In the forebay observation zone, a small flock of grebes was occasionally noted. Gulls and cormorants were roosting on the rocks by the Washington shore boat dock, which is outside the forebay observation zone.

Table 3. McNary Project Daily Avian Count.

Date	Zone	Gull	Cormorant	Tern	Pelican	Grebe
Sep 25	Forebay	0	0	0	0	0
	Spill	1	5	0	0	0
	Powerhouse	3	1	2	0	0
	Outfall	0	0	0	0	0
Sep 26	Forebay	0	0	0	0	0
	Spill	67	37	0	0	0
	Powerhouse	12	0	0	0	0
	Outfall	12	1	0	0	0
Sep 27	Forebay	0	0	0	0	0
	Spill	97	3	0	0	0
	Powerhouse	6	0	0	0	0
	Outfall	0	0	0	0	0
Sep 28	Forebay	0	0	0	0	17
	Spill	104	22	0	0	0
	Powerhouse	59	1	0	0	0
	Outfall	2	5	0	0	0
Sep 29	Forebay	0	0	0	0	5
	Spill	83	62	0	0	0
	Powerhouse	82	3	0	0	0
	Outfall	4	0	0	0	0
Sep 30	Forebay	0	0	0	0	8
	Spill	21	17	0	0	0
	Powerhouse	27	1	0	0	0
	Outfall	3	0	0	0	0

Gulls and cormorants were observed in the tailwater observation area, roosting on the navigation lock wing wall and feeding in the powerhouse flow. Overall bird numbers appear to be fluctuating. It appears the birds are feeding on juvenile shad. Terns were noted just once.

Occasionally, gulls and cormorants were observed near the juvenile bypass outfall.

Great blue and night herons were also occasionally observed near the project. A large flock of gulls was noted at the nearby golf course.

Bird hazing distress calls remain deployed around the project and continued to function satisfactorily. The fisheries mechanic and the general maintenance staff continued to clean the bird hazing water cannon pump intake three times a week. One of the two sprinklers remains jammed. Ordering parts or a replacement sprinkler are among the options being considered.

Research: On October 5, the adult lamprey passage structure at SFEW2 will be closed for the season.

Project: Ice Harbor
Biologist: Ken Fone
Dates: September 25 – October 1, 2015

Turbine Operation

Unit 4 was out of service (OOS) for annual maintenance from August 31 at 0830 hours to September 30 at 1341 hours. Unit 3 was OOS for annual maintenance from August 31 at 0930 hours to October 1 at 1603 hours. Unit 2 was OOS from September 21 at 0754 hours to September 24 at 1538 hours to repair a vacuum breaker that was stuck open. Units were operated within the 1% peak efficiency range (hard constraint).

Adult Fish Passage Facility

Fish facility personnel inspected the adult fishways on September 28, 29, 30, and October 1.

Fish Ladders: The north fish ladder inspection areas (head differentials at fishway exit and picketed leads, and depth over weirs) were in criteria on all inspections. The south fish ladder inspection areas (head differentials at fishway exit and picketed leads, and depth over weirs) were in criteria on all inspections. Criteria for head differentials at ladder exits and picketed leads, and depth over the weirs are 0.5 feet or less, 0.3 feet or less, and 1.0-1.3 feet, respectively. The water surfaces above the fish ladder exits were clear of debris and the bubblers were operating satisfactorily.

Fishway Entrances and Collection Channel: The south shore entrance (SFE-1) depth and channel/tailwater differential were in criteria on all inspections. The north powerhouse entrance (NFE-2) depth and channel/tailwater differential were in criteria on all inspections. The north shore entrance (NSE-1) depth and channel/tailwater differential were in criteria on all inspections. Fishway entrance criteria are 8 feet depth or greater, or on sill. Channel/tailwater differential criteria are 1 – 2 feet.

The south shore channel velocity was in criteria on all inspections. The channel velocity criterion is 1.5-4.0 feet/second.

Auxiliary Water Supply (AWS) System: Two of the three north shore AWS pumps were operated throughout the week. Six of the eight south shore AWS pumps were operated throughout the week.

Juvenile Fish Passage Facility

Forebay Debris/Gatewell Debris/Oil: There was an average of approximately 4 square yards of surface debris observed in the forebay. There was little to no surface debris coverage in the gatewells.

STSs/VBSs: The STSs are being operated in cycle-run mode. STS inspections and unit 5 VBS inspections occurred on September 21 and 23. There were no screen problems observed. The next monthly inspections will occur the week of October 19.

Orifices, Collection Channel, Dewatering Structure, and Bypass Pipe: The juvenile fish bypass system is operating with 20 orifices open. Orifices were routinely cycled and back-flushed once per day. The bird abatement hydrocannon at the bypass pipe outfall was found to be nonfunctional on September 27 and is currently undergoing repairs.

Juvenile Fish Facility: Fish are being routed through the bypass pipe.

Fish Sampling: Fish sampling is done for the season.

Removable Spillway Weir (RSW): Mandated spill for fish passage began on April 3 and ended on August 31.

River Conditions

River conditions during the week are outlined in Table 1 below.

Table 1. River conditions at Ice Harbor Dam.

Daily Average River Flow (kcfs)		Daily Average Spill (kcfs)		Water Temperature* (^{o}F)		Water Clarity (Secchi disk - feet)	
High	Low	High	Low	High	Low	High	Low
18.5	12.2	0.0	0.0	66.0	64.0	7.8	7.4

*Unit 1 scrollcase temperature.

Other

Inline Cooling Water Strainers: The turbine cooling water strainers were inspected on August 31 (units 3 and 4 during their annual maintenance), September 21 (units 5 and 6), and September 23 (units 1 and 2). There were a total of 24 juvenile shad and 15 Siberian prawns found (all mortalities). The next monthly inspections will occur the week of October 19.

Invasive Species: No new exotic species have been found.

Avian Activity: A moderate number of piscivorous birds were seen around the dam during the week, with the majority of them roosting on Eagle Island. There was no bird activity observed at the bypass pipe outfall.

Research: Beginning on September 9, sensor fish were released into the unit 1 turbine intake via pipes installed on the STS framework in gatewell slot 1B, for the turbine environment characterization study. Sensor fish releases temporarily ended on September 18 and will recommence in early October.

Project: Lower Monumental
Biologists: Bill Spurgeon and Raymond Addis
Dates: September 25 – October 1, 2015

Turbine Operation

The units are being operated within the hard constraint 1% peak efficiency criteria. Unit 1 was removed from service on December 10, 2014 for unit rehabilitation with an estimated return to service date of January 12, 2017. Unit 4 was removed from service at 0742 hours on September 28 for annual maintenance with an estimated return to service of October 15. Unit 6 was out of service from 0730 until 1015 hours on September 28 for headgate cylinder removal.

Adult Fish Passage Facility

The adult fishway was inspected by Corps and Blue Leaf Environmental biologists on September 26, 27, 28, and 30.

Fish Ladders: Fishway exit head differentials and depth over the weirs were within criteria (≤ 0.5' and 1.0'-1.3', respectively) on all inspections. Picketed lead head differentials were in criteria (≤ 0.4' and ≤ 0.3' for north and south shore fishways, respectively) on all inspections.

Fishway Entrances and Collection Channel: NSE1 and NSE2 weir gates were in depth criteria (criteria: ≥ 8' or on sill) on all inspections. North shore channel/tailwater head was in criteria (1'-2') on all inspections.

SPE1 and SPE2 weir gates were in sill criteria (criteria: ≥ 8' or on sill) on all inspections. While on sill, both gate depth readings ranged from 7.1 to 7.8 feet. South powerhouse channel/tailwater head was in criteria (1'-2') on all inspections.

SSE1 weir gate was in depth or sill criteria (criteria: ≥ 8' or on sill) on all inspections. While on sill, gate depth reading was 7.2 feet. SSE2 was in criteria (6' above sill) on all inspections. South shore channel/tailwater head was in criteria (1'-2') on all inspections.

Auxiliary Water Supply System: AWS pumps 1, 2, and 3 were operated throughout this period.

Juvenile Fish Passage Facility

Forebay Debris/Gatewell Debris/Oil: There was an average of 23 square yards of forebay debris observed during this period. Gatewell debris ranged from 0 - 5% surface coverage. No problems were observed in the gatewells.

STSs/VBSs: STS operations changed to cycle-run mode on August 7 as average sub-yearling Chinook length became greater than 120 mm. STS inspections were conducted September 1 and 2 with all screens found in good operating condition.

Orifices, Collection Channel, Dewatering Structure, Flume: The collection channel was operated with 19 orifices open.

Collection Facility: The sampling season ended at 0700 hours on October 1 at which time the facility went into primary bypass. No problems occurred.

Transport Summary: Every-other-day truck transport concluded at 0700 hours on October 1.

River Conditions

No spill occurred this report period. River conditions during the week are outlined in Table 1 below.

Table 1. River conditions at Lower Monumental Dam.

Daily Average River Flow (kcfs)		Daily Average Spill (kcfs)		Water Temperature (^{o}F)*		Water Clarity (Secchi disk - feet)	
High	Low	High	Low	High	Low	High	Low
17.2	13.4	0.0	0.0	64	64	5.0	4.4

*Scrollcase temperatures.

Other

Inline Cooling Water Strainers: Cooling water strainers were inspected on September 2. Live fish recovered included 47 Siberian prawn. Mortalities included 50 Siberian prawn.

Invasive Species: No zebra mussels were observed at the monitoring stations on September 4.

Avian Activity: Daily tailrace counts of feeding piscivorous birds are summarized in Table 2 below. Gulls and cormorants were the dominant species observed during inspections this week. Hazing ended on June 2.

Table 2. Lower Monumental Tailrace Counts of Foraging Piscivorous Birds.

Date	Time (hours)	Gulls	Cormorants	Caspian Terns	Pelicans
Sept 25	1100	1	13	0	0
Sept 26	1115	2	22	0	0
Sept 27	1100	5	3	0	0
Sept 28	1110	2	1	0	0
Sept 29	1105	0	2	0	0
Sept 30	1100	0	3	0	0
Oct 1	1100	2	2	0	0

Research: No onsite research is in progress at this time.

Project: Little Goose
Biologist: Richard Weis
Dates: September 25 – October 1, 2015

Turbine Operation

All turbine units were available for service throughout this report period except units 1, 3 and 5. Unit 3 was placed out of service on August 25 for digital governor installation and returned to service on September 25. Unit 3 was placed out of service on September 29 after wicket gate locks failed to disengage during a start up operation. Unit 5 was removed from service for its annual maintenance on September 16. Hard constraints of 1% peak efficiency criteria are in effect. No violations were seen.

Adult Fish Passage Facility

Adult fishway inspections were performed on Sept. 27 and October 01.

Fish Ladder: The ladder exit head differentials ranged between 0.1 and 0.2 feet (criteria $\leq$ 0.5 ft.). Water depths over the ladder weirs ranged between 1.2 and 1.3 feet (criteria 1.0-1.3 ft.) and picketed lead head differentials held steady at 0.0 feet (criteria $\leq$ 0.3 ft.). The air bubbler used to prevent debris from collecting near the ladder exit operated satisfactorily.

Fishway Entrances and Collection Channel: The adult fishway system is in automatic mode. Channel to tailwater head differentials ranged between 1.0 and 1.4 feet (criteria 1.0 to 2.0 ft.). SSE weir depths ranged between 8.8 and 9.4 feet (criteria $\geq$ 8.0 ft). NPE weir depths ranged between 6.1 and 6.5 feet and were on sill (criteria $\geq$7.0 ft. or on sill). NSE weir depths ranged between 6.1 and 6.4 feet (criteria $\geq$ 6.0 ft.). Collection channel surface water velocity measured at the North powerhouse ranged between 2.3 and 2.6 fps (criteria 1.5 to 4.0 fps). The monthly water velocity measured at the north powerhouse using the Rickly velocity equipment measured 1 foot from bottom, mid depth and surface averaged 3.8 fps.

Auxiliary Water Supply System: Fish pumps 2 and 3 operated as designed. The fish pump 1 gear box was rebuilt and is waiting on return to service.

Juvenile Fish Passage Facility

Forebay Debris/Gatewell Debris/Oil: The trash/shear boom is currently still on shore. Efforts are underway to have it repaired. Woody debris in the immediate forebay ranged between 150 and 540 square feet for the week. Fish screen 3A was pulled on September 17 to evaluate the source of an oil leak. Oil is still seen in gatewell 3A.

Spillway Weir: The spillway weir was removed for the season on June 18.

ESBS/VBS: ESBSs are all deployed and gatewells are clean except for slot 3A which has a light sheen of oil. Drawdowns were not performed this week. All criteria were met.

Orifices, Collection Channel, Dewatering Structure, and Flume: The juvenile bypass system is running with 18 open orifices.

Transportation Facility: The juvenile fish facility (JFF) continued transporting fish every other day by truck. GBT (Gas Bubble Trauma) sampling ended for the season.

Transport Summary: The collection and transportation facility operated within criteria this report period. A total of 104 fish were collected for transport. The descaling and mortality rates were 1.6% and 5.3% respectively. No adult lamprey were removed from sample this week and none were released upstream at Little Goose Landing.

River Conditions

River conditions during the week are outlined in Table 1 below.

Table 1. River conditions at Little Goose Dam.

Daily Average River Flow (kcfs)		Daily Average Spill (kcfs)		Water Temperature* (^{o}F)		Water Clarity (Secchi disk - feet)	
High	Low	High	Low	High	Low	High	Low
16.3	13.6	0.0	0.0	64.3	64.1	5.9	4.9

*Ladder temperature.

Other

Inline Cooling Water Strainers: All cooling water strainers were checked on September 19. No fish were seen.

Invasive Species: The zebra mussel substrate monitor was inspected on September 13. No zebra mussels were detected.

Avian Activity: Bird hazing ended on June 16. See Table 2 below for the numbers observed.

Table 2. Daily maximum tailrace piscivorous bird counts at Little Goose Dam*.

Date	Time (hours)	Gulls	Cormorants	Caspian Terns	Pelicans
Sept 25	1030	21	9	0	0
Sept 26	1000	19	8	0	0
Sept 27	1140	21	12	0	0
Sept 28	1010	26	6	0	0
Sept 28	1030	27	12	0	0
Sept 30	1120	24	11	0	0
Oct 1	1145	27	12	0	0

*Bird counts are taken from a single observation, Forebay and Tailrace.

Scroll Case Temperature: Little Goose Dam has only one temperature probe on the scroll case in unit 1. The temperature ranged between 65.0 and 71 degrees F. Unit 1 is out of service for digital governor installation and water is not moving through the strainer system.

Research: No onsite research is in progress at this time.

Project: Lower Granite
Biologists: Elizabeth Holdren, Robert (JR) Horal
Dates: September 25 – October 1, 2015

Turbine Operation

Units are operating within the hard constraint 1% peak efficiency criteria. Unit 5 was removed from service at 0630 hours September 14 for annual maintenance and fish screen slot closures.

Adult Fish Passage Facility

The adult fish ladder was inspected by Corps or Blue Leaf Environmental biologists on September 26, 30, and October 1.

Fish Ladder: Fish ladder exit head differential and depth over the weirs were in criteria (≤0.5' and 1.0-1.3', respectively) on all inspections. Picketed lead head differential was in criteria (≤ 0.3') on all inspections.

Fishway Entrances and Collection Channel: SSE1 and SSE2 weir gates were in depth criteria (criteria ≥8' or on sill) on all inspections. South shore channel/tailwater head differential was in criteria (criteria 1'-2') on all inspections.

NPE1 and NPE2 weir gates were in depth criteria (criteria ≥8' or on sill) on all inspections. North powerhouse channel/tailwater head differential was in criteria (criteria 1'-2') on all inspections with the exception of a 0.9 feet reading September 26.

NSE1 was out of criteria (criteria ≥7' or on sill) on all inspections with gate depth reading of 5.0', 4.5', and 5.0 feet. NSE2 remains set with a chain fall hoist in the closed position to improve channel/tailwater head differentials. North shore channel/tailwater head differential was in criteria (criteria 1'-2') on all inspections with the exception of a 0.9 feet reading September 26.

Collection channel velocity was out of criteria (criteria 1.5-4.0 fps) on all inspections with readings ranging from 0.9 – 0.8 fps and a weekly average of 0.8 fps. Alternative methods of measuring collection channel velocity are being investigated.

Auxiliary Water Supply System: The fish ladder is in two pump operation with AWS pumps 1 and 2 operating and pump 3 is in standby mode.

Juvenile Fish Passage Facility

Forebay Debris/Gatewell Debris/Oil: Forebay debris was minimal. Daily gatewell surface inspections continue. Floating debris is being removed daily to prevent orifice blockages. No oil was reported in the gatewell slots.

ESBSs/VBSs: Video inspections are scheduled for late October.

Orifices, Collection Channel, Dewatering Structure, Bypass Pipe: Orifices are being backflushed every three hours.

Collection Facility: Collection for juvenile transport and condition sampling continues. Descaling rates have increased over the last week with rates of 6.3% (1 descaled/16 sampled), 14.3% (2 descaled/14 sampled), 6.7% (1 descaled/15 sampled), 11.1% (3 descaled/27 sampled), 7.7% (4 descaled/52 sampled), and 7.5% (6 descaled/80 sampled). The collection facility was inspected and no obstructions were found in orifices, pipes, or flumes. Fine debris has increased in the collection facility over the last week.

Transport Summary: Truck transport continues with trucks departing Lower Granite on odd numbered days.

River Conditions

No spill is occurring at this time. River conditions during the week are outlined in Table 1.

Table 1: River conditions at Lower Granite Dam.

Daily Average River Flow (kcfs)		Daily Average Spill (kcfs)		Water Temperature* (F^o)		Water Clarity (Secchi disk - feet)	
High	Low	High	Low	High	Low	High	Low
18.2	16.1	0.0	0.0	65.5	64.4	5.0+	5.0+

*Cooling water intake temperature.

Other

Inline Cooling Water Strainers: Unit cooling water strainers will be inspected in late October.

Invasive Species: No evidence of zebra/quagga mussel was observed September 7.

Avian Activity: Piscivorous bird observation counts are taken from the juvenile fish separator platform one hour after sunrise and one hour before sunset. Maximum piscivorous bird counts are summarized in Table 2 below.

Table 2. Daily maximum tailrace piscivorous bird counts at Lower Granite Dam.

Date	Time (hours)	Gulls	Cormorants	Terns
Sept 25	0745	2	0	0
Sept 26	0745	0	0	0
Sept 27	0745	2	0	0
Sept 28	0745	1	0	0
Sept 29	0745	1	0	0
Sept 30	0745	1	0	0
Oct 1	1725	0	23	0

Fish Ladder Temperature Mitigation: Auxiliary pump 1 and all three temporary ladder cooling pumps were removed from service at 1705 hours on September 30.

Adult Fish Trap Operations: The adult trap is in 24 hour operation with a 12% sample rate. Collection of adult fall Chinook for truck transportation to Lyons Ferry Hatchery and for the Nez Perce Hatchery (NPT) continued this week. Collection of adult Coho from the adult trap for NPT was initiated September 25.

Fish Rescue Operation: No fish rescues occurred.

Research

U.S. Geological Survey (USGS) Early Life History of Juvenile Fall Chinook: This project focuses on research, monitoring, and evaluation of spawning and early life history of Snake River fall Chinook salmon, develop strategies to reduce non-indigenous fish, and enhance research on salmon predators and invasive species. LGR and LGO reservoirs food web changes are being investigated to determine importance of non-native Siberian prawn and opossum shrimp in juvenile salmon diets.