

McNary Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. During periods of high river flow, spill volumes and the elevation of McNary reservoir may need to be manipulated on a daily or every-other-day basis to provide safe conditions for loading the fish barge at the juvenile fish facility below the dam.

1.2. Doble Tests. Two transformer banks, T1 and T3, and the respective turbine units will be taken out of service for Doble testing in 2008. Turbine units 1, 2, 5 and 6 will be unavailable for generation during the testing. The outage is tentatively scheduled for (dates and month) 2008.

1.3. TSW Installation. TSW1 is to be moved from spillbay 22 to spillbay 18 prior to the start of the 2008 spill season. This change will require one or two spill patterns depending on the number of research case studies planned. New spill pattern(s) will be devised prior to the start of the 2008 fish passage season.

1.4. Headgate Repair. Repairing main unit headgates by adding new roller chain, seals, anodes, etc. This is a long term program to return the headgates to a safe operating condition. The plan will require short unit outages throughout the year while transporting gates from units to the repair pit and other handling needs to facilitate the repairs.

1.5. New Turbine Unit Oil Coolers. The existing turbine unit thrust bearing oil coolers are failing and are in need of replacement. The project has been replacing the internal oil coolers with external coolers as they fail. The plan is to replace the remaining oil coolers during planned outages rather than through forced outages. This work started in July, 2007 and will continue into 2008.

1.6. Navigation. Short term adjustments in spill patterns, spill discharge rates and/or turbine operations may be required for navigational safety. This includes both commercial tows and fish barges.

1.7 Rehabilitation of Spillway Gates. Contract 06-C-0029 was awarded on 19 Sep 2006 for the rehabilitation of three spillway gates. One of the gates was refurbished during a 150 calendar day period commencing on 6 Oct 2006. The second and third gates are currently being rehabbed during a 90 calendar day period which commenced on 4 Sep 2007. The work involves resurfacing wheels, installing low-friction seals, and painting. Each gate would be removed

¹ The purpose of this section is to notify regional interests of planned activities that will or may affect fish passage. Further coordination may occur as needed.

from its slot for rehab and a spare gate set in the upstream slot while the gate is being rehabbed. Handling gates for rehab would require a four to six hour outage in one spillway bay at a time, about one swap per month. Twenty-one of the 22 spillway bays would be operable during the period of time that each spillway gate is being rehabbed.

1.8 Waterfowl Nesting. From the end of April to the beginning of July, the McNary pool may be restricted to operations to elevations between 337.0 and 340.0 feet in support of waterfowl nesting on Lake Wallula. Pool elevations are also operated between 338.5 and 339.5 feet at least once every 4 days during daylight hours for a period of 4 to 6 hours.

1.9 McNary Dam – Underwater Sounding Inspections. Underwater sounding safety inspections of the McNary Dam stilling basin are planned in September 2008. This will require changes in turbine unit priorities and some restrictions in spill. Water surface is monitored on a continuous basis to determine and account for causes of changes in elevations. During the surveys, turbine units nearest the stilling basin will not be in use, and no spills will be taking place.

2. Studies.

2.1. Evaluation of Juvenile Salmonid Passage and Survival. A passage and survival study to evaluate the performance of one or more top-spill weirs (TSW) will be conducted during the spring and summer of 2008. Both spring and summer evaluations will consist of two project spill operations yet to be determined. Equipment setup and installation requiring diving and considerable boat activity in the forebay BRZ will begin in February and continue through mid-April. The spring evaluation will begin in April and continue into early June. The summer evaluation will begin later in June and continue until late July. During the evaluations, juvenile salmonids will be collected at the juvenile fish facility for tagging with acoustic tags. The facility will alternate between days of primary bypass and secondary bypass in the spring (April 1 to approximately June 20). Within this time period (approximately April 17 to July 25) during days of primary bypass, the facility will switch to secondary bypass for up to a few hours each day to collect additional fish for tagging if necessary. Tagged fish will be released upstream of the project and monitored as they enter the forebay and pass the project. Also during the evaluation, daily boat access to the forebay BRZ will be required for equipment maintenance. Regional coordination will be necessary to determine appropriate spill levels and patterns for spring and summer evaluations. Treatment schedules and test spill patterns will be developed through SRWG and FFDRWG prior to the study.

2.2. Examination of Ice Harbor Passage and Survival Study Fish. Fish tagged with radio transmitters and PIT-tags at Ice Harbor Dam for Ice Harbor RSW evaluation will be collected at McNary Dam using the sort by code PIT-tag diversion system. Necropsies will be performed on these fish at McNary to determine effect of route passage history at Ice Harbor Dam on fish condition. No special operations are anticipated for the activity.

2.3. TSW Direct Injury and 48-hour Survival Evaluation.

A direct injury and 48-hour evaluation of Hi-Z balloon-tagged fish passing spillbay 20 will be conducted in March prior to regular spill operations during the fish passage season. Evaluation will require spill through conventional and TSW bays (~7-8 kcfs per bay) prior to the spill season. A treatment schedule will be developed through SRWG and FFDRWG prior to the evaluation.

2.4. Estimate of hydrosystem latent mortality associated with barge and in-river life-history strategies of Snake River spring/summer Chinook salmon. The study will require access to fish collection facilities at Lower Granite, McNary, and Bonneville Dams and access to barges and coordination with barge operations. The study will monitor pathogen prevalence and disease incidence in the barge holds and hydropower bypass facilities along the Snake and Columbia River migration corridor and characterize the impact of transport operations on disease transmission. The study will also assess the impact of loading density and water volume exchange rates on disease dynamics and estimate the incidence of latent mortality associated with the type and severity of infectious disease.

2.5. Smolt Responses to Hydrodynamic and Physical Characteristics of Forebay Flow Nets Upstream of Surface Flow Outlets. This study by Battelle will examine fish movement and hydraulic variables upstream of the removable spillway weir (a “surface flow outlet” similar to the corner collector at Bonneville Dam and sluiceway at The Dalles Dam). DIDSON and ADCP equipment will be installed on a barge for data collection. The barge will be anchored to one of the piers adjacent to the TSW. Installation activities will be coordinated with dam operations. Barge access by researchers after installation will only occur if electronic problems need to be fixed and will be coordinated with project staff. The barge can be accessed via a man basket picked from a crane. A trailer will be placed on the spillway to control and operate equipment. Deployment of the barge and equipment would need to occur during February and March 2008. Data collection will focus on determining a water velocity threshold that causes rejection at surface flow entrances and providing hydraulic guidelines for future designs.

2.6. Developing a separator for Juvenile Lamprey. This study will require access to fish collection facilities at McNary Dam and access to the fish collection channel and orifice trap. In addition, project assistance may be needed to obtain lamprey from bypass collection operations. Project assistance may also be required during installation and removal of test screen material in the JBS exit raceways. Pacific lamprey macrophthalmia and ammocoetes collected at the JBS are inadvertently transported downstream during barging and trucking operations to transport juvenile salmonids past dams. The ability to separate lamprey at these operations would allow release of both anadromous and resident lamprey juveniles back into the river after collection. Methods to separate lamprey at JBS exit raceways may provide insights into ways to reduce other sources of juvenile lamprey mortality at dams.

2.7. Evaluation of Adult Pacific Lamprey Passage Success at McNary and Lower Snake River Dams. This study will require access to: AC power at McNary and Ice Harbor and potentially other Snake River dams for electronics equipment in the fishways and tailrace areas during 2008, fishways to install, repair, and test electronic and trapping equipment (some crane

support may be needed to install antennas in and near fishways), tailraces and fishways for downloading of radio and PIT receivers, fishways to trap adult lamprey at McNary Dam, and Space at the juvenile facility to process, hold, and tag adult lamprey and access to AC power and a supply of river water to hold lamprey prior to and following tagging. Maintenance and installation of equipment will occur during the period when fishways are dewatered whenever possible. This study will evaluate passage success for adult Pacific lamprey *Lampetra tridentata* at McNary Dam, Ice Harbor Dam, and the remaining lower Snake River dams and associated river segments using a combination of radio telemetry and half duplex passive integrated transponder (HD PIT) systems.

Ice Harbor Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM.

1.2. Doble Tests. Three transformer banks, TW3, TW4, and TW0 and the respective turbine units will be taken out of service for Doble testing in 2008. Turbine units 3 and 4, and the station service unit will be unavailable for generation during the testing. The outage is tentatively scheduled for 14-17 July 2008.

1.3. Navigation. Short term adjustments in spill patterns, spill discharge rates and/or turbine operations may be required for navigational safety. This includes both commercial tows and fish barges.

1.4. Ice Harbor RSW Tests. Tests are tentatively scheduled for February or March, depending on the availability of project support. The purposes of these tests are twofold: final acceptance tests would make sure the RSW meets all contractual specifications and performance requirements before the government formally commissions the RSW; and to discover the causes and operational of the unusual RSW vibrations that intermittently occurred over the past season. The vibration tests will require divers to install accelerometers on and in the vicinity of the RSW. Turbine unit and spillway outages will likely be needed during the dives.

2. Studies.

2.1. Removable Spillway Weir (RSW) Passage and Survival Evaluation. The RSW will again be evaluated through a radio-telemetry study in 2008. The tainter gate at spillbay 2, when operated, will be either fully open or fully closed. The flow over the RSW will be regulated by the project forebay elevation and not by the tainter gate. Projected flow through the RSW at the anticipated forebay elevation of MOP will be around 8,000 cfs. Project operations (spill levels and possibly patterns) will change according to a randomized block schedule. Details of the schedule and operations are not available at this time, but will be developed through the SRWG and FFDRWG. Spill operation may involve two operations including the RSW and varying levels of “training” spill. Specifics will be coordinated with the fishery agencies and others as needed.

¹ The purpose of this section is to notify regional interests of planned activities that will or may affect fish passage. Further coordination may occur as needed.

2.3. Evaluate the Impacts of Avian Predation on Salmonid Smolts from the Columbia and Snake Rivers. This is a continuation of a pilot study to determine how various biotic and abiotic factors are associated with differences in steelhead smolt vulnerability to predation by Crescent Island terns and Foundation Island cormorants. The study request PIT tagging both hatchery and wild steelhead collected in the smolt monitoring sample at Lower Monumental and Ice Harbor dams April-July. The recorded condition of a fish will be attached to a specific tag code and vulnerability to avian predation will be evaluated using PIT tag recovery data collected from the avian bird colonies. A sample of 500 fish per week is desired.

2.4. Approach patterns of juvenile salmonids at Snake River projects. This study is primarily concerned with the survival of fish passing McNary Dam; one factor being examined during the 2008 season is whether prior passage history influences smolt survival rates at McNary Dam. Yearling Chinook, subyearling Chinook are to be captured, tagged with both acoustic and PIT tags, and released above Lower Granite Dam. Downstream migration will be tracked by hydrophones placed in the forebays and upstream faces of Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams. These hydrophones are to be installed in February and March 2008, prior to the spring spill season and will be removed after study completion. Tagging, release and data collection will take place from April to July 2008.

2.5 Capture and tag adult salmon and steelhead in the trap at Ice Harbor fish ladder. This activity would be necessary in support of the adult passage and behavior study planned at Little Goose as well as an evaluation of adult holding in the Lower Granite fish ladder and transition pool in 2008. The trap would be used during the spring and summer spill periods for spring Chinook, steelhead and fall Chinook. Access to the ladder may be necessary for inspecting and preparing the trap location during the dewatered period from January 1 through February 28, 2008.

2.5. Evaluation of Adult Pacific Lamprey Passage Success at McNary and Lower Snake River Dams. This study will require access to: AC power at McNary and Ice Harbor and potentially other Snake River dams for electronics equipment in the fishways and tailrace areas during 2008, fishways to install, repair, and test electronic and trapping equipment (some crane support may be needed to install antennas in and near fishways), tailraces and fishways for downloading of radio and PIT receivers, fishways to trap adult lamprey at McNary Dam, and Space at the juvenile facility to process, hold, and tag adult lamprey and access to AC power and a supply of river water to hold lamprey prior to and following tagging. Maintenance and installation of equipment will occur during the period when fishways are dewatered whenever possible. This study will evaluate passage success for adult Pacific lamprey *Lampetra tridentata* at McNary Dam, Ice Harbor Dam, and the remaining lower Snake River dams and associated river segments using a combination of radio telemetry and half duplex passive integrated transponder (HD PIT) systems.

Lower Monumental Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. During periods of high river flow, spill volumes and the elevation of Lower Monumental reservoir may need to be manipulated on a daily or every-other-day basis to provide safe conditions for loading the fish barge at the juvenile fish facility below the dam.

1.2. Replacement of Turbine Unit Fire Protection System. The final phase of stage turbine unit fire protections will take place in 2008. This work involves the installation of a new water mist system. High pressure CO₂ fire protection systems were installed on each of the turbine units in 2007. The impact on turbine operations is uncertain at this time. This section will be updated as more information becomes available.

1.3. 500 KV Disconnect Switch Replacement. The T1 line 500 KV disconnect switch is tentatively scheduled to be replaced in late September or early October 2008. The current switch which failed in January 2007, is a key safety and equipment protection device. This work will require a total powerhouse outage, and 100% spill (except for station service) for up to 2 weeks. This work will be coordinated with other potential outages such as Doble testing.

1.4. Spillway Gate Control Upgrades. The spillway gate controls will be upgraded to allow direct communication with GDACs. This work will start in December and be completed in March. This work should not impact generation and be completed prior to the typical start of the required spill season.

1.5. Navigation. Short term adjustments in spill patterns, spill discharge rates and/or turbine operations may be required for navigational safety. This includes both commercial tows and fish barges.

2. Studies.

2.1. Evaluate the Impacts of Avian Predation on Salmonid Smolts from the Columbia and Snake Rivers. This is a pilot study to determine how various biotic and abiotic factors are associated with differences in steelhead smolt vulnerability to predation by Crescent Island terns and Foundation Island cormorants. The study request PIT tagging both hatchery and wild steelhead collected in the smolt monitoring sample at Lower Monumental and Ice Harbor dams April-July. The recorded condition of a fish will be attached to a specific tag code and

¹ The purpose of this section is to notify regional interests of planned activities that will or may affect fish passage. Further coordination may occur as needed.

vulnerability to avian predation will be evaluated using PIT tag recovery data collected from the avian bird colonies. A sample of 500 fish per week is desired.

2.2. Approach patterns of juvenile salmonids at Snake River projects. This study is primarily concerned with the survival of fish passing McNary Dam; one factor being examined during the 2008 season is whether prior passage history influences smolt survival rates at McNary Dam. Yearling Chinook, subyearling Chinook are to be captured, tagged with both acoustic and PIT tags, and released above Lower Granite Dam. Downstream migration will be tracked by hydrophones placed in the forebays and upstream faces of Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams. These hydrophones are to be installed in February and March 2008, prior to the spring spill season and will be removed after study completion. Tagging, release and data collection will take place from April to July 2008.

2.3. Smolt Responses to Hydrodynamic and Physical Characteristics of Forebay Flow Nets Upstream of Surface Flow Outlets. This study by Battelle will examine fish movement and hydraulic variables upstream of the removable spillway weir (a “surface flow outlet” similar to the corner collector at Bonneville Dam and sluiceway at The Dalles Dam). DIDSON and ADCP equipment will be installed on a barge for data collection. The barge will be anchored to one of the piers adjacent to the RSW. Installation activities will be coordinated with dam operations. Barge access by researchers after installation will only occur if electronic problems need to be fixed and will be coordinated with project staff. The barge can be accessed via a man basket picked from a crane. A trailer will be placed on the spillway to control and operate equipment. Deployment of the barge and equipment would need to occur during February and March 2008. Data collection will focus on determining a water velocity threshold that causes rejection at surface flow entrances and providing hydraulic guidelines for future designs.

Little Goose Dam¹

1. Special Project Operations.

- 1.1. **Spill.** Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM.
- 1.2. A periodic inspection at Little Goose Lock and Dam this year scheduled for May 20, 2008. The backup power system will be activated to operate the spillway gates under emergency power. The test will require opening as many gates as the power will allow and close them again. They will inspect the forebay and tailwater dam structures and embankments for signs of damage via a boat upstream and downstream of the project. Another inspection will assess the condition of concrete surfaces on the spillway above tailwater. This test is requesting a period of 4 hours of no spill over the spillway.
- 1.3. **Navigation.** Short term adjustments in spill patterns, spill discharge rates and/or turbine operations may be required for navigational safety. This includes both commercial tows and fish barges.

2. Studies.

2.1 A Study to Determine Tailrace Egress and Behavior of Juvenile Salmonids Under Varying Spill Conditions . Using fish tagged and released at Lower Granite Dam, the goals of this study include: (1) Determine the timing and route of passage for yearling Chinook salmon, sub-yearling Chinook salmon and juvenile steelhead relative to spill and powerhouse operations; (2) Determine the effects of dam operations (e.g. varying flows, pool levels, power house operations, and spill volumes) on smolt tailrace egress at Little Goose Dam. Single-release survival estimates may also be determined. Two to three spill/dam operations treatments may be evaluated.

Radio tag antennas will be placed on the dam in order to cover all passage routes, as well as in the forebay and tailrace of Little Goose Dam. Dive work (and associated turbine and spill outages) may be necessary to install spillway antennas. In addition antenna repair and installation may be necessary on ESBSs and VBSs. The research biologists may also need access to the BRZ for radio-tracking antenna placement if barges are necessary to obtain the passage information needed.

¹ The purpose of this section is to notify regional interests of planned activities that will or may affect fish passage. Further coordination may occur as needed.

2.2. Approach Patterns of Juvenile Salmonids at Snake River Projects. This study is primarily concerned with the survival of fish passing McNary Dam; one factor being examined during the 2008 season is whether prior passage history influences smolt survival rates at McNary Dam. Yearling Chinook, subyearling Chinook are to be captured, tagged with both acoustic and PIT tags, and released above Lower Granite Dam. Downstream migration will be tracked by hydrophones placed in the forebays and upstream faces of Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams. These hydrophones are to be installed in February and March 2007, prior to the spring spill season and will be removed after study completion. Tagging, release and data collection will take place from April to July 2008.

2.3 Evaluate Behavior and Passage of Adult Salmon and Steelhead Under Varying Spill Conditions. Adult spring Chinook, steelhead and fall Chinook will be collected at the Ice Harbor fish ladder adult trap, radio-tagged, and released in the forebay of Ice Harbor Dam. The behavior and passage of these fish will be tracked in the tailrace and through the fish ladder at Little Goose Dam under two, or possibly three, spill and power house operations. The study is planned for the spring spill season with an optional task to include the summer spill period of approximately June 1 through termination of spill in August.

Radio tag antennas will be placed in the tailrace, at the north and south ladder entrances, and in the fish ladder. There are currently radio antennas in the ladder that will require inspection, repair and/or replacement during the dewatered period from January 1 through February 28, 2008. Antenna locations may include but are not limited to the north shore, the earth fill portion of the dam, the peninsula, the juvenile outfall pipe, and the navigation lock drain. The research biologists may also need access to the tailrace BRZ for radio-tracking antenna placement if barges are necessary to obtain the behavior information needed.

In addition to tracking adults, GPS-equipped drogues will be released into selected spillways in order to record and characterize flow patterns in the tailrace under various spill patterns and power house operations.

Boat access to the tailrace will be necessary for recovering the drogues as well as mobile tracking of adults.

Spill patterns and power house test treatments will require coordination through FPOM and the regional fish managers.

2.4 Bull Trout PIT tag Study – Details Pending

Lower Granite Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. During periods of high river flow, spill volumes and the elevation of Lower Granite reservoir may need to be manipulated on a daily or every-other-day basis to provide safe conditions for loading the fish barge at the juvenile fish facility below the dam.

1.3 Turbine Unit 2 Repair. Turbine unit 2 is currently undergoing rotor pole repair and is estimated to be returned to service by late July 2008 to late October 2008. Two weeks of operational tests are needed after the completion of repairs to verify turbine and generator controls, start-up & shut-down sequence operations, relay action, alarms, and other associated components. Operation outside of normal priority may be necessary.

1.4. Turbine Unit 3 Cavitation Repair. Unit 3 is scheduled to be taken OOS for cavitation repair early summer (Approx. Mid June-Mid July, when flows are expected to stay below 60 KCFS) and will remain OOS for approximately 4 months.

1.5 Main Unit Fire Protection. Each main unit will need to be taken OOS for a duration of approx 8 to 10 days one unit at a time to upgrade the fire protection system to a bulk CO2 storage system. (Project to start sometime in either June or July).

1.6. Power System Stabilizer (PSS) installation on Units 4, 5, 6. Units will be scheduled OOS for approximately 1 week (one unit at a time) to perform the physical installation of PSS. After physical installations are complete, each unit will then be scheduled OOS (one unit at a time) for 1 to 2 days to tie in to existing system and commission each PSS. These outages are estimated to begin in late July to late August during mandatory spill season when river flows are low.

2. Studies.

2.1. Alternate Barge Release Strategies. In 2008, NOAA Fisheries will PIT tag yearling Chinook salmon and steelhead to evaluate if an alternate release site for barged fish improves survival. In addition, Battelle will acoustically tag 2,000 fish. The study will require one 2000 series barge for transporting the smolts downriver to near Astoria Bridge for release, and a separate towboat will be contracted to move this barge downriver for the release. Six separate alternate site releases on an ebb tide are planned and tagging will occur five days prior to each release. The control group will be transported in a normal barge trip with all other collected fish

¹ The purpose of this section is to notify regional interests of planned activities that will or may affect fish passage. Further coordination may occur as needed.

for release at Skamania. Arrangements have been made to use the NOAA PIT tagging buildings and personnel for the PIT marking. Acoustic marking and BKD sampling will need to take place either in the wet lab or the shed used for gas bubble monitoring. This study may require an increase in the normal facility sampling rate in order to get the required number of fish on marking days. The study will require coordination with other onsite researchers and the project biological staff and this effort has already been initiated.

2.2. Comparative Performance of Acoustic-tagged and PIT-tagged Juvenile Salmonids.

This study will examine performance differences between fish tagged with only a PIT tag against fish tagged with both a microacoustic tag and PIT tag. A modification to the existing PIT tag diversion for the east raceway flume is planned to occur during February 2007. This will change the existing drop gate into a PIT diversion slide gate capable of rapid response. The modification will be done by NOAA Fisheries, and the PIT tag equipment operation and maintenance will be the responsibility of PSMFC. All facility modifications and testing are planned to occur prior to the fish passage season.

2.3. A study to compare seasonal SARs of early in-river migrating versus transported Snake River yearling anadromous salmonids. At Lower Granite, this study will ask for fish to be collected and held starting April 1 and transported by barge once a week until regularly scheduled transportation operations begin. The desired transported sample size is 6,000 wild Chinook and 6,000 wild steelhead per week for five to six weeks beginning approximately April 1. Currently, the tagging level for the inriver migrating group is 2000 fish per week using NOAA Fisheries Survival Study tagging levels. The study will request an increase in the inriver migrating sample size for comparison. An estimated sample size for the in-river migrating group to estimate weekly SARs with 95% confidence interval is being developed.

2.4. Estimate of hydrosystem latent mortality associated with barge and in-river life-history strategies of Snake River spring/summer Chinook salmon. The study will require access to fish collection facilities at Lower Granite, McNary, and Bonneville Dams and access to barges and coordination with barge operations. The study will monitor pathogen prevalence and disease incidence in the barge holds and hydropower bypass facilities along the Snake and Columbia River migration corridor and characterize the impact of transport operations on disease transmission. The study will also assess the impact of loading density and water volume exchange rates on disease dynamics and estimate the incidence of latent mortality associated with the type and severity of infectious disease.

2.5. Approach patterns of juvenile salmonids at Snake River projects. This study is primarily concerned with the survival of fish passing McNary Dam; one factor being examined during the 2008 season is whether prior passage history influences smolt survival rates at McNary Dam. Yearling Chinook, subyearling Chinook are to be captured, tagged with both acoustic and PIT tags, and released above Lower Granite Dam. Downstream migration will be tracked by hydrophones placed in the forebays and upstream faces of Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams. These hydrophones are to be installed in February and March 2008, prior to the spring spill season and will be removed after study completion. Tagging, release and data collection will take place from April to July 2008.

2.6. Evaluate causes of adults holding in the fish ladder and transition pool. This study is tentative, based on the availability of funding. Fish tagged at the Ice Harbor adult trap for the behavior and passage study at Little Goose Dam will be tracked again upon entrance in the tailrace at Lower Granite. Ladder conditions at Lower Granite would be monitored and evaluated with relation to adult passage/behavior. Radio antennas that are already present in the Lower Granite ladder would need to be inspected and repaired or replaced during the dewatered period from January 1 through February 28, 2008.

2.6. Estimate survival of in-river and transported yearling Chinook salmon originating from Dworshak hatchery in the lower Columbia River and Estuary with emphasis on increasing understanding of causes of differential delayed mortality. The study will require access to fish collection facilities at Lower Granite and Bonneville Dams and access to barges and coordination with barge operations. The primary goal of this study is to use JSATS acoustic tags and concomitant detection arrays in conjunction with estuary net pens to increase the understanding of the extent and cause of differential delayed mortality of transported and in-river yearling Chinook salmon smolts originating from Dworshak hatchery specifically in the lower Columbia River and Estuary.