Save Our wild Salmon

Portland office: 2031 SE Belmont St. Portland, OR 97214 • 503.230.0421; 503.230.0677 fax
Seattle office: 200 1st Ave. W., Ste. 201 Seattle, WA 98119 • 206.286.4455; 206.286.4454 fax
Field offices: 406 Pueblo St. Boise, ID 83702 • 208.245.9067; 208.343.9376 fax
35 W. Main Ave., Ste. 200 Spokane, WA 99201 • 509.747.2030; 509.456.8400 fax
122 C St. NW, Ste. 240 Washington, DC 20001 • 202.266.0466

September 10, 2009

Michelle Pirzadeh, Acting Regional Administrator
Environmental Protection Agency, Region 10
1200 6th Ave., Suite 900
Seattle, WA 98101

RE: Save Our Wild Salmon's Total Dissolved Gas petition with the Washington Department of Ecology

Dear Ms. Pirzadeh,

I write you today on behalf of the Save Our Wild Salmon coalition (SOS) to request EPA's assistance in resolving a petition we had filed with the Washington Department of Ecology regarding total dissolved gas (TDG) standards for the Columbia and Snake Rivers. That petition (attached) was denied on August 10. SOS detailed its concerns about that denial to EPA staff in an August 21 letter to Mary Lou Soscia and John Palmer.

As noted in the letter to Ms. Soscia and Mr. Palmer, we petitioned Ecology to reverse an earlier decision and revise its water quality standards for TDG because current limits have a very detrimental effect on Columbia and Snake River salmon and steelhead. As it stands now, beneficial releases of water over the federal dams on the Columbia and Snake Rivers (commonly called "spill") is being unnecessarily constrained by Washington's TDG standards. After an extensive cooperative review with Washington, Oregon's Department of Environmental Quality (DEQ) recognized that fact and has now revised its standards to be more protective of threatened and endangered salmon.[1] Unfortunately, Ecology's failure to do the same will render Oregon's actions meaningless, as spill levels will be managed to meet Washington's unnecessarily restrictive standard.

Indeed, Ecology's decision not to change its standards is surprising, given the robust investigation conducted by the Adaptive Management Team (AMT) that Ecology and Oregon DEQ convened to help guide their decisionmaking. Having been an active participant in the AMT, it seemed clear the evidence adduced there pointed toward a change in the standard, and obviously that is what Oregon DEQ has done. The joint process employed by Ecology/DEQ was sound, but it is unfortunate that Ecology reached the wrong conclusion.

[1] Washington has a standard of 120% TDG in the tailrace of Columbia and Snake River dams and 115% in the forebay of the next dam downstream. Oregon also formerly operated under those standards, but has since removed the forebay monitoring requirement altogether.

Given the conflicting decisions by Oregon and Washington, and given the harmful impacts that will result for Columbia and Snake River salmon, SOS believes this is an appropriate matter for EPA guidance and perhaps intervention. For the reasons below, we therefore ask for your involvement in resolving this dispute and hope that, if necessary, EPA might use its authority to help remove this unnecessary constraint on beneficial spill for threatened and endangered salmon and steelhead in the Columbia and Snake Rivers.

1. Forebay monitors do not accurately measure TDG: There is little dispute that the forebay monitors on the Columbia and Snake Rivers are not accurate measurement tools for TDG. We disagree that we should be limiting crucial spill based on a monitoring method that does not work. As a result, we made a request in our petition[2] to eliminate the forebay monitoring requirement altogether if the 115% forebay requirement were not increased to 120%.

2. Removing the 115% forebay requirement would mean more spill for fish: As laid out in detail in Section IV of the petition (especially on page 5), there is also no dispute that removing the 115% forebay requirement would result in more beneficial spill for fish. There is quite a range of *how much* extra spill would result, however.

For example, the Fish Passage Center (FPC) projected that **an additional 4.1 million acre-feet** of spill would have been available to outmigrating young fish in 2006 if the 115% requirement had not been in effect. The AMT process initiated by Ecology looked into a variety of scenarios and "water years" and came to a similar conclusion: removing the 115% standard means more spill, ranging from the 1 percent to 60 percent increase predicted by FPC to an overall increase of just 1.3 percent according to an analysis done by the Bonneville Power Administration (BPA).

Unfortunately, Ecology chose to focus its attention primarily on FPC's Scenario B, which contained spill increases more in line with BPA's and U.S. Army Corps' projections. FPC's other scenarios – which address conditions more likely to actually be obtained under current operations – were apparently given little credence, even though they showed much greater potential spill levels. We believe it was inappropriate to disregard this crucial component of FPC's analysis.

3. More spill means better survival for fish: The Ecology/DEQ decision makes it clear that nearly all analyses done for the AMT concluded that additional spill would result in greater fish survival through the hydrosystem. Again, the range of survival benefits varied depending on the model. The COMPASS model developed by NOAA for use in the 2008 Biological Opinion for the federal dams showed only a 1% or less survival increase if the 115% standard were removed.[3]

---

[2] See section III (pp. 4-5) of June 19, 2009, SOS petition.

[3] COMPASS – and only COMPASS – also showed a potential detriment to Snake River steelhead with more spill. According to the COMPASS model – and in contrast to what we're seeing with this year's huge steelhead returns – steelhead have cast aside evolution and now prefer to be transported around the dams.

However, analyses by FPC and the U.S. Fish and Wildlife Service showed potential survival benefits in the 1-9% range for yearling chinook and steelhead. Ecology characterized these survival increases as inconsequential, but to put this potential survival benefit into perspective, it is interesting to compare these survival numbers to survival improvements expected from the 2008 FCRPS BiOp, which the State of Washington is vigorously defending:

- a 5% survival improvement for Snake River spring/summer chinook from all of the prospective hydro actions in the RPA
- a 6% survival improvement for spring/summer chinook from prospective estuary habitat improvements
- a 2% survival improvement for Snake River spring/summer chinook from prospective bird predation actions
- a 1% survival improvement for Snake River spring/summer chinook from prospective pike-minnow predation actions[4]

These are just a few of the examples from the 2008 BiOp and there are many others. It is difficult to understand how these survival increases similar to or greater than those predicted by the 2008 BiOp are not reason enough for Ecology to go through a rule change to remove the 115% forebay standard.

4. Ecology's concerns about adverse impacts of additional spill are unfounded: As covered in Section II (page 4) and the second half of Section IV (pp. 6-8) of our petition, the lone biological concern about additional spill – causing excess gas bubble trauma (GBT) in some fish or other river residents – is simply not a compelling issue at the spill levels under consideration. The science is clear that the incidence of GBT in juvenile and adult chinook and steelhead, in resident fish, and in invertebrates is negligible when TDG levels meet the 120 percent tailrace criteria.

Ecology even admits in the joint decision with DEQ that the empirical in-river evidence of substantial harm just does not exist: "It is important to note that high mortalities are not found in the Columbia and Snake Rivers when TDG reaches these levels, presumably due to depth compensation."[5] We do not believe that the science supports a decision that gives greater weight to these *potential* and negligible effects than to the overwhelming evidence of the benefits of the additional spill resulting from removing the 115% forebay standard.

Thus, for all of these reasons, we respectfully request the assistance of EPA in this matter. Thank you very much for your attention to this issue and please do not hesitate to contact me with any further questions or requests for additional detail.

[4] All of these survival numbers can be found at section 8.5-54 of the BiOp.
[5] Ecology/DEQ decision at p. 46.

Sincerely,

Rhett Lawrence
Policy Analyst

Enclosure

CC: Mary Lou Soscia (without enclosure)
John Palmer (without enclosure)

Save Our Wild Salmon * American Rivers * Northwest Sportfishing Industry Association * Association of Northwest Steelheaders * Idaho Rivers United * Berkley Conservation Institute * Citizens For Progress * Pacific Coast Federation of Fishermen's Associations

June 19, 2009

Jerry Thielen
Rules Coordinator, Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RE: Petition to amend WAC 173-201A-200(1)(f)(ii)

Dear Mr. Thielen,

Pursuant to RCW 34.05.330, Save Our Wild Salmon and its undersigned coalition members (hereinafter collectively referred to as "petitioner" or "SOS") hereby petitions the Washington State Department of Ecology ("Ecology") to amend WAC 173-201A-200(1)(f)(ii), which Ecology promulgated pursuant to RCW 90.48.035.[1] This rule sets water quality standards ("WQSs") for total dissolved gas ("TDG") in Washington's fresh surface waters. Generally, the rule requires that TDG levels not exceed 110 percent of saturation at any point in the sample collection. However, the rule includes exemptions to facilitate fish passage through the federal dams on the Snake and Columbia Rivers:

> The following special fish passage exemptions for the Snake and Columbia rivers apply when spilling water at dams is necessary to aid fish passage:
> - TDG must not exceed an average of one hundred fifteen percent as measured in the forebays of the next downstream dams and must not exceed an average of one hundred twenty percent as measured in the tailraces of each dam (these averages are measured as an average of the twelve highest consecutive hourly readings in any one day, relative to atmospheric pressure); and
> - A maximum TDG one hour average of one hundred twenty-five percent must not be exceeded during spillage for fish passage.[2]

Petitioner agrees that an exemption to the 110 percent TDG limit is necessary to ensure safe salmonid passage on the Snake and Columbia Rivers; however, the

[1] Save Our Wild Salmon previously filed a petition similar to this one in March 2007. That petition was later withdrawn so that SOS could enter into discussions with Ecology about TDG in the Columbia and Snake Rivers. As a result of those conversations and a decision from the Oregon Environmental Quality Commission in June 2007, Ecology convened an Adaptive Management Team ("AMT") as prescribed by the Lower Columbia River Total Dissolved Gas Total Maximum Daily Load ("TMDL"). Petitioner was a member of the AMT, which met approximately monthly from November 2007 through September 2008.

[2] WAC 173-201A-200(1)(f)(ii)

requirement that TDG not exceed 115 percent in the forebays is unduly restrictive, at odds with sound science, and contrary to federal and state law.

Under the Clean Water Act ("CWA"), states have the authority to adopt water quality standards. 33 U.S.C. § 1313. State water quality standards include three central elements: (1) designated uses, (2) water quality criteria, and (3) antidegradation rules. 40 C.F.R. § 131.6(a)-(d); 40 C.F.R. §§ 131.10-.13. Water quality standards must include criteria that will protect each designated use. 40 C.F.R. § 131.11(a)(1). These criteria may be expressed in numeric or narrative form. 40 C.F.R. § 131.11(b)(1), (2). Washington State has set the designated use for the Snake and Columbia Rivers to include "aquatic life uses," including salmonid habitat, spawning, rearing, and migration. WAC 173-201A-200(1)(a)(ii)-(iv).

I. Spill is a vital salmon and steelhead protection measure

For juvenile salmon and steelhead migrating in the Snake and Columbia Rivers, spill indisputably provides the safest passage through the Federal Columbia River Power System ("FCRPS") dams.[3] There is also substantial evidence that spill is the safest route of passage for adult salmon and steelhead through dams.[4] Allowing increased water over the spillways at these dams allows juvenile salmon to avoid traveling through the power turbines – a passage route that increases mortality of these fish by subjecting them to rapid pressure changes and direct impacts with turbine blades.[5] Increased spill also results in lower mortality than the practice of diverting fish from the turbine intakes and "bypassing" them through a series of screens, pipes, and tunnels to be ejected at the lower side of the dam, which is the only other method available to ensure that fish migrating in-river are not forced to pass through the turbines.

Recent experience underscores the beneficial effects of increased spill. Court injunctions have required the U.S. Army Corps of Engineers (Corps) to spill additional water at the FCRPS dams to aid downstream fish passage, which resulted in some of the highest in-river juvenile survival rates in years and allowed more juvenile salmon to migrate in the river under better conditions. These in-river survivals have translated into increased adult returns. For example, the 2008 adult return of sockeye salmon to the Columbia and Snake Rivers (fish that had out-migrated in 2006 and 2007) shattered recent records. According to an analysis of these increased adult returns by the Fish Passage Center (FPC), survival through the hydrosystem in the years these fish migrated to the ocean was better than any year since the late-1990s:

> [J]uvenile sockeye from the Mid-Columbia had a reach survival from Rock Island to John Day dam of approximately 0.88, which was the

[3] See NMFS 2000 Federal Columbia River Power System Biological Opinion (2000 BiOp) at 6-17.
[4] See CRITFC July 3, 2008 memorandum to the AMT, *Review of Adult Passage Through Different Dam Passage Routes.*
[5] 2000 BiOp at 9-83.

> highest survival among the years analyzed. Reach survival in 2007 was 0.56, the second highest among the years analyzed.[6]

Critically endangered Snake River sockeye salmon experienced similarly high reach survival:

> [J]uvenile sockeye from the Snake River had a reach survival from Lower Granite to John Day dam of approximately 0.86, which was the highest survival among the years analyzed. Reach survival for migration year 2007 was 0.62.[7]

These high reach survivals were due in large measure to good river conditions produced by adequate rivers flows and court-ordered spill levels.[8] FPC's conclusions were questioned by the National Marine Fisheries Service/NOAA Fisheries ("NOAA"), which conducted a separate review concluding that the high sockeye returns in 2008 were generally due to favorable ocean conditions. In response, FPC reviewed NOAA's analysis, carefully reexamined its own findings, and concluded that:

> There is no doubt that ocean conditions are important, but this does not reduce the importance of migration conditions and fish survival in-river . . . . The NOAA conclusion that attributes the 2008 high return of sockeye salmon to marine/estuary conditions while discounting the effect of higher in-river survival, lower proportion transported and improved in-river conditions, is flawed because it fails to recognize that fish must reach the ocean/estuary alive to benefit from good ocean conditions. Even the best ocean conditions will not resurrect dead fish.[9]

Indeed, NOAA has previously acknowledged that, along with removable spillway weirs, "[h]igher survival for in-river migrants in 2006 was likely the result of higher flows and greater volumes of water spilled."[10] NOAA had also concluded as long ago as 2000 that "measures that increase juvenile fish passage over FCRPS spillways are the highest priority" for passage improvements.[11]

In short, spill provides the best and safest route of passage for juvenile and adult salmon and steelhead by allowing them to avoid higher turbine and screen bypass mortalities, reducing passage delay, and dispersing predators. At the same time, spill can cause excessive TDG levels, which can be harmful to fish by causing gas

---

[6] FPC Memo (July 14, 2008) at 1. A copy of this analysis is available from: http://www.fpc.org/documents/memos/109-08.pdf

[7] FPC Memo (July 14, 2008) at 2. The "years analyzed" in FPC's analysis were 1998-2007.

[8] Id. at 2.

[9] FPC Memo (Feb. 18, 2009) at 1. A copy of this analysis is available from: http://www.fpc.org/documents/memos/18-09.pdf

[10] NMFS, Northwest Fisheries Science Center, Preliminary Survival Estimates 2006 Spring Juvenile Migration at 1-4 (Aug. 30, 2006).

[11] 2000 BiOp at 9-82.

bubble trauma ("GBT"). State and federal laws require Ecology to set TDG limits that maximize salmon survival by balancing the benefits of spill with the risks of GBT. The 115 percent forebay TDG limit does not properly achieve this balance in light of the available evidence.

II. The 115 percent forebay TDG limit does not have a sound scientific basis.

A state's water quality criteria "must be based on sound scientific rationale . . . ." 40 C.F.R. § 131.11(a)(1). Similarly, the Washington Legislature requires Ecology to use "credible data" when it determines "whether any surface water of the state is supporting its designated use . . . ." RCW 90.48.580(2)(c). In order to be considered "credible" the data must be "representative of water quality conditions at the time the data was collected." RCW 90.48.585(1)(b). The 115 percent forebay limit violates the CWA and Washington law because it is not based on sound science.

The AMT looked in detail at the relationship between increased TDG levels due to spill and the incidence of gas bubble trauma in aquatic organisms. As Ecology notes in the January 2009 joint decision with the Oregon Department of Environmental Quality (ODEQ), the various reviews of the relationship of TDG to GBT show that the incidence of GBT in juvenile and adult chinook and steelhead, in resident fish, and in invertebrates is negligible when TDG levels meet the 120 percent tailrace criteria.[12] The percentage of fish afflicted with GBT does not exceed 1 percent until TDG levels surpass 120 percent, at which point it begins to increase substantially, especially as it approaches 125 percent and above.[13]

Accordingly, as was recognized by ODEQ in its January 2009 decision and its June 2009 formal modification of its TDG waiver, there is no scientific basis for limiting TDG in the forebays to 115 percent.[14]

III. Forebay monitors do not provide credible data necessary for monitoring compliance with water quality standards.

Moreover, it is well documented that forebay monitoring is unreliable. As described in the joint Ecology/ODEQ Evaluation from January 2009, there is a long history of concern about the validity of data from forebay monitoring, particularly the Camas-Washougal gauge. In its 2000 BiOp, NMFS acknowledged the concerns over the adequacy of forebay monitors because of their tendency to produce thermally-induced and seemingly non-representative spiking of TDG. For this reason, that BiOp included a reasonable and prudent alternative (RPA 132) directing federal

---

[12] Washington Department of Ecology/Oregon Department of Environmental Quality, Adaptive Management Team Total Dissolved Gas in the Columbia and Snake Rivers: *Evaluation of the 115 Percent Total Dissolved Gas Forebay Requirement* (January 2009) at p. 53, citing analyses from the FPC GBT Monitoring Program, Ecology's *Evaluation of Total Dissolved Gas Criteria (TDG) Biological Effects Research*, NOAA Fisheries' *Washington and Oregon State – Adaptive Management Team Resident Fish Literature Review*, and the Don Weitkamp/Parametrix *Total Dissolved Gas Supersaturation Biological Effects, Review of Literature 1980-2007.*

[13] Ecology/ODEQ Evaluation at pp. 51-52.

[14] Id. at p. 61.

agencies to conduct a systematic review of the TDG monitoring stations in the forebays of all the mainstem Snake and Columbia River dams. Based on that review, the Corps concluded that routine spikes in daily water temperature were strongly associated with the daily spikes in TDG and subsequently relocated several of the forebay monitors to see if that would remedy the inaccuracies.[15]

The Fish Passage Center included an extensive review of the utility of forebay monitors in a 2006 memo evaluating spring spill in the FCRPS. As that memo relates in great detail, the Corps undertook a follow-up to its RPA 132 study to determine whether the relocation of the forebay monitors solved the problem. In the course of this study, it became clear that "forebay monitors do not accurately reflect the TDG of mixed waters and continue to be impacted by localized processes. Measures (relocation) taken under RPA 132 to assure that the forebay monitors were representative of mixed water at several of the projects did not achieve that objective."[16] FPC concluded in its 2006 evaluation that "[d]ownstream forebay monitors, as presently configured, are not indicative of the readings in a well-mixed water column due to the local influence of temperature, barometric pressure and biological processes."[17]

The Ecology/ODEQ joint evaluation also acknowledges that the Camas-Washougal gauge is particularly suspect and cites to 2001 and 2004 USGS studies of the efficacy of that gauge. The evaluation notes that those studies found that daily variations of TDG were "probably due to the production of oxygen by aquatic plants and to water-temperature variations on warm, sunny days."[18]

As years of implementation and study demonstrate, monitoring data produced by the forebay monitors is not the kind of "credible data" that Ecology may rely on when it determines "whether any surface water of the state is supporting its designated use" because it is not "representative of water quality conditions at the time the data was collected." See RCW 90.48.580(2)(c); RCW 90.48.585(1)(b). Under these circumstances, Ecology must eliminate the requirement for forebay TDG monitoring.

IV. The 115 percent forebay TDG limit does not protect the most sensitive designated use of the Snake and Columbia rivers: salmonid habitat.

States adopting WQSs are required to designate uses for state waters and ensure that their WQSs "protect the designated use." 40 C.F.R. § 131.11(a)(1). When there are multiple use designations, the WQSs "shall support the most sensitive use." Id. Ecology has designated four uses for Washington's fresh surface waters. WAC 173-201A-200. The first of these designated uses – "aquatic life uses" – includes providing salmonid habitat and facilitating salmonid spawning, rearing, and

---

[15] BiOp Measure 132 Final Report, December, 2004: "Total Dissolved Gas Forebay Fixed Monitoring Station Review and Evaluation for Lower Snake River Projects and McNary Dam, 2003-2004," http://www.nwd-wc.usace.army.mil/tmt/wq/studies/rpa132_20041230.pdf

[16] Fish Passage Center, Spring Spill 2006 Memorandum (Sept. 29, 2006) at p. 9.

[17] Id. at pp. 1-2.

[18] Water-Resources Investigations Report 01-4273, page 11 and Figure 13 on page 12, http://or.water.usgs.gov/pubs_dir/WRIR01-4273/index.html

migration. WAC 173-201A-200(1)(a)(ii)-(iv). In addition, Ecology designated "recreational uses," "water supply uses," and "miscellaneous uses." WAC 173-201A-200(2)-(4). The miscellaneous freshwater uses "are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics." WAC 173-201A-200(4). Power generation is not a designated use for Washington's fresh surface waters.

Despite the benefits of increased spill, it has been limited in recent years in the spring and summer months in the Snake and Columbia Rivers in order to comply with the 115 percent forebay dissolved gas standard. As noted in our prior petition, FPC conducted an extensive analysis of spring spill in 2006 for the eight FCRPS dams. That evaluation found that, primarily due to the Corps' actions to meet the forebay limits, spring spill was approximately 4.4 million acre feet ("MAF") less than would be expected under the Court's Order if TDG were not a constraint at all. Without the forebay gas caps and only the tailrace waiver at 120 percent, 4.1 MAF of this 4.4 MAF would have been spilled.[19] Thus the forebay gas caps play a dominant role in reducing spill for salmon survival.

The AMT's investigation of the matter went even farther, considering analyses by the Corps[20] and Bonneville Power Administration,[21] along with a new FPC examination.[22] The conclusions from those analyses varied pretty widely, as did the assumptions that went into the different analyses. However, all agreed that there would be additional spill in the system if the forebay monitoring requirement were removed, ranging from the 1 percent to 60 percent increase predicted by FPC to an overall increase of just an average of 1.3 percent according to BPA. And there was basic agreement across the analyses as well that Little Goose, Lower Monumental, and Bonneville dams would see the greatest increase in spill if the 115 percent requirement were removed.

Ecology's claims regarding the additional protections afforded aquatic life by the 115 percent forebay standard are simply not supported by the science. In the first place, as noted in Section III above, downstream forebay monitor readings are not accurately gauging the effects of upstream spill, but are instead reflecting local conditions such as temperature and wind. Thus, basing actions to protect the most sensitive use – aquatic life – on TDG measurements that do not actually represent the conditions in the river makes no sense.

Likewise, Ecology's statements regarding the effects of TDG on aquatic life near the water surface are unfounded. We know from screen bypass data and tests of fish approaching dams with and without surface bypass and spill that nearly all juvenile salmon approach the dam in the forebay from depths in excess of one meter. For example, in extensive surface collector tests at Bonneville Dam, all juvenile fish (15,800 targets) from 17 meters out to the face of the dam were located with sonar

[19] Fish Passage Center, Spring Spill 2006 Memorandum (Sept. 29, 2006) at p. 2-3.
[20] U.S. Army Corps of Engineers, Northwest Division, Report On the SYSTDG Modeling for AMT With and without 115% TDG standard (July 7, 2008).
[21] Bonneville Power Administration, HYDSIM Use in Analysis of Removing 115% TDG Forebay Gauge Requirements, BPA Report to the Adaptive Management Team – May 2008
[22] Fish Passage Center, Spill Volume Changes with Use of Tailrace Monitors (January 2008).

equipment between 2.5 and 10 meters in depth.[23] At Lower Granite Dam, another study found that as fish approached the dam in the forebay, they tended to move to the center of the river at a deeper depth than upstream where they were found in shallower areas near shore. The study also noted that fish 100 feet upstream of the dam were found deeper in the water column in front of the spillbays than in front of the powerhouse. Furthermore, most of the fish in the forebay were in the 5-15 meter depth range and few if any were in the 0-1 meter depth range.[24]

Regarding duration of exposure to TDG, Ecology's statement that "most aquatic life spends more of their time in the forebays"[25] is not fully accurate. In fact, some evidence indicates that dams with spill reduce forebay residence time and fish density. For example, one study found that yearling chinook residence time in the McNary Dam forebay was only 0.6 hours with spill and 2.6 hours without spill.[26] Another study found that during 64% spill, the mean forebay residence time was 0.1 hour; under 30% spill, the mean residence time was 1 hour. In short, with spill, residence time was only "fractions of an hour."[27]

A study at The Dalles Dam noted that forebay residence time was correlated with spill volume: the greater the spill, the lower the residence time for juvenile steelhead. The authors summarized the importance of reduced fish residence time in the forebay:

- Delay in emigration disrupts life history synchrony
- Delay causes fish fatigue from searching and milling which can lead to stress, which will increase the predation risk due to reduced predator avoidance fitness
- Increased residence time may attract predators to areas of high prey density[28]

Thus, in light of the abundant evidence that GBT is unlikely to occur if TDG levels stay below 120 percent in the tailrace and that the 115 percent forebay standard affords no additional protection, the spill that is being foregone due to the 115

---

[23] Johnson, R.L., R.A. Moursund and M.A. Simmons. Fish behavior in front of the prototype surface collector at Bonneville Dam, 1998. Project No. 2877. Prepared for Portland Division, Corps of Engineers, by Pacific Northwest Laboratory, Richland, WA.

[24] Adams, N.S., D.W. Rondorf , E.E. Kopfoot, M.J. Banach and M.A. Tuell. Migration characteristics of juvenile salmon and steelhead in the forebay of Lower Granite Dam relative to 1996 surface bypass collector tests. Project No. E 86930151 to Walla Walla District Corps of Engineers, by USGS and Nez Perce Tribe. Cook, WA, 1997.

[25] Washington Department of Ecology/Oregon Department of Environmental Quality, *Evaluation* at p. 60.

[26] Axel, G.A., E.E. Hockersmith, M.B. Eppard and B.P. Sandford. Passage and survival of hatchery yearling Chinook salmon at McNary Dam, 2003. Contract W68SBV92844866 to Walla Walla District Corps of Engineers, by Fish Ecology Division, Northwest Fisheries Science Center, NOAA Fisheries. Seattle, WA, 2004.

[27] Allen, M.B and eight co-authors. Movement, distribution, and behavior of radio-tagged yearling and subyearling salmon in the tailrace of The Dalles Dam, 1999. Report to Portland District, Corps of Engineers, by USGS, Cook WA, 1999.

[28] Ploskey, G., T. Poe, A.Giorgi and G. Johnson. Synthesis of hydroacoustic, radio telemetry and survival studies of juvenile salmon at The Dalles Dam (1982-2000). Contract with Portland District, Corps of Engineers and Pacific Northwest Laboratory, Portland, OR, and Richland, WA, 2001.

percent standard is actually impeding salmon and steelhead survival. For this reason, the 115 percent forebay standard is unlawful because it interferes with the most sensitive designated use of Washington's fresh surface water: habitat for salmonids. Furthermore, the 115 percent forebay TDG exemption is simply not based on sound science. Accordingly, Ecology should amend the exemption to its water quality standards to remove the 115 percent forebay gas cap.

V. Ecology should amend WAC 173-201A-200(1)(f)(ii) to remedy its violations of federal and state law.

Ecology should delete the requirement that TDG be monitored in the forebays. This amendment would not only allow for spill to maximize, to the extent possible, salmon and steelhead survival through the hydrosystem, but would also eliminate a monitoring approach that is well documented as being unreliable. Alternatively, Ecology should increase the forebay TDG limit to 120 percent.

Oregon's Department of Environmental Quality considered the same evidence as Ecology and came to the conclusion that "the removal of the forebay monitoring requirement will not cause excessive harm to the beneficial use, aquatic species in the Columbia River, during fish passage spill season."[29] Based on that conclusion, ODEQ has removed the requirement for the use of forebay monitors as of 2009.[30]

Ecology, on the other hand, did not dispute the science, but instead determined that the benefits to salmon from changing its water quality standards was outweighed by the complexity of the process for making that change in Washington State law.[31] Nothing in the Clean Water Act or Washington law suggests that administrative convenience is a sufficient rationale for retaining a water quality standard that is harmful to beneficial uses. In addition, notwithstanding its finding that 120 percent TDG level in the tailrace "does allow for additional spill that benefits salmon," Ecology declined to change its 115 percent forebay standard because it placed weight on its inaccurate belief that there is a risk of "detrimental effects on aquatic life near the surface when TDG" exceeds 115% in the forebays and "approaches 120%."[32] But Ecology has not pointed to any specific evidence it relied on to make this finding, how it weighed or combined this evidence with other evidence, or why it found this line of evidence more compelling than another.[33] Nor has it addressed the contrary evidence regarding near-surface use of water in the forebays by salmon

---

[29] Washington Department of Ecology/Oregon Department of Environmental Quality, *Evaluation* at p. 61.

[30] Id. at 62 ("Based on these consultations and the findings and conclusions described in this document, the Department proposes to remove the requirement for the use of forebay monitors in 2009.") That proposal was adopted by the Oregon Environmental Quality Commission on June 18, 2009.

[31] Id. at 61 (reciting the requirements that may be triggered by a rule change, including state environmental policy act review and approval by EPA, and summarily concluding that "Ecology does not believe the overall benefits of additional spill versus additional risk of gas bubble trauma are clear and are sufficient for a rule revision.")

[32] Id. at 60.

[33] Indeed, Ecology offered only an unsupported assertion that the "evidence from available scientific studies *clearly* points" to the conclusion that TDG levels approaching 120% risk harm to aquatic life near the surface. Id. (emphasis added).

discussed above. Washington State's Administrative Procedure Act prohibits the agency from relying upon such unexplained statements.[34]

Ecology's failure to follow the science and change its standards will limit spill at the dams and further harm the designated beneficial use of salmon migration in these rivers. In addition, the spill limitations pursuant to the decision not to modify or eliminate the forebay standards will increase fish residence time, which will increase TDG exposure and may actually cause fish to occupy higher portions of the water column where they will be more affected by TDG.

Ecology's refusal to revise its standards also threatens to undermine ODEQ's more protective waiver that eliminates the forebay monitoring requirement. Unless and until Ecology changes Washington's standards, the Corps apparently will seek to abide by the lowest common denominator in Washington's standards, rather than the more protective standard contained in Oregon's waiver.[35] This will result in the undermining of Oregon's decision and continue to deprive these threatened and endangered fish of spill levels that would increase their survival, though there is no adequate basis for doing so.[36]

Ecology should therefore either abandon altogether the counterproductive requirement that TDG be monitored in the forebay or it should increase the forebay limit to 120 percent. Petitioner proposes the following amendments to WAC 173-201A-200(1)(f)(ii):

Preferred amendment proposal:

> The TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department approved gas abatement plan. This plan must be accompanied by fisheries management and physical and biological monitoring plans. The elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The following special fish passage exemptions for the Snake and Columbia rivers apply when spilling water at dams is necessary to aid fish passage:
>
> - TDG must not exceed an average of ~~one hundred fifteen percent as measured in the forebays of the next downstream dams and must not exceed an average of~~ one hundred twenty percent as measured in the tailraces of each dam (these averages are measured as an average of the twelve highest consecutive hourly readings in any one day, relative to atmospheric pressure); and
> - A maximum TDG one hour average of one hundred twenty-five percent must not be exceeded during spillage for fish passage.

Alternative amendment proposal:

> The TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department approved gas abatement plan. This plan must be accompanied by fisheries management and physical and biological monitoring

[34] *See* RCW 34.05.570.
[35] *See* 2009 Summer Fish Operations Plan (May 14, 2009), attached as Exhibit A.
[36] *See Arkansas v. Oklahoma*, 503 U.S. 91, 105 (1992) (reviewing regulations that prohibit issuing pollution permits that "'cannot ensure compliance with the applicable water quality requirements of all affected States'").

plans. The elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The following special fish passage exemptions for the Snake and Columbia rivers apply when spilling water at dams is necessary to aid fish passage:

- TDG must not exceed an average of one hundred ~~fifteen~~ *twenty* percent as measured in the forebays of the next downstream dams and must not exceed an average of one hundred twenty percent as measured in the tailraces of each dam (these averages are measured as an average of the twelve highest consecutive hourly readings in any one day, relative to atmospheric pressure); and
- A maximum TDG one hour average of one hundred twenty-five percent must not be exceeded during spillage for fish passage.

*The stricken text indicates suggested deletions from the current regulation. The italicized text indicates suggested additions to the current regulation.

Conclusion

It is well documented that voluntarily spilling water over the dams on the Snake and Columbia Rivers benefits salmonids. While spill can pose a risk to salmonids if TDG levels are too high, biological monitoring conducted over the last decade and more demonstrates the minimal negative impact to migrating salmonids, resident fish, and invertebrates when TDG levels are at 120 percent. On the other hand, setting TDG standards at levels below 120 percent unnecessarily and illegally limits the benefits of spill for these fish and degrades and diminishes a beneficial use of the Snake and Columbia Rivers. Therefore, it is counter to the science and the requirements of the CWA and Washington law for Ecology to limit forebay TDG in the Snake and Columbia Rivers to 115 percent.

For the above reasons, SOS hereby petitions Ecology to promptly amend WAC 173-201A-200(1)(f)(ii) by either deleting the forebay monitoring requirement or, at the very least, setting both forebay and tailrace TDG standards to 120 percent so that these revised standards can be adopted and in place before the 2010 juvenile salmon migration season begins. SOS would also request that this change be made on an emergency basis for 2010 if a complete rule amendment process cannot be completed before the commencement of the spring migration and spill season on or about April 10, 2010.

Sincerely,

R. Nicole Cordan, Policy and Legal Director
Save Our Wild Salmon

Liz Hamilton, Executive Director
Northwest Sportfishing Industry Association

Michael Garrity, Washington Conservation Director
American Rivers

Jim Martin, Conservation Director
Berkley Conservation Institute

Dustin W. Aherin, President
Citizens For Progress

Bill Sedivy, Executive Director
Idaho Rivers United

Paul J. Cathcart, Executive Director
Association of Northwest Steelheaders

Glen Spain, Northwest Regional Director, **Pacific Coast Federation of Fishermen's Associations**

CC: Jay Manning, Dept. of Ecology
Ed Bowles, Oregon Dept. of Fish and Wildlife
Agnes Lut, Oregon Dept. of Environmental Quality
Mike Carrier, Office of Gov. Ted Kulongoski
Keith Phillips, Office of Gov. Chris Gregoire
Mary Lou Soscia, U.S. Environmental Protection Agency

CENWD-PDD June 2, 2009

2009 Summer Fish Operations Plan

BACKGROUND

The 2009 Summer Fish Operations Plan (FOP) describes the U.S. Army Corps of Engineers (Corps) planned operations for fish passage at its mainstem Federal Columbia River Power System (FCRPS) dams during the 2009 summer fish migration season. The 2009 Summer FOP is consistent with the adaptive management provisions in the 2008 NOAA Fisheries FCRPS Biological Opinion (2008 BiOp) and the Corps' Record of Consultation and Statement of Decision (ROCASOD) adopting the project operations contained in the 2008 BiOp and the Columbia Basin Fish Accords (Accords).

As in 2008, the 2009 Summer FOP incorporates planned operational adjustments necessary to perform essential research, and to accommodate the adjustment of surface bypass structures or other features for the 2009 summer migration season. The FCRPS water management and project operations not specifically addressed in this 2009 Summer FOP are consistent with the 2008 BiOp and other operative documents including the 2009 Water Management Plan (WMP), seasonal WMP updates, and the 2009 Fish Passage Plan (FPP). As in 2008, operations may be adjusted through coordination with regional sovereigns.

The following sections describe: factors that influence management of fish operations during various runoff conditions, including TDG management, spillway operations, and minimum generation; specific summer operations for fish passage at each mainstem project; the juvenile fish transportation program operations; protocols for emergencies; coordination with the region; and, monthly reporting.

GENERAL CONSIDERATIONS FOR FISH OPERATIONS

For planning purposes, the Corps' 2009 Summer FOP spill levels, summarized in Table A below, assume "average" run-off conditions. However, because actual run-off conditions vary in timing and shape and may be higher or lower than average, adjustments in spill levels (kcfs discharge rates, spill percentages, or spill caps) will be adaptively managed in-season as needed to avoid or minimize poor juvenile or adult fish passage conditions, navigation safety concerns, or to accommodate powerhouse or transmission constraints. Actual spill levels may be adaptively managed from those displayed in the table below for research or other conditions and will be coordinated through the Technical Management Team (TMT) or other appropriate regional forum. Such conditions are discussed in more detail below.

Management of Spill for Fish Passage

The Corps will continue to manage spill for fish passage to avoid exceeding 120% in the project tailrace, and 115% in the forebay of the next project downstream consistent with the current State of Washington total dissolved gas (TDG) saturation upper limits.[1] These levels are referred to as "gas caps." The project maximum flow rate or spill discharge level that meets but does not exceed the gas caps, is referred to as the "spill cap." The gas caps are constant, whereas, spill caps may vary daily depending on flow, temperature, and other environmental conditions.

As noted above, the spill rates presented in Table A are the planned summer spill operations and assume average runoff conditions; however, adjustments to these spill rates may be necessary for the following reasons:

1. high runoff conditions where flows exceed the powerhouse hydraulic capacity with the specified spill rates;
2. navigation safety concerns;
3. generation unit outages that reduce powerhouse capacity;
4. power system or other emergencies that reduce powerhouse discharges; and,
5. a lack of power demand resulting in an increase in the rate of spill.

Spill below the specified rates could also occur during low runoff conditions when meeting minimum generation levels at a project requires reducing spill rates. This would most likely occur in July and August. Minimum generation and spill rates are included below in the project specific information.

The Corps' Reservoir Control Center (RCC) is responsible for daily management of TDG responsive to changing conditions. In order to manage gas cap spill rates consistent with the States' TDG saturation limits, RCC establishes the spill caps for each project on the lower Columbia and Snake rivers on a daily basis throughout the fish passage season. These spill caps are set so that resultant TDG percent saturation levels are not expected to exceed the 120%/115% TDG limits, measured as the average of the highest 12 hourly readings each day.

Within any given day, some hours of measured TDG levels may be higher or lower than the gas caps due to changing environmental conditions (wind, air temperature, etc.). The process of establishing daily spill caps entails reviewing existing hourly data at each dam (including flow, spill, temperature, and TDG levels) and taking into consideration a number of forecast conditions (including total flow, flow through the powerhouse, wind and temperature forecast, etc.). This information is used as input into the System TDG (SYSTDG) modeling tool. The SYSTDG model estimates TDG levels in the rivers several days into the future, and is a tool integral to daily decision-making when establishing spill caps at individual dams.

[1] In February 2009, the State of Oregon modified its waiver for 2009 to remove the 115% forebay TDG limit. However, the Corps will continue to manage to 120% and 115% limits (the Washington TDG standard) in 2009.

Spill caps set by RCC in daily spill priority requests will be met at the projects by using the spill pattern in the appropriate FPP spill table which most closely corresponds to the requested spill (i.e. may be slightly over or under). During the freshet when flows are often expected to be greater than hydraulic capacity with the specified spill rates at the dams, or if a lack of power load results in an increase in the spill rate, the Corps will attempt to minimize TDG on a system-wide basis. In this case, spill caps are also developed for 125%, 130%, or 135% saturation to minimize TDG throughout the system.

In accordance with the 2009 Spring FOP, spring spill operations commenced on April 3 at 0001 hours for the Corps' lower Snake projects and on April 10 at 0001 hours for the lower Columbia projects. Spill caps have been established at the specified amounts and will continue unless conditions require changing to maintain TDG within the upper limits of 120% in the tailwater of a dam and 115% in the forebay of the next project downstream (and at Camas/Washougal). Spill will transition to summer levels at 2359 hours, or shortly before midnight, at each project just prior to the summer start dates specified.

Operations to manage TDG will continue to be coordinated through the TMT.

Spillway Operations

The Action Agencies will meet the specified spill levels to the extent feasible; however, actual hourly spill quantities at dams will be slightly greater or less than specified in Table A below. Actual spill levels depend on the precision of spill gate settings, flow variations in real time, varying project head (the elevation difference between a project's forebay and tailwater), automatic load following, and other factors.

Operational Considerations:

- Spill discharge rates: Due to limits in the precision of spill gates and control devices, short term flow variations, and head changes, it is not possible to discharge exactly the spill rates stated in Table A, or as stated in RCC spill requests (teletypes) to projects that call for specific spill discharges. Therefore, spillway gates are opened to the settings in FPP spill pattern tables, which provide discharges that are the closest to the spill discharge rates. The spill rates in Table A coincide with specific gate settings in the FPP spill tables. Actual spill may be higher or lower than the identified spill rate due to low flow conditions, periods of minimum generation, TDG spill cap limitations on spill amounts, spill curtailment for navigation safety, and other circumstances.

- Spill percentages: Spill percentages are considered target spill levels. The project control room operator and BPA duty scheduler calculate spill rates to attempt to be within +/- 1% of the target percentage for the following hour (or +/- 1.5% at Little Goose Dam when flows are less than 30 kcfs). These percentages may not be attained due to low flow conditions, periods of minimum generation, TDG spill cap

limitations on spill amounts, spill curtailment for navigation safety, and other circumstances. Operators and schedulers will review the percentages achieved during the day and adjust spill rates in later hours, with the objective of ending the day with a day average spill that achieves the target.

Minimum Generation

The Corps has identified minimum generation flow values derived from FPP tables which specify turbine operation within the 1% of best efficiency range. These values are approximations and do not account for varying head or other small adjustments that may result in variations in the reported minimum generation flow and spill amount. Conditions that may result in minor variations include:

1. Varying pool elevation: as reservoirs fluctuate within the operating range, flow rates through the generating unit change.
2. Generating unit governor "dead band": the governor controls the number of megawatts the unit should generate and cannot precisely control a unit; variations can be +/- 1% to 2% of generation.
3. System disturbances: once the generator is online and connected to the grid, it responds to changes in system voltage and frequency. These changes may cause the unit to increase flow and generation slightly within an hour.
4. Individual units may operate slightly differently or have unit specific constraints.
5. Generation control systems regulate megawatts (MW) generation only, and not flow through turbines.

All of the lower Snake River powerhouses may be required to keep one generating unit on line at all times for power system reliability, which may result in a reduction of spill at that project. During low flows, one generator runs at the lower end of the 1% of best efficiency range. All of the Snake River plants have two “families” of turbines with slightly different capacities. In most cases one of the smaller units, with somewhat less generation and flow, will be online during these times. The smaller units are generally numbered 1 – 3 and are the first priority for operation during the fish passage season. An exception to this is at Ice Harbor Dam, where the unit priority list has been modified to accommodate the transformer bank outage at Sacajawea. Also, if smaller units are unavailable, one of the larger units may be used. Further, at Lower Monumental, generating unit 1, which is the first priority unit during fish passage, was damaged, then welded in a fixed blade configuration. Consequently the unit cannot operate at the low end of the design range. In addition, Ice Harbor units cannot be operated at the lower end of the 1% of best efficiency range. These units experience cavitation at a generation level somewhat higher than the lower 1% limit, which damages the turbine and can be detrimental to fish. Therefore, Ice Harbor units will operate at their lower cavitation limits. Minimum generation flows are 50 kcfs at McNary, John Day and The Dalles and 30 kcfs at Bonneville.

Low Flow Operations

Low flow operations at lower Snake River projects are triggered when inflow is not sufficient to provide for both minimum generation and the planned spill levels. In these situations, the projects will operate one unit at minimum generation and spill the remainder of flow coming into the project. As flows transition from higher flows to lower flows, there may be situations when flows recede at a higher rate than forecasted. In addition, inflows provided by nonfederal projects upstream are variable and uncertain. The combination of these factors may result in instances where unanticipated changes to inflow result in forebay elevations dropping to the low end of the Minimum Operating Pool (MOP). Since these projects have limited operating flexibility, maintaining minimum generation and the target spill may not be possible on every hour.

During low flow conditions, when the navigation lock is being emptied, the total spill remains unchanged but the spill stated as a percent of total flow may be temporarily reduced below the target spill percentage. This occurs because the volume of water needed to empty the navigation lock during periods of low flow is a greater percentage of the total flow than when flows are higher.

At Little Goose Dam, when day average flows in the lower Snake River are below about 40 kcfs, achieving 30% spill requires changing turbine operations between 2 units at the low end of the 1% of best efficiency range and one unit at the high end of the 1% range. This operation is incompatible with the more constant discharge upstream at Lower Granite Dam. It is also difficult to meet the constant FOP spill level downstream at Lower Monumental Dam. The unsteady flow at Little Goose also impacts that project's reservoir operation and can cause inadequate navigation depths at the downstream sill of the Lower Granite navigation lock. In 2008, through coordination with TMT during these low flow periods, Little Goose spill changed from the 30% level in the FOP to a flat spill pattern of approximately 11 kcfs to smooth out Little Goose discharges, meet Lower Monumental spill levels, and maintain the MOP operating range at Little Goose. A similar operation, modified as necessary to consider configuration or operational changes such as spillway weir and turbine unit 1 operations, will be implemented in 2009 if needed during low flow periods, in coordination with TMT.

Operations during Rapid Load Changes

Project operations during hours in which load and/or intermittent generation changes rapidly may result in not meeting planned hourly spill level because projects must be available to respond to within-hour load variability to satisfy North American Electric Reliability Council (NERC) reserve requirements ("on response"). This usually occurs at McNary, John Day and The Dalles dams. In addition to within-hour load variability, projects on response must be able to respond to within hour changes that result from intermittent generation (such as wind generation). During periods of rapidly changing loads and intermittent generation, projects on response may have significant changes in turbine discharge within the hour while the spill quantity remains the same within the hour. Under normal conditions, within-hour load changes occur mostly on hours

immediately preceding and after the peak load hours, however, within-hour changes in intermittent generation can occur at any hour of the day. Due to the high variability of within-hour load and intermittent generation, these load swing hours may have a greater instance of reporting actual spill percentages that vary more than the +/- 1% requirement than other hours.

Turbine Unit Testing around Maintenance Outages

Turbine units may be operationally tested for up to 30 minutes by running the unit at speed no load and various loads within the 1% of best efficiency range to allow pre-maintenance measurements and testing and to allow all fish to move through the unit. Units may be operationally tested after maintenance or repair efforts but before a unit comes out of a maintenance or forced outage status. Operational testing may consist of running the unit for up to 30 minutes before it is returned to operational status. Operational testing of a unit under maintenance is in addition to a unit in run status (e.g. minimum generation) required for power plant reliability. Operational testing may deviate from unit operating priorities and may use water that would otherwise be used for spill if the running unit for reliability is at the bottom of the 1% of best efficiency range. Water will be used from the powerhouse allocation if possible, and water diverted from spill for operational testing will be minimized. The Corps will coordinate this testing with the region through the Fish Passage Operations and Maintenance Coordination Team (FPOM).

Navigation Safety

Short-term adjustments in spill may be required for navigation safety, primarily at the lower Snake projects but may also be necessary at the lower Columbia projects. This may include changes in spill patterns, reductions in spill discharge rates, or short-term spill stoppages. In addition, adjustments to pool elevation in the Little Goose pool of up to 1.0 foot above the MOP operating range may be necessary to accommodate safe navigation at Lower Granite Dam during periods of low flow (approximately 40 kcfs or less). These adjustments may be necessary for both commercial tows and fish barges.

2009 SUMMER SPILL OPERATIONS

Lower Snake River Projects

Summer spill will begin on June 21 at Lower Granite, Little Goose, and Ice Harbor dams. However, at Lower Monumental Dam, fish run timing and research schedules may require transitioning to summer spill earlier than June 21. Such changes will be coordinated through TMT. Summer spill will occur through August 31, 2009 at all four lower Snake River projects. Summer spill levels are shown in Table A.

Lower Columbia River Projects

Summer spill will begin July 1 at John Day and The Dalles dams, and will begin June 21 at Bonneville Dam. However, at McNary Dam, fish run timing and research schedules may require transitioning to summer spill earlier than July 1. Such changes will be coordinated through TMT. Summer spill will occur through August 31, 2009 at all four projects. Summer spill levels are shown in Table A.

Table A. Summary of 2009 summer spill levels at lower Snake and Columbia River projects.[2]

Project	Planned Operations for Summer 2009 (Day / Night)	Comments
Lower Granite	**18 kcfs / 18 kcfs**	Same as 2008
Little Goose	**30% / 30%**	Same as 2008
Lower Monumental	**17 kcfs / 17 kcfs**	Same as 2008
Ice Harbor	**45 kcfs / gas cap on non-test days; 30% / 30% or 45 kcfs / gas cap on test days**	Same as 2008
McNary	**40% / 40% or 60% / 60%**	Same as 2008
John Day	**30% / 30% on non-test days; 30% / 30% or 40% / 40% on test days**	Same as 2008
The Dalles	**40% / 40%**	Same as 2008
Bonneville	**85 or 75 kcfs day / gas cap night** (85 kcfs day through July 20, then 75 kcfs day through August 31)	Same as 2008

SUMMER FISH OPERATIONS BY PROJECT

The following describes the 2009 summer spill operations for each project. Included in the description are planned research activities identified in the 2008 BiOp. The Corps, regional agencies, and Tribes are interested in the continuation of project research studies under the Corps' Anadromous Fish Evaluation Program (AFEP). The 2009 studies have been through the annual AFEP review process with the regional agencies and Tribes, with the study designs being finalized in an interagency meeting held on January 15, 2009. The studies are intended to provide further information on project survival and

[2] Table A displays in summary form the planned summer spill operations. More specific detail governing project operations is in the section entitled "Summer Fish Operations By Project."

assist the region in making decisions on future operations and configuration actions to improve fish passage and survival at the lower Snake and Columbia River dams.

Lower Granite

Summer Spill Operations June 21 through August 31, 2009: 18 kcfs (including approximately 6 kcfs from the RSW and 12 kcfs from training spill) 24 hours per day. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Summer research operations: Normal summer spill patterns and rates as described in the FPP will be used. An alternate (bulk) spill pattern may be used at Lower Granite in summer, as discussed and recommended at the April 2009 FFDRWG meeting. This pattern was evaluated in 2006 and 2007 and will have the same spill level as the FPP spill pattern. There will be no specific spill level variations for testing.

Operational Considerations:

- Lack of power load or unexpected unit outages could cause involuntary spill at higher total river discharges that could result in exceeding the gas cap limits.
- During high flow periods when involuntary spill occurs, there may be periods where certain spill levels create hydraulic conditions that are unsafe for fish barges crossing the tailrace and/or while moored at fish loading facilities. If such runoff conditions occur, spill may be reduced temporarily when fish transport barges approach or leave the barge dock or are moored at loading facilities. If conditions warrant a spill reduction, the MOP elevation range at Lower Granite will be exceeded temporarily to enable the barge to exit the tailrace safely.
- Minimum spill: During periods of low flow before the spring freshet and during the summer period, there may be periods where spill quantities are limited so that tailrace conditions are not advantageous to fish passage. If such low runoff conditions occur, alternative spill operations at the dam will be coordinated through the TMT.
- Minimum generation: The minimum generation amount represents the operation of one unit at the lower end of its 1% of best efficiency range and is needed for power system reliability. This operation will result in individual turbine flows of approximately 11.3 kcfs – 13.1 kcfs at units 1 – 3 and 13.5 kcfs - 14.5 kcfs at units 4 - 6. There may be slight variations in the generation due to power system fluctuations. Also, the outflow will fluctuate because of changing head at the dam. This condition may occur in early spring before the freshet and during the late summer period with low flow conditions.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.

Little Goose

Summer Spill Operations June 21 – August 31, 2009: 30% spill 24 hours per day. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Spill duration for testing: Juvenile passage will be studied throughout the summer spill period.
- Summer research operations: 30% spill 24 hour/day. The spill pattern used in the spring will be continued in the summer. Final test conditions will be coordinated through FPOM and/or Studies Review Work Group (SRWG).
- Objectives of the biological test: The goals of this study include: (1) Determine the timing and route of passage for subyearling Chinook salmon relative to spillway weir spill and powerhouse operations; (2) Estimate route-specific and overall concrete survival of sub-yearling Chinook; (3) Determine the effects of spillway weir operation and associated training spill, as well as powerhouse operations, on smolt approach paths in the forebay of Little Goose Dam; (4) Estimate survival (concrete) as the first year to determine if BiOp performance standards are being met with the tested configuration and operation.
- Spill pattern during the biological test: The test spill patterns have been developed through ERDC modeling and in coordination with FPOM and/or SRWG.

Operational Considerations:

- Day average flows in the lower Snake River below about 40 kcfs can result in incompatible operations with Lower Monumental Dam and cause spill quantity fluctuations. Little Goose operations to resolve this issue are described in the Low Flow Operations section above (page 5).
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.
- Turbine Unit 1 Operation: For 2009, a new more limited operating range is set within the GDACS program for Little Goose Dam to restrict Turbine Unit 1 operation to approximately the upper 25% of the 1% of best efficiency range (about 16 kcfs). This will ensure a strong flow along the south shore to counter the strong eddy that forms during certain spill conditions. A strong south shore current is important for both adult fish passage and juvenile fish egress. Special turbine operations are expected to continue through the spring and summer spill periods until river flow can support only one operating turbine unit. Once low flow conditions occur, the full 1% of best efficiency range will be restored, to minimize impacts on spill levels.
- Minimum spill: During periods of low flow before the spring freshet and during the late summer period, there may be periods where spill quantities are so low that it creates tailrace conditions not advantageous to fish passage. If such flow conditions occur, alternative operations at the dam will be coordinated through the TMT.

- Minimum generation: The minimum generation amount represents the operation of one unit at the lower end of its 1% efficiency range and is needed for power system reliability. This should result in individual turbine flows of 11.3 kcfs – 13.1 kcfs at units 1 – 3 and 11.5 kcfs – 14.5 kcfs at units 4 – 6. There may be slight variations in the generation due to power system fluctuations. Also, the outflow will fluctuate because of changing head at the dam. This situation may occur in early spring before the freshet and during the late summer period with low flow conditions.

Lower Monumental

Summer Spill Operations Approximately June 21 – August 31, 2009: Spill 17 kcfs 24 hours per day (subject to 120%/115% TDG spill cap limits) with the RSW operating. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Spill duration for testing: Summer testing will begin approximately June 21 or earlier, and lasting until mid-July. The dates of testing will be dependent on the availability of subyearling fall Chinook of sufficient size for tagging. Final dates for testing will be coordinated through FPOM and/or SRWG.
- Summer research operations: 17 kcfs 24 hours per day with one spill pattern treatment. The spill pattern will be the pattern used in 2008 and coordinated through FPOM and/or SRWG.
- Objectives of the biological test: Estimate passage distribution, survival, forebay retention, tailrace egress, and vertical distribution of fish passing over the RSW for subyearling fall Chinook under one spill pattern. Estimate survival (concrete) to determine if BiOp performance standards are being met with the tested configuration and operation.
- Spill pattern during the biological test: The 2008 FPP spill pattern will be used for summer testing.

Operational Considerations:

- Daily average flows near 30 kcfs results in incompatible operations with Little Goose Dam and results in spill quantity fluctuation.
- As in the spring, the amount of water spilled in the summer at Little Goose may affect the Lower Monumental spill volume (due to elevated TDG levels).
- Transit of the juvenile fish barge across the Lower Monumental tailrace, then docking at and disembarking from the fish collection facility, may require the level of spill to be reduced due to safety concerns. The towboat captain may request that spill be reduced or eliminated during transit. During juvenile fish loading operations, spill is typically reduced to 15 kcfs, but can be reduced further if needed for safety reasons. Loading periods can take up to 3.5 hours. Because of the time needed to complete loading at Lower Monumental, the Little Goose Project personnel will notify the Lower Monumental personnel when the fish barge departs from Little Goose. This ensures that BPA scheduling is provided advance notice for spill control at Lower

Monumental Dam. Reducing spill may cause Lower Monumental to briefly operate outside of MOP conditions.

- Minimum spill: During periods of low flow before the spring freshet and during the summer period, there may be periods when spill quantities are limited so that tailrace conditions are not advantageous to fish passage. This condition is interpreted to be a minimum spill level provided through the spillway weir only (approximately 6.8 kcfs with the reservoir operating at MOP). If such a low flow condition occurs, alternative operations at the dam will be coordinated through the TMT.
- Minimum generation: The minimum generation amount represents the operation of one unit at the lower end of its 1% of best efficiency range and is needed for power system reliability. This will result in individual turbine flows of approximately 11.3 kcfs – 13.1 kcfs for units 2 and 3 and 13.5 kcfs – 14.5 kcfs for units 4 – 6 and 16.5 kcfs – 19.5 kcfs for unit 1. There may be slight variations in the generation due to power system fluctuations. Also, the outflow will fluctuate because of changing head at the dam. This limit may occur in early spring before the freshet and during the late summer period with low flow conditions.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.

Ice Harbor

Summer Spill Operations June 21 – August 31, 2009: Spill 30% 24 hours per day or 45 kcfs day / spill cap night; then 45 kcfs day / spill cap night after the end of the test, with the RSW operating. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Summer research operations: Spill patterns will be verified and coordinated through FPOM and/or SRWG. Radio tagged fish will be monitored for passage route and survival.
- Objectives of the biological test: The objectives of the test are to determine passage routes and estimate route-specific and concrete survival under the two spill conditions for subyearling Chinook.
- Spill pattern during the biological test: Spill patterns will be verified and coordinated through FPOM and/or SRWG.

Operational Considerations:

- Minimum generation or higher powerhouse operation will occur at all times during the 2009 summer fish spill season, until repairs are complete at BPA's Sacajawea transmission facility near the project. Mobile capacitor groups remain in use at BPA's Franklin transmission facility to partially resolve power system issues. In addition, continuous generation is required at Ice Harbor Dam for power system stability and reliability. Normal unit operating priorities will be re-established when the Sacajawea transformer is returned to service, expected in July 2009.

- Minimum spill: During periods of low flow before the spring freshet and during the summer period, there may be periods where spill quantities are limited so that tailrace conditions are not advantageous to fish passage. The minimum spill for Ice Harbor Dam is 15.2 kcfs, which includes providing spill through the RSW and training spill to ensure good tailrace egress conditions. If such a low flow condition occurs, alternative operations at the dam will be coordinated through the TMT.
- Minimum generation: The minimum generation amount represents the operation of one unit at the lower cavitation limit. The cavitation limit is within the 1% of best efficiency range. This will result in individual turbine flows of approximately 8.5 kcfs – 11.5 kcfs at units 1 – 3 and 10.8 kcfs – 13.8 kcfs at units 4 – 6. Unit 2 has been modified by fixing the blades in a single position to eliminate an oil leak. As a result, its MW output and kcfs discharge at the low end of 1% will be higher than the other 5 units. There may be slight variations in the generation due to power system fluctuations. Also, the outflow will fluctuate because of changing head at the dam. This limit may occur in early spring before the freshet and during the late summer period with low flow conditions.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.

McNary

Summer Spill Operations Approximately July 1 through August 31, 2009: 40% or 60% spill 24 hours per day, in two day blocks throughout the summer spill period. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Spill duration for testing: Approximately early June through August 3. The dates of testing will be dependent on the size of fish, fish availability, and the number of treatments needed for testing. Final dates for testing will be coordinated through the SRWG.
- Summer research operations: 40% or 60% spill 24 hours per day. Continue to evaluate spillway weir performance by changing the configuration to optimize the spillway and reduce navigation issues. Each test spill level will occur for two days in a randomized block test design, throughout the period. Two spillway weirs will be in place during the test, located at spill bays 4 and 20.
- Objectives of the biological test:
    - Estimate passage and survival rates of subyearling fall Chinook salmon under two treatments.
    - Characterize subyearling fall Chinook behavior in the forebay of McNary Dam under two treatments.
- Spill pattern during the biological test: Spill patterns have been identified using the general model at ERDC by USACE Walla Walla District staff and representatives of the regional fisheries agencies and tribes. Test spill patterns are modifications of the

2003-2005 flat pattern and the 2008 test pattern to accommodate the new placement of the spillway weirs.

- After the study is complete, about August 3, the spillway weir in spill bay 4 will be removed. The spillway weir in spill bay 20 will remain in place. The project will return to the 2008 summer spill pattern. Spill schedule and configuration will be determined in coordination with FFDRWG and TMT. The spill schedule will consider fish passage, power system needs, and changing flow conditions.

Operational Considerations:

- Spillway weir 1 (relocated from spill bay 19) is located in spill bay 4. Spillway weir 2 remains in spill bay 20.
- During the periods when total river discharge exceeds approximately 320 kcfs, involuntary spill in excess of the States' TDG limits for fish passage may occur.
- In addition, low power demand may also necessitate involuntary spill during any given spill treatment.
- Spill will be curtailed as needed to allow safe operation of fish transportation barges near collection facilities downstream of the project. Spill changes will be minimized in order to reduce effects on spill research. Specifically, the spillway, including spillway weirs in spill bays 4 and 20, will be closed while barges are crossing the tailrace (15 – 30 minutes per crossing). Gate hoists at spill bays 4 and 20 are modified to allow closure with spillway weirs in place.
- Minimum generation: A minimum powerhouse discharge of 50 kcfs is required at all times to meet minimum generation requirements. The lower Columbia River dams provide some of the required generation capacity reserves for the power system. Due to this requirement and the constant fluctuations in power demands throughout the day, the 50 kcfs flow cannot be maintained precisely on an hourly basis. The flow may increase by as much as 10 kcfs for short periods. Therefore, the minimum generation flow should meet or exceed 50 kcfs for all hours.
- If total river discharge drops below about 90 kcfs, 40% spill treatments may be reduced to maintain 50 kcfs powerhouse discharge for minimum generation. Similarly, if total river discharge drops below about 135 kcfs, 60% spill treatments may be reduced to maintain a 50 kcfs powerhouse discharge.
- Minimum spill: During periods of low flow before the spring freshet and during the summer period, there may be periods where spill quantities are limited so that tailrace conditions are not advantageous to fish passage. If such a low flow condition occurs, alternative operations at the dam will be coordinated through the TMT.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.

John Day

Summer Spill Operations July 1 – August 31, 2009: 30% or 40% spill 24 hours per day, then 30% spill 24 hours per day after the summer test. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Spill duration for testing: Approximately early June to July 20. The dates of testing will be dependent on the size of fish, fish availability, and the number of treatments needed for testing. Final dates for testing will be coordinated through the SRWG.
- Summer research operations: If planned abatement measures are successful at reducing avian predation in the tailrace of John Day Dam, a repeat of the 2008 spillway weir test will be conducted. Two training spill percentages, 30% and 40% 24 hours per day, will be tested. If avian predation in the tailrace is at an unacceptably high level, to be determined during a May 21 SRWG meeting, spill will revert to the 2008 FPP summer pattern which is 30%, 24 hours per day. The two spillway weirs will be shut off to accommodate this, and a north bulked pattern will use spill bays 1-14.
- Objectives of the biological test: The objectives of the study are to assess passage distribution and efficiency metrics, forebay retention, tailrace egress, and survival for subyearling fall Chinook.
- Spill pattern during the biological test: Spill patterns for 30% and 40% spill have been developed at ERDC in coordination with regional agencies. These patterns are included in the FPP. From approximately early June to July 20, 30% spill versus 40% spill will be evaluated. Pending the outcome of the May 21 SRWG meeting, either spill patterns described in the 2008 FPP or the 30% spillway weir pattern will be used from the conclusion of the spillway weir test to the end of spill (approximately July 20 – August 31).

Operational Considerations:

- Wire lines in the avian wire array across the tailrace need to be replaced. A full spillway outage is required to accomplish the work. The Corps is coordinating with the region to stop spill during daylight hours for one or more days to repair the array. The outage is being considered for early June between spring and summer fish outmigration periods, and prior to the start of the summer spillway weir test.
- Minimum spill: During periods of low flow before the spring freshet and during the summer period, there may be periods where spill quantities are limited so that tailrace conditions are not advantageous to fish passage. If such a low flow condition occurs, alternative operations at the dam will be coordinated through the TMT.
- Minimum generation: A minimum powerhouse discharge of 50 kcfs is required at all times to meet minimum generation requirements. The lower Columbia River dams provide some of the required generation capacity reserves for the power system. Due to this requirement and the constant fluctuations in power demands throughout the day, the 50 kcfs flow cannot be maintained precisely on an hourly basis. The flow may increase by as much as 10 kcfs for short periods. Therefore, the minimum generation flow should meet or exceed 50 kcfs for all hours.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.

- Unit outages and spill outages may be required to repair research equipment. These will be coordinated through FPOM and TMT.
- If river flows drop below about 75 kcfs then spill may need to drop below 30% spill in order to maintain station service and power system needs.

The Dalles

Summer Spill Operations July 1 – August 31, 2009: 40% spill 24 hours per day. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Spill pattern during the biological test: No research is planned for 2009. The FPP spill patterns will be used.

Operational Considerations:

- When high river flows are such that available spill bays 1 – 6 cannot maintain 40% spill (when spill exceeds 162 kcfs), FPOM and TMT will discuss the preferred spill pattern and rate. The project may maintain 40% spill of the total river flow and depart from the spill pattern, or spill less than 40% of the total river flow using a pattern other than that shown in the FPP.
- Spill bays 10, 11, 13, 16, 18, and 19 are not operational due to wire rope and structural concerns. Spill bay 23 has undercutting issues but may be used during high flows.
- The spill pattern in the FPP is based on a nominal Bonneville forebay elevation of 74 feet.
- Minimum generation: A minimum powerhouse discharge of 50 kcfs is required at all times to meet minimum generation requirements. The lower Columbia River dams provide some of the required generation capacity reserves for the power system. Due to this requirement and the constant fluctuations in power demands throughout the day, the 50 kcfs flow cannot be maintained precisely on an hourly basis. The flow may increase by as much as 10 kcfs for short periods. Therefore, the minimum generation flow should meet or exceed 50 kcfs for all hours.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.
- If river flows drop below about 90 kcfs then spill may need to drop below 40% spill in order to maintain station service and power system needs.

Bonneville

Summer Spill Operations June 21 through August 31, 2009: Spill 85 kcfs during daytime hours from June 21 through July 20, then spill 75 kcfs during daytime hours from July 21 through August 31. Spill to the 120%/115% TDG spill cap at night. Daytime spill hours change periodically and are defined in FPP Table BON-6. It takes

approximately 10 minutes to change between day and night summer spill levels. See Table A for operational spill levels.

Changes in Operations for Research Purposes:

- Spill duration for testing: No special spill operations are required in 2009. Spill patterns and durations from the FPP will be used.
- Summer research operations: No special spill operations are required for 2009 biological tests.
- Objectives of the biological test: Estimate juvenile subyearling Chinook passage distribution in response to a behavioral guidance structure at Powerhouse 2.
- Spill Patterns for summer operations: Spill patterns in the FPP will be used.

Operational Considerations:

- Minimum generation: A minimum powerhouse discharge of 30 kcfs is required at all times to meet minimum generation requirements. The lower Columbia River dams provide some of the required generation capacity reserves for the power system. Due to this requirement and the constant fluctuations in power demands throughout the day, the 30 kcfs flow cannot be maintained precisely on an hourly basis. The flow may increase by as much as 10 kcfs for short periods. Therefore, the minimum generation flow should meet or exceed 30 kcfs for all hours.
- Unit outages will occur for required maintenance activities. The outage schedule for the project is shown in the FPP. Dates are subject to change in coordination with FPOM or TMT.
- Turbine unit and corner collector outages may be required to repair hydrophones and other research equipment. These will be coordinated through FPOM.
- Minimum spill discharge level is 50 kcfs. This is to provide acceptable juvenile fish egress conditions in the tailrace.
- Actual spill levels at Bonneville Dam may range from 1 to 3 kcfs lower or higher than specified Table A. A number of factors influence this including hydraulic efficiency, exact gate opening calibration, spillway gate hoist cable stretch due to temperature changes, and forebay elevation (a higher forebay results in a greater volume of spill since more water can pass under the spill gate).
- The second powerhouse corner collector (5 kcfs discharge) will operate until the afternoon of August 31, 2009.
- A mid-season spillway outage will be required to survey the stilling basin for erosion. Pending the outcome of this survey, the 2009 spill operation may be altered to maintain dam safety. Changes to spill operations may include changing the spill pattern to avoid further erosion or discontinuing spill until repairs can be made. The mid-season survey will take approximately ½ day to complete. The Corps will coordinate this work through the Fish Facility Design Review Work Group (FFDRWG), FPOM, and TMT.

JUVENILE FISH TRANSPORTATION PROGRAM OPERATIONS

As noted above, the Corps' planned spill operations assume average runoff conditions. The following explains the juvenile fish transportation program under all runoff conditions and is consistent with the 2008 transport operations. The lower Snake River projects are described first, followed by McNary project operations. Detailed descriptions of project and transport facility operations to implement the program, including the transition from barges to trucks when fish numbers decrease in the summer, and the end dates for transport, are contained in FPP Appendix B.

Lower Snake River Dams - Operation and Timing

The 2009 Spring FOP provides information about the initiation of transport at the lower Snake River collector projects; however, the Snake River projected seasonal average (April 3 – June 20) flows were greater than 70 kcfs and the Corps initiated transportation on a staggered start basis. Dates to begin transport at the lower Snake River collector projects were coordinated through TMT.

The collection of fish for transport began at Lower Granite Dam on May 1 at 0700 hours. It began 4 days later at Little Goose Dam, on May 5 at 0700 hours; and began 3 days after that at Lower Monumental, on May 8 at 0800 hours. Barging of fish began the following day and will continue with collected juvenile fish barged from each facility on a daily or every-other-day basis (depending on the number of fish) throughout the spring and into the summer. Starting on or about August 15, fish will be transported by truck, pending numbers of subyearling Chinook collected. Transport operations will be carried out concurrent with FOP spill operations at each project and in accordance with all relevant FPP operating criteria. Fish transportation operations for the lower Snake River collector projects are described in FPP Appendix B.

Fish transportation operations are expected to continue through approximately October 31 at Lower Granite and Little Goose dams, and through September 30 at Lower Monumental Dam. Transportation operations may be adjusted due to research, conditions at the collection facilities, or through the adaptive management process to better match juvenile outmigration timing or achieve/maintain performance standards.

McNary Dam - Operation and Timing

Juvenile fish collected at McNary between April and the start of transport will be bypassed to the river. The normal operation is to bypass fish through the full flow bypass pipe, which has interrogation capability to monitor for PIT tags. Every other day, however, in order to sample fish for the Smolt Monitoring Program, fish are routed through the separator, interrogated for PIT tags, and then bypassed to the river.

Transportation will be initiated at McNary Dam during July 15 – 30, 2009 as per the 2008 BiOp (RPA 30, Table 4) and in coordination with NOAA Fisheries and TMT. Fish will be transported from McNary Dam by barge through August 16, then transported by

truck every other day. All fish collected will be transported except those marked for in-river studies. Fish are expected to be transported through September 30, 2009. The presence of factors such as excess shad, algae or bryozoans that can clog screens and flumes may result in discontinuing transport operations at McNary Dam before September 30. Detailed criteria for McNary transport are contained in the FPP, Appendix B.

Transportation operations may be adjusted for research purposes, due to conditions at the collection facilities, or as a result of the adaptive management process (to better match juvenile outmigration timing and/or to achieve or maintain performance standards). If new information indicates that modifying (or eliminating) transportation operations at McNary Dam is warranted, adaptive management will be used to make appropriate adjustments through the TMT coordination process.

TRANSPORT, LATENT MORTALITY, AND AVIAN RESEARCH

Spring operations to conduct research on the seasonal effects of transport and latent mortality are described in the 2009 Spring FOP. The avian predation study continues into the summer and is described below.

Avian Predation

A study is being conducted to evaluate the impacts of avian predation on salmonid smolts from the Columbia and Snake rivers. The study will 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 requests PIT tagging both hatchery and wild steelhead collected in the smolt monitoring sample at Lower Monumental and Ice Harbor dams, beginning April 1 and continuing through 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. The study needs a minimum sample of 100 fish each day that are collected for condition by the smolt monitoring program.

EMERGENCY PROTOCOLS

The Corps and the Bureau of Reclamation will operate the projects in emergency situations in accordance with the WMP Emergency Protocols (WMP Appendix 1). The Protocols define emergency conditions and situations that may arise while operating the FCRPS projects, and the immediate actions that may be taken in the face of the emergency. The most recent version of the Emergency Protocols is located at: http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2009/final/emerproto/

COORDINATION

To make adjustments in response to changes in conditions, the Corps will utilize the existing regional coordination committees. Changes in spill rates when flow conditions are higher or lower than anticipated will be coordinated through the TMT. This could include potential issues and adjustments to the juvenile fish transportation program. Spill patterns and biological testing protocols that have not been coordinated to date will be finalized through the Corps' AFEP subcommittees, which include the SRWG, FPOM, and FFDRWG.

REPORTING

The Corps will provide periodic in-season updates to TMT members on the implementation of 2009 fish passage operations. The updates will include the following information:

- the hourly flow through the powerhouse;
- the hourly flow over the spillway compared to the spill target for that hour; and,
- the resultant 12-hour average TDG for the tailwater at each project and for the next project's forebay downstream.

The updates will also provide information on substantial issues that arise as a result of the spill program (e.g. Little Goose adult passage issues in 2005 and 2007), and will address any emergency situations that arise.

The Corps will continue to provide the following data to the public regarding project flow, spill rate, TDG level, and water temperature.

- Flow and spill quantity data for the lower Snake and Columbia River dams are posted to the following website every hour: http://www.nwd-wc.usace.army.mil/report/projdata.htm

- Water Quality: TDG and water temperature data are posted to the following website every six hours: http://www.nwd-wc.usace.army.mil/report/total.html These data are received via satellite from fixed monitoring sites in the Columbia and Snake rivers every six hours, and placed on a Corps public website upon receipt. Using the hourly TDG readings for each station in the lower Snake and Columbia rivers, the Corps will calculate both the highest and highest consecutive 12-hour average TDG levels daily for each station. These averages are reported at:
  http://www.nwd-wc.usace.army.mil/ftppub/water_quality/12hr/html/