T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / Lori Postlethwait*	**BPA:**	*Scott Bettin / John Wellschlager*
NMFS:	*Paul Wagner / Chris Ross*	**USFWS:**	*David Wills / Howard Schaller*
OR: *Ron Boyce*	**WA:** *Shane Scott*	**ID:** *Steve Pettit*	**MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner*

TMT MEETING

02 July 2003   0900 - 1200 hours

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

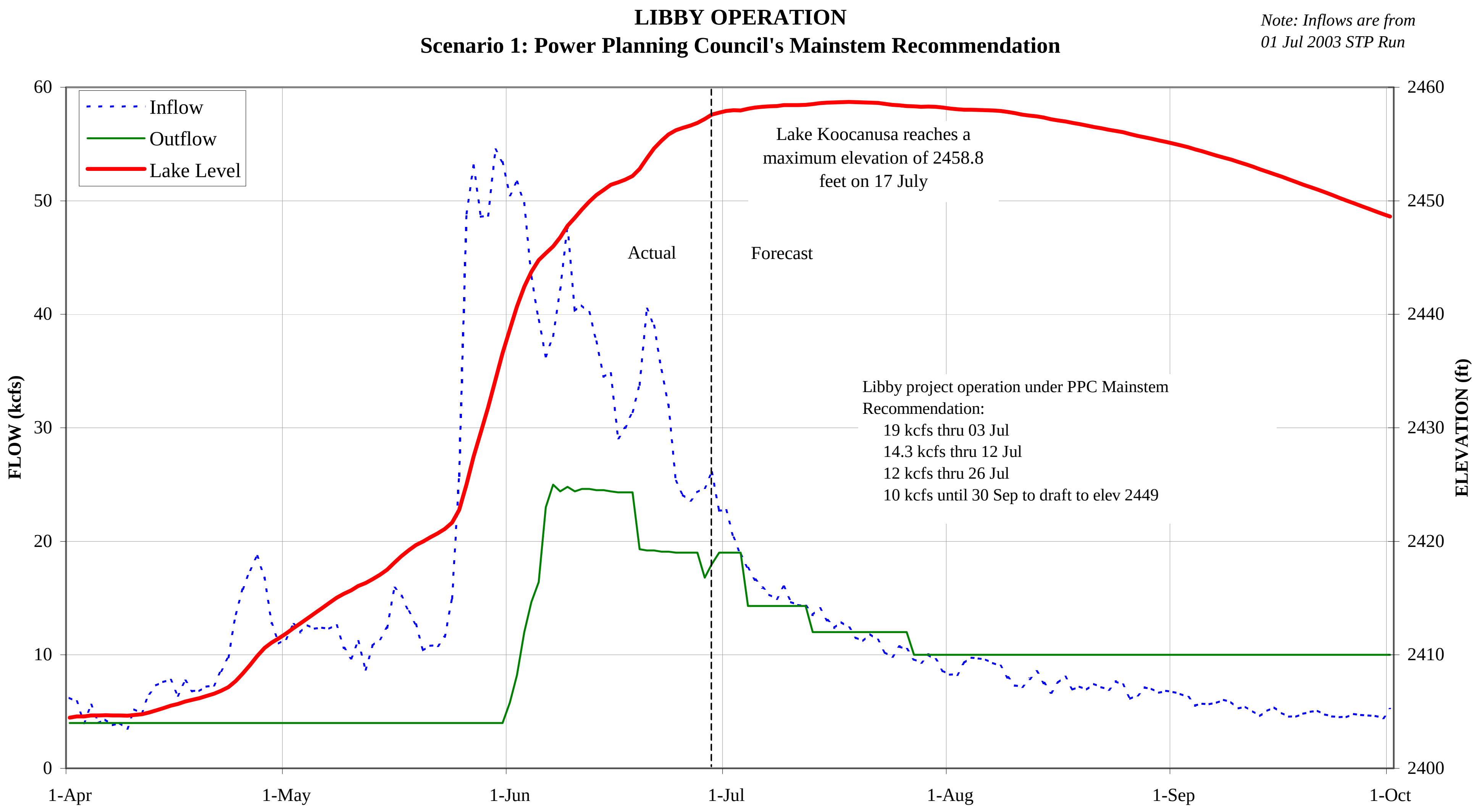
All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

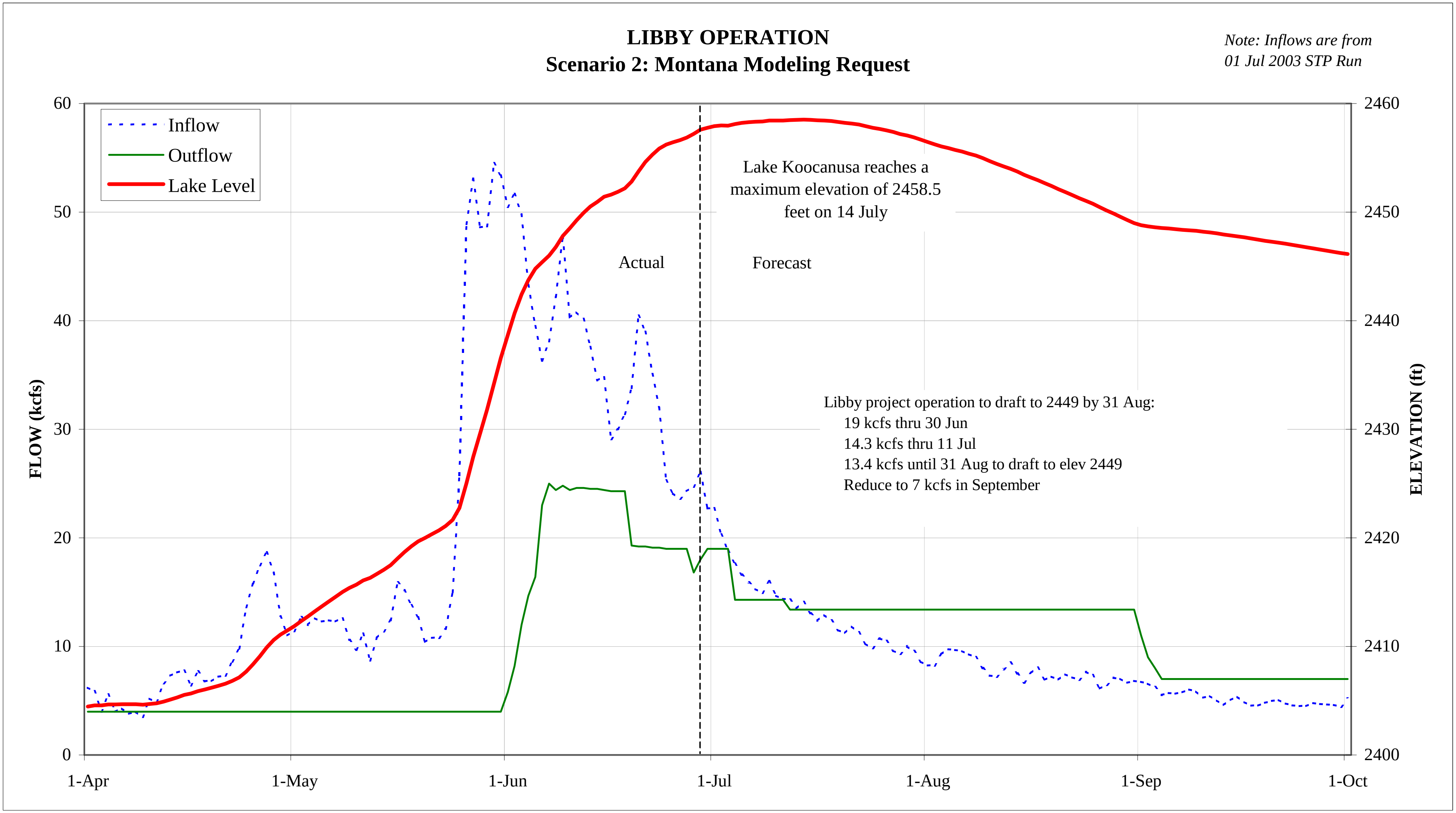
AGENDA

1. Welcome and introductions.
2. Fish spill status and tracking. (COE)
   [High 12hr Averages] [Exceedence Tracking]
3. Libby sturgeon update (SOR #2003-10) . (USFWS)
4. Libby and Hungry Horse summer operations; BiOp and NPPC strategies. (COE, BOR, MT) (SOR #2003-MT-1) . (Libby Operation) .
5. Dworshak summer operations; flow and temperature. (NOAA Fisheries, COE)
   [2002 Dworshak Summer Operations Report] [dwor-temp-profile] [dwor-release-calcs]
6. McNary fish transportation. (COE)
7. Lower Granite bypass pipe update. (COE)
8. Ice Harbor spill test and post-test operations. (NOAA Fisheries, COE)
9. Review current system conditions.
   - fish migration status (NOAA Fisheries, USFWS)
   - reservoir operation, power system, water supply (COE, BOR, BPA)
10. Review operations requests.
11. Develop recommended operations for July 07 - 20.
12. Other.
    - set agenda for next meeting

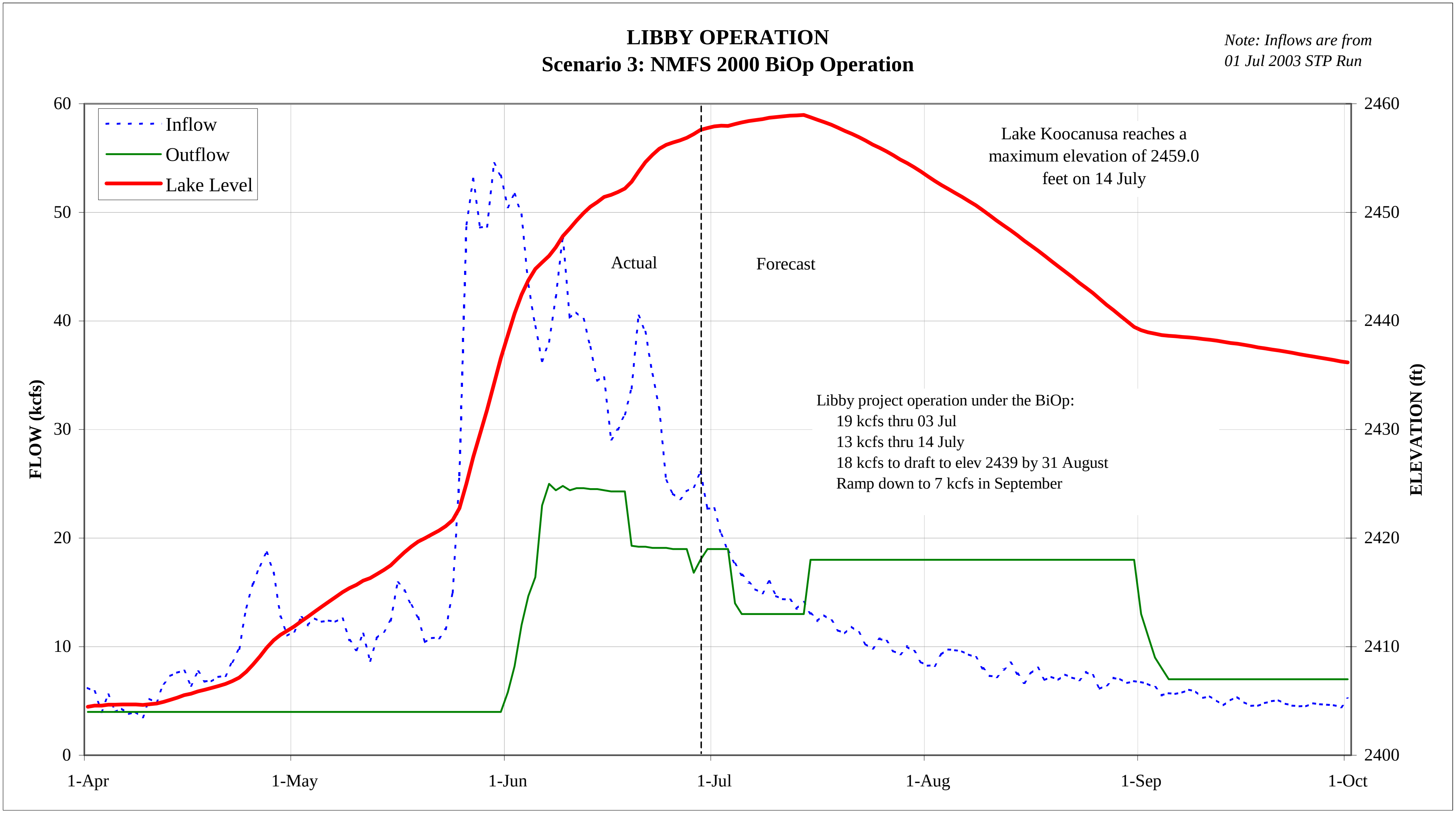
Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

LIBBY OPERATION
Scenario 1: Power Planning Council's Mainstem Recommendation

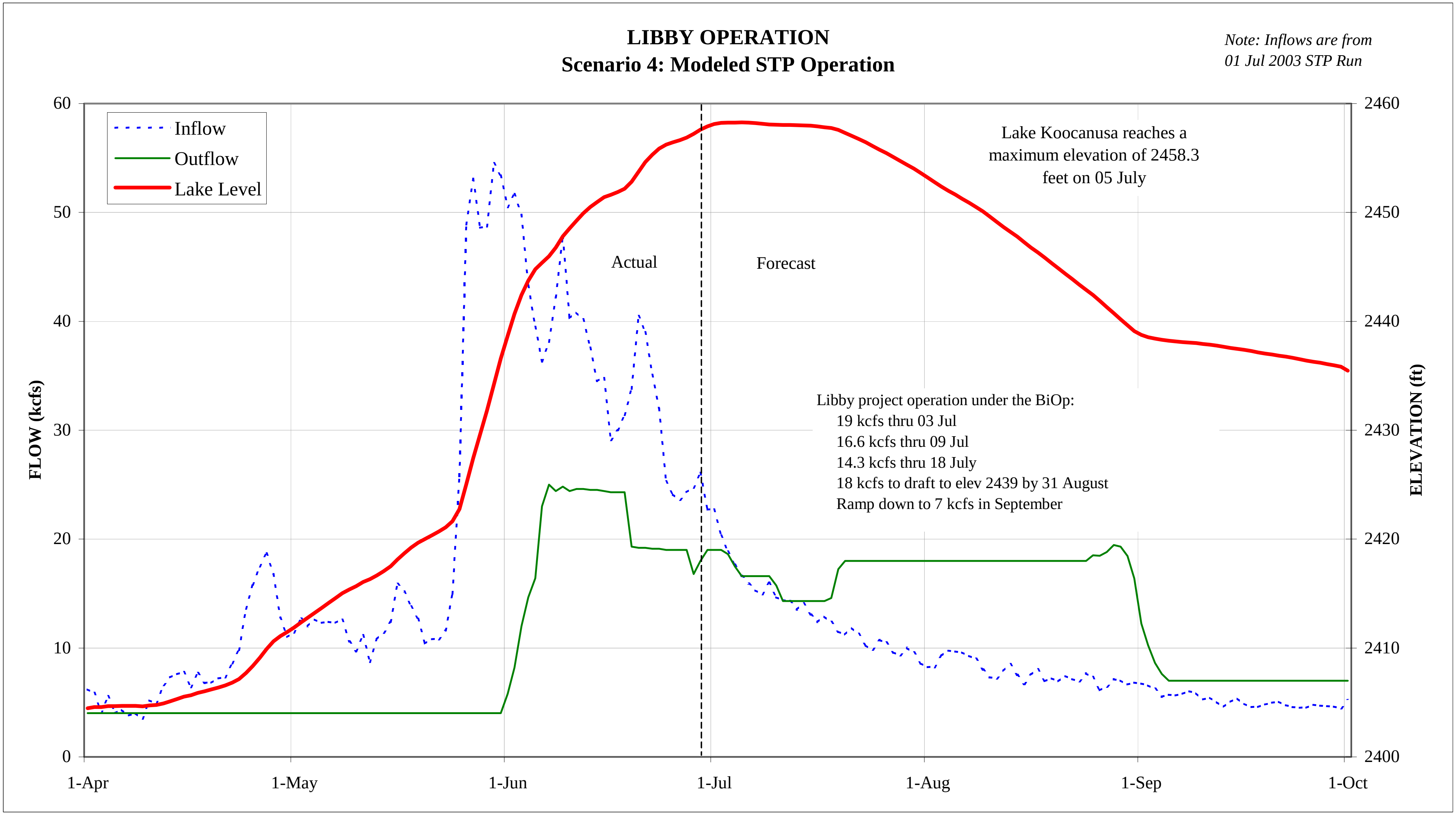




LIBBY OPERATION
Scenario 2: Montana Modeling Request
Note: Inflows are from
01 Jul 2003 STP Run
Inflow
Outflow
Lake Level
FLOW (kcfs)
ELEVATION (ft)
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
Lake Koocanusa reaches a
maximum elevation of 2458.5
feet on 14 July
Actual
Forecast
Libby project operation to draft to 2449 by 31 Aug:
19 kcfs thru 30 Jun
14.3 kcfs thru 11 Jul
13.4 kcfs until 31 Aug to draft to elev 2449
Reduce to 7 kcfs in September



LIBBY OPERATION
Scenario 3: NMFS 2000 BiOp Operation
Note: Inflows are from
01 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Lake Koocanusa reaches a
maximum elevation of 2459.0
feet on 14 July
Actual
Forecast
Libby project operation under the BiOp:
19 kcfs thru 03 Jul
13 kcfs thru 14 July
18 kcfs to draft to elev 2439 by 31 August
Ramp down to 7 kcfs in September
FLOW (kcfs)
ELEVATION (ft)
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct


LIBBY OPERATION
Scenario 4: Modeled STP Operation
Note: Inflows are from
01 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Lake Koocanusa reaches a
maximum elevation of 2458.3
feet on 05 July
Actual
Forecast
Libby project operation under the BiOp:
19 kcfs thru 03 Jul
16.6 kcfs thru 09 Jul
14.3 kcfs thru 18 July
18 kcfs to draft to elev 2439 by 31 August
Ramp down to 7 kcfs in September
FLOW (kcfs)
ELEVATION (ft)
0
10
20
30
40
50
60
2400
2410
2420
2430
2440
2450
2460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
July 2, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Current System Status:
Fish: Paul Wagner, NOAA, reported that smolts are at a record high for subyearling Chinook. The goal from the Salmon Managers' perspective is to maintain conditions for survival. Lower Granite temperatures are ranging from 66-70 degrees. Flows at Lower Granite are down to 38 kcfs out.

Reservoir operations: Bonneville is operating at 188 kcfs out, and declining. McNary is releasing an average 17 kcfs; Lower Granite is at 39 kcfs out; Dworshak is full and releasing 3.4 kcfs; Libby is at elevation 2458' and will continue operating at 19 kcfs out until inflows reduce (the project is being operated to avoid fill and spill); Albeni Falls is at 2062.35'; Grand Coulee is at 1286.1' and filling; and Hungry Horse is at 3557.9' and will not fill. Tony Norris, BOR, reported that the intended operation at Hungry Horse is to maintain the project at 3500' until 7/7, then release 5 kcfs and hold it at 20' down until August 31. The water supply forecast shows dry conditions. The STP run shows a dip over the July 4th weekend, then improvements.

Power system: Scott Bettin gave the group a heads up on possible lightning and resulting fires that may impact the system.

Water supply: The July early bird forecast showed no change from the June final at key projects.

Housekeeping: The COE noted that there is a need to update the emergency call list. Rudd Turner will send a reminder to TMT members.

SOR 2003-MT-1:
Jim Litchfield presented an SOR based on NPPC recommendations for summer operations at Libby and Hungry Horse. Jim explained that the philosophy behind the request is to reduce impacts on Montana reservoirs for lower river fish and support native resident fish. Additionally, they are trying to suggest a better, faster way to achieve RPA's for resident and Lower Snake River fish. Montana's hope is to begin this year with a phased start-up to river operation changes, and measure and evaluate the impacts this year. A question was raised about when the Snake River fish are typically observed in the lower river in large numbers. They tend to be observed through August.

ACTION: Jim Litchfield and Paul Wagner will look at the latest information on August and September fish and the SAR response. There is a need to look at wild fish data and estimated numbers this year. Other suggestions for information that would be helpful were expressed: a model other than SIMPAS that is sensitive to flow and elevation changes; cost estimates; and any existing empirical data on biological benefits to resident fish in Montana.

ACTION: The COE will run a model on the SOR's effects on McNary flows. TMT plans to make a decision on Hungry Horse and Libby operations on 7/16, or a decision will be made at a 7/17 IT resolution call.

Dworshak Summer Operations:

TMT received last year's data on Dworshak operations and this year's calculations prepared by Laura Hamilton, COE. Paul Wagner, NOAA, explained that, while FPAC did not reach complete consensus, they did put a framework together for summer operations at Dworshak. The proposed operation starts early and leaves some water for September (see handout). The priority is to maintain some cool water for September *and*, if temperatures rise to lethal levels, use the cooler water earlier. Oregon asked if the target for this framework is better passage in September versus August. Paul responded that both need protection. The suggestion was then made to maximize July, which would mean a 2 kcfs redistribution.

Dave Statler, Nez Perce Tribe, noted that fish in the Clearwater have been measured at 62 and 54 mm on June 23/24. They will need to grow significantly before they can actively migrate (around mid to late July). If viewed as a segment of the whole population, there would be a good reason to support them later by not reducing temperatures too much, too soon.

ACTION: The COE expressed agreement with the framework and would like to continue to revisit the issue on a weekly basis. The operation will be as follows:

Week 1: Draft up to 14 kcfs to arrest temperature increases at Lower Granite. Observe the impacts on temperatures, then adaptively manage to maintain in order to minimally impact the lower Clearwater growth rates. 7/3-7/6: 5 kcfs out; 7/7: 10kcfs; 7/8: 14 kcfs up to the 110 gas cap and temperature of 48 degrees.

There will be a TMT conference call on 7/9 to review the Dworshak operation and temperatures. Triggers for not adhering to the framework should also be developed.

Ice Harbor Spill Test:

Spill tests at Ice Harbor are currently underway, as agreed to by NOAA and the COE. The two test treatments are no spill and bulk spill. There is a need to discuss how to operate Ice Harbor after the test is complete. To do so, information about whether the test programs are working is needed. Options will be forwarded to TMT and discussed at the 7/9 TMT conference call. The most recent balloon data is needed.

Next Meeting, CONFERENCE CALL, July 9, 9 am:

- All Remaining Updates from 7/2 Agenda
- Dworshak Operations
- Ice Harbor (options)

Meeting Minutes

1. Greeting and Introductions

The July 2 Technical Management Team meeting was chaired by Rudd Turner of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Turner at 503/808-3935. TMT members agreed to revise the agenda and cover current system conditions first, followed by discussions of Libby, Hungry Horse, and Dworshak summer operations, then Ice Harbor post-test spill operations, and close by hearing updates as time allows.

2. Current System Conditions.

With respect to the status of the fish migration, Wagner said the species of concern, currently, is the fall chinook. The subyearling index is where the action is, he said; at Lower Granite, we're seeing 15,000-20,000 fish per day, with just over 1 million subyearlings past Lower Granite to date, significantly larger than any previous year's run (the previous high for this date was just over 700,000). Those high numbers are a reflection, in part, of the large number of hatchery fish released this year. Our main concern right now is passage conditions at Lower Granite, particularly temperature, he said. There are also large subyearling index numbers being seen at McNary, he said, although those numbers aren't larger than what we've seen in the past – good numbers, but not exceptional. The numbers are also good at John Day and Bonneville, although again, they are within the range of expectations.

With respect to water temperatures in the Lower Granite forebay, they're currently averaging about 65 degrees, down from about 67 degrees on Monday because air temperatures remain relatively cool, Wagner said. Temperatures from here on out will be on the rise at Lower Granite, he said; it's just that time of year. Kyle Martin said that, in looking at the weather forecast data, he doesn't foresee any sharp warming trends over the next 10 days in the Lower Granite vicinity; the weather is expected to be intermittently sunny and cloudy. Lower Granite tailrace temperatures are running about 63 degrees F, and can also be expected to increase from here on out, Wagner said. With respect to flows, he added, yesterday's day-average flow at Lower Granite was 39 Kcfs; flows are expected to continue to decline as temperatures rise further. In other words, said Wagner, we're now at that annual decision point when we need to decide how to manage flow and temperature at Lower Granite to produce the best possible passage conditions for fish.

Moving on to reservoir operations, Turner reported that Bonneville saw a day-average flow of 188 Kcfs yesterday, down from a peak of 282 Kcfs over the past two weeks. Yesterday's day-average at McNary was 172 Kcfs; at Lower Granite, 39 Kcfs, down from a high of 83 Kcfs over the past two weeks. Turner added that the spring seasonal average flow at McNary was 231.4 Kcfs, above the spring flow objective of 220 Kcfs. At Priest Rapids, the seasonal average flow was 141.4 Kcfs, compared to a seasonal average flow target of 135 Kcfs. The spring seasonal average flow at Lower Granite was 90 Kcfs, just over the 89 Kcfs spring seasonal target.

Turner said the summer flow objectives at Lower Granite and McNary, based on the June final runoff forecast, are 50.9 Kcfs and 200 Kcfs, respectively; he said it is unlikely that either summer objective will be met. Dworshak touched full on June 30 and is now releasing 5 Kcfs, with inflows of 4.6 Kcfs. Libby is now at elevation 2458 feet, one foot from full; the project has filled 7 feet over the past two weeks. Libby is currently passing inflow of 19 Kcfs, and will continue that operation at least through tomorrow. Albeni Falls is at elevation 2062.3 feet and releasing 25.5 Kcfs outflow, with 30 Kcfs inflow.

At Grand Coulee, said Norris, the current elevation is 1286.1 feet; the plan is to get the project full as soon as possible. The current Hungry Horse elevation is 3557.9 feet; the project is releasing 3.5 Kcfs, and will hold that through July 7, when project discharge will increase to 5 Kcfs. Reclamation plans to hold 5 Kcfs outflow through August 31, Norris said, targeting elevation 3540 feet, 20 feet from full; Hungry Horse will probably not completely fill in 2003. He noted that recent forecasts for Hungry Horse have dropped dramatically due to falling precipitation. We're now looking at a water supply forecast in the low-70% of normal at Hungry Horse, down from a forecast in the 90% of average range in the late spring, Norris said.

You went to 3.5 Kcfs outflow from Hungry Horse sooner than planned due to a substation outage? Boyce asked. That's correct, Norris replied – in effect, you're getting some of your salmon water sooner.

Turner also distributed the Corps' most recent STP run, showing summer flows at Lower Granite, Priest Rapids, Bonneville and McNary. The STP run shows gradually-declining flows at these projects through the end of August. Again, said Turner, it does not appear that the summer flow objectives will be met at either Lower Granite or McNary.

The power system is doing as well as can be expected – the lights are on, Bettin said. It is the fire and lightning season, however, so it's hard to say what will happen.

Water supply? Silverberg asked. The final published water supply forecast of the year – the July early-bird – is now available, said Turner; there is little or no change in the forecasts except at Libby and Dworshak, where the forecasts have increased by a couple of percentage points.

3. Libby Sturgeon Update.

On June 6, the Fish and Wildlife Service submitted SOR 2003-10, covering the 2003 sturgeon "pulse" operation at Libby Dam. This SOR requests the following specific operations:

- From June 5 through June 26, attempt to maintain a minimum discharge target from Libby Dam of 20 Kcfs
- Sturgeon augmentation flows should be followed by a rampdown to the tiered bull trout flow minimum flows/salmon flows per the 2000 BiOp, except as noted below
- Avoid forced spill at Libby
- Refill the project to hear 2459 feet by July 1 or later if needed to avoid forced spill

- If on June 26 additional water is available, we recommend splitting that volume equally to extend the then-current target sturgeon incubation flow beyond June 26, and to achieve a higher tiered bull trout flow through July, if possible up to the optimum tiered flow of 9 Kcfs
- Should the actual volume available to split, as described above, be exceeded, we recommend that the remainder be used to further extend the duration of the sturgeon incubation flow.
- At some point early in this sturgeon flow request, while low-elevation runoff remains relatively high, we recommend up to two days of maximum powerhouse releases to facilitate ongoing U.S. Geological Survey sediment transport studies, designed to aid conservation of the sturgeon. As much advance coordination as possible would be appreciated.

This SOR was implemented as requested and is now complete.

4. Libby and Hungry Horse Summer Operations.

On July 1, the State of Montana submitted SOR 2003 MT-1, covering Montana's proposed summer operations at Libby and Hungry Horse Dams. This SOR, supported by Montana Fish, Wildlife and Parks, requests the following specific operations:

- During July, adjust Libby outflows until refill has been achieved while avoiding significant risk of filling and spilling or in failing to fill to less than five feet from full
- Adjust Libby's target outflow as necessary to maintain a stable weekly average outflow that results in drafting Libby to elevation 2449 by the end of September. It is preferred that outflows are held flat or are reduced gradually from July through September
- Establish a weekly average target of 3.7 Kcfs at Hungry Horse Dam
- Adjust the target outflow as necessary to maintain a stable weekly average outflow and draft Hungry Horse to elevation 3550 by the end of September. It is preferred that outflows are held flat or are reduced gradually from July through September.
- Maintain flows out of Libby and Hungry Horse that are at least the minimum flows for bull trout. Minimum bull trout flows are a higher priority than the ending elevations targeted for the storage reservoirs by the end of September.
- Continue to implement bull trout research to measure changes in fish survival and productivity.
- Reduce summer bypass spills at Bonneville Dam to a daily average of 50 Kcfs, ending on August 15 (rather than the planned date of August 31)
- Reduce summer bypass spills at The Dalles Dam to 30 percent of river flow, ending August 15 (rather than the planned date of August 31)
- Conduct the current spill test at John Day Dam and eliminate bypass spill once the test is concluded. This is planned to occur at the end of July.

Litchfield spent a few minutes going through the specifics of this SOR, the full text of which is hot-linked to the TMT homepage. Please refer to this document for details of the SOR's justification.

The group devoted a few minutes of debate to the justification for Montana's SOR; Boyce noted that, in his opinion, focusing on cumulative passage indices at Bonneville is misleading – it would be much more informative to look at the indices for specific wild and hatchery stocks, he said. Paul Wagner observed that, according to information developed by the NMFS Science Center, the smolt-to-adult return rates for the juveniles migrating late in the season – in late August and September – are significantly higher than the SARs for juveniles migrating earlier in the season. Litchfield replied that, according to the ISAB, incremental differences in flow and spill may not be that significant in terms of their impact on fish survival.

A lengthy discussion of the biological merits of the traditional BiOp operation at Libby and Hungry Horse vs. those of Montana's proposed operation ensued. Dave Statler observed that changes to the flow and spill regimes in the lower river obviously have region-wide impacts; any such changes need to be approached very deliberately, he said. Litchfield agreed – it's obvious that it is one, big, interconnected system, he said, and if you tweak one part of it, it will have an effect elsewhere in the system.

The group also discussed the potential financial cost (in terms of lost power revenues) of Montana's proposed operation, as well as its potential impacts on fish survival in the lower river. The bottom line is that, in Montana's view, this operation will produce a more balanced operation for both anadromous fish and for listed resident bull trout and sturgeon in Montana, as the ISAB has recommended, Litchfield said. At Boyce's request, Litchfield said he will provide the TMT with the available biological data on the expected benefits of Montana's proposed operation on resident fish in Montana.

Turner then directed the group's attention to the model runs developed by the Corps in response to a request from Montana, all of which were initialized using yesterday's STP run. This modeling exercise included Scenario 1, a 10-foot draft of Libby by September 30 (as requested in SOR 2003 MT-1) which would result in a Libby outflow of approximately 10 Kcfs through most of July, August and September; Scenario 2, a 10-foot draft of Libby by August 31, which would yield an average Libby outflow of 13.4 Kcfs through most of July and August, followed by 7 Kcfs outflow through September 30; Scenario 3 (the BiOp operation), which would draft Libby to elevation 2440 (20 feet from full) by August 31, with an average outflow of about 18 Kcfs through July and August followed by a drop to 7 Kcfs outflow in September, and Scenario 4, the modeled STP operation, which would hold Libby outflow at 19 Kcfs through July 3, then drop it to 16.6 for the period July 4-9, then to 14.3 Kcfs for July 10-18. Under Scenario 4, Libby outflow would then increase to 18 Kcfs for the period July 19-August 31, drafting the project to elevation 2439 feet by that date. Again, under Scenario 4, September outflow would be held at 7 Kcfs.

In response to a question from Wagner, Turner said it would be possible to smooth out the operation in Scenario 4 to avoid the drop in Libby outflow followed by an increase to 18 Kcfs. In response to another request, Turner said the Corps is also modeling the impact of Montana's requested Libby operation on summer flows at McNary; this information is not yet available, however. Turner noted that, absent another recommendation from TMT, Scenario 4 is the Corps' planned Libby operation for July, August and September.

Ultimately, it was agreed that the TMT will not attempt to reach resolution on this very complex topic at today's meeting. The IT will take up the policy and BiOp implications of Montana's proposed operation at its meeting tomorrow; the TMT will then re-engage on this SOR at its next meeting.

What about the recommended Libby operation for the next two weeks? Silverberg asked. After a brief discussion, it was agreed that, at least for the next two weeks, Libby will be operated as needed to avoid filling and spilling, and will continue to pass inflow (currently about 19 Kcfs), running four units most of the time. It was further agreed that Libby outflow will not fall below three units (about 14 Kcfs-15 Kcfs) no matter what the inflows to the project, for the next two weeks. Reclamation plans to increase Hungry Horse outflow to 5 Kcfs outflow on July 7, said Tony Norris; bear in mind that every day we're above minimum outflow at that project subtracts from the volume available to implement the Hungry Horse operation Montana is requesting.

5. Dworshak Summer Operations.

Turner drew the group's attention to the three Dworshak-related handouts distributed at today's meeting; the first a summary of the 2002 Dworshak temperature operations. As you will recall, Turner said, we had 140% of normal runoff volume to work with at Dworshak last year, as opposed to 90% of normal this year. The 2002 Dworshak summer operation was basically full powerhouse discharge plus spill up to the 110% gas cap for two months, beginning in mid-July, with discharge temperatures ranging from 45 degrees to 49.5 degrees F, Turner said. Bear in mind that discharge temperature is as important as flow to this equation, he said.

Turner also provided information on the summer temperature regime in the Lower Granite forebay and tailwater in response to the cold-water releases from Dworshak in 2002. Laura Hamilton noted that the release of 45-degree water from Dworshak had the desired effect in 2002, lowering the forebay temperature at Lower Granite from almost 77 degrees F on July 24 to below 68 degrees F within a few days. Turner also provided charts showing the temperature profiles within Dworshak Reservoir for 2002-2003. The group spent a few minutes reviewing this information, offering a few clarifying questions and comments.

Next, Turner drew the group's attention to the Corps' estimate of the volume of 45-degree F water (in Ksfd) available from Dworshak in 2003 – approximately 7 weeks of 13.8 Kcfs outflow.

Wagner noted that there was a lengthy discussion on the topic of Dworshak summer operations at yesterday's FPAC meeting. It wouldn't be fair to say that we reached consensus on that operation, he said, but we were close enough that we developed what might be called a framework for the 2003 operation. Essentially, what this plan does is attempt to leave some water in the bank for use in September, Wagner said. It does start Dworshak flow augmentation early, however:

- July 7-20: 14 Kcfs outflow
- July 21-August 10: 12 Kcfs outflow

- August 11-24: 10 Kcfs outflow
- August 25-September 7: 8 Kcfs outflow
- September 8-14: 7 Kcfs outflow

Wagner explained the biological justification underlying this proposed operation, noting that it utilizes the majority of the available cool water from Dworshak early in the summer season, when subyearling chinook passage is highest, but does retain some cool water for use in September to maintain a reasonable temperature regime in the Lower Snake for both migrating juveniles and adults. Again, he said, this is just a framework; if the weather turns unbelievably hot, we may deviate from it.

After September 14, Dworshak would go to minimum outflow? Litchfield asked. That's correct, Wagner replied – 1.3 Kcfs outflow. In response to another question from Turner, Wagner said the August 31 elevation target at Dworshak would be 1535 feet. That would leave about 200 KAF for use in September, Turner observed; that translates in a reduction of 1.4 Kcfs in flow at Lower Granite for the July-August period. He added that the Corps' most recent forecast shows a seasonal average flow of 37 Kcfs at Lower Granite for the summer period, well below the target of 50.9 Kcfs.

Boyce noted that the vast majority of the Snake River subyearling chinook migrate in July and August, rather than September. The question is, do we want to encourage higher passage in early September, or concentrate as much flow as possible in July and August? he said. Our hope is to provide some cooler water to allow the fish to continue to migrate between August 31 and the time natural cooling occurs, Statler replied. Still, I don't understand why you would want to reduce flows and biological benefit in July, when peak numbers are migrating through the Lower Snake, Boyce said. The reason is that the naturally-produced fall chinook in the Lower Clearwater outmigrate later in the summer, Statler replied – those fish need to grow considerably more than some of the other stocks before they will outmigrate, and the bulk of that segment of the run does not begin to pass Lower Granite until the latter part of July. Still, if the growth of the Clearwater fish is a concern, why would you go to 14 Kcfs outflow from Dworshak next week, then reduce Dworshak outflow once those fish are ready to outmigrate? Boyce asked. Actually, we would prefer to see 11 Kcfs outflow from Dworshak for the week of July 7-13, unless Lower granite temperatures spike severely, Statler replied.

Wagner noted that what the temperature modeling data shows is that, if Dworshak releases only 11 or 12 Kcfs at the beginning of the temperature control operation, Lower Snake water temperatures rise too quickly, and it is difficult to bring them down once they spike. It is better, from a temperature management standpoint, to release 14 Kcfs initially, then reduce the Dworshak outflow gradually from there in order to stay on top of the Lower Granite water temperature, he said. Bettin observed that air temperatures in the Lewiston area are not expected to be excessively warm in the next two weeks; this might provide an opportunity to conserve some of Dworshak's cold-water volume over the next two weeks. Again, what history shows us is that, if you want to stay in control of the temperature situation at Lower Granite, you need to release a high volume of cold water from Dworshak beginning early in July, Wagner replied. Cathy Hlebechuk noted that it will not be possible to move the selector gates at Dworshak during the July 14-21 period, so it will not be possible to change whatever temperature regime is chosen for that period until after July 21.

Turner said the Corps has modeled the proposed “framework” operation, looking at 13.5 Kcfs rather than 14 Kcfs for the period of July 7-20. That model run shows that Dworshak would be elevation 1532, rather than elevation 1535, on August 31. Turner recommended that the TMT continue to discuss the Dworshak operation at its bi-weekly meeting, but in the interim, to implement the framework operation as recommended by NOAA Fisheries. Statler said he is sensitive to Wagner’s argument that it is important to get ahead of the temperature curve; he said the Nez Perce Tribe would not be opposed to starting to release 14 Kcfs from Dworshak on July 7, with the understanding that this operation could be adjusted based on continued TMT discussion.

After a few minutes of further discussion, the TMT recommended that the action agencies implement the framework operation for Dworshak essentially as outlined: continue to release 5 kcfs through July 6, then begin releasing 10 Kcfs from Dworshak (full powerhouse discharge) on the morning of July 7, then go to 14 Kcfs (full powerhouse discharge plus spill to the 110% TDG cap) from Dworshak on the morning of July 8. It was further agreed that the TMT will revisit the Dworshak operation, the weather and water temperature situation at Lower Granite and the growth status of the Lower Clearwater fall chinook smolts at a conference call on July 9.

David Wills observed that, in his mind, the triggers under which the 200 KAF September flow augmentation volume would be moved into July and August to alleviate an emergency temperature situation at Lower Granite are somewhat ambiguous. It was agreed to attempt to firm up these criteria at the next TMT meeting.

6. Ice Harbor Spill Test and Post-Test Operations.

Turner said the summer spill test is now underway at Ice Harbor: alternating between no spill and BiOp spill in two-day blocks, with a modified (bulk) spill pattern concentrating the spill into Bays 2-4 at 6-9 stops each. The intent is to reduce injury to fish, Turner said. The test runs through July 16, he said; NOAA Fisheries researchers are PIT-tagging fish – a minimum of 36,000 – for recovery and evaluation at Lower Monumental. About 20,000 fish have been PIT-tagged to date.

Another factor is that the District is working on the design for a balloon-tag test at Ice Harbor, Turner said. Marvin Shutters said the SRWG had discussed the possibility of using rainbow trout for the balloon-tag test through the bulk spill condition, but there was no SRWG agreement that this study would yield relevant or useable data. Rather than rainbow trout, we are now considering using subyearlings collected at Ice Harbor, Shutters said. We expect to get the cost proposal from the contractor today, he said; if the cost estimates are within expectations, we plan to go forward with two treatments for the balloon-tag test – BiOp spill (a flat spill pattern) and bulk spill. In this test, the bulk spill would go through Bays 4-6, rather than Bays 2-4, Shutters added. Would that be a daytime test only? Bettin asked. Yes, Shutters replied. In response to a question from Chris Ross, Shutters said the Corps is contemplating a four-day duration for the balloon-tag test; the starting date has not yet been finalized.

Boyce said FPAC recommends that the details of the balloon-tag study be run through the SRWG; it really isn't a TMT call. Shutters agreed, but asked that any TMT concerns about the proposed balloon-tag test be communicated to him as soon as possible.

The question to TMT is, what kind of post-test operation do you want to see at Ice Harbor, given the fact that the BiOp planning date for the end of spill at that project is August 31? Turner said. Shutters said information from the PIT-tag test could be available by mid-August; data from the balloon-tag test would be available almost immediately following the conclusion of the test.

It was agreed to revisit the issue of the Ice Harbor spill test at the July 9 TMT conference call. It sounds, then, as though we have four options for the post-test period, said Wagner: no spill, bulk spill, spill through narrow gate openings (the current BiOp spill operation) or a mix of the two (two days of no spill, two days of bulk spill or narrow spill openings). Wagner said he will discuss these options with others in his office. Boyce observed that, in the absence of information from the 2003 spill test, it will be very difficult for the TMT to make an informed decision on this issue.

7. New System Operational Requests.

SOR 2003 MT-1 was covered earlier in today's agenda.

8. Recommended Operations.

Recommended operations were summarized earlier in today's agenda.

9. McNary Fish Transportation.

Turner said smolt collection began at McNary on June 27 at 7 am, and the first barge went downriver on June 28; collection and transport began when McNary flows fell below 220 Kcfs and temperatures reached and exceeded the 62 degree threshold in the BiOp.

10. Lower Granite Bypass Pipe Update.

There will be a 12-hour line outage on July 14 which will shut down the powerhouse at Lower Granite, said Bettin; that will require us to go outside of MOP. During the outage, one unit will operate at speed-no-load (4 Kcfs-5 Kcfs); we will need to pond the remainder of that water, he said. No TMT objections were raised to this operation. Managing flows for this operation will be discussed further at the July 9 conference call.

11. Fish Spill Status and Tracking.

This item was deferred until the next face to face meeting, on July 16.

12. Next TMT Meeting Date.

It was agreed that there will be a TMT conference call to discuss the Dworshak operation on July 9. The next face-to-face meeting of the Technical Management Team was set for Wednesday, July 16. Meeting summary prepared by Jeff Kuechle, BPA contractor.

TMT PARTICIPANT LIST
July 2, 2003

Name	**Affiliation**
Jim Litchfield	Montana
Steve Petit	IDFG
Dave Statler	NPT
Kyle Martin	CRITFC
Tom Haymaker	PNGC Power
Tim Heizenrater	PPM
Shane Scott	WDFW
Rudd Turner	COE
Donna Silverberg	Facilitation Team
David Wills	USFWS
Laura Hamilton	COE
Scott Boyd	COE
Tony Norris	USBR
Scott Bettin	BPA
Ron Boyce	ODFW
Paul Wagner	NOAA Fisheries
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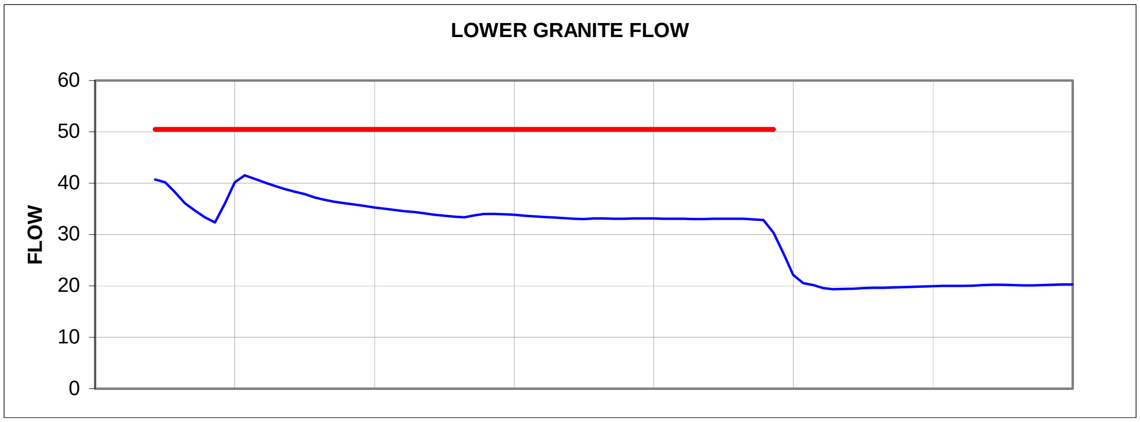
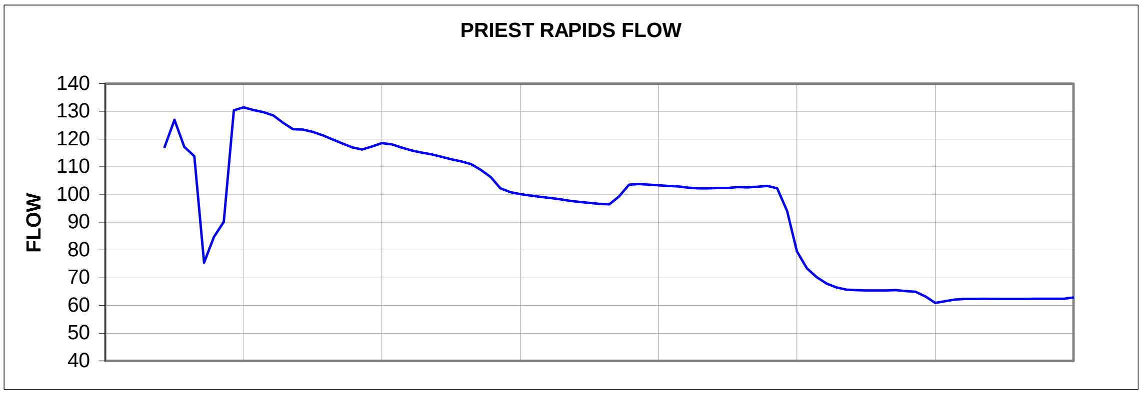
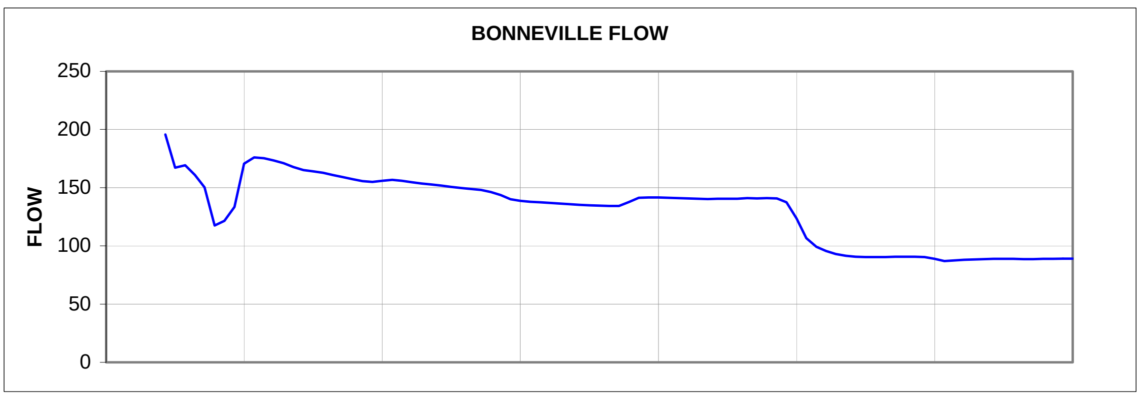
Cindy Henriksen	COE
Margaret Filardo	FPC
Richelle Beck	D. Rohr & Associates
Steven Wallace	PacifiCorp
Nick Lane	BPA
Connie Little	BPA
John Wellschlager	BPA

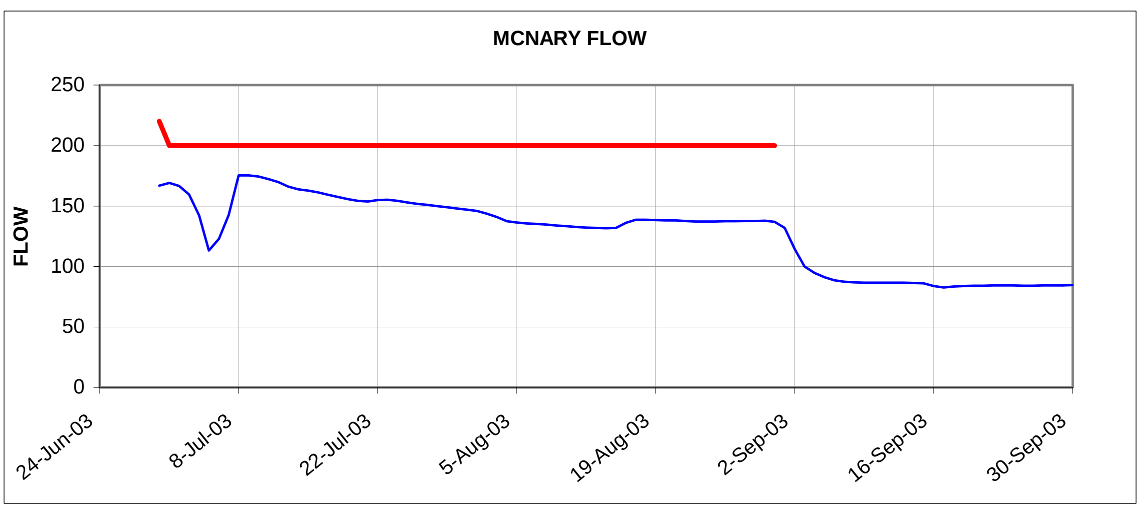
Chris Ross	NOAA Fisheries
Jim Adams	COE
Steve Hayseker	USFWS
David Benner	FPC
Tina Lundell	COE
Tom Le	PSE
Bill Rudolph	NW Fish Letter
Lance Elias	PPL
Kim Fodrea	BPA
Colin Beam	PPM

STP Run 07/01/03









T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / Lori Postlethwait* **BPA:** *Scott Bettin / John Wellschlager*
NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*
OR: *Ron Boyce* **WA:** *Shane Scott* **ID:** *Steve Pettit* **MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner*

TMT CONFERENCE CALL

09 July 2003 0900 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Lower Granite bypass pipe update and powerhouse outage. (COE)
2. Ice Harbor Spill test and post-test operations.
3. Treaty Fishery request, SOR # 2003 C-3. (CRITFC) (SOR #2003-C3) .
4. Libby and Hungry Horse summer operations; BiOp and NPPC strategies. (COE, BOR, MT) (SOR #2003-MT-1) . (Libby Operation) . (Resident Fish Impacts-1) (MFWP) . (Additional Resident Fish Impacts-2) (MFWP) .
5. Dworshak summer operations; flow and temperature. (NOAA Fisheries, COE)
   Also determine desired water temperature when selector gates are inoperable July 14 - July 23.
   (SOR #2003-C4) . (SOR #2003-11) . (Dworshak Operation Plan) .
6. Develop recommended operations.
7. Other.
   - set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

DWORSHAK OPERATION PLAN

Prepared by: Idaho Department of Water Resources
Water Planning Bureau

Prepared for: Idaho Water Resource Board

Adopted December 21, 2000

Acknowledgements

The Idaho Water Resource Board would like to acknowledge the Dworshak Operation Plan Committee and key contributors for their efforts in formulation of the Dworshak Operation Plan.

I. Dworshak Operation Plan Committee

Mayor Roy Clay, City of Orofino
Roger Colgan, Board of County Commissioners, Clearwater County
Rep. Charles D. Cuddy, Idaho State Legislature
Alex Irby, Orofino Chamber of Commerce
Rick Laam, City of Orofino
Sen. Marguerite McLaughlin, Idaho State Legislature
Sandy Medley, Orofino Chamber of Commerce
Earl Pickett, Board of County Commissioners, Clearwater County
D. Richard Wyatt, Idaho Water Resource Board, Lewiston, Ad Hoc Member

II. Key Contributors

Jim Bellatty, Idaho Department of Environmental Quality, Lewiston
Rick Eichstaedt, Nez Perce Tribe Office of Legal Council
Greg Haller, Nez Perce Tribe Water Resource Department
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Erik Petersen, Corps of Engineers, Dworshak Project
Ed Schriever, Idaho Department of Fish and Game, Lewiston
Dave Statler, Nez Perce Tribe Fisheries Department
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University of Michigan
Peter Goodwin, Ecohydraulics Research Group, College of Engineering, University of Idaho

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Introduction

The Idaho Water Resource Board (Board) adopted the Comprehensive State Water Plan – North Fork Clearwater River Basin in January 1996. The plan contains a series of policies formulated by the Board, in consultation with local citizens and public officials, to provide direction to the Corps of Engineers (CoE) and other federal agencies regarding the operation of the Dworshak Project (dam and reservoir). The sixth policy in the Plan calls for a committee consisting of state and local representatives, to develop a management plan, in consultation with the CoE, for the Dworshak Project that fully addresses the other five policies, listed below:

(1) The Dworshak Project will be operated as a multiple use project in full consideration of the current authorizations of flood control, navigation (log transport), recreation, power production and fish and wildlife conservation.

(2) Summer reservoir levels will be managed to optimize the seasonal beneficial uses of recreation and log transportation.

(3) Dworshak Project outflows, other than during the summer months, will be configured to benefit the Clearwater River population of B-run steelhead.

(4) Dworshak Pool will be managed to support reservoir and upper basin fish and wildlife, and to provide a high-quality source of water to the Ahsahka fish hatcheries.

(5) Water released from the Dworshak Project will be in compliance with state water quality standards.

Consistent with this policy, the Dworshak Operation Plan is formulated as an amendment to the North Fork Clearwater River Basin plan.

Plan Objective

The objective of the Dworshak Operation Plan is to implement procedures that optimize the use of Dworshak water for all beneficial uses, including flood control, power production, recreation, commercial navigation, fish (both anadromous and resident populations), wildlife, and water quality. The operation plan recognizes the management policies set forth in the North Fork Clearwater Plan.

Current Operations

Commencing in 1992, spring and summer flow releases from the Dworshak Project were modified to improve out migration conditions for juvenile anadromous fish. Populations of concern are chinook salmon, sockeye salmon, and steelhead originating from Idaho, Oregon and Washington tributaries, as well as the mainstem Snake River. Dworshak releases subsequently contributed to flow objectives for the lower Snake River set out in the 1995 Columbia River Power System Biological Opinion, and in the 1998 supplement to that document. The flow objectives as measured at Lower Granite Dam are:

> 85,000 – 100,000 cfs from April 1 to June 20.
> 50,000 – 55,000 cfs from June 21 to August 31.

Within this framework, spring augmentation usually commences around April 10 with Dworshak releases approaching 20,000 cfs. Duration of spring augmentation is normally around 30 days. Releases are then reduced in an attempt to fill the Dworshak pool by June 30. Summer releases typically approach 20,000 cfs by mid-July and often remain high until the end of August. Reservoir elevations begin to decline from the full pool elevation in early July, and continue to recede to elevation 1520 feet. Summer augmentation provides 1.2 million acre-feet of Dworshak storage in addition to reservoir inflows. During six of the nine flow augmentation years, the reservoir pool was lowered to elevation 1,520 feet by August 31. During the remaining three years, the reservoir was lowered to elevation 1,520 feet no later than September 12.

Impacts of Project Operations

Resident Fishery

Dworshak Reservoir Productivity

The majority of the North Fork Clearwater River drainage is comprised of nutrient- poor granites of the Idaho batholith. Dworshak Reservoir, like most new reservoirs, experienced a few years of higher productivity. Since 1977 the reservoir has gradually become less productive and is now classified as oligotrophic (Reiman and Meyers, 1992). Most of the nutrient budget is probably comprised of recycled phosphorus and nitrogen and inputs from tributary streams and shoreline areas (Bennett, 1997). The current low-nutrient condition of the reservoir does not support rapid fish growth.

Fisheries Mitigation

The CoE has the legal responsibility to mitigate the effects of lost fishing opportunity created by Dworshak Reservoir. Originally that mitigation was defined as 100,000 pounds of hatchery-reared fish. Since 1972 that level of stocking has only been met three times. The average stocking level for those 25 years has been 38,500 lbs. In the past 10 years the stocking level has averaged less than 15,000 lbs. (IDFG stocking records).

When Dworshak Reservoir was new, productivity was relatively high, fish food was relatively abundant and rainbow trout dominated the sport fishery. These rainbow trout were stocked as part of a federal fisheries mitigation requirement. Small-mouth bass and kokanee salmon were introduced to the reservoir a few years later. Originally, small-mouth bass performed very well on the abundant forage of red side shiners. In fact, Dworshak Reservoir produced an Idaho state record small-mouth bass in 1982. However, success and consistency of the two fisheries are limited and widely variable, largely due to the operational effects of Dworshak, and the lack of nutrients. Kokanee populations fluctuate wildly from year to year, mostly controlled by mortality (entrainment) caused by winter releases from Dworshak. Small-mouth bass in Dworshak Reservoir exhibit the slowest growth rate of any population in the region, due primarily to a lack of forage. Water level fluctuations have eliminated successful spawning of redside shiners, the preferred forage of small-mouths in Dworshak. The small-mouth fishery currently produces only limited harvest to Dworshak anglers.

Trout stocking has shown mixed results over the history of Dworshak Reservoir. In years of low kokanee abundance, stocked trout provide the bulk of consumptive fishing opportunity in the reservoir. Hatchery trout also dominate the creel of shoreline anglers at Dworshak.

Fisheries Enhancement

The Idaho Department of Fish and Game (IDFG), CoE, U.S. Fish and Wildlife Service, and Nez Perce Tribe are attempting to work together to provide a reasonable and responsible fisheries program for Dworshak Reservoir. This program recognizes the importance of optimizing the kokanee fishery, enhancing the bass fishery, stocking trout, and managing native species, primarily bull trout and westslope cutthroat. Reservoir operation and integration of access, recreation, and anadromous fish all play important roles in the Dworshak resident fisheries program.

Historically, fry, fingerling, sub-catchable, and catchable size rainbow trout have been stocked. Rainbow trout stocking has associated risks to native populations and benefits to localized fishery opportunities. Most risks associated with stocking hatchery rainbow trout concern genetics of native cutthroat trout.

Hatchery rainbow trout that leave Dworshak Reservoir and ascend tributaries could spawn with native cutthroat and contaminate the genetics of these native fishes. Earlier reservoir research indicates that size at stocking and stocking location are factors in rainbow trout movement (Ball and Pettit, 1974). Stocking catchable size fish downstream of the Dent Bridge may minimize hatchery fish movement into Dworshak tributaries (Maiolie et al., 1992). Stocking catchable size trout at major access points enhances harvest opportunity. Furthermore, development of sterilized rainbow trout to be stocked in Dworshak Reservoir was recently accomplished.

Total angler use averaged approximately 88,000 hours annually from 1972 through 1980. During these years rainbow trout dominated the fishery. Catch rates averaged less than one fish per hour. Following introduction in the 1970's, kokanee salmon became more prevalent in the reservoir and by the 1980's had replaced rainbow trout as the dominant fishery (Horton, 1981). Plentiful populations and liberal bag limits provided annual harvests of up to 200,000 kokanee per year from Dworshak. Harvest of kokanee was 206,000 in 1988 and fell to 98,000 in 1990. Creel surveys indicate the kokanee decline advanced further in 1991 (Maiolie et al., 1992).

The Dworshak kokanee population has not been stable from year to year, and has exhibited exceedingly low annual survival rates, much lower than other kokanee populations in the same geographical region. In some years over 80 percent of yearling kokanee have "died" before entering the fishery the following year, and may have resulted in up to a 60 percent reduction in fishing effort (Maiolie and Elam, 1994).

Research has shown a strong relationship between the quantity of water discharged through the dam on an annual basis and kokanee survival. Recent analysis suggests that dam discharge can be a more important factor in driving the population than the number of spawning fish (Fredricks, 1995). Years with high snow pack forced flood control rule curve evacuations that flushed kokanee from the reservoir because kokanee tend to congregate in the lower six reaches of the reservoir during winter and early spring. Powerhouse operation of up to 10,000 cfs generally flushed yearling fish. Spill during winter and early spring flushed all age classes (Maiolie et al., 1992).

Changes in dam operation associated with summer drafting of Dworshak Reservoir coupled with relatively low flow years have significantly increased kokanee survival and density in Dworshak Reservoir. Although removal of up to 80 feet of water from the reservoir is not popular with people that recreate on Dworshak Reservoir during the summer, it has reduced the loss of kokanee out of the reservoir. Bennett (1997) found a higher correlation between kokanee entrainment and mean daily discharge during January – March than during July – September. When water is released during the summer kokanee are more active and are not congregated near the dam. Lower numbers of kokanee are lost through the dam under this scenario. In fact, annual kokanee survival during years of summer drafting has been as much as 10 times higher than in years of winter drafting. Unfortunately, this has generally resulted in over abundant kokanee populations, small fish and a decline in angler satisfaction.

Bull Trout

Dworshak Reservoir is in a key watershed for bull trout, currently listed under the Endangered Species Act as threatened, and may provide important over-wintering habitat. Kokanee is a primary food source of bull trout, and both species may congregate near the lower end of the reservoir in the winter. Late winter or early spring spills from the Dworshak Project have been linked to major losses of kokanee through entrainment, and may cause similar losses of bull trout.

Late summer drawdown of the Dworshak pool may also result in negative impacts to North Fork Clearwater bull trout population. Dewatered shorelines can decrease reservoir productivity. Low pool elevations can create both physical and thermal barriers, which may interfere with fall kokanee and bull trout spawning migration.

Anadromous Fishery

Dworshak Dam eliminated access of anadromous fish to all but the lower 1.9 miles of the North Fork Clearwater River. Dworshak hatchery was constructed to mitigate the loss of steelhead caused by the elimination of this production area. Dworshak Hatchery brood stock was developed from wild adult steelhead from the North Fork Clearwater River population. A second hatchery became operational in 1991, primarily to produce B-run steelhead and spring chinook salmon for the Clearwater Basin. Returning adult hatchery steelhead were intended to perpetuate this genetically unique population and provide sport fishing and tribal harvest.

Water released from Dworshak Reservoir during April and May is primarily used to augment flows in the lower Snake River when necessary to meet the NMFS flow target of 85,000 – 100,000 cfs at Lower Granite Dam. In mid-summer, 1.2 million acre-feet (80 feet of pool elevation) from Dworshak Reservoir is used to help meet the NMFS 50,000 – 55,000 cfs flow target at Lower Granite Dam. Summer flow augmentation is for the benefit of juvenile fall chinook salmon. Mid-summer releases from Dworshak Reservoir also cool water temperatures in the lower Snake River. Both increased flow and cooler water temperatures are reported by NMFS to be beneficial for fall chinook salmon juveniles. NMFS uses reservoir elevation 1520 (80 feet down) at Dworshak Reservoir as a target regardless of lower Snake River conditions, fish presence or abundance (Columbia R. dart; Ed Shriever personal communication).

Historically, juvenile fall chinook would have left the lower Snake River by mid-July. Changes to the ecosystem caused by hydro-power development have shifted migration timing of juvenile fish from May-June to July. Providing artificially cold water condi-tions in the lower Snake River in the sum-mer may further complicate the ecosystem and delay the out-migration of these fish.
Some recent evidence indicates that cold-water releases from Dworshak in August and September may be beneficial to immigrating adult fall chinook and steelhead (Karr et al., 1998). Fall chinook and steelhead upstream migration into the Snake River system begins in mid-August and continues through October 31. Declining water temperature in the lower Snake River result in lower residence time, and may increase adult survival. Releases from Dworshak in November and/or December likely benefit the steelhead sport fishery in the lower Clearwater River.

The Nez Perce Tribe is currently bringing new hatchery facilities near Lenore into production. This facility will produce juvenile fall chinook salmon to supplement the Clearwater stocks. Late summer flow augmentation in the lower Clearwater River would likely enhance out-migration of these fish.

Wildlife

Winter operation of the Dworshak Project may impact wildlife through related icing patterns. Deer and elk have been observed falling through the ice during attempted cross-reservoir migrations. Winter management to retard ice build-up, or to enhance early formation of safe ice cover may have a substantially positive impact on winter deer and elk survival.

Recreation

Recreation Facilities

Approximately 80 minicamp locations provide 125 sites for camping and day use. Two fee campgrounds have been developed. The CoE operates Dent Acres and Idaho Department of Parks and Recreation (IDPR) operates Dworshak State Park and Big Eddy Marina. There are seven improved boat launch facilities. Four facilities allow boats to be launched with up to a 90-foot pool reduction, and three allow boats to be launched with up to a 110-foot pool reduction. CoE visitor surveys at Dworshak Reservoir indicate that the overwhelming reason people come to the reservoir is to fish.

Mid-summer water level reductions have negatively impacted visitor use at Dworshak Reservoir. Visitor days at CoE docks and camps averaged 131,425 from 1984-91 (Jaymi Osborne, CoE, personal commun-ication, data provided). Visitor days at the same locations averaged 98,399 from 1992-94, a 25 percent reduction. Visitor days at Dworshak State Park averaged 36,960 during 1990 and 91. Use was at or above this average in 1992 and 93, but fell to 65 percent of average in 1994 (Mike McElhatton, Idaho Department of Parks and Recreation, personal communication, data provided). Regression analysis of visitor use and water level indicates that, except for June, from May to August the majority of the variation in user visits can be explained by reservoir elevation. Further analysis of use and water level indicates that minicamp use is virtually abandoned when drawdown exceeds 30 feet. Operation plan committee members also observed that boater use was substantially reduced when drawdown exceeded 30 feet.

Economics

Using the direct cost method, the fishery in Dworshak reservoir in the late 80's is valued at approximately $620,000 annually (1985 dollars, Sorg et. al.). Multiplied by three for an estimated economic ripple effect, the reservoir fishery generates approximately $1.8 million annually (1985 dollars). Applying visitation trends to the fishery indicates a 20-25 percent reduction in participation due to reduced pool elevations in the summer months. However, the economic value of the steelhead sport fishery in the Clearwater River has been estimated at 10-14 million dollars annually. A four- percent increase in the economic value of the steelhead fishery may compensate for a 20 percent decline in the value of the reservoir fishery.

Commercial Navigation

Between 1988 and 1991, 81 million board feet of timber were transported from four dump sites on the Dworshak pool to takeout facilities located near Dworshak Dam (Fig. 1; BPA *et al.*, 1995a). Approximately 90 percent of this activity occurred in the months of June, July, and August. Logs have not been transported via the reservoir since 1991 due to early drafting for flow augmentation and resulting declines in reservoir elevations. The log dumpsites cannot be used when the reservoir elevation drops below 1570 ft. The added annual cost of truck transportation when the reservoir

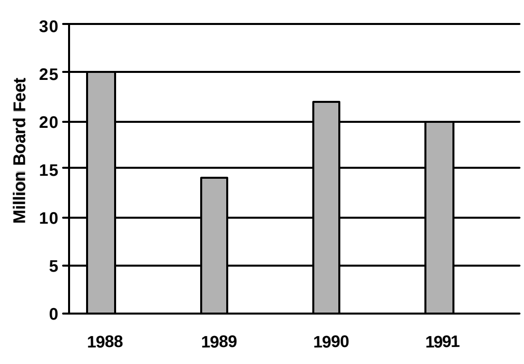

Figure 1. Log Transportation on the Dworshak Pool.

cannot be used has been estimated as high as $470,000 when harvest is near the more distant dump sites.

Power Production

The average annual power production for the Dworshak Project between 1974 and 1991 was 1,769,000 megawatt hours (Fig. 2, CoE Power Production Records). At the Bonneville Power Administration preferred customer rate of 24 mils/kilowatt hour, the average annual power value was $42.5 million. The average annual production between 1992 and 1998 was 1,418,000 megawatt hours, resulting in an average annual value of $34.0 million. This represents a 20 percent reduction in power revenues under flow augmentation During the pre flow augmentation period (1974-1991) one of the peak power production periods was November through January, which helped offset regional winter demands (Fig. 3). During the flow augmentation period, 1992-1998, peak production coincided with spring and summer augmentation releases. Power production during the winter months has been reduced substantially.

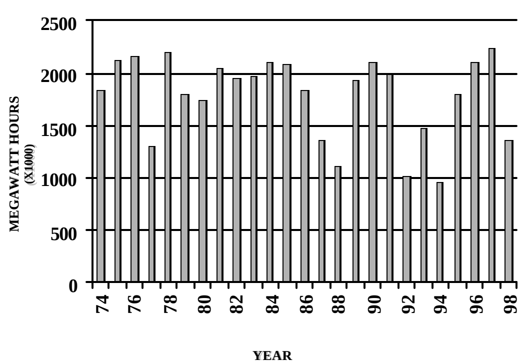

Figure 2. Annual Power Production for the Dworshak Project, 1974-1998.

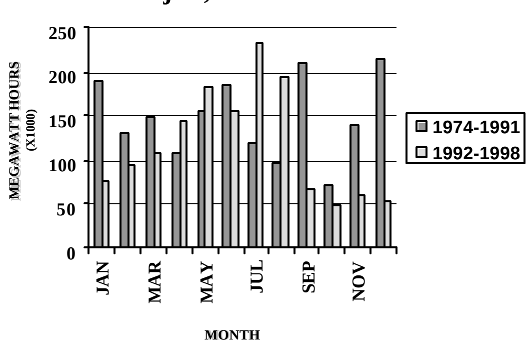

Figure 3. Average Monthly Power Production for the Dworshak Project, 1974-1998.

Flood Control

The primary objective of Columbia River system flood control operations is to reduce peak flows on the lower Columbia River (BPA *et al.*, 1995b). This area includes parts of Portland, Oregon and an additional 120 river miles protected by 42 diking districts. Under traditional operations, the Dworshak pool was maintained at or near full until after September 1. Between September 1 and January 1, the pool was gradually drafted to pool elevations of 1550 to 1560 feet (this provided approximately 700,000 acre-feet of space). Drafting continued into early April resulting in low pool elevations approaching 1450 feet (1,970,000 acre-feet available storage). Spring runoff resulted in reservoir refill, and full pool, elevation 1600 feet, was typically attained around June 10th. The reservoir pool elevation was usually maintained at 1600 feet through September 1.

With the advent of flow augmentation in 1992, some of the flood control space could be transferred from Dworshak to the Grand Coulee project. In theory, this would leave more water in the Dworshak pool to support spring flow augmentation while increasing the likelihood of full pool in late spring or early summer.

Water Quality

In 1998, the Idaho Division of Environmental Quality (IDEQ) issued a draft list of 19 stream segments in the Upper North Fork Clearwater (Hydrologic Unit Code 17060307), which are purportedly water quality limited due to excess sediment pollution. In addition, Osier Creek is also listed as water quality limited due to water temperature exceedances and flow/habitat alterations. A total daily maximum load (TMDL) analyses for the Upper North Fork Clearwater is scheduled for completion by December 31, 2000.

Water quality issues in the lower North Fork Clearwater River (Hydrologic Unit Code 17060308) and the mainstem Clearwater River (Hydrologic Unit Code 17060306) include both water temperature and total dissolved gas supersaturation. Specifically, IDEQ and IDFG are concerned about thermal shock and gas saturation created when 20,000 cfs of 8 deg C water is released from the dam during the summer low flow period. Releasing cold water from Dworshak Reservoir for the purpose of flow augmentation and water temperature control in Lower Granite Reservoir during the summer can have an adverse effect on the growth and the productivity of both resident and anadromous fish in the lower Clearwater River. A TMDL for the lower North Fork Clearwater River is due in the year 2002 and a TMDL for the mainstem Clearwater River is due in the year 2003.

Short Term Activity Exemption

Since April 1995, the National Marine Fisheries Service (NMFS) has sent annual requests to both the IDEQ and to the Nez Perce Tribe seeking approval for a short-term activity exemption to exceed the total dissolved gas standard of 110 percent supersaturation in the North Fork Clearwater and the mainstem Clearwater Rivers below Dworshak Dam. The basis for this request is to provide water from Dworshak Reservoir to augment flows in the lower Snake River for the purpose of improving migration conditions for juvenile chinook, steelhead, and sockeye salmon originating from Idaho, Oregon, and Washington tributaries as well as the mainstem Snake River. Dissolved gas monitoring information from the CoE indicates that the 110 percent standard is exceeded in the river below Dworshak Dam at approximately 4,000 to 5,000 cfs spillway flow, or 14,000 to 15,000 cfs total flow.

The Idaho Administrative Procedures Act (IDAPA 16, Title 01, Chapter 02, Section 080.02) provides that the Idaho Department of Health and Welfare or the Board of Health and Welfare may conditionally authorize short-term activities that may result in a violation of state water quality standards (rules). The Idaho Water Quality Standards provide state that no activity can be authorized unless:

- The activity is essential to the protection or promotion of public interest;
- No permanent or long-term injury of beneficial uses is likely as a result of the activity. The designated beneficial uses listed for the North Fork Clearwater and the Clearwater Rivers in the Idaho Water Quality Standards are:

- Cold Water Biota
- Salmonid Spawning
- Primary Contact Recreation
- Secondary Contact Recreation
- Special Resource Water

Gas Bubble Trauma Monitoring

Beginning in 1995, NMFS requested a variance from the total dissolved gas standard to allow flow augmentation spills that could result in total dissolved gas levels up to 120 percent saturation. A requirement imposed by IDEQ with the activity exemption was a monitoring program for fish populations in the affected waters to determine extent of gas bubble trauma (GBT) associated with elevated dissolved gas saturation levels. Over the course of the past five years (1995 through 1999), over 30,000 individual fish were examined for gas bubble trauma (Table 1; Cochnauer, 1999). The incidence of GBT was never greater than 1.0 percent of all fish examined in a given year. Over 95 percent of all GBT incidences were observed in the two monitoring areas closest to Dworshak Dam. Wild rainbow trout showed the highest incidence of GBT in 1996 and 1997. The highest incidence of GBT for both an individual species and all species collectively occurred in 1997 when the greatest number of days exceeding the 110 percent and 120 percent total dissolved gas saturation occurred. Seventy-three percent of the fish exhibiting GBT were at the lowest trauma level. Fifty-three percent of GBT was observed during the summer flow augmentation interval.

Table 1. Summarization of days by year with total dissolved gas exceeding Idaho state water quality standard and the percentage of gas bubble trauma observed for selected fish species (Cochnauer, 1999).

	1995	1996	1997	1998	1999
Days TDG exceeding 110%	33	41	55	47	41
Days TDG exceeding 120%	10	17	20	0	0
Number of individual fish examined	4,752	5,773	8,557	5,474	5,935
Number of fish species with GBT	5	2	7	1	2
% GBT for all species	0.2	0.2	0.8	<0.1	<0.1
%GBT for wild rainbow trout	0.0	2.0	7.5	0.0	0.4
%GBT for mountain whitefish	1.0	0.1	0.7	0.0	0.0
%GBT for largescale sucker	0.1*	0.2*	1.3	0.0	<0.1

*May include some bridgelip suckers

Ongoing Activities

Total Dissolved Gas Activity Exemption

In March 2000, the IDEQ and the Nez Perce Tribe worked together in a collaborative manner to prepare a joint response to the NMFS annual request for a short-term activity exemption (Appendix A). This approach provides for the State of Idaho and the Nez Perce Tribe to have a collective regional voice with the Federal Caucus.

The 2000 Activity Exemption also varies from past exemptions in that conditions are attached that pertain to summer water storage and release from the Dworshak Project. These conditions specify that the Dworshak Project will be at full pool by June 30th, that full pool will be maintained through July 31 and that 200,000 acre-feet of the flow augmentation water will be preserved for augmentation needs after August 31. The purpose of these conditions is to shape releases from Dworshak to better meet anadromous and resident fish needs, as well the other traditional beneficial uses of the Project.

Following issuance of the waiver on March 31, 2000, NMFS notified the Tribe and the State that the conditions of exemption were unacceptable. Spring releases from Dworshak were made at levels that were not supposed to exceed the 110 percent standard. Subsequent review of hourly recordings indicated that the CoE may have been in violation of the standard. Summer releases from Dworshak are also being shaped to not exceed the 110-percent saturation standard.

If flow augmentation is successful in 2000 without exceeding the total dissolved gas standard, annual activity exemptions may no longer be required on a regular basis. It is anticipated that any future requests for exemptions will be linked to the integrated rule curve currently being developed for the Dworshak Project (see page 18), and supported by flow, temperature, total dissolved gas, and fish passage monitoring and modeling.

Technical Basis for Flow Augmentation (temperature modeling)

Prior to formulation of the Dworshak Operation Plan, efforts to model water temperature have focussed on the Snake River from Lower Granite Reservoir to its confluence with the Columbia River. Water quality and flow parameters for the Snake and Clearwater Rivers above Lower Granite Reservoir are input as boundary conditions. Mixing processes at the confluence of the two rivers and the effect of cold water releases from Dworshak had not been modeled.

Dr. Steven Wright of the University of Michigan, working through the University of Idaho, provided hydrologic analysis and preliminary temperature modeling in support of the Dworshak Operation Plan. Dr. Wright's hydrologic analysis focused on the mixing processes at the confluence of the Snake and Clearwater Rivers. Subsequent modeling simulated the impact of cold water releases from Dworshak on Snake River temperatures below the Clearwater confluence.

The hydrologic analysis of mixing processes at the confluence of the Snake and Clearwater Rivers relied heavily on thermal imagery developed for the Idaho Department of Environmental Quality (Wright, 2000a). In a thermal scan of the Snake and Clearwater confluence during 1999 summer flow augmentation, the colder Clearwater River water is shown diving under the warmer Snake River water. Warm surface water temperatures indicate that very little mixing occurs below the confluence. Water released from the bottom of pool at Lower Granite Dam is substantially cooler than water surface in the forebay. The cooler Clearwater River water flows along the bottom of the reservoir and out the intakes at Lower Granite. The warmer water occupies the upper portions of the water column and remains relatively stagnant. The degree of vertical stratification is reduced as water moves through the remaining lower Snake reservoirs. The difference between forebay surface and the bottom-of-pool temperature is about one degree at Ice Harbor Dam.

A numerical model developed by Dr. Wright used historical data for mainstem Clearwater and Snake River discharges and temperature along with two different scenarios for Dworshak releases (Wright, 2000b). Simulations were performed for the summer release seasons (6/1 to 8/31) for four years; 1994 (dry), 1995 (average), 1996 (wet), and 1997 (very wet). The numerical model was one-dimensional and predicted Snake River temperatures are based on an assumption of complete mixing with Clearwater River water.

Under the NMFS Scenario (Scenario A), release begins on July 1 with a reservoir discharge of 14,500 cfs. This is the maximum discharge from Dworshak that remains at or below the state total dissolved gas saturation standard of 110 percent. Discharge then remains at 14,500 cfs until the full 1.2 million acre-feet of flow augmentation water are released (Fig. 4-7). The end of release date varies from August 16 (dry) to August 25 (very wet). The general effect of Dworshak augmentation under Scenario A is a reduction of temperature following the July 1 flow increase. Water temperature down-reservoir of the Snake confluence remains below 20 deg C (considered to be the upper limit of tolerance for migrating salmonids) until the 1.2 million acre-feet have been released (usually between 8/15 and 8/25). After augmentation, reservoir outflow is generally reduced to equal inflow. Mid to late August reductions are followed by Lower Granite temperatures exceeding 20 deg C. often into mid-September.

Under the Idaho Scenario (Scenario B), Dworshak remains at full pool from July 1 through July 31, then 1 million acre-feet are released from storage, along with natural inflow by August 31 (Fig. 8-11). This leaves 200,000 acre-feet of storage for late summer or early fall augmentation. In Scenario B the temperature reduction occurs later in summer, and remains in effect through August 31. The temperature reduction may be somewhat more pronounced due to a higher flow release from Dworshak, and the temperature reduction effect may be greater during dry years, such as 1994. Lower Granite water temperature may exceed 20 deg C in September, but this can be controlled through the use of the 200,000 acre-feet held in reserve, and by slight reductions in August release discharges from Dworshak.

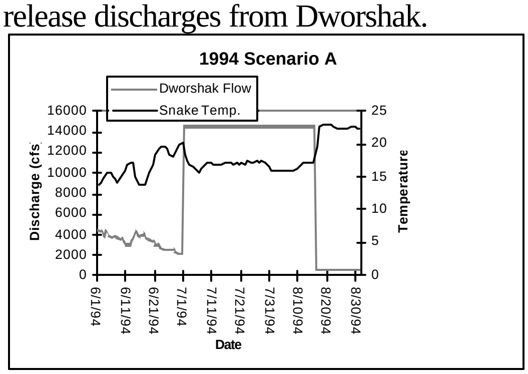

Figure 4. Scenario A, 1994.

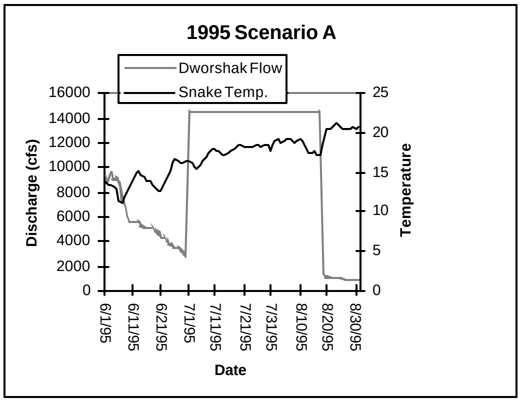

Figure 5. Scenario A, 1995

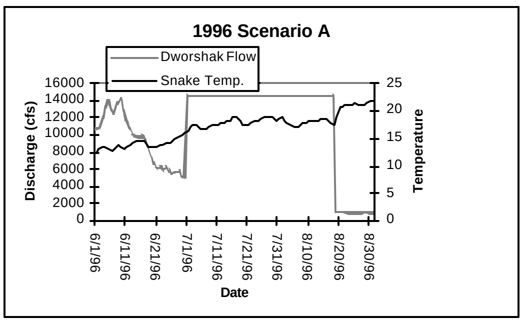

Figure 6. Scenario A, 1996.

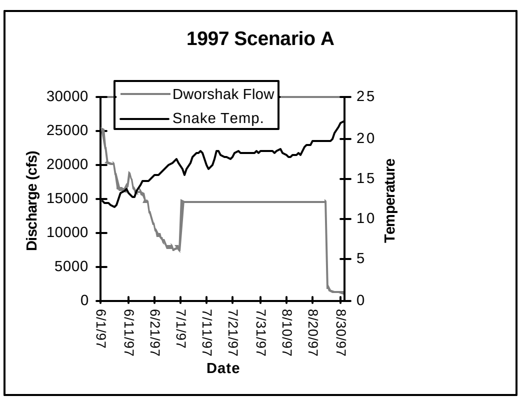

Figure 7. Scenario A, 1997.

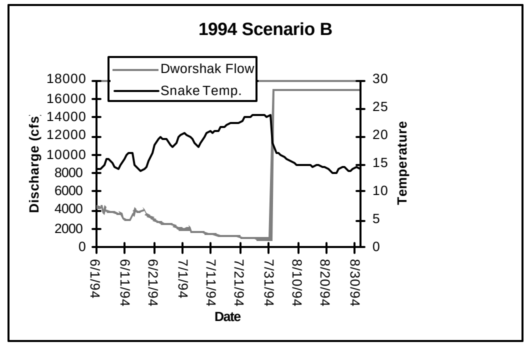

Figure 8. Scenario B, 1994.

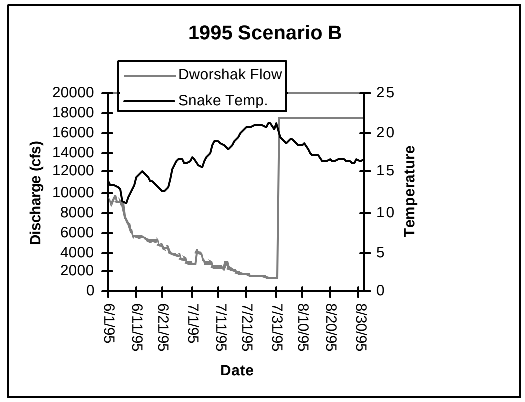

Figure 9. Scenario B, 1995

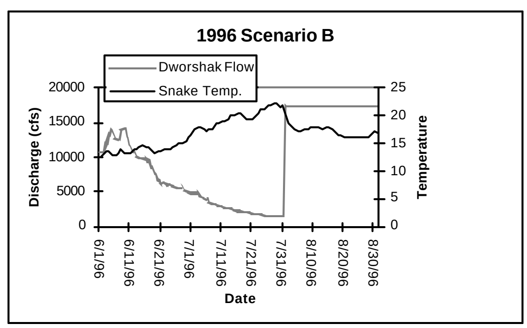

Figure 10. Scenario B, 1996

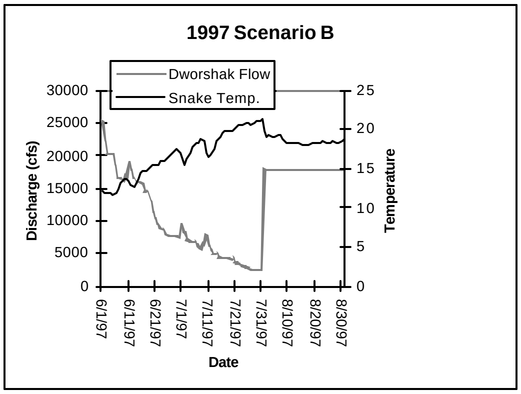

Figure 11. Scenario B, 1997.

Dr. Wright also provided an analysis of conditions that would be expected to result in thermal stratification in Lower Granite. Based on the depth and water velocity for a 14,500 cfs Clearwater flow at the confluence, Dr. Wright estimated that with a temperature difference of 6 deg C or greater between the Snake River and Clearwater temperatures, thermal stratification would develop in the Lower Granite pool.

The modeling support provided by Dr. Wright illustrates the importance of obtaining expertise in this area, and utilizing modeling capabilities to optimize the beneficial uses of Idaho's water. To this end, the Department of Water Resources, in partnership with the IDEQ and the University of Idaho, is obtaining the capability to model water quality. Initially this effort will focus on TMDL development and flow augmentation in the Snake River below Hells Canyon Dam and the Clearwater below the Dworshak Project.

Integrated Rule Curve

The Dworshak Operation Plan Committee learned of the Nez Perce Tribe's integrated rule curve (IRC) development through a presentation at the Committee's June 16, 1999 meeting. The beneficial uses of significance to the Tribe are similar to the authorizations specified by the Dworshak Management Policies in the North Fork Clearwater Plan. This led to discussions of the benefits of state and tribal collaboration in the IRC modeling process. A verbal commitment to work together in developing a model that considered beneficial uses of importance to both Idaho and the Tribe was reached in October 1999. The Idaho Department of Fish and Game is currently cooperating with the Nez Perce Department of Fisheries in this effort.

The Tribe's Department of Fisheries is currently in the process of developing an IRC model for the Dworshak Project that optimizes project storage and outflows to meet multiple beneficial uses. The tribal fisheries agency received funding through the Northwest Power Planning Council to initiate the development of an IRC model for the Dworshak project in 1995. Extensive efforts to collect dissolved oxygen, temperature, photometry, and productivity data for the Dworshak pool were recently completed. Additional information regarding recreation, power production, commercial navigation, flood control, resident and anadromous fish, and wildlife has also been pulled together.

The Nez Perce Tribe recently entered into a subcontract with Washington State University to apply the Montana Biological Rule Curve modeling template (Marotz *et al., 1996)* to the Dworshak Project. Model development is scheduled for completion in early 2001.

Multi-Species Framework

The Columbia Multi-Species Framework Project is an ongoing effort by state, federal, and tribal resource managers to address fish and wildlife planning in the Columbia River Basin. The Framework provides a structure for regional planning, stressing ecological objectives, and strategies supported by a long-term science-based vision. The Multi-Species aspect reflects the emphasis on breaking down the usual demarcations between terrestrial and aquatic management and between management of anadromous versus resident fish.

The main application of the Framework Project will be the development of the fish and wildlife program for the Northwest Power Planning Council. The Council plans to structure the goals and actions of their next program, which directs the expenditure of $127 million annually around the Framework. The Framework analysis will also be the basis for future watershed-level planning. This will be aimed at development of specific sub-basin plans to provide sub-basin objectives and guide annual prioritization and selection of actions. In the Clearwater River Basin, watershed level planning is being accomplished and co-coordinated by the Idaho Soil Conservation Commission and the Nez Perce Tribe through a Clearwater Focus Program.

The Clearwater Focus Program

The Northwest Power Planning Council (NPPC), under the Northwest Power Act of 1980, developed a program to protect and enhance Columbia River Basin fish and wildlife, including threatened or endangered species. This program promotes protecting and improving anadromous and resident fish habitat and water quality. To facilitate this concept, the NPPC proposed in 1995 that Idaho, Montana, Oregon, and Washington each identify at least one basin in which to apply and implement the approach used in the Pacific Northwest Model Watershed Project. This process emphasizes local involvement in developing strategies to manage fish and wildlife. In June 1995, the NPPC recommended that a focus project be implemented in the Clearwater River subbasin.

The Clearwater Focus Program is co-coordinated by the Idaho Soil Conservation Commission and the Nez Perce Tribe. Input and assistance are provided by a policy advisory committee with representation from the Idaho Association of Soil Conservation Districts, the Idaho Department of Environmental Quality, the Idaho Department of Fish and Game, the Idaho Department of Lands, the Clearwater National Forest, the Potlatch Corporation, the Idaho County Commission, and the Nez Perce Tribe. To date, the Clearwater Focus Program has provided leadership, continuity, and a framework for water quality and fisheries habitat improvements in the Clearwater River subbasin. The project has been instrumental in developing an inventory of watershed projects and technical data sources, and in implementing a comprehensive watershed assessment process. The ultimate goal of the Clearwater Focus Program is to develop a plan that identifies critical habitat protection and improvement needs, sets basin-wide priorities, and establishes funding strategies for plan implementation. The Dworshak Operation Plan is expected to be a key component of the integrated Clearwater Focus Project Plan.

National Recreation Lakes Pilot

Program

In September 2000, the CoE, Walla Walla District nominated Dworshak Dam and Reservoir for inclusion in the National Recreation Lakes Pilot Program. Through this program, a commission appointed by the President will prepare reports for selected federally managed manmade lakes and reservoirs that:

1. Review the extent to which components identified in specific authorizations have been accomplished.
2. Evaluate the feasibility of enhancing recreation opportunities at federally managed lakes and reservoirs.
3. Consider legislative changes that would enhance recreation opportunities.
4. Make recommendations on alternatives for enhanced recreation opportunities.

Dworshak Dam and Reservoir were not selected for inclusion in the program during the current federal fiscal year.

Recommendations

Consistent with the Dworshak management policies and the objective of this plan, the Board makes the following recommendations:

1. The Board recommends that the CoE incorporate the integrated rule curve developed for the for Dworshak Project by Nez Perce Tribe in collaboration with the Water Resource Board and the State of Idaho into the Dworshak Master Plan.

2. The Board recommends continued collaborative issuance of annual short-term activity exemptions for total dissolved gas that contain operating conditions consistent with the integrated rule curve for the Dworshak Project.

3. The Board recommends and supports continued water quality modeling, including temperature, by the State of Idaho to determine the quantity and timing of discharges from Dworshak to optimize anadromous fish migration through the lower Snake River, while providing favorable conditions for resident species of concern. Resident species of concern include bull trout and cutthroat trout. Future modeling efforts must include biological parameters to directly link fish migration data with water quality parameters.

4. The Board recommends continued support by the Northwest Power Planning Council of the Clearwater Focus Program to perform an ecological assessment and to formulate a plan for the Clearwater River subbasin. The assessment process will identify critical habitat, and the planning process will define implementation actions and strategies.

5. The Board recommends that the CoE review the Dworshak mitigation-stocking program with the Idaho Department of Fish and Game on an annual basis. The Board further recommends that this program be utilized to optimize the resident sport fishery in Dworshak Reservoir.

6. The Board recommends that the CoE study the following enhancements to the Dworshak Project through their master plan process:

   - A strobe light or equivalent system at the Dworshak outlet works to eliminate or reduce resident fish escapement from the reservoir.
   - Improved swimming and boating facilities that provide continued use of the reservoir under less than full conditions.
   - Processes, such as tributary fertilization, to enhance the resident sport fishery.
   - Funding mechanisms for the maintenance of Dent Bridge.
   - Enhancements to log transportation facilities that would provide for dumping and transport under drawdown conditions.
   - Processes that may improve reservoir shoreline vegetation.
   - Project landscaping enhancements.

   Feasibility analysis of these enhancements must focus on the overall benefit to the region and the nearby community of Orofino. The Board recommends that enhancements determined to have substantial positive benefits be implemented on a timely basis.

7. The Board recommends that the CoE resubmit the nomination of Dworshak Dam and Reservoir for inclusion in the National Recreation Lakes Pilot Program prior to 2002 federal fiscal year.

8. The Board recommends that the Dworshak Project be operated in a manner that is consistent with Idaho Code and the Comprehensive State Water Plan.

Action

Pursuant to Policy 4B of the Comprehensive State Water Plan, Part A (the statewide water policy plan), the Board will meet annually with the CoE to discuss spring and summer flow release strategies for the Dworshak Project.

Implementation

The Board requests the support of the Idaho congressional delegation in ensuring that the Dworshak Operation Plan is incorporated into the Dworshak Master Plan currently being prepared by the CoE. The Board will then seek full implementation of the Master Plan.

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US Army Corps of Engineers, Bonneville Power Administration, US Bureau of Reclamation and National Marine Fisheries Service. 1995b. ESA Section 7 Consultation, Supplemental Biological Opinion. Appendix E, Flood Control.

Wright, Steven J. 2000a. Written communication to Mr. William S. Whelan, dated March 20, 2000.

Wright, Steven J. 2000b. Written communication to Mr. Bill Graham, dated June 2, 2000.

Appendix A: Letter and Attachment Regarding Short Term Activity Exemption of Total Dissolved Gas Supersaturation Standard

March 31, 2000

William Stelle, Jr., Regional Director
United States Department of Commerce
National Marine Fisheries Service
525 NE Oregon Street
Portland, Oregon 97232-2737

Brigadier General Carl A. Strock
Commander, North Pacific Division
United States Army Corps of Engineers
P.O. Box 2870
Portland, Oregon 97208-2870

Re: Short Term Activity Exemption of Total Dissolved Gas Supersaturation Standard

Dear Gentlemen:

This letter is a joint response from the Nez Perce Tribe and the State of Idaho to a request on February 17, 2000 by the National Marine Fisheries Service (NMFS) for a short term activity exemption to allow exceedance of the water quality standard of 110% total dissolved gas (TDG) supersaturation in the North Fork of the Clearwater River below Dworshak Dam and the Clearwater River below the North Fork between April 3 and August 31, 2000. The stated reason for the NMFS request for exceedance of the TDG standard is to supplement flows in the lower Snake River to achieve flow objectives as set forth in the 1995 Federal Columbia River Power System Biological Opinion and the 1998 supplement to that document.

The Nez Perce Tribe and the State of Idaho, in consultation with various state and federal agencies, have reviewed the information provided by the referenced request for a short term activity exemption. The Nez Perce Tribe and the State of Idaho grant a short term activity exemption to allow exceedance of the TDG standard up to 120% for 12 of the highest hourly measurements during 24 hour spill, as measured at the U.S. Army Corps of Engineers Dworshak fish hatchery monitoring station, for the lower North Fork Clearwater and the mainstem Clearwater Rivers during the period April 3 through August 31, 2000. This short term activity exemption is granted by the Nez Perce Tribe and the State of Idaho under the conditions set forth in Attachment A.
This joint response to your request for a short term activity exemption represents a collaborative effort between the Nez Perce Tribe and the State of Idaho and is designed to address the needs of migrating and resident fish and to optimize water management in the Snake and Clearwater River Basins. We

look forward to working with you and other federal, tribal and state agencies to successfully implement this short term activity exemption process.

Sincerely,

Samuel N. Penney
Chairman
Nez Perce Tribe

C. Stephen Allred
Administrator
Idaho Division of Environmental Quality

cc: James Yost
Karl Dreher
Rod Sando
Chuck Clarke
Mike Field

CONDITIONS OF THE SHORT TERM ACTIVITY EXEMPTION TO THE STATE AND TRIBAL TOTAL DISSOLVED GAS STANDARD

31 March 2000

The Nez Perce Tribe (Tribe) and the State of Idaho (State) are jointly issuing a short term activity exemption, through their authorities, to the total dissolved gas standard of 110 percent of saturation. The short term activity exemption allows the standard to be exceeded up to 120 percent within the North Fork Clearwater River, Dworshak Project to mouth, and the main Clearwater River, North Fork confluence to mouth. The conditions of the short term activity exemption are set forth in this document.

Conditions of Short term activity exemption

1. The Dworshak Project will be at full pool (elevation 1600 ft) by June 30th.

2. The Dworshak Pool will be maintained at elevation 1600 ft through July 31st.

3. On August 31st, the Dworshak pool will be at or above elevation 1537 ft. This will provide 200,000 AF to meet late summer/fall augmentation needs.

4. All releases from Dworshak for the purposes of anadromous fish migration and water temperature control must first be approved by the State and the Tribe upon a finding that the release is supported by scientifically defensible water quality and fish migration studies and data.

- Supporting studies and/or data must show that Dworshak releases will achieve their stated purpose(s).
  - Releases from Dworshak will not interfere with the rearing and migration of Clearwater River fall chinook smolts.
  - Specific flow augmentation releases will be authorized jointly in writing by the designated representatives of the Tribe and the State within this framework, after demonstration that there is scientifically defensible support for the release.

Releases will be approved only with the written concurrence of both parties.

5. The US Army Corps of Engineers will maintain the dissolved gas and temperature monitoring network, including monitoring stations at Dworshak, Peck and Lewiston. These stations will be operated and maintained on a continuous basis during the period of the short term activity exemption, except that the Dworshak station will be operated and maintained year-around.

Exceptions

Exceptions to these conditions may be granted under unusual circumstances (e.g. drought, specific fish passage needs, flood management requirements, etc.) if supported by scientifically defensible data and/or studies.

- The request for an exception will be made in writing to the Tribe and the State, and may result in a meeting with designated state and tribal representatives in Lewiston.

- Scientific data supporting the need for an exception will be attached to the request.
- A joint decision regarding the request for exception will be issued in writing by the designated state and tribal representatives.
- System operations requests for use of Dworshak water for flow augmentation and temperature control will not be presented to the NMFS Adaptive Management Process (TMT, IT) until after the request for exception is approved and issued by the designated state and tribal representatives.

Exceptions will be approved only with written concurrence of both parties.

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
July 9, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

TMT Internet Homepage: http://www.nwd-wc.usace.army.mil/TMT/index.html

DRAFT

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Lower Granite Bypass Update and Powerhouse Outage:
Rudd Turner, COE, reported on a bypass outage at Lower Granite on July 1 from 9am-12:45pm to investigate a potential problem with a valve. Operators found no obstruction or deformity of the valve, but found that the problem was with the "strip gears". For now, the valve is being operated manually until the problem is fixed.

Rudd also reported that there will be a powerhouse outage at Lower Granite next week in order to rehabilitate the transformers. This will be a twelve hour daytime operation. TMT members discussed how to manage flow during the outage.

ACTION: TMT agreed to the following operation: Fill Little Goose 2' above the current elevation (up to MOP +4) on Saturday 7/12 through Monday 7/14 6am; draft out to within the MOP+1 to MOP+2 range by 6 pm on Tuesday 7/15; fill the pool at Lower Granite during the outage (on 7/15), then release water over the next 24 hours beginning at 6 pm and shaping the water into the evening hours, 6 pm to midnight. Maintain the minimum 11.5 kcfs discharge at Lower Granite to keep water moving through the whole system for migrating fish and to manage temperatures.

Ice Harbor Spill Test and Post Test Operations*:*
TMT discussed the Ice Harbor spill test and operations following the test. The balloon data collected from the test will be important in deciding what operations should follow the test at Ice Harbor. Paul Wagner, NOAA, explained that the data collected will be compared to that in the Spring to determine whether injury is a cause for lower survival rates.

ACTION: Operations will continue as they are in the current program until the balloon data is available, at which time TMT will revisit the issue. In the meantime, Rudd Turner will distribute a report from 2000 to help inform TMT decisions.

Dworshak Summer Operations:
Rudd Turner updated TMT on the current status of Dworshak. It is currently at 1597.3' (and was full by the end of June) and is drafting while discharging ~14 kcfs. Temperatures are slightly below 48 degrees. Greg Haller, Nez Perce Tribe, reported that 93 wild fish were observed in the Clearwater with an average length of 71.4 mm, which is an increase in size from last week. Paul Wagner reported on temperatures and numbers of PIT-tagged wild subyearling Chinook at Dworshak observed so far (933 total). It appears that 60-80% of the run has passed. Paul reported that the shape of the run this year looks similar to that of 2000.

SOR 2003 C-4: Idaho and CRITFC Tribes put forth an SOR for summer operations at Dworshak. The request is for a maximum front load through July using the coldest water that hatcheries can tolerate with a gradual step down to allow water into September.

SOR 2003-11: The USFWS and Oregon submitted a request to implement the Biological Opinion operation for Dworkshak, which would maintain 14 kcfs through August.

ACTION: The two plans are identical for the first two weeks, so TMT will review the SORs and come prepared to discuss and make a decision about Dworshak operations at the 7/16 TMT meeting. Until then, Lower Granite will be operated to maintain 14 kcfs outflow and not exceed 110% TDG. Billy Connor, Idaho Fish and Game, may provide some additional data to inform the group's decision.

Temperature: Dave Statler, Nez Perce, will provide information on temperatures in the Clearwater at the next TMT meeting. Laura Hamilton provided information on Dworshak temperatures from last year to inform decisions this year. TMT agreed to operate at 48 degrees through Friday 7/11, then target 45 degrees to begin on Monday 7/14. Once the gates are set at the project for maintenance, the temperature can be controlled by flow changes.

SOR 2003 C-3:
CRITFC was not represented at TMT today so a brief explanation of the treaty fishery request and planned operation was presented by the COE, and TMT agreed to allow the decision for this request to be made off-line between CRITFC, BPA and the COE. Rudd Turner will inform TMT via email when a decision is made.

Next Meeting, Wednesday July 16, 9am-noon:
Agenda Items:
- TDG Tracking Update
- Ice Harbor Spill Test/Hungry Horse Operations
- Dworshak Operations
- Montana SOR
- Implementation Plan '04-08

Meeting Minutes

1. Greeting and Introductions

The July 9 Technical Management Team meeting was chaired by Rudd Turner of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Turner at 503/808-3935.

2. Lower Granite Bypass Pipe Update and Powerhouse Outage.

Turner said that, as had been discussed at a previous TMT meeting, the Lower Granite bypass line was dewatered from 9 a.m. to 12:45 p.m. on July 1; we were able to stay within the three to five-hour criteria in the Fish Passage Plan, he said. The three available units were operated at the lower end of the 1% of best efficiency range during the outage. Project personnel inspected the pipe from the inside and found no obstruction in the area of the valve; nor was the valve deformed. It looks like the problem is stripped gears in the valve, Turner said; they were able to close the valve again, and can now open and close the valve manually. While that’s not an ideal situation, he said, the consensus was that the valve can be operated that way for the rest of the passage season. The parts needed to repair the valve are on order.

There is also a powerhouse outage scheduled at Lower Granite for next week, on July 15, said Turner -- 12 hours to perform planned transformer maintenance. They must de-energize the main line to that project for safety, said Turner, which means station service only. The question is, how do we want to manage flow during that outage? he said -- with Dworshak now releasing 14 Kcfs, flows at Lower Granite will be in the 40 Kcfs range. We’ll run one unit (about 5 Kcfs) at speed-no-load, he said, but there is an 11.5 Kcfs minimum flow requirement in the Lower Snake at this time of year. Turner noted that there is a one-foot operating range in effect in Lower Granite Reservoir; we need about four feet of storage space, total, to pond the water that will accumulate during the outage. In addition, the Little Goose pool can be filled a couple of feet before the outage and drafted during it, providing higher than minimum flow in the Snake River below Lower Granite. We’re looking for a recommendation from TMT as to how to operate Lower Granite and Little Goose to manage flow during the outage period, he said.

The group devoted a few minutes of discussion to the preferred Lower Granite operation during and following this scheduled outage. Chris Ross asked the Corps to make sure Lower Granite Unit 5 is available for the speed-no-load operation; Turner said the Corps is working on that even as we speak. And how long will it take to get the ponded water out once the operation concludes? Ross asked. About a day, Scott Bettin replied.

Ultimately, it was agreed to fill Little Goose pool to MOP +4, two feet above its current maximum elevation, beginning at midnight on Friday; Little Goose pool will then be drafted beginning Tuesday morning, to keep flows up in the Lower Snake below Lower Granite. During the outage, Lower Granite will be ponding up to full pool, or MOP +5. Once the maintenance operation is completed, Lower Granite will go to maximum project outflow to release the ponded water within 24 hours if possible. The TMT also recommended that the action agencies spill 6

Kcfs at Lower Granite to maintain the 11.5 Kcfs minimum Lower Snake flow during the Lower Granite outage; the action agencies agreed to do so.

3. Ice Harbor Spill Test and Post-Test Operations.

Turner said that, at its meeting next week, the Implementation Team asked TMT to develop a recommendation on this operation. Paul Wagner summarized the post-test operational alternatives under consideration for Ice Harbor: no spill, the current bulk spill/no spill operation, the BiOp (spread) spill pattern, and bulk spill only. The current Ice Harbor spill test is scheduled to end on July 16. A balloon-tag test is scheduled between now and next week, he said; the information from that test will help inform our decision, and NOAA Fisheries would prefer to wait to make a decision until that information is available.

Wagner noted that the expectation was that survival through the Ice Harbor spillway would be much higher than the 88%-89% seen this spring; the theory is that those high rates of mortality were caused by injuries sustained by fish passing the project through the spread (BiOp) spill pattern. The point of the Ice Harbor spill test is to see whether the bulk spill pattern reduces that rate of injury and provides increased survival. Shane Scott said he has heard that personnel at McNary (the next project downstream from Ice Harbor) are still observing fish with injuries during the current test. The balloon tag test runs July 13-15, Scott Boyd added. We should have some information on injury rates to look at during the July 16 TMT meeting, then, said Scott.

4. Treaty Fishery Request SOR 2003 C-3.

Bettin said BPA and the Corps will coordinate the implementation of this SOR following today's meeting; it requests the usual one-foot operating range at the three pools in Zone 6 (Bonneville, The Dalles and John Day) from 6 a.m. July 14 to 6 p.m. July 16. He noted that this is the first summer fishery the tribes have had in many years; Turner said the Corps will operate Bonneville Pool within a 1.5-foot operating range and will work with BPA to operate The Dalles and John Day pools in the narrowest possible operating range during the fishery.

5. Libby and Hungry Horse Summer Operations.

It was agreed to discuss this topic at the July 16 TMT meeting. Turner noted that Libby is now releasing 14 Kcfs with 3 units operating, an operation that will continue at least through next week's TMT meeting. He added that the technical information requested from Montana at last week's TMT meeting has been provided and emailed to the TMT membership; it is also available as a link from today's meeting agenda on the TMT homepage.

6. Dworshak Summer Operations.

Turner said Dworshak is now at elevation 1597.3 feet, down from full (1600') on July 1. As agreed at last week's TMT meeting, outflow has now been increased to 14 Kcfs around the clock (as of 9 a.m. today); the project is now drafting, he said. The release temperature is running 47.2-47.8 degrees, Turner added. Greg Haller said that, as of July 7, the average fork length of the 93 fall chinook outmigrants captured during the past week was 71.4 mm, up about

10 mm from fish captured two weeks ago.

Wagner updated the TMT on conditions in the Lower Granite pool, as well as current smolt passage information. The Lower Granite forebay temperature is running about 69 degrees, currently, he said; tailwater temperatures are in the 67-degree range. We haven't seen any dramatic change in the last few days, he said; obviously the Dworshak releases haven't yet had a tremendous impact on Lower Granite water temperatures. With respect to fish passage, we're seeing indices in the 7,000-fish-per-day range at Lower Granite, Wagner said; that's a decline from last week's indices. A total of 933 of Billy Connor's 4,500 PIT-tagged wild chinook subyearlings have passed Lower Granite to date, he added. Passage was better earlier in the month, he said; overall, the shape of the run seems to be a bit earlier than what we've seen during the previous few years. Looking at previous years' ESU PIT-tag detections at Lower Granite, it was observed that, in most years, the vast majority of the fall chinook run moves out in July; after August 1, in every recent year except 1999, very little fall chinook passage occurs at Lower Granite. In 2003, it does appear that the wild fall chinook outmigrants responded to the freshet and moved out; DART estimates that 79% of the 2003 run has passed Lower Granite to date. The current flow at Lower Granite is 36.5 Kcfs, Turner added.

The action agencies received two SORs on the topic of Dworshak operations prior to today's meeting. The first was SOR 2003 C-4, supported by CRITFC and the State of Idaho, requesting the following specific operations at Dworshak:

- Hold outflows of 13.5 Kcfs-14 Kcfs through July 20
- Ramp flows to 12 Kcfs by the morning of July 21 and hold through August 3
- Ramp flows to 11 Kcfs by the morning of August 4 and hold through August 10
- Ramp flows to 10 Kcfs by the morning of August 11 and hold through August 24
- Ramp flows to 8 Kcfs by the morning of August 25 and hold through August 31
- Draft limit of 1535' by August 31
- From September 1 through September 14, release flows of 8.4 Kcfs
- By September 15, reduce flows to Dworshak minimum of 1.4 Kcfs as elevation 1520' is reached.

In response to a question, Steve Pettit said Idaho would prefer to see Dworshak release the coldest possible water at this point in the season; Greg Haller said he anticipates no problems at the hatchery if Dworshak's outflow temperature is reduced from its current 47-48-degree range.

On July 8, the action agencies also received SOR 2003-11. This SOR, supported by USFWS and the State of Oregon, requests the following specific operations:

- Implement the Biological Opinion measures at Dworshak Reservoir drafting to elevation 1520' by August 31
- Increase outflow from Dworshak to 14 Kcfs on July 8 and maintain as long as possible. Based on the July 1 STP run we estimate that an outflow of 14 Kcfs can be maintained through August 24, with a decrease to 5.7 Kcfs the last week of August, ending in an August 31 elevation of 1520 feet.

- Initial release temperature should be at 48 degrees F, but should be decreased to 45 degrees F prior to the proposed [selector gate] work being conducted at Lower Granite Dam.

It was agreed that, as both SORs agree that the current operation – 14 KCFS outflow from Dworshak – should continue through at least July 20, there is no need to reach a recommendation on Dworshak operations at today's meeting. It was agreed that the TMT will come to the group's July 16 meeting prepared to engage in a substantive discussion on this issue.

The group devoted a few minutes of discussion to the justification for and biological information underlying the two competing Dworshak SORs; Haller noted that the intent of the CRITFC/Idaho SOR is to protect the later-migrating Clearwater component of the fall chinook outmigration, while the Oregon/USFWS SOR is intended to deliver the maximum benefit of the cool-water releases from Dworshak during the period when the majority of the fall chinook run is migrating.

Silverberg asked the TMT to consider both SORs and provide any questions they may have directly to the SOR sponsors. Wagner offered to provide current NOAA Fisheries data on reach survival, and to ask Billy Connor to provide a presentation on the relevant biological information on the fall chinook outmigration at the TMT's July 16 meeting; it was agreed that this would be helpful. Pettit requested that the Nez Perce Tribe provide data on the temperature regime in the Lower Clearwater so the TMT can see what effect the Dworshak releases are having on Clearwater River temperatures at the Peck and Spaulding gauges and other sites; it was so agreed.

With respect to release temperatures at Dworshak, Turner reminded the group that there will be a 10-day maintenance period (July 14-23) during which the Dworshak selector gates cannot be moved; he asked the group how they would like the gates set during that maintenance outage. Laura Hamilton provided information on the current temperature regime within Dworshak Reservoir, noting that, as the reservoir drafts, the warm-water layer at the top of the reservoir will be moving down toward the selector gates. Turner suggested that the project start targeting a 45 degree discharge a couple of days before the selector gate work begins, so they can find the best depth to manage discharge temperatures, then go with that setting when the gate controls are taken out of service. Ultimately, the group recommended that the Corps set the selector gates to target a Dworshak outflow temperature of 45 degrees beginning the morning of July 12.

7. Recommended Operations.

Recommended operations were summarized during a previous agenda item.

8. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, July 16 at 9 a.m. Meeting summary prepared by Jeff Kuechle.

TMT ATTENDANCE LIST
JULY 9, 2003

Name	Affiliation
Scott Boyd	COE
Tony Norris	USBR
Shane Scott	WDFW
Paul Wagner	NOAA Fisheries
Chris Ross	NOAA Fisheries
Donna Silverberg	Facilitation Team
Colin Beam	PPM
Robin Harkless	Facilitation Team
Tim Heizenrater	PPM
Mary Karen Scullion	COE
Scott Bettin	BPA
Laura Hamilton	COE
Mike O'Bryant	CBB
Cindy Henriksen	COE
Julie Ammann	COE
Don Walker	COE
Steve Pettit	IDFG
Greg Haller	NPT
Nick Lane	BPA
David Benner	FPC
Margaret Filardo	FPC
Richelle Beck	D. Rohr & Associates
Kevin Nordt	PGE
David Wills	USFWS
Bill Rudolph	NW Fish Letter
Davis Mills	Puget Sound Energy
Russ George	WMCI

Dave Statler	NPT
John Wellschlager	BPA

OPEN FILE REPORT
MONTANA FISH, WILDLIFE & PARKS

Greg Hoffman
Clint Muhlfeld
Brian Marotz

April 11, 2000

Biological Impacts Associated With Riverine Flow Fluctuation

This file report summarizes the results of our Instream Flow Incremental Methodology (IFIM) research in the Kootenai and Flathead River systems and the biological reservoir modeling of Hungry Horse and Libby Dam operations. We have also drawn from site-specific examinations of the macrozoobenthos community in the two Montana watersheds (see Dr. Rick Hauer's reports and Dr Jack Stanford et al.). IFIM model calibration of the Kootenai River is nearly complete and simulations are ongoing. The Libby IFIM report will be published this year. Research on the Flathead system has been completed for the first year of physical and biological sampling. Completion of the model will quantify the biotic and abiotic effects of flow fluctuations on target native species caused by the operation of the hydropower system.

Flow fluctuation results in the desiccation of the varial zone and associated aquatic plants and zoobenthos. Radio telemetry and visual observation have demonstrated that adult and juvenile trout frequently occupy the shallow, lateral margins of the river, and are displaced as discharges increase or decrease. The spreadsheet below indicates loss of area per 1,000 cfs (=1 kcfs) drop in flow (Table 1). The availability and location of preferred cover at each river stage can be overlaid on river stage and channel morphometry. This can be directly related to fish locations and the resources that those fish use. As flows decline, fish must move to more suitable locations. Preliminary evidence indicates that displaced fish are more vulnerable to predation enroute, and movement to undesirable locations in the river subtracts from the individual's energy budget.

Kootenai River below Libby Dam

Ramping below 9 kcfs is not biologically justifiable due to a number of factors. A flow reduction from 9 kcfs to the minimum flow of 4 kcfs results in a loss of 37.4% of the total available depth, and a loss of 46.4% of the channel width. Flow fluctuations at higher discharges also influence fish habitat use. On average, a 6Kcfs ramp between 12Kcfs and 24Kcfs (normal range of ramping) effects 1.32 ft of depth, 24.86 ft of width, and 131,261 ft^2 of varial zone. Changes in velocity also have adverse effects on juvenile trout. Specifically, if juvenile trout are displaced, they are forced to seek velocity breaks, thus increasing their vulnerability to predation. Eighty-two percent of juvenile rainbow trout observed during snorkeling were in 2.5 – 5.5 ft. of water. Ramping from 12kcfs to 26kcfs would effect every trout within this depth range. Based on our best available data on juvenile bull trout locations, this evidence can be extrapolated to juvenile bull trout as well.

From Hauer, flow manipulation has deleterious effects on all macrozoobenthos. For example, greater than 558 *Baetis tricaudatus* per ft^2 (2,946,240 per mile), and greater than 37 *Hydropsychids* per ft^2 (195,360 per mile) are influenced in some manner by water levels. Baetis are multivoltine, and need suitable habitat year around. Many of the dominant *Plecopterans*, including *Pteronacys*, are semi-voltine, and require quality conditions to complete their life cycles.

Another issue is flow variability as it relates to redd-building of fluvial rainbows during April and May. There appears to be a pretty close correlation between numbers of redds and flow variability in the years that redds counts were conducted.

The Hauer graphs that are attached, as well as Hauers data, are good indicators of the change that has occurred since Libby was built as it relates to daily flow fluctuations and their effect on productivity. The obvious effects of water manipulation on the creatures that depend on that productivity clearly demonstrate that flow ramping rates should be established.

Methods – Habitat Suitability Indexes

Depth was measured to the nearest 0.1 ft, and was grouped in 0.5 ft increments for data analysis. Velocity (nose, and 0.2 and 0.8 x depth) was measured to the nearest 0.001 ft/sec, and was grouped into 0.5 ft/sec increments for data analysis.

Data sets collected for Instream Flow Incremental Methodology (IFIM) were compiled and combined into one set for the two habitat sections of the Kootenai River from Libby Dam to the Idaho border. Observation data were stratified by juvenile or adult life stage based on estimated fish length. Within each life stage, data were pooled from all streamflow, habitat cluster, and habitat type strata into frequency distributions of depth, mean column velocity, and substrate and cover variables. Suitability functions were developed for depth and velocity by fitting polynomial regression models to the raw frequency distributions (Figures 1,2 and 3). Sequential orders of polynomials were added to the regression function in a stepwise manner; when a new order failed to significantly reduce the remaining unexplained variance (the significance was measured with a t-test), the stepwise procedure was terminated and all lower order models were examined for aptness of fit by visual correlation with data, by t-statistics, and with correlation tests. The simplest model fulfilling these criteria was selected to describe habitat suitability. Minor hand-drawn adjustments to the deep (for depth) or fast (for velocity) tail of the regression curves were typically necessary to maintain a realistic fit.

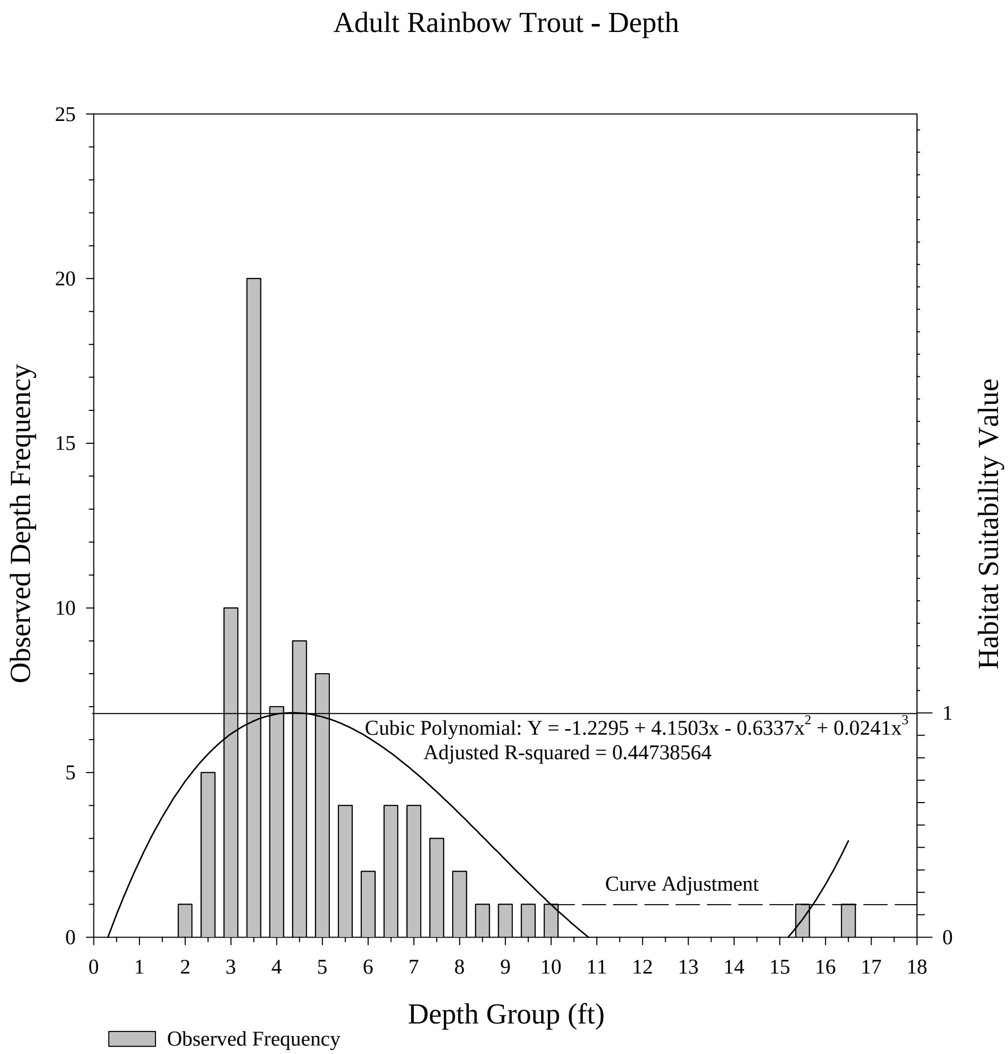


Figure 1. Depth habitat suitability curve for adult rainbow trout in Sections 1 and 2 of the Kootenai River between Libby Dam, Montana and Bonners Ferry, Idaho.

Juvenile Rainbow Trout - Depth

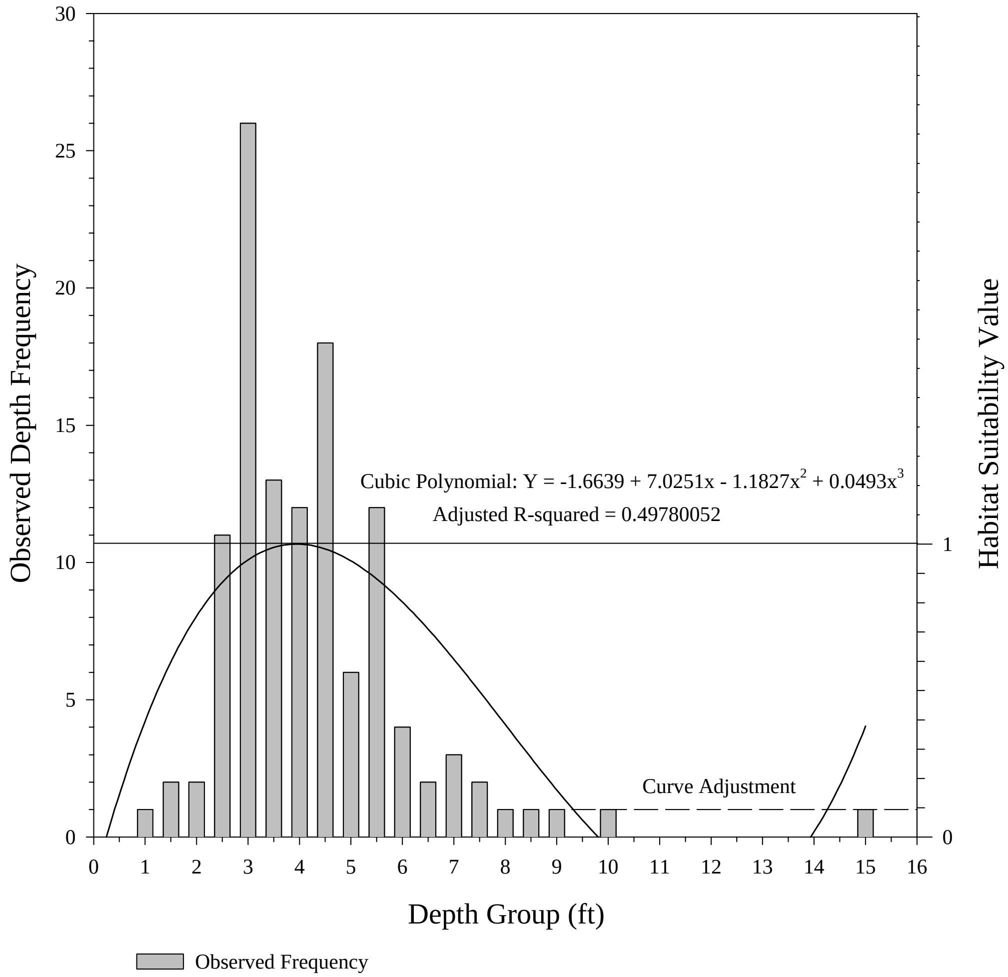


Figure 2. Depth habitat suitability curve for juvenile rainbow trout in Sections 1 and 2 of the Kootenai River between Libby Dam, Montana and Bonners Ferry, Idaho.

Juvenile Rainbow Trout - Velocity

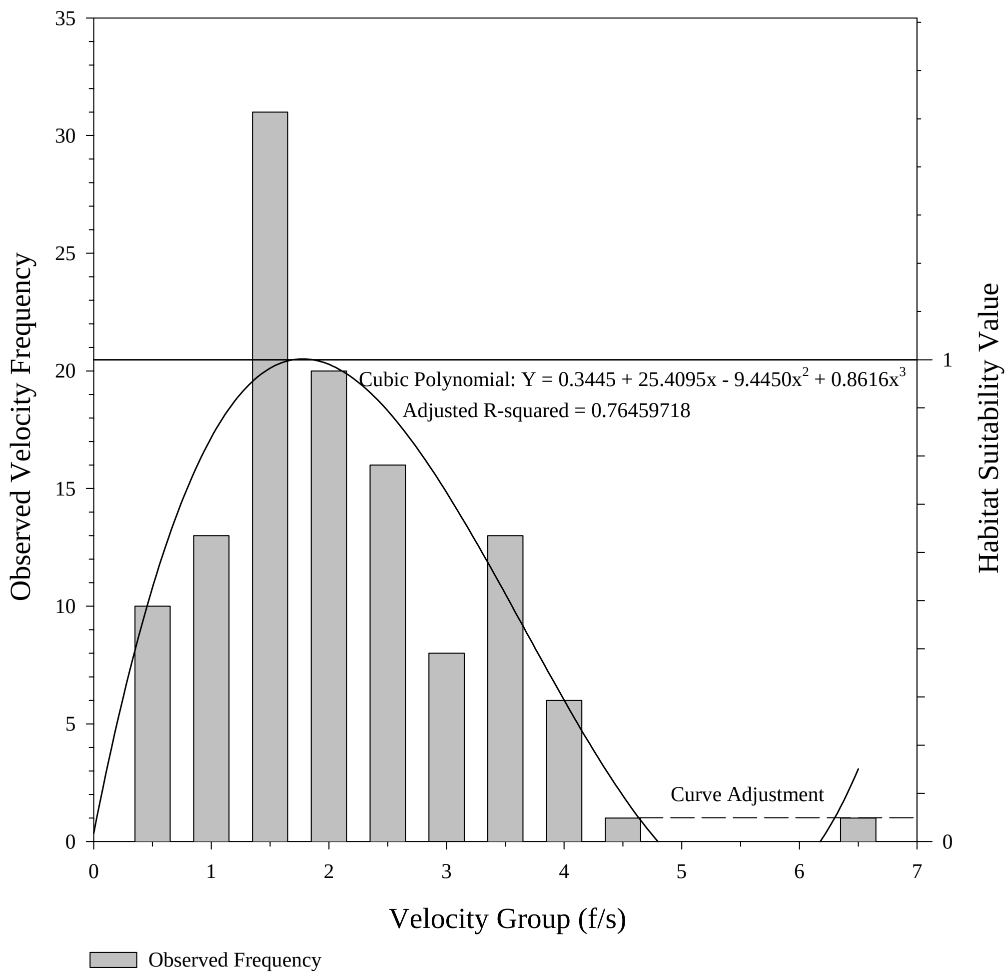


Figure 3. Velocity habitat suitability curve for juvenile rainbow trout in Sections 1 and 2 of the Kootenai River between Libby Dam, Montana and Bonners Ferry, Idaho.

Flow Variance and Rainbow Trout Redds
Kootenai River below Libby Dam
1980 - 1996

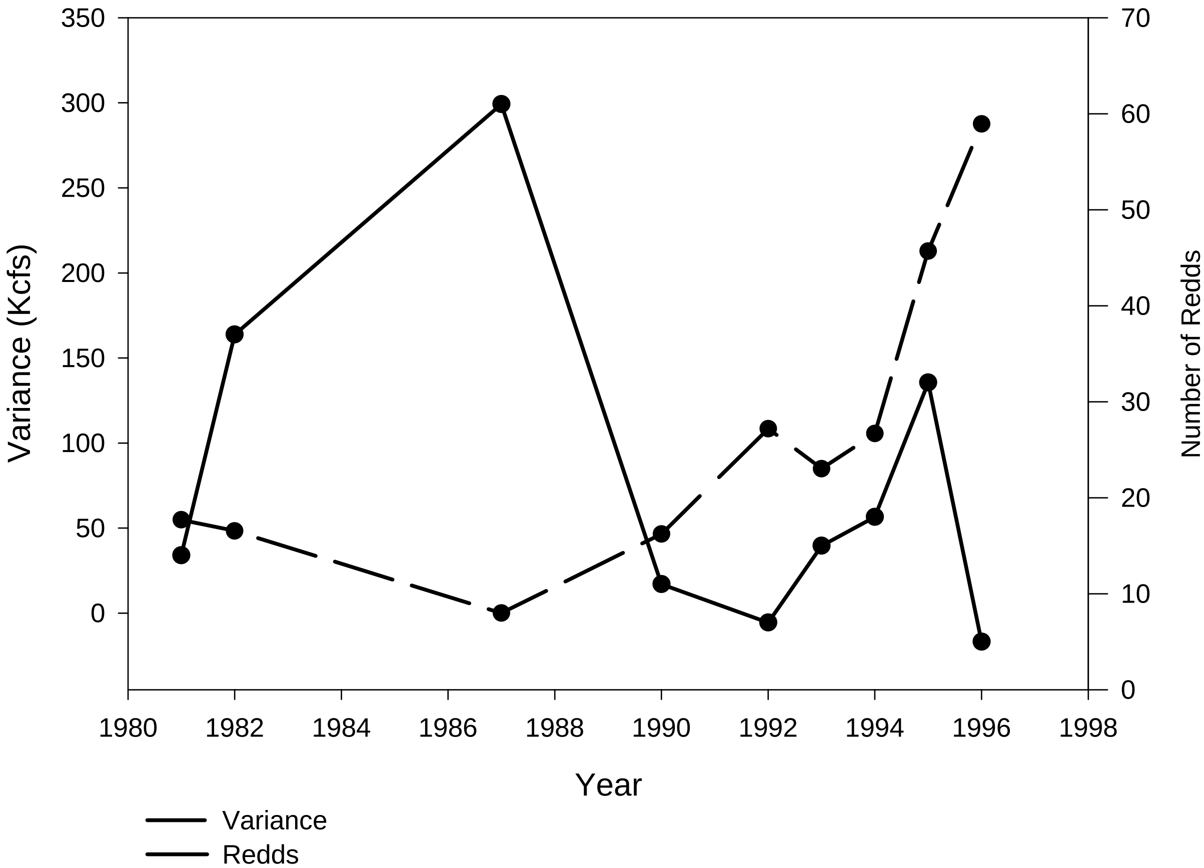
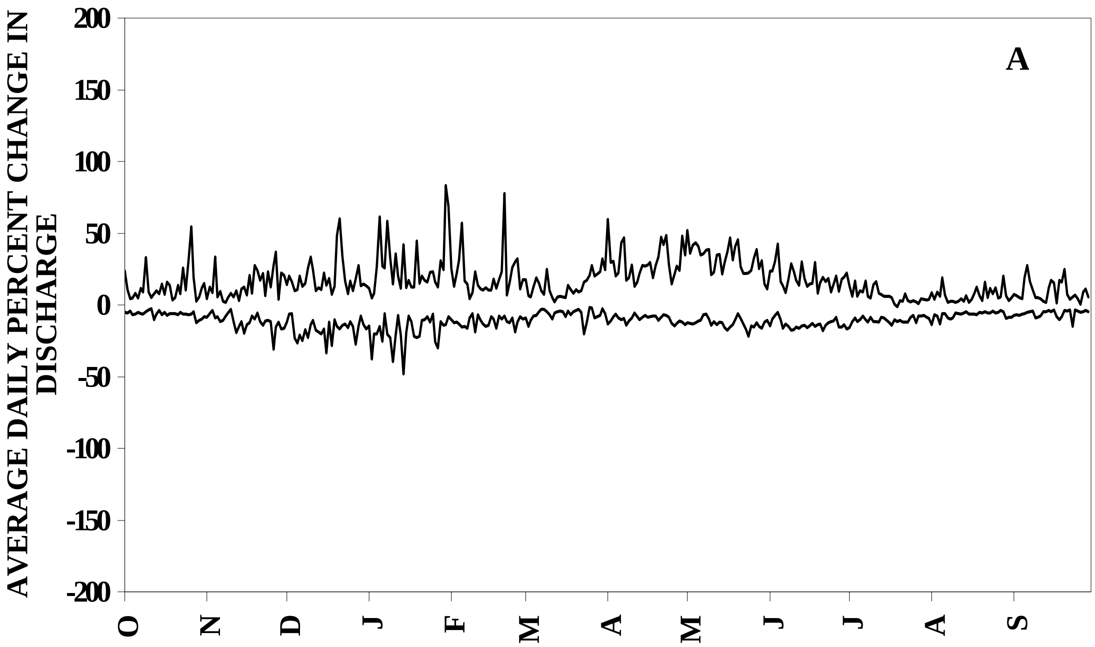
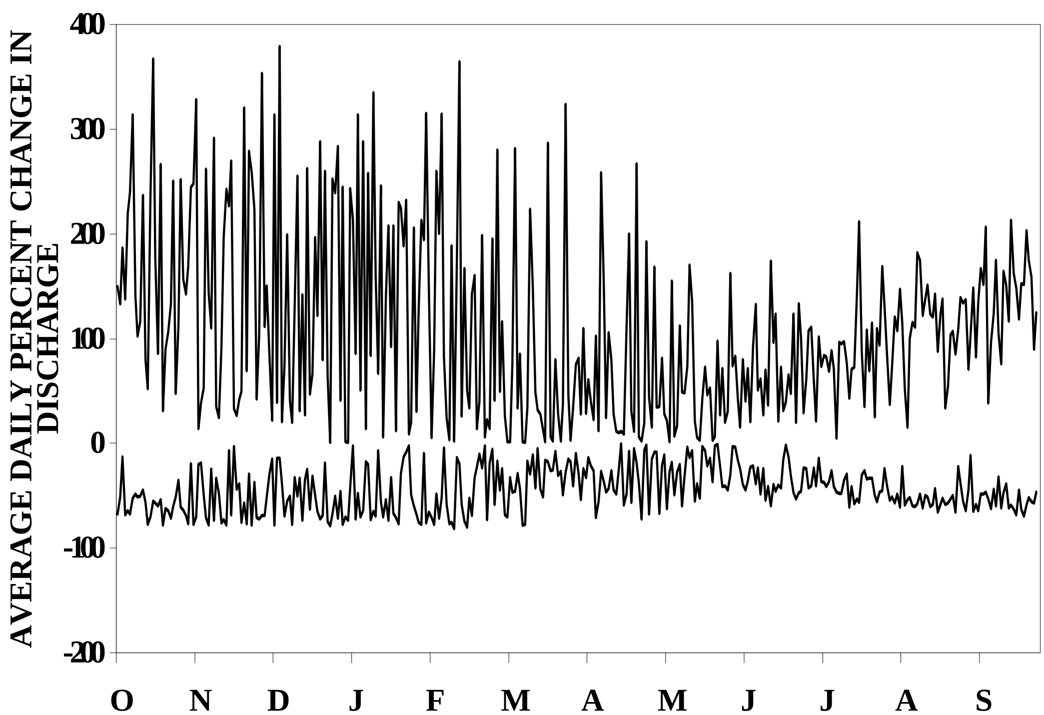


Table 1. Loss of varial zone area and depth with changes in Q-out from Libby Dam in Section 1 of the Kootenai River (Dam to Falls).

Qout	avg maxdepth	change/1kcfs	Cumulative	avg maxwidth	change/1kcfs	Cumulative	ft2/mile	mean of ft2/mile
4000	8		0	396		0	0	441619
5000	8.21	0.46	0.46	411.18	15.61	15.61	82421	
6000	8.61	0.4	0.86	424.05	12.87	28.48	150374	
7000	8.98	0.37	1.23	434	9.95	38.43	202910	
8000	9.32	0.34	1.57	441.02	7.02	45.45	239976	
9000	9.64	0.32	1.89	446.27	5.25	50.7	267696	
10000	9.94	0.3	2.19	450.69	4.42	55.12	291034	
11000	10.22	0.28	2.47	455.06	4.37	59.49	314107	
12000	10.49	0.27	2.74	459.22	4.16	63.65	336072	
13000	10.75	0.26	3	463.05	3.83	67.48	356294	
14000	11	0.25	3.25	466.86	3.81	71.29	376411	
15000	11.24	0.24	3.49	470.87	4.01	75.3	397584	
16000	11.47	0.23	3.72	475.11	4.24	79.54	419971	
17000	11.69	0.22	3.94	479.35	4.24	83.78	442358	
18000	11.9	0.21	4.15	484.51	5.16	88.94	469603	
19000	12.11	0.21	4.36	489.94	5.43	94.37	498274	
20000	12.31	0.2	4.56	495.68	5.74	100.11	528581	
21000	12.51	0.2	4.76	500.11	4.43	104.54	551971	
22000	12.7	0.19	4.95	504.54	4.43	108.97	575362	
23000	12.89	0.19	5.14	506.89	2.35	111.32	587770	
24000	13.07	0.18	5.32	508.92	2.03	113.35	598488	
25000	13.25	0.18	5.5	510.84	1.92	115.27	608626	
26000	13.43	0.18	5.68	512.67	1.83	117.1	618288	
27000	13.6	0.17	5.85	514.45	1.78	118.88	627686	

Figure 4. Range in daily percent change in discharge of the Kootenai River from water year 1952 through 1971 (A) and below Libby Dam from water year 1975 through 1995 (B) *in* Hauer and Stanford (1997).





Flathead River below Hungry Horse Dam

The installation of Hungry Horse Dam in 1952 changed the physical and biological characteristics of the Flathead River downstream of the dam. Therefore, in 1999 Montana Fish, Wildlife and Parks (FWP) initiated a three-year IFIM study to assess the available physical habitat and fish habitat use relative to changes in river discharge for native species (i.e. bull trout and westslope cutthroat trout) inhabiting the Flathead River, Montana. The overall goal of the project will be to allow FWP to make flow recommendations to the Bureau of Reclamation (BOR) for Hungry Horse Dam operation that will mutually benefit power production, flood control and native fish species in the Flathead system. The following habitat use information was collected during the first year of the study from August 1999 through March 2000 in Reach 1 of the mainstem Flathead River.

Study Area

The overall study area encompasses the Flathead River from the confluence of the South Fork Flathead River downstream to the river mouth at Flathead Lake, Flathead County Montana. The Flathead River was stratified into three reaches based on changes in river morphology. Reach 1 begins at the confluence of the mainstem and the South Fork Flathead River and flows in a southerly direction approximately 12.4 miles to a gradient break near Presentine Bar, Kalispell, Montana. The study reach is classified as a Rosgen C3/4 channel characterized by run dominated habitat with pool and riffle inclusions.

Methods

The following habitat use data were collected following standard IFIM random sampling methods (e.g. snorkeling) and radio-telemetry. Snorkel surveys were conducted during August and September 1999 and telemetry surveys from August through March 2000. Data were combined for subsequent analyses and reported for westslope cutthroat trout (>75 mm; n = 193), juvenile bull trout (<290 mm; n = 15), and sub-adult and adult bull trout (>290 mm; n = 233). In addition, we conducted 24-tracking surveys on one sub-adult and one adult bull trout in the mainstem Flathead River below Hungry Horse Dam on September 22-23, 1999.

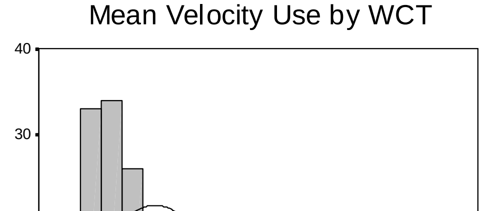
Preliminary Results

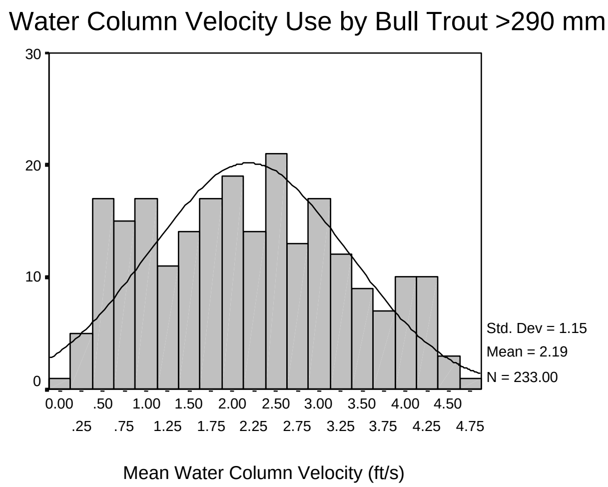
Habitat use- Frequent flow fluctuations that sporadically influence the varial zone of the river will affect the habitat used by westslope cutthroat trout and juvenile, sub-adult and adult bull trout in the Flathead River below Hungry Horse Dam. In general, westslope cutthroat trout and all size-classes of bull trout used low-velocity areas of the stream. Mean water column velocity used by westslope cutthroat trout and juvenile, sub-adult/adult bull trout was 1.27 ft/sec (S.D.= 0.88), 2.6 ft/sec (S.D.=1.76), and 2.19 ft/sec (S.D. = 1.15), respectively (Figure 5). In addition, cutthroat trout and all size-classes of bull trout commonly used areas of the channel with moderate water depths. Mean water depth used by cutthroat trout, juvenile and sub-adult and adult bull trout (Figure 6) was 7.7 ft (S.D.= 4.37), 8.2 ft (S.D.=2.84), and 8.2 (S.D. = 3.94), respectively. Furthermore, our results suggest that both target species and size-classes, in particular cutthroat trout, used channel margins more than expected. Approximately 79.1%, 56.2%, and 44.9 % of the observations for cutthroat trout, juvenile bull trout and sub-adult and adult bull trout, respectively, were located in lateral, near-shore areas of the channel. Thus, our preliminary results show that cutthroat trout and all size-classes of bull trout commonly used low velocity areas with moderate depths located in lateral margins of the river channel. Completion of the IFIM model will allow us to relate habitat use to availability to quantify the amount of suitable habitat for each target species and size-class at various flow regimes.

Diel surveys- Preliminary diel movement and habitat use surveys revealed that bull trout (>290 mm) used various habitat types throughout well-defined home ranges in the Flathead River below Hungry Horse Dam. Bull trout were active both day and night, and we observed them commonly occupying a variety of deep (i.e. pools) and shallow (i.e. shoals) habitat types; 34% of the relocations were in pools, 44% in runs and 22% in shoals. The observed variable habitat use and movements were probably related to feeding behavior. During night, bull trout were commonly associated with shallow shoal habitats where mountain whitefish are concentrated and readily available as prey. Therefore, our preliminary data suggests that shallow areas located in lateral margins of the channel and deep, low-velocity resting habitats are important to bull trout on a daily basis. Similarly, electrofishing surveys in the Flathead River revealed that juvenile bull trout are commonly found in shallow, low-velocity habitats located in the channel margins.

Radio-telemetry- Reservoir operations may affect fluvial bull trout that inhabit the mainstem Flathead River below Hungry Horse Dam. Our preliminary movement results reveal that a component of the migratory bull trout population may adhere to a fluvial life-history strategy that was previously undocumented in the Flathead system. Bull trout #32 was originally captured and released on April 1 1998 near Eleanor Island, approximately 6.5 km downstream of Columbia Falls. Spring surveys revealed that the study fish remained within the vicinity of Eleanor Island ($\pm$ 3.6 km) during April and May. On June 22, it passed through the North Fork permanent telemetry ground station (at Glacier Rim) moving a total distance of 37 km upstream of Eleanor Island. On September 28, the study fish passed through the North Fork ground station and 8 days later returned to Eleanor Island. It was consistently relocated near Eleanor Island through June 6, 1999 until battery expiration. Thus, the pronounced summer to fall upstream and subsequent downstream migration by bull trout #32 coincides with typical spawning migrations reported for migratory bull trout in the Flathead system.

Mean Velocity Use by WCT





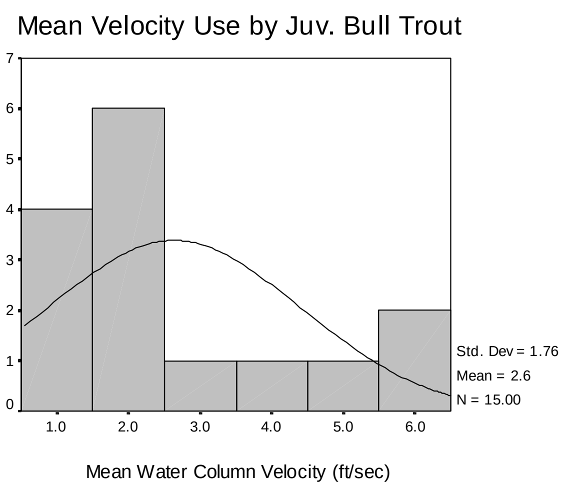
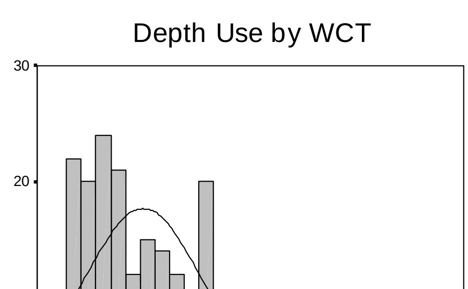
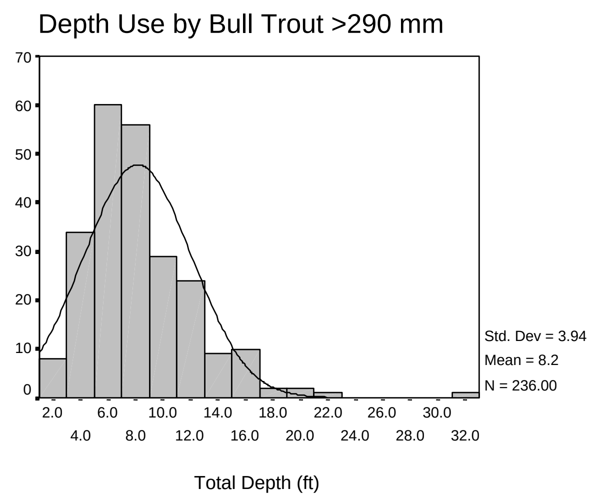


Figure 1. Mean water column velocity use by westslope cutthroat trout (>75 mm), juvenile bull trout (< 280 mm) and sub-adult and adult bull trout (>280 mm) in the Flathead River from August 1999 through March 2000.





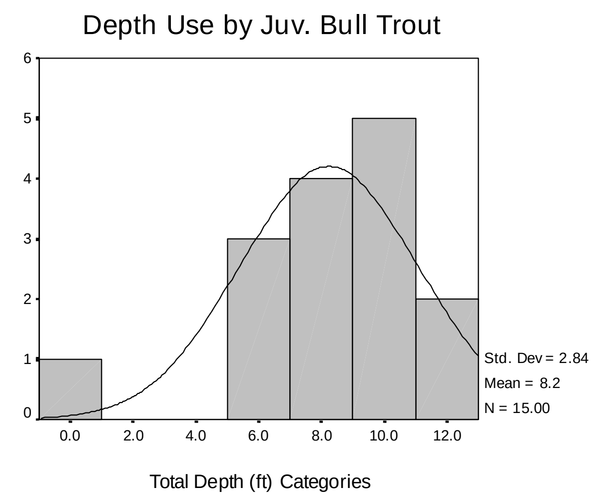


Figure 2. Total depth use (m) by westslope cutthroat trout (>75 mm), juvenile bull trout (< 280 mm) and sub-adult and adult bull trout (>280 mm) in the Flathead River from August 1999 through March 2000.

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RE: Comments on the Draft Mainstem Amendments document 2002-16

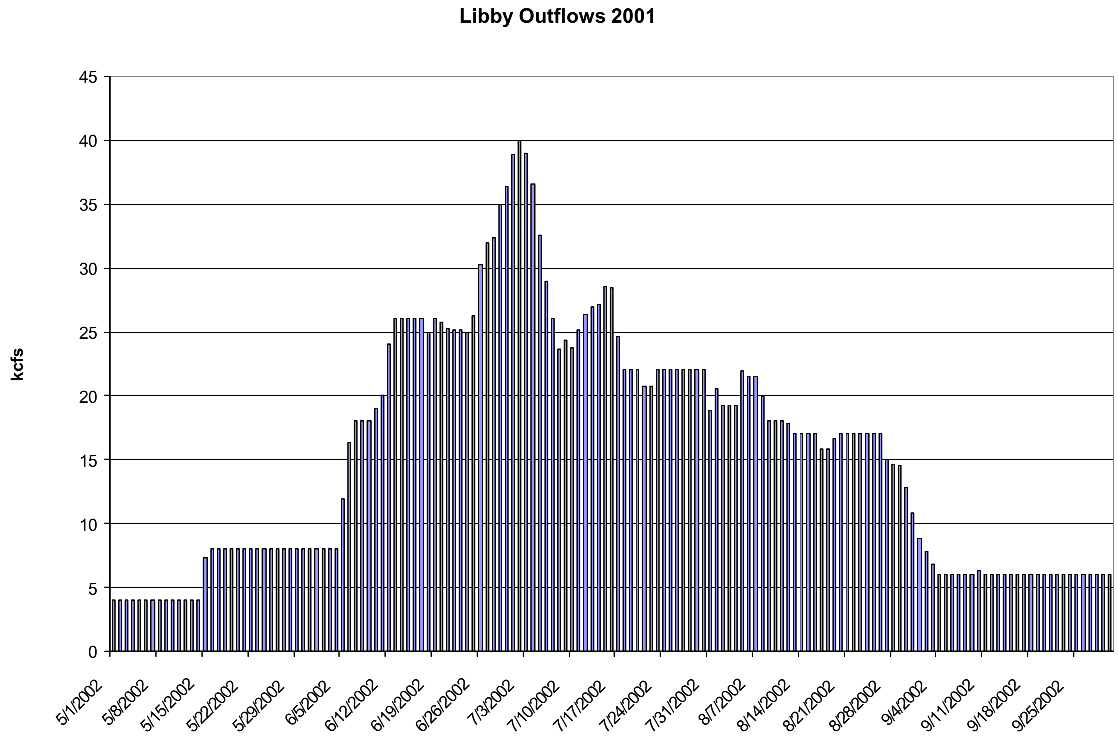
Thank you for the opportunity to comment on the proposed Mainstem Amendments. We generally agree with the Council's strategies to balance the needs of fish and wildlife, flood control and power generation. Flood control drafting of the reservoirs should be accomplished using the variable flow, or VARQ strategy, developed by the US Army Corps of Engineers. Reservoirs refill should follow the Integrated Rule Curves developed by Montana Fish, Wildlife & Parks. Summertime flow augmentation for anadromous fish recovery should be released at a constant flow rate over the months of July through September to protect resident fish immediately downstream of the headwater storage reservoirs.

Our comments are arranged in response to the specific questions asked by the Council. Detailed comments are preceded by an executive summary. Literature referenced in the text provides additional detail and supporting information.

BACKGROUND
During August of 2002, the State of Montana recommended to reduce and stabilize the flows out of Libby dam through the end of September. The flows out of Libby Dam were greater than 20 kcfs during the first portion of August, which was far in excess of the optimum bull trout flows of 9 kcfs. The State of Montana filed a System Operations Request with the other states and federal agencies in the Technical Management Team (TMT) process. The biological objective of Montana was to provide a better balance between the needs of resident fish in Montana with the demands for additional flows for anadromous fish recovery in the lower Columbia River.

Montana's request was included in SOR 2002-MT1. We requested reduced, stabilized flows out of Libby Dam to improve habitat conditions for bull trout and resident fish in the Kootenai River and Libby Reservoir by creating a relatively constant outflow from Libby Dam. Our requested flow strategy was identical to that proposed in the Council's draft Mainstem Amendment, which Montana believes can be accomplished without significantly impacting anadromous fish in the lower Columbia River.

The Montana request to the TMT was to reduce flows out of Libby dam to 11 kcfs and to maintain this flow until the end of September. Montana recommended a flow of 11 kcfs from Libby Dam based on the inflow forecasts at the time, which would have drafted Libby Reservoir to elevation 2449 feet by the end of September. Montana further recommended that any flow changes should follow the flow ramp rates in the Biological Opinion for the threatened bull trout. The following graph illustrates the actual flows out of Libby dam during the period from May through September 2002.



Montana recognizes that 2002 was a difficult hydrologic year and that there were impacts on resident fish above and below Libby Dam that were difficult to prevent. However, the summer began with a forecast of average flow volumes and after only a few days of testing of the effects of spill on resident fish, rapid runoff necessitated massive spills to maintain a controlled rate of refill. Outflows peaked at 40 kcfs with almost 16 kcfs of this flow being spilled. These spills created gas supersaturation conditions in the river that exceeded Montana's water quality standard of 110 percent saturation and harmed fish and habitat conditions far downstream of the dam. Immediately following this event the fish in the Kootenai River were further impacted because the TMT began large drafts of Libby Dam in an attempt to remove the full 20 feet of storage called for by the NMFS 2000 Biological Opinion.

The State of Montana's request for the salmon managers to reduce and stabilize the flows out of Libby Dam would have helped to reestablish bull trout habitat downstream of the dam. This operation would also have reduced the rapid drawdown of Libby Reservoir to below the Integrated Rule Curves, designed by Montana Fish Wildlife & Parks to Balance the requirements of resident fish in Montana with the needs of anadromous fish downstream. However, the TMT salmon managers rejected Montana's request.

The resulting dam operation in 2002 maintained abnormally high flows during August and then suddenly dropped the flows out of Libby Dam to 6 kcfs during September. This created additional impacts on bull trout that could have been avoided by slowing the rate of draw down and extending the draft to the end of September.

The optimal habitat conditions as measured by Montana Fish Wildlife & Parks in the Kootenay are approximately 9 kcfs. Montana is sensitive to the tradeoffs between the flows out of Libby Dam and the needs of anadromous fish below McNary but the releases from Libby Dam do not translate into a one-for-one increase in McNary flows due to a number of factors. The first factor is the extended distance between Libby Dam and the lower Columbia River system. This distance and the intervening dams serve to attenuate the flows that will reach McNary. The most dramatic affect is the ability for Canada to store, in Kootenay Lake British Columbia, a portion of the water released from Libby Dam. In communications between the Corps and BC Hydro they estimated that approximately 35 percent of the flows out of Libby Dam during the summer of 2002 were captured in Kootenay Lake and not passed downstream.

In early August when Montana submitted its SOR, the average seasonal flow over the period from July 1 to the end of August was 197 kcfs at McNary. Montana's proposed reduction in Libby outflows of approximately 11 kcfs, after 35 percent of the flows are retained in Kootenay Lake, would have resulted in a flow reduction at McNary of a little more than 7 kcfs. However, even this change would have only affected the flows during the last three weeks of August. Taking this into account, the average McNary flow over the July – August period would have been 195 kcfs if Montana's recommendation had been implemented. This is a very small change in overall hydrologic conditions in the Lower Columbia River, yet the biological impacts on Montana's resident fish were very serious. Montana's proposed operation would have provided substantial biological benefits for Montana's resident fish while having no measurable impact on downstream salmon populations; however, this request was rejected by the salmon managers in the TMT.

The State of Montana supports the Council's proposed operations strategy for both Libby and Hungry Horse Reservoirs because it will help to avoid the same impacts that the resident fish in Montana experienced in 2002.

Comments on the Northwest Power Planning Council's Proposed Mainstem Amendment document 2002-16.

Montana Fish, Wildlife & Parks

Executive summary

The Council requested comment on the science surrounding the benefits to fish populations resulting from their proposed Mainstem Amendments. Specific comments were sought on the Council's hypothesis that their proposed operational strategies will have significant biological benefits to the fish species that live upstream and downstream of federal hydropower dams. This document describes the biological justification for Montana Fish, Wildlife & Park's preferred operating strategy, with attention to the Montana portion of the Federal Columbia River Power System. **We believe this strategy will restore normative functions in the Columbia River headwaters, consistent with dam operations called for in the NMFS and USFWS 2000 Biological Opinions**.

Our preferred strategy for operating Columbia River Dams generally agrees with the Council's proposed Mainstem Amendments. The strategy was designed to protect the threatened bull trout and the endangered Kootenai white sturgeon, as Mainstem Columbia River flows are augmented to recover anadromous stocks. The resulting operation will also benefit non-listed fish species that are directly influenced by the headwater storage projects. **Fish directly impacted by headwater dams should receive a high priority for protection, as reservoir operations are managed systemwide. The resulting flows coincide seasonally with flow requirements in the Mainstem Columbia River.**

Our findings suggest that recovery objectives for anadromous and resident fish can be achieved simultaneously by mimicking the natural spring runoff event, within flood constraints, then gradually reducing dam discharge toward stable flows during the biologically productive summer and fall period. We generally support the Council's strategies to balance the needs of fish and wildlife with flood control and power operations. **Flood control drafting of the reservoirs should be accomplished using the variable flow, or VARQ strategy, developed by the US Army Corps of Engineers. Reservoir refill should follow the Integrated Rule Curves developed by Montana Fish, Wildlife & Parks. Summertime flow augmentation for anadromous fish recovery should be released at a constant flow rate to protect resident fish immediately downstream of the headwater storage reservoirs. Flow augmentation during spring and summer must be proportional to water availability on an annual basis.**

Background

It is necessary to compare the proposed operating strategies with the river in its natural state to describe the biological effects of the Council's Mainstem Amendment. Prior to dam construction, the Columbia River and its tributaries flowed unimpeded. The annual hydraulic cycle included a high flow event during the spring melt (which peaked between late May through early June) and relatively constant low flows throughout the remainder of the year. Headwater storage projects, including Hungry Horse and Libby Dams, reversed this discharge pattern by storing water during the spring runoff to prevent flooding and releasing water to generate electricity, primarily during the fall and winter when flows were naturally low (Figure 1).

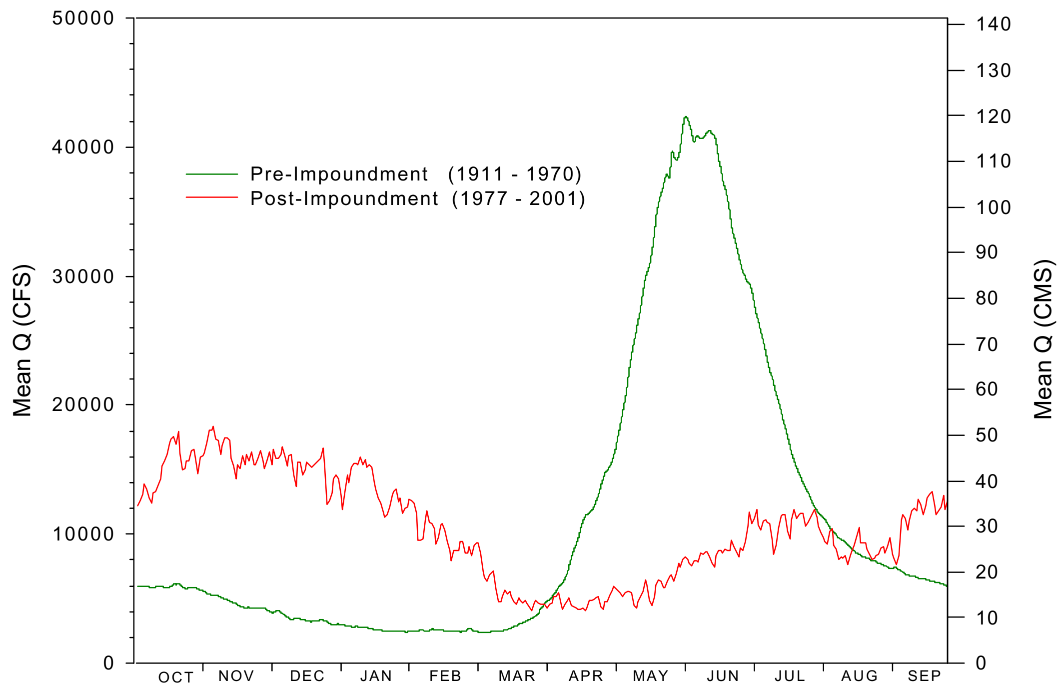


Figure 1. Example of flow regulation below headwater storage projects. These data compare the Kootenai River discharge prior to impoundment by Libby Dam (1911-1970) and regulated flows post-impoundment (1977-2001) in mean annual cubic feet per second (cfs) and cubic meters per second (cms). Spring flows were higher, and winter flows lower, prior to impoundment.

Under natural conditions, river flows during the low flow period were relatively stable and the portion of channel affected by flow fluctuation (called the "*varial zone*") was a narrow band along the shoreline. The nearshore habitat provides food and security cover for fish and wildlife. High springtime river flows flushed fine sediments from river gravels creating spaces between the stones (called "*interstitial habitat*") for insects and juvenile bull trout. High flows each spring defined the river channels and cleansed fine sediments from the riverbed gravels improving conditions for fish spawning.

Fine sediments flushed from the river bottom were deposited on the river margins providing a fertile medium for water tolerant plants. Spring scouring can provide the seedbed preparation necessary for plant reproduction, particularly for cottonwoods. Riparian vegetation withstood annual flooding or reestablished seasonally, providing secure habitat along river margins and reducing erosion of silt into the river. Deltas that form at the mouths of tributary streams were swept away annually, improving fish passage to critical spawning habitat in the headwaters.

Fluctuating or abnormally frequent high discharges disrupt this natural floodplain process. Unnaturally low spring water levels alter vegetation and habitats associated with riverine meanders and sloughs. High and variable winter flows scour recently established seedlings and limit the potential range of elevations for successful cottonwood and willow recruitment (Jamieson and Braatne 2001; Suchomel 1994).

Changes in storage reservoir operation

Mainstem Columbia River operations profoundly influence dam operations as far upstream as headwater reservoirs. Dam operations affect environmental conditions in the reservoirs upstream, and rivers downstream of the dams. The abundance, productivity and diversity of fish and wildlife species inhabiting the headwaters of the Columbia River are dependent on their immediate environment that ebbs and flows with river management.

Our comments related to reservoir biology are based on field sampling and quantitative biological modeling of Hungry Horse and Libby Reservoirs (Chisholm et al. 1989; May et al. 1988; Cavigli et al. 1998; Dalbey et al 1997; Zubik and Fraley 1987; Skaar et al 1996). Computer models were constructed using empirical field measurements of physical and biological parameters, as related to dam operations (Marotz et al. 1996). Conditions in the reservoirs resulting from various dam operation scenarios were assessed beginning with the hydrologic mass balance and thermal structure in the reservoir pool. The models calculate the biological response extending from primary producers (plants) through tertiary trophic levels (fish growth). Fish growth is correlated with survival, fecundity and reproductive success (Chapman and Bjornn 1969).

Headwater reservoirs fluctuate annually, reaching minimum pool during mid-April, refilling during the spring snow-melt, and increasing towards full pool in the summer. Water is then released for fish flow augmentation, flood control and power generation and the cycle continues. Since construction, Hungry Horse Reservoir has fluctuated as much as 189 feet and Libby Reservoir has been drafted as far as 152 feet (MFWP and CSKT 1997; Marotz and DosSantos 1993). Extreme reservoir drawdowns result in the desiccation of vast expanses of lake bottom, which become biologically unproductive (Figure 2).

Nearly all biological production in the reservoir pool occurs during the warm months (Chisholm et al. 1989; May et al. 1988; Marotz et al. 1996) (Figures 3-7). Failure to refill the reservoir each summer impacts reservoir productivity. At full pool, the reservoir presents a large volume and surface area. The sunlit surface layer of the reservoirs produces food (*zooplankton*, a microscopic crustacean that grazes on suspended algae called *phytoplankton*) that forms the base of the food web. The large flooded area produces aquatic insects and the large surface area traps insects from the surrounding landscape. Insects provide the primary food source for westslope cutthroat trout and juvenile bull trout during summer and fall (May et al. 1988). Biological production generally increases with reservoir elevation (Figures 8-11). The term *flatline* in the figures refers to the data presented, which assume that the surface was stable yearlong. Biological production increases when the annual fluctuation of the reservoir pool is minimized (Figures 8-11).

Figure 2. Annual reservoir drawdown and refill cycles expose the reservoir bottom to desiccation and freezing. The zone of water fluctuation becomes biologically unproductive. This photo shows Hungry Horse Reservoir at 180 feet from full pool near Lost Johnny Creek, looking upstream.

Reducing reservoir drawdown (duration and frequency), especially during summer, protects aquatic insect production in remaining wet portions of the reservoirs, assuring an ample food supply for fish. During winter, fish (kokanee, westslope cutthroat and rainbow trout, whitefish, chubs, and suckers) eat mainly *zooplankton*, a microscopic crustacean that grazes on *phytoplankton,* suspended algae. **We support the Council's proposal to restrict summertime reservoir drawdown to 10 feet from full pool during the highest 80th percentile water years and 20 feet from full pool during the driest 20th percentile water years**.

The Variable flow, or VARQ flood control strategy developed by the Army Corps of Engineers (ACOE 1999), improves reservoir refill probability. Improved reservoir refill increases the frequency of years in which water is available for spring and summer flow augmentation. NMFS 2000 states that "VARQ reduces system flood control drafts at Libby and Hungry Horse Reservoirs in years when flood control risks are moderate (average to below average water years) and adds about 10,000 cfs to summer flows at McNary Dam without increasing flood risks". VARQ supplies additional water for the

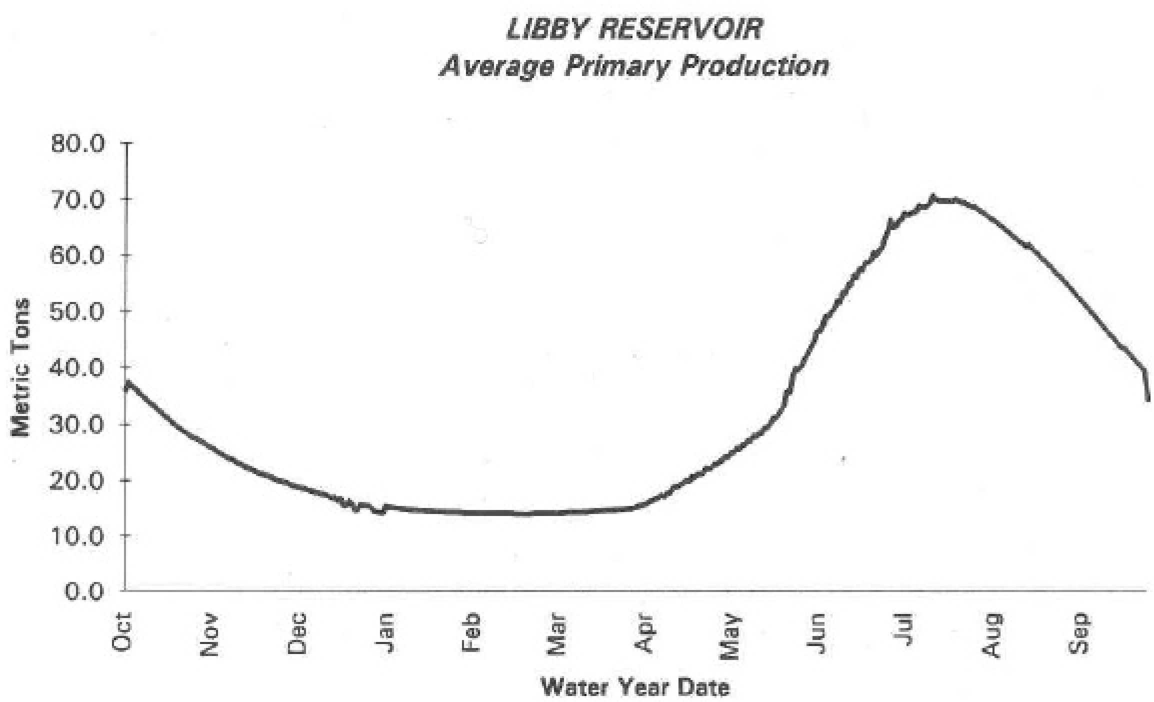


Figure 3. Daily calculations of primary production during 1982 at Libby Reservoir. The model LRMOD calculates carbon fixation within sectors along the reservoir length, then sums the results. Controlling factors include: reservoir volume, dam discharge and seasonal effects (temperature, solar aspect and attenuation). Biological production is greatest during the warm months.

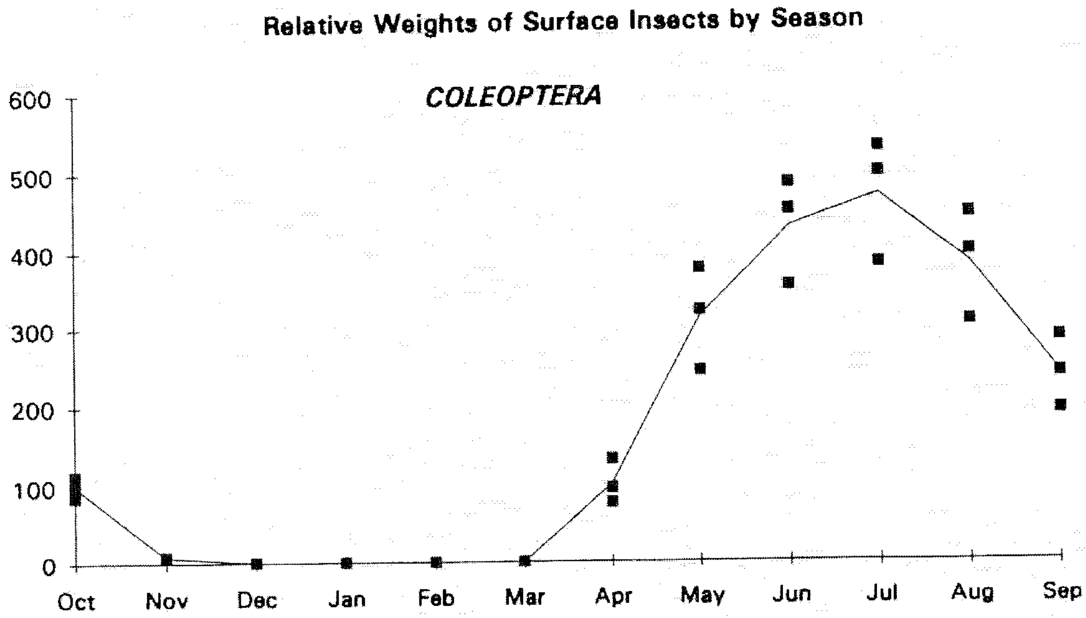


Figure 4. Seasonal distribution of beetles, *Coleoptera* deposited on the reservoir surface from the surrounding landscape. Coleopteran deposition was significantly greater in nearshore areas (<100m) at Hungry Horse and Libby Reservoirs. The line represents average conditions. The points reveal the range over normal reservoir operating conditions.

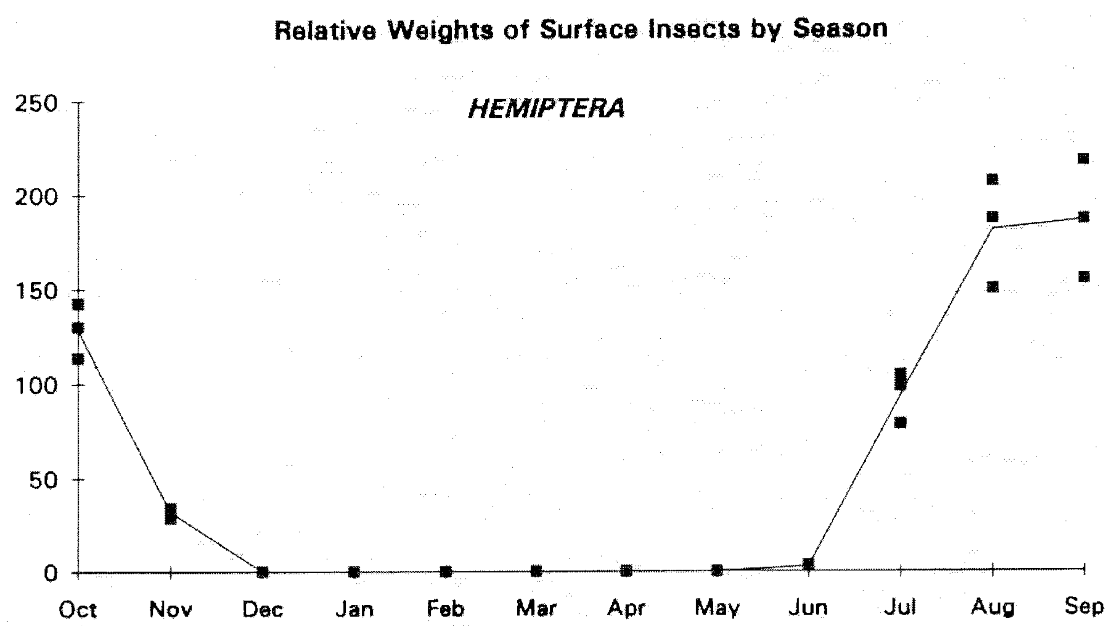


Figure 5. Seasonal distribution of true bugs, *Hemiptera* deposited on the reservoir surface from the surrounding landscape. Hemipteran deposition was significantly greater in nearshore areas (<100m) at Hungry Horse and Libby Reservoirs. The line represents average conditions. The points reveal the range over normal reservoir operating conditions.

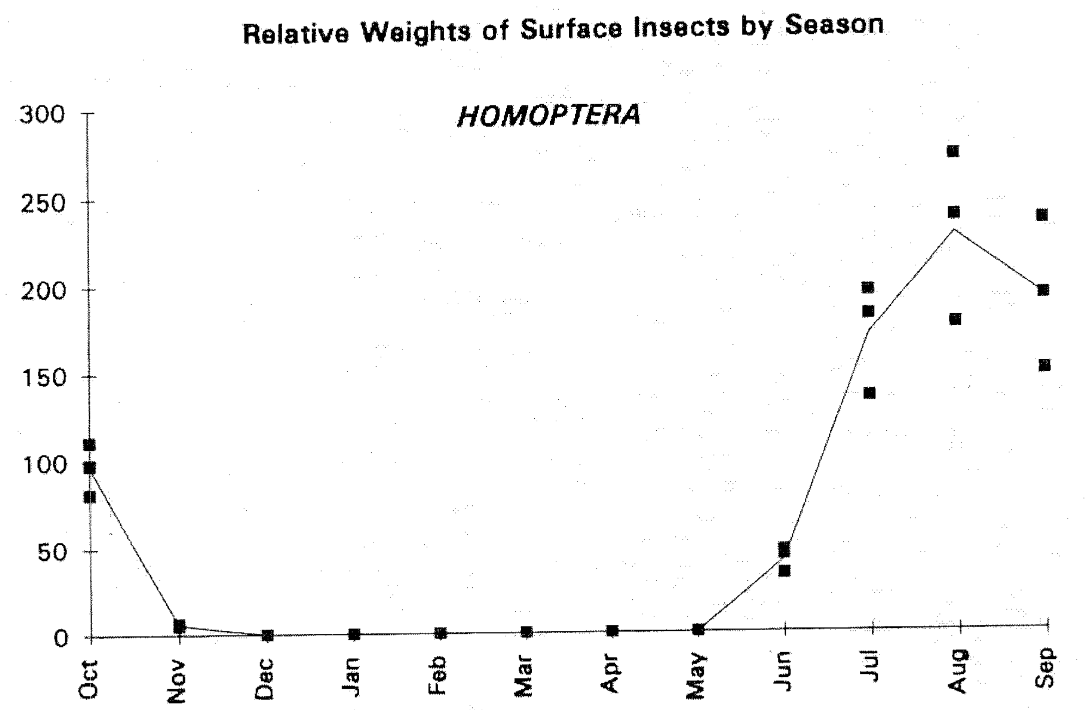


Figure 6. Seasonal distribution of leaf hoppers, *Homoptera* deposited on the reservoir surface from the surrounding landscape. Homopteran deposition was randomly distributed over the surfaces of Hungry Horse and Libby Reservoirs. The line represents average conditions. The points reveal the range over normal reservoir operating conditions.

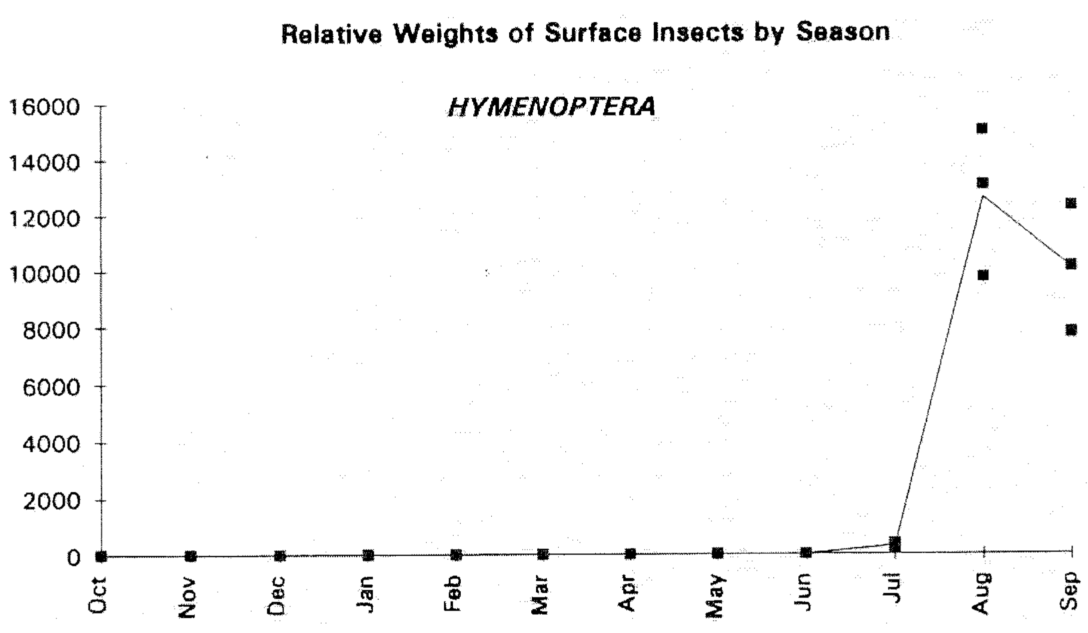


Figure 7. Seasonal distribution of ants, wasps and bees, *Hymenoptera* deposited on the reservoir surface from the surrounding landscape. Hymenopteran deposition was randomly distributed over the surfaces of Hungry Horse and Libby Reservoirs. The line represents average conditions. The points reveal the range over normal reservoir operating conditions. Hymenoptera are the most important source of food for trout during summer and early fall.

Hungry Horse Reservoir
Flatline Analysis

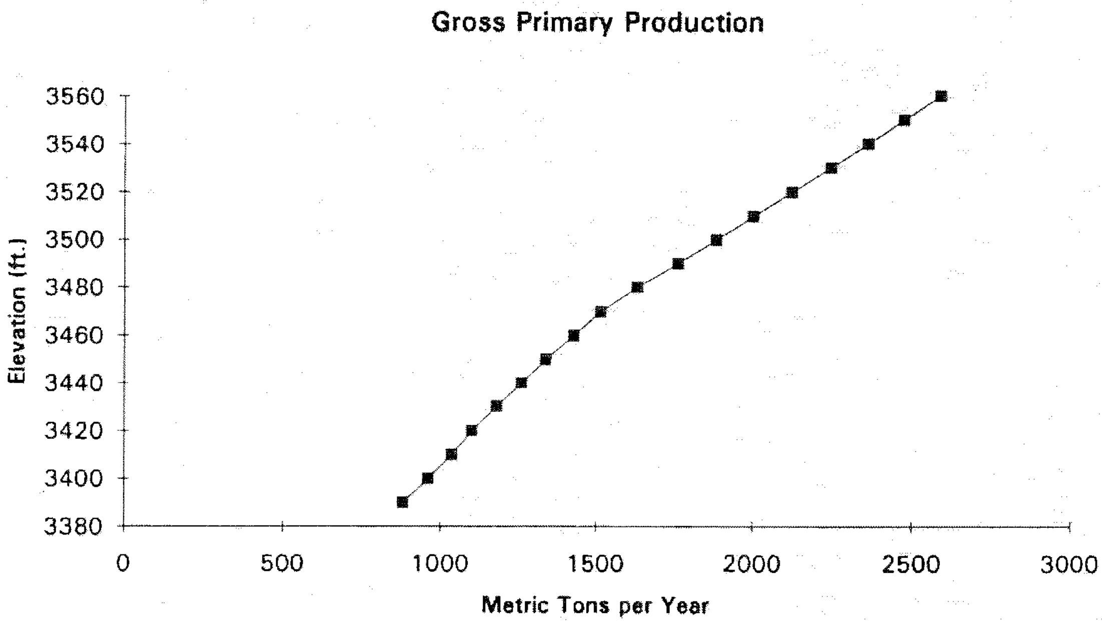


Figure 8. Generalized relation between reservoir surface elevation and gross primary production in Hungry Horse Reservoir. The seasonal effects of reservoir operation were removed to simplify the relationship.

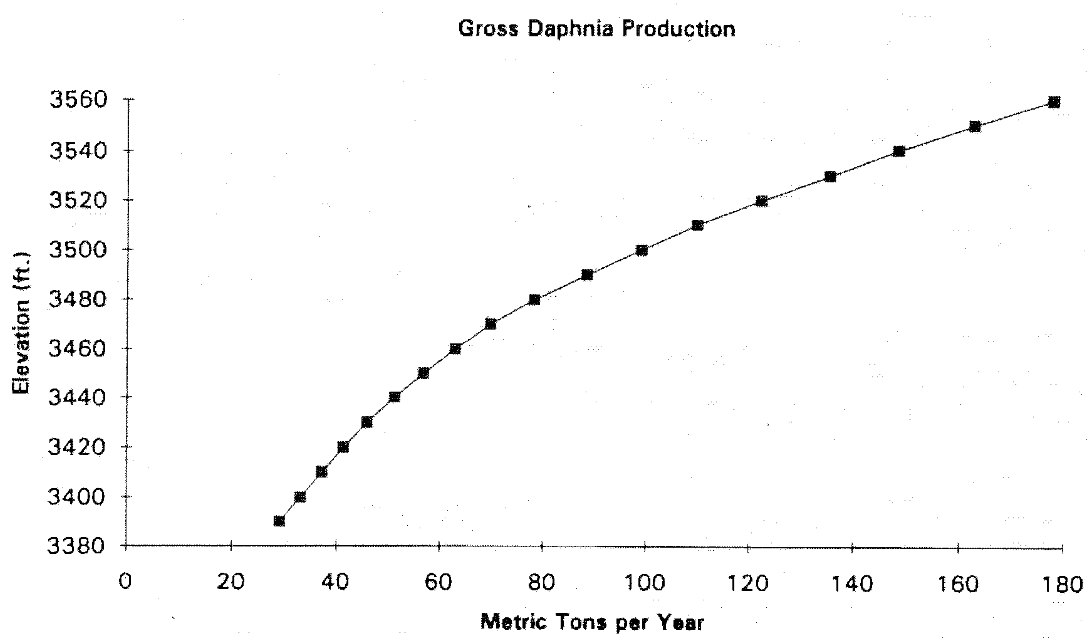


Figure 9. Generalized relation between reservoir surface elevation and gross *Daphnia* production in Hungry Horse Reservoir. The seasonal effects of reservoir operation were removed to simplify the relationship. Daphnia are zooplankton that are the most important food source for trout during the winter. Kokanee select for Daphnia all year.

endangered Kootenai white sturgeon by April, 30-90 percent of the time, and provides additional water 30-60 percent more often for bull trout and salmon (BPA model runs Dec. 2000).

Improved reservoir refill assures that passage into spawning tributaries is maintained for bull trout that begin their fall spawning run in July. Another species of special concern in Montana, the westslope cutthroat trout, ascends the spawning streams during April and May when the reservoirs are near the annual minimum elevation. Figure 12 shows an example of a complete fish barrier when Hungry Horse Reservoir is approximately 50 feet below full pool.

Our operating strategy was designed for use with monthly water supply forecasts beginning in January each year, and updated each month as forecasts become available. Monthly adjustments accommodate forecasting error and unpredictable precipitation events. For example, the Integrated Rule Curves (IRCs) developed for Hungry Horse and Libby Reservoirs categorize the inflow volume into five categories (from drought to flood) based on the historic record. Each category corresponds with a draw down and refill curve for reservoir operation (Marotz et al. 1996 and 1999; Fraley 1989). Reservoir elevations can also be calculated mathematically for the entire year (See attached IRC instructions). Adjustments are made mathematically when actual water supplies differ from the forecast.

Reservoir operations should be based on local inflows to each storage project. Reservoir fisheries benefit by operating the dams consistent with the variable flood control strategy (ACOE 1999), Integrated Rule Curves (IRC) during reservoir refill and a gradual reservoir draft during summer and fall as flows are augmented for anadromous fish recovery (NMFS 2000).

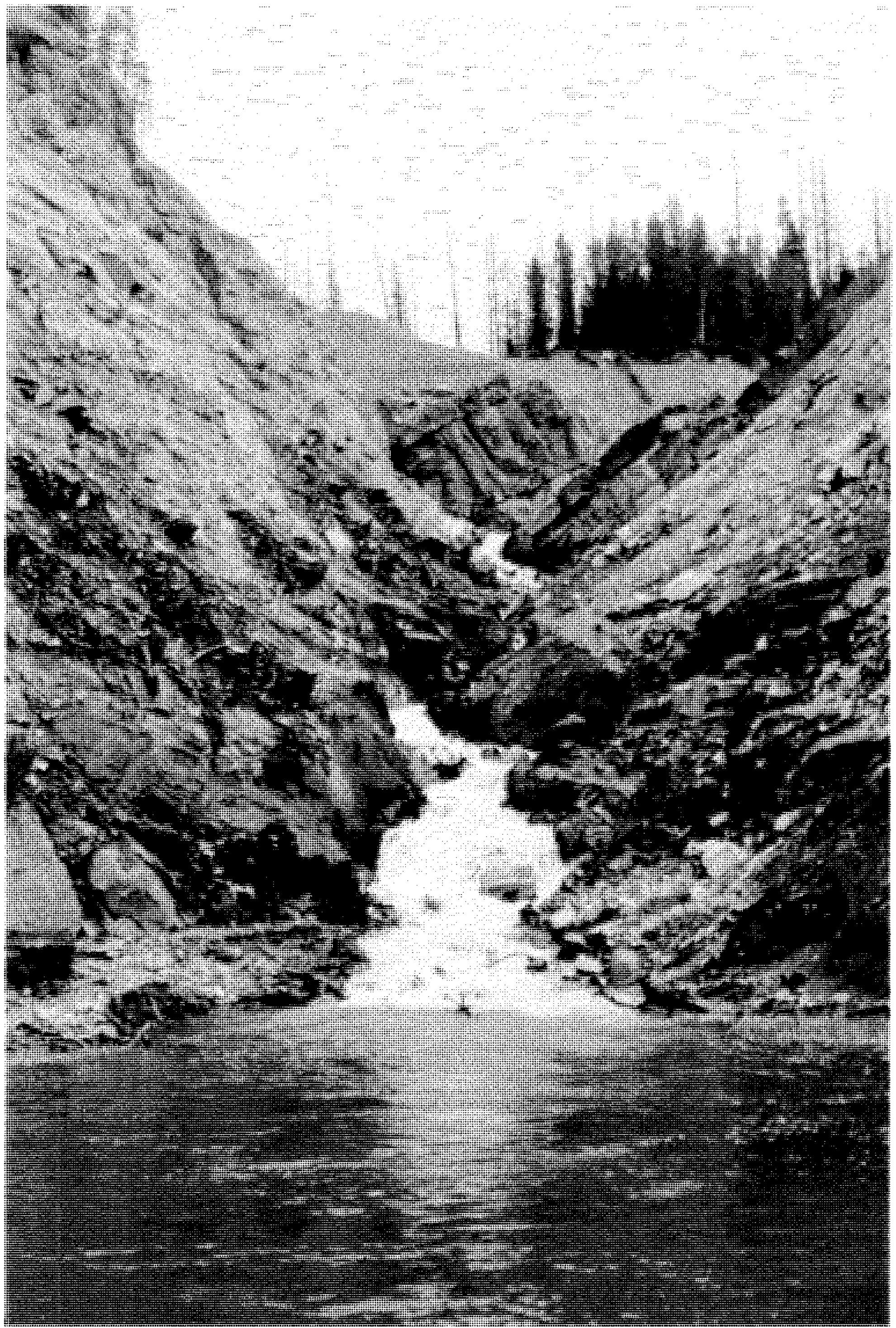


Figure 12. Lost Johnny Creek, a tributary to Hungry Horse Reservoir, is an example of a complete fish barrier when Hungry Horse Reservoir is approximately 50 feet below full pool.

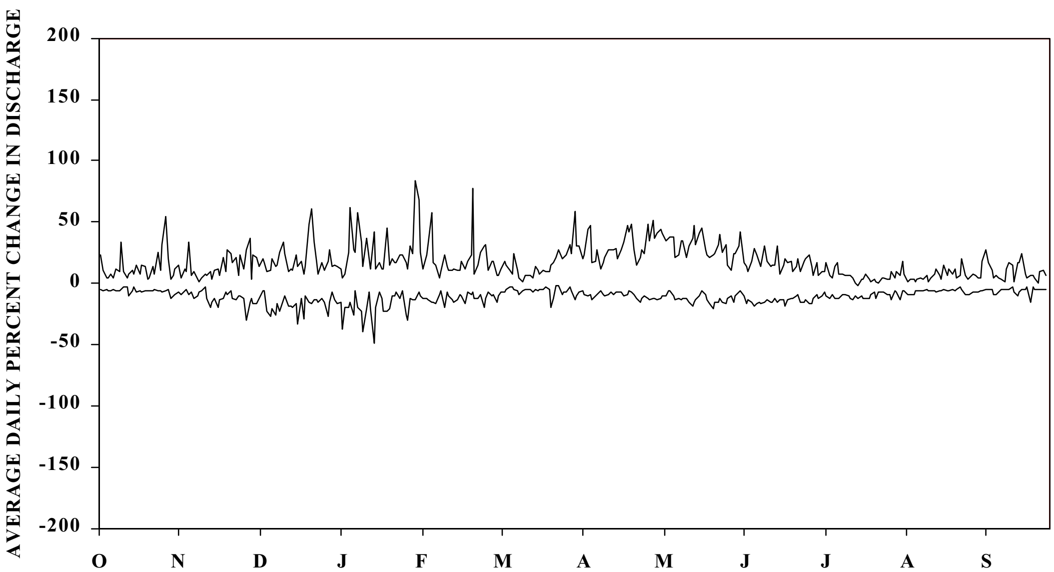
Changes in river operations – summer flows.

Our comments on riverine biology are based on field sampling (Fraley and Graham 1982) and quantitative computer models that were designed using a modified form of the Instream Flow Incremental Methodology (IFIM). River models quantify the total availability of various habitats for selected life stages of native fishes (i.e. bull trout and westslope cutthroat trout) under different dam operation scenarios. The IFIM models were developed based on site-specific habitat suitability data collected from the Flathead and Kootenai Rivers downstream of the dams. IFIM studies have provided empirical evidence for seasonal flow limitations and ramping rates (Hoffman et al. 2002; Marotz and Muhlfeld 2000; Muhlfeld et al. 2003). Tiered flows for Kootenai River white sturgeon and allowable ramping rates for bull trout are specified by the USFWS 2000 BiOp and Recovery Plan (USFWS 2000; USFWS 1999).

River fisheries benefit when dams are operated consistent with normative hydrologic conditions (Muhlfeld et al. 2003; Paragamian 2000; Independent Scientific Group 1999; ISAB 1997 and 1997b; Hauer and Potter 1986). Normative hydrologic conditions mimic natural processes and minimize impacts on fish and wildlife (Ward and Stanford 1979). For example, Muhlfeld et al. (2003) found that subadult bull trout moved from deep, mid-channel areas during the day, to shallow low-velocity areas along the channel margins without overhead cover at night in the partially regulated reaches of the Flathead River. The authors recommended that restoration of the most natural and stable flow regime possible under the current management constraints will protect key ecosystem processes and maintain or restore bull trout populations in the Flathead and elsewhere in the Pacific Northwest (Independent Scientific Group 1999). Conversely, fluctuating stream flows resulting from dam operation directly affect the aquatic environment and associated riparian and wetland habitats downstream of headwater reservoirs. Figure 13 shows the influence of dam regulation on daily flow fluctuation downstream of a storage project. Flow fluctuation increases the width of the varial zone that becomes biologically unproductive (Perry et al 1986; Hauer et al. 1997; Hauer et al. 1974).

Normalized river flows benefit all fish species of special concern in Montana, then flows continue downstream to aid anadromous salmon smolt migration in the mainstem Columbia River. The naturalized spring freshet resorts and cleans river sediments and helps restore nutrient cycles and floodplain function (Shepard et al. 1984). Once the spring runoff ends, river flows should gradually decline toward stable summer flows to protect biological production in the rivers downstream of the dams, especially during the productive warm months. The IRCs for reservoir operation provide seasonality of flow in downstream reaches that are consistent with the Normative River Concept (ISAB 1997, 1997b).

Springtime dam operations at Hungry Horse and Libby Dams should avoid uncontrolled spills. Instituting a “sliding scale” for the refill date, based on reservoir inflow forecasts, can mitigate the potential for uncontrolled spill at Hungry Horse and Libby Dams (Marotz et al. 1999). The reservoirs can safely refill earlier during dry water years, but should



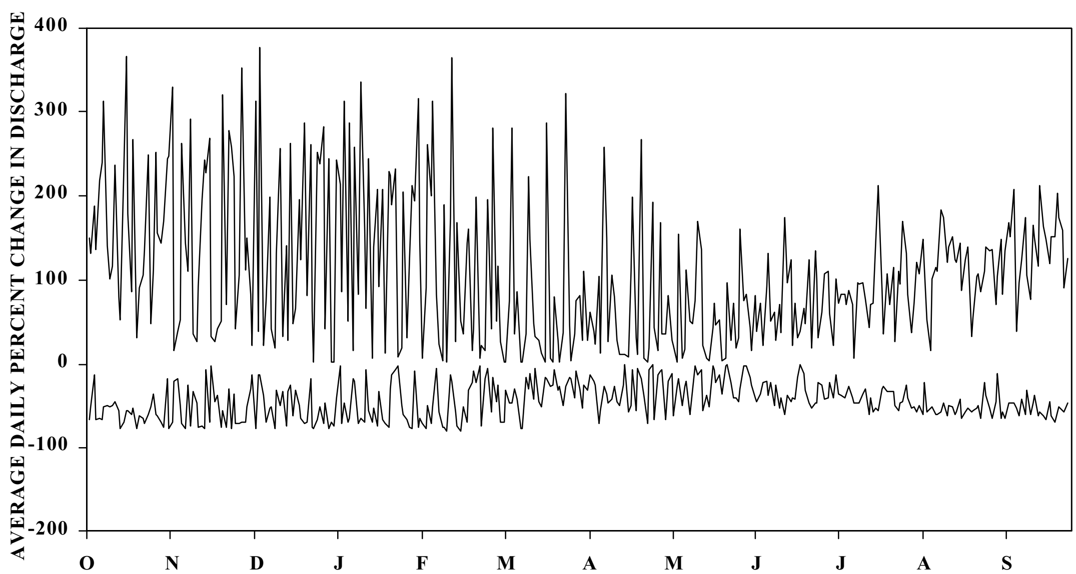


Figure 13. Range in daily change in discharge of the Kootenai River from water year 1952 through 1971 (top) and below Libby Dam from water years 1975 through 1995 (bottom) *in* Hauer 1996.

refill later during high water years to avoid the use of the spillways, which cause biological damage associated with gas supersaturation and abrupt changes in water temperature. Reservoir refill should be achieved by slowing the rate of refill as the reservoir approaches full pool. This allows operational flexibility to respond to inflow volumes and smooth the discharge prior to and after refill. The goal should be to fill the reservoir as soon as inflows decline to turbine capacity so that discharge after refill approximates the discharge prior to refill. **The Council should adjust the refill date to reduce the potential for uncontrolled spill and associated gas supersaturation problems downstream of headwater storage projects. Smoothing the discharge benefits river productivity because the width of the unproductive varial zone is reduced.**

To avoid unnecessary impacts in Montana, Hungry Horse and Libby Reservoirs should be operated conservatively, releasing stored water gradually over the summer to avoid unnatural flow fluctuations. The primary objective for summer operations should be to maximize habitat for optimal biological production in the rivers downstream of storage reservoirs during the period of July through September. Preliminary results of the IFIM models show that the availability of critical riffle habitat (e.g. wetted perimeter) sharply declines below 6,000 cfs in the Flathead River (Figure 14) and 9,000 cfs in the Kootenai River (Figure 15). These data suggest that dam operations that stabilize river discharge at or above these inflection points (up to 10,000 cfs) will optimize aquatic insect production. The ongoing IFIM research will quantify the total usable area for each target fish species and life stage at various flows of interest. The combination of the wetted perimeter and total usable area relationships will allow resource managers to identify flows that will maximize both aquatic invertebrate and fish production using a comprehensive ecosystem approach.

We support the Council's strategy to extend dam discharges from Libby and Hungry Horse Reservoirs for summer flow augmentation through the end of September, and to require that the water be released in a stable way that minimizes or eliminates fluctuations. Further, we recommend that the Council use recommendations from the ongoing IFIM studies in the Kootenai and Flathead Rivers to refine flow ramping rates and flow windows for each project.

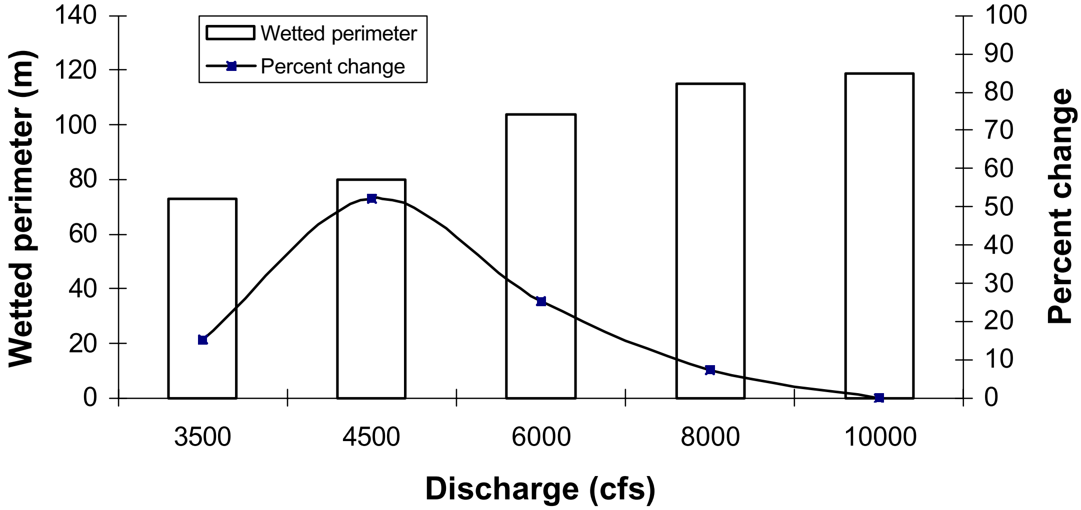


Figure 14. The wetted perimeter-discharge relationship for 2 riffle sections in the mainstem Flathead River near Columbia Falls, Montana. Note that at 6,000 cfs most of the wetted perimeter remains biologically productive and losses increase at lower flows.

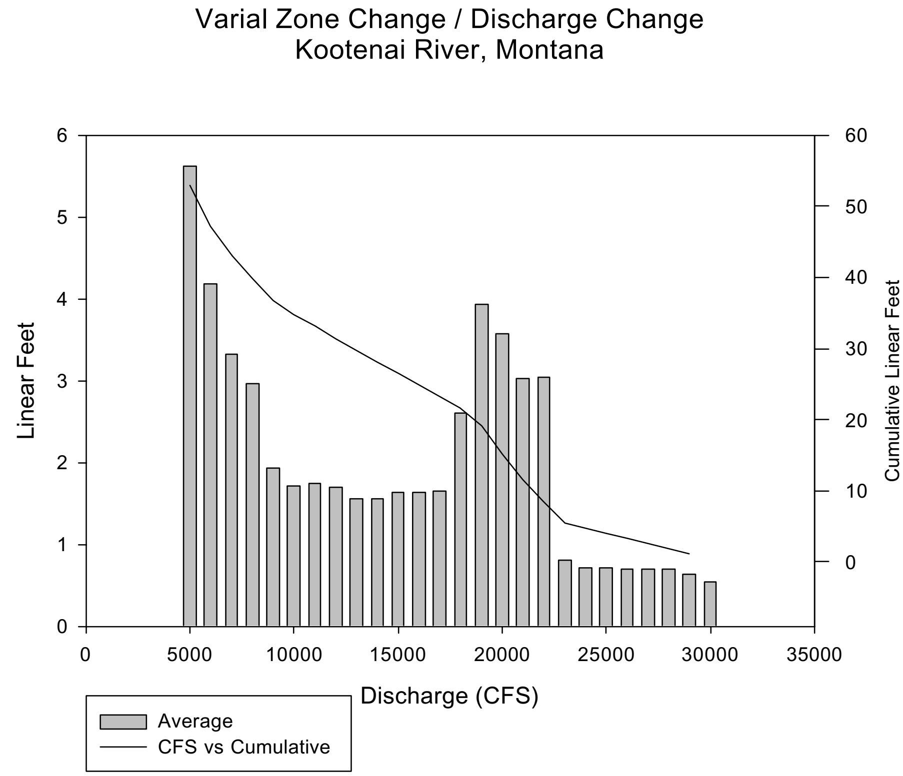


Figure 15. Varial zone exposed in the Kootenai River, Montana, below Libby Dam per mile for each 1,000 cfs drop in discharge. Note that at 9,000 cfs, most of the wetted perimeter remains biologically productive and losses increase rapidly at lower flows.

We concur with the mathematical technique developed by the Council for calculating stable summer flows (John Fazio, model runs and personal communication). Specifically, the reservoir volume above the summer reservoir draft limit plus a conservative estimate if inflow volume, spread equally each day throughout the July through September period. Flow management during the summer should be based on the volume of water in storage behind Libby Dam available for salmon augmentation down to elevation 2449 feet, and Hungry Horse to elevation 3550 feet. During the driest 20 percent of water years, these draft limits can be adjusted 10 feet lower, to 20 feet from full pool. This is consistent with the USFWS 2000 BiOp, which specifies higher flows during the summer for bull trout downstream of Libby Dam. **We concur with this sliding-scale flow strategy for bull trout as specified (USFWS 2000). Further, we urge the Council to implement a similar sliding-scale minimum flow target for bull trout downstream of Hungry Horse Reservoir.**

The USFWS BiOp stated that the white sturgeon tiered flows should be refined by developing a mathematical formula, based on water availability, to define the required volume to be released from storage at Libby Dam to meet flow targets at Bonners Ferry, Idaho (USFWS 1999, 2000). **We support the new formula for sturgeon flows, which is in the Council's preferred alternative.**

The USFWS and NMFS 2000 Biological Opinions on the operation of the FCRPS called for the variable flow, flood control strategy (VARQ). VARQ allows dam operators to store more water prior to runoff during less than average water years (years with low flood potential) to create a naturalized spring runoff (within flood constraints) without compromising the probability of reservoir refill. This limits the duration and frequency of deep reservoir drawdowns and improves the likelihood of reservoir refill. River flows can be augmented while protecting resident fish in and below Hungry Horse and Libby Reservoirs (ACOE 1999, Marotz et al. 1999). VARQ flood control should be implemented within the flood stage requirement at the nearest downstream flood control centers. **We support VARQ flood control at Hungry Horse and Libby Dams** (ACOE 1999; Complete data set received by MFWP from ACOE December 2002).

The minimum flow during the remainder of the year should remain at 3,500 in the Flathead River at Columbia Falls and 4,000 cfs discharge from Libby Dam.

The minimum flow in the South Fork Flathead River immediately downstream of Hungry Horse Dam should continue to follow the "sliding scale" adjustment based dependant on water availability. The existing 900 cfs minimum flow downstream of Hungry Horse Dam benefits riffle and shallow run habitats in the affected 8.4-km reach. However, reservoir refill failure would affect the entire shoreline of the 42-km long reservoir. Hungry Horse Reservoir contains one of the few remaining native species assemblages and one of the strongest metapopulations of bull trout in existence. To avoid impacts to reservoir productivity, the minimum flow shall be determined based on the January final volume runoff forecast for Hungry Horse Reservoir for the period of April 1 to August 31. When the April through August forecast is greater than 1,790 thousand acre feet (KAF), the minimum flow shall be 900 cfs. When the forecast is less than 1,190 KAF, the minimum flow may be reduced to 400 cfs. When the forecast is between 1,190 and 1,790 KAF, the minimum flow shall be linearly interpolated between 400 and 900 cfs. Hungry Horse Dam discharge must maintain the established minimum flow of 3,500 cfs at Columbia Falls. However, in the event of a flood emergency (when river stage at Columbia Falls reaches 13 feet) the minimum flow in the South Fork can be reduced to the physical minimum (approximately 145 cfs) (Marotz and Muhlfeld 2000).

Riparian and wetland areas have the greatest influence over the biological health of the watershed (Bissell 1996; Bayley 1995; Naiman et al. 1993). Small changes in the structure and composition of riparian habitats can adversely affect populations of riparian dependant species. For example, riparian habitats support more priority avian species than any other habitat (Casey 2000). They provide security cover for fish and terrestrial wildlife, habitat and food for insect production, and woody debris that creates channel diversity and pocket water for spawning gravel deposition. Ground cover vegetation and riparian canopy in the riparian zone traps sediments produced from adjacent land areas. Cottonwood recruitment generally requires a decline in river stage immediately following the spring peak in the order of 2.5 cm/day. However, in cases of reaches dominated by fine substrates, seedlings may survive stage declines of up to 3 to 5 cm/day (Rood and Mahoney 2000). Stable or slowly declining summer flows help maintain cottonwood and willow seedlings established earlier in the year (Jamieson and Braatne 2001). **The Council's program should identify and protect the best available remaining riparian and wetland habitats through the use of conservation agreements and land acquisitions and modify the activities that are causing the degradation of impacted areas or that are preventing the ecosystem from recovering.**

Action vs. Status Quo

The preferred alternative selected by the Council in the draft amendment is generally consistent with our biological goals. During review of flow augmentation, we urge that the Council implement these strategies immediately, rather than maintain Status Quo operations.

Elimination of April 10 flood control elevation target.

The Council proposed to remove the April 10 flood control target specified by NMFS and replace it with a 95% refill probability by June. The Council hypothesizes that this reduction in spring flows would be muted by the 95% priority refill requirement at the end of June. The assumption is that the reservoirs could never be drafted too deeply in winter or refill probability would be reduced below 95 percent. Therefore any reductions in spring flows would be relatively minor and would not have significant adverse effects on the survival of spring-migrating anadromous fish.

We reviewed the Council's model simulations that indicate that this strategy would allow dam operators, in many years, to draft the reservoirs somewhat deeper in winter to provide additional flexibility for power generation at peak winter times as needed. This is consistent with the flexibility designed into the IRCs. However, because model simulations are unable to mimic the real-time decision space available to human operators (e.g. short-term weather forecasting, precipitation records etc.) it remains uncertain how operations would occur in reality. **We therefore recommend that provisional and firm power drafting be conservative to prioritize reservoir refill.**

Increasing the frequency of deep reservoir drafts and/or refill failure impacts biological productivity. In the reservoirs, the depth of drawdown is more biologically important than the number of days the reservoir remains at each elevation. Once the substrate desiccates and/or freezes (for roughly one week), aquatic production ceases at that elevation until the following spring when the substrate is re-flooded for approximately five weeks and aquatic life recolonizes. Biological modeling indicates that annual biological production changes very little if the reservoir is drafted to the same minimum elevation, during winter or later during spring. However, once the reservoir refills and becomes biologically productive, annual production is increased the longer the pool remains at or near full. **If the Council's proposed operation indeed implements IRCs and VARQ, the question of removing the April 10 flood control limit becomes moot.**

VARQ and IRCs will ensure that the reservoirs are not drafted so deeply in the winter to impact on refilling all of the reservoirs.

River productivity is similarly impacted by low river stage and intermittent fluctuations (Perry 1984; Hauer and Stanford 1982). Once the substrate desiccates and/or freezes (for roughly one week), aquatic production ceases at that elevation until the substrate is re-flooded and aquatic life recolonizes (Gersich and Brusven 1981). **River productivity is enhanced when flow fluctuation is reduced and the varial zone minimized.**

The above operational strategies represent actions related to mainstem operations that will create desirable habitat and help recover fish and wildlife populations in the headwaters while recovery actions for anadromous fish continue in the lower Columbia River. These operations are consistent with established mitigation plans in the Flathead and Kootenai subbasins (Fraley et al. 1989; MFWP and CSKT 1991,1993; MFWP, CSKT and KTOI 1998).

Criteria and procedures for emergency operations.

The Council sought comment on provisions for when and how it would be permissible to declare a power system emergency and reduce or eliminate operations for fish. Montana's recommendations for operating the FCRPS were designed to meet the needs of fish and wildlife with minimal impacts to power supply needs and system flood control in the northwest region. Power analyses have been completed by BPA (Wright 1996; Also see model simulations by Roger Schiewe BPA).

We believe hydrologic calculations in the Columbia Watershed should begin with water availability in the headwaters and work downstream. Monthly inflow forecasts for each headwater reservoir should be used to calculate reservoir drawdown and refill targets, and/or dam discharge schedules (SOR EIS 1995). Water availability in the Flathead and Kootenai subbasins varies somewhat independently from the main stem Columbia River; the subbasins might be wet or dry compared to the whole Columbia Watershed. Dam discharge is regulated by the physical characteristics of catchments/dams and downstream flood constraints. River friction and downstream catchments, water travel times and hyporheic interactions, dampen flow peaks. Flows from unregulated sources are added enroute downstream. These variables must be considered for system operation. **The Council should request the Action Agencies to develop a weekly time-step system operation model capable of simulating water routing strategies. This tool would allow for greater efficiency to maximize benefits from the Columbia River.**

The Council should consider more inter-regional energy transfers, energy conservation, and alternative energy technologies to resolve the region's power supply problems. Additional transmission associated with Hungry Horse and Libby Dams would have the added fisheries benefit of stabilizing river flows when electrical storms cause grid interruptions.

The Council should incorporate costs associated with damages to fish and wildlife resources and losses to past mitigation investments when the power supply impacts of proposed operations are evaluated. Economic analyses should not externalize costs associated with losses to ecosystem health.

We urge the Council to have project sponsors develop loss statements associated with each dam in the FCRPS and ultimately develop a measurable system for evaluating progress toward mitigating those losses. The Council previously approved the loss statement for Hungry Horse Reservoir (MFWP and CSKT 1991, and 1993), and the loss statement for Libby Reservoir was submitted to the Council in 1998 (MFWP, CSKT and KTOI 1998).

The construction and operation of **Libby Dam** caused the following fisheries losses that must be mitigated (MFWP, CSKT and KTOI 1998):

- Replace the annual loss of 15,000 trout and 377,000 mountain whitefish from the river inundated by Libby Reservoir.
- Replace the annual loss of 57,000 juvenile *Oncorhynchus spp* from inundated tributaries.
- Replace the annual loss of 5,990 juvenile *Oncorhynchus spp* from tributaries blocked by new road construction to accommodate the reservoir.
- Replace the annual loss of 2,100 juvenile westslope cutthroat trout from the Kootenai River downstream of Libby Dam.
- Increase burbot in the Kootenai River to replace a loss of an approximate 90 percent reduction in the burbot fishery.
- White sturgeon are now endangered and bull trout are designated threatened under the Endangered Species Act (ESA). These populations need to be restored to sustainable numbers to allow delisting these species.
- Replace 175 km of the Kootenai River and 134 km of tributary stream habitat lost to inundation by Libby Reservoir.
- Replace 25 km of adfluvial trout habitat was blocked by road construction when new roads were built around the reservoir to accommodate filling the pool.

The construction and operation of **Hungry Horse Dam** resulted in the following fisheries losses that must be mitigated (Zubic and Fraley 1987; MFWP and CSKT 1991):

- Replace a minimum annual loss of 65,000 juvenile westslope cutthroat trout.
- Replace an annual loss of 250,000 juvenile bull trout
- The loss statement also identifies the loss of 100,000 adult kokanee. Since experimental stocking could not restore the kokanee population, the implementation plan calls for replacing this loss using native trout species.
- Replace the loss of 78 miles of river and tributary habitat lost due to inundation by Hungry Horse Reservoir.

Only when fish and wildlife populations show positive trend can the Council conclude that it is adopting a fish and wildlife program that truly does protect, mitigate and enhance fish and wildlife, while continuing to assure the region an adequate, efficient, economical and reliable power supply.

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Integrated Rule Curves
Operating Instructions

Background

The Integrated Rule Curves (IRCs) were developed by Montana Fish, Wildlife & Parks and the Confederated Salish and Kootenai Tribes as a tool to balance the requirements of hydropower generation and flood control with resident and anadromous fish. They are the result of over 17 years of field and laboratory research to assess the effects of hydropower operations on the aquatic resources in the Columbia River watershed in northwestern Montana.

The IRCs were designed to limit the duration and frequency of deep reservoir drawdowns, improve reservoir refill probability and produce a more naturally shaped dam discharge hydrograph. All of these actions are necessary to partially mitigate fisheries losses attributable to the construction and operation of Hungry Horse (MFWP and CSKT 1991,1993) and Libby Dams (MFWP, CSKT and KTOI 1999). Reduced drawdown protects aquatic food production in the reservoirs, assuring an ample springtime food supply for fish. Increased refill frequency improves biological production during the warm months. At full pool, the reservoir contains the maximum volume and biological productivity for fish growth and a large surface area for the deposition of terrestrial insects, an important summer fish food component, from the surrounding landscape. Refill timing also assures that passage into spawning and rearing habitats in tributaries is maintained for the threatened bull trout that begins its fall spawning run in July. Another species of special concern in Montana, the westslope cutthroat trout, ascends the spawning streams during April and May when the reservoirs are near the annual minimum elevation. Downstream of the dams, biological production in the river is protected by the more naturally shaped hydrograph. The naturalized spring freshet resorts and cleans river sediments and helps restore nutrient cycles and floodplain function. Normalized river flows benefit all species of special concern, including the endangered Kootenai white sturgeon and interior redband trout. In Montana, these species occur only in the Kootenai River below Libby Dam. River discharges from both projects then continue downstream to aid anadromous salmon smolt migration.

The IRC elevational targets published by Marotz et al. (1996) have been revised for compatibility with the various system models, and to improve conditions for the Kootenai white sturgeon and other resident and anadromous fish species. For example, the four-year "critical period" method for dam operation was abandoned due to fishery-related changes in the operation of Columbia River dams. The IRC operations now assume that every year is designated "critical year one" to better mimic current operations. This revision was consistent with Montana's recommended operation because of the improved reservoir refill probability resulting from the IRC operation. However, the system will continue to experience refill failures, but to a lesser degree, even if IRCs are applied to other storage projects. The Columbia watershed naturally experiences wet and dry periods. The elevational targets published in 1996 have also been revised for use in the monthly system models to better mimic the results of our daily models.

Lastly, Montana revised the IRCs to accommodate a 10 foot summer drawdown from full pool at both reservoirs to aide in the recovery of anadromous fish stocks, and shaped the discharge to benefit listed and petitioned fish and wildlife species in the Flathead and Kootenai systems. The 10 foot draft limit can be adjusted to 20 feet from full pool during the lowest 20th percentile water years.

The reservoir models (HRMOD and LRMOD) and an earlier draft of the IRC (Biological Rule Curves or BRCs) were critically examined during the period 1991-1995, in the Columbia River System Operation Review (SOR) conducted by Bonneville Power Administration (BPA), U.S. Bureau of Reclamation (BOR), and U.S. Army Corps of Engineers (ACOE). State, tribes, and agencies represented on the SOR Resident Fish Workgroup assessed analytical tools available for biological assessments of various reservoir operation strategies. Our methodology was deemed appropriate for use in the SOR process. A simplified version of the Montana models was modified for use on the other storage reservoirs in the U.S. portion of the Columbia River System. Results were published in Appendix K of the Final Environmental Impact Statement (SOR EIS 1995). This "screening model" enabled researchers to evaluate compromises between resident fish species in the headwaters and salmon and steelhead in the lower Columbia. The IRCs and similar resident fish constraints at other storage projects formed the basis of SOS #4 which met the requirements of more work groups than the preferred alternative. Alternatives designed to improve anadromous fish survival with increased instream flow had a negative effect on the reservoirs fisheries (Geist et al. 1996).

Although the IRCs were adopted by the Northwest Power Planning Council in its1994 Fish and Wildlife Program ,they were not implemented in 1995 because of conflicting requirements in the NMFS 1995 Biological Opinion (BiOp). In general, the original IRC and BiOp were similar throughout the operating year but differ substantially during the summer. Whereas the IRCs attempted to fill the reservoirs in July and maintain elevations near full pool, the Biological Opinion attempts to fill the projects by June 30, then drafts the projects 20 feet by the end of August. The BiOp operation results in a failure to refill the projects by up to 20 feet in some years (Data provided by NMFS, and Roger Schiewe BPA). Reservoir refill failure impacts biological production in the reservoirs during the productive warm months and causes unnatural flow fluctuations in the Kootenai and Flathead rivers below the dams. The IRCs delay the refill date during high water years to avoid forced spill and associated gas supersaturation in the Kootenai and Flathead rivers

Flow augmentation NMFS 2000 Biological Opinion should be released at a constant rate over the July through September period to avoid creating a second flow peak following the naturally-timed spring freshet for white sturgeon. Reservoir discharge should mimic

the natural hydrograph which historically declined gradually from a peak flow in early June to basal low flows by late July. Rapid flow fluctuation is biologically damaging because a large portion of the river margins become dewatered, stranding insects, zooplankton, and potentially fish and fish eggs (Hauer 1994, 1997). This could directly impact young white sturgeon if they use backwater areas (information on habitat requirements of sturgeon during their first year of life is sparse) or flow fluctuation could impact sturgeon prey production (sturgeon food habits during their first year includes insects and other invertebrates and small fish).
Juvenile bull trout can also be harmed when flows first decline in July, then increase in August. Upon emigrating from their natal tributaries, young bull trout reside in shallow river margins (< 1 m depth), often associated with unimbedded cobble. Insects are an important food component as juvenile shift from insects to fish prey. As flows increase, much of the habitat in the river margins includes the portion of channel that was recently dewatered and killed, essentially moving the bull trout into the unproductive varial zone. Conversely, the IRCs gradually reduce flows after the spring runoff peak and moderate flow fluctuations, thus avoiding this riverine impact.

The IRC concept was compared to the Biological Opinion and two other alternatives (Wright et al. 1996). This analysis did not address incremental tradeoffs between anadromous and resident fish species resulting from the alternatives. The process did, however, focus the debate by identifying similarities and differences. Results of the Wright analysis also showed that the enhanced reservoir operation (IRC concept) was the least expensive of the alternatives analyzed, saving the power system an incremental average of $27 million per year as compared to the Biological Opinion.

Scientific and policy guidance is needed to resolve the obvious potential for conflicting direction for salmon steelhead, white sturgeon and bull trout recovery. The Independent Scientific Group (ISG 1996) noted that the IRCs provide seasonality of flow in downstream reaches that are consistent with the Normative River Concept (ISAB 1997). The Group also noted "that an incremental, empirical relation between flow [in the lower Columbia] and survival [of anadromous smolts] has not been demonstrated, even though it is likely that survival is higher on high runoff (wet) years," and that non-seasonal flow augmentation [summer releases] to aid summer smolt migration in the lower Columbia River may do more harm than good because the smolts may not have accumulated necessary growth and energy reserves for successful migration. The Independent Scientific Advisory Board (ISAB 1997a) also reported that the operations called for by the BiOp cause harm to resident fish species in the Montana reservoirs and rivers downstream. Given these uncertainties, we have focused our biological research on reservoir and riverine effects and have tailored the IRCs to balance the potentially conflicting needs of various native species. Fortunately, the NMFS Biological Opinion contains language that allows for operational changes when new information becomes available.

A multi-species watershed approach can be used to balance actions for white sturgeon and bull trout with actions for anadromous salmon and steelhead. Recovery efforts throughout the basin can also be balanced with important non-listed species. The IRCs strive to benefit fish throughout the Columbia Basin by coordinating water flows from the headwaters to produce a protracted flow event in the main stem. By implementing operating curves similar to the IRCs at other storage projects, sub-basins experiencing wet conditions can supply the bulk of salmon flow augmentation. Dry sub-basins provide less flow, protecting important reservoir and riverine stocks.

Operations

The IRCs are a family of reservoir elevation targets for dam operation that incorporate incremental adjustments to allow for uncertainties in water availability. IRCs delimit five categories, or *Quintiles*, of water availability and are intended for use similar to power and flood control rule curves. In real time, the dam operator would receive an inflow forecast in early January and interpolate the corresponding reservoir elevational target. Elevation targets are derived by first comparing the most accurate inflow forecast to four inflow thresholds to determine the corresponding quintile. Next, a coefficient is derived through linear interpolation by using the two curves that bracket the most recent inflow forecast. An equation described below is used to calculate the end of month elevational target.

The models, HRMOD and LRMOD, run on the water year October 1 through September 30, and use the April 1 through August 31 inflow forecast (water year day 183 - 335). We can also set up the model to run on forecasts for any other period (e.g. April through July or April through September).

At Libby Dam (LRMOD) the inflow volume thresholds (that designate which IRC elevational targets) are equally spaced as follows:

Vol1 = 4214.52 (KAF April 1 to Aug 31);
Vol2 = 5481.60;
Vol3 = 6748.68;
Vol4 = 8015.76. Each increment is 1267.08 KAF.

At Hungry Horse Dam (HRMOD) the thresholds are equally spaced as follows:

Vol1 = 1192.34 (KAF April 1 to Aug 31);
Vol2 = 1590.37;
Vol3 = 1988.40;
Vol4 = 2386.43. Each increment is 398.03 KAF

These thresholds have not changed since 4/23/96 (Version IRC-v96). The curves representing the IRC targets (LMATRIX and HMATRIX) have changed very little since 1996, but have varied only subtly, to smooth the curves and to make them function better in the system models.

The inflow thresholds (Vol1 through Vol4) define the divisions of the five quintiles of inflow volumes. Inflow forecasts should be compared to the threshold values and an elevational target should be interpolated from the MATRIX for each project (IRC curves, Tables 1 and 2). For example, if the January inflow forecast for Libby Reservoir for the period April 1 through August 31 is 7000 KAF, the forecast would be intermediate between Vol3 and Vol4, or quintile 4. The coefficient would be .1983 (the difference between 7000 – 6748.68 = 251.32 divided by the total range of the quintile 8015.76 - 6748.68 = 1267.08, or 251.32 / 1267.08 = .1983). If the inflow was extremely high, say 9000, the quintile would be 5 and the coefficient would be .777 (or difference 984.25 / difference 1267.08). Next, we would refer to LMATRIX and find the corresponding elevational targets for the end of January. The deepest end of January elevation is curve F = 2378, the next deepest is E= 2383 and the next is D=2390. The first volume would yield 2390' + .1983(2383'-2390') = 2388.61 feet. The second volume would yield 2383' + .777(2378-2383) = 2379.12 feet. A new end-of-month elevational target should be interpolated from the IRC curves as each consecutive inflow forecast become available. These represent minimum elevational targets. The reservoirs can be operated at elevations higher than the IRCs (e.g. operated to VARQ) if required for other system needs. This causes the actual operation to be flexible and variable over time. Actual operations will vary somewhat from the target elevations due to inflow forecasting error. Negative deviations from the targets caused by forecasting error can be verified mathematically.

The Endangered White Sturgeons Recovery Team's Kootenai River IRCs (KIRC) and "tiered flow approach" for white sturgeon recovery is consistent with the Montana state and tribe's preferred operation plan for other non-listed stocks and recreational fisheries in the Flathead and Kootenai drainages. It is important that Libby Reservoir be operated to or above the IRC to balance the sturgeon release with reservoir refill. If the reservoir elevation is below the IRC on May 1 (as in 1999), release of the sturgeon volume will result in reservoir refill failure and difficulty shaping flows for sturgeon, bull trout and anadromous species. During sturgeon flow augmentation, Libby discharge should be held to the minimum needed to achieve the minimum flow target. However, if more water must be released to avoid overfill and spill, the minimum Bonners Ferry targets can be exceeded up to (but not beyond) flood stage at Bonners Ferry. Daily simulations have shown that flows at Bonners Ferry seldom exceed 50 kcfs when the IRC and tiered flows are used in concert. The portion of the target contributed from Libby Dam is somewhat flexible for inseason management to achieve the greatest benefit for sturgeon and other listed or petitioned fish stocks.

For modeling purposes, the unregulated flows below Libby Dam were calculated using concurrent daily data as the difference between Libby Dam discharge and the river gauge at Port Hill. The unregulated flow component was then regressed on the daily inflow to Libby Reservoir. We then used a time series regression to predict the magnitude and duration of the low elevation runoff between Libby Dam and Bonners ferry as a function of reservoir inflow (which includes high elevation runoff that typically occurs a week or two later). The model output was designed to be constrained by operating rules provided by the International Joint Commission (IJC 1938; data were provided by BC Hydro), but we would like to reexamine this model component with flood control experts.

Under the IRC operation, pass-through flows from Libby Reservoir are enhanced for the endangered white sturgeon and both Montana projects contribute spring and summer flows to enhance salmon migrations. A gradual ramp down from the spring runoff normalizes the river hydrograph while simultaneously increasing flows in August. This reduces the area of the river varial zone, improving biological production for riverine species including bull trout. Pass- through flows, augmented with conservative storage release, can be shaped to achieve the greatest benefit for sturgeon, salmon, and non-listed stocks. This can typically be achieved by providing an 9 kcfs minimum flow from Libby Dam for bull trout. Flows should remain stable through September. Similar protection in the Flathead River below Hungry Horse Dam by providing 6 kcfs minimum flow at Columbia Falls for bull trout. Flows should remain stable until flows increase for electrical generation when cold weather increases load (circa late September). The actual volume released should be calculated based on reservoir elevation and water availability.

Citations

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T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / Lori Postlethwait* **BPA:** *Scott Bettin / John Wellschlager*

NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*

OR: *Ron Boyce* **WA:** *Shane Scott* **ID:** *Steve Pettit* **MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner*

TMT MEETING

16 July 2003 0900-1200 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

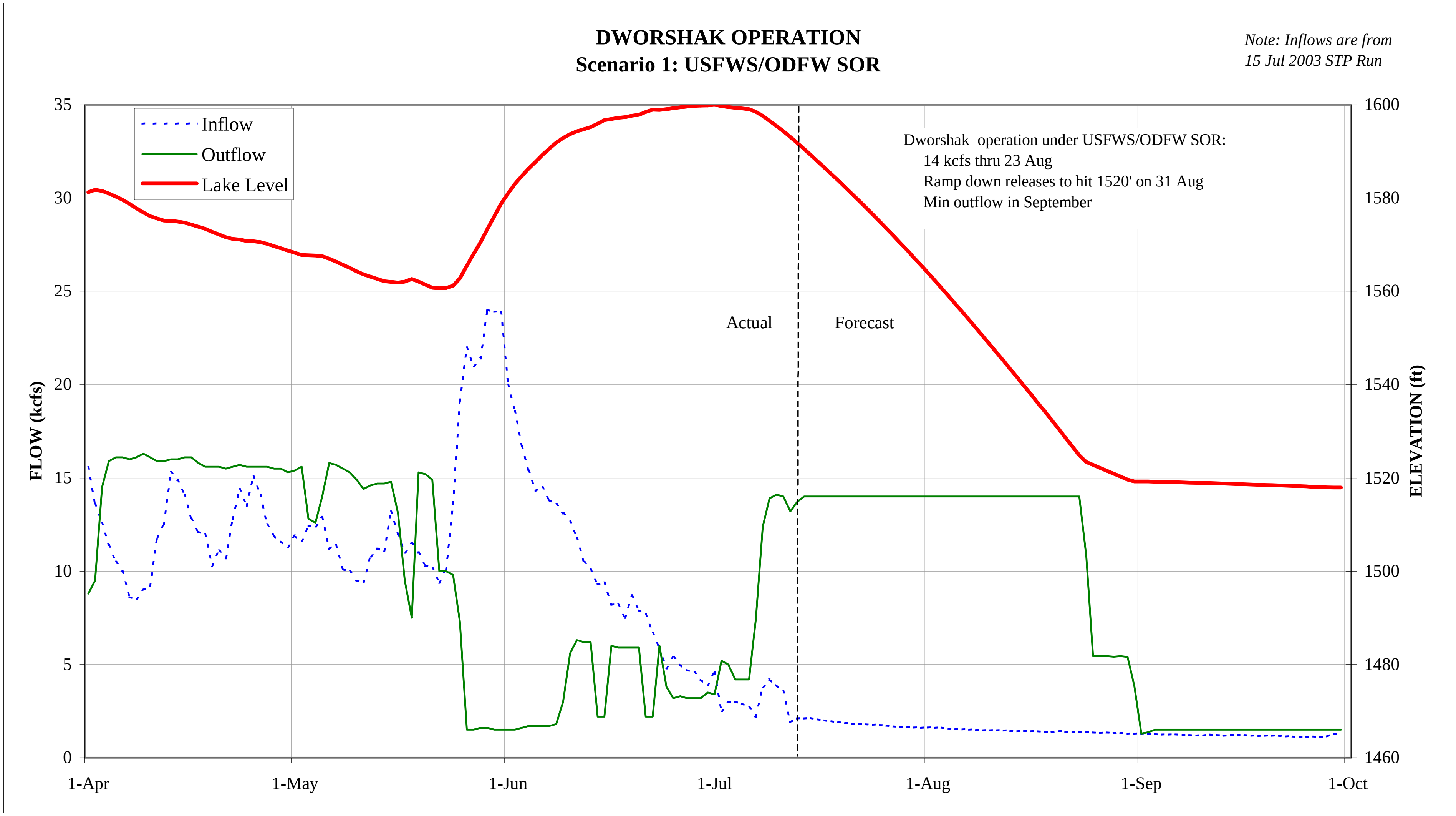
All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed. Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

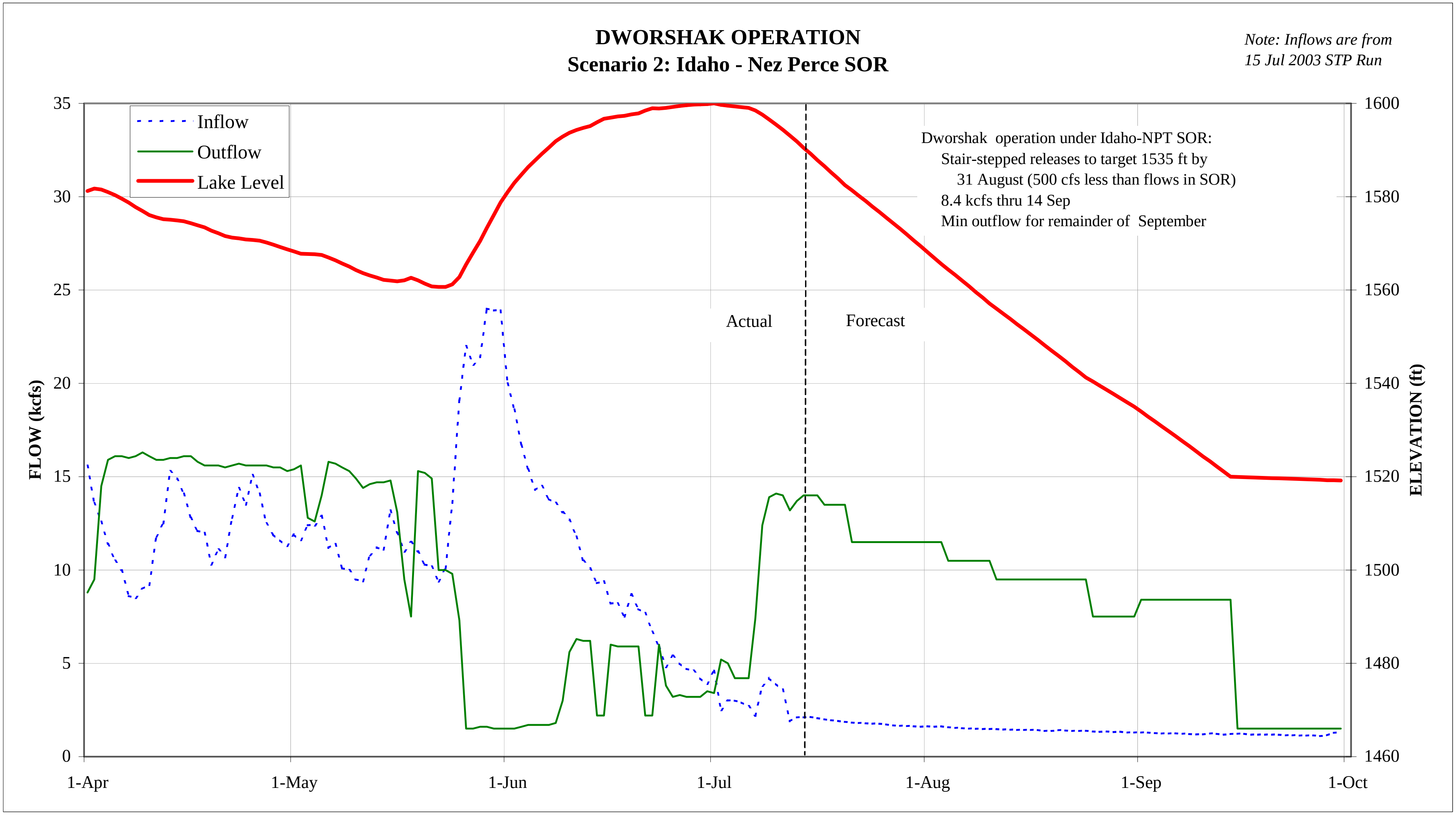
1. Welcome and introductions
2. TDG Tracking Update. (COE)

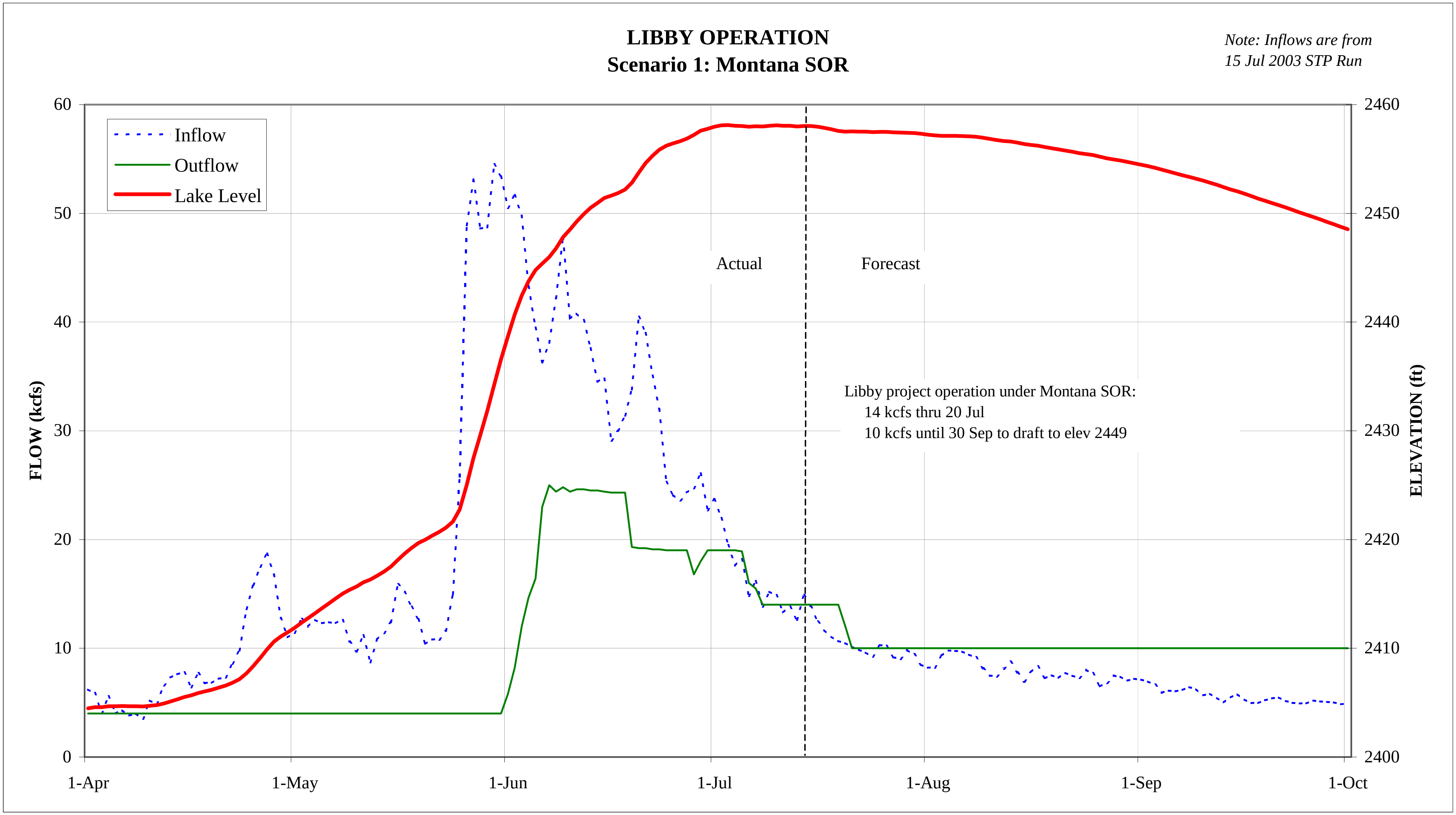
   [June 17-30 High 12hr Averages] [June 17-30 Exceedence Tracking] [July 1-14 High 12hr Averages] [July 1-14 Exceedence Tracking]
3. Ice Harbor Spill Test. (COE)
4. Hungry Horse Operations. (BOR)
5. Dworshak operations. (COE)
   [SOR #2003-C4] [SOR #2003-11] [Graphs] . [Fish and Wildlife Service Memo] . [Bill Muir Power Point Presentation]
6. Montana SOR (All). (SOR #2003-MT-1) . (Graphs) .
7. Review current system conditions.
   - fish migration status (NOAA Fisheries, USFWS)
   - reservoir operation, power system, water supply (COE, BOR, BPA)
8. Review operations requests.
9. Develop recommended operations for July 21 - August 3.
10. Implementation Plan '04-08.(COE)
11. Other.
    - set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

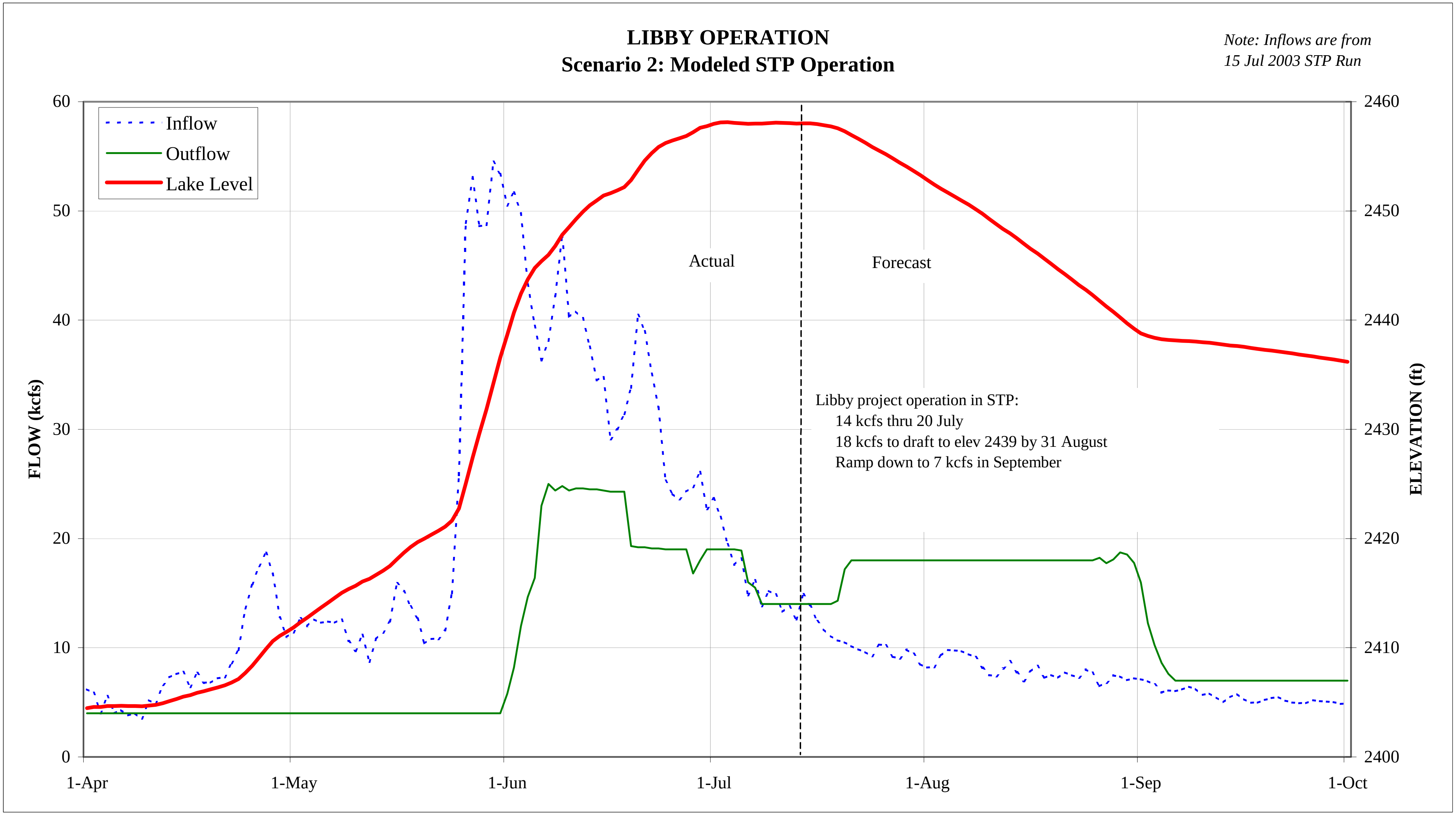


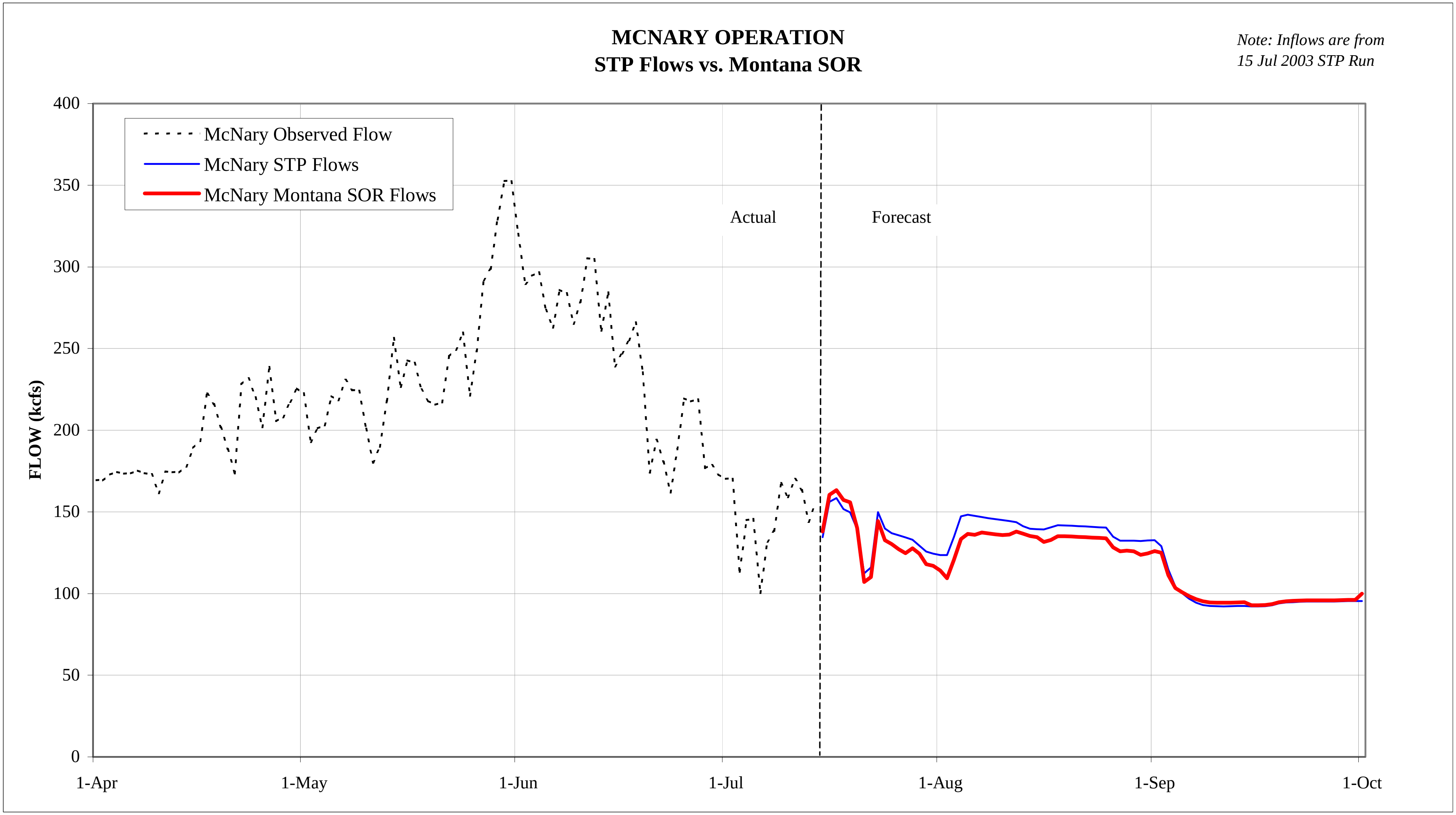
DWORSHAK OPERATION
Scenario 1: USFWS/ODFW SOR
Note: Inflows are from
15 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Dworshak operation under USFWS/ODFW SOR:
14 kcfs thru 23 Aug
Ramp down releases to hit 1520' on 31 Aug
Min outflow in September
Actual
Forecast
FLOW (kcfs)
ELEVATION (ft)
35
30
25
20
15
10
5
0
1600
1580
1560
1540
1520
1500
1480
1460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct


DWORSHAK OPERATION
Scenario 2: Idaho - Nez Perce SOR
Note: Inflows are from
15 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Dworshak operation under Idaho-NPT SOR:
Stair-stepped releases to target 1535 ft by
31 August (500 cfs less than flows in SOR)
8.4 kcfs thru 14 Sep
Min outflow for remainder of September
Actual
Forecast
FLOW (kcfs)
ELEVATION (ft)
35
30
25
20
15
10
5
0
1600
1580
1560
1540
1520
1500
1480
1460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct



LIBBY OPERATION
Scenario 1: Montana SOR
Note: Inflows are from
15 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Actual
Forecast
Libby project operation under Montana SOR:
14 kcfs thru 20 Jul
10 kcfs until 30 Sep to draft to elev 2449
FLOW (kcfs)
ELEVATION (ft)
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct


LIBBY OPERATION
Scenario 2: Modeled STP Operation
Note: Inflows are from
15 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Actual
Forecast
Libby project operation in STP:
14 kcfs thru 20 July
18 kcfs to draft to elev 2439 by 31 August
Ramp down to 7 kcfs in September
FLOW (kcfs)
ELEVATION (ft)
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct



MCNARY OPERATION
STP Flows vs. Montana SOR
Note: Inflows are from
15 Jul 2003 STP Run
FLOW (kcfs)
400
350
300
250
200
150
100
50
0
McNary Observed Flow
McNary STP Flows
McNary Montana SOR Flows
Actual
Forecast
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Idaho Fishery Resource Office
P.O. Box 18
4147 Ahsahka Road
Ahsahka, Idaho 83520-0018

15 July 2003

Dear Dave,

Clarification is needed on information I provided to resource managers this summer. Please circulate this memo to members of FPAC and TMT.

The topics include: 1) the effect of 2002 Dworshak summer operations on survival of wild Snake River subyearlings; 2) the 2003 passage forecast at Lower Granite Dam for wild Snake River subyearlings; and 3) my thoughts on decreasing flows at some point in July or August to provide water for augmentation in September.

The Effect of 2002 Dworshak Summer Operations on Survival

In 2002, some of the Dworshak Reservoir water typically released for summer flow augmentation in July and August was saved and released in early September. The effect of this change in operations on survival of wild subyearling chinook salmon in the Snake River was assessed as generally described by Connor et al. (2003a).

Survival was calculated to the tailrace of Lower Granite Dam for four cohorts of wild subyearling chinook salmon in each of five years (1998-2002; Table 1). Cohorts are groups of fish. Cohort 1 passes Lower Granite Dam first, followed by fish from Cohort 2, 3, and then 4. Cohort 1 typically experiences the highest flows and coolest temperatures, whereas cohort 4 experiences the lowest flows and warmest temperatures.

I fit a regression model for predicting survival to the tailrace of Lower Granite Dam from flow and temperature measured in Lower Granite Dam tailrace during 1998-2002. The regression equation was Cohort survival = 87.5 + 0.03186 Flow -4.8285 Temperature (N = 20; R^2 = 0.86; P < 0.0001).

Table 1.—Estimates of survival probability (%±SE) to the tailrace of Lower Granite Dam for cohorts of wild subyearling chinook salmon, 1998-2002.

Cohort	Survival by year					Cohort means
	1998	1999	2000	2001	2002	
1	70.8±2.9	87.7±4.6	57.1±4.1	40.1±3.1	55.4±3.0	63.9
2	66.1±3.3	77.0±3.8	53.4±4.2	20.5±2.5	48.3±3.0	54.3
3	52.8±3.1	81.2±5.8	44.4±3.6	17.2±3.0	39.2±3.0	48.9
4	35.6±2.9	36.4±3.5	35.7±4.3	4.0±1.3	19.4±2.0	27.9
Annual means	56.3	70.6	47.7	20.5	40.6	

I predicted survival for each cohort using the flows and temperatures observed in the tail race of Lower Granite Dam during the time the majority of smolts from each of the 2002 cohorts were passing the dam (Prediction A; Table 2). I then predicted survival for each cohort using the flows and temperatures that were approximated to have occurred if flow augmentation would have begun earlier in July. This alternative scenario included increasing outflow at Dworshak Dam up to approximately 14,000 CFS on 3 July and maintaining this release level until 18 August, after which outflow was gradually decreased to 10,000 CFS by 31 August.

Predicted survival under the alternative scenario (Prediction B; Table 2) was slightly higher than predicted survival under the observed scenario (Prediction A; Table 2). Although the differences in survival are not statistically different, predicted mean survival is greater under the alternative scenario compared to the observed scenario for each cohort. From a decision-making perspective, this suggests that the alternative scenario has greater survival benefit than the observed scenario (Table 2).

I suggest that shifting water into September 2002 had little effect on survival of wild Snake River subyearlings because inflow to Dworshak Reservoir was higher than normal through the first two weeks of July.

Table 2.—Predicted survival (%±95% C.I.) to the tailrace of Lower Granite Dam for cohorts of wild subyearling fall chinook salmon tagged in the Snake River in 2002. Prediction A = predictions made for observed flow and temperature conditions and Prediction B = predictions had flow augmentation begun earlier.

Cohort	Prediction A	Prediction B
1	65 ± 8	67 ± 8
2	58 ± 6	60 ± 7
3	47 ± 5	49 ± 6
4	27 ± 6	31± 6

The 2003 Passage Forecast at Lower Granite Dam

Since 1999, I have provided resource managers with forecasts of passage at Lower Granite Dam for wild subyearling fall chinook salmon that were PIT tagged in the Snake River. The forecast procedures were developed and validated using data collected during 1993-1998 (Connor et al. 2000). Forecast performance was marginal during 1999-2002. In two years, forecasted passage was very similar to observed passage. In two years, forecasted passage was markedly later than observed passage. The same pattern (i.e., good performance 50% of the time) was reported by Connor et al. (2000).

I keep revisiting the analyses in the hopes of improving forecast performance (makes me glad I am not a TV weatherman). I made the 2003 forecast using one of the improved methods. The resulting 2003 forecast is given in Table 3. A forecasted passage histogram is given in Figure 1 (top) for comparison to observed passage up until 10 July (Figure 1; bottom). The forecast suggests that 53% of the wild Snake River subyearlings passed Lower Granite Dam by 30 June and that passage would be complete by 2 August (Table 3; Figure 1).

Two outcomes are possible since I have not completely refined forecasting. The forecast will make the run look more protracted than in reality, or the forecasted passage date histogram is accurate but should have a long skinny tail extending into August.

Table 3.-Abridged forecast of daily cumulative passage at Lower Granite Dam for wild subyearling chinook salmon PIT tagged in the Snake River in 2003.

Year	Date	Forecast	90% Forecast Limits	
			Lower	*Upper*
2003	18-May	0%	0%	11%
2003	22-Jun	26%	16%	37%
2003	30-Jun	53%	42%	64%
2003	6-Jul	70%	59%	81%
2003	15-Jul	91%	80%	100%
2003	2-Aug	100%	89%	100%

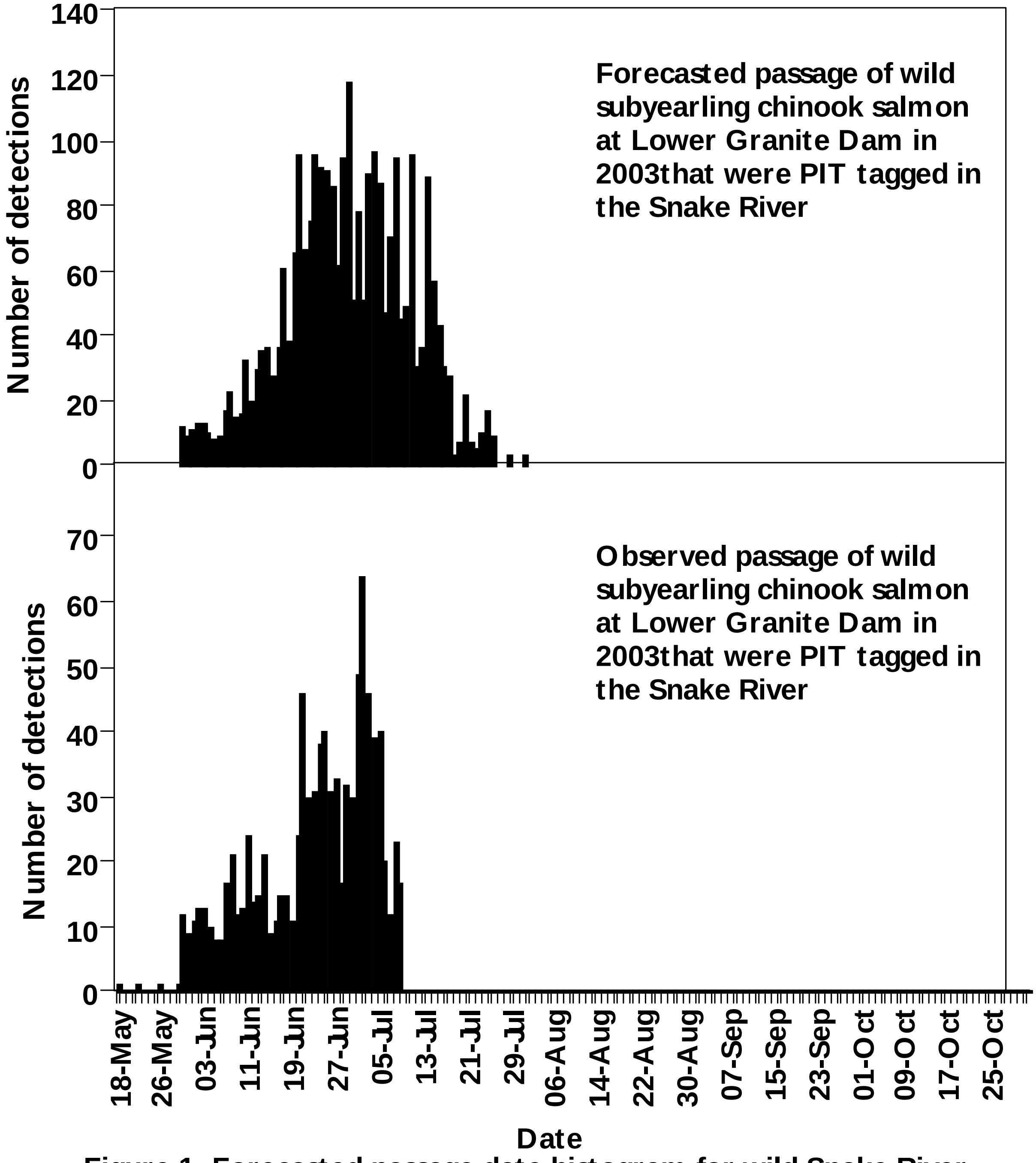


Figure 1.-Forecasted passage date histogram for wild Snake River subyearling chinook salmon at Lower Granite Dam in 2003 (top) compared to observed passage of PIT-tagged wild Snake River subyearlings at Lower Granite Dam in 2003 (bottom).

Thoughts on Releasing water in September

Releasing water in July and August is supported by five peer-reviewed analyses (Connor et al. 1998, 2002, 2003a, 2003b; Smith et al. in press). These papers focus mainly on Snake River fish, but also show benefits of flow augmentation for juveniles from the Clearwater River.

Releasing water in September is not supported by any peer-reviewed analysis on juvenile or adult fall chinook salmon from the contemporary spawning areas in the Snake River basin.

Therefore, I suggest that releasing the water in July in August is the option supported by the "Best Available Science" and the alternative most likely to help recover the Snake River fall chinook salmon ESU listed under the Endangered Species Act.

Some offer that water should be released in September to increase survival of September migrants because September migrants have high smolt-to-adult return rates (SARs). Though the existing evidence for high SARs for September migrants is exciting, the method for this analysis hasn't been written down or peer reviewed. I suggest that it would be premature to use this information as a basis for releasing water in September. Managers need to know: 1) what the 95% C.I.s are on the SAR estimates; 2) the assumptions and limitations of the analyses; and 3) why data collected on PIT-tagged hatchery juveniles represents SARs for wild untagged juveniles? *Managers also need to consider that reducing August flows will reduce the number of juveniles that survive through August to become September migrants.*

Another idea is that water should be released in September to help adult fall chinook salmon and steelhead. Dr. Chris Peery and his crew found evidence for decreases in body temperature and perhaps some behavioral effects associated with September releases. These are interesting results, but what managers really need to know is does releasing water in September increase the viability of fall chinook salmon spawners, their gametes, or their offspring?

Now don't get me wrong, releasing Dworshak water in September might indeed help fall chinook salmon juveniles and adults. My point is that the potential benefits of this September water have not been proven by conclusive empirical analyses.

In closing, I think submitting an SOR advocating the use of the water in July and August was the scientific thing to do. If we advocate the September releases in 2003, we will deviate from scientific management. The problem I see with this deviation is the precedence it sets for future years. In the future, spring run off into Dworshak Reservoir will not always extend into July (e.g., 2002) and passage at Lower Granite Dam by wild Snake River subyearlings won't always be complete by early August (e.g., 2003).

Keep up the good work,

William P. Connor
Fishery Biologist

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Smith, S. G., W. D. Muir, E. E. Hockersmith, R.W. Zabel, R. J. Graves, C. V. Ross, W. P. Connor, and B. D. Arnsberg. In press. Influence of river conditions on survival and travel time of Snake River subyearling fall chinook salmon. North American Journal of Fisheries Management.

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
July 16, 2003

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Ice Harbor Spill Test:
Mark Smith, COE, reported on the spill test at Ice Harbor that ended yesterday, which was compared to a similar test done last spring. The data presented today was raw and the results still uncertain. Mark did offer that a higher gate opening may be better for fish. As the data becomes clear, the results will be shared with TMT.

TMT discussed operations at Ice Harbor. NOAA proposed to continue the current operation, alternating bulk and no spill every two days until the results of the spill test is available. BPA proposed an alternative operation, half day spill (10 pm-10 am) and half day no spill (10 am-10 pm). The COE expressed concerns about erosion with bulk spill and would like to conduct a three day survey that would require no spill. The COE agreed to operate some bulk spill for the next week, but would like to revisit the issue next week. The USFWS expressed a desire to spill rather than not spill and will send a letter to TMT on this in the near future. The Service chose not to elevate the issue to IT at this time.

ACTION: A subgroup of TMT representatives met after today's meeting to discuss the details of the Ice Harbor operation, as everyone agreed to an alternating bulk/no spill operation over the next week.

UPDATE (7/17/03): The TMT sub-group consisted of Paul Wagner and Chris Ross (NOAA Fisheries), David Wills (USFWS), Shane Scott (WDFW), Scott Bettin (BPA), and Rudd Turner (COE). The sub-group agreed to 12 hours of bulk spill each night at Ice Harbor Dam, 8pm to 8am, then no spill each day from 8am to 8pm. There is no spill today after the end of the spill test, then bulk spill begins at 8pm tonight, Thu 17 July. There may be no spill for more than 12 hours next week to accommodate hydro surveys of the stilling basin, and this was acceptable to the sub-group. If more than 12 hours of no spill is needed, the sub-group requested that the extra hours occur in the morning rather than in the evening, i.e. start before 8am rather than end after 8pm. Due to concerns about possible stilling basin erosion, the COE's agreement to provide bulk spill operations is temporary, pending results of the hydro survey.

Current System Conditions*:*

Fish: Paul Wagner, NOAA Fisheries, reported on fish status, saying that there seems to be a decreasing trend in migration. Subyearling Chinook have been observed in significant numbers throughout the system. Snake River Fall Chinook passage peaked on July 1 at Lower Granite. Total numbers of PIT-tagged subyearling fish observed were high (1,064 at Lower Granite). Paul noted that the fish moved quickly through the system during high flows.

Reservoirs: Rudd Turner, COE, reported that Bonneville released 171.6 kcfs yesterday and is experiencing temperatures of 68-69 degrees; McNary was operating at 151.5 kcfs out, 68 degrees in the tailwater; Lower Granite, due to an outage yesterday, saw 23.1 kcfs out and 67-69 degrees; Dworshak is at 1589.2' elevation and releasing 14 kcfs; Libby is at 2458' releasing 14 kcfs; Albeni Falls is at 2062.3' and releasing 16 kcfs. Tony Norris reported Grand Coulee at elevation 1285.4'. Hungry Horse is at 3555.2' and releasing 5 kcfs.

Power system: Scott Bettin, BPA, reported that a line outage was completed at Lower Granite yesterday and everything is back to normal.

Water supply: A July final forecast has been issued from the National Weather Service, indicating below average precipitation this year. Rudd Turner reported that the COE STP run was completed (a handout was provided) showing McNary flows at about 150 kcfs this week, 140 next week, and 130 the following week. The projected summer season flow average is 141 kcfs at McNary and 34 kcfs at Lower Granite.

<u>Montana SOR 2003-MT-1</u>:
Jim Litchfield, Montana, gave a brief overview of the requests laid out in the SOR for operations at Libby and Hungry Horse:

1) A more gradual and stable outflow at both projects;
2) Support resident fish;
3) Reduce the overall draft to 10' by the end of September without going below the bull trout minimum flows;
4) Reduce summer spill in the lower river (50 kcfs at Bonneville, 30% of the river flow at The Dalles, and end spill at John Day upon completion of the current spill test).

Jim provided biological justification for this request to TMT from Montana and said that additional information can be found on the NPPC website. Before discussing this SOR, Paul Wagner discussed **SOR 2003-12** that was put forward by NOAA to explore a Libby/Arrow-Duncan water swap. This SOR, he said, would support Montana's request for stable flows at Libby. Scott Bettin updated TMT that BPA has been engaging in formal conversations with Canada on the potential for a swap. So far, Canada is not interested in a swap this year due to lack of available water and reservoir impacts to Canada.

<u>ACTION</u>: BPA will request a formal written response from Canada on this issue at the next TMT meeting.

Paul Wagner said that, absent the proposed swap and a good scientific study on effects of changes to the system, NOAA feels that the requests laid out by Montana cannot be achieved this year. NOAA supports continuing with the current Biological Opinion operation. NOAA is willing to engage in a regional study plan for Libby and Hungry Horse for future years and examine the effects of changes to the system and benefits/impacts on salmon.

The COE provided a model run of STP flows vs. the Montana SOR as requested at the last TMT meeting. The COE expressed concern that the requested operation would begin far below the flow objective and they are not supportive of this. They encouraged NOAA, Montana and others to engage in long term operation strategy discussions together.

Members of the TMT offered their responses to the Montana request:
Oregon – continue with the Biological Opinion operation and engage in regional discussions to develop a long term evaluation plan; will continue to look for ways to support Montana's request through a swap or other action.
Idaho – convene a consensus group to develop a test for Montana's request for 2004, and continue with the current operation for this year.
USFWS – regional buy-in is needed to change the operation so that it does not create a dispute. Continue with the current operation and develop a plan for 2004.
Washington – the study will be significant and should be conducted by the entire region. For now, continue with the Biological Opinion operation.
BPA – possibly implement some of the spill reductions requested; continue to examine the request as the season continues through regional discussions.
BOR – support NOAA's recommendation.
COE – plans to increase Libby discharge this weekend to get closer to 20' below full by the end of August; attempt to meet Biological Opinion summer flow objective at McNary and would like to see a regional evaluation.

Given today's discussion, Montana requested that the issue be elevated to IT and deferred to next week to allow further discussions to occur. The question to IT is: Should the recommendations on page 2 of SOR 2003-MT-1 be implemented in 2003?

The IT call is currently scheduled for next Thursday, 7/24 at 1 pm. The meeting will be held at NOAA in the First floor conference room, and the call-in number is 503-326-7672.

Dworshak Operations:
Bill Muir, NMFS Science Center, presented the latest information on Fall Chinook studies from 1995-2002. A handout was provided – see the handout for conclusions of the study. A TMT member asked if late migrant fish are bigger, and if this could be the reason for better survival?

Paul Wagner offered additional information on current fish conditions. July 1 was the peak passage date for Fall Chinook at Lower Granite. It appears that the fish are passing earlier this year so there may be an opportunity, from one perspective, to alter operations to support other migrating fish (in the Clearwater). Another perspective is to continue with operations as in the past to support fish from mid- to the end of July. Kyle Martin (CRITFC) said that the Nez Perce Tribe would like to see flows cut back after high temperatures subside after this weekend and not during those high temperatures, and get Dworshak to 1535' at the end of August, in order to benefit Clearwater fish.

ACTION: TMT agreed to operate Dworshak at 14 kcfs for one more week and check in during a TMT conference call next Wednesday, July 23.

ACTION: TMT will also review and discuss, during the 7/23 call, a memo from Billy Connor, USFWS, that gives an explanation of his data (the memo was distributed today).

Implementation Plan '04-08:
Ken Barnhardt, BOR, reported that the Action Agencies are soliciting feedback on the '04-'08 one- and five- year Implementation Plans before a draft plan is distributed. There is also a three year check in that will be conducted simultaneously. The Action Agencies would like input by the end of July and hope to finalize the Plan in September. A handout was provided with information on what type of input is being solicited and who to respond to.

Scott Boyd also noted that the COE one- and five- year Water Management Plans are being developed – TMT members should look for a draft one year plan in August.

TDG Tracking Update:
Jim Adams, COE, reported that there were some TDG exceedances from July 1-14, mostly at McNary and due to sharp temperature increases, possibly related to IHR spill. The COE is managing these exceedances as best as possible.

Develop Recommended Operations:
Rudd Turner summarized operations for the next week:

- Dworshak will hold at 14 kcfs;
- Libby will increase to 18 kcfs on 7/20; and
- Ice Harbor will continue an alternating spill/no spill pattern, the specifics of which will be determined by a subgroup of TMT (*See earlier note*).

CRITFC Comments on Fishery:
Kyle Martin, CRITFC, commented on the latest summer treaty fishery, which ended today. There was a drop in outflow which was due to transmission problems. Kyle said there will likely not be another summer Chinook fishery request this year.

Next Meeting, Conference Call, Wednesday July 23, 9 am:
Next week's conference call will be held to discuss Dworshak operations.

Analysis of LFH PIT tag SAR's

1995-2000 Releases

Design of Study

- This study was designed to evaluate relationships among smolt travel time, survival, and environmental variables- NOT ADULT RETURN RATES

Design of Study

- This study was designed to evaluate relationships among smolt travel time, survival, and environmental variables- NOT ADULT RETURNS
- Most non tagged juvenile fall chinook salmon (75-80%) are transported, therefore, SAR’s from fish slide-gated back to the river are not representative of the general population

Study Design

- In most years, releases (equal in size) were made upstream and downstream of the Salmon River and in some years the Clearwater River, from the end of May through early July at weekly intervals to provide estimates of survival and travel time over the entire fall chinook migration

Study Design

- Smolt size and timing of releases were based on natural migrants from USFWS

Study Design

- Smolt size and timing of releases were based on natural migrants from USFWS
- Travel times, arrival dates at LGR, and survival to LGR were nearly the same for wild and hatchery fish in 1995-1998, and 2001, but survival was much lower for hatchery fish in 1999, 2000, and 2002.

Preliminary Results

- From releases of 209,388 PIT tagged smolts, 615 adults have returned so far

Preliminary Results

- 7,234 smolts were transported
- 58,047 smolts were bypassed
- 21,603 smolts estimated never detected
- 3,386* smolts migrated the following year
- The rest died above Lower Granite Dam

*Unable to quantify for 1999 releases because of detection system changes

Preliminary Results

Disposition	# adults	SAR*
Transported	100	1.38%
Bypassed	245	0.42%
Never detected	223	1.06%
Holdovers	42	1.24%

* LGR to LGR, estimated

Preliminary Results

- SAR from release to return to LGR was similar among release groups from early (late May/early June) to late (late June/early July) releases

Preliminary Results

- SAR from release to return to LGR was similar among release groups from early (late May/early June) to late (late June/early July) releases
- Estimated SAR from LGR to LGR (i.e., accounting for differences in estimated survival release-to-LGR) was substantially higher for the later release groups

Preliminary Results

	Adults	SAR rel-LGR	S	SAR LGR-LGR
Early June	87	0.77%	41.7	2.10%
Mid June	103	0.91%	25.5	3.84%
Early July	73	0.64%	9.0	12.08%

1999 releases (incomplete returns)

Conclusions

- Hatchery fish were reasonable surrogates for wild fish in most years

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Conclusions

- Hatchery fish were reasonable surrogates for wild fish in most years
- Since most fish are transported, their performance is the real issue, however we have little data for them
- For fish that remain inriver, SAR’s are higher for later migrants and fish that holdover, perhaps due to culling effects

Conclusions

- We currently have insufficient data for transported fish to determine whether there are temporal trends in SAR

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / Lori Postlethwait* **BPA:** *Scott Bettin / John Wellschlager*

NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*

OR: *Ron Boyce* **WA:** *Shane Scott* **ID:** *Steve Pettit* **MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner*

TMT CONFERENCE CALL

23 July 2003   0900-1100 hours

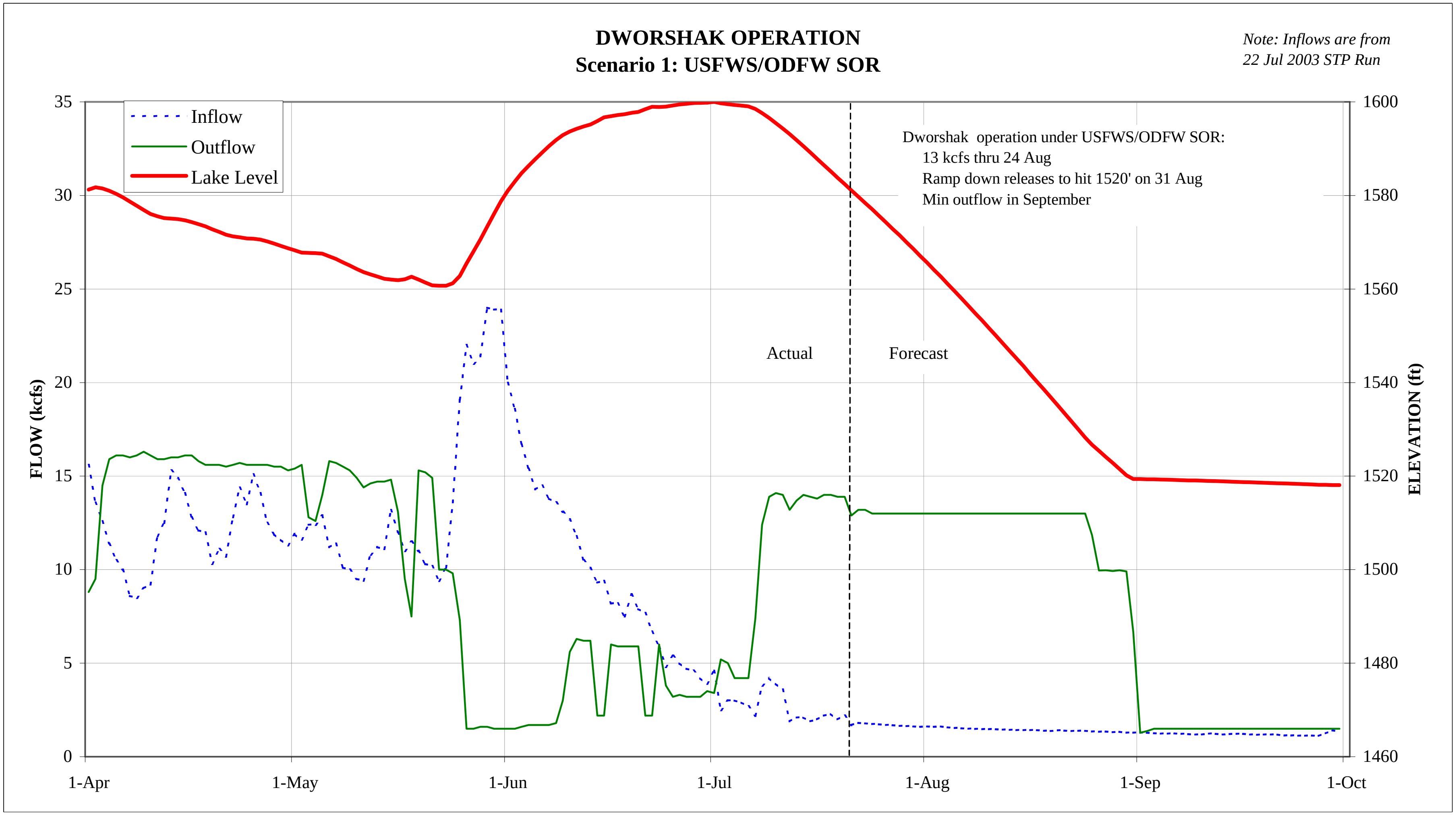
Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

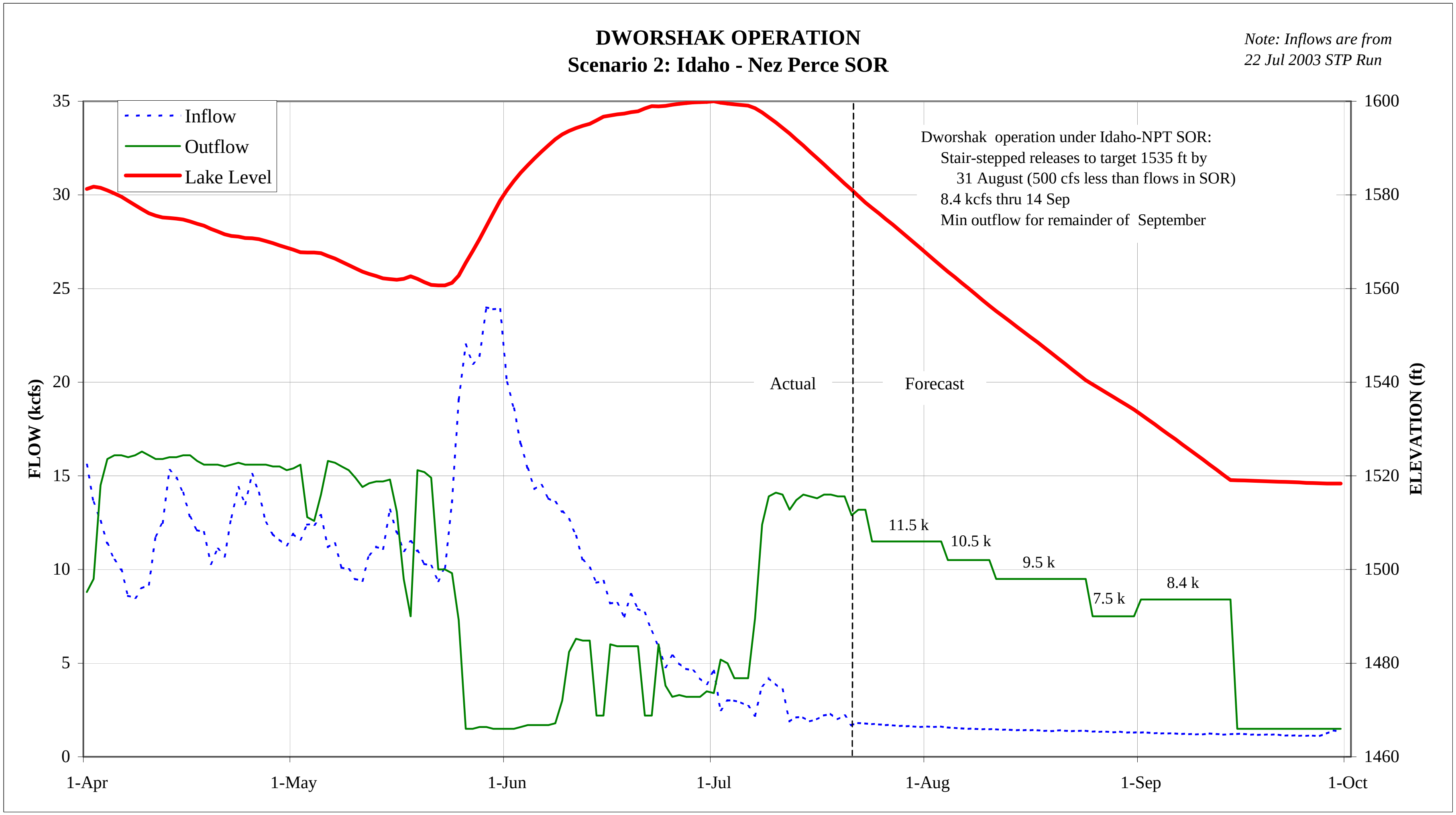
All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions
2. Ice Harbor spill update. (COE) [Joint Technical Staff Letter] .
3. Libby and Hungry Horse operations update. (COE, BOR) (LIB Graphs) .
4. Dworshak operations. [SOR #2003-C4] [SOR #2003-11] (DWR Graphs) .
5. Summer spill - Lower Columbia. (SOR #2003-MT-1) .
6. Other.
    - set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.


DWORSHAK OPERATION
Scenario 1: USFWS/ODFW SOR
Note: Inflows are from
22 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Dworshak operation under USFWS/ODFW SOR:
13 kcfs thru 24 Aug
Ramp down releases to hit 1520' on 31 Aug
Min outflow in September
Actual
Forecast
FLOW (kcfs)
ELEVATION (ft)
35
30
25
20
15
10
5
0
1600
1580
1560
1540
1520
1500
1480
1460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct



DWORSHAK OPERATION
Scenario 2: Idaho - Nez Perce SOR
Note: Inflows are from
22 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Dworshak operation under Idaho-NPT SOR:
Stair-stepped releases to target 1535 ft by
31 August (500 cfs less than flows in SOR)
8.4 kcfs thru 14 Sep
Min outflow for remainder of September
Actual
Forecast
11.5 k
10.5 k
9.5 k
7.5 k
8.4 k
FLOW (kcfs)
ELEVATION (ft)
35
30
25
20
15
10
5
0
1600
1580
1560
1540
1520
1500
1480
1460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct

State, Federal and Tribal Fishery Agencies Joint Technical Staff

US Fish and Wildlife Service

Columbia River Inter-Tribal Fish Commission

Idaho Department of Fish and Game

Oregon Department of Fish and Wildlife

Washington Department of Fish and Wildlife

Shoshone-Bannock Tribes

July 21, 2003

Brian Brown
Assistant Regional Administrator
NOAA Fisheries
525 NE Oregon St., Suite 420
Portland, OR 97232

Jim Ruff, NMFS
Chief Hydro Operations Branch
NOAA Fisheries
525 NE Oregon St.
Portland, OR 97232-2737

Dear Mr. Brown and Mr. Ruff:

The technical staffs of the Columbia River Inter-Tribal Fish Commission, the Oregon Department of Fish and Wildlife, the Washington Department of Fish and Wildlife, the Idaho Department of Fish and Game, the U. S. Fish and Wildlife Service and the Shoshone-Bannock Tribes have serious concerns regarding NOAA Fisheries' recent decision to support the federal operators in curtailing daytime spill at Ice Harbor Dam. This spill is required under the 2000 FCRPS Biological Opinion. A series of rapid conclusions were drawn and decisions were made primarily based upon preliminary data that has not been available for our review. At the June 20, 2003 NOAA Fisheries' Implementation Team meeting, NOAA Fisheries and the federal operators made a decision to implement and study two options: a bulk spill pattern operation and a no-spill operation. In addition to the process by which the decision-making took place, we do not agree with the conclusions drawn or the summer post-study operations decision. We believe that the 24 hour Biological Opinion (BiOp) spill, either the existing or bulk spill pattern, should be implemented until information from ongoing studies identify alternative operations can provide higher survival benefits than the BiOp.

We have serious concerns regarding the application of the recent Ice Harbor passage study results to short and long term fishery operations decisions at Ice Harbor Dam. Our primary concern is that NOAA Fisheries is making passage mitigation decisions on the basis of data that do not adequately support those decisions. We believe that the studies recently conducted at Ice Harbor Dam are significantly flawed with respect to study design. Further, the studies are insufficient for making project operational decisions for fish passage because, among other things, they are not robust in describing project (reservoir, dam and tailrace) mortality[1] or adequate in determining indirect and delayed effects that are only possible in smolt-to-adult survival studies. In addition, the NOAA Fisheries' decision-making process did not allow for adequate participation by the co-managers, since recent results were not available for review when the decision was made. NOAA Fisheries' decision-making process was faulty because it incorporated recent study results without adequate consideration of the weaknesses of the research results. The decision process was finalized without recognition of the value of collecting data in a comparable fashion across years and without adopting a precautionary approach in examining the likely detriments of no-spill operations. NOAA Fisheries should be joining the co-managers in developing broadly-based and comprehensive monitoring and evaluation programs to provide early detection to avoid significant impacts to stock productivity from passage as noted by Hilborn (1987).

We expand on the details of our specific concerns in the following discussion. In summary, they are:

- Recent studies (in 2003) at Ice Harbor (although preliminary) raise issues regarding validity of the results from studies conducted in 2000 and 2002.

- Studies at Ice Harbor have not provided information on relative survival through specific passage routes, yet NOAA Fisheries is making management decisions on survival through specific passage routes assumed in the 2000 Biological Opinion.

- A no-spill operation is not a normative river condition and will likely decrease migration rates and increase forebay delay, which could result in significant mortality via predation, disease and residualization of the run at large. A no-spill operation likely increases injury and mortality for adult fall chinook and steelhead that fall back through the powerhouse (turbines and juvenile bypass system) rather than over spillway. While NOAA Fisheries identified reduction of fall back mortality as a key concern for recovery (NMFS 1999), they have not considered it in making the operational decision to curtail Ice Harbor daytime spill during hours of peak adult passage.

- A scientifically rigorous study design adopted with the concurrence of the fishery managers must be developed to evaluate spill passage at Ice Harbor. The results of studies conducted under such an agreed-upon design would provide a common acceptable basis for future fish passage management decisions.

---

[1] The 2000 FCRPS Biological Opinion specifies that project mortality should be measured as the preferred metric to assess individual project effects on salmon passing the project.

As outlined in our previous technical memorandum, for a mark-recapture study to be valid, marked fish must reflect the actual conditions that fish will experience arriving at, passing through, and traveling below the dam. To date, it appears that none of the studies to estimate spillway survival at Ice Harbor have achieved this criterion, and therefore cannot be considered sufficient for changing BiOp requirements. In particular, we question the use of the hose releases in selected locations for representing the experience of a smolt passing through the spillway. This is an extremely important study design requirement at Ice Harbor since mechanical injury of fish has been shown to be highly influenced by the depth of fish passing over a spillgate with higher mortality observed for fish that were released deeper in the water column.

The only final report available addressing Ice Harbor Spillway survival is Eppard et al. (2002). In this study conducted in 2000, river-run hatchery yearling and subyearling chinook salmon were collected at Lower Monumental Dam, PIT tagged, transported to Ice Harbor Dam, and released. The treatment groups were released through a 10.2 cm diameter hose into spillbays 3, 5 and 7; release depth is not specified in the report. The control groups were released from a barge at mid-channel 0.8 km below the dam. Relative spillway survival for hatchery yearling chinook was estimated to be 97.8%. Relative spillway survival for hatchery subyearling chinook was estimated to be 88.5%. For both yearling and subyearling chinook the relative survival estimates increased with both total dam discharge and spillway gate position (number of stops). However, hose releases inject fish into a specific depth within the water column and thus do not reflect the actual conditions experienced by fish arriving at and passing through a spillway. Because the hose depth may differ from the depth at which fish pass through the spillway, the depth of the release point may affect the study results.

Eppard and Gores conducted a similar study in 2002 at Ice Harbor Dam with the addition of radio tags, but to-date only the research proposal is available for review. Consequently, we are unable to comment on the research methods or the validity of the results that were generated. However, NOAA Fisheries has repeatedly cited these results in support of the change in summer operations.

Balloon tag studies on yearling chinook were conducted at Ice Harbor Dam during the spring of 2003. In this study, the proportion of fish without injuries was estimated. Summarizing the preliminary results into a deep release group (3 feet above ogee, with 2, 3, or 4 stops) and a shallow release group (7 feet above ogee, with 5 stops or more) resulted in estimates of 82.2% and 94.4% uninjured fish, respectively. These preliminary results suggest that either the depth of release or the spillway gate position (stops) may affect the injury rate of yearling chinook. However, these results also force us to question how the depth of release and the number of stops affected the survival estimates reported in Eppard et al. (2002). If release depths or gate stops can affect injury rates, then it is reasonable to expect that these factors will also affect survival estimates. This is a significant shortcoming, which calls into question the validity of the results for 2000 and the preliminary results for 2002.

While we understand the concern these data have generated, a thorough review of all relevant studies needs to be conducted before extensive alterations are made to a study design that was agreed upon before the season. Two years of similar data are not enough to make a dramatic change in operations, especially considering the situation the region witnessed at The Dalles Dam, where two years of data showed similar results, but the third year showed significantly different results from the previous years. Each year is unique with regard to flow, temperature, time of freshet, fish condition, and migration time. Two years of data, one of which we have been unable to review, is hardly enough to justify radical changes in fish passage operations. We support continued evaluations at Ice Harbor, however, we need several (at least three) years of replicated and standardized treatments to insure that data are adequate to make management decisions.

No recent turbine survival estimates are available at this time. The only turbine survival study conducted at Ice Harbor was in 1968. This study indicated an 81 to 90% turbine survival of coho salmon with a substantially higher predation loss. While the predation loss may have improved over time with better project operations (units 4-6 were skeleton bays at that time) and predator removal, the direct turbine survival may have decreased due to substantial wear on the turbine units, particularly units 1-3 (which are scheduled for rehab in the next few years). The current turbines at Ice Harbor are getting close to the end of their design life. Fatigue and failures have occurred both recently and in the past. Turbine unit #3 is out of service for an extended period after part of the turbine blade broke off and was discharged into the draft tube. It is likely that the other turbines in the powerhouse are similarly nearing their life expectancy and not operating at peak operations, which could be negatively impacting juvenile survival through the units. It is therefore likely that the 90% survival estimate that was used in the 2000 BiOp and in model studies, is overestimating survival. The Dalles turbines, which are also scheduled for rehabilitation over the next several years, have survival estimated to be in the low 80 percentile range. The spring migrant survival estimate for turbine passage at units 1 and 3 in 2003 was estimated at 87%. This is likely an optimistic estimate since the fish were directly released into the turbines, and therefore did not account for any forebay mortality prior to the release point in the turbine. Further, predation upon spring migrants is less of a factor than predation upon summer migrants due to lower water temperatures, predator abundance, and behavior. Summer migrants are likely to be more stressed due to high temperatures combined with disease and parasite concerns, since the Snake River regularly surpasses the 68 degree F water temperature standard. There are no summer migrant survival data related to the bypass system. Guidance has been estimated to be 54% from the 2000 FCRPS Biological Opinion, using upstream projects as an estimate. A no-spill operation could potentially put 46% of the migrants through the turbines.

A no-spill operation would also increase forebay delay. Venditti et al. (2000) studied the migration of fall chinook in the Snake River, specifically at Little Goose Dam. They compared migration times and patterns from 1995 – 1997. The July flows for this time period were considered above normal, with the years ranking eighth, tenth, and fifth in flow overall. While the bulk of the migrants passed through the upper reach within 5 days, a significant proportion, 10-20% of population, delayed in the lower reservoir and forebay reach for 7 days or more. In the slack water forebays of dams without spill, Venditti et al. found that nearly 22% of the fish reversed migration and migrated back upstream. These excursions and delays waste finite energy reserves necessary for survival to saltwater and exacerbate the low energy reserves noted in fall chinook from lack of quality food in Lower Snake River reservoirs (Bennett et al.1999). Further, delays and upstream excursions subject salmon migrants to increased exposure to high water temperatures. These temperatures are correlated with increased predation rates associated with elevated temperatures (Poe et al. 1991), diseases and parasites (McCullough 1999), impairment to migration and reversal of smoltification (Zaugg 1981). Migration times in a low flow year (e.g., 2003) would likely be even worse. This increased delay exposes migrants to two deleterious conditions (predation and high water temperatures), which can increase the likelihood for considerable mortality among smolts that experience lengthy delay. None of this was accounted for in the discussions about a no-spill option.

In conclusion, we request that NOAA Fisheries reconsider their decision to curtail daytime spill at Ice Harbor Dam and collaborate with co-managers to develop a robust study design incorporating passage through the entire project (with smolt to adult returns if feasible) that will support the management decision-making process. We encourage NOAA Fisheries to seriously consider the concerns and comments of the co-managers in short and long-term fish passage management decisions at Ice Harbor and other projects where we share management responsibility. Changes to dam operations for fish passage specified by the 2000 FCRPS Biological Opinion are significant and should not occur based upon uncertain and inadequate technical information and without full consultation leading to concurrence by the state, tribal and other federal fishery co-managers. We request that NOAA fisheries respond to this letter and specifically describe their technical justification for recommending this variation from the spill measures contained in the 2000 Biological Opinion.

Sincerely,

David Wills, USFWS

Steve Pettit, IDFG

Ron Boyce, ODFW

Tom Lorz, CRITFC

Shane Scott, WDFW

Keith Kutchins, SBT

References

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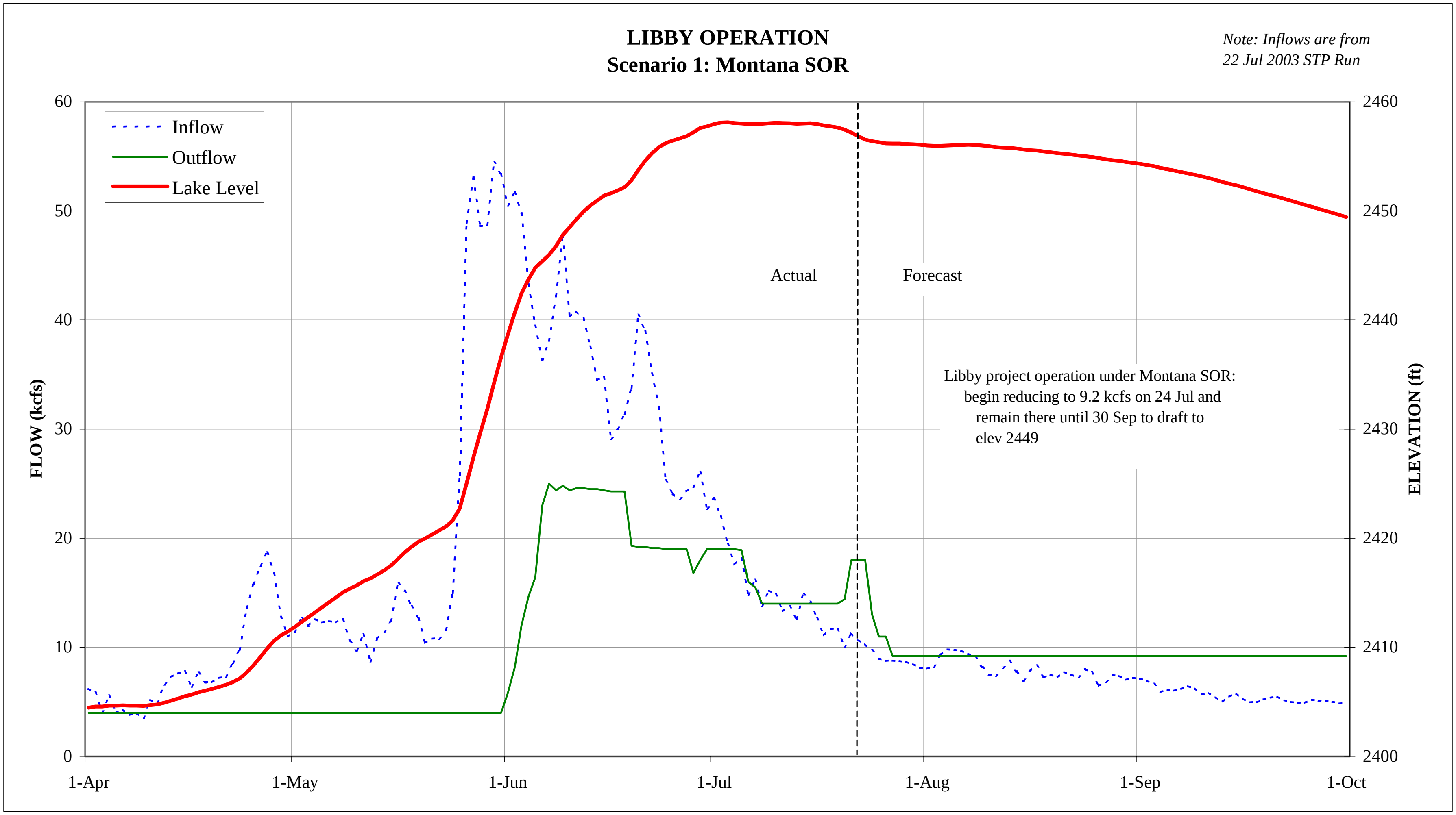
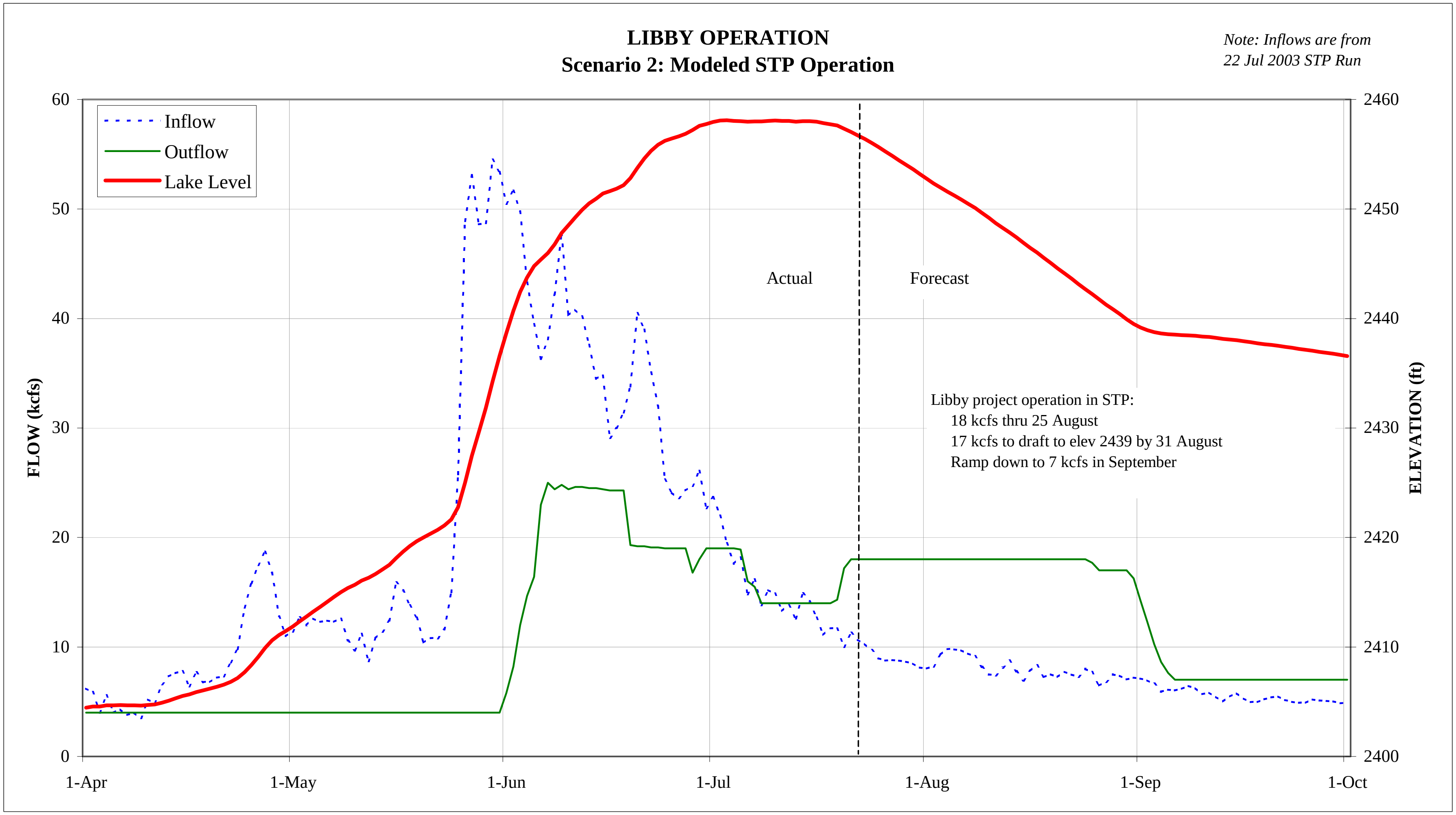


LIBBY OPERATION
Scenario 1: Montana SOR
Note: Inflows are from
22 Jul 2003 STP Run
FLOW (kcfs)
ELEVATION (ft)
Inflow
Outflow
Lake Level
Actual
Forecast
Libby project operation under Montana SOR:
begin reducing to 9.2 kcfs on 24 Jul and
remain there until 30 Sep to draft to
elev 2449
0
10
20
30
40
50
60
2400
2410
2420
2430
2440
2450
2460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct



LIBBY OPERATION
Scenario 2: Modeled STP Operation
Note: Inflows are from
22 Jul 2003 STP Run
Inflow
Outflow
Lake Level
FLOW (kcfs)
ELEVATION (ft)
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
Actual
Forecast
Libby project operation in STP:
18 kcfs thru 25 August
17 kcfs to draft to elev 2439 by 31 August
Ramp down to 7 kcfs in September
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
July 23, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

TMT Internet Homepage: http://www.nwd-wc.usace.army.mil/TMT/index.html

DRAFT

1. Greeting and Introductions

The July 23 Technical Management Team conference call was chaired by Rudd Turner of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Rudd Turner at 503/808-3935.

2. Ice Harbor Spill Update.

Turner said that, at last week's TMT meeting, it was agreed to implement a 12-hour-on, 12-hour-off post-test spill regime at Ice Harbor. A TMT subgroup convened after that meeting set the hours of the spill operation at 8 p.m. to 8 a.m., with no spill from 8 a.m. to 8 p.m. At the TMT meeting, said Turner, the Corps expressed concern about Ice Harbor stilling basin erosion due to bulk spill, and said it may be necessary to have a no-spill period of 12 hours or more this week to conduct a survey of the sites of concern. There was a 14-hour no-spill period yesterday and again today to allow the contractor to conduct those surveys, he said, from 6 a.m. to 8 p.m. Once spill begins tonight, the schedule will return to normal. The contractor's report, which will tell the Corps whether it is OK to continue bulk spill this summer, will be available by August 1; until we receive his report, the Corps will continue to provide bulk spill of 11 Kcfs-18 Kcfs per spill bay during the evening hours, Turner said.

Turner added that no information is available yet from the PIT-tag survival and injury test at Ice Harbor; the earliest that information is going to be available is the end of this week. The Corps will distribute that information to the TMT as soon as it becomes available, Turner said. We'll convene a special meeting if the information warrants, he said.

Wills noted that six fishery management agencies have drafted a letter in response to the decision to discontinue spill during daytime hours at Ice Harbor for the rest of the season. The analysis in the letter is the opinion of the six fish agencies as to why that should not happen, said Wills. The bottom line is that we don't support the decision by the subcommittee to discontinue bulk spill during the day, said Boyce; we feel that decision needs to be brought back to this table once the information from the PIT-tag test becomes available. Turner noted that it was a TMT, not a subgroup, decision to alternate zero spill and bulk spill during daytime and nighttime hours; Boyce replied that, in the opinion of the salmon managers, that was a premature decision. Wills noted that the Fish and Wildlife Service's position, expressed at that TMT meeting, was that daytime spill should continue. Paul Wagner said NOAA Fisheries will be providing a response to the letter.

3. Libby and Hungry Horse Operations Update.

Turner said Libby elevation, as of midnight last night, was 2457.1 feet, two feet from full; the project is releasing 18 Kcfs and drafting 0.3 feet per day. Inflows are about 12 Kcfs. We increased flow from Libby from 14 Kcfs to 18 Kcfs at 10 p.m. Sunday night, Turner said; at this point, we plan to continue that rate of discharge through August 25. Ted Day of Reclamation said Hungry Horse, as of midnight last night, was at elevation 3553.2 feet, releasing 5 Kcfs, drafting 0.3 feet per day, with inflows of 1.2 Kcfs. We are on a path to draft both Libby and Hungry Horse 20 feet by August 31, said Turner.

In response to a question from Boyce, Scott Bettin reiterated that the Canadian operators are not interested in doing a Libby/Arrow swap in 2003, due to low flows in the Canadian portion of the system. Arrow is currently four feet from full, and will be drafting heavily across the month of August, said Cindy Henriksen – that's why they're not interested in swapping. Also, at Duncan, the high flows last year caused environmental (flooding, bull trout habitat) problems, so they are unwilling to repeat last year's Libby/Duncan swap, Henriksen said.

At last week's TMT meeting, Montana indicated that it would be elevating the implementation of SOR MT-1, covering the 2003 Libby/Hungry Horse operation, to the Implementation Team; that meeting has been set for tomorrow (July 24) at 1 p.m., Turner said.

4. Dworshak Operations.

At last week's TMT meeting, we agreed to continue to release 14 Kcfs from Dworshak until today, Turner said. We have been doing so, with the exception of a couple of brief reductions to adjust the selector gates to maintain the target release temperature of 45 degrees. Dworshak is now at elevation 1579.7 feet, 20 feet from full, with inflows of less than 2 Kcfs and discharge of 13.2 Kcfs – we're starting to bump up against the 110% TDG cap. The project is drafting 1.3 feet per day, Turner said.

The question for today's meeting is, do we want to reduce Dworshak outflow? Wagner said. The current release volume and temperature is doing a pretty good job of moderating temperatures in the Lower Granite tailrace, which are running 65-66 degrees despite the fact that air temperatures in the Lewiston area are in excess of 100 degrees. The forecast starting tomorrow is for moderating temperatures, with air temperatures in the low 90s through the weekend, said Kyle Martin. NOAA Fisheries' proposal is to reduce Dworshak discharge to 12 Kcfs starting at 6 p.m. Thursday, then watch Lower Granite forebay temperatures closely to see what will happen, said Wagner; we will discuss the data at FPAC on Tuesday, and again at TMT on July 30.

Turner distributed a pair of Corps modeling runs showing the flow and elevation impacts of the Idaho/Nez Perce and Oregon/USFWS SORs; he spent a few minutes going through the contents of these analyses. We need to know what elevation we want Dworshak to be on August 31, said Turner, because we're nearing the next decision point at which we will need to step down Dworshak outflow if we're going to implement the Idaho/Nez Perce SOR. Wagner noted that air temperatures are expected to peak during the next two weeks, after which they should begin to move downward; to NOAA Fisheries, it makes sense to frontload the cold water into this period, but review the operation on a weekly basis, as is being done today. Martin said CRITFC agrees with this assessment.

Boyce said that, in Oregon's opinion, it doesn't make sense to reduce Dworshak outflow at this time. Adult passage has dropped off like a rock, and biologically, it doesn't make sense to drop flows at this time, he said. If this is part of the overall Idaho/Nez Perce/NOAA Fisheries strategy, that's fine, he said, but let's flesh out the long-term strategy, rather than adjusting on the fly at the TMT's weekly meetings. Turner said that, in his opinion, the decision has not yet been made as to whether Dworshak should end August at elevation 1535 or elevation 1520.

Silverberg asked the TMT members to state their position on this issue. Wagner said that, because of the early subyearling chinook run timing this year, NOAA Fisheries would prefer to save some water for use in September, with the objective of maintaining tolerable temperatures in the Lower Granite tailrace across the entire migration season, which includes the first two weeks in September. Given the very high SARs of the fish that outmigrate late in the season, said Wagner, we feel the biological benefits of this strategy are real. Martin added that September releases from Dworshak will also benefit adult passage during that period.

Oregon and the Fish and Wildlife Service would prefer to draft Dworshak to elevation 1520 by August 31, said Boyce and Wills; however, as our SOR states, we probably won't raise that issue to IT, Wills said. That doesn't mean we have consensus, it just means we aren't going to elevate the issue.

Any other thoughts on the Dworshak operation? Silverberg said. It is Idaho's hope that the operation laid out in our SOR will not result in a significant change in the temperature regime in the Lower Snake, compared to the Oregon/USFWS SOR, said Pettit. Shane Scott said that, in WDFW's opinion, the operation should continue as planned, targeting an August 31 elevation at Dworshak of 1535 feet, with weekly TMT check-ins. Boyce reminded the group that flow is as important as temperature at this time of year; the cooling effects will be better at 14 Kcfs than they will at 12 Kcfs or 10 Kcfs. True, said Scott, but then we'll be killing fish in September.

The Corps is OK with reducing Dworshak outflow to 12 Kcfs at this time, and to target elevation 1535 feet at Dworshak by August 31, with the caveat that, as Shane says, we ought to continue to check in on this issue weekly, Turner said. The Corps does have some concern that we will not meet the summer BiOp flow objectives at Lower Granite and McNary, and the Idaho/Nez Perce operation will move additional water out of the summer period, Turner said; however, given the information NOAA Fisheries has recently put on the table regarding the benefits of continued cool-water releases on passage and survival during the late summer and fall, we're willing to implement the requested operation.

Day said Reclamation is willing to implement the Idaho/Nez Perce operation as long as

NOAA Fisheries supports it; he added, however, that he doesn't understand why Idaho Power/Hells Canyon complex operations have not been a part of this discussion. If past operations are any indication of Idaho Power's likely strategy during the next few weeks, he said, you can expect a significant increase in the amount of warm water heading down the system from Brownlee. Bettin replied that, because Idaho Power generally chooses not to participate in the Regional Forum process, there is little the TMT can do to influence Hells Canyon operations.

Bettin said BPA is willing to support the requested operation, but would prefer to see Dworshak outflow reduced to full powerhouse capacity, with no further spill at that project, as soon as possible.

Our planned operation, then is to maintain the current Dworshak operation until 6 p.m. tomorrow, July 24, at which point we will reduce Dworshak outflow to 12 Kcfs, Turner said. We will maintain that rate of discharge at least until next week's TMT meeting. We also understand that we're starting down a path that will end with an August 31 elevation of 1535 feet at Dworshak, Turner said. In response to a question from Kathy Hlebechuk, Wills said his understanding is that Dworshak National Fish Hatchery is reporting no unusual problems with fish growth due to the Dworshak operation at this time.

Dave Statler noted that, on the positive side, it appears that the gods have been smiling, in that, by implementing the Idaho/Nez Perce operation in 2003, it has been possible to maintain an acceptable temperature range at Lower Granite despite very hot weather in the Lewiston area.

5. Summer Spill at the Lower Columbia Projects.

This topic was not discussed at today's meeting.

6. Next TMT Meeting Date.

The next face-to-face meeting of the Technical Management Team was set for Wednesday, July 30. Meeting summary prepared by Jeff Kuechle, BPA contractor.

TMT PARTICIPANT LIST
July 23, 2003

Name	**Affiliation**
Scott Bettin	BPA
Ron Boyce	ODFW
Cindy Henriken	COE
Rudd Turner	COE
Jim Litchfield	Montana
Shane Scott	WDFW

Paul Wagner	NOAA Fisheries
Donna Silverberg	Facilitation Team
Cathy Hlebechuk	COE
David Benner	FPC
Russ George	WMCI
David Wills	USFWS
Ted Day	Reclamation
Lance Elias	PPL
Tom Le	PSE
Terry Weeks	PNGC
Steve Hayseker	USFWS
Richelle Beck	D. Rohr & Associates
Tim Heizenrater	
Kevin Nordt	PGE
Laura Hamilton	COE
Jim Adams	COE
Scott Boyd	COE
Kyle Martin	CRITFC
Mike O’Bryant	CBB
Nick Lane	BPA
Mike Buchko	Powerex
Bill Rudolph	NWFL
Dave Statler	NPT
Steve Pettit	IDFG

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / Lori Postlethwait*			**BPA:**	*Scott Bettin / John Wellschlager*		
NMFS:	*Paul Wagner / Chris Ross*			**USFWS:**	*David Wills / Howard Schaller*		
OR:	*Ron Boyce*	**WA:**	*Shane Scott*	**ID:**	*Steve Pettit*	**MT:**	*Jim Litchfield*
			COE: *Cindy Henriksen / Rudd Turner*				

TMT MEETING

30 July 2003   0900-1200 hours

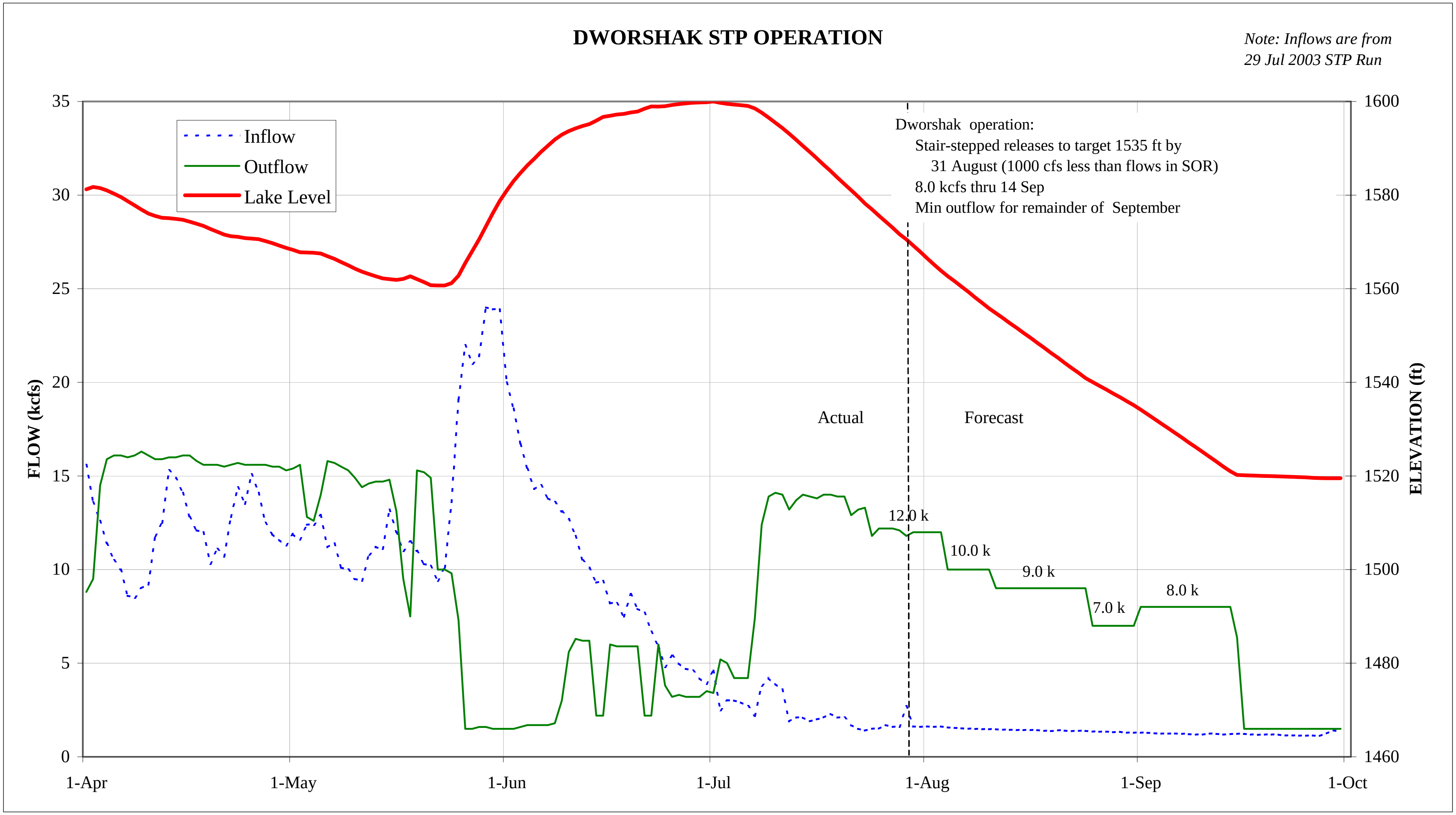
Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Operations updates: Dworshak, Libby, Hungry Horse. (COE, BOR)
3. Ice Harbor spill update. (COE)
4. Zone 6 Treaty fishing report. (CRITFC)
5. Review current system conditions.
    - fish migration status (NOAA Fisheries, USFWS)
    - reservoir operation, power system, water quality, water supply (COE, BOR, BPA) [Exceedence] [High 12-hour]
6. Review operations requests.
7. Develop recommended operations for August 4 - 17.
8. Other.
    - set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.



DWORSHAK STP OPERATION
Note: Inflows are from
29 Jul 2003 STP Run
Inflow
Outflow
Lake Level
Dworshak operation:
Stair-stepped releases to target 1535 ft by
31 August (1000 cfs less than flows in SOR)
8.0 kcfs thru 14 Sep
Min outflow for remainder of September
Actual
Forecast
12.0 k
10.0 k
9.0 k
7.0 k
8.0 k
FLOW (kcfs)
ELEVATION (ft)
35
30
25
20
15
10
5
0
1600
1580
1560
1540
1520
1500
1480
1460
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 N.E. Oregon, Suite 200, Portland, Oregon 97232
Telephone (503) 238-0667
Fax (503) 235-4228
www.critfc.org

TO: Technical Management Team (TMT)
FROM: Kyle Martin, *Senior Hydrologist*, CRITFC Hydro Program
DATE: July 30, 2003

SUBJECT: Impact of Pool Fluctuations on the 2003 Summer Treaty Fishery

CRITFC submitted two System Operation Requests (2003-C3 and 2003-C5) via the NMFS' TMT forum in support of a summer treaty fishery—first one in 38 years. The CRITFC request asked for (1) specific elevations and (2) stable pool elevations during July 14-16 and July 21-23.

Criterion #1 asked to operate the pools within a one-foot specified elevation range. The Corps replied with a commitment to a 1.5-foot range, and then only in Bonneville pool, as they have done so since 1996 (according to the Corps' interpretation of the "Ted Strong agreement"). The Corps claims the top operating limit at the Bonneville pool is 76.5 feet, and not 77 feet (full pool) as outlined in the CRITFC request, and will not exceed that upper limit except for an emergency.

The table below shows the hourly compliance of CRITFC's elevation range criteria during the treaty fishery. On average, the Bonneville pool complied 22% of the time. Using the Corps 75.5 to 76.5 foot range, compliance was 82%. The Dalles (Celilo) pool complied 54% of the time. The John Day pool complied 17% of the time.

2003	Bonneville Pool	The Dalles Pool	John Day pool
1 foot range (CRITFC):	76 - 77 ft	158.5 -159.5 ft	263.5 - 264.5 ft
JUL 14 - 16	39%	34%	10%
JUL 21 - 23	5%	74%	25%
1 foot range (COE):	75.5 - 76.5 ft	158.5 -159.5 ft	263.5 - 264.5 ft
JUL 14 - 16	89%	34%	10%
JUL 21 - 23	75%	74%	25%
1.5 foot range (COE):	75 - 76.5 ft	158 -159.5 ft	263 - 264.5 ft
JUL 14 – 16*	100%	89%	77%
JUL 21 - 23	100%	100%	90%

*BPA reported transmission line problems from The Dalles to John Day dams.

Pool elevation data is a good measure as to the absolute pool fluctuations (Criterion #2) as shown in figures 1 (Bonneville) and 2 (The Dalles). Bonneville pool saw 0.8 - 1.0 foot swings. The Dalles pool saw 0.8 – 1.8 foot swings. John Day pool saw 0.5 – 1 foot swings. This data will serve as a base-line for future summer fisheries. The Tribal harvest of summer Chinook was ~2100 during the July 14-16 fishery and ~1500 during the July 21-23 fishery.

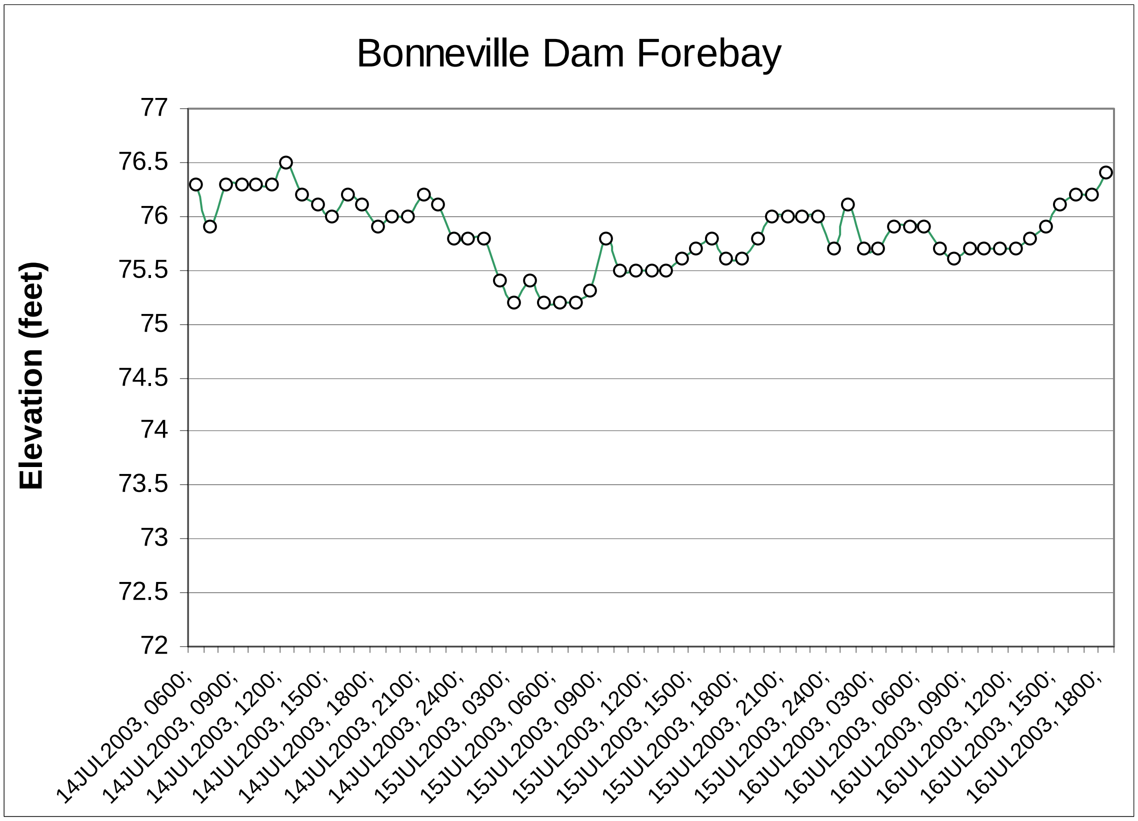


Figure 1a. Observed pool elevations during July 14-16, 2003 summer treaty fishing (BON pool).

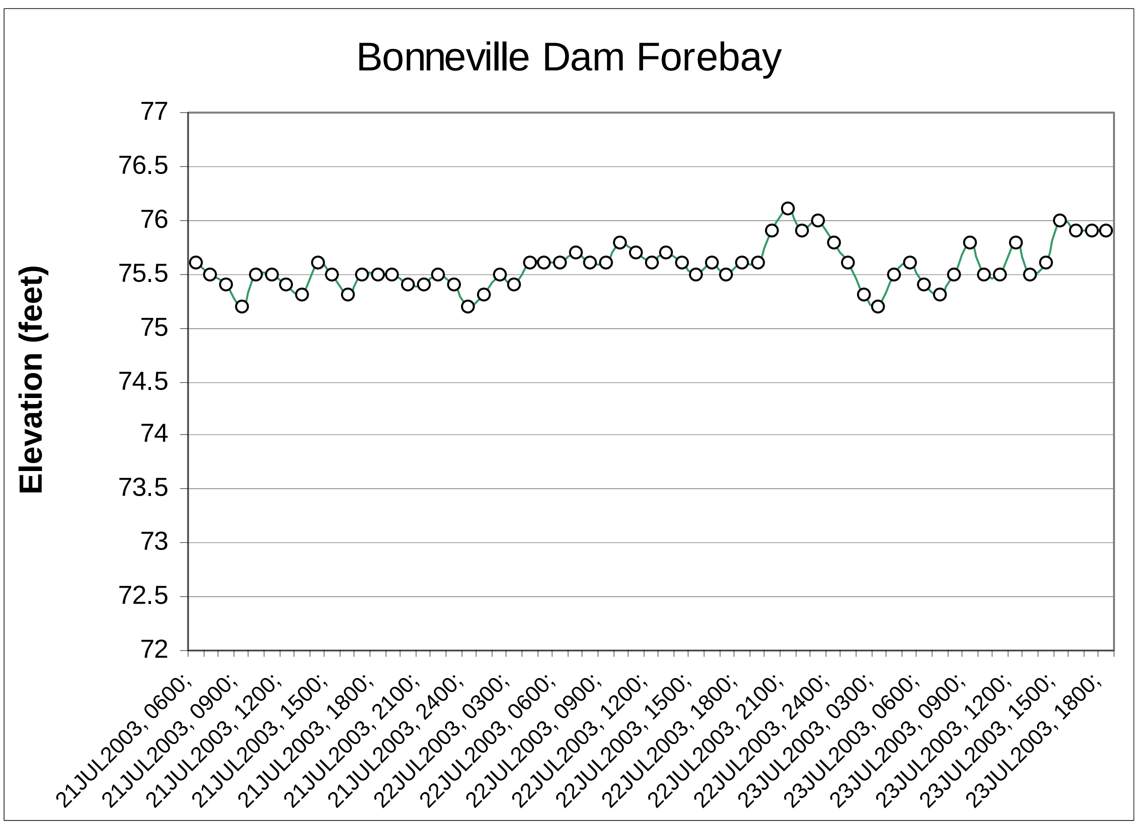


Figure 1b. Observed pool elevations during July 21-23, 2003 summer treaty fishing (BON pool).

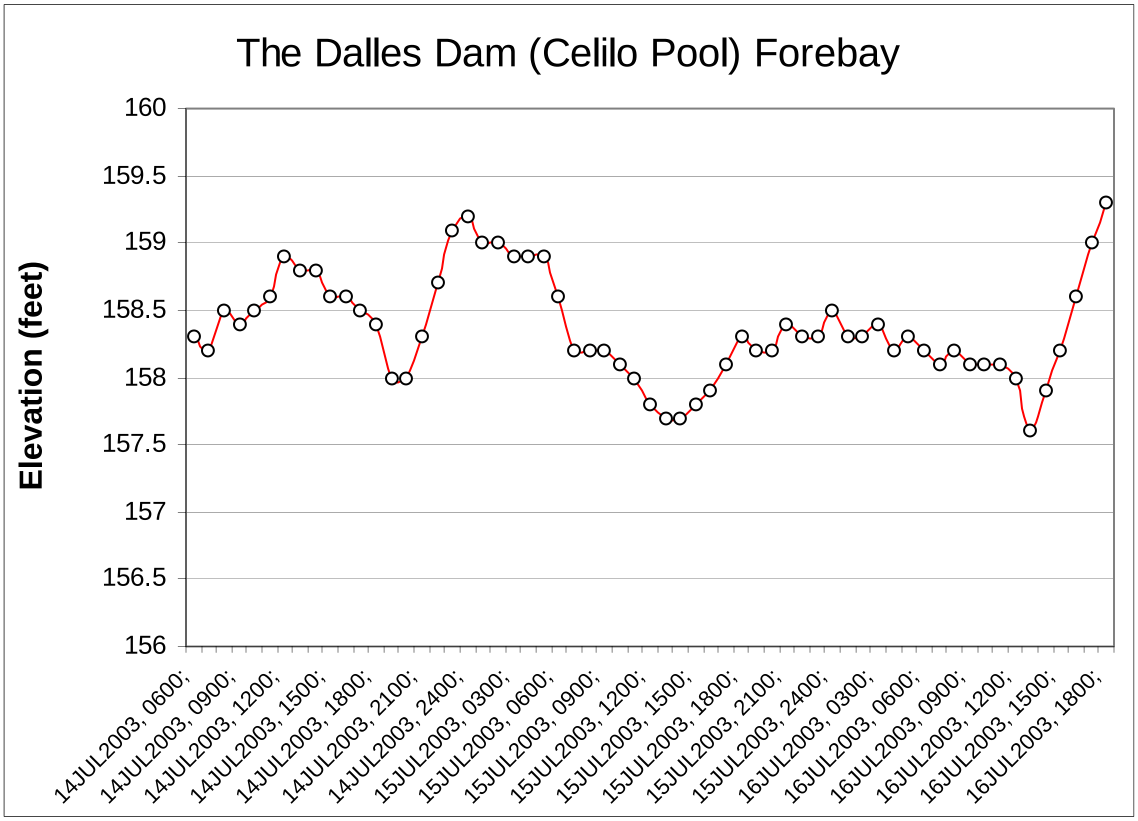


Figure 2a. Observed pool elevations during July 14-16, 2003 summer treaty fishing (TDA pool).

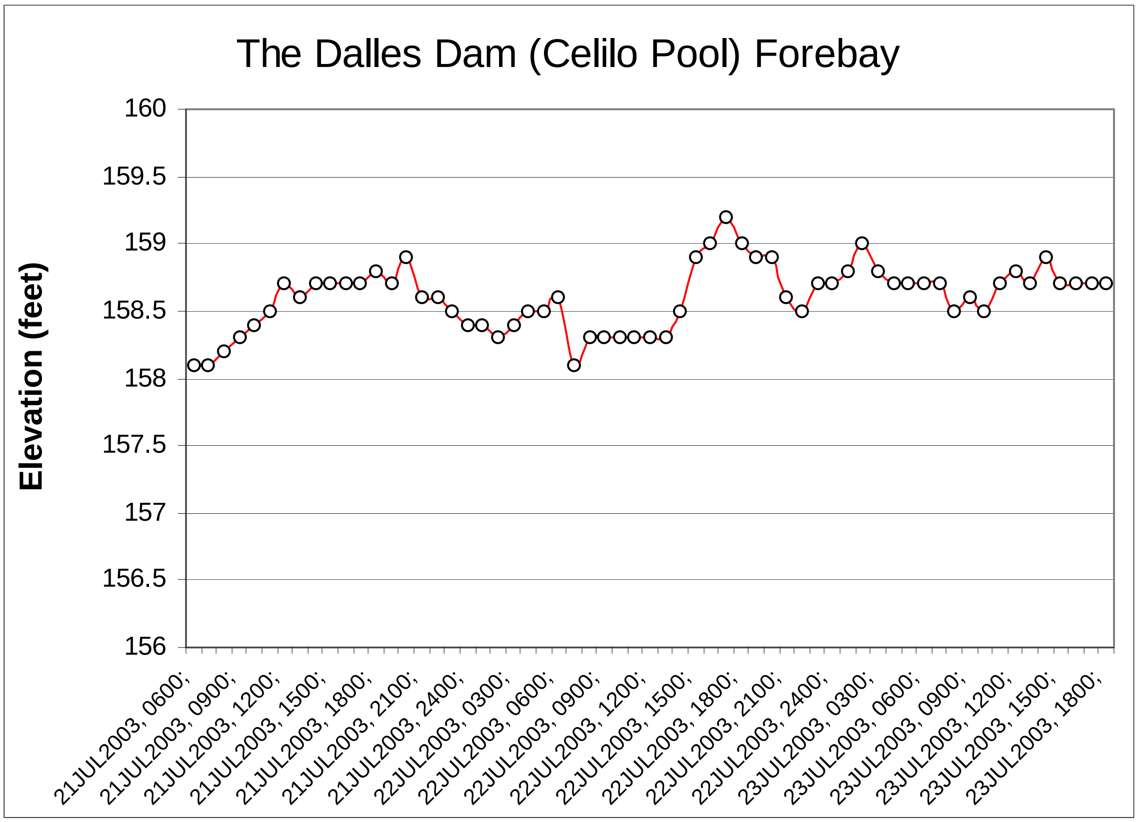


Figure 2b. Observed pool elevations during July 21-23, 2003 summer treaty fishing (TDA pool).

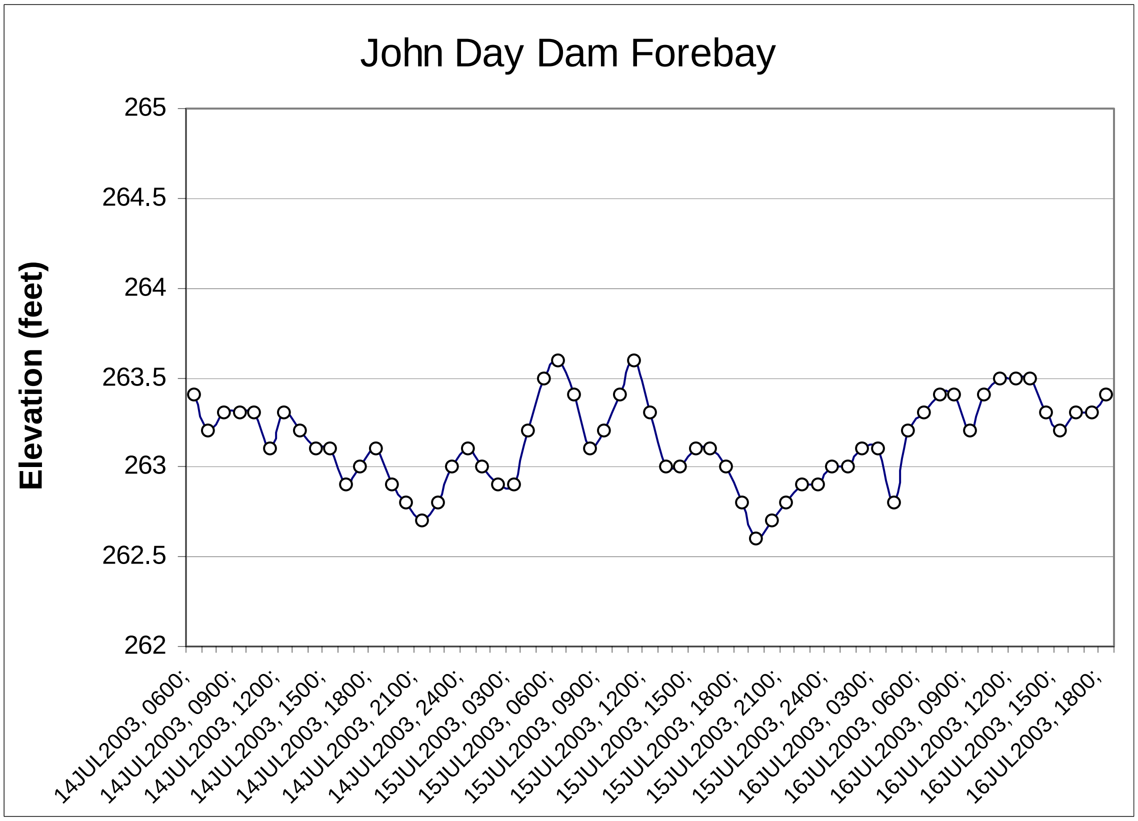


Figure 3a. Observed pool elevations during July 14-16, 2003 summer treaty fishing (JDA pool).

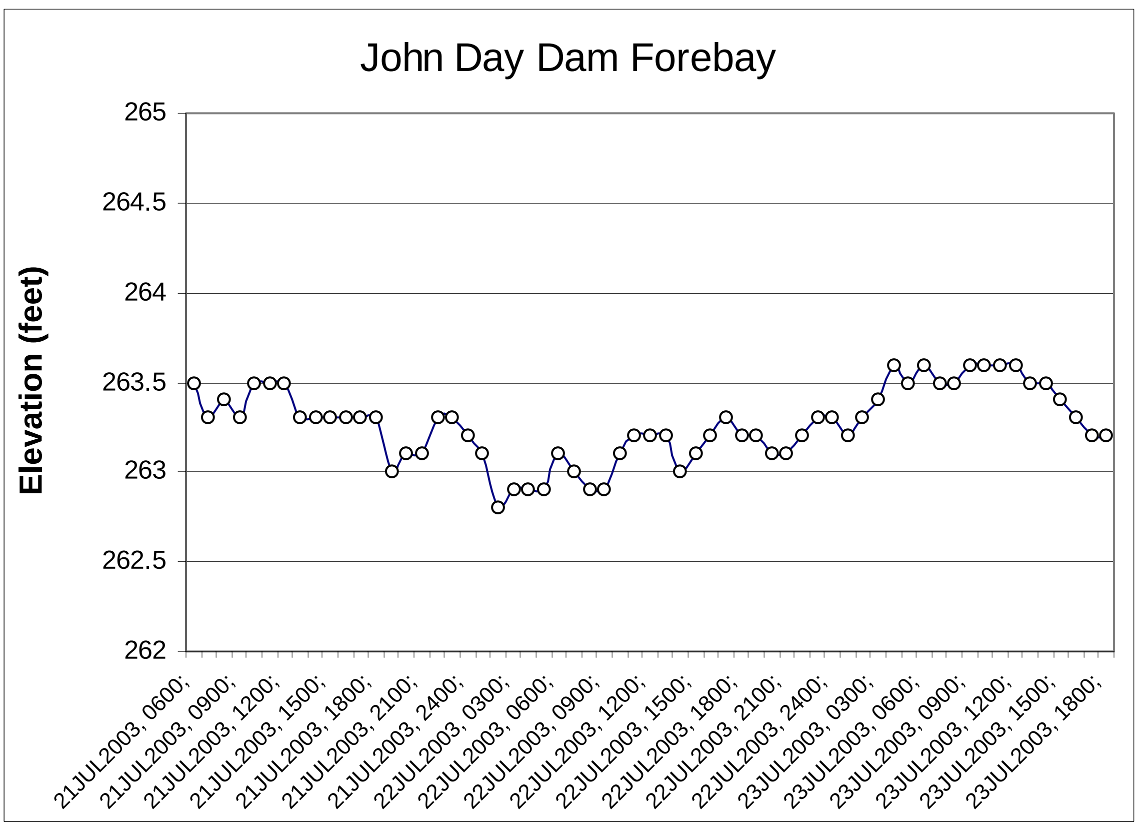


Figure 3b. Observed pool elevations during July 21-23, 2003 summer treaty fishing (JDA pool).

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
July 30, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Robin Harkless

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Operations Updates:

Dworshak: Cindy Henriksen, COE, provided handouts and reported that operations at Dworshak are 'on track'; the reservoir is 20' from full. The model run provided by the COE puts Dworshak at an elevation of 1535' by August 31. The model run ramped the project down on Monday, August 4 to 10 kcfs. TMT discussed operations for the next week at Dworshak. The Salmon Managers support targeting 1535' with temperatures as the top priority. Air temperatures are expected to be high in the Lewiston area. The Salmon Managers would like to check on temperatures in the area again on Friday before making operation decisions about Dworshak.

ACTION: As agreed to by the TMT, Cindy Henriksen, Paul Wagner, and Greg Haller will hold a conference call this Friday to discuss temperatures and operations at Dworshak. Paul will email the operating decision to TMT members after the call on Friday afternoon. Flows will be reduced on Monday, August 4. TMT will revisit this issue during a conference call next Wednesday, August 6.

Libby is operating at 17 kcfs outflow, and is five feet from full and drafting.

Hungry Horse is at elevation 3550.5' and releasing 5 kcfs out. Tony Norris reported that the BOR will continue to monitor the project through August and may operate Columbia Falls at minimum flows ahead of schedule.

Grand Coulee is at elevation 1283'. Banks Lake is scheduled to be drafted around August 1 with a target of 1565' at Grand Coulee before Labor Day weekend.

Jeanne Cozad from the Transmissions Business Line (TBL) joined the TMT to answer questions about Tuesday's outage at Libby. She gave TMT a heads up that a power circuit breaker will need to be replaced, which will require restrictions at Libby for three weeks. The proposed schedule for this is October 27-November 14. TMT will revisit this issue at a future meeting.

ACTION: John Wellschlager, BPA, will coordinate with Tracy Rolstad and a policy person from the TBL to present information to TMT about power outages. Specifically, they will present information about configuration problems (and fish interaction with transmission stability) and the request to upgrade the transmission. John will check on their availability to present at the August 13 or 27 TMT meeting.

Ice Harbor Spill Update*:*
Paul Wagner reported that the results from the Ice Harbor spill test are not yet available. FDRWG was scheduled to discuss the results during a meeting after today's TMT discussion. NOAA recommended that the bulk spill pattern continue until the information is available. A survey was done by the COE to look at effects of a bulk spill pattern on the spillway at Ice Harbor. The results of the survey should be available later this week.

SOR 2003-13:
Dave Wills, USFWS, presented a request for the Action Agencies to mitigate for losses in BiOp. spill at Ice Harbor by increasing spill at Lower Columbia projects, (e.g. McNary) through the spill season. Some TMT members felt that until there is known data about the effects of the Ice Harbor spill test on fish, it is not known whether the reduction in spill had a positive or negative impact so mitigation is not required. Those that signed onto the SOR disagreed with the spill test operation, feeling that it was a 'rapid' decision based on preliminary data that wasn't made available to everyone. They would like to see spill elsewhere in the system to make up for lost spill at Ice Harbor. Paul Wagner, NOAA, noted that better communication was needed between the co-managers on this issue to avoid the perception that the spill test was a decision made in haste. Cindy Henriksen noted that this was a planned test that requires adaptive management and that the COE would not support mitigating for a planned study. Due to uncertainty at McNary regarding temperature and other factors, NOAA did not sign on to the SOR and expressed a desire to have a more informed discussion.

ACTION: If information is available, there will be a conference call this Friday, August 1 at 1:00 p.m. to discuss Ice Harbor operations. TMT hopes to have more concrete data from the spill test, and the COE may have results from the survey conducted last week.

Zone 6 Treaty Fishing Report:
Kyle Martin, CRITFC, reported on the latest summer treaty fishery and offered comparative statistics to the last spring fishery. Overall he noted that there seems to have been an improvement in the COE's operations; the fishing was slow but good and no damage to nets had been reported to date. Kyle's handout can also be found on the TMT web page.

ACTION: Jim Litchfield requested information on spring chinook and steelhead numbers at the next TMT meeting, which Kyle Martin will provide.

Review Current System Conditions:

Fish: Paul Wagner reported that adult total numbers were high. July 18 is the predicted 95% passage date at Lower Granite for Snake River wild fall Chinook. Paul pointed out that it was an early run for juvenile out-migration.

Reservoirs/power/water quality/water supply: Jim Adams, COE, reported that there were six TDG exceedances at McNary, most likely due to high temperatures over the last two weeks. Operators did a good job of staying very close to the gas cap at Dworshak even during a transition in operations. Cindy Henriksen said there will be observed runoff data available at the next TMT meeting.

Other:

- Shane Scott, Washington, shared with TMT that he will be leaving his position at WDFW on July 31 and joining the Public Power Council on September 1. He expressed appreciation for the opportunity to work with members of the TMT. TMT members thanked him for his contributions to the team and wished him well in his new position.
- Rudd Turner, COE, noted that there will be a special operation at Ice Harbor this Saturday, August 2, to allow for a dive to retrieve a portion of a turbine blade. This will require some minimum flows at Ice Harbor. TMT members agreed that health and safety issues are a priority. If the COE needs to change the operation to no spill, TMT will be notified of this action.

Next Meeting, Conference Call, Wednesday August 6, 9 am:
NOTE: There may be a conference call this Friday, August 1, to discuss Ice Harbor spill data and the COE survey, if the information is available. This will be followed by a TMT conference call next Wednesday, August 6, at which Dworshak operations will be discussed. If there are agenda items to add to the August 6 TMT call, please contact Cindy Henriksen at the COE or Robin Harkless at DS Consulting. Thank you.

1. Greeting and Introductions

The July 30 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Robin Harkless. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Operations Updates: Dworshak, Libby, Hungry Horse.

Henriksen distributed a handout showing the currently-modeled Dworshak operation for August, noting that Dworshak is releasing 12 Kcfs and is near elevation 1570, about 30 feet from full. One of our goals for today's meeting is to revisit the Dworshak operation in light of the current water temperature information from Lower Granite, she said. In our modeling this week, we put our priority of reaching elevation 1535 by August 31; that translates into a flow across the month of August that is about 1 Kcfs less than the flows requested in SOR 2003 C-4. That means we would need to reduce Dworshak outflow to 10 Kcfs, rather than 11 Kcfs, on August 4, she said.

At Libby, we're continuing to release 18 Kcfs except for a short rampdown yesterday for a transmission system outage, Henriksen said; the project is five feet from full and drafting. Hungry Horse is at elevation 3550 and five feet from full; we're looking at whether or not we need to step down to the Columbia falls minimum to reach 3540 by the end of August, she added. Norris reported that Grand Coulee is now at elevation 1283, said Tony Norris; Banks Lake is within two feet of full pool and will begin drafting on August 1, with the goal of reaching elevation 1565 by the Friday or Saturday before the Labor Day weekend. The Columbia Falls minimum is 3,372 cfs; the Hungry Horse minimum outflow is 687 cfs, at least until the January forecast is available.

Is there TMT agreement that we should be shaping our operation to hit elevation 1535 at Dworshak on August 31? Henriksen asked. FPAC discussed this issue yesterday, Paul Wagner replied; while there was some difference of opinion, there was general agreement that we should be targeting elevation 1535 by August 31, subject to regular review of the water temperature situation at Lower Granite. Despite the recent hot weather at Lower Granite, tailrace temperatures continue in the 65-67 degrees F range. In other words, he said, the 12 Kcfs from Dworshak seems to be doing the job, in terms of keeping water temperatures at Lower Granite below the 68-degree threshold. The weather continues to be very hot in Lewiston; it's supposed to be 107 degrees today, but the trend over the next week is downward, beginning Friday – in the mid-90s, rather than 100 degrees+, said Kyle Martin.

Wagner touched briefly on the temperature situation in 2003 compared to previous years, noting that there is little difference between the temperature situation in 2003 and 2000, 2001 and 2002. We're doing what we've been doing, said Wagner; I would like to check in on Friday, to see whether or not we want to go to 10 Kcfs from Dworshak on Monday. Wagner said the salmon managers will review current air and water temperature information and will contact Henriksen on Friday afternoon with their recommendation.

Martin said that, based on his forecast, the peak of summer air temperatures is likely just about over; the traditional late summer jet stream pattern is setting in and temperatures should begin to moderate somewhat from here on out. Shane Scott noted that, at yesterday's FPAC meeting, while there was agreement that the Corps should structure the Dworshak operation to target elevation 1535 by August 31, temperature control at Lower granite is actually the highest priority. After a few minutes of additional discussion, it was agreed that, unless there is a radical departure from the planned operation, there is no need for a TMT conference call on Friday. Instead, Wagner will send out an email to the TMT membership describing the Dworshak operation. It was agreed that there will be a brief TMT conference call next Wednesday, August 6, to revisit the Dworshak operation.

The discussion then turned to yesterday's transmission system emergency at Libby Dam; Avista had a circuit breaker problem at Noxon, so outflow was stepped down while the problem was corrected. Avista plans to replace the PCBs at that station from October 27 through November 14; that will require the Corps to reduce generation to a 240 MW maximum at Libby during that period. Henriksen suggested that the TMT discuss that planned maintenance operation at an upcoming meeting. Litchfield noted that there are currently a number of transmission-related voltage stability issues in the system, many of which could impact fish operations. John Wellschlager offered to have personnel from Bonneville's Transmission Business Line come to a future TMT meeting to provide a presentation on this topic, either August 13 or August 27. It was agreed that this would be useful.

3. Ice Harbor Spill Update.

Wagner said his understanding is that FFDRWG will be discussing results from the Ice Harbor balloon-tag and PIT-tag survival tests at its meeting today; he said no additional data from these tests has been provided to NOAA Fisheries since the last TMT meeting. As a result, said Henriksen, we're continuing with the bulk spill operation we discussed last time. The surveys of the spillway were concluded earlier this week; no information from those surveys has yet been provided.

4. Zone 6 Treaty Fishing Report.

Martin said there is a hotlink to the report on the most recent tribal treaty fishery on the TMT homepage; he went briefly through the contents of this report. He noted that the Corps had agreed to implement a 1.5-foot operating range at Bonneville only; he said that the bottom line is that Bonneville pool was in compliance with the operating range requested by the tribes only 22 percent of the time; it was in compliance with the operating range agreed to by the Corps 100 percent of the time. Overall, compliance was somewhat better during the summer fishery than it was during the spring treaty fisheries at Bonneville. It was slightly worse at The Dalles and John Day pools, in comparison with spring fishery compliance, Martin said. Martin added that his understanding was that the overall quality of the fishery was good, although the fishing was a little on the slow side in comparison to the spring fishery. There have been no reports of damage to the nets during the summer fishery, although there were reports of six nets being destroyed by floating debris during the spring treaty fishery in Bonneville pool. No boat damage or injuries to fishers were reported.

Litchfield noted that he had observed two damaged nets on the banks of The Dalles pool over the weekend; Mary Karen Scullion said there were reports of very high winds during the latter part of the summer fishery, and nets that weren't promptly retrieved were often damaged.

In response to another question, Martin said the next tribal treaty fishery will likely occur in mid-August.

5. Current System Conditions.

Wagner started this agenda item with a report on the status of the summer chinook adult migration: a total of 113,000 fish past Bonneville, much better than the 1999, 2000 or 2001 runs, but slightly less than the 126,000 seen in 2002. With respect to the status of the Snake River fall chinook subyearling outmigration, the indices of marked wild subyearlings continue to show a downward trend at Lower Granite; in general, they have closely mirrored Billy Connor's preseason forecast. The current model run shows that 93% of the Snake River PIT-tagged wild subyearling chinook run has now passed Lower Granite. Wagner noted, however, that river flows have fallen since many of those smolts passed Lower Granite, with migratory conditions degrading as river flows have receded and water temperatures rise.

Wagner said the combined yearling chinook index at Lower Granite is now about 1.35 million; at McNary, just over 6.9 million. Again, however, daily passage indices have now fallen to below 1,000 at Lower Granite, he said. The 1.35 million index at Lower Granite is far in excess of anything that has been seen at that project in recent years, he said.

Moving on to the current reservoir operation status, Henriksen noted that this information was covered earlier in today's meeting. One additional note on operations, said Henriksen, is the Libby outflow operation in August. Because of the recession of inflow to the reservoir, the outflow from Libby will likely have to be reduced from 18 kcfs in August, so as to achieve elevation 2439 feet at the end of the month. Right now, the Corps is exploring the option of reducing outflow to 14 kcfs the last week of August, to not draft below elevation 2439. Wellschlager said that, currently, there are no problems to report on the power system. Jim Adams said there were six water quality standard exceedences in the McNary forebay last week; those exceedences were due primarily to the high air and water temperatures, which have caused TDG production to rise. Adams also described recent operations to regulate the 45-degree release temperature at Dworshak.

Henriksen said she will provide observed summer runoff data at the August 13 TMT meeting.

6. New System Operational Requests.

On July 29, the action agencies received SOR 2003-13. This SOR, supported by USFWS, IDFG, ODFW and CRITFC, requests the following specific operations with respect to mitigation for losses in BiOp summer spill at Ice Harbor:

- Mitigate for losses in Biological Opinion spill levels at Ice Harbor Dam since the beginning of the spill season (July 21) by increasing spill at the Lower Columbia projects. Mitigation should be volume-for-volume, ie, volume-neutral. Increases in spill in the Lower Columbia River should be equivalent to the combined 2003 seasonal deficits, past and future, from the required Biological Opinion spill operation at Ice Harbor.

Wills went briefly through the contents of this SOR, the full text of which is hot-linked to the TMT's Internet homepage. He noted that, while the SOR does not specify where this mitigation should occur, McNary, where temperatures are very hot and large numbers of fish are passing, might be one possibility.

Aren't we still determining whether the spill program at Ice Harbor was good or bad? Wellschlager asked. Doesn't the evidence suggest that, by reducing the spill at Ice Harbor, we are actually producing a greater biological benefit? Your understanding is correct, but the jury is still out on the data from the 2003 biological tests at Ice Harbor, Wills replied. In the interim, we do have a BiOp spill program that is based on the best available information, and we expect it to be implemented. I'm unfamiliar with the volume-for-volume concept you've included in the SOR, said Litchfield – I don't recall seeing that in the BiOp. Aren't spill volumes constantly changing based on total river flow through the system? The language in this SOR is simply an attempt to capture the intent of the BiOp, Wills replied -- we have an opportunity to provide some extra benefit elsewhere in the system, since we're not able to do so at Ice Harbor. We thought it would be equitable and useful to transfer that benefit to McNary, since we're not getting that benefit at Ice Harbor, he said.

The group discussed the validity of the results from the 2003 survival tests at Ice Harbor; Wills said there is still considerable uncertainty around those numbers, and there will continue to be uncertainty until they have undergone peer review. Litchfield noted that the peer-review process could take years; in the interim, he said, the preliminary numbers we've seen – injury rates of 20%+ under the BiOp spill program at Ice Harbor – suggest that we should use adaptive management to make changes in that program in order to provide the maximum benefit to fish. It seems to me it is our obligation to say that, based on the most recent test data, we shouldn't be spilling at Ice Harbor, said Litchfield; I don't see why it necessarily follows that need to make up that spill volume at some other project.

Henriksen noted that the 2003 Ice Harbor biological testing was coordinated through the 2003 Fish Passage Plan and NOAA Fisheries; the goal was to determine the best route of passage for fish at that project. To say, then, that we need to provide mitigation at another project because we're not providing the full BiOp spill program at Ice Harbor lacks some validity, because this wasn't some sudden choice – it was coordinated in advance. That's true up to the point that the test was over, Wills replied – after that, the BiOp spill program is supposed to resume. That was just a few days ago, Henriksen replied. Any change to the BiOp spill operation needs to be based on a full understanding of what the data shows, Wills said – the results from the 2003 test simply aren't in yet. Rudd Turner took issue with this statement, noting that the results from 2003 are consistent with the results seen from the 2000 and 2002 tests at Ice Harbor. Wills replied that the report on the 2002 testing has not yet been made available for independent review. If the test results had indicated that additional spill at Ice Harbor would be beneficial to fish, wouldn't the salmon managers be pushing for that to happen based on these "preliminary" data? Wellschlager asked. Yes, because that's what the BiOp indicates as well, Wills replied.

In response to a question, Wagner said NOAA Fisheries did not endorse SOR 2003-13; rather, based on the data trend from the biological testing at Ice Harbor, they chose to split the difference, spreading the risk with some spill at Ice Harbor rather than endorsing either the full BiOp spill program or zero spill. The discussion continued in this vein for some minutes. Ultimately, it was agreed that it may be prudent to schedule a Friday afternoon (1 p.m.) TMT call to discuss the Ice Harbor spill program, after FPAC and FFDRWG have had a chance to discuss the results from the 2003 biological testing at Ice Harbor. It was agreed that this call will take place only if the information presented indicates that a change in Ice Harbor operations is warranted. Turner added that information from the Corps' Ice Harbor spillway hydro survey may also be available by this Friday.

As far as the mitigation question raised in the SOR, said Henriksen, the Corps does not intend to provide mitigation for an operation to support a study that was coordinated with NOAA Fisheries and the region in advance. I guess this SOR just serves to highlight the lack of agreement on that change in operation, Wills observed.

7. Recommended Operations for August 4-17.

Henriksen said Dworshak may go to 10 Kcfs outflow on August 4, as long as the weather and water temperature data supports this change; if needed, there will be a TMT conference call at 1 p.m. this Friday to discuss Ice Harbor spill. There will also be a conference call to discuss the Dworshak operation on August 6. At the Friday call, the TMT may also discuss spill operations at Ice Harbor, again if the data warrants a change.

8. Other.

Shane Scott reported that he is resigning from WDFW effective tomorrow; he has taken a job with the Public Power Council as of September 1. He expressed his appreciation to everyone at TMT, noting that he has learned a lot in this forum. He said he will maintain contact with the other TMT members, and expressed his thanks for the experience. Wills thanked Scott for his input and participation in the TMT process, and said he has been a valued member of the TMT team.

Turner added that there will be a dive operation at Ice Harbor this Saturday, August 2, to retrieve a broken turbine blade; there will be no powerhouse discharge and no pumped water supply to the powerhouse collection channel portion of the adult fishway while the dive is taking place. The Ice Harbor navigation lock will also be shut down during the dive. Ice Harbor will spill 10 Kcfs during the operation to maintain minimum flows in the Snake. It will also be necessary to fill Ice Harbor one foot to pond inflows above 10 Kcfs; the Corps will then release that stored water during the evening hours, Turner said. The outage is scheduled for 7 a.m. to 3 p.m., but may take less time to complete. After a brief discussion, there was agreement that, if it becomes necessary for safety reasons, Ice Harbor may stop spill and go to zero flow during the dive.

9. Next TMT Meeting.

TMT conference calls were scheduled to discuss Ice Harbor spill and operations at Dworshak on Friday, August 1 and Wednesday, August 6, respectively. The next face-to-face meeting of the Technical Management Team was set for Wednesday, August 13. Meeting summary prepared by Jeff Kuechle.

TMT PARTICIPANT LIST

JULY 30, 2003

Name	**Affiliation**
Robin Harkless	Facilitation Team
David Wills	USFWS
Mary Karen Scullion	COE
Rudd Turner	COE
David Benner	FPC
Kyle Martin	CRITFC
Shane Scott	WDFW
Paul Wagner	NOAA Fisheries
Jim Litchfield	Montana
Cindy Henriksen	COE
Tony Norris	Reclamation
Tim Heizenrater	PPM
Chris Ross	NOAA Fisheries
Steven Wallace	PacifiCorp
Laura Hamilton	COE
Nancy Yun	COE
Julie Ammann	COE
Tom Haymaker	PNGC
Scott Boyd	COE
Mike O’Bryant	CBB
Maria Van Houten	PGE
Tina Lundell	COE
Jim Adams	COE
Greg Bauers	COE
Tom Le	PSE
Russ George	WMCI
Bill Rudolph	NW Fish Letter
Greg Haller	NPT
Margaret Filardo	FPC

Richelle Beck	D. Rohr & Associates
John Wellschlager	BPA

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / Lori Postlethwait*	**BPA:**	*Scott Bettin / John Wellschlager*
NMFS:	*Paul Wagner / Chris Ross*	**USFWS:**	*David Wills / Howard Schaller*
OR: *Ron Boyce*	**WA:** *Shane Scott*	**ID:** *Steve Pettit*	**MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner*

TMT CONFERENCE CALL

6 August 2003   0900-1200 hours

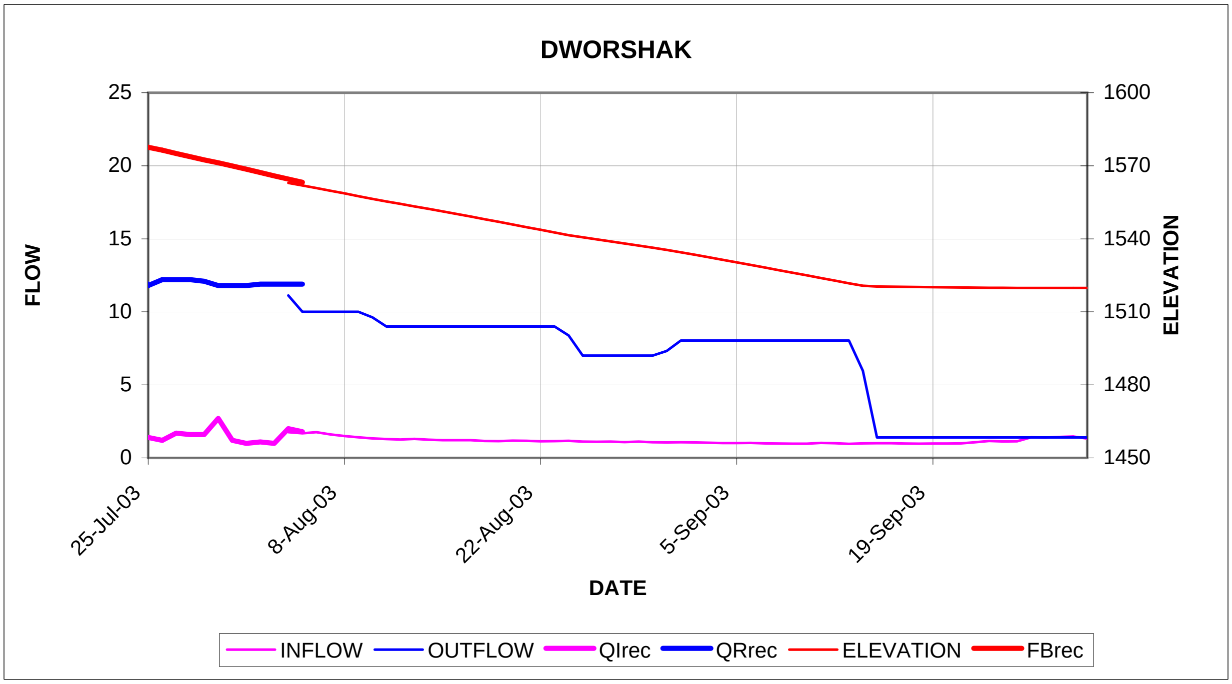
Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Dworshak Operations, Lower Granite tailrace temperature. (COE, BOR) [DWR Graph]
3. Ice Harbor spill update. (COE)
4. Develop recommended operations for August 11 - 17.
5. Other.
   - set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.



DWORSHAK
FLOW
ELEVATION
DATE
25
20
15
10
5
0
1600
1570
1540
1510
1480
1450
25-Jul-03
8-Aug-03
22-Aug-03
5-Sep-03
19-Sep-03
INFLOW
OUTFLOW
QIrec
QRrec
ELEVATION
FBrec

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
August 6, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

<u>FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS</u>
Facilitator: Robin Harkless

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

<u>Regional Executives Update:</u>
Jim Litchfield, Montana, updated the group on the previous day's Regional Executives meeting to discuss SOR MT 2003-1, on Libby and Hungry Horse operations. Jim reported that the Regional Executives chose not to implement Montana's recommended operation this year and asked that the region work together to develop a strategy for a better operating plan for future years. Currently, there is concern over the lawsuit over the NOAA Biological Opinion. There is a need to improve communication with the courts in order to foster better understanding of the flexibilities built into the BiOp. Regional Executive members expressed a need to improve operations at Libby and Hungry Horse. TMT will continue to work together on this issue for next year.

<u>Dworshak Operations</u>:
Cindy Henriksen, COE, provided handouts and reported that operations at Dworshak have continued similarly to that expressed in SOR 2003-C4. As a result of FPAC discussions last Friday and Monday (8/1, 8/4), the project was held at 12 kcfs, then was ramped down to full power house out on Monday to target 1535' by the end of August. This operation was <u>not</u> the result of a consensus but not enough objection was expressed to raise the issue to IT. Cindy distributed a DRAFT graph, also found on the TMT web page, of projected outflows for August and September that would enable the project to reach elevations 1535' by the end of August and 1520' by mid-September. The graph showed outflows dropping to 7 kcfs for a week or more at the end of August, then increasing to 8 kcfs in September. Cindy noted that, depending on the water supply and temperature forecasts, this projection could change. Kyle Martin, CRITFC, spoke on behalf of the tribes and said that 200 kaf during the first week in September is important, but that the tribes are flexible on how to get there.

Paul Wagner, NOAA, reported that temperatures have not shown much response to the drop in flows. Temperatures are dropping and there is some expected precipitation. There is still fish passage occurring at the project.

<u>ACTION</u>: As agreed to by the TMT, Cindy Henriksen, Paul Wagner, and possibly Greg Haller (Nez Perce) will hold a conference call this Friday and again on

Monday to discuss temperatures and operations at Dworshak. Cindy will email the operating decision to TMT members on Monday. Flows may be reduced to ~9 kcfs late on Monday. TMT will revisit the issue during the TMT meeting next Wednesday, August 13.

Ice Harbor Spill Update*:*
Paul Wagner reported that the results from the Ice Harbor spill test are not yet available. NOAA recommended that the bulk spill pattern continue until the data is available, possibly by next Wednesday's TMT meeting. Cindy Henriksen updated TMT on the COE survey conducted two weeks ago and on the special operation that occurred Saturday, August 2 to remove a blade. No future special operations will be needed at Ice Harbor for this issue, and the survey found no adverse effects of bulk spill, except possibly during very high flow which is unlikely considering the current low flows.

ACTION: Given the known data from the survey, it was agreed by TMT to continue with the bulk spill pattern until next Wednesday, August 13. FPAC will discuss Ice Harbor operations and if data is available before Wednesday, there may be a special conference call held to discuss the issue.

Other:
Status of Migration/End of Spill: Paul Wagner said there were no updates on migration status at this time. Jim Litchfield reported that the Regional Executives recommended no operational changes but to continue to monitor conditions and make in season management decisions. Paul reported on fish passage and will present travel time analyses at the next TMT meeting.

Operations:
Hungry Horse is at elevation 3548' and releasing 5 kcfs. A ramp down is expected during the 3rd week in August. Grand Coulee is at 1282.6' and Banks Lake is at 1568.3'. Libby is releasing 18 kcfs outflow, is nearly 8' from full and may need to drop to 14 kcfs out later this month as inflows drop. Dworshak will be held to full power house this week, then possibly drop to 9 kcfs late on Monday, 8/11, depending on FPAC discussions and communication with the COE. The COE will produce a model of Dworshak operations to aid discussions at the next TMT meeting.

Next Meeting, August 13, 9am-noon:
Agenda Items:
- Operation Updates
- Ice Harbor Spill Update
- Review Current Conditions
- Status of Migration
  - Travel time analysis – NOAA
- SOR's
- Water Management Plan – Draft for Review
- Develop Recommended Operations
- Next Meeting Agenda
- Other

1. Greeting and Introductions

The August 6 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Robin Harkless. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Dworshak Operations.

Henriksen said that FPAC had discussed Dworshak operations on Friday and agreed with the planned outflow reduction at that project. Accordingly, the Corps held Dworshak outflow at 12 Kcfs until Monday night at midnight, then reduced Dworshak outflow to full powerhouse discharge, about 9.8 Kcfs, targeting elevation 1535 on August 31. This was done with the understanding that, while there is not full TMT consensus on that operation, there is no desire to elevate it for dispute resolution at this point, Henriksen said.

Henriksen distributed the most recent Dworshak operational forecast graph, showing the expected operation needed to achieve elevation 1535 on August 31. According to this forecast, the Corps will need to reduce Dworshak outflow to 7 Kcfs during the last week of August, after which Dworshak outflow would be ramped back up to 8 Kcfs and held at that level through September 19.

Kyle Martin said that, in CRITFC's opinion, the region would get the biggest bang for the buck from the cool water from Dworshak during the first two weeks of September. Wagner asked whether the recent thunderstorms in the region have resulted in a bump to inflow to some projects; Martin replied that there was a slight increase at some projects. It was noted that water temperatures have held relatively steady since Dworshak outflow was reduced to full powerhouse discharge; if anything, Lower Granite tailrace temperatures have declined slightly. Martin noted that the weather in the Lewiston region has moderated considerably, with air temperatures falling from the low 100s to the mid-80s to the low 90s. There has been some precipitation in the area, with more expected early next week. I don't see any return of the major heating we saw during July, Martin said.

In response to a question, Paul Wagner said subyearling chinook passage is continuing at Lower Granite; the indices have actually increased somewhat over the past few days. One process question, said Henriksen – the CRITFC SOR asked that the next stepdown in Dworshak outflow, to 9 Kcfs, occur on Monday, August 11. Do we want to make that change, or shall we just maintain the current operation? After a brief discussion, there was general agreement that the reduction should occur as scheduled, in order to minimize the magnitude of the decrease to 7 Kcfs at the end of the month. It was agreed that, procedurally, the change will occur in the same way the reduction happened this week, with check-in calls on Friday and Monday between Henriksen, Wagner and Greg Haller to discuss the current water temperature situation at Lower Granite. The reduction to 9 Kcfs Dworshak outflow will occur late in the evening on Monday, August

11, unless water temperature or weather conditions dictate otherwise. The full TMT will then discuss the Dworshak operation at their August 13 meeting.

3. Ice Harbor Spill Update.

Wagner said there isn't much new to report on this topic; there are still no updated numbers available from the Ice Harbor PIT-tag evaluation. Henriksen touched on the results from the erosion survey of the Ice Harbor spillway, noting that the survey showed little reason for concern at this point; there has been some discussion of opening another spill bay at night to reduce the concentration of spill somewhat. Events may overtake us, however, in that river flows continue to fall, with spill volumes falling in response, Henriksen said. She added that the broken turbine blade discussed at the last TMT meeting has been found but has not yet been recovered, because it was larger than expected. The turbine blade will be recovered today or tomorrow, with no special operations needed. In the meantime, the plan is to continue with bulk spill at Ice Harbor during nighttime hours, at least until the PIT-tag information is available, possibly by the end of this week. The TMT will then discuss this information at its August 13 meeting. It was agreed that there could be a need for a special TMT call before next Wednesday if the information warrants.

4. Recommended Operations.

The group briefly recapped expected operations for the period of August 11-17. Tony Norris said Hungry Horse is at elevation 3548 and releasing 5 Kcfs; the project will probably start ramping down to the Columbia Falls minimum some time in the third week in August. Grand Coulee elevation was 1282.6 as of midnight last night; Banks Lake was at 1568 feet. Henriksen said Libby continues to release 18 Kcfs; it's approaching 8 feet from full and drafting. Inflow projections to that project are falling; as a result, Libby outflow will need to be reduced to 14 Kcfs later this month, perhaps as early as August 20, Henriksen said. Dworshak will continue to release full powerhouse discharge until midnight Monday, at which point discharge will be reduced to 9 Kcfs, as long as water temperature and weather information continues to support that reduction. Dworshak is now at elevation 1561, 39 feet from full.

5. Other.

Jim Litchfield reported that, at the request of the Governor of Montana, there was a meeting yesterday of the Regional Executives, states and some tribes; the topic was the Montana SOR. To cut to the chase, he said, the Executives decided to maintain current Libby operations for this year. However, there was a great deal of interest expressed at the meeting in finding a better way to do things next year. The main reason for the refusal to implement the SOR this year was legal constraints arising from the current litigation, Litchfield said. At this point, we're unsure what the next steps will be; Montana still feels the current Libby operation is very undesirable, and plans to continue to pursue a more equitable operation for next year.

Scott Bettin requested an update on the current status of the juvenile outmigration, with the goal of setting an ending date for the lower river spill program.

Wagner went to the DART homepage and pulled up the current index information for subyearling chinook passage at Lower Granite, reiterating that the daily index has bumped up from less than 1,000 to about 4,500. In the lower river, we're still seeing subyearling indexes of 45,000+ at McNary and 10,000+ at John Day and Bonneville, he said. There are still plenty of subyearlings passing through the system, in other words, Wagner said. And the reason the indices are higher at McNary than they are at the lower river projects is that a large percentage of the upriver fish are being transported at McNary? Litchfield asked. That's correct, Wagner replied -- we transport 50% of the subyearlings arriving at McNary, and there is some loss of in-river fish in the reach between McNary and Bonneville. Wagner also reviewed the most recent cumulative passage information, noting that, as has been observed before, the overall timing of the subyearling outmigration was somewhat earlier than normal in 2003. According to the DART in-season forecast graphs, the 95% subyearling passage point was reached at Lower Granite on August 4; however, only 85% of the run had passed McNary by that date. Hopefully by Wednesday of next week we'll have more information, Bettin said.

6. Next TMT Meeting Date.

The next face-to-face meeting of the Technical Management Team was set for Wednesday, August 13, 2003. Meeting summary prepared by Jeff Kuechle.

TMT PARTICIPANT LIST
August 6, 2003

Name	**Affiliation**
Cindy Henriksen	COE
Robin Harkless	Facilitation Team
Jim Litchfield	Consultant -- Montana
Kyle Martin	CRITFC
Colin Beam	PPM
Mike O'Bryant	CBB
Scott Boyd	COE
Paul Wagner	NOAA Fisheries
Russ George	WMCI
Mary Karen Scullion	COE
Scott Bettin	BPA
Tony Norris	USBR
Jim Adams	COE
Tom Le	PSE
David Wills	USFWS

Randy Hortman	COE
Greg Bauers	COE
Kevin Nordt	PGE
Mike Butchko	Powerex
David Benner	FPC
Dave Statler	NPT
Julie Ammann	COE
Nancy Yun	COE

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / Lori Postlethwait* **BPA:** *Scott Bettin / John Wellschlager*
NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*
OR: *Ron Boyce* **WA:** *Shane Scott* **ID:** *Steve Pettit* **MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner*

TMT MEETING

13 August 2003 0900-1200 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Ice Harbor pit tag data and spill update. (NOAA, COE)

   [Preliminary Results of the 2003 Summer Spill Studies at Ice Harbor]
3. 2004 Water Management Plan. (COE)
4. Review current system conditions.
   - fish migration status (NOAA Fisheries, USFWS)
     1. Timing of the run
     2. Travel time analysis
   - reservoir operation, power system, water quality, water supply (COE, BOR, BPA) [High 12hr Average] [Exceedence Tracking]
5. Review operations requests.
6. Develop recommended operations for August 18 - 31.
7. Other.
   - set agenda for next meeting
     1. BPA Transmission Business Line: Transmission Limitations

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
August 13, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

<u>FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS</u>
Facilitator: Robin Harkless

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

<u>Ice Harbor Pit Tag Data and Spill Update:</u>
Paul Wagner, NOAA, reported that the results from the pit tag data are now available. He provided a memo that provided an overview of the test and preliminary results, which show 96.4% passage survival through the spillway, 94.7% through the powerhouse bypass, and 89.3% through the turbines. It was noted that the confidence intervals for these statistics are wide. NOAA is still engaging in internal discussions on the data, and recommended today that the bulk spill pattern continue until further discussions can occur. In the meantime, NOAA asked for input from TMT members on the issue. Ron Boyce, Oregon, said that he would like to look at the data more closely, considering operations in the context of making changes to the BiOp spill program at Ice Harbor. Oregon committed to continue discussions with federal and state partners on this issue. Cindy Henriksen, COE, clarified that the current spill pattern was based on known information and that it is uncertain if survival is increased or decreased by going to a 12-hour spill pattern. Dave Statler, Nez Perce Tribe, expressed agreement with Oregon to review the data before making a decision to change operations at Ice Harbor. Steve Haeseker, USFWS, said that based on point estimates, it would be more beneficial to operate a 24-hour spill pattern, but raised no objection to maintaining the current pattern for now.

Cindy Henriksen asked Paul Wagner about any additional data being distributed. Paul Wagner responded that Brad Eppard is the contact point on the study. NOAA has been engaged with Brad in discussions about the data. Brad was scheduled to present information to the NPPC during a meeting later today. Anyone interested in being involved in these discussions should contact Paul or Brad. The raw pit tag data is available on the DART web site. The memo distributed today will also be available on the TMT website. It was acknowledged that some "abrupt" decisions were made this year and that, in the future, it would be helpful for regional partners to have ample time to review the data before making operational decisions.

Fish migration status: To aid in the discussion on Ice Harbor spill, Paul Wagner presented information on fish passage of subyearlings. Large numbers are still being observed at McNary and John Day. The DART forecast showed 91% pit tag passage at

Ice Harbor. Ron Boyce pointed out that the model is not always accurate with timing of the run. Scott Bettin, BPA, noted that, from his perspective, the numbers of fish are small so there is not a significant biological impact from spill or no spill at Ice Harbor. Dave Statler offered that the Fall Chinook run, half of which has not reached Lower Granite, should also be taken into account when making operating decisions at Ice Harbor.

Paul Wagner reported that FPAC has been looking at criteria for spill. On the mid-Columbia, a 95% passage criteria is used and FPAC is discussing whether this may also be appropriate for the Snake. They will discuss this at the next FPAC meeting on Tuesday and hope to have a recommendation for TMT by Wednesday.

ACTION: FPAC will discuss spill criteria for the Snake River projects and NOAA will continue internal discussions of the pit tag data. TMT will meet again next Wednesday, August 20, to discuss Ice Harbor spill. In the meantime, the current bulk spill pattern will continue as in the past week.

Reservoir Operations:
Libby is 11+ feet from full and drafting, and expected to reach elevation 2439' by August 31. Cindy Henriksen reported that outflows will need to be reduced around August 22 in order to meet the target elevation. Hungry Horse is at elevation 3545.3' and releasing 5 kcfs. A ramp down is expected sometime during the third week of August to meet Columbia Falls elevations. Grand Coulee is at elevation 1282.7'.

Dworshak continues to release 10 kcfs outflow, per discussions between the COE and NOAA on Monday, August 11. The target for Dworshak is to reach elevation 1535' by the end of August. Given this, the model shows that flows will need to be reduced to 6.5 kcfs on August 18-31, then back up to 8.4 kcfs to reach elevation 1520' by mid-September. Temperatures at the Lower Granite tailwater have increased slightly in the past few days. NOAA would like to maintain the tailwater at around 66 degrees. Kyle Martin reported that the weather is supposed to cool down in the next week in that area.

Paul Wagner clarified that there is no specified recommendation in the BiOp on how to reach elevations at Dworshak, although a particular operation has been referred to as a "BiOp operation".

ACTION: Flows at Dworshak will be reduced to 6.5 kcfs at midnight on August 18 and be maintained until the end of August. The Nez Perce Tribe agreed to the recommended operation. While there was not enough objection to elevate the issue to IT, Oregon and USFWS expressed that they did not fully agree with NOAA's recommendation for operations at Dworshak.

Flows at Lower Granite are at 30 kcfs and showing a recession below the seasonal average. Likewise, McNary, at 130 kcfs, is showing a recession below the expected average seasonal flow, which is 137 kcfs.

Water Supply/Quality:
The runoff forecast showed 74% average for the season in January. The actual January-July observed was 82% at the Dalles due to high flows in March and April. Grand Coulee experienced a 69% of average runoff in July. The January-July observed at Grand Coulee was 86%. At Lower Granite, the April-July observed runoff was 78%.

Laura Hamilton reported that there were two TDG exceedances over the last two weeks, both at McNary, due to high temperatures. High temperatures are the main water quality concern at the moment.

Other:
Transmission Business Line: There will be a presentation from a policy and technical person from the TBL during a TMT meeting in September. Cindy Henriksen noted that if possible, it would be beneficial to have that presentation sooner, if only one of the two presenters are available.

Lower Granite: Scott Bettin reported that lines need to be replaced at the Lower Granite powerhouse due to an outage that occurred earlier this year. BPA proposed to operate 11.5 kcfs out for 8 hours and pond above MOP on August 28 beginning at 8 am. No objections were raised from TMT members on this proposed operation.

MOP Operations: BPA would like to lift minimum operating pool (MOP) requirements from Little Goose, Lower Monumental and Ice Harbor as soon as possible. FPAC will discuss this issue relative to juvenile passage at their meeting next Tuesday, and TMT will revisit the issue next Wednesday.

2004 Water Management Plan: A draft of the WMP will be available on the TMT web site later this week. TMT will discuss logistics of the comment period during next week's TMT meeting.

Next Meeting, August 20, 9am:
Agenda Items:

- Ice Harbor Spill
    - End of Spill
    - Lower Columbia Spill
- MOP Operations – end of requirement
- Dworshak Operations Update
- 2004 WMP

1. Greeting and Introductions

The August 13 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Robin Harkless. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Ice Harbor PIT-Tag Data and Spill Update.

Paul Wagner said the PIT-tag data from the 2003 spill survival test at Ice Harbor is now available and the long-awaited results are in. The bottom line, said Wagner, is the following relative survival estimates: 96.4% for spillway survival, 89.3 for turbine survival and 99.7% for bypass survival. Overall powerhouse survival is about 95%, said Wagner, adding that the confidence intervals around these numbers are fairly wide. As far as our recommendation, NOAA Fisheries is still cogitating on what to do with this and whether or not we're going to make a change, Wagner said – we have not yet decided whether to make a change to the current spill program at Ice Harbor, as of today, but are continuing to discuss that question internally. We are curious about what other agencies would recommend, Wagner said, but at this point, NOAA Fisheries is not ready to recommend a deviation from the current spill operation, bulk (100% of river flow) spill from 8 p.m. to 8 a.m. with large gate openings in three bays.

Ron Boyce said ODFW would like a chance to look more closely at this data in the context of potential changes to the BiOp spill program at Ice Harbor. This program will be over within two weeks, possibly sooner, he said; the point of this test was to see whether we could improve spillway survival. We all need to feel comfortable with this data before any significant changes are made, Boyce said, adding that the salmon managers do not have any plans to elevate the current operation for dispute resolution. Boyce noted, however, that survival through the spillway is higher (96.4% vs. 95%) than overall powerhouse survival.

So NOAA Fisheries and the other salmon managers are looking at this data, said Henriksen; we have heard that NOAA Fisheries is not recommending any change in operation at this time. What changes might be made to the spill program once that analysis is complete? she asked. The current operation is nighttime only, Boyce replied; the BiOp calls for 24-hour spill at Ice Harbor during this period. The recommendation for 12-hour bulk spill was made based on best available information, Henriksen said; I'm curious where this new information may lead. It may indicate that the current operation is producing lower overall project survival than 24-hour spill would, Boyce replied. Bettin noted the 2003 balloon-tag data indicates an injury rate of up to 20% for fish passing through spill – statistically, there is no difference between survival under zero spill and bulk spill, he said. Therefore spill as a passage route should be questioned, let alone increasing the use of that passage route. Also, how many fish are passing Ice Harbor, currently? We'll cover that later in today's agenda, Boyce replied.

Dave Statler said the Nez Perce Tribe agrees that the salmon managers need more time to review this data before any changes are made. Steve Haeseker said these data suggest that a 24-hour spill program at Ice Harbor would be more beneficial for fish at Ice Harbor; the point estimates support pushing as many fish as possible through the spillway, so the Fish and Wildlife Service will likely be recommending 24-hour spill at Ice Harbor, he said. Boyce noted that the delay associated with zero spill at Little Goose indicate that no spill would increase passage timing by up to a week -- that's another biological consideration. In response to a question from Bettin, Boyce said there is no direct data on delay caused by zero spill at Ice Harbor.

Boyce expressed the concern that the BiOp summer spill operation at Ice Harbor has already been compromised, and Oregon did not agree with that decision. Wagner agreed that NOAA Fisheries took the lead in making that decision; in retrospect, he said, it probably would have been better to include everyone in that decision-making process up front. That will be our goal for next year at Ice Harbor, said Wagner. We'll put this topic on the agenda for next week's TMT meeting, said Bettin. Henriksen said she will post the NOAA Fisheries PIT-tag data memo to the TMT homepage this afternoon; it will be hot-linked to today's TMT agenda.

3. 2004 Water Management Plan.

Henriksen said the draft 2004 WMP will be posted to the TMT website later this week.

4. Current System Conditions.

Wagner updated the group on the current status of the subyearling migration, using the Fish Passage Center website. At Lower Granite, the daily passage index fell to 800 fish on July 30, went back up to 4,500 fish on August 5 and has since receded to about 1,600 fish. The increase was the result of thunderstorm and precipitation events in the area. There are still respectably large numbers of subyearling chinook passing the McNary and John Day projects, Wagner said.

With respect to the DART passage forecast, Wagner said the current forecast of PIT-tagged wild Snake River subyearling chinook passage (% of run passed to date) is 97% at Lower Granite, 94% at Little Goose, 91% at Ice Harbor and 90% at McNary. Boyce noted that Billy Connor's work (upon which these estimates are based) is skewed toward the early component of the subyearling chinook run. Bettin replied that Boyce is focusing only on in-river fish – 90% of the total run has already been transported. Wagner noted that the indices capture only a portion – perhaps 40% – of what is actually passing these projects. Statler observed that up to half of the later-migrating smolts from the Clearwater system have not yet reached Lower Granite; that's the run the Nez Perce are primarily concerned about – historically, only 40% of that run reaches Lower Granite by August 31. Bettin replied that those fish are being taken care of by contining cool water releases from Dworshak into September; once those fish reach the dam, they are mainly being transported.

The point is that there are still several hundred wild subyearling chinook being detected daily at Ice Harbor; only half of the BiOp spill program is being provided at this time at Ice Harbor, and we have general agreement that it is important to protect the tail of the run, said Boyce. Our feeling is that, based on the best available information, this year's operation is not compromising the BiOp, said Bettin – we have met our planning date for ESA listed fish, and have already protected the 95% of the run the BiOp calls for. Do we want to protect 100% of the run? You need to be careful in interpreting that data, Boyce replied.

The overall point is that the fish are still moving through the system, said Wagner; the lower you go in the system, the lower the percentage of the total run that has passed each project to date. In response to a question, Wagner said DART estimates that 98% of the combined (hatchery and wild) subyearling chinook run has passed McNary Dam to date (+/- 7%). The group devoted a brief discussion to how these estimates are developed.

The question, obviously, is when the summer spill program should end, said Bettin – based on this information, if we're not there now, we're very, very close. In response to a question from Henriksen, it was noted that spill at the Mid-Columbia projects is continuing at least through next Monday, August 18. Combined subyearling chinook passage at Rock Island Dam is currently at 97%, based on the DART estimate.

Does BPA have a proposal ready for presentation at today's meeting? Boyce asked. We've reached the 95% passage point at Lower Granite, but we're not quite there at Ice Harbor, said Bettin. Boyce noted that the indices at Lower Monumental are still substantial for this time of year. Still, you're talking about a few hundred fish in the context of a run at large of more than 1 million, Bettin replied. Boyce reiterated the importance of protecting the later-migrating component of the listed Snake River fall chinook subyearling run; he noted that FPAC will be discussing the status of the run at its meeting next week. After a few additional minutes of debate about the validity and meaning of the passage timing estimates, it was agreed to revisit this topic again at the August 20 TMT meeting. The salmon managers will explore the criteria used by the Mid-Columbia parties to measure 95% run passage and will begin to develop such criteria for the Snake/Columbia River system.

Henriksen said that, at Libby, the Corps continues to draft the project to reach elevation 2439 by August 31; Libby continues to release 18 Kcfs and is about 12 feet from full. Outflow will likely be reduced to 14 Kcfs on August 22, she said. Hungry Horse is at 3545 feet and releasing 5 Kcfs, said Tony Norris; we'll start ramping down to meet the Columbia Falls minimum during the third week in August. As of midnight last night, Grand Coulee was at elevation 1282.7 feet. Also at midnight last night, Banks Lake was at 1567.6 feet, said Bettin. At Dworshak, we've been releasing 10 Kcfs, Henriksen said; we talked about going to 8.8 Kcfs outflow at midnight Monday, August 11, but given the tailwater temperature situation and weather in the Lewiston area, we agreed to continue to release 10 Kcfs. Dworshak is at elevation 1552, about 48 feet from full, Henriksen said. Henriksen said the Corps will need to reduce Dworshak outflow to 6.5 Kcfs at midnight Monday, August 18 in order to achieve elevation 1535 on August 31.

Forebay water temperatures at Lower Granite have fallen from 76 degrees three days ago to 71 degrees, currently, Wagner added; they have been as low as 69 degrees over the past three days. Tailwater temperatures at the project have increased from 65.4 degrees to about 67 degrees, currently, he added. This is somewhat higher than anything we've seen this year, he said; that's why we kept the Dworshak discharge at 10 Kcfs. We would prefer to maintain tailwater temperatures in the 66-67 degree range, he said. Kyle Martin added that, while air temperatures in the Lewiston area are currently in the mid-90s, they are expected to moderate to the mid-80s by next week.

Do we still want to target elevation 1535 at Dworshak by August 31? Henriksen asked. There was general TMT agreement with this operation. In that case, said Henriksen, Dworshak discharge will decrease to 6.5 Kcfs at midnight Monday, August 18, then increase to about 8.4 Kcfs on September 1. Boyce noted that, while Oregon does not intend to elevate this issue, this Dworshak operation was not the one Oregon originally envisioned – we would prefer to use all of the available Dworshak storage during July and August, he said. Statler said the Nez Perce Tribe agrees that targeting elevation 1535 at Dworshak on August 31 is appropriate.

The current flow at Lower Granite is just under 30 Kcfs and declining, Henriksen said; the seasonal average flow at Lower Granite is now forecast to be about 33 Kcfs. At McNary, the current week-average flow is 130 Kcfs and is receding; the summer seasonal average flow at McNary is now forecast to be 137 Kcfs. She added that the National Weather Service has completed the observed runoff process for 2003; at The Dalles, for the month of July, flow was only 67% of average. For the season (January-July), it was 82% of average. At Grand Coulee, July runoff was only 69% of average; observed January-July runoff was 86% of average at that project. At Lower Granite, April-July, runoff was 78% of average, she added. It was only 54% of average during the month of July.

Laura Hamilton said there were only two TDG exceedences reported during the most recent reporting period, both due to high water temperatures. We are exceeding the state standard of 68 degrees at most sites, she added.

5. New System Operational Requests.

No new SORs were submitted prior to today's meeting.

6. Recommended Operations for August 18-31.

Recommended operations were summarized during a previous agenda item.

7. Other.

A. Lifting MOP at Snake Pools. Bettin said this is traditionally the time of year when the MOP restriction is lifted at Ice Harbor, Little Goose, and Lower Monumental; we would like to end MOP today, so the full operating range is available at those projects, he said. Chris Ross noted that the BiOp specifies that MOP be maintained while substantial numbers of juvenile migrants are present in the system; we'll need to take that into account. We'll be talking about that at next week's FPAC meeting, said Wagner; we can revisit the discussion of when to lift the MOP operation at the August 20 TMT meeting.

B. Line Outage at Lower Granite. Bettin said the line at Lower Granite will need to be taken out of service for eight hours on August 28 to complete the previously-mentioned repairs at that project. The project will release 5 kcfs through the powerhouse at speed no load, and make up the rest of the flow to 11.5 kcfs through spill. There may be some need to fill the reservoir above MOP during the outage, but inflow will be low and that fill may be small.

C. BPA Transmission Business Line Transmission Limitations. Bettin said BPA will provide a presentation on the West of Hatwai restriction, the north of John Day cutplane and transmission system limitations at a September TMT meeting.

8. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, August 20. Meeting summary prepared by Jeff Kuechle.

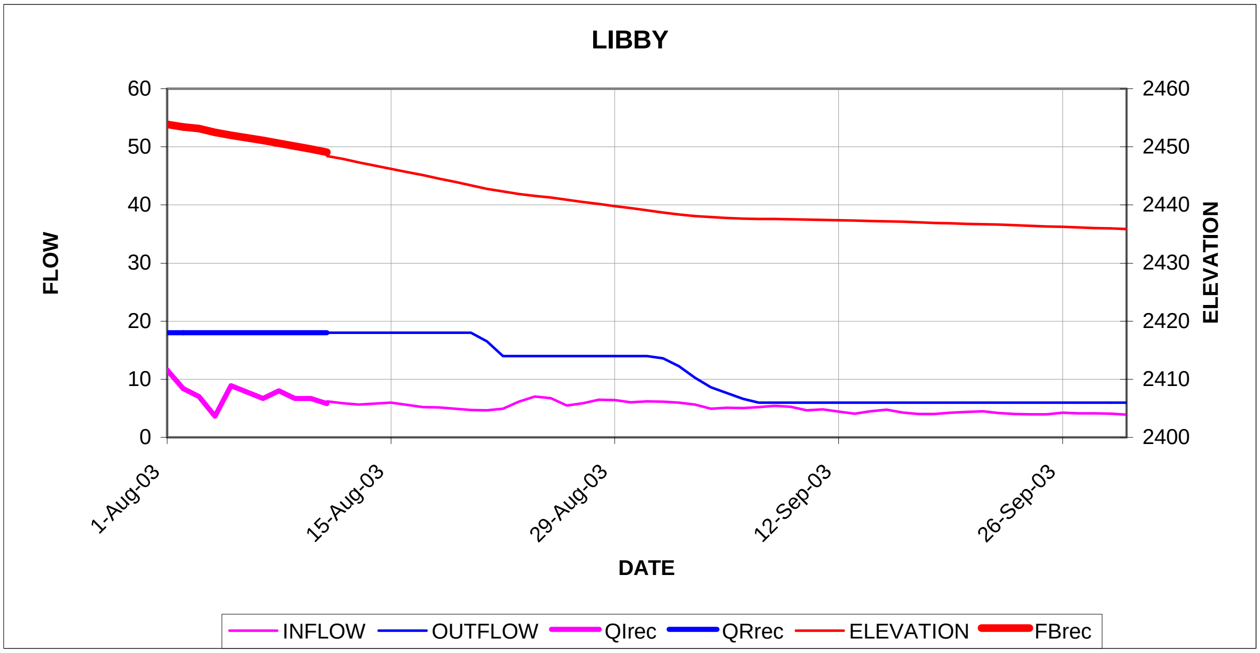
TMT PARTICIPANT LIST
August 13, 2003

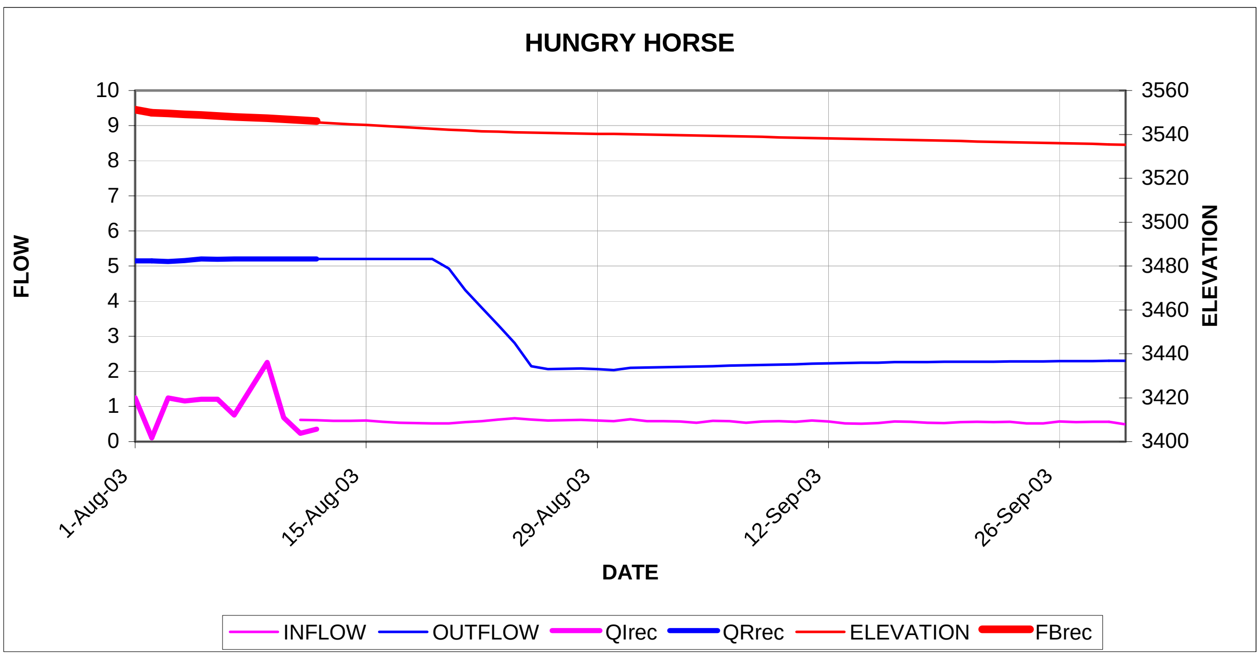
Name	**Affiliation**
Kyle Martin	CRITFC
Colin Beam	PPM
Tim Heizenrater	PPM
Tony Norris	USBR
Cindy Henriksen	COE
Robin Harkless	Facilitation Team
Russ George	WMCI
Scott Boyd	COE
Scott Bettin	BPA
David Benner	FPC
Rudd Turner	COE
Paul Wagner	NOAA Fisheries
Ron Boyce	ODFW
Tine Lundell	COE
Laura Hamilton	COE
Randy Wartman	COE
Tiffany James	BPA
Nick Lane	BPA
Tom Haymaker	PNGC
Dave Statler	NPT
Margaret Filardo	FPC

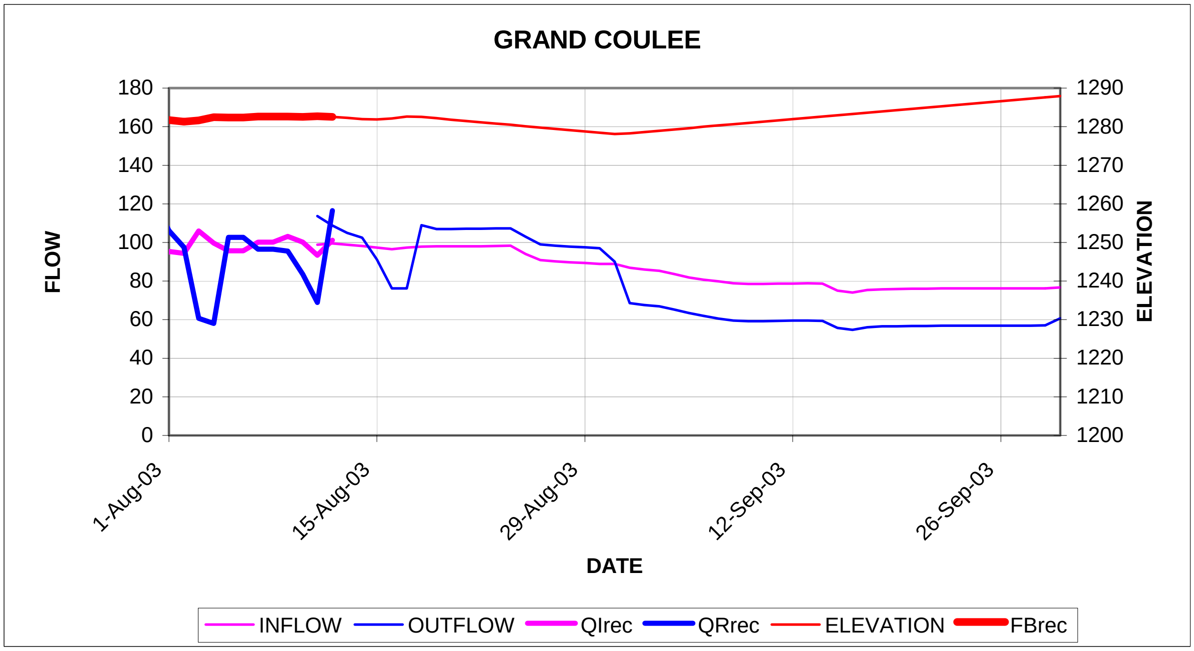
Tom Le	PSE
Martin Hatscher	SCL
Richelle Beck	D. Rohr & Associates
Steven Wallace	PacifiCorp
Mike O’Bryant	CBB
Chris Ross	NOAA Fisheries
Mike Butchko	Powerex
Dan Bedbury	EWEB
Steve Hayseker	USFWS
Bill Rudolph	NW Fish Letter

13 August 2003 TMT Meeting

STP MODEL RUN



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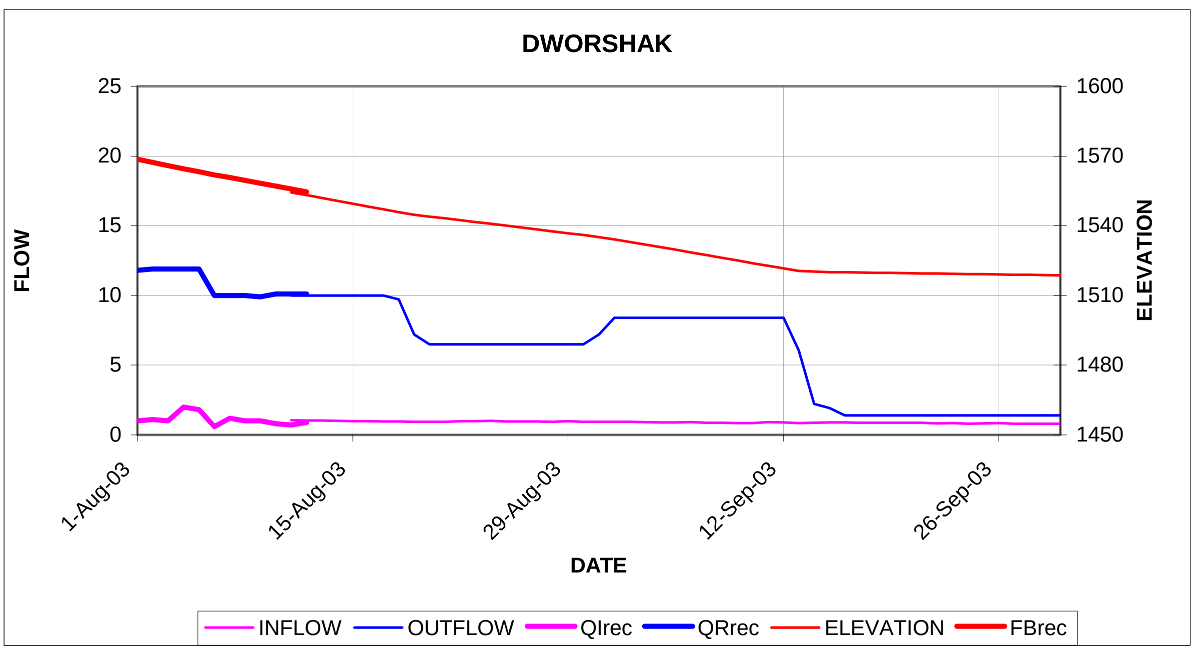
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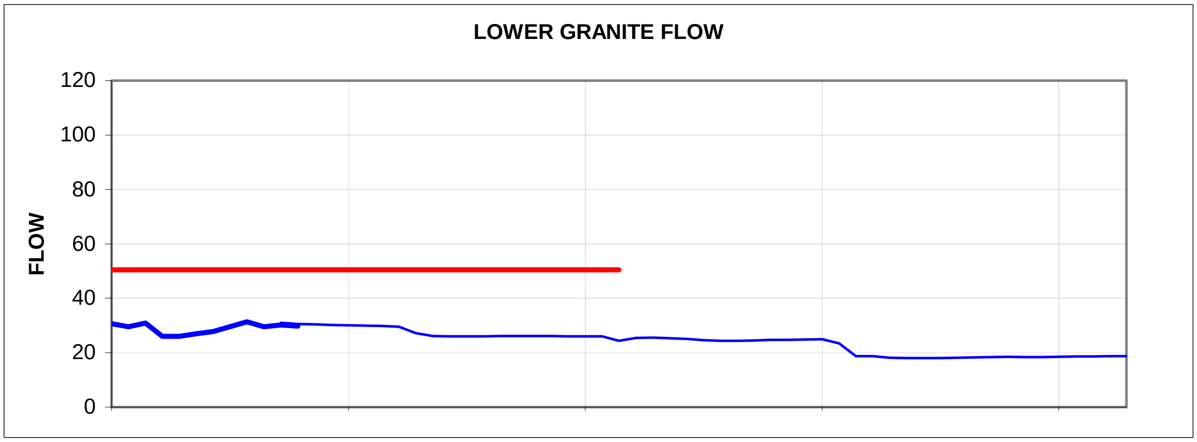
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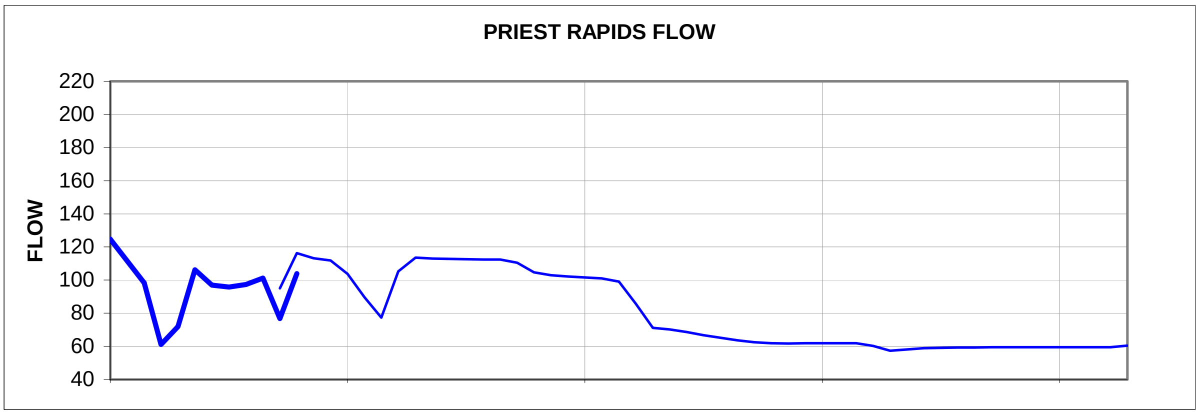
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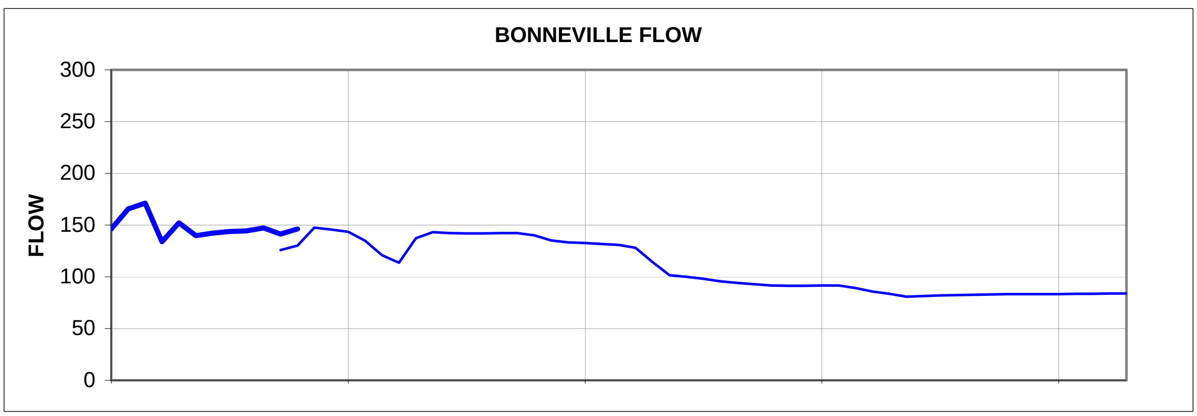
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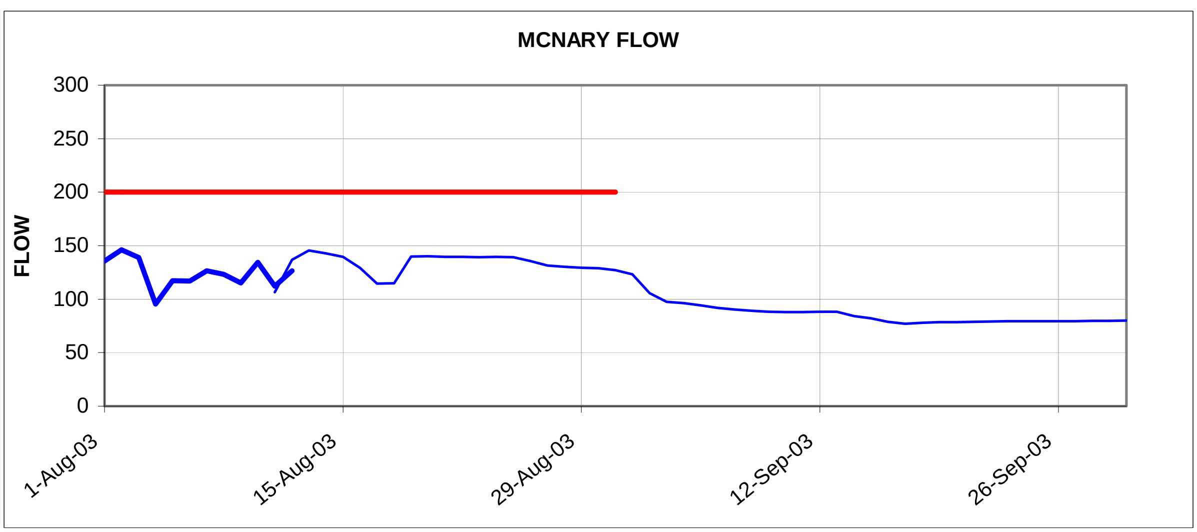
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Northwest Fisheries Science Center
Fish Ecology Division
2725 Montlake Boulevard East
Seattle, Washington 98112-2097

August 11, 2003

MEMORANDUM FOR: F/NWR5 - Brian J. Brown

FROM: F/NWC3 - John W. Ferguson

SUBJECT: Preliminary Results of the 2003 Summer Spill Studies at Ice Harbor Dam

In 2000 and 2002, the Fish Ecology Division of the Northwest Fisheries Science Center conducted spillway passage survival studies at Ice Harbor Dam for subyearling chinook salmon (*Oncorhynchus tshawytscha*) using PIT-tag methodology. These studies resulted in spillway passage survival estimates of 0.885 (95% CI 0.855, 0.915) and 0.894 (95% CI 0.856, 0.932) in 2000 and 2002, respectively (Eppard et al. 2002, Eppard et al. *in prep*). In 2003, studies were funded by the U. S. Army Corps of Engineers to investigate the causal mechanisms of spillway mortality at Ice Harbor Dam. Based on preliminary results from research conducted in the spring, two operations at Ice Harbor Dam were developed for summer testing: a concentrated spill pattern and a no-spill condition. The concentrated spill pattern consisted of 2000 Federal Columbia River Power System Biological Opinion spill volumes (45 kcfs in the daytime, 100% of total river flow at night) in 2-3 spillbays rather than spreading it across all 10 spillbays. Testing of the concentrated spill and the no-spill conditions occurred in 2-day block intervals from 24 June to 13 July.

Run-of-river hatchery subyearling chinook salmon were collected and PIT tagged at Lower Monumental Dam and transported to Ice Harbor Dam 16-24 hours prior to release. During the spill condition, morning releases were made into each open spillbay, the collection channel, Turbine Unit 1 and a control release downstream from Ice Harbor Dam. Evening releases were made into each open spillbay and a control release downstream. During the no-spill condition, morning and evening releases were made into the bypass collection channel, Turbine Unit 1 and a downstream

control. Downstream control releases were made by transferring PIT-tagged fish through a hose into a tank on a release barge. Fish were then transported downstream and released at a time estimated to coincide with the passage of treatment fish. To mimic the handling that control fish received, all test groups were also transferred from the tagging tank into a holding tank before release. Bypass collection channel releases were made through a hose into the collection channel adjacent to Turbine Unit 6. Turbine releases were made through a hose attached to the trailing edge of the submerged traveling screen in the A slot of Turbine Unit 1 which terminated in the center of the lower cross member, releasing the fish in the center of the intake slot. Spillway releases were made by lowering the release tank to near water level with a crane. The release tank had a weighted section of hose attached which released the fish approximately 6 feet below the surface. The velocity present in the release location did not allow the weighted hose to release fish deeper in the water column. Approximately equal numbers of fish were released into each treatment location both morning and evening each release day.

Survival was estimated for daily groups of PIT-tagged fish released into the spillway, turbines, bypass collection channel, and tailrace of Ice Harbor Dam and detected in the juvenile bypass systems of McNary, John Day, and Bonneville Dams using the single-release Cormack-Jolly-Seber (CJS) model (Burnham et al. 1987, Iwamoto et al. 1994). The ratios of spillway, turbine, and collection channel CJS estimates to tailrace CJS estimates were calculated to obtain daily "relative" survival estimates. Weighted geometric mean estimates with 95% confidence intervals were then calculated. (Note: The process to make the calculations was to log-transform the estimates, calculate the weighted arithmetic mean where the weights were the inverse relative variances of the individual estimates [i.e., weight = mean^2/variance], calculate symmetric 95% confidence intervals [i.e., ± t(.05, df=n-1)*SE, where SE = standard error of the weighted mean], and then back-transform the estimates and confidence interval endpoints.)

Preliminary analyses for the 2003 Ice Harbor subyearling chinook salmon spillway evaluation indicate relative survival estimates of 0.964 (95% CI 0.909, 1.022), 0.997 (95% CI 0.959, 1.036), and 0.893 (95% CI 0.849, 0.940) for spillway, bypass collection channel, and turbine releases, respectively. These estimates do not separate turbine and bypass collection channel survival

between spill and no spill days.

We received a request from Jim Ruff for the preliminary results of the 2003 summer spill studies at Ice Harbor Dam on 7 August 2003. He said they were needed by 11 August for Federal Hydro Caucus discussions scheduled that week. While we were able to respond quickly in this instance, in the future, please provide more advance notice, when possible, of any deadlines you may have to give us as much time as possible to focus on the details and carry out the quality assurance steps we take associated with processing and analyzing important data sets such as these. Secondly, on 7 August 2003 I received an email from Mark Smith, U. S. Army Corps of Engineers Walla Walla District, in which he provided Fish Passage Center estimates of summer spill survival at Ice Harbor Dam. While many people and organizations have access to PITAGIS and can download the detection files, to report results of PIT-tag analyses without first contacting the researchers who conducted the work so the analyses can be performed with an understanding of the study design used to obtain the raw data and the actual conditions under which the study was conducted is scientifically unsound. I trust that you concur and your staff does not condone this approach to decision making. I understand these kinds of issues are best discussed in the context of the Fish Passage Center Oversight Board, and while I plan to do so, I wanted you to be aware of our concerns.

cc: F/NWC3 - Dey
F/NWC3 - Eppard
F/NWC3 - Williams

REFERENCES

Eppard, M. B., E. E. Hockersmith, G. A. Axel, B. P. Sandford. 2002. Spillway survival for hatchery yearling and subyearling chinook salmon passing Ice Harbor Dam, 2000. Report to U. S. Army Corps of Engineers, Contract W68SBV92844866, Walla Walla, WA.

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Iwamoto, R. N., W. D. Muir, B. P. Sandford, K. W. McIntyre, D. A. Frost, J. G. Williams, S. G. Smith, and J. R. Skalski. 1994. Survival estimates for the passage of juvenile chinook salmon through Snake River dams and reservoirs. 1993 annual report to Bonneville Power Administration, Contract DE-AI79-93BP10891, 140 p.

TECHNICAL MANAGEMENT TEAM			
BOR: *Tony Norris / Lori Postlethwait*		**BPA:** *Scott Bettin / John Wellschlager*	
NMFS: *Paul Wagner / Chris Ross*		**USFWS:** *David Wills / Howard Schaller*	
OR: *Ron Boyce*	**WA:** *Shane Scott*	**ID:** *Steve Pettit*	**MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner*			

TMT CONFERENCE CALL

20 August 2003 0900-1200 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed. Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Ice Harbor spill. (ALL)
3. Fish Passage Status (NOAA Fisheries, All)
    1. Timing of the run
    2. Criteria used to determine 95% passage
    3. End of Spill
4. Dworshak Operation, Update (COE)
5. MOP Operation at Ice Harbor, Lower Monumental, and Little Goose. (All)
6. 2004 Water Management Plan. (COE) (Draft 08-13-03)
7. Review current system conditions.
    - fish migration status (NOAA Fisheries, USFWS)
    - reservoir operation, power system, water quality, water supply (COE, BOR, BPA)
8. Review operations requests.
9. Develop recommended operations for August 25 - 31.
10. Other.
    - set agenda for next meeting
        1. Availability of staff from BPA Transmission Business Line: Transmission Limitations

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
August 20, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Fish Passage Status/95% Criteria/End of Spill:
TMT discussed criteria for end of spill at the Snake River projects. Paul Wagner, NOAA, reported that FPAC discussed three methodologies that were presented on 95% passage criteria. FPAC did not reach a consensus on which methodology to use, but after internal discussions, Paul presented a method to TMT. Essentially, Paul used two tools, DART and a passage index for the run at large, to determine when the 95% passage criteria had been met. This methodology is similar to that used for the Mid-Columbia, although slightly more conservative. Based on the criteria used in Paul's methodology (meeting 95% criteria for three days in a row satisfied the criteria that 95% of the run had passed.), NOAA recommended that the spill continue as of today.

Steve Haeseker, USFWS, presented two alternative methodologies, also presented at FPAC earlier this week. A handout was provided. The first method includes the influence of hatchery fish in determining run times for the run at large. The second method used cumulative passage numbers starting with August 15. Again, no agreement was reached on whether to utilize either of these methodologies to determine an end of spill date.

The key issue of concern for TMT today is the lack of regional agreement as to what the criteria meant, and a need for clarification from NOAA about the interpretation of the BiOp relative to the Aug. 31 planning date. After further discussion and a caucus, TMT was asked to respond to the following question, which was then elevated to the IT by BPA:

Has enough of the ESA run at large passed to end spill at the four Snake River projects and still meet the intent of the BiOp?

Oregon: Unable to answer the BiOp question, but believes there are still enough fish in the river that warrant protection through continued spill.

USFWS: Agreed with Oregon's perspective.

Idaho: Need clarification on BiOp in order to answer the question. Not enough confidence from the region that 95% of the fish have passed to end spill – need agreement on the methodology for the 95% criteria.

Montana: End spill – new information still does not show a benefit to fish or that the operation is cost-effective.

Washington: No room in the BiOp to have this discussion – IT should clarify objectives and IF the objective is 95%, direct TMT to develop criteria for determining that number.

CRITFC: Continue spill – consistent with the tribes' river operating plan and supports late migration of Clearwater stocks.

BOR: Will follow NOAA's recommendation.

COE: What is the intent of the BiOp? Interest in developing spill objectives; defer to the IT and NOAA to do that.

NOAA: Need to clarify the policy.

BPA: NOAA needs to clarify the policy at IT.

UPDATE: *IT met to discuss the issue on August 21st and was also unable to reach consensus. BPA requested that the issue be elevated to the Executive level as soon as possible. The issue was put forward for possible resolution by the federal executives.*

Ice Harbor Spill:
No new information was available since last week's TMT meeting. NOAA recommended that the 12-hour nighttime bulk spill pattern continue through the spill season. Oregon raised concerns with the operation and requested a written explanation on this issue from NOAA.

Dworshak Operations Update:
Cindy Henriksen, COE, reported that to meet the target elevation 1535' at Dworshak, outflows were reduced to 6.5 kcfs on Tuesday evening 8/19 and are scheduled to remain there through the end of August, with some shaping. Outflows will then be increased on 9/8 to 8.4 kcfs in order to meet a target 1520' by mid-September. After some discussion it was agreed that a steady flow would be sought so the average daily discharge would be similar between the end of August and the first two weeks of September. Paul Wagner reported that tailwater temperatures are around 66.5 degrees. Jim Adams, COE, said to keep in mind that temperatures will decrease at the headwaters, to about 43.5 degrees. The USFWS voiced concern with going much below 45 degrees. Idaho Fish and Game raised some concern that if flows are not flat, stranding may occur. Russ Kieffer will report to Paul Wagner if stranding is observed in the area, and Paul will notify the TMT.

MOP Operations:
As requested by BPA, FPAC discussed the possibility of ending MOP restrictions at Little Goose, Lower Monumental, and Ice Harbor. The Salmon Managers feel that the criteria for passing adults have not yet been met. TMT will check in again on this issue at the next TMT meeting on August 27.

2004 Water Management Plan:
Scott Boyd, COE, reported that the 2004 WMP is now on the TMT website in PDF and is also available as a Word document for anyone interested. Scott requested that comments be sent by September 10. There will be some discussion of the WMP at next week's TMT meeting. One suggestion was made to include the methodology and end of spill criteria in the WMP, when it is decided.

ACTION: Scott will send the word document to all TMT members via email.

Current Conditions:
Tony Norris, BOR, reported that forest fires near the transmission lines at Hungry Horse may require the lines to shut down and the project to be operated at spill/zero powerhouse, or speed/no load, the latter of which would affect Columbia Falls. The project has already begun ramping down at 500 cfs per day. Brian Marotz is coordinating with BOR on Hungry Horse operations.

Next Meeting, August 27, 9am-noon:
An agenda will be developed and posted on the web prior to the next TMT meeting.

1. Greeting and Introductions

The August 20 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Ice Harbor Spill.

Paul Wagner said he has not been provided any new information on results from the 2003 Ice Harbor spill test. Ron Boyce said that, if (as discussed in the next agenda item) the IT agrees that the 2003 summer spill program should continue, the TMT needs to make a recommendation as to whether Ice Harbor spill should continue only from 8 p.m. to 8 a.m., or should be expanded to 24 hours. NOAA Fisheries' position is that we should stay the course and provide spill during nighttime hours only, said Wagner. Boyce asked that NOAA Fisheries provide a written justification for this policy; Wagner said he will do so.

3. Fish Passage Status Update.

Wagner reminded the group that, at several recent meetings, the TMT has discussed whether the BiOp spill program can be terminated in season. The basic question is, does the BiOp say we need to arrive at the 95% passage point in order for spill to end? The BiOp is not very clear on that issue, Wagner said; August 31 is specified as the planning date for the end of spill, but the BiOp provides no criteria by which the TMT might recommend a different ending date.

Isn't the purpose of this agenda item to talk about the post-test spill operation? Boyce asked. Yes, but we're being overrun by the end of spill season issue, Scott Bettin replied. That's correct, said Wagner – the world I've been living in for the past week is the proposal that spill should end in season, and the criteria by which we'll make that decision. The focus has changed from 12-hour spill vs. 24-hour spill to whether or not spill should end before August 31, he said. I thought the focus was to resolve the apparent spillway injury issue at Ice Harbor, Boyce said. Bettin replied that, at the last TMT meeting, it was agreed that FPAC would discuss that issue at its meeting yesterday. However, if the decision is to continue spill, we need to discuss the 12 vs. 24 hours issue, Boyce replied.

Again, the BiOp isn't clear about the mechanism by which to decide when to end spill, said Wagner. The 95% passage point is one generally-accepted criteria, he said, but this is really the first time we've seriously considered ending spill prior to August 31. We have talked about it and made that request in years past, but the salmon managers have been unwilling to agree to that request, said Bettin.

We discussed this issue yesterday at FPAC, said Wagner; at that meeting, I put forward some possible criteria for deciding when to end summer spill. Those criteria were not accepted without criticism, he said; we discussed various alternative methodologies as well, but came to no consensus. This question has been hashed over for years at the Mid-Columbia projects, he said; in general, I think we'll need more time to come to consensus on this question. We don't have that time this year, he said, but I've been asked to share NOAA's conclusions on this issue.

Following yesterday's FPAC meeting, said Wagner, we had some additional conversations at NOAA about how we might answer that question. There are two tools that would be applied to answer it, the first being the DART passage prediction tool, which is based on the passage of marked wild fish. This tool does not represent all wild fish, including the Clearwater fish, but it is a tool that is available to us, he said. Wagner took the group through the current DART smolt passage prediction graph; the numbers (in terms of the percentage of the PIT-tagged wild Snake River subyearling chinook run passed to date) broke down as follows: Lower Granite, 98%; Little Goose, 96%, Lower Monumental, 95%, Ice Harbor, 94% and McNary, 93%. One of the boxes NOAA Fisheries feels needs to be checked is that the 95% passage point has been reached, Wagner said. There is some mortality that occurs between projects, observed Jim Litchfield – is that taken into account in these estimates? No, Chris Ross replied.

Using this tool, then, we're very close to the 95% passage point at Ice Harbor but not quite there, Wagner said. The other tool available to us is the Fish Passage Center's passage indices, which is more representative of the run at large – it tales the Lyons Ferry hatchery fish into account, for example. Wagner put up an Excel spreadsheet showing passage index data by project for the years 1992-2002. We determined the 95% passage date for each year, Wagner said; for McNary, it ranged from July 19 to August 19. The spreadsheet also included the daily passage index on the day the 95% point of passage was reached; at McNary, it ranged from 18,840 to 80,872. At John Day, the date of 95% passage ranged between August 4 and August 29; at Lower Granite, July 25 to October 10; at Little Goose, July 30 to September 27.

Haven't we been making changes to our index methodology in the past 10 years? Litchfield asked. Yes, Wagner replied, although the methodology for calculating the indices have not changed, to my knowledge. He noted that, interestingly, the date the 95% passage point was reached is significantly earlier at Little Goose and Lower Monumental than it is at Lower Granite.

To apply this, said Wagner, since the numbers bounce around, you need a series of dates at which the 95% passage point is reached. What I came up with was the concept that if the index falls below the lowest historic passage index numbers on the date the 95% passage point is reached for three consecutive days, then you're there. He said he had applied this criteria to the historic index data at John Day, McNary, Lower Monumental, Little Goose and Lower Granite with somewhat mixed results – this tool was more accurate for some projects than it was at others.

So in order to build another layer of certainty into this, in NOAA Fisheries' view, you need to be satisfied that the 95% point of passage has been reached at all projects, using both the DART predictor and this tool, Wagner said. If you reach the 95% passage point at all projects using both tools, you can be reasonably certain you're there, he said. Again, I presented this methodology at yesterday's FPAC meeting, and there was not universal agreement about its validity.

Rod Woodin noted that this methodology is limited by the sampling period at individual projects -- if you sample through December at McNary, you have a larger database from which to make your prediction, he said. Boyce said that, at yesterday's FPAC meeting, Bettin brought up the point of what we're managing to – what percentage of the run? ESU fish only? The run at large? The second point was whether this should be used to shorten spill or, conceivably, lengthen the spill period, Boyce said. These are all points on which we need TMT agreement, he said. Would we also need to discuss shortening or lengthening the flow augmentation period? Tony Norris asked. Absolutely, Boyce replied.

As we spill for single-digit passage indices at the cost of millions of dollars, we need to decide whether or not that's worthwhile, Bettin noted – that's not something we can answer here at TMT, it's a policy call. In response to a question, Woodin noted that the Mid-Columbia spill program is intended to provide protection to 95% of the run at large. Spill ended at Rocky Reach and Rock Island on August 13 and 15, respectively; they're still spelling at Wells dam. Grant County ended spill on August 13 and 14. Spill at Wells will end on August 26, he said, the historic date by which the 95% passage point has been reached in 18 of the last 20 years. He noted, however, that the criteria for deciding when to end spill at the Mid-Columbia projects are agreed to before the season begins – they don't try to decide on those criteria at the end of the season. Woodin added that, at Rocky Reach and Rock Island, spill ends after there have been either three consecutive days or three days out of five when the daily index declines to 0.3% of the cumulative passage to date at those projects, a similar method to that which Wagner has proposed.

So does NOAA Fisheries have a proposal for the TMT to consider? Silverberg asked. The question I was asked was, based on our analysis, do we believe we have achieved the 95% point of passage at Ice Harbor? Wagner replied. Applying the criteria NOAA has proposed, he said, for this year, the answer to that question is yes – the daily index we're looking for at Lower Granite is 1,940 or less for three consecutive days; we've been there since August 11. At Little Goose, the index number is 663; we were there from August 11 to August 17, but in the past two days, the index has bumped back up to 1,000+. At Lower Monumental, daily indices have also fallen below the target index number, Wagner said. In response to a question from Woodin, Wagner noted that the methodology he is proposing is actually more conservative (erring on the side of the fish) than the methodology used to determine the 95% passage point at the Mid-Columbia projects.

The discussion continued in this vein for some minutes. Ultimately, Russ Kiefer said that, in IDFG's view, the BiOp is not ambiguous – it says spill will be provided until August 31. We are willing to be adaptive, he said, but we believe spill must protect 95% of the wild run, not the run at large; we believe any agreement must include the flexibility to extend spill beyond August 31 in years when the run is late. Finally, he said, IDFG will not agree to change the BiOp spill operation without full technical agreement by all relevant parties that such a change is warranted. We do not believe such an agreement has been reached in 2003, Kiefer said.

We need further discussion on this issue, said Boyce, noting that there were other approaches discussed at yesterday's FPAC meeting. Steve Haeseker outlined the two methods proposed by the Fish and Wildlife Service at yesterday's meeting. The first is designed to negate the influence of hatchery fish on the 95% passage point calculation; according to this method, the 95% passage point will not be reached for the wild run at Lower Granite until September 6. Bettin noted that the Snake River ESU includes both hatchery and wild fish. After a few minutes of discussion, Silverberg noted that there is obviously no clear technical agreement on which methodology should be used.

Haeseker said the second method he has developed uses the historical percent of run passed by August 15 to predict the 95% point of passage date in a given year. The group offered a few clarifying questions and comments on this method as well, which predicted that, in 2003, the 95% passage point will not be reached at Lower Granite until September 12..

So what does all this mean, in terms of our discussion here at TMT? Silverberg asked. Bettin observed that, according to Council estimates, the current summer spill program is costing the region millions of dollars to save about five fish. Our interpretation of the BiOp is that August 31 is a planning date for the end of spill, he said; obviously, you're correct when you say we don't have technical agreement on when the 95% passage point is reached. We can't develop a criteria everyone can agree upon, said Bettin; my suggestion is that we raise this issue to the IT – are we there?

We've all had dealings with IT, said Henriksen; my guess is that the IT will tell us, as the Regional Forum's technical body, to figure out whether or not we're at the 95% passage point, or whatever "there" is. It's impossible for us to decide if we're "there" yet if we don't know what "there" is, Woodin observed. To me, the question is, have we protected enough of the ESA run at large to end spill? Bettin replied. Isn't the question more, what is the August 31 planning date intended to encompass? Wagner asked – is it 95% of the run, or was August 31 simply a negotiated date? To me, said Litchfield, given the cost of the spill program, the real policy question is, when should we stop spill and shift those resources to more productive recovery methods?

After a brief caucus break, Bettin said the question, to him, is whether or not there is consensus that enough of the ESA run has passed to stop spill at all four projects and still meet the intent of the BiOp. Silverberg asked the TMT members to state their positions on this question. Boyce said he cannot answer the intent of the BiOp; NOAA Fisheries needs to answer that. However, there are still enough juvenile fish passing through the system, particularly Clearwater fish, to warrant continued spill at this point. Haeseker said the Fish and Wildlife Service agrees with Oregon's position. Kiefer said IDFG's position is that clarification is needed on what the BiOp says; it will be difficult for the TMT to meaningfully engage on the spill issue until that question is answered. He added that IDFG needs an SOR for its policy personnel to review before they can decide on an agency position; further, he said, how is this different from the Montana SOR? The last point is that I do not believe that we, as a region, have enough confidence that 95% of the run has passed, Kiefer said – until we have agreement on a methodology to determine that, we can't make a decision on this issue.

Litchfield said Montana feels that the 2003 summer spill program should be terminated as soon as possible. Woodin said Washington's position is that it is procedurally inappropriate for the TMT to be asking this question. We feel it would be appropriate to ask the IT to consider the question of what criteria should guide when the spill program should end; until they clarify the objectives of the summer spill program, we can't really, at TMT, develop a methodology to determine whether those criteria have been met, he said.

Kyle Martin said CRITFC's position is that the summer spill program should continue. Norris said Reclamation will follow NOAA Fisheries' recommendation on this issue. Henriksen said the Corps agrees with this, and seeks regional concurrence. Wagner said that, clearly, there is no consensus on this issue; this is, then, an IT issue, and the IT needs to clarify the intent of the BiOp. Bettin said BPA, along with the other action agencies, would like NOAA Fisheries to clarify the intent of the BiOp through the IT.

Is the wording of the question the same as stated above? Silverberg asked -- is there consensus that enough of the ESA run has passed to stop spill at all four projects and still meet the intent of the BiOp? Kiefer said that, in his opinion, the IT needs to first answer the question of whether the BiOp allows the TMT to make a decision to truncate a recovery measure in-season, before the IT considers whether spill should be truncated this year. Wagner replied that both TMT and IT are given a fair amount of flexibility to implement the BiOp as written. So if there is consensus, the planning dates in the BiOp can be changed? Silverberg asked. Actually, the BiOp doesn't mention consensus, Litchfield said – it says that the achievement of performance standards will drive any changes that are made. That is certainly one interpretation of the BiOp, Wagner replied; it also says that the IT will provide dispute resolution when the TMT is unable to reach consensus. Silverberg said she will forward this issue to IT with the expectation that the IT will convene tomorrow afternoon at 2 p.m.

4. Dworshak Operation Update.

Litchfield noted that, in the context of the preceding discussion, it is interesting that the TMT has decided to leave 15 feet of storage in Dworshak on August 31, despite direction to the contrary in the BiOp. Henriksen said that, per last week's TMT discussion, the Corps continues to target an elevation near 1535 at Dworshak on August 31. Dworshak outflow was reduced at midnight last night; average daily outflow from the project will be 6.5 Kcfs-7 Kcfs through the end of the month, with some load shaping (higher flows during daytime hours, lower flows at night).

Didn't we agree to hold a constant Dworshak outflow until elevation 1520 is met in September, rather than having lower flows now and higher flows later? Wagner asked. We agreed, I thought, that this would be a better operation, even if we miss elevation 1535 by a foot or two on August 31, Wagner said. That would be acceptable, if that is what the TMT would prefer, said Henriksen – I'll check to see where we're at, operationally, at Dworshak. That would mean a steady outflow of about 7 Kcfs, then, Wagner noted. BPA needs the flexibility to continue load shaping at Dworshak, releasing 8 Kcfs during the day and 5.8 Kcfs at night, said Bettin. It sounds, then, as though every day's operation will be the same between now and September 15, Henriksen said.

Kiefer said IDFG is not happy with the load-shaping operation, but can live with it. He asked, however, who should be responsible for looking for stranded fish. That would be IDFG's responsibility, Bettin replied – they're your fish. I don't think this operation will strand fish, said Kiefer, but I do believe we should be looking to see whether it is. I assume that the ramp rates at Dworshak are designed to address this issue, said Wagner. If IDFG finds listed fish, please let NOAA Fisheries know, said Silverberg. Kiefer agreed to do so. Martin said the CRITFC tribes would prefer flat flows from Dworshak, but will not object to this operation.

The group briefly discussed Dworshak ouflow temperature; Jim Adams said that, by tomorrow, both units at Dworshak will need to go to undershot mode, which will mean colder outflow temperatures – about 43 degrees, rather than 45 degrees. Haeseker noted that this is likely to cause some problems at Dworshak National Fish Hatchery; Adams replied that, because of turbine head pressure requirements and the falling reservoir elevation, the Corps has no choice but to operate both units in undershot mode.

5. End of MOP Operation at Ice Harbor, Lower Monumental and Little Goose.

The request at last week's TMT meeting was to lift the MOP requirement to allow the action agencies to use the full extent of the pools' flexibility, said Bettin. The consensus at FPAC was that we're approaching the criteria laid out in the BiOp for lifting the MOP requirement, but we're not there yet, Wagner replied – we would prefer to revisit this question next week. The group discussed the historic end-of-MOP timing, as well as the logistics involved in ending MOP operation. Ultimately, it was agreed to revisit this issue at the August 27 TMT meeting.

6. 2004 Water Management Plan.

Scott Boyd said the draft 2004 WMP is now available via the TMT's Internet homepage; he noted that all changes from last year's document are highlighted in legislative format. He asked that any comments on the plan be submitted to him by September 10. People need to look at this document, he said; I am underwhelmed, to date, by the volume of comments received. Boyd went briefly through some of the changes he has made to the 2004 plan.

7. Current System Conditions.

Norris said there are forest fires going on near the Hungry Horse transmission lines which could force Reclamation to shut the Hungry Horse powerhouse down; he said USBR is coordinating with the State of Montana about what to do if that occurs. One option is to spill, which would sharply increase TDG levels in the river below the project; we could also waive the Columbia Falls minimum and go to speed-no-load operation, Norris said. Hungry Horse outflow has begun ramping down to the Columbia Falls minimum at a rate of 500 cfs per day. Norris said the speed-no-load option is the more attractive alternative to both Reclamation and Montana.

8. New System Operational Requests.

No new SORs were submitted prior to today's meeting.

9. Recommended Operations for August 25-31.

Recommended operations were covered during a previous agenda item.

10. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, August 27. Meeting summary prepared by Jeff Kuechle.

TMT PARTICIPANT LIST
August 20, 2003

Name	**Affiliation**
Kyle Martin	CRITFC
Kevin Nordt	PGE
Russ George	WMCI
Tim Heizenrater	PPM
Mary Karen Scullion	COE
Scott Boyd	COE
Tony Norris	USBR
Scott Bettin	BPA
Jim Litchfield	Consultant – Montana
Steve Hayseker	USFWS
Donna Silverberg	Facilitation Team
Robin Harkless	Facilitation Team
Jim Adams	COE
Ron Boyce	ODFW
Laura Hamilton	COE
Nick Lane	BPA
Tiffany James	BPA
Randy Wartman	COE
Tina Lundell	COE
David Benner	FPC
Gail Lear	COE
John Gleason	BPA

Dan Bedbury	EWEB
Steven Wallace	PacifiCorp
Mike Butchko	Powerex
Glenn Traeger	Avista
Todd Perry	Constellation Power Source
Richelle Beck	D. Rohr & Associates
Tom Le	PSE
Russ Kiefer	IDFG
Lance Elias	PPL
Paul Wagner	NOAA Fisheries
Chris Ross	NOAA Fisheries
Rod Woodin	WDFW
Phil Kenzie	BPA
Nancy Yun	COE

T E C H N I C A L M A N A G E M E N T T E A M			
BOR: *Tony Norris / Lori Postlethwait*		**BPA:** *Scott Bettin / John Wellschlager*	
NMFS: *Paul Wagner / Chris Ross*		**USFWS:** *David Wills / Howard Schaller*	
OR: *Ron Boyce*	**WA:**	**ID:** *Russ Kiefer*	**MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner*			

TMT CONFERENCE CALL

27 August 2003   0900-1200 hours

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Recap of issue raised to IT during August 20, TMT meeting. (NOAA)
   [Final Executive statement on summer spill, August 26, 2003]
3. Dworshak Operation, Update (COE)
4. MOP Operation at Ice Harbor, Lower Monumental, and Little Goose. (All)
5. 2004 Water Management Plan. (COE)
6. Review current system conditions.
   - Fish migration status (NOAA Fisheries, USFWS)
   - Reservoir operation, power system, water quality, water supply (COE, BOR, BPA) [Exceedence Tracking] [High 12-hr Average]
7. Review operations requests. [SOR 2003-C6]
8. Other.
   - Set agenda for next meeting
     1. Availability of staff from BPA Transmission Business Line: Transmission Limitations

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

August 26, 2003

Statement of Corps of Engineers, Bonneville Power Administration, NOAA Fisheries
Re: Continuation of Summer Spill for Fish Passage in the Columbia and Snake Rivers

The regional heads of the Corps of Engineers (General William Grisoli), Bonneville Power Administration (Steve Wright) and NOAA Fisheries (Bob Lohn) said today that spill at Federal Columbia Basin dams to aid juvenile salmon migrants will continue until Aug. 31 consistent with the planning date identified in the 2000 NOAA Fisheries Biological Opinion on operation of the Federal Columbia River Power System. But the agency heads said they believe changes must be implemented before next summer to more clearly allow alternative measures that could accomplish the biological benefit associated with spill at a reduced cost.

Currently the river system is operated consistent with a 2000 biological opinion that provides recommendations for operating the system to improve survival of salmon and steelhead listed as threatened or endangered. The opinion sets a planning date for terminating the summer spill program on August 31, although the exact date is subject to in-season management by the Technical Management Team. However, the biological opinion provides little guidance for determining when to end spill in a particular year.

The federal agency heads noted that the summer spill program, based on available evidence, appears to be excessively costly relative to the biological benefit provided. An analysis performed by the Northwest Power and Conservation Council concludes that summer spill in August is likely to result in an increase in the number of 5 adult listed Snake River fall chinook, while non-listed adult upper Columbia River fall chinook are expected to increase by approximately 2400. Estimates by some of the region's Tribes indicate potentially higher numbers of survival as a result of the spill program. Spill this year is reducing revenues for the Bonneville Power Administration by approximately $1 million a day in August. The federal agency heads are concerned that under any of the survival estimates the costs appear exceedingly high relative to the biological benefit.

The federal agencies attempted to work with States and Tribes to identify alternative measures that would achieve similar or greater biological benefits. However, regional consensus could not be reached. Following considerable review, the federal agencies concluded there was an inadequate basis to cease spill this year at a time other than the August 31 planning date. The federal agencies determined to continue spill through August 31.

The agency heads stated their goal is to have a method in place by next year to help ensure that biological benefits are met in the most cost effective manner available. The agency heads concluded that they have a responsibility to the region to devise an approach that is less costly while maintaining the ability to achieve the biological objectives for salmon and steelhead, and will work with all interested parties in the region to accomplish this objective.

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
August 27, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

TMT Internet Homepage: http://www.nwd-wc.usace.army.mil/TMT/index.html

DRAFT

<u>FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS</u>
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

<u>Recap of IT Issue:</u>
Scott Bettin, BPA, reported on last week's IT discussions regarding end of summer spill on the Snake River. The IT was unable to reach consensus, so BPA elevated the issue to the executive level. The Federal Executives met on Friday and drafted a letter (provided today) explaining their decision to continue spill until August 31 as stated in the BiOp for this year and develop end of spill criteria for future years. Discussions on criteria will begin during next week's IT meeting. A suggestion was made from a TMT member to include the criteria, when they are developed, in the Water Management Plan. Russ Kiefer, Idaho, raised a concern with the tone of the Executive's summary, saying that it implies unwillingness from the states and tribes to work with the Feds on this issue. The comment was duly noted by the federal TMT representatives. The Executive's summary is attached to today's agenda and posted on the TMT web site.

<u>Dworshak Operations Update</u>:
Cindy Henriksen, COE, reported that Dworshak is continuing to discharge 8 kcfs during the day and 5.7 kcfs at night to reach elevation 1533' at the end of August and draft to 1520' by mid-September. Outflow temperatures are ~46.5° (day) and ~43.5° (night). Jim Adams, COE, asked TMT how big a temperature fluctuation is acceptable and what the maximum day time temperature should be.

<u>ACTION</u>: Paul Wagner will coordinate with the Salmon Managers on these questions and get back to Jim Adams as soon as possible. An update on their recommendation will be give at the next TMT meeting.

MOP Operations*:*
Last week, BPA requested that the Salmon Managers discuss an end date for MOP restrictions at Little Goose, Lower Monumental and Ice Harbor. Following discussion and a caucus, the Salmon Managers present at today's TMT meeting agreed to end restrictions at midnight (0001 hours) on Sunday (8/31) at Little Goose, midnight on Monday (9/1) at Lower Monumental, and midnight on Tuesday (9/2) at Ice Harbor.

2004 Water Management Plan:
Scott Boyd, COE, distributed hard copies of the draft WMP to TMT members last week and requested that written comments be sent by September 10. TMT members listed discussion items that will be further explored at the September 3 TMT meeting:

- 5 kcfs at BON corner collector
- Libby ramp rates (10 or 5 kcfs; 1 or 2 units?)
- RSW Operations at LGR (12 vs 24 hr. spill; curtain in or out?)
- Ice Harbor operations/ research plan review
- Beginning and end of Spring/Summer spill
- Transport and 85 kcfs at Snake River projects
- Albeni Falls operations – ISAB review?
- Libby/Hungry Horse drafting strategies
- Include process issues re: potential BiOp changes?
- Research appendix
- BON flow and spill revisions
- John Day operations re: research results – placeholder?
- Spring Creek – spill or not?
- "Other Operations"
- Intro paragraph re: why things are in the WMP
- Chum planning date

*The Water Quality portion of the WMP is being revised by Jim Adams of the COE and will be reviewed by the WQT at their meeting on September 9.

Current System Conditions:
Fish: Paul Wagner reported that adult numbers began their big movement yesterday, with a large number observed at Bonneville. Adult numbers so far are lower than previous years due likely to higher temperatures. Juveniles are nearly out of the system.

Reservoir operations: Libby is drafting to 2439' by the end of August – currently at elevation 2441'. Cindy Henriksen reported that outflows will be reduced next week and Scott Bettin noted that there may be some load shaping at the project. Hungry Horse is at elevation 3540.7' and releasing 2.3 kcfs. Fires have so far not had an impact on the project. Banks Lake is close to elevation 1565'. Grand Coulee is at 1279' and should reach 1278' on Friday; the BOR plans to limit fills at Grand Coulee over the Labor Day weekend to 1' per day.

Power system: BPA requested that spill end at 6 pm on August 31. After discussions with the co-managers, the Salmon Managers recommended that spill end at midnight on the 31st.

Water quality/supply: There were a number of reported TDG exceedances at McNary and Camas/Washougal over the last two weeks due to monitor dysfunction. Jim Adams reported that the monitors have been repaired and the levels are back to normal. The water supply Jan-July average was 83% of normal, as reported at last week's TMT meeting.

CRITFC SOR C-6:
Cindy Henriksen presented an operation request from CRITFC for a Fall fishery on 8/26-30; 9/2-5; and 9/9-12. The COE has instructed the following operations:

- The Bonneville pool will be held at 75-76.5' as a hard constraint.
- The Dalles will be operated for power, so no specific instructions relative to the SOR. The COE is aware of the need for a steady pool at the project.
- John Day will be operated at a 1.5' operating range as recommended in the BiOp. The COE is aware of the need for a steady pool at the project.

Other:
September 3 meeting agenda:

- Update on Salmon Managers response re: temperatures at Dworshak
- 2004 WMP discussion

September 10 meeting agenda:

- BPA Transmission Business Line?
- RPA 143 presentation (will be on September 24)
- Usual updates, current conditions, SOR's
- Additional agenda items for the 9/10 TMT meeting should be sent to the facilitation team or Cindy Henriksen at the COE.

Meeting Minutes

1. Greeting and Introductions

The August 27, 2003 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Update on Spill Issue Raised to IT at August 20 TMT Meeting.

Scott Bettin briefly recapped the spill issue raised to IT last week; he noted that, at its August 21 meeting, the IT was unable to reach consensus. The issue was then elevated to the Federal Executives. The Executives met to resolve the issue on Friday, said Bettin; their decision was to stay the course on the spill program this year, but to develop criteria for next year so that we have a clear understanding of when to start and stop spill. The bottom line is that the summer spill program will continue through August 31 this year, Bettin said. We will schedule the criteria discussion for a future TMT meeting, said Silverberg.

Russ Kiefer noted that, in his view, the written summary of the Federal Executives' discussion implied that the states and tribes were uncooperative in trying to reach consensus on an alternative operation that would provide equal or greater benefits at a lower cost. He said IDFG was unwilling to accept a model they had never seen, which seemed to mis-predict the 95% passage point about half the time. The statement to which you're referring didn't really have to do with the model, Bettin replied – it covers the entire lengthy discussion process that led up to the federal executives' decision. I hear your concern, said Silverberg; you're saying that it looks like it was your fault, and we'll bring that to the attention of those who wrote this statement.

So whose fault was it? Jim Litchfield asked. I think the point is that this could be written in such a way that fault isn't assigned, Silverberg replied. In the State of Idaho's view, there is no fault to be assigned in connection with the fact that we can't be sure 95% of the fish have passed, said Kiefer – Jim Yost's position is that the benefits of the spill program are limited, and that the money spent on spill could be better used on other mitigation efforts. It sounds, then, as though there is a disagreement between your position and Yost's, Litchfield observed. That was Jim Yost's position representing the State of Idaho at IT, Kiefer replied – my position, representing Idaho at the technical, TMT level, is that there is insufficient information to tell us whether or not the fish are gone. Henriksen noted that the Executives' statement is hot-linked to the agenda for today's meeting on the TMT homepage.

3. Dworshak Operation.

We're continuing to draft Dworshak, load-shaping with 8 Kcfs outflow during the day and 5.7 Kcfs at night, said Henriksen. We expect to reach elevation 1533' on August 31 and will draft the project to elevation 1520' by mid-September. Outflow temperature is 46 degrees during the day and 43.5 degrees at night, said Jim Adams; that range is expected to increase over time, particularly during the day, such that the diurnal fluctuation becomes larger between day and night. One question for the TMT is, what is the maximum acceptable daytime temperature? He added that the statement at last week's TMT meeting that there was only a day or two left before the Corps needed to move to undershot mode was incorrect – there are about 40 feet left to draft before we need to move to undershot-only mode, he said.

The group devoted a few minutes of discussion to the differences between overshot and undershot draft mode at Dworshak. Ultimately, Paul Wagner said there is no problem, from the salmon managers' standpoint, with the current diurnal fluctuation of 3 degrees F. in Dworshak outflow temperature. He added that he will discuss the question of a maximum daytime outflow temperature with the other salmon managers and will report back to Adams as soon as possible.

4. MOP Operation at Ice Harbor, Lower Monumental and Little Goose.

Last week, the salmon managers were asked to discuss whether we can lift the MOP restriction at the three projects, Silverberg said – what was the outcome of that discussion? We discussed that at yesterday's meeting, and our first thought was that we should watch the fish numbers for a while longer, then discuss this again at next Tuesday's meeting, said Chris Ross. MOP can be released when "small numbers" of juveniles are present, so it's a qualitative judgment call, he said. My understanding, however, is that Bonneville would like a quicker decision, and would like to reach consensus at today's meeting, if possible. We would prefer not to have a TMT meeting next week, said Bettin; our proposal would be to end MOP at Little Goose on Saturday, Lower Monumental on Sunday and Ice Harbor on Monday, to give us the full operating range at those projects.

After a brief caucus break, Wagner offered the following counterproposal: Sunday, Monday and Tuesday. We've got a deal, said Bettin – we'll lift the MOP restriction at Little Goose at midnight (0001 hours) on Sunday, at Lower Monumental at midnight on Monday and at Ice Harbor at midnight Tuesday. MOP will continue at Lower Granite into the fall. It was so agreed.

5. 2004 Water Management Plan.

We distributed hard copies of the most recent draft of the 2004 WMP at last week's meeting, said Henriksen; it is also linked to today's agenda on the TMT homepage. Written comments are due at the next TMT meeting on September 10, she said. Boyd said few comments have been received to date; he noted that there are going to be many significant issues that will need to be resolved in the 2004 Plan. The group went briefly through the draft Plan, identifying what they see as the most significant issues that will need to be addressed, including:

- Lower Granite RSW operations (12 vs. 24 hours? BGS in or out?)
- Libby/Hungry Horse ramp rates
- the water quality appendix – WQT review?
- operation of Bonneville corner collector (when should it be on and off? How to account for the 5 Kcfs that goes through it?)
- criteria for the beginning and end of spill (spring and summer)
- how to operate Ice Harbor
- the Snake River 85 Kcfs threshold issue/when to begin transport,
- winter lake level at Albeni Falls

- Libby/Hungry Horse drafting strategies
- how to incorporate potential changes to the NOAA and USFWS BiOps
- the research appendix
- flow and spill revisions
- John Day operations
- Bonneville operations
- Spring Creek hatchery releases – to spill or not to spill?
- non-BiOp operational requirements
- the introductory paragraph
- the chum planning date – criteria for the start of the chum operation

Silverberg asked the TMT participants to consider these and other issues and to come to the September 3 TMT meeting prepared to discuss them.

6. Current System Conditions.

With respect to the current status of the adult migration, Wagner said, fall chinook counts at Bonneville increased very significantly yesterday; however, the 2003 run is lagging behind 2000, 2001 and 2002 in both numbers and timing. In other words, he said, it appears that the 2003 run is just beginning in earnest. He noted that water temperatures in the Bonneville forebay have been warmer this year than in the past four years – in the 22-degree C range throughout the month of August, compared to 21-22 degrees in 2000, 2001 and 2002. What's the projection for the total seasonal count? Bettin asked. I'm not sure, but 400,000 rings a bell, said Wagner.

Moving on to Snake River subyearling fall chinook passage, said Wagner, there isn't much going on at Lower Granite; Lower Monumental shows the most action, but the daily indices for PIT-tagged wild Snake River subyearlings are in the single digits at all projects. The combined subyearling chinook indices have shown a decreasing trend through the month of August at all projects, Wagner said. Wagner also touched on the water temperature regimes at Lower Granite and the downstream projects.

Wagner noted that chum operations are on the horizon; there are no estimates of the size of the run, as yet, but the indications are that it will be a large run this year.

Moving on to reservoir operations, Henriksen said Libby is drafting toward elevation 2439' by August 31, it's at elevation 2441', currently, and releasing 14 Kcfs. We will reduce that somewhat on Sunday to avoid drafting too fast, she said; Libby is expected to release about 6 Kcfs in September. There may be some load-shaping coming up at Libby, although the ramp rates at that project will limit the magnitude of changes in outflow from that project, Bettin added.

Tony Norris said the current Hungry Horse elevation is 3540.7 feet, with outflow of 2.3 Kcfs to meet the current 4.1 Kcfs Columbia Falls minimum. The fires have not impacted Hungry Horse operations so far, he said. Banks Lake is near 1565 feet and should touch that elevation by the end of the week. Grand Coulee is at elevation 1279', currently, and should touch 1278’ on Friday. We plan to fill Grand Coulee by one foot on Saturday and Sunday, he said, and plan to refill the reservoir to elevation 1283’ during September.

Power system? Silverberg asked. The power system is fine so far; the lights are still on, Bettin said. With respect to the end of the summer spill program, said Bettin, normally we would end spill at 6 p.m. on August 31 and would like to do so again this year. Wagner said he had discussed this issue with others at NOAA Fisheries; we would prefer that spill continue until midnight on August 31 at all four projects, he said.

Jim Adams said there have been a number of water quality exceedences recorded, particularly at the McNary Washington-side monitor and camas Washougal, over the past week; those TDG exceedences were due to monitor malfunction. That problem has now been corrected, Adams said.

7. New System Operational Requests.

On August 27, the action agencies received SOR 2003 C-6. This SOR, developed and supported by the Columbia River Inter-Tribal Fish Commission, requests that the following specific operations be implemented as a hard constraint:

- August 26, 6 a.m. through August 30, 6 p.m.
- September 2, 6 a.m. through September 5, 6 p.m.
- September 9, 6 a.m. through September 12 6 p.m.
- Bonneville Pool: operate the pool within 1 foot from full pool (msl elevation 76.5-75.5)
- The Dalles pool: operate the pool within 1 foot (msl elevation 159.5-158.5)
- John Day pool: operate the pool within 1 foot (msl elevation 264.5-263.5)

The TMT went briefly through the contents of this SOR. Henriksen said the Corps has issued instructions to Bonneville Dam to maintain a pool elevation between 75 and 76.5. The soft constraint is a one-foot range between 75.5 and 76.5, Henriksen said. We’re aware of the need at The Dalles pool, but that pool’s operating range is three feet and rarely uses all of it. There is already a 1.5-foot operating range in place at John Day, and it seldom fluctuates more than one foot at this time of year, she said. Kyle Martin would also like you to know that these fish are for sale for $2 per pound at Cascade Locks, Bettin said.

8. Recommended Operations.

Recommended operations were discussed during a previous agenda item.

9. Next TMT Meeting Date.

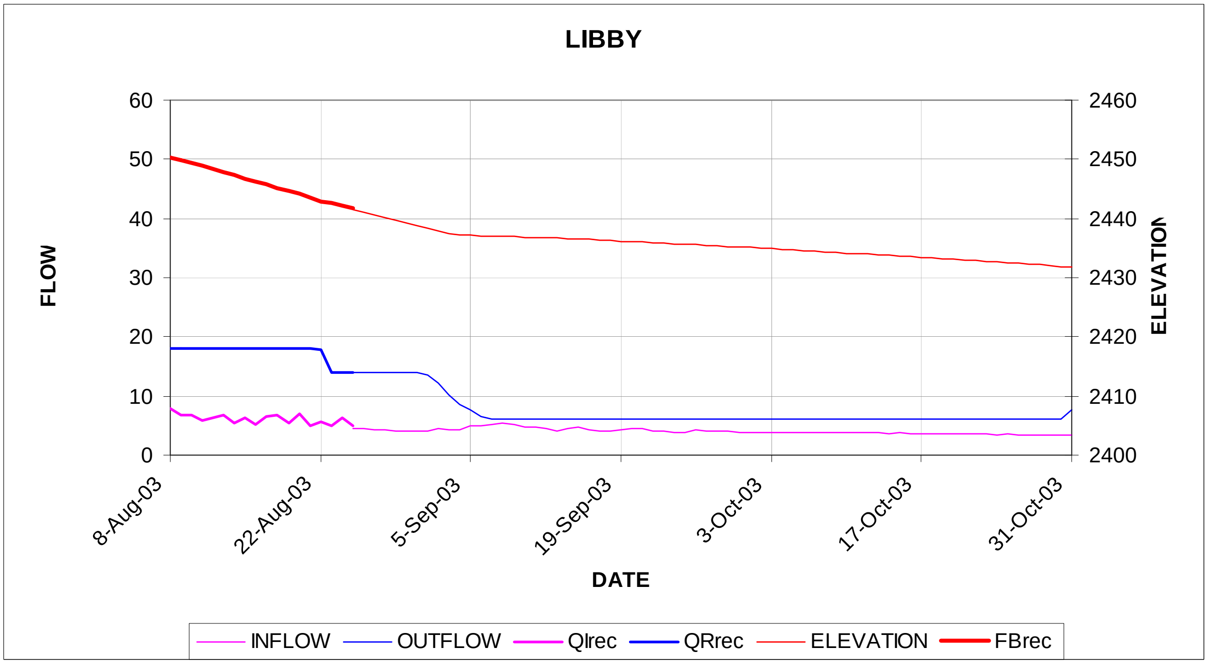
The next meeting of the Technical Management Team was set for Wednesday, September 3; the primary purpose of this meeting is to discuss the 2004 Water Management Plan. Meeting summary prepared by Jeff Kuechle.

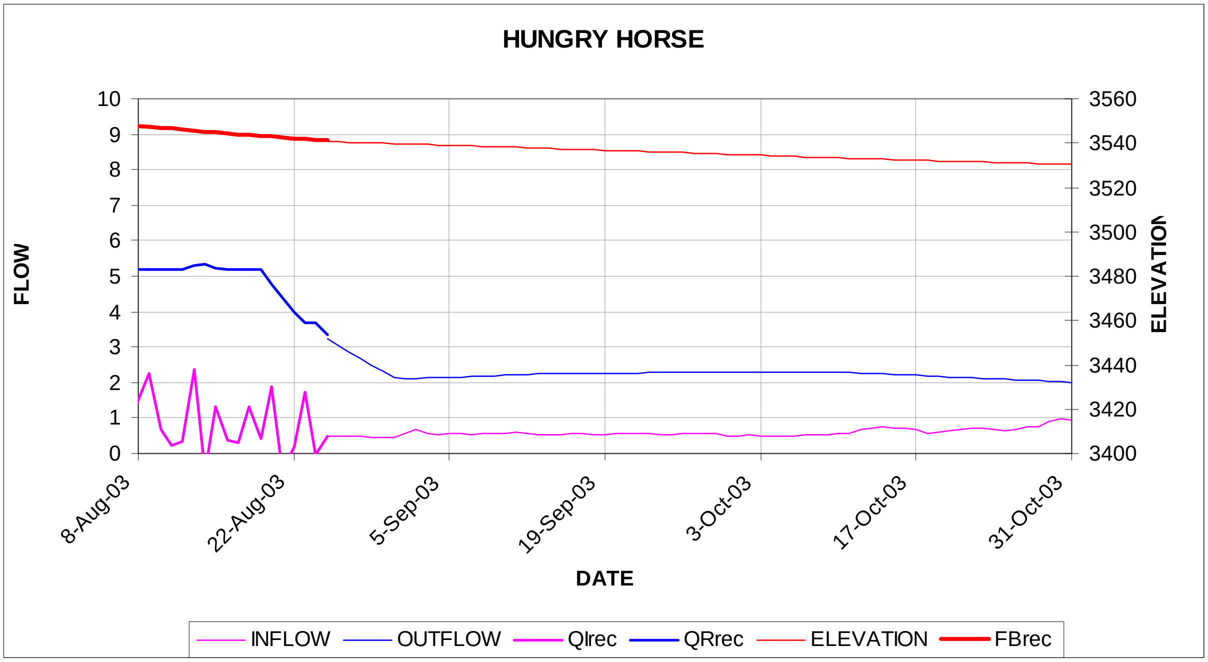
TMT PARTICIPANT LIST
August 27, 2003

Name	**Affiliation**
Donna Silverberg	Facilitation Team
Paul Wagner	NOAA Fisheries
Russ Kiefer	IDFG
Tony Norris	USBR
Cindy Henriksen	COE
Mary Karen Scullion	COE
Rudd Turner	COE
Russ George	WMCI
David Benner	FPC
Robin Harkless	Facilitation Team
Kevin Nordt	PGE
Tim Heizenrater	PPM
Scott Bettin	BPA
Chris Ross	NOAA Fisheries
Julie Ammann	COE
Nancy Yun	COE
Scott Boyd	COE
John Wellschlager	BPA
Jim Adams	COE
Jim Litchfield	Consultant (Montana)
Nick Lane	BPA
Randy Wortman	COE
Tina Lundell	COE
Colin Beam	PPM
Mike Butchko	Powerex

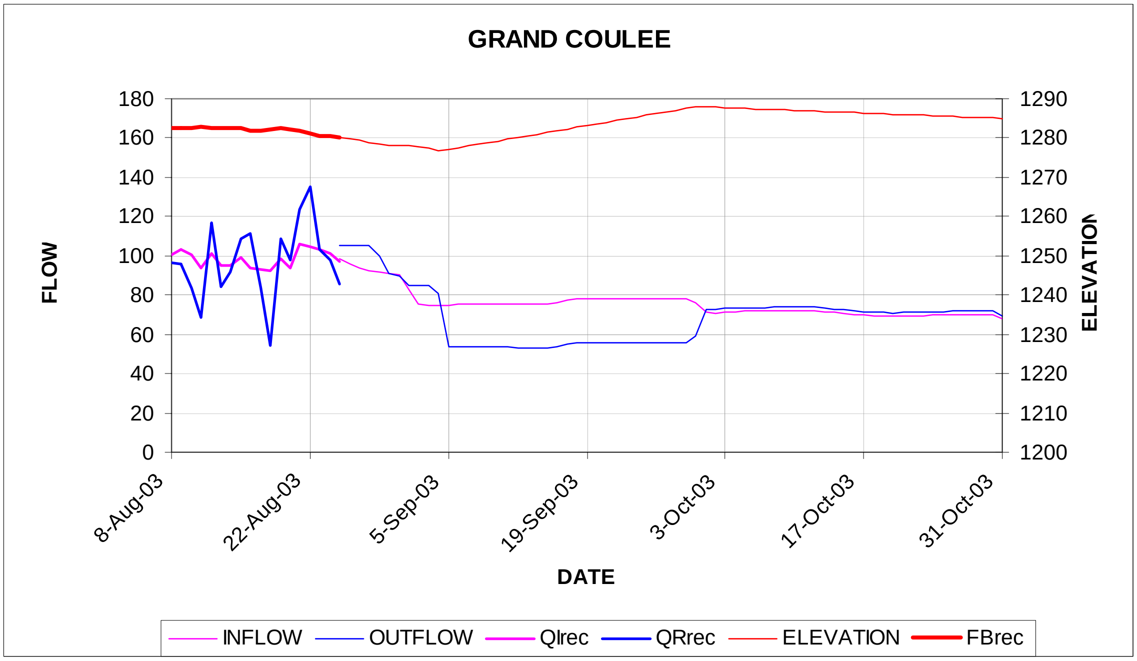
Tom Haymaker	PNGC
Martin Hatscher	SCL
Bill Rudolph	NWFL
Margaret Filardo	FPC
Lance Elias	PPL
Mike O’Bryant	CBB
Glenn Traeger	Avista Energy
Tom Le	PSE

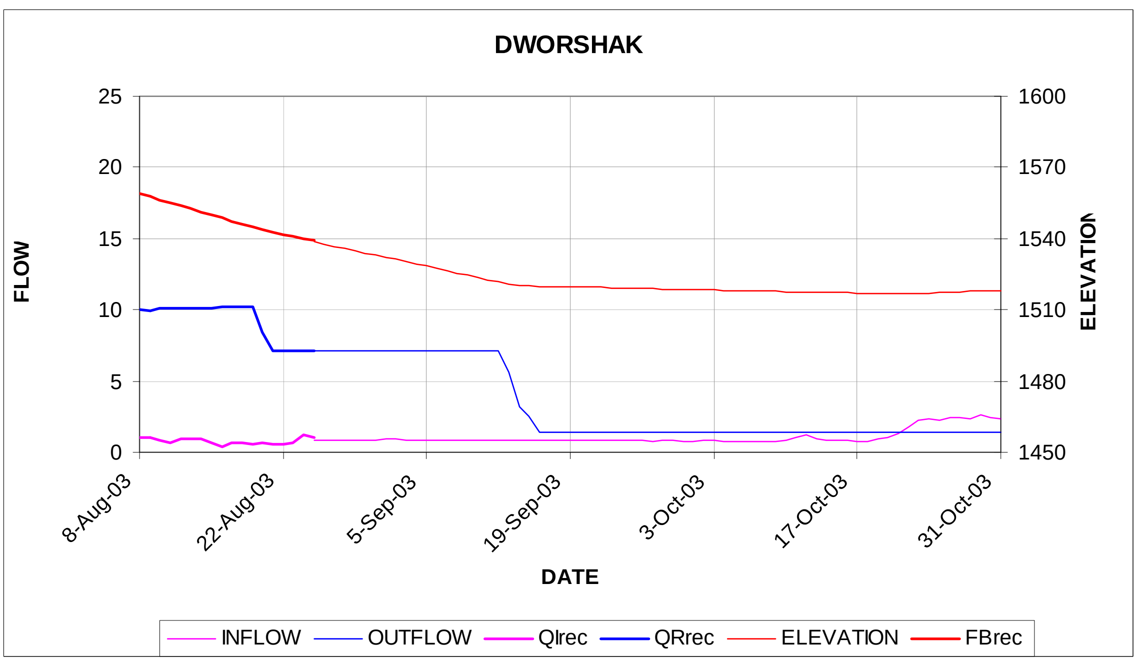
STP for August 25, 2003





STP for August 25, 2003





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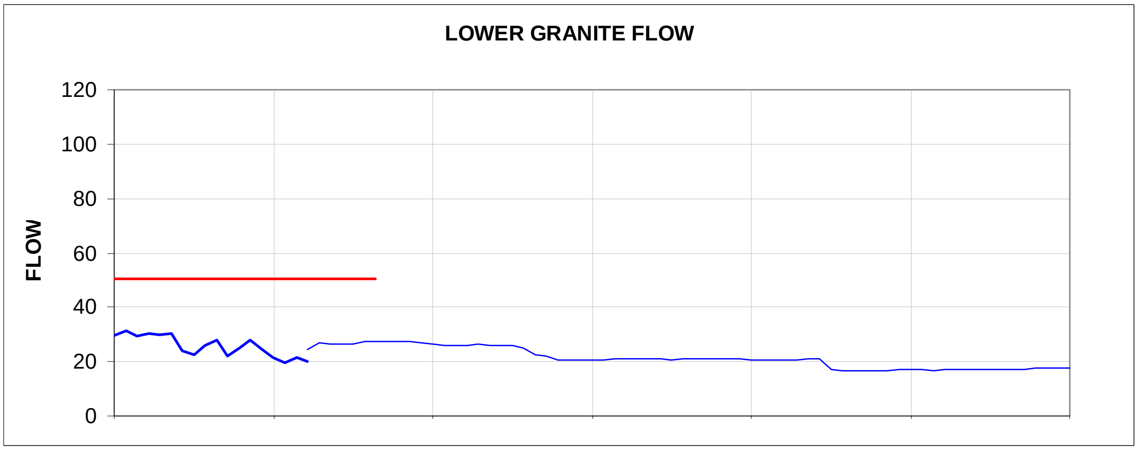
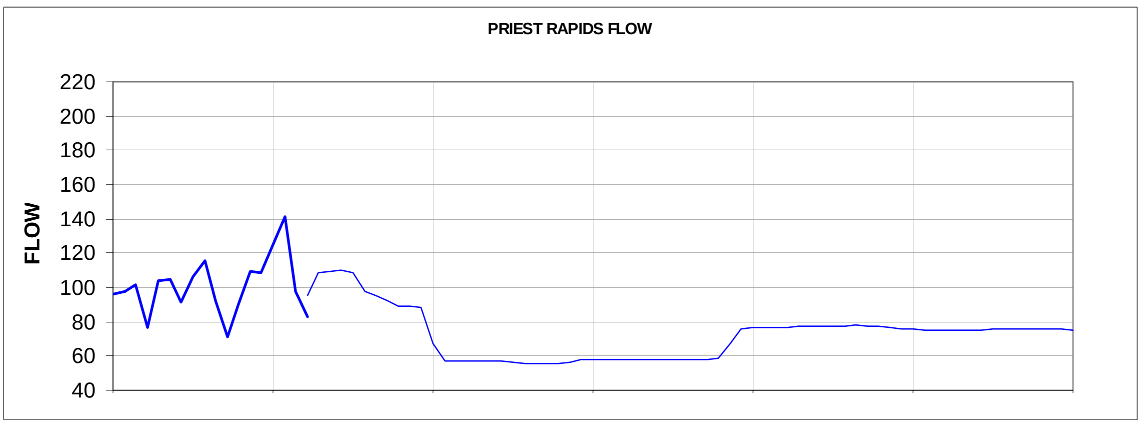
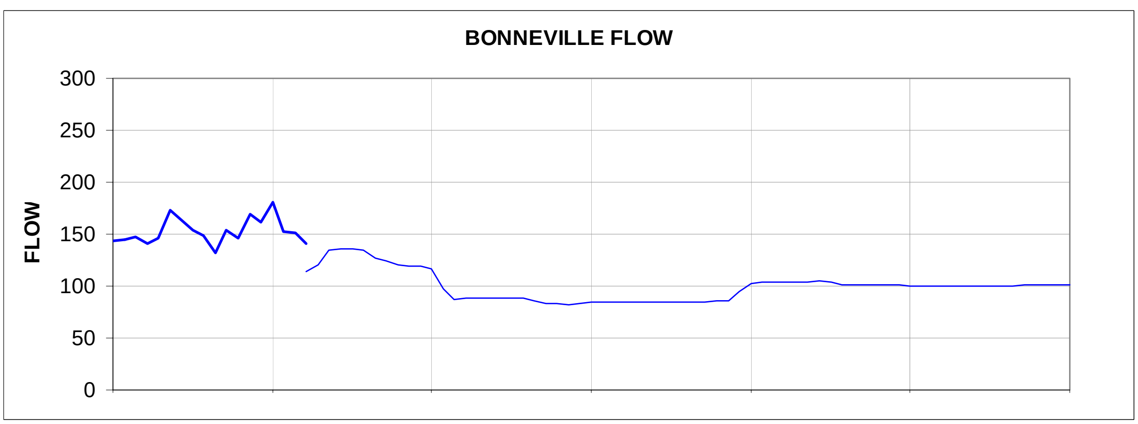
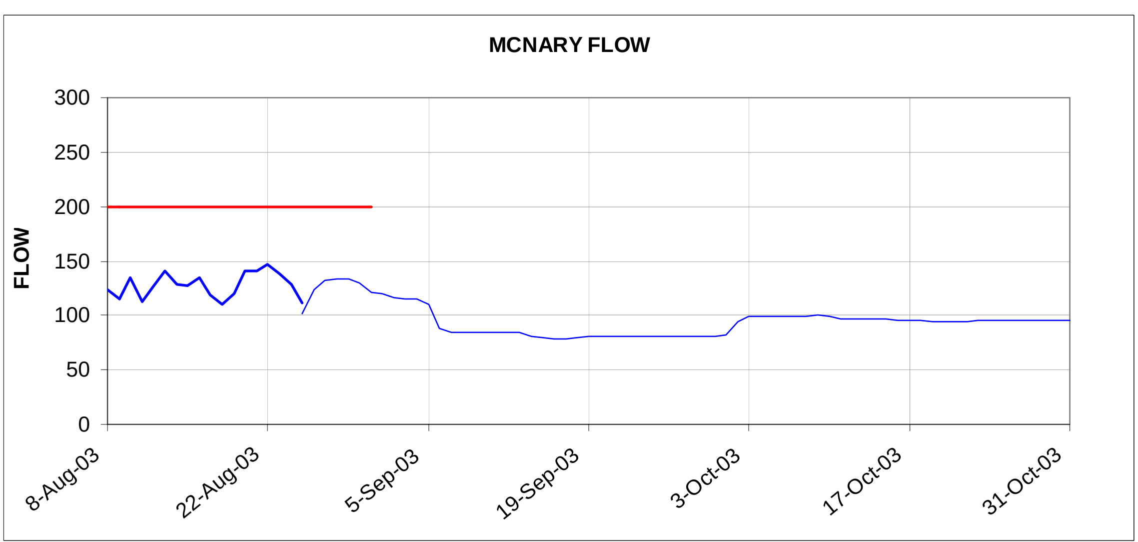








TECHNICAL MANAGEMENT TEAM

BOR: *Tony Norris / Lori Postlethwait* **BPA:** *Scott Bettin / John Wellschlager*
NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*
OR: *Ron Boyce* **WA:** **ID:** *Russ Kiefer* **MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner*

TMT MEETING

03 September 2003 0900-1200 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Water Management Plan Discussion. (ALL)
3. DwLorshak Operations for temperature. (USFWS, NOAA, CoE)
   [SOR 2003-14]
4. Other.
   - Set agenda for next meeting
     1. Availability of staff from BPA Transmission Business Line: Transmission Limitations

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
September 3, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Dworshak Operations:
Per last week's TMT discussion on Dworshak operations, the Salmon Managers developed an SOR (2003-14) requesting a flat flow out of the project to maintain temperatures between 44 and 48 degrees. Jim Adams, COE, explained the current Dworshak operation and offered alternative suggestions that would meet the needs of the Salmon Managers.

ACTION: As agreed to by the TMT, the COE will maintain the current operation at Dworshak and switch to all undershot mode if temperatures are above 45°.

2004 Water Management Plan:
During last week's TMT meeting, members developed a list of items in the WMP to further discuss today. The group flagged the issues that will need to be addressed and put a time frame on when decisions will be made. These issues will then be taken to the IT for approval. The following bullets summarize today's discussion:

- Process Changes to the BiOp: TMT members discussed the BiOp remand and how that might affect this group in making changes. They agreed the introduction should address that there is a potential for change to the WMP due to decisions made re: the remand in the next year. Also, a note will be put in that the COE is in consultation with USFWS on Libby operations, which could affect the USFWS BiOp. A third issue that will be included is how TMT will address recommendations from the NWPPC.
- 5 kcfs at BON Corner Collector: SRWG will look at test design proposals at an AFEP meeting Sept. 16-18. The outcome of those decisions will be included in the Spring/Summer update to the WMP.
- Libby Ramp Rates: A typo was noted in the USFWS Bull Trout BiOp – Dave Wills will make corrections and update TMT on the change at next week's meeting.
- RSW Operations at Lower Granite: SRWG will research this and FPOM will implement the decision using data from '03 tests – available in November. This information will be included in the Spring/Summer update to the WMP.

- Ice Harbor Operations/Research Plan Review: Again, SRWG will research, FPOM will implement, and information will be included in the Spring/Summer update. There needs to be a loop back from FPOM to TMT as to changes to the BiOp; agencies should be urged to attend and support this and other forums.
- Begin/End Spill: IT will begin to discuss this policy issue at their September 4 meeting and TMT will be updated at the September 10 TMT meeting. There may be a need for a joint TMT/IT meeting to discuss this issue.
- Transport and 85 kcfs: The current operation, transport all fish collected, is included in the '03 WMP. The new question raised by BPA is: Specific to April/May, use spill to leave fish in river or use the bypass facilities to leave fish in river? TMT felt that this may be an appropriate question for FPOM to answer (what are the technical differences of the two?) and bring to TMT for a full discussion.
    - ACTION: FPAC will discuss this issue and make recommendations to TMT based on biological research.
- Albeni Falls Operations: Note that it is anticipated this operation will be reviewed by ISAB (Lake Ponderey levels) prior to October 31.
    - ACTION: USFWS and NOAA are currently in negotiations on this issue. Paul Wagner will update TMT on those discussions at the September 24 meeting.
- Libby/Hungry Horse Drafting Strategies: Include a statement in the WMP that there are recommendations to change the current strategies, experiments may be underway and there may be a possible operation change in 2004. There is a PPC meeting Friday, Sept. 5 to discuss the recommendations, which will then go to AFEP and other forums.
    - ACTION: Paul Wagner will find out if and how CBFWA is involved in this process and inform TMT at next week's meeting.
- Research Appendix: There may be updates for new research to include. Mention pending research projects from NPPC and point the reader to other places for more detailed descriptions.
- BON Flow and Spill Revisions: Desired changes, if major, should be brought forward through Implementation Plan discussions.
- John Day Operations RE: Research Results: Research results are due in November. In the meantime, NOAA will be working with the Action Agencies via the Implementation Plan.
- Spring Creek – Spill or No Spill? Discussions are underway regarding hatchery operation/releases and operating decisions. USFWS is coordinating the discussions.
- "Other Operations": A suggestion was made that more operations outside the BiOp exist and could be added to Table 1.3 – the COE will add any that are brought forth by TMT members. The Columbia Falls operation will be deleted because it is a BiOp operation.
- Intro Paragraph RE: Why Items are in the WMP: TMT members will offer a paragraph on this, or leave it to other team members.
- Chum Planning Date: Criteria for beginning chum operations will be included in the WMP – the criteria will be discussed at the next TMT meeting.

Other:

Libby Operations: Cindy Henriksen, COE, reported that Libby was currently at elevation 2438' and releasing 11.9 kcfs (11 kcfs the previous night). The intended operation is to reduce outflows by 1 kcfs every other day to reach 6 kcfs by 9/13. Montana requested to flatten flows at 7 kcfs for the rest of September. The Action Agencies will discuss this possibility during next week's TMT meeting. For now, outflows will be reduced by 1 kcfs every other day.

Treaty Fishing: Cindy Henriksen reported that due to a number of non-power requirements (Grand Coulee nearing the bottom of its operating range, McNary refill, low flows, etc.), Bonneville may sink below its operating range this week, which may affect the treaty fishery.

Reservoir Operations: Tony Norris, BOR, reported that Hungry Horse reached elevation 3540' on 8/31; Grand Coulee reached 1278' on 8/29 and did not fill much over the weekend.

Summer Flows: The July-August seasonal average flow at Lower Granite was 32.3 kcfs and 135.5 at McNary.

Next Meeting, September 10*:*
Agenda Items:
- IT Input on Spill Criteria/Process
- Albeni Falls Update
- Chum Criteria
- Transmission Business Line
- Libby Operations
- Schedule Year End Review

Meeting Minutes

1. Greeting and Introductions

The September 3 Technical Management Team meeting was chaired by Rudd Turner of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Turner at 503/808-3935.

2. Discussion of 2004 Water Management Plan.

At its last meeting, the TMT identified a list of potential issues associated with the 2004 Water Management Plan, said Silverberg; shall we just start at the top? Scott Bettin noted that a number of these issues are being addressed in other forums, and it may be sufficient to simply note where that is taking place.

Paul Wagner suggested that it may be helpful to briefly discuss the process for changing the Biological Opinion. The project operators, for example, feel that the 2004 Implementation Plan is the avenue through which many of these changes will be made, Wagner said. The agencies have to be very clear in committing to the process as to when, and in what avenue, changes to the BiOp will be made, and in what time-frame, Wagner said. The Implementation Plan is developed by the action agencies, said Bettin; the 2004 Water Management Plan is our plan as well, and we're here to get input on that plan. It's an evolving process, said Wagner; it's not intended to remain static, but needs to be based on whatever new information comes to hand.

I see it as a hierarchical process, said Jim Litchfield – there's the BiOp, the findings letters that append to the BiOp, the Implementation Plan and the Water Management Plan. That's not quite the way things worked out last year, Wagner replied; having been through this last year, I wanted to be clear that there may be more rigid avenues and time-frames within which the structure of the BiOp can be changed.

The group also discussed the potential impact of the current litigation on the process for changing the BiOp. I think we at least need to reference, in the Water Management Plan, the fact that the 2000 BiOp has been remanded to NOAA Fisheries for revision, and a new BiOp is expected in May which may significantly change the operations in the 2004 WMP, Litchfield said.

The whole idea behind the Water Management Plan is to make the operation of the system as transparent to the public as possible, and to anticipate any contentious issues the TMT will need to deal with in the year ahead, so that we don't have to start those negotiations cold right before a decision needs to be made, said Silverberg. There was general agreement that this is the case.

We are also re-initiating consultation on the U.S. Fish and Wildlife Service on Libby Dam operations related to sturgeon and bull trout, which could have an impact, Turner said. We should also mention the Council's mainstem recommendations as something we're seeking to implement, Litchfield said. How are we going to do that? Wagner asked -- there is no Montana study in the AFEP submittal, and AFEP is going to start meeting next week. Montana is working on its study, and I simply think it would be astute of us to recognize that the Council has made a series of recommendations, and we're going to need to address them in the WMP, Litchfield replied.

Bettin noted that there are operational inconsistencies in the Council recommendations; he suggested that the TMT may want to approach Council staff to ask for their comments on the Water Management Plan. We could address them in the research appendix to the WMP, Tony Norris suggested. The Water Management Plan is intended to implement the BiOp, Norris observed – until the Council recommendations become an accepted part of the BiOp, we can't effectively address them. Litchfield replied that there are a number of actions in the Water Management Plan that have nothing to do with the BiOp. Again, it would be helpful to ask the Council, what are your expectations for 2004? Bettin said – it would be nice to know that. Perhaps we can simply acknowledge that the TMT is aware of the ongoing efforts of the Council staff to develop an implementation plan for the recommendations in the Council's mainstem amendments, Silverberg suggested.

Again, we need greater clarity on how changes will be made to the BiOp, Wagner said – this is an action agency document, and my concern is that you will be unwilling to consider any actions that represent a significant departure from the BiOp unless they are incorporated in the Implementation Plan. That's correct, said Bettin – likely, those changes will be made in the 2004 Implementation Plan. Paul's concern is, how do we make a change, in advance, such as putting criteria in place for when the summer spill program should end – should it end before August 31, or extend past that date? Silverberg noted -- we need to set up the processes to do that. We need to flag the areas where we have process questions, and help set up a process for resolving those issues. That resolution likely won't occur at TMT, however, Silverberg observed. Mainly, I want to be sure we're all clear that there is a process, and that process is X, Wagner said – we need to identify issues here at TMT, and make suggestions as to a process by which they can be resolved. There are a number of issues that won't be resolved until we have certain information in hand, he said; it may be possible to say, that information is expected to be available at this point, and once that occurs, here is a process by which we anticipate it can be resolved.

The group then continued on through the list of issues identified at the last TMT meeting:

1. 5 Kcfs at Bonneville Corner Collector: Bettin noted that the issue here is that there is no agreement as to how to turn this structure, which is scheduled to be operational in March 2004, on. Is it a spillway? A sluiceway? he asked. Bettin noted that he has heard that the corner collector will need to have some spill running by it in order to operate most efficiently. Where, then, will this issue be addressed? Silverberg asked. Turner replied that FPOM will be discussing the corner collector operation in order to specify a Bonneville project operation for fish in the 2004 Fish Passage Plan. David Wills added that there are corner collector operational and study proposals that are being evaluated within AFEP. The question at AFEP, however, will be, what are you trying to test? said Bettin – there are conflicting viewpoints about that.

The group discussed the concept behind the corner collector, noting that it is essentially a surface collector designed to increase B2 fish passage efficiency, operating at the corner of the B2 forebay. The fish are placed in an area where egress is good and predation is less of a problem, Wagner explained. It's a sluiceway that has been modified to operate as a surface collector; preliminary tests have shown that it is very effective in increasing fish passage efficiency, observed Ron Boyce. As Scott has said, we need to define the operational objectives for that structure through FPOM and AFEP. Wills said AFEP will be meeting on September 15, 16 and 17, at which time there will be further discussion of this topic.

2. Libby Ramp Rates: This is simply a typo in the U.S. Fish and Wildlife Service bull trout BiOp, Bettin explained; the BiOp doesn't specify the number of units, and the question is simply how typos are corrected in that document. I'll check, said Wills.

3. RSW Operations at Lower Granite (12 vs. 24-Hour Spill, Curtain In or Out?): This is primarily an FPOM issue, said Boyce; FPOM will develop a plan which we will then have an opportunity to review. The data from the 2003 test will be available in

November; that research will inform the operational recommendation for 2004. It sounds as though the spring/summer update to the 2004 WMP is the place to define the actual operation, Wagner observed.

4. Ice Harbor Operations/Research Plan Review: The research is now done at this project, and the question is, what do we do here? Boyce said – again, this will be handled through FPOM, AFEP and the spring/summer update.

5. Beginning and End of Spring/Summer Spill Program: It was agreed that this item will be discussed at tomorrow's IT meeting; eventually, TMT will likely be asked to develop the criteria under which this decision will be made. Boyce observed that the direction from the Federal Executives includes a statement to the effect that the economics of the spill program need to be considered; that is not something the TMT addresses, he said. Silverberg suggested that it is likely that the IT and TMT will be asked to consider this question in tandem, and that the IT will probably take on the cost aspect of this issue. I expect that the IT will discuss this issue at its September 4 meeting and will provide guidance at that point, Silverberg said. We'll discuss this issue again at TMT's September 10 meeting, Bettin said.

6. Transport and 85 Kcfs at Snake River Projects: I wanted to be sure that we include the criteria developed on this issue last year in the 2004 Water Management Plan, stating the relevant factors that need to be considered in this decision, Wagner explained – essentially, that there are seasonal factors to be taken into account in deciding whether we go to max transport or stay with a spread-the-risk strategy. It was observed that this is essentially a spill question and could be combined with Issue 5, above. They could be independent, as well, Boyce noted. There really isn't a forum that deals with transportation, Wagner observed; TMT is probably the most appropriate forum to deal with transportation issues, and the question is, what is the protocol for taking up potential operational changes? I would suggest that the Implementation Plan is the logical place to make such a change, Bettin said. Turner said that FPOM contains the remnants of the old Fish Transportation Oversight Team, and FPOM discussed and agreed to a change in the end date of transportation at McNary. This was incorporated into the 2003 Fish Passage Plan. After a few minutes of discussion, Idaho suggested asking FPAC to consider this question, and bring a recommendation back to TMT. Basically, we need an assessment of the technical differences in survival between the various operational choices available at this point in the season, said Bettin: transport, spill or bypass. If the difference in survival between spill and bypass is .0001%, but the difference in cost is millions of dollars, hopefully that can be factored in as well, he said.

7. Albeni Falls Operation – AFEP Review? This is mainly an information item, said Wagner; this issue will be reviewed by the ISAB this year. The time horizon for that review is three to six months out, however, Bettin observed. Wagner noted that there have been two different lake elevations that have been implemented at Lake Pend Oreille since 1996; kokanee spawn along the shore, and different lake elevations provide different levels of in-gravel productivity. There have been higher and lower lake elevations in effect at various times, he said; the plan is to go to an every-other-year, higher vs. lower lake operation through 2007, at which point a decision will be made as to the most beneficial lake elevation.

It's essentially a tradeoff between the needs of kokanee and the needs of chum, which could use the water from Pend Oreille during the fall, Wagner said. Cindy Henriksen said that a decision about the winter lake elevation needs to be made by October 31 and implemented by November 15. But the ISAB's recommendation won't be available at that time, said Bettin – can we agree that the Fish and Wildlife Service, NOAA Fisheries and IDFG will decide whether, this year, we're in an up year or a down year at Lake Pend Oreille, then let the ISAB's recommendation guide future years' operations? After a brief discussion, it was so agreed. Wagner noted that 2002 was an "up" year, so 2003 will likely be a "down" year. It was agreed that NOAA Fisheries, USFWS and IDFG will make a recommendation on this issue within the next two weeks.

8. Libby/Hungry Horse Drafting Strategies: This discussion is obviously going to continue for a while, said Litchfield, but Montana would like to get its recommended operational changes in place by this winter. He noted that the Council is discussing what kind of evaluations need to be in place to support Montana's recommended operational changes to Libby and Hungry Horse drafting strategies, with the goal of implementing those changes next summer. Litchfield suggested that language to this effect be inserted in the 2004 WMP. It was added that CBFWA has volunteered to develop a study plan for Montana's proposed Libby and Hungry Horse operations; Wagner agreed to contact CBFWA regarding the status of that effort and will report back to the TMT at a future meeting. TMT members invited Montana to participate in the 2004 study development process for the Corps' AFEP and NPCC program, so that activities can be approved and implemented.

9. Include Process Issues re: Potential BiOp Changes: This topic was covered during the introduction to this agenda item.

10. Research Appendix: The issue here is that, as the Council and others in the region develop research recommendations, it may be necessary to change the research appendix to the 2004 WMP, Litchfield said. Also, that it is appropriate to mention that there is impending research for Libby, Hungry Horse and other projects, said Norris; in other words, we should not expect the research appendix to be a static document this year. There is also a question about what level of detail is appropriate to avoid excessive length and redundancy with the five-year implementation plan and Fish Passage Plan, Cindy Henriksen observed. After a few minutes of discussion, it was agreed to refer readers of the research appendix to the appropriate place to find more detailed information.

11. Bonneville Flow and Spill Revisions: What I have heard on this topic is that, if change, such as higher daytime spill, is desired here, the appropriate place to bring it up is the implementation planning process, Wagner said. No disagreements were raised to this statement. The only thing I would add is that, if changes are desired for 2004, they need to be submitted very quickly, because that implementation planning process is underway now, said Turner – the Implementation Plan is due by October 1.

12. John Day Operations re: Research Results – Placeholder? This is very similar to Item 11, said Bettin – it's an issue that needs to be decided within the Implementation Plan. It was observed that the final results from the 2003 research at John Day won't be available until November, which may present a timing problem. However, we could say that, based on previous years' research, this is what we would do; if the 2003 results are similar, this is how we would operate John Day, Bettin said. If the research results do not support such a conclusion, however, I'm concerned that the action agencies will reply that it is too late to change the operation for 2004, Wagner said.

13. Spring Creek – Spill or No Spill? Wills said he doesn't know, at this point, what the recommended Spring Creek operation is for 2004; some conversations occurred earlier this year, but they were inconclusive. He said he has been trying to discover what is planned in terms of further discussion of spill in support of the Spring Creek Hatchery releases, but there is no resolution yet. Wills said he will report back at a future TMT meeting once those discussions have borne fruit.

14. Other Operations. This section is intended to refer to non-BiOp operations on which TMT has some input, said Bettin. So essentially, we need to say that TMT will from time to time discuss non Bi-Op operations? Silverberg asked. That's correct, Bettin replied – there is a table in the 2003 WMP, laying out the non-BiOp operations that may impact the TMT's operational flexibility. Silverberg observed that the intent of the WMP is not only to discuss the TMT's Biological Opinion responsibilities, but to inform readers of how the river is going to be operated in 2004. After a brief discussion, it was agreed to delete the Columbia Falls minimum flow from the list. Litchfield said that, to him, this list is incomplete; Bettin asked that any comments about other operations that should be included be submitted as soon as possible.

15. Intro Paragraph: Why Things Are In the WMP: Silverberg suggested that a TMT member volunteer to draft appropriate language for insertion in the opening section of the 2004 WMP. Litchfield read some language he has drafted regarding the remand of the 2000 BiOp; perhaps we should all take a stab at this, he suggested. It was agreed that anyone who wants to draft language for insertion into the opening paragraph do so.

16. Chum Planning Date: The planning date in the BiOp for the start of the chum operation is November 1, said Bettin; my concern is that we have no criteria for determining when enough fish are present on the spawning grounds to decide when to commence the chum operation in a given year. Basically, he said, I don't want to get to the 11th hour before we make a decision on this issue; I'd like to start the discussion earlier, if possible. We have discussed such criteria in the past, said Litchfield; it would be helpful to include them in the WMP. I'll dust those off and bring them to the next TMT meeting, said Wagner.

3. Dworshak Water Temperature Operations.

On September 2, the action agencies received SOR 2003-14. This SOR, supported by USFWS, NOAA Fisheries, IDFG, ODFW, WDFW and CRITFC, requests the following specific operations:

- If necessary to maintain water temperature criteria, increase outflows at Dworshak to 8 Kcfs beginning September 3 and continue through September 11. On September 12, use remaining storage water to ramp outflows down to the minimum Dworshak discharge; enough storage water should remain to provide a similar three-day rampdown as modeled in the August 25 STP run. September 3-11 outflows should be consistent at 8 Kcfs throughout each day with little daily load following fluctuations. Temperatures of Dworshak release water should be 44-48 degrees F. Whenever possible, meet both the 68 degree F temperature criteria at Lower Granite and the Dworshak release water of 44-48 degrees F.

Wills went briefly through the SOR, noting that Jim Adams had called him a week ago to explain the upcoming temperature changes at Dworshak. He wanted to know what the salmon managers would like to see as a preferred Dworshak operation, in the context of the current temperature situation at Lower Granite, Wills said. He noted that there have been blocks of time over the past few days when Lower Granite water temperatures have spiked above the 68-degree temperature criteria. The hatchery would prefer no more than a 4-degree F diurnal shift in Dworshak outflow temperatures, with a maximum daily discharge temperature of 52 degrees. This SOR is intended to spell out that operation, Wills said.

Jim Adams noted that the current daytime discharge at Dworshak is 8 Kcfs at 48 degrees; at night, the project is releasing 5.3 Kcfs at about 45 degrees. We could run a higher volume of cooler water at night, if the salmon managers desire, Adams said. We could also keep the discharge volumes the same but shift both units to undershot mode during the day, he said; the only downside to that option is that we will run out of cold water faster. Last year, however, we had 46-degree water available through the end of September, said Adams, the temperature profile in the reservoir looks similar this year, so I don’t anticipate that we’ll run out of cold water before that date.

The group briefly reviewed the most recent temperature information from the Lower Granite forebay, noting that the 68-degree temperature standard is being slightly exceeded (68.4 degree maximum) between the hours of 6 p.m. and midnight. Paul Wagner said he would be willing to try shifting both Dworshak units to undershot mode while keeping the current 8 Kcfs-5.3 Kcfs daytime-nighttime discharge volume regime in place, to see whether that would be enough to maintain Lower Granite forebay water temperatures below the 68-degree standard.

Scott Bettin noted that this is the typical water temperature pattern seen during the first week in September; part of the reason is that the discharge of warm water from the Hells Canyon Complex has increased. We have no control over that operation, he said. Turner noted that cooler weather and precipitation is expected to arrive in the Lewiston area this weekend.

After a few minutes of additional discussion, the TMT agreed to continue the current load-following operation at Dworshak (8 Kcfs during daytime hours, 5.3 Kcfs at night), but to shift both Dworshak units to undershot mode to reduce the average discharge temperature at the project to about 45 degrees around the clock. Turner stated that the project would be able to accommodate this recommendation.

4. Other.

With respect to Libby operations, Turner said the current elevation at the project is 2438 feet and drafting slightly. He said the Corps is working with BPA to develop a slower rampdown than previously discussed. We went to 11 Kcfs last night, down from 12 Kcfs, and are planning to reduce Libby outflow further, to 10 Kcfs, tomorrow. The Corps would then reduce Libby outflow by 1 Kcfs every other day, reaching 6 Kcfs discharge on September 13. Montana appreciates the slower rampdown but would prefer that you end at 7 Kcfs and hold that level through the end of the month, said Litchfield – that will make a large difference in the wetted perimeter and the aquatic environment for bull trout. That will require a faster rampdown rate, Bettin said, given BPA's internal end-of-September target elevation. After a brief discussion, it was agreed that the Corps will do the appropriate calculation; it may be necessary to ramp down at a rate of one Kcfs per day, rather than one Kcfs every other day. We'll send out a memo once the operation is defined, Henriksen said.

With respect to Dworshak operations, Wills said he checked with Bill Miller (Dworshak National Fish Hatchery manager) and Miller is fine with the above-recommended operation.

With respect to the fall treaty fishery, Henriksen said the Corps is trying to hold the requested pool elevation at Bonneville; however, with the current low flows in the system and Grand Coulee near its bottom elevation of 1278 feet, as well as the need to refill the pools at John Day and The Dalles, Bonneville pool may need to sag below its current operating range this week this week. I'll check with our people to see whether we hear any complaints, said Kyle Martin. We can try to draft the pool during hours when the nets are out of the water, Bettin said.

Hungry Horse was just below elevation 3540 feet at midnight on August 31; Grand Coulee hit elevation 1278 feet for a couple of hours last Friday, Norris said. Grand Coulee is now gradually refilling. Our goal for September 30 is to refill to elevation 1283 feet at Grand Coulee, Norris said.

Turner noted that, at Lower Granite, the 2003 actual summer seasonal average was 32.3 Kcfs; at McNary, average summer seasonal discharge was 135.5 Kcfs, compared to the summer flow objectives of 51 Kcfs and 200 Kcfs, respectively. Summer precipitation was only 60-65% of average, he added. In other words, the spring BiOp flow objectives were met at Lower Granite, McNary, and Priest Rapids, but the summer objectives at Lower Granite and McNary were not met. The BiOp does not have a summer flow objective at Priest Rapids.

5. Next TMT Meeting.

The next meeting of the Technical Management Team was set for Wednesday, September 10. Meeting summary prepared by Jeff Kuechle.

TMT PARTICIPANT LIST
September 3, 2003

Name	Affiliation
Russ Kiefer	IDFG
David Wills	USFWS
Mary Karen Scullion	COE
Rudd Turner	COE
Scott Bettin	BPA
Shane Scott	Public Power Council
Jim Litchfield	Montana (consultant)
Robin Harkless	Facilitation Team
Colin Beam	PPM
Tom Haymaker	PNGC
Paul Wagner	NOAA Fisheries
John Wellschlager	BPA
Kyle Martin	CRITFC
Mike O'Bryant	CBB
Ron Boyce	ODFW
Cindy Henriksen	COE
Tony Norris	USBR
Jim Adams	COE
Randy Wortman	COE
Nick Lane	BPA
Greg Bauers	COE
Steve Hayseker	USFWS
Dan Bedbury	EWEB
Mike Butchko	Powerex
Steven Wallace	PacifiCorp
Greg Hoffman	COE
Tom Le	PSE

Martin Hatscher	SCL

TECHNICAL MANAGEMENT TEAM					
BOR:	*Tony Norris / Lori Postlethwait*		**BPA:**	*Scott Bettin / John Wellschlager*	
NMFS:	*Paul Wagner / Chris Ross*		**USFWS:**	*David Wills / Howard Schaller*	
OR:	*Ron Boyce*	**WA:**	**ID:**	*Russ Kiefer*	**MT:** *Jim Litchfield*
		COE: *Cindy Henriksen / Rudd Turner*			

TMT MEETING

10 September 2003 0900-1200 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Transmission Limitations. (BPA Transmission Business Line - Tracy Rolstad/Brian Silverstein).

   [Constrained Paths.ppt] [Infrastructure Map.ppt] [BPA-TBL-TOT-TMT.ppt]
3. IT Input on spill criteria/process
4. Review current system conditions.
   - fish migration status (NOAA Fisheries, USFWS)
   - reservoir operation, power system, water quality, water supply (COE, BOR, BPA)
     1. Albeni Falls update.
     2. Libby Operation.
5. Chum Criteria.
6. Review operations requests.
7. Develop recommended operations for September 15 - 28.
8. Water Management Plan Discussion. (ALL)
9. Schedule Year End Review.
10. Other.
    - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935.

BPAT/TOT TMT Discussion – Agenda

- Introduction
  - Tracy Rolstad, Technical Operations, TBL
- Transmission System Use
  - Planning, Operations, Marketing
  - Philosophy
- Cutplane Map
  - Implications
- West of Hatwai discussion

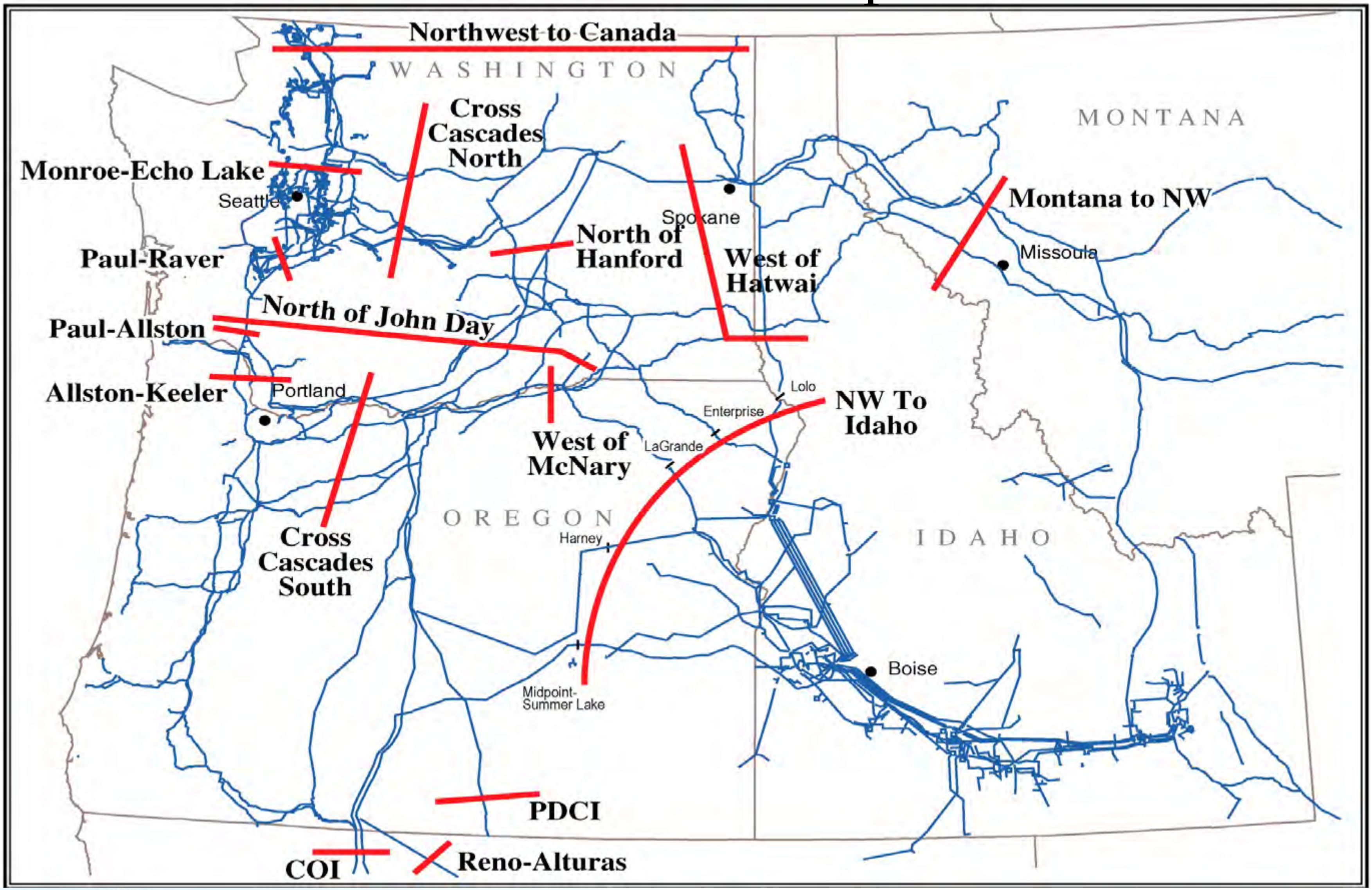
Different Needs and Uses of Transmission System

- System Planning, System Operations, and Marketing all review transmission system use and commitments to advance organizational responsibilities.
- Organizational Perspectives:
  - Planning: Longer term view of entire system needs; makes assumptions about lines and equipment in/out of system configuration. Gives view of system capacity for reliability.
  - System Operations: Determines OTC and tracks the actual operations. Considers reliability standards and manages system operating risk. Operates the system to an N-1 or N-2 condition based on current system status (which may be an N-5 condition from a planning viewpoint).
  - Marketing: Uses operating capability of the system to determine ATC and market transmission capacity while assuring both product quality and fiduciary responsibility.

Philosophy

- The BPA transmission system is planned, designed, constructed, and operated to insure cost-effective reliability of service. Cost-effectiveness is viewed from the perspective of the electricity consumer. The system is planned to have sufficient strength or capacity to maintain continuity and quality of service to electrical loads during certain more common contingencies or system disturbances. For other less common contingencies, it is not economical to provide enough capacity to maintain full service, so interruption of service or some reduction of quality of service is allowed.
    - BPA Reliability Criteria for System Planning

Interties and NW Cutplanes



Bonneville Power Administration Transmission

West of Hatwai

- TBL’s firm ATC across this cutplane is zero.
- Construction has begun on the Bell-Grand Coulee 500kV line which alleviates the congestion on this cutplane (completed by Jan 2005).
- TBL has had a scheduling procedure in place since 2001 for managing West of Hatwai.
- Late spring/early summer
  - Curtailment “season”

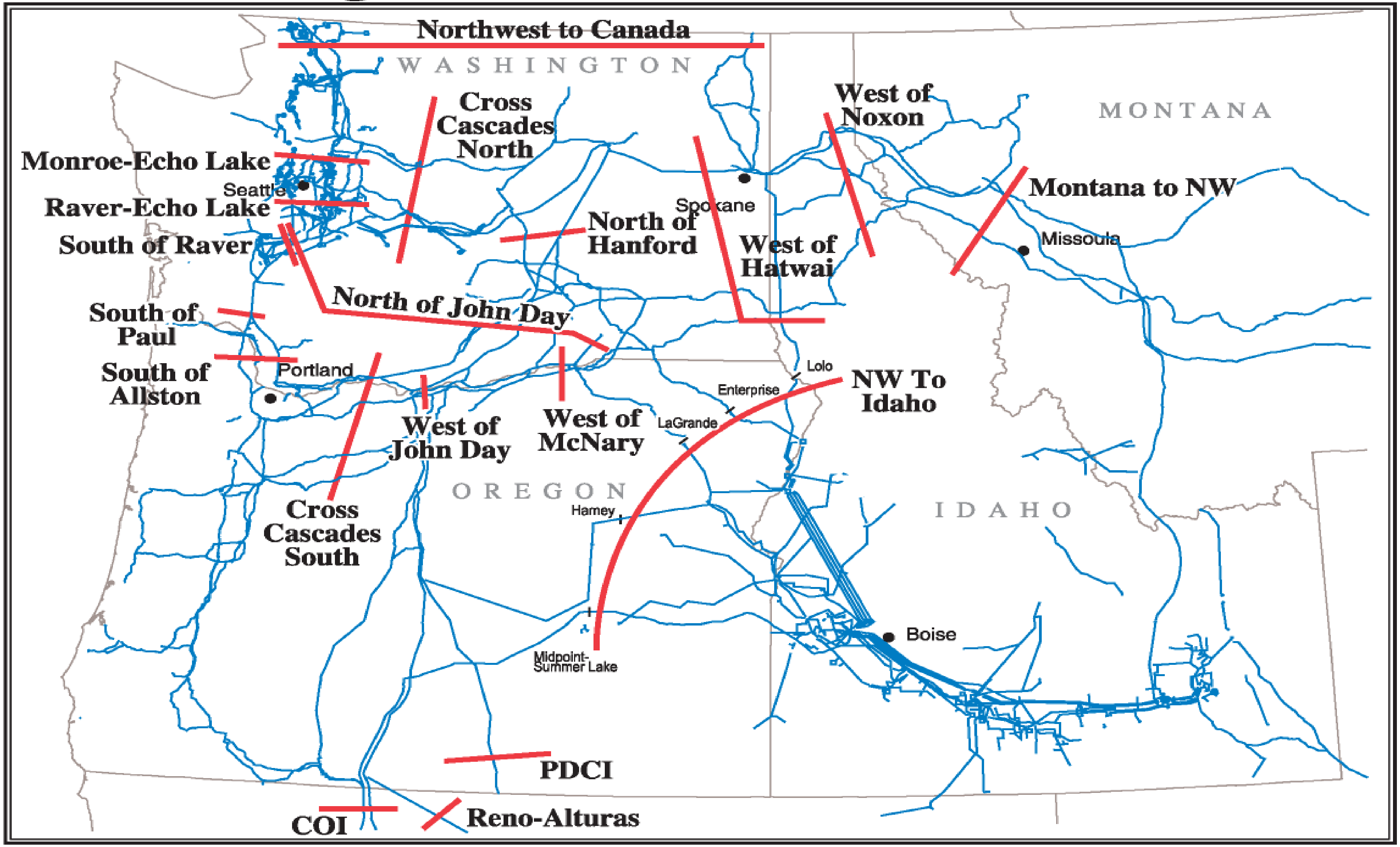
West of Hatwai Curtailments

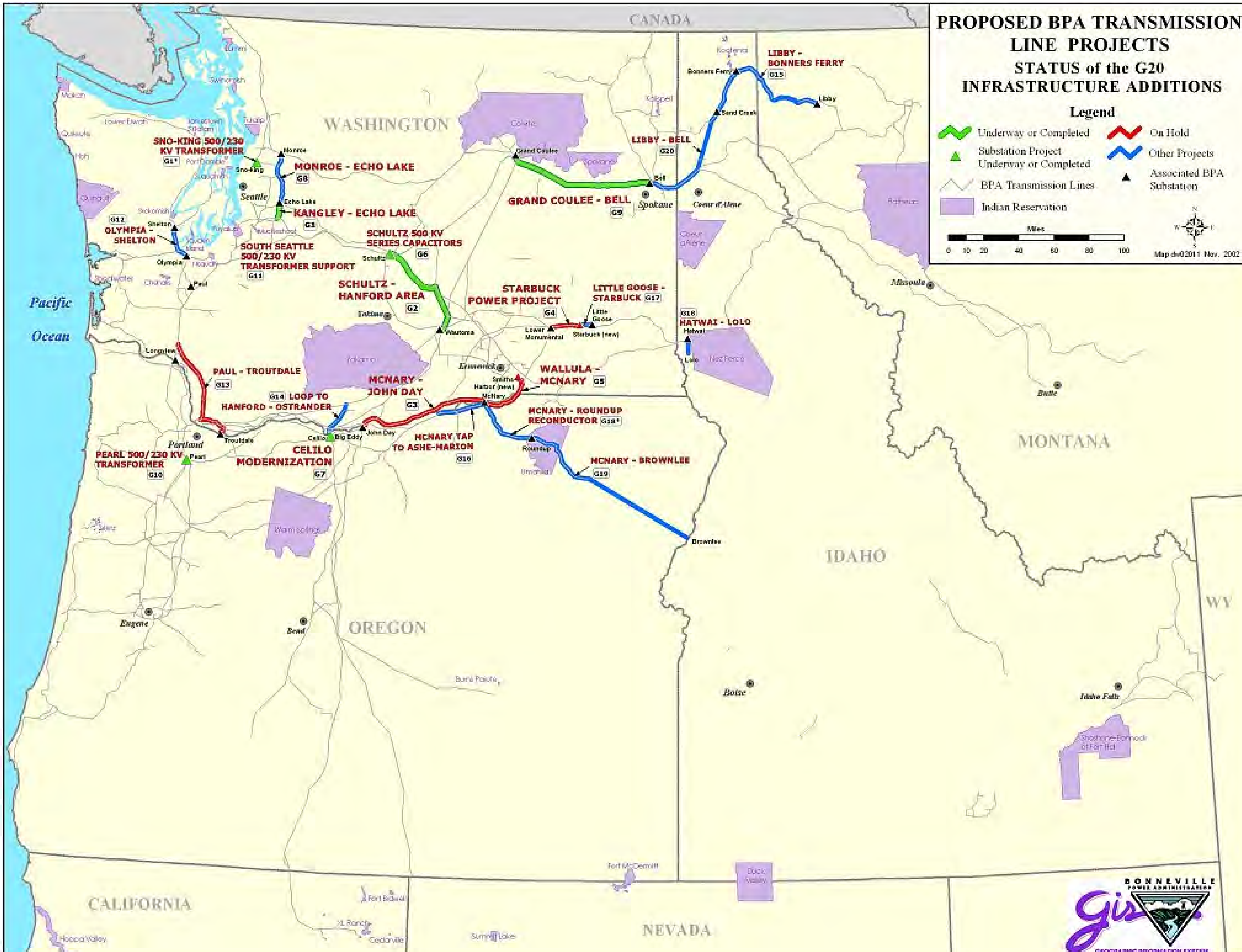
- Applied in a pro-rata fashion by contract right and use
- Resources affected:
  - Libby, Dworshak, Hungry Horse, Albeni Falls
    - Load netting comes into play
    - Influenced by activities at Coulee and Chief Joe
  - Avista west bound schedules
  - NWE westbound schedules (that cross WOH—i.e. Colstrip)
- Curtailments not always caused by BPA

Example Curtailment

- Avista is replacing the Libby-Noxon #1 230 kV circuit breaker (PCB-316)
- Forces out the Libby-Noxon line from 27 Oct to 14 Nov 03 (continuous outage)
- This outage limits Libby generation
- Outage period was chosen by AVA and BPAT for minimum impact on generation

Figure 1: NW Constrained Paths




PROPOSED BPA TRANSMISSION LINE PROJECTS
STATUS of the G20 INFRASTRUCTURE ADDITIONS
Legend
Underway or Completed
On Hold
Substation Project Underway or Completed
Other Projects
BPA Transmission Lines
Associated BPA Substation
Indian Reservation
Miles
0 10 20 40 60 80 100
Map dv02011 Nov. 2002
CANADA
WASHINGTON
OREGON
IDAHO
MONTANA
WY
CALIFORNIA
NEVADA
Pacific Ocean
SNO-KING 500/230 KV TRANSFORMER G1*
MONROE - ECHO LAKE G8
KANGLEY - ECHO LAKE G1
OLYMPIA - SHELTON G12
SOUTH SEATTLE 500/230 KV TRANSFORMER SUPPORT G11
SCHULTZ 500 KV SERIES CAPACITORS G6
SCHULTZ - HANFORD AREA G2
GRAND COULEE - BELL G9
LIBBY - BELL G20
LIBBY - BONNERS FERRY G15
STARBUCK POWER PROJECT G4
LITTLE GOOSE - STARBUCK G17
HATWAI - LOLO G16
PAUL - TROUTDALE G13
G14 LOOP TO HANFORD - OSTRANDER
MCNARY - JOHN DAY G3
WALLULA - MCNARY G5
MCNARY - ROUNDUP RECONDUCTOR G18*
MCNARY TAP TO ASHE-MARION G16
MCNARY - BROWNLEE G19
CELILO MODERNIZATION G7
PEARL 500/230 KV TRANSFORMER G10
Seattle
Spokane
Coeur d'Alene
Portland
Eugene
Bend
Boise
Idaho Falls
Butte
Missoula
Kennewick
Monroe
Echo Lake
Sno-King
Shelton
Olympia
Paul
Schultz
Wautoma
Grand Coulee
Bell
Bonners Ferry
Sand Creek
Libby
Lower Monumental
Little Goose
Starbuck (new)
Hatwai
Lolo
Longview
Troutdale
Pearl
Celilo
Big Eddy
John Day
McNary
Smiths Harbor (new)
Roundup
Brownlee
Colville
Spokane
Yakama
Nez Perce
Umatilla
Warm Springs
Burns Paiute
Fort McDermitt
Duck Valley
Shoshone-Bannock of Fort Hall
Flathead
Coeur d'Alene
Quinault
Makah
Hoopa Valley
BONNEVILLE POWER ADMINISTRATION
GEOGRAPHIC INFORMATION SYSTEM

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
September 10, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Transmission Business Line – Transmission Limitations:
Brian Silverstein, Tracy Rolstad and Mike Kreipe, BPA TBL, presented information to the TMT on BPA's regional transmission system, its limitations and proposed and current transmission line projects. Handouts were provided and can be obtained by contacting John Welschlagger. Of the $1.5 billion total estimated cost, $500 million is for six transmission line projects currently under construction. Three of these are new construction, the other three are changes at existing sub-stations. Brian discussed the Grand Coulee-Bell project, which is scheduled for completion in December 2004. Cindy Henriksen, COE, pointed out the inter-connectedness between BiOp operations and transmission line emergencies that occur. Mike reported on the Libby preliminary studies that were done – a "thermal analysis" of previous outages in the area, and a "reactive margin analysis" that looked at how a heavily loaded system removes the margin relative to voltage. The TBL is discussing whether to build a new line at a cost of over $100 million from Libby to Bonners Ferry, or to continue doing "bandage" work to fix the current system, and are also exploring the possibility of alternative operations at Hungry Horse and Libby. TMT agreed that there is a need for a feedback loop with the TBL to anticipate changes in operations, which will allow for better planning capabilities.

IT Input on Spill Criteria/Process:
During last week's IT meeting, members began discussing a process for developing beginning/end of spill criteria for future years. As soon as next month, IT will review historical data of fish runs, survival, the PUD approach in the Mid-Columbia, and other information that will help the group begin developing regionally acceptable criteria. There was an expressed desire to have a joint TMT/IT meeting so that the TMT can provide technical input as the IT looks over the data. TMT will be informed as soon as possible when/if that joint meeting is scheduled.

Current Conditions:
Fish status: Ron Boyce, Oregon, reported that there has been the biggest catch of returning adults this year than ever before. To date, approx. 238,000 fish have been observed. Paul Wagner reported that juvenile numbers increased for a few days in early September at Little Goose and

Lower Granite, then declined. Temperatures were higher for longer than usual this year, still ranging around 68 degrees.

Reservoir operations: Grand Coulee is at elevation 1279’ and expected to reach 1283’ by the end of September. Hungry Horse is near 3538’ and meeting Columbia Falls requirements. Tony Norris, BOR, reported that so far there have been no “trip-offs” resulting from fires in the area. Libby outflows were increased on Monday to 11kcfs to compensate for emergency water supply intake from Kooteney to the City of Bonner’s Ferry. Cathy Hlebechuk, COE, reported after the meeting that the outflows would be ramped down to 7 kcfs this Saturday, 9/13. Donna Silverberg, facilitator, noted that email notification of emergency operations such as this have enhanced clearer communication amongst the TMT. Dworshak is releasing 7.3 kcfs and is currently at elevation 1524’. Outflows are expected to reduce to 4.7 kcfs on Friday, then even further to reach elevation 1520’ early next week. Per discussions last week, Paul Wagner reported that the ISAB has no time to review Albeni Falls operations this year. Instead, NOAA and USFWS will engage in discussions about this year’s Albeni Falls operations and suggest who will review the recommendations. Paul and Russ Keifer, Idaho, will update the group with additional information at the next TMT meeting.

Chum Criteria*:*
TMT members began exploring options for chum operations for this year (storing additional water at Grand Coulee, changing the structure of spawning areas at Hamilton Creek, etc.) They agreed to gather information for the September 24th TMT meeting:

- Chum criteria list developed last year – Paul Wagner
- Information on the Oregon/Washington survey of redds – Ron Boyce
- Long range winter forecast – Kyle Martin
- Model of anticipated flows based on reservoir elevations – COE, BOR
- Estimates for fish numbers (if available) – Salmon Managers

Water Management Plan:
The deadline for sending comments in on the WMP has been moved to September 24th, but all were encouraged to get them in sooner!

Year End Review:
TMT will hold its annual year end review on November 5th. At the 9/24 TMT meeting, the facilitation team will provide topics from previous years to help TMT members develop an agenda for this year’s review.

Other:
Paul Wagner provided a Salmon Manager handout of an Implementation Plan process chart. TMT began discussing the chart today and it became clear that there was not full agreement from members on the process for making changes to BiOp operations.

ACTION: TMT members will take the chart to their respective organizations and get feedback. If there are other ways of looking at the process, members should bring ideas to the next TMT meeting for discussion.

Next Meeting, September 24, 2 pm (NOTE NEW TIME!!):
Agenda:

- Chum Criteria
- RPA 143 Presentation
- Process for Making Changes to Biop Operations
- Year End Review Topics

1. Greeting and Introductions

The September 10 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Transmission Limitations.

Scott Bettin reminded the group that Jim Litchfield and others had requested a presentation on the West of Hatwai cut-plane issue and other transmission system constraints that influence -- and are influenced by -- BiOp operations. He said he had invited personnel from BPA's Transmission Business Line (TBL) to provide that presentation at today's meeting.

BPA's Brian Silverstein led this discussion. He distributed three handouts – a map of proposed BPA transmission line projects, a map of constrained transmission paths in the Northwest, and a PowerPoint presentation on how BPA uses the transmission system and explaining the West of Hatwai phenomenon. Silverstein noted that BPA got its wake-up call on this issue in 1996 when an outage caused a blackout in the Portland area that cut off power to 2 million consumers; this event is thought to have cost the region about $2 billion. Other serious transmission-related events occurred in 2000 and 2001. BPA has not built a new major transmission line in 16 years, Silverstein said; despite a very robust economy during the 1990s, we were able to get by using more sophisticated controls on the transmission system and by working smarter. One problem facing the TBL is the fact that, if you upgrade one part of the system, the next place improvements are needed is often the next transmission line over. However, the time has now come to put wires in the air, and undertake new transmission line construction, Silverstein said.

He drew the group's attention to the map of "Northwest Constrained Paths,"noting that there are two major constrained paths – east to west, between the dams and generation facilities east of the Cascades and consumers along the I-5 corridor, and north to south, between the Northwest hydrosystem and consumers in California. The West of Hatwai constraint limits our ability to move power from the generating facilities at Libby, Hungry Horse and elsewhere in Montana to consumers west of the Cascades, Silverstein said.

Recognizing these problems, said Silverstein, BPA identified 20 major transmission projects, some of which have been on the books for some time, which we feel are needed to maximize the efficiency and reliability of the transmission system. He drew the group's attention to the "Proposed BPA Transmission Line Projects" map. All told, he said, the projects on the map will cost $1.2 billion. BPA has limited borrowing authority, he said; we asked Congress last year to approve an additional $1.5 billion in borrowing authority, but they gave us less than half of that – $700 million. Of the 20 projects on this list, six are now under construction but only three of the six are major transmission line projects. By the time they're energized in 2005, these six projects will cost $500 million. The projects under construction are noted in green on the map (the Coulee-Bell transmission line, the Schultz-Wautoma transmission line, the Kangley-Echo Lake project, the Sno-King500/230 kV transformer, the Celilo modernization project and the Pearl 500/230 kV transformer).

And these projects will alleviate the West of Hatwai problem? Ron Boyce asked. Yes, Silverstein replied; the Coulee-Bell line will take care of that problem, but bear in mind that there are other problems east of the Cascade. The current path capability is 2,800 MW; once the Coulee-Bell line is complete, at a cost of $150 million, that capacity will be increased to 4,000 MW. Silverstein spent a few minutes going through some of the other projects on this map; he noted that BPA is confident that the projects now underway will be completed on time.

Continuing on, Silverstein noted that there are some who believe transmission system constraints are simply a figment of BPA's imagination. The utility industry is generally reluctant to discuss near-misses, he said; this August, there was an incident where there was a great deal of power being produced and transmitted from Montana, but virtually no generation at Grand Coulee or Chief Joseph. The project operator noticed that voltage levels were starting to fluctuate; he called for redispatch, bringing up generation at Grand Coulee and cutting back generation at Libby. The problem was averted, but if the operator had not been alert, my guess is that Spokane would have dropped off the grid, he said. Silverstein also described another near-miss that occurred in the West of Hatwai area on June 4, during which generation at Libby and Dworshak had to be suddenly curtailed to avoid transmission system problems. The bottom line is that this is a real problem, said Silverstein; as we saw on the East Coast in August, power outages and cascading blackouts can occur without warning.

Silverstein continued on through the list of "on-hold" transmission system projects, noting, for example, that the design and environmental work is now complete on the McNary-John Day transmission line, which will support the Columbia wind projects and upcoming gas turbine construction. BPA is now waiting for someone to write them a check for $150 million so the two-year construction period can commence. Silverstein explained that the projects shown in red on the map are those for which at least some work have completed, but are on hold due to funding, environmental or other issues; projects shown in blue have not yet been started.

Silverstein added that the events on the East Coast this summer have increased the level of interest in transmission system upgrades and line construction; it is impossible to predict, however, what the effect will be in terms of additional funding.

Henriksen noted that the June 4 West of Hatwai problem had a direct impact on the Biological Opinion operations agreed to at TMT; it was necessary to reduce outflow and generation at Dworshak during the period the problem was being resolved.

BPA's Tracy Rolstad then went through the PowerPoint presentation, which described how BPA's Transmission Business Line uses the Northwest transmission system. He touched on the following major topic areas:

- Different needs and uses of the transmission system
- BPA's transmission system philosophy
- Interties and Northwest cutplanes (map)
- A description of the West of Hatwai cutplane
- West of Hatwai curtailments (how they are applied, projects affected etc.)
- A curtailment example

Rolstad noted that there is an important statement in the "Philosophy" slide: "For other less-common contingencies, it is not economical to provide enough capacity to maintain full service, so interruption of service or some reduction of quality of service is allowed." In other words, said Rolstad, while the transmission system is designed to function efficiently over 95% of the range of possible conditions, it is simply not economical to build in the safeguards necessary to prevent all outages.

Rolstad noted that the real West of Hatwai problem showed up in 2001, when the aluminum smelters shut down. The current transmission system was designed to service the aluminum plants, he said; when they not operating, problems become much worse. The late spring/early summer period is typically when the West of Hatwai problem occurs, he added; unfortunately, that is one of the key BiOp water management periods as well.

In response to a question from Cathy Hlebechuk, Rolstad said the TBL does differentiate between different types of emergencies – essentially, those that can be anticipated, and true emergencies, under which automatic actions, such as the near-instantaneous curtailment of generation in response to equipment failure, are taken. There is no discussion of those emergency response actions, he said – they are taken automatically to prevent catastrophic failure of the transmission system. I just wanted to be sure the salmon managers understand that there are different types of emergencies, Hlebechuk said – that there are situations under which BiOp operations will be constrained when problems occur.

Rolstad noted that the West of Hatwai curtailments are applied in a pro-rata fashion by contract right and use – in other words, he said, they are equitably applied. The resources affected by the West of Hatwai cutplane are Libby, Dworshak, Hungry Horse and Albeni Falls; the transmission line is also affected by operations at Chief Joseph and Grand Coulee. Avista's westbound schedules and other Montana resources such as Colstrip can also be impacted. When it is energized in January 2005, the new Coulee-Bell transmission line will solve some of these problems, he added, but not all of them.

Silverstein said BPA has done some preliminary studies on the possibility of adding a sixth unit at Libby. BPA's Mike Kreipe described the history of this project and the economics behind it. The new unit would increase Libby's transmission capacity from 600 MW to 720 MW. Kreipe described BPA's thermal analysis of the conductor limits associated with this project, as well as the upgraded control systems the sixth unit would necessitate. He noted that if the sixth unit is added at Libby, it would remove a lot of the reactive margin from the system, increasing the likelihood of voltage oscillations or collapse. An additional 230 kV Libby-Bell transmission line would be needed to support a sixth unit at Libby, Kreipe said. The bottom line is that we could do band-aid solutions – tighten the lines or install more sophisticated controls, or we can build the $100 million+ transmission line, or we can look at operational tradeoffs, Silverstein said, adding that, if BPA spends $100 million on a transmission projects, it expects 1,000 MW in additional capacity, not 100 MW.

Rolstad noted that the summer spill program can exacerbate transmission system instability; it was definitely a contributing problem to the August 1996 outage. Spill comes with a cost, he said – decreased reliability. The better we understand which units aren't going to be spinning, he said, the more precisely we can describe our operational limits. Silverstein noted that improved dewatering capability at The Dalles and John Day, as well as the construction of the Schultz-Wautoma transmission line, due for energization in December 2005, will help alleviate this problem.

Again, however, despite the projects that are now underway, in the Northwest transmission system, we're essentially shoving problems from one area of the system to another, Rolstad said. If we fix the west of Hatwai problem, that could cause additional problems in, say, the west of Noxon area. The bottom line is that we're going to need to adopt some new criteria if we're going to get completely out of the salmon managers' hair, said Rolstad. The challenge is that we can only plan for the operations we can anticipate, said Silverstein – when operations change, we have to scramble to deal with that. To the extent that you can anticipate changes, that allows us to be forward-looking in our planning, and to head off concerns before they become actual problems, he said.

Boyce thanked BPA for a very informative presentation.

3. IT Input on Spill Criteria/Process.

Henriksen said that, at its meeting last week, the IT requested historic data on the timing of all of the fish runs at all projects – that will be the first step in this journey, she said. The Fish Passage Center is going to try to provide this data a week in advance of the October IT meeting. At that meeting, the IT also plans to review the BiOp's contemplated survival targets, as well as the methodologies that have been proposed so far for deciding when to start and end spill, as well as the criteria used by the Mid-Columbia PUD spill programs, Silverberg said. There was a desire, on the IT's part, to involve the TMT in that review – a joint IT/TMT meeting, in other words, Silverberg said. We'll look into the logistics of that, she said; it will likely happen during the first week in October.

4. Current System Conditions.

Beginning with the current status of the migration, Paul Wagner said the action, currently, is in the adults. Boyce noted that fishermen in the Rainier area of the Columbia are currently enjoying phenomenal success; current catch rates for upriver bright chinook are the highest ever recorded. They are also talking about upping the run size prediction upward from the original estimate of 600,000 fall chinook entering the river mouth, Boyce said. Wagner said 240,000 adult chinook have passed Bonneville to date; the daily peak exceeded 20,000 fish in early September, although passage counts have fallen somewhat in recent days, to about 11,000 yesterday. Now that temperatures have begun to moderate, Boyce said, we'll probably see those counts come back up. It's a very good run, comparable with the counts to date seen in 2001.

With respect to juveniles, said Wagner, combined subyearling chinook indices at Lower Granite have been running in the 200-400 range recently; the surprise was Little Goose, where indices jumped up to the 1,100-1,800 range until two days ago, when they receded to the 700-900 range. Water temperatures, as Ron noted, are beginning to moderate throughout the system, he said.

Moving on to current reservoir operations, Tony Norris said Grand Coulee is currently at elevation 1279; Hungry Horse, 3538 feet and meeting the Columbia Falls minimum flow. The fires still have caused no transmission system problems in the Hungry Horse area, he said, and with the current rain, it is unlikely that they will. The plan is to refill Grand Coulee to elevation 1283 by September 30, Norris said.

Henriksen said that, as, as discussed at last week's TMT meeting, flow was reduced by 1 Kcfs per day at Libby over the weekend, as project outflow approached 7 Kcfs, there was an issue with the backup water supply at Bonners Ferry – the intake for the system in the Kootenai River was too high. We have therefore increased Libby outflow to 11 Kcfs temporarily until the city can get a pump running to water up their wells, perhaps later today or early tomorrow, Henriksen said, at which point Libby outflow will once again be reduced from 11 Kcfs to 7 Kcfs, again, at a rate of 1 Kcfs per day. It will take us five days to get back down to 7 Kcfs, so if we start tomorrow, we will be at 7 Kcfs by Sunday night, she said.

Henriksen said Dworshak is releasing 7.3 Kcfs on a day-average, under the load-following scenario laid out at the last meeting. The project is currently at elevation 1524 feet and will ramp down to a day-average outflow of 4.7 Kcfs, running one big unit during the day and one small unit at night, on Friday, September 12. By Tuesday, Dworshak will be at elevation 1520 and releasing minimum outflow, she said.

There are no problems to report in the power system, currently, said Bettin. With respect to water quality, Laura Hamilton reported that Dworshak's release temperature continues in the 45-degree range; forebay temperatures in the Lower Snake are averaging about 66 degrees, F.

At Albeni Falls, said Henriksen, we wanted to follow up on the discussion we had last week regarding winter operations at that project. The word from the ISAB was that they do not have time to address that issue this year, said Wagner; NOAA Fisheries is now discussing a process for making that decision with the Fish and Wildlife Service. You will recall that, for the 2004-2007 period, we had asked for ISAB guidance about drawup vs. drawdown at Albeni Falls (2051 vs. 2055, or some elevation in between) to support kokanee spawning in the lake. In the meantime, then, NOAA is talking with the Fish and Wildlife Service about what to do this year? Silverberg asked. That's correct, Wagner replied. We'll discuss it again at the TMT's September 24 meeting, Silverberg said.

5. Chum Criteria.

In response to a question from Boyce, Bettin said BPA has not yet received a fall water supply forecast. If don't get fall rain, Bettin said, our plan is to keep Bonneville outflows down to keep the fish from spawning at higher elevations, so we don't have to dewater redds later. Can we make more water available, perhaps by ponding additional water at Grand Coulee this fall? Boyce asked. Grand Coulee isn't large enough to significantly increase Lower Columbia flows for two months, Bettin replied. The other problem is that such an operation will give you a maximum Vernita Bar protection flow, Henriksen said. Since we don't yet know what water conditions are going to be this fall or winter, that would be very risky, she said. Bettin added that the BiOp planning date for the beginning of chum operations is November 1; by then, better information will be available on the available water supply.

At this point, we're still considering all options, Bettin said – we just don't know what we're going to do yet. In response to a question from John Wellschlager, Boyce said that, when the chum start to arrive below Bonneville, the salmon managers would like to implement the minimum Bonneville tailwater elevation called for in the BiOp, 11.5 feet. So your interest is to maximize the spawning habitat available to the chum, to avoid the destruction of redds by later-arriving fish? Wellschlager asked. Correct, Boyce replied – we have had some discussions about physical modification to improve access to the spawning areas at lower Bonneville outflows, but there are risks associated with that. Those risks include changing the gradient of flow and the groundwater environment, for a species that needs good spring and upwelling flow in the gravel for successful incubation, noted Wagner. In other words, in trying to help, you may be creating a worse environment for spawning, said Boyce.

The plan for today was to review some of the issues that traditionally have been associated with the chum operation, said Silverberg, noted Silverberg; perhaps we should wait to delve into the specifics until we get an updated water supply forecast. Kyle Martin said his fall/winter weather forecast, as well as the University of Washington's predicted streamflows in the Columbia after October 1 will be available soon; he offered to provide a weather briefing at a TMT meeting in late September or early October. It was generally agreed that this would be useful; Martin said he will attempt to provide that presentation at the TMT's September 24 meeting.

Will we have the Hamilton Creek gauges in place to allow us to monitor spawning ground conditions in real-time this year? Henriksen asked. Yes, Boyce replied. Perhaps at the next TMT meeting, we can also discuss the Oregon/Washington redd mapping information developed after the 2002 spawning, Bettin suggested. I'll try to provide that, Boyce replied. At the September 24 meeting, we can also review the criteria we've used to make chum operational decisions in past years, Silverberg suggested. It would also be helpful if the Corps could provide some modeling runs of the flows anticipated to be available for chum, Boyce said. Henriksen suggested that Boyce look at the current baseline BiOp 27c run; in the absence of new runoff forecast information, we can’t really give you a more accurate picture of what operations are likely to look like, she said. Didn’t you provide some model runs last year based on current reservoir elevations? Wagner asked. Yes, but if you take a look at the runs we did last year, you’ll find that reservoir elevations are almost identical to last year’s.

Operationally, would it be possible to store some additional water in Grand Coulee, if the current dry conditions persist? Boyce asked. Physically we might be able to fill above elevation 1285, Bettin replied, but that would require us to go to an average flow of 70 Kcfs or 80 Kcfs at Bonneville. Storing into the top seven feet at Grand Coulee would provide an additional 300 kaf in storage, Henriksen said; however, that only translates into an additional flow of 5 Kcfs per day for one month. We’re just looking for some additional water that might help bridge the gap between low flows in the fall and higher winter flows, Boyce said. The other unanswered question is whether we are required to do that operation under the BiOp, Bettin observed.

6. New System Operational Requests.

No new SORs were submitted prior to today’s meeting. Martin said he had little new to report on problems reported during the fall treaty fishery; he noted, however, that there has been some discussion of extending the fishery for a week or two. He said he will provide catch-to-date information at the next TMT meeting.

7. Recommended Operations.

Recommended operations were covered during Agenda Item 4, above; no other major operational changes are planned for the next two weeks.

8. Discussion of 2004 Water Management Plan.

Boyce said Oregon has developed its draft comments on the 2004 Water Management Plan; while these comments have not yet been reviewed internally at ODFW and are not yet ready for submission, ODFW is working diligently to finalize them. He said it should be possible for his agency to submit its comments within a week or two. CRITFC is also working on its comments and they are undergoing internal review, said Martin. Wagner said NOAA Fishery’s comments are mostly minor and editorial in nature; he said he will provide them directly to Boyd within a day or two. Russ Kiefer said IDFG also has a few minor comments, which he will submit electronically within the next few days. Steve Haeseker said he does not know, at this point, if the Fish and Wildlife Service plans to submit comments on the 2004 WMP.

9. Schedule for Year-End Review.

After a brief discussion, it was agreed to hold the TMT’s annual year-end review on Wednesday, November 5. Henriksen asked the TMT participants to consider the specific topics they would like to review, to allow the Corps and other to prepare the necessary information for presentation at the meeting. It was agreed to discuss this topic further at the next TMT meeting.

10. Other.

Wagner drew the group's attention to a handout, developed at yesterday's FPAC meeting, showing a flow chart developed by the salmon managers describing a strawman process for making changes to the Implementation Plan or to BiOp actions. He noted that FPAC felt that the comment period on the Implementation Plan was the best place to put forward the operational changes various parties would like to see, and that the TMT is the best forum through which to bring those changes to the implementation planners' attention. Bettin noted that this flow chart is fairly generic; it might be helpful to list the 15 issues already identified by the TMT, as well as where and when the TMT anticipates that these issues will be resolved.

The group devoted a few minutes of discussion to this framework. Ultimately, it was agreed that some additional clarity is needed on the process for making operational changes to the BiOp. It was further agreed that the TMT participants will discuss this issue within their own agencies and come to the next TMT meeting prepared to discuss it in greater detail.

11. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for 2 p.m. Wednesday, September 24, followed by another meeting on October 8. Meeting summary prepared by Jeff Kuechle.

TMT ATTENDANCE LIST

September 10, 2003

Name	*Affiliation*
Cindy Henriksen	COE
Donna Silverberg	Facilitation Team
Tony Norris	USBR
John Wellschlager	BPA
Robin Harkless	Facilitation Team
Colin Beam	PPM
Tim Heizenrater	PPM
Mary Karen Scullion	COE
Steve Haeseker	USFWS
Scott Boyd	COE
Julie Ammann	COE

Nancy Yun	COE
Russ George	WMCI
David Benner	FPC
Mike O’Bryant	CBB
Rudd Turner	COE
Jim Adams	COE
Nick LAne	BPA
Paul Wagner	NOAA Fisheries
Laura Hamilton	COE
Brian Silverstein	BPA
Mike Kreipe	BPA
Randy Wortmann	COE
Russ Kiefer	IDFG
Tonm Le	PSE
Margaret Filardo	BPA
Lance Elias	PPL
Mike Butchko	Powerex
Kyle Martin	CRITFC
Tracy Rolstad	BPA
Scott Bettin	BPA
Cathy Hlebechuk	COE

T E C H N I C A L M A N A G E M E N T T E A M			
BOR: *Tony Norris / Lori Postlethwait*		**BPA:** *Scott Bettin / John Wellschlager*	
NMFS: *Paul Wagner / Chris Ross*		**USFWS:** *David Wills / Howard Schaller*	
OR: *Ron Boyce*	**WA:**	**ID:** *Russ Kiefer*	**MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*			

TMT MEETING

13 September 2003

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Fish Traffic Jam at Bonneville Dam,
   They counted over 58,000 Salmon and Steelhead at Bonneville on this day, Saturday September 13, 2003. Photos provided by Lyle Gilbreath.
2. Bonneville Washington Shore Ladder - 13-Sept-03 - Upstream From Counting Station - Photo - 1
   [091303BWSL-1.jpg]
3. Bonneville Washington Shore Ladder - 13-Sept-03 - Downstream From Counting station - Photo - 2
   [091303BWSL-2.jpg]
4. Bonneville Washington Shore Ladder - 13-Sept-03 - Counting Station Window - Photo - 3
   [091303BWSL-3.jpg]

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503 808-3942


A view into the fish ladder

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / Lori Postlethwait*	**BPA:**	*Scott Bettin / John Wellschlager*
NMFS:	*Paul Wagner / Chris Ross*	**USFWS:**	*David Wills / Howard Schaller*
OR:	*Ron Boyce*	**WA:**	
ID:	*Russ Kiefer*	**MT:**	*Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT MEETING

24 September 2003   1400-1700 hours

NOTE NEW TIME!!

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed. Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. RPA 143 Presentation.

   [Bi-Op Measure 143 powerpoint presentation - 10.0 MB Large file est. 2 minutes to load]
   [sms13.avi] [sms4.avi]
3. Chum Criteria

   [Rationale for NMFS recommened Bonneville Dam Operations to support chum spawning in the fall of 2002]
   [Chum Spawning Considerations]
4. Process for Making Changes to the BiOp.
5. Year End Review Topics.
6. System Status.
   [SOR 2003-C7] [SOR 2003-C8]
7. Status of Finalization of the Water Management Plan.
8. Other.
   - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503 808-3942

MEMO

To: Technical Management Team
From: NMFS
Date: January 9, 2002
Subject: Chum Spawning Considerations

This memo is in response to a request from the Implementation Team (IT) for NMFS to prepare a list of factors and our decision process that led us to the chum spawning operation for the 2001 fall season. The IT directive followed a request from the Technical Management Team (TMT) for the IT to clarify which team (TMT or IT) should develop criteria that would be used if conditions were to deteriorate and a determination of de-watering existing redds was necessary. The specific question of whether chum de-watering criteria should be developed, and by which team, was not addressed. Instead, the IT request came after extensive discussion of chum spawning considerations. NMFS considered a number of factors in making its weekly recommendation during this year's chum spawning season and would consider a number of factors if it were faced with a dewatering decision.

The general approach taken by NMFS in its 2000 FCRPS Biological Opinion is to be conservative in the quantity of water used to support the chum spawning operation. The rationale being, chum spawn at a time when little information exists regarding the coming year's water supply. Also, the length of time that flows need to be maintained to support established redds through emergence can be as long as six months. Since many actions in the RPA are based on reservoirs being as full as possible in the spring, a conservative use of water for the chum provides a higher level of assurance that other RPA actions will be implemented. By being conservative at the onset of spawning, the likelihood of having to make a dewatering decision is reduced.

There were several factors unique to the year 2001 which influenced this year's decision process. These included the following issues:

- A refill analysis which indicated initiating the chum operation at a 125 kcfs level in early November would result in lower than an 85% probability of achieving April 10 flood control elevation at Grand Coulee as specified in NMFS' 2000 FCRPS Opinion. The Opinion specifies the initiation of chum spawning flows should not affect implementation of other RPA actions which include refill probabilities of FCRPS storage project and spring and summer flow objectives.

- A recognition that November rains resulted in high discharge from Hardy and Hamilton creeks which were providing spawning habitat for chum. Also, the discharge from Hamilton Creek was inundating much of the mainstem Columbia River spawning habitat similar to what was observed in prior years with a Bonneville Dam discharge of 125 kcfs.
- A recognition that chum were spawning in areas previously not described. The BiOp's specification for the Columbia River to provide a minimum 125 kcfs discharge below

Bonneville Dam was based on observations of habitat used by mainstem chum spawners. At that time, habitat was believed to be limited to the Ives Island area, which required a Bonneville Dam flow of 125 - 160 kcfs to become usable. During the late fall and winter of 2000 and 2001, chum have been observed spawning in mainstem areas near I-205 (Woods Seeps and Rivershore development), which is habitat less restricted by mainstem flow levels.

- A desire for the chum spawning operation to not conflict with the Vernita Bar agreement. NMFS' 2000 Opinion specifies that a mainstem chum operation cannot adversely affect implementation of the parties' ability to comply with the Vernita Bar agreement. This year, due to the extremely low natural stream flows during October and early November, the initiation of a chum spawning operation would have exceeded the targeted flow level agreed upon by parties to the Vernita Bar agreement. NMFS, BPA, several tribes, and the states of Oregon and Washington are among the signatories to this agreement.

- Based on the lessons learned from 2000 and 2001, the Bonneville tailwater gauge level can be used for management purposes instead of a fixed flow. Use of the Bonneville tailwater gauge better reflects the influence of the Willamette River, tides, and local stream flow on the available spawning habitat below Bonneville Dam than managing to a fixed discharge. A linear regression of the data collected over the past several years between flow and tailwater elevation resulted in an excellent fit (R^2 =.97). This analysis indicated a flow of 125 kcfs was equivalent to a tailwater elevation of approximately 11.5 ft.

There are several other factors relevant to the chum population which indicate they are at a lower risk than other listed anadromous stocks covered by NMFS' FCRPS 2000 Opinion. These include:

- NMFS estimated median population growth rate (lambda) over a base period of the Columbia River chum ESU (including the Grays River system, Hardy and Hamilton Creeks, and Hamilton Springs) during development of its 2000 Opinion to be 1.04. A lambda of 1 indicates a stable population trend. NMFS' management interpretation of this is reflected in the Opinion's specification that the chum operation should not come at the expense of the RPA's water management operation for other theatened and endangered ESUs for which median population growth rates actually declined over the base period.

- The geographic distribution of the chum salmon ESU. Genetic Stock Identification studies by WDFW indicate that this ESU is comprised of two distinct population segments, the Grays River chum and the chum which spawn in the mainstem and tributary creeks below Bonneville Dam as far as I-205 bridge. Results of WDFW's analysis indicate that the chum spawning in the mainstem Columbia/Ives Island complex are part of the same population as the chum spawning in Hamilton and Hardy creeks.

- Adherence to a chum operation that is consistent with the conservative direction provided in NMFS' 2000 Biological Opinion. The BiOp specifies that a chum spawning operation should only be initiated if it is believed the operation can be maintained from the initiation of spawning through emergence. Data collection in 2001 indicate the chum operation necessitates a flow operation being sustained for nearly six months. A lower flow level has a much higher probability of being sustained than a higher flow level with less of an impact on FCRPS refill probabilities and spring and summer flow augmentation programs for threatened endangered Snake River and Upper Columbia river ESUs .

While a conservative approach to managing the quantity of water used during spawning reduces the risk of having to make a dewatering decision, it does not eliminate dewatering as a possibility. However, the development of a priori criteria for making a dewatering decision is not appropriate. The basis for a dewatering decision would depend greatly on in-season conditions. These types of decisions are best made by the TMT process because of their focus on real time conditions. Factors that should be considered in making a dewatering decision include:

- The number and percentage of the total redds which would be affected by the decision
- The percentage of the total chum population that spawned in the creeks
- The percentage of the total chum population that spawned at other locations
- The component of the overall population that these redds represent
- Status of the FCRPS reservoir elevations
- Expected benefit to reservoir levels and river operations which would be provided by the dewatering decision
- Precipitation and runoff forecasts
- Expected river operations due to power market environment
- Status of the upriver listed stocks
- Existence and status of a brood contingency plan

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
September 24, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

<u>FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS</u>
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

<u>RPA 143 Subgroup Report:</u>
Mike Schneider (COE), Ben Cope (EPA), and Mark Schneider (NOAA) gave a power point presentation on work relative to RPA 143 done by a subgroup of the WQT. The group worked through a consensus process to select the CEQUAL-W2 model for temperature monitoring in the Snake River from the Hell's Canyon complex to the confluence of the Snake and Clearwater rivers. The model is to be used as a pre-season planning tool and for real time monitoring. The group is now looking for a modeling strategy for implementing the tool and would like TMT to offer decision support on how the model can be synthesized to be more user-friendly. The monitoring is critical not just for modeling, but for real time data. The RPA 143 subgroup hopes for the tool to be operational by Summer 2004. Anyone interested in joining the modeling work group should contact Mike Schneider. Kyle Martin, CRITFC, expressed interest in working with the group. The subgroup will give a progress update to TMT in February or March.

<u>System Status</u>:
Reservoir operations: Cindy Henriksen, COE, reported that Libby has been reduced to 6 kcfs. The project will be reduced to minimum or near-minimum outflows starting on Sept. 29th to accommodate in- river work by USGS for a study of critical habitat for sturgeon recovery. Libby is currently 25' from full and drafting. Bonneville switched to powerhouse one because of the large numbers of fish at the project, and is now back to powerhouse 2. Dworshak reached elevation 1520' on September 15th and has since been releasing 1.6 kcfs. John Roache, BOR, reported that Grand Coulee is at elevation 1284.2'. Hungry Horse is at 3536.6' and releasing 2 kcfs to maintain flows at Columbia Falls. Banks Lake is at elevation 1557.1'.

<u>ACTION</u>: FPAC and BPA will check in next Wednesday, October 1st, on MOP operations at Lower Granite. Paul Wagner, NOAA, will email the results of that discussion to the COE.

Fish status: Paul Wagner reported that Fall Chinook have reached a total of 560,000 to date at Bonneville – more than two times the ten year average!

SOR's: CRITFC submitted two SOR's, 2003-C7 and 2003-C8 for treaty fisheries for the previous two weeks. Kyle Martin, CRITFC, reported that the COE did an excellent job meeting CRITFC's operational request for 100% of the time. There may be another request for a fishery next week – Kyle expected to have more information on this on Friday. Cindy Henriksen said that the COE may not be able to keep Bonneville at the 1-1.5' range requested due to other constraints, but would like to find an acceptable elevation that could remain stable. The COE and CRITFC will work together on this.

Chum Criteria:
Paul Wagner presented two handouts (also linked to today's agenda on the TMT home page) of NOAA's rationale for chum operations from November 2002 and January 2002. The overall message was one of conservatism. Paul would like the two memos to be referenced in the WMP. The criteria are:

- Start low (125 kcfs to maintain 11.5' tailwater)
- Maintain Vernita Bar flows
- Hold low flow/elevation to avoid dewatering; step up if the season indicates a good water year, and as weather allows.

Paul said that NOAA's recommendation for timing to begin chum operations is: plan to begin November 1 and observe for presence of fish, precipitation and long term hydrologic forecasts.

Kyle Martin presented his draft winter forecast and flow forecasts, which showed near normal temperatures and above normal precipitation until March, followed by near normal precipitation. Kyle will present an update of his forecast at the November 5th TMT year end review.

Process for Making Changes to the BiOp:
The Action Agencies are working on a process 'flow chart' in response to one presented from FPAC at the last TMT meeting. The goal of this exercise is for all TMT members to work within the same process and timeline. The discussion was deferred to the October 8 meeting so the Action Agencies can further develop a process visual.

Year End Review Topics:
The facilitation team shared a list of year end review topics from previous years (1999-2002). TMT began adding to the list today and were asked to think about additional items before or at the next TMT meeting. Topics noted today:

- Operations review: Begin/end spill
- Results of reach survival '03 (performance standards) for Chinook and steelhead – NOAA
- Billy Connor's analysis of Fall Chinook migration and distribution in reservoir relative to temperature
- Comparison to other years
    - Fish passage
    - Water
- 2001 fish returns analysis of effects from no spill year, if available (Paul will check on this)
- Kyle's weather forecast

Water Management Plan:

Scott Boyd, COE, reported that NOAA, USFWS, and Montana have submitted comments on the 2004 WMP. Oregon, Idaho and CRITFC plan to submit comments (preferably soon!). The Action Agencies expect to finalize the document October 8-22. All comments will be posted on the TMT website.

<u>**Next Meeting, October 8, 9am-noon**</u>:
<u>Agenda items</u>:

- Review of Autumn treaty fishing – CRITFC
- System status
- WMP status – COE
- Process chart – Action agencies
- Year End review topics
- Hamilton Creek rating curve – COE Portland district
- Update on Albeni Falls/Lake Pend Orielle coordination between NOAA/USFWS
- Update on Spring Creek spill status – USFWS

1. Greeting and Introductions

The September 24 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. RPA 143 Presentation.

Mark Schneider said the intent of this agenda item is to provide an overview of the work products of the Reasonable and Prudent Action (RPA) 143 subgroup of the Water Quality Team. RPA 143 called for the development of a model showing the water temperature effects of alternative Snake River operations, including a data collection strategy to develop and operate the model and to document the effects of project operations. The model is intended to be a predictive tool, one- or two-dimensional; its purpose is to facilitate both pre-season planning and real-time management of river temperatures, Schneider said. It also recognizes that the current water quality monitoring system is not adequate to fulfill those needs, hence the need for an enhanced data collection system. The report from the RPA 143 subgroup is now available, Schneider said.

With that, he yielded the floor to Mike Schneider, who said any TMT feedback about how to optimize the model for pre-season and in-season use would be most helpful. Mike Schneider and Ben Cope then went through a series of PowerPoint slides laying out the highlights of the final RPA 143 subgroup report, touching on the following major topic areas:

- July 30, 2003 – draft plan/report complete
- The contents of the report
- 2002 Data collection and analysis (characterized 2002 thermal patterns in the Lower Snake River system during the summer and fall periods, provided information to evaluate existing water quality monitors in representativeness for both spatial and temporal

patterns in temperature and provide guidance of future sampling requirements, provided information that helped to decide on the required model resolution and model; provided calibration and verification data for the selected model)

- 2002 data collection and analysis conclusions -- characterization of Lower Snake River thermal patterns (annual vertical temperature gradient in Dworshak; cold-water releases from Dworshak can result in rapid changes in Lower Clearwater River temperatures; resulting change in Lower Granite forebay temperatures is more subtle; annual thermal cycles are consistent for all study area sampling stations; the Clearwater underflows when mixing in with the Middle Snake, annual vertical thermal gradient in Lower Granite pool of 6 degrees C exists from July-mid-September)
- 2002 data collection and analysis conclusions -- evaluation of the representativeness of the fixed water quality monitors (the tailwater monitor was a good measure of tailwater and average forebay water temperature even during periods of significant vertical gradients; the forebay monitors were generally comparable to the 5 m profile instruments; both tailwater and forebay samples are point measures in space but the tailwater reach is generally well mixed; the forebay instrument is positioned at one discreet depth in an area that can experience some significant vertical thermal gradients and will be a biased measure of forebay temperature)
- The model selection process – based on the 2002 data collection/analysis and other model selection criteria, the RPA 143 technical team recommends using the CEQUAL-W2 model for this modeling effort – it is two-dimensional, model code is non-proprietary, it has a long history of successful similar applications, is supported by USACE ERDC, handles other water quality parameters in addition to temperature; computer run times are in the medium range in comparison to other tools.
- The model's geographic boundaries – three phases; the model will ultimately encompass the Dworshak reservoir head down to the mouth of the Snake, including Brownlee reservoir
- Water temperature routine sampling – high priority: continue water temperature monitoring at each project tailwater and forebay (long-term) with the following recommendations – water temperature monitoring year-'round at all stations, suggest relocating forebay monitor upstream of project to avoid downwelling/upwelling associated with dam face; suggest replacing point monitoring approach with a profiling approach using a real-time temperature string; no changes to tailwater stations)
- Water temperature research sampling – high priority: continue vertical and longitudinal thermal monitoring in the Lower Snake River from spring through the fall period
- Data collection strategy – tributary/boundary sampling (high priority): fixed temperature loggers at (Phase 1) Snake R. at Anatone, Clearwater at Orofino, Toucannon, Palouse; (Phase 2) Grande Ronde R., Salmon R., Snake R. mainstem at Hells Canyon tailrace; (Phase 3) Snake mainstem at head of Brownlee Reservoir
- Data collection strategy – water discharge/project operation (high priority): continue close-interval project operations data, continue routine COE operations data collection
- Data collection strategy – meteorological data (high priority): continue current weather stations (8 total) monitoring air temperature, dew point temperature, barometric pressure, wind speed and direction, solar radiation, precipitation, cloud cover
- Proposed model implementation: objective (temperature management for habitat, improvement in the Lower Snake basin) and approach (CEQUAL W-2, short and long-

term forecasts of hydrological and meteorological conditions)

- Proposed model implementation: goals – develop an operational model by the summer of 2004 (domain Phase 1: Clearwater River to the confluence with the Snake, Snake River from Anatone to Lower Granite; decision support: water control alternatives, temperature control alternatives at Dworshak, fisheries management)
- Model development team under the leadership of COE, in partnership with regulatory agencies: EPA, WDOE, IDEQ, BPA, the Tribes, the Fish and Wildlife Service, consultants, other interested parties
- Initial tasks: data assimilation (flow, stage, velocity, water temperature, channel bathymetry, meteorology, biology, hydraulic structure)
- Other tasks: numerical grid generation, boundary conditions, model calibration, model verification, real-time model application (forecasting)
- Decision support: What decisions are needed to begin "real-time" management using the temperature model? (what we can control – Dworshak release temperature, Dworshak flow, Snake flow; constraints – general water supply outlook, minimum temperature in the Clearwater, minimum flow from Dworshak during certain weeks for the purpose of simply moving fish)
- Decision support: pilot water temperature targets – e.g. daily average temperature in Lower Granite tailrace in a normal snowpack year: for example, 19 degrees C from June 1-September 15; draft TMDL targets July 7-Sept. 30; "as cold as we can get it all summer, until elevation 1520 is reached (don't need a model to shoot for this target)
- Real time: what is the necessary flow from Dworshak now to meet the target at Lower Granite a few days from now? Predictive application of the model, using: today's measured conditions at system boundaries (flow, temperature); weather and flow forecasts for the coming week; release temperature constraints; vary the Dworshak flow until the target is met; step forward one day and do it again.
- Potential benefits of real-time management (conservation of Dworshak cold water, saving water during cool weather; fewer, smaller temperature spikes; clearer basis for operational changes; less decision-making burden on TMT; over time, a better understanding of what is possible)

Cope noted that model development is already underway; the goal is to have it up and running by the spring of 2004. In order to make this a real-time decision-making tool for Dworshak, however, we're going to need a lot of information, including well-defined operational scenarios, Cope said.

Essentially, we just wanted to let the TMT know that we have selected a model and identified a data collection strategy to support it, Mark Schneider said; the next step is to have it operational in time for use during the 2004 in-season management period. Schneider added that the RPA 143 report will be available on CD-ROM soon; he asked anyone with an interest in reviewing this document to contact him directly.

The group devoted a few minutes to a discussion of next steps in the model development process; Mike Schneider said that, in his view, information from the TMT as to their needs – can we go beyond simply a flat temperature, for example – would be very helpful. If the model can tell us how much cooler we can get for a given amount of water, that would be helpful, said

Wagner – if the model can tell us how to optimize the available water from Dworshak to benefit the greatest number of fish, that would be the ideal. Henriksen noted that weather parameters would have a large influence on the model results, and asked how the model will predict future weather conditions as much as three months into the future. Cope conceded this is still an issue in model input. After a few minutes of additional discussion, it was agreed that the RPA 143 modeling team will update the TMT on its efforts some time in February or March.

3. Chum Criteria.

Wagner distributed a document titled “Chum Spawning Criteria” dated November 12, 2002 (available via hotlink from today’s agenda on the TMT homepage). Wagner explained that this document lays out NOAA Fisheries’ thinking during the 2001 and 2002 chum spawning and incubation seasons; as you can see, he said, that thinking was quite conservative – start low (125 Kcfs outflow from Bonneville) because that is what the system can generally sustain through the incubation period. Wagner went briefly through this document, touching on both NOAA Fisheries’ recommendations and their underlying rationale. Bonneville outflow can then be stepped up through the season if the water supply forecasts support such a course of action, Wagner said. The problem, of course, is that the chum spawning season begins in early November, long before we know what kind of a water year we can anticipate, he said.

I thought there might be some value in referencing previous years’ chum management experiences in the 2004 Water Management Plan, Wagner continued. That includes the fact that there is a good relationship between the 11.5-foot minimum tailwater elevation and the 125 Kcfs discharge level from Bonneville, he said. Perhaps we can reference the November 2002 memo as an appendix in the 2004 Water Management Plan, Wagner suggested. No TMT disagreements were raised to this suggestion.

I’m not very clear on the timing of the start of the chum operation, particularly given the very low base flows in the system, currently, Henriksen said – will that be addressed in the plan? Basically, last year we had an El Niño condition, Wagner said; we started the operation on November 6. We monitored the presence of fish and started off at an 11.3-foot Bonneville tailwater elevation, then bumped it up to 11.5 feet. The Water Management Plan has November 1 as a planning date, he said; when the operation actually begins depends on hydrologic conditions, the presence of fish, and the water supply forecast. Wagner noted, however, that the BiOp says the chum operation should begin no later than November 1.

Kyle Martin then provided his winter forecast information, based on the University of Washington’s Climate Impact Group’s one-year forecast. He noted that this forecast is subject to change. Martin said his forecast assumes the cold-wet phase of Pacific Decadal Oscillation and ENSO (El Niño-La Niña) neutral conditions.

Martin said that, based on his analysis, the Northwest can expect near-normal temperatures in November, December, January and February, trending slightly colder than normal; he expects temperatures to be colder than normal in March. With respect to precipitation, Martin expects November to be above-normal (110%-130%), December to be near-normal (90%-110%), January to be above-normal (110%-130%), February to be above-normal (110%-130%) and March to be near-normal (90%-110%). The bottom line, he said, is that based on currently-available information, I'm forecasting a January-July water supply forecast at The Dalles of 125 MAF, 116% of normal. He noted that his predictions for last year were fairly accurate, although they did underpredict observed precipitation, particularly in the month of March. Martin added that he will present an updated forecast at the TMT's October 22 meeting.

4. Process for Making Changes to BiOp.

Henriksen noted that, at the last TMT meeting, the group briefly discussed this issue and the FPAC flow chart showing a suggested process for making changes to the BiOp. The action agencies generally agreed that we did not see the world that way, she said; we agreed that we would present our own recommendations about where and under what timeline the BiOp might be changed, but have not yet finalized those recommendations. It was agreed to defer this discussion to a future TMT agenda, probably on October 8.

5. Year-End Review Status.

Silverberg said the facilitation team had looked at past year's meeting notes to generate a list of past year-end review topics. These included:

- Temperature/water and runoff patterns, comparison to previous years
- alternative operations for spring flow augmentation
- Dworshak operations
- coordinating hatchery releases
- water year water supply forecast (Harold Opitz)
- Vernita Bar
- Mixers at McNary
- Lower Granite study
- Comparison analysis to other years
- FPC operations analysis
- Snake River operations
- TDG level variations: criteria for modifications to spill
- fall chinook survival in the Snake River
- Hanford Reach juvenile stranding
- history of spawning correspondent to Vernita Bar levels
- Migration status
- NOAA survival study: comparison to previous year
- Performance standards
- weather review (Kyle Martin)
- CRITFC winter climate forecast

Scott Bettin suggested that the beginning/end of spill issue be added to the agenda for this year's review meeting, scheduled for November 5. The results of the reach survival evaluations for 2003 would also be a worthwhile topic, suggested Rudd Turner. Billy Connor's analysis of what happened this year in terms of the fall chinook migration, as well as his work on vertical distribution of fish in the reservoir relative to temperature, would also be interesting, Wagner suggested. We should also get the usual comparison and analysis of fish passage in 2003 compared to other years, he added. Can we look at the adult returns from the 2001 outmigration with an eye toward assessing the impacts of the 2001 operation? Bettin asked. I'll see what's available, Wagner replied. Silverberg asked everyone to consider the agenda for the 2003 "lessons learned" meeting and to provide any suggestions they may have to her.

6. System Status.

Henriksen said Libby outflow has been reduced to 6 Kcfs, the minimum needed for instream flows and bull trout. Libby outflow will likely be reduced further, to minimum (4 Kcfs) or near minimum beginning September 29 to accommodate some USGS in-river work. The minimum or near minimum outflow will likely be held through the end of October. Libby inflow is still very low; the project is now 25 feet from full and drafting.

Scott Boyd said there are still large numbers of fish passing Bonneville Dam; we moved some flow to Bonneville PH1 for a few days to relieve some of the pressure, he said. Bonneville flow has now been transferred back to PH2.

Henriksen said Dworshak reached elevation 1520 on September 15; the project has been at minimum discharge (1.6 Kcfs) ever since. Flow at Lower Granite is now in the 18 Kcfs-21 Kcfs range. Dworshak will continue at minimum flow for the foreseeable future, she added.

John Roche of Reclamation said Grand Coulee is at elevation 1284.2 and filling gradually; it will be around this elevation through October. Hungry Horse is at elevation 3536.6 feet and releasing enough flow to meet the 3.6 Kcfs Columbia Falls minimum.

Flows at McNary have ranged between 71 Kcfs and 109 Kcfs over the past week, Henriksen said, base flows in the Columbia are very low, currently. The system is being initialized very dry for the next 30-60 days of forecasting, she said.

Wagner said the current fall chinook count is 560,000 adults to date at Bonneville, 2.4 times the 10-year average, with 7,000-8,000 fish per day currently passing the project.

Kyle Martin said CRITFC has submitted two SORs covering the fall treaty fishery since the last TMT meeting; compliance, in terms of maintaining stable pools, has been phenomenal even relevant to CRITFC criteria at both Bonneville and The Dalles Dam, he said. There may or may not be a formal fishery next week, he said; we'll know by late tomorrow morning. Henriksen said it may be trickier, next week, to maintain a stable pool elevation in Bonneville pool; we will work with you to see if we can find a range that works for CRITFC, she said.

7. Status of Water Management Plan.

Comments on the 2004 WMP were due today, said Boyd; comments have been received from the action agencies, NOAA Fisheries, the Fish and Wildlife Service and Montana. Others intending to comment are Oregon, CRITFC and Idaho, he said. Martin said CRITFC's comments are very nearly complete and will be submitted soon. The plan is to finalize the 2004 Plan within two to four weeks, said Boyd; at that point, we'll need to start working on the fall/winter update. He added that the comments received to date have been posted to the TMT website.

8. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, October 8. Meeting summary prepared by Jeff Kuechle.

TMT PARTICIPANT LIST
September 24, 2003

Name	**Affiliation**
Donna Silverberg	Facilitation Team
Ben Cope	EPA
Mark Schneider	NOAA Fisheries
Steve Hayseker	USFWS
Paul Wagner	NOAA Fisheries
Cindy Henriksen	COE
Richelle Beck	D. Rohr & Associates
David Benner	FPC
Scott Boyd	COE
Nancy Yun	COE
Julie Ammann	COE
Rudd Turner	COE
Greg Bauers	COE
Tim Heizenrater	PPL
Colin Beam	PPL
Robin Harkless	Facilitation Team
Randy Chun	COE
Mary Karen Scullion	COE
Mike O'Bryant	CBB
John Roche	Reclamation
Margaret Filardo	FPC
Kyle Martin	CRITFC

Ron Boyce	ODFW
Nick Lane	BPA
Ken Barnhardt	BPA
John Wellschlager	BPA
Scott Bettin	BPA
Tom Le	PSE
Martin Hatscher	SCL
Mike Schneider	COE

Subject: Rationale for NMFS' recommended Bonneville Dam operations to support chum spawning in the fall of 2002.

Date: November 12, 2002

The chum operation to date is being operated consistent with the provisions of NMFS' 2000 FCRPS biological opinion. The Opinion does not stipulate that a mainstem spawning operation needs to occur every year. A chum spawning operation is conditional on whether "The best hydrologic data available by early October indicate that precipitation, runoff, and reservoir storage are likely to support the operation from the start of spawning (late October or early November) until the end of emergence". Information regarding precipitation and runoff in early October is limited to an El Nino/Southern Oscillation (ENSO) forecast. This year, the Southern Oscillation Index (SOI) is negative, indicating an El Nino event this year. During an El Nino condition, precipitation is often below average in the Columbia River Basin. The current NOAA long term forecast calls for direr-than-average conditions in the Pacific Northwest during fall 2002. This effect is also reflected in the Corps' early season forecast for flood control operations at Dworshak Reservoir. The October forecast for the North Fork Clearwater Basin was 2.05 Maf. Average runoff is 2.7 Maf for this basin. Also, precipitation leading up to the month of October was well below normal in the Columbia River Basin. Water held in reservoir storage was near normal, however, the availability of water from Lake Pend Oreille would be limited to drafting this project to elevation 2055 this year, as opposed to elevation 2051 last year. Precipitation conditions through October 2002 remained dry, resulting in this being one of the driest Octobers on record. Neither Hardy or Hamilton Creeks were flowing in late October. To summarize, both the long term forecasts and near term precipitation requirements were not satisfied, and reservoir storage was less than optimal. Given these conditions adopting an alternative operation to the 125 kcfs November 1 start date is warranted.

The alternative operation chosen was to initiate a stable tailwater elevation in the Ives Island area beginning early November. The initial targeted daytime tailwater elevation was 11.1 feet beginning November 5. This elevation was increased to 11.3 feet on November 6. The elevation will increase to 11.5 feet on November 13. This stepwise increase in elevation has coincided with fish observations in the area, and an increase in local precipitation. However, the seasonal precipitation to date is still less than 30% of normal and an early season precipitation forecast for the Libby Reservoir Basin is also for a below average volume runoff (81.7%).

Recent information suggests that mainstem chum spawning sites exist at flows below the 125 kcfs level referenced in the Opinion. Observations from last year indicated chum spawned in numerous sites below Bonneville Dam when flows were held below the 125 kcfs level through most of November, 2001.

Bi-Op Measure 143
Water Temperature Modeling and Data Collection Plan
For Lower Snake River Basin

"The Action Agencies shall develop and coordinate with NOAA Fisheries and EPA on a plan to model the water temperature effects of alternative Snake River operations. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NOAA Fisheries and state and tribal water-quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of project operations."

Water Temperature Modeling and Data Collection Plan for Lower Snake River Basin

- 30 July 2003 Draft Plan/Report Complete
  - Reviews past and ongoing monitoring and modeling
  - Reviews Available Biological Information
  - Presents 2002 data collection and analysis
  - Documents model selection process
  - Recommends selected model
  - Recommends supporting data collection strategy

2002 Data Collection and Analysis

- Characterized thermal patterns in the Lower Snake River System during the 2002 summer and fall period
- Provided information to evaluate existing water quality monitors in representativeness for both spatial and temporal patterns in temperature and provide guidance of future sampling requirements
- Provided information that helped to decide on the required model resolution and coverage.
- Provided calibration and verification data for selected model

2002 Data Collection and Analysis Conclusions

- **Characterization of Lower Snake River Thermal Patterns**
  - Annual vertical thermal gradient in Dworshak 12-14 °C from surface to 60 m resulting in large volumes of deeper waters at 4-6 °C
  - Dworshak releases of cold waters can result in rapid changes in the lower Clearwater River temperatures depending on the ratio of the warmer Clearwater River water to the North Fork
  - Resulting change in Lower Granite forebay water temperature is more subtle/dampened and highly dependent on the ratios of middle Snake and Clearwater River water, total discharge (travel time), and weather conditions
  - Annual thermal cycles are consistent for all of the study area sampling stations. Daily solar warming results in significant diel temperature cycles as well as lasting general warming on most of the riverine reaches.
  - Clearwater River water underflows when mixing in with the middle Snake River waters. This incomplete mixing persists throughout the length of Lower Granite pool with the colder Clearwater River water flowing underneath the warmer Snake River waters. There appears to be slight warming of the surface waters.

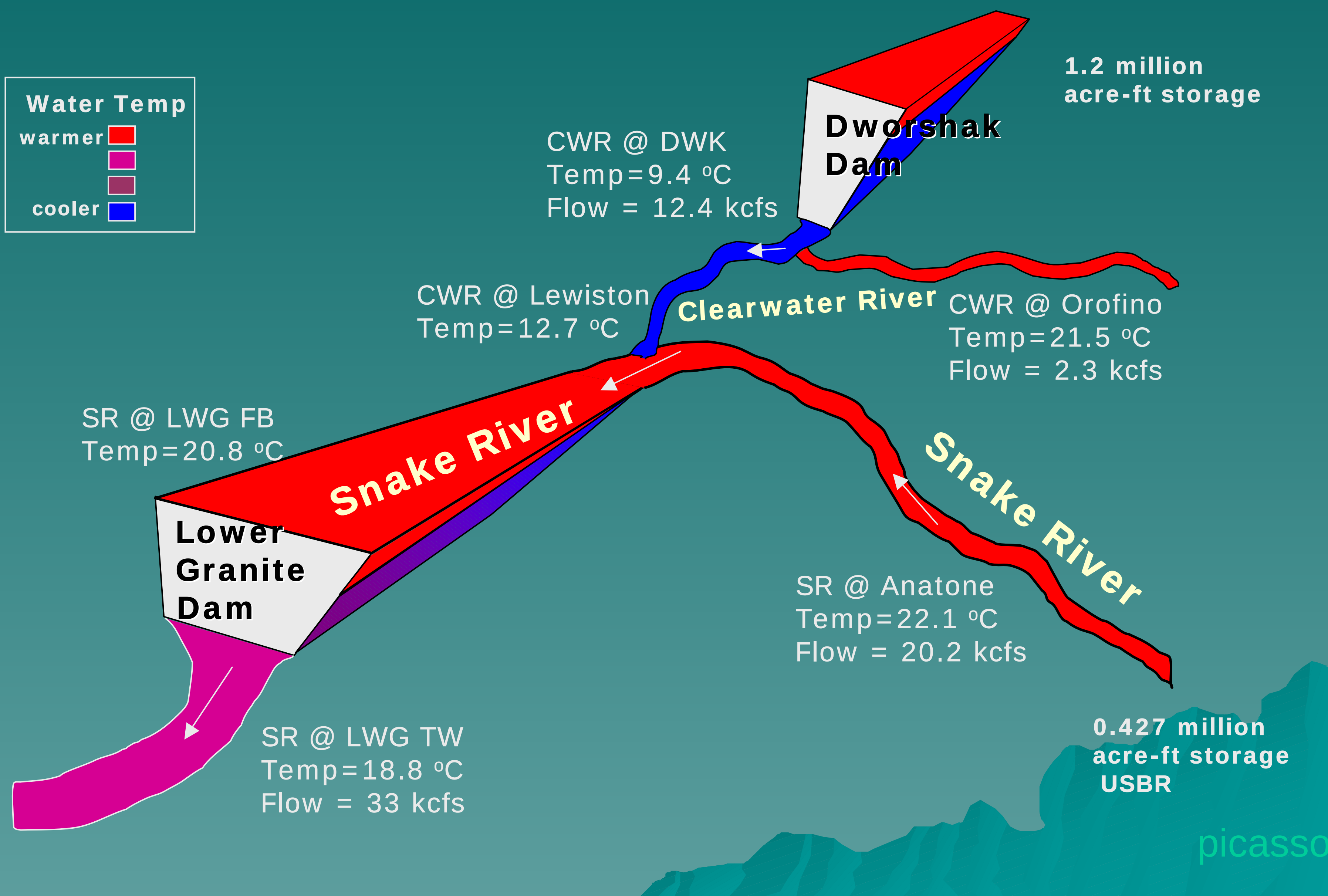
2002 Data Collection and Analysis Conclusions (Continued)

- **Characterization of Lower Snake River Thermal Patterns**
  - Annual vertical thermal gradient in Lower Granite pool of 6 °C from surface to bottom exists from early July until mid September
  - Stations downstream of Lower Granite dam indicated much weaker vertical thermal gradients.
  - Longitudinal thermal gradients due to warming as the water flowed down the Lower Snake were indicated. The change was gradual with a total change of 2 °C from Lower Granite Dam down to Ice Harbor Dam during the July-August period.
  - A longitudinal increase of approximately 1 °C occurred in the Lower Granite pool from the head waters down to the dam.
  - Longitudinal changes of approximately 1 °C were indicated in the downstream reaches of the Clearwater River
  - Occasional warming by 0.5 °C was detected on the middle Snake River from river mile 170 down to river mile 156 during the July-August period.
  - Lateral thermal gradients were minimal in relation the vertical and even some of the longitudinal gradients. The average lateral differences recorded were in the order of 0.2 °C.

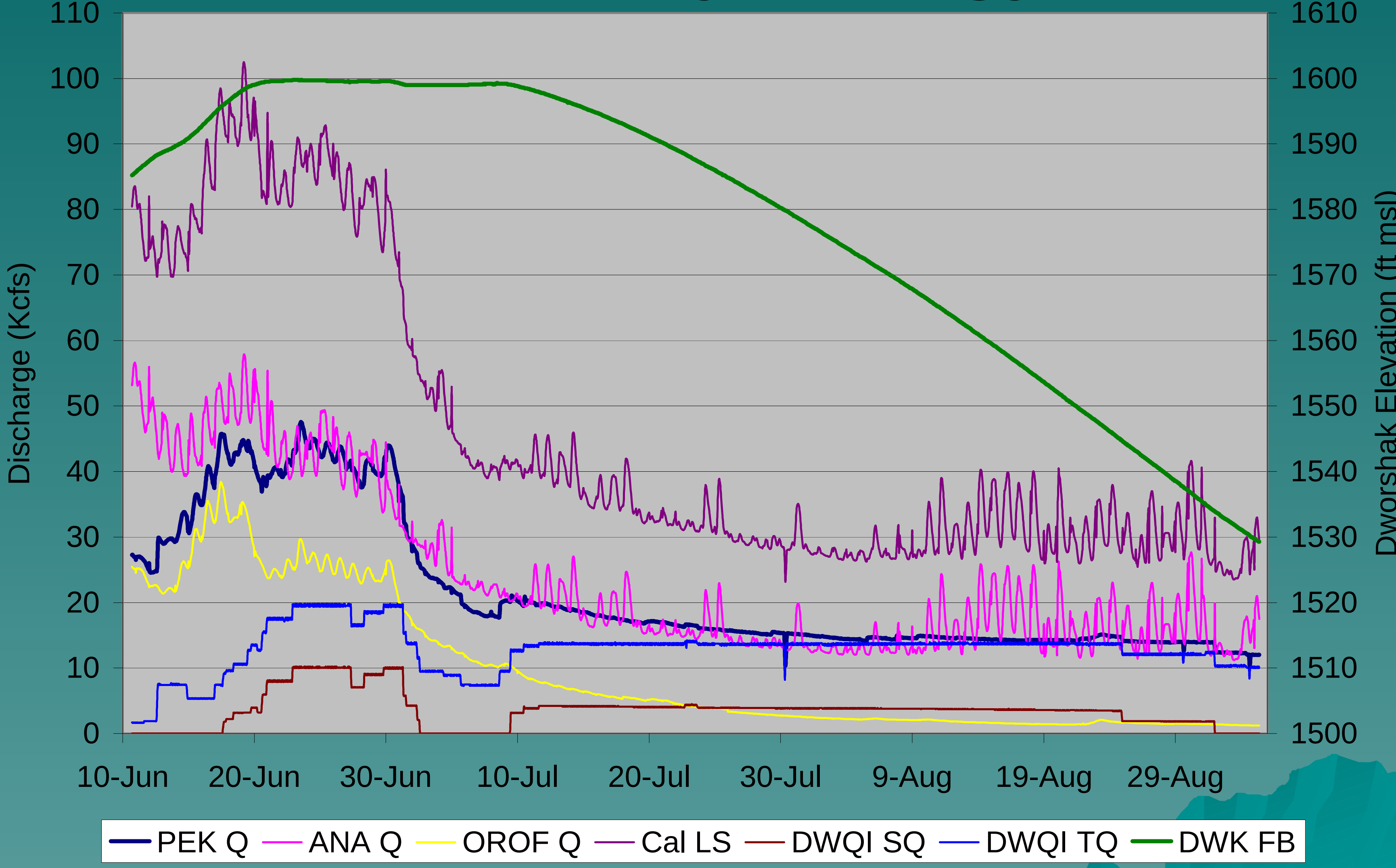
2002 Data Collection and Analysis Conclusions (Continued)

- Evaluation/Representativeness of Fixed Water Quality Monitors
  - The tailwater monitor was a good measure of tailwater and average forebay water temperature even during periods of significant vertical gradients. Forebay profile column average data was found to be no different from the tailwater fixed monitor data.
  - The forebay monitors were generally comparable to the 5 m profile instruments as would be expected during the stratified period.
  - Both tailwater and forebay samples are point measures in space but the tailwater reach is generally well mixed and made up of a fairly uniform blend of the forebay water in the case of the Lower Snake projects.
  - The forebay instrument is positioned at one discreet depth in an area that can experience some significant vertical thermal gradients and will be a biased measure of forebay temperature.

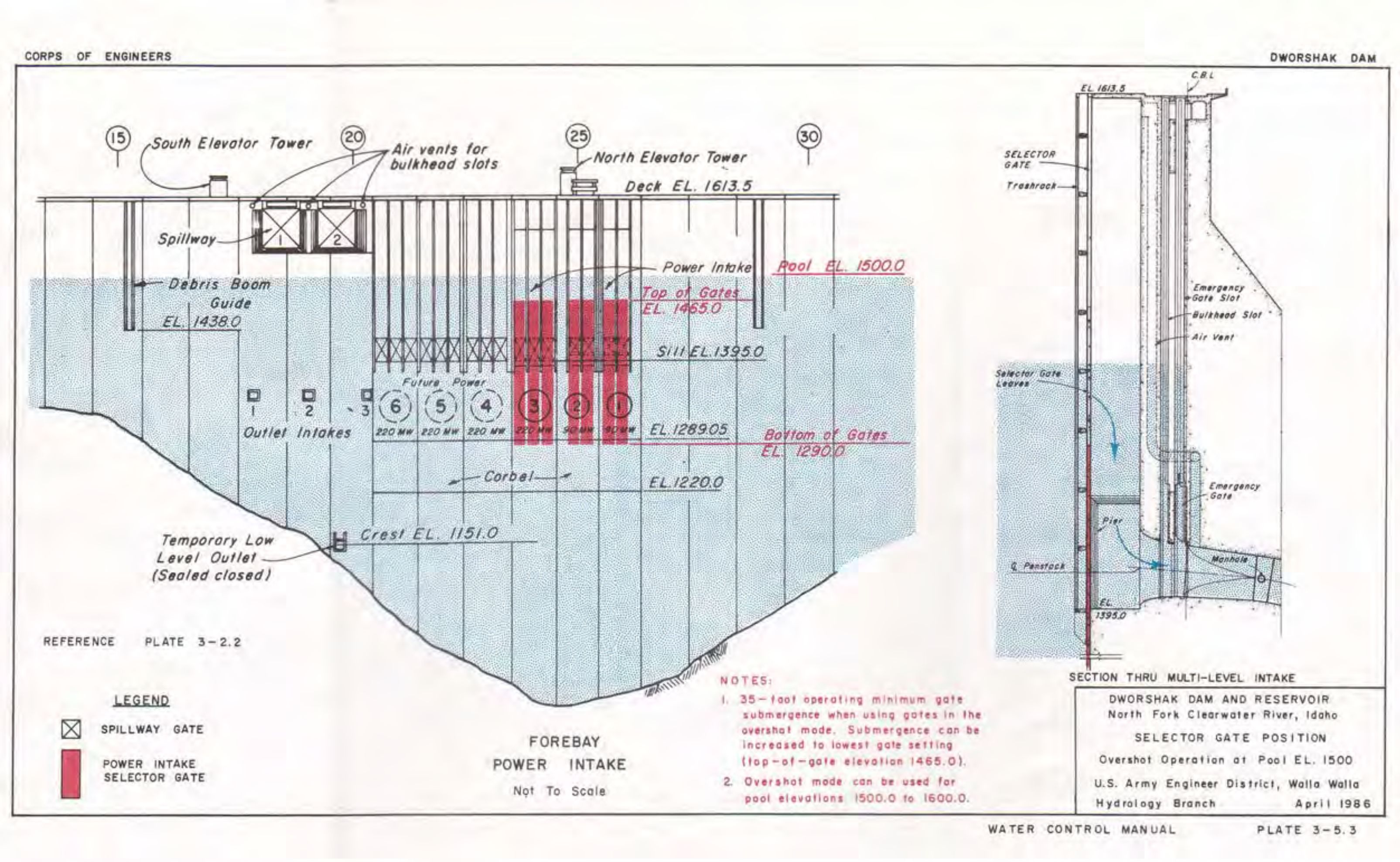
Lower Snake River Average Monthly Flow and Temperature Properties, August 1995-2003



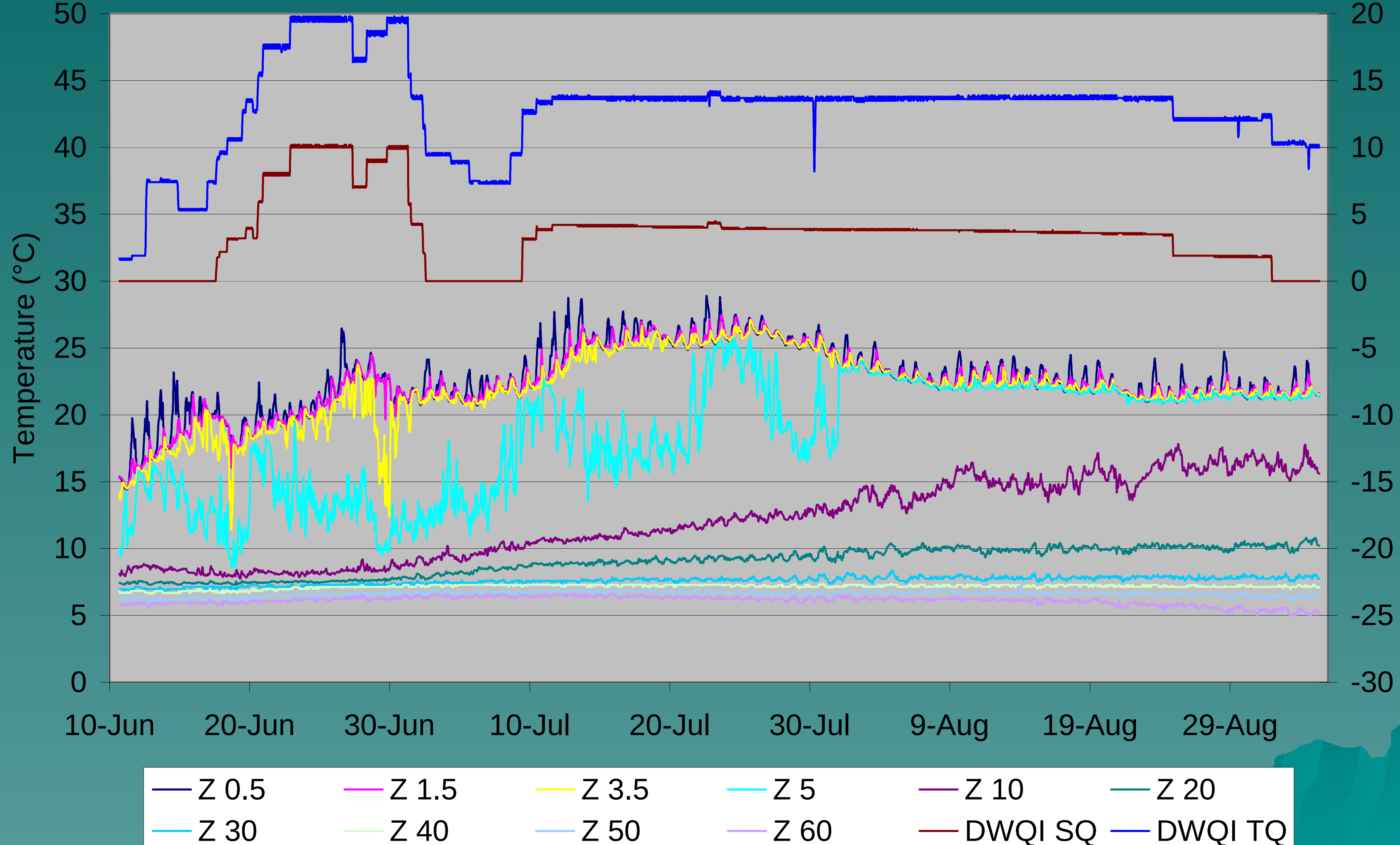
Basin Hydrology

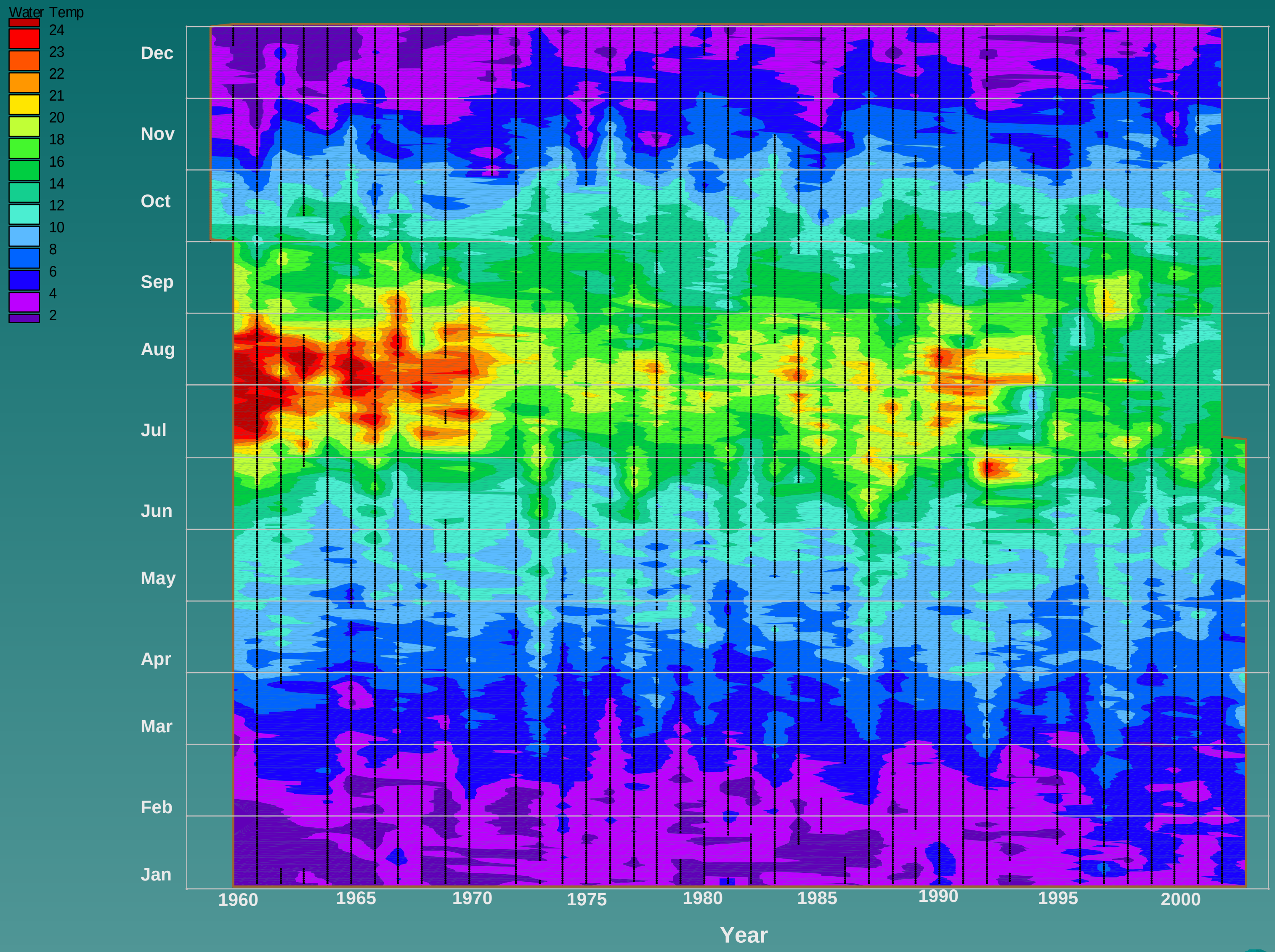


Dworshak Dam Outlet Configuration
Selective Withdrawal



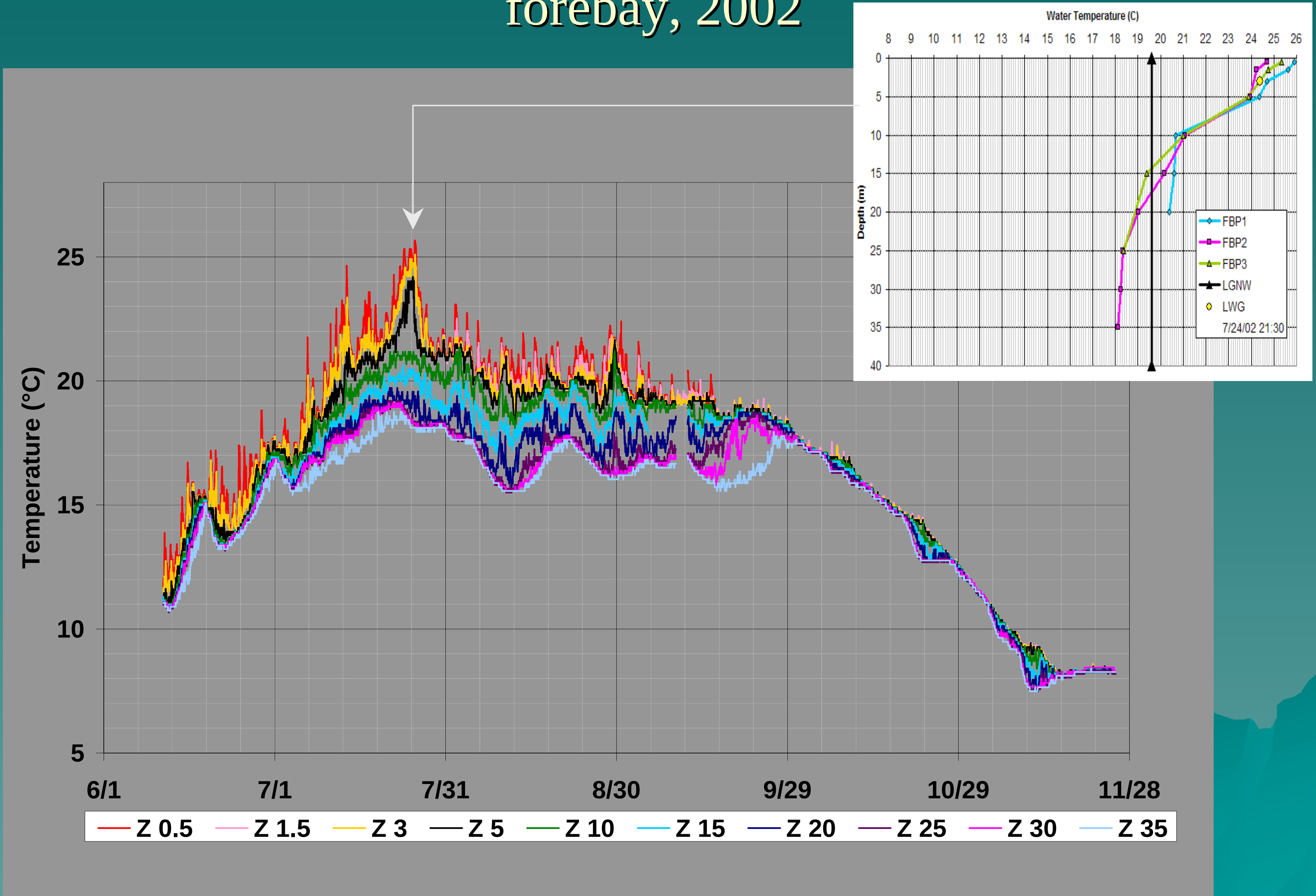
Dworshak Pool Thermal Stratification



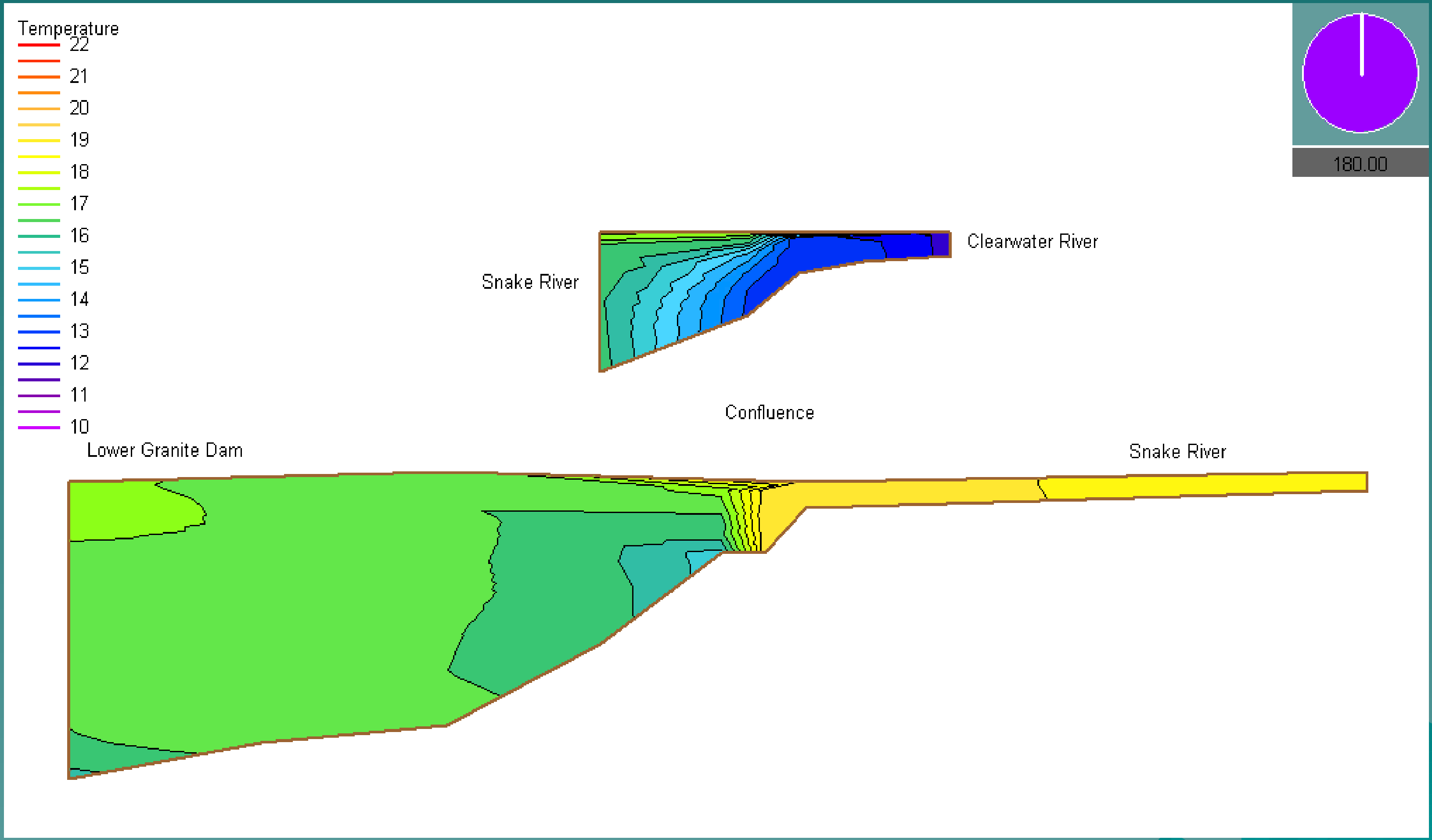


Daily average water temperature on the Clearwater River at Spalding, 1959-2003

Temperature profile time histories for Lower Granite forebay, 2002



Thermal Patterns in Lower Granite Pool, June 29-August 8, 2002



Model Selection

- Based on 2002 data collection/analysis and other model selection criteria, the RPA 143 technical team recommends using CEQUAL-W2 model for this modeling effort.
  - 2 dimensional (laterally averaged) hydrodynamic/water quality model
  - Model code is non-proprietary
  - Long history of successful applications river/reservoir systems
  - Supported by USACE ERDC
  - Handles other WQ parameters in addition to temperature.
  - Required computer resources are modest

Model Geographic Domain

Phase	North Fork Clearwater Boundary	Mainstem Clearwater Boundary	Upstream Snake River Boundary	Downstream Snake River Boundary
1	Mouth	Orofino	Anatone	Lower Granite Dam
2	Dworshak Reservoir Head	Orofino	Hells Canyon Dam Tailrace	Mouth
3	Dworshak Reservoir Head	Orofino	Brownlee Reservoir Head	Mouth

Data Collection Strategy
Water Temperature Routine Sampling

- Continue water quality monitoring at each project tailwater and forebay (long term) with the following recommendations
  - Forebay monitoring stations
    - Relocate stations to avoid near-structure influences
    - Replace point monitoring approach with a vertical profiling approach
      - Temperature string
    - Real time access to data
  - No change in location of tailwater sampling station
    - Maintain year round sampling
  - Add stations as necessary to support management/modeling needs

Data Collection Strategy
River/Tributary Monitoring

- Fixed temperature logging at the following locations:
  - –Snake mainstem at Anatone
  - –Clearwater at Orofino, DWQI across river
  - –Toucannon
  - –Palouse
  - –Grande Ronde
  - –Salmon
  - –Snake mainstem at Hells Canyon tailrace
  - –Snake mainstem at head of Brownlee Reservoir
  - –North Fork Clearwater upstream of Dwk Reservoir

Data Collection Strategy
Water discharge/Project Operation

- Continue close interval project operations data collection through 2003-2004
- Continue routine COE operations data collection

Data Collection Strategy
Meteorological Data – High Priority

- Continue current weather stations (Long-term)
  - Pasco, WA, airport (National Weather Service)
  - Lewiston, ID, (National Weather Service)
  - Lake Bryan-Rice Bar, WA, near little Goose Dam (Agri-Met)
  - Silcott Island, WA, upstream Lower Granite pool (Agri-Met)
  - Dworshak pool/Dent Acres, ID (Agri-Met)
  - Fish Hook Park, Ice Harbor Pool (PAWS)

- Add a weather stations on the Snake River (Hells Canyon, Cache Bar)

- Parameters
  - Air temperature
  - Dew Point temperature
  - Barometric pressure
  - Wind speed
  - Wind direction
  - Solar radiation
  - Precipitation
  - Cloud Cover

Data Collection Strategy
Database Operation

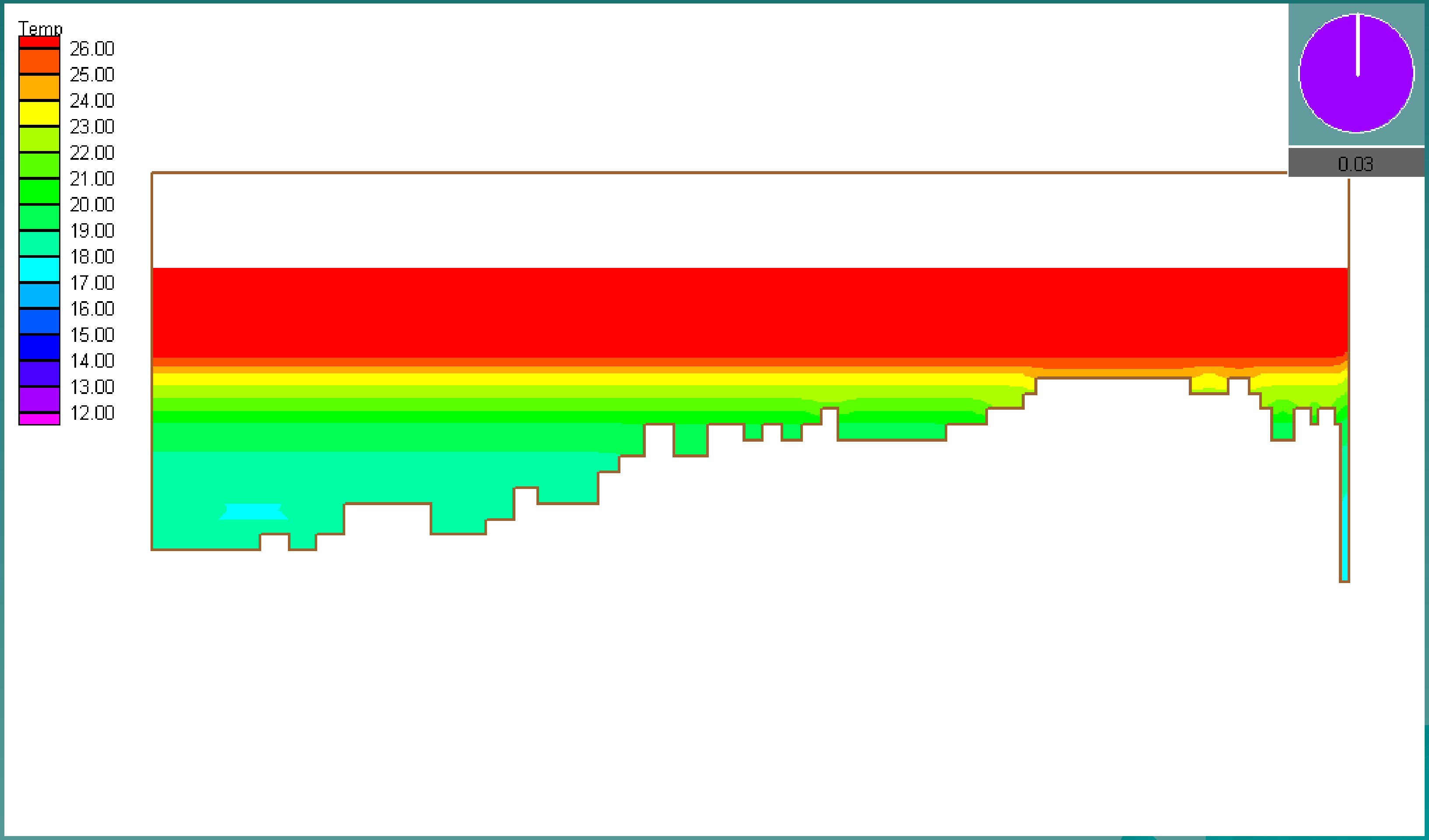
- Continue maintenance of research database
  - Water temperature (research and routine)
    - COE-WES (in river)
    - COE-NWW (routine water quality)
    - PNNL
    - IDEQ
    - Idaho Power
    - USGS
    - COE-NWW (in-project fishway thermal data)
  - Project operations data
    - Routine
    - Special operations close interval
  - Weather data
- Incorporate historical data for research evaluations and trend analysis

Proposed Model Implementation

- Objective
  - Water temperature management for habitat improvement in the Lower Snake River Basin
- Approach
  - Development of Numerical Model and Data input
    - CE-QUAL-W2
      - 2D Laterally Averaged Hydrodynamic-Water Quality Model
      - Velocity, stage, temperature
      - Reservoir/River Systems
    - Short and Long Term Forecasts - Hydrologic and Meteorologic Conditions

CE-Qual-W2 Simulation

Cold Water Discharge into Warm Water Body



Proposed Model Implementation

- Goals
  - Operational Model by Summer of 2004
    - Domain Phase I
      - Clearwater River @ DWK to confluence of Snake River
      - Snake River from Anatone (RM 167) to Lower Granite Dam
    - Decision support
      - Water control alternatives (flow augmentation)
      - Temperature control alternatives at Dworshak Dam
      - Fisheries Management (summer/fall temperature targets)

Proposed Model Implementation

- Model Development Team
  - US Army Corps of Engineers-Leadership
    - Walla Walla District
    - ERDC
  - Partnership of Regulatory Agencies
    - EPA
    - State of Washington
    - State of Idaho
    - State of Oregon
  - BPA, BOR, IP, Tribes, NOAA, USFW

Proposed Model Implementation

- Initial Tasks
  - Data Analyses
    - Flow, Stage, Velocity
      - Water Budget Estimates
    - Water Temperature
      - Reach Specific Heat Budget
    - Channel Bathymetry
      - Stage/Storage Relationships
    - Meteorology
      - Heat exchange processes
    - Biology
      - Timing and Abundance of Runs
      - Coupled interactions with flow, temperature
    - Hydraulic Structure
      - Outlet features and stratified flow

Proposed Model Implementation

- Tasks
  - Numerical Grid Generation
  - Boundary Conditions
  - Model Calibration
    - Parameter determination
  - Model Verification
  - Model Application
    - forecasting

Decision Support - TMT

- What decisions are needed to begin "Real Time" management using the temperature model?
  - What we can control
    - Dworshak release temperature
    - Dworshak flow
    - Snake flow??
  - Constraints – examples
    - General water supply outlook
    - Minimum temperature in the Clearwater
    - Minimum flow from Dworshak during particular weeks for the purpose of simply "moving fish"

Decision Support

- Pilot Water Temperature Targets
  - E.g., “Daily average temperature in Granite tailrace in normal snowpack year=“
    - “19.0 deg C from June 1 – Sept 15”
    - “Draft TMDL Targets – July 7 – Sept 30”
    - “As cold as we can get it all summer, until 1520’”
      - Don’t need a model to shoot for this target

Real Time

What is necessary flow from Dworshak now to meet target at Lower Granite a few days from now?

- Predictive Application of the Model
  - Using:
    - Today's measured conditions at system boundaries (flow,temp)
    - weather and flow forecasts for coming week
    - release temperature constraints
  - Vary the Dworshak flow until target is met
  - Step forward one day and do it again

Potential Benefits of Real Time Management

- Conservation of DWK cold water – saving water during cool weather
- Fewer, smaller temperature spikes
- Clearer basis for operational changes
- Less decision making burden on TMT
- Over time, better understanding of what is possible

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / John Roache* **BPA:** *Scott Bettin / John Wellschlager*
NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*
OR: *Ron Boyce* **WA:** **ID:** *Russ Kiefer* **MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT MEETING

08 October 2003   0900-1200 hours

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

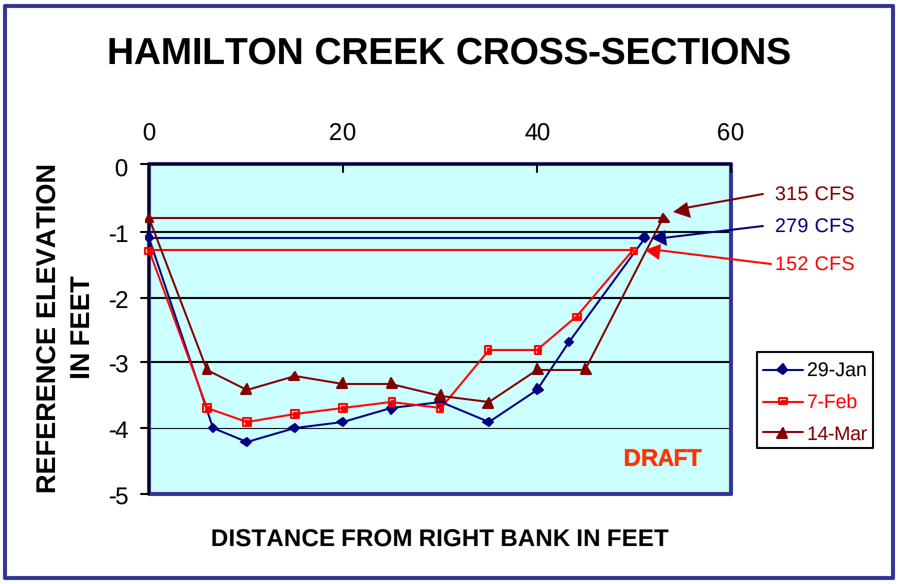
AGENDA

1. Welcome and introductions.
2. Hamilton Creek Rating Curve - COE Portland District [Hamilton Creek Presentation]
3. Update on Albeni Falls/Lake Pend Oreille [SOR 2003-FWS1]
4. Recommendation on end of MOP operation at Lower Granite - NOAA
5. Update on Spring Creek spill status - USFWS
6. System Status
   - Chum operations
   - Dworshak
7. WMP status - COE
8. Process chart - Action agencies - **POSTPONED**
9. Review of Autumn treaty fishing - CRITFC - **POSTPONED**
10. Year End review topics [Possible topics]
11. Other.
    - Set agenda for next meeting

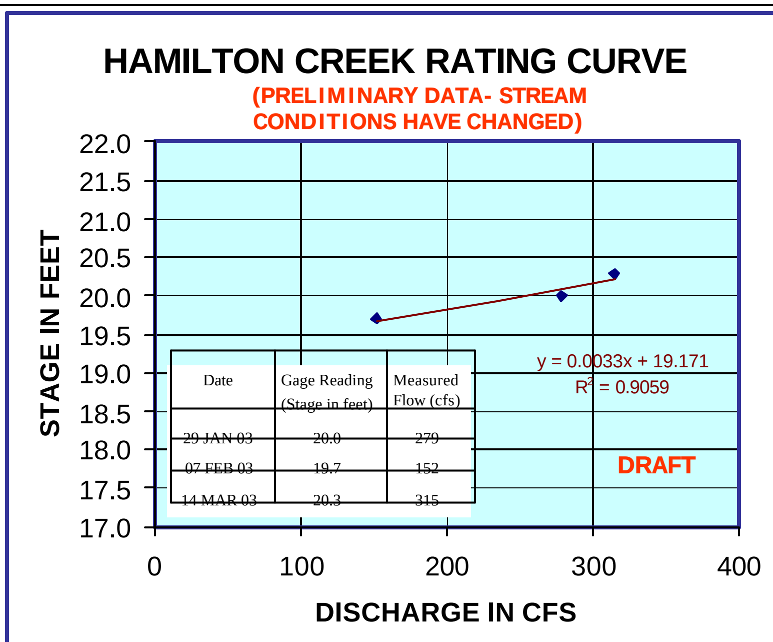
Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503 808-3942


Hamilton Creek
Stream Gage


Gage Location
PIERCE
NATIONAL
WILDLIFE REFUGE
North Bonneville
Beacon Rock
Golf Course
Hamilton
Island
COLUMBIA RIVER
Ives Island
Pierce Island
Little Beacon Rock
Beacon Rock
BEACON ROCK STATE PARK
SKAMANIA CO
MULTNOMAH CO
WASHINGTON
OREGON
Mobile Home Park
Greenleaf



PRELIMINARY RESULTS



Date	Gage Reading (Stage in feet)	Measured Flow (cfs)
29 JAN 03	20.0	279
07 FEB 03	19.7	152
14 MAR 03	20.3	315

PRELIMINARY RESULTS


Jan 2003
Oct 2003

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM

October 8, 2003

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Hamilton Creek Rating Curve:
Representatives from the Portland District COE presented information on a monitoring gage located at Hamilton Creek. Pete Dickerson explained that because the channel is dynamic, it is not the best location for getting a rating curve. The Portland District COE is looking to the TMT to find out what the team desires. TMT said they need to know when passage to Hamilton Creek is open, what the depth is and what fluctuations are occurring. A number of options were expressed, including: using a web cam on the bridge; surveying the cross section after a rain event to be certain the transponders are working; and tracking elevations and posting the information on the TMT web page.

ACTION: TMT will revisit the Hamilton Creek gage issue and make a recommendation at the October 22nd TMT meeting, after the Salmon Managers (some of which were not present today) have a chance to discuss the options laid out today.

Update on Albeni Falls/Lake Pend Oreille Operations:
Dave Wills, USFWS, presented SOR 2003-FWS-01, which recommended that Lake Pend Oreille be lowered to elevation 2051' this year to support a ten year study that evaluates the effects of the lake's elevation on kokanee and bull trout. The USFWS coordinated with Idaho Fish and Game and NOAA Fisheries on the issue before developing the recommendation. TMT provided an opportunity for the Lake Pend Oreille Commission to give input as well. Questions and comments raised from TMT representatives and others are summarized below:

- Idaho Fish and Game: Because the adult kokanee population is expected to be low this year, IDFG supports the lower lake level this year, then raising it during the following two years to support a healthier stock of fish.
- BPA: From a power/economic standpoint, BPA prefers the 2051' elevation.
- COE: Is there a study protocol? There are no hard numbers for levels for the lake.
- NOAA: The study requires two years at 2051' for accurate and beneficial data. Only one year has been collected. This year, with low numbers of adults and downstream needs factoring in, appears to be ideal to get the data without doing harm to one and while benefiting the other.
- Lake Pend Oreille Commission: The Commission supports higher elevations. Spokesperson Ford Elsaesser asked for the opportunity to put the Commission's request (for elevation 2055') in writing to TMT and to participate in follow-up discussions on this issue. The Commission has a desire to benefit warm water species, recreational use of the lake, and the higher level provides a substantial benefit to the

community. The Commission was created by the Legislature to represent water quality and quantity issues, and to provide input on decisions regarding lake operations.

ACTION: The COE will target elevation 2055-2056' by the end of October until further discussion at the October 22nd TMT meeting.

ACTION: The Lake Pend Oreille Commission will send information to the COE or the facilitation team to forward on to the TMT.

Lower Granite End of MOP:
The USFWS recommended that, unless there were compelling reasons to do otherwise, MOP operations be held until the end of transport (end of October), as there are still subyearling Chinook coming from the Clearwater. Holding the project at MOP would support the needs of the Nez Perce tribe. NOAA Fisheries said that the Biological Opinion requires the Lower Granite pool to be held low until the reservoir has cooled, and this requirement has been met. Therefore, they saw no Biogical Opinin requirement to keep the pool low. BPA expressed a desire, from an economic standpoint, to remove MOP restrictions at the project because the higher head allows for more generation.

ACTION: TMT consented to a removal of MOP to allow for full range operations at Lower Granite with a soft constraint for lower elevations. Also, the COE's teletype will note the Salmon Managers' preference to operate at a lower range if possible.

Update on Spring Creek Spill:
Dave Wills, USFWS, reported on the work of a subgroup that is discussing Spring Creek hatchery issues and alternative solutions that would eliminate a need for March releases. A B2 corner collector will go on line in March 2004; the USFWS is working with the COE to possibly do hydro acoustic monitoring work this year. TDG waiver requests have been submitted to Oregon DEQ and exemption requests have been sent to Washington DOE to keep all options on the table. As yet, no decisions have been made on operations for Spring Creek but the group is trying to find a creative solution. Dave will continue to update TMT on this issue.

System Status:
Chum: The 2002 chum report is now available. Nearly 20,000 fish were indexed on the Washington side, which is 10 times the average!! TMT will look for more information on chum at the next TMT meeting.

ACTION: The facilitation team will contact Ron Boyce to give a report on chum at the 10/22 TMT meeting.

Reservoirs: Dworshak is operating just above minimum flows, at 1.7 kcfs. There is a need to continue slightly higher flows to reduce cavitation of pumps for the hatchery; this should have a minimal impact on refill. The project is currently at elevation 1517.4'. Libby is at elevation 2433.5' and releasing 4-4.6 kcfs out. Albeni Falls is at 2059.3' and drafting, releasing 16 kcfs. For now, the target for Albeni Falls is elevation 2055-2056' for the end of October. John Day is operating at a 2.5' range. Lower Granite will go to minimum outflows in October due to a number of line outages scheduled. Grand Coulee is at elevation 1288'. Hungry Horse is drafting to meet Columbia Falls and is currently at elevation 3534'.

Water Management Plan Update:
Scott Boyd, COE, reported that comments on the 2004 WMP have been received from CRITFC, Oregon and Idaho. The plan should be finalized by the October 22nd TMT meeting. Scott will provide an update at that time.

Year End Review Topics:
TMT members reviewed and narrowed a draft list of year end review topics. The review is scheduled for November 5th, 10am-3pm. The revised topic list is as follows:

1. Temperature/water and runoff patterns, comparison to previous years – COE
2. Lower Granite study; RSW results – COE Walla Walla
3. Snake River operations – BPA
4. TDG level variations: criteria for modifications to spill – COE
5. Fall Chinook survival in the Snake River, and vertical distribution of fish in the reservoir relative to temperature – Billy Connor
6. NOAA survival study: results of the reach survival evaluations for 2003 and comparison to previous year – NOAA
7. Performance standards – NOAA
8. Weather review and winter climate forecast – CRITFC
9. Beginning and end of spill: latest update, lessons learned – NOAA
10. Comparison and analysis of fish passage in 2003 compared to other years – FPC
11. Adult returns from the 2001 out-migration (what were impacts of 2001 operations?) – FPC
12. Ice Harbor study results – COE Walla Walla
13. NOAA status review related to LAMBDA

Next Meeting, October 22, 9am-noon:
Agenda items:

- Process chart – Action Agencies
- Autumn treaty fishery – CRITFC
- Lake Pend Oreille update – All
- Hamilton Creek response – Salmon Managers
- Chum report – Oregon
- Spring Creek spill update – USFWS
- Water Management Plan final – COE
- System status

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
October 8, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

TMT Internet Homepage: http://www.nwd-wc.usace.army.mil/TMT/index.html

DRAFT

1. Greeting and Introductions

The October 8 Technical Management Team meeting was chaired by Cathy Hlebechuk of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Cindy Henriksen at 503/808-3945.

2. Hamilton Creek Rating Curve.

The Corps' Pete Dickerson said his agency has installed a gauge in Hamilton Creek, at the first bridge on the Columbia. We were trying to develop a rating curve for this area, he said, but this was not a good location for measuring the stage in the channel. We've been out three times since the gauge was installed, and as you can see by the graphs, the cross-section did not change significantly, while the stage change was 0.3 feet. The other problem we noticed was significant changes in the channel shape following these three events – the gauge was pretty much dry all summer, Dickerson said. Please note that Dickerson's presentation is linked to today's agenda on the TMT homepage; please refer to this document for details.

Essentially, this is a very dynamic stream, said Dickerson; we could try to fill in the flow values in between these various measurement points, but it wouldn't make for a very accurate rating curve. Dickerson showed a series of pictures taken in the field, showing the stream and gauge under various instream flow conditions. The bottom line is that we don't think a rating curve is going to help TMT very much, he said. One thing we can tell you, though, is if there is water in the channel – are there other TMT information needs we might be able to supply? Jim Litchfield suggested that placing a gauge on the bridge would at least tell TMT when water starts flowing to a depth that will allow chum to enter the stream. So are you interested in flow or water depth? Dickerson asked. Depth, Paul Wagner replied. We can keep track of the flow near the gauge and post that to the TMT website, Dickerson said. Another participant suggested that a webcam might be a useful way to track in-stream conditions in real-time.

It sounds, then, as though there is an interest in knowing when passage conditions are open for salmon, in terms of water depth at the entrance to the creek, since the rating curve isn't going to work, Silverberg said. A webcam is one idea; there is also the possibility of posting information from the gauge. There is also interest in checking the accuracy of the transponder at the site through a field survey following the next rain event, she said. Silverberg said she will ask the salmon managers to discuss the various options laid out today, with the goal of reaching a recommendation at the October 22 TMT meeting.

3. Update on Albeni Falls/Lake Pend Oreille.

On October 7, the action agencies received SOR 2003-FWS-01, covering winter operations at Lake Pend Oreille. This SOR, developed by the Fish and Wildlife Service and coordinated through NOAA Fisheries, requests the following specific operations:

- By November 15, draw Lake Pend Oreille down to elevation 2051 feet to precede significant lake shore spawning by kokanee and subsequent redd dessication or disturbance by wave action, and to redistribute shoreline gravel for subsequent years' spawning. During the winter water year 2005, hold Lake Pend Oreille at elevation 2055 feet to continue the evaluation of the effect of lake level on kokanee spawning success.

David Wills went through the details of this SOR, available via hotlink from today's agenda on the TMT homepage. He noted that there is a conflict between the USFWS bull trout BiOp and the 2000 NMFS BiOp between the water needs of Lake Pend Oreille kokanee and listed salmon downstream. After consulting with NOAA Fisheries, said Wills, this SOR is our operational recommendation – a low lake level in 2003-2004, and a high lake level in 2004-2005. We were unable to reach consensus on a recommended lake level for 2005-2006, Wills said, adding that once the three-year test is concluded, a longer-term Lake Pend Oreille operation will be developed.

Ford Elsaesser of the Idaho Lakes Commission asked about the reasoning behind the need for a low lake level this winter. Wills replied that his understanding is that, given the size of the 2003 kokanee brood, a low lake level will provide adequate spawning habitat and conditions, so some additional water is available for downstream use this fall and winter. Wagner said the purpose of the ongoing evaluation is to determine the effects of the higher and lower Lake Pend Oreille elevations on kokanee spawning in that system; the experimental design calls for alternating years of higher and lower lake level operation.

Jeff Laufle provided a brief historical overview of this 10-year experiment, which began in the winter of 1996-1997. In response to a question, Russ Kiefer said IDFG supports the Fish and Wildlife Service SOR. Scott Bettin said that, because it would provide a $3 million-$4 million power benefit, Bonneville also supports drafting Lake Pend Oreille to elevation 2051 this winter. The group also discussed the ongoing efforts to encourage lake trout population reduction in Lake Pend Oreille through liberalized sport and commercial fishing regulations.

The group also discussed the 1997 ISAB review of the 10-year study plan, which supported the need for alternating years of higher and lower lake elevations in order to conduct a valid study. Ned Horner said IDFG is trying to avoid a collapse in the kokanee and bull trout population, hence the general preference, in Idaho, for a higher lake elevation. Horner agreed, however, that given the size of the 2003 year-class, elevation 2051 should provide adequate spawning and rearing conditions this winter. The group also discussed Flathead Lake operations this winter.

Cathy Hlebechuk said the Corps will operate Lake Pend Oreille to achieve elevation 2055-2056 by October 31; the lake will then be positioned so it could be maintained or drafted to elevation 2051 by November 15, if needed. Silverberg said the TMT will develop that recommendation at its October 22 meeting. Elsaesser said his group intends to provide their input in writing prior to that meeting, and will also participate in the October 22 discussion.

Is there another reason the Commission would like to keep the lake level higher? Bettin asked. The feeling in the community here is that the higher lake level provides a substantial benefit, in terms of better warm-water fishing and recreational conditions, Elsaesser replied, noting that his Commission was recently chartered by the State of Idaho to speak for the state on the operation of Lake Pend Oreille. He said he will provide a list of email contacts for the Commission to the Corps.

4. Recommendations on the End of MOP Operation at Lower Granite.

Wills said that, at yesterday's FPAC meeting, while there was a wide diversity of opinion on this issue, the consensus was to maintain MOP at Lower Granite until the end of the transport season on October 31. In response to a question, Wagner said 400-500 Clearwater juveniles continue to arrive at, and to be transported from, Lower Granite daily. He noted that the BiOp says MOP should be maintained at Lower Granite until natural cooling reduces the temperature in the reservoir; we are now there, he said, so personally, I don't feel strongly that MOP needs to be maintained at Lower Granite through the end of the month. Our feeling was that, given the larger-than-normal numbers of juveniles still arriving at Lower Granite, it would be best to move them through the reservoir as quickly as possible by keeping the project at MOP. Bettin said Bonneville would prefer to have the additional four feet of operational flexibility at Lower Granite, given the fact that the BiOp requirements have now been met. After a few minutes of additional discussion, the Corps and BPA said they will end MOP operations at Lower Granite effective today, with a soft constraint on the lower operating range preferred by the salmon managers.

5. Update on Spring Creek Spill.

Wills said discussions on this issue began last year, with the goal of reprogramming or eliminating Spring Creek's large release group. The ideas were well-received, but the cost bogged things down, Wills said. The group also discussed moving a portion of the Spring Creek production group to a downstream location, he said, perhaps Big Creek. NOAA Fisheries had some concerns about mingling the Spring Creek tules with the naturally-produced stock in that area, however. The bottom line is that the group is still talking, but the probability that reprogramming will be possible is becoming less over time, Wills said. The Bonneville corner collector comes on-line this year, which will allow us to monitor passage through various routes of passage, he said. How the corner collector will be operated (with or without training spill) is still under discussion, he said, adding that, to keep all options open, USFWS has submitted the necessary water quality waiver requests to allow the spill program to go forward this spring.

Silverberg said further updates on this topic will be presented at future TMT meetings.

6. System Status.

Bettin noted that the report on the 2002 chum spawning is now available; the bottom line is that about 20,000 chum spawned below Bonneville last year. We will no doubt discuss that further at the year-end review meeting, Silverberg said.

Dworshak is releasing just over minimum flow, 1.7 Kcfs, said Hlebechuk; the hatchery had been having pump cavitation problems at the lower flow, so we increased flow by 100 cfs. We plan to continue at the higher rate of flow until the pump problem is fixed, she said. Exciter testing at Dworshak over the next month will also cause short periods of higher outflow, she said, noting that Dworshak's current elevation is 1517.4. Libby is currently at elevation 2433.5, with outflow increased to 4.6 Kcfs, a single unit, this morning. Albeni Falls is drafting; current elevation is 2059, with 16 Kcfs out. The project will be drafted to elevation 2055-2056 by October 31, at which point we'll decide whether to draft further, she said. John Day is operating within a 2.5-foot operating range currently. There are several line outages scheduled at Lower Granite later this month, which will mean minimum outflow from that project for one day several times this month, she added.

Grand Coulee is at elevation 1288, currently, said Tony Norris; Hungry Horse continues to draft to meet the Columbia Falls minimum and is currently at elevation 3534.

Bettin said there are no power system problems to report. In response to a question, Wagner said a total of 591,000 adult fall chinook have passed Bonneville Dam to date.

7. WMP Status.

Scott Boyd said he hopes to have a final draft of the 2004 Water Management Plan in time for presentation at the October 22 TMT meeting. There will likely be a lot of changes in the fall/winter update, he said.

8. Year-End Review Topics.

You will recall that, at the last TMT meeting, I asked folks to think about any additional topics they would like to address at the next year-end review meeting, Silverberg said. She went through the list of topics developed at the last meeting, offering the group an opportunity to confirm their interest (or lack thereof) in each topic.

Silverberg said she will provide an update list of post-season review topics at the next TMT meeting.

9. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, October 22. Meeting summary prepared by Jeff Kuechle.

.Possible Year-End Review Topics

- Temperature/water and runoff patterns, comparison to previous years
- alternative operations for spring flow augmentation
- Dworshak operations
- coordinating hatchery releases
- water year water supply forecast (Harold Opitz)
- Vernita Bar
- Mixers at McNary
- Lower Granite study
- Comparison analysis to other years
- FPC operations analysis
- Snake River operations
- TDG level variations: criteria for modifications to spill
- fall chinook survival in the Snake River
- Hanford Reach juvenile stranding
- history of spawning correspondent to Vernita Bar levels
- Migration status
- NOAA survival study: comparison to previous year
- Performance standards
- weather review (Kyle Martin)
- CRITFC winter climate forecast
- Beginning and end of spill
- Results of the reach survival evaluations for 2003
- Billy Connor's analysis of fall Chinook migration, and vertical distribution of fish in the reservoir relative to temperature.
- Comparison and analysis of fish passage in 2003 compared to other years
- Adult returns from the 2001 outmigration (what were impacts of 2001 operation?)

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / John Roache*	**BPA:**	*Scott Bettin / John Wellschlager*
NMFS:	*Paul Wagner / Chris Ross*	**USFWS:**	*David Wills / Howard Schaller*
OR: *Ron Boyce*	**WA:**	**ID:** *Russ Kiefer*	**MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT MEETING

22 October 2003 0900-1200 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

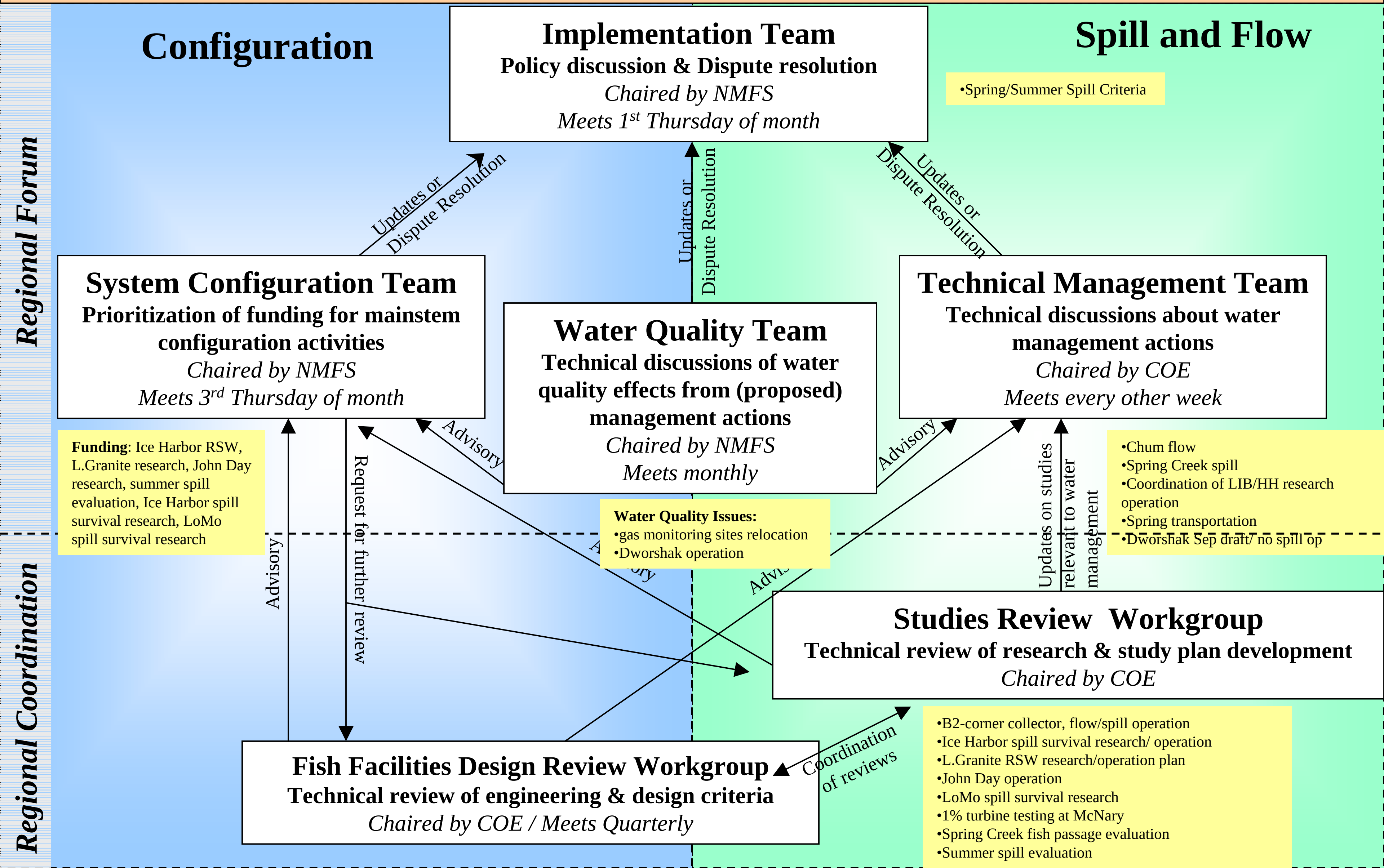
1. Welcome and introductions.
2. Lake Pend Oreille update-All - [SOR 2003-FWS1]
3. Process chart - Action Agencies [REGIONAL FORUM APPROACH TO 2004 HYDRO ISSUES]
4. Autumn treaty fishery - CRITFC - [Impact of Pool Fluctuations on the 2003 Autumn Treaty Fishery] Kyle Martin
5. Hamilton Creek gage response - Salmon Managers
6. Chum report - Oregon
7. Spring Creek spill update - USFWS
8. Water Management Plan final - COE
9. System status
   - Lower Monumental outage
10. Year End review topics
11. Other.
    - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

Hamilton Creek Gage Options (in lieu of rating curve):

- Web cam on bridge
- Survey cross section after rain event to be certain the transponders are working.
- Tracking elevations and posting the information on the TMT web page.

Regional Forum Approach to 2004 Hydro Issues



Regional Forums	Upcoming Meetings	Planning Events
Technical Management Team *Chaired by COE* *Meets every other week*	**October 23**, Joint IT/TMT Meeting	**October 31**, 04 Water Management Plan (WMP) **December –** Winter Update to WMP **February** – Fish Passage Plan **April –** Spring/Summer Update to WMP
Studies Review Workgroup *Chaired by COE*	**October 27,** Portland SRWG(J Day, Bonn Operation) **November 17-21** Corps Research Review	**November** 04 Research Plans Finalized **November 17-21** Corps Research Review **February,** Adjust research to runoff forecast
Fish Facilities Design Review Workgroup *Chaired by COE / Meets Quarterly*	**October 28** Portland FFDWG **November 5-6**, Walla Walla FFDWG	
Implementation Team *Chaired by NMFS* *Meets 1st Thursday of month*	**October 23,** Joint IT/TMT Meeting **November 6** IT Meeting	**November –** 04 BiOp Implementation Plan Issued
System Configuration Team *Chaired by NMFS* *Meets 3rd Thursday of month*	**October 16 –** SCT Funding Priorities	**October –** 04 CRFM Appropriation **November** – 04 BiOp Implementation Plan Issued
Water Quality Team *Chaired by NMFS* *Meets monthly(2nd Tuesday)*	**No October Meeting** **November 11**	

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
October 22, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

1. Greeting and Introductions

The October 22 Technical Management Team meeting was chaired by Cathy Hlebechuk of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Cindy Henriksen at 503/808-3945.

2. Lake Pend Oreille Update.

David Wills said he had not been able to participate in the Idaho Lakes Commission meeting earlier this week. Silverberg noted that the Lakes Commission had provided a letter to TMT following that meeting. Ford Elsaesser said the commission's position, with respect to this year's drawdown of Lake Pend Oreille, is that the kokanee experiment was scheduled for three years of draw-up, which has never been provided. That resulted in litigation, which resulted in two years of compromise at elevation 2053, which basically pleased no one, Elsaesser said. Since the 2000 BiOp went into effect, we've had one year of draw-up at Lake Pend Oreille, and the plan for this year is to draw down to elevation 2051 because of the low year-class of spawners.

The commission's view is that the experiment called for three years, said Elsaesser. The independent scientific reviews have supported the experiment and its favorable effects on kokanee when it was allowed to go forward. The unanimous vote of the commission is that the experiment should continue, Elsaesser said. If the action agencies are determined to draw Lake Pend Oreille down this year, the commission's position is that this year's operation should be followed by a three-year draw-up, to allow the full recovery of Lake Pend Oreille kokanee. The commission further believes that the lake should be drawn up to elevation 2055 or 2056 no later than March 15, said Elsaesser. Further, the lake should be refilled to its summer elevation at the earliest possible date in the spring consistent with prudent flood control management, rather than June 30.

Our greatest concern is that the kokanee experiment be maintained with some degree of integrity, Elsaesser said – so far, it has never been allowed to take place. There is nothing in the documentation on this lake that shows a default position of 2051; that has had a disastrous impact on the fishery in the lake in years past, he said. We need to give the science a chance to work, he said; we strongly urge that the kokanee experiment be allowed to continue. Elsaesser said he will provide a written version of the commission's position to Hlebechuk later today.

Russ Kiefer said going to elevation 2051 this year will not compromise the current Lake

Pend Oreille study design; it calls for being at elevation 2051 during the winter in one out of four years. At the last meeting, you were going to provide some background on the commission members – can you still provide that? Scott Bettin asked. Elsaesser said he will provide this information, noting that the commission was created by statute to be the action agency for the Priest Lake and Lake Pend Oreille basins for water quality and quantity. There are five members, he said, all residents of Bonner County, plus Susan Martin of the Fish and Wildlife Service and the attorney general of Idaho, who has appointed a deputy to participate.

Are the economic impacts of the operation considered? Bettin asked. Our charge is quite broad, Elsaesser replied; economics are considered, but they are focused on the interests of the people of the state of Idaho. What you're proposing is a $50 million expense to the region, if we draw up three years in a row and fill by March, Bettin said. Elsaesser replied that the Lake Pend Oreille PUD has never been able to demonstrate a $10 million-per-year economic impact from draw-up. I would like to see any hard evidence you may have that Albeni Falls draw-up costs the region anywhere near $10 million, he said, particularly if it doesn't have the partisan aspect of the information provided by Pend Oreille PUD. Bonneville will provide that, said Bettin. We will put it on our next Lakes Commission agenda, Elsaesser replied.

Bob Hallcok said the Fish and Wildlife Service addressed this question in its 2000 BiOp; we were looking for completion of a 10-year study, he said, because kokanee are the forage base for the threatened bull trout. That study period concludes in 2006, he said. We now have full outside review of the experimental design, said Hallock; we also asked the reviewers to respond to the question of the recommended frequency of draw-up vs. draw-down. Last year, the lake was up. The year before, it was down. There is also a density-dependent relationship, he said -- if the kokanee are in bad enough shape, it's difficult to show a benefit from this operation. The bottom line is that the Service does not have a dog in this fight, said Hallock; we have agreed to provide a letter to supplement the information in the SOR, but because of new information, we're in a changed condition that supercedes the review.

What does "we don't have a dog in this fight" mean? Hlebechuk asked. We can't show a benefit or a detriment to draw-up vs. draw-down in 2003, Hallock replied – we do, however, feel that it's crucial to provide a draw-up condition in 2004. We realize that chum may be impacted if the lake is not drawn down this year, Hallock added, but chum are not a part of the Fish and Wildlife Service BiOp.

Where does that leave the other TMT members, with respect to the Fish and Wildlife Service SOR? Silverberg asked. We have not retracted the SOR, Wills replied; I haven't heard anything today that would indicate that it should be changed – the lower lake level would benefit chum in 2003, and would not negatively impact kokanee in Lake Pend Oreille. The Lakes Commission would like to guarantee a high lake level in 2005, 2006 and 2007, Wills said, and that's an issue we need to continue to discuss.

The group devoted a few minutes of discussion to the biological impact of the lake levels provided during the previous of this study; it was noted that survival has increased significantly since the experiment began, but the highest survivals were seen in years when the lake level was highest.

Silverberg asked the other TMT members to state their positions on the Fish and Wildlife Service SOR. Ron Boyce said that, while he is unfamiliar with all of the Lake Pend Oreille kokanee data from the previous years of the experiment, ODFW supports operations that enhance chum spawning and rearing conditions. He stated, however, that ODFW would prefer to avoid discussions that trade off benefits for one species vs. another. He said ODFW will defer to the Fish and Wildlife Service with respect to the science underlying this SOR.

IDFG supports the SOR as written, said Kiefer. Bill Hevlin said NOAA Fisheries supports the SOR as written. CRITFC supports the SOR as written, said Kyle Martin. From an economic standpoint, Bonneville supports drawdown to elevation 2051, said Bettin; however, we defer to the Corps in terms of the final decision on this operation. Tony Norris said Reclamation, too, will defer to the Corps. The Corps would like to wait to receive the additional information that has been requested from the Commission and from the Fish and Wildlife Service before we make the final determination, said Hlebechuk. The 2004-2005 operation will be discussed next year, she said, the same is true of the request to refill Lake Pend Oreille by mid-March – that's not guaranteed either. Hlebechuk said she will distribute the Corps' decision to the TMT membership via email once the determination is made.

Would the water from Lake Pend Oreille be held at Grand Coulee for use later on chum? Elsaesser asked. During March, holding Albeni Falls four feet higher would result in drafting Grand Coulee four feet lower, Bettin replied. What I'm saying is that the 30+ years of drawdown we've seen in recent decades hasn't directly benefitted chum, Elsaesser said. Paul Wagner has indicated that he will provide some information on that question, Silverberg said. Hevlin noted that the connection between flows and the chum population can be found on page 9-6 of the 2000 BiOp. Bettin noted that the March 15 requirement is a new twist.

A Corps representative asked that the Fish and Wildlife Service and IDFG provide further information about what the Lake Pend Oreille kokanee study calls for next year, because, in her opinion, that is unclear. Elsaesser replied that the Fish and Wildlife Service request for 2004 is clear – it calls for a draw-up. Still, we would like to have the documentation underlying that request, the Corps representative said – that is the operational request, but we need the additional documentation to be provided. We will provide that, said Hallock. In the meantime, said Silverberg, the Corps will issue its decision before the end of the month.

3. Process Chart.

Silverberg said the draft process chart is available via hotlink from today's agenda on the TMT homepage. In response to a question, Boyce said this chart was developed in an attempt to answer the question of how changes should be made to the operations called for in the 2000 BiOp. You will recall that the salmon managers developed a chart and the action agencies requested some additional time to discuss it, Silverberg said. Hlebechuk said that, in the Action Agencies' view, this chart simplifies the decision-making hierarchy. The group devoted a few minutes of discussion to the process chart, offering a variety of clarifying questions and comments. Ultimately, it was agreed that the TMT membership will continue to review the process chart and will bring any comments they may have to the TMT's 2003 seasonal review meeting on November 5.

4. Fall Treaty Fishery Compliance.

Martin noted that the best year for compliance with the one-foot pool elevation standard requested by CRITFC was 2002 for Bonneville pool and 2003 for The Dalles pool. Fishing conditions for the tribal fishers was excellent in 2003, particularly during the last two weeks of September, when it was 100%. Martin also noted that the Fishing season in October had good compliance on the part of the Corps at the John Day reservoir. Hlebechuk said this was because CRITFC specifically requested a priority at John Day rather than Bonneville during these last two weeks. Martin agreed this was the priority for those seasons. The chairman of the CRITFC tribal commission expressed his thanks to the action agencies for their efforts in this regard, Martin said.

5. Hamilton Creek Gauge Response.

Wills reminded the group that, during its recent presentation to the TMT, USGS representatives informed the group that a Hamilton Creek gauge rating curve was impractical; in the absence of a curve, he said, we discussed the possibility of a web cam to show when adequate water was present in Hamilton Creek to allow spawning access. None of the options we discussed at FPAC seemed to be a practical way to meet our real-time management needs, said Wills; I think we’re back to relying on the modeling work we’ve done in past years, and managing to a tailwater elevation that is dictated by flow at Bonneville Dam.

After a brief discussion, Wills said that, in his opinion, the jury is still out as to whether the Hamilton Creek gauge can be used, rather than Bonneville tailwater elevation, as a management tool for the 2003 chum operation. It was agreed to discuss this issue further at a future TMT meeting.

6. Chum Report.

Boyce said FPAC had discussed the chum information requested at its last meeting, but was somewhat unclear about what TMT needs to know. He said that, during yesterday’s Ives Island field survey, no chum were seen; they will not show up in any numbers until early November. A few coho and chinook were seen, together with two redds. He said a chum SOR will be submitted within a few days, but at this point, field personnel have seen only a few bright chinook and coho.

The most reliable information on chum is from Ives Island itself, he said; it shows that the chum arrive in numbers during the first week in November. Some years we provide a Bonneville tailwater of 11.5 feet during that first week, and other years we don’t, he said; there is some information that indicates that not providing that minimum tailwater elevation early in the season has a negative impact on eventual survival rates. We need to be cognizant of the potential impacts of the Bonneville tailwater elevation on later survival, he said – if we don’t provide 11.5 feet early enough, we could be missing an important window of opportunity to enhance spawning conditions. Bettin noted that the Ives Island site is just one of 38 lower river chum spawning sites identified in 2002.

The group devoted a few minutes of discussion to the spawning location question. Ultimately, it was agreed that a further chum update will be provided at the next TMT meeting.

7. Spring Creek Spill Update.

Wills said the larger group discussion on Spring Creek spill in 2004 has not yet taken place. The question is still up in the air, he said; my personal opinion is that reprogramming will not be possible in 2004. The proposal, in that case, will likely be that the March release will go forward as usual in conjunction with an evaluation, Wills said. We appreciate the fact that we're talking about this sooner, rather than later, he added.

8. 2004 Water Management Plan Update.

Scott Boyd said the most recent version of the 2004 WMP is available on the TMT website. While this is considered the "final" WMP, there are still a number of questions, such as RSW operations, that need to be resolved. He reminded the group that there are still two updates to come on this document, the fall/winter and spring/summer updates, in which operations will be fleshed out further as more information and direction are received. Next up is the fall/winter update, said Boyd; he asked that any operational suggestions be sent to him as soon as possible.

9. System Status.

Hlebechuk said Libby is currently at elevation 2433.3, and is releasing 4.3 Kcfs. Albeni Falls is at elevation 2056.8 and drafting, releasing 10 Kcfs-13 Kcfs. Dworshak is at elevation 1516 feet, with outflow of 1600 cfs. Day-average flow at Bonneville Dam has been between 80 Kcfs and 116 Kcfs over the past week. A Lower Monumental line outage is scheduled for Nov. 17-28, so the project will be spilling everything above 5 Kcfs, with total flow of 15-20 Kcfs expected. Tony Norris said Grand Coulee is at elevation 1289, currently; Hungry Horse is still drafting to meet the Columbia Falls minimum.

Jim Adams noted that there is some missing water quality data from a number of sites over the past two weeks; the Corps is investigating why that is occurring. The problem is not limited to Corps sites, he said; we're tracing back up the line to try to find out what might be causing the problem.

10. Year-End Review Topics.

Silverberg said the facilitation team has developed an agenda for the TMT's year-end review meeting, based on the input received at the last two TMT meetings. She asked that anyone who plans to attend let her know as soon as possible. She went briefly through the agenda for the meeting to see who plans to present each agenda topic.

11. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, November 5. Meeting summary prepared by Jeff Kuechle.

TMT Participant List
October 22, 2003

Name	**Affiliation**
Donna Silverberg	Facilitation Team
Bob Hallock	USFWS
Scott Bettin	BPA
Jim Adams	COE
Scott Boyd	COE
Robin Harkless	Facilitation Team
Ron Boyce	ODFW
David Wills	USFWS
Russ Kiefer	IDFG
Cathy Hlebechuk	COE
Tony Norris	USBR
Bill Hevlin	NOAA Fisheries
John Wellschlager	BPA
Nic Lane	BPA
David Benner	FPC
Tim Heizenrater	PPL
Shane Scott	PPC
Russ George	WMCI
Kyle Martin	CRITFC
Laura Hamilton	COE
Ford Elsaesser	Idaho Lakes Commission
Mitch Hill	ILC
Jeff Loughley	USFWS
Tom Le	PSE
Margaret Filardo	FPC
Richelle Beck	D. Rohr & Associates

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 NE Oregon, Suite 200, Portland, Oregon 97232
Telephone 503 238 0667
Fax 503 235 4228

TO: Technical Management Team (TMT)
FROM: Kyle Martin, *Senior Hydrologist*, CRITFC Hydro Program
DATE: October 22, 2003

SUBJECT: Impact of Pool Fluctuations on the 2003 Autumn Treaty Fishery

CRITFC submitted five System Operation Requests (2003-C6 through 2003-C10) via the TMT forum in support of this autumn's treaty fishing. The CRITFC requests asked for (1) specific elevations, and (2) stable pool elevations.

Criterion #1 asked to operate the pools within a one-foot specified elevation range. The Corps replied with a commitment to a 1.5 foot range, and then only in Bonneville pool, as they have done so since 1996, although the Corps showed more flexibility this season. CRITFC agreed to the Corps' claim of the top operating limit at the Bonneville pool of 76.5 feet.

The table below shows the hourly compliance of CRITFC's elevation range criteria during the treaty fisheries. On average, the Bonneville pool complied 73% of the time. On average, the Celilo (The Dalles) pool complied 84% of the time. On average, the John Day pool complied 39% of the time.

2003	Bonneville Pool	The Dalles Pool	John Day pool
1 foot range (CRITFC):	75.5 - 76.5 feet	158.5 -159.5 feet	263.5 - 264.5 feet
AUG 26 - 30	83%	59%	19%
SEP 2 - 5	86%	41%	2%
SEP 9 - 12	100%	100%	36%
SEP 16 - 20	100%	100%	14%
SEP 24 - 27	99%	93%	1%
OCT 1 - 4	16%	99%	100%
OCT 8 - 11	24%	93%	100%
Average:	73%	84%	39%
1.5 foot range (COE):	75 - 76.5 ft	158 -159.5 ft	263 - 264.5 ft
AUG 26 - 30	100%	92%	77%
SEP 2 - 5	100%	78%	22%
SEP 9 - 12	100%	100%	100%
SEP 16 - 20	100%	100%	95%
SEP 24 - 27	100%	100%	98%
OCT 1 - 4	75%	100%	100%
OCT 8 - 11	69%	100%	100%
Average:	92%	96%	85%

Pool elevation data is a good measure as to the absolute pool fluctuations (Criterion #2). If the criterion was to limit fluctuations to one foot or less, irrespective to any absolute elevation criteria, then the pools stayed near 0.25 - 0.5 foot and complied most of the time. The Corps is reducing the absolute pool fluctuations, even if they are not in full compliance with the elevation criteria.

This spring, Rudd Turner of the Corps pointed out that two forebay gages exist at Bonneville dam. The Corps uses the "HS" (spillway) gage as their official gauging station. The Bonneville pool data that CRITFC has downloaded over the last few years has been updated with the "HS" data and compliance statistics for 2002 back to 1999 have been re-calculated and given below.

2002	Bonneville Pool	The Dalles Pool	John Day pool
1 foot range (CRITFC):	76 - 77 ft	158.5 -159.5 ft	263.5 - 264.5 ft
AUG 28 - 31	25%	38%	51%
SEP 4 - 7	32%	58%	88%
SEP 11 - 14	33%	55%	62%
SEP 16 - 20	25%	77%	50%
SEP 25 - 28	20%	78%	68%
Average:	27%	61%	64%
1 foot range (COE):	75.5 - 76.5 ft	158.5 -159.5 ft	263.5 - 264.5 ft
AUG 28 - 31	98%	38%	51%
SEP 4 - 7	82%	58%	88%
SEP 11 - 14	94%	55%	62%
SEP 16 - 20	90%	77%	50%
SEP 25 - 28	92%	78%	68%
Average:	91%	61%	64%
1.5 foot range (COE):	75 - 76.5 ft	158 -159.5 ft	263 - 264.5 ft
AUG 28 - 31	100%	60%	100%
SEP 4 - 7	100%	79%	100%
SEP 11 - 14	100%	99%	100%
SEP 16 - 20	100%	100%	98%
SEP 25 - 28	100%	100%	98%
Average:	100%	88%	99%

2001	Bonneville Pool	The Dalles Pool	John Day pool
1 foot range (CRITFC):	76 - 77 feet	158.5 -159.5 feet	263.5 - 264.5 feet
AUG 28 - SEP 1	6%	75%	95%
SEP 4 - 8	13%	73%	100%
Average:	10%	74%	98%
1 foot range (COE):	75.5 - 76.5 ft	158.5 -159.5 ft	263.5 - 264.5 ft
AUG 28 - SEP 1	60%	75%	95%
SEP 4 - 8	99%	73%	100%
Average:	80%	74%	98%
1.5 foot range (COE):	75 - 76.5 ft	158.5 -159.5 ft	263.5 - 264.5 ft
AUG 28 - SEP 1	100%	100%	100%
SEP 4 - 8	100%	90%	100%
Average:	100%	95%	100%

2000	Bonneville Pool	The Dalles Pool	John Day pool
1 foot range (CRITFC):	76 - 77 feet	158.5 -159.5 feet	263.5 - 264.5 feet
AUG 30 - SEP 2	0%	75%	100%
SEP 5 - 9	14%	56%	83%
SEP 12 - 16	15%	34%	97%
SEP 19 - 23	7%	56%	88%
Average:	9%	55%	92%
1 foot range (COE):	75.5 - 76.5 ft	158.5 -159.5 ft	263.5 - 264.5 ft
AUG 30 - SEP 2	0%	75%	100%
SEP 5 - 9	83%	56%	83%
SEP 12 - 16	66%	34%	97%
SEP 19 - 23	75%	56%	88%
Average:	56%	55%	92%
1.5 foot range (COE):	75 - 76.5 ft	158 -159.5 ft	263 - 264.5 ft
AUG 30 - SEP 2	0%	82%	100%
SEP 5 - 9	100%	89%	100%
SEP 12 - 16	83%	67%	100%
SEP 19 - 23	97%	79%	100%
Average:	70%	79%	100%

1999	Bonneville Pool	The Dalles Pool	John Day pool
1 foot range (CRITFC):	76 - 77 feet	158.5 -159.5 feet	263.5 - 264.5 feet
AUG 31-SEP 4	8%	50%	100%
SEP 7 - 11	10%	47%	100%
SEP 15 - 18	4%	74%	100%
SEP 22 - 25	2%	33%	100%
SEP 29 - OCT 2	0%	36%	100%
Average:	5%	48%	100%
1 foot range (COE):	75.5 - 76.5 ft	158.5 -159.5 ft	263.5 - 264.5 ft
AUG 31-SEP 4	31%	50%	100%
SEP 7 - 11	28%	47%	100%
SEP 15 - 18	79%	74%	100%
SEP 22 - 25	55%	33%	100%
SEP 29 - OCT 2	42%	36%	100%
Average:	47%	48%	100%
1.5 foot range (COE):	75 - 76.5 ft	158 -159.5 ft	263 - 264.5 ft
AUG 31-SEP 4	87%	78%	100%
SEP 7 - 11	70%	78%	100%
SEP 15 - 18	100%	92%	100%
SEP 22 - 25	88%	47%	100%
SEP 29 - OCT 2	87%	95%	100%
Average:	86%	78%	100%

COLUMBIA RIVER REGIONAL FORUM

Technical Management Team
Annual Review of Lessons Learned: 2003

November 5th, 2003
10 am – 3 pm
COE Customs House
Portland, OR
2ND Floor Conference Room

DRAFT AGENDA

1. 2003 Comparison to Previous Years

    - Temperature, Water and Runoff patterns – COE
    - TDG Level Variations – COE
    - Fish Passage – Fish Passage Center
    - Beginning and End of Spill Relative to Fish Passage – FPC
    - Weather – Kyle Martin, CRITFC

2. Snake River Review

    - Spring Spill Trigger – BPA
    - Fall Chinook Survival Studies – Billy Connor, USFWS

3. 2003 Study Information That Might Impact 2004 Operations

    - Lower Granite RSW Results – COE
    - NOAA Survival Study – Science Center
    - ICH Results – COE Walla Walla
    - NOAA's Status Review Related to LAMBDA –NOAA

4. Other Lessons Learned

    - Impacts of 2001 operations on adult returns – FPC
    - Performance Standards: How are things measuring up? – NOAA

NOTE: Lunch will be brought in for all participating in or attending the meeting. A $5 contribution is encouraged and RSVP required to guarantee enough food for everyone!

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / John Roache*	**BPA:**	*Scott Bettin / John Wellschlager*
NMFS:	*Paul Wagner / Chris Ross*	**USFWS:**	*David Wills / Howard Schaller*
OR:	*Ron Boyce*	**WA:**	
ID:	*Russ Kiefer*	**MT:**	*Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT MEETING

30 October 2003   0900-1200 hours

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5191

" NOTE NEW CALL IN NUMBER "

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Albeni Falls winter operation. (ALL) -
3. Chum Operation (SOR 2003-15) - [SOR 2003-C15]
4. Other.
   - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
October 30, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON
Facilitator: Donna Silverberg

The following is a summary of the discussion between members of the Technical Management Team on 10/30/03. The notes are not intended to be a verbatim account of the meeting nor do they serve as the official "record". They are intended to highlight discussion points, decisions, and actions.

Albeni Falls Operations Update:
Cindy Henriksen, COE, reported that information that was requested from the Lake Pend Oreille Lake Commission, USFWS, IDFG and NOAA were sent to the COE. This information and the discussions at TMT regarding Albeni Falls operations aided in the COE's decision to operate to meet elevation 2051' at Lake Pend Oreille for 2003-2004. Outflows will be increased to 26 kcfs on 10/31 a.m. to reach 2051' around November 15th.

SOR 2003-15:
Dave Wills, USFWS, introduced SOR 2003-15, requesting a minimum tailrace elevation of 11.5' at Bonneville, beginning no later than November 1st, and continuing until further notice, to support chum spawning needs. 300 chum have been observed in Gray's Creek this week, none at Ives Island. Generally, Dave noted, it takes one to two weeks for the chum to reach Ive's from Gray's. 10 live Chinook were observed at the Ives Island complex on Tuesday, October 27th.

The following comments were expressed by the TMT representatives:

- BPA proposed, since there are no chum currently present, to start operating the project on Monday, November 3rd, to 11.2' minimum and 11.5' maximum (daytime), then revisit the issue at next Wednesday's TMT meeting.
- NOAA expressed agreement, given the current information, with BPA's proposed chum operations as long as the chum operation begins around the BiOp proposed November 1st date (and Nov. 3rd does this).
- USFWS expressed no disagreement with BPA's proposed operation but would like to keep in mind the desire NOT to wait too late to ramp up the project to the 11.5' elevation.
- Cindy Henriksen, COE, noted her understanding of the NOAA criteria: presence of fish, available water and adaptive management. Since there is not a presence of chum in the Ives area, the COE agreed with BPA's proposed operation.
- Oregon expressed a preference to observe the Ives area again tomorrow, and as soon as results are in and IF there is a significant increase in observed chum (75), to call a TMT meeting on Monday to discuss whether to change operations.

<u>ACTION</u>: The COE will operate the BON tailrace at an 11.2'-11.5' daytime elevation (7 am-7 pm) and 11.2' minimum nighttime elevation beginning Monday, November 3rd. If the results of observations before that time show a dramatic increase in the presence of live chum (~75), an emergency TMT call will be held at 1 pm on Monday. Otherwise, TMT will revisit chum operations at the beginning of the TMT year end review meeting, Wednesday November 5th.

<u>Next Meeting, YEAR END REVIEW, November 5th, 10am-3pm</u>:
A detailed agenda will be sent to TMT members prior to the meeting. The year end review will be held at the Water Resources Education Center in Vancouver, Washington. The address and directions will be included with the agenda. Food will be provided at a cost of $5. **If you have not already done so, please notify the facilitation team today if you plan to attend the meeting**.

1. Greeting and Introductions

The October 30 Technical Management Team conference call was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Albeni Falls Winter Operations.

Henriksen said that, following recent discussions on this topic, the Corps asked the resource agencies for their recommendations on the 2003/2004 winter lake elevation at Lake Pend Oreille. Additional information was received from the Fish and Wildlife Service, which indicated that operating to elevation 2051 would not compromise their bull trout operation, Henriksen said; IDFG also sent information about their kokanee protocols. That received, said Henriksen, the Corps has begun drafting Lake Pend Oreille to achieve elevation 2051 by November 15 to 20; today, outflow is being increased from 18 Kcfs to 26 Kcfs. We plan to be at or near 2051 by mid-November, she said.

3. Chum Operations – SOR 2003-15.

On October 24, the action agencies received SOR 2003-15. Supported by USFWS, NOAA Fisheries, IDFG, WDFW, CRITFC, the Shoshone-Bannock Tribe and ODFW, this SOR requests the following specific operations:

- As required by the 2000 NMFS Biological Opinion, beginning when chum are present (no later than Nov. 1) and continuing until further notice, provide a minimum instantaneous tailrace elevation of 11.5 feet at Bonneville Dam. On average it is anticipated that daily flows will not exceed 125 Kcfs.

David Wills went briefly through the background and justifications for this SOR, the full text of which is available via hotlink from today's agenda on the TMT homepage.

Have you seen any fish in the Greys River or at Ives Island? Scott Bettin asked. About 300 adult chum have been observed to date in the Greys River, but none have been seen at Ives Island to date, Wills replied; you will recall that, typically, there is a one- to two-week lag time between the arrival of chum in the Greys River and their arrival at the Ives Island spawning grounds. We saw 10 live chinook, a couple of coho, and no chum in our last Ives Island field survey, added Ron Boyce; we don't expect the chum to arrive at Ives Island in significant numbers until next week.

For that reason, we were hoping to start off at an 11.2-foot minimum and 11.5-foot maximum daytime tailwater elevation at Bonneville on Monday; we can then discuss the operation further once chum are observed at Ives Island, Bettin said. We'll need to talk about that, Boyce replied – the problem is, if you don't have the water, you don't have proper hydraulic conditions over the spawning areas, and you won't see any fish in the preferred areas. That hasn't been the case in recent years, Bettin said. We'll be doing another field survey tomorrow, said Boyce, but bear in mind that the chum arrive at Ives Island during the first week in November just like clockwork, and we have a very narrow window of opportunity here.

John Wellschlager noted that last year's chum operation didn't begin until November 4, and it started at the lower tailwater elevation, not 11.5 feet. Boyce replied that research indicates that starting the chum operation later and at a lower elevation led to egg-to-fry survival problems last year. I understand the argument, said Wellschlager, but I don't necessarily agree that tailwater elevation is the only factor in lower egg-to-fry survival – the large number of returning adults, for instance, likely scoured out a number of earlier redds. You're correct, that is a factor, which is one reason we want to provide the higher tailwater elevation this year, Boyce replied. I don't think you'll hear any arguments about that, said Wellschlager; the only thing we're arguing is that we should wait until we actually have fish on the Ives Island spawning grounds before we start sending a lot of water down the river.

In response to a question from Silverberg, Kyle Martin said CRITFC has no problem with using a "ramp-up" approach to this year's chum spawning operation; Paul Wagner said NOAA Fisheries has no problem with waiting a few days before the 11.5-foot tailwater elevation goes into effect. I guess the Fish and Wildlife Service would agree with that assessment, said Wills, but I don't want to leave it too late.

The group devoted a few minutes of discussion to previous years' operations, with Boyce noting that water conditions are looking much better this year than they have in the previous two years. Bettin reiterated that, while Bonneville is not opposed to the operation requested in the SOR, they would prefer to wait until chum are actually present on the Ives Island spawning grounds before providing the water to meet the requested 11.5-foot minimum tailwater elevation. It's also about providing proper hydraulic conditions over the seeps, Boyce replied.

My understanding is that the NOAA Fisheries criteria for the start of this operation include the presence of fish, agreement at TMT that there is enough water in the system to sustain this operation, and having enough information to engage in adaptive management, Henriksen said. We have heard that the chum will not be arriving at Ives Island until next week, she said; beyond that, we don't have any more information on the Ives Island area. Thus far, there have been no chum sightings, so that particular criteria has not yet been met, she said. Another survey is scheduled for this afternoon, she said, but until that information is available, we can't really say much more. We have agreed to provide a Bonneville tailwater elevation of 11.2-11.5 feet starting Monday morning, she said; that will wet the perimeter, so if fish enter the spawning grounds, they will find suitable habitat watered up.

Wellschlager noted that, with the weather getting colder, Bonneville will be operating to a tailwater elevation of about 11 feet just to meet load. He added that it is too soon to assume that there will be plenty of water in the system this year. With respect to next steps, said Boyce, we will be surveying at Ives Island later tomorrow and Tuesday, and will check in at TMT next Wednesday. If we find anything striking – say, 75 adult chum on the Ives Island spawning grounds this afternoon – we can convene a conference call at 1 p.m. Monday, Boyce said. That's understood in the TMT protocols, Silverberg replied.

Is everyone OK with the proposed operation? Silverberg asked. One question, said Henriksen – it sounds as though we're in agreement to start maintaining an 11.2-11.5-foot daytime tailwater elevation range at Bonneville starting Monday morning. The problem is that Bonneville's nighttime tailwater elevations have been higher than 11.5 feet recently. We need to prevent that, said Boyce – there is evidence, compiled by the Fish and Wildlife Service, that shows that chum spawn at night in the Ives Island mainstem area. We don't want nighttime tailwater elevations to be too high, otherwise those redds could be dewatered later in the year, he said.

The group devoted a few minutes of discussion to this issue; ultimately, Wellschlager said that, before this discussion continues, he would like to check with project personnel to see what is physically possible, in terms of limiting nighttime tailwater elevations at Bonneville. In the meantime, said Boyce, ODFW will be intensively documenting this year's chum spawning, in particular, the location of the highest redds.

Do you expect nighttime tailwater elevation to go below 11.2 feet? Wills asked. Not after Monday, Bettin replied.

To summarize, then, said Silverberg, further field surveys are planned over the next few days; if a significant number of chum are observed, there will be a TMT call at 1 p.m. Monday. If not, we will discuss this operation further at Wednesday's TMT meeting. In the meantime, starting Monday morning, we will operate Bonneville to an 11.2-foot minimum, 11.5-foot maximum tailwater operation from 7 a.m. to 7 p.m., with the possibility of somewhat higher tailwater elevations at night.

4. Next TMT Meeting Date.

If large numbers of chum spawners are observed today or tomorrow, it was agreed to convene a TMT conference call at 1 p.m. Monday, November 3. The next regularly-scheduled TMT meeting was set for Wednesday, November 5. Meeting summary prepared by Jeff Kuechle.

TMT Participant List
October 30, 2003

Name	**Affiliation**
Donna Silverberg	Facilitation Team
Cindy Henriksen	COE
Ron Boyce	ODFW
David Wills	USFWS
Scott Bettin	BPA
Kyle Martin	CRITFC
Scott Boyd	COE
Richelle Beck	D. Rohr & Associates
Russ George	WMCI
Tim Heizenrater	PPL
Tom Le	PSE
Tony Norris	USBR
John Roche	USBR
Russ Kiefer	IDFG
Paul Wagner	NOAA Fisheries
Tom Haymaker	PNGC
Chris Ross	NOAA Fisheries
Mike Buchko	Powerex
Robin Harkless	Facilitation Team

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / John Roache* **BPA:** *Scott Bettin / John Wellschlager*

NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*

OR: *Ron Boyce* **WA:** **ID:** *Russ Kiefer* **MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

COLUMBIA RIVER REGIONAL FORUM

Technical Management Team

Annual Review of Lessons Learned: 2003

05 November 2003   1000-1500 hours

Columbia River Inter-Tribal Fish Commission
729 NE Oregon
Portland, OR

Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

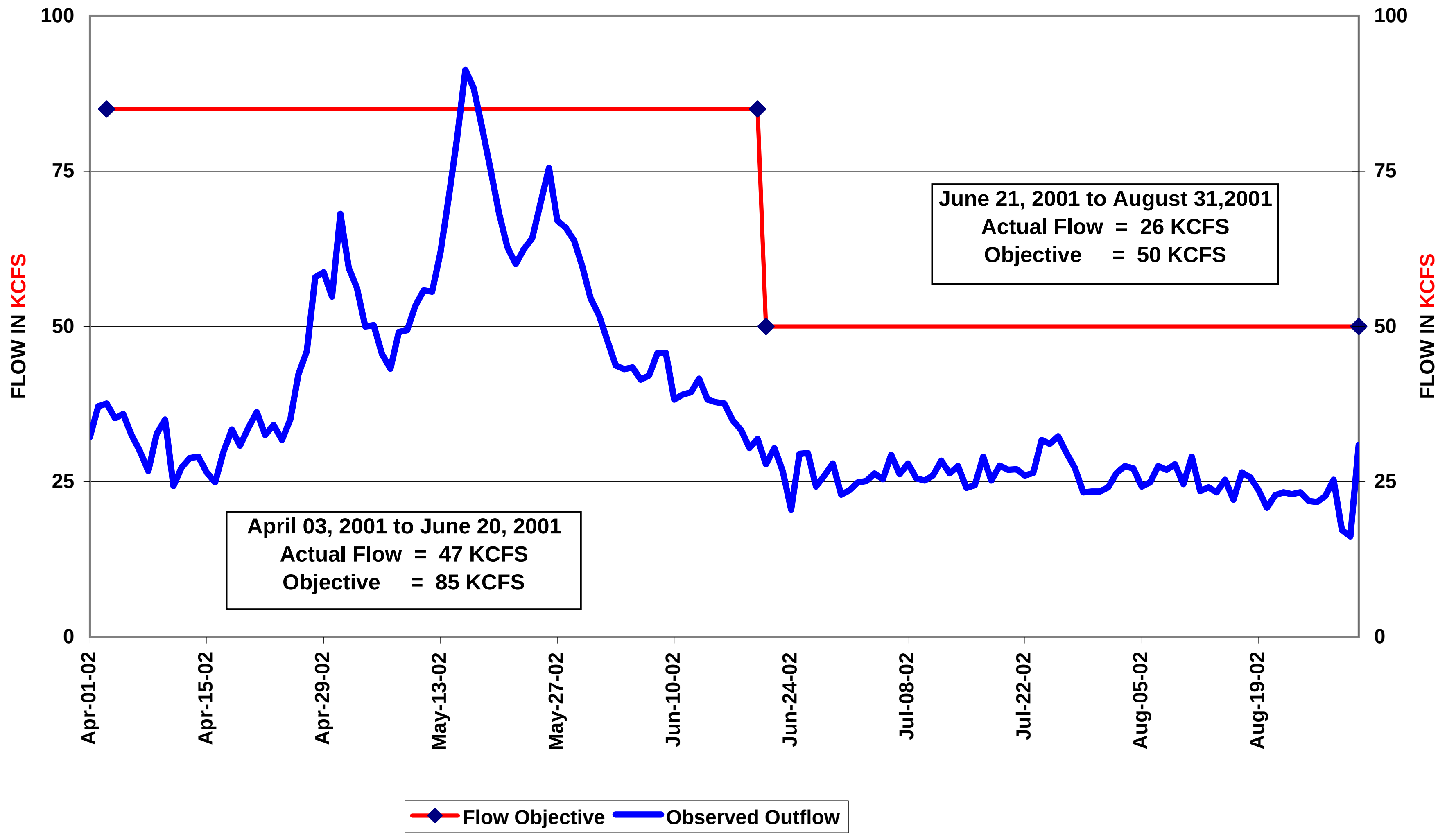
1. Welcome and introductions.
2. 2003 Comparison to Previous Years
   a. Temperature, Water and Runoff patterns - Cindy Henriksen, COE
      [Libby Reservoir_______2003] [Comparsion____] [Priest Rapids 2003_] [Priest Rapids_2002] [Priest Rapids__2001]
      [Hungry Horse Reservoir 2003] [Observed Runoff] [McNary_______2003] [McNary______2002] [McNary_______2001]
      [Dworshak Reservoir___2003] [______________] [Lower Granite 2003] [Lower Granite 2002] [Lower Granite 2001]
      [Grand Coulee Reservoir 2003]
   b. TDG, temperature level variations - Jim Adams, COE [2003 TMT WQ Year End Review - PPT]
   c. Fish Passage - Jerry McCann, Fish Passage Center [Early Draft - Smolt Migration 2003 - PPT]
   d. Beginning and End of Spill Relative to Fish Passage - Jerry McCann, FPC
   e. Weather - Kyle Martin, CRITFC [Summary of Water Year 2003 Weather] .
3. Snake River Review
   a. Spring Spill Trigger - Scott Bettin, BPA
   b. Fall Chinook Survival Studies - Ken Tiffan, USGS
   c. DWK Operations into September - Scott Bettin, BPA
      i. Idaho / Nez Perce Plan
4. 2003 Study Information That Might Impact 2004 Operations

a. Lower Granite RSW Results - COE [RSW for TMT] . [IHR TMT REV 03] .
b. NOAA Survival Study - Science Center
[Transported - Summer Chinook Smolts & Steelhead Smolts] . [Survival- PPt]
c. Ice Harbor Results - COE
d. Status Review Related to LAMBDA - Chris Toole, NOAA
[Natural-Spawning Population Trends Through 2001 Returns] .

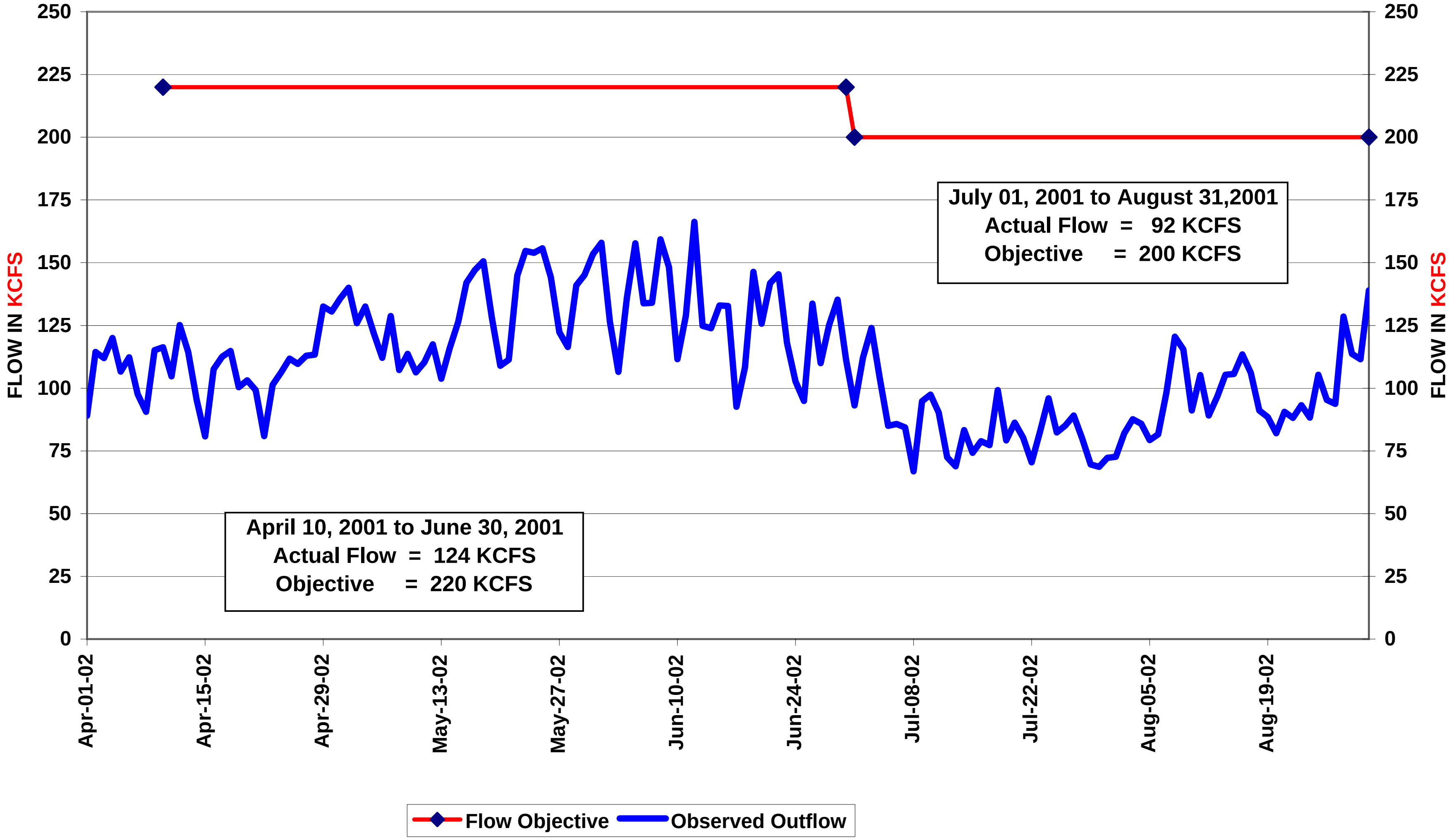
5. Other Lessons Learned
    a. Impacts of 2001 operations on adult returns
        i. Scale Analysis - Jeff Fryer, CRITFC
        ii. Pit Tag Returns to the Snake River, Russ Kiefer, IDFG [Snake River PIT-Tagged-Sp/Su Chinook - PPT]
        iii. Juveniles and Adults, Chris Perry, Univ. of Idaho
        iv. Mid-Columbia Stocks, TBA
        v. Information from Transport Data, NOAA
    b. Performance Standards: How are things measuring up? - Paul Wagner, NOAA [Survival Charts] . [Survival Tables] .
6. 2003 - 2004 Weather Forecast - Kyle Martin , CRITFC
[WINTER WEATHER 2003-2004 FORECAST] . [Winter 2003-2004 Climate Forecast - PPT]

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

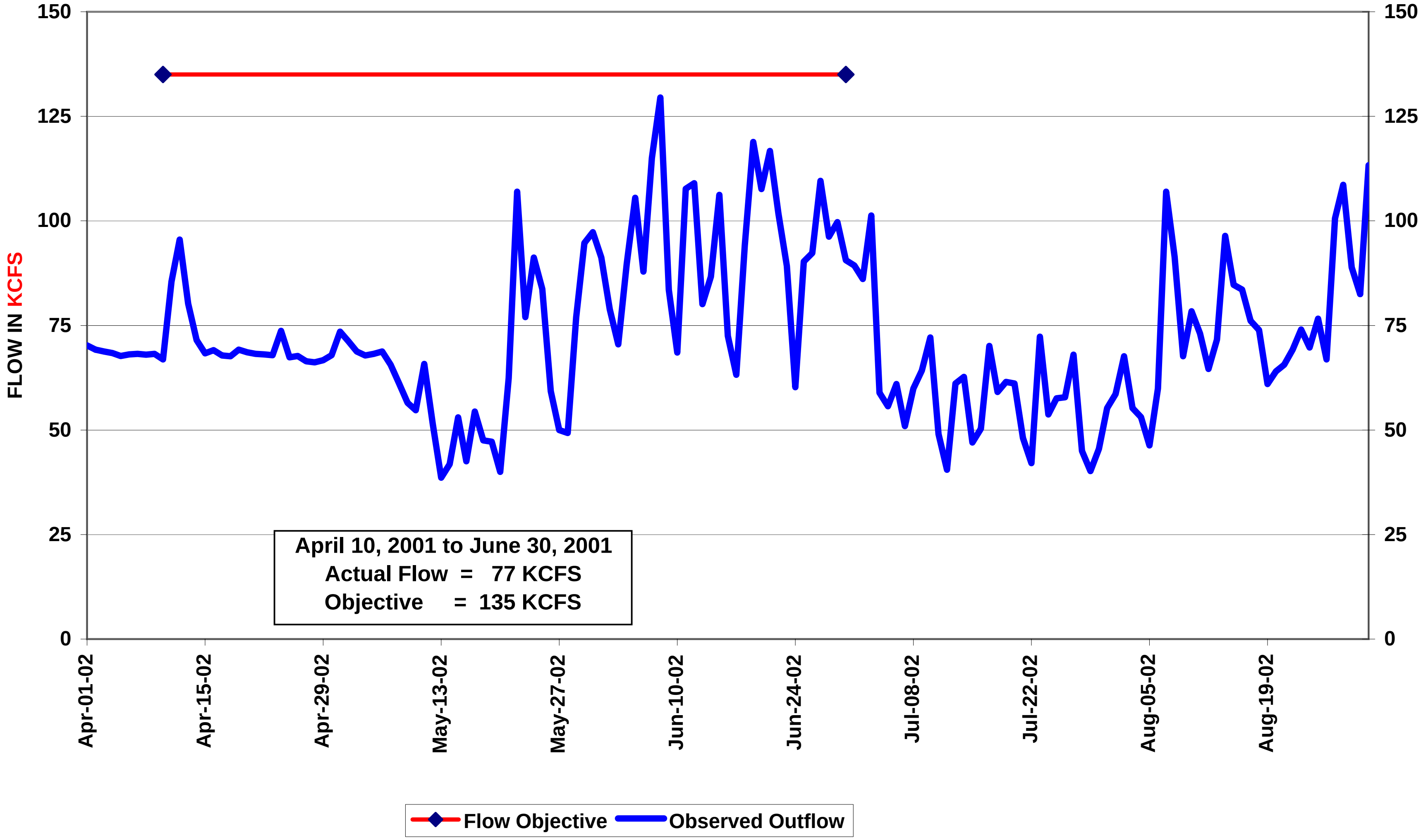
LOWER GRANITE 2001



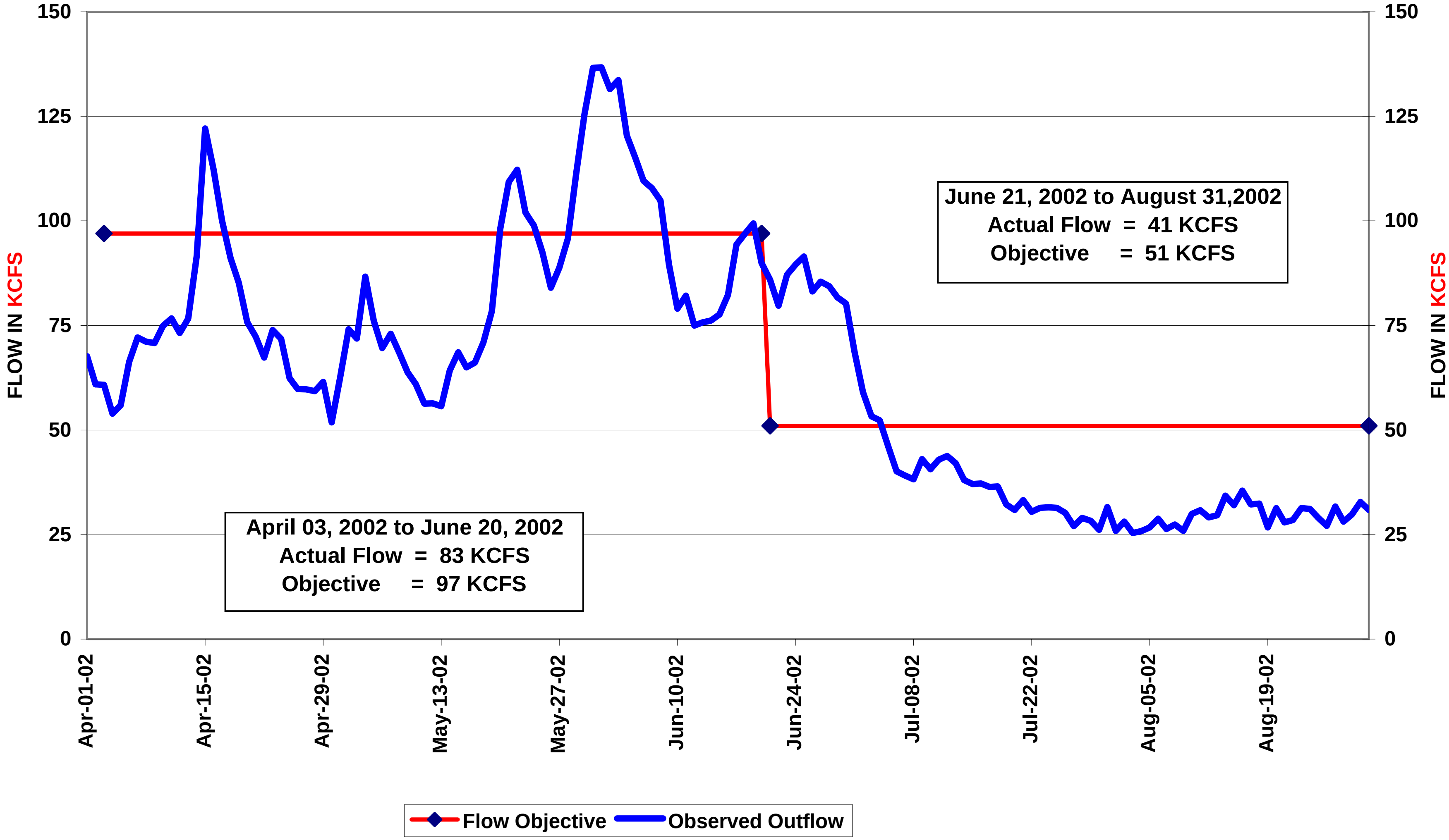
MCNARY 2001


FLOW IN KCFS
250
225
200
175
150
125
100
75
50
25
0
July 01, 2001 to August 31,2001
Actual Flow = 92 KCFS
Objective = 200 KCFS
April 10, 2001 to June 30, 2001
Actual Flow = 124 KCFS
Objective = 220 KCFS
Apr-01-02
Apr-15-02
Apr-29-02
May-13-02
May-27-02
Jun-10-02
Jun-24-02
Jul-08-02
Jul-22-02
Aug-05-02
Aug-19-02
Flow Objective
Observed Outflow

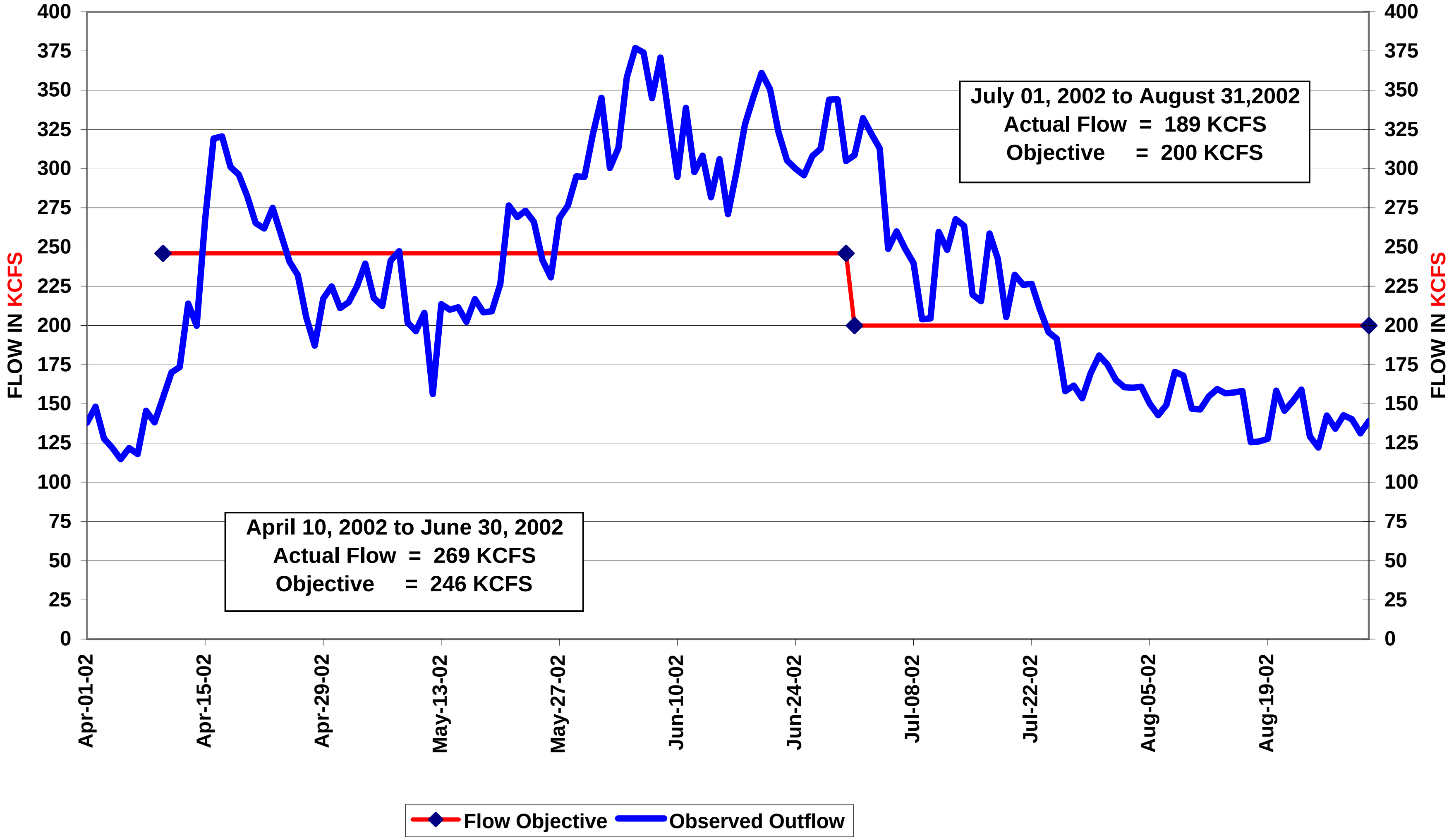
PRIEST RAPIDS 2001



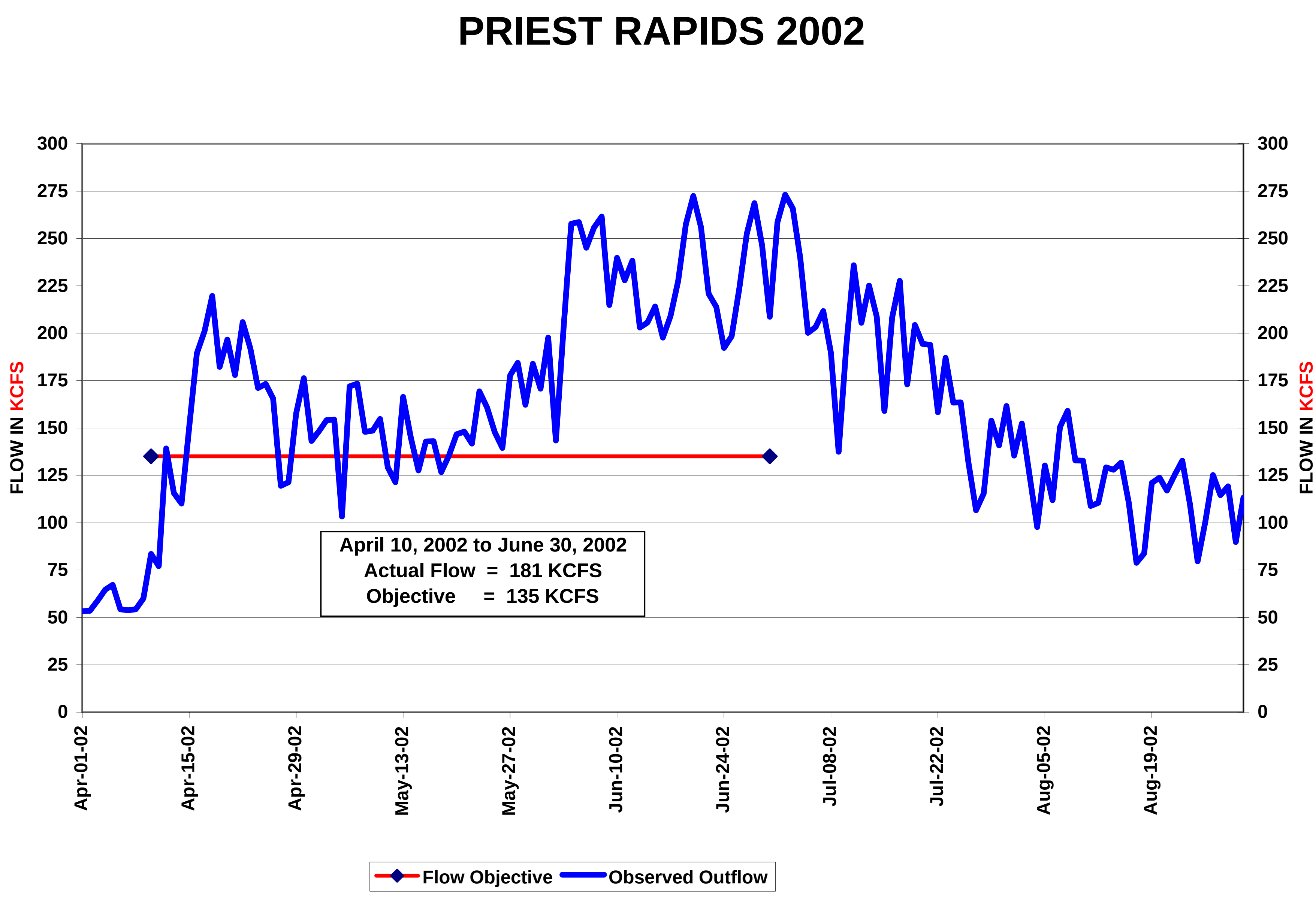
LOWER GRANITE 2002

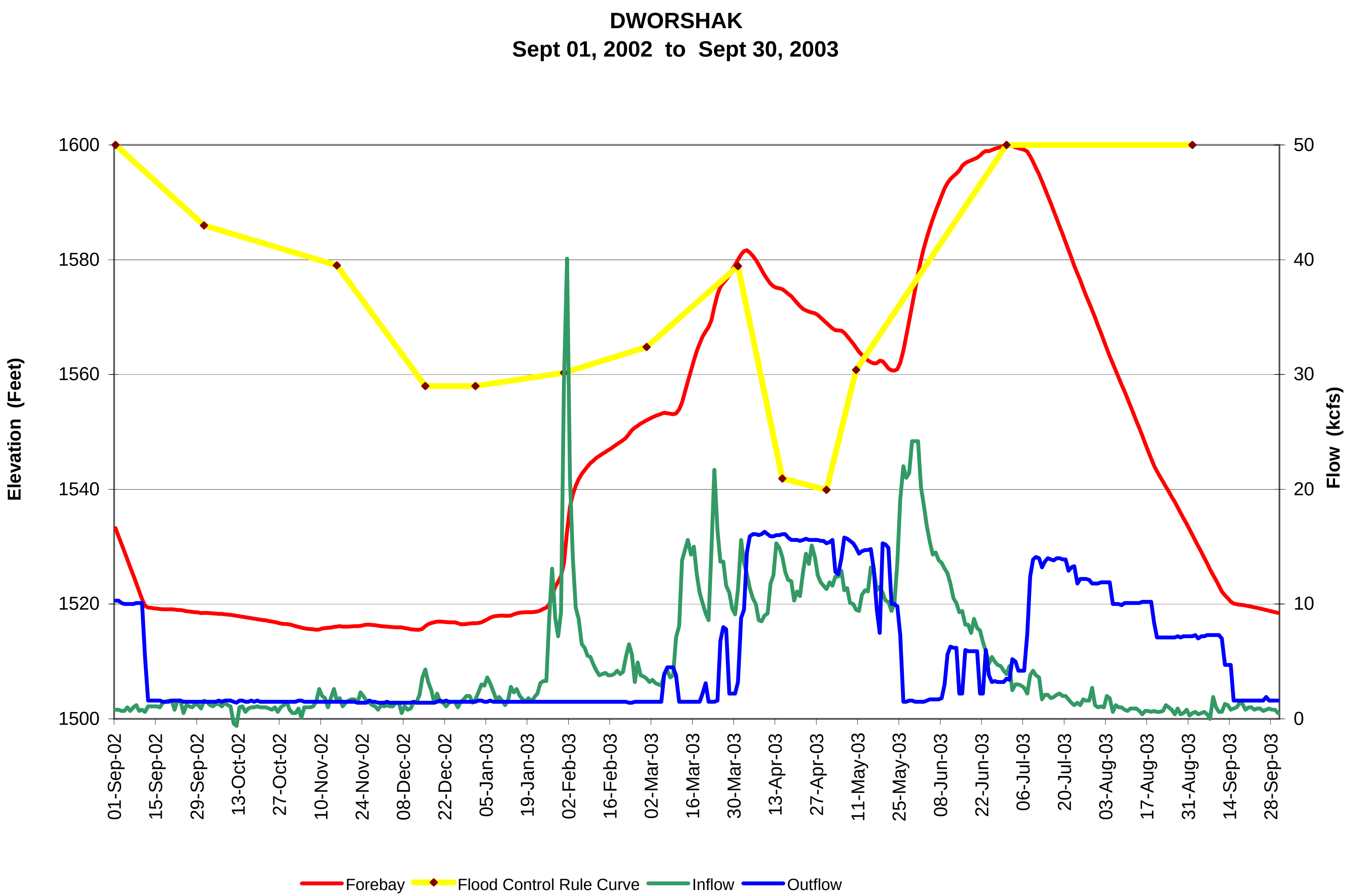


MCNARY 2002

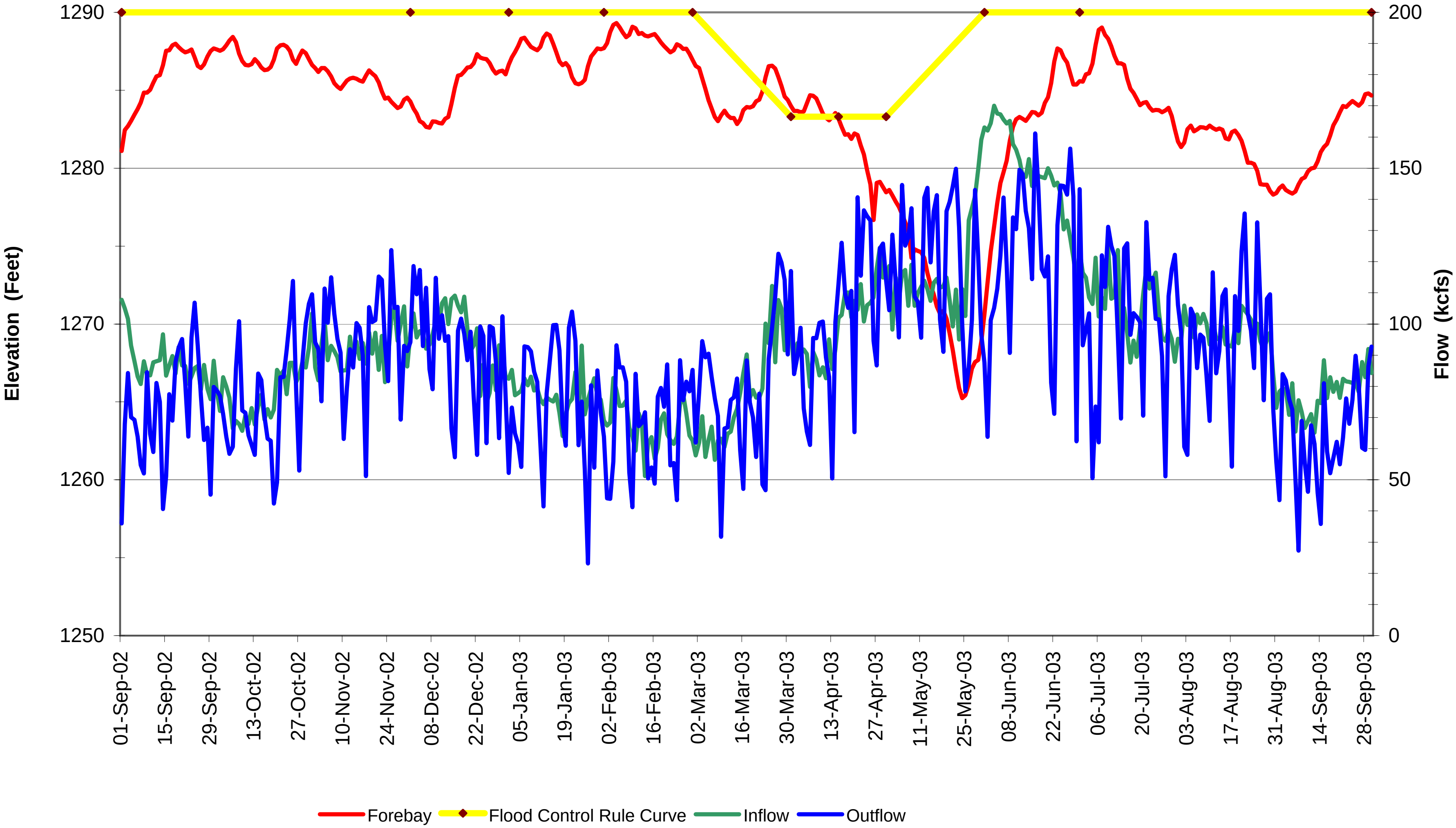


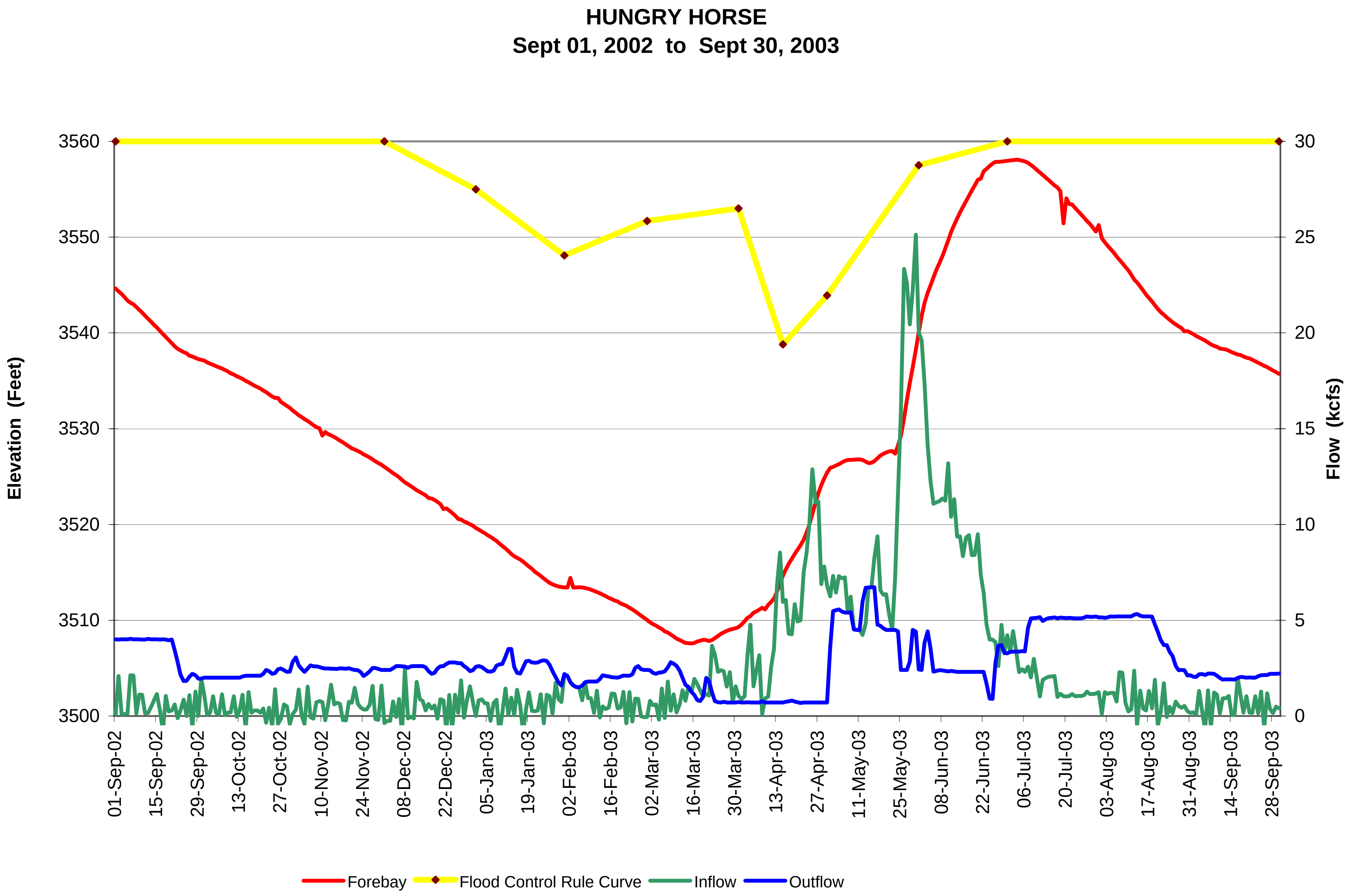
FLOW IN KCFS
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
Apr-01-02
Apr-15-02
Apr-29-02
May-13-02
May-27-02
Jun-10-02
Jun-24-02
Jul-08-02
Jul-22-02
Aug-05-02
Aug-19-02
July 01, 2002 to August 31,2002
Actual Flow = 189 KCFS
Objective = 200 KCFS
April 10, 2002 to June 30, 2002
Actual Flow = 269 KCFS
Objective = 246 KCFS
Flow Objective
Observed Outflow


PRIEST RAPIDS 2002
FLOW IN KCFS
300
275
250
225
200
175
150
125
100
75
50
25
0
Apr-01-02
Apr-15-02
Apr-29-02
May-13-02
May-27-02
Jun-10-02
Jun-24-02
Jul-08-02
Jul-22-02
Aug-05-02
Aug-19-02
April 10, 2002 to June 30, 2002
Actual Flow = 181 KCFS
Objective = 135 KCFS
Flow Objective
Observed Outflow

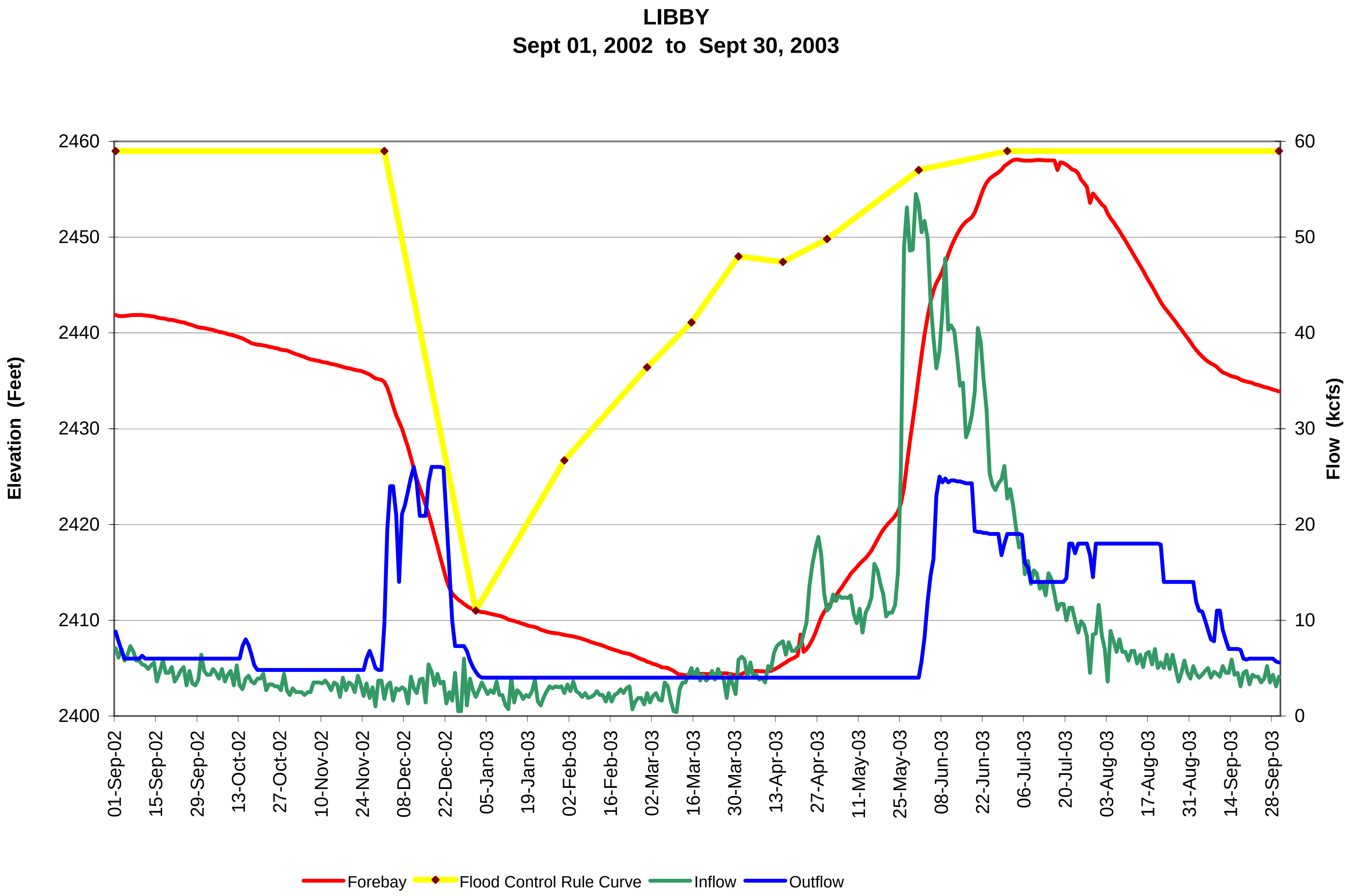

DWORSHAK
Sept 01, 2002 to Sept 30, 2003
Elevation (Feet)
Flow (kcfs)
1600
1580
1560
1540
1520
1500
50
40
30
20
10
0
01-Sep-02
15-Sep-02
29-Sep-02
13-Oct-02
27-Oct-02
10-Nov-02
24-Nov-02
08-Dec-02
22-Dec-02
05-Jan-03
19-Jan-03
02-Feb-03
16-Feb-03
02-Mar-03
16-Mar-03
30-Mar-03
13-Apr-03
27-Apr-03
11-May-03
25-May-03
08-Jun-03
22-Jun-03
06-Jul-03
20-Jul-03
03-Aug-03
17-Aug-03
31-Aug-03
14-Sep-03
28-Sep-03
Forebay
Flood Control Rule Curve
Inflow
Outflow

GRAND COULEE
Sept 01, 2002 to Sept 30, 2003



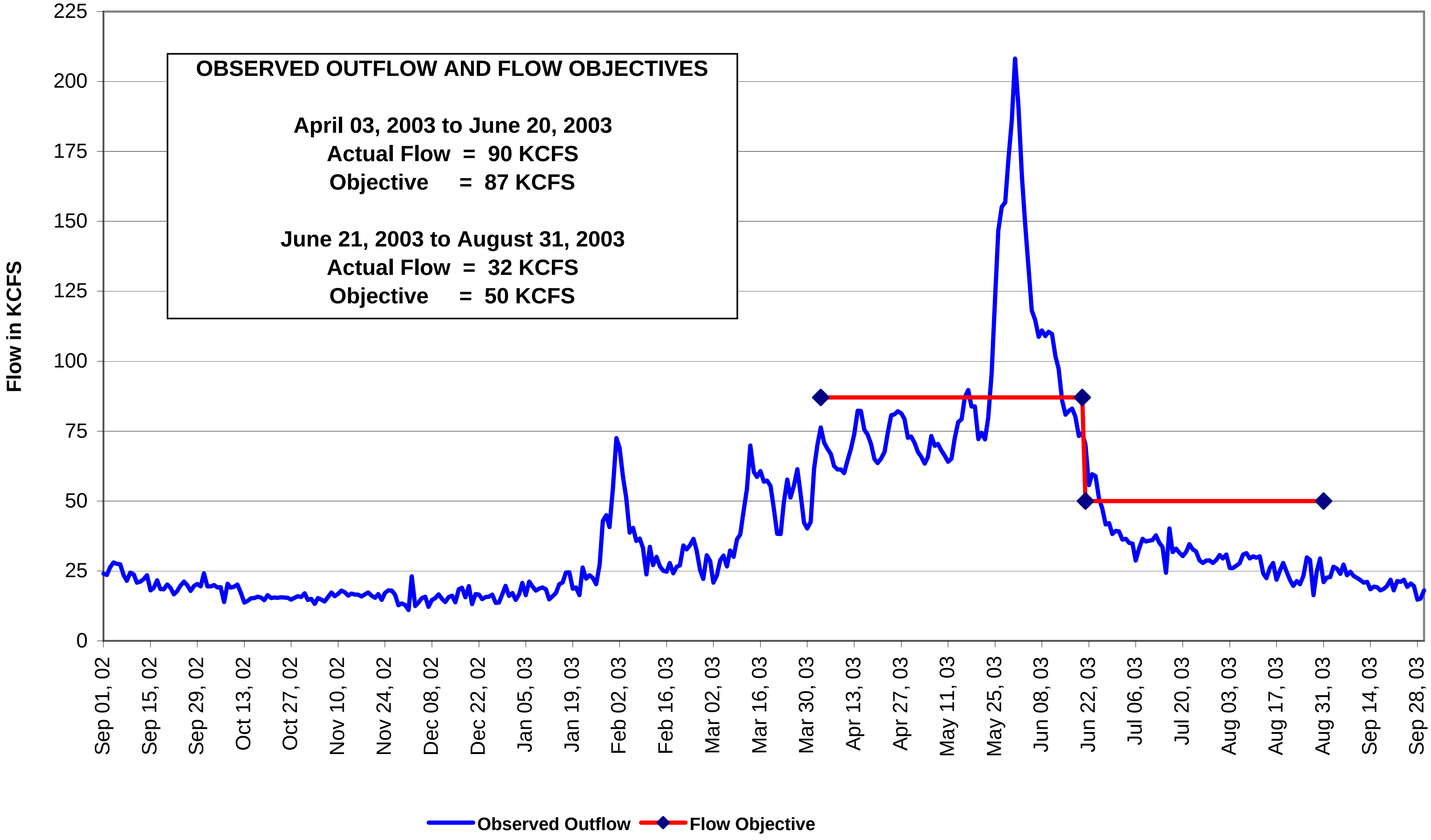


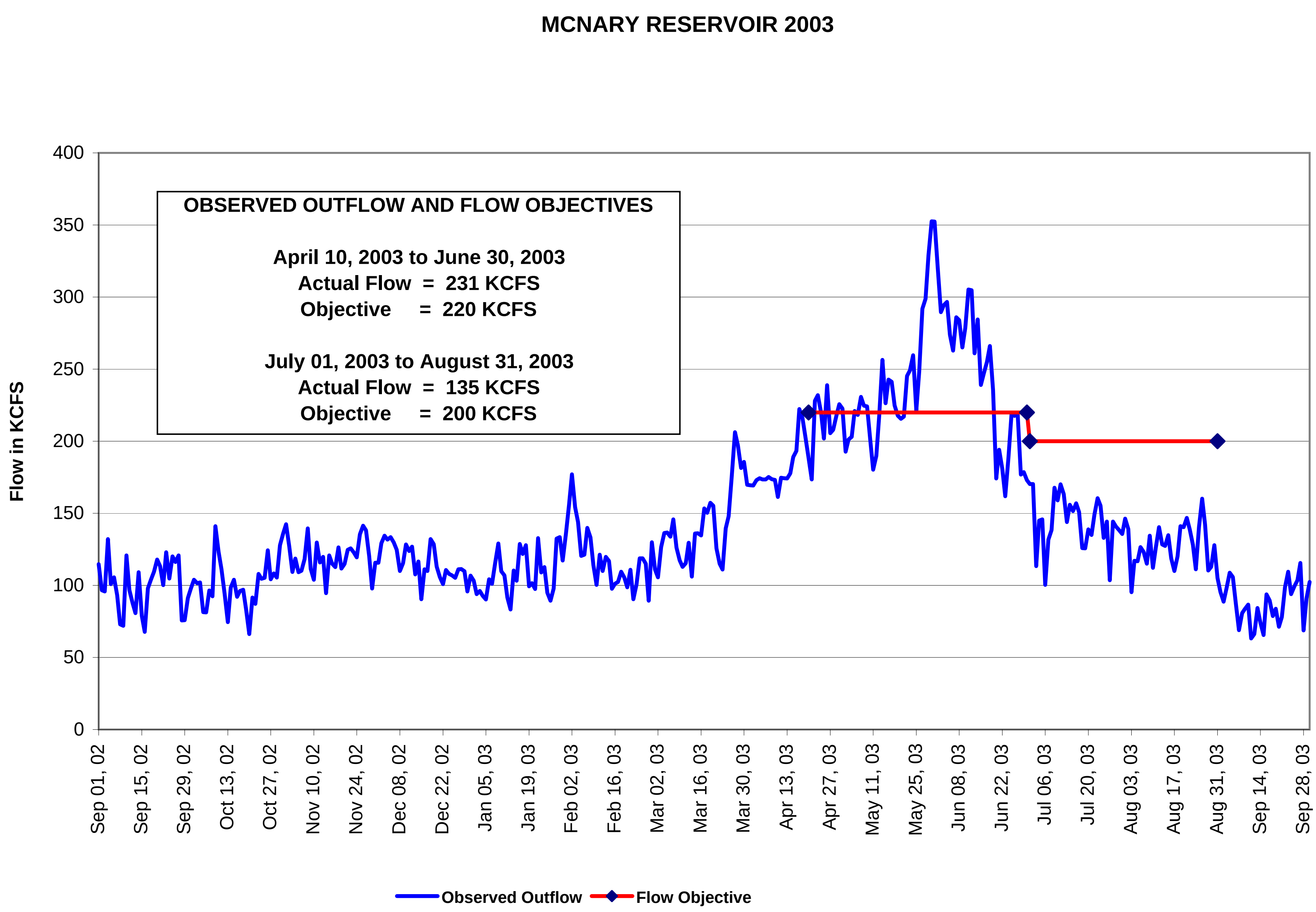
HUNGRY HORSE
Sept 01, 2002 to Sept 30, 2003
Elevation (Feet)
Flow (kcfs)
3560
3550
3540
3530
3520
3510
3500
30
25
20
15
10
5
0
01-Sep-02
15-Sep-02
29-Sep-02
13-Oct-02
27-Oct-02
10-Nov-02
24-Nov-02
08-Dec-02
22-Dec-02
05-Jan-03
19-Jan-03
02-Feb-03
16-Feb-03
02-Mar-03
16-Mar-03
30-Mar-03
13-Apr-03
27-Apr-03
11-May-03
25-May-03
08-Jun-03
22-Jun-03
06-Jul-03
20-Jul-03
03-Aug-03
17-Aug-03
31-Aug-03
14-Sep-03
28-Sep-03
Forebay
Flood Control Rule Curve
Inflow
Outflow



LIBBY
Sept 01, 2002 to Sept 30, 2003
Elevation (Feet)
Flow (kcfs)
2460
2450
2440
2430
2420
2410
2400
60
50
40
30
20
10
0
01-Sep-02
15-Sep-02
29-Sep-02
13-Oct-02
27-Oct-02
10-Nov-02
24-Nov-02
08-Dec-02
22-Dec-02
05-Jan-03
19-Jan-03
02-Feb-03
16-Feb-03
02-Mar-03
16-Mar-03
30-Mar-03
13-Apr-03
27-Apr-03
11-May-03
25-May-03
08-Jun-03
22-Jun-03
06-Jul-03
20-Jul-03
03-Aug-03
17-Aug-03
31-Aug-03
14-Sep-03
28-Sep-03
Forebay
Flood Control Rule Curve
Inflow
Outflow

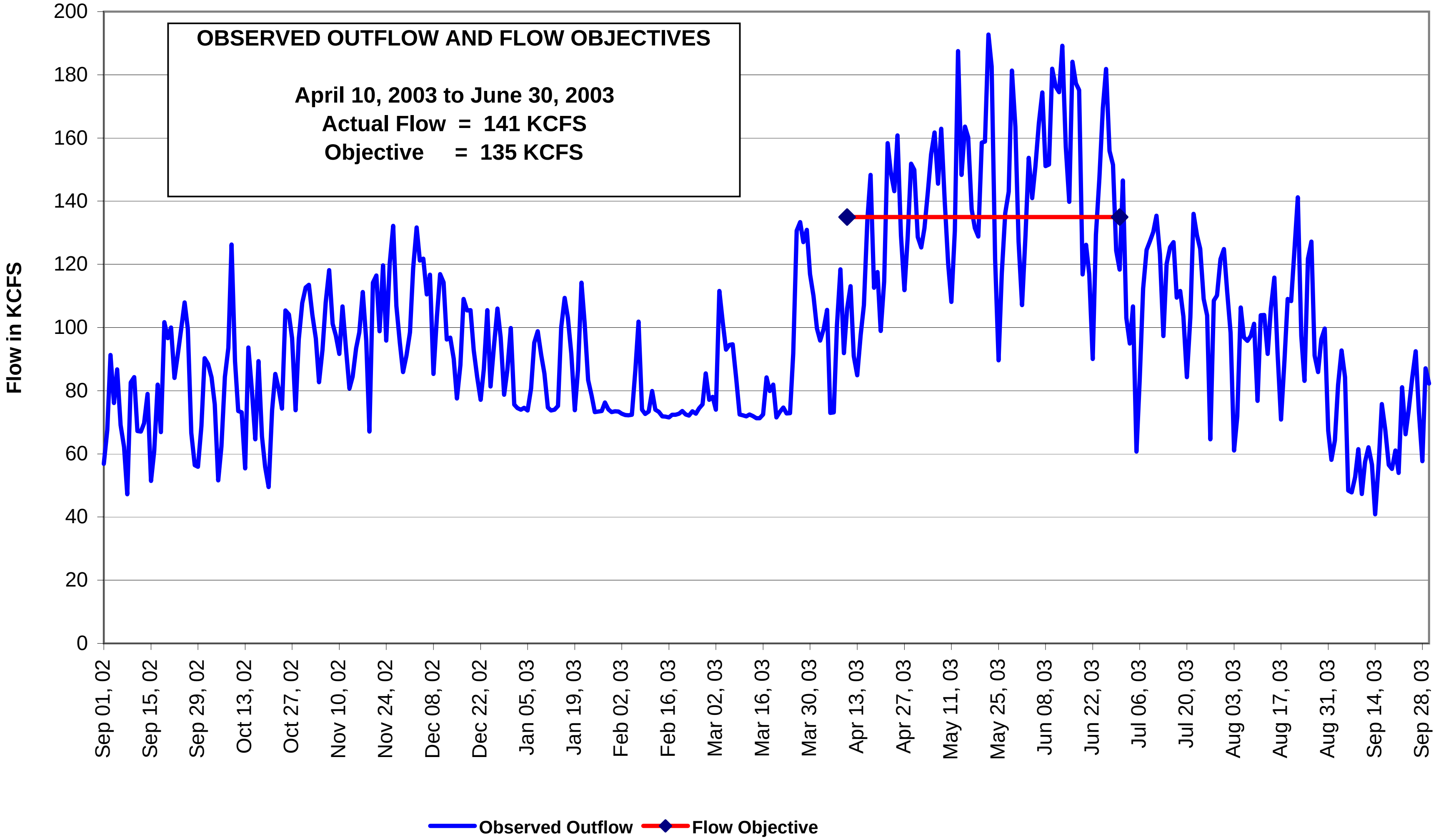
LOWER GRANITE RESERVOIR 2003





MCNARY RESERVOIR 2003
OBSERVED OUTFLOW AND FLOW OBJECTIVES
April 10, 2003 to June 30, 2003
Actual Flow = 231 KCFS
Objective = 220 KCFS
July 01, 2003 to August 31, 2003
Actual Flow = 135 KCFS
Objective = 200 KCFS
Flow in KCFS
400
350
300
250
200
150
100
50
0
Sep 01, 02
Sep 15, 02
Sep 29, 02
Oct 13, 02
Oct 27, 02
Nov 10, 02
Nov 24, 02
Dec 08, 02
Dec 22, 02
Jan 05, 03
Jan 19, 03
Feb 02, 03
Feb 16, 03
Mar 02, 03
Mar 16, 03
Mar 30, 03
Apr 13, 03
Apr 27, 03
May 11, 03
May 25, 03
Jun 08, 03
Jun 22, 03
Jul 06, 03
Jul 20, 03
Aug 03, 03
Aug 17, 03
Aug 31, 03
Sep 14, 03
Sep 28, 03
Observed Outflow
Flow Objective

PRIEST RAPIDS RESERVOIR 2003



Technical Management Team 2003 Year End Review

Water Quality

NUMBER OF EXCEEDENCES AT EACH GAGE DURING 2003 SPILL SEASON

Water Quality Gages	Quantity
Lower Granite Forebay	0
Lower Granite Tailwater	15
Little Goose Forebay	10
Little Goose Tailwater	6
Lower Monumental Forebay	19
Lower Monumental Tailwater	10
Ice Harbor Forebay	35
Ice Harbor Tailwater	4
McNary Forebay - Wa.	24
McNary Forebay - Or.	32
McNary Tailwater	12
John Day Forebay	10
John Day Tailwater	0
The Dalles Forebay	11
The Dalles Tailwater	4
Bonneville Forebay	17
Warrendale	1
Camas/Washougal	33
Chief Joseph Forebay	0
Chief Joseph Tailwater	0
Total Number of Exceedences	**243**

TYPES OF EXCEEDENCES FOR 2003 SPILL SEASON

QUANTITY	TYPE #	DEFINITION
106	6	Exceedence due to uncertainities when using best professional judgement to apply the spill guidance criteria (travel time; degassing; water temperature effects; spill patterns).
68	1	Exceedence due to high runoff flows and flood control efforts.
33	12	Exceedence due to sharp rise in water temperature (a 3 to 5 degree F. change in a day).
20	11	Exceedence due to high TDG levels coming from the Ice Harbor Dam.
18	7	Exceedence due to high TDG levels coming from the Priest Rapids Dam(see Pasco FMS readings).
7	9	Exceedence due to lack of information: the FMS gage was not working and we had no information.
9	10	Exceedence due to mechanical problems (gate was stuck open, passing debris etc.).
1	5	Exceedence due to a break down in communication. Teletype went out but no change occurred or Project operator interpreted teletype differently than what was intended.
0	2	Exceedence due to Intertie line outages.
0	3	Exceedence due to unit outages during repair or maintance.
0	4	Exceedence due to BPA is unable to handle load so they had to spill.
0	8	Exceedence due to a load rejection, the powerhouse was not working and the river was spilled.

Note: Table does not include Dworshak

APRIL EXCEEDENCES AT A GLANCE

	LGNW	LGS	LGSW	LMN	LMNW	IHR	IDSW	MCQW	MCQO	MCPW	JDA	TDA	TDDO	BON	WRNO	CWM
DATE	TYPE OF EXCEEDENCE															
4/12/2003	N/A	N/A	N/A	N/A	N/A	6	N/A									
4/13/2003	N/A	N/A	N/A	6	N/A	6	N/A									
4/17/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
4/19/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
4/20/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
4/21/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/22/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/23/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A
4/26/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	9
4/27/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	9
4/28/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	6	N/A	N/A	N/A	6	N/A	6
4/29/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6	N/A	6
4/30/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6

Note: Only days with exceedences are shown.

Blue = gradual melting of snow and gentle rise in river flows.
(All Month)

MAY EXCEEDENCES AT A GLANCE

	LGNW	LGS	LGSW	LMN	LMNW	IHR	IDSW	MCQW	MCQO	MCPW	JDA	TDA	TDDO	BON	WRNO	CWM
DATE	TYPE OF EXCEEDENCE															
5/1/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
5/2/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	7	7	N/A	N/A	N/A	N/A	6	N/A	6
5/3/2003	N/A	N/A	N/A	6	N/A	6	N/A	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/8/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/9/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/11/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
5/12/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/13/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	6
5/14/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A
5/15/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/20/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
5/21/2003	N/A	N/A	N/A	N/A	6	6	N/A	N/A	7	6	N/A	N/A	N/A	6	N/A	6
5/22/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	7	7	6	N/A	N/A	N/A	6	N/A	6
5/23/2003	N/A	N/A	N/A	6	N/A	6	N/A	7	7	N/A	6	6	N/A	N/A	N/A	6
5/24/2003	N/A	N/A	N/A	6	6	6	N/A	7	7	N/A	6	6	N/A	6	N/A	6
5/25/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	7	7	N/A	6	N/A	N/A	N/A	N/A	N/A
5/26/2003	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/27/2003	1	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	1	N/A	N/A
5/28/2003	1	1	N/A	1	1	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	1	N/A	1
5/29/2003	1	1	1	1	1	1	1	11	11	1	N/A	6	N/A	6	10	10
5/30/2003	1	1	1	1	1	1	1	N/A	11	1	N/A	N/A	N/A	6	N/A	6
5/31/2003	1	1	1	1	1	1	1	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	6

Blue = gradual melting of snow and gentle rise in river flows (Top).
Orange = Freshet has begun and river flows are high (Bottom).

JUNE EXCEEDENCES AT A GLANCE

	LGNW	LGS	LGSW	LMN	LMNW	IHR	IDSW	MCQW	MCQO	MCPW	JDA	TDA	TDDO	BON	WRNO	CWM
DATE	TYPE OF EXCEE DENCE	TYPE OF EXCE EDEN	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEE DENC	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEED ENCE	TYPE OF EXCE EDEN	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEE DENCE
6/1/2003	1	1	1	1	1	1	1	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	6
6/2/2003	1	1	1	1	1	1	N/A	11/12	11/12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/3/2003	1	1	1	1	1	1	N/A	11/12	11/12	N/A	1	1	N/A	1	N/A	1
6/4/2003	N/A	1	N/A	1	N/A	1	N/A	11/12	11/12	N/A	1	N/A	N/A	1	N/A	1
6/5/2003	N/A	1	N/A	1	N/A	1	N/A	11/12	11/12	N/A	6	6	N/A	6	N/A	6
6/6/2003	N/A	1	N/A	1	N/A	1	N/A	11/12	11/12	N/A	6	6	6	6	N/A	6
6/7/2003	N/A	N/A	N/A	6	N/A	6	N/A	11/12	11/12	N/A	6	6	6	6	N/A	6
6/8/2003	N/A	N/A	N/A	6	N/A	6	N/A	11/12	11/12	N/A	6	6	6	6	N/A	6
6/9/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	11/12	11/12	N/A	6	N/A	N/A	N/A	N/A	N/A
6/13/2003	N/A	N/A	N/A	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/15/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
6/16/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6
6/17/2003	N/A	N/A	N/A	6	N/A	6	N/A	7/10	7/11	N/A	N/A	6	6	6	N/A	6
6/18/2003	N/A	N/A	N/A	6	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/19/2003	N/A	N/A	N/A	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/28/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7/12	7/12	N/A	N/A	N/A	N/A	N/A	N/A	6
6/29/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7/12	7/12	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Orange = Freshet has begun and river flows are high (Top).
Yellow = Sunny climate and solar radiation is increasing water temperatures (Bottom).

JULY EXCEEDENCES AT A GLANCE

DATE	LGNW TYPE OF EXCEE DENCE	LGS TYPE OF EXCE EDEN	LGSW TYPE OF EXCEE DENCE	LMN TYPE OF EXCEED ENCE	LMNW TYPE OF EXCEED ENCE	IHR TYPE OF EXCEE DENC	IDSW TYPE OF EXCEE DENCE	MCQW TYPE OF EXCEED ENCE	MCQO TYPE OF EXCEED ENCE	MCPW TYPE OF EXCEED ENCE	JDA TYPE OF EXCE EDEN	TDA TYPE OF EXCEE DENCE	TDDO TYPE OF EXCEED ENCE	BON TYPE OF EXCEE DENCE	WRNO TYPE OF EXCEED ENCE	CWM TYPE OF EXCEE DENCE
7/5/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/6/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/7/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/11/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/15/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/19/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/20/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/21/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/22/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/23/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/29/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/30/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Yellow = Sunny climate and solar radiation is increasing water temperatures. (All Month)

AUGUST EXCEEDENCES AT A GLANCE

DATE	LGNW	LGS	LGSW	LMN	LMNW	IHR	IDSW	MCQW	MCQO	MCPW	JDA	TDA	TDDO	BON	WRNO	CWM
	TYPE OF EXCEE DENCE	TYPE OF EXCE EDEN	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEE DENC	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEED ENCE	TYPE OF EXCE EDEN	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEE DENCE	TYPE OF EXCEED ENCE	TYPE OF EXCEE DENCE
8/14/2003	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/15/2003	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/16/2003	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/17/2003	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/18/2003	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/19/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/20/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/21/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/22/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/25/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9
8/26/2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9

Gray = Sunny climate with low river flows making mechanical repairs possible. (All Month)

EXCEEDENCES AT DWORSHAK DAM DURING 2003 SPILL SEASON

DATE	# of Hours	TDG Levels (Percent)	Type of Exceedence	Cause
4/10/2003	3	110.1 to 110.4	1	Exceedence due to high runoff flows and flood control effort
4/15/2003	1	110.1	1	Exceedence due to high runoff flows and flood control effort
6/10/2003	2	110.4	8	The transmission people of BPA required a cutback on generation and for a 5 hour period the large unit was at reduced generation,and not operating at optimum levels which generated higher TDG.
6/24/2003	1	111.4	5	The schedule(teletype) called for 190 MW (2 small units almost fully loaded), however the project chose to run the big unit (300 MW) at a reduced capacity. This caused a spike in TDG due to an inefficient loading of the unit.
7/12/2003	1	111.7	3	The switchgear and transformer for the 5 KV equipment needed to be upgraded to meet code. This is a safety issue. In order to do the repair the selector gates are required to be set in undershot mode. An exceedence occurred while turning the units off
7/21/2003	3	110.4 to 111.3	3	After the switchgear and transformer for the 5 KV equipment repair, the selector gates needed to be set in overshot mode. An exceedence occurred while turning the units off to move selector gates.
TOTAL	**11**			

COMPARISON OF EXCEEDENCES WITH PREVIOUS YEARS

(TDG EXCEEDENCES OF HIGH 12 HR AVERAGE)

Year	Days In Spill Season	Number of Days Exceeded	Percent Exceeding TDG Standard (%)	Percent In Compliance With TDG Standard (%)
2003	2760	243	8.8	**91.2**
2002	2760	490	17.8	**82.2**
2001	2760	13	0.5	**99.5**
2000	2760	269	9.7	**90.3**
Before 2000	Exceedences were not tabulated.			
Note: Number of Spill Days are based on 20 gages X 138 days from April 15 - August 31.				

Year	Days In Spill Season	Number of Days Exceeded	Percent Exceeding TDG Standard (%)	Percent In Compliance With TDG Standard (%)
2003	2844	243	8.5	**91.5**
2002	2864	490	17.1	**82.9**
2001	2005	13	0.6	**99.4**
2000	2932	269	9.2	**90.8**
Before 2000	Exceedences were not tabulated.			
Note: Number of Spill Days are based on 20 gages X days between April 3 - August 31 when spill actually began.				

DWORSHAK GATE INFORMATION

Type of Discharge Outlet	Maximum Discharge Rate (kcfs)	Elevation Selector gates can be placed at		Elevation that units pulls water from	
		Undershot mode (ft)		Overshot mode (ft)	
		Elevation	Pulls water	Elevation	Pulls water
1	2.5	1435 only	in a 40 ft swath	1465 to 1610	in a 40 ft swath
2	2.5	1435 only	in a 40 ft swath	1465 to 1610	in a 40 ft swath
3	5.9	1435 only	in a 60 ft swath	1465 to 1610	in a 60 ft swath
RO	7.7	1350	in a 40 ft swath	N/A	in a 40 ft swath
RO	7.7	1350	in a 40 ft swath	N/A	in a 40 ft swath
RO	7.7	1350	in a 40 ft swath	N/A	in a 40 ft swath
Spillway	181	1545 ft only		1545 ft only	

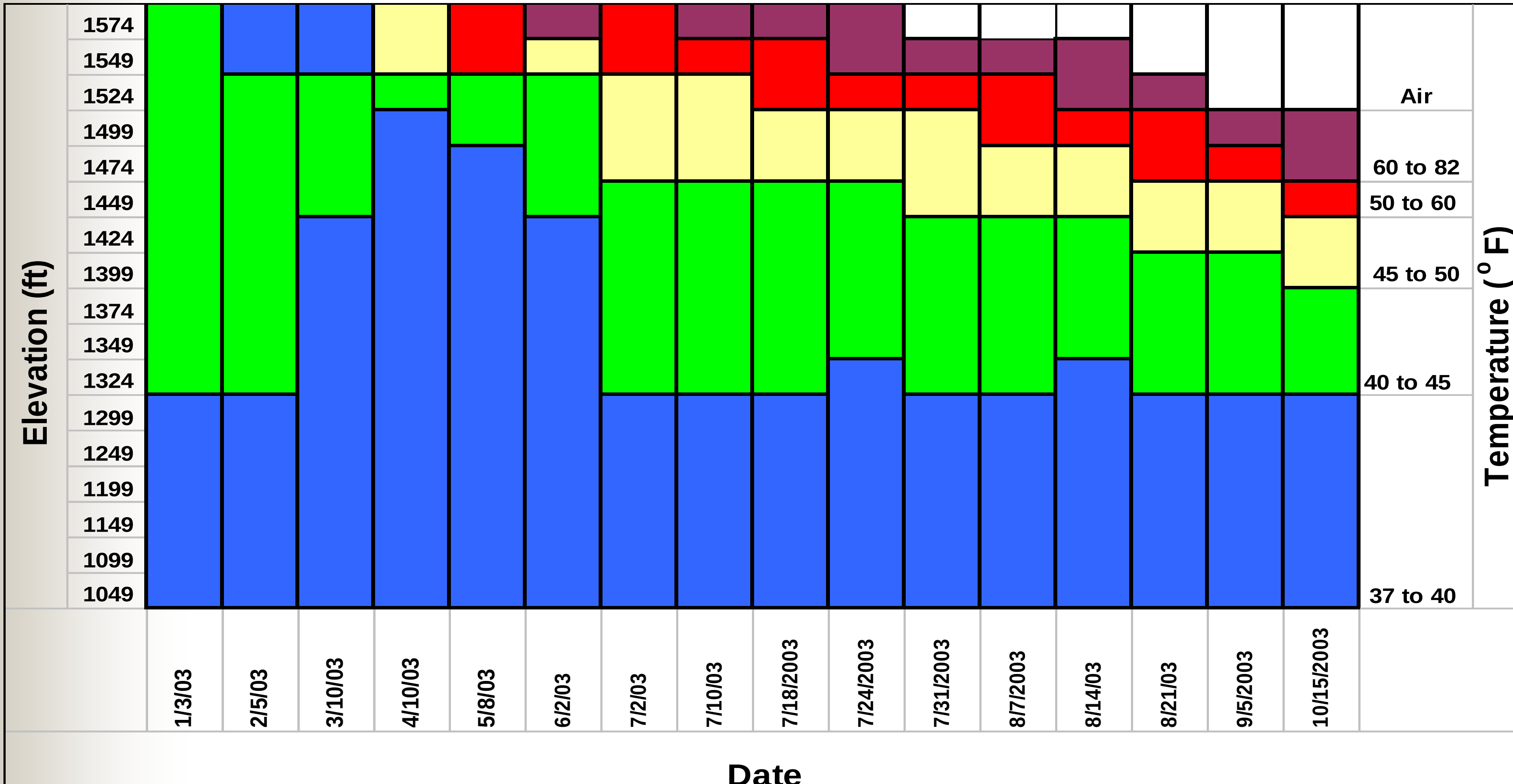
DWORSHAK OUTFLOW

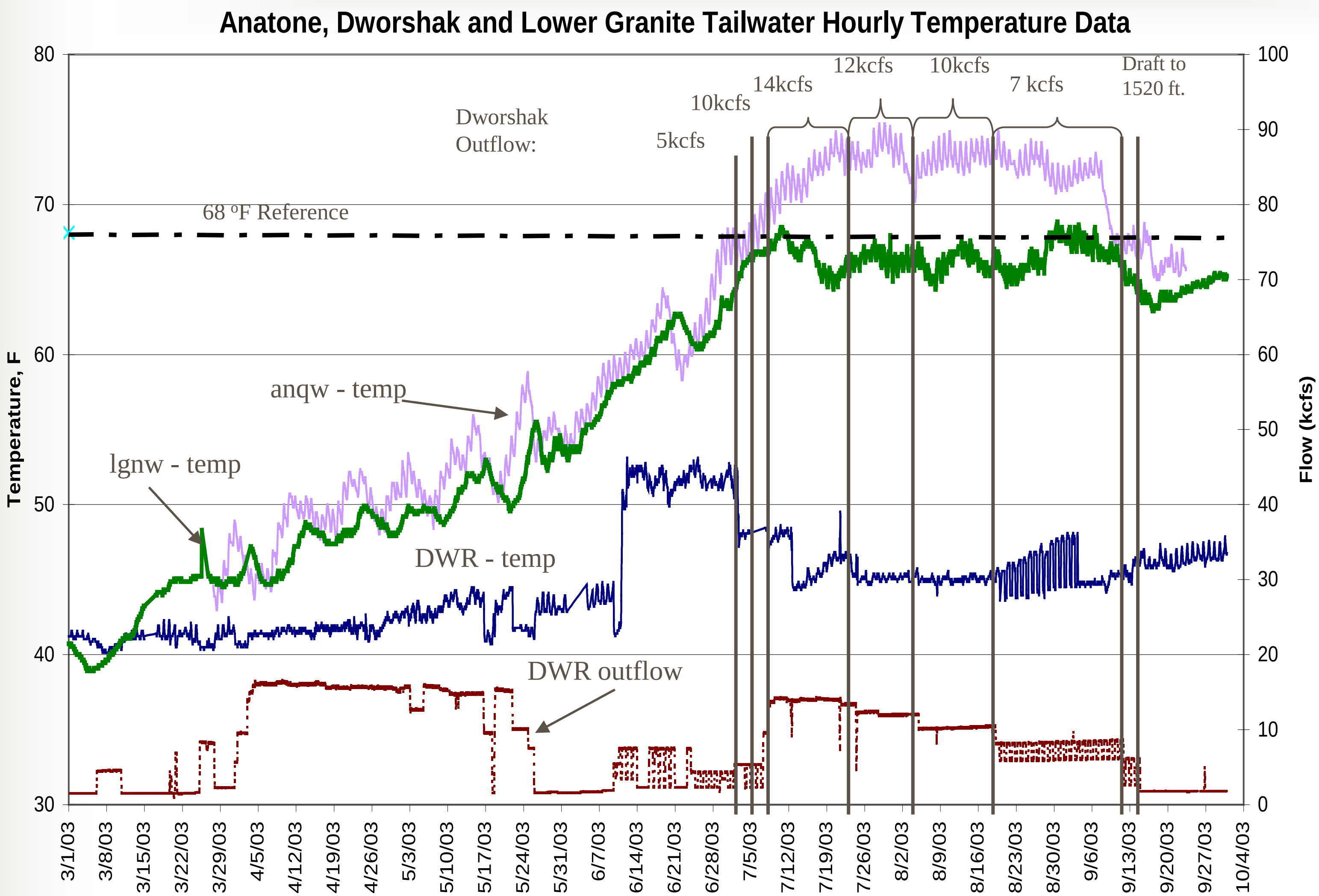
Dates	Outflows Range (KCFS)	Ave. Outflows (KCFS)
July 3 - July 6	5.3 - 2.2	4.6
7-Jul	9.6 - 9.4	9.5
July 8 - July 23	14.0 - 12.7	13.6
July 24 - Aug 4	12.2 - 11.2	12.0
Aug 5 - Aug 18	10.2 - 9.8	10.1
Aug 19 - Sept 11	8.4 - 5.6	7.2
Sept 12 - Sept 14	6.1 - 2.1	4.7

DWORSHAK OUTFLOW TEMPERATURES

Dates	Temperature Range (F)	Ave. Temp. (F)
June 13 - July 1	52.2 - 51.0	51.6
July 2 - July 11	48.9 - 47.6	48.3
July 11 - July 21	46.5 - 45.2	45.8
July 21 - Sept 12	45.9 - 44.5	45.2

DWORSHAK TEMPERATURE PROFILES




Anatone, Dworshak and Lower Granite Tailwater Hourly Temperature Data
Temperature, F
Flow (kcfs)
68 ºF Reference
Dworshak Outflow:
5kcfs
10kcfs
14kcfs
12kcfs
10kcfs
7 kcfs
Draft to 1520 ft.
anqw - temp
lgnw - temp
DWR - temp
DWR outflow
80
70
60
50
40
30
100
90
80
70
60
50
40
30
20
10
0
3/1/03
3/8/03
3/15/03
3/22/03
3/29/03
4/5/03
4/12/03
4/19/03
4/26/03
5/3/03
5/10/03
5/17/03
5/24/03
5/31/03
6/7/03
6/14/03
6/21/03
6/28/03
7/5/03
7/12/03
7/19/03
7/26/03
8/2/03
8/9/03
8/16/03
8/23/03
8/30/03
9/6/03
9/13/03
9/20/03
9/27/03
10/4/03

OBSERVED 2001, 2002 AND 2003 VOLUME RUNOFF

	Jan-Jul 01		Jan-Jul 02		Jan-Jul 03		Apr-Aug 01		Apr-Aug 02		Apr-Aug 03	
Project	Observed	%	Observed	%	Observed	%	Observed	%	Observed	%	Observed	%
Hungry Horse	1.30	57	2.30	103	1.82	82	1.27	60	2.21	107	1.66	80
Libby	3.34	52	7.175	114	5.187	82	3.174	50	7.097	114	5.084	81
Albeni Falls	7.74	50	15.92	104	11.977	78	7.012	51	14.68	110	10.053	75
GrandCoulee	37.39	59	68.02	108	54.179	86	37.422	61	65.32	108	50.243	83
Dworshak	1.82	51	4.35	123	3.564	100	1.542	55	3.87	141	2.35	86
LowerGranite	14.38	48	23.99	80	23.809	79	11.064	48	19.99	87	17.648	77
The Dalles	58.19	55	103.75	97	87.688	82	52.790	57	93.8	101	73.767	79

COMPARISON OF WY 01, 02 AND 03 ACTUAL FLOWS AND OBJECTIVES

MCNARY ACTUAL AVG OUTFLOW AND FLOW OBJECTIVES

April 10 to June 30	2001	2002	2003
Actual Avg Flow	124 KCFS	269 KCFS	231 KCFS
Objective	220 KCFS	246 KCFS	220 KCFS

July 01 to Aug 31			
Actual Avg Flow	92 KCFS	189 KCFS	135 KCFS
Objective	200 KCFS	200 KCFS	200 KCFS

LOWER GRANITE ACTUAL AVG OUTFLOW AND FLOW OBJECTIVES

April 03 to June 20			
Actual Avg Flow	47.5 KCFS	83 KCFS	90 KCFS
Objective	85 KCFS	97 KCFS	87 KCFS

June 21 to August 31			
Actual Avg Flow	26 KCFS	41 KCFS	32 KCFS
Objective	50 KCFS	51 KCFS	50 KCFS

PRIEST RAPIDS ACTUAL AVG OUTFLOW AND FLOW OBJECTIVES

April 10 to June 30			
Actual Avg Flow	77 KCFS	181 KCFS	141 KCFS
Objective	135 KCFS	135 KCFS	135 KCFS

Preliminary
Estimates of Updated "Indicator Metrics" Applied in the 2000 FCRPS Biological Opinion[1]

September 29, 2003

The information in this report is preliminary and subject to change. It is being shared in this preliminary form to ensure that all interested parties have access to the data and analyses that NOAA Fisheries is currently reviewing.

INTRODUCTION

The 2000 Federal Columbia River Power System (FCRPS) Biological Opinion (FCRPS Biop) evaluated whether the operation of the FCRPS, when combined with survival rates expected to occur in all other life stages, would result in a "high likelihood of survival and a moderate-to-high likelihood of recovery." This qualitative determination was informed by quantitative estimates for several evolutionarily significant units (ESU). Specifically, NOAA Fisheries evaluated:

> whether or not there would be a 5% or lower probability of absolute extinction of natural spawners within 24- and 100-year periods as a "metric indicative of survival;"
>
> whether or not there would be at least a 50% probability of the 8-year geometric mean natural spawners being equal to, or greater than, interim recovery abundance levels in 48 and 100 years as a primary "metric indicative of recovery;"
>
> and whether or not there would be at least a 50% likelihood of the annual population growth rate ("lambda") being equal to, or greater than, 1.0 as an alternate "metric indicative of recovery" for populations lacking interim recovery abundance goals.

As NOAA Fisheries begins the remand of the 2000 FCRPS Biop, it is necessary to update the biological information, including the indicator metrics. Recently, NOAA Fisheries' West Coast Salmon Biological Review Team (BRT) released a draft review of the status of listed ESUs in the Columbia River basin (BRT 2003). This report uses the information assembled by the BRT, along with supplemental analyses, and converts it to "indicator metrics" to provide a preliminary look at how these have changed in response to recent returns since the 2000 FCRPS Biop was issued. Additionally, a supplemental analysis that looks at the sensitivity of choice of time period for "lambda" estimation was included at the request of Federal fisheries managers.

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The information in this report was presented in preliminary form to Federal Caucus members on July 23, 2003, and was presented to the Columbia Basin Fish and Wildlife Authority (CBFWA) Anadromous Fish Managers on July 30, 2003.

This exercise of updating the 2000 FCRPS Biop's "indicator metrics" should not be taken as a commitment on NOAA Fisheries' part to employ identical methodology in the new biological opinion. We will be reviewing some of these methods through a process that was specified in the 2000 FCRPS Biop. We will also be reviewing the methods in light of the recent ruling on biological opinion remand.

METHODS

Data Sets NOAA Fisheries' BRT reviewed available data for salmon and steelhead spawning aggregations for the draft status review (BRT 2003). The draft report, including all data sets used to generate it, was released to state and tribal co-managers for review in February 2003. Based on comments received during the review, the data sets were updated and posted on the internet at www.nwfsc.noaa.gov/trt/brtrpt.htm . This report relies upon the updated BRT data sets.

Original data sources for the BRT data sets were generally state fisheries agencies, although other data sources include tribes, the US Fish and Wildlife Service, and dam operators. Data are reported in units of **Fish** (either direct counts at dams or weirs, or redd count expansions that were considered reliable by the BRT), **Redd Counts** (RC), or **Redds Per Mile** (RPM). Redd counts were reported for data sets in which redds were counted in the same stream reaches each year, or for which adjustments considered reliable by the BRT were made when index areas or methods changed. Redds per mile were reported when the stream reach varied such that total redds were not comparable on a year-to-year basis. Redds per mile serves as a relative index of spawners, based on the assumption that density of spawners in the index areas sampled each year correlates with total abundance of spawners. Descriptions of the sources for each data set and details of are found in the last worksheet of the data spreadsheet for Interior ESUs and in a documentation file in the Willamette/Lower Columbia ESU zipped file packet, each of which is at www.nwfsc.noaa.gov/trt/brtrpt.htm .

Population Structure In response to requests from Federal managers to place the data sets into context with respect to ESU population structure, we relied upon two recent reports. The Interior Columbia Basin Technical Recovery Team (Interior TRT) released a report in July 2003 proposing demographically independent populations for Snake River (SR) spring/summer chinook salmon, SR fall chinook salmon, SR steelhead, SR sockeye salmon, Upper Columbia River (UCR) spring chinook, UCR steelhead, and Mid-Columbia River (MCR) steelhead (Interior TRT 2003). Members of the Lower Columbia/Willamette TRT issued a similar report proposing population structure for Lower Columbia River (LCR) chinook, LCR steelhead, Upper Willamette River (UWR) chinook, UWR steelhead, and Columbia River chum salmon (Myers et al. 2003). Information from these reports was used to organize data sets by population and ESU.

Additionally, we attempted to identify each data set in relation to Northwest Power and Conservation Council (Council) subbasins, since there was considerable interest in this information from people involved in the Council's subbasin planning process.

Analyses To Estimate 2000 FCRPS Biop Indicator Metrics We estimated the median population growth rate (lambda) and three indicator metrics that are derived from population growth rate, according to methods used in the 2000 FCRPS Biop and some more recent improvements.

1. Median Population Growth Rate (Lambda). We estimated lambda following "Dennis/Holmes" methodology (Holmes 2001). Briefly, an exponential trend is fit to a time series of four-year running sums of natural spawners, redd counts, or redds per mile. Lambda less than 1.0 means a population is declining, while lambda greater than 1.0 means that it is increasing. Variance is estimated using diffusion approximation methods. The "Dennis/Holmes" method has been developed for data sets with high sampling error and age-structured cycles, both of which are common to Pacific Northwest salmonid data sets. The methods have been extensively tested using simulations for both threatened and endangered populations as well as for stocks believed to be at low risk (Holmes *in press*). The method has also been cross-validated with time series data (Holmes and Fagan 2002).

The population growth rate analysis in this report is similar to those recently completed by McClure et al. (2003) and BRT (2003). The actual calculations were performed using a model developed by Eli Holmes (McClure 2003) and with the SimSalmon model (McElhany and Payne 2001), which implements the "Dennis/Holmes" methodology, among other features. We cross-tested to ensure that both methods produced identical results. This was the case for most data sets, but for a few there were relatively minor differences in estimated lambda, which at this point cannot be explained.

The primary differences between the lambda estimates in this report and those in McClure et al. (2003) and BRT (2003) are related to the time period of the data sets and our assumptions regarding historical effectiveness of hatchery-origin natural spawners (hereafter, "hatchery effectiveness"). Regarding time period, we used data sets that include 1-2 more recent years than the time series in each of the previous analyses. The updated BRT data that we used generally ended in 2001. Also, unlike BRT (2003), we were primarily interested in estimating lambda from the 1980-present time series, since this was the period deemed relevant in the 2000 FCRPS Biop. Unlike both of the previous reports, which considered "hatchery effectiveness" assumptions of 0 and 1.0, we considered 0.2 and 0.8, based on an assessment of best available information in the 2000 FCRPS Biop (Waples 1999).

An important practice applied in our lambda calculations was estimation of missing data using an average of the previous and subsequent values. In a large percentage of the data sets there are one or more missing years of counts or of estimated hatchery fraction. In the 2000 Biop, McClure et al. (2003), and BRT (2003), data averaging was used to allow estimates from as many locations as possible. We excluded any data sets with more than two adjacent missing values. Many data sets had no information on hatchery fraction and, because we were interested in natural population growth rate, these data sets were eliminated from consideration.

Because there has been much interest by salmon managers in sensitivity of population growth rate to alternative time periods, we investigated alternatives in two ways. First, for two data sets, Marsh Creek spring/summer chinook salmon and Wenatchee River spring chinook, we estimated lambda for every possible time period ending with 2001 and plotted the results. Second, because the BRT (2003) report also pointed out the relevance of 1990-present and the longest time period possible, we included a summary of lambda estimates based on those time periods. Again, these estimates differ from the lambda estimates in BRT (2003) because of the "hatchery effectiveness" assumptions and because of the additional year in our data sets.

2. Survival Change Necessary To Reduce Extinction Risk To 5% Or Less Estimation of extinction risk with the "Dennis/Holmes" method is described in Holmes (2001). Briefly, extinction risk is related to three variables: the current population size, the estimated population trend, and the variance of the trend. Using this information, it is possible to estimate the likelihood that a population will cross a certain abundance threshold within a certain period of time. The extinction threshold defined in the 2000 FCRPS Biop is a running sum of 1 fish or less, the time periods of interest were 24 and 100 years, and the acceptable risk of extinction for jeopardy analyses was defined as 5% or less. Because the risk of extinction in 100 years is always greater than the risk in 24 years, we have focused on the 100-year extinction risk (as was the case in the 2000 FCRPS Biop). However, estimates for both time periods will be presented in subsequent reports and in the new biological opinion.

Extinction risk could only be estimated for a small percentage of the available data sets. One reason is because the data must be in units of fish, rather than redd counts or redds per mile, which eliminates a large number of data sets. Second, it can only be calculated for data sets with valid lambda estimates. As described above, this also eliminates many data sets with no information on hatchery fraction.

Analyses provided by McClure (2003) and those implemented with the SimSalmon model estimate the percentage change in lambda that would be necessary to reduce extinction risk in 100 years to 5% or less. As described in Appendix A of the 2000 FCRPS Biop, we then converted these needed changes in lambda to needed changes in survival by raising the lambda multiplier to the power of the mean generation time for the spawning aggregation in question. Mean generation time was estimated from weighted age structure in the data sets.

3. Survival Change Necessary For 50% Likelihood of Reaching Recovery Abundance Goal In 48 or 100 Years. The method of estimating the recovery metric is described in Appendix A of the 2000 FCRPS Biop. Briefly, the population growth rate needed to meet the interim recovery goal in a certain time period is the current recovery abundance level divided by the current abundance level, with the result raised to the power of 1 divided by the number of years remaining in the time period. Because lambda is a median value, this is the population growth rate which, if implemented instantaneously, would result in 50% likelihood that the population would reach the recovery goal in the defined time period. A key assumption of this calculation is that density-dependence does not occur as the population is growing towards the recovery level (see discussion in 2000 FCRPS Biop). Both the current and recovery abundance levels are defined as 8-year geometric means. To determine the survival change necessary to meet the goal, the needed lambda is divided by the current lambda, and the result is raised to the power of the mean generation time for the spawning aggregation in question.

Interim recovery abundance goals have not been defined for Lower Columbia and Willamette River ESUs. Interim recovery abundance goals for Interior ESUs are described in Lohn (2002). Because relatively few interim recovery goals have been identified, the goals often are at a higher hierarchical level than the available data sets, and because the goals only apply to data sets that represent fish counts, the ability to estimate this indicator metric was limited.

4. Survival Change Necessary For 50% Or Greater Likelihood That Lambda Is Equal Or Greater Than 1.0 This metric was used as a "fall-back" recovery indicator metric, when it was not possible to estimate the "primary" recovery indicator metric described above. Because lambda represents an estimate of the median population growth rate, there is a 50% chance that the true population growth rate is equal or greater than the calculated value. As described in Appendix A of the 2000 FCRPS Biop, the needed change in lambda is estimated by dividing 1.0 by the current estimate of lambda. The result is then raised to the power of the mean generation time in order to calculate the needed change in survival.

It was possible to estimate this indicator metric for each data set for which an estimate of lambda was possible.

Adjustments to Population Growth Rate Estimates

In the 2000 FCRPS Biop we made adjustments to the current estimate of lambda to reflect changes in some life stage survival rates that had occurred from 1980 to the present. For example, harvest rates on SR fall chinook, SR steelhead, and UCR steelhead were considerably lower in 2000 than they had been on average during the 1980-1999 period and these lower harvest rates were expected to continue into the future according to the Basin-wide Salmon Recovery Strategy. Similarly, survival of juveniles through the FCRPS was higher in 2000 than it had been on average between 1980-1999 due to improvements in configuaration and operation of projects. An adjustment in lambda was made for both the current survival rate in 2000 and the survival rate expected from the reasonable and prudent alternative (RPA).

For the purpose of updating the jeopardy indicator metrics in light of recent court decisions, it was not clear if these adjustments were still appropriate. We therefore evaluated the indicator metrics under two conditions: with no adjustments and with adjustments identical to those applied in the 2000 FCRPS Biop. It is possible that alternative adjustments (e.g., to reflect an environmental baseline in which no future federal activities would occur unless they had undergone Section 7 consultation) will be more appropriate, but these have not yet been developed.

RESULTS

Updated 2000 FCRPS Biop Indicator Metrics

Table 1 displays 166 populations proposed by the Interior TRT and the Lower Columbia/Willamette TRT that are relevant to the 11 ESUs considered in this analysis. At least one BRT data set representing a relevant spawning aggregation was associated with 92 of the populations (55%). No applicable data set could be identified for the remaining 74 populations. Because some data sets represent aggregates of two or more populations and because multiple data sets are available for some populations, there is not a direct correspondence between the number of data sets and the number of populations. All told, 139 data sets were available for the analysis. In most cases, data set documentation does not indicate if a data set represents the entire population or a subset of the population.

Table 1 displays the applicability of each data set to the 2000 FCRPS Biop indicator metrics, based on 1980-present population growth rate, and also indicates if data sets correspond to similarly-named data sets that were used in the 2000 FCRPS Biop. Table 2 provides more details regarding applicability of the data sets to each indicator metric. Note that Table 2 comments are not restricted to the 1980-present time period, so Table 1 is based on a combination of the comments in Table 2 and consideration of the time period represented by the data set.

The 1980-present (generally 2001) population growth rate could be calculated for 83 of the data sets. This calculation is important because it is necessary for each of the other indicator metrics and is directly used for the "lambda $\geq$1" alternate recovery indicator metric. A 1980-present lambda could not be calculated for the remaining 56 data sets because they did not encompass the entire time period, too many years were missing within the time period, or hatchery fraction was not available for the data set (Table 2).

The change in survival necessary to reduce extinction risk to 5% in 100 years, based on the 1980-present population growth rate, could be calculated for 53 data sets. Thirty data sets, for which lambda could be calculated, were not valid for extinction risk estimates because the data were not in units of fish (which is necessary to evaluate the extinction threshold) or because the variance about lambda could not be calculated (Table 2). The "Dennis/Holmes" method estimates variance by the "slope method" and certain assumptions must be met for this approach to work. Holmes (2001) showed that alternative methods of estimating variance are biased.

The change in survival necessary for a 50% likelihood of meeting interim recovery abundance goals in 48 years, based on the 1980-present population growth rate, could be calculated for 19 data sets. The main reason that so few data sets could be used for this purpose is the lack of interim recovery abundance goals for lower Columbia and Willamette ESUs and a lack of correspondence between the scale of many of the interior Columbia interim recovery goals and the scale of the available data sets (Table 2). Another reason was the lack of correspondence between units of interim recovery goals (fish) and units of data sets (often redd counts or redds per mile).

Table 1 indicates that relatively few updated results are directly comparable to results in the 2000 FCRPS Biop. The main reason for this lack of correspondence is the more stringent review of data sets by the BRT and by state and tribal co-managers during the review of the draft BRT (2003) report. In many cases, previous data sets were either merged or split, as appropriate to ensure consistency in methods and coverage. As a result, many data sets used in the 2000 FCRPS Biop were dropped and many new ones now exist. A large number of the data sets that are in units of "fish" are actually expansions of data sets that are in units of redd counts or redds per mile. In many instances, the expansion methods were reviewed and updated so the resulting data set, while representing the same geographical area as a data set used in the 2000 FCRPS Biop, now is not directly comparable. If the updated data set appeared to have relatively minor changes for years represented in the 2000 FCRPS Biop analysis, or if the changes were significant but differed by a constant factor such that the trend was unchanged, we considered the data sets comparable. In the case of UCR steelhead, we determined that the results were not comparable because of different methods of estimating lambda used for that ESU in the 2000 FCRPS Biop and used in the new analysis, not because the data sets differed.

Table 3 and Figures 1-9 display the updated lambda estimates, along with 95% confidence limits, and Table 3 makes appropriate comparisons to lambda estimates included in Appendix A of the 2000 FCRPS Biop. Nearly all of the spawning aggregations for LCR chinook, LCR steelhead, UWR chinook, UWR steelhead, UCR chinook, and UCR steelhead had population growth rates less than 1.0 (i.e., they are declining). CR chum salmon, MCR steelhead, SR steelhead, and SR spring/summer chinook generally had population growth rates greater than 1.0 , although this was not true for all spawning aggregations. SR fall chinook were either increasing or decreasing, depending upon "hatchery effectiveness" assumptions.

Because adult returns in 2001 were well above average for most stocks, the updated lambda estimates are generally higher than those estimated in the 2000 FCRPS Biop. In general, lambda increased by about 2-10% (absolute). Exceptions included the aggregate SR spring/summer chinook data set, and LCR chinook and steelhead data sets, which declined from the 2000 FCRPS Biop estimates.

The range of survival changes necessary to achieve each of the indicator metrics are displayed in Table 4 for each of the ESUs determined to be jeopardized in the 2000 FCRPS Biop. Details for each ESU are included in Tables 5-17. These tables follow the format of tables in section 9 of the 2000 FCRPS Biop to indicate how they might be updated based upon currently available biological information. There are two tables for each ESU - one that does not adjust the 1980-present lambda estimate to account for current survival rates that differ from the average 1980-present survival rates or to account for survival changes expected from the RPA. The second table applies the same adjustments that were included in the 2000 FCRPS Biop under the columns labeled "Expected Survival Change".

Table 4 indicates that, at least under some assumptions (all of which were considered equally valid in the 2000 FCRPS Biop), at least one spawning aggregation within each ESU is currently achieving the 2000 FCRPS Biop indicator criteria. It also indicates that under some assumptions at least one spawning aggregation for every ESU except CR chum salmon requires additional survival improvements. These additional improvements are high for SR steelhead and UCR steelhead. For UCR steelhead, the natural survival rate would have to increase nearly seven-fold to meet the indicator criteria under all assumptions and for all spawning aggregations.

Sensitivity To Alternative Time Periods

Figures 10 and 12 show the sensitivity of lambda estimates to alternative choices of time period for the Marsh Creek spring chinook and Wenatchee River spring chinook data sets. In each case, the estimate of median population growth rate is highly dependent upon choice of the first year in the time series. For example, Figure 10 indicates that the choice of time series that begin in 1979, 1980, 1981, 1982, or 1983 and end in 2001 results in lambda greater than 1.0, which would indicate that the population is growing. On the other hand, choice of time series that begin in 1984, 1985, 1986, 1987, or 1988 and end in 2001 results in lambda less than 1.0, which indicates that the population is declining. Figures 11 and 13 show the 99% confidence limits around the lambda estimates for each of the time series. These generally indicate that the shorter the time period, the greater the uncertainty regarding the estimate of lambda.

Table 18 displays estimates of median population growth rate and 95% confidence limits for the 1990-present time period and for the longest possible time period, each of which was identified as important in BRT (2003). These estimates are evaluated at "hatchery effectiveness" assumptions of 20% and 80%. There is considerable variability both within and among ESUs as to whether these alternative time periods yield higher or lower estimates of lambda than the 1980-present time period.

NEXT STEPS

Next steps include further review of the data sets and preliminary analyses included in this report; updating adult return data through 2002 (expected from TRTs in October 2003); completion of a review of population growth rate methods by the Northwest Fisheries Science Center, including a workshop that includes a larger scientific group, during the fall of 2003; completion of the final BRT status review (date uncertain); and evaluation of other quantitative indicators of population status for possible inclusion in the new biological opinion.

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Figure 1. Updated 1980-present Lambda estimates with 95% confidence intervals for the Snake River Spring and Summer Chinook ESU calculated with hatchery effectiveness of 0.2 and 0.8

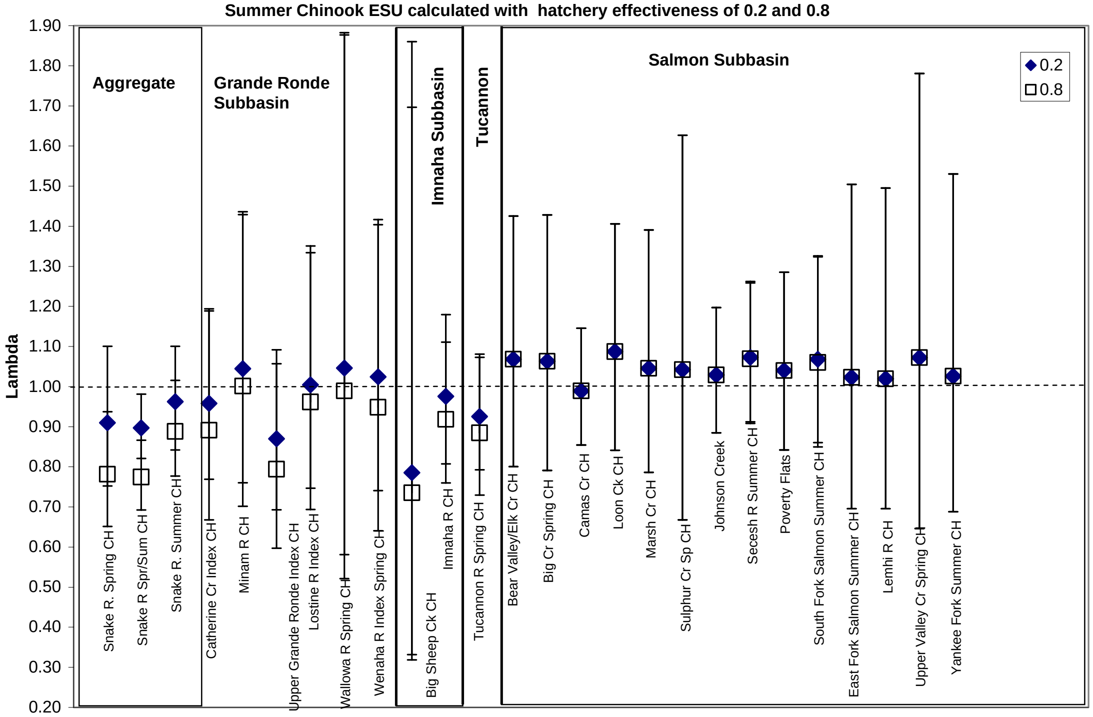

Figure 2. Updated 1980-present Lambda estimates with 95% confidence intervals for the Snake River Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8

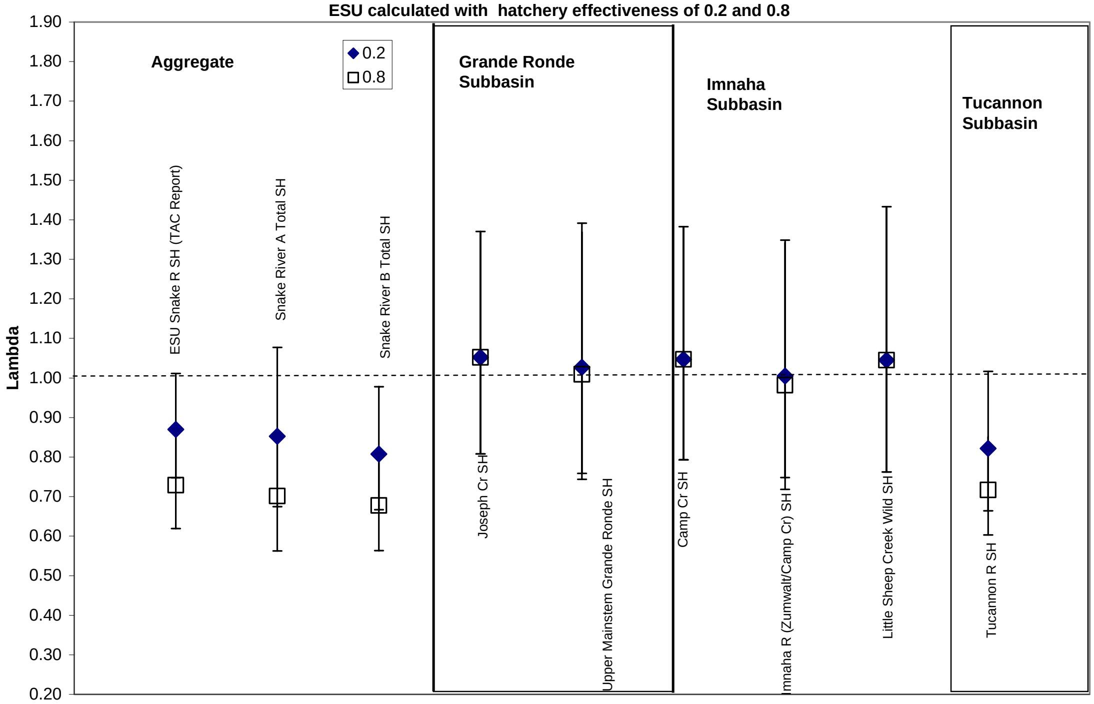

Figure 3. Updated 1980-present Lambda estimates with 95% confidence intervals for the Upper Columbia River Chinook ESU calculated with hatchery effectiveness of 0.2 and 0.8

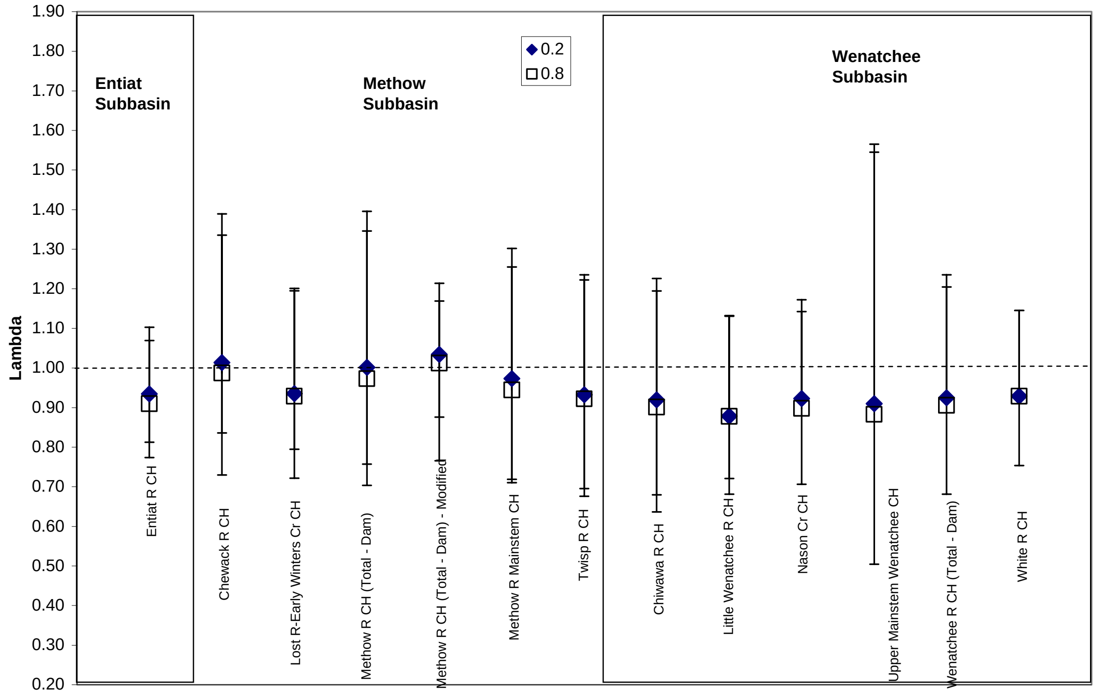

Figure 4. Updated 1980-present Lambda estimates with 95% confidence intervals for the UpperColumbia Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8

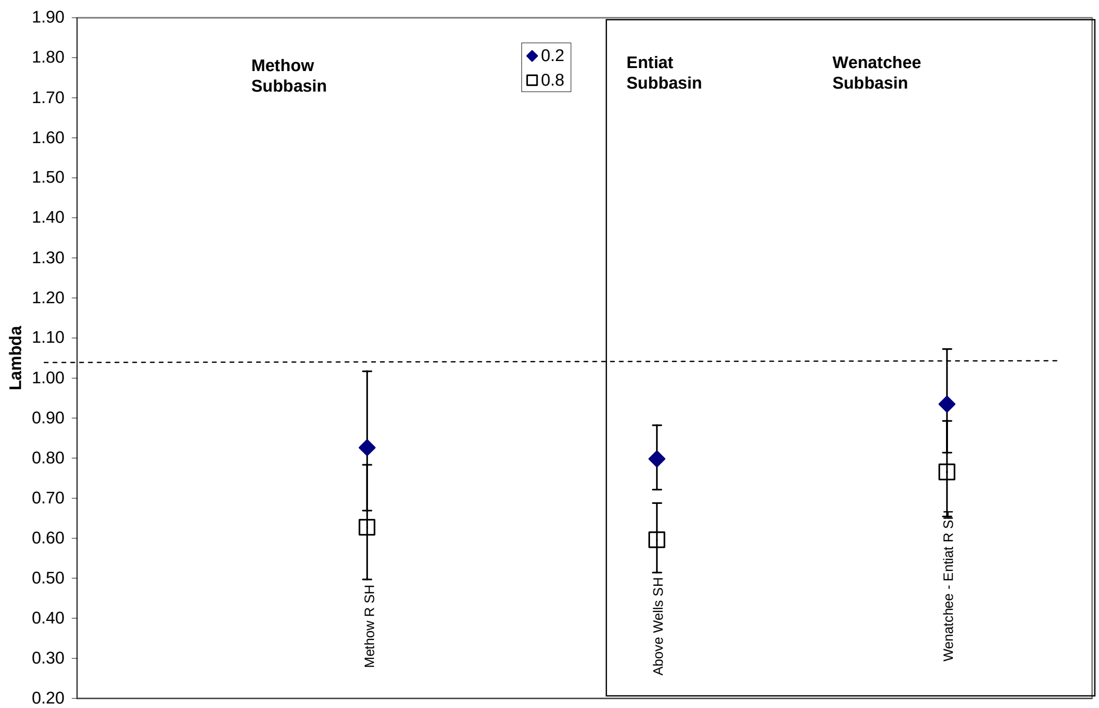

Figure 5. Updated 1980-present Lambda estimates with 95% confidence intervals for the Mid Columbia Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8

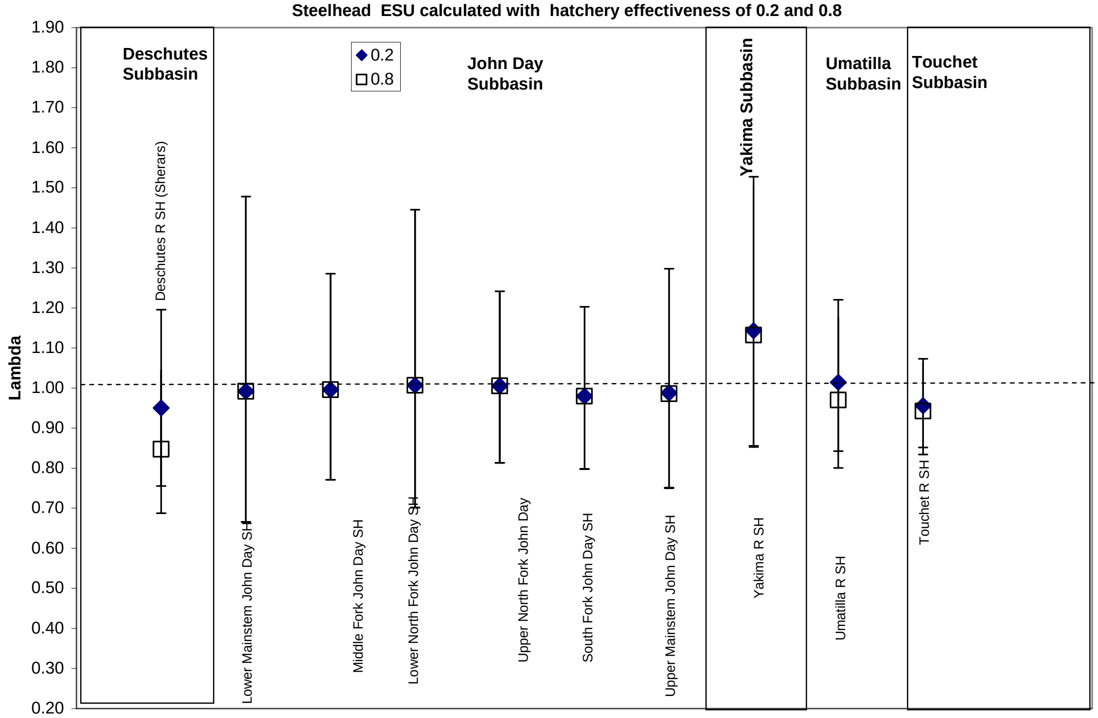

Figure 6. Updated 1980-present Lambda estimates with 95% confidence intervals for the Columbia Chum ESU calculated with hatchery effectiveness of 0.2 and 0.8

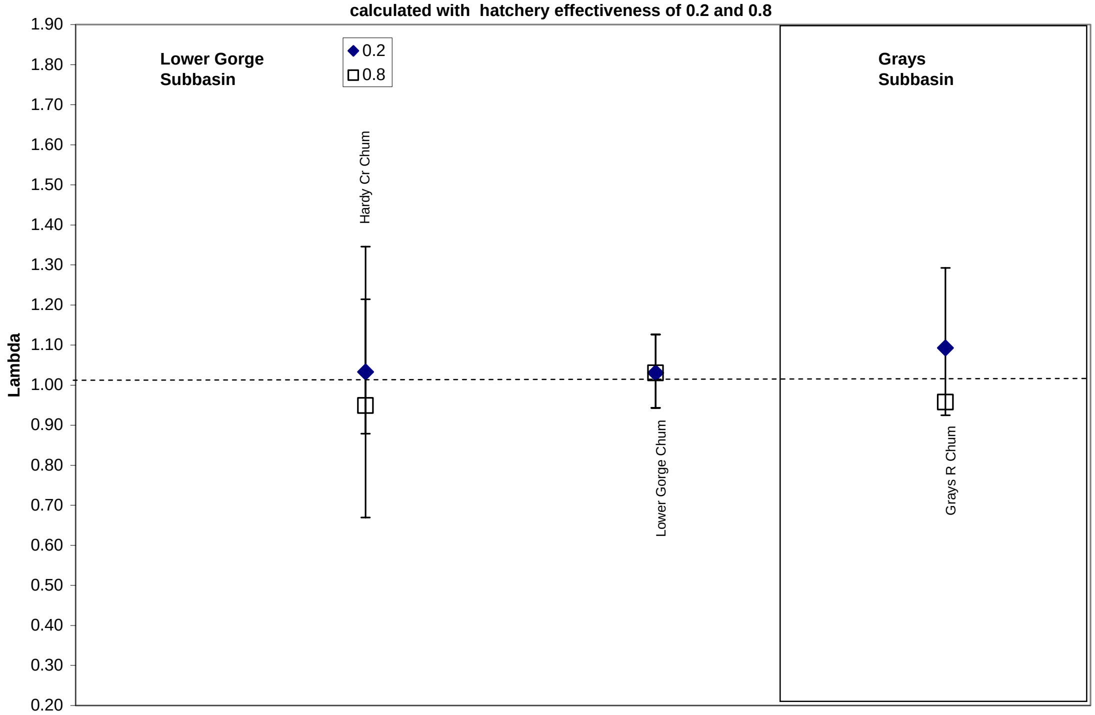

Figure 7. Updated 1980-present Lambda estimates with 95% confidence intervals for the Lower Columbia Chinook ESU calculated with hatchery effectiveness of 0.2 and 0.8

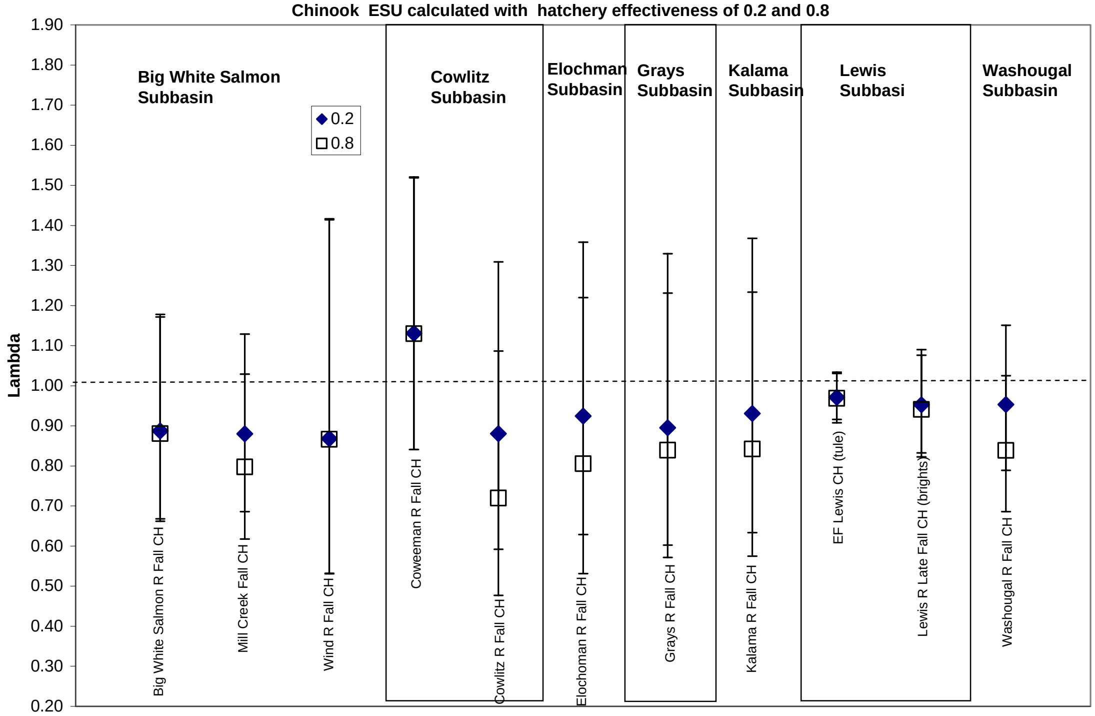

Figure 8. Updated 1980-present Lambda estimates with 95% confidence intervals for the Lower Columbia Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8

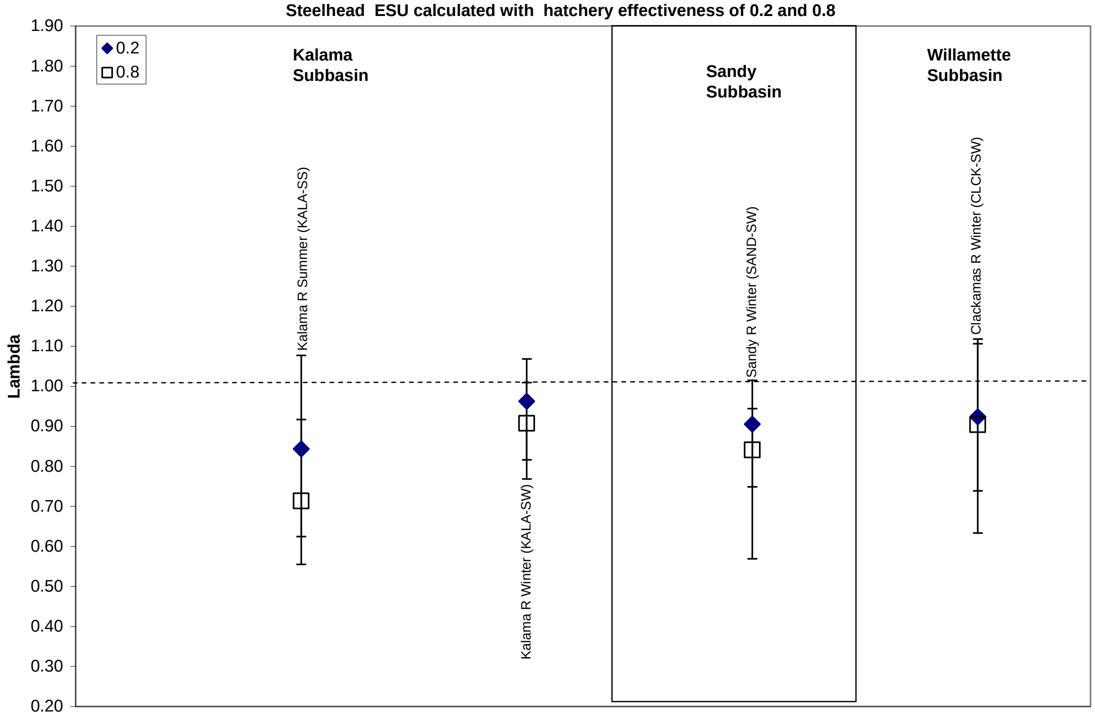

Figure 9. Updated 1980-present Lambda estimates with 95% confidence intervals for the Upper Willamete Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8

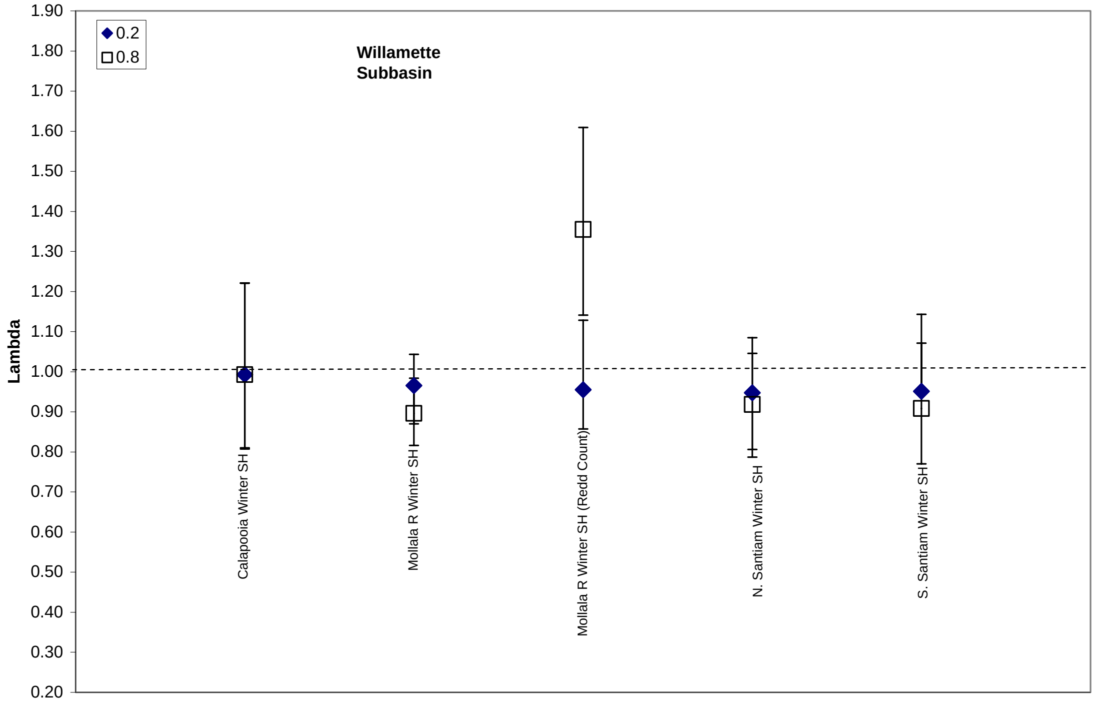

Figure 10. Sensitivity of Median Lambda estimates to alternative dhoices of time period for the Marsh Creek spring chinook data set. Each point represents and estimate for the starting year through 2001. This population has no hatchery influence.

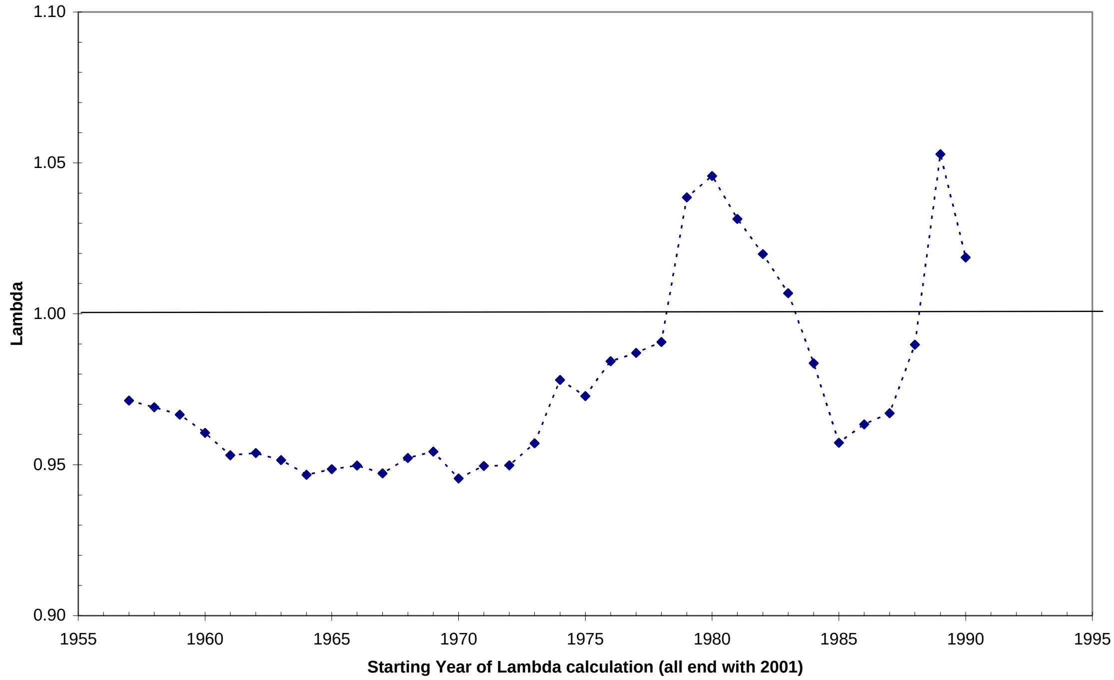

Figure 11. Sensitivity of 95% confidence intervals to alternative time periods for the Marsh Creek spring chinook lambda estimates displayed in Figure 10.

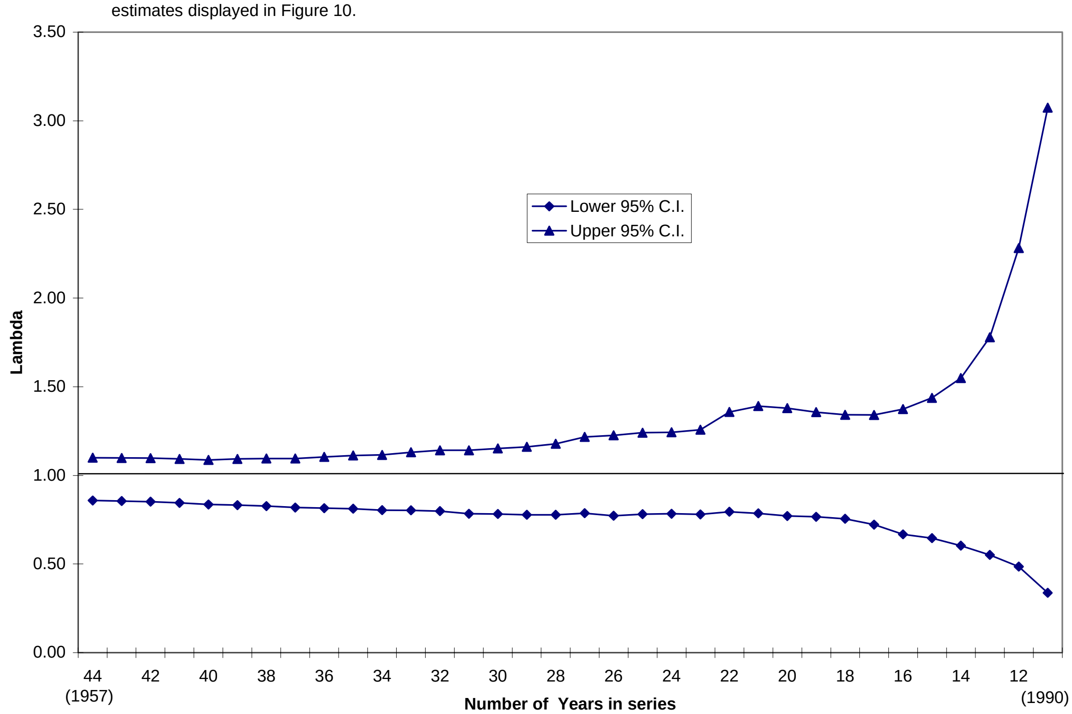

Figure 12. Sensitivity of Median Lambda estimates to alternative dhoices of time period for the Wenatchee River spring chinook data set. Each point represents and estimate for the starting year through 2001.

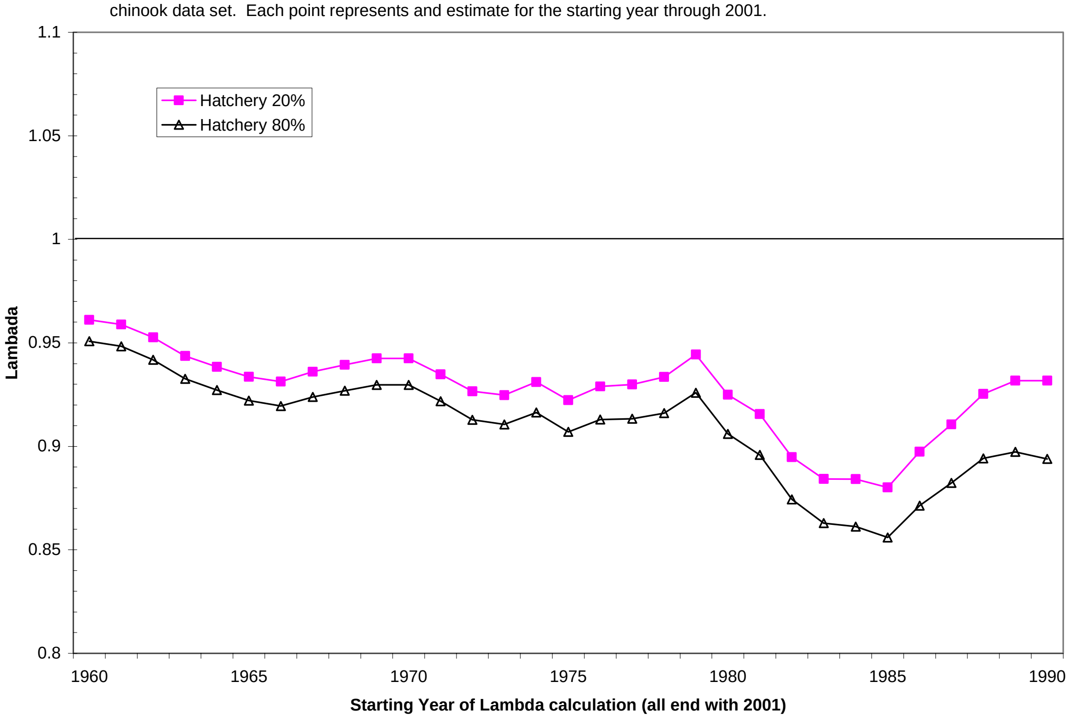

Figure 13. Sensitivity of 95% confidence intervals to alternative time periods for the Wenatchee River spring chinook lambda estimates displayed in Figure 10.

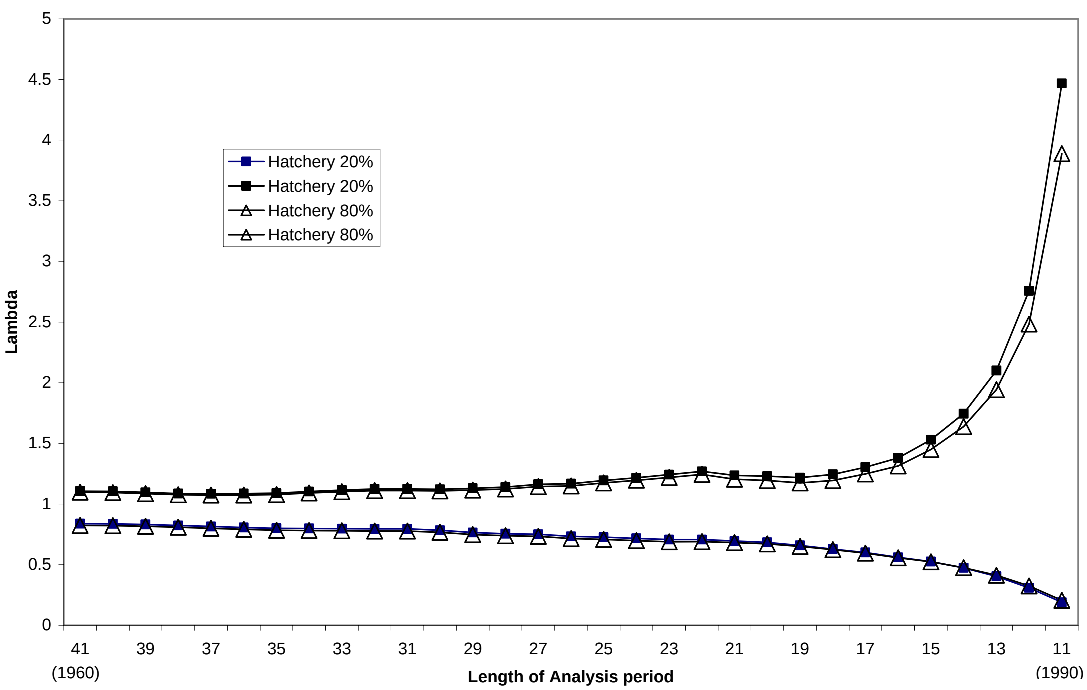

Table 1. Description of population structure, availability of relevant data sets, and use of data sets for evaluating 2000 FCRPS Biop jeopardy indicator metrics using updated 1980-present data.

ESU	NPCC Subbasin	Population	Spawning Agregation	Data	Start Year	End Year	Can Updated 1980-Present Lambda Be Calculated?	Can Updated Survival Change For <5% Extinction Risk, Based on 1980-Present Lambda, Be Calculated?	Can Updated Survival Change For 50% Likelihood of Recovery in 48 Years, Based on 1980-Present Lambda, Be Calculated?	Can Updated Estimates Be Compared to 2000 Biop Estimates (i.e., are the data sets and methods comparable)?
Snake River Fall Chinook Salmon	Snake-Hells Canyon, Snake-Lower	Snake River (SNMAI)	Snake River Fall Total	Fish	1975	2001	**Yes**	**Yes**	**Yes**	**Yes**
Snake River Spring/Summer Chinook Salmon	Multiple	Aggregate	Snake R. Spring CH	Fish	1979	2001	**Yes**	**Yes**	**No**	**No**
" "	" "	" "	Snake R Spr/Sum CH	Fish	1980	1999	**Yes**	**Yes**	**No**	**Yes**
" "	" "	" "	Snake R. Summer CH	Fish	1979	2001	**Yes**	**Yes**	**No**	**No**
" "	Grande Ronde	Catherine Ck (GRCAT)	Catherine Ck CH	Fish	1953	1996	**No**	**No**	**No**	**No**
" "	" "	" "	Catherine Cr Index CH	RC	1957	2001	**Yes**	**No**	**No**	**No**
" "	" "	*Lookingglass Cr. - (GRLOO) (Historic Population - now only hatchery)*	*Lookingglass Cr CH*	*RC*	*1957*	*2001*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Minam R (GRMIN)	Minam R CH	Fish	1964	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	Upper Mainstem (GRUMA)	Upper Grande Ronde CH	Fish	1959	1996	**No**	**No**	**No**	**No**
" "	" "	" "	Upper Grande Ronde Index CH	RC	1960	2001	**Yes**	**No**	**No**	**No**
" "	" "	Wallowa/Lostine (GRLOS)	Lostine R Index CH	RC	1964	2001	**Yes**	**No**	**No**	**Yes**
" "	" "	" "	Wallowa R Spring CH	RC	1963	2001	**Yes**	**No**	**No**	**Yes**
" "	" "	Wenaha R (GRWEN)	Wenaha R Index Spring CH	RC	1963	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Wenaha R Spring CH	Fish	1964	1996	**No**	**No**	**No**	**No**
" "	Imnaha	Big Sheep Ck (IRBSH)	Big Sheep Ck CH	RC	1957	2000	**Yes**	**No**	**No**	**Yes**
" "	" "	Imnaha R Mainstem (IRMAI)	Imnaha R CH	Fish	1953	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	Imnaha R Mainstem (IRMAI)	Lick Cr (Imnaha) CH	RC	1964	2001	**No**	**No**	**No**	**No**
" "	Tucannon	Tucannon R (SNTUC)	Tucannon R Spring CH	Fish	1979	2001	**Yes**	**Yes**	**Yes**	**No**
" "	Salmon (*Middle Fork*)	Bear Valley/Elk Creeks (MFBEA)	Bear Valley/Elk Cr CH	Fish	1960	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	Big Cr (MFBIG)	Big Cr Spring CH	Fish	1957	2001	**Yes**	**No**	**No**	**Yes**
" "	" "	" "	Big Cr Summer CH	RC	1957	2001	**No**	**No**	**No**	**No**
" "	" "	Camas Cr (MFCAM)	Camas Cr CH	RC	1972	2001	**Yes**	**No**	**No**	**No**
" "	" "	Loon Cr (MFLOO)	Loon Ck CH	RC	1957	2001	**Yes**	**No**	**No**	**Yes**
" "	" "	Marsh Cr (MFMAR)	Marsh Cr CH	Fish	1957	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	Middle Fork Salmon Above Indian Cr. (MFUMA)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Middle Fork Salmon Below Indian Cr. (MFLMA)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Pistol Cr (MFPIS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 1. Description of population structure, availability of relevant data sets, and use of data sets for evaluating 2000 FCRPS Biop jeopardy indicator metrics using updated 1980-present data.

ESU	NPCC Subbasin	Population	Spawning Agregation	Data	Start Year	End Year	Can Updated 1980-Present Lambda Be Calculated?	Can Updated Survival Change For <5% Extinction Risk, Based on 1980-Present Lambda, Be Calculated?	Can Updated Survival Change For 50% Likelihood of Recovery in 48 Years, Based on 1980-Present Lambda, Be Calculated?	Can Updated Estimates Be Compared to 2000 Biop Estimates (i.e., are the data sets and methods comparable)?
Snake River Spring/Summer Chinook Salmon	Salmon (*Middle Fork*)	Sulphur Creek (MFSUL)	Sulphur Cr Sp CH	Fish	1957	2001	**Yes**	**Yes**	**No**	**Yes**
" "	Salmon (*S. Fork*)	EF SF Salmon/ Johnson Creek (SFEFS)	Johnson Creek	Fish	1957	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	Secesh R. (SFSEC)	Lake Cr Summer CH	RPM	1952	1997	**No**	**No**	**No**	**No**
" "	" "	" "	Secesh R Summer CH	RC	1957	2001	**Yes**	**No**	**No**	**No**
" "	" "	South Fork Salmon (SFMAI)	Poverty Flats	Fish	1957	2001	**Yes**	**Yes**	**No**	**Yes**
" "	" "	" "	South Fork Salmon Summer CH	RC	1957	2001	**Yes**	**No**	**No**	**Yes**
" "	Salmon (*Tribs*)	Chamberlain Cr (SRCHA)	Chamberlain Cr CH	RPM	1952	1997	**No**	**No**	**No**	**No**
" "	" "	Little Salmon R. (SRLSR)	*Rapid River (hatchery stock)*	*RPM*	*1972*	*2001*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Salmon (*Upper*)	E. Fork Salmon R. (SREFS)	East Fork Salmon Spring CH	RPM	1952	1997	**No**	**No**	**No**	**No**
" "	" "	" "	East Fork Salmon Summer CH	RPM	1957	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Herd Cr CH	RPM	1958	1986	**No**	**No**	**No**	**No**
" "	" "	Lemhi R (SRLEM)	Lemhi R CH	RC	1957	2001	**Yes**	**No**	**No**	**No**
" "	" "	NF Salmon River (SRNFS)	North Fork Spring CH	RC	1960	2000	**No**	**No**	**No**	**No**
" "	" "	Pahsimeroi R (SRPAH)	Pahsimeroi R CH	TLC	1980	2001	**No**	**No**	**No**	**No**
" "	" "	*Panther Creek (SRPAN) (Historic population)*	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Mainstem Salmon Above Redfish Lake (SRUMA)	Alturas Lake Cr CH	RC	1957	2001	**No**	**No**	**No**	**No**
" "	" "	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Spring CH	RC	1954	2001	**No**	**No**	**No**	**No**
" "	" "	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Summer CH	RPM	1957	1997	**No**	**No**	**No**	**No**
" "	" "	Valley Cr (SRVAL)	Upper Valley Cr Spring CH	RC	1957	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Upper Valley Cr Summer CH	RPM	1952	2000	**No**	**No**	**No**	**No**
		Yankee Fork (SRYFS)	Yankee Fork Spring CH	RPM	1952	1997	**No**	**No**	**No**	**No**
" "	" "	" "	Yankee Fork Summer CH	RC	1960	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Yankee Fork West Fk Spring CH	RC	1960	2001	**No**	**No**	**No**	**No**

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ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**Data**	**Start Year**	**End Year**	**Can Updated 1980-Present Lambda Be Calculated?**	**Can Updated Survival Change For <5% Extinction Risk, Based on 1980-Present Lambda, Be Calculated?**	**Can Updated Survival Change For 50% Likelihood of Recovery in 48 Years, Based on 1980-Present Lambda, Be Calculated?**	**Can Updated Estimates Be Compared to 2000 Biop Estimates (i.e., are the data sets and methods comparable)?**
Snake River Steelhead	Multiple	Aggregate	ESU Snake R SH (TAC Report)	Fish	1980	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	" "	Snake River A Total SH	Fish	1985	2001	**No**	**No**	**No**	**No**
" "	" "	" "	Snake River B Total SH	Fish	1985	2001	**No**	**No**	**No**	**No**
" "	Asotin	Asotin Creek (SNASO-s)	Asotin Cr SH	Fish	1986	2001	**No**	**No**	**No**	**No**
" "	Clearwater	Lochsa River (CRLOC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lolo Creek (CRLOL-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lower Clearwater R (CRLMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
	" "	*North Fork Clearwater (CRNFC-s) (Historic population)*	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Selway River (CRSEL-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	South Fork Clearwater (CRSFC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Grande Ronde	Joseph Creek (GRJOS-s)	Joseph Cr SH	Fish	1974	2002	**Yes**	**Yes**	**Yes**	**No**
" "	" "	Lower Grande Ronde (GRLMT-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Grande Ronde (GRUMA-s)	Upper Mainstem Grande Ronde SH	RPM	1967	2000	**Yes**	**No**	**No**	**No**
" "	" "	Wallowa River (GRWAL-s)	Wallowa SH	RPM	1965	1996	**No**	**No**	**No**	**No**
" "	Imnaha	Imnaha (IRMMT-s)	Camp Cr SH	Fish	1974	2002	**Yes**	**Yes**	**No**	**No**
" "	" "	" "	Imnaha R (Zumwalt/Camp Cr) SH	RPM	1974	2000	**Yes**	**No**	**No**	**No**
" "	" "	" "	*Little Sheep Creek Hatchery SH*	*Fish*	*1985*	*2002*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	" "	Little Sheep Creek Wild SH	Fish	1985	2002	**Yes**	**Yes**	**No**	**No**
" "	Salmon River	Chamberlain Creek (SRCHA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Little Salmon and Lower almon Tribs (SRLSR-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	East Fork Salmon R (SREFS-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lemhi River (SRLEM-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lower Middle Fork (MFBIG-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	North Fork Salmon R (SRNFS-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Pahsimeroi River (SRPAH-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Panther Creek (SRPAN-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

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Snake River Steelhead	Salmon River	Secesh River (SFSEC s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	South Fork Salmon R (SFMAI-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Mainstem Salmon R (SRUMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Middle Fork Salmon R (MFUMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Snake Hell's Canyon	Hell's Canyon tribs (SNHCT-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Tucannon	Tucannon R (SNTUC-s)	Tucannon R SH	Fish	1987	2001	**Yes**	**Yes**	**Yes**	**No**
Upper Columbia River Spring Chinook Salmon	Entiat	Entiat R (UCENT)	Entiat R CH	Fish	1960	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	Methow	Methow R (UCMET)	Chewack R CH	RC	1960	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Lost R-Early Winters Cr CH	Fish	1958	2001	**Yes**	**Yes**	**No**	**No**
" "	" "	" "	Methow R CH (Total - Dam)	Fish	1960	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	" "	Methow R CH (Total - Dam) - Modified	Fish	1960	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	" "	Methow R Mainstem CH	RC	1958	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Twisp R CH	RC	1958	2001	**Yes**	**No**	**No**	**No**
" "	Wenatchee	Wenatchee R (UCWEN)	Chiwawa R CH	RC	1958	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Icicle Cr CH	RC	1958	2001	**No**	**No**	**No**	**No**
" "	" "	" "	Little Wenatchee R CH	RC	1958	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Nason Cr CH	RC	1958	2001	**Yes**	**No**	**No**	**No**
" "	" "	" "	Upper Mainstem Wenatchee CH	RC	1959	2001	**Yes**	**No**	**No**	**No**
" "	" "	Wenatchee R (UCWEN)	Wenatchee R CH (Total - Dam)	Fish	1960	2001	**Yes**	**Yes**	**Yes**	**Yes**
" "	" "	" "	White R CH	RC	1958	2001	**Yes**	**No**	**No**	**No**
Upper Columbia River Steelhead	Methow	Methow R (UCMET-s)	Methow R SH	Fish	1976	2001	**Yes**	**Yes**	**Yes**	**No**
" "	Methow& Okanagan	Methow R (UCMET-s) & Okanagan R (UCOKA-s)	Above Wells SH	Fish	1976	2001	**Yes**	**Yes**	**No**	**No**
" "	Okanogan	Okanogan R (UCOKA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Wenatchee	Wenatchee R (UCWEN-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Wenatchee&Entiat	Wenatchee R (UCWEN-s) & Entiat R (UCENT-s)	Wenatchee - Entiat R SH	Fish	1976	2001	**Yes**	**Yes**	**Yes**	**No**

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Middle Columbia River Steelhead	Deschutes	Deschutes Eastside (DREST-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Deschutes Eastside (DREST-s) & Westside (DRWST-s)	Deschutes R SH (Sherars)	Fish	1978	2002	**Yes**	**Yes**	**Yes**	**No**
" "	" "	Deschutes Westside (DRWST-s)	Shitike Cr SH	RPM	1976	2002	**No**	**No**	**No**	**No**
" "	" "	Deschutes Westside (DRWST-s)	*Warm Springs Hatchery SH*	*Fish*	*1980*	*1999*	*N/A*	*N/A*	*N/A*	*N/A - Also, this data set does not match the "Warm Springs NFH Sum" data set used for the 2000 Biop - counts are off-set by two years.*
" "	Fifteenmile	Fifteenmile Cr (MCFIF-s)	Fifteenmile Cr SH	RPM	1964	2001	**No**	**No**	**No**	**No**
" "	John Day	Lower Mainstem John Day (JDLMT-s)	Lower Mainstem John Day SH	RPM	1965	2002	**Yes**	**No**	**No**	**No**
" "	" "	Middle Fork John Day (JDMF-s)	Middle Fork John Day SH	RPM	1974	2001	**Yes**	**No**	**No**	**No**
" "	" "	North Fork John Day (JDNFJ-s)	Lower North Fork John Day SH	RPM	1976	2002	**Yes**	**No**	**No**	**No**
" "	" "	" "	Upper North Fork John Day	RPM	1977	2002	**Yes**	**No**	**No**	**No**
" "	" "	South Fork John Day (JDSF-s)	South Fork John Day SH	RPM	1974	2002	**Yes**	**No**	**No**	**No**
" "	" "	Upper Mainstem John Day (JDUMA-s)	Upper Mainstem John Day SH	Fish	1974	2002	**Yes**	**Yes**	**Yes**	**No**
" "	Klickitat	Klickitat R (MCKLI-s)	Klickitat R SH	RC	1990	2002	**No**	**No**	**No**	**No**
" "	Palouse	Rock Creek (MCROC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Yakima	Aggregate - Dam	Yakima R SH	Fish	1980	2001	**Yes**	**Yes**	**??**	**Yes**
" "	" "	Upper Mainstem (YRUMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Naches River (YRNAC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Satus and Toppenish Creeks (YRTOS-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Umatilla	Umatilla R (MCUMA-s)	Umatilla R SH	Fish	1966	2002	**Yes**	**Yes**	**Yes**	**No**
" "	Walla Walla	Walla Walla R (WWMAI-s)	Walla Walla R SH	Fish	1993	2000	**No**	**No**	**No**	**No**
" "	" "	Touchet R (WWTOU-s)	Touchet R SH	Fish	1987	2001	**Yes**	**Yes**	**No**	**No**

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Columbia River Chum Salmon	Columbia Estuary	Big Creek (BIGC-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Chinook River (CHIN-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Clatskanie River (CLAT-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Mill Creek (MILL-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Young's Bay (YOUN-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Columbia Gorge	Upper Gorge tribs (UGRG-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Columbia Lower	Lower Gorge tribs (LGRG-CM)	Hardy Cr Chum	Fish	1957	2000	**Yes**	**Yes**	**No**	**No**
" "	" "	" "	Lower Gorge Chum	Fish	1944	2000	**Yes**	**Yes**	**No**	**No**
" "	Cowlitz	Cowlitz R. fall/summer (COWL-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Salmon Creek (SALM-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Elochman	Elochman River (ELOC-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Grays R	Grays R. (GRAY-CM)	Grays R Chum	Fish	1951	2000	**Yes**	**Yes**	**No**	**No**
" "	" "	" "	Grays River II Chum	Fish	1967	1998	**No**	**No**	**No**	**No**
" "	Kalama River	Kalama River (KALA-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Lewis River	Lewis River (LEWS-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Lower Columbia	Scappose Creek (SCAP-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Sandy	Sandy R. (SAND-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Washougal	Washougal R. (WASH-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Willamette	Clackamas R. (CLCK-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Lower Columbia River Chinook Salmon	Big White Salmon	Big White Salmon R Fall (BWSR-KF)	Big White Salmon R Fall CH	Fish	1967	2001	**Yes**	**Yes**	**No**	**No**
" "	" "	Big White Salmon Spring (BWSR-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Columbia Estuary	Big Creek Fall (BIGC-KF)	Big Creek Fall CH	FPM	1970	2001	**No**	**No**	**No**	**No**
" "	" "	Clatskanie R Fall (CLAT-KF)	Clatskanie Fall CH	FPM	1970	2001	**No**	**No**	**No**	**No**
" "	" "	Mill Creek Fall (MILL-KF)	Mill Creek Fall CH	Fish	1980	2001	**Yes**	**Yes**	**No**	**No**
" "	" "	Young's Bay Fall (YOUN-KF)	Young's Bay Fall CH	FPM	1950	2001	**No**	**No**	**No**	**No**

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Lower Columbia River Chinook Salmon	Columbia Gorge	Lower Gorge Tribs LGRG-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Gorge Tribs (UGRG-KF)	Wind R Fall CH	Fish	1964	2001	**Yes**	**Yes**	**No**	**No**
" "	Cowlitz	Cispus R Spring (CISP-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Coweeman R Fall (COWE-KF)	Coweeman R Fall CH	Fish	1964	2001	**Yes**	**Yes**	**No**	**No**
" "	" "	Tilton R Spring (TILT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Toutle R Fall (TOUT-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Toutle R Spring (TOUT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Cowlitz R Fall (UCWL-KF) + Lower Cowlitz R Fall (LCWL-KF)	Cowlitz R Fall CH	Fish	1964	2000	**Yes**	**Yes**	**No**	**No**
" "	" "	Upper Cowlitz R Spring (UCWL-KS)	Cowlitz R Spring CH	Fish	1980	2001	**No**	**No**	**No**	**No**
" "	Elochoman	Elochoman R Fall (ELOC-KF)	Elochoman R Fall CH	Fish	1964	2001	**Yes**	**Yes**	**No**	**No**
" "	Grays	Grays R Fall (GRAY-KF)	Grays R Fall CH	Fish	1964	2001	**Yes**	**Yes**	**No**	**No**
" "	Hood	Hood R Fall (HOOD-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Hood R Spring (HOOD-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Kalama	Kalama R Fall (KALA-KF)	Kalama R Fall CH	Fish	1964	2001	**Yes**	**Yes**	**No**	**Yes**
" "	" "	Kalama R Spring (KALA-KS)	Kalama R Spring CH	Fish	1980	2001	**No**	**No**	**No**	**Yes**
" "	Lewis	Lewis R. Late Fall (LEWL-KF)	EF Lewis CH (tule)	Fish	1980	2000	**Yes**	**Yes**	**No**	**Yes?**
" "	" "	" "	Lewis R Late Fall CH (brights)	Fish	1964	2001	**Yes**	**Yes**	**No**	**Yes?**
" "	" "	Lewis R. Spring (LEWS-KS)	Lewis R. Spring CH	Fish	1980	2001	**No**	**No**	**No**	**Yes**
" "	" "	Salmon Creek Fall (SALM-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Sandy	Sandy River Early Fall (SNDE-KF)	Sandy R Early Fall	Fish	1988	2001	**No**	**No**	**No**	**No**
" "	" "	Sandy River Late Fall (SNDL-KF)	Sandy R Late Fall CH	Fish	1984	2001	**No**	**No**	**No**	**Yes**
" "	Washougal	Washougal R Fall (WASH-KF)	Washougal R Fall CH	Fish	1964	2001	**Yes**	**Yes**	**No**	**No**
" "	Willamette	Clackamas R Fall Chinook (CLCK-KF)	Clackamas R Fall CH	Fish	1967	2001	**No**	**No**	**No**	**No**

Table 1. Description of population structure, availability of relevant data sets, and use of data sets for evaluating 2000 FCRPS Biop jeopardy indicator metrics using updated 1980-present data.

ESU	NPCC Subbasin	Population	Spawning Agregation	Data	Start Year	End Year	Can Updated 1980-Present Lambda Be Calculated?	Can Updated Survival Change For <5% Extinction Risk, Based on 1980-Present Lambda, Be Calculated?	Can Updated Survival Change For 50% Likelihood of Recovery in 48 Years, Based on 1980-Present Lambda, Be Calculated?	Can Updated Estimates Be Compared to 2000 Biop Estimates (i.e., are the data sets and methods comparable)?
Lower Columbia River Steelhead	Columbia Gorge	Lower Gorge Tributaries (LRG-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Gorge Tributaries (UGRG-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Cowlitz	Cispus R Winter (CISP-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Coweeman R Winter (COWE-SW)	Coweeman R Winter SH	RC	1987	2002	**No**	**No**	**No**	**No**
" "	" "	Lower Cowlitz R Winter (LCWL-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	N Fork Toutle R Winter (Green River) (NTOU-SW)	N Fork Toutle Winter SH	Fish	1989	2002	**No**	**No**	**No**	**No**
" "	" "	S Fork Toutle R Winter (STOU-SW)	S Fork Toutle Winter SH	Fish	1984	2002	**No**	**No**	**No**	**Yes?**
" "	" "	Tilton R Winter (TILT-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Cowlitz R Winter (UCWL-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Hood	Hood R Summer (HOOD-SS)	Hood R Summer SH	Fish	1992	2000	**No**	**No**	**No**	**No**
" "	" "	Hood R Winter (HOOD-SW)	Hood R Winter SH	Fish	1992	2000	**No**	**No**	**No**	**No**
" "	Kalama	Kalama R Summer (KALA-SS)	Kalama R Summer SH	Fish (Trap Count)	1977	2003	**Yes**	**Yes**	**No**	**Yes**
" "	" "	Kalama R Winter (KALA-SW)	Kalama R Winter SH	Fish	1977	2002	**Yes**	**Yes**	**No**	**Yes**
" "	Lewis	E Fork Lewis R Summer (ELEW-SS)	EF Lewis R Summer SH	Fish	1996	2003	**No**	**No**	**No**	**No**
" "	" "	E Fk Lewis R Winter (ELEW-SW)	E Fk Lewis R Winter SH	Fish	1985	1994	**No**	**No**	**No**	**No**
" "	" "	N Fork Lewis R Summer (NLEW-SS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	N Fk Lewis R Winter (NLEW-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Sandy	Salmon Creek Winter (SALM-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Sandy R Winter (SAND-SW)	Sandy R Winter SH	Fish	1978	2001	**Yes**	**Yes**	**No**	**Yes**
" "	Washougal	Washougal R Summer (WASH-SS)	Washougal R Summer SH	Fish	1986	2003	**No**	**No**	**No**	**No**
" "	" "	Washougal R Winter (WASH-SW)	Washougal R Winter SH	RC	1991	2002	**No**	**No**	**No**	**No**
" "	Willamette	Clackamas R Winter (CLCK-SW)	Clackamas R Winter SH	Fish	1958	2001	**Yes**	**Yes**	**No**	**No**
" "	Wind	Wind R Summer - (WIND-SS)	Wind R Summer SH	Fish	1989	2003	**No**	**No**	**No**	**No**

Table 1. Description of population structure, availability of relevant data sets, and use of data sets for evaluating 2000 FCRPS Biop jeopardy indicator metrics using updated 1980-present data.

ESU	NPCC Subbasin	Population	Spawning Agregation	Data	Start Year	End Year	Can Updated 1980-Present Lambda Be Calculated?	Can Updated Survival Change For <5% Extinction Risk, Based on 1980-Present Lambda, Be Calculated?	Can Updated Survival Change For 50% Likelihood of Recovery in 48 Years, Based on 1980-Present Lambda, Be Calculated?	Can Updated Estimates Be Compared to 2000 Biop Estimates (i.e., are the data sets and methods comparable)?
Upper Willamette River Chinook Salmon	Sandy	Sandy R Spring (SAND-KS)	Sandy R Spring CH	Fish	1977	2001	No	No	No	No
" "	Willamette	Aggregate	Willamette Falls Spring CH	Fish	1946	2001	No	No	No	No
" "	" "	Calapooia R Spring (CALA-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Clackamas R Spring (CLCK-KS)	Clackamas R Spring CH (NF Dam)	Fish	1958	2002	No	No	No	No
" "	" "	McKenzie R Spring (MCKZ-KS)	McKenzie R Spring CH (Leaburg Dam)	Fish	1970	2001	No	No	No	Yes
Upper Willamette River Chinook Salmon	Willamette	Middle Fork Willamette Spring (MFWL-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Mollala R Spring (MOLA-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	N. Santiam R Spring (NSNT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	S. Santiam R Spring (SSNT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Upper Willamette River Steelhead	Willamette	Aggregate	Willamette Falls Winter SH Dam Counts	Fish	1971	2002	No	No	No	No
" "	" "	Calapooia R Winter (CALA-SW)	Calapooia Winter SH	Fish	1980	1997	Yes	Yes	No	No
" "	" "	" "	Calapooia Winter SH (Redd Count)	RC	1980	2000	No	No	No	No
" "	" "	Mollala R Winter (MOLA-SW)	Mollala R Winter SH	Fish	1980	1997	Yes	Yes	No	No
" "	" "	" "	Mollala R Winter SH (Redd Count)	RC	1980	2000	Yes	Yes	No	No
" "	" "	N. Santiam R Winter (NSNT-SW)	N. Santiam Winter SH (Redd Count)	RC	1983	2000	No	No	No	No
" "	" "	" "	N. Santiam Winter SH	Fish	1980	1997	Yes	Yes	No	No
" "	" "	S. Santiam R Winter (SSNT-SW)	Foster Dam Winter SH	Fish	1973	2000	No	No	No	No
" "	" "	" "	S. Santiam Winter SH	Fish	1980	1997	Yes	Yes	No	No
" "	" "	" "	S. Santiam Winter SH (Foster Dam)	Fish	1967	2002	No	No	No	No
" "	" "	" "	S. Santiam Winter SH (Redd Count)	RC	1980	2001	No	No	No	No
" "	" "	Westside Tributaries Winter (WEST-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 2. Details regarding use of data sets for evaluating jeopardy indicator metrics in the 2000 FCRPS Biop. Note that, in contrast to Table 1, considerations are not restricted to the 1980-present time period.

ESU	NPCC Subbasin	Population	Spawning Agregation	Data	Start Year	End Year	Can Lambda Be Calculated (Basis For All 2000 Biop Indicator Metrics, Including 50% Likelihood of Lambda>1 Recovery Indicator Metric)?	Can Survival Change For <5% Extinction Risk Be Calculated (For 2000 Biop Survival Indicator Metric)?	Can the Survival Change For 50% Likelihood of Recovery in 48 Years Be Calculated (For 2000 Biop Primary Recovery Indicator Metric)?	Can Updated Estimates Be Compared to 2000 Biop?
Snake River Fall Chinook Salmon	Snake-Hells Canyon, Snake-Lower	Snake River (SNMAI)	Snake River Fall Total	Fish	1975	2001	Yes	Yes	Yes - the interim recovery goal is 2500 aggregate spawners	Yes - Matches the "Snake River Fall Chinook Aggregate" data set used in the 2000 Biop.
Snake River Spring/Summer Chinook Salmon	Multiple	Aggregate	Snake R. Spring CH	Fish	1979	2001	Yes	Yes	No - no interim recovery goal for aggregate spring chinook	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Snake R Spr/Sum CH	Fish	1980	1999	Yes	Yes	No - no interim recovery goal for aggregate ESU	Yes - Matches the "Aggregate ESU" data set used in the 2000 Biop.
" "	" "	" "	Snake R. Summer CH	Fish	1979	2001	Yes	Yes	No - no interim recovery goal for aggregate summer chinook	No - there was not a similar data set used in the 2000 Biop.
" "	Grande Ronde	Catherine Ck (GRCAT)	Catherine Ck CH	Fish	1953	1996	Yes	Yes	No - no interim recovery goal	No - This is the "Catherine Creek" data set used in the 2000 Biop and it has not been updated since then. It is derived from the Catherine Creek Index CH data set, based on run reconstruction information.
" "	" "	" "	Catherine Cr Index CH	RC	1957	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - this data set does not match the "Catherine Creek" data set used in the 2000 Biop.
" "	" "	*Lookingglass Cr. - (GRLOO) (Historic Population - now only hatchery)*	*Lookingglass Cr CH*	*RC*	*1957*	*2001*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Minam R (GRMIN)	Minam R CH	Fish	1964	2001	Yes	Yes	Yes - the interim recovery goal is 439 spawners	Yes - Matches the "Minam River" data set used in the 2000 Biop.
" "	" "	Upper Mainstem (GRUMA)	Upper Grande Ronde CH	Fish	1959	1996	Yes	Yes	No - no interim recovery goal	No - This is the "Grande Ronde River" data set used in the 2000 Biop and it has not been updated since then. It is derived from the Upper Grande Ronde Index CH data set, based on run reconstruction information.
" "	" "	" "	Upper Grande Ronde Index CH	RC	1960	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - this data set does not match the "Grande Ronde River" data set used in the 2000 Biop.
" "	" "	Wallowa/Lostine (GRLOS)	Lostine R Index CH	RC	1964	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	Yes - Matches the "Lostine Creek" data set used in the 2000 Biop.
" "	" "	" "	Wallowa R Spring CH	RC	1963	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	Yes - Matches the "Wallowa Creek" data set used in the 2000 Biop.
" "	" "	Wenaha R (GRWEN)	Wenaha R Index Spring CH	RC	1963	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - this data set does not match the "Wenaha River" data set used in the 2000 Biop.
" "	" "	" "	Wenaha R Spring CH	Fish	1964	1996	Yes	Yes	No - no interim recovery goal	No - This is the "Wenaha River" data set used in the 2000 Biop and it has not been updated since then. It is derived from the Wenaha River Index CH data set, based on run reconstruction information.
" "	Imnaha	Big Sheep Ck (IRBSH)	Big Sheep Ck CH	RC	1957	2000	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	Yes - Matches the "Big Sheep Creek" data set used in the 2000 Biop.

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Snake River Spring/Summer Chinook Salmon	Imnaha	Imnaha R Mainstem (IRMAI)	Imnaha R CH	Fish	1953	2001	Yes	Yes	Yes - the interim recovery goal is 2500 spawners	Yes - Matches the "Imnaha River" data set used in the 2000 Biop.
" "	" "	**Imnaha R Mainstem (IRMAI)**	Lick Cr (Imnaha) CH	RC	1964	2001	No - there are too many zero returns, making some running sums go to zero, and lambda undefined because it requires natural logs of the running sums	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	Tucannon	Tucannon R (SNTUC)	Tucannon R Spring CH	Fish	1979	2001	Yes	Yes	Yes - the interim recovery goal is 1000 spawners and data set represents spawners.	No - there was not a similar data set used in the 2000 Biop.
" "	Salmon (*Middle Fork*)	Bear Valley/Elk Creeks (MFBEA)	Bear Valley/Elk Cr CH	Fish	1960	2001	Yes	Yes	Yes - the interim recovery goal is 911 spawners	Yes - Matches the "Bear Valley/Elk Creeks" data set used in the 2000 Biop.
" "	" "	Big Cr (MFBIG)	Big Cr Spring CH	Fish	1957	2001	Yes	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Big Cr Summer CH	RC	1957	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Camas Cr (MFCAM)	Camas Cr CH	RC	1972	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Camas Creek" data set used in the 2000 Biop - counts are greater than the Biop data set estimates and differences are not consistent.
" "	" "	Loon Cr (MFLOO)	Loon Ck CH	RC	1957	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	Yes - This data set does not match the "Loon Creek" data set used in the 2000 Biop - counts are approximately 16-18x greater than the Biop data set estimates, but the difference is fairly consistent so trends should be comparable.
" "	" "	Marsh Cr (MFMAR)	Marsh Cr CH	Fish	1957	2001	Yes	Yes	Yes - the interim recovery goal is 426 spawners	Yes - Matches the "Marsh Creek" data set used in the 2000 Biop.
" "	" "	Middle Fork Salmon Above Indian Cr. (MFUMA)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Middle Fork Salmon Below Indian Cr. (MFLMA)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Pistol Cr (MFPIS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Sulphur Creek (MFSUL)	Sulphur Cr Sp CH	Fish	1957	2001	Yes	Yes	No - no interim recovery goal	Yes - Matches the "Sulphur Creek" data set used in the 2000 Biop.
" "	Salmon (*S. Fork*)	EF SF Salmon/ Johnson Creek (SFEFS)	Johnson Creek	Fish	1957	2001	Yes	Yes	Yes - the interim recovery goal is 288 spawners	Yes - Matches the "Johnson Creek" data set used in the 2000 Biop.
" "	" "	Secesh R. (SFSEC)	Lake Cr Summer CH	RPM	1952	1997	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - this is the "Lake Creek" data set used in the 2000 Biop, but it has not been updated since then.
" "	" "	" "	Secesh R Summer CH	RC	1957	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Secesh River" data set used in the 2000 Biop - counts are greater than the Biop data set estimates and differences are not consistent.

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Snake River Spring/Summer Chinook Salmon	Salmon (*S. Fork*)	South Fork Salmon (SFMAI)	Poverty Flats	Fish	1957	2001	Yes	Yes	No - no interim recovery goal	Yes - Matches the "Poverty Flats" data set used in the 2000 Biop.
" "	" "	" "	South Fork Salmon Summer CH	RC	1957	2001	Yes	No - data set does not represent spawners	No - there is an interim recovery goal of 9200 spawners, but the data set does not represent spawners.	Yes - This data set does not match the "Salmon R. S. Fork" data set used in the 2000 Biop - counts are approximately 40x greater than the Biop data set estimates, but the difference is consistent so trends should be comparable.
" "	Salmon (*Tribs*)	Chamberlain Cr (SRCHA)	Chamberlain Cr CH	RPM	1952	1997	No - hatchery fraction is not available and many years of returns are missing	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Little Salmon R. (SRLSR)	*Rapid River (hatchery stock)*	*RPM*	*1972*	*2001*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Salmon (*Upper*)	E. Fork Salmon R. (SREFS)	East Fork Salmon Spring CH	RPM	1952	1997	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - there is an interim recovery goal of 700 spawners, but the data set does not represent spawners.	No - This data set does not match the "Salmon River E. Fork" data set used in the 2000 Biop
" "	" "	" "	East Fork Salmon Summer CH	RPM	1957	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Salmon River E. Fork" data set used in the 2000 Biop
" "	" "	" "	Herd Cr CH	RPM	1958	1986	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Lemhi R (SRLEM)	Lemhi R CH	RC	1957	2001	Yes	No - data set does not represent spawners	No - there is an interim recovery goal of 2200 spawners, but the data set does not represent spawners.	No - This data set does not match the "Lemhi River" data set used in the 2000 Biop - counts are much greater than the Biop data set estimates and differences are not consistent.
" "	" "	NF Salmon River (SRNFS)	North Fork Spring CH	RC	1960	2000	No - hatchery fraction is not available and several years of returns are missing	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Pahsimeroi R (SRPAH)	Pahsimeroi R CH	TLC	1980	2001	No - hatchery fraction is not available and several years of returns are missing	No - lambda, which is basis for calculation, could not be estimated	No - there is an interim recovery goal of 1300 (wild) spawners, but the data set does not distinguish between wild and hatchery spawners.	No - there was not a similar data set used in the 2000 Biop.
" "	" "	*Panther Creek (SRPAN) (Historic population)*	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Mainstem Salmon Above Redfish Lake (SRUMA)	Alturas Lake Cr CH	RC	1957	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Alturas Lake Creek" data set used in the 2000 Biop - counts are several times greater than the Biop data set estimates and differences are not consistent.
" "	" "	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Spring CH	RC	1954	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Upper Salmon River" data set used in the 2000 Biop

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Snake River Spring/Summer Chinook Salmon	Salmon (*Upper*)	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Summer CH	RPM	1957	1997	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - there is an interim recovery goal of 2000 spawners, but the data set does not represent spawners.	No - This data set does not match the "Upper Salmon River" data set used in the 2000 Biop
" "	" "	Valley Cr (SRVAL)	Upper Valley Cr Spring CH	RC	1957	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Upper Valley Creek" data set used in the 2000 Biop
" "	" "	" "	Upper Valley Cr Summer CH	RPM	1952	2000	No - hatchery fraction is not available and several years of returns are missing	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Upper Valley Creek" data set used in the 2000 Biop
		Yankee Fork (SRYFS)	Yankee Fork Spring CH	RPM	1952	1997	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Yankee Fork" data set used in the 2000 Biop
" "	" "	" "	Yankee Fork Summer CH	RC	1960	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Yankee Fork" data set used in the 2000 Biop
" "	" "	" "	Yankee Fork West Fk Spring CH	RC	1960	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - This data set does not match the "Yankee West Fork" data set used in the 2000 Biop - some differences are minor and others are quite large.
Snake River Steelhead	Multiple	Aggregate	ESU Snake R SH (TAC Report)	Fish	1980	2001	Yes	Yes	No - no interim recovery goal	Yes - This data set is a revised version of the "ESU Aggregate" data set used for the 2000 Biop - changes are not significant.
" "	" "	" "	Snake River A Total SH	Fish	1985	2001	Yes (but only after 1985 because of missing data in earlier years)	Yes	No - no interim recovery goal	No - This data set does not match the "A-Run Aggregate" data set used for the 2000 Biop - start year is 1985 (no comparable 1980-84 data), 1985 estimate differs by over 30,000 fish, counts after 1985 are close.
" "	" "	" "	Snake River B Total SH	Fish	1985	2001	Yes (but only after 1985 because of missing data in earlier years)	Yes	No - no interim recovery goal	No - This data set does not match the "B-Run Aggregate" data set used for the 2000 Biop - start year is 1985 (no comparable 1980-84 data), although subsequent years are similar in the two data sets.
" "	Asotin	Asotin Creek (SNASO-s)	Asotin Cr SH	Fish	1986	2001	No - hatchery fraction is not available and several years of returns are missing	No - lambda, which is basis for calculation, could not be estimated	No - there is an interim recovery goal of 500 (wild) spawners, but the data set does not distinguish between wild and hatchery spawners.	No - there was not a similar data set used in the 2000 Biop.
" "	Clearwater	Lochsa River (CRLOC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lolo Creek (CRLOL-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lower Clearwater R (CRLMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	*North Fork Clearwater (CRNFC-s) (Historic population)*	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

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Snake River Steelhead	Clearwater	Selway River (CRSEL-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	South Fork Clearwater (CRSFC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Grande Ronde	Joseph Creek (GRJOS-s)	Joseph Cr SH	Fish	1974	2002	Yes	Yes	Yes - the interim recovery goal is 1,400 spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Lower Grande Ronde (GRLMT-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Grande Ronde (GRUMA-s)	Upper Mainstem Grande Ronde SH	RPM	1967	2000	Yes	No - data set does not represent spawners	No - There is an interim recovery goal of 4000 spawners, but the data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Wallowa River (GRWAL-s)	Wallowa SH	RPM	1965	1996	No - hatchery fraction is not available and several years of returns are missing	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	Imnaha	Imnaha (IRMMT-s)	Camp Cr SH	Fish	1974	2002	Yes	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Imnaha R (Zumwalt/Camp Cr) SH	RPM	1974	2000	Yes	No - data set does not represent spawners	No - There is an interim recovery goal of 2700 spawners, but the data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	*Little Sheep Creek Hatchery SH*	*Fish*	*1985*	*2002*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	" "	Little Sheep Creek Wild SH	Fish	1985	2002	Yes (but only after 1985 because of missing data in earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Salmon River	Chamberlain Creek (SRCHA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Little Salmon and Lower almon Tribs (SRLSR-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	East Fork Salmon R (SREFS-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lemhi River (SRLEM-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Lower Middle Fork (MFBIG-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	North Fork Salmon R (SRNFS-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Pahsimeroi River (SRPAH-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Panther Creek (SRPAN-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Secesh River (SFSEC s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	South Fork Salmon R (SFMAI-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Mainstem Salmon R (SRUMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Middle Fork Salmon R (MFUMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

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Snake River Steelhead	Snake Hell's Canyon	Hell's Canyon tribs (SNHCT-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Tucannon	Tucannon R (SNTUC-s)	Tucannon R SH	Fish	1987	2001	Yes	Yes	Yes - there is an interim recovery goal of 500 spawners	No - there was not a similar data set used in the 2000 Biop.
Upper Columbia River Spring Chinook Salmon	Entiat	Entiat R (UCENT)	Entiat R CH	Fish	1960	2001	Yes	Yes	Yes - the interim recovery goal is 500 spawners	Yes - Matches the "Entiat River" data set used in the 2000 Biop.
" "	Methow	Methow R (UCMET)	Chewack R CH	RC	1960	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Lost R-Early Winters Cr CH	Fish	1958	2001	Yes	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Methow R CH (Total - Dam)	Fish	1960	2001	Yes	Yes	Yes - the interim recovery goal is 2000 spawners	Yes - Matches the "Methow River" data set used in the 2000 Biop. This data set includes all of the fish in the other Methow R data sets. All returning fish were intercepted in 1996 and 1998 for supplementation program so these years are missing from this data set.
" "	" "	" "	Methow R CH (Total - Dam) - Modified	Fish	1960	2001	Yes	Yes	Yes - the interim recovery goal is 2000 spawners	Yes - Matches the "Methow River" data set used in the 2000 Biop. This data set includes all of the fish in the other Methow R data sets. All returning fish were intercepted in 1996 and 1998 for supplementation program - the intercepted fish are counted as returns in those years for this data set.
" "	" "	" "	Methow R Mainstem CH	RC	1958	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Twisp R CH	RC	1958	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	Wenatchee	Wenatchee R (UCWEN)	Chiwawa R CH	RC	1958	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Icicle Cr CH	RC	1958	2001	No - hatchery fraction is not available	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Little Wenatchee R CH	RC	1958	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Nason Cr CH	RC	1958	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Upper Mainstem Wenatchee CH	RC	1959	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Wenatchee R (UCWEN)	Wenatchee R CH (Total - Dam)	Fish	1960	2001	Yes	Yes	Yes - the interim recovery goal is 3750 spawners	Yes - Matches the "Wenatchee River" data set used in the 2000 Biop. This count includes all of the fish in the other Wenatchee R data sets

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Upper Columbia River Spring Chinook Salmon	Wenatchee	Wenatchee R (UCWEN)	White R CH	RC	1958	2001	Yes	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
Upper Columbia River Steelhead	Methow	Methow R (UCMET-s)	Methow R SH	Fish	1976	2001	Yes	Yes	Yes - the interim recovery goal is 2500 spawners	No - This data set matches the "Methow River" data set used in the 2000 Biop. However, for the 2000 Biop, lambda for this data set was estimated by a different method (QAR - Cooney 2000) than current estimates of lambda. For an unknown reason the results do not appear to be comparable.
" "	Methow& Okanagan	Methow R (UCMET-s) & Okanagan R (UCOKA-s)	Above Wells SH	Fish	1976	2001	Yes	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Okanogan	Okanogan R (UCOKA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Wenatchee	Wenatchee R (UCWEN-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Wenatchee&Entiat	Wenatchee R (UCWEN-s) & Entiat R (UCENT-s)	Wenatchee - Entiat R SH	Fish	1976	2001	Yes	Yes	Yes? - the Wenatchee interim recovery goal is 2500 spawners, the Entiat goal is 500 spawners, so the combined goal could be considered 3000, but there would have to be some assurance that at least 500 fish spawn in the Entiat.	No - This data set matches the "Wenatchee/Entiat River" data set used in the 2000 Biop. However, for the 2000 Biop, lambda for this data set was estimated by a different method (QAR - Cooney 2000) than current estimates of lambda. For an unknown reason the results do not appear to be comparable.
Middle Columbia River Steelhead	Deschutes	Deschutes Eastside (DREST-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Deschutes Eastside (DREST-s) & Westside (DRWST-s)	Deschutes R SH (Sherars)	Fish	1978	2002	Yes	Yes	Yes - the interim recovery goal is 5400 spawners	No - This data set does not match the "Deschutes R Sum" data set used for the 2000 Biop - counts in this data set are considerably lower and do not vary consistently from the Biop data set.
" "	" "	Deschutes Westside (DRWST-s)	Shitike Cr SH	RPM	1976	2002	No - hatchery fraction is not available	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Deschutes Westside (DRWST-s)	*Warm Springs Hatchery SH*	*Fish*	*1980*	*1999*	*N/A*	*N/A*	*N/A*	*N/A - Also, this data set does not match the "Warm Springs NFH Sum" data set used for the 2000 Biop - counts are off-set by two years.*
" "	Fifteenmile	Fifteenmile Cr (MCFIF-s)	Fifteenmile Cr SH	RPM	1964	2001	Yes - but much missing data - can't do 1980-present because 80-83 missing	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	John Day	Lower Mainstem John Day (JDLMT-s)	Lower Mainstem John Day SH	RPM	1965	2002	Yes	No - data set does not represent spawners	No - there is an interim recovery goal of 3200 spawners, but the data set does not represent spawners.	No - there was not a similar data set used in the 2000 Biop.

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Middle Columbia River Steelhead	John Day	Middle Fork John Day (JDMF-s)	Middle Fork John Day SH	RPM	1974	2001	Yes	No - data set does not represent spawners	No - there is an interim recovery goal of 1300 spawners, but the data set does not represent spawners.	No - there was not a similar data set used in the 2000 Biop.
" "	" "	North Fork John Day (JDNFJ-s)	Lower North Fork John Day SH	RPM	1976	2002	Yes	No - data set does not represent spawners	No - there is an interim recovery goal of 1300 spawners, but the data set does not represent spawners.	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	Upper North Fork John Day	RPM	1977	2002	Yes	No - data set does not represent spawners	No - no interim recovery goal for Upper N. Fork (just for Upper and Lower, combined) and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	South Fork John Day (JDSF-s)	South Fork John Day SH	RPM	1974	2002	Yes	No - data set does not represent spawners	No - no interim recovery goal for Lower N. Fork (just for Upper and Lower, combined) and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Upper Mainstem John Day (JDUMA-s)	Upper Mainstem John Day SH	Fish	1974	2002	Yes	Yes	Yes - there is an interim recovery goal of 2000 spawners	No - there was not a similar data set used in the 2000 Biop.
" "	Klickitat	Klickitat R (MCKLI-s)	Klickitat R SH	RC	1990	2002	No - missing years in middle of short data set	No - data set does not represent spawners	No - there is an interim recovery goal of 3600 spawners, but the data set does not represent spawners.	No - there was not a similar data set used in the 2000 Biop.
" "	Palouse	Rock Creek (MCROC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Yakima	Aggregate - Dam	Yakima R SH	Fish	1980	2001	Yes	Yes	Yes? - the Yakima interim recovery goal is distributed among four reaches. If added together, the aggregate interim recovery goal would be 10,500 spawners, but there would have to be some assurance that the fish were distributed as anticipated in the more specific goals.	Yes - This data set is a revised version of the "Yakima R Sum" data set used for the 2000 Biop - changes are not significant.
" "	" "	Upper Mainstem (YRUMA-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Naches River (YRNAC-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Satus and Toppenish Creeks (YRTOS-s)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Umatilla	Umatilla R (MCUMA-s)	Umatilla R SH	Fish	1966	2002	Yes	Yes	Yes - there is an interim recovery goal of 2300 spawners, and the data set represents spawners.	No - This data set does not match the "Umatilla R Sum" data set used for the 2000 Biop - changes are significant.

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Middle Columbia River Steelhead	Walla Walla	Walla Walla R (WWMAI-s)	Walla Walla R SH	Fish	1993	2000	No - not enough data	No - not enough data	No - although there is a recovery goal of 2600 spawners, there is not enough data to determine the needed survival change	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Touchet R (WWTOU-s)	Touchet R SH	Fish	1987	2001	Yes	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
Columbia River Chum Salmon	Columbia Estuary	Big Creek (BIGC-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Chinook River (CHIN-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Clatskanie River (CLAT-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Mill Creek (MILL-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Young's Bay (YOUN-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Columbia Gorge	Upper Gorge tribs (UGRG-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Columbia Lower	Lower Gorge tribs (LGRG-CM)	Hardy Cr Chum	Fish	1957	2000	Yes	Yes	No - no interim recovery goal	No - data set does not match any of the chum salmon data sets used in the 2000 Biop
" "	" "	" "	Lower Gorge Chum	Fish	1944	2000	Yes	Yes	No - no interim recovery goal	No - data set does not match any of the chum salmon data sets used in the 2000 Biop
" "	Cowlitz	Cowlitz R. fall/summer (COWL-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Salmon Creek (SALM-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Elochman	Elochman River (ELOC-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Grays R	Grays R. (GRAY-CM)	Grays R Chum	Fish	1951	2000	Yes	Yes	No - no interim recovery goal	No - data set does not match any of the chum salmon data sets used in the 2000 Biop
" "	" "	" "	Grays River II Chum	Fish	1967	1998	No - unresolved questions about data	No - unresolved questions about data	No - no interim recovery goal	No - data set does not match any of the chum salmon data sets used in the 2000 Biop
" "	Kalama River	Kalama River (KALA-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Lewis River	Lewis River (LEWS-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Lower Columbia	Scappose Creek (SCAP-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Sandy	Sandy R. (SAND-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Washougal	Washougal R. (WASH-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Willamette	Clackamas R. (CLCK-CM)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

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Lower Columbia River Chinook Salmon	Big White Salmon	Big White Salmon R Fall (BWSR-KF)	Big White Salmon R Fall CH	Fish	1967	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Big White Salmon Spring (BWSR-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Columbia Estuary	Big Creek Fall (BIGC-KF)	Big Creek Fall CH	FPM	1970	2001	No - hatchery fraction is not available	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - data set does not match the "Big Creek" data set used in the 2000 Biop
" "	" "	Clatskanie R Fall (CLAT-KF)	Clatskanie Fall CH	FPM	1970	2001	No - hatchery fraction is not available	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - data set does not match the "Clatskanie" data set used in the 2000 Biop
" "	" "	Mill Creek Fall (MILL-KF)	Mill Creek Fall CH	Fish	1980	2001	Yes	Yes	No - no interim recovery goal	No - data set does not match the "Mill Fall" data set used in the 2000 Biop
" "	" "	Young's Bay Fall (YOUN-KF)	Young's Bay Fall CH	FPM	1950	2001	No - hatchery fraction is not available	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - data set does not match the "Youngs" data set used in the 2000 Biop
" "	Columbia Gorge	Lower Gorge Tribs LGRG-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Gorge Tribs (UGRG-KF)	Wind R Fall CH	Fish	1964	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Cowlitz	Cispus R Spring (CISP-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Coweeman R Fall (COWE-KF)	Coweeman R Fall CH	Fish	1964	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Tilton R Spring (TILT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Toutle R Fall (TOUT-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Toutle R Spring (TOUT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Cowlitz R Fall (UCWL-KF) + Lower Cowlitz R Fall (LCWL-KF)	Cowlitz R Fall CH	Fish	1964	2000	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	No - data set does not match the "Cowlitz Tule" data set used in the 2000 Biop
" "	" "	Upper Cowlitz R Spring (UCWL-KS)	Cowlitz R Spring CH	Fish	1980	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Elochoman	Elochoman R Fall (ELOC-KF)	Elochoman R Fall CH	Fish	1964	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	Yes - This data set is a revised version of the "Elochoman" data set used for the 2000 Biop - changes are not significant.
" "	Grays	Grays R Fall (GRAY-KF)	Grays R Fall CH	Fish	1964	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	Yes - This data set is a revised version of the "Grays Tule" data set used for the 2000 Biop - changes are not significant.
" "	Hood	Hood R Fall (HOOD-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Hood R Spring (HOOD-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Kalama	Kalama R Fall (KALA-KF)	Kalama R Fall CH	Fish	1964	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	Yes - This data set is a revised version of the "Kalama" data set used for the 2000 Biop - changes are not significant.

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Lower Columbia River Chinook Salmon	Kalama	Kalama R Spring (KALA-KS)	Kalama R Spring CH	Fish	1980	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	Yes - This data set is a revised version of the "Kalama Spring" data set used for the 2000 Biop - changes are not significant.
" "	Lewis	Lewis R. Late Fall (LEWL-KF)	EF Lewis CH (tule)	Fish	1980	2000	Yes	Yes	No - no interim recovery goal	Yes? - This data set is a revised version of the "Lewis, E Fk Tule" data set used for the 2000 Biop - most changes are not significant.
" "	" "	" "	Lewis R Late Fall CH (brights)	Fish	1964	2001	Yes	Yes	No - no interim recovery goal	Yes? - This data set is a revised version of the "Lewis R Bright" data set used for the 2000 Biop - most changes are not significant.
" "	" "	Lewis R. Spring (LEWS-KS)	Lewis R. Spring CH	Fish	1980	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	Yes - This data set is a revised version of the "Lewis Spring" data set used for the 2000 Biop - changes are not significant.
" "	" "	Salmon Creek Fall (SALM-KF)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Sandy	Sandy River Early Fall (SNDE-KF)	Sandy R Early Fall	Fish	1988	2001	No - not enough data (4 missing years in short time series)	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Sandy River Late Fall (SNDL-KF)	Sandy R Late Fall CH	Fish	1984	2001	Yes (but only after 1984 because no data for earlier years)	Yes	No - no interim recovery goal	Yes - matches the "Sandy Late" data set used in the 2000 Biop.
" "	Washougal	Washougal R Fall (WASH-KF)	Washougal R Fall CH	Fish	1964	2001	Yes (but only after 1980 because of missing hatchery fraction in earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Willamette	Clackamas R Fall Chinook (CLCK-KF)	Clackamas R Fall CH	Fish	1967	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
Lower Columbia River Steelhead	Columbia Gorge	Lower Gorge Tributaries (LRG-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Gorge Tributaries (UGRG-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Cowlitz	Cispus R Winter (CISP-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Coweeman R Winter (COWE-SW)	Coweeman R Winter SH	RC	1987	2002	No - not enough data (four missing years in short time series)	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Lower Cowlitz R Winter (LCWL-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	N Fork Toutle R Winter (Green River) (NTOU-SW)	N Fork Toutle Winter SH	Fish	1989	2002	Yes (but only after 1989 because no data for earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	S Fork Toutle R Winter (STOU-SW)	S Fork Toutle Winter SH	Fish	1984	2002	Yes (but only after 1984 because no data for earlier years)	Yes	No - no interim recovery goal	Yes? - This data set is very similar to the "Toutle winter" data set used for the 2000 Biop - most changes are not significant.
" "	" "	Tilton R Winter (TILT-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Upper Cowlitz R Winter (UCWL-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

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Lower Columbia River Steelhead	Hood	Hood R Summer (HOOD-SS)	Hood R Summer SH	Fish	1992	2000	No - not enough data (does not begin until 1992)	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Hood R Winter (HOOD-SW)	Hood R Winter SH	Fish	1992	2000	No - not enough data (does not begin until 1992)	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Kalama	Kalama R Summer (KALA-SS)	Kalama R Summer SH	Fish (Trap Count)	1977	2003	Yes	Yes	No - no interim recovery goal	Yes - matches the "Kalama summer" data set used in the 2000 Biop.
" "	" "	Kalama R Winter (KALA-SW)	Kalama R Winter SH	Fish	1977	2002	Yes	Yes	No - no interim recovery goal	Yes - matches the "Kalama River winter" data set used in the 2000 Biop.
" "	Lewis	E Fork Lewis R Summer (ELEW-SS)	EF Lewis R Summer SH	Fish	1996	2003	No - not enough data (does not begin until 1996)	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	E Fk Lewis R Winter (ELEW-SW)	E Fk Lewis R Winter SH	Fish	1985	1994	Yes (but only after 1985 because no data for earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	N Fork Lewis R Summer (NLEW-SS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	N Fk Lewis R Winter (NLEW-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	Sandy	Salmon Creek Winter (SALM-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Sandy R Winter (SAND-SW)	Sandy R Winter SH	Fish	1978	2001	Yes	Yes	No - no interim recovery goal	Yes - matches the "Sandy winter" data set used in the 2000 Biop.
" "	Washougal	Washougal R Summer (WASH-SS)	Washougal R Summer SH	Fish	1986	2003	Yes (but only after 1989 because no data for earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Washougal R Winter (WASH-SW)	Washougal R Winter SH	RC	1991	2002	No - not enough data (does not begin until 1991, and 1 year after that is missing)	No - lambda, which is basis for calculation, could not be estimated and data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.
" "	Willamette	Clackamas R Winter (CLCK-SW)	Clackamas R Winter SH	Fish	1958	2001	Yes	Yes	No - no interim recovery goal	No - This data set is a revised version of the "Clackamas winter" data set used for the 2000 Biop - some of the changes are significant.
" "	Wind	Wind R Summer - (WIND-SS)	Wind R Summer SH	Fish	1989	2003	Yes (but only after 1989 because no data for earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
Upper Willamette River Chinook Salmon	Sandy	Sandy R Spring (SAND-KS)	Sandy R Spring CH	Fish	1977	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	Willamette	Aggregate	Willamette Falls Spring CH	Fish	1946	2001	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	Calapooia R Spring (CALA-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Clackamas R Spring (CLCK-KS)	Clackamas R Spring CH (NF Dam)	Fish	1958	2002	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	McKenzie R Spring (MCKZ-KS)	McKenzie R Spring CH (Leaburg Dam)	Fish	1970	2001	No - hatchery fraction is not available prior to 1994	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	Yes - matches the "McKenzie River above Leaburg" data set used in the 2000 Biop.

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Upper Willamette River Chinook Salmon	Willamette	Middle Fork Willamette Spring (MFWL-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	Mollala R Spring (MOLA-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	N. Santiam R Spring (NSNT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
" "	" "	S. Santiam R Spring (SSNT-KS)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Upper Willamette River Steelhead	Willamette	Aggregate	Willamette Falls Winter SH Dam Counts	Fish	1971	2002	No - hatchery fraction is not available	No - lambda, which is basis for calculation, could not be estimated	No - no interim recovery goal	No - does not appear to correspond to the "ESU Aggregate" data set used in the 2000 Biop
" "	" "	Calapooia R Winter (CALA-SW)	Calapooia Winter SH	Fish	1980	1997	Yes	Yes	No - no interim recovery goal	No - This is the "Calapooia" data set used in the 2000 Biop and it has not been updated since then. It is derived from the Calapooia Winter SH (Redd Count) data set, based on run reconstruction information.
" "	" "	" "	Calapooia Winter SH (Redd Count)	RC	1980	2000	No - hatchery fraction not available after 1997	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - does not match the "Calapooia" data set used in the 2000 Biop
" "	" "	Mollala R Winter (MOLA-SW)	Mollala R Winter SH	Fish	1980	1997	Yes	Yes	No - no interim recovery goal	No - This is the "Mollala" data set used in the 2000 Biop and it has not been updated since then. It is derived from the Mollala R Winter SH (Redd Count) data set, based on run reconstruction information.
" "	" "	" "	Mollala R Winter SH (Redd Count)	RC	1980	2000	Yes	Yes	No - no interim recovery goal and data set does not represent spawners	No - does not match the "Mollala" data set used in the 2000 Biop
" "	" "	N. Santiam R Winter (NSNT-SW)	N. Santiam Winter SH (Redd Count)	RC	1983	2000	Yes (but only after 1983 because no data for earlier years)	Yes	No - no interim recovery goal and data set does not represent spawners	No - does not match the "N Santiam" data set used in the 2000 Biop
" "	" "	" "	N. Santiam Winter SH	Fish	1980	1997	Yes	Yes	No - no interim recovery goal	No - This is the "N Santiam" data set used in the 2000 Biop and it has not been updated since then. It is derived from the N Santiam Winter SH (Redd Count) data set, based on run reconstruction information.
" "	" "	S. Santiam R Winter (SSNT-SW)	Foster Dam Winter SH	Fish	1973	2000	Yes - (but only after 1983 because hatchery fraction not available for earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	S. Santiam Winter SH	Fish	1980	1997	Yes	Yes	No - no interim recovery goal	No - This is the "S Santiam" data set used in the 2000 Biop and it has not been updated since then. It is derived from some combination of the other S Santiam data sets.
" "	" "	" "	S. Santiam Winter SH (Foster Dam)	Fish	1967	2002	Yes (but only after 1982 because hatchery fraction not available for earlier years)	Yes	No - no interim recovery goal	No - there was not a similar data set used in the 2000 Biop.
" "	" "	" "	S. Santiam Winter SH (Redd Count)	RC	1980	2001	Yes - (but only after 1983 because hatchery fraction not available for earlier years)	No - data set does not represent spawners	No - no interim recovery goal and data set does not represent spawners	No - there was not a similar data set used in the 2000 Biop.

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Upper Willamette River Steelhead	Willamette	Westside Tributaries Winter (WEST-SW)	*No Applicable Data Set*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Table 3. Updated median population growth rate estimates (lambda), based on 1980 through most recent year available. Where comparable 2000 Biop estimates exist, the absolute difference in (updated - original) estimates is displayed.

				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**End Year**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**End Year**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**
Snake River Fall Chinook Salmon	Snake-Hells Canyon, Snake-Lower	Snake River (SNMAI)	Snake River Fall Total	2001	0.77	0.91	1.09	0.86	1.01	1.17	1996	**0.92**	**0.87**	-0.01	0.30
Snake River Spring/Summer Chinook Salmon	Multiple	Aggregate	Snake R. Spring CH	2001	0.75	**0.91**	1.10	0.65	**0.78**	0.94					
" "	" "	" "	Snake R Spr/Sum CH	1999	0.82	**0.90**	0.98	0.69	**0.77**	0.87	1999	**0.91**	**0.82**	-0.01	-0.05
" "	" "	" "	Snake R. Summer CH	2001	0.84	**0.96**	1.10	0.78	**0.89**	1.02					
" "	Grande Ronde	Catherine Ck (GRCAT)	Catherine Ck CH	1996											
" "	" "	" "	Catherine Cr Index CH	2001	0.77	**0.96**	1.19	0.67	**0.89**	1.19					
" "	" "	*Lookingglass Cr. - (GRLOO) (Historic Population - now only hatchery)*	*Lookingglass Cr CH*	*2001*											
" "	" "	Minam R (GRMIN)	Minam R CH	2001	0.76	**1.04**	1.44	0.70	**1.00**	1.43	1999	**0.98**	**0.93**	0.07	0.07
" "	" "	Upper Mainstem (GRUMA)	Upper Grande Ronde CH	1996											
" "	" "	" "	Upper Grande Ronde Index CH	2001	0.69	**0.87**	1.09	0.60	0.79	1.06					
" "	" "	Wallowa/Lostine (GRLOS)	Lostine R Index CH	2001	0.75	**1.00**	1.35	0.69	**0.96**	1.33	1997	**0.90**	**0.87**	0.10	0.09
" "	" "	" "	Wallowa R Spring CH	2001	0.58	**1.05**	1.88	0.52	**0.99**	1.88					
" "	" "	Wenaha R (GRWEN)	Wenaha R Index Spring CH	2001	0.74	**1.02**	1.42	0.64	**0.95**	1.40					
" "	" "	" "	Wenaha R Spring CH	1996											
" "	Imnaha	Big Sheep Ck (IRBSH)	Big Sheep Ck CH	2000	0.33	**0.79**	1.86	0.32	**0.74**	1.70	1997	**0.88**	**0.85**	-0.09	-0.12
" "	" "	Imnaha R Mainstem (IRMAI)	Imnaha R CH	2001	0.81	**0.98**	1.18	0.76	**0.92**	1.11	1999	**0.89**	**0.88**	0.08	0.04
" "	" "	Imnaha R Mainstem (IRMAI)	Lick Cr (Imnaha) CH	2001											
" "	Tucannon	Tucannon R (SNTUC)	Tucannon R Spring CH	2001	0.79	**0.93**	1.08	0.73	**0.88**	1.07					
" "	Salmon (*Middle Fork*)	Bear Valley/Elk Creeks (MFBEA)	Bear Valley/Elk Cr CH	2001	0.80	**1.07**	1.43	0.80	**1.07**	1.43	1999	**1.02**	**1.02**	0.05	0.05
" "	" "	Big Cr (MFBIG)	Big Cr Spring CH	2001	0.79	**1.06**	1.43	0.79	**1.06**	1.43					
" "	" "	" "	Big Cr Summer CH	2001											
" "	" "	Camas Cr (MFCAM)	Camas Cr CH	2001	0.85	**0.99**	1.15	0.85	**0.99**	1.15					
" "	" "	Loon Cr (MFLOO)	Loon Ck CH	2001	0.84	**1.09**	1.41	0.84	**1.09**	1.41	1999	**1.00**	**1.00**	0.08	0.08
" "	" "	Marsh Cr (MFMAR)	Marsh Cr CH	2001	0.79	**1.05**	1.39	0.79	**1.05**	1.39	1999	**0.99**	**0.99**	0.06	0.06
" "	" "	Middle Fork Salmon Above Indian Cr. (MFUMA)	*No Applicable Data Set*	*N/A*											
" "	" "	Middle Fork Salmon Below Indian Cr. (MFLMA)	*No Applicable Data Set*	*N/A*											
" "	" "	Pistol Cr (MFPIS)	*No Applicable Data Set*	*N/A*											

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				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**End Year**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**End Year**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**
Snake River Spring/Summer Chinook Salmon	Salmon (*Middle Fork*)	Sulphur Creek (MFSUL)	Sulphur Cr Sp CH	2001	0.67	**1.04**	1.63	0.67	**1.04**	1.63	1999	**1.04**	**1.04**	0.00	0.00
" "	Salmon (*S. Fork*)	EF SF Salmon/ Johnson Creek (SFEFS)	Johnson Creek	2001	0.88	**1.03**	1.20	0.88	**1.03**	1.20	1999	**1.01**	**1.01**	0.02	0.02
" "	" "	Secesh R. (SFSEC)	Lake Cr Summer CH	1997											
" "	" "	" "	Secesh R Summer CH	2001	0.91	**1.07**	1.26	0.91	**1.07**	1.26					
" "	" "	South Fork Salmon (SFMAI)	Poverty Flats	2001	0.84	**1.04**	1.29	0.84	**1.04**	1.29	1999	**1.00**	**0.99**	0.04	0.05
" "	" "	" "	South Fork Salmon Summer CH	2001	0.86	**1.07**	1.33	0.85	**1.06**	1.32	1999	**1.06**	**1.06**	0.01	0.00
" "	Salmon (*Tribs*)	Chamberlain Cr (SRCHA)	Chamberlain Cr CH	1997											
" "	" "	Little Salmon R. (SRLSR)	*Rapid River (hatchery stock)*	*2001*											
" "	Salmon (*Upper*)	E. Fork Salmon R. (SREFS)	East Fork Salmon Spring CH	1997											
" "	" "	" "	East Fork Salmon Summer CH	2001	0.70	**1.02**	1.50	0.70	**1.02**	1.50					
" "	" "	" "	Herd Cr CH	1986											
" "	" "	Lemhi R (SRLEM)	Lemhi R CH	2001	0.70	**1.02**	1.49	0.70	**1.02**	1.49					
" "	" "	NF Salmon River (SRNFS)	North Fork Spring CH	2000											
" "	" "	Pahsimeroi R (SRPAH)	Pahsimeroi R CH	2001											
" "	" "	*Panther Creek (SRPAN) (Historic population)*	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Mainstem Salmon Above Redfish Lake (SRUMA)	Alturas Lake Cr CH	2001											
" "	" "	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Spring CH	2001											
" "	" "	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Summer CH	1997											
" "	" "	Valley Cr (SRVAL)	Upper Valley Cr Spring CH	2001	0.65	**1.07**	1.78	0.65	**1.07**	1.78					
" "	" "	" "	Upper Valley Cr Summer CH	2000											
		Yankee Fork (SRYFS)	Yankee Fork Spring CH	1997											
" "	" "	" "	Yankee Fork Summer CH	2001	0.69	**1.03**	1.53	0.69	**1.03**	1.53					
" "	" "	" "	Yankee Fork West Fk Spring CH	2001											

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				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	NPCC Subbasin	Population	Spawning Agregation	End Year	Lower 95% CI	Lambda	Upper 95% CI	Lower 95% CI	Lambda	Upper 95% CI	End Year	Lambda @ 20% Hatch. Eff.	Lambda @ 80% Hatch. Eff.	Lambda @ 20% Hatch. Eff.	Lambda @ 80% Hatch. Eff.
Snake River Steelhead	Multiple	Aggregate	ESU Snake R SH (TAC Report)	2001	0.75	**0.87**	1.01	0.62	**0.73**	0.86	1997	**0.83**	**0.72**	0.04	0.01
" "	" "	" "	Snake River A Total SH	2001											
" "	" "	" "	Snake River B Total SH	2001											
" "	Asotin	Asotin Creek (SNASO-s)	Asotin Cr SH	2001											
" "	Clearwater	Lochsa River (CRLOC-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Lolo Creek (CRLOL-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Lower Clearwater R (CRLMA-s)	*No Applicable Data Set*	*N/A*											
	" "	*North Fork Clearwater (CRNFC-s) (Historic population)*	*No Applicable Data Set*	*N/A*											
" "	" "	Selway River (CRSEL-s)	*No Applicable Data Set*	*N/A*											
" "	" "	South Fork Clearwater (CRSFC-s)	*No Applicable Data Set*	*N/A*											
" "	Grande Ronde	Joseph Creek (GRJOS-s)	Joseph Cr SH	2002	0.81	**1.05**	1.37	0.81	**1.05**	1.37					
" "	" "	Lower Grande Ronde (GRLMT-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Grande Ronde (GRUMA-s)	Upper Mainstem Grande Ronde SH	2000	0.76	**1.03**	1.39	0.74	**1.01**	1.37					
" "	" "	Wallowa River (GRWAL-s)	Wallowa SH	1996											
" "	Imnaha	Imnaha (IRMMT-s)	Camp Cr SH	2002	0.79	**1.05**	1.38	0.79	**1.05**	1.38					
" "	" "	" "	Imnaha R (Zumwalt/Camp Cr) SH	2000	0.75	**1.00**	1.35	0.72	**0.98**	1.34					
" "	" "	" "	*Little Sheep Creek Hatchery SH*	*2002*											
" "	" "	" "	Little Sheep Creek Wild SH	2002	0.76	**1.05**	1.43	0.76	**1.05**	1.43					
" "	Salmon River	Chamberlain Creek (SRCHA-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Little Salmon and Lower almon Tribs (SRLSR-s)	*No Applicable Data Set*	*N/A*											
" "	" "	East Fork Salmon R (SREFS-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Lemhi River (SRLEM-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Lower Middle Fork (MFBIG-s)	*No Applicable Data Set*	*N/A*											
" "	" "	North Fork Salmon R (SRNFS-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Pahsimeroi River (SRPAH-s)	*No Applicable Data Set*	*N/A*											

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				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**End Year**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**End Year**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**
Snake River Steelhead	Salmon River	Panther Creek (SRPAN-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Secesh River (SFSEC-s)	*No Applicable Data Set*	*N/A*											
" "	" "	South Fork Salmon R (SFMAI-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Mainstem Salmon R (SRUMA-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Middle Fork Salmon R (MFUMA-s)	*No Applicable Data Set*	*N/A*											
" "	Snake Hell's Canyon	Hell's Canyon tribs (SNHCT-s)	*No Applicable Data Set*	*N/A*											
" "	Tucannon	Tucannon R (SNTUC-s)	Tucannon R SH	2001	0.66	**0.82**	1.02	0.60	**0.72**	0.85					
Upper Columbia River Spring Chinook Salmon	Entiat	Entiat R (UCENT)	Entiat R CH	2001	0.79	**0.93**	1.10	0.77	**0.91**	1.07	1998	0.85-0.89	0.81-0.89	0.04-0.08	0.03-0.10
" "	Methow	Methow R (UCMET)	Chewack R CH	2001	0.74	**1.01**	1.39	0.73	**0.99**	1.34					
" "	" "	" "	Lost R-Early Winters Cr CH	2001	0.73	**0.94**	1.20	0.72	**0.93**	1.20					
" "	" "	" "	Methow R CH (Total - Dam)	2001	0.72	1.00	1.40	0.70	0.97	1.35	1998	0.86-0.90	0.85-0.90	0.10-0.14	0.07-0.12
" "	" "	" "	Methow R CH (Total - Dam) - Modified	2001	0.88	1.03	1.21	0.88	1.01	1.17	1998	0.86-0.90	0.85-0.90	0.13-0.17	0.11-0.16
" "	" "	" "	Methow R Mainstem CH	2001	0.73	**0.97**	1.30	0.71	**0.94**	1.26					
" "	" "	" "	Twisp R CH	2001	0.70	**0.93**	1.24	0.70	**0.92**	1.22					
" "	Wenatchee	Wenatchee R (UCWEN)	Chiwawa R CH	2001	0.69	**0.92**	1.23	0.68	**0.90**	1.19					
" "	" "	" "	Icicle Cr CH	2001											
" "	" "	" "	Little Wenatchee R CH	2001	0.68	**0.88**	1.13	0.68	**0.88**	1.13					
" "	" "	" "	Nason Cr CH	2001	0.73	**0.92**	1.17	0.71	**0.90**	1.14					
" "	" "	" "	Upper Mainstem Wenatchee CH	2001	0.53	**0.91**	1.57	0.50	**0.88**	1.55					
" "	" "	Wenatchee R (UCWEN)	Wenatchee R CH (Total - Dam)	2001	0.69	**0.92**	1.24	0.68	**0.91**	1.20	1998	**0.80-0.88**	**0.80-0.88**	0.04-0.12	0.03-0.11
" "	" "	" "	White R CH	2001	0.75	**0.93**	1.15	0.75	**0.93**	1.15					
Upper Columbia River Steelhead	Methow	Methow R (UCMET-s)	Methow R SH	2001	0.66	**0.83**	1.03	0.51	**0.63**	0.77					
" "	Methow& Okanagan	Methow R (UCMET-s) & Okanagan R (UCOKA-s)	Above Wells SH	2001	0.64	**0.80**	0.99	0.49	**0.60**	0.73					
" "	Okanogan	Okanogan R (UCOKA-s)	*No Applicable Data Set*	*N/A*											
" "	Wenatchee	Wenatchee R (UCWEN-s)	*No Applicable Data Set*	*N/A*											
" "	Wenatchee&Entiat	Wenatchee R (UCWEN-s) & Entiat R (UCENT-s)	Wenatchee - Entiat R SH	2001	0.78	**0.93**	1.12	0.66	**0.77**	0.88					

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				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	NPCC Subbasin	Population	Spawning Agregation	End Year	Lower 95% CI	Lambda	Upper 95% CI	Lower 95% CI	Lambda	Upper 95% CI	End Year	Lambda @ 20% Hatch. Eff.	Lambda @ 80% Hatch. Eff.	Lambda @ 20% Hatch. Eff.	Lambda @ 80% Hatch. Eff.
Middle Columbia River Steelhead	Deschutes	Deschutes Eastside (DREST-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Deschutes Eastside (DREST-s) & Westside (DRWST-s)	Deschutes R SH (Sherars)	2002	0.76	**0.95**	1.20	0.69	**0.85**	1.04					
" "	" "	Deschutes Westside (DRWST-s)	Shitike Cr SH	2002											
" "	" "	Deschutes Westside (DRWST-s)	*Warm Springs Hatchery SH*	*1999*											
" "	Fifteenmile	Fifteenmile Cr (MCFIF-s)	Fifteenmile Cr SH	2001											
" "	John Day	Lower Mainstem John Day (JDLMT-s)	Lower Mainstem John Day SH	2002	0.67	**0.99**	1.48	0.67	**0.99**	1.48					
" "	" "	Middle Fork John Day (JDMF-s)	Middle Fork John Day SH	2001	0.77	**1.00**	1.29	0.77	**1.00**	1.29					
" "	" "	North Fork John Day (JDNFJ-s)	Lower North Fork John Day SH	2002	0.70	**1.01**	1.45	0.70	**1.01**	1.45					
" "	" "	" "	Upper North Fork John Day	2002	0.81	**1.01**	1.24	0.81	**1.01**	1.24					
" "	" "	South Fork John Day (JDSF-s)	South Fork John Day SH	2002	0.80	**0.98**	1.20	0.80	**0.98**	1.20					
" "	" "	Upper Mainstem John Day (JDUMA-s)	Upper Mainstem John Day SH	2002	0.75	**0.99**	1.30	0.75	**0.99**	1.30					
" "	Klickitat	Klickitat R (MCKLI-s)	Klickitat R SH	2002											
" "	Palouse	Rock Creek (MCROC-s)	*No Applicable Data Set*	*N/A*											
" "	Yakima	Aggregate - Dam	Yakima R SH	2001	0.86	**1.14**	1.53	0.85	**1.13**	1.50	1994	**1.04**	**1.01**	0.11	0.12
" "	" "	Upper Mainstem (YRUMA-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Naches River (YRNAC-s)	*No Applicable Data Set*	*N/A*											
" "	" "	Satus and Toppenish Creeks (YRTOS-s)	*No Applicable Data Set*	*N/A*											
Middle Columbia River Steelhead	Umatilla	Umatilla R (MCUMA-s)	Umatilla R SH	2002	0.84	**1.01**	1.22	0.80	**0.97**	1.18					
" "	Walla Walla	Walla Walla R (WWMAI-s)	Walla Walla R SH	2000											
" "	" "	Touchet R (WWTOU-s)	Touchet R SH	2001	0.85	**0.96**	1.07	0.83	**0.94**	1.06					

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				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**End Year**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**End Year**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**
Columbia River Chum Salmon	Columbia Estuary	Big Creek (BIGC-CM)	*No Applicable Data Set*	*N/A*											
" "	" "	Chinook River (CHIN-CM)	*No Applicable Data Set*	*N/A*											
" "	" "	Clatskanie River (CLAT-CM)	*No Applicable Data Set*	*N/A*											
" "	" "	Mill Creek (MILL-CM)	*No Applicable Data Set*	*N/A*											
" "	" "	Young's Bay (YOUN-CM)	*No Applicable Data Set*	*N/A*											
" "	Columbia Gorge	Upper Gorge tribs (UGRG-CM)	*No Applicable Data Set*	*N/A*											
" "	Columbia Lower	Lower Gorge tribs (LGRG-CM)	Hardy Cr Chum	2000	0.88	**1.03**	1.21	0.88	**1.03**	1.21					
" "	" "	" "	Lower Gorge Chum	2000	0.94	**1.03**	1.13	0.94	**1.03**	1.13					
" "	Cowlitz	Cowlitz R. fall/summer (COWL-CM)	*No Applicable Data Set*	*N/A*											
" "	" "	Salmon Creek (SALM-CM)	*No Applicable Data Set*	*N/A*											
" "	Elochman	Elochman River (ELOC-CM)	*No Applicable Data Set*	*N/A*											
" "	Grays R	Grays R. (GRAY-CM)	Grays R Chum	2000	0.92	**1.09**	1.29	0.92	**1.09**	1.29					
" "	" "	" "	Grays River II Chum (Eli added 99,00 from Grays River I for 80-00)	1998											
" "	Kalama River	Kalama River (KALA-CM)	*No Applicable Data Set*	*N/A*											
" "	Lewis River	Lewis River (LEWS-CM)	*No Applicable Data Set*	*N/A*											
" "	Lower Columbia	Scappose Creek (SCAP-CM)	*No Applicable Data Set*	*N/A*											
" "	Sandy	Sandy R. (SAND-CM)	*No Applicable Data Set*	*N/A*											
" "	Washougal	Washougal R. (WASH-CM)	*No Applicable Data Set*	*N/A*											
" "	Willamette	Clackamas R. (CLCK-CM)	*No Applicable Data Set*	*N/A*											

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					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**End Year**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**End Year**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**
Lower Columbia River Chinook Salmon	Big White Salmon	Big White Salmon R Fall (BWSR-KF)	Big White Salmon R Fall CH	2001	0.67	**0.89**	1.18	0.66	**0.88**	1.17					
" "	" "	Big White Salmon Spring (BWSR-KS)	*No Applicable Data Set*	*N/A*											
" "	Columbia Estuary	Big Creek Fall (BIGC-KF)	Big Creek Fall CH	2001											
" "	" "	Clatskanie R Fall (CLAT-KF)	Clatskanie Fall CH	2001											
" "	" "	Mill Creek Fall (MILL-KF)	Mill Creek Fall CH	2001	0.69	**0.88**	1.13	0.62	**0.80**	1.03					
" "	" "	Young's Bay Fall (YOUN-KF)	Young's Bay Fall CH	2001											
" "	Columbia Gorge	Lower Gorge Tribs LGRG-KF)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Gorge Tribs (UGRG-KF)	Wind R Fall CH	2001	0.53	**0.87**	1.42	0.53	**0.87**	1.41					
" "	Cowlitz	Cispus R Spring (CISP-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	Coweeman R Fall (COWE-KF)	Coweeman R Fall CH	2001	0.84	**1.13**	1.52	0.84	**1.13**	1.52					
" "	" "	Tilton R Spring (TILT-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	Toutle R Fall (TOUT-KF)	*No Applicable Data Set*	*N/A*											
" "	" "	Toutle R Spring (TOUT-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Cowlitz R Fall (UCWL-KF) + Lower Cowlitz R Fall (LCWL-KF)	Cowlitz R Fall CH	2000	0.59	**0.88**	1.31	0.48	**0.72**	1.09					
" "	" "	Upper Cowlitz R Spring (UCWL-KS)	Cowlitz R Spring CH	2001											
" "	Elochoman	Elochoman R Fall (ELOC-KF)	Elochoman R Fall CH	2001	0.63	**0.92**	1.36	0.53	**0.81**	1.22					
" "	Grays	Grays R Fall (GRAY-KF)	Grays R Fall CH	2001	0.60	**0.89**	1.33	0.57	**0.84**	1.23					
" "	Hood	Hood R Fall (HOOD-KF)	*No Applicable Data Set*	*N/A*											
" "	" "	Hood R Spring (HOOD-KS)	*No Applicable Data Set*	*N/A*											
" "	Kalama	Kalama R Fall (KALA-KF)	Kalama R Fall CH	2001	0.63	**0.93**	1.37	0.57	**0.84**	1.23	1996	**0.99**	**N.A.**	-0.06	N.A.
" "	" "	Kalama R Spring (KALA-KS)	Kalama R Spring CH	2001											
" "	Lewis	Lewis R. Late Fall (LEWL-KF)	EF Lewis CH (tule)	2000	0.92	**0.97**	1.03	0.91	**0.97**	1.03	1996	**0.99**	**N.A.**	-0.02	N.A.
" "	" "	" "	Lewis R Late Fall CH (brights)	2001	0.83	**0.95**	1.09	0.82	**0.94**	1.08	1996	**0.99**	**N.A.**	-0.03	N.A.

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					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	NPCC Subbasin	Population	Spawning Agregation	End Year	Lower 95% CI	Lambda	Upper 95% CI	Lower 95% CI	Lambda	Upper 95% CI	End Year	Lambda @ 20% Hatch. Eff.	Lambda @ 80% Hatch. Eff.	Lambda @ 20% Hatch. Eff.	Lambda @ 80% Hatch. Eff.
Lower Columbia River Chinook Salmon	Lewis	Lewis R. Spring (LEWS-KS)	Lewis R. Spring CH	2001											
" "	" "	Salmon Creek Fall (SALM-KF)	*No Applicable Data Set*	*N/A*											
" "	Sandy	Sandy River Early Fall (SNDE-KF)	Sandy R Early Fall	2001											
" "	" "	Sandy River Late Fall (SNDL-KF)	Sandy R Late Fall CH	2001											
" "	Washougal	Washougal R Fall (WASH-KF)	Washougal R Fall CH	2001	0.79	**0.95**	1.15	0.69	**0.84**	1.02					
" "	Willamette	Clackamas R Fall Chinook (CLCK-KF)	Clackamas R Fall CH	2001											
Lower Columbia River Steelhead	Columbia Gorge	Lower Gorge Tributaries (LRG-SW)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Gorge Tributaries (UGRG-SW)	*No Applicable Data Set*	*N/A*											
" "	Cowlitz	Cispus R Winter (CISP-SW)	*No Applicable Data Set*	*N/A*											
" "	" "	Coweeman R Winter (COWE-SW)	Coweeman R Winter SH	2002											
" "	" "	Lower Cowlitz R Winter (LCWL-SW)	*No Applicable Data Set*	*N/A*											
" "	" "	N Fork Toutle R Winter (Green River) (NTOU-SW)	N Fork Toutle Winter SH	2002											
" "	" "	S Fork Toutle R Winter (STOU-SW)	S Fork Toutle Winter SH	2002											
" "	" "	Tilton R Winter (TILT-SW)	*No Applicable Data Set*	*N/A*											
" "	" "	Upper Cowlitz R Winter (UCWL-SW)	*No Applicable Data Set*	*N/A*											
" "	Hood	Hood R Summer (HOOD-SS)	Hood R Summer SH	2000											
" "	" "	Hood R Winter (HOOD-SW)	Hood R Winter SH	2000											
" "	Kalama	Kalama R Summer (KALA-SS)	Kalama R Summer SH	2003	0.66	**0.84**	1.08	0.56	**0.71**	0.92	1996	**0.91**	**0.77**	-0.07	-0.05
" "	" "	Kalama R Winter (KALA-SW)	Kalama R Winter SH	2002	0.87	**0.96**	1.07	0.82	**0.91**	1.01	1995	**0.97**	**0.90**	-0.01	0.00
" "	Lewis	E Fork Lewis R Summer (ELEW-SS)	EF Lewis R Summer SH	2003											
" "	" "	E Fk Lewis R Winter (ELEW-SW)	E Fk Lewis R Winter SH	1994											
" "	" "	N Fork Lewis R Summer (NLEW-SS)	*No Applicable Data Set*	*N/A*											

Table 3. Updated median population growth rate estimates (lambda), based on 1980 through most recent year available. Where comparable 2000 Biop estimates exist, the absolute difference in (updated - original) estimates is displayed.

				Updated Analysis							Comparable Biop Estimate			Absolute Change	
					20% Hatchery Effectiveness			80% Hatchery Effectiveness							
ESU	**NPCC Subbasin**	**Population**	**Spawning Agregation**	**End Year**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**Lower 95% CI**	**Lambda**	**Upper 95% CI**	**End Year**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**	**Lambda @ 20% Hatch. Eff.**	**Lambda @ 80% Hatch. Eff.**
Lower Columbia River Steelhead	Lewis	N Fk Lewis R Winter (NLEW-SW)	*No Applicable Data Set*	*N/A*											
" "	Sandy	Salmon Creek Winter (SALM-SW)	*No Applicable Data Set*	*N/A*											
" "	" "	Sandy R Winter (SAND-SW)	Sandy R Winter SH	2001	0.81	**0.91**	1.01	0.75	**0.84**	0.94	1996	**0.91**	**0.85**	-0.01	-0.01
" "	Washougal	Washougal R Summer (WASH-SS)	Washougal R Summer SH	2003											
" "	" "	Washougal R Winter (WASH-SW)	Washougal R Winter SH	2002											
" "	Willamette	Clackamas R Winter (CLCK-SW)	Clackamas R Winter SH	2001	0.76	**0.92**	1.12	0.74	**0.90**	1.11					
" "	Wind	Wind R Summer - (WIND-SS)	Wind R Summer SH	2003											
Upper Willamette River Chinook Salmon	Sandy	Sandy R Spring (SAND-KS)	Sandy R Spring CH	2001											
" "	Willamette	Aggregate	Willamette Falls Spring CH	2001											
" "	" "	Calapooia R Spring (CALA-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	Clackamas R Spring (CLCK-KS)	Clackamas R Spring CH (NF Dam)	2002											
" "	" "	McKenzie R Spring (MCKZ-KS)	McKenzie R Spring CH (Leaburg Dam)	2001											
" "	" "	Middle Fork Willamette Spring (MFWL-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	Mollala R Spring (MOLA-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	N. Santiam R Spring (NSNT-KS)	*No Applicable Data Set*	*N/A*											
" "	" "	S. Santiam R Spring (SSNT-KS)	*No Applicable Data Set*	*N/A*											
Upper Willamette River Steelhead	Willamette	Aggregate	Willamette Falls Winter SH Dam Counts	2002											
" "	" "	Calapooia R Winter (CALA-SW)	Calapooia Winter SH	1997	0.81	**0.99**	1.22	0.81	**0.99**	1.22					
" "	" "	" "	Calapooia Winter SH (Redd Count)	2000											
" "	" "	Mollala R Winter (MOLA-SW)	Mollala R Winter SH	1997	0.89	**0.97**	1.04	0.82	**0.90**	0.98					
" "	" "	" "	Mollala R Winter SH (Redd Count)	2000	0.81	0.96	1.13	1.14	1.36	1.61					
" "	" "	N. Santiam R Winter (NSNT-SW)	N. Santiam Winter SH (Redd Count)	2000											
" "	" "	" "	N. Santiam Winter SH	1997	0.83	**0.95**	1.08	0.81	**0.92**	1.05					

Table 3. Updated median population growth rate estimates (lambda), based on 1980 through most recent year available. Where comparable 2000 Biop estimates exist, the absolute difference in (updated - original) estimates is displayed.

ESU	NPCC Subbasin	Population	Spawning Agregation	Updated Analysis: End Year	20% Hatchery Effectiveness: Lower 95% CI	20% Hatchery Effectiveness: Lambda	20% Hatchery Effectiveness: Upper 95% CI	80% Hatchery Effectiveness: Lower 95% CI	80% Hatchery Effectiveness: Lambda	80% Hatchery Effectiveness: Upper 95% CI	Comparable Biop Estimate: End Year	Comparable Biop Estimate: Lambda @ 20% Hatch. Eff.	Comparable Biop Estimate: Lambda @ 80% Hatch. Eff.	Absolute Change: Lambda @ 20% Hatch. Eff.	Absolute Change: Lambda @ 80% Hatch. Eff.
Upper Willamette River Steelhead	Willamette	S. Santiam R Winter (SSNT-SW)	Foster Dam Winter SH	2000											
" "	" "	" "	S. Santiam Winter SH	1997	0.79	**0.95**	1.14	0.77	**0.91**	1.07					
" "	" "	" "	S. Santiam Winter SH (Foster Dam)	2002											
" "	" "	" "	S. Santiam Winter SH (Redd Count)	2001											
" "	" "	Westside Tributaries Winter (WEST-SW)	*No Applicable Data Set*	*N/A*											

Table 4. Range of needed survival improvements to meet the critical jeopardy indicator metric over all data sets. Numbers represent survival multipliers (i.e., 1.04 = 1.04 times the current survival rate; 1.00 means no change is necessary)

	For Critical Indicator Metric			
	With No Additional Survival Improvements:		With Additional Survival Improvements From 2000 Biop	
	Lowest Estimate of Needed Survival Change From Tables 5-17	Highest Estimate of Needed Survival Change From Tables 5-17	Lowest Estimate of Needed Survival Change From Tables 5-17	Highest Estimate of Needed Survival Change From Tables 5-17
Snake River Fall Chinook Salmon	1.04	1.32	1.00	1.00
Snake River Spring/Summer Chinook Salmon	1.00	2.89	1.00	2.23
Snake River Steelhead	1.00	4.73	1.00	3.15
Upper Columbia River Spring Chinook Salmon	1.00	2.08	1.00	1.67
Upper Columbia River Steelhead	1.49	6.91	1.00	4.67
Middle Columbia River Steelhead	1.00	1.98	1.00	1.62
Columbia River Chum Salmon	1.00	1.00	1.00	1.00
Snake River Sockeye Salmon	N/A	N/A	N/A	N/A

Table 5 (Updated Table 9.7-7 in RPA). **Snake River fall chinook** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation assumes no adjustment to lambda to reflect harvest and hydro improvements.

									Additional Change In Survival Needed to Achieve:			
			1980-Present Lambda		Expected Survival Change		Expected Lambda		5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low**[1]	**High**[2]	**Low**[3]	**High**[4]	**Low**[5]	**High**[6]	**Low**[7]	**High**[8]	**Low**[7]	**High**[8]
Snake-Hells Canyon, Snake-Lower	**Snake River**	**Snake River Fall Total**	0.94	1.02	1.00	1.00	0.94	1.02	1.00	1.03	1.04	1.32

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 6. (Updated TABLE 9.7-7 in RPA). **Snake River fall chinook** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation adjusts lambda as in the 2000 FCRPS Biop to reflect harvest and hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		Additional Change In Survival Needed to Achieve: 50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Snake-Hells Canyon, Snake-Lower	**Snake River**	**Snake River Fall Total**	0.94	1.02	1.49	1.86	1.07	1.24	0.54	0.69	0.56	0.89

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents 2000 FCRPS Biop "low" survival improvement associated with base-current and current-RPA survival changes
4 "High" represents 2000 FCRPS Biop "high" survival improvement associated with base-current and current-RPA survival changes
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

.....Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
.....All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 7 (Updated Table 9.7-6 in RPA). **Snake River spring/summer chinook** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation assumes no adjustment to lambda to reflect hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		Additional Change In Survival Needed to Achieve: 50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low**[1]	**High**[2]	**Low**[3]	**High**[4]	**Low**[5]	**High**[6]	**Low**[7]	**High**[8]	**Low**[7]	**High**[8]
Multiple	**Aggregate**	**Snake R. Spring CH**	0.78	0.91	1.00	1.00	0.78	0.91	1.16	2.12	1.50	2.89
" "	" "	**Snake R Spr/Sum CH**	0.77	0.90	1.00	1.00	0.77	0.90	1.09	1.86	1.49	2.56
" "	" "	**Snake R. Summer CH**	0.89	0.96	1.00	1.00	0.89	0.96	1.00	1.25	1.19	1.70
Grande Ronde	**Catherine Cr**	**Catherine Cr Index CH**	0.89	0.96	1.00	1.00	0.89	0.96	N.A	N.A	1.19	1.61
" "	**Minam R.**	**Minam R CH**	1.00	1.04	1.00	1.00	1.00	1.04	1.00	1.09	0.98	1.14
" "	**Upper Mainstem**	**Upper Grande Ronde Index CH**	0.79	0.87	1.00	1.00	0.79	0.87	N.A	N.A	1.77	2.59
" "	**Wallowa R./Lostine R.**	**Lostine R Index CH**	0.96	1.00	1.00	1.00	0.96	1.00	N.A	N.A	1.00	1.19
" "	" "	**Wallowa R Spring CH**	0.99	1.05	1.00	1.00	0.99	1.05	N.A	N.A	0.84	1.02
" "	**Wenaha R**	**Wenaha R Index Spring CH**	0.95	1.02	1.00	1.00	0.95	1.02	N.A	N.A	0.91	1.24
Imnaha	**Big Sheep Ck**	**Big Sheep Ck CH**	0.74	0.79	1.00	1.00	0.74	0.79	N.A	N.A	2.29	2.89
" "	**Imnaha Mainstem**	**Imnaha R CH**	0.92	0.98	1.00	1.00	0.92	0.98	N.A	N.A	1.32	1.76
Salmon (Middle Fork)	**Bear Valley/Elk Creeks**	**Bear Valley - Elk Cr CH**	1.07	1.07	1.00	1.00	1.07	1.07	1.00	1.00	0.93	0.93
" "	**Big Cr**	**Big Cr Spring CH**	1.06	1.06	1.00	1.00	1.06	1.06	1.00	1.00	0.75	0.75
" "	**Camas Cr**	**Camas Cr CH**	0.99	0.99	1.00	1.00	0.99	0.99	N.A	N.A	1.05	1.05
" "	**Loon Cr**	**Loon Cr CH**	1.09	1.09	1.00	1.00	1.09	1.09	N.A	N.A	0.68	0.68
" "	**Marsh Cr**	**Marsh Cr CH**	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	1.13	1.13
" "	**Sulphur Cr**	**Sulphur Cr Spring CH**	1.04	1.04	1.00	1.00	1.04	1.04	1.42	1.42	0.83	0.83
Salmon (South Fork)	**EF SF Salmon/Johnson Cr**	**Johnson Cr CH**	1.03	1.03	1.00	1.00	1.03	1.03	N.A	N.A	1.01	1.01
" "	**Secesh R.**	**Secesh R Summer CH**	1.07	1.07	1.00	1.00	1.07	1.07	N.A	N.A	0.74	0.75
" "	**South Fork Salmon R.**	**Poverty Flat CH**	1.04	1.04	1.00	1.00	1.04	1.04	1.00	1.00	0.85	0.85
" "	" "	**South Fork Salmon Summer CH**	1.06	1.07	1.00	1.00	1.06	1.07	N.A	N.A	0.75	0.77
" "	**East Fork Salmon**	**East Fork Salmon Summer CH**	1.02	1.02	1.00	1.00	1.02	1.02	N.A	N.A	0.92	0.92
" "	**Lemhi R**	**Lemhi R CH**	1.02	1.02	1.00	1.00	1.02	1.02	N.A	N.A	0.92	0.92
" "	**Upper Valley Cr**	**Upper Valley Cr Spring CH**	1.07	1.07	1.00	1.00	1.07	1.07	N.A	N.A	0.72	0.72
" "	**Yankee Fork**	**Yankee Fork Summer CH**	1.03	1.03	1.00	1.00	1.03	1.03	N.A	N.A	0.91	0.91
Tucannon	**Tucannon R**	**Tucannon R Spring CH**	0.88	0.93	1.00	1.00	0.88	0.93	1.23	1.39	1.78	2.28

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 8 (Updated Table 9.7-6 in RPA). Snake River spring/summer chinook estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation adjusts lambda as in the 2000 FCRPS Biop to reflect hydro improvements.

									Additional Change In Survival Needed to Achieve:			
			1980-Present Lambda		Expected Survival Change		Expected Lambda		5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Multiple	**Aggregate**	**Snake R. Spring CH**	0.78	0.91	1.30	1.38	0.83	0.98	0.84	1.64	1.08	2.23
" "	" "	**Snake R Spr/Sum CH**	0.77	0.90	1.30	1.38	0.83	0.98	0.79	1.44	1.08	1.98
" "	" "	**Snake R. Summer CH**	0.89	0.96	1.30	1.38	0.94	1.03	0.72	0.97	0.86	1.31
Grande Ronde	**Catherine Cr**	**Catherine Cr Index CH**	0.89	0.96	1.30	1.38	0.95	1.04	N.A	N.A	0.86	1.24
" "	**Minam R.**	**Minam R CH**	1.00	1.04	1.30	1.38	1.07	1.12	0.72	0.84	0.71	0.88
" "	**Upper Mainstem**	**Upper Grande Ronde Index CH**	0.79	0.87	1.30	1.38	0.84	0.94	N.A	N.A	1.28	2.00
" "	**Wallowa R./Lostine R.**	**Lostine R Index CH**	0.96	1.00	1.30	1.38	1.02	1.08	N.A	N.A	0.72	0.92
" "	" "	**Wallowa R Spring CH**	0.99	1.05	1.30	1.38	1.07	1.14	N.A	N.A	0.61	0.79
" "	**Wenaha R**	**Wenaha R Index Spring CH**	0.95	1.02	1.30	1.38	1.01	1.11	N.A	N.A	0.65	0.96
Imnaha	**Big Sheep Ck**	**Big Sheep Ck CH**	0.74	0.79	1.30	1.38	0.80	0.87	N.A	N.A	1.66	2.23
" "	**Imnaha Mainstem**	**Imnaha R CH**	0.92	0.98	1.30	1.38	0.97	1.05	N.A	N.A	0.96	1.35
Salmon (Middle Fork)	**Bear Valley/Elk Creeks**	**Bear Valley - Elk Cr CH**	1.07	1.07	1.30	1.38	1.13	1.15	0.72	0.77	0.67	0.72
" "	**Big Cr**	**Big Cr Spring CH**	1.06	1.06	1.30	1.38	1.12	1.14	0.72	0.77	0.54	0.58
" "	**Camas Cr**	**Camas Cr CH**	0.99	0.99	1.30	1.38	1.05	1.06	N.A	N.A	0.76	0.81
" "	**Loon Cr**	**Loon Cr CH**	1.09	1.09	1.30	1.38	1.15	1.17	N.A	N.A	0.49	0.53
" "	**Marsh Cr**	**Marsh Cr CH**	1.05	1.05	1.30	1.38	1.11	1.12	0.72	0.77	0.82	0.87
" "	**Sulphur Cr**	**Sulphur Cr Spring CH**	1.04	1.04	1.30	1.38	1.10	1.12	1.03	1.10	0.60	0.64
Salmon (South Fork)	**EF SF Salmon/Johnson Cr**	**Johnson Cr CH**	1.03	1.03	1.30	1.38	1.09	1.11	N.A	N.A	0.73	0.78
" "	**Secesh R.**	**Secesh R Summer CH**	1.07	1.07	1.30	1.38	1.14	1.16	N.A	N.A	0.54	0.58
" "	**South Fork Salmon R.**	**Poverty Flat CH**	1.04	1.04	1.30	1.38	1.11	1.12	0.72	0.77	0.61	0.65
" "	" "	**South Fork Salmon Summer CH**	1.06	1.07	1.30	1.38	1.13	1.15	N.A	N.A	0.54	0.60
" "	**East Fork Salmon**	**East Fork Salmon Summer CH**	1.02	1.02	1.30	1.38	1.10	1.12	N.A	N.A	0.66	0.71
" "	**Lemhi R**	**Lemhi R CH**	1.02	1.02	1.30	1.38	1.08	1.10	N.A	N.A	0.66	0.71
" "	**Upper Valley Cr**	**Upper Valley Cr Spring CH**	1.07	1.07	1.30	1.38	1.13	1.15	N.A	N.A	0.52	0.56
" "	**Yankee Fork**	**Yankee Fork Summer CH**	1.03	1.03	1.30	1.38	1.10	1.12	N.A	N.A	0.66	0.70
Tucannon	**Tucannon R**	**Tucannon R Spring CH**	0.88	0.93	1.30	1.38	0.94	1.01	0.89	1.07	1.29	1.76

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
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5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 200
Note: This table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are availabl

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 9 (Updated Table 9.7-11 in RPA). **Snake River steelhead** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation assumes no adjustment to lambda to reflect harvest or hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		Additional Change In Survival Needed to Achieve: Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Multiple	**Aggregate**	**ESU Snake River SH (TAC Report**	0.73	0.87	1.00	1.00	0.73	0.87	1.16	2.36	1.99	4.73
Grande Ronde	**Joseph Creek**	**Joseph Cr SH**	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	0.83	0.83
Grande Ronde	**Upper Grande Ronde**	**Upper Mainstem Grande Ronde SH**	1.01	1.03	1.00	1.00	1.01	1.03	NA	NA	0.87	0.96
Imnaha	**Imnaha**	**Camp Cr SH**	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	0.82	0.82
Imnaha	**Imnaha**	**Imnaha R (Zumwalt/Camp Cr) SH**	0.98	1.00	1.00	1.00	0.98	1.00	NA	NA	1.00	1.09
Imnaha	**Imnaha**	**Little Sheep Creek Wild SH**	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	0.83	0.83
Tucannon	**Tucannon R**	**Tucannon R SH**	0.72	0.82	1.00	1.00	0.72	0.82	2.10	3.64	2.47	4.47

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 yea
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 10 (Updated Table 9.7-11 in RPA). **Snake River steelhead** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation adjusts lambda as in the 2000 FCRPS Biop to reflect harvest and hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		Additional Change In Survival Needed to Achieve: Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low**[1]	**High**[2]	**Low**[3]	**High**[4]	**Low**[5]	**High**[6]	**Low**[7]	**High**[8]	**Low**[7]	**High**[8]
Multiple	**Aggregate**	**ESU Snake River SH (TAC Report**	0.73	0.87	1.50	1.61	0.79	0.96	0.72	1.57	1.24	3.15
Grande Ronde	**Joseph Creek**	**Joseph Cr SH**	1.05	1.05	1.50	1.61	1.16	1.18	0.62	0.67	0.51	0.55
Grande Ronde	**Upper Grande Ronde**	**Upper Mainstem Grande Ronde SH**	1.01	1.03	1.50	1.61	1.10	1.14	NA	NA	0.54	0.64
Imnaha	**Imnaha**	**Camp Cr SH**	1.05	1.05	1.50	1.61	1.15	1.17	0.62	0.67	0.51	0.55
Imnaha	**Imnaha**	**Imnaha R (Zumwalt/Camp Cr) SH**	0.98	1.00	1.50	1.61	1.08	1.12	NA	NA	0.62	0.72
Imnaha	**Imnaha**	**Little Sheep Creek Wild SH**	1.05	1.05	1.50	1.61	1.15	1.17	0.62	0.67	0.51	0.55
Tucannon	**Tucannon R**	**Tucannon R SH**	0.72	0.82	1.50	1.61	0.79	0.91	1.31	2.42	1.54	2.98

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: This table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 yea
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 11 (Updated Table 9.7-8 in RPA). **Upper Columbia River spring chinook** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the RPA. This presentation assumes no adjustment to lambda to reflect hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		Additional Change In Survival Needed to Achieve: 50% Recovery In 48 Years or Lambda =	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Entiat	**Entiat R**	**Entiat R CH**	0.91	0.93	1.00	1.00	0.91	0.93	1.23	1.33	1.72	1.88
Methow	**Methow R**	**Chewack R CH**	0.99	1.01	1.00	1.00	0.99	1.01	NA	NA	0.96	1.04
" "	" "	**Lost R-Early Winters Cr CH**	0.93	0.94	1.00	1.00	0.93	0.94	1.58	1.57	1.30	1.37
" "	" "	**Methow R CH (Total - Dam)**	0.97	1.00	1.00	1.00	0.97	1.00	1.07	1.15	1.22	1.39
" "	" "	**Methow R CH (Total - Dam) - Modified**	1.01	1.03	1.00	1.00	1.01	1.03	NA	NA	1.09	1.19
" "	" "	**Methow R Mainstem CH**	0.94	0.97	1.00	1.00	0.94	0.97	NA	NA	1.14	1.31
" "	" "	**Twisp R CH**	0.92	0.93	1.00	1.00	0.92	0.93	NA	NA	1.37	1.44
Wenatchee	**Wenatchee R**	**Chiwawa R CH**	0.90	0.92	1.00	1.00	0.90	0.92	NA	NA	1.43	1.57
" "	" "	**Little Wenatchee R CH**	0.88	0.88	1.00	1.00	0.88	0.88	NA	NA	1.74	1.71
" "	" "	**Nason Cr CH**	0.90	0.92	1.00	1.00	0.90	0.92	NA	NA	1.43	1.58
" "	" "	**Upper Mainstem Wenatchee CH**	0.88	0.91	1.00	1.00	0.88	0.91	NA	NA	1.50	1.74
" "	" "	**Wenatchee R CH**	0.91	0.92	1.00	1.00	0.91	0.92	1.34	1.29	1.99	2.08
" "	" "	**White R CH**	0.93	0.93	1.00	1.00	0.93	0.93	NA	NA	1.37	1.37

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
Note: For as yet unknown reasons, lambda was higher under the 80% assumption than under the 20% assumption for four spawning aggregations, so "low" and "high" are reversed from the description in Fo
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 yea
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 12 (Updated Table 9.7-8 in RPA). **Upper Columbia River spring chinook** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the RPA. This presentation adjusts lambda as in the 2000 FCRPS Biop to reflect hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda =	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Entiat	**Entiat R**	**Entiat R CH**	0.91	0.93	1.37	1.55	0.98	1.03	0.79	0.97	0.87	1.08
Methow	**Methow R**	**Chewack R CH**	0.99	1.01	1.46	1.65	1.08	1.13	NA	NA	0.58	0.72
" "	" "	**Lost R-Early Winters Cr CH**	0.93	0.94	1.46	1.65	1.02	1.06	0.96	1.07	0.79	0.94
" "	" "	**Methow R CH (Total - Dam)**	0.97	1.00	1.46	1.65	1.06	1.12	0.65	0.79	0.74	0.95
" "	" "	**Methow R CH (Total - Dam) - Modified**	1.01	1.03	1.46	1.65	1.10	1.16	#VALUE!	#VALUE!	0.66	0.82
" "	" "	**Methow R Mainstem CH**	0.94	0.97	1.46	1.65	1.03	1.09	NA	NA	0.69	0.89
" "	" "	**Twisp R CH**	0.92	0.93	1.46	1.65	1.00	1.04	NA	NA	0.83	0.98
Wenatchee	**Wenatchee R**	**Chiwawa R CH**	0.90	0.92	1.25	1.42	0.95	1.00	NA	NA	1.00	1.25
" "	" "	**Little Wenatchee R CH**	0.88	0.88	1.25	1.42	0.93	0.95	NA	NA	1.23	1.36
" "	" "	**Nason Cr CH**	0.90	0.92	1.25	1.42	0.95	1.00	NA	NA	1.01	1.26
" "	" "	**Upper Mainstem Wenatchee CH**	0.88	0.91	1.25	1.42	0.93	0.99	NA	NA	1.06	1.39
" "	" "	**Wenatchee R CH**	0.91	0.92	1.25	1.42	0.96	1.00	0.94	1.03	1.40	1.67
" "	" "	**White R CH**	0.93	0.93	1.25	1.42	0.98	1.01	NA	NA	0.97	1.10

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
Note: For as yet unknown reasons, lambda was higher under the 80% assumption than under the 20% assumption for four spawning aggregations, so "low" and "high" are reversed from the description in Fo
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 yea
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 13 (Updated Table 9.7-12 in RPA). **Upper Columbia River steelhead** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation assumes no adjustment to lambda to reflect harvest or hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to 5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Methow	**Methow R.**	**Methow R SH**	0.63	0.83	1.00	1.00	0.63	0.83	2.23	6.18	2.47	6.91
Okanogan and Methow	**Okanagan R and Methow R.**	**Above Wells SH**	0.60	0.80	1.00	1.00	0.60	0.80	2.44	7.07	2.30	6.71
Wenatchee and Entiat	**Wenatchee R. and Entiat R**	**Wenatchee - Entiat R SH**	0.77	0.93	1.00	1.00	0.77	0.93	1.20	2.52	1.49	3.03

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: This table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 yea
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 14 (Updated Table 9.7-12 in RPA). **Upper Columbia River steelhead** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation adjusts lambda as in the 2000 FCRPS Biop to reflect harvest and hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to: 5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Methow	**Methow R.**	**Methow R SH**	0.63	0.83	1.48	1.68	0.70	0.95	1.33	4.18	$\boxed{1.47}$	$\boxed{4.67}$
Okanogan and Methow	**Okanagan R and Methow R.**	**Above Wells SH**	0.60	0.80	1.48	1.68	0.67	0.92	1.45	4.77	1.37	4.53
Wenatchee and Entiat	**Wenatchee R. and Entiat R**	**Wenatchee - Entiat R SH**	0.77	0.93	1.31	1.49	0.83	1.03	0.81	1.92	$\boxed{1.00}$	$\boxed{2.31}$

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

$\boxed{}$ …..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 yea
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 15 (Updated Table 9.7-13 in RPA). **Mid-Columbia River steelhead** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA.** This presentation assumes no adjustment to lambda to reflect harvest or hydro improvements.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		Additional Change In Survival Needed to Achieve: 50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	Population	Spawning Aggregation	Low[1]	High[2]	Low[3]	High[4]	Low[5]	High[6]	Low[7]	High[8]	Low[7]	High[8]
Deschutes	**Deschutes East and West Sides**	**Deschutes R SH**	0.85	0.95	1.00	1.00	0.85	0.95	NA	NA	1.24	1.98
John Day	**Lower Mainstem John Day**	**Lower Mainstem John Day SH**	0.99	0.99	1.00	1.00	0.99	0.99	NA	NA	1.03	1.03
" "	**Middle Fork John Day**	**Middle Fork John Day SH**	1.00	1.00	1.00	1.00	1.00	1.00	NA	NA	1.02	1.02
" "	**North Fork John Day**	**Lower North Fork John Day SH**	1.01	1.01	1.00	1.00	1.01	1.01	NA	NA	0.97	0.97
" "	" "	**Upper North Fork John Day SH**	1.01	1.01	1.00	1.00	1.01	1.01	NA	NA	0.98	0.98
" "	**South Fork John Day**	**South Fork John Day SH**	0.98	0.98	1.00	1.00	0.98	0.98	NA	NA	1.08	1.08
" "	**Upper Mainstem John Day**	**Upper Mainstem John Day SH**	0.99	0.99	1.00	1.00	0.99	0.99	1.00	1.00	1.05	1.05
Umatilla	**Umatilla**	**Umatilla R SH**	0.97	1.01	1.00	1.00	0.97	1.01	1.00	1.00	0.96	1.12
Walla Walla	**Touchet R**	**Touchet R SH**	0.94	0.96	1.00	1.00	0.94	0.96	1.00	1.00		
Yakima	**Upper Mainstem, Naches River, and Toppenish and Satus Creek**	**Yakima R SH**	1.13	1.14	1.00	1.00	1.13	1.14	1.00	1.00	0.56	0.58

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 16 (Updated Table 9.7-13 in RPA). **Mid-Columbia River steelhead** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. This presentation adjusts lambda as in the 2000 FCRPS Biop to reflect harvest and hydro improvements.

									Additional Change In Survival Needed to Achieve:			
			1980-Present Lambda		Expected Survival Change		Expected Lambda		5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	Population	Spawning Aggregation	Low[1]	High[2]	Low[3]	High[4]	Low[5]	High[6]	Low[7]	High[8]	Low[7]	High[8]
Deschutes	**Deschutes East and West Sides**	**Deschutes R SH**	0.85	0.95	1.22	1.22	0.89	1.00	NA	NA	1.02	1.62
John Day	**Lower Mainstem John Day**	**Lower Mainstem John Day SH**	0.99	0.99	1.33	1.33	1.07	1.07	NA	NA	0.78	0.78
" "	**Middle Fork John Day**	**Middle Fork John Day SH**	1.00	1.00	1.33	1.33	1.07	1.07	NA	NA	0.76	0.76
" "	**North Fork John Day**	**Lower North Fork John Day SH**	1.01	1.01	1.33	1.33	1.09	1.09	NA	NA	0.73	0.73
" "	" "	**Upper North Fork John Day SH**	1.01	1.01	1.33	1.33	1.08	1.08	NA	NA	0.74	0.74
" "	**South Fork John Day**	**South Fork John Day SH**	0.98	0.98	1.33	1.33	1.06	1.06	NA	NA	0.81	0.81
" "	**Upper Mainstem John Day**	**Upper Mainstem John Day SH**	0.99	0.99	1.33	1.33	1.06	1.06	0.75	0.75	0.79	0.79
Umatilla	**Umatilla**	**Umatilla R SH**	0.97	1.01	1.33	1.33	1.05	1.09	0.75	0.75	0.72	0.84
Walla Walla	**Touchet R**	**Touchet R SH**	0.94	0.96	1.09	1.24	0.96	1.00	0.81	0.92		
Yakima	**Upper Mainstem, Naches River, and Toppenish and Satus Creek**	**Yakima R SH**	1.13	1.14	1.09	1.24	1.15	1.20	0.81	0.92	0.45	0.54

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 17 (Updated Table 9.7-16 in RPA). **Columbia River chum salmon** estimates of current and expected median annual population growth rate (lambda), expected survival change from RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the **RPA**. No survival improvements were estimated in Table 9.7-16.

			1980-Present Lambda		Expected Survival Change		Expected Lambda		Additional Change In Survival Needed to Achieve: 5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Subbasin	**Population**	**Spawning Aggregation**	**Low[1]**	**High[2]**	**Low[3]**	**High[4]**	**Low[5]**	**High[6]**	**Low[7]**	**High[8]**	**Low[7]**	**High[8]**
Columbia Lower	**Lower Gorge**	**Hardy Cr Chum**	1.03	1.03	1.00	1.00	1.03	1.03	1.00	1.00	0.89	0.89
Columbia Lower	**Lower Gorge**	**Lower Gorge Chum**	1.03	1.03	1.00	1.00	1.03	1.03	NA	NA	0.90	0.90
Grays R	**Grays R**	**Grays R Chum**	1.09	1.09	1.00	1.00	1.09	1.09	1.00	1.00	0.73	0.73

1 "Low" represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
2 "High" represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically, except for the Imnaha (50% as effective).
3 "Low" represents
4 "High" represents
5 "Low" represents the "Low" 1980-Present lambda estimate multiplied by the "Low" survival improvement estimate, raised to the power of 1/mean generation time.
6 "High" represents the "High" 1980-Present lambda estimate multiplied by the "High" survival improvement estimate, raised to the power of 1/mean generation time.
7 "Low" represents the lowest estimate of needed survival improvement divided by the "High" estimate of the expected survival improvement.
8 "High" represents the highest estimate of needed survival improvement divided by the "Low" estimate of the expected survival improvement.

Note: The 48-year recovery period is treated as beginning in 1995. Therefore, calculations used a 41-year period from 2003.
Note: **T**his table includes only those spawning aggregations for which valid lambda calculations through at least 2000 are available

…..Box indicates estimates based on 50% probability of reaching interim recovery abundance levels in 48 years
…..All other recovery estimates are based on achieving lambda = 1.0 in 48 immediately

Table 18. Updated median population growth rate estimates (lambda), from the earliest available data and fromm 1990 through the most recent year available

				Longest Series								**1990-Most Recent**						
						20% Hatchery Effectiveness			**80% Hatchery Effectiveness**				**20% Hatchery Effectiveness**			**80% Hatchery Effectiveness**		
ESU	**NPPC Subbasin**	**Population**	**Spawning aggregation**	**Start Year**	**End Year**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**LastYear**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**
Snake River Fall Chinook Salmon	**Snake-Hells Canyon, Snake-Lower**	**Snake River (SNMAI)**	**Snake River Fall Total**	1975	2001	0.81	**0.92**	1.04	0.89	**0.99**	1.10	2001	0.85	**1.00**	1.19	0.86	1.10	1.39
Snake River Spring/Summer Chinook Salmon	Multiple	Aggregate	Snake R. Spring CH	1979	2001	0.77	**0.92**	1.10	0.66	**0.79**	0.95	2001	0.31	**0.91**	2.62	0.30	0.76	1.91
" "	" "	" "	Snake R Spr/Sum CH	1980	1999	0.82	**0.90**	0.98	0.69	**0.77**	0.87	1999	0.43	**0.86**	1.73	0.42	0.74	1.29
" "	" "	" "	Snake R. Summer CH	1979	2001	0.85	**0.97**	1.10	0.79	**0.89**	1.02	2001	0.71	**0.97**	1.31	0.64	0.88	1.22
" "	Grande Ronde	Catherine Ck (GRCAT)	Catherine Ck CH	1953	1996	0.76	**0.89**	1.05	0.70	**0.86**	1.05	1996	N.A.	**0.91**	N.A.	N.A.	0.79	N.A.
" "	" "	" "	Catherine Cr Index CH	1957	2001	0.85	**0.96**	1.09	0.80	**0.93**	1.08	2001	0.56	**1.11**	2.21	0.41	1.04	2.63
" "	" "	*(GRLOO) (Historic*	*Lookingglass Cr CH*	*1957*	*2001*													
" "	" "	**Minam R (GRMIN)**	**Minam R CH**	1964	2001	0.82	**0.97**	1.15	0.79	**0.95**	1.13	2001	0.92	**1.08**	1.26	0.72	1.03	1.47
" "	" "	Upper Mainstem (GRUMA)	Upper Grande Ronde CH	1959	1996	0.74	**0.89**	1.08	0.68	**0.85**	1.07	1996	N.A.	**0.81**	N.A.	N.A.	0.68	N.A.
" "	" "	" "	Upper Grande Ronde Index CH	1960	2001	0.81	**0.91**	1.03	0.74	**0.87**	1.03	2001	0.50	**0.88**	1.53	0.33	0.81	1.96
" "	" "	**(GRLOS)**	**Lostine R Index CH**	1964	2001	0.85	**0.97**	1.11	0.82	**0.95**	1.10	2001	0.58	**1.15**	2.27	0.47	1.09	2.55
" "	" "	" "	Wallowa R Spring CH	1963	2001	0.72	**0.94**	1.23	0.69	**0.92**	1.22	2001	N.A.	**1.45**	N.A.	N.A.	1.38	N.A.
" "	" "	Wenaha R (GRWEN)	Wenaha R Index Spring CH	1963	2001	0.82	**0.96**	1.12	0.77	**0.92**	1.10	2001	0.68	**1.22**	2.18	0.49	1.13	2.64
" "	" "	" "	Wenaha R Spring CH	1964	1996	0.77	**0.90**	1.04	0.72	**0.86**	1.03	1996	N.A.	**1.07**	N.A.	N.A.	0.90	N.A.
" "	Imnaha	Big Sheep Ck (IRBSH)	Big Sheep Ck CH	1957	2000	0.59	**0.83**	1.18	0.57	**0.80**	1.14	2000	0.09	**0.96**	10.41	0.09	0.84	7.65
" "	" "	**Imnaha R Mainstem (IRMAI)**	**Imnaha R CH**	1953	2001	0.88	**0.96**	1.04	0.86	**0.93**	1.02	2001	0.50	**1.06**	2.24	0.43	0.94	2.04
" "	" "	" "	Lick Cr (Imnaha) CH	1964	2001													
" "	Tucannon	Tucannon R (SNTUC)	Tucannon R Spring CH	1979	2001	0.81	**0.93**	1.08	0.74	**0.89**	1.07	2001	0.45	**0.90**	1.78	0.44	0.82	1.55
" "	**Salmon (*Middle Fork*)**	**Bear Valley/Elk Creeks (MFBEA)**	**Bear Valley/Elk Cr CH**	1960	2001	0.84	**0.96**	1.09	0.84	**0.96**	1.09	2001	0.33	**1.02**	3.17	0.33	1.02	3.17
" "	" "	Big Cr (MFBIG)	Big Cr Spring CH	1957	2001	0.86	**0.97**	1.10	0.86	**0.97**	1.10	2001	0.34	**1.06**	3.26	0.34	1.06	3.26
" "	" "	" "	Big Cr Summer CH	1957	2001													
" "	" "	Camas Cr (MFCAM)	Camas Cr CH	1972	2001	0.91	**1.01**	1.12	0.91	**1.01**	1.12	2001	0.93	**1.04**	1.17	0.93	1.04	1.17
" "	" "	**Loon Cr (MFLOO)**	**Loon Ck CH**	1957	2001	N.A.	**0.98**	N.A.	N.A.	**0.98**	N.A.	2001	0.28	**1.19**	4.99	0.28	1.19	4.99
" "	" "	**Marsh Cr (MFMAR)**	**Marsh Cr CH**	1957	2001	0.86	**0.97**	1.10	0.86	**0.97**	1.10	2001	0.34	**1.02**	3.07	0.34	1.02	3.07
" "	" "	Middle Fork Salmon Above Indian Cr. (MFUMA)	*No Applicable data set*															
" "	" "	Middle Fork Salmon Below Indian Cr. (MFLMA)	*No Applicable data set*															
" "	" "	Pistol Cr (MFPIS)	*No Applicable data set*															
" "	" "	**Sulphur Creek (MFSUL)**	**Sulphur Cr Sp CH**	1957	2001	0.80	**0.96**	1.16	0.80	**0.96**	1.16	2001	0.24	**0.88**	3.21	0.24	0.88	3.21
" "	**Salmon (*S. Fork*)**	**EF SF Salmon/ Johnson Creek (SFEFS)**	**Johnson Creek**	1957	2001	0.89	**0.97**	1.05	0.89	**0.97**	1.05	2001	0.51	**0.97**	1.86	0.51	0.97	1.86
" "	" "	Secesh R. (SFSEC)	Lake Cr Summer CH	1952	1997	0.84	**0.97**	1.13	0.84	**0.97**	1.13	1997	0.59	**1.00**	1.69	0.59	1.00	1.69
" "	" "	" "	**Secesh R Summer CH**	1957	2001	0.87	**0.97**	1.07	0.87	**0.96**	1.07	2001	0.50	**1.10**	2.42	0.49	1.09	2.41
" "	" "	South Fork Salmon (SFMAI)	Poverty Flats	1957	2001	0.87	**0.96**	1.06	0.87	**0.96**	1.06	2001	0.39	**0.96**	2.33	0.39	0.96	2.33

Table 18. Updated median population growth rate estimates (lambda), from the earliest available data and fromm 1990 through the most recent year available

				Longest Series								1990-Most Recent						
						20% Hatchery Effectiveness			80% Hatchery Effectiveness				20% Hatchery Effectiveness			80% Hatchery Effectiveness		
ESU	**NPPC Subbasin**	**Population**	**Spawning aggregation**	**Start Year**	**End Year**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**LastYear**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**
Snake River Spring/Summer Chinook Salmon	**Salmon (*S. Fork*)**	" "	**South Fork Salmon Summer CH**	1957	2001	0.87	**0.97**	1.07	0.87	**0.96**	1.06	2001	0.48	**0.97**	1.99	0.47	0.96	1.95
" "	Salmon (*Tribs*)	Chamberlain Cr (SRCHA)	Chamberlain Cr CH	1952	1997													
" "	" "	Little Salmon R. (SRLSR)	*Rapid River (hatchery stock)*	*1972*	*2001*													
" "	Salmon (*Upper*)	E. Fork Salmon R. (SREFS)	East Fork Salmon Spring CH	1952	1997													
" "	" "	" "	East Fork Salmon Summer CH	1957	2001	0.82	**0.95**	1.09	0.82	**0.95**	1.09	2001	0.20	**1.01**	5.09	0.20	1.01	5.09
" "	" "	" "	Herd Cr CH	1958	1986													
" "	" "	**Lemhi R (SRLEM)**	**Lemhi R CH**	1957	2001	0.83	**0.96**	1.10	0.83	**0.96**	1.10	2001	0.45	**1.13**	2.86	0.45	1.13	2.86
" "	" "	NF Salmon River (SRNFS)	North Fork Spring CH	1960	2000													
" "	" "	Pahsimeroi R (SRPAH)	Pahsimeroi R CH	1980	2001													
" "	" "	*Panther Creek (SRPAN) (Historic population)*	*No Applicable data set*															
" "	" "	Salmon Above	Alturas Lake Cr CH	1957	2001													
" "	" "	Upper Mainstem Salmon Below Redfish Lake (SRLMA)	Upper Salmon Spring CH	1954	2001													
" "	" "	" "	Upper Salmon Summer CH	1957	1997													
" "	" "	**Valley Cr (SRVAL)**	**Upper Valley Cr Spring CH**	1957	2001	0.77	**0.98**	1.25	0.77	**0.98**	1.25	2001	0.39	**1.21**	3.77	0.39	1.21	3.77
" "	" "	" "	Upper Valley Cr Summer CH	1952	2000													
		Yankee Fork (SRYFS)	Yankee Fork Spring CH	1952	1997													
" "	" "	" "	**Yankee Fork Summer CH**	1960	2001	0.75	**0.94**	1.18	0.75	**0.94**	1.18	2001	0.11	**1.01**	9.30	0.11	1.01	9.30
" "	" "	" "	Yankee Fork West Fk Spring CH	1960	2001													
Snake River Steelhead	**Multiple**	**Aggregate**	**ESU Snake R SH (TAC Report)**	1980	2001	0.75	**0.87**	1.01	0.62	**0.73**	0.86	2001	0.46	**0.88**	1.67	0.38	0.71	1.33
" "	" "	" "	**Snake River A Total SH**	1985	2001	0.67	**0.85**	1.08	0.56	**0.70**	0.87	2001	0.46	**0.89**	1.73	0.38	0.72	1.37
" "	" "	" "	**Snake River B Total SH**	1985	2001	0.67	**0.81**	0.98	0.56	**0.68**	0.82	2001	0.50	**0.81**	1.31	0.42	0.67	1.05
" "	Asotin	Asotin Creek (SNASO-s)	Asotin Cr SH	1986	2001													
" "	Clearwater	Lochsa River (CRLOC-s)	*No Applicable data set*															
" "	" "	Lolo Creek (CRLOL-s)	*No Applicable data set*															
" "	" "	Lower Clearwater R (CRLMA-s)	*No Applicable data set*															
" "	" "	*North Fork Clearwater (CRNFC-s) (Historic population)*	*No Applicable data set*															
" "	" "	Selway River (CRSEL-s)	*No Applicable data set*															
" "	" "	South Fork Clearwater (CRSFC-s)	*No Applicable data set*															
" "	Grande Ronde	Joseph Creek (GRJOS-s)	Joseph Cr SH	1974	2002	0.88	**1.07**	1.30	0.88	**1.07**	1.30	2002	0.61	**1.02**	1.71	0.61	1.02	1.71
" "	" "	Lower Grande Ronde (GRLMT-s)	*No Applicable data set*															

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ESU	NPPC Subbasin	Population	Spawning aggregation	Start Year	End Year	Lower 95%CI	Median Lambda	Upper 95%CI	Lower 95%CI	Median Lambda	Upper 95%CI	LastYear	Lower 95%CI	Median Lambda	Upper 95%CI	Lower 95%CI	Median Lambda	Upper 95%CI
Snake River Steelhead	Grande Ronde	Upper Grande Ronde (GRUMA-s)	Upper Mainstem Grande Ronde SH	1967	2000	0.77	**0.96**	1.21	0.76	**0.95**	1.20	2000	0.75	**1.00**	1.33	0.73	0.97	1.28
" "	" "	Wallowa River (GRWAL-s)	Wallowa SH	1965	1996													
" "	Imnaha	Imnaha (IRMMT-s)	Camp Cr SH	1974	2002	0.88	**1.08**	1.32	0.88	**1.08**	1.32	2002	0.68	**1.01**	1.49	0.68	1.01	1.49
" "	" "	" "	Imnaha R (Zumwalt/Camp Cr) SH	1974	2000	0.85	**1.05**	1.30	0.82	**1.03**	1.29	2000	0.84	**0.94**	1.04	0.81	0.91	1.01
" "	" "	" "	*Little Sheep Creek Hatchery SH*	*1985*	*2002*													
" "	" "	" "	Little Sheep Creek Wild SH	1985	2002	0.76	**1.05**	1.43	0.76	**1.05**	1.43	2002	0.47	**1.08**	2.48	0.47	1.08	2.48
" "	Salmon River	Chamberlain Creek (SRCHA-s)	*No Applicable data set*															
" "	" "	Little Salmon and Lower almon Tribs (SRLSR-s)	*No Applicable data set*															
" "	" "	East Fork Salmon R (SREFS-s)	*No Applicable data set*															
" "	" "	Lemhi River (SRLEM-s)	*No Applicable data set*															
" "	" "	Lower Middle Fork (MFBIG-s)	*No Applicable data set*															
" "	" "	North Fork Salmon R (SRNFS-s)	*No Applicable data set*															
" "	" "	Pahsimeroi River (SRPAH-s)	*No Applicable data set*															
" "	" "	Panther Creek (SRPAN-s)	*No Applicable data set*															
" "	" "	Secesh River (SFSEC s)	*No Applicable data set*															
" "	" "	South Fork Salmon R (SFMAI-s)	*No Applicable data set*															
" "	" "	Upper Mainstem Salmon R (SRUMA-s)	*No Applicable data set*															
" "	" "	Upper Middle Fork Salmon R (MFUMA-s)	*No Applicable data set*															
" "	Snake Hell's Canyon	Hell's Canyon tribs (SNHCT-s)	*No Applicable data set*															
" "	Tucannon	Tucannon R (SNTUC-s)	Tucannon R SH	1987	2001	0.66	**0.82**	1.02	0.60	**0.72**	0.85	2001	0.70	**0.85**	1.03	0.62	0.73	0.86
Upper Columbia Spring Chinook Salmon	**Entiat**	**Entiat R (UCENT)**	**Entiat R CH**	1960	2001	0.88	**0.97**	1.06	0.87	**0.95**	1.05	2001	0.37	**0.93**	2.37	0.37	0.90	2.19
" "	Methow	Methow R (UCMET)	Chewack R CH	1960	2001	0.81	**0.96**	1.14	0.80	**0.94**	1.12	2001	0.24	**0.98**	4.00	0.25	0.95	3.65
" "	" "	" "	Lost R-Early Winters Cr CH	1958	2001	0.84	**0.95**	1.08	0.83	**0.95**	1.08	2001	0.28	**0.88**	2.75	0.29	0.87	2.59
" "	" "	" "	Methow R CH (Total - Dam)	1960	2001	0.84	**0.96**	1.10	0.83	**0.95**	1.09							
" "	" "	" "	Methow R CH (Total - Dam) - Modified	1960	2001	0.87	**0.97**	1.08	0.86	**0.96**	1.06	2001		**0.83**			0.83	
" "	" "	" "	Methow R Mainstem CH	1958	2001	0.87	**1.02**	1.09	0.85	**1.00**	1.07	2001	0.20	**0.96**	4.55	0.21	0.92	4.07
" "	" "	" "	Twisp R CH	1958	2001	0.82	**0.94**	1.08	0.81	**0.93**	1.07	2001	0.26	**0.86**	2.87	0.27	0.84	2.62
" "	Wenatchee	Wenatchee R (UCWEN)	Chiwawa R CH	1958	2001	0.85	**0.97**	1.11	0.84	**0.96**	1.11	2001	0.22	**0.91**	3.81	0.23	0.87	3.32
" "	" "	" "	Icicle Cr CH	1958	2001							2001						
" "	" "	" "	Little Wenatchee R CH	1958	2001	0.81	**0.96**	1.14	0.81	**0.96**	1.14	2001	0.27	**0.82**	2.50	0.27	0.82	2.47
" "	" "	" "	Nason Cr CH	1958	2001	0.86	**0.96**	1.07	0.84	**0.95**	1.07	2001	0.24	**0.91**	3.49	0.25	0.86	2.94
" "	" "	" "	Upper Mainstem Wenatchee CH	1959	2001	0.75	**0.93**	1.15	0.74	**0.92**	1.14	2001	0.15	**0.73**	3.58	0.17	0.68	2.83

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ESU	NPPC Subbasin	Population	Spawning aggregation	Start Year	End Year	Lower 95%CI	Median Lambda	Upper 95%CI	Lower 95%CI	Median Lambda	Upper 95%CI	LastYear	Lower 95%CI	Median Lambda	Upper 95%CI	Lower 95%CI	Median Lambda	Upper 95%CI
Upper Columbia Spring Chinook Salmon	Wenatchee	" "	**Wenatchee R CH (Total - Dam)**	1960	2001	0.83	**0.96**	1.11	0.82	**0.95**	1.10	2001	0.19	**0.93**	4.47	0.21	0.89	3.89
" "	" "	" "	White R CH	1958	2001	0.87	**0.99**	1.13	0.87	**0.99**	1.13	2001	0.34	**0.93**	2.56	0.34	0.93	2.56
Upper Columbia Steelhead	**Methow**	**Methow R (UCMET-s)**	**Methow R CH**	1976	2001	0.70	**0.82**	0.96	0.53	**0.62**	0.72	2001	0.30	**0.85**	2.37	0.26	0.65	1.67
" "	Methow& Okanagan	Methow R (UCMET-s) & Okanagan R (UCOKA-s)	Above Wells SH	1976	2001	0.68	**0.79**	0.93	0.51	**0.59**	0.69	2001	0.29	**0.81**	2.22	0.24	0.61	1.54
" "	Okanogan	Okanogan R (UCOKA-s)	*No Applicable data set*															
" "	Wenatchee	Wenatchee R (UCWEN-s)	*No Applicable data set*															
" "	**Wenatchee&Entiat**	**Wenatchee R (UCWEN-s) & Entiat R (UCENT-s)**	**Wenatchee - Entiat R SH**	1976	2001	0.80	**0.94**	1.10	0.67	**0.76**	0.87	2001	0.56	**0.96**	1.66	0.47	0.78	1.30
Middle Columbia Steelhead	Deschutes	Deschutes Eastside (DREST-s)	*No Applicable data set*															
" "	" "	**Deschutes Eastside (DREST-s) & Westside (DRWST-s)**	**Deschutes R SH (Sherars)**	1978	2002	0.78	**0.97**	1.20	0.70	**0.86**	1.07	2002	0.50	**0.98**	1.93	0.46	0.85	1.55
" "	" "	Deschutes Westside (DRWST-s)	Shitike Cr SH	1976	2002													
" "	" "	" "	***Warm Springs Hatchery SH***	*1980*	*1999*	0.76	**0.94**	1.17	0.76	**0.94**	1.17	1999	0.28	**0.90**	2.94	0.28	0.90	2.94
" "	Fifteenmile	Fifteenmile Cr (MCFIF-s)	Fifteenmile Cr SH	1964	2001	0.85	0.97	1.12	0.85	0.97	1.12	2001	1.12	1.13	1.13	1.12	1.13	1.13
" "	John Day	Lower Mainstem John Day (JDLMT-s)	Lower Mainstem John Day SH	1965	2002	0.81	**0.98**	1.18	0.81	**0.98**	1.18	2002	0.52	**0.99**	1.91	0.52	0.99	1.91
" "	" "	Middle Fork John Day (JDMF-s)	Middle Fork John Day SH	1974	2001	0.80	**0.97**	1.16	0.80	**0.97**	1.16	2001	0.44	**0.95**	2.05	0.44	0.95	2.05
" "	" "	North Fork John Day (JDNFJ-s)	Lower North Fork John Day SH	1976	2002	0.77	**1.01**	1.34	0.77	**1.01**	1.34	2002	0.84	**1.17**	1.63	0.84	1.17	1.63
" "	" "	" "	Upper North Fork John Day	1977	2002	0.85	**1.01**	1.21	0.85	**1.01**	1.21	2002	N.A.	**1.08**	N.A.	N.A.	1.08	N.A.
" "	" "	South Fork John Day (JDSF-s)	South Fork John Day SH	1974	2002	0.82	**0.97**	1.14	0.82	**0.97**	1.14	2002	0.57	**1.01**	1.79	0.57	1.01	1.79
" "	" "	Upper Mainstem John Day (JDUMA-s)	Upper Mainstem John Day SH	1974	2002	0.80	**0.97**	1.18	0.80	**0.97**	1.18	2002	0.55	**0.96**	1.69	0.54	0.96	1.68
" "	Klickitat	Klickitat R (MCKLI-s)	Klickitat R SH	1990	2002													
" "	Palouse	Rock Creek (MCROC-s)	*No Applicable data set*															
" "	**Yakima**	**Aggregate - Dam**	**Yakima R SH**	1980	2001	0.86	**1.14**	1.53	0.85	**1.13**	1.50	2001	0.51	**1.10**	2.35	0.51	1.09	2.32
" "	" "	Upper Mainstem (YRUMA-s)	*No Applicable data set*															
" "	" "	Naches River (YRNAC-s)	*No Applicable data set*															
" "	" "	Satus and Toppenish Creeks (YRTOS-s)	*No Applicable data set*															

Table 18. Updated median population growth rate estimates (lambda), from the earliest available data and fromm 1990 through the most recent year available

						Longest Series						1990-Most Recent						
						20% Hatchery Effectiveness			80% Hatchery Effectiveness				20% Hatchery Effectiveness			80% Hatchery Effectiveness		
ESU	**NPPC Subbasin**	**Population**	**Spawning aggregation**	**Start Year**	**End Year**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**LastYear**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**
Middle Columbia Steelhead	**Umatilla**	**Umatilla R (MCUMA-s)**	**Umatilla R SH**	1966	2002	0.91	**1.00**	1.09	0.88	**0.97**	1.07	2002	0.68	**1.04**	1.60	0.64	0.96	1.44
" "	Walla Walla	Walla Walla R (WWMAI-s)	Walla Walla R SH	1993	2000	N.A.	**0.90**	N.A.	N.A.	**0.88**	N.A.							
" "	" "	Touchet R (WWTOU-s)	Touchet R SH	1987	2001	0.85	**0.96**	1.07	0.83	**0.94**	1.06	2001	0.78	**0.98**	1.23	0.76	0.96	1.23
Columbia River Chum Salmon	Columbia Estuary	Big Creek (BIGC-CM)	*No Applicable data set*															
" "	" "	Chinook River (CHIN-CM)	*No Applicable data set*															
" "	" "	Clatskanie River (CLAT-CM)	*No Applicable data set*															
" "	" "	Mill Creek (MILL-CM)	*No Applicable data set*															
" "	" "	Young's Bay (YOUN-CM)	*No Applicable data set*															
" "	Columbia Gorge	Upper Gorge tribs (UGRG-CM)	*No Applicable data set*															
" "	Columbia Lower	Lower Gorge tribs (LGRG-CM)	Hardy Cr Chum	1957	2000	0.91	**1.00**	1.10	0.88	**1.03**	1.21	2000	0.67	**0.95**	1.35	0.94	1.04	1.15
" "	" "	" "	Lower Gorge Chum	1944	2000	0.91	**0.99**	1.08	0.91	**0.99**	1.08	2000	0.59	**1.00**	1.69	0.59	1.00	1.69
" "	Cowlitz	Cowlitz R. fall/summer (COWL-CM)	*No Applicable data set*															
" "	" "	Salmon Creek (SALM-CM)	*No Applicable data set*															
" "	Elochman	Elochman River (ELOC-CM)	*No Applicable data set*															
" "	Grays R	Grays R. (GRAY-CM)	Grays R Chum	1967	2000	0.94	**1.04**	1.15	0.92	**1.09**	1.29	2000	N.A.	**0.96**	N.A.	0.91	1.00	1.10
" "	" "	" "	Grays River II Chum (Eli added 99,00 from Grays River I for 80-00)	1967	1998													
" "	Kalama River	Kalama River (KALA-CM)	*No Applicable data set*															
" "	Lewis River	Lewis River (LEWS-CM)	*No Applicable data set*															
" "	Lower Columbia	Scappose Creek (SCAP-CM)	*No Applicable data set*															
" "	Sandy	Sandy R. (SAND-CM)	*No Applicable data set*															
" "	Washougal	Washougal R. (WASH-CM)	*No Applicable data set*															
" "	Willamette	Clackamas R. (CLCK-CM)	*No Applicable data set*															
Lower Columbia Chinook Salmon	Big White Salmon	Big White Salmon R Fall (BWSR-KF)	Big White Salmon R Fall CH	1967	2001	0.70	**0.89**	1.13	0.69	**0.88**	1.12	2001	0.65	**0.88**	1.18	0.71	0.86	1.04
" "	" "	Big White Salmon Spring (BWSR-KS)	*No Applicable data set*															
" "	Columbia Estuary	Big Creek Fall (BIGC-KF)	Big Creek Fall CH	1970	2001													
" "	" "	Clatskanie R Fall (CLAT-KF)	Clatskanie Fall CH	1970	2001													

Table 18. Updated median population growth rate estimates (lambda), from the earliest available data and fromm 1990 through the most recent year available

				Longest Series								1990-Most Recent							
						20% Hatchery Effectiveness			80% Hatchery Effectiveness				20% Hatchery Effectiveness			80% Hatchery Effectiveness			
ESU	**NPPC Subbasin**	**Population**	**Spawning aggregation**	**Start Year**	**End Year**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**LastYear**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**
Lower Columbia Chinook Salmon	Columbia Estuary	Mill Creek Fall (MILL-KF)	Mill Creek Fall CH	1980	2001	0.69	**0.88**	1.13	0.62	**0.80**	1.03	2001	0.46	**0.81**	1.42	0.38	0.72	1.35
" "	" "	Young's Bay Fall (YOUN-KF)	Young's Bay Fall CH	1950	2001													
" "	Columbia Gorge	Lower Gorge Tribs LGRG-KF)	*No Applicable data set*															
" "	" "	Upper Gorge Tribs (UGRG-KF)	*No Applicable data set*															
" "	Cowlitz	Cispus R Spring (CISP-KS)	*No Applicable data set*															
" "	" "	Coweeman R Fall (COWE-KF)	Coweeman R Fall CH	1964	2001	0.89	**1.13**	1.44	0.89	**1.13**	1.44	2001	0.33	**1.05**	3.34	0.33	1.05	3.34
" "	" "	Tilton R Spring (TILT-KS)	*No Applicable data set*															
" "	" "	Toutle R Fall (TOUT-KF)	*No Applicable data set*															
" "	" "	Toutle R Spring (TOUT-KS)	*No Applicable data set*															
" "	" "	Upper Cowlitz R Fall (UCWL-KF) + Lower Cowlitz R Fall (LCWL-KF)	Cowlitz R Fall CH	1964	2000	0.64	**0.88**	1.21	0.52	**0.72**	1.00	2000	N.A.	**1.00**	N.A.	0.68	0.84	1.03
" "	" "	Upper Cowlitz R Spring (UCWL-KS)	*No Applicable data set*															
" "	Elochoman	Elochoman R Fall (ELOC-KF)	Elochoman R Fall CH	1964	2001	0.67	**0.92**	1.27	0.57	**0.81**	1.13	2001	0.33	**0.95**	2.76	0.23	0.85	3.15
" "	Grays	Grays R Fall (GRAY-KF)	Grays R Fall CH	1964	2001	0.65	**0.89**	1.24	0.61	**0.84**	1.15	2001	0.71	**0.92**	1.21	0.84	0.87	0.90
" "	Hood	Hood R Fall (HOOD-KF)	*No Applicable data set*															
" "	" "	Hood R Spring (HOOD-KS)	*No Applicable data set*															
" "	Kalama	Kalama R Fall (KALA-KF)	Kalama R Fall CH	1964	2001	0.68	**0.93**	1.28	0.61	**0.84**	1.15	2001	0.50	**0.90**	1.62	0.43	0.82	1.56
" "	" "	Kalama R Spring (KALA-KS)	Kalama R Spring CH	1980	2001													
" "	Lewis	Lewis R. Late Fall (LEWL-KF)	EF Lewis CH (tule)	1980	2000	0.92	**0.97**	1.03	0.91	**0.97**	1.03	2000	0.76	**1.00**	1.32	0.76	1.00	1.32
" "	" "	" "	Lewis R Late Fall CH (brights)	1964	2001	0.85	**0.95**	1.06	0.84	**0.94**	1.05	2001	0.73	**0.93**	1.20	0.72	0.92	1.19
" "	" "	Lewis R. Spring (LEWS-KS)	Lewis R. Spring CH	1980	2001													
" "	" "	Salmon Creek Fall (SALM-KF)	*No Applicable data set*															
" "	Sandy	Sandy River Early Fall (SNDE-KF)	Sandy R Early Fall	1988	2001													
" "	" "	Sandy River Late Fall (SNDL-KF)	Sandy R Late Fall CH	1984	2001	0.83	**0.94**	1.07	0.82	**0.94**	1.06	2001	0.61	**0.92**	1.39	0.60	0.91	1.38
" "	Washougal	Washougal R Fall (WASH-KF)	Washougal R Fall CH	1964	2001	0.82	**0.95**	1.11	0.71	**0.84**	0.99	2001	0.71	**0.89**	1.11	0.56	0.78	1.08
" "	Willamette	Clackamas R Fall Chinook (CLCK-KF)	Clackamas R Fall CH	1967	2001													

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				Longest Series								1990-Most Recent						
						20% Hatchery Effectiveness			80% Hatchery Effectiveness				20% Hatchery Effectiveness			80% Hatchery Effectiveness		
ESU	**NPPC Subbasin**	**Population**	**Spawning aggregation**	**Start Year**	**End Year**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**LastYear**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**	**Lower 95%CI**	**Median Lambda**	**Upper 95%CI**
Lower Columbia Steelhead	Columbia Gorge	Lower Gorge Tributaries (LRG-SW)	*No Applicable data set*															
" "	" "	Upper Gorge Tributaries (UGRG-SW)	*No Applicable data set*															
" "	Cowlitz	Cispus R Winter (CISP-SW)	*No Applicable data set*															
" "	" "	Coweeman R Winter (COWE-SW)	Coweeman R Winter SH	1987	2002	0.68	**0.87**	1.13	0.62	**0.80**	1.04	2002	0.52	**0.88**	1.50	0.48	0.81	1.37
" "	" "	Lower Cowlitz R Winter (LCWL-SW)	*No Applicable data set*															
" "	" "	N Fork Toutle R Winter (Green River) (NTOU-SW)	N Fork Toutle Winter SH	1989	2002	1.01	**1.06**	1.12	1.01	**1.06**	1.12	2002	N.A.	**1.04**	N.A.	N.A.	1.04	N.A.
" "	" "	S Fork Toutle R Winter (STOU-SW)	S Fork Toutle Winter SH	1984	2002	0.77	**0.94**	1.14	0.77	**0.93**	1.14	2002	0.50	**0.93**	1.72	0.50	0.93	1.72
" "	" "	Tilton R Winter (TILT-SW)	*No Applicable data set*															
" "	" "	Upper Cowlitz R Winter (UCWL-SW)	*No Applicable data set*															
" "	Hood	Hood R Summer (HOOD-SS)	Hood R Summer SH	1992	2000	N.A.	**0.75**	N.A.	N.A.	**0.60**	N.A.	2000	N.A.	**0.75**	N.A.	N.A.	0.60	N.A.
" "	" "	Hood R Winter (HOOD-SW)	Hood R Winter SH	1992	2000	N.A.	**0.96**	N.A.	N.A.	**0.87**	N.A.	2000	N.A.	**0.96**	N.A.	N.A.	0.87	N.A.
" "	Kalama	Kalama R Summer (KALA-SS)	Kalama R Summer SH	1977	2003	0.71	**0.88**	1.09	0.59	**0.74**	0.93	2003	0.55	**0.84**	1.26	0.47	0.73	1.13
" "	" "	Kalama R Winter (KALA-SW)	Kalama R Winter SH	1977	2002	0.90	**0.99**	1.08	0.85	**0.93**	1.02	2002	0.70	**0.97**	1.34	0.65	0.93	1.33
" "	Lewis	E Fork Lewis R Summer (ELEW-SS)	EF Lewis R Summer SH	1996	2003	N.A.	**1.25**	N.A.	N.A.	**1.17**	N.A.	2003	N.A.	**1.25**	N.A.	N.A.	1.17	N.A.
" "	" "	E Fk Lewis R Winter (ELEW-SW)	E Fk Lewis R Winter SH	1985	1994													
" "	" "	N Fork Lewis R Summer (NLEW-SS)	*No Applicable data set*															
" "	" "	N Fk Lewis R Winter (NLEW-SW)	Lewis R Winter	1985	1994													
" "	Sandy	Salmon Creek Winter (SALM-SW)	*No Applicable data set*															
" "	" "	Sandy R Winter (SAND-SW)	Sandy R Winter SH	1978	2001	0.83	**0.91**	1.00	0.77	**0.84**	0.93	2001	0.75	**0.86**	0.98	0.69	0.80	0.92
" "	Washougal	Washougal R Summer (WASH-SS)	Washougal R Summer SH	1986	2003	0.79	**1.00**	1.27	0.79	**1.00**	1.26	2003	0.69	**1.03**	1.54	0.69	1.02	1.51
" "	" "	Washougal R Winter (WASH-SW)	Washougal R Winter SH	1991	2002	0.75	**1.16**	1.78	0.75	**1.16**	1.78	2002	0.75	**1.16**	1.78	0.75	1.16	1.78
" "	Willamette	Clackamas R Winter (CLCK-SW)	*No Applicable data set*	1958	1998	0.87	**0.97**	1.08	0.85	**0.95**	1.06	1998	0.60	**0.86**	1.25	0.58	0.84	1.20
" "	Wind	Wind R Summer - (WIND-SS)	Wind R Summer SH	1989	2003	0.89	**0.97**	1.06	0.86	**0.95**	1.04							

Table 18. Updated median population growth rate estimates (lambda), from the earliest available data and fromm 1990 through the most recent year available

ESU	NPPC Subbasin	Population	Spawning aggregation	Longest Series Start Year	Longest Series End Year	Longest Series 20% Hatchery Effectiveness Lower 95%CI	Longest Series 20% Hatchery Effectiveness Median Lambda	Longest Series 20% Hatchery Effectiveness Upper 95%CI	Longest Series 80% Hatchery Effectiveness Lower 95%CI	Longest Series 80% Hatchery Effectiveness Median Lambda	Longest Series 80% Hatchery Effectiveness Upper 95%CI	1990-Most Recent LastYear	1990-Most Recent 20% Hatchery Effectiveness Lower 95%CI	1990-Most Recent 20% Hatchery Effectiveness Median Lambda	1990-Most Recent 20% Hatchery Effectiveness Upper 95%CI	1990-Most Recent 80% Hatchery Effectiveness Lower 95%CI	1990-Most Recent 80% Hatchery Effectiveness Median Lambda	1990-Most Recent 80% Hatchery Effectiveness Upper 95%CI
Upper Willamette Chinook Salmon	Sandy	Sandy R Spring (SAND-KS)	Sandy R Spring CH	1977	2001													
" "	Willamette	Aggregate	Willamette Falls Spring CH	1946	2001													
" "	" "	Calapooia R Spring (CALA-KS)	*No Applicable data set*															
" "	" "	Clackamas R Spring (CLCK-KS)	Clackamas R Spring CH (NF Dam)	1958	2002													
" "	" "	McKenzie R Spring (MCKZ-KS)	McKenzie R Spring CH (Leaburg Dam)	1970	2001	N.A.	**1.19**	N.A.	N.A.	**1.14**	N.A.							
" "	" "	Middle Fork Willamette Spring (MFWL-KS)	*No Applicable data set*															
" "	" "	Mollala R Spring (MOLA-KS)	*No Applicable data set*															
" "	" "	N. Santiam R Spring (NSNT-KS)	*No Applicable data set*															
" "	" "	S. Santiam R Spring (SSNT-KS)	*No Applicable data set*															
Upper Willamette Steelhead	Willamette	Aggregate	Willamette Falls Winter SH Dam Counts	1971	2002													
" "	" "	Calapooia R Winter (CALA-SW)	Calapooia Winter SH	1980	1997	0.81	**0.99**	1.22	0.81	**0.99**	1.22	1997	0.62	**1.05**	1.80	0.62	1.05	1.80
" "	" "	" "	Calapooia Winter SH (Redd Count)	1980	2000													
" "	" "	Mollala R Winter (MOLA-SW)	Mollala R Winter SH	1980	1997	0.89	**0.97**	1.04	0.82	**0.90**	0.98	1997	0.62	**1.03**	1.69	0.57	0.98	1.71
" "	" "	" "	Mollala R Winter SH (Redd Count)	1980	2000													
" "	" "	N. Santiam R Winter (NSNT-SW)	N. Santiam Winter SH (Redd Count)	1983	2000													
" "	" "	" "	N. Santiam Winter SH	1980	1997	0.83	**0.95**	1.08	0.81	**0.92**	1.05	1997	0.52	**0.94**	1.70	0.52	0.90	1.57
" "	" "	S. Santiam R Winter (SSNT-SW)	Foster Dam Winter SH	1973	2000													
			S. Santiam Winter SH	1980	1997	0.79	**0.95**	1.14	0.77	**0.91**	1.07	1997	0.52	**0.93**	1.68	0.52	0.93	1.68
			S. Santiam Winter SH (Foster Dam)	1967	2002													
" "	" "	" "	S. Santiam Winter SH (Redd Count)	1980	2001													
" "	" "	Westside Tributaries Winter (WEST-SW)	*No Applicable data set*															

TMT Year-End Review

Survival and Passage studies at Ice Harbor Dam, 2003

In 2000 and 2002 NOAA Fisheries conducted spill survival studies at Ice Harbor Dam as post construction evaluation of the flow deflector installation. Results of these spillway survival studies had shown low survival rates. In response to the low levels of spill survival observed in the previous years, an alternate spill operation was proposed for testing in the spring and summer this year (2003). Funding was prioritized through the System Configuration Team. The Fish Facility Design Work Group (FFDRWG) and Studies Review Work Group (SRWG) designed a study to compare passage and survival in both spring and summer between 50% spill 24 hours per day, and the Biological Opinion operation of 45 Kcfs day and DGAS cap (90%-100% up to 100 Kcfs) at night. The 45 Kcfs was expected to improve tailrace egress and flow deflector performance. Spill patterns were coordinated through the Fish Passage Operations (FPOM) committee. The operations required were coordinated with RCC and BPA through weekly calls.

Spring Operations – 2 Treatments

1. "BiOp" 45 Kcfs day and DGAS cap (90 - 100 Kcfs) at night.
2. 50% Spill 24 hrs.

Evaluation Techniques:

Radiotelemetry – Passage Efficiency, spill survival, and project survival.
PIT tag – Turbine survival and collection channel through tailrace survival
Direct Injury – Spillway injury rates.
Hydroacoustics – Passage Efficiency and behavior

In Season Coordination- Spring

The spring direct injury study reported very high injury rates. Normandeau Associates Inc. proposed adding a day to look at a larger gate opening in response to trends in the data. COE staff discussed this with NOAA Fisheries, RCC, and FPOM.

Operation - An additional treatment was tested with 5ft gate openings (pattern change only).

Coordination – Summer Operations

The preliminary results from the 2003 spring tests of the experimental spill operation indicated that serious levels of injury occurred under both study treatments. This information caused significant concern about exposing ESA listed Snake River fall Chinook to these operating conditions for a third year of study. A new test condition was developed to help identify the project operations that could provide the best project survival for summer fish. The test treatments include a no spill treatment, which was controversial. A modified study was presented to SRWG. The issue was in turn raised to SCT and the Implementation Team (IT). Technical Management Team (TMT) also scheduled a meeting to discuss the altered summer study. IT supported going ahead with the study.

Rationale developed for the altered summer study:

Fall chinook spillway studies conducted in 2000 and 2002 using PIT tag detection, estimated survival at 88 and 89%, which is much lower than BiOp estimate of 98%. These studies were conducted under BiOp spill volumes and Fish Passage Plan spill patterns. No empirical data are available for fall chinook survival through the powerhouse passage routes. Resolution of the low survival was expected to be achieved by modifying the spill operations to provide good tailrace egress and skimming flow over the spill deflectors.

Preliminary results from direct injury (spring Chinook) studies at spillbays in 2003 indicated a 10-22% fish injury rate. Injuries included bloody eyes, decaling, loss of eyes, torn operculum. These are the highest estimates of injury rates recorded in the Snake and Columbia rivers with this type of testing (balloon tags).

OBJECTIVE: Test a Project operation at IHR Dam that will improve fish survival.

PROPOSED ACTION: Develop a survival study at IHR for summer 2003 that would assist in providing information for more fish safe operation of the Project. This action would be designed to protect fish in 2004, and would lead to improved fish survival in the future.

The current spill tests include 2-day blocks of BiOP spill levels vs. 50% spill. Based on past years survival results for fall Chinook and recent direct injury tests this spring, there is significant concern that fall Chinook survival will be poor in 2003 under both operations as they were previously coordinated. Survival tests conducted in 2000 and 2002 estimated survival of fall Chinook passing via spillway between 85 and 88% with radio telemetry.

Proposed test at ICR for summer 2003 would be similar to the originally proposed test. It will still include 2 treatments, however the treatments will be changed. One treatment will be BiOP spill with a spill condensed to 3 spill bays. Second treatment will be without spill. Fish survival will be estimated with PIT tags at spillway, bypass, and turbine.

JUSTIFICATION FOR A MODIFICATOIN OF STUDY PLAN:

Summary of recent spillway studies at ICR

Study Year	**Species**	**Spillway Survival**
2000	fall Chinook	88.5%
2001	fall Chinook	no spill
2002	fall Chinook	89.4%

- Data indicates poor spillway survival for fall Chinook in both years studied. Data also indicates poor survival of spring Chinook in 1 of the two years of study.

- 2003 direct injury studies were conducted in late April 2003. Results from this study showed injury rates (bloody eyes, decaling, loss of eyes, torn operculum) of up to 20%.

- Results of spillway studies in 2000 and 2002, have shown a high level of mortality. These studies were conducted under BiOP spill volumes and patterns. Therefore, the Corps cannot accept a study in 2003 that will include a condition that has shown poor survival.

JUSTIFICATION FOR A "NO SPILL" TREATMENT

BiOP estimates used for survival estimates at IHR
Spillway 98%
Juvenile bypass 98%
Turbine 90%
FGE 54%

- Using the assumptions of BiOp , estimates of survival under a no-spill operation is calculated at 94.3%

Estimates based on recent data
Juvenile bypass 99% (2001,2002 draft)
Turbine 88% (preliminary 2003 data)
Powerhouse 96% (NMFS, 2001)

- Using these estimates, Project survival for a no-spill option is calculated at 95.3%.

- Based on the data from 2000 and 2002, BiOp spill operations will result in a Project survival around 90%

- Using the above estimated survival estimates, it is possible that a "no spill" condition would improve survival of juvenile fall Chinook passing Ice Harbor.

ADDITIONAL CONCERNS:

Water Quality: It is anticipated that condensing spill to three bays may increase TDG in the spillway and downstream of IHR. Corps and NMFS representatives conducted a "test" spill of 45kcfs spilled through bays 2, 3,and 4 on 3/17/03. This operation was run for over 2 hours with an initial TDG level of 113 at the downstream monitor. Over the test TDG increase to 120 and stabilized at that level. Therefore, it is expected that 45kcfs will be the upper limit of spill for the spill test condition. TDG will likely increase as river flow decreases due to a higher proportion of total river flow being spilled. This will be monitored during the study and modified as need to keep TDG below 120.

<u>Summer Operations</u> – 2 Treatments

1. Bulked Spill about 45 Kcfs 24 hrs per day.
2. No Spill

2003 Results:

Project and route specific survival estimates for yearling Chinook using RT
Spillway and turbine fish survival estimates for sub-yearling Chinook salmon
Direct injury studies (spillbay 5)
Sensor "fish" studies (spillbay 5)
Hydroacoustic evaluation of fish passage.

1: Summary of preliminary RT survival studies (Yearling Chinook)

	Yearling Chinook Survival Estimates (RT)	
	BiOp spill levels	Test (50% spill)
Turbine	86.2% (77.8 - 95.5%)	87.8% (84.1 - 91.6%)
Bypass	98.1% (89.4 - 107%)	97.4% (88.7 - 107%)
Spillway	94.8% (91.5 - 98.1%)	92.8% (86.0 - 100%)
Project	93.7% (91.1 - 96.3%)	91.9% (85.9 - 98.3%)

2: Summary of preliminary PIT survival studies (Sub-yearling Chinook)

	Subyearling Survival Estimates
	Bulk Spill
Turbine	89% (85 - 94%)
Bypass	100% (96 - 103%)
Spillway	96% (91 - 102%)

3: Summary of Direct Injury Studies.

Spring study		
	50% spill	100% spill
Injury Rate	21%	10%

Summer study			
	Bulk		FPP pattern
	Deep release	Shallow release	Deep release
Injury Rate	21%	10%	23%

Summary of Yearling Chinook Data

	2000	2001	2002	2003 Spring	
				BiOp Pattern	50% spill
Turbine	Not estimated	not estimated	not estimated	86.2% (77.8 - 95.5%)	87.8% (84.1 - 91.6%)
Bypass	not estimated	99.6% (94.7 - 104%)	not estimated	98.1% (89.4 - 107%)	97.4% (88.7 - 107%)
Spillway	97.8% (94.1 - 102%)	No spill in 2001	89.1% (86 - 95%)	94.8% (91.5 - 98.1%)	92.8% (86.0 - 100%)
Project	not estimated	93.6% (89.5 - 97.7%)	not estimated	93.7% (91.1 - 96.3%)	91.9% (85.9 - 98.3%)

Summary of Subyearling Chinook Data

	2000	2001	2002	2003
				Bulk Spill
Turbine	not estimated	not estimated	not estimated	89% (85 - 94%)
Bypass	not estimated	not estimated	not estimated	100% (96 - 103%)
Spillway	88.5% (85.6 - 91.5%)	not estimated	89.4% (86 - 93%)	96% (91 - 102%)
Project	not estimated	not estimated	not estimated	not estimated

2004 Coordination

SRWG and FFDRWG met to discuss these results and plan next year's studies on 15 July, 31 July, and 1 October 2003. We will again discuss it 6 November 2003. Specific study designs will not be developed until the new 1:20 hydraulic model of the spillway is available. Any changes to spill patterns would coordinated through RCC and FPOM. As much detail as possible will be included in Appendix A of the Fish Passage Plan. In season coordination with RCC and BPA will be through weekly telephone calls.

Natural-Spawning Population Trends Through 2001 Returns

Overview For TMT

November 5, 2003

Chris Toole, NOAA Fisheries

Summary of October 1, 2003, Report to Court, Exhibit D:

Preliminary Estimates of Updated "Indicator Metrics" Applied in the 2000 FCRPS Biological Opinion

http://www.salmonrecovery.gov/remand/court_docs/federal_defendants_first_quarterly_status_report/d_Population_Status_Report.pdf

Population Data Availability

- Immediately Available – Dam counts by species/ESUs, mixed wild and hatchery
- Some Months Later – Dam counts by species/ESU and by wild and hatchery fraction; raw spawner/redd counts in some areas
- A Year Or More Later – Final spawner estimates and/or redd counts by population, including (where applicable) hatchery/wild fractions, redd count expansions, age structure, etc.

Data Sources Through 2001

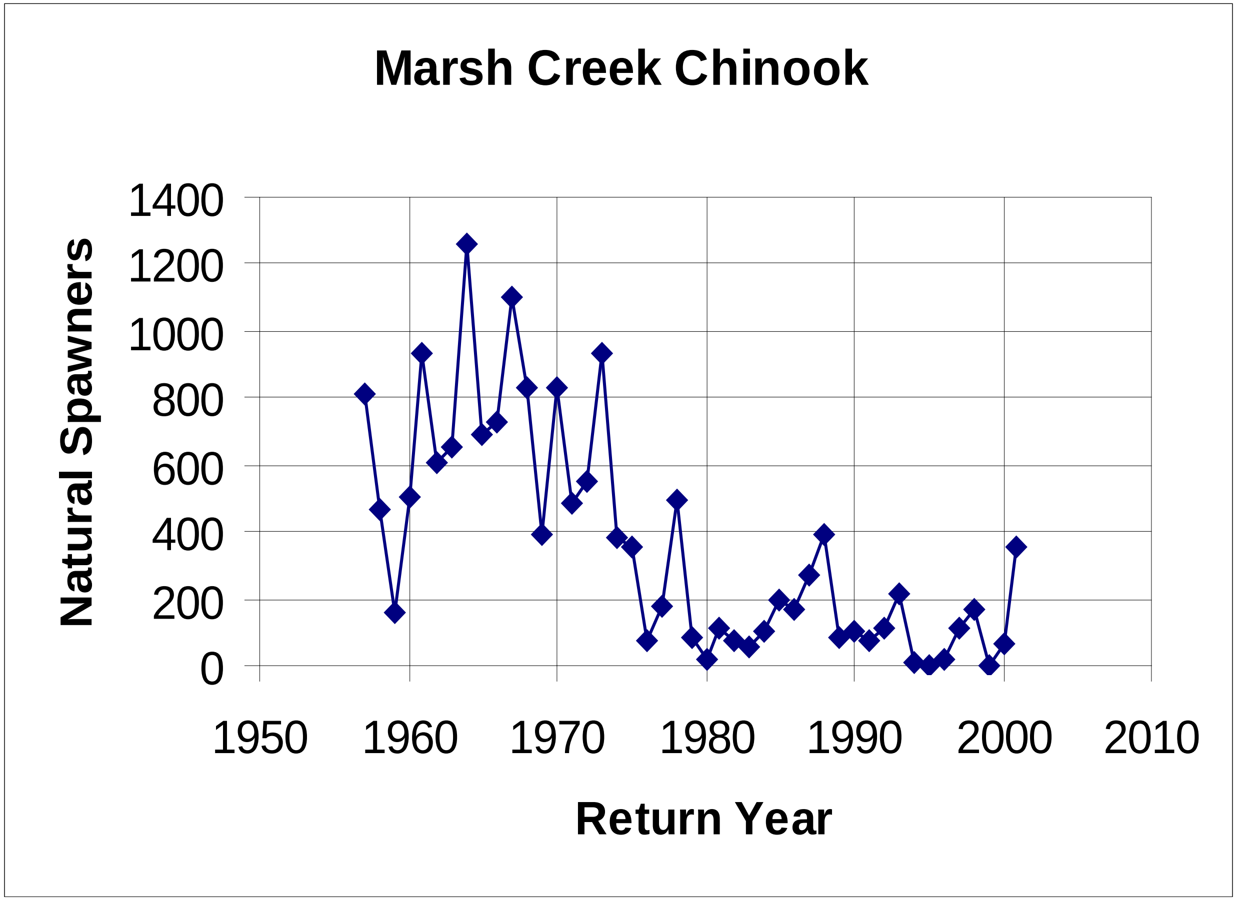
- Many reports by states, tribes, FWS, PUDs, etc.
- Collated and reviewed by NOAA Fisheries Biological Review Team (BRT) for new Status Review
- Data sets for Interior ESUs and Lower Columbia/Willamette ESUs at: http://www.nwfsc.noaa.gov/trt/brtrpt.htm
- Schedule for data through 2002, 2003

What We Did To the Data Sets

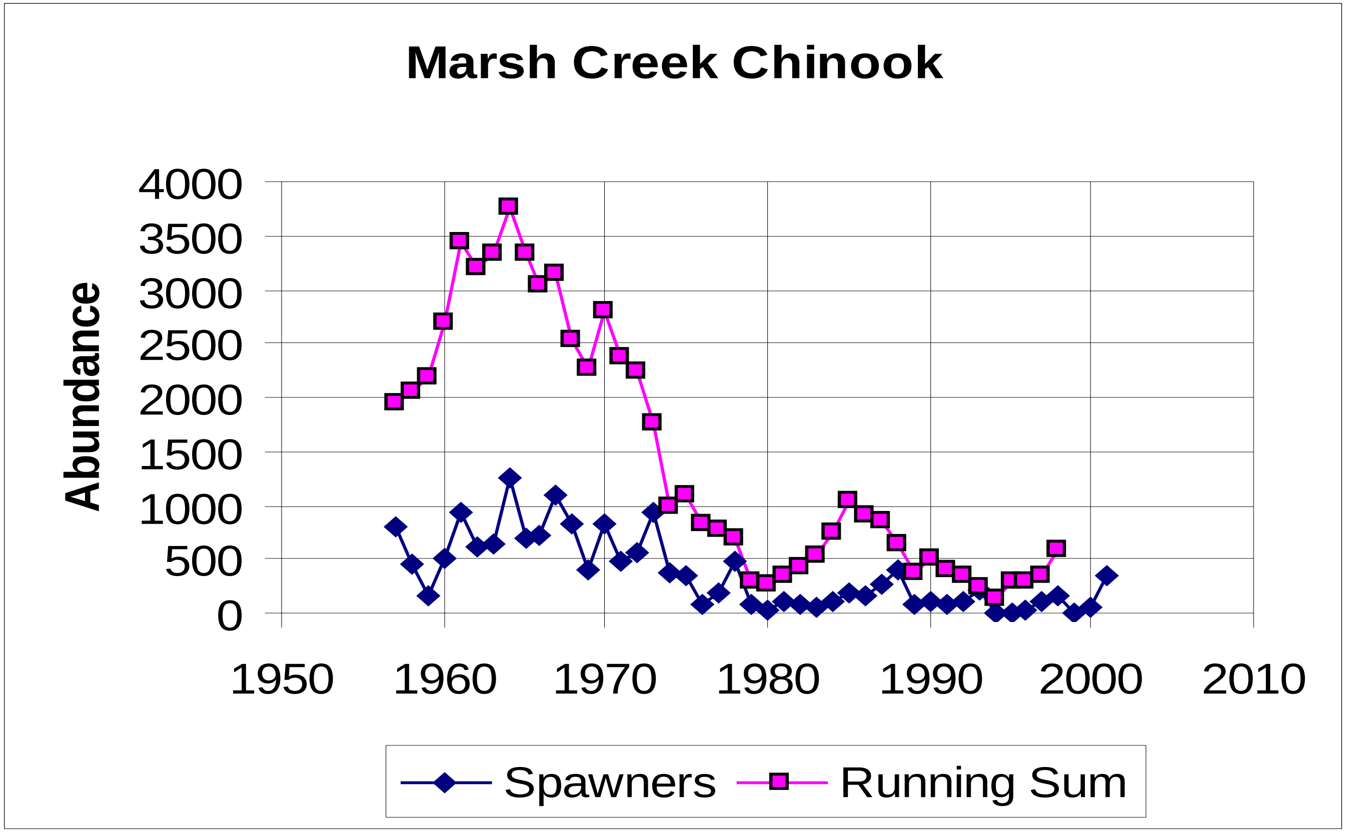
- BRT evaluated status, using a number of ways of looking at the data, and released February 2003 draft Status Review.
- NOAA Hydro Program used data to update estimates of the jeopardy “indicator metrics” used in 2000 FCRPS Biop. Based on population growth rate (“lambda”) and other metrics derived from lambda.
- SimSalmon: SimSalmon is an analytical tool developed by Paul McElhany and John Payne (2001), one module of which estimates lambda and extinction risk using the Dennis/Holmes method -

  http://research.nwfsc.noaa.gov/trt/viability_simSalmon.htm

First Step – Updated Spawner or Redd Count Estimates
Example: Marsh Creek Population of Snake River Sp/Sum Chinook



Next step in estimating the trend with the Dennis/Holmes method is to generate 4-year running sums. This reduces sampling bias and makes adult counts proportional to counts of all life stages.



An exponential trend is fit to whichever years of running sums are of interest. The median trend is referred to as either “lambda” or “alpha”. Lambda greater than 1.0 means that there’s at least a 50:50 chance that the population is increasing; lambda less than 1.0 means that it is declining.

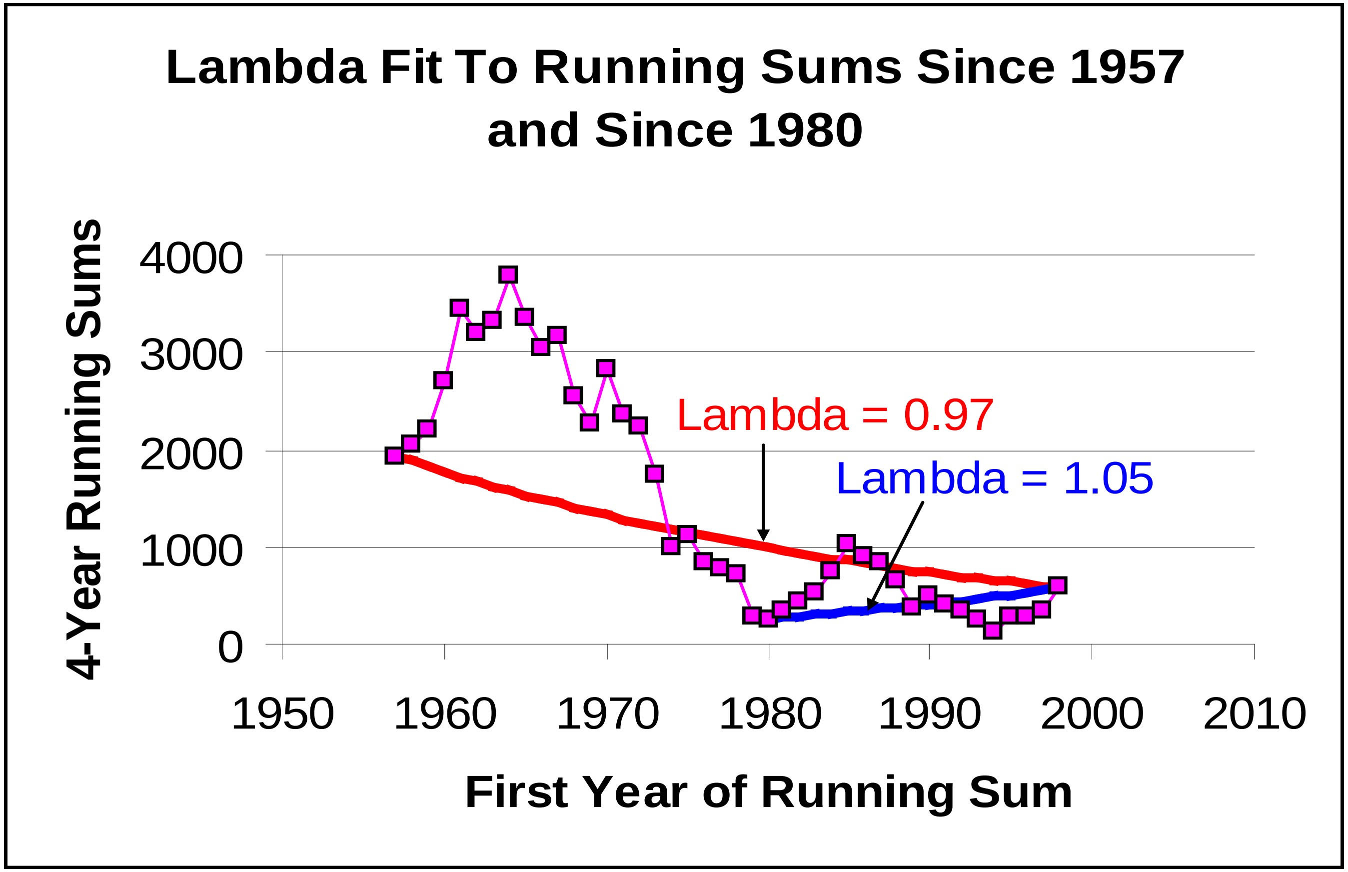
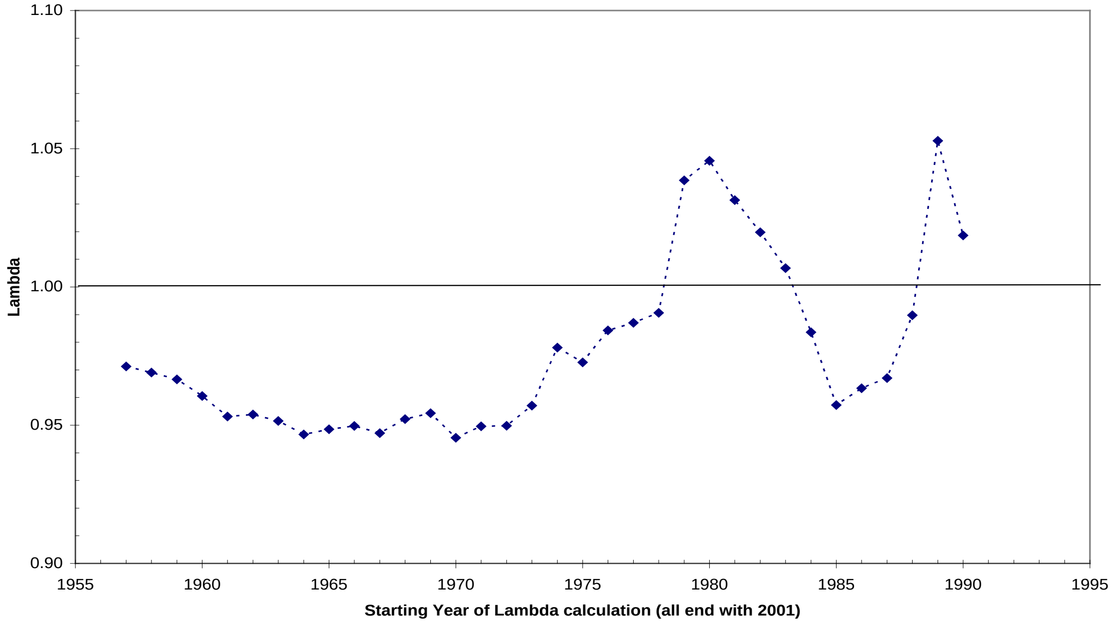
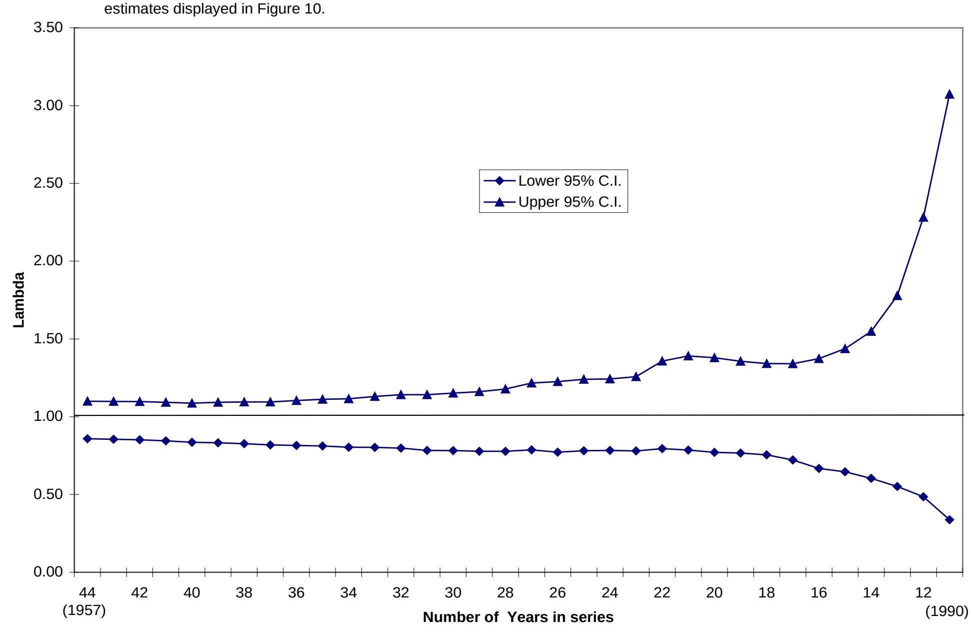


Figure 10. Sensitivity of Median Lambda estimates to alternative dhoices of time period for the Marsh Creek spring chinook data set. Each point represents and estimate for the starting year through 2001. This population has no hatchery influence.



Effect of Choosing Alternative Start Years On Median Lambda Estimate

Figure 11. Sensitivity of 95% confidence intervals to alternative time periods for the Marsh Creek spring chinook lambda estimates displayed in Figure 10.



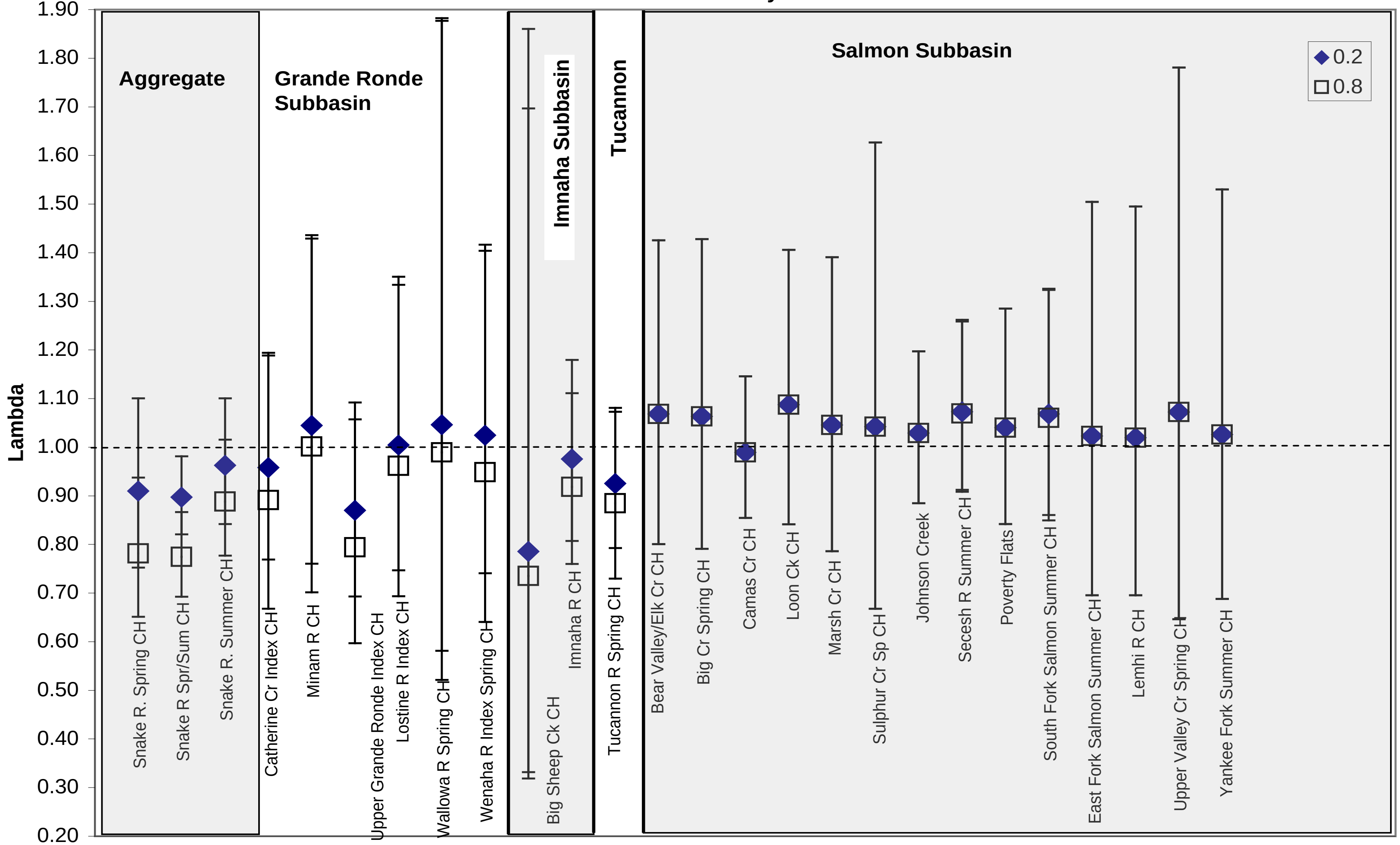
Effect of Choosing Alternative Start Years on Lambda Confidence Limits

How Data Sets Relate To Proposed Populations

- Technical Recovery Teams (TRTs) have identified approximately 166 populations relevant to the 11 ESUs considered in analysis (SR sockeye, the 12th, was not evaluated)
- At least one BRT data set was associated with 92 populations (55%). 139 data sets total, since sometimes >1 data set per population.
- 1980-2001 “lambda” could be calculated for 83 of these data sets. Lack of hatchery fraction or incomplete time series were main reasons for inability to calculate “lambda” for other data sets.

Snake River Spring/Summer Chinook ESU

Figure 1. Updated 1980-present Lambda estimates with 95% confidence intervals for the Snake River Spring and Summer Chinook ESU calculated with hatchery effectiveness of 0.2 and 0.8



Snake River Fall Chinook ESU

80% Effectiveness of Hatchery-Produced Wild Spawners:

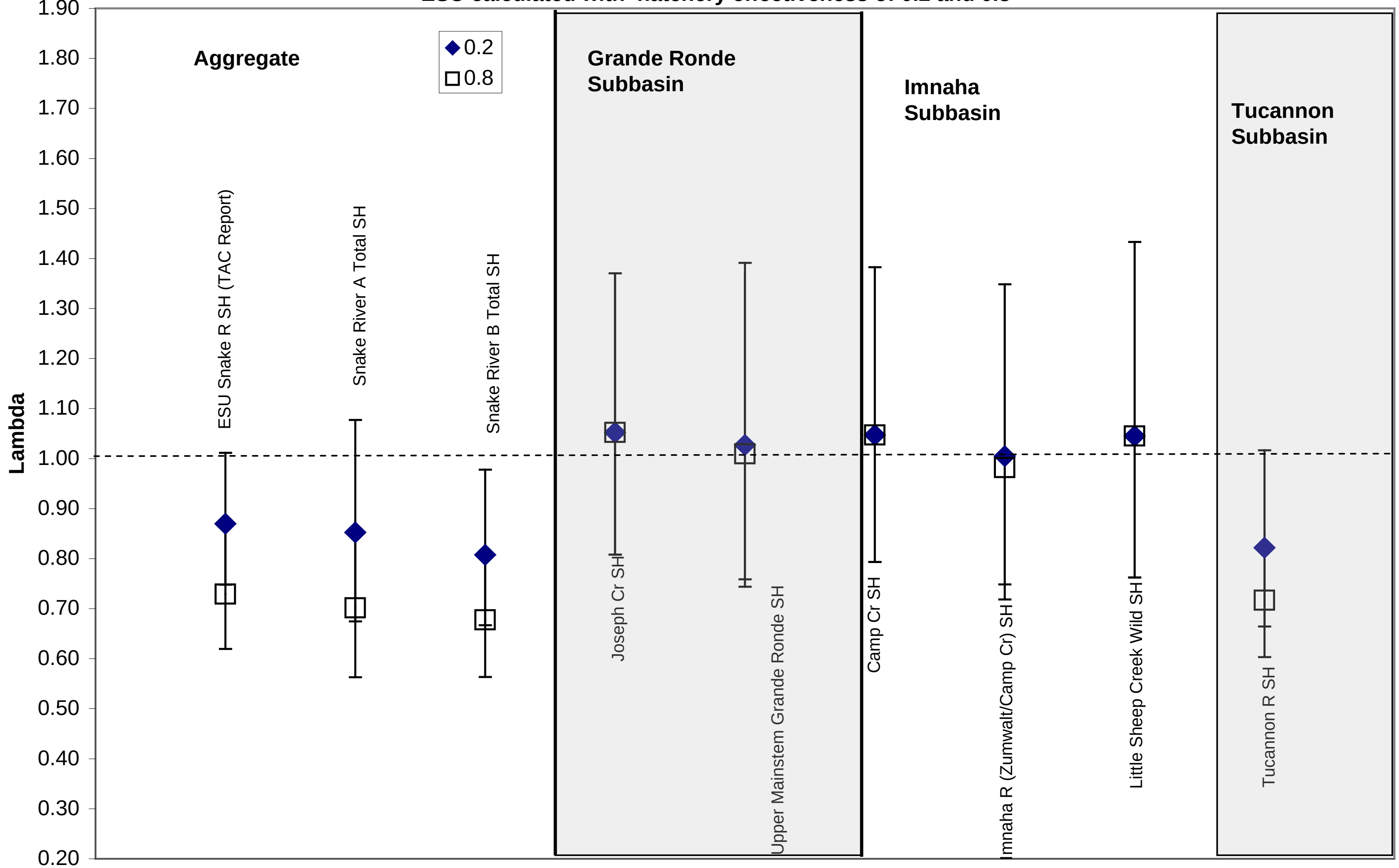
Lambda = 0.91 (0.77, 1.09)

20% Effectiveness of Hatchery-Produced Wild Spawners:
Lambda = 1.01 (0.86, 1.17)

NOTE: These numbers were reversed for 20% and 80% effectiveness in the Report to the Court. Also, I have heard that TAC has revised the 2001 wild fraction upwards - if so, these numbers will increase.

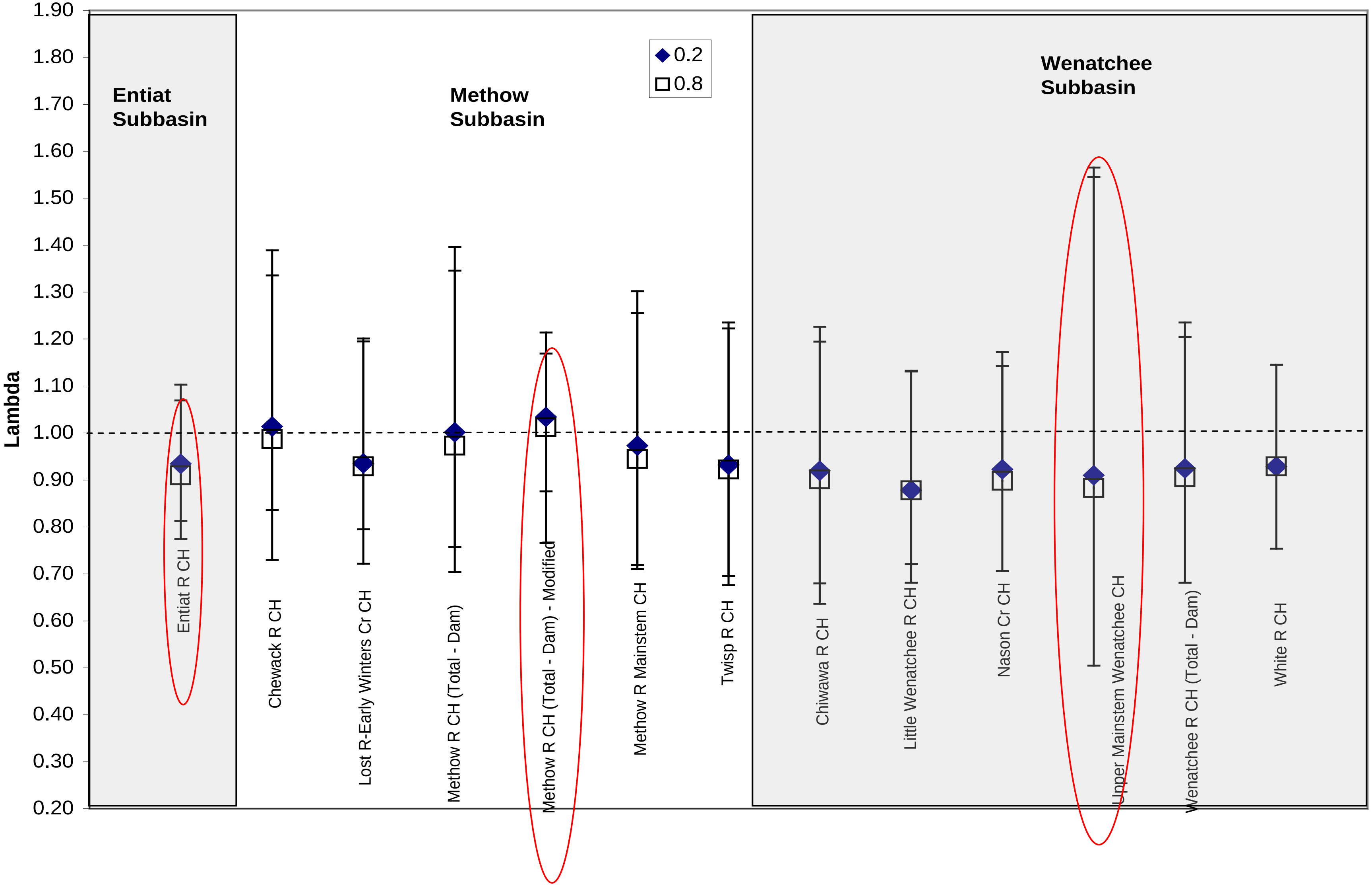
Snake River Steelhead ESU

Figure 2. Updated 1980-present Lambda estimates with 95% confidence intervals for the Snake River Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8



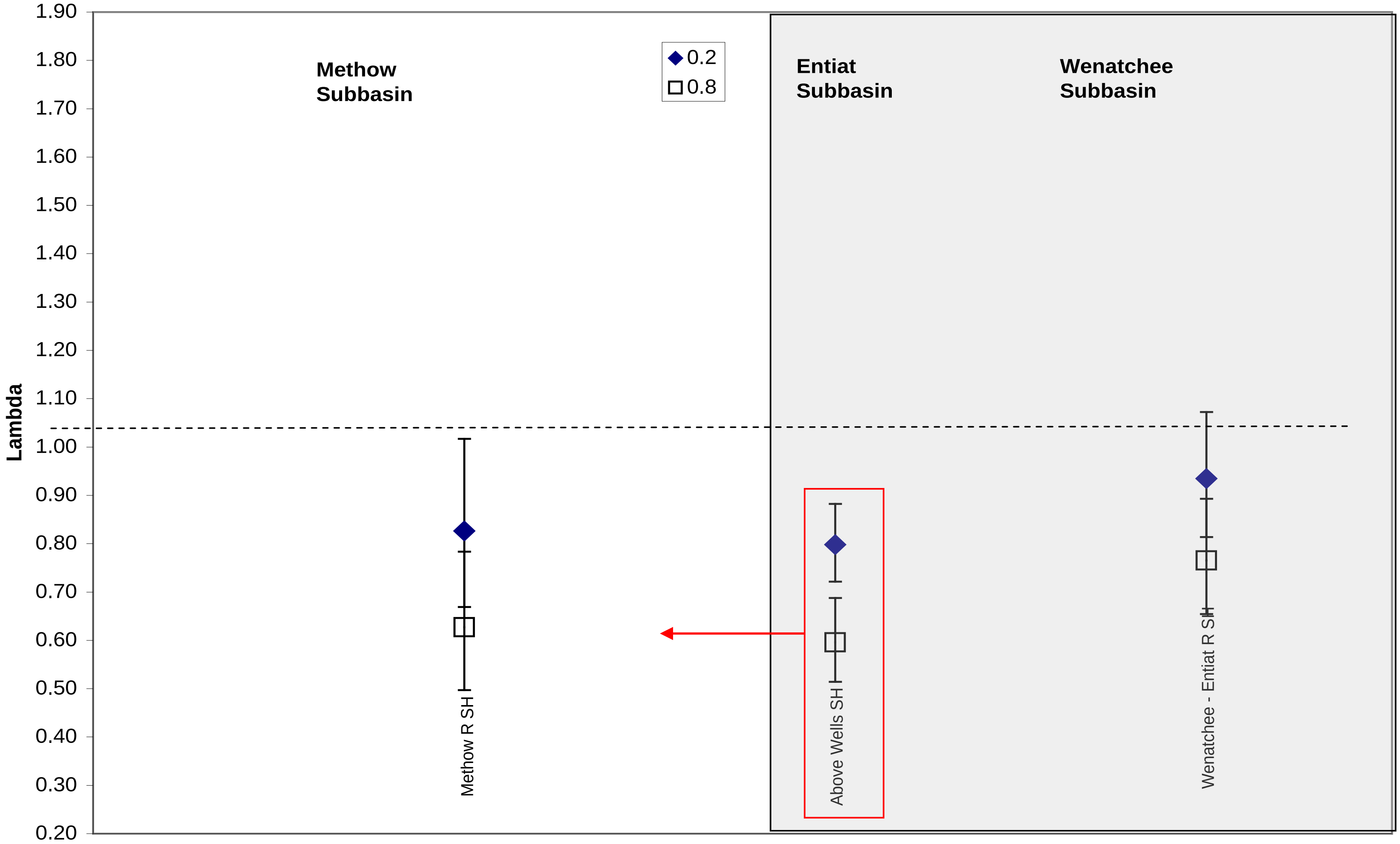
Upper Columbia Spring Chinook ESU

Figure 3. Updated 1980-present Lambda estimates with 95% confidence intervals for the Upper Columbia River Chinook ESU calculated with hatchery effectiveness of 0.2 and 0.8



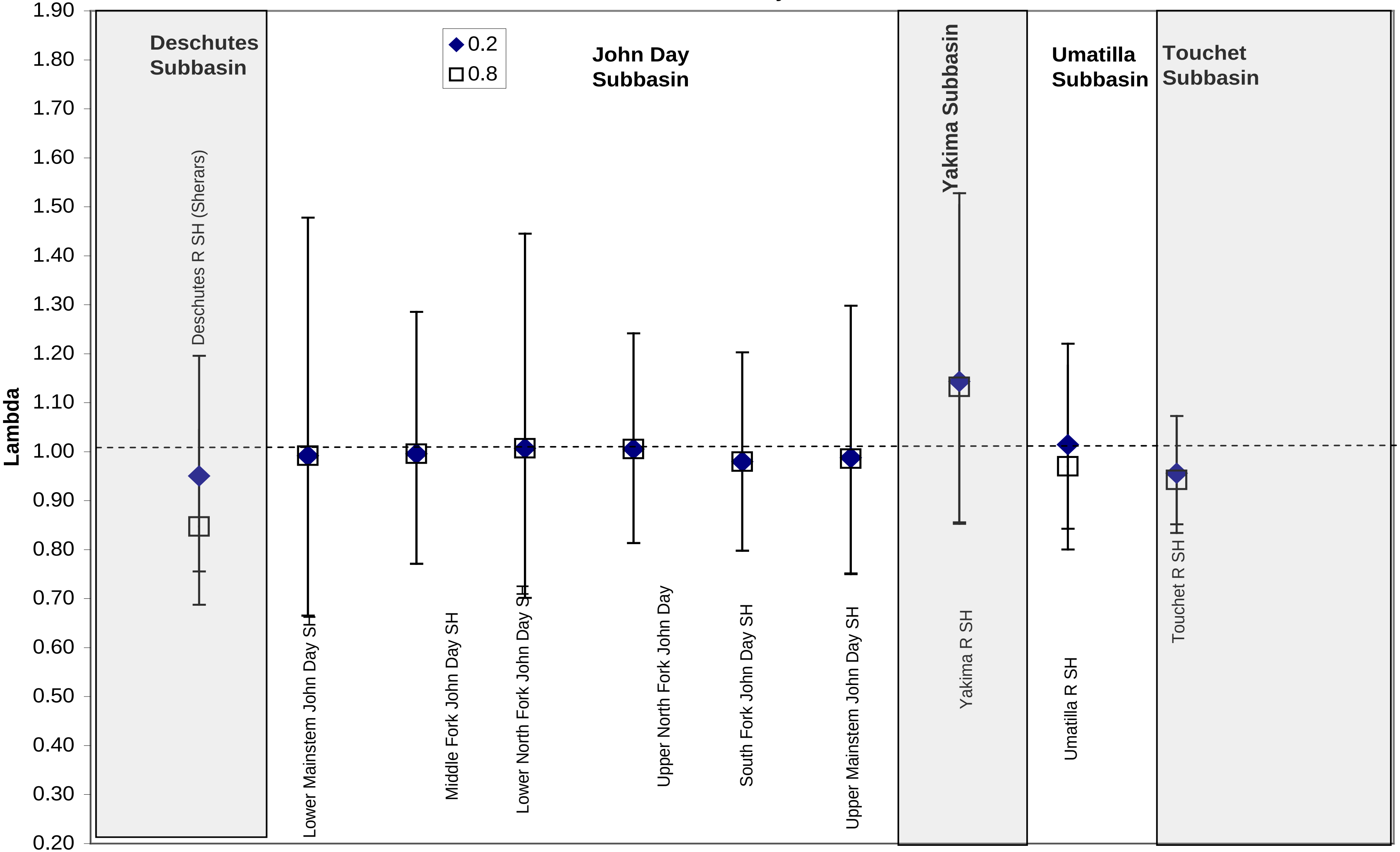
Upper Columbia Steelhead ESU

Figure 4. Updated 1980-present Lambda estimates with 95% confidence intervals for the UpperColumbia Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8



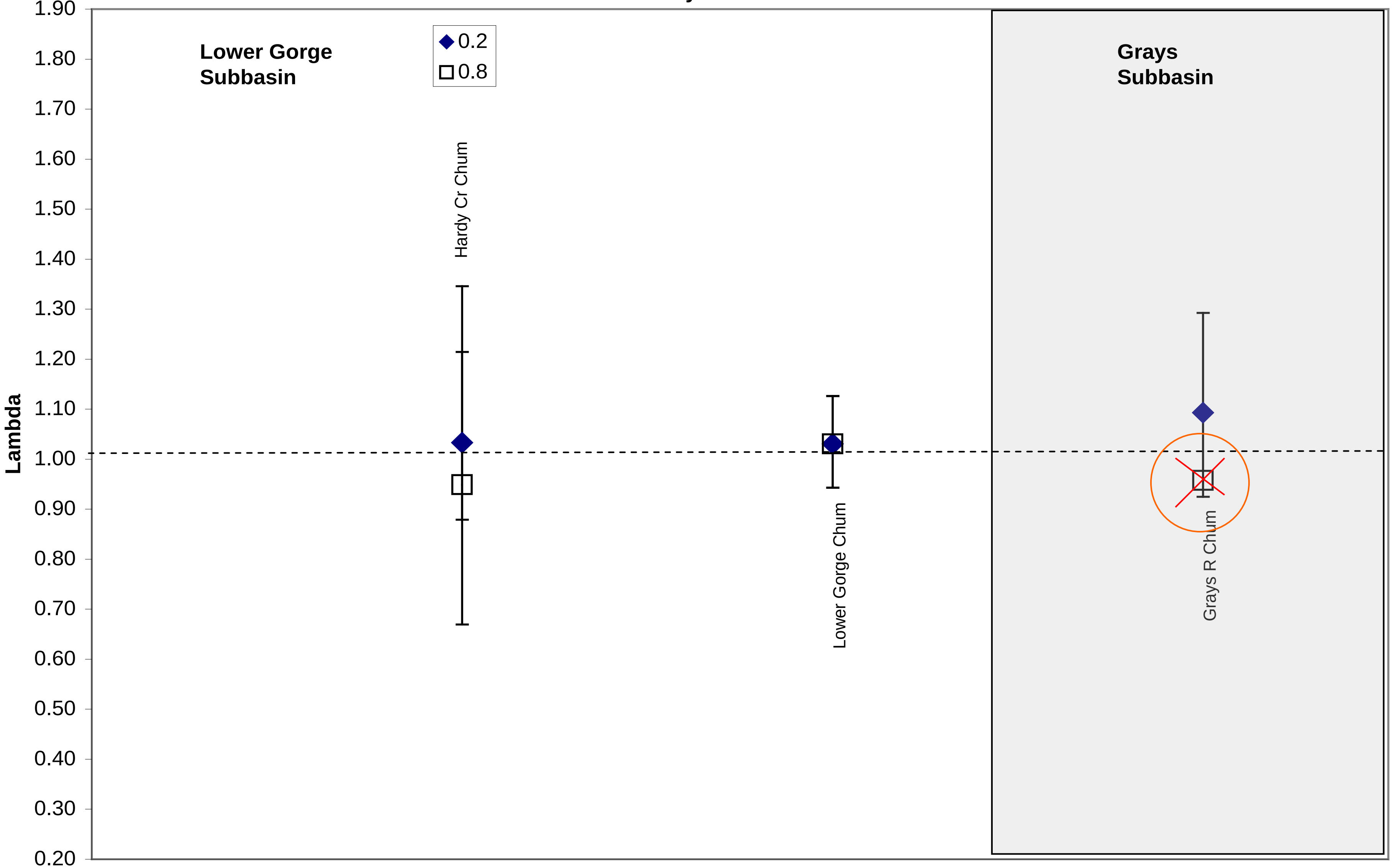
Middle Columbia Steelhead ESU

Figure 5.   Updated 1980-present Lambda estimates with 95% confidence intervals for the Mid Columbia Steelhead ESU calculated with hatchery effectiveness of 0.2 and 0.8



Columbia River Chum Salmon ESU

Figure 6. Updated 1980-present Lambda estimates with 95% confidence intervals for the Columbia Chum ESU calculated with hatchery effectiveness of 0.2 and 0.8



TECHNICAL MANAGEMENT TEAM
MEETING NOTES
November 5, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

<u>FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS</u>
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

<u>Chum Operations Update:</u>
Ron Boyce, Oregon, began today's TMT discussion with information on the numbers of fish observed at the Ives Island complex on Tuesday, November 6th – six live chum and 108 Chinook. As of 11/6, the Bonneville tailwater was operating at an 11.2-11.5' range from 7 am to 7 pm, and an overnight minimum tailrace of 11.2'. The Salmon Managers, interested in flattening flows at night to accommodate chum spawning, requested an 11.5' minimum daytime elevation. BPA and the COE expressed concerns about starting the operation too soon and offered to wait a few days to maintain some flexibility. Russ Kiefer, Idaho, suggested that there be a 'medium' constraint placed on the project operation for now, and revisit the issue after the next survey.

<u>ACTION</u>: The Bonneville tailwater continued to be operated at 11.2-11.5' daytime and minimum 11.2' at night. The COE agreed to make best efforts to level out nighttime flows by putting flexibility into daytime operations. BPA agreed to run a feasibility analysis on the requested operation and respond to TMT via email as soon as possible.

<u>2003 TMT YEAR END REVIEW</u>:

<u>2003 Comparison to Previous Years</u>:
- *<u>Temperature/ water and runoff</u>*: Cindy Henriksen, COE, presented information on '03 operations for each of the projects. Of note, the year began with low expectations for water supply, the VARQ flood control operation was implemented at Libby, and the COE shifted flood control at Dworshak in April to release full powerhouse plus 15 kcfs to provide higher flows in the Snake River. (NOAA, Nez Perce, and others expressed appreciation for this operation.)
    - **<u>LESSON LEARNED</u>**: Chris Ross (NOAA) expressed appreciation for the Dworshak operation. The Nez Perce tribe agreed and said that in the future, they would prefer that outflows be increased to slightly *above* minimum at the same time that the freshet is observed.

- *<u>TDG/Temperature:</u>* Jim Adams, COE, reported on 2003 total dissolved gas exceedances. They totaled 243 and comprise a 91.2% compliance rate. This does not include Dworshak which has a different exceedance standard. Jim noted that most exceedances resulted from professional judgment calls and high flows, and were generally off by a percent or two. The COE achieved better compliance in 2003 than the previous year. Jim also presented new temperature profiles that show where water was taken from and then used to cool in-river temperatures. A question was asked about the circulation and cooling system at the hatchery downstream of DWR.

- **LESSON LEARNED**: The new tools show that using Dworshak water to cool the Snake River in August/September is indeed a successful management strategy.
- **LESSON LEARNED**: The Salmon Managers expressed an interest in viewing the new temperature profiles on the web to aid them in making operational recommendations.
- **ACTION**: Dave Wills, USFWS, will share information on the circulation system that addresses problems with Dworshak release temperatures at the hatchery, at the next TMT meeting.

- *Fish Passage*: Jerry McCann, FPC, reported on 2003 smolt migration: run size, timing, travel time, and survival. There was an increase in subyearling summer Chinook hatchery releases this year, which impacted the run timing. Overall, hatchery and wild yearling Chinook survival and travel time was fairly consistent with previous years.

- *Weather*: Kyle Martin, CRITFC, reported that 2003 saw low to normal temperatures early in the year and hot and dry late in the season. An early El Nino event provided difficulty for forecasting, unless looking at sun spot predictions. Kyle forecasted near normal precipitation and colder temperatures for 2004. He also said that, of six methodologies presented at the Oregon Chapter American Meteorological Society's annual winter weather forecasting event, all predicted snow in Portland! Kyle provided a handout showing last year's predictions compared to observed for 2003. Anyone interested in receiving monthly forecasts should contact Kyle at mark@critfc.org.

Snake River Review:

- *Snake River Fall Chinook Survival Studies*: Ken Tiffan, USGS, reported on Billy Connor's '98-'02 Fall Chinook survival studies that examined effects of summer flow augmentation on survival. An additional year of data will be collected for the study.
  - **LESSON LEARNED**: Billy Connor's analysis from the studies was that lower temperatures and higher velocity are supportive conditions for increasing survival rates of migrating juveniles in the Snake River. A few unintended consequences of these conditions noted were wandering, delay, and other altered migration behavior.

2003 Study Information that Might Impact 2004:

- *Status Review Related to LAMBDA*: Chris Toole, NOAA, reported on 'natural spawning trends' from results of 2001 returns – the data sets are available on the FPC web site. Fall Chinook results generally showed a positive growth rate over the 1980-present time period. Mid-Columbia steelhead also showed optimistic estimates of LAMBDA (population growth rate).

- **ACTION**: NOAA will present a white paper on this data at a workshop in Seattle on December 5th, along with a request for comments. Chris said that additional information on the process would be available later in the week.
- **NEXT STEPS**: The data sets will be revised to include the 2002 return results, and available in early 2004. Chris said that it is unlikely that 2003 data will be included.

- *Lower Granite/Ice Harbor RSW Results*: Cindy Henriksen, COE, reported on RSW treatments that were used to test survival probabilities at Lower Granite and Ice Harbor. In its third year of the test at Ice Harbor, there are ongoing concerns with low survival. The final year of data at Ice Harbor will be collected next year, beginning in a few weeks.
  - **NEXT STEPS**: There will be a more detailed discussion of this information at a meeting in Walla Walla in two weeks – Cindy sent an email notice to TMT regarding this. TMT members expressed an interest in determining the benefits to out-migrating fish with the bulk spill operation that was implemented at Ice Harbor. This will be explored at the meeting in Walla Walla with an update at a future TMT meeting.

- *NOAA Survival Studies*: Paul Wagner, NOAA, shared results on 2003 fish survival studies for yearling spring Chinook and steelhead. Overall there was earlier and better survival at Lower Granite. Chinook numbers were very similar in '02 and '03, both much higher than 2001. The trend for steelhead was much lower, but there was still improvement from 2001. Paul noted that the cause for lower increases in survival of steelhead is unknown at this time, but also noted that tern predation is often cited. He also offered preliminary estimates of the percentage of fish transported: Spring chinook saw 56% thransported in 2003; 65% in 2002, and 99% in 2001. Steelhead percent transported was 76% in 2003 and 2002; and 99% in 2001.

Other Lessons Learned:

- *Impacts of 2001 Operations on Adult Returns*: Russ Kiefer, Idaho, presented preliminary results on PIT tag returns to the Snake River in 2003. He reminded the group that most of the wild PIT-tagged smolts were bypassed for river reach survival estimates, while the majority of the run-at-large (smolts in 2001) were transported. There was a very low 2-ocean adult return rate of PIT-tagged wild spring/summer Chinook compared to recent outmigration years. A proportionally large return of 3-ocean adults from the 2000 outmigration appears to have provided most of the wild Snake River Chinook spawning in 2003; the reason for this high proportion of 3-ocean returns is not yet known. Russ reported a similar trend for hatchery Chinook from the 2001 outmigration (with about half of these PIT-tagged hatchery fish being transported). Adult returns from the 2001 outmigrants will be virtually complete when the 3-ocean adults return in 2004, since very few 4-ocean adults are ever observed, and overall survival rates can be estimated then.

- *Performance Standards*: Paul Wagner, NOAA, gave an analysis of how well things are measuring up for in-river and transported fish. Overall, he offered that progress is being made in nearly all populations <u>except</u> for Snake River steelhead, which is doing much worse for both in-river and transported fish. As noted above, the reasons for this are as yet unknown and studies are underway to explain the decline of steelhead.

- *Comment from Nez Perce on operations to the Plan in '03*: Dave Statler, Nez Perce, noted that overall, the hot, low water year provided unique challenges for cooling the Snake River. This which was achieved with the added cool water from Dworshak. He also noted that saving water for September was a positive action this year – and there was still a benefit for migration. The process of meeting, receiving data, discussing the relevant information and managing the system accordingly seemed to work toward making good management decisions this year. He was encouraged and encouraging about this perspective.

SUMMARY:

- The new tools for measuring and managing temperature and gas have improved the ability of TMT to do a more precise job of managing the system to meet needs of migrating fish.
- The monitoring and analytical data has improved, as has the ability to share that information with other salmon and action agency managers, with regards to nearly all aspects of the TMT since the first of the "lessons learned" meetings four or five years ago.
- A more comprehensive monitoring program could provide more answers to important questions about steelhead and late summer migrants.
- Improvements have been seen in the run size of most species—but notably NOT steelhead. It was noted by the facilitation team that steelhead are not a big portion of discussions at TMT and they suggested that focus may need to be brought towards these fish in future TMT meetings.

Next Meeting, November 19th, 9am-noon:

- Chum update-OR
- Other Snake River issues:
    - Chris Perry (U of ID) presentation;
    - Spring spill trigger and Dworshak operations into September – BPA
- Spring Creek Update
- Water Management Plan-Update
- Schedule process meeting

1. Greeting and Introductions

The November 5, 2003 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

Silverberg welcomed everyone to today's meeting, noting that it had been agreed that today's meeting would begin with a brief update on the status of the 2003 chum spawning.

Ron Boyce said that, during yesterday's survey, field personnel found six live adult chum and one redd in Section 1, near Hamilton Creek. They also found108 live adult chinook near Hamilton Island and in the slot between Ives and Pierce Island. The bottom line is that the chum have begun to arrive, said Boyce, adding that field crews will be surveying the non-index sites – I-205 and Multnomah – later today. Henriksen noted that the chum operation -- an 11.2-11.5-foot tailrace elevation at Bonneville between the hours of 7 a.m. and 7 p.m. – started Monday morning, November 3.

Boyce said that, while that was the interim operation agreed to at last week's TMT meeting, now that the chum have arrived, ODFW recommends that the originally-requested operation – a minimum Bonneville tailwater elevation of 11.5 feet – be implemented immediately. Boyce noted that current day-average flows at Bonneville are 130 Kcfs, so the amount of water shouldn't be a problem. Nic Lane replied that BPA would prefer to maintain some operational flexibility at Bonneville and wait until a few more chum are present on the spawning grounds before agreeing to maintain the higher flow and tailwater level requested by the salmon managers.

Cindy Henriksen noted that there is no precipitation in the immediate forecast; while we recognize that we need to transition to the higher tailwater elevation, she said, we would like to know a bit more about what our water supply is likely to be. John Wellschlager said that maintaining the 11.5-foot minimum tailwater elevation for 24 hours is an operational problem for BPA at this point in the season, because reverse load factoring is leading to higher nighttime flows. Our concern is that if we commit to the 11.5-foot minimum tailwater elevation too early in the season, he said, that will cause Grand Coulee to draft more quickly than planned. Boyce noted that the Fish and Wildlife Service has documented nighttime chum spawning; providing higher flows, on the order of 170 Kcfs, at night could have detrimental consequences, in the form of dewatered redds later in the season.

Paul Wagner noted that while there is evidence that fish move gravel and may be spawning at night, there is no evidence that they are depositing redds at the higher levels watered up during reverse load factoring. We can't document detrimental impacts of pushing that much water out at night, said Boyce, but there is the potential for detrimental impact -- why can't you use a more conservative operation, given that uncertainty? We don't always push a lot of water out at night, Wellschlager replied, but Bonneville, the last dam in the system, is a pinch-point, and if you want to maintain a consistent flow and a higher tailwater elevation at that project, you're going to drain the system prematurely. Flow varies, and we need the flexibility to manage it effectively, Wellschlager said – there is a lot of refurbishment work going on at Bonneville, currently, and the project is actually quite constrained as to the amount of flow it can pass during any given hour.

Silverberg asked when the action agencies had planned to bump up to the 11.5-foot tailwater elevation at Bonneville. Again, said Henriksen, we would like to have a bit more information about the water supply forecast for the coming year – at the moment, we're in a dry weather cycle.

We have a day-average flow of 130 Kcfs at Bonneville, said Boyce – why can't you shape a bit more of that water into daytime hours? Again, the action agencies need the operational flexibility to meet load, Tony Norris replied.

With respect to the weather, said Kyle Martin, the cold snap will end this weekend, with temperatures moderating to near-normal levels by Monday. We should start seeing a bit of precipitation next week as well, he said.

Wellschlager said that, in the action agencies' view, without more information about the water supply for the coming year, it would not be judicious for the action agencies to drain the system now to meet the needs of the chum when there is a host of other species with needs that must be met next year. There has to be some period during the 24 hours of the day when we have the flexibility to release higher flow at Bonneville, he said, whether that's during the day or during nighttime hours. Could we provide a tailwater range of 11.3 feet to 11.7 feet during the day? Boyce asked. Wouldn't it be better to wait until more chum arrive and the spawners become habitat-limited? Wellschlager asked. What Ron is suggesting is that you put more flow into the daytime hours to reduce the nighttime peak, Norris observed.

After a few minutes of further discussion, Wellschlager said it should be possible to bump up the Bonneville daytime tailwater elevation to the 11.3-11.7-foot range, but he would like to run some further analysis before definitively agreeing to this operation. And this would not be a hard constraint, but the action agencies will agree to do everything possible to meet that range? Silverberg asked. Correct, was the reply. And if we can try to level out the flows more to avoid large nighttime peaks, that would also be desirable on the part of the salmon managers, Jim Litchfield observed. Bear in mind, however, that if temperatures go back up to the 60-degree range, flows at Bonneville are going to recede from their current levels, Wellschlager said. In the meantime, if Bonneville can pass more water during the day, reducing the nighttime peaks, that's a win-win situation for both Bonneville and the chum, Litchfield said. That may be doable, but again, I would like to check with my technical staff before I agree, said Wellschlager -- the tailwater elevation at Bonneville is a complex calculation. He said he will provide the results of the BPA analysis to the TMT membership via email as soon as it is available.

And in the meantime? Boyce asked. We are continuing with the 11.2-11.5-foot operating range at Bonneville, until we hear otherwise from BPA, Henriksen replied. Again, said Wellschlager, I don't think the 11.3-11.7 range will be a problem, but I'm not doing my job unless I check first with my technical team before agreeing. And you understand that time is of the essence? Silverberg asked. I don't agree, said Wellschlager – we've just heard that there are six chum on the spawning grounds. If there were 500, then time would be of the essence. As noted last week, said Boyce, it isn't just the number of spawners – it is the depth of water over the spawning grounds and upwelling through the gravel that provide the conditions the chum are looking for. We will update the TMT on spawner numbers as additional field surveys are completed, Boyce said, adding that the salmon managers' preference would be the operation requested in the SOR (an instantaneous minimum tailwater elevation of 11.5 feet).

2. 2003 Comparison to Previous Years.

A. Temperature, Water and Runoff Patterns. Henriksen began by noting that her presentation today is available via hotlink from today's agenda on the TMT website. Beginning with Libby, she noted that, on September 1, 2002, Libby was at elevation 2439, 20 feet from full. The project was on minimum flow through the winter, then increased outflow to draft to its flood control elevation. We did implement a VARQ operation at Libby this year, she said.

The January Libby water supply forecast was only 78% of average, Henriksen said; this resulted in low outflow from Libby through the spring. By March, the Libby forecast had fallen to 4.1 MAF, 67% of average, and the flood control point was 2450 – we were physically unable to get there. In June, we had a sturgeon pulse, beginning June 6; we ultimately released 950 kaf from Libby for sturgeon. We refilled to within the top foot by the end of June, and stayed at that level through the beginning of July, passing inflow; we then drafted to 2439 feet, 20 feet of full, by August 31, because we were unable to negociate a Libby-Canada storage swap in 2003 due to hydrologic conditions in Canada, Henriksen said.

At Hungry Horse, said Henriksen, we began the season slightly above the August 31, 2002 draft limit because the salmon managers asked us to retain 140 kaf of Hungry Horse storage for release in September. We met the Columbia Falls minimum through the fall and winter. With the dry fall and low expected runoff, Hungry Horse was well below its flood control elevation through the season. The January water supply forecast at the project was only 85% of average, she said; bear in mind that this is the forecast used to calculate the project's flood control point. The seasonal average water supply at Hungry Horse actually turned out to be 74% of average, she said. Ultimately, Hungry Horse filled to within the top two feet by June 30, and drafted 20 feet by September 15, meeting its BiOp obligations.

At Grand Coulee, in 2002 the project drafted 10 feet by August 31, Henriksen said; Grand Coulee then refilled to elevation 1293 feet by September 4, very early, and stayed at that level through the rest of the fall and winter. The January Grand Coulee water supply forecast was 80% of average, and later dropped to 44 MAF, 73% of average. Observed runoff was 50.2 MAF, 83% of average, at Grand Coulee, Henriksen said. Grand Coulee drafted heavily through May for flow augmentation at Priest Rapids, reaching elevation 1265 on May 24. The project refilled over the July 4 weekend, then drafted to elevation 1278 by August 31.

Moving on to Dworshak, Henriksen said that, in 2002, 15 feet of storage was reserved for release during the month of September. The project reached elevation 1520 on September 15, then released minimum flow through the fall and winter. We were well below flood control until April, she said. Observed Dworshak runoff for the April-July period was 2.3 MAF, 86% of average, well above the January, February and March water supply forecasts, Henriksen said. We shifted flood control at Dworshak this year, storing above flood control at Dworshak and releasing more at Grand Coulee, she said; the shifted elevation was 1580 feet at Dworshak. We were actually able to fill above Dworshak's flood control elevation, allowing us to release 15 Kcfs from Dworshak during April to increase Snake River flows. Dworshak, too, was full by July 4; we reserved 200 kaf for release from Dworshak during the month of September. Chris Ross thanked the Corps for their extra efforts in agreeing to fill Dworshak above its flood control elevation limit in 2003 – that put a lot of water on the fish right when they needed it in April and May, he said.

However, Dworshak had to go to minimum outflow during the spring freshet in order to refill, Dave Statler observed – it would have been preferable if Dworshak could have released some of that water a bit earlier. We had to get back to Dworshak's flood control elevation in May, Henriksen said; also, the freshet was somewhat larger than expected. It seems to me that there wasn't much of a flood control issue at that time, Statler said – it would be preferable for Dworshak not to have to reduce outflow to minimum while it's refilling.

Moving on to Priest Rapids operations, Henriksen said flow augmentation for fish passage began at that project in late March and early April, using water from Grand Coulee's draft to 1265. At Lower Granite, said Henriksen, we were able to keep outflows at or near the BiOp target flow in May even as Dworshak outflow was going to minimum, due to the size of the spring freshet. Flows peaked at about 200 Kcfs in mid-May at Lower Granite. The summer flow objective was 50 Kcfs at that project; observed flow was 32 Kcfs. Observed flow was 79% of average at Lower Granite for the year.

The observed average flow at McNary was 230 Kcfs during the spring period, above the target of 200 Kcfs, Henriksen said. Observed average flow at McNary was 135 Kcfs for the summer period, below the BiOp target. Flows at McNary peaked at 350 Kcfs on May 31. Observed water supply, January-July, was 82% of average at McNary, Henriksen said. In other words, 2003 was a somewhat dry water year, but not nearly as dry as 2001, she added.

B. TDG Level Variations. Jim Adams reviewed 2003 water quality data, noting that there were a total of 243 days of TDG exceedence during the 2003 runoff season. He went through the exceedences by location and type, noting that all of this information is available via the TMT homepage. Adams also touched on:

- April, May and June exceedences at a glance
- Exceedences at Dworshak (11 in all)
- A comparison of 2003 exceedences with previous years (there were 490 days of exceedence in 2002, and only 13 in 2001)
- 2003 Dworshak gate operations
- 2003 Dworshak outflow data
- Dworshak temperature profiles
- Hourly temperature data from the Anatone and Dworshak tailwater gauges

Has the Dworshak water temperature problem now been fixed? Jim Ruff asked. The recirculation system work is supposed to be complete this month, Davis Wills replied, but my understanding is that there may still be window when water temperature is a problem during the fall. Release temperature will no longer be a problem during the summer, though? Ruff asked. I'll clarify that with the hatchery and report back at the next TMT meeting, Wills replied. Boyce noted that it would be helpful to have information on both the magnitude of the daily TDG exceedences and on days when TDG levels were under the waiver limits. Henriksen reminded Boyce that state waivers represent an upper limit. Any excursion above the waived limits is an exceedance. Ruff asked whether the state water quality agencies had contacted the Corps about any of these exceedences. No, Adams replied.

C. Fish Passage. Jerry McCann briefed the group on juvenile fish passage data from

2003, stressing that this is preliminary information. He touched on the following major topics:

- Combined yearling chinook passage at Lower Granite Dam'
- Yearling chinook timing at Lower Granite (similar to previous years)
- Survival of yearling chinook from Salmon River trap to Lower Monumental 1999-2003 (0.7% for wild chinook, 0.6% for hatchery, comparable to recent years)
- Combined hatchery and wild steelhead population at Lower Granite and hatchery releases, 1998-2003
- Steelhead timing at Lower Granite (comparable to the historic average)
- Survival of hatchery steelhead from traps to Lower Monumental 1999-2003 (2003 survival was higher than previous years)
- Hatchery/supplementation releases of subyearling chinook above Lower Granite, 1995-2003 (gradually-increasing numbers since 2000)
- Subyearling chinook timing at Lower Granite (significantly earlier than average in 2003 for the run at large)
- Water transit time Lower Granite to the tailwater of Ice Harbor vs. average flow at Little Goose, Lower Monumental and Ice Harbor
- Travel time, Lower Granite to McNary for hatchery and wild yearling chinook, 1998-2003 (2003 travel times similar to previous years)
- Survival of hatchery and wild yearling chinook, Lower Granite to McNary, 1998-2003 (2003 survival similar to previous years)
- Steelhead travel time, 1998-2003, Lower Granite to McNary (2003 travel time similar to previous years)
- Steelhead survival 1998-2003, Lower Granite to McNary (2003 survival similar to previous years)
- Travel time for hatchery and wild yearling chinook, 1999-2003, McNary to Bonneville (2003 survival similar to previous years)
- Survival for hatchery and wild yearling chinook, 1999-2003, McNary to Bonneville (2003 survival similar to previous years)
- Travel time for steelhead, 1999-2003, McNary to Bonneville (2003 similar to previous years)
- Survival for steelhead, 1999-2003, McNary to Bonneville (2003 similar to previous years).

Any lessons learned from 2003? Silverberg asked. Only that the timing of the spring migration was similar to previous years, McCann replied – again, this is preliminary data, and there is still a fair amount of analysis to be done.

D. Beginning and End of Spill Relative to Fish Passage.

E. Weather. Martin briefed the group on weather conditions in 2002/2003, noting that, last fall, temperatures were generally warmer than average, with below-average precipitation. The pattern held sway through February, a pattern consistent with an El Niño effect. Then in March, the El Niño died out, which gave us a late blast of precipitation in March and April, with temperatures near the average range. That's what basically saved our bacon, in averting another drought year in 2003, Martin said.

That's also where the good news ends, Martin continued; beginning in June, temperatures were well above normal, a pattern that continued up until two weeks ago. Precipitation for the basin during the June-September period was only about 50% of average. If you're wondering why the Corps wasn't able to keep flows up in the river, that's why, Martin said. The Columbia at The Dalles ended the season at 85% of normal runoff, Martin added; the Snake River Basin was drier, with runoff in the 70%-75% of normal range. The runoff in the Upper Columbia basin was also below normal, Martin said.

Martin noted that 2003 had a very unusual El Niño pattern, one that was accurately predicted using Southern Oscillation Index (SOI) and sunspot data. It was a weak El Niño, however, and its effects on runoff were moderate in the spring, but severe in the summer.

For the coming year, said Martin, both CRITFC and the University of Washington forecasts are predicting below-average temperatures and normal precipitation. With respect to runoff, the prediction is 104 MAF-110 MAF, 97%-102% of average at The Dalles, Martin said. But there are large bandwidths around that forecast at this point in the season, in terms of both minimum and maximum? Wellschlager asked. Correct, Martin replied.

3. Snake River Review.

A. Spring Spill Trigger. Ken Tiffan of USGS said he was here in place of Billy Connor, who was unable to attend today's meeting. Tiffan briefed the TMT on the most recent results of the USGS efforts to evaluate when spill should begin in the Lower Snake River. Tiffan touched on the following major topics:

- Rearing temperatures, subyearling chinook, 1998-2003
- Subyearling chinook growth, 1998-2003
- Flow during rearing,1998-2003
- Subyearling chinook survival to Lower Granite Dam tailrace, 2003 (in 2003, for the first time, the earliest-emerging fish showed the lowest survival – normally, they have the highest survival. This year's result may have had something to do with the fact that the fish were flushed out with high flows, at a time when large amounts of woody debris were present at the dams)
- Mean cohort survival to the Lower Granite Dam tailrace, 1998-2003
- Survival to Lower Granite tailrace vs. fork length, 1998-2003 (the larger the fork length, the higher the survival)
- Survival to Lower Granite Dam tailrace vs. flow, 1998-2003
- Survival to Lower Granite Dam tailrace vs. temperature, 1998-2003
- Regression results using these variables
- Observed flow, approximate flow without augmentation and approximate flow for early Dworshak releases, June 1-August 31
- Observed temperature, approximate temperature without augmentation, and approximate temperature for early Dworshak releases, June 1-August 31
- Survival predictions, 2003
- Conclusion: without flow augmentation, water temperatures in the Lower Snake would

have been lethal for about three weeks after July 28, so augmentation increased the survival of late-migrating fish, assuming that these fish found the cold water

Tiffan then moved on to his evaluation of the effects of flow augmentation on fish behavior. He touched on the following topics:

- Objective: define the relationship between water velocity and fish migration rate
- Approach: release radio-tagged run-at-large subyearlings at lower Granite to obtain behavioral information and migration rate data, gather water velocity data
- Radio telemetry detection sites
- Detection efficiencies at these sites
- Water velocity data from the acoustic Doppler current profiler
- Water velocity vs. travel time data
- Upstream excursions (only one of the 10 fish that headed upstream was eventually detected at Lower Granite Dam)
- Temperature selection data
- Summary of temperature selection data
- Flow chart showing the relationship between temperature, flow augmentation, water velocity, travel time and survival

Any differences between the migratory behavior of the Clearwater and Snake fish? Statler asked. The radio-tagged fish showed little difference, but it is interesting that many of the temperature-tagged fish migrated in the warmer part of the water column, Tiffan replied – in other words, some, but not all, of the fish seemed to find the cooler water.

B. Fall Chinook Survival Studies. This topic was not addressed.

C. Dworshak Operations Into September. This topic was not addressed.

4. 2003 Study Information That Might Impact 2004 Operations.

A. Lower Granite Removable Spillway Weir (RSW) Results. Henriksen said a more detailed discussion of this data will take place two weeks from now at the Corps' Walla Walla District headquarters; some information is available via the TMT website. Basically, she said, in 2003, when the spillway weir operated, about 12 Kcfs was spilled; when it was not operating, the project spilled to the gas cap. The estimated survival probability was 98% through the RSW in 2003, and 93% through regular spill. There is some indication that forebay residence time was less when the RSW was operating, Henriksen said; the incidence of fish traveling upstream in the forebay was less with the RSW on.

Henriksen said that the plan, at this point, is to re-test the Lower Granite RSW in 2004, this time with the behavioral guidance system moved from the south shore to the north. Again, she said, we will be discussing the 2004 operation at Walla Walla in two weeks. She said she will send the agenda for this meeting to the TMT membership.

B. NOAA Survival Study. Wagner said this study focused on transported Snake River spring/summer chinook and steelhead smolts. Using a series of PowerPoint slides, he touched on the following major topic areas:

- Estimated survival and standard error for yearling chinook released at Snake River and Upper Columbia hatcheries to the Lower Granite and McNary tailraces
- Mean estimated survival of Snake River yearling chinook and steelhead (hatchery and wild, in-river fish only) through the hydropower system, 2001-2003 (53% and 31%, respectively, to the Bonneville tailrace for chinook and steelhead smolts in 2003)

Wagner noted that the largest drop in between-project steelhead survival occurs in the Lower Monumental-McNary reach; it is believed that predation may be the cause.

Moving on, Wagner touched on:

- Mean estimated survival and standard error through the Lower Columbia River for yearling chinook and steelhead originating in the Upper Columbia River, 2002-2003 (hatchery only) – 77% and 70%, respectively, for chinook and steelhead in 2003
- Estimated survival probability for yearling chinook and steelhead, by reach
- Percentage of Snake River spring/summer chinook smolts transported, 1999-2003 (56% in 2003, compared to 99% in 2001 and 80% in 2000)
- Percentage of Snake River steelhead smolts transported, 1999-2003 (77% in 2003)

C. Ice Harbor Results. Henriksen said there were also two spill treatments at Ice Harbor in 2003: 45 Kcfs spill during the day and spill up to the gas cap at night, and 50% spill 24 hours a day. She said that, in March, the Corps tested bulk spill, confined to Spill Bays 2, 3 and 4 using similar spill volumes; preliminary results showed increased survival from this treatment. The decision was then made to continue with 45 Kcfs bulk spill 24 hours per day. Basically, it was the shape, rather than the quantity, of spill that was different at Ice Harbor this year, Henriksen said. For 2004, we will need to decide what spill pattern to use; that will be one of the items discussed at Walla Walla in two weeks, she said.

D. Status Review Related to LAMBDA. Chris Toole provided this presentation; he noted that it is derived from a report to the court titled “Preliminary Estimates of Updated Indicator Metrics Applied to the 2000 FCRPS BiOP.” Toole touched on the following major topic areas, noting that all data is through 2001 only:

- Population data availability
- Data sources through 2001
- What we did to the data sets
- Updated spawner or redd count estimates – example: Marsh Creek population of Snake River spring/summer chinook
- Estimating the trends in this population using the Dennis/Holmes method
- LAMBDA (population growth rate) fit to running sums since 1957 and since 1980
- Effects of choosing alternative start years on median LAMBDA estimate
- Effects of choosing alternative start years on LAMBDA confidence limits
- How data sets relate to proposed populations

- Updated 1980-present LAMBDA estimates for Snake River spring and summer chinook and steelhead and Upper Columbia spring chinook, Middle Columbia steelhead and Columbia River chum ESUs

Toole noted that many of these data sets are currently being revised to reflect 2002 data; the timeline for the incorporation of the 2003 data is uncertain at this time.

5. Other Lessons Learned.

A. Impacts of 2001 Operations on Adult Returns. This topic was not addressed.

B. PIT Tag Returns to the Snake River. Russ Kiefer said he had agreed to provide some of IDFG's preliminary data on PIT-tagged wild spring/summer chinook and steelhead returns tagged above Lower Granite Dam from migration year 2001 (through adult return year 2003). He touched on the following major topic areas:

- Detected SAR percentages for one-ocean (jack), two-ocean and three-ocean wild spring/summer chinook.
- Imnaha Hatchery summer chinook SARs smolt migration years 1995-2002
- Rapid River spring chinook SARs, smolt migration year 1995-2002
- Dworshak Hatchery spring chinook SARs, smolt migration year 1995-2002
- Wild steelhead SARs, migratory year 1990-2001

C. Juveniles and Adults. This topic was not addressed.

D. Mid-Columbia Stocks. This topic was not addressed.

E. Information from Transport Data. This topic was not addressed.

6. Performance Standards: How Are Things Measuring Up?

Wagner noted that the 2000 FCRPS BiOp set a goal for performance -- to exceed the 2000 average survival for both in-river fish and system survival. For in-river Snake River spring/summer chinook, (Lower Granite-Bonneville) that number was 49.6%; in 2001 the goal was not met; in 2002 and 2003, it was slightly exceeded. The system survival goal for this stock was 54.8%; in 2000, we were slightly under the goal; in 2001 and 2002, we were slightly above it.

Wagner said the BiOp goal for Upper and Middle Columbia steelhead survival was set at 66.4% for inriver fish; that goal has not been met in any of the years from 2000 to 2003. The system survival goal for this stock is 67.7%; again, it has not been met in any of the subsequent years.

Wagner said the BiOp RPA goal for Upper and Middle Columbia spring/summer chinook inriver migrants was 67.7%; that goal was exceeded in 2000, 2002 and 2003. The system survival goal for this stock was 66.4%; it has been met or exceeded every year since 2000, with the exception of 2001, when survival with "D" was slightly below the goal.

For Snake River fall chinook, Wagner said the BiOp RPA goal was set at 14.3% survival for in-river fish; that goal was not met in 2000 or 2001. The system survival goal for this stock was set at 12.7%; that goal was slightly exceeded in 2000 and 2001.

Finally, said Wagner, the BiOp RPA survival goal for Snake River steelhead migrating inriver was set at 51.6%; we have been well below that goal since the BiOp was issued. The system survival goal for this stock was set at 49% with an assumed "D" value of 52%; again, we were below the goal in 2000, 2001 and 2002. With an assumed "D" value of 56%, the goal of 52.5% was exceeded slightly in 2001 and missed slightly in 2000 and 2002.

Wagner noted that there are various theories regarding the low survival rates for steelhead; avian predation is one popular idea. It is striking that things seem to be looking better for all of the stocks except steelhead, Silverberg noted; one thing to think about is how we might change management strategies to help the steelhead.

7. 2003-2004 Weather Forecast.

Martin ended the post-season review by briefing the group on his 2003/2004 climate forecast. First, however, he asked Statler to say a few words about Dworshak operations in light of the Nez Perce/Idaho plan and how it was implemented in 2003. It was a hot year and a low water year, Statler said; under those conditions, it was challenging to maintain temperatures in the Lower Snake. I think we met those conditions and did as well as we could do last summer in terms of moderating inriver temperatures, Statler said; as we heard in some of the earlier presentations, our operations did have a positive impact on the Lower Snake temperature regime. We were also able to retain some cool water storage in Dworshak for use in September, and given the weather conditions, it's a good thing we did, Statler said. I don't know if it was luck, skill or a combination of both, he added, but working from the information in hand, we made some very responsible week-to-week management decisions.

With that, Martin moved on to his weather briefing. First, however, he distributed a handout showing preliminary tribal fish harvest numbers from the summer and fall of 2003.

With respect to the upcoming weather, Martin said his forecast indicates the following:

Month	**Temperature**	**Precipitation (% of normal)**
November	Near-normal	Near-normal (90%-110%
December	Near-normal	Near-normal (90%-110%)
January	Below-normal	Below-normal (70%-90%)
February	Below-normal	Near-normal (90%-110%)
March	Near-normal	Near-normal (90%-110%)

Martin noted that the Portland-area snow probability is 40% in November, 70% in December and January and 90% in February and March.

Moving on to his water year 2004 water resources forecast, Martin said that, according to his forecast, the region can expect the January-July water supply at The Dalles to be in the 104 MAF-110 MAF range, 97%-102% of normal.

Martin also provided a comparison of his 2002 weather predictions to the actual temperature and precipitation observed, by month. Martin's temperature forecast compared quite favorably to the actual temperatures observed in November, February and March but failed to predict the above-normal temperature excursions in December and January. For precipitation, Martin's forecast underpredicted observed precipitation in December, January and March and overpredicted precipitation in November and February. He asked anyone interested in receiving his 30-day and 90-day forecast to email him at mark@critfc.org.

With that, the TMT's 2003 post-season review was adjourned. Meeting summary prepared by Jeff Kuechle.

Snake River PIT-tagged Sp/Su Chinook

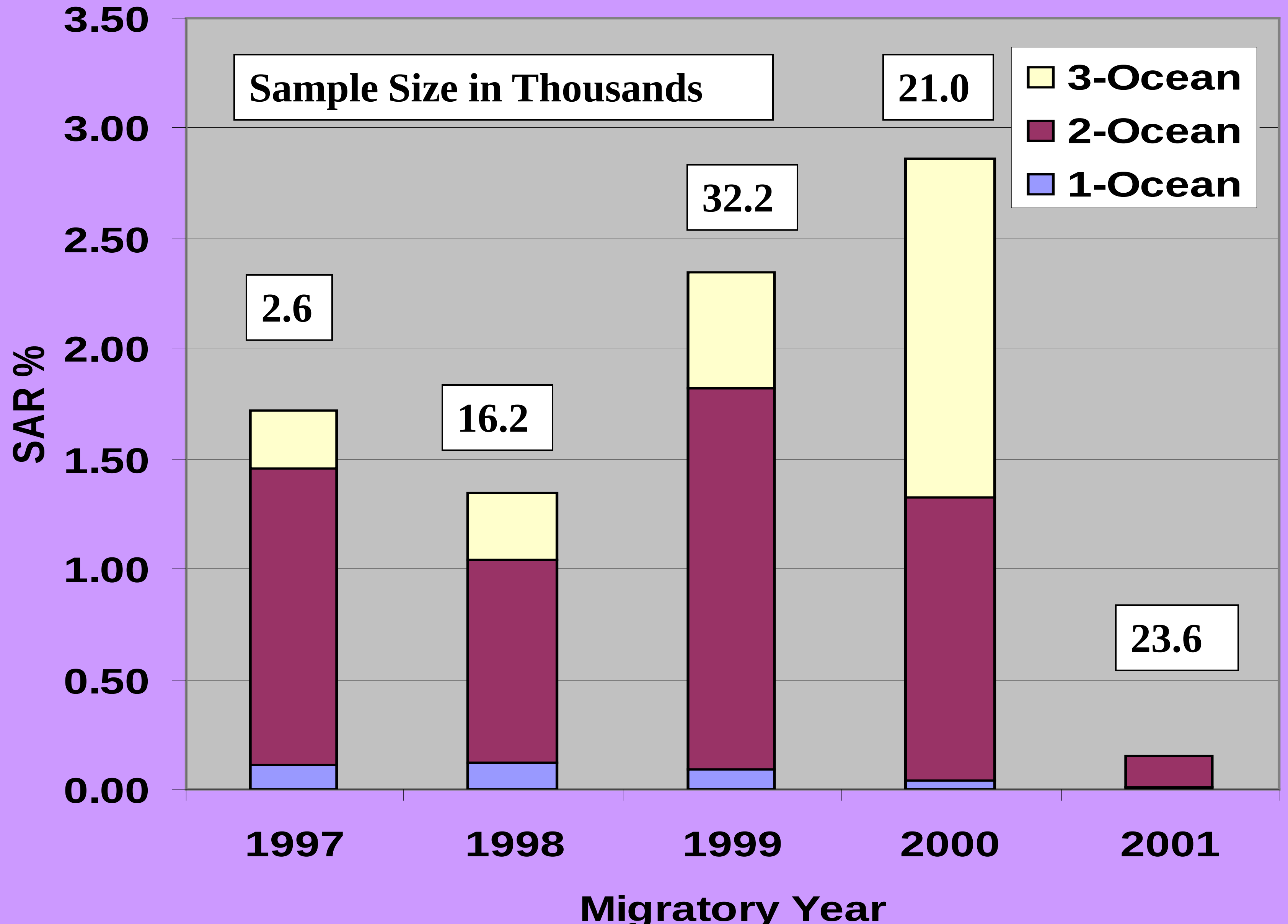
What do they tell us about smolt migration year 2001!

A preliminary View of Detected Smolts Through Adult Return Year 2003

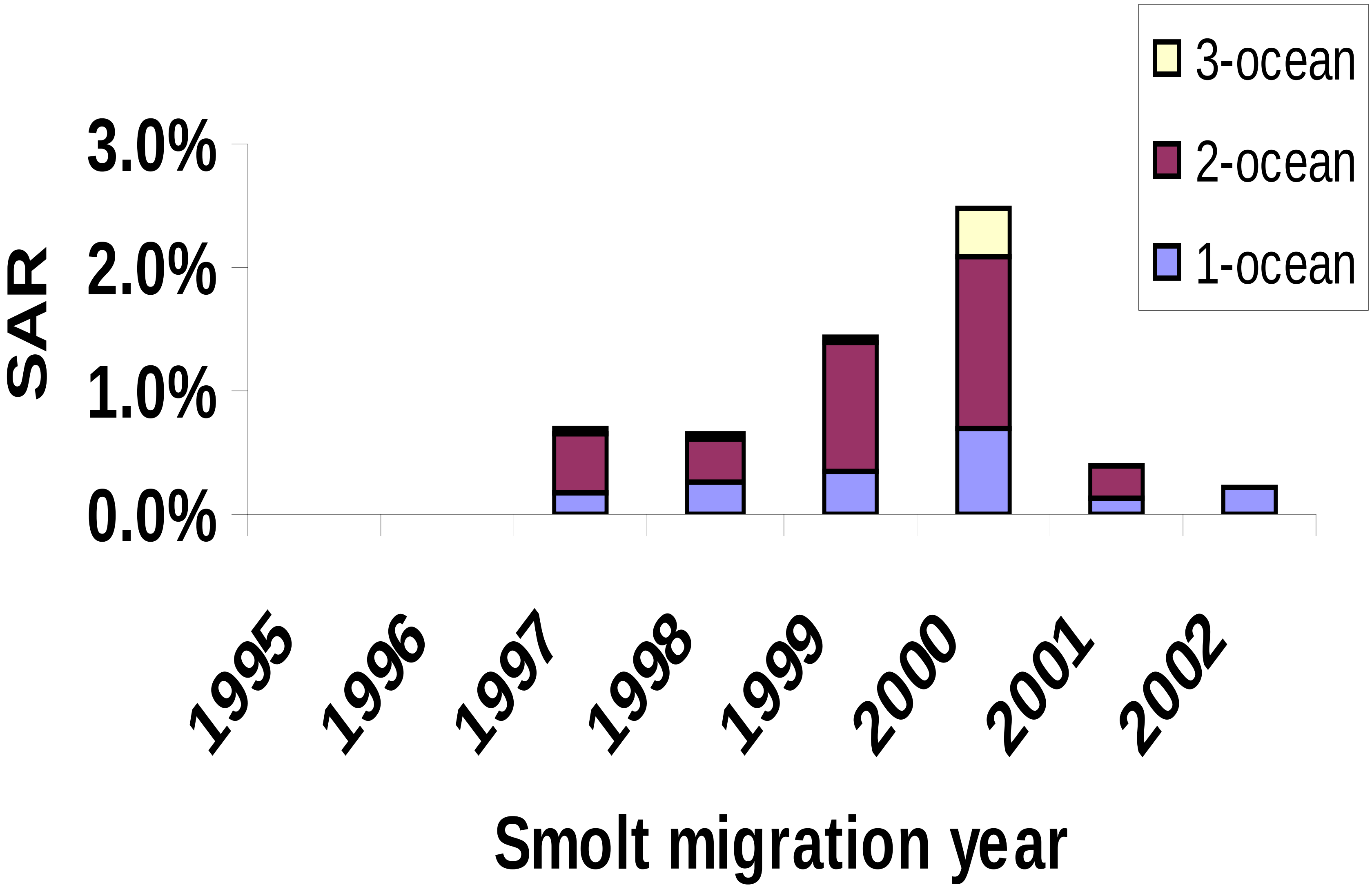
by

Russ Kiefer

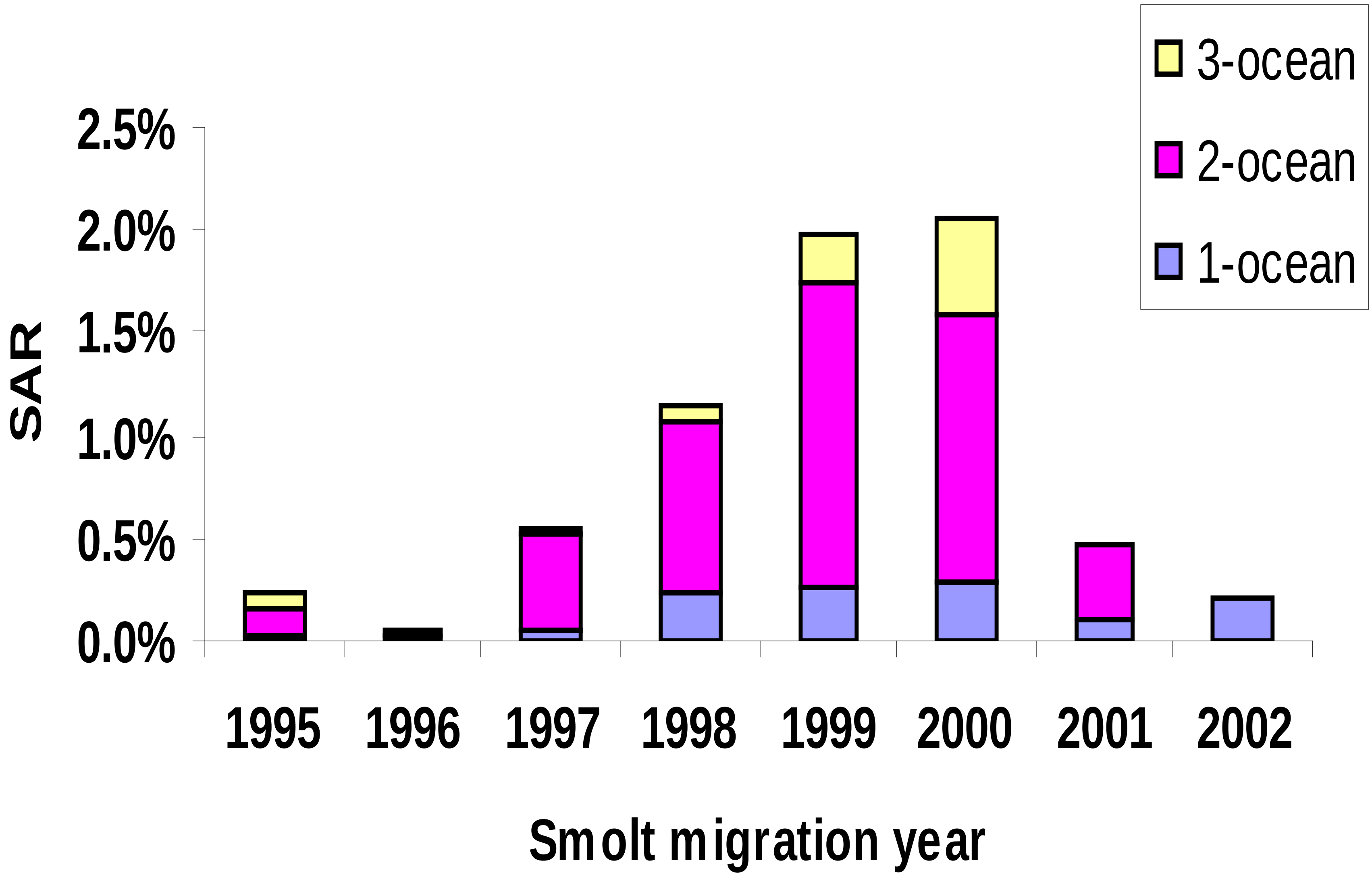
PIT-tagged Wild S/S Chinook Detected SARs



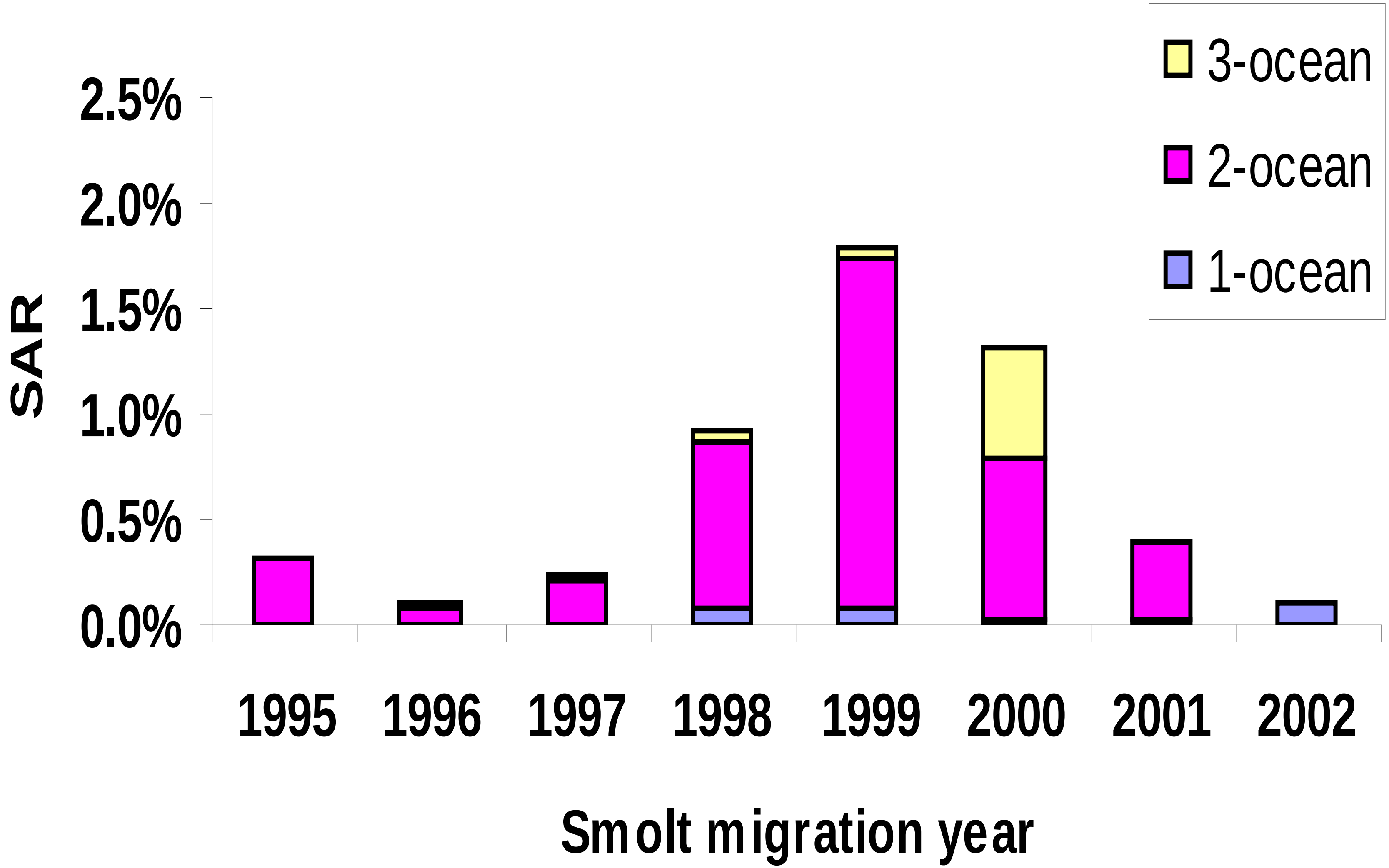
Imnaha hatchery summer chinook



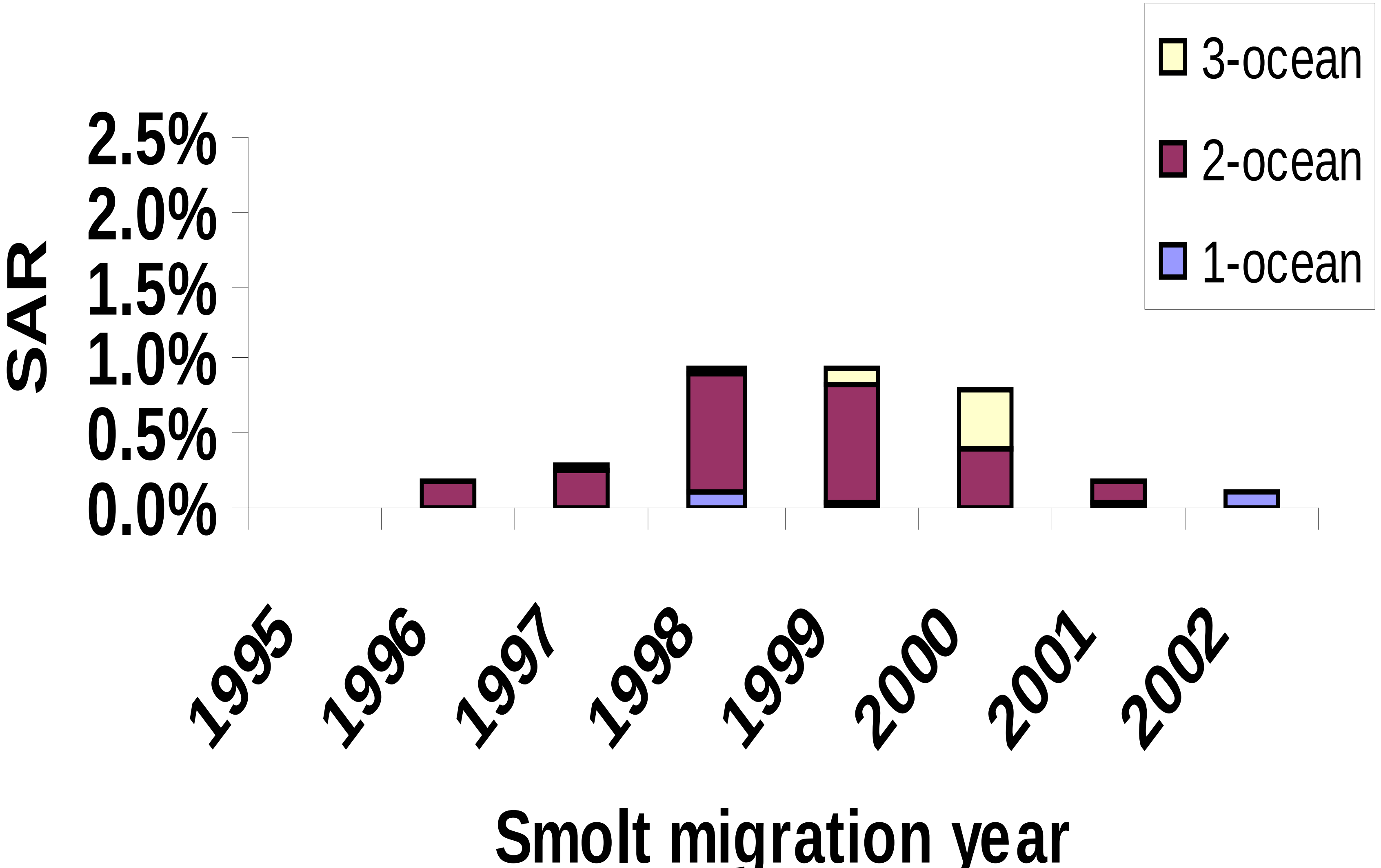
McCall hatchery summer chinook

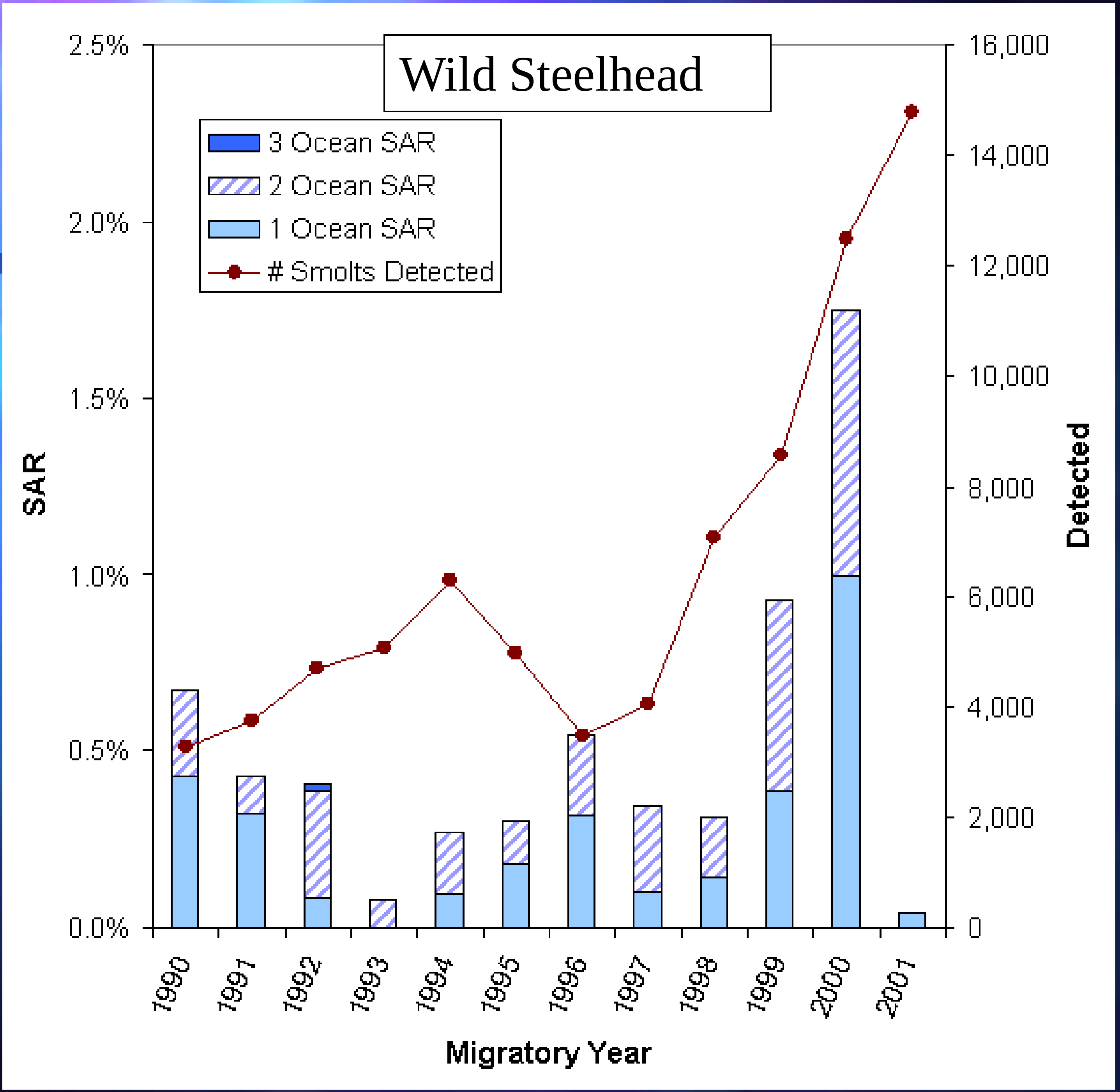


Rapid River hatchery spring chinook



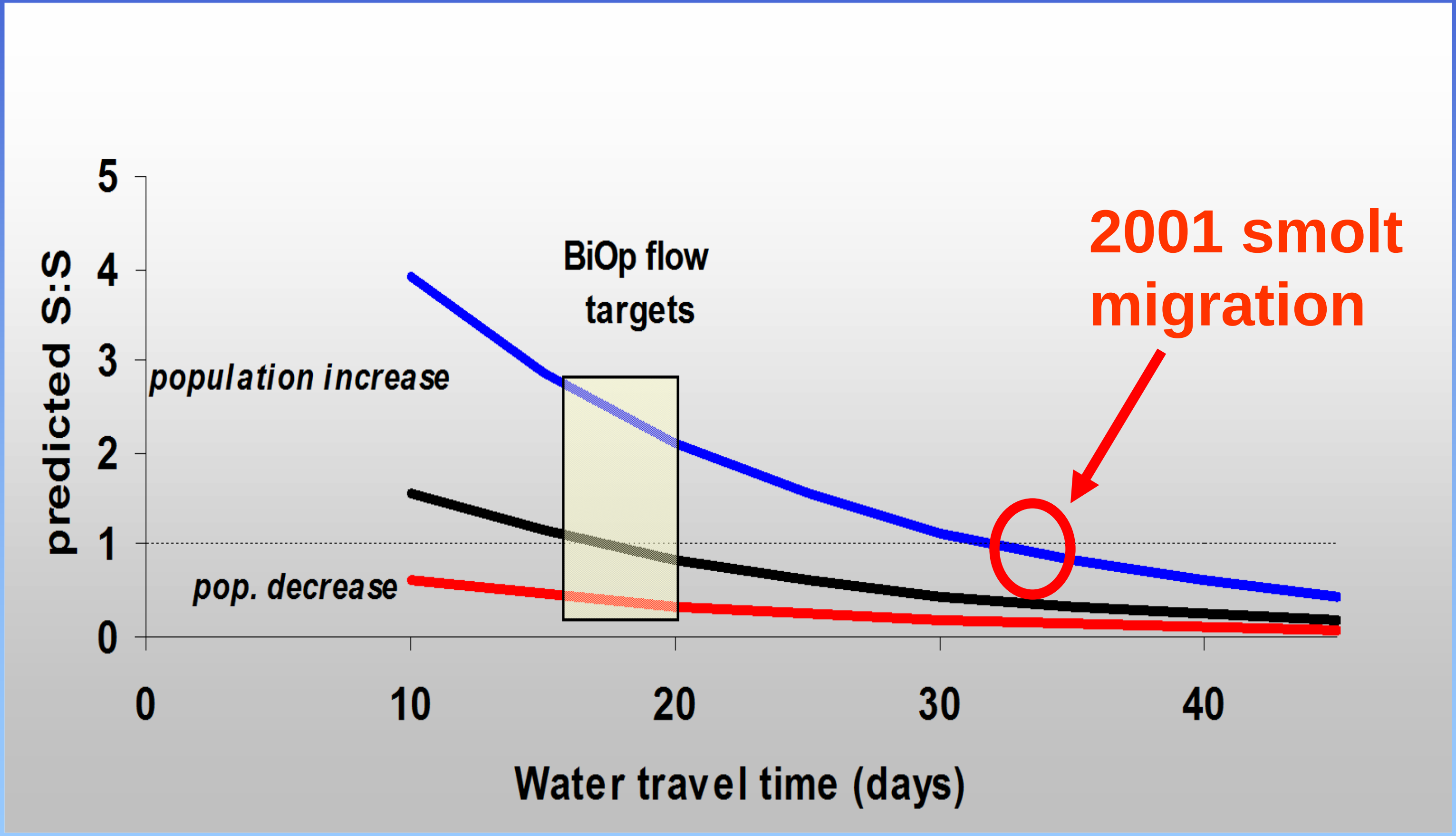
Dworshak hatchery spring chinook





Wild Steelhead
3 Ocean SAR
2 Ocean SAR
1 Ocean SAR
Smolts Detected
SAR
Detected
Migratory Year
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001

2001 smolt migration, poor flows but good ocean. Model predicted poor to mediocre returns



TMT Year-End Review

Lower Granite Removable Spillway Weir 2003

The 2003 Lower Granite Removable Spillway Weir (RSW) studies were coordinated through the Studies Review Work Group (SRWG) and the Fish Facility Design Review Work Group (FFDRWG) of the Northwestern Division's Anadromous Fish Evaluation Program (AFEP). Funding priorities were made through the System Configuration Team (SCT). Specific operations for the 2003 RSW studies were made through the Corps' Reservoir Control Center (RCC) and were discussed at weekly conference calls before and during the test period with RCC and BPA.

In 2003 the simulated wells intake, surface bypass collector, and behavioral guidance device were removed.

2003 Lower Granite RSW Evaluation – Preliminary Results
(Information from Oct. 1 USGS presentation)

Operations – 2 "Treatments"
1. Spill to the gas cap for 12 hours at night (~40 Kcfs spill, bays 2 - 8). (RSW OFF)
2. RSW operation plus ~12 Kcfs training spill in bays 2-8. (RSW ON)

Evaluation Technique – Radiotelemetry and acoustic tag tracking
1. 1,300 Chinook above dam, 460 below dam (radio)
2. 400 hatchery steelhead above dam (radio)
3. 400 wild steelhead above dam (radio)
4. 200 hatchery Chinook above dam (acoustic)
5. 200 hatchery steelhead above dam (acoustic)
6. 200 wild steelhead above dam (acoustic)

Passage Results (Radiotelemetry)

RSW On

	RSW	Spill	Combined
H. Chinook	58%	8%	66%
H. Steelhead	69%	5%	74%
W. Steelhead	67%	4%	71%

RSW Off

	Spill
H. Chinook	52%
H. Steelhead	59%
W. Steelhead	54%

Survival Results (Radiotelemetry, hatchery Chinook)

Relative survival of fish passing through the RSW and through gas cap spill

RSW survival probability: 98.0% (+/- 2.3%, 95% CI)
Spill survival probability: 93.1% (+/- 6.0%, 95% CI)
(No significant difference, numbers not adjusted for detection of dead fish)

<u>Other findings</u>

- Forebay residence time was less for RSW-ON condition, more so at lower flows.
- Percentage of fish traveling upstream in the forebay was less for RSW-ON condition, again more so at lower flow.
- FGE was high regardless of treatment (Chinook – 80-85%, H. Steelhead – 88-90%, W. Steelhead – 95-98%)

2004 RSW Evaluation Plan (Tentative)

We are currently planning for a 2004 evaluation of the RSW at Lower Granite. The major change from previous years will be the moving of the Behavioral Guidance Structure (BGS) to the north. The attachment point at the dam has been between units 3 and 4. The BGS will be moved so it will be attached to the dam between units 5 and 6. It will occlude units 1 – 5.

Tentative plans call for operating the RSW with some level of training spill during the spring, with evaluation by radio-tagged fish (or possibly hydroacoustics). A summer test is also planned for 2004. Specific operations have not been discussed for summer, but will likely be similar to spring. Evaluation in summer will be with radio-telemetry. Continued coordination and planning will be through the FFDRWG and SRWG.

Snake River Spring/ Summer Chinook

Fig. 3A. Snake River Yearling Chinook % Instream Survival LGR-BON

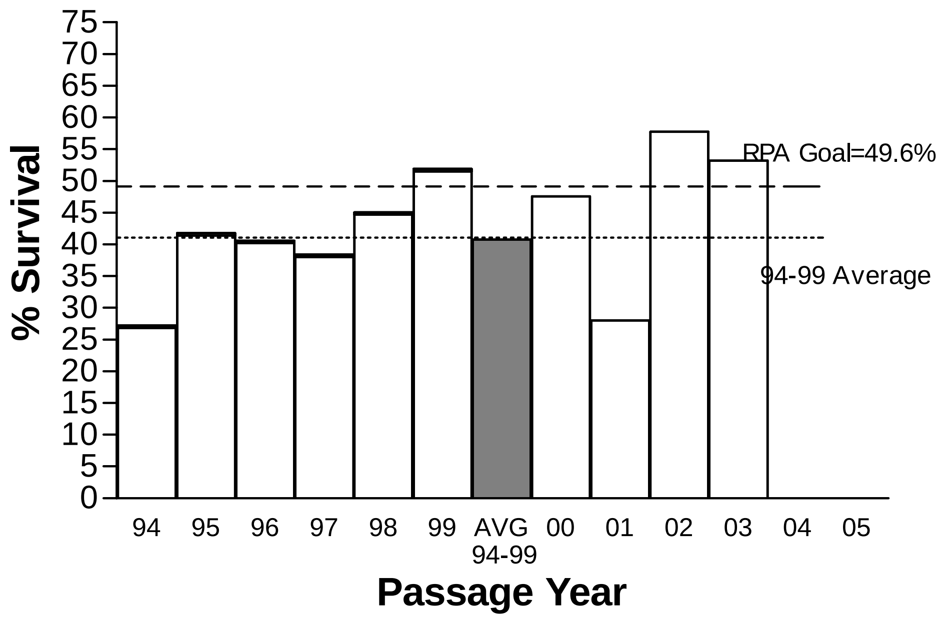


Fig. 5D. Snake River Spring Chinook System Survial with "D"=0.63

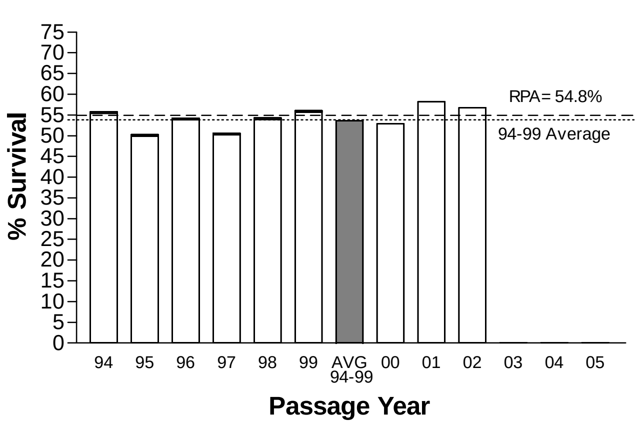
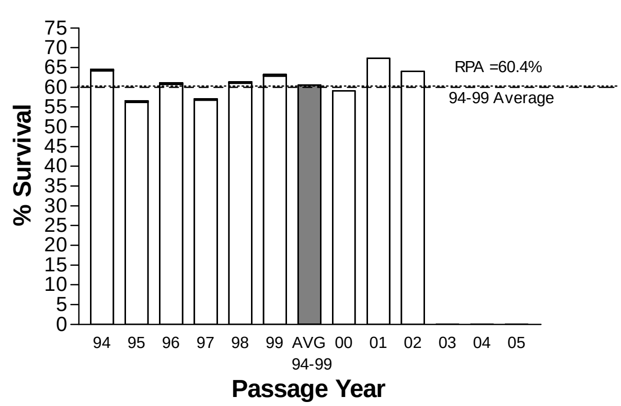


Fig. 5E. Snake River Spring Chinook System Survial with "D"=0.73



Upper/Mid Columbia Steelhead

Fig. 3E. Upper and Middle Columbia Steelhead % Instream Survival MCN to BON

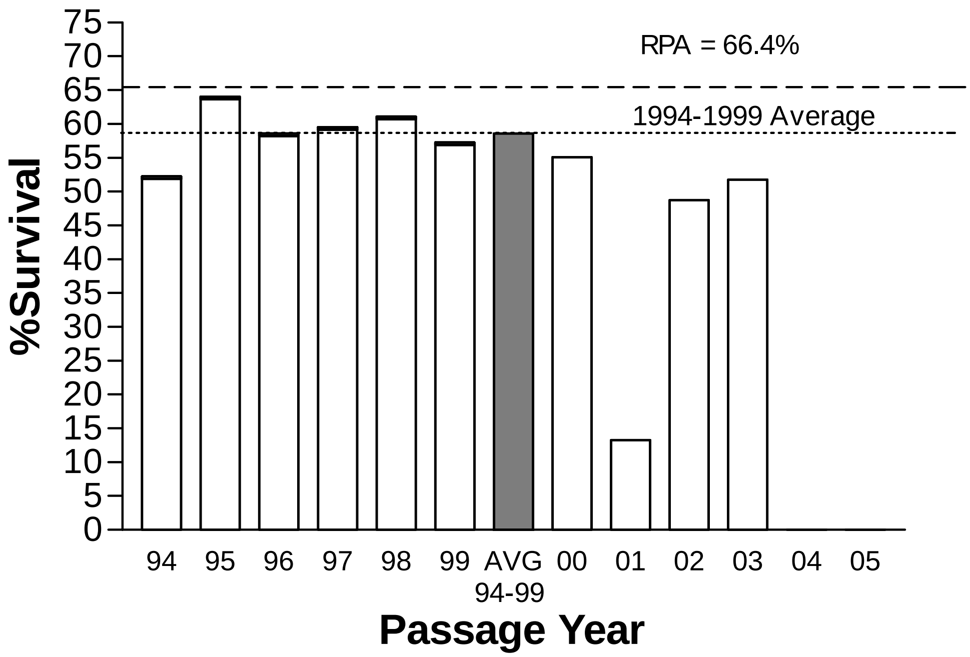
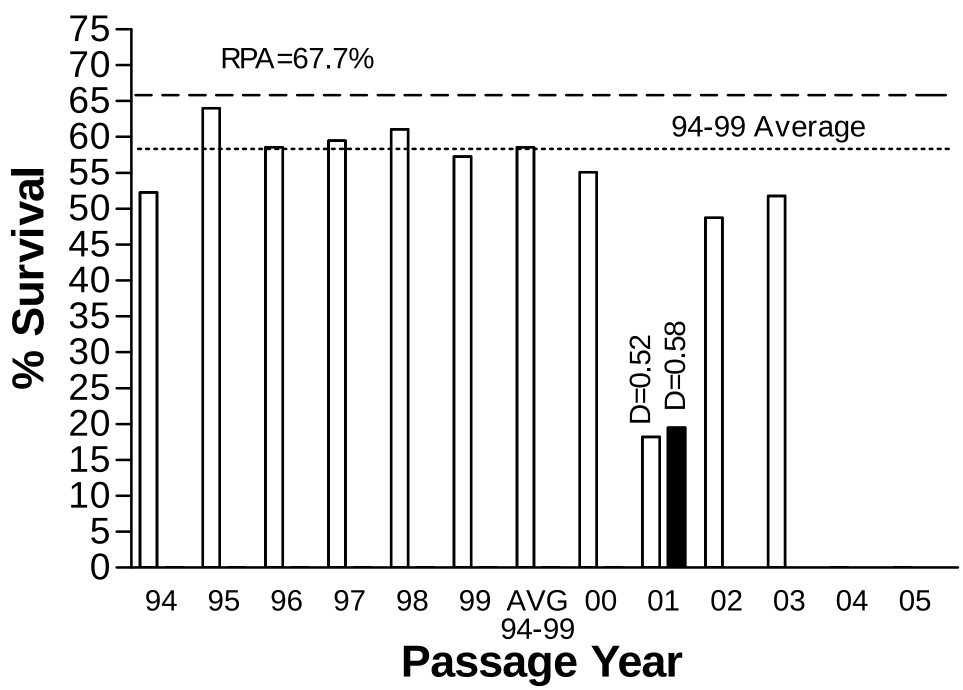


Fig. 5C. Upper and Mid Columbia Steelhead system survival MCN-BON with "D"



Upper/Mid Columbia Spring Chinook

Fig. 3C. Upper and Middle Columbia Spring Chinook
% Instream Survival MCN to BON

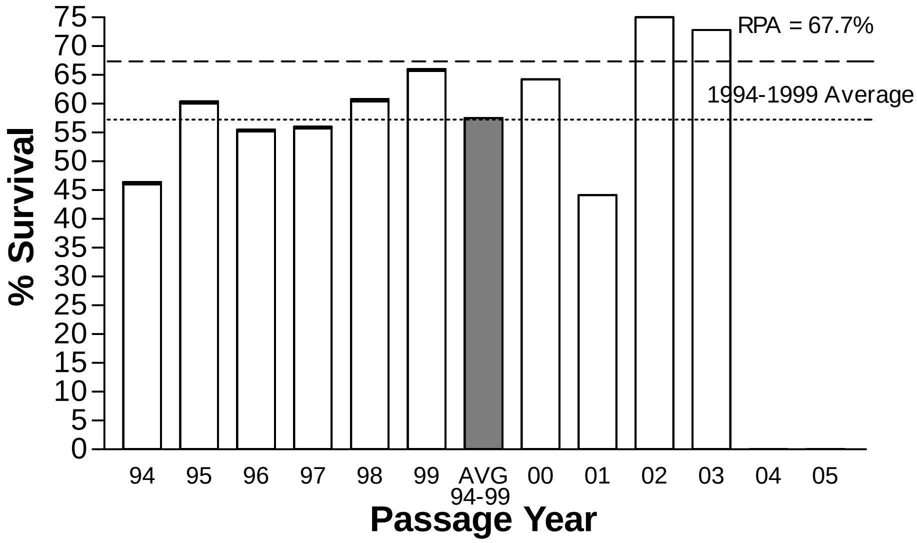
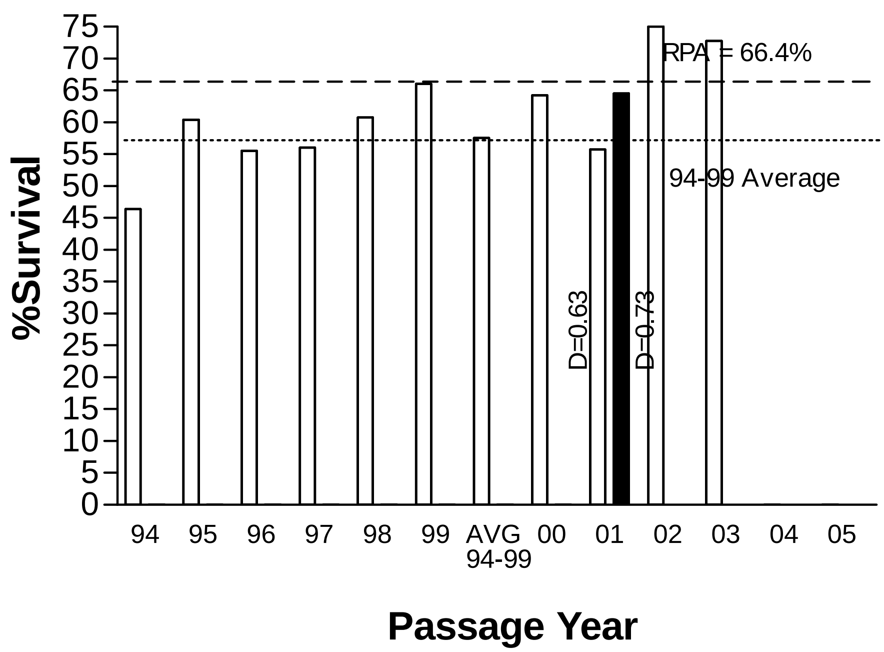


Fig. 5B. Upper and Mid Columbia Spring Chinook
Survival MCN to BON with "D"



Snake River Steelhead

Fig. 3D. Snake River Steelhead % instream Survival LGR-BON

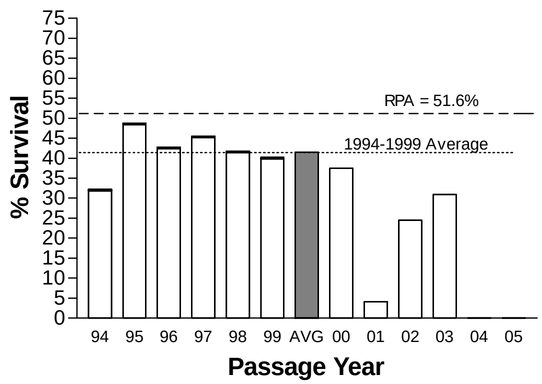


Fig. 5F. Snake River Steelhead System Survival with "D"=0.52

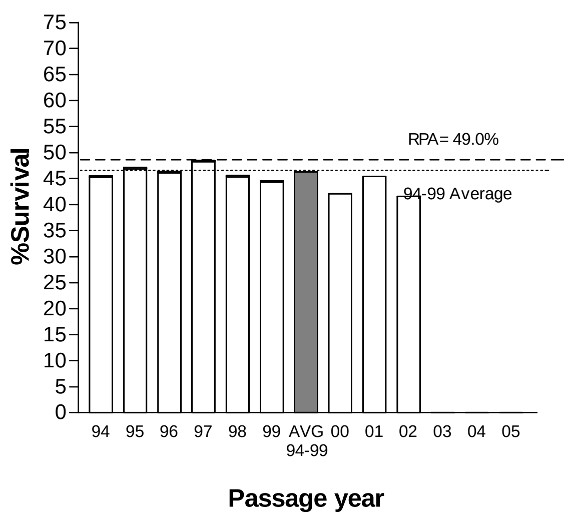
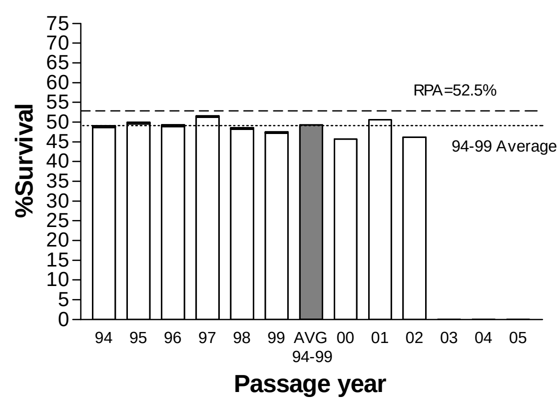


Fig. 5G. Snake River Steelhead System Survival with "D"=0.56



Snake River Fall Chinook

Fig. 3B. Snake River Fall Chinook % Instream Survival LGR-BON

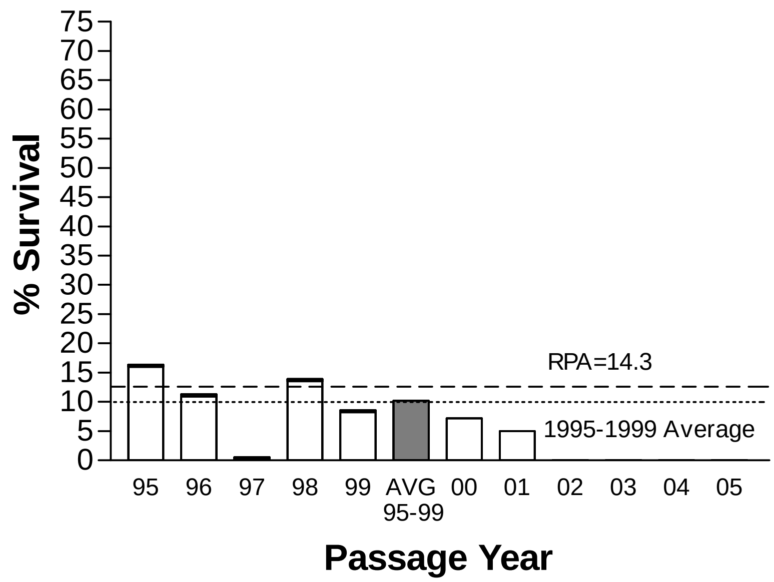
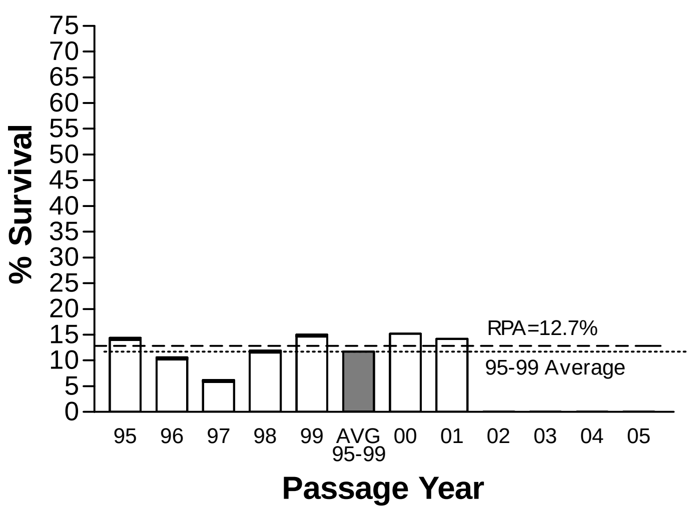


Fig. 5A. Snake River Fall Chinook System Survival with "D"= 0.24



Smolt Migration 2003

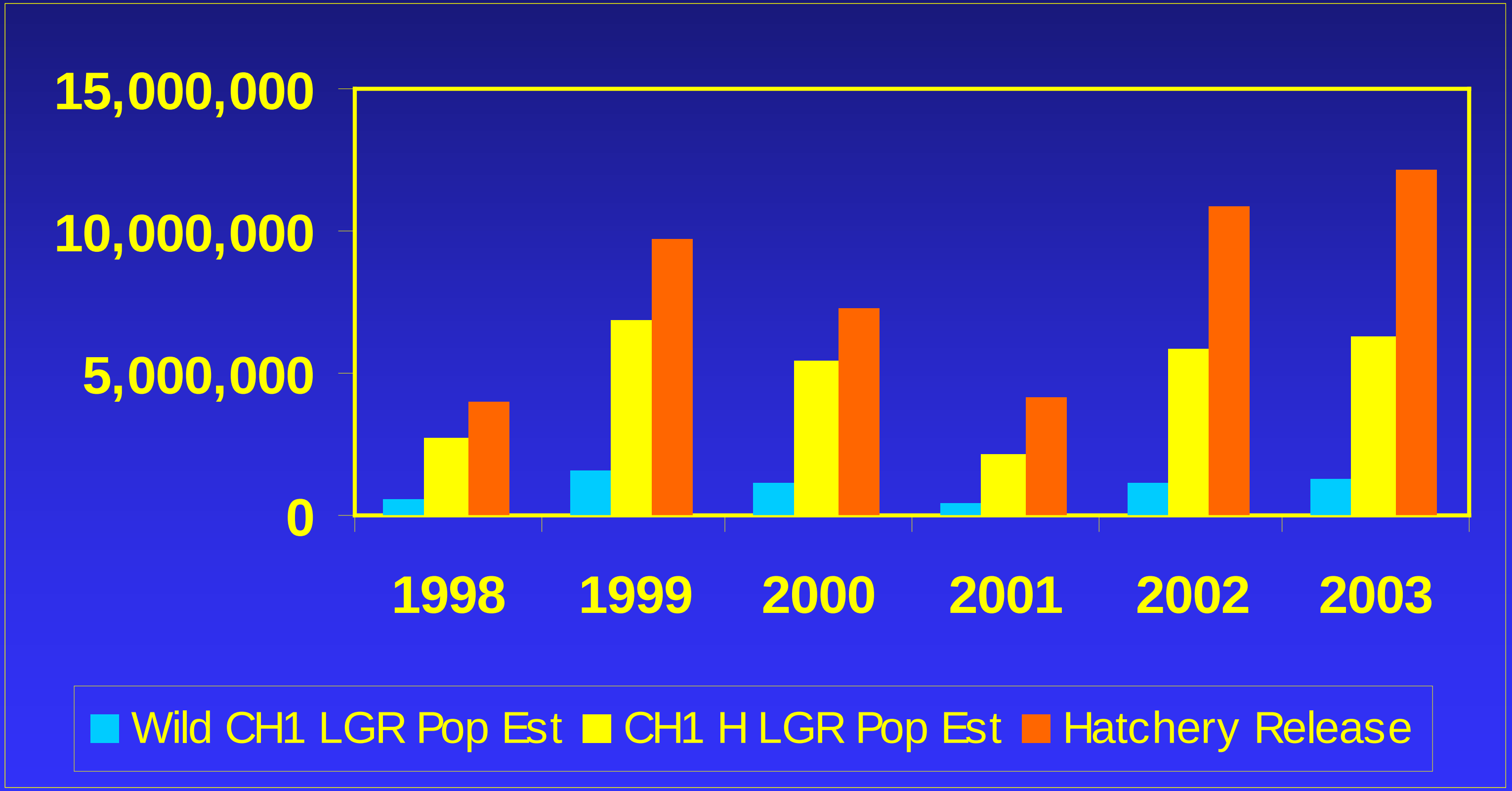
Jerry McCann

Fish Passage Center

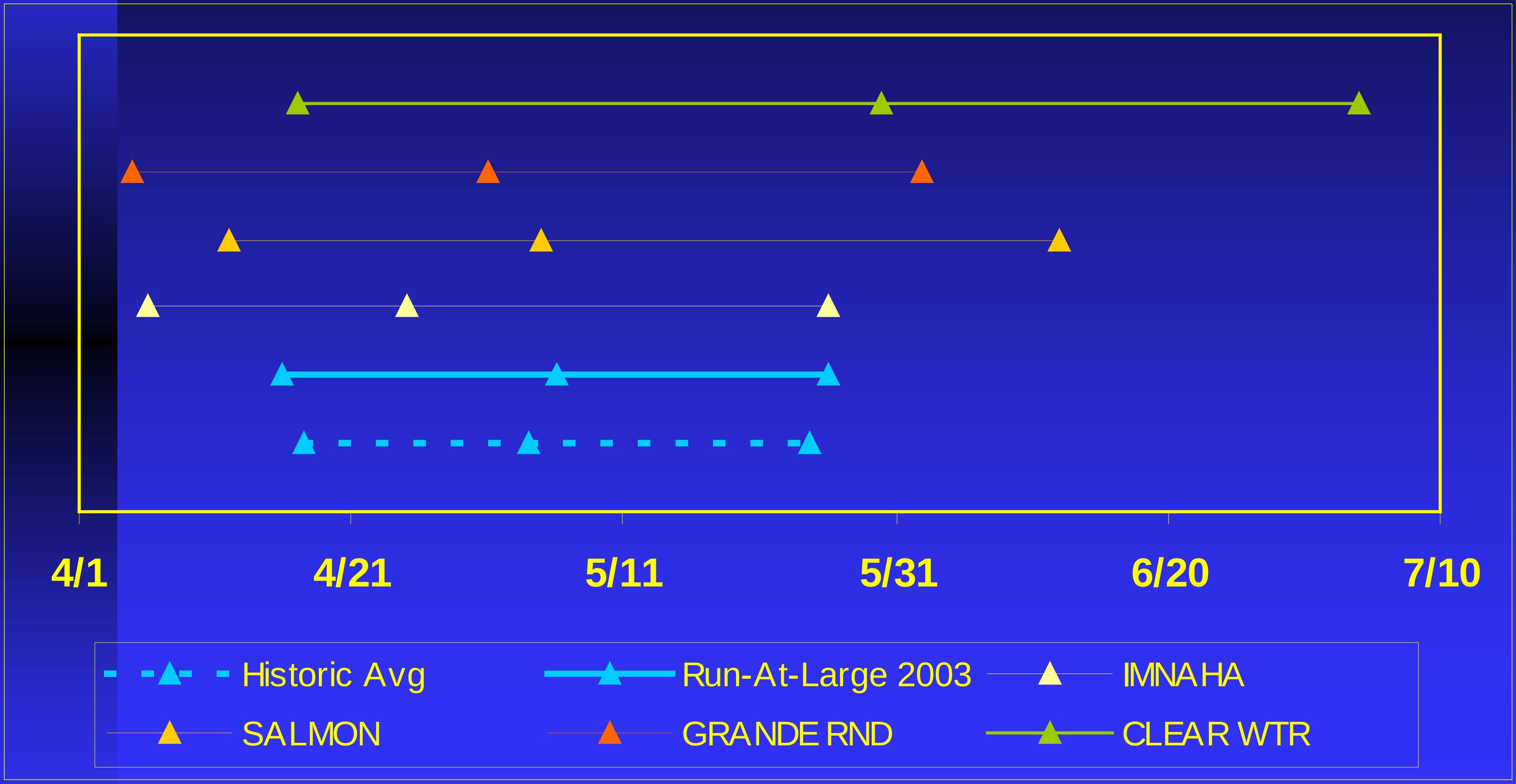
Review of 2003 Smolt Migration

- Run Size
- Timing
- Travel Time
- Survival

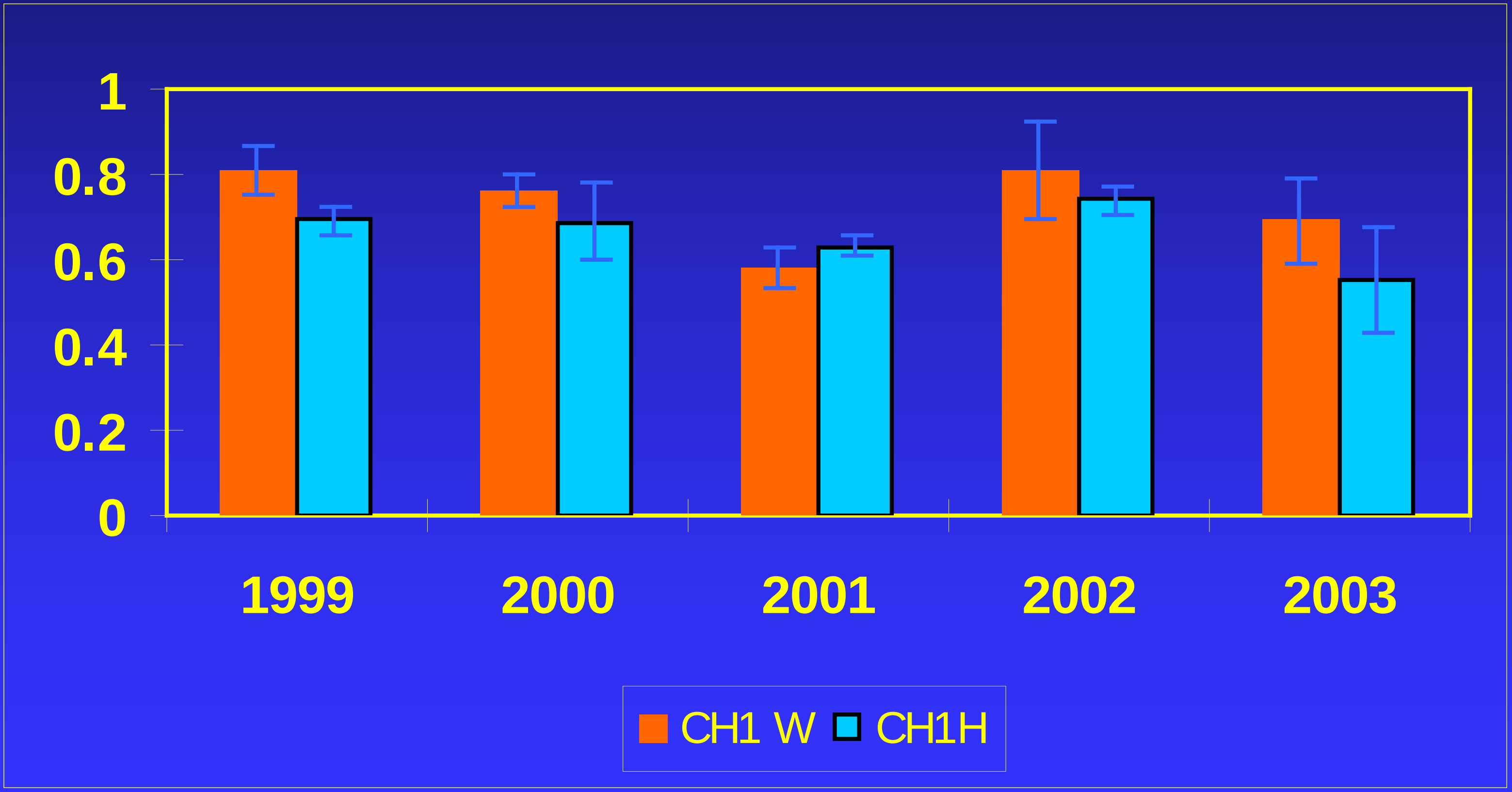
Yearling Chinook Population at Lower Granite and Hatchery Releases



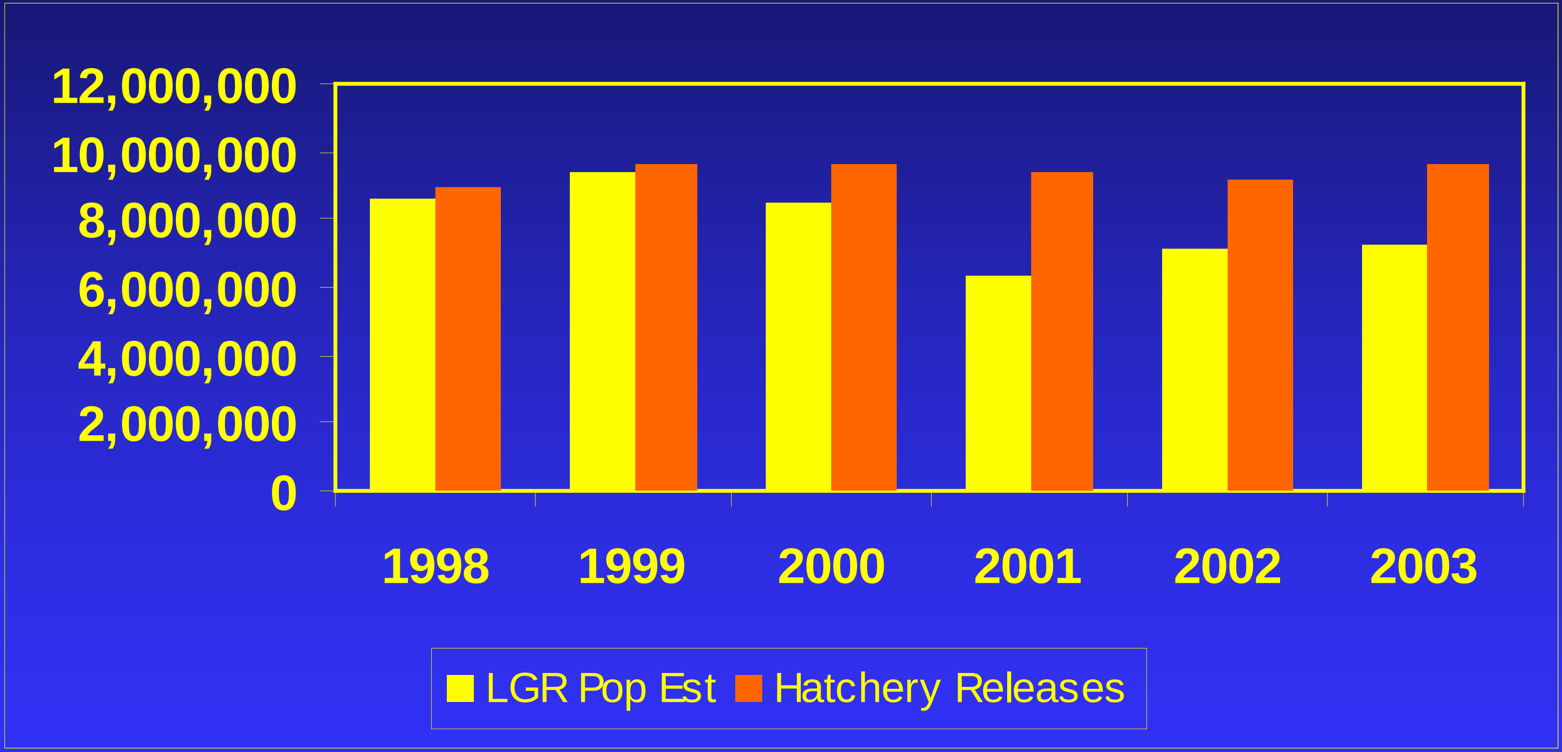
Yearling Chinook Timing at LGR



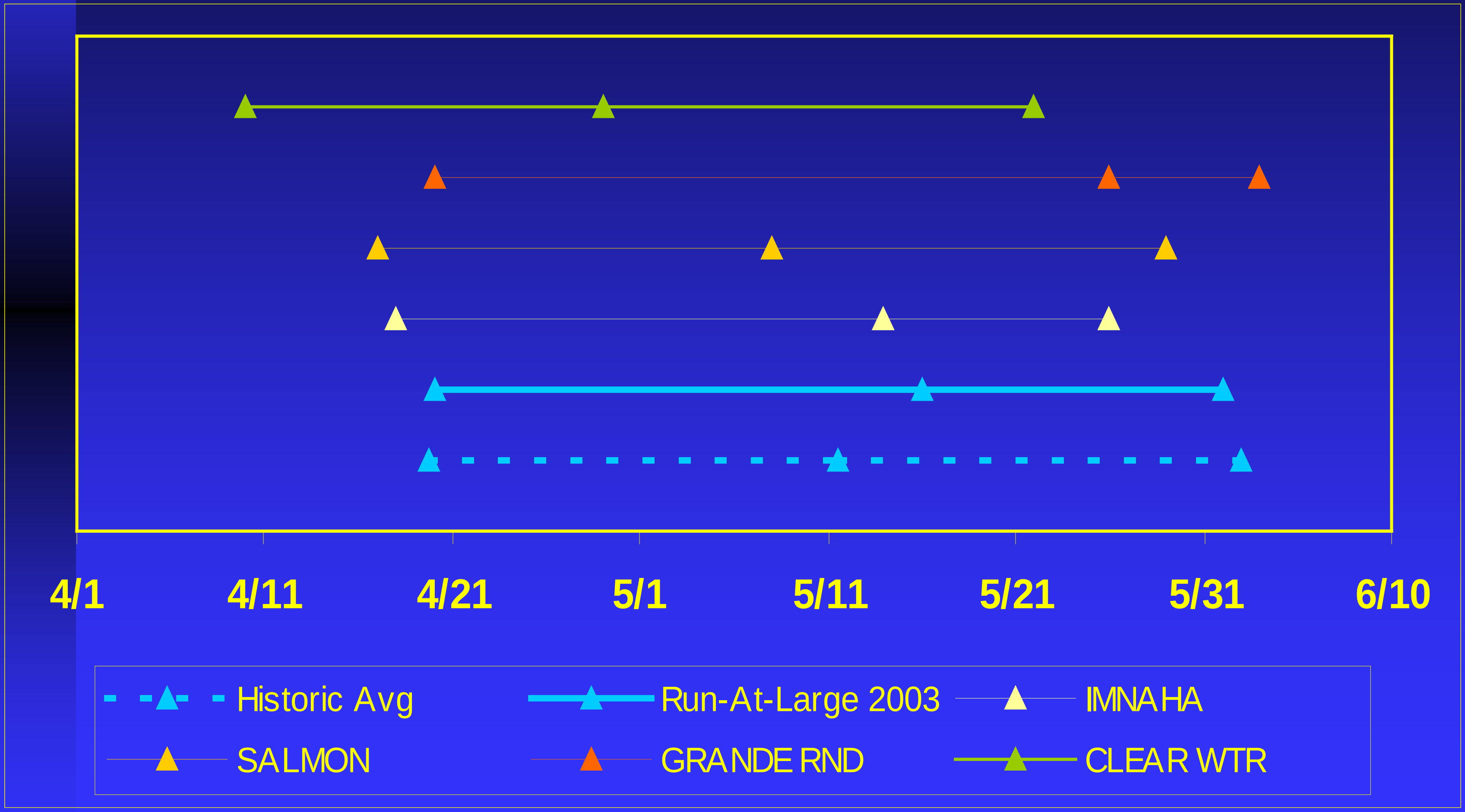
Survival of Yearling Chinook from Salmon R Trap to LMN



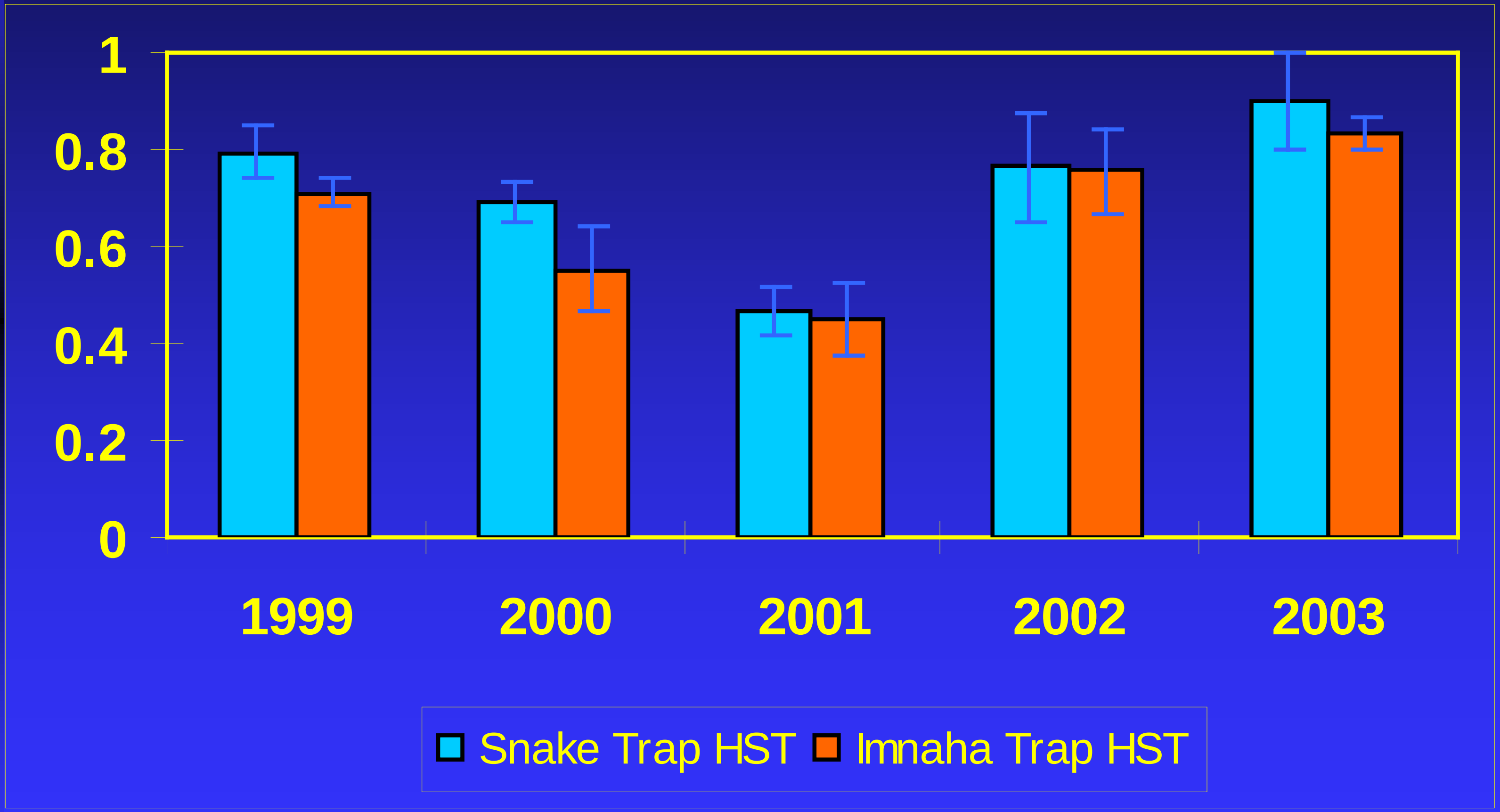
Combined H&W Steelhead Population at Lower Granite and Hatchery Releases



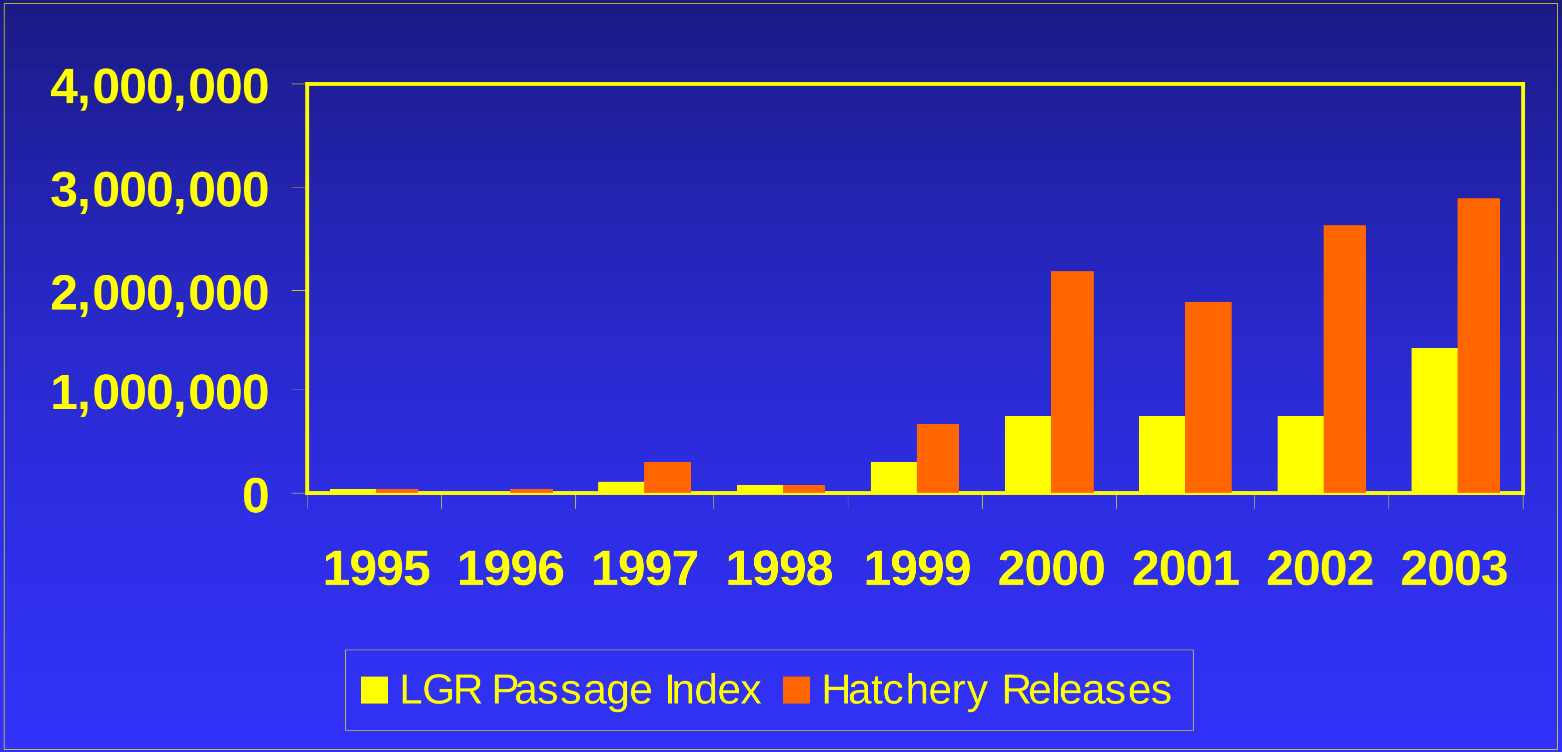
Steelhead Timing at Lower Granite



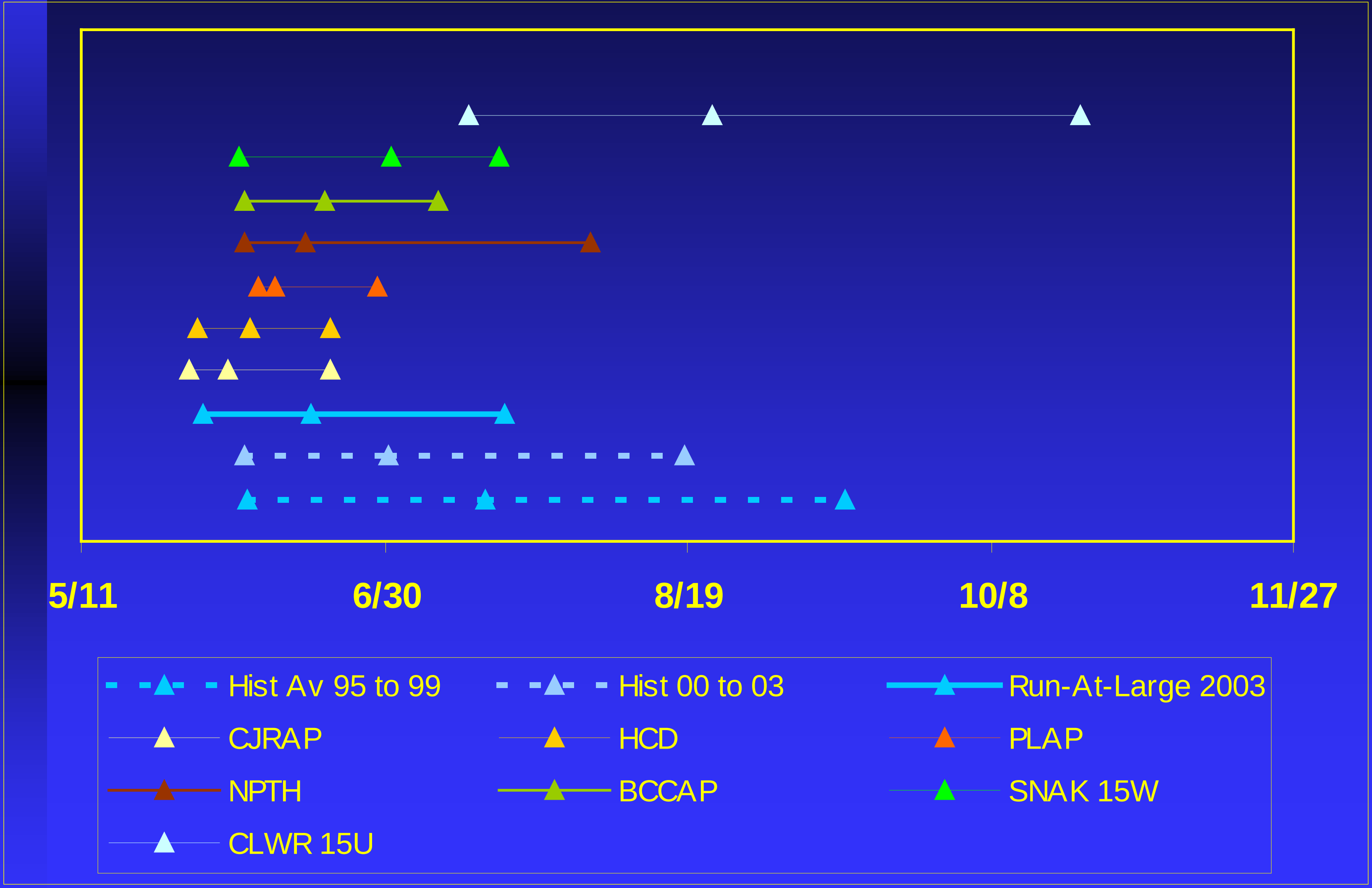
Survival of Hatchery Steelhead from Traps to LMN



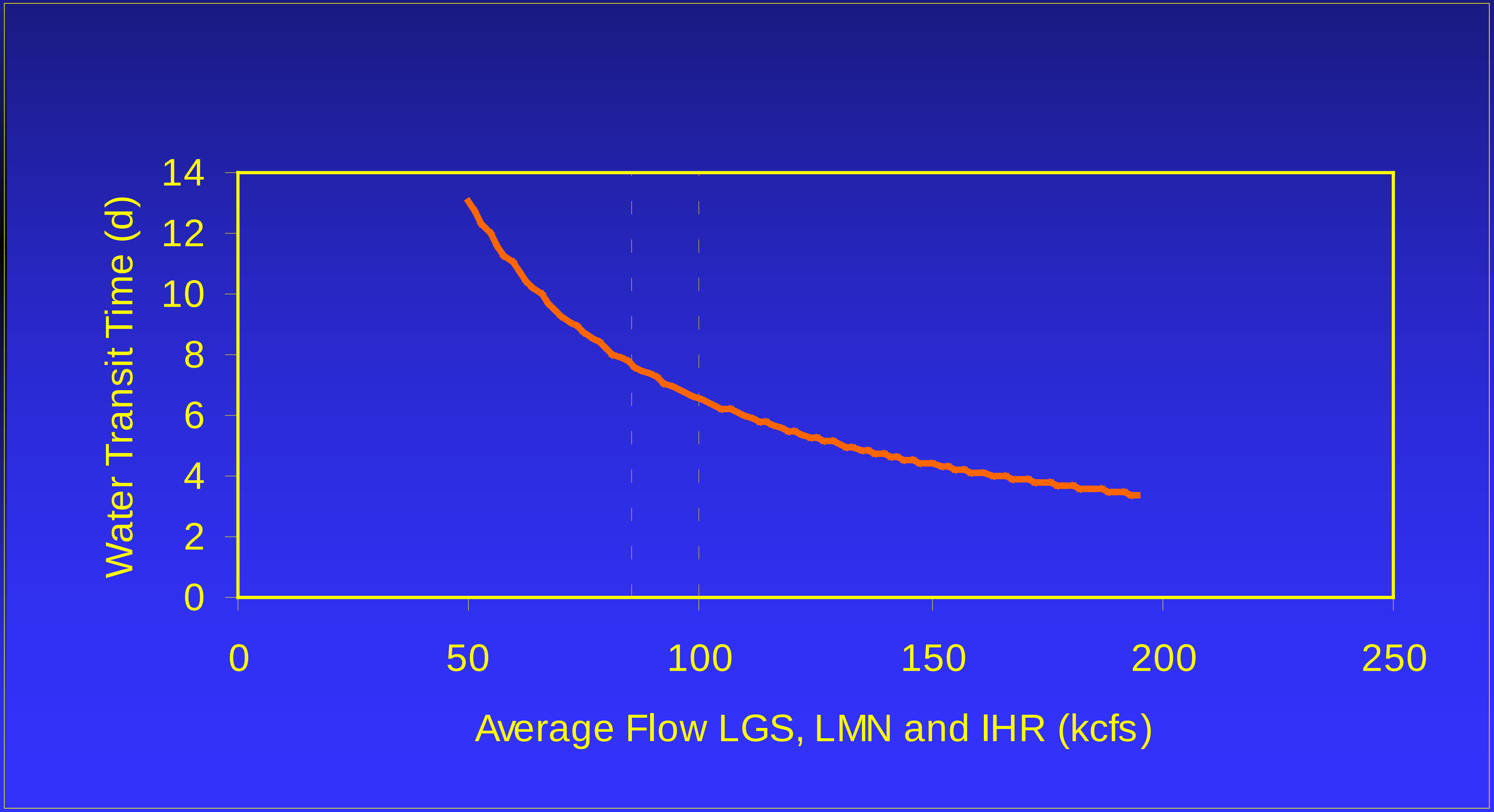
Hatchery/Supplementation Releases of Subyearling Chinook above LGR



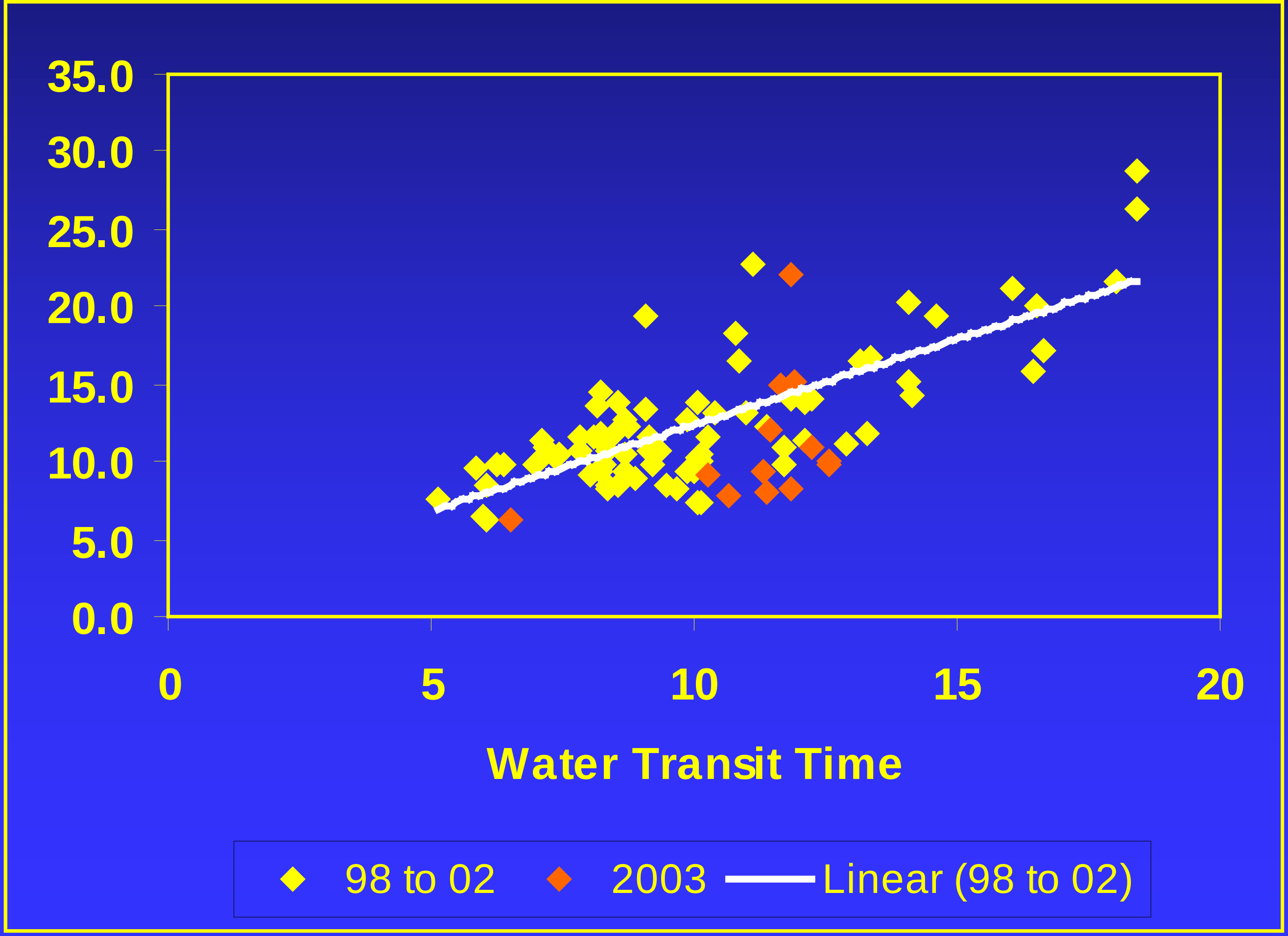
Subyearling Chinook Timing at LGR



Water Transit Time Lower Granite to Tailwater Ice Harbor Dam versus average flow at LGS, LMN and IHR dams



Travel Time LGR to MCN for Hatchery and Wild Yearling Chinook ‘98 to ’02 and 2003



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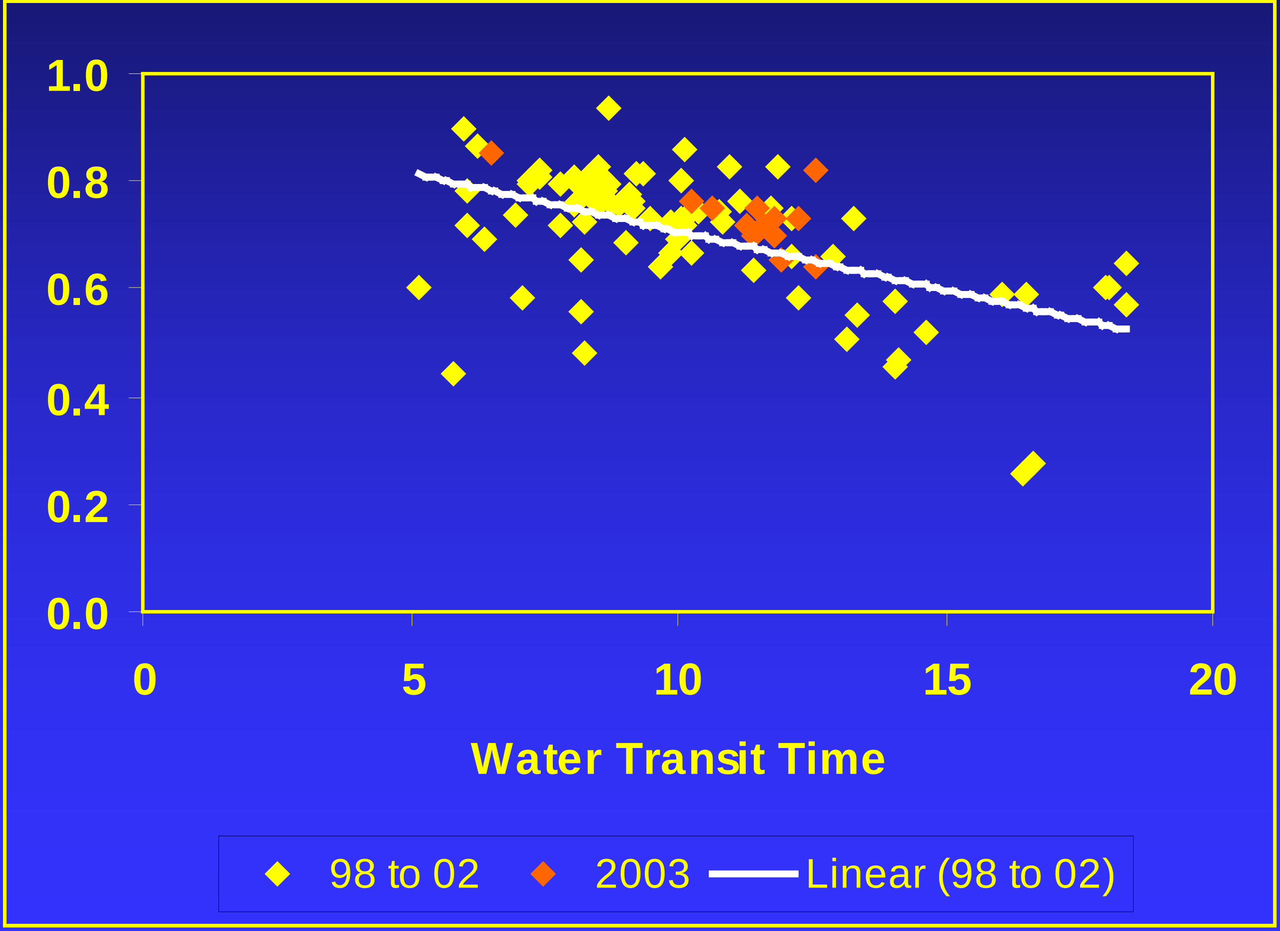
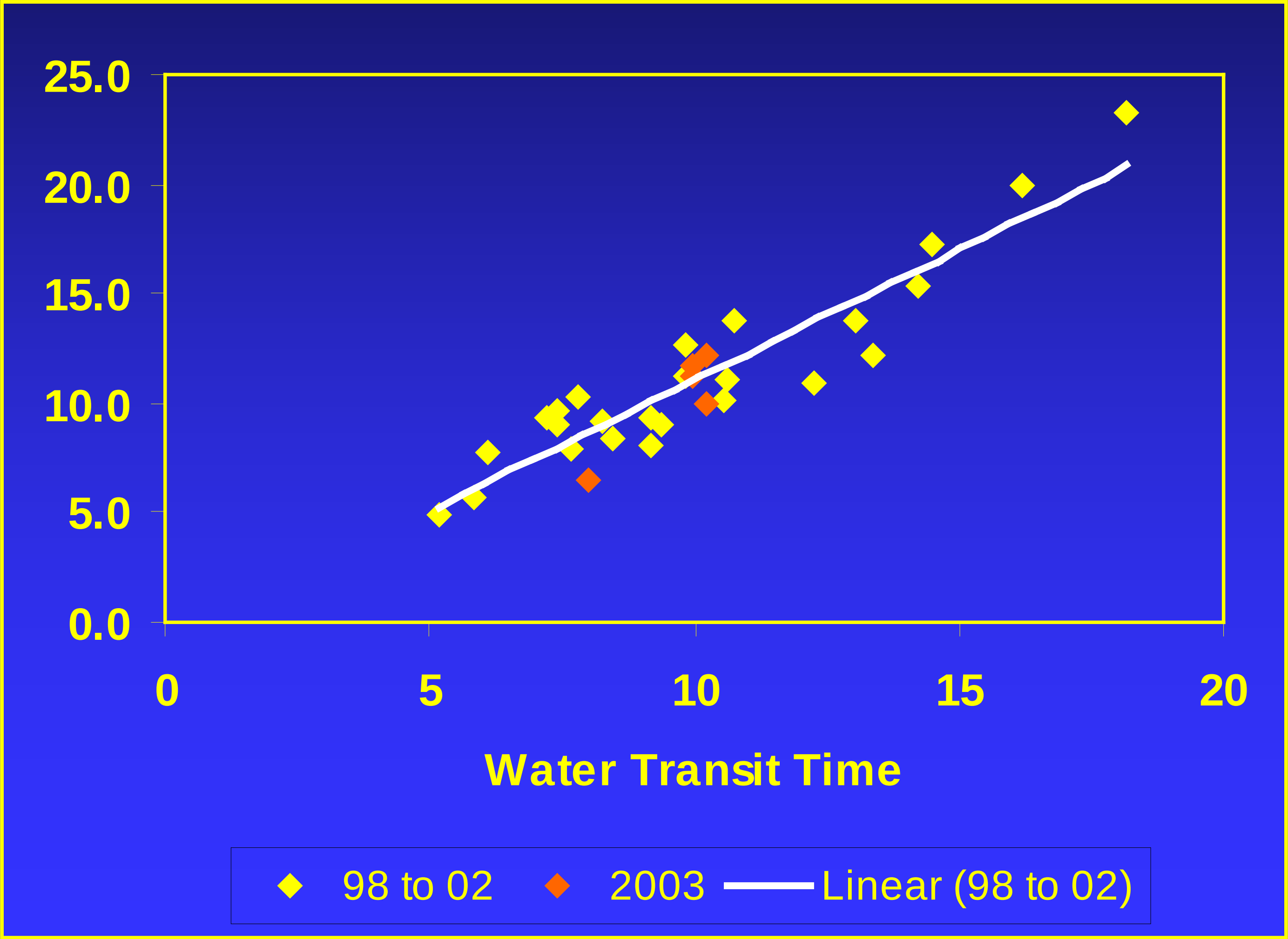
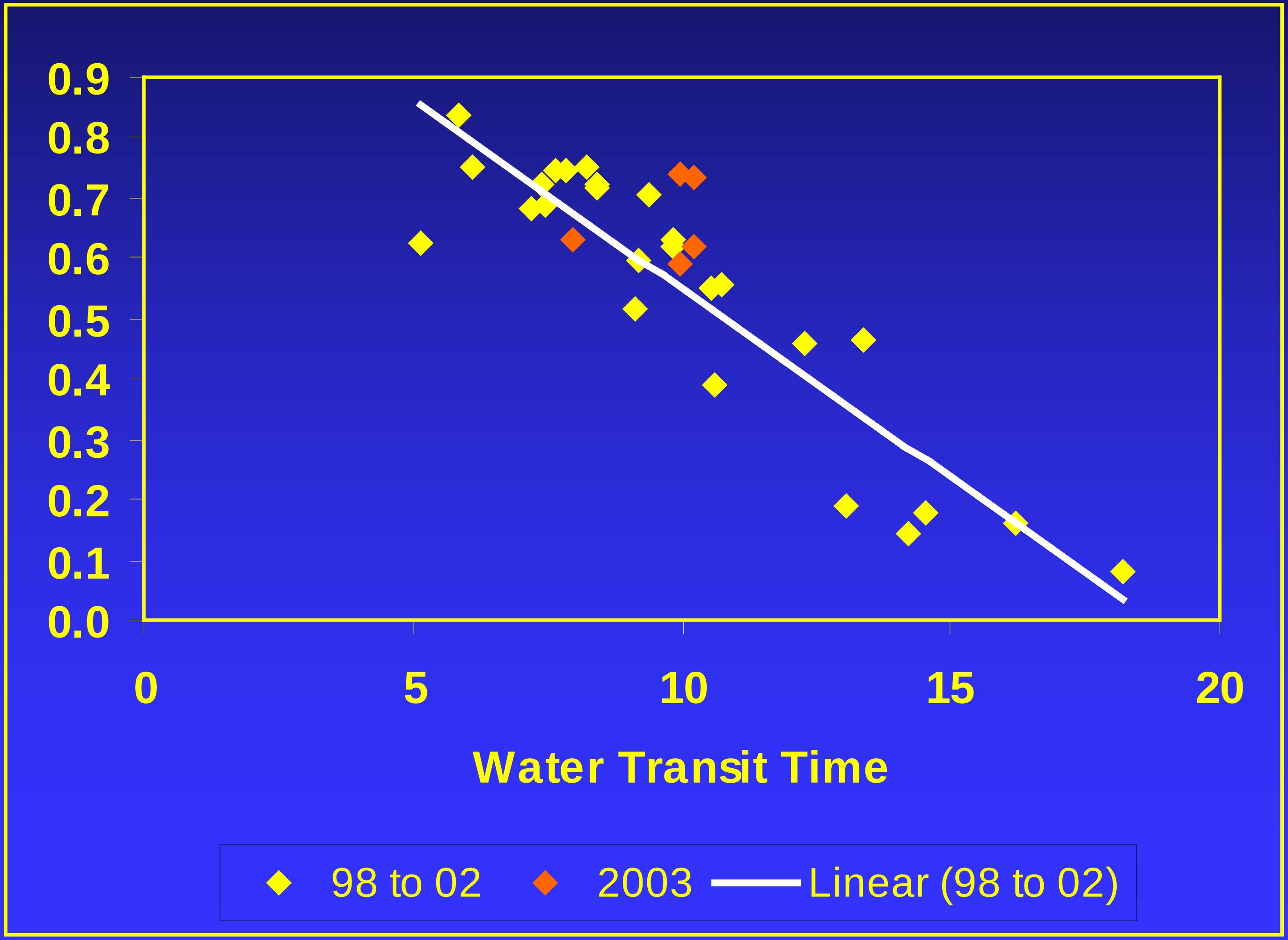


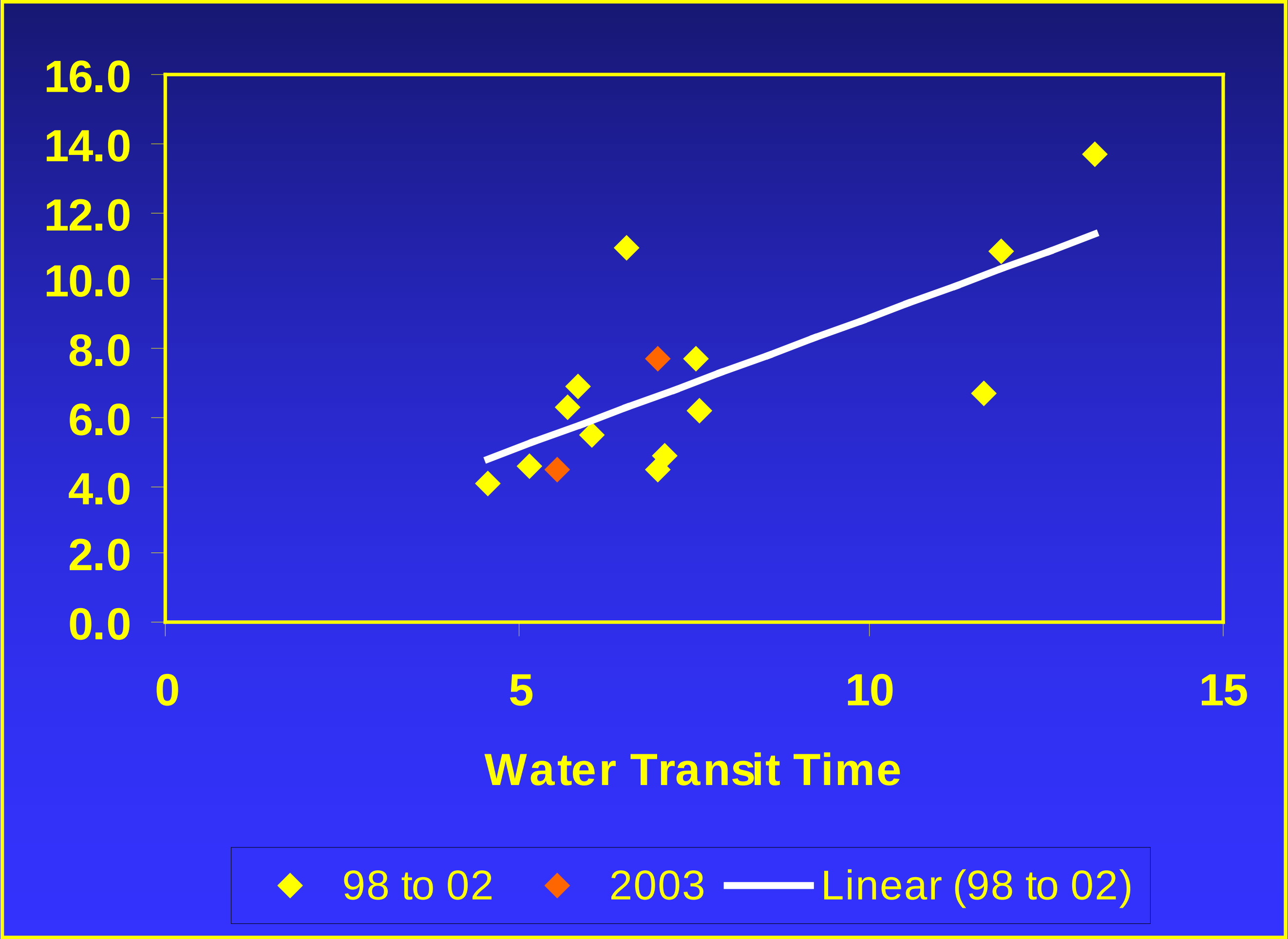
Travel Time LGR to MCN for Steelhead ‘98 to ‘02 and 2003



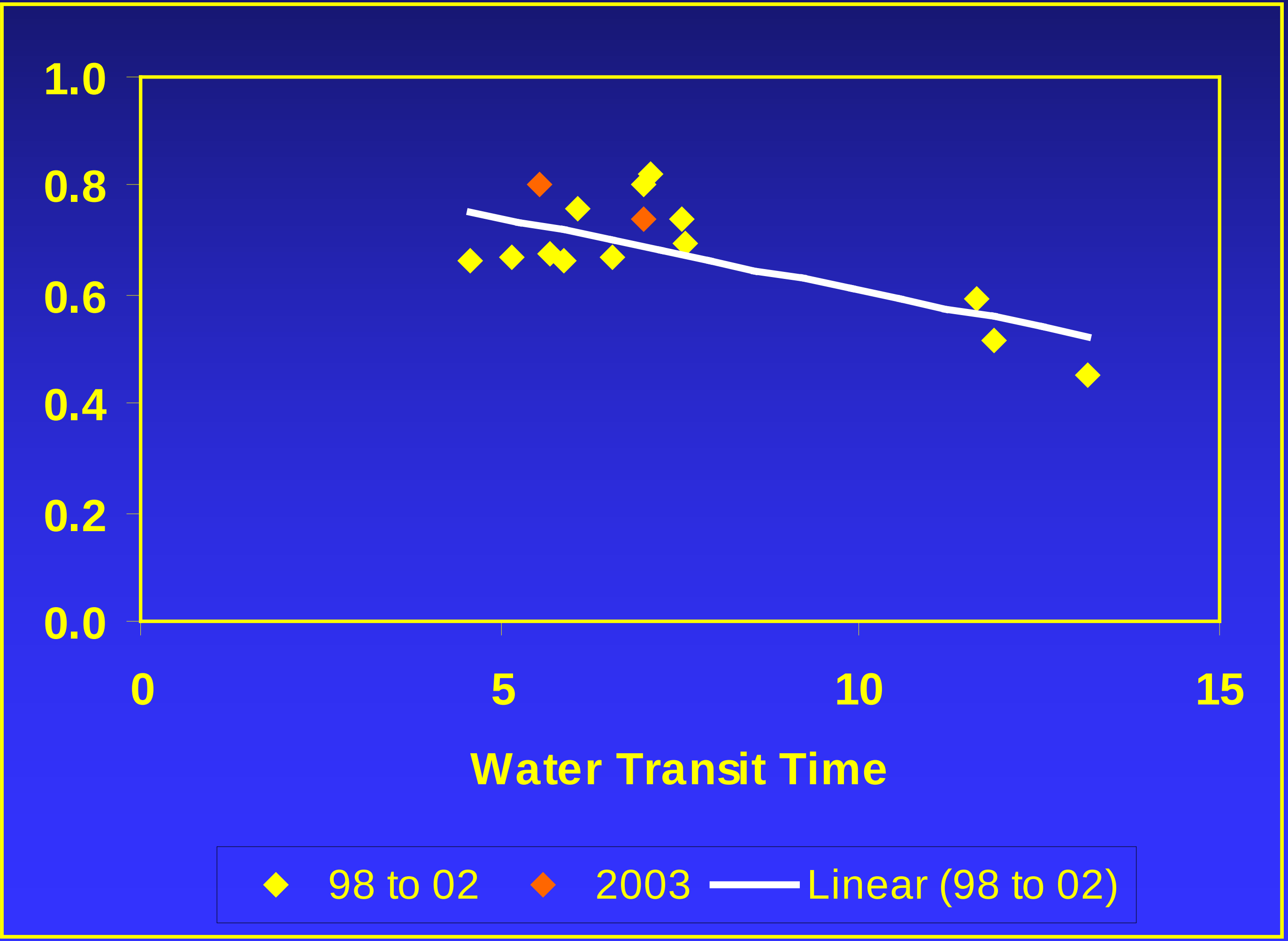
Survival LGR to MCN for Steelhead ‘98 to ‘02 and 2003



Travel Time MCN to BON for Hatchery and Wild Yearling Chinook ‘99 to ’02 and 2003



Survival MCN to BON for Hatchery and Wild Yearling Chinook '99 to '02 and 2003



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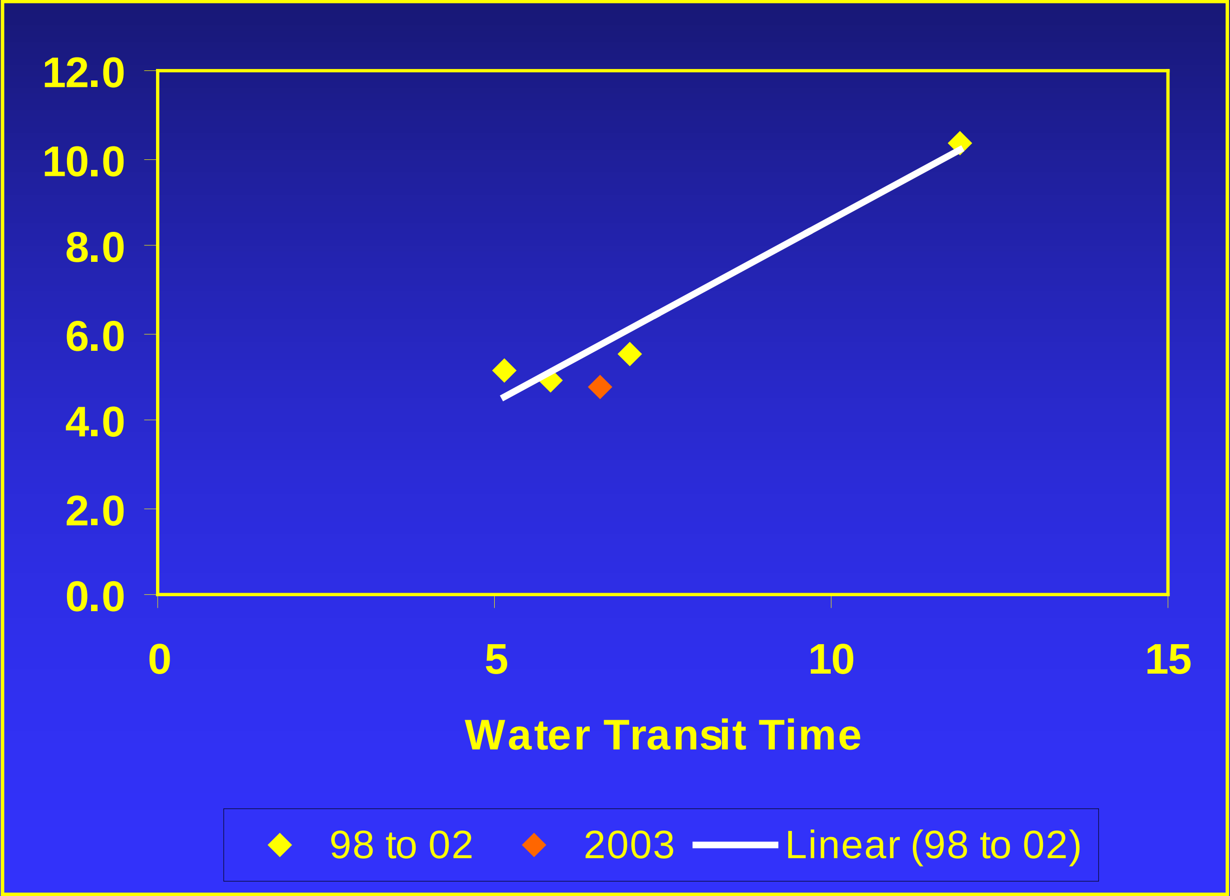
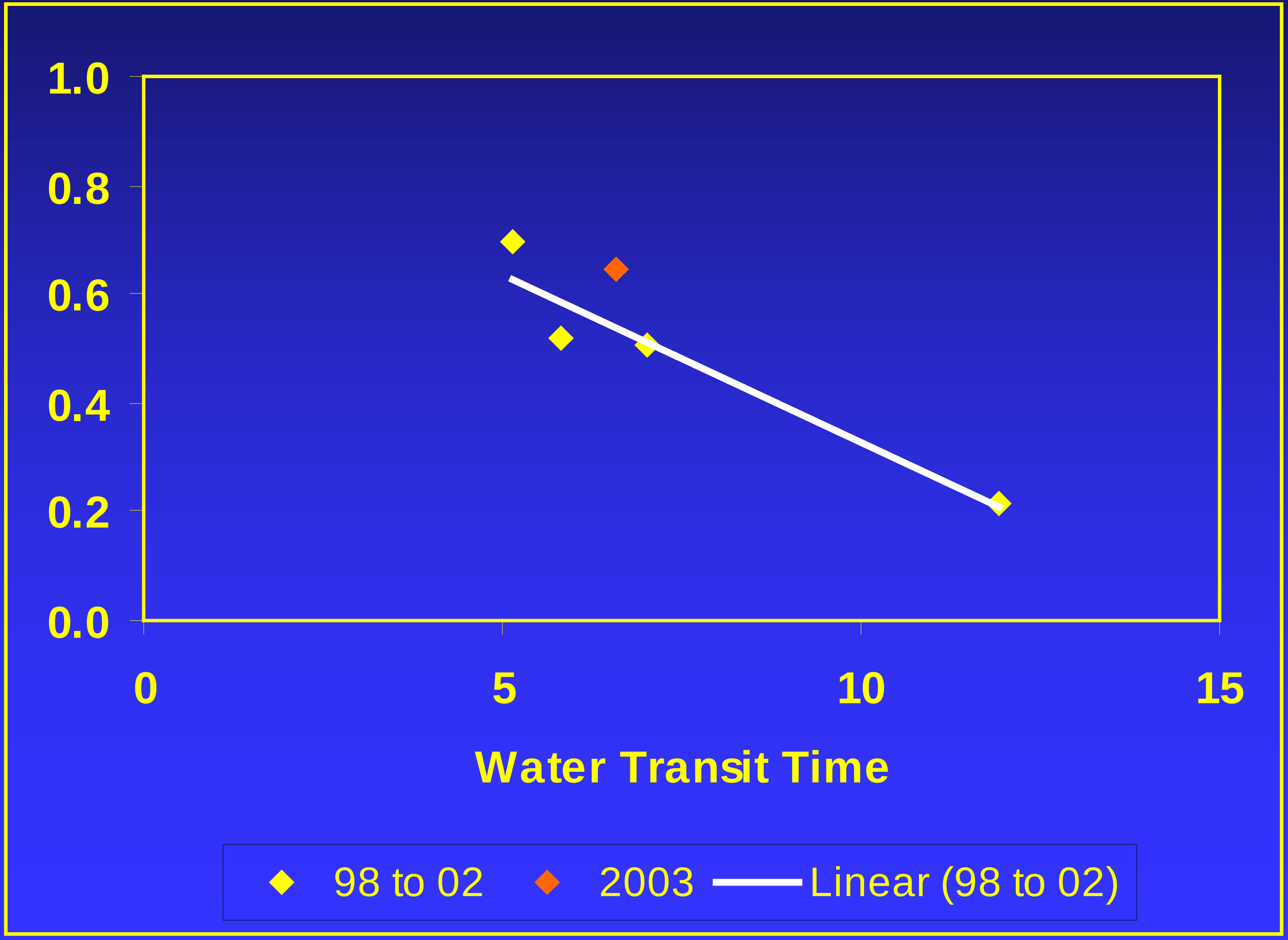


Survival MCN to BON for Steelhead '99 to '02 and 2003



Comparison of Recent Hydro Survival With 2005/2008 and 2010 Performance Standards

	Migration Year	In-River Survival (Pit Tag studies)	Total System survival (Simpas generated) D=0.63	D=0.73
Snake River Spring/Summer Chinook	1994	27.2	55.8	64.5
	1995	41.8	50.3	56.6
	1996	40.6	54.2	61.1
	1997	38.4	50.6	57.1
	1998	45.1	54.3	61.4
	1999	51.9	56.1	63.2
	1994-1999 average (2005/2008 Perf. Std.)	40.8	53.6	60.6
	2010 Perf. Std.	49.6	54.8	60.4
	2000	47.6	52.9	59.1
	2001	28.0	58.2	67.4
	2002	57.8	56.8	64
	2003	53.2	N/A	N/A
			D=.24	
Snake River Fall Chinook	1994	16.4	14.4	
	1995	11.3	10.6	
	1996	0.5	6.2	
	1997	13.9	11.9	
	1998	8.6	15	
	1999	10.2	11.7	
	1994-1999 average (2005/2008 Perf. Std.)	10.2	11.6	
	2010 Perf. Std.	14.3	12.7	
	2000	7.2	15.2	
	2001	5.0	14.2	
	2002	N/A	N/A	
	2003	N/A	N/A	
			D=0.63	D=0.73
Upper Columbia Spring Chinook	1994	46.4		
	1995	60.4		
	1996	55.5		
	1997	56.0		
	1998	60.8		
	1999	66.0		
	1994-1999 average (2005/2008 Perf. Std.)	57.5		
	2010 Perf. Std.	66.4		
	2000	64.2		
	2001	44.1	55.7	64.5
	2002	76.3		
	2003	72.8		

Comparison of Recent Hydro Survival With 2005/2008 and 2010 Performance Standards

	Migration Year	In-River Survival (Pit Tag studies)	Total System survival (Simpas generated)	
			D=.52	D=.56
Snake River Steelhead	1994	32.2	45.5	49
	1995	48.8	47.1	49.9
	1996	42.8	46.4	49.3
	1997	45.5	48.5	51.6
	1998	41.8	45.6	48.6
	1999	40.2	44.6	47.5
	1994-1999 average (2005/2008 Perf. Std.)	41.5	46.3	49.3
	2010 Perf. Std.	51.6	49.0	52.5
	2000	37.5	42.1	45.7
	2001	4.1	45.4	50.6
	2002	26.2	41.6	46.2
	2003	30.9		

	Migration Year	In-River Survival	D=.52	D=.56
Upper Columbia Steelhead and Mid Columbia Steelhead Originating Above McNary Dam (Note: MCR steelhead stocks that originate from lower tributaries have lower expected survival)	1994	52.3		
	1995	64.0		
	1996	58.6		
	1997	59.5		
	1998	61.1		
	1999	57.3		
	1994-1999 average (2005/2008 Perf. Std.)	58.6		
	2010 Perf. Std.	67.7		
	2000	55.1		
	2001	13.3	18.2	19.5
	2002	48.8		
	2003	51.8		

Table 1. Mean estimated survival and standard error (s.e.) for yearling chinook salmon released at Snake River Basin and Upper Columbia River hatcheries to Lower Granite Dam tailrace (LGR) and McNary Dam tailrace (MCN) during 2002 and 2003.

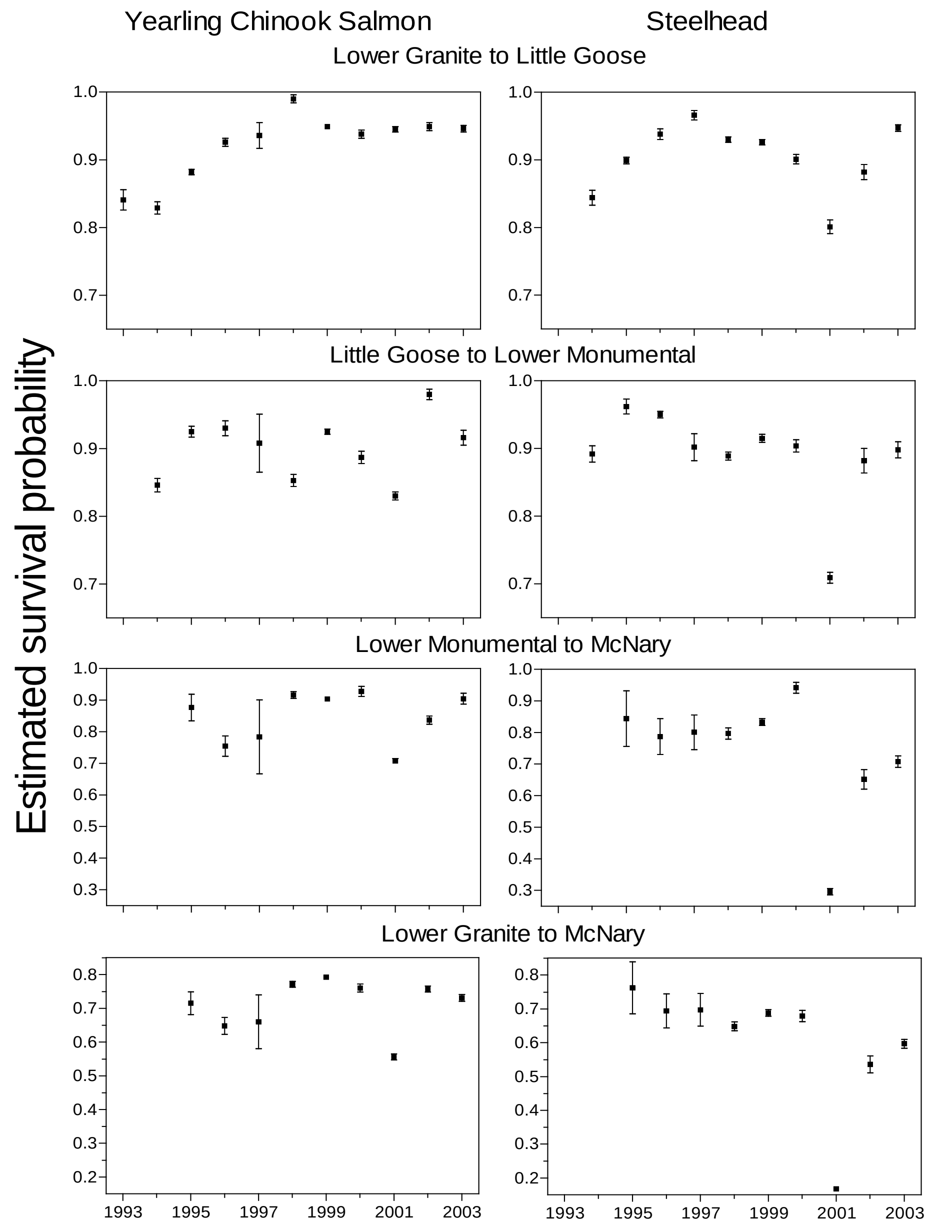
	2002		2003	
Hatchery	Survival to LGR (s.e.)	Survival to MCN (s.e.)	Survival to LGR (s.e.)	Survival to MCN (s.e.)
Dworshak	0.819 (0.011)	0.602 (0.007)	0.720 (0.008)	0.581 (0.009)
Kooskia	0.787 (0.036)	0.580 (0.041)	0.560 (0.043)	0.293 (0.026)
Lookingglass (Catherine Cr.)	0.405 (0.008)	0.313 (0.013)	0.347 (0.028)	0.316 (0.009)
Lookingglass (Grande Ronde)	0.408 (0.020)	0.329 (0.034)	0.438 (0.046)	0.347 (0.016)
Lookingglass (Imnaha River)	0.667 (0.012)	0.514 (0.011)	0.715 (0.012)	0.531 (0.015)
Lookingglass (Lostine River)	0.653 (0.009)	0.497 (0.016)	0.574 (0.030)	0.405 (0.012)
McCall (Johnson Cr.)	0.242 (0.006)	0.185 (0.011)	0.244 (0.009)	0.205 (0.015)
McCall (Knox Bridge)	0.592 (0.006)	0.476 (0.008)	0.573 (0.006)	0.488 (0.009)
Rapid River	0.755 (0.003)	0.592 (0.003)	0.691 (0.007)	0.534 (0.010)
Entiat	---	0.533 (0.009)	---	0.655 (0.010)
Winthrop	---	0.505 (0.021)	---	0.553 (0.014)
Leavenworth	---	0.573 (0.005)	---	0.637 (0.003)
Methow	---	---	---	0.508 (0.014)

Table 2. Mean estimated survival and standard error (s.e.) through various reaches of the Snake and Columbia River hydropower system for yearling chinook salmon and steelhead originating in the Snake River during 2001 through 2003. Hatchery and wild fish combined.

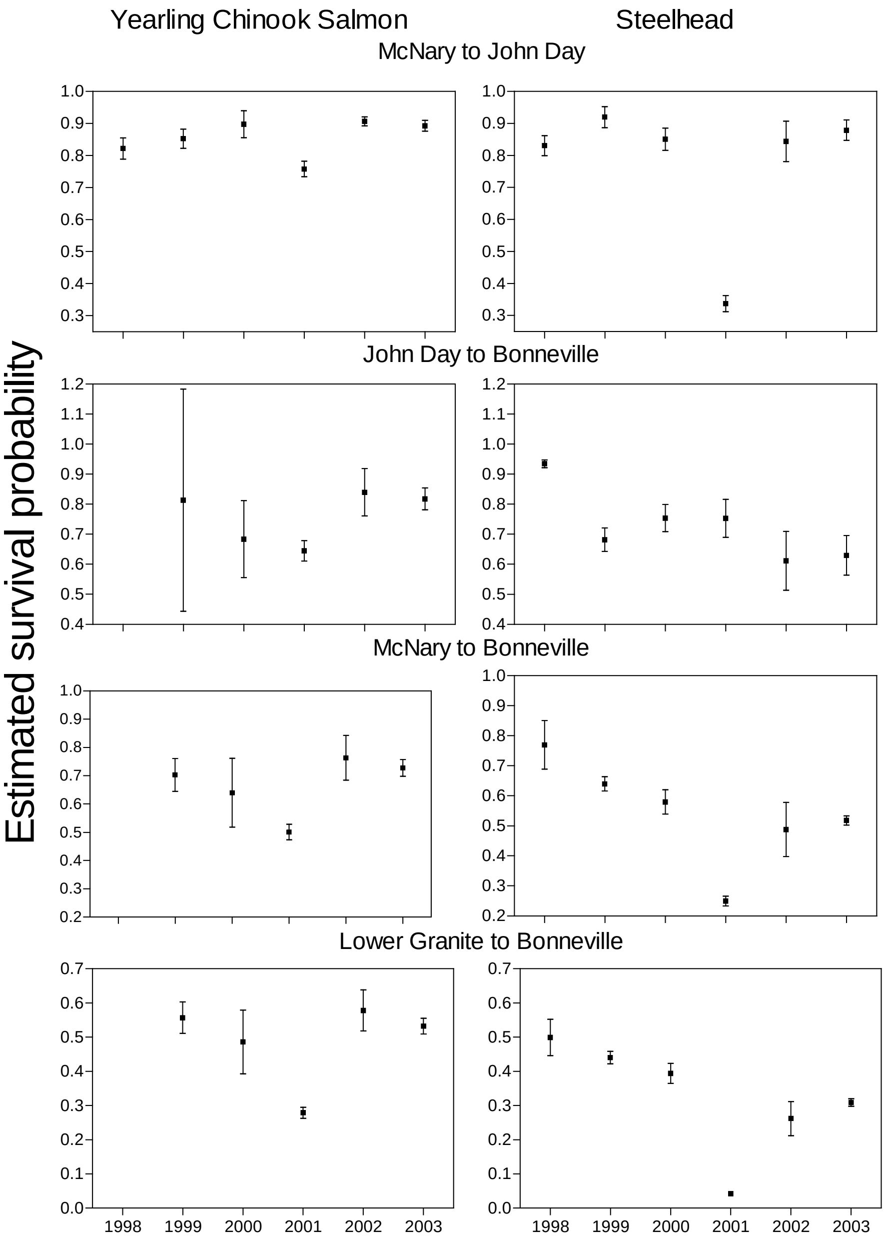
Reach	Yearling chinook salmon			Steelhead		
	2001	2002	2003	2001	2002	2003
LGR-LGO	0.945 (0.004)	0.949 (0.006)	0.946 (0.005)	0.801 (0.010)	0.882 (0.011)	0.947 (0.005)
LGO-LMO	0.830 (0.006)	0.980 (0.008)	0.916 (0.011)	0.709 (0.008)	0.882 (0.018)	0.898 (0.012)
LMO-MCN	0.708 (0.007)	0.837 (0.013)	0.905 (0.017)	0.296 (0.010)	0.652 (0.031)	0.708 (0.018)
MCN-JD	0.758 (0.024)	0.907 (0.014)	0.893 (0.017)	0.337 (0.025)	0.844 (0.063)	0.879 (0.032)
JD-BON	0.645 (0.034)	0.840 (0.079)	0.818 (0.036)	0.753 (0.063)	0.612 (0.098)	0.630 (0.066)
LGR-MCN	0.556 (0.009)	0.757 (0.009)	0.731 (0.010)	0.168 (0.006)	0.536 (0.025)	0.597 (0.013)
MCN-BON	0.501 (0.027)	0.763 (0.079)	0.728 (0.030)	0.250 (0.016)	0.488 (0.090)	0.518 (0.015)
LGR-BON	**0.279 (0.016)**	**0.578 (0.060)**	**0.532 (0.023)**	**0.042 (0.003)**	**0.262 (0.050)**	**0.309 (0.011)**

Table 3. Mean estimated survival and standard error (s.e.) through reaches of the lower Columbia River hydropower system for yearling chinook salmon and steelhead originating in the upper Columbia River during 2002 and 2003. Hatchery fish only (no wild fish tagged). Steelhead tagging during 2002 was not sufficient for survival estimation in these reaches.

Reach	Yearling chinook salmon		Steelhead	
	2002	2003	2002	2003
MCN-JD	0.856 (0.012)	0.902 (0.025)	NA	0.954 (0.047)
JD-BON	0.867 (0.079)	0.848 (0.091)	NA	0.786 (0.119)
MCN-BON	0.745 (0.069)	0.767 (0.069)	NA	0.695 (0.108)



Yearling Chinook Salmon
Steelhead
Lower Granite to Little Goose
Little Goose to Lower Monumental
Lower Monumental to McNary
Lower Granite to McNary
Estimated survival probability
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
1993
1995
1997
1999
2001
2003



Yearling Chinook Salmon
Steelhead
McNary to John Day
John Day to Bonneville
McNary to Bonneville
Lower Granite to Bonneville
Estimated survival probability
1998
1999
2000
2001
2002
2003

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

729 N.E. Oregon, Suite 200, Portland, Oregon 97232 Telephone (503) 238-0667
Fax (503) 235-4228
www.critfc.org

TO: Technical Management Team (TMT)
FROM: Kyle Martin, *Senior Hydrologist*, CRITFC Hydro Program
DATE: November 5th, 2003

SUBJECT: **Summary of Water Year 2003 Weather**

At the request of TMT, this memo summarizes monthly weather events that impacted basin flows and fish migrations during Water Year 2003 (October 2002 - September 2003). Autumn saw warmer than normal temperatures and below normal precipitation patterns. Precipitation totals for Columbia at The Dalles in October, November, and December were 33%, 57%, and 102%, respectively, and mean basin wide temperature departures were –3.2, +1.2, and +5.2 degree F. Many new record high temperature records were set across the region.

Winter was a mixed bag. Record breaking warmth in the lower 60s occurred in January. Precipitation totals for Columbia at The Dalles in January and February were 116% and 69%, respectively. Mean basin wide temperature departures were +7.3 and +0.3 degree F.

As ***El Nino*** died out in late winter, a “fire hose” of precipitation kicked in for spring. Near normal temperatures were noted. Precipitation totals for Columbia at The Dalles in March, April, and May were 175%, 130% and 85%, respectively. Mean basin wide temperature departures were +1.5, -0.3, and –0.1 degree F.

A dry hot summer was in store for migrating salmon. Many record-breaking daily high temperatures were set from early June through early September. Precipitation totals for Columbia at The Dalles in June, July, August, and September were 50%, 20%, 56%, and 83%, respectively. Mean basin wide temperature departures were +2.2, +4.9, +3.0, and +2.3 degree F.

Cumulative precipitation totals for Water Year 2003 for Columbia at The Dalles ended at 85%. The driest basins were the Upper Snake (75%), Snake River Plain (70%), and Flathead plus Kootenai (74%). The Umatilla and lower John Day basins fared the best at 102% (Figure 2).

CRITFC’s climate outlook for WY 2004 is for near normal precipitation but cold winter temperatures. UW Climate Impacts Group suggests that WY 2004 runoff will be near normal (Figure 3) with a probable January-July volume forecast of 110 MaF (or 102%) for the Columbia at The Dalles. (http://www.hydro.washington.edu/Lettenmaier/Projects/fcst/index.htm) The NOAA-NCEP climate forecasts offer above normal temperatures and near normal precipitation.

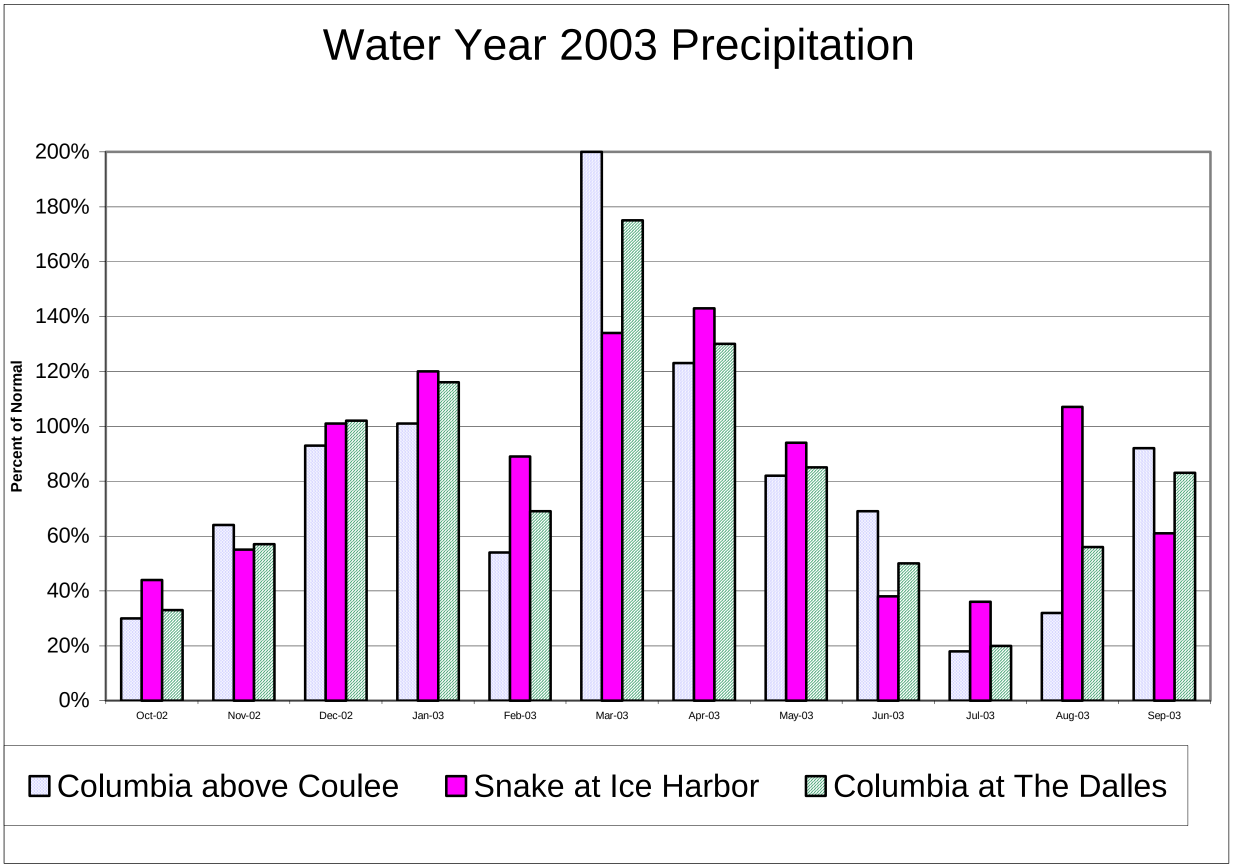


Figure 1. Water Year 2003 Division Precipitation Summary (using NOAA-NWRFC data).

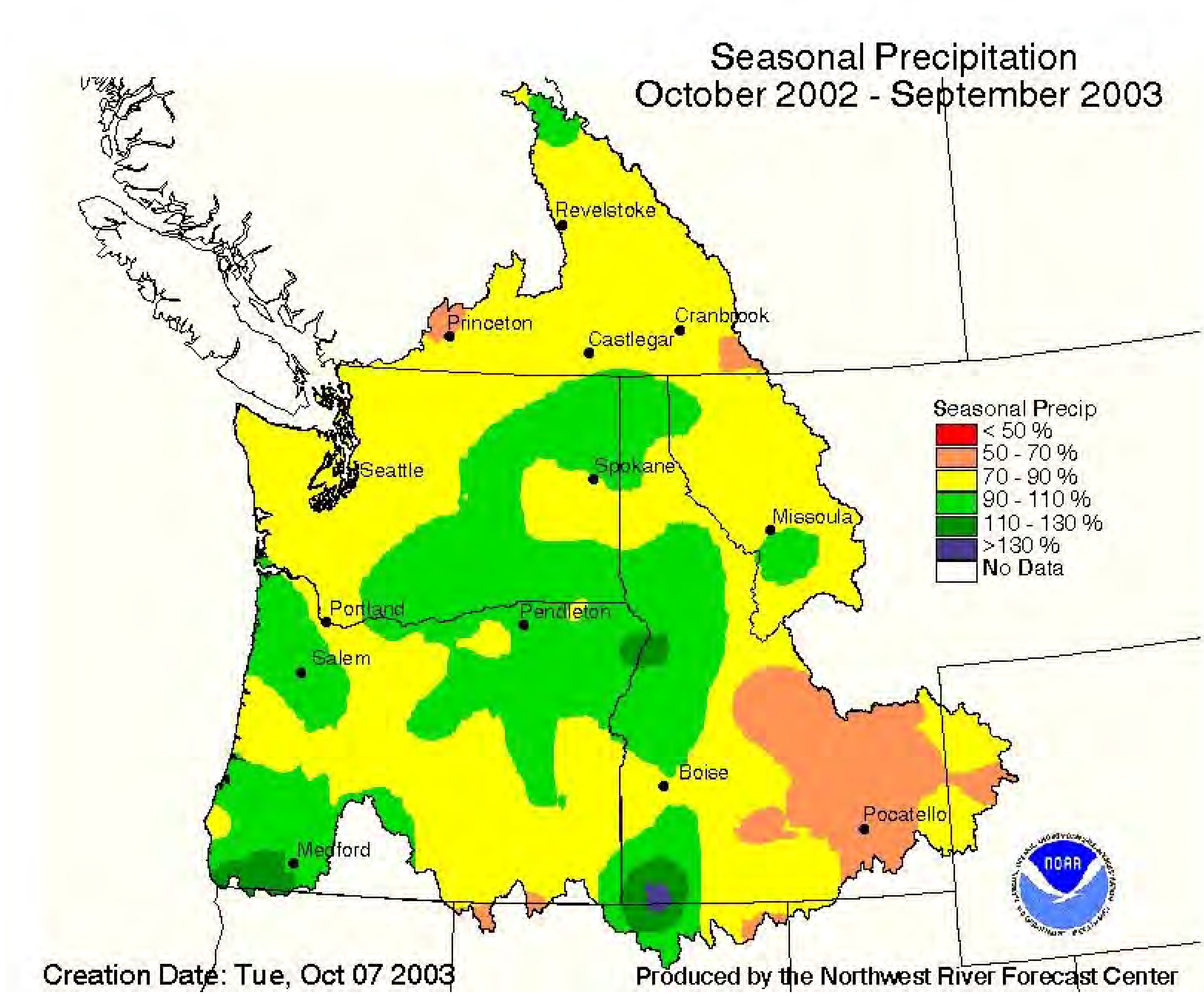


Figure 2. Water Year 2003 Columbia Basin Cumulative Seasonal Precipitation.

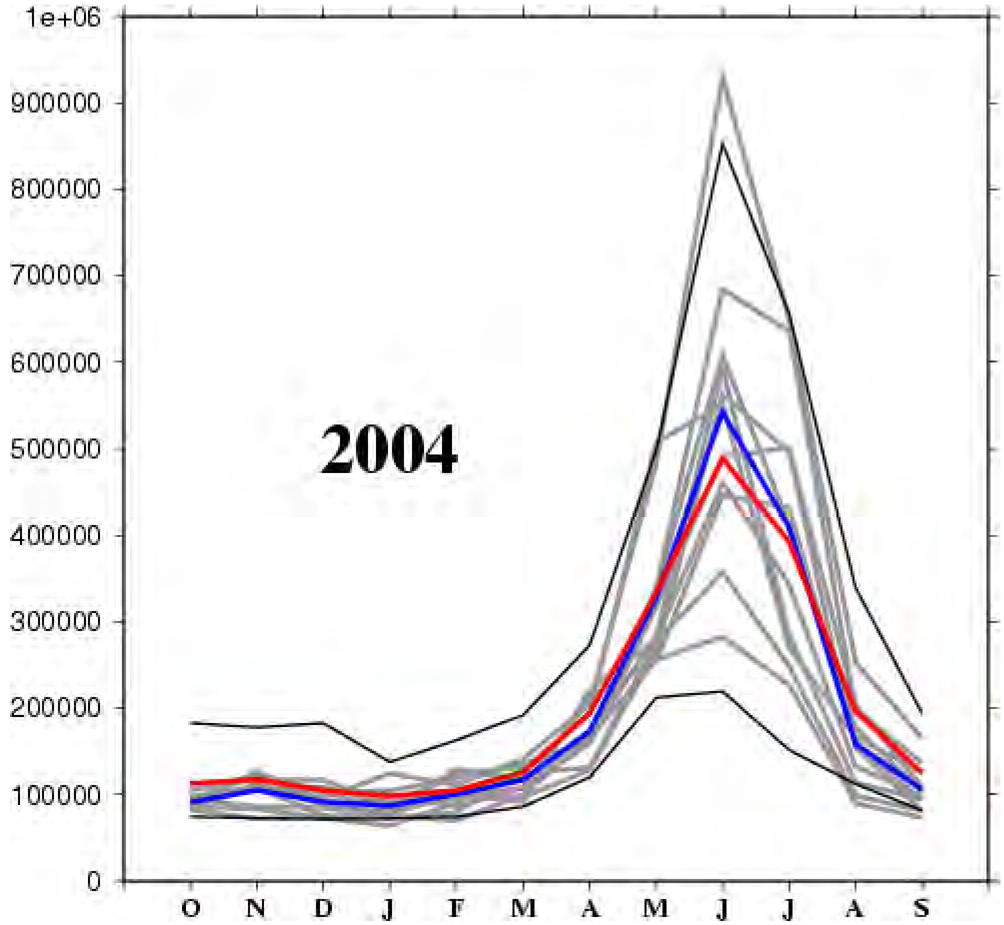
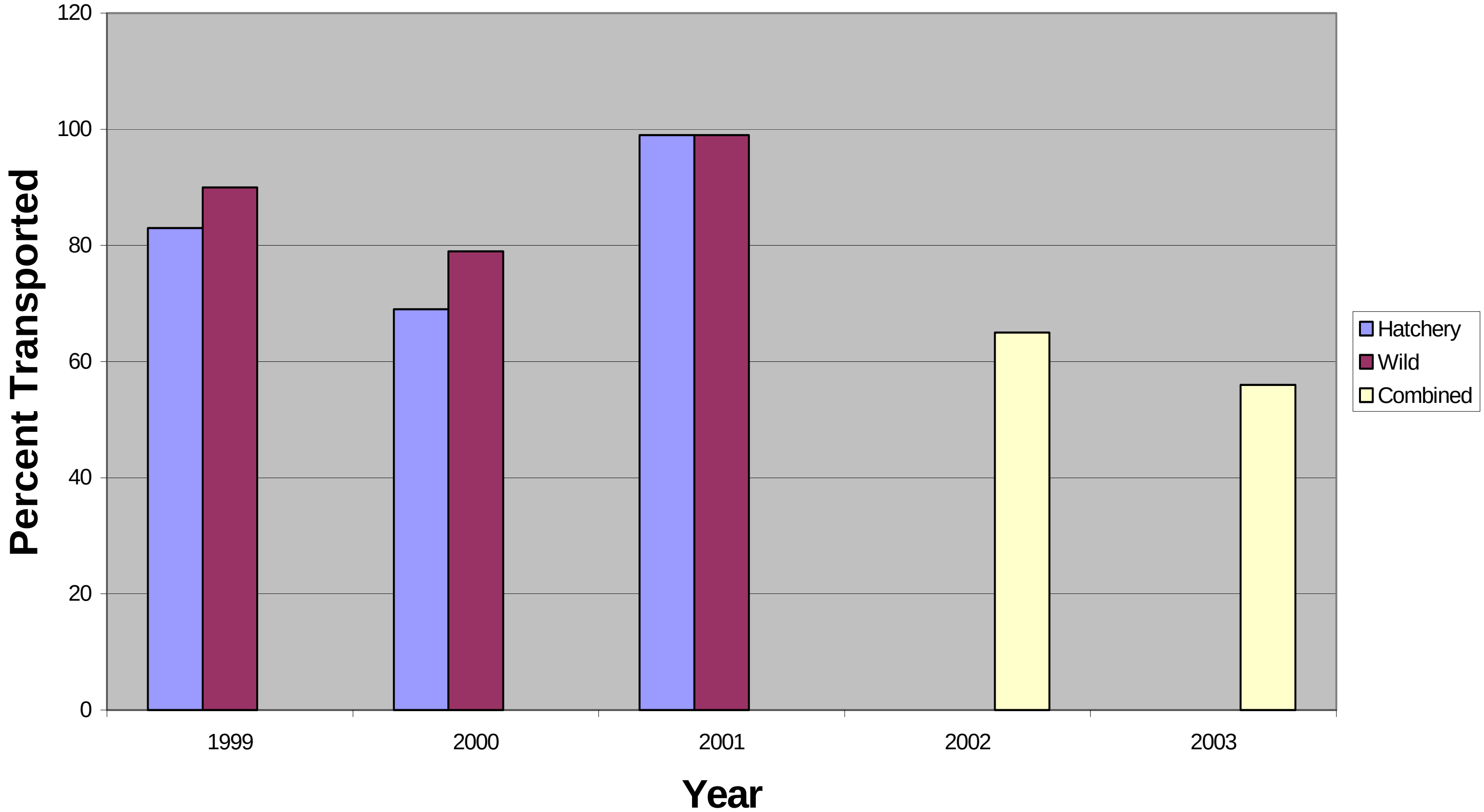
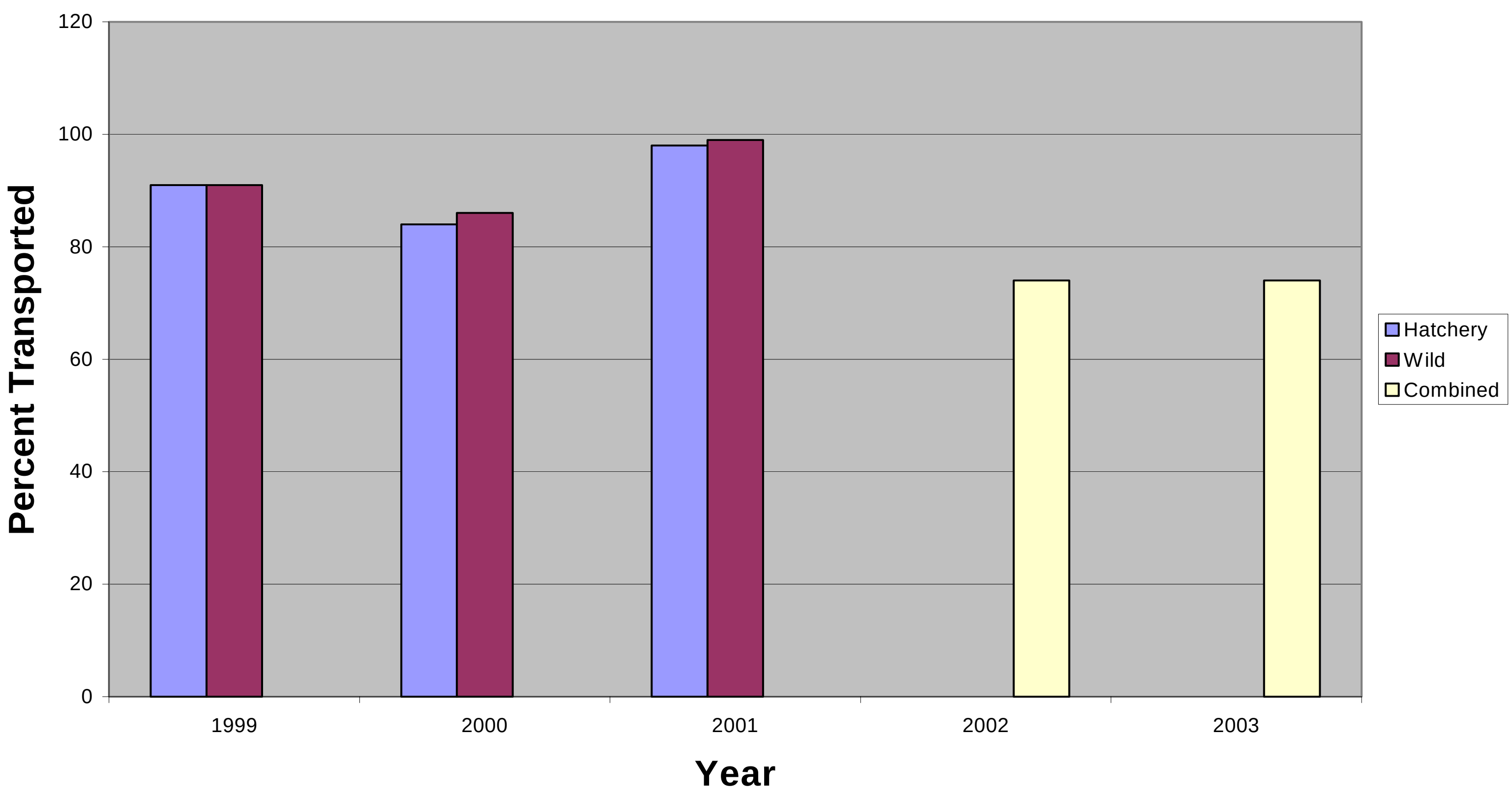


Figure 3. UW Climate Impacts Group 2004 Forecast for the Columbia River at The Dalles (unregulated or natural flow). The long-term simulated mean for all years from 1948-2000 is shown in red and the ensemble mean is shown in blue.

Percentage of Snake River Spring/Summer Chinook Smolts Transported



Percentage of Snake River Steelhead Smolts Transported



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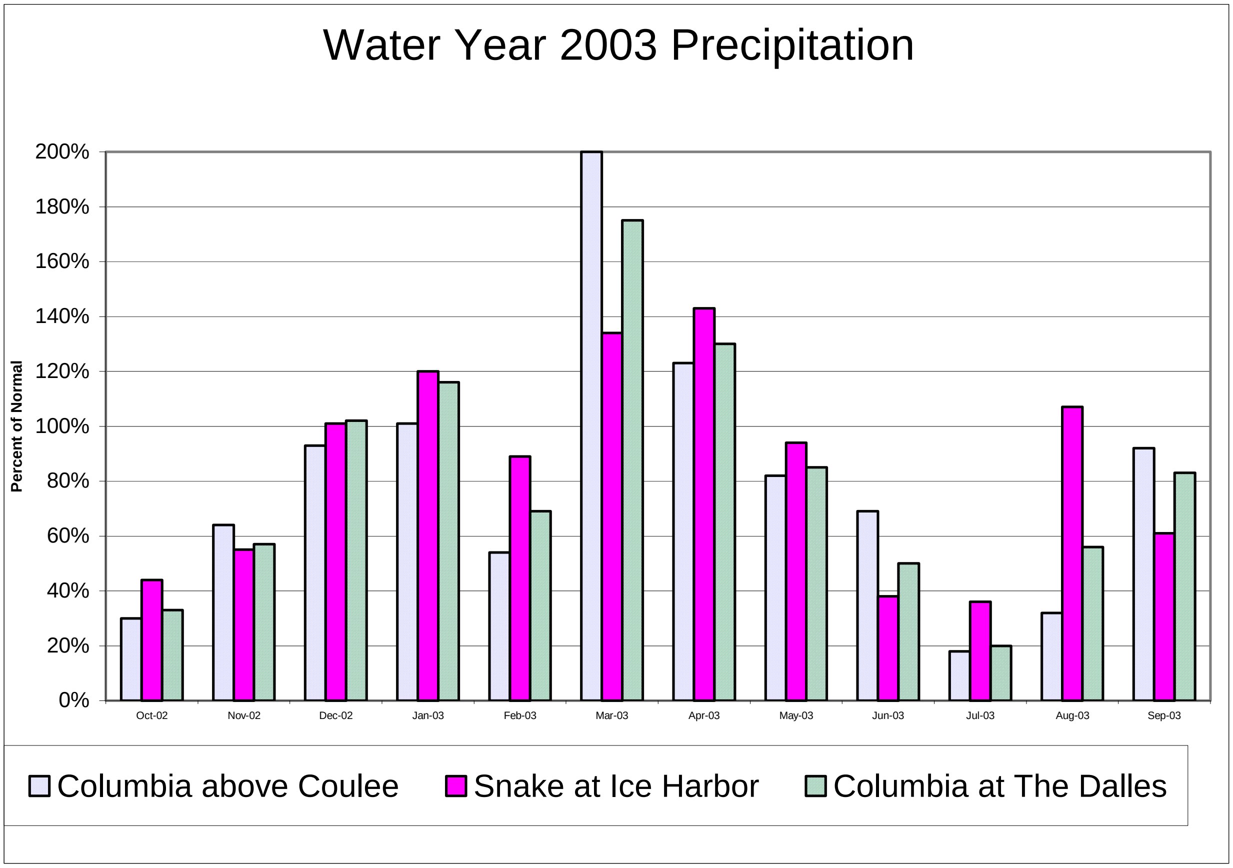

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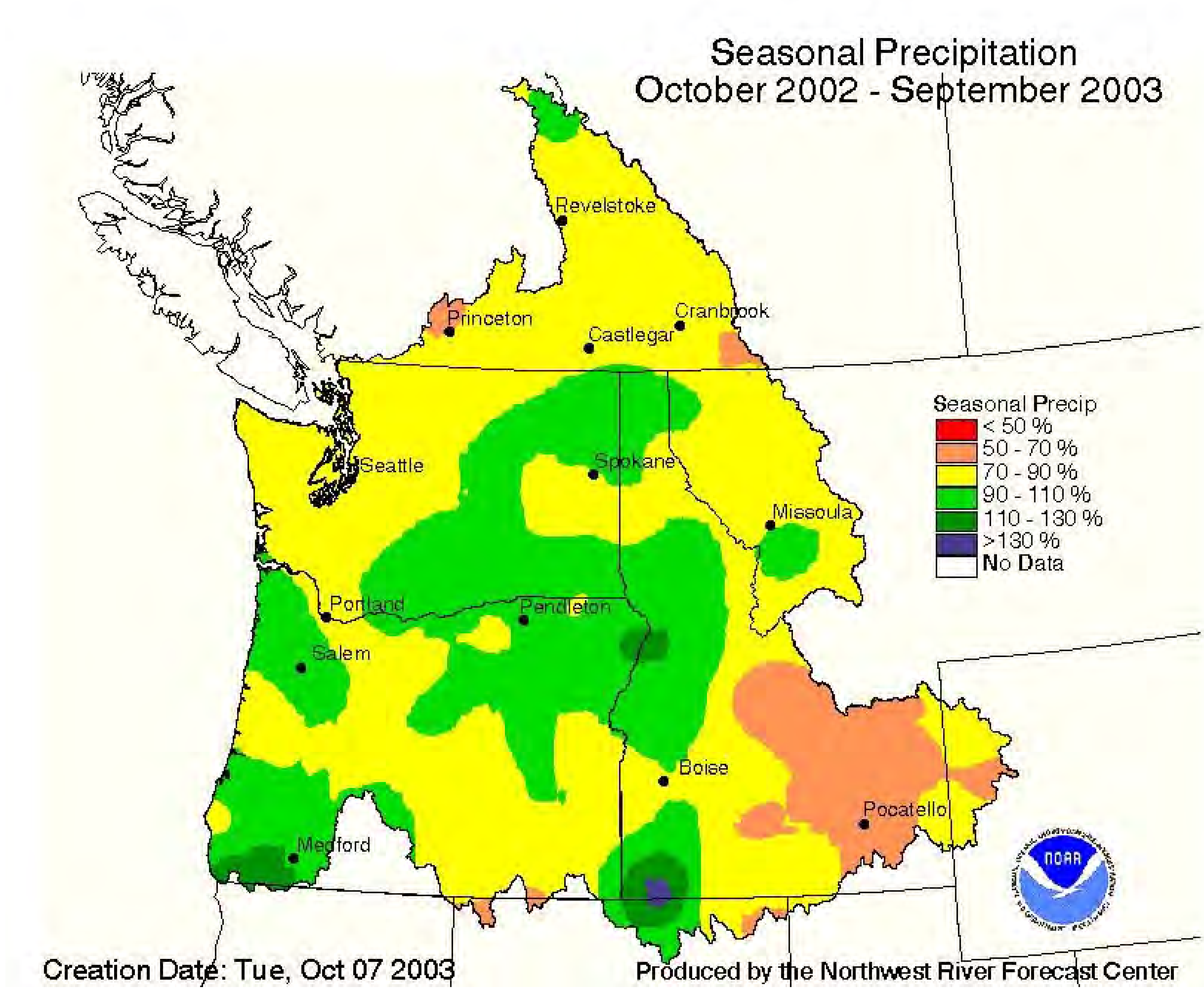

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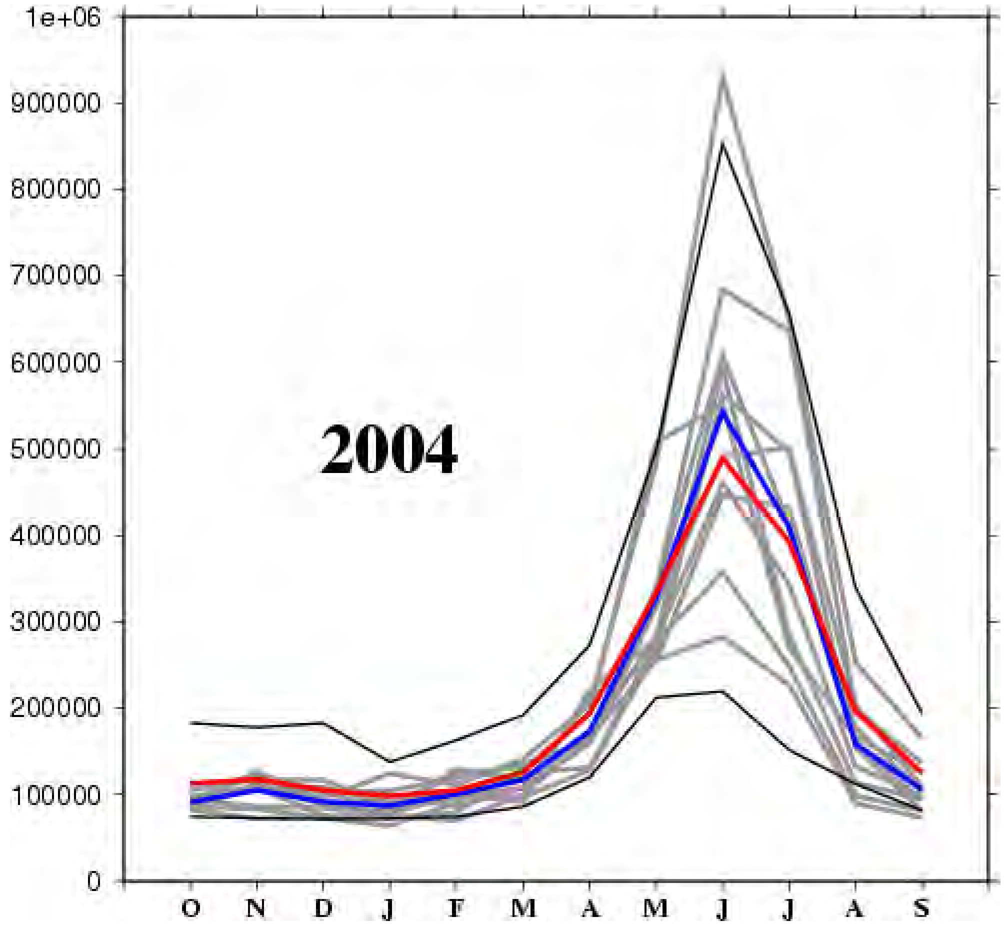

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WINTER WEATHER 2003-2004 FORECAST
American Meteorological Society Meeting, October 30th, 2003

Kyle Martin, *Senior Hydrologist* and USDA Certified Meteorologist

Climate prediction tools used:

1. University of Washington Climate Impacts Group VIC Hydro model (http://www.hydro.washington.edu/Lettenmaier/Projects/fcst/index.htm)

2. Assume weakly warm phase Pacific Decadal Oscillation, ENSO neutral conditions.

3. Analog Water Years: 1961, 1962, 1967, 1979, 1981, 1982, 1990, 1991, 1993, 1994, and 1997.

4. Sea Surface Temperature departures (http://www.emc.ncep.noaa.gov/research/cmb/sst_forecast/images/cmb.recordxy.gif)

5. Dr. Landscheidt's Solar Cycle Model (Germany)
(http://www.john-daly.com/sun-enso/sun-enso.htm)
(http://www.vision.net.au/~daly/sun-enso/revisit.htm)
Current and historical sunspot data: (http://www.sunspotcycle.com/)

Winter 2003-2004 Climate Forecast for Portland:

Month:	Temperature (mean monthly):	"Hedge"	Precipitation (% normal):	"Hedge"
November	Near Normal (-1.8 to + 1.8 degF)	-0.1	Near Normal (90 - 110%)	95%
December	Near Normal (-1.8 to + 1.8 degF)	-0.6	Near Normal (90 - 110%)	93%
January	Below Normal (< -1.8 degF)	-1.8	Below Normal (70 - 90%)	75%
February	Below Normal (< -1.8 degF)	-1.9	Near Normal (90 - 110%)	100%
March	Near Normal (-1.8 to + 1.8 degF)	1.2	Near Normal (90 - 110%)	102%

Snow (% probability): November 40%, December 70%, January 70%, February 90%, March 90%.

Water Resources Forecast for WY 2004:
January-July Water Supply Forecast (Columbia at The Dalles): **104-110 MaF** or 97-102% of normal.

Winter 2002-2003 Climate Forecast vs. Observed for Portland:

Month:	Temperature (mean monthly):	"Hedge"	**Observed**	Precipitation (% normal):	"Hedge"	**Observed**
November	Near Normal (-1.8 to + 1.8 degF)	1.1	**1.9**	Below Normal (70 - 90%)	84%	**52%**
December	Near Normal (-1.8 to + 1.8 degF)	-1.8	**3.2**	Near Normal (90 - 110%)	110%	**140%**
January	Near Normal (-1.8 to + 1.8 degF)	1.2	**4.8**	Above Normal (110 - 130%)	132%	**151%**
February	Above Normal (> + 1.8 degF)	2.5	**1.2**	Below Normal (70 - 90%)	80%	**57%**
March	Above Normal (> + 1.8 degF)	2.9	**1.8**	Below Normal (70 - 90%)	88%	**155%**

Winter 2003-2004 Climate Forecast

Kyle Martin

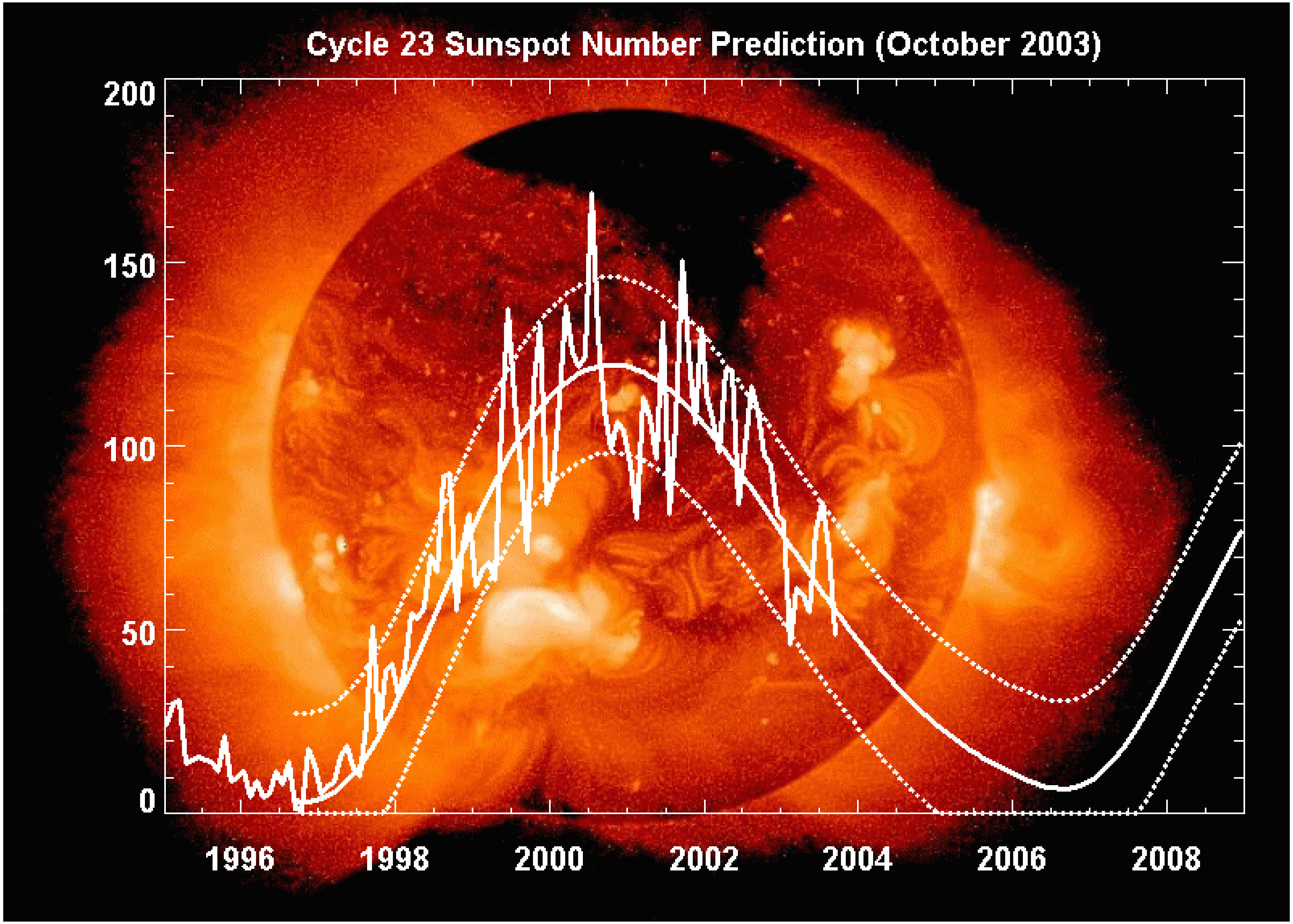
Senior Hydrologist

November 5th, 2003

Columbia River Inter-Tribal Fish Commission

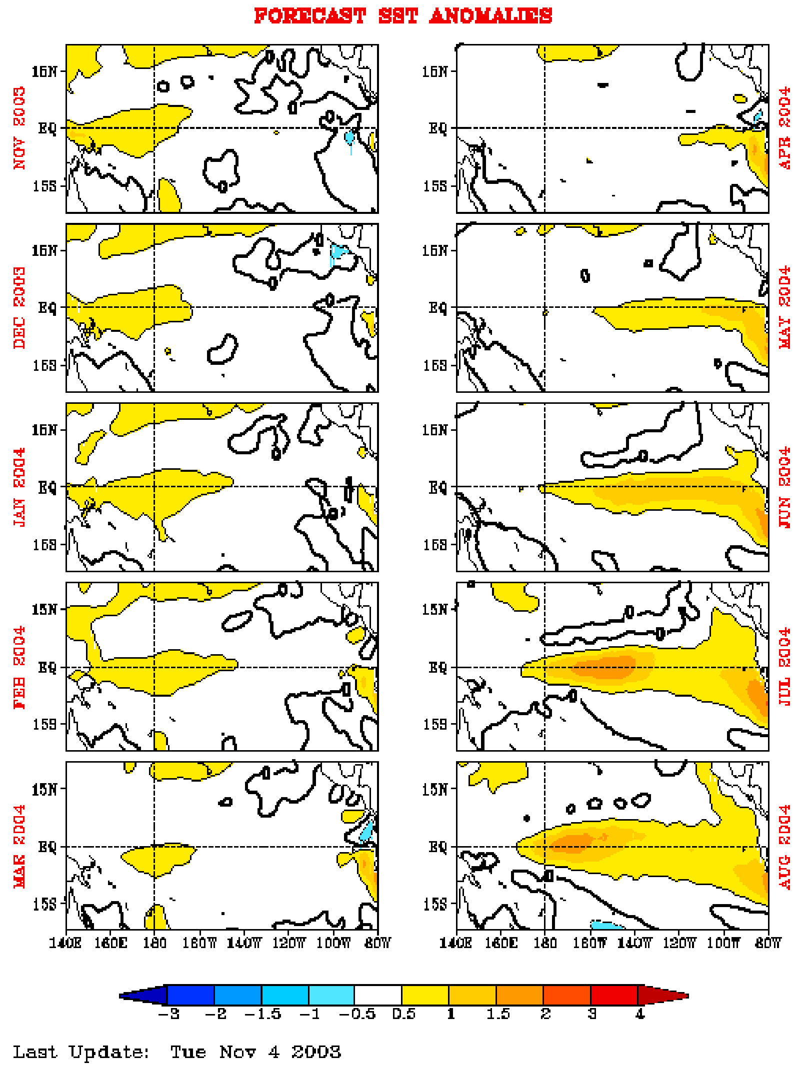
Introduction

- Forecast uses a holistic approach.
- Big-picture: Solar-Forcing (e.g., sunspot cycles). Influenced the Drought of 2001?
- Sea-Surface Temperature Forecasts
- Hydro-Climate approach: use water year volume forecast and find analog years.

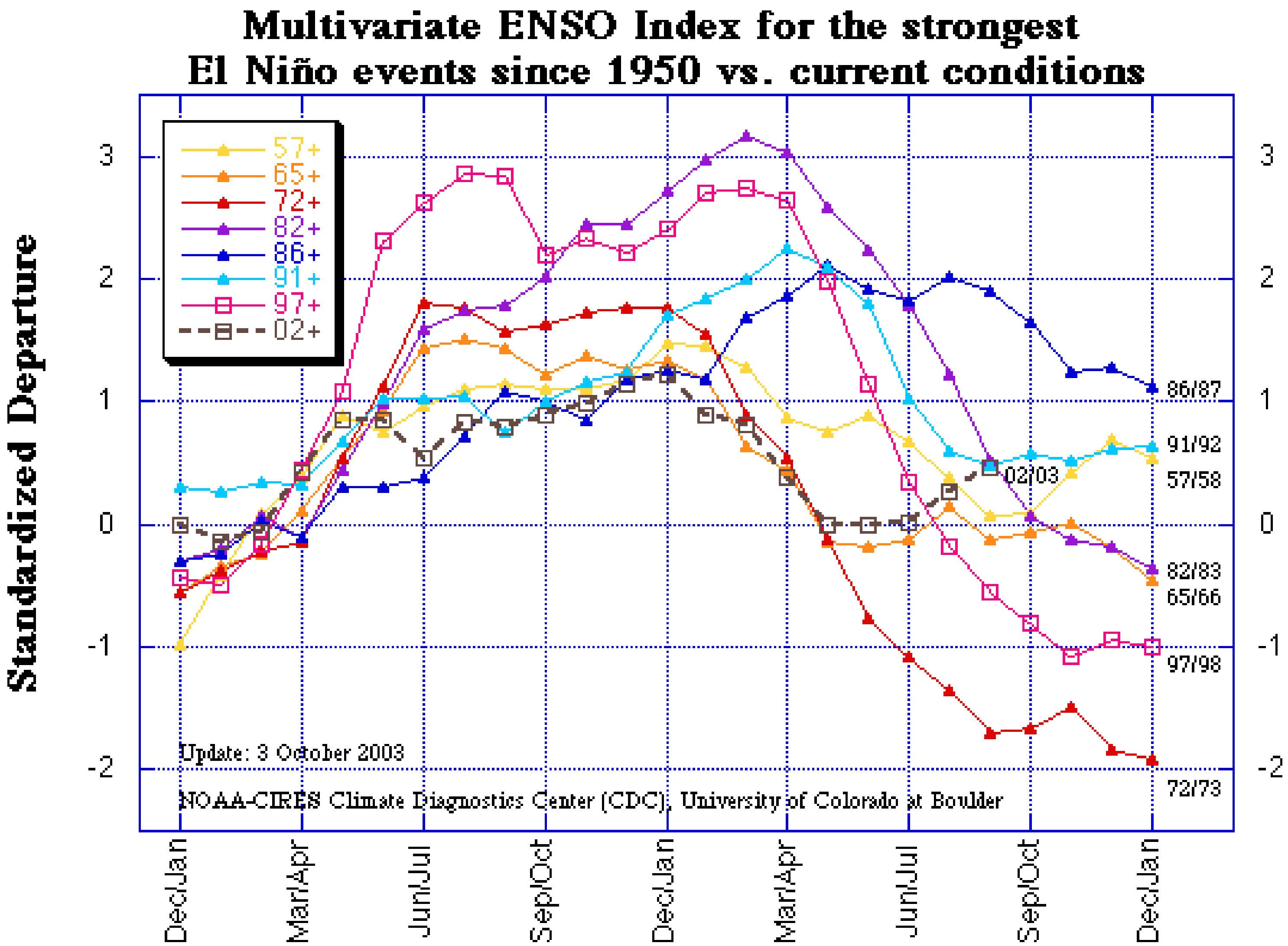


www.sunspotcycle.com

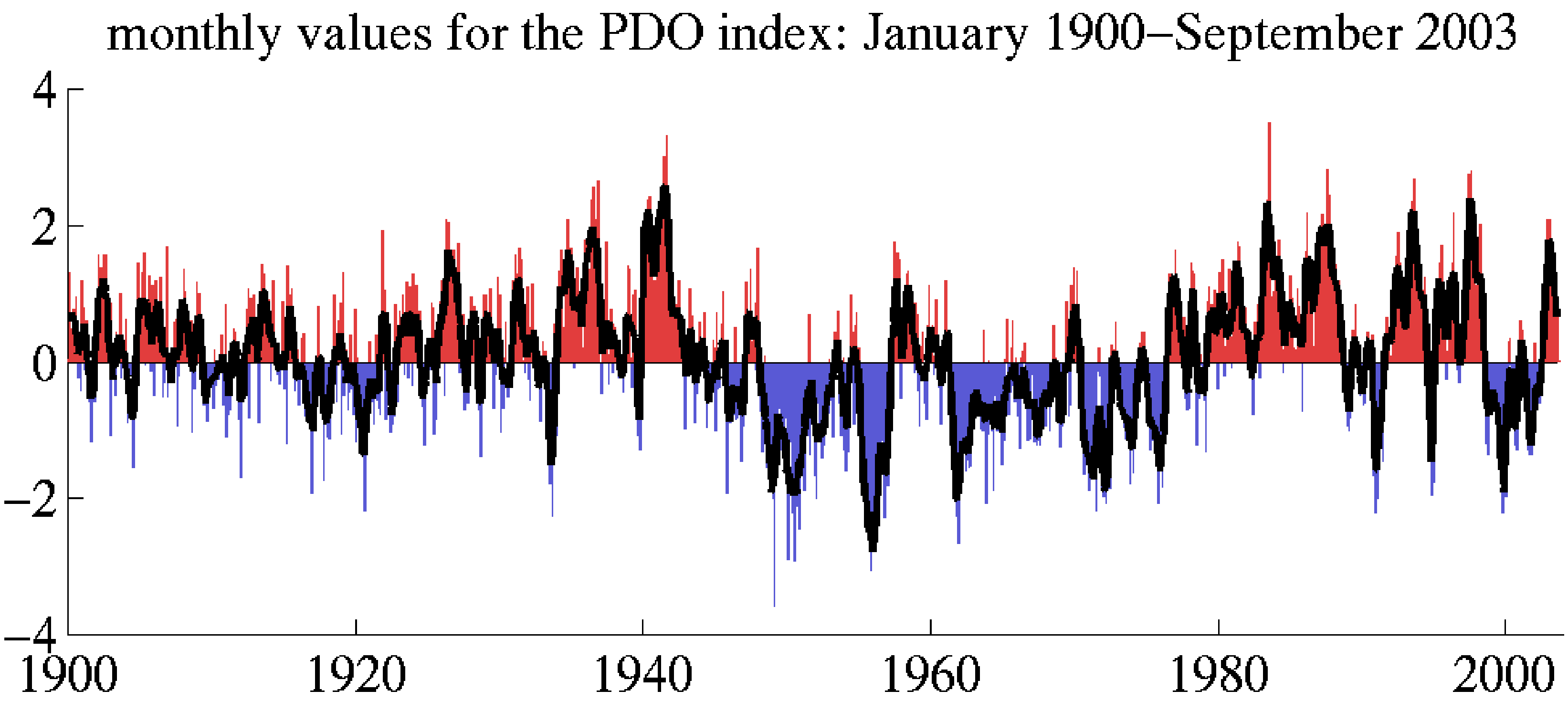
SEA SURFACE TEMPERATURE DEPARTURE FORECAST



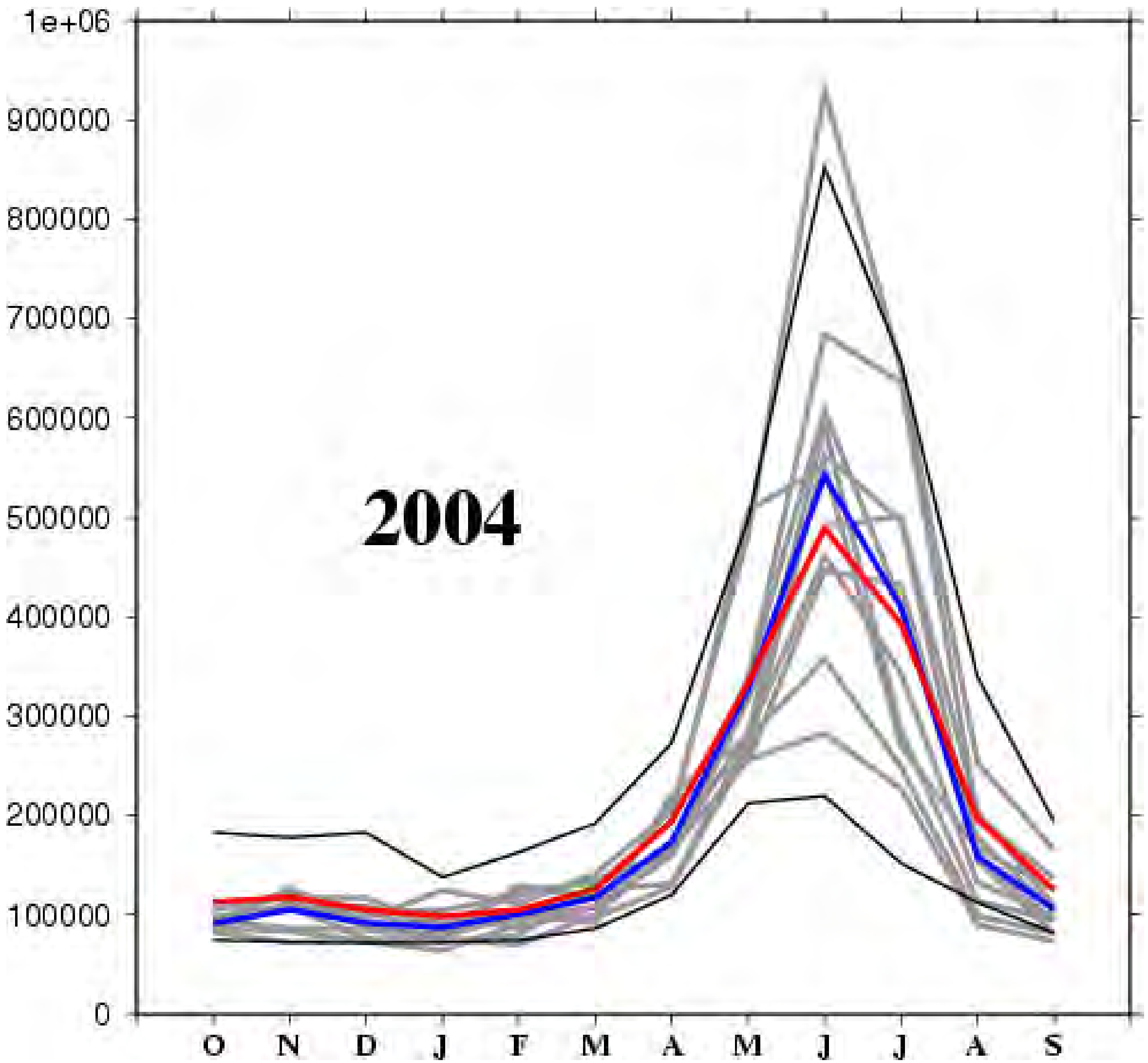
MEI-- MULTI-VARIABLE EL NINO INDEX



PACIFIC DECADAL OSCILLATION



UW CLIMATE IMPACTS GROUP ONE-YEAR LEAD EXPERIMENTAL FORECAST



Summary: The Forecast

Month:	Temperature (mean monthly):	"Hedge"	Precipitation (% normal):	"Hedge"
November	Near Normal (-1.8 to + 1.8 degF)	-0.1	Near Normal (90 - 110%)	95%
December	Near Normal (-1.8 to + 1.8 degF)	-0.6	Near Normal (90 - 110%)	93%
January	Below Normal (< -1.8 degF)	-1.8	Below Normal (70 - 90%)	75%
February	Below Normal (< -1.8 degF)	-1.9	Near Normal (90 - 110%)	100%
March	Near Normal (-1.8 to + 1.8 degF)	1.2	Near Normal (90 - 110%)	102%

…but what about snow events?!

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / John Roache*			**BPA:**	*Scott Bettin / John Wellschlager*		
NMFS:	*Paul Wagner / Chris Ross*			**USFWS:**	*David Wills / Howard Schaller*		
OR:	*Ron Boyce*	**WA:**		**ID:**	*Russ Kiefer*	**MT:**	*Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT CONFERENCE CALL

12 November 2003   0900-1000 hours

Custom House   Room 210
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Chum Operation (SOR 2003-15) - [SOR 2003-C15]
3. Other.
   - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

TECHNICAL MANAGEMENT TEAM
CONFERENCE CALL NOTES
November 12, 2003
CORPS OF ENGINEERS NORTHWESTERN DIVISION OFFICES – CUSTOM HOUSE
PORTLAND, OREGON

Facilitator: Robin Harkless

The following is a summary of the process discussion between members of the Technical Management Team on 11/12/03. The notes are not intended to be a verbatim account of the meeting nor do they serve as the official "record". They are intended to highlight discussion points, decisions, and actions.

Chum Operations Update:

TMT members revisited chum operations at the Bonneville tailwater, which was operating at an 11.2-11.5' range following discussions and a TMT recommendation at the November 5th TMT meeting. Ron Boyce, Oregon, presented information from surveys that were done on Friday (11/7) and yesterday (11/11) at the Ives Island complex. 33 chum were observed in the area on Friday. 156 live chum, including 41 redds, were observed yesterday. Ron pointed out that the pattern looks similar to last year, during which the numbers increased dramatically over the next few days. Therefore, the Salmon Managers requested that the tailwater be increased to a range of 11.3-11.7' at Bonneville, as soon as possible. Comments were offered from TMT members:

- Kyle Martin, CRITFC, offered his forecast for the Portland area that shows an increase in precipitation over the weekend.
- Dave Wills, USFWS, said that there is still a desire to meet the request expressed in SOR 2003-15 for 11.5' minimum tailwater for Hamilton Creek.
- John Wellschlager, BPA, offered an alternative operation: raise the tailwater by 1/10' on Friday, then another 1/10' on Monday to allow time for the chum to arrive.
- Ron Boyce, Oregon, noted that the request for 11.5' is consistent with the BiOp – which states that the operation should occur in the first week of November. He expressed a preference for the 11.3-11.7' sooner than later.
- Cindy Henriksen, COE, reported that the overall day average flow has been slightly down for various reasons including below average precipitation and low load demands. There is a concern that the overall low flows may impact spring operations, and the COE would like to make 'best use of a finite resource'.
- Paul Wagner, NOAA, said that the current request and the direction that TMT is heading for operations are consistent with the BiOp.

ACTION: TMT agreed to recommend an 11.3-11.6' operation at the Bonneville tailrace beginning tomorrow, November 13th, at 7 am. The Action Agencies will monitor conditions and if there is an increase in precipitation, will increase the tailwater range to 11.3-11.7'. An email will be sent out to TMT by 2:00 pm on Monday, November 16th, notifying TMT whether the increase occurred or not, and why. TMT will revisit chum operations at their next regularly scheduled meeting, Wednesday November 19th.

1. Greeting and Introductions

The November 12 Technical Management Team conference call was chaired by Cindy Henriksen of the Corps and facilitated by Robin Harkless. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

Herkless reminded the group that chum operations were discussed at last week's regular TMT post-season review. We decided that, if information from subsequent chum surveys warranted, we would re-convene today to discuss the chum operation, Harkless said. At that meeting, we also asked BPA if they could increase the tailwater elevation to the 11.3-11.7-foot range, said David Wills; John Wellschlager agreed to check on that.

Ron Boyce said that, during yesterday's survey, field crews found 156 live adult chum and 41 redds on the spawning ground, as well as 204 live adult chinook and 83 redds. Both represent a big jump from the numbers seen during last week's surveys, Boyce said. In response to a question from Scott Bettin, Boyce said the numbers from the most recent Greys River survey are available via the Fish Passage Center homepage. Paul Wagner said the most recent number he had seen was 2,100 spawners in the Greys River, much higher than the number seen on this date in 2002.

Boyce said the chum numbers this year are tracking last year's trend fairly closely; he asked that the action agencies implement the requested 11.3-11.7-foot Bonneville tailwater operating range immediately. In response to a question from Henriksen, Wills said there is no access to the creeks as yet; however, if Bonneville tailwater elevation is increased to 11.5 feet creek access will likely be possible. Kyle Martin noted that heavy rain is expected this weekend and early next week, so local flows will likely be on the rise. Wills added that the State of Washington has requested a Bonneville tailwater elevation of 11.5 feet to support its Duncan Creek project.

The bottom line is that we're now there, in terms of chum numbers on the spawning ground, said Boyce – the salmon managers would like to see the requested chum operation begin as soon as possible. Wellschlager agreed that the chum have indeed begun to arrive, and said Bonneville is agreeable to increasing the Bonneville tailwater elevation. He said it would be helpful if the action agencies could have a couple of days to set the river up, because it takes a couple of days to get the water from Grand Coulee to Bonneville. He suggested that the minimum Bonneville tailwater elevation be increased by a tenth of a foot on Friday, and another tenth of a foot on Monday. Boyce replied that the water is there now, and it is simply a matter of shaping flows to benefit chum spawning. Bettin disagreed with this assessment.

Henriksen noted that day-average flows at Bonneville have fallen to about 120 Kcfs. She said that, while rain is forecast in the Portland area, that forecast does not necessarily extend to the east side of the Cascades, where the storage projects are located. We are concerned that we do not have the storage to support this operation for an extended period, she said; it is still too early to say what kind of a water year this is shaping up to be. We're trying to make the best use of a finite resource, she said.

There are no surprises here, said Boyce; the fish are here now, and they need the water. What is the actual routing time from Grand Coulee to Bonneville? he asked. Twenty-four hours, Bettin replied. Boyce requested that the action agencies implement the requested 11.3-11.7-foot Bonneville tailwater operating range beginning tomorrow, noting that that is what the fish need. In response to a question, Wagner said the operational direction that has been proposed is consistent with the BiOp. We have been in a dry period, Wagner said; however, the fish are now arriving.

So what is the actual operating range to be implemented? Harkless asked. Bonneville is comfortable with a range of 11.3-11.6 feet, Wellschlager replied. And if the forecast is correct, and significant rain bumps up local flows? Boyce asked. Then Bonneville flows will be higher, Bettin replied.

What's different about this year? Boyce asked – why aren't the usual chum flows being provided? Are we habitat-limited, at this point? Bettin asked. Probably not, Boyce replied, but we may be hydraulically-limited, in terms of conditions on the spawning grounds. Can we go to a tighter operating range, 11.4-11.6 feet? he asked. No, Bettin replied.

We're trying to make the best use of the resource while meeting the needs of chum as well, said Wellschlager. Hopefully the rains will materialize, and we'll be able to adjust the top end of the operating range a little, and make everyone happy, he said. We definitely understand what you're trying to get to, Bettin said; he suggested that the action agencies discuss the chum operation on Monday and email their operational decision to the rest of the TMT. The TMT will then re-convene next Wednesday, he said. The more that we're at the 11.5-11.6-foot level, the better, from both Oregon's and Washington's perspective, Boyce said. Understood, Bettin replied.

Are you expecting a good return of chum this year? Wellschlager asked. Of chum and of chinook as well, Boyce replied.

After a few minutes of additional discussion, Bettin reiterated the action agencies' agreement to bump the Bonneville tailwater operating range up to 11.3-11.6 feet beginning tomorrow morning, November 13. What about nighttime flows? Boyce asked. Right now nighttime flows are low, Bettin replied; however, if we get the volume of rain Kyle is predicting, nighttime flows will have to increase at Bonneville. Is there any way to avoid or minimize that? Boyce asked. Not unless we get a lot of rain on the east side of the Cascades, Bettin replied.

With that, the conference call was adjourned. Meeting summary prepared by Jeff Kuechle.

TECHNICAL MANAGEMENT TEAM			
BOR: *Tony Norris / John Roache*		**BPA:** *Scott Bettin / John Wellschlager*	
NMFS: *Paul Wagner / Chris Ross*		**USFWS:** *David Wills / Howard Schaller*	
OR: *Ron Boyce*	**WA:**	**ID:** *Russ Kiefer*	**MT:** *Jim Litchfield*
COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*			

TMT MEETING

19 November 2003 0900-1000 hours

Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed. Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Chum update-OR
3. Other Snake River issues:
   - Chris Perry (U of ID) presentation;
   - Spring spill trigger and Dworshak operations into September - BPA
4. Spring Creek Update
5. Water Management Plan-Fall/Winter Update
6. Schedule process meeting
7. Lessons Learned report to IT in December
8. Operations Update
9. Other.
   - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM

November 19, 2003

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS

Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Chum Update:

Ron Boyce, Oregon, reported that on November 14th, 298 live chum and 266 live Chinook were observed. On November 18th, 104 live chum and 196 live Chinook were observed (probably due to poor visibility caused by weather conditions). Yesterday's totals reached 607 for chum and 995 for Chinook, compared to 993 chum and 1555 Chinook total observed on the same day in 2002. Gray's river observed chum totals were 2340 on November 10th. The chum data can be found on the FPC website.

As of yesterday (11/18), operations changed to 11.4-11.7 tailwater elevation at Bonneville. Dave Wills, USFWS, extended appreciation to the COE for doing such a great job operating within the requested range.

ACTION: TMT agreed to take a field trip during their next scheduled TMT meeting, December 3rd, to observe chum in the Mainstem, Hamilton Springs, and Hardy and Duncan Creeks. Those interested in a ride should meet at the east side of the NOAA building at 8 am. Otherwise, meet at the boat ramp at Beacon Rock at 9 am to begin the tour. The facilitation team will email information about where to meet for the TMT meeting at noon.

Spring Creek Update:

Dave Wills, USFWS, reported that BPA, the COE, and USFWS are discussing three corner collector treatment scenarios for Spring Creek operations in March 2004. These options will be presented to TMT after more discussion occurs between the three federal agencies. Dave will continue to update TMT on this issue.

2004 Water Management Plan Fall/Winter Update:

Cindy Henriksen, COE, reported that the 2004 WMP has been finalized, and now the Action Agencies are working on the Fall/Winter update. The AA's are using 2003's update as a template. New items from 2003 include chum operations and criteria for chum operation decisions used this year; and flood control operations at Libby.

ACTION: TMT members will review the Fall/Winter update and come prepared to comment on it at the December 3rd TMT meeting.

TMT Process Meeting:

TMT agreed to hold a process meeting during the second half of the December 17th TMT meeting. The facilitation team will work with TMT members to develop the agenda.

Lessons Learned Report to IT in December:
TMT will present the following information to the IT, to highlight lessons learned and shared at TMT's year end review on November 5th:

- NOAA's in-river survival results – Paul Wagner
- 2003 summer operations at Dworshak (Nez Perce/Idaho plan and temperature) – COE

NOTE: The 2001 in-river and transport results information will be presented to IT at a later date, as more data from the transport study is further analyzed, unless NOAA's white paper on this is completed by the IT meeting.

Operations Update:
Grand Coulee is at elevation 1286', and Hungry Horse is at 3530'. Libby is releasing 20 kcfs, which will remain the maximum for the rest of the year as the project experienced a forced outage. Libby is operating to reach 2411' by the end of December. The COE is looking at the possibility of implementing a burbot operation at Libby. Minimum outflows continue at Dworshak, which is at elevation 1515'. Albeni Falls is operating at a 2051-2051.5' elevation. Cold and dry weather conditions are expected through the week. Kyle Martin, CRITFC, added that there should be more precipitation next week.

Next Meeting, FIELD TRIP, December 3rd, 9:00 AM:
TMT will meet at Beacon Rock at 9 am to begin a field trip of Hamilton Springs and Hardy and Duncan Creek, and the Mainstem. The team will then go to Charburger at noon for discussion on:

- Chum Update
- Spring Creek Update
- WMP Fall/Winter Update
- Operations Update

1. Greeting and Introductions

The November 19 Technical Management Team meeting was chaired by Cindy Henriksen of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Turner at 503/808-3945.

2. Chum Update.

Boyce said new chum numbers have been posted to the Fish Passage Center homepage. Surveys took place on Friday and Monday; field crews counted 298 live chum and 266 live chinook on the spawning grounds. Counts went down on Monday, said Boyce; crews only observed 104 live chum and 196 live chinook. We believe that is an artifact of weather conditions and visibility, and expect numbers to increase again when the field crews go back out this Friday, he said.

Boyce noted that, compared to 2002, when the highest chum return in the past five years occurred, counts are somewhat lower in 2003 (607 total, compared to 993 chum by this date in 2002), although again, visibility is likely a factor in the decreased counts. Boyce noted that tailwater elevations at Bonneville have been in the 11.4-11.7-foot range since yesterday. The tributaries are beginning to flow, and we're seeing a bit of a backwater effect, which is allowing the action agencies to release a bit less water at Bonneville to maintain the tailwater range. In response to a question, Boyce said the most recent (November 10) chum count in Greys River showed 2,340 adult chum.

Paul Wagner suggested a TMT field trip to the Lower Columbia spawning grounds for the next scheduled meeting, December 3. Boyce said this should be possible. It was agreed that this would be a useful addition to the TMT agenda. The December 3 TMT meeting will take place following the field trip.

David Wills said he had checked Bonneville tailwater elevations last Thursday; he thanked the Corps for their accuracy in staying within the agreed-upon tailwater range.

3. Other Snake River Issues.

A. Chris Perry Presentation. Paul Wagner reported that there is no new information available from Chris Perry at this time. Does he have any results from 2003? Boyce asked – they did have some radio-tagged fish in the area. Do you want to contact Perry? Silverberg asked. I will, Boyce replied.

4. 2004 Water Management Plan Fall/Winter Update.

Henriksen said the 2003 WMP is now final; it is now time to turn our attention to the fall/winter update. The plan is to use last year's update as our template for 2003/2004, she said; it will include information about what we've done so far, as far as Bonneville tailwater elevations for chum. She asked the group to re-familiarize themselves with the format and the chum information and criteria. She noted that the early November water supply forecast for Libby was 117% of average, which means that the December 31 elevation at that project will be no higher than 2411. Those kinds of issues will be addressed in the fall/winter update as they arise, Henriksen said. Will we talk about the fall/winter update at the December 3 meeting? Silverberg asked. That's the plan, said Henriksen.

What's happening with the five-year Water Management Plan? asked Nic Lane. My understanding is that Ken Barnhart of BPA is updating that plan, said Silverberg. I think we're waiting for the Implementation Plan to be completed before we really turn our attention to the five-year Water Management Plan, Tony Norris added.

5. Schedule Process Meeting.

We wanted to schedule a TMT process meeting, said Silverberg; she asked when the next convenient date for such a meeting might be. It was agreed to schedule this meeting for the afternoon of December 17, following the regular TMT meeting.

6. Lessons Learned Report to IT in December.

We discussed the need for the TMT to provide a report on the highlights from its lessons learned from 2003 meeting at the December 4 IT meeting, Silverberg noted. What should we report, and who should report it? We should report on the NOAA Fisheries reach survival results from the 2003 season, said Wagner. I would add the Nez Perce/Idaho plan for Dworshak summer/fall operations, suggested Kyle Martin. There was also some useful water temperature information presented in conjunction with that report, said Silverberg. Other suggested topics for the IT report included IDFG's Snake River in-river survival data from 2001 and the most recent transport survival data, although the latter information piece may not be available until later in the year. Russ Kiefer said he may be able to provide at least some transport survival information at the December IT meeting; he said he will coordinate this information with NOAA Fisheries. A report on Lower Granite RSW operations and spill was also suggested, although Silverberg noted that the TMT has not yet had an opportunity to review this data.

7. Operations Update.

Norris said the current elevation is 1286 feet at Grand Coulee, 3530 feet at Hungry Horse. Henriksen said Libby is currently releasing 20 Kcfs. The project had an unexpected forced outage, and will be limited to 20 Kcfs maximum outflow (four units) through the end of the calendar year. Again, we're shooting for elevation 2411 by December 31, she said. We're monitoring the potential for increased inflow to that project, and are investigating the possibility of a period of 10 Kcfs outflow for burbot in December, Henriksen added. Dworshak continues to release minimum outflow – 1.3-1.6 Kcfs on a day-average. The project is drafting (about 5 feet since mid-September) and is at elevation 1515 feet, currently. Inflows on the east side have picked up a little, but most precipitation this week is falling in the form of snow in the mountains east of the Cascades. We're expecting colder, dryer weather for the next few days, she said. Another series of storms is expected early next week, said Martin, not as strong as this week.

In response to a question, Henriksen said Albeni Falls reached elevation 2051 on November 13, and will operate in the 2051-2055 range through the end of December.

8. Spring Creek Update.

Wills said there is little new to report on this topic; the Fish and Wildlife Service continues to discuss various Bonneville corner collector operations -- up to three different treatments -- for this spring. We will report back to the TMT once we have agreement on the corner collector operation this spring, Wills said.

9. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, December 3, beginning at noon at the Charburger Restaurant in Cascade Locks. A field trip to the mainstem spawning grounds will take place before the meeting. It was agreed that the group will meet at the Beacon Rock boat ramp at 9 a.m. A van will leave the NMFS parking lot at 8 a.m. Meeting summary prepared by Jeff Kuechle.

TMT ATTENDANCE LIST
November 19, 2003

Name	Affiliation
Ron Boyce	ODFW
Tom Le	PSE
Tom Haymaker	PNGC
Donna Silverberg	Facilitation Team
Margaret Filardo	FPC
David Benner	FPC
John Wellschlager	BPA
Tony Norris	USBR
Richelle Beck	D. Rohr & Associates
Paul Wagner	NOAA Fisheries
Mary Karen Scullion	COE
Robin Harkless	Facilitation Team
Kyle Martin	CRITFC
Tim Heizenrater	PPL
Nic Lane	BPA
Cathy Hlebechuk	COE
Laura Hamilton	COE
Mike O'Bryant	CBB
Cheri Long	BPA
David Wills	USFWS
Michele DeHart	FPC
Russ Kiefer	IDFG
Ruth Burris	PGE
Martin Hatscher	SCL

EMERGENCY TMT CONFERENCE CALL

01 December 2003 1400-1500 hours

Custom House Room 118
Portland, Oregon

NOTE PHONE NUMBER CHANGE

Conference call line: 503-808-5191

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

The call was requested by Scott Bettin, BPA TMT representative to discuss going to "zero flow" on the Snake River in the winter. Also to be discussed is logistics of the December 3 field trip to Ives Island.

1. ZEROLGS- [zerolgs.xls]
2. ZEROLMN- [zerolmn.xls]
3. ZEROLWG- [zerolwg.xls]

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

COLUMBIA RIVER REGIONAL FORUM
Technical Management Team
Conference Call
December 1, 2003
Facilitator: Donna Silverberg

The following is a summary of the process discussion between members of the Technical Management Team on 12/01/03. The notes are not intended to be a verbatim account of the meeting nor do they serve as the official "record". They are intended to highlight discussion points, decisions, and actions.

12/3 TMT Field Trip:
TMT members discussed logistics for the upcoming TMT field trip this Wednesday, December 3rd. Folks that are interested should meet either at NOAA for a ride (at 8 am), or at the boat ramp at Beacon Rock at 9 am. Others are welcome to meet at the Charburger in Cascade Locks from 12:30-2 pm for a post-field trip TMT discussion. Anyone who would like to walk around the sites (rather than stay in the boat) during the tour is strongly encouraged to bring appropriate attire (hip waders, etc.).

BPA Request for Zero Flow at Snake River:
Cathy Hlebechuk, COE, informed the group that historical data for Snake River flows from December 1-February 29 was made available as a link to today's TMT agenda. The data listed the times per hour that Snake River flows were below 1 kcfs from Dec.-Feb. during the last two years. Scott Bettin, BPA, requested zero flows in the Snake River for a 24-hour period to provide BPA with flexibility for cost effective operations. He requested information on the biological impacts to steelhead by implementing a zero flow operation.

Chris Ross, NOAA, offered that 100-150 returning adult steelhead passed Lower Monumental per day from November 15-26. He also said that, according to studies, zero nighttime flow would have little to no impact on returning adults, and zero daytime flow would have some impact on returning adults. Scott Bettin offered that, from 2000-2002, 3-12% total hours of zero flow were operated during December-February. Cathy Hlebechuk reminded the group that the COE takes guidance from a written Water Control Manual that requires agreement with the fish managers to operate at zero flow only when there are "very few or no actively migrating fish" in the Snake River. Russ Kiefer, Idaho, said that, during the first half of December, between 335 and 6,375 adult steelhead passed Lower Granite in the previous four years.

Idaho would require a policy discussion before making a decision about changing to a zero flow in the Snake River.

NOAA agreed to a zero nighttime flow, and minimum daytime flow to accommodate adult Steelhead passage.

Oregon expressed an interest in gathering and assessing relevant data, then discussing the issue at Wednesday's TMT meeting. Oregon is pleased that BPA is engaging with regional partners on this issue this year. Oregon does not agree to the zero nighttime flow at this time.

Nez Perce agreed with Oregon to look at the data before making any changes to operations. Nez Perce does not agree to the zero nighttime flow at this time.

USFWS is not comfortable with zero flow, but agreed to zero night time flows (if operating at zero flow is a must) and would like to look at the data before making any changes.

BPA expressed frustration that this is an old issue that was put forth early, and stalling a decision to move forward would be costly for BPA. A suggestion was made to include this issue in the Water Management Plan so TMT can plan to have the discussion earlier in future years.

Next Steps:

- The group agreed to move forward quickly to make an informed recommendation regarding BPA's zero flow request.
- The Salmon Managers will request data from the FPC, then review and discuss the data during tomorrow's FPAC meeting.
- The Salmon Managers will email the results of that discussion to Cathy Hlebechuk and Scott Bettin as soon as possible.
- The full TMT will discuss the issue during Wednesday's TMT meeting. Anyone who does not plan to attend the meeting on Wednesday should provide comments to the COE and BPA before that time.
- If a consensus is reached to move forward before Wednesday, COE and BPA should be notified so they can go ahead with the proposed operations.

Editor's notes: added edits from Rudd Turner, Corps of Engineers.

TECHNICAL MANAGEMENT TEAM
CONFERENCE CALL NOTES
December 1, 2003
COE RESERVOIR CONTROL CENTER - CUSTOMS HOUSE
PORTLAND, OREGON

1. Greeting and Introductions

The December 1 Technical Management Team conference call was chaired by Cathy Hlebechuk of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

Scott Bettin began the call by noting that December 1 is the traditional date on which the action agencies can go to zero flow at the Snake River projects. We would like the flexibility to do that, beginning tonight, he said. Are you talking zero flow 24 hours a day, or zero nighttime flow? Chris Ross asked. The Blue Book says zero flow period, Bettin replied. What is the purpose of this operation? asked another participant. To shift flow from light-load periods to heavy-load periods, Bettin replied.

Bettin asked about the biological impacts of such an operation. Cathy Hlebechuk noted that, last year, after December 1, the Snake went to zero flow (1 Kcfs or less) on an as-needed basis, but only from midnight to 6 a.m., and only through February 29. Ross noted that there was a two-week outage at Lower Monumental beginning November 15; video counts showed 100-150 adult steelhead per day passing Lower Monumental during that period. Greg Haller said 50-150 adult steelhead, primarily from the Clearwater, are passing Lower Granite currently on their way upstream to spawn. There are also juvenile Clearwater fall chinook overwintering in the Lower Granite pool, before outmigrating next spring, Haller said. Would going to zero flow impact them? Bettin asked. If juveniles are migrating, then zero flow obviously stops their migration, replied Ross -- if they're overwintering, then we'll see them next spring. Other studies have shown that zero nighttime flow is not a detriment to adult steelhead passage at this time of year, he added.

Hlebechuk read the relevant passage from the Water Control Manual, which permits zero Snake River flow on a limited basis during this time of year, when only a few adult steelhead are passing the Snake River projects daily, during nighttime hours and weekends. This is what we're using for project guidance right now, she said.
Editor's note: here is the specific passage from the Snake River water control manuals. Lower Granite, Lower Monumental, Little Goose and Ice Harbor have the same passage. "From December to February, "zero" minimum project discharge is permitted on a limited basis. Under an agreement between the Corps of Engineers and the fishery agencies, zero riverflow is allowed for water storage during low power demand periods (at night and on weekends) when there are few, if any, actively migrating anadromous fish present in the Snake River...Water stored under zero riverflow conditions may maximize power production from the Columbia River Basin system, but zero riverflow operations are not recommended at *, when fish are actively migrating in the Snake River."
****Project name in water control manual is same as project; i.e. in Lower Granite manual it is "Lower Granite", in Little Goose manual it is "Little Goose", etc.***

Is there other input we need on this issue? Bettin asked. It seems to me that the question of what is "few" is open to interpretation, said Russ Kiefer; in looking at the data from the past four years, we've seen between 334 and 6,000+ adult steelhead passing Lower Granite during the first two weeks in December. Counting at Lower Granite stops on December 15, he said, so we don't have a clear picture of the fish passage situation after that date. Kiefer said he will need to check with policy personnel at IDFG before he can make a call on what constitutes "few." Do I understand correctly that you need salmon manager concurrence with this operation? he asked. Not necessarily, Bettin replied – at this point, however, we're asking for your input.

Bettin noted that, in 2002, the Snake went to zero nighttime flow during only 13 percent of the available hours from December 1-February 28; in 2001, it was 6 percent of the time; during 2000, 3 percent of the time. Haller said the Nez Perce Tribe isn't a big fan of zero flow, even at night, because there are still adult fish migrating through the system. Ross said NOAA Fisheries is willing to support zero nighttime flow, but is not willing to support zero Snake River flow during daytime hours, even on weekends, because daytime zero flow delays adult passage but zero nighttime flow does not. So a delay of a day would be a significant biological impact? Bettin asked. I'm not going to say so, Ross replied.

Kiefer reiterated that he would like to discuss this issue with others at IDFG before agreeing to support the zero nighttime flow operation. Bettin observed that IDFG's Steve Pettit agreed to the zero nighttime flow operation last year; he added that he had hoped to begin the zero nighttime flow operation tonight. Ron Boyce said that, once again, all of the relevant information is not on the table; there is still a lot of uncertainty and conflicting data about even the zero nighttime flow operation. He suggested that it would make sense to look more closely at the available historic data, current passage numbers and the potential effects of the zero flow operation on incubating steelhead eggs in the Lower Snake before making this decision. Haller said he agreed with Boyce.

Bettin suggested that BPA be given the flexibility to implement the zero Snake River flow operation, given the fact that it has never been implemented more than 13 percent of the time, until the TMT can then revisit the data Boyce is requesting at Wednesday's TMT meeting. Kiefer said he is most concerned about the potential impacts of this operation on fall chinook redds below Lower Granite. Ross said the evidence, as he understands it, is that fish pick areas with good upwelling conditions to spawn. As long as the redds are watered up during the zero-flow period, he said, egg to smolt survival should remain high.

How much fluctuation would there be in, say, the Little Goose tailwater elevation during a typical zero-flow event? Ross asked. A few tenths of a foot, Bettin replied. In response to another question, David Wills said the Fish and Wildlife Service would not oppose going to zero flow during nighttime hours at this point. Given that fact, said Silverberg, is anyone uncomfortable with BPA going to a zero nighttime flow operation at the four Lower Snake projects, on an as-needed basis, beginning tonight? Haller said the Nez Perce Tribe would not be comfortable with beginning the zero flow operation before the TMT has an opportunity to discuss all of the relevant data. It was agreed that Wills will ask the Fish Passage Center to assemble some historic and current adult steelhead passage data for Lower Granite.

In the meantime, said Silverberg, it sounds as though the TMT is going to be unable to reach a consensus recommendation on the zero nighttime flow operation at the Lower Snake projects at today's meeting. We will discuss it further at Wednesday's TMT meeting, she said.

Bettin noted that this is a very old issue, one that comes up every year. I asked that we implement this operation two weeks early, he said, yet here we are discussing it today as if it's a surprise issue. Rudd Turner noted that one new twist this year is that BPA is asking for the flexibility to implement the zero flow operation 24 hours a day, something that the data does not support. What if we took that off the table and went to zero nighttime flow only? Bettin asked. I think we asked that question earlier, and there were some parties who were uncomfortable with that operation until they've had a chance to look more closely at the available data, Silverberg replied. Bettin said that, to him, some parties appear to be seeking to delay the implementation on the zero flow operation this year.

I hear your frustration and can understand where it's coming from, said Silverberg – can we get everyone's commitment to move forward with this as expeditiously as possible, and to try to make a decision on this issue on Wednesday? Silverberg asked. Yes, was the reply. In response to a question, Bettin said the potential financial impact of this operation, for Bonneville and the region, is approximately $50,000 per night of implementation, the approximate value of moving 400 MW of energy from light-load into heavy-load hours.

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / John Roache*	**BPA:**	*Scott Bettin / John Wellschlager*
NMFS:	*Paul Wagner / Chris Ross*	**USFWS:**	*David Wills / Howard Schaller*
OR:	*Ron Boyce* **WA:**	**ID:**	*Russ Kiefer* **MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT Field Trip Meeting

03 December 2003   0800-1700 hours

Custom House   Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed.
Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

This is a field trip to the Ives Island area where chum are spawning. Folks will meet in front of National Marine Fisheries Service at 525 N.E. Oregon Street (near Lloyd Center) at 8 a.m. or at the Beacon Rock boat ramp at 9 a.m. After the field trip at abut noon, there will be a TMT meeting at Cascade Locks Charburger to discuss:

- Chum Update
- Spring Creek Update
- WMP Fall/Winter Update .
- Operations Update

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

TECHNICAL MANAGEMENT TEAM
MEETING NOTES
December 3, 2003
CHARBURGER RESTAURANT
CASCADE LOCKS, OREGON
FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Chum Update:
The TMT spent the morning on a field trip observing chum spawning grounds at Ives Island, Hamilton Creek, Duncan Creek and Hardy Springs. Updates on chum numbers were circulated. Dave Wills, USFWS, reported that 12/2 and 12/5 chum observations will be shared with the TMT at the next TMT meeting.

Spring Creek Update:
Dave Wills, USFWS, reported that BPA, the COE, and USFWS are continuing discussions about Spring Creek operations for March 2004. A TDG waiver consideration has been addressed through the Oregon public hearing process and is scheduled to be discussed at an Oregon DEQ meeting in February. It is yet unknown whether USFWS will need an exemption from the state of Washington relative to the Spring Creek operation. The agency is working to obtain these waivers to keep open the option of spill to support the hatchery release.

2004 Water Management Plan Fall/Winter Update:
Rudd Turner, COE, distributed a draft WMP fall/winter update for review and follow-up discussion at the 12/17 TMT meeting. The update describes current conditions, chum spawning, burbot, flood control operations, Spring Creek, Vernita Bar, and zero flow operations on the Snake River. One suggestion was made today to tighten up language relative to screens at the Bonneville powerhouse 2, discussed in the Spring Creek hatchery section of the update.

ACTION: TMT members will review the Fall/Winter update and come prepared to make comments at the December 17th TMT meeting. TMT will consider whether the 1% excursions operation should be included in the update. The Action Agencies will check the WMP to see if this issue is included there.

Operations Update:
Cathy Hlebechuk, COE, and Tony Norris, BOR, updated the group on system operations. Libby is being operated to meet elevation 2411' by the end of December. A request for burbot operations should be forthcoming in the next week or so. Dworshak is operating at minimum flows. The Bonneville tailwater is being operated at 11.4-11.7' elevation for chum. Grand Coulee is at elevation 1286.4' and Hungry Horse is at 3529.8'.

Zero Flows at Snake River:

Per discussions during a TMT conference call on Monday 12/1, FPAC reviewed some available data relative to effects of zero flow on Snake River migrating adults and juveniles, and redds. The salmon managers are looking for winter counting data for adult passage at Lower Granite. They are concerned that the numbers are beyond the "few, if any" criteria for adults and juveniles. The salmon managers, through consensus, recommended no zero flow during daytime hours. They also expressed, at FPAC, concern with starting zero flow at night until additional issues can be resolved. Dave Wills, USFWS, reported that the Nez Perce tribe was uncomfortable with moving to zero flow and would like to wait two to three weeks to allow for more adults to pass through the projects.

Chris Ross, NOAA, reported that winter 2001-02 ~~juvenile~~ adult counts from the Walla Walla COE are available, and that counts for winter '03 are expected soon for Lower Monumental and Little Goose. Chris offered that available data shows no detrimental effects of zero flow on redds through January. He also said that salmon managers will need to study and address oxygen needs for alevins ~~smolts~~ in ~~emerging from~~ redds with no flow in February and March. ~~NOAA's~~ ~~r~~Research suggests that a six hour nighttime zero flow is not detrimental to migrating fish and ~~they~~ therefore NOAA Fisheries is ~~are~~ not opposed to the operation.
Editor's note: above paragraph edits from Chris Ross, NOAA Fisheries.

The USFWS would like a bit more time to review the data before agreeing to any zero flow operation.

The COE would like to strike a balance between operations for fish and BPA's need for flexibility. Are the fish "actively migrating" or just moving? This question could not yet be answered during today's discussion.

ACTION: Members of the TMT that were present at today's meeting did not object to the following operation: Flexibility of zero flow for a six hour maximum time period during the hours of 10 pm to 6 am, beginning on Thursday evening, 12/4. Delaying the operation by one day allowed for any TMT member to elevate the issue to IT if so desired. The salmon managers identified a need to review all current data relative to this operation. TMT will review the agreement referenced in the water control manual to see if it is still appropriate, given the current data and system knowledge that the region has gained after 16 years since the document was drafted.. This issue will be revisited at the next TMT meeting.

The facilitation team helped the group draft, and will distribute to all TMT members, an issue statement in the event that someone wishes to elevate to IT. (see attached)

Next Meeting, December 17th, 9-noon:

Agenda Items:

- Chum Update
- Spring Creek Update
- WMP Fall/Winter Review
- Operations Update

1. Greeting and Introductions

The December 3 Technical Management Team meeting was chaired by Cathy Hlebechuk of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Henriksen at 503/808-3945.

2. Chum Update.

David Wills said the most recent chum survey was conducted yesterday, but he has not yet seen the numbers for Hamilton Creek. Overall, he said, 2003 chum numbers at Ives Island are tracking well below the 2002 numbers, although they're still running well ahead of the 10-year average. Overall, however, we did expect to see a lot more chum in the Ives Island area than we've seen to date in 2003, Wills said. It appears that fall chinook spawning may be somewhat later than normal this year, observed Rudd Turner – it could be that something similar is going on with chum, for whatever reason.

3. Spring Creek Update.

Wills said discussions between the Corps, BPA and the Fish and Wildlife Service are ongoing regarding how the Bonneville corner collector will be operated following the release of the Spring Creek Hatchery fish in March 2004. We'll report back as more information becomes available, said Wills; all we can say at the moment, however, is that discussions are continuing. In response to a question, Wills said the Fish and Wildlife Service did submit its usual water quality waiver request to Oregon DEQ this September; this request would cover a 10-day period of spill following the Spring Creek Hatchery release, and is being processed through the ususal channels. The Service is also seeking a Washington DOE water quality exemption to cover Spring Creek Hatchery spill in 2004, although it is unclear whether or not such an exemption will be needed.

4. WMP Fall/Winter Update.

Rudd Turner distributed copies of the draft fall/winter update to the 2004 Water Management Plan; he asked the other TMT members to review this document and provide any comments they may have at the December 17 TMT meeting. Turner went briefly through the contents of the draft update, noting some of the areas of similarity and dissimilarity between the 2003 and 2004 fall/winter updates. Turner noted that the Vernita Bar minimum flow for this winter has been set at 70 Kcfs. Scott Bettin asked the group to think about whether or not the excursion from 1% operation referenced in the fish passage plan should also be addressed in the fall/winter update.

5. Operations Update.

Hlebechuk said the final burbot SOR will be submitted soon; a draft has been submitted and the burbot operation has already begun. Libby is currently releasing 20 Kcfs and will do so until about December 18, at which point Libby outflow will be reduced to about 10 Kcfs. Libby's December 31 target elevation is 2411 feet. Libby will try to maintain as stable a flow as possible through the month of January, if flood control elevations allow. The draft SOR requested outflows from mid December through the end of January be as stable as possible. We're still in negotiations on the specifics of the burbot operation, Hlebechuk said; again, the final SOR should be submitted later this week.

Dworshak continues to release minimum outflow, Hlebechuk said; we have also changed the Bonneville tailwater range for chum to 11.4-11.7 feet. Tony Norris added that Grand Coulee is currently at elevation 1286.4 feet; Hungry Horse is at 3529.8 feet.

6. Snake River Zero Flow Operations.

Wills noted that, at the conclusion of Monday's TMT conference call, he had agreed to gather some data regarding the fish passage situation in the Snake River during the month of December. We were trying to get the winter video counting data from a couple of the Snake River projects, he said; the concern among most FPAC members was that the number of adult steelhead currently passing Lower Granite is much higher than normal. We were looking for any historic data that might shed some insight into whether or not the 2003 counts are truly higher than normal, he said, and were able to obtain some November-February counts from Little Goose and Lower Monumental, which were done in response to the bull trout SOR.

There are varying degrees of concern among the FPAC membership about whether zero flow at night is a concern, he said; FPAC was unanimous in its concern about zero flow during the day, said Wills. There were also some concerns raised about the impacts of zero flow in the Snake on any juvenile migrants that are still present in the system, he said; however, there really isn't any data available to answer that question. Another concern was the effects of zero flow on fall chinook redds established below the Snake River projects, said Wills; Chris Ross was able to assemble some information on that issue.

As far as what FPAC decided, yesterday's meeting ended with some questions still outstanding, Wills said; for that reason, FPAC was in agreement not to begin the zero flow operation at this time, until some of these outstanding questions can be answered. He noted that the Nez Perce Tribe and Oregon, in particular, would prefer to wait at least two weeks to begin the zero nighttime flow operation, until adult steelhead numbers fall below a couple of dozen per day at Lower Granite.

Ross said the Corps' Walla Walla District had provided video fish-counting information from Little Goose and Lower Monumental from 2001 and 2002; this information comes from video counts conducted during the months of November, December, January and February at those two projects. Ross noted that, in 2002, fish did not start moving past these two projects to spawn until early March.

The other issue that was brought up at yesterday's FPAC call was the effects of zero flow on redds deposited below the Snake River projects, said Ross; I found one paper that said that short periods of zero flow over the eggs is not detrimental. He added that he had discussed this issue with Russ Kiefer, who had spoken to Idaho hatchery personnel; they indicated much the same thing, said Ross. The other question is the potential impacts of periods of zero flow on the fry once they emerge from the eggs, said Ross.

In response to a question, Bettin said the zero flow period would be confined to the hours of 10 a.m.-6 p.m. He noted that the redds below the Snake River projects would not be dewatered under the zero nighttime flow operation; they are too deep, and the tailwater elevations would fluctuate by only a few tenths of a foot.

The bottom line, however, is that the Nez Perce Tribe, Oregon and Idaho are all opposed to the action agencies' implementing a zero nighttime flow operation at the Snake River projects at this time, said Wills. And is that opposition strong enough that the salmon managers would want to elevate this issue to the IT? Silverberg asked. We didn't discuss that directly, Wills replied. Ross noted that the Corps' criteria – "a few fish" – are clearly not being met currently, with more than 100 adults still passing Lower Granite daily.

Turner noted that the Corps has been unable to find a formal written agreement between the Corps and the fishery agencies on this issue. The group devoted a few minutes of discussion to this issue, notably, about what constitutes "a few" adult migrants at Lower Granite, and who would elevate this issue to the IT, if necessary. Wills noted that, while the salmon managers recognize that the winter zero flow operation is rooted in history, it may not be rooted well. This isn't a new operation, he said, but there is an inclination, on the part of some of the salmon managers, to rethink it somewhat more deeply this year. Wills noted that NOAA Fisheries is not one of those parties; at this point, NOAA is comfortable with allowing the zero nighttime flow operation to proceed. Bettin noted that the Nez Perce are not actually a part of the Regional Forum process therefore, it would be up to Oregon or Idaho to elevate this issue. Hlebechuk added that, in her opinion, this may not be a TMT issue, because it is not a BiOp issue.

Richelle Beck asked what has changed this year, given the fact that the zero flow operation has been implemented at the Lower Snake projects every year since 1987. One participant noted that BPA's request to implement a 24-hour zero flow operation, rather than zero flow only during nighttime hours, was the catalyst. There is also some new information about the upstream movement of adult chinook during the winter that people would like to consider, Ross observed.

Turner said that, from the Corps' perspective, the desired outcome is an operation that meets the needs of fish and provides adequate operational flexibility during the highest-demand period of the year. The discussion we've had since Monday has been extremely good, he said; this is clearly a topic that deserves further consideration. However, it is not clear to us that some limited flexibility to go to a zero-flow operation at the Lower Snake projects during nighttime hours – 10 p.m. to 6 a.m. – would be detrimental to adult migrants in the Snake at this point in the season, Turner said. We will make that operational flexibility available beginning tomorrow night at 10 p.m., said Turner; if someone wants to elevate it, there will be an opportunity to discuss this issue at tomorrow's IT meeting.

Wills reiterated the salmon managers' position, developed at yesterday's FPAC meeting – essentially, that all of the salmon managers were uncomfortable with the concept of daytime zero flow. Various parties also expressed varying degrees of concern about going to a zero nighttime flow operation at the Lower Snake projects at this point, he said, to the extent that it is fair to say that the salmon managers would not recommend implementing this operation at this time. I think it is likely that someone will elevate this issue at tomorrow's IT meeting, Wills said. Ross noted that the effects of this operation on the health of the river may also be a concern. In response to a request, Bettin said BPA is willing to try to limit the zero flow operation to any six hours within the eight-hour window, but said he cannot guarantee that it will be possible to do so.

Ultimately, it was agreed to attempt to frame this issue for tomorrow's IT meeting, although it was still unclear whether or not it will be formally elevated. The issue was framed as follows:

Given current fish conditions and power marketing opportunities, should zero flow operational flexibility be implemented at the four Lower Snake projects now, or at some time in the future?

Silverberg said she will contact Ron Boyce later this afternoon to see whether or not Oregon want to elevate this issue to the IT.

7. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for Wednesday, December 17. Meeting summary prepared by Jeff Kuechle.

TMT ATTENDANCE LIST

December 3, 2003

Name	**Affiliation**
Donna Silverberg	Facilitation Team
Robin Harkless	Facilitation Team
Richelle Beck	D. Rohr & Associates
Cathy Hlebechuk	COE
Chris Ross	NOAA Fisheries
David Benner	FPC
Scott Bettin	BPA
David Wills	USFWS
Russ George	WMCI
Rudd Turner	COE

Ben Zolinski	BPA
John Wellschlager	BPA
Jim Adams	COE
Nic Lane	BPA
Tony Norris	USBR

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR: *Tony Norris / John Roache* **BPA:** *Scott Bettin / John Wellschlager*

NMFS: *Paul Wagner / Chris Ross* **USFWS:** *David Wills / Howard Schaller*

OR: *Ron Boyce* **WA:** **ID:** *Russ Kiefer* **MT:** *Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT MEETING

17 December 2003 0900-1030 hours

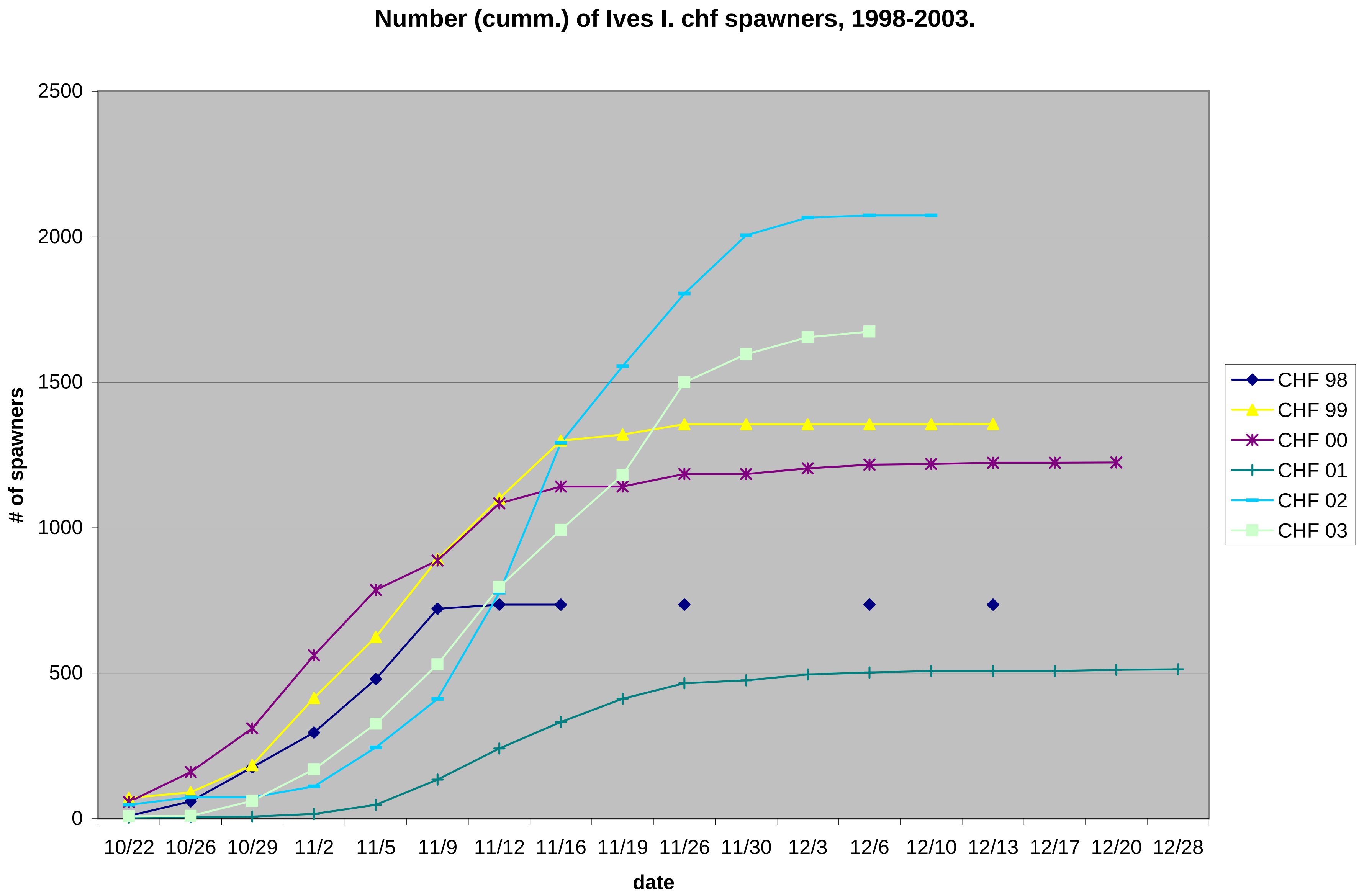
Custom House Room 118
Portland, Oregon
Conference call line: 503-808-5190

All members are encouraged to call Donna Silverberg with any issues or concerns they would like to see addressed. Please e-mail her at dsilverberg@cnnw.net or call her at (503) 248-4703.

AGENDA

1. Welcome and introductions.
2. Chum update-OR
   [Ives Island Spawning Ground Survey Results, 2003]
   [Number (cumm.) of Ives I. chf spawners, 1998-2003.]
   [Chf - data file - 1998-2003]
   [Number (cumm.) of Ives I. chum spawners, 1998-2003]
   [Chum data file - 1998-2003]
3. Other Snake River issues:
   - Spring spill trigger and Dworshak operations into September - BPA
   - Zero Flow in the Snake River
     a. Clarification of Action Agency information
     b. Update on Salmon Managers' review of fishery data
4. Spring Creek Update - USFWS
5. Water Management Plan-Fall/Winter Update - COE
6. Operations Update - ALL [SOR 2003-03]
7. Libby end of December variable draft limit - COE
   - Status of report
8. Other.
   - Set agenda for next meeting

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942



Number (cumm.) of Ives I. chf spawners, 1998-2003.
2500
2000
1500
1000
500
0
# of spawners
10/22
10/26
10/29
11/2
11/5
11/9
11/12
11/16
11/19
11/26
11/30
12/3
12/6
12/10
12/13
12/17
12/20
12/28
date
CHF 98
CHF 99
CHF 00
CHF 01
CHF 02
CHF 03

Lives

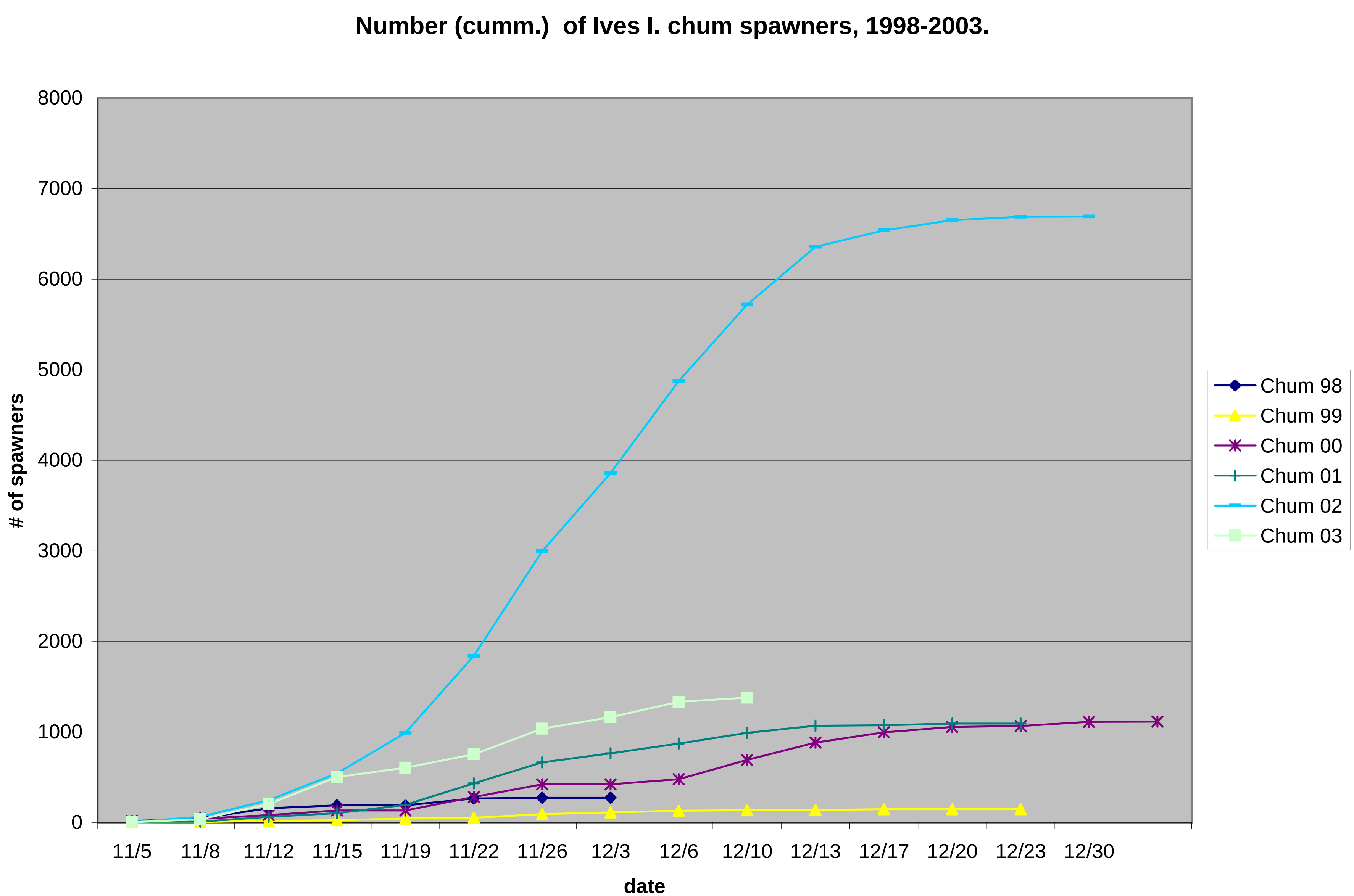
	CHF 98		CHF 99		CHF 00		CHF 01		CHF 02		CHF 03
10/26	9	10/22	71	10/27	57	10/22	3	10/22	47	10/21	8
10/30	59	10/26	90	10/30	160	10/26	5	10/25	73	10/24	9
11/2	176	10/29	184	11/3	310	10/29	7	10/30	73	10/31	61
11/6	296	11/2	414	11/6	561	11/2	16	11/1	110	11/4	169
11/9	479	11/5	624	11/9	786	11/5	47	11/5	244	11/6	326
11/16	721	11/9	892	11/14	887	11/9	134	11/8	411	11/10	530
11/23	735	11/12	1100	11/17	1083	11/12	241	11/12	776	11/14	796
12/10	735	11/16	1299	11/20	1141	11/16	332	11/15	1291	11/18	992
		11/19	1320	11/21	1141	11/19	412	11/19	1555	11/21	1181
12/14	735	11/23	1355	11/27	1184	11/26	465	11/22	1804	11/25	1499
		11/30	1355	11/30	1184	11/30	475	11/26	2005	12/2	1596
		12/3	1355	12/1	1204	12/3	495	12/3	2065	12/5	1654
12/16	735	12/7	1355	12/4	1216	12/6	502	12/6	2073	12/12	1674
		12/10	1355	12/8	1219	12/10	507	12/10	2073		
12/20	735	12/14	1356	12/12	1223	12/13	507				
				12/15	1223	12/17	507				
				12/18	1224	12/20	511				
						12/28	513				

		10/5	18	10/16	5	10/3	1	10/8	10		
		10/8	26	10/20	13	10/8	1	10/11	21		
		10/12	41	10/23	38	10/15	1	10/15	25		
		10/15	55					10/18	31		
		10/19	61								

Redds

	Chf 98		Chf 99		Chf 00		Chf 01		Chf 02		Chf 03
10/16	0	10/15	88	10/16	3	10/16	0	10/18	6	10/16	0
10/26	16	10/19	133	10/20	12	10/22	1	10/22	16	10/31	10
10/30	58	10/22	175	10/23	37	10/26	2	10/25	28	11/4	49
11/2	82	10/26	205	10/27	72	10/29	3	10/30	34	11/6	108
11/6	121	10/29	233	10/30	162	11/2	5	11/1	42	11/10	191
11/9	199	11/2	357	11/3	371	11/5	38	11/5	73	11/14	325
11/16	198	11/5	534	11/6	537	11/9	86	11/8	123		
		11/9	686	11/9	762	11/12	127	11/12	268		
		11/12	800	11/14	790	11/16	169	11/15	482		
		11/16	892	11/17	930	11/19	177	11/19	652		
		11/19	904	11/20	976	11/26	222	11/22	863		
		11/23	929	11/21	976	11/30	228	11/26	1000		
				11/27	1090	12/3	232	12/3	1061		
						12/6	234	12/6	1098		
						12/10	237				

		10/5	9
		10/8	18
		10/12	57


Number (cumm.) of Ives I. chum spawners, 1998-2003.
8000
7000
6000
5000
4000
3000
2000
1000
0
# of spawners
11/5
11/8
11/12
11/15
11/19
11/22
11/26
12/3
12/6
12/10
12/13
12/17
12/20
12/23
12/30
date
Chum 98
Chum 99
Chum 00
Chum 01
Chum 02
Chum 03

Lives

	Chum 98		Chum 99		Chum 00		Chum 01		Chum 02		Chum 03
11/6	13	11/2	3	11/6	18	11/5	10	11/5	5	11/4	6
11/9	48	11/5	7	11/8	42	11/9	11	11/8	65	11/6	39
11/16	158	11/9	19	11/9	84	11/12	65	11/12	248	11/10	205
11/23	191	11/12	26	11/13	136	11/16	104	11/15	544	11/14	503
11/30	191	11/16	46	11/14	136	11/19	196	11/19	993	11/18	607
12/7	266	11/19	55	11/17	283	11/26	435	11/22	1,840	11/21	756
12/14	274	11/23	95	11/20	423	11/30	665	11/26	2,997	11/25	1037
12/27	274	11/30	113	11/21	423	12/3	766	12/3	3,860	12/2	1164
		12/3	131	11/27	479	12/6	873	12/6	4,875	12/5	1335
		12/7	137	12/1	694	12/10	991	12/10	5,719	12/12	1381
		12/10	140	12/4	883	12/13	1071	12/13	6,358		
		12/14	147	12/8	996	12/17	1075	12/17	6,540		
		12/17	147	12/12	1057	12/20	1093	12/20	6,653		
		12/27	147	12/15	1067	12/27	1093	12/23	6,690		
				12/18	1114			12/30	6,694		
				12/27	1115						
12/10	97%	12/10	95	12/10	86	12/10	91	12/10	85		+200

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM
December 17, 2003

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg

The following notes are a summary of issues that are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Chum Update:
Ron Boyce, Oregon, reported that the cumulative observed live chum this year at Ives Island reflected 25% of the totals observed last year. Currently, live chum and chinook are on the decline. The cumulative total population estimate will be made available at a later date. The Bonneville operation as of Friday Dec. 12th was a tailwater elevation range of 11.6-11.9', and yesterday (Dec. 16th) went to an 11.8-12.1' range. Dave Wills, USFWS, reported that no objection to this operation was raised by participants that attended yesterday's FPAC meeting. The COE raised concerns about maintaining incubation flows through April and meeting Grand Coulee demands in the spring. The COE's concern was noted and the TMT will monitor operations over the next two weeks.

Snake River Issues:
Zero Flow in Snake River: Cathy Hlebechuk, COE, shared percentages of how often zero flow was used in 2000, 2001 and 2002, using a 24-hour period and 6-hour period. It was noted that, since Dec. 4th of this year, zero flow has been used as much as possible within the agreed to 6-hour period. Scott Bettin, BPA, said that this is a useful tool for cost-effective operations. During yesterday's FPAC discussion, concerns were raised that the implementation of zero flow thus far does not represent 'limited use' as a criteria agreed to at the last TMT meeting and part of the Water Control Manual. Also, questions remain for the salmon managers about the "few if any" language in the agreement. It would be useful for the COE, salmon managers and others to look at the agreement and clarify these issues. There is still uncertainty about the impacts to juveniles downstream and adult steelhead migrating upstream. FPAC continues to sift through the available data. No conclusions have yet been made. Greg Haller, Nez Perce, noted that a delay to adult steelhead passage could have an economic impact on the region and asked that the operation not continue until the group is confident that only 'few if any' fish are passing.

ACTION: Rudd Turner, COE, will inquire about what data is available relative to adult passage numbers, when the information from this year will be available, and what the possibilities are of extending the video monitoring beyond Dec. 15th. Rudd will send this information out to TMT members via email in the next day or two.

Spring Creek Update:
Dave Wills, USFWS, reported that discussions between the COE, NOAA and USFWS are moving forward on Spring Creek operations for March 2004. Any decisions will be shared with TMT as they are made.

Water Management Plan Fall/Winter Update:
Scott Boyd reported that no additional comments have been made on the fall/winter update. Comments are always welcome, and the goal is to finalize the plan as soon as possible.

Operations Update:
SOR 2003-3, a Libby operation request put forth by the salmon managers, is being implemented. Libby is ramping down, from the current 15 kcfs to 10 kcfs at midnight on Friday, Dec. 19th, in order to draft Libby to 2411' by the end of December. The SOR requests steady flows through Jan. 30th, recognizing flood control constraints. Albeni Falls is at 2051-2051.5' and releasing 15 kcfs. Dworshak is at 1517.6' and releasing minimum flows. Libby is currently at elevation 2417.6', Grand Coulee is at 1286', and Hungry Horse is at 3527.8'.

Libby End of December Variable Draft Limit:
Cathy Hlebechuk reported that the COE completed a model analysis of the possibility of a variable draft limit at Libby, which is in final draft and available to anyone interested. The COE did not implement the variable limit because of the high December forecast (111% vs. the 85% acceptable forecast).

Next Meeting, January 7th, 9-noon:
Agenda Items:

- Chum Update
- Snake River Issues (Zero Flow, Spring Spill Trigger)
- Spring Creek Update
- WMP Fall/Winter Review
- Operations Update
- Early Bird Water Forecast - RFC

COLUMBIA RIVER REGIONAL FORUM

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- Operations Update
- Early Bird Water Forecast – RFC

1. Greeting and Introductions

The December 17 Technical Management Team meeting was chaired by Cathy Hlebechuk of the Corps and facilitated by Donna Silverberg. The following is a distillation, not a verbatim transcript, of items discussed at the meeting and actions taken. Anyone with questions or comments about these minutes should call Cindy Henriksen at 503/808-3945.

2. Chum Update.

Ron Boyce provided information from the most recent chum spawning surveys, noting that live chum and chinook counts on the lower river spawning grounds have peaked, and have now begun to decline. Flows have come up due to the heavy precipitation over the weekend, he said, and fewer chum are now being seen. Boyce noted that, overall, field crews have counted about 1,500 live chum on the Ives Island spawning grounds to date in 2003, down from more than 6,000 by this date in 2002. Scott Bettin noted that Boyce is referring only to chum in the Ives Island area; these numbers do not include returns to Hamilton Springs, Multnomah Creek and other areas. Do you have a 2003 chum population estimate for the entire lower river? Bettin asked. Not yet, Boyce replied. And the plan is to continue to do the spawning ground surveys through the end of December? Bettin asked. Correct, Boyce replied. We should talk about ending the chum operation at today's meeting, said Bettin; the planning date in the BiOp is December 31.

Hlebechuk noted that, on Friday, the Corps sent out a teletype instructing project personnel to raise the Bonneville tailwater elevation to a range of 11.6-11.9 feet; yesterday, with recent rain events pushing Willamette flows pat 90 Kcfs and Lower Columbia flows at Bonneville past 250 Kcfs at times, another teletype went out increasing the tailwater range further, to11.8-12.1 feet. This teletype goes into effect at 11 a.m. this morning, she added. So 11.8 feet will be the minimum tailwater elevation during the incubation period as well? Boyce asked. That's correct, Bettin replied. While there some salmon mangers expressed concern about spawning at high elevations when the tailwater range is this high, no strong FPAC objections were raised to this operation. We'll monitor the situation, said Boyce, although with the number of live spawners on the decline, we don't anticipate a major problem.

With respect to incubation flows, said Hlebechuk, if the spawning flow averaged 135 Kcfs, my understanding is that the incubation flow would need to be at least 125 Kcfs. A tailwater elevation of 11.8 feet at Bonneville should provide the level of protection needed during the incubation phase, Paul Wagner replied, but we'll verify that through field surveys.

The Corps does have some concerns about our ability to fill Grand Coulee and other storage projects and to maintain that level of flow for lower river chum, Hlebechuk said – is it fair to say that Grand Coulee refill by April 10 should be a higher operational priority than maintaining flows for chum incubation, if the two come into conflict? she asked. It is for some, Boyce replied. That is generally an accurate statement, added Wagner; every year, however, it is a judgement call. We'll look at the data, said Boyce – there may not be any spawners above the 11.5-foot level which is where the better springs are. How about if we agree to maintain the 11.8-12.1-foot elevation range at least through the TMT's January 7 meeting, Bettin said. We will also assume that the chum spawning protection operation will end on December 31, he added. The 11.8-foot minimum elevation will remain in place, however? Boyce asked. That's correct, Bettin replied.

3. Other Snake River Issues.

Bettin said the spring spill trigger issue will be discussed at the January TMT meeting. With respect to the zero nighttime flow issue for the Lower Snake projects, said Silverberg, there were a few loose ends to be tied up. As agreed at the last TMT meeting, Hlebechuk reported on the percentage of the available hours the Snake projects have gone to zero flow in the last three years. We ran two separate analyses, she said; the first assumed that 24 hours a day was available to go to zero flow. In 2000/2001, the percentage this operation was implemented was 3%, in 2001/2002, 4.8%, 2002/2003, 12.5%. Under the second assumption, only six hours a day are available for the operation, and the percentages go up proportionally, she said: 2000/2001, 12%, 2001/2002, 19%, 2002/2003, 50% of the available hours during the period December 1-February 28.

Do you have the numbers for this year? Boyce asked. Starting on the evening of December 4, we've implemented zero nighttime flow in nearly 100% of the six available nightly hours, Bettin replied – we've been trying to use it every night, because it's been very helpful, from an economic standpoint. There have been a few nights when we've only gone to zero flow during five of the available six hours, Scott Boyd said.

At yesterday's FPAC meeting, there were concerns raised about the language of the agreement covering this operation, particularly the concept of "limited use" of this operational strategy, as well as the concept of "few if any" adult steelhead arriving at Lower Granite, said David Wills. There was some wording in the original agreement that it would be helpful to get some clarification on, he said; in our opinion, a meeting between NOAA Fisheries, the Fish and Wildlife Service, the other salmon managers and the action agencies might be a good idea. We think it makes sense to try to update that agreement, Wills said.

It should be noted that we are not implementing that agreement as written, Bettin said -- we're limiting the numbers of hours per day the agreement originally specified.

The primary biological concern, for the salmon managers, is the effects of this operation on the adult steelhead currently migrating upstream? John Wellschlager asked. Correct, Wills replied – there are some new numbers available from the video counts at Little Goose, for example, which we're in the process of analyzing. Generally speaking, however, the number of adult steelhead passing the project drops of during nighttime hours, Wills said.

Greg Haller said the Nez Perce Tribe remains concerned about the biological effects of this operation, particularly with respect to delayed adult passage and its effects on fall chinook juveniles rearing in the Lower Snake reservoirs. Haller noted that the last information he has seen said more than 100 adult steelhead per day are still passing Lower Granite; there could be economic impact due to the impacts on the winter steelhead fishery in the Clearwater River. Haller asked for the Corps' interpretation of the "few if any" adult migrants criteria specified in the original agreement. We have not been able to find that agreement, Hlebechuk replied; until it is found, it's difficult to offer an interpretation of the specific language in the agreement.

Does zero flow affect fish health, or just timing? Bettin asked. I don't know the answer to that question, Haller replied – opinions vary about what the studies actually say on that question. Boyce said that, in his opinion, shutting off flow in the system seems unnatural, even if it's only a few hours of the day. I think we need to make sure we're not causing a detrimental biological impact through this operation, Boyce said.

Are you suggesting that a separate TMT meeting is needed on this issue? Silverberg asked. Let's put it on the agenda for the January 7 TMT meeting, Wills replied. The tribes would prefer that the zero flow operation be stopped until this issue can be resolved, Haller said. Doesn't the 1987 agreement specify that the salmon managers must agree with this operation? Russ Kiefer asked. We cannot find that agreement, Bettin replied; this seems an arbitrary point in time to revisit an operation we've implemented every year since 1987.

We operate per the water control manual, Hlebechuk said. If the salmon managers want to elevate this issue to the IT, they are welcome to do so, Silverberg said – we can convene an IT meeting tomorrow, if folks feel strongly enough. The IT did discuss this issue at its December meeting, Silverberg said; their recommendation was that TMT work through the available data as soon as possible with the goal of reaching technical agreement on this operation. Basically, the salmon managers are still looking at the data, said Wills; once we've completed that process, we need to have some further discussion on this issue. In response to a question from Kiefer, Hlebechuk said the relevant section of the water control manual specifies that

> Minimum project discharge limits ensure the safe passage of anadromous fish during their migration to the spawning grounds. From December through February, “zero” minimum project discharge is permitted on a limited basis. Under an agreement between the Corps of Engineers and the fishery agencies zero river flow is allowed for water storgae during low power demand periods (at night and on weekends) when there are few if any actively migrating anadromous fish present in the Snake River.

Kiefer said that his understanding was that one of the criteria under which this operation can be implemented include salmon manager agreement; you do not have that agreement, he said. Bettin replied that the issue has been worked through the Regional Forum process, and the salmon managers had declined to elevate it for IT decision. Hlebechuk noted that the language in the water control manual does not refer to salmon manager concurrence.

The discussion continued in this vein for some minutes. Ultimately, Wills noted that there is unanimous agreement, among the salmon managers, that the most recent dam counts for adult steelhead, 100+ per day at Lower Granite, exceed the "few if any" criteria. He reiterated the additional salmon managers' concern that the operation is being implemented all of the time, rather than during a limited amount of the time. We are willing to discuss this issue further, once the salmon managers come to agreement on what the technical information means and what the criteria should be, Bettin said. Haller noted that it should be the Corps' responsibility both to find the 1987 agreement and to provide additional data, for example, fish counts from the Lower Snake projects. In the meantime, though, we're concerned that this operation is ongoing, said Kiefer – we feel it should be stopped while this issue is resolved.

Ultimately, Hlebechuk said that, in the Corps' opinion, the agency is within its legal authority to operate as it currently is doing. Kiefer said he stands corrected; the relevant water control manual language does not refer to salmon manager concurrence with this operation. Turner said he is in the process of checking on the availability of the adult steelhead video count data from the Lower Snake projects – we can at least make the tapes available for fisheries agency review, he said. We will discuss the criteria the salmon managers feel is appropriate, Hlebechuk said, once the salmon managers are ready to do so. And in the meantime? Haller asked. The current operation will continue, Bettin replied. And I can raise this issue to IT any time? Haller asked. Correct, Silverberg replied.

And does BPA intend to exercise this flexibility 100% of the time? Boyce asked. We do intend to implement it 100% of the 25% of the time we are allowed to use the zero flow operation, Bettin replied – we have agreed to limit that operation to no more than six of the 24 hours in the day. In response to another question, Bettin said this operation is worth approximately $25,000 per day in increased power revenues. He added that this operation only makes economic sense at flows of up to 60 Kcfs in the Snake River.

We will look for an email from Rudd regarding the availability of the video count data, said Silverberg, and will then see where the other TMT members want to go with this issue. Until that is decided, the action agencies will continue with the current operation.

4. Spring Creek Update.

Wills reported that the discussions on this issue are moving forward, but there is nothing substantive to report at this time.

5. Water Management Plan.

Scott Boyd said he has received no additional comments on the fall/winter update to the 2004 WMP; if anyone would like to comment, on the zero flow in the Lower Snake operation or any other issue, they are welcome to do so, he said. We'll look at it and get back to you by January 7, Boyce replied.

6. Operations Update.

Bettin said SOR 2003-03, regarding burbot operations, is being implemented, and Libby outflow is being ramped down from its current rate of 15 Kcfs to reach 10 Kcfs by midnight this Friday, December 19. The intent is to draft the project to elevation 2411 by December 31. We will try to hold flows as steady as possible through the end of December, Hlebechuk said; however, the December final forecast for Libby is 111% of average, so we will likely have to increase outflow at some point. The current Libby elevation is 2417.6 feet.

Hlebechuk said Albeni Falls is releasing 15 Kcfs, with current elevation in the 2051.5-2050.5 range. Dworshak is at elevation 1517.6 feet, currently, far below its December 31 flood control elevation of 1558 feet, and continues to release minimum project discharge. The current Grand Coulee elevation is 1286 feet; at Hungry Horse, 3527.8, said Tony Norris.

7. Libby End-of December Variable Draft Limit.

Hlebechuk said the Corps has completed model analysis and the report; if conditions were appropriate, she said, we would have implemented the operations recommended in the study and would have targeted drafting Libby to higher than 2411 by December 31. The forecast would have needed to be 85% of normal or less to implement the variable draft limit, she said.

8. Next TMT Meeting Date.

The next meeting of the Technical Management Team was set for January 7.

TMT PARTICIPANT LIST
December 17, 2003

Name	**Affiliation**
Donna Silverberg	Facilitation Team
Ron Boyce	ODFW
Shane Scott	PPC
Kyla Martin	CRITFC
David Wills	USFWS

John Wellschlager	BPA
Scott Bettin	BPA
Tom Haymaker	PNGC
Cindy Henriksen	COE
Bruce McKay	Consultant
Jim Adams	COE
Paul Wagner	NOAA Fisheries
Robin Harkless	Facilitation Team
Mary Karen Scullion	COE
Nic Lane	BPA
Mike O'Bryant	CBB
Randy Wartman	COE
Lee Corum	PNUCC
Dan Bedbury	EWEB
Martin Hatscher	SCL
Todd Perry	Constellation Power Source
Tom Le	PSE
Greg Haller	NPT
Richele Beck	D. Rohr & Associates
Steve Hayseker	USFWS
Russ Kiefer	IDFG
Russ George	WMCI

Ives Island Spawning Ground Survey Results, 2003.

12/12/2003 Update

ODFW 12/15/03

Date	Redds: Fall Chinook	Redds: Chum	Redds: Coho	Lives: Fall Chinook	Lives: Chum	Lives: Coho	Deads: Fall Chinook	Deads: Chum	Deads: Coho	
10/6/2003	0	0	0	3	0	0	0	0	1	
10/14/2003	0	0	0	0	0	9	2	0	3	
10/21/2003	2	0	0	8	0	8	1	0	7	
10/24/2003	0	0	0	1	0	5	0	0	5	
10/31/2003	10	0	0	52	0	9	2	0	1	
11/4/2003	39	1	8	108	6	8	17	0	3	
11/6/2003	59	4	10	157	33	28	6	0	7	
11/10/2003	83	41	0	204	166	17	60	2	0	
11/14/2003	134	114	0	266	298	12	59	2	0	
11/18/2003	133	62	0	196	104	2	na	13	47	
11/21/2003	175	169	0	189	149	0	50	37	7	
11/25/2003	190	164	0	318	281	0	188	63	0	
12/2/2003	130	216	0	97	127	0	215	93	13	
12/5/2003	93	262	0	58	171	0	67	98	0	deads sampled 12/9
12/12/2003	40	187	0	20	46	0	8	46	0	

Details:

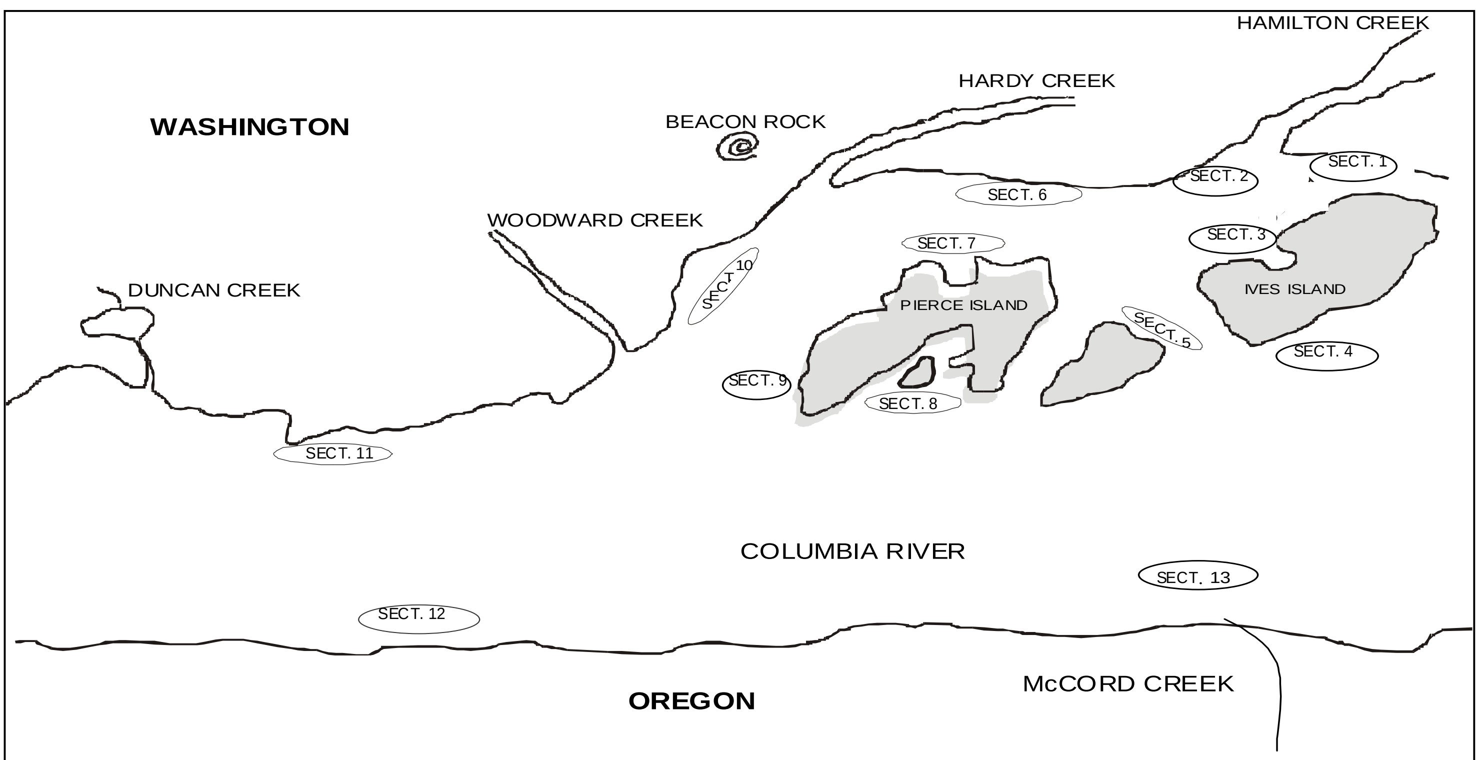
Locations of fish & redds on 12/12: Tailwater at 12:00pm. : 11.7'.

		Live	Dead	Redds
Section 1:	CHF	2	na	5
	Chum	7	"	25
Section 2:	CHF	9	"	15
	Chum	16	"	89
Section 3 :	CHF	0	2	0
	Chum	1	10	10
Section 5 :	CHF	3	3	7
	Chum	10	4	17
Section 8 :	CHF	6	1	3
	Chum	0	0	0

		Live	Dead	Redds
Section 11:	CHF	0	2	0
	Chum	11	20	32
Section 13:	CHF	0	0	0
	Chum	1	2	14

Below index area chum

	Live	Dead	Redds
Multn. Falls (OR)	33	15	69
St. Cloud (WA)	7	3	16
Horsetail Falls (OR)	3	10	8



Ives Island adult sampling areas, 2003.

T E C H N I C A L   M A N A G E M E N T   T E A M

BOR:	*Tony Norris / John Roache*			**BPA:**	*Scott Bettin / John Wellschlager*		
NMFS:	*Paul Wagner / Chris Ross*			**USFWS:**	*David Wills / Howard Schaller*		
OR:	*Ron Boyce*	**WA:**		**ID:**	*Russ Kiefer*	**MT:**	*Jim Litchfield*

COE: *Cindy Henriksen / Rudd Turner / Cathy Hlebechuk*

TMT MEETING

18 December 2003　　1100-1200 hours

Conference call line:

AGENDA

The call was requested by Paul Wagner, NOAA Fisheries and Scott Bettin, BPA. There is a lot of river in the lower river right now. Paul and Scott want to talk about how to shape the release of the water from Bonneville Dam.

Questions about the meeting may be referred to Cindy Henriksen at (503) 808-3945, or Rudd Turner at (503) 808-3935, or Cathy Hlebechuk at (503) 808-3942

COLUMBIA RIVER REGIONAL FORUM

Technical Management Team
Conference Call
December 18, 2003
Facilitator: Donna Silverberg

The following is a summary of the process discussion between members of the Technical Management Team on 12/18/03. The notes are not intended to be a verbatim account of the meeting nor do they serve as the official "record". They are intended to highlight discussion points, decisions, and actions.

Bonneville Tailwater Operations:

BPA and NOAA requested a call today to discuss releases of high water levels at Bonneville. There is a 7' tailwater change constraint that BPA would like to stay within, otherwise the agency is required to obtain an exceedance from the COE. Because of the high flows in the river, the tailwater elevation at Bonneville has increased at night at the project.

TMT discussed how to operate the system in light of the high water levels. A question was raised whether a flatter 24-hour flow would be possible. Dave Wills, USFWS, explained that at the end of the chum spawning season such an operation could help reduce superimposition of redds, thereby aiding the existing redds. A flatter flow maintained over 24 hours would be preferred and, if new redds were deposited at higher elevations, the numbers would be so small that dewatering at a later date could be contemplated.

Paul Wagner, NOAA, explained that the chum BiOp states that any redds deposited at higher levels must be maintained (watered) throughout the season. As such, he suggested an alternate operation that would reduce the likelihood of deposits at high elevation and attempt to support some spawning between 7 am and 2 pm. NOAA suggested an operation that would increase flows later in the day and into the night when the likelihood of spawning is less, then work toward the 11.8-12.1' range by 7 am. CRITFC expressed interest in flatter/smoother flows and agreed with the NOAA proposal. BPA requested the flexibility to do this through the end of December, in order to avoid the need for another conference call during the holiday season. The COE did not foresee a need for this operation, after the next two days, until after December 29th. The COE felt that the operation should occur over the next two days, then if necessary, hold a conference call to discuss implementing the emergency operation again. The USFWS expressed concern with high differentials in nighttime flow, but did not have an objection to giving the action agencies flexibility through December. NOAA did not object to granting the action agencies the flexibility through December and acknowledged the concern raised by the USFWS. CRITFC also did not object to the operation or flexibility issue. In light of this, a compromise operation was suggested and agreed to by the group.

ACTION:

The following emergency operation to reduce water levels and stay within the chum BiOp constraints was not objected to by the TMT: BON will be operated to allow 15' tailwater beginning at 2 pm (1400) below the project to reduce pools higher in the system. This elevation and increase in flows is expected to discourage chum spawning in higher elevations that likely could not be supported by flows later in the season. At 0700 the project will bring flows back to the 12' range (with lesser flows) to support chum spawning while staying within the 7' tailwater range requirement. (note: USFWS expressed concern that the shortened timeframe may NOT support any chum spawning at all and preferred a flatter flow, but was willing to defer the decision to NOAA).

This agreement/operation is expected to occur for the next two days only. However, if there is an unexpected weather event and the water level rises to a day average of above 170 ~~160~~ kcfs (COE to confirm this number) before 12/31, the action agencies may use this tool again without calling a TMT meeting. If the COE has a high level of concern over such action, they may call for another emergency TMT meeting.

Editor's note: On 12/19, COE analysis determined threshold should be set at day average of above 170 kcfs. Cindy henriksen called John Wellschlager and told him of the change.