



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: Rob Lothrop, CRITFC

FROM: Michele DeHart, FPC

DATE: November 30, 2012

RE: Odessa Subarea Special Study, Final Environmental Impact Statement

In response to your request the Fish Passage Center (FPC) reviewed the final EIS for the Odessa Subarea special study. The US Department of Interior, Bureau of Reclamation and the Washington Department of Ecology are proposing additional water withdrawals from the Columbia River. These proposals include options for water withdrawal from the Columbia River during the spring and during the fall. The FPC reviewed the draft EIS and developed comments. Those comments are dated January 13, 2011 and are posted on the FPC website. The final EIS and US Bureau of Reclamation final EIS alternatives do not adequately address our comments on the draft EIS. Those comments are attached. We offer the following comments for your consideration. Our primary conclusions are listed below followed by discussion of each point.

- **The Columbia Basin Ecosystem is a single hydrological unit. The EIS does not consider Columbia River ecosystem impacts of additional water withdrawals and therefore understates potential impact of additional water withdrawals as proposed on salmon and steelhead. This is inconsistent with an adaptive management approach. The document does not address a fundamental component of all environmental assessments; that events in one place can re-emerge as impacts at distant places (Holling 1978).**
- **Several other additional proposals for water withdrawals from the Columbia River in the spring and fall from various locations are being considered in the region at the same time in addition to the Odessa proposal. Although these are proposed by different state agencies the Federal management action agency, the US Department**

of Interior is an action agency in each proposal. The combined ecosystem impact of all these additional proposals for water withdrawal is not considered. Therefore the potential combined impacts of these proposals on salmon and steelhead survival and recovery are not addressed.

- The EIS includes alternatives to withdraw water from the Columbia River in fall and winter months, but does not recognize that fall Chinook juveniles continue to migrate through the lower Columbia River throughout October. In addition fall Chinook juveniles overwinter in estuary habitat throughout the fall and winter months.
- The EIS includes proposals to withdraw water from the Columbia River when flows are above 135 kcfs, the target flow below which NOAA Fisheries has determined that significant impact to salmon survival occurs. However, the EIS does not include recent data and analyses that show that juvenile salmon and steelhead survival continues to increase with flows increasing above 135 kcfs through the upper Columbia River. The EIS does not address recent data and analyses indicating that water travel time, i.e. flow and spill are important variables impacting smolt to adult return rates for steelhead and Chinook salmon.
- Water withdrawals in fall and winter months can impact river operations, flows and fish passage conditions in other parts of the year such as meeting spring reservoir elevations and chum salmon spawning and rearing flows requirements.

## Discussion

**The Columbia Basin Ecosystem is a single hydrological unit. The EIS does not consider Columbia River ecosystem impacts of additional water withdrawals and therefore understates potential impact of additional water withdrawals as proposed on salmon and steelhead resources. This is inconsistent with an adaptive management approach. The document does not address a fundamental component of all environmental assessments; that events in one place can re-emerge as impacts at distant places (Holling 1978).**

The development of the Columbia River basin has had serious impacts on salmon and steelhead populations. The cumulative impacts of development for irrigation and other purposes have resulted in the Endangered Species Act listing of most of the remaining populations of Columbia Basin salmon and steelhead. The Odessa EIS considers an individual proposal for additional water withdrawal from the Columbia River. The effects of additional small diversions accumulate however, and will eventually have serious consequences for salmon, especially when interacting with such variables as climate, ocean conditions, and human population growth (National Academy of Sciences 2004).

The Northwest Power and Conservation Council Independent Scientific Advisory Board (ISAB) summarized changes in Columbia River Estuary habitat that resulted from development of the Columbia River for power, irrigation and flood control throughout the river basin. Changes in flow have affected estuary habitat. (ISAB 2000). In recent comments on the Comparative Survival Study reports the ISAB has raised overall concerns regarding scientific evidence of survival bottlenecks in the Columbia River estuary (ISAB 2012). The understanding of salmon life cycle survivals at various stages has increased significantly since the completion of the

present NOAA Fisheries Biological Opinion. It is clear that flow effects fish travel time and survival is an important variable affecting survival later in the life cycle such as estuary and first year ocean survival. (Haseker et al. 2012; Petrosky et al 2010).

Columbia River operations in the fall and winter affect resulting conditions in the spring and summer. Even without the EIS additional proposed water withdrawals in the spring, fall and winter, the NOAA Biological Opinion spring reservoir elevations for ESA listed salmon and steelhead are not always met. Winter and fall operations can preclude reaching the April 10; reservoir elevations established by NOAA Fisheries Biological Opinion for Grand Coulee, Libby and Hungry Horse reservoirs, for juvenile spring migration. Additional water withdrawals in fall and winter months could impact operations in other parts of the year.

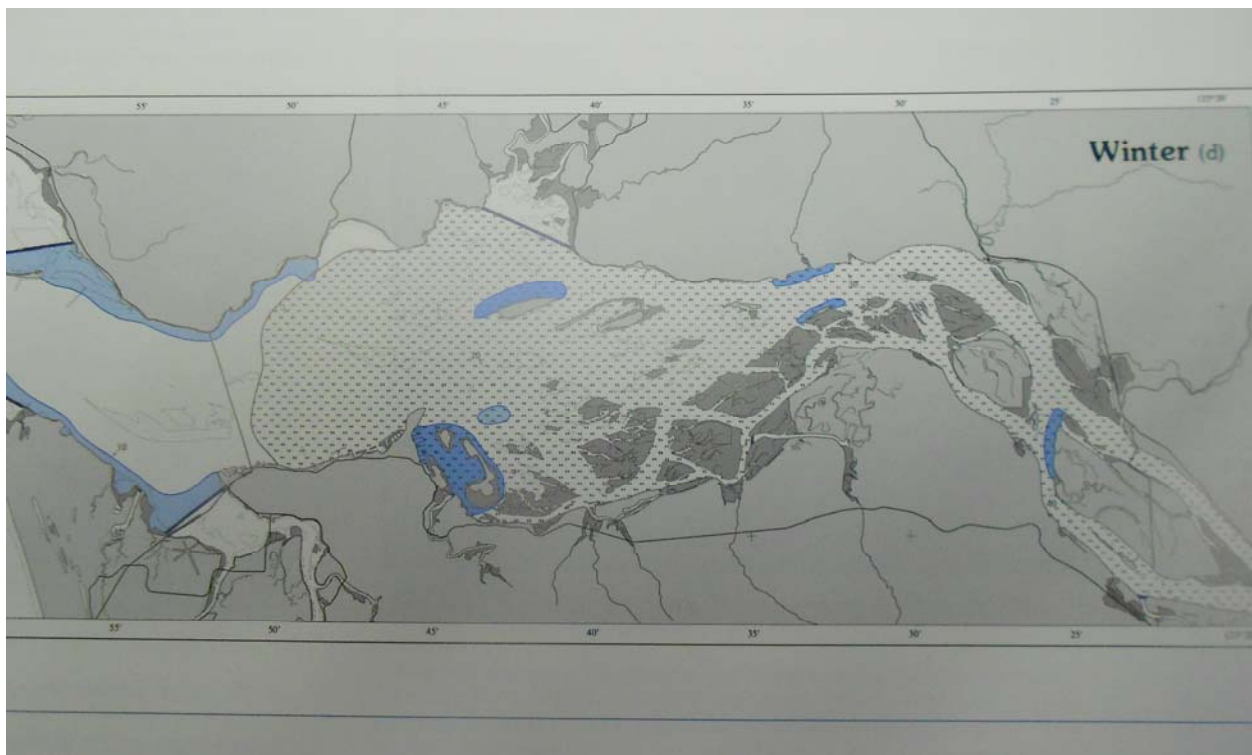
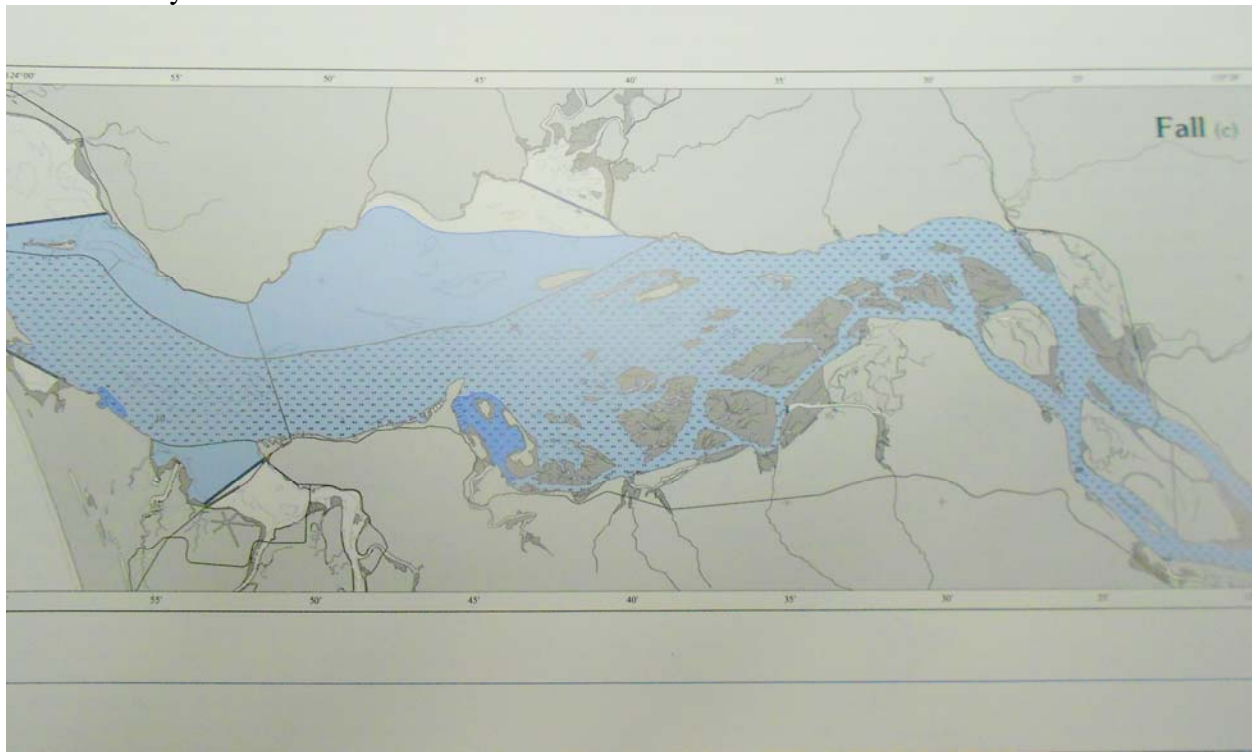
**Several other additional proposals for water withdrawals from the Columbia River in the spring and fall from various locations are being considered in the region at the same time, in addition to the Odessa proposal. Although these are proposed by different state agencies the Federal management action agency, the US Department of Interior is an action agency in each proposal. The combined ecosystem impact of all these additional proposals for water withdrawal is not considered. Therefore the potential combined impacts of these proposals on salmon and steelhead survival and recovery are not addressed.**

Other proposals are being developed in other processes for additional withdrawal of Columbia River water in the spring and fall. For example the Oregon Solutions Task Force is considering additional similar water withdrawals for irrigation from the McNary/Umatilla reach of the Columbia downstream of the Odessa area proposal. The cumulative effects of these individual withdrawals on the Columbia River ecosystem and the estuary are not being considered because water withdrawal permits are issued by individual states.

**The EIS includes alternatives to withdraw water from the Columbia River in fall and winter months, but does not recognize that fall Chinook juveniles continue to migrate through the lower Columbia River throughout October. In addition fall Chinook juveniles overwinter in estuary habitat throughout the fall and winter months.**

Fish Passage Center (FPC) Annual Reports of the Smolt Monitoring Program show that fall Chinook salmon juveniles are passing Bonneville Dam through the end of sampling at the end of October, similarly fall Chinook juveniles are passing McNary Dam through the end of sampling at the end of September. The FPC summarized fall Chinook migration timing in a memorandum dated February 10, 2012 (attached). The summary highlights characteristics of the fall Chinook outmigration; wild fall Chinook have a protracted outmigration, the summer minimum flow targets are rarely met, further protracting the fall Chinook migration period in the lower Columbia, fall Chinook are present in the lower Columbia River throughout October, juvenile fall Chinook migrating through the McNary to Bonneville Reach from August through December contribute to adult returns.

The Columbia River Estuary Data Development Program documented juvenile fall Chinook rearing in the Columbia River Estuary in the Fall and winter months.(CREDDP 1984) The following images show ( in cross hatch), the occurrence of juvenile fall Chinook in the Columbia River estuary in the fall and winter months.



**The EIS includes proposals to withdraw water from the Columbia River when flows are above 135 kcfs in the upper Columbia, the target flow below which NOAA Fisheries has determined that significant impact to salmon survival occurs. However, the EIS does not include recent data and analyses that show that juvenile salmon and steelhead survival continues to increase with flows increasing above 135 kcfs through the upper Columbia River. The EIS does not address recent data and analyses indicating that water travel time, i.e. flow and spill are important variables affecting smolt to adult return rates for steelhead and Chinook salmon.**

The Odessa proposal and other proposals for additional water withdrawals from Columbia River mistakenly utilize the minimum target flows discussed in the NOAA Biological Opinions as the maximum required for fish survival and recovery. The target flows are minimums below which significant negative impact to survival of salmon and steelhead occur. NOAA has not stated that the minimum target flows will result in recovery of listed salmon and steelhead. More recent data and analyses have shown that increased flow, above the Biological Opinion minimum targets, during the juvenile outmigration results in increased juvenile survival and increased adult return rates (Haeseker et al 2012; Tuomikoski et al. 2012, 2011, 2010 CSS reports).

The Biological Opinion flow target is a floor not a maximum and is discussed in terms of a seasonal target, which obscures significant impacts to anadromous fish by not recognizing long periods of low flow which affect fish travel time and survival.

**Water withdrawals in fall and winter months can impact river operations, flows and fish passage conditions in other parts of the year such as meeting spring reservoir elevations and chum salmon spawning and rearing flows requirements.**

The EIS does not address potential impacts of water withdrawals on other parts of the year. Nor does it address potential impacts of water withdrawals on other parts of the river. Listed chum salmon spawn below Bonneville Dam and require spawning and rearing flows in November and December and rearing flows in late winter and early spring. River operations in the fall and winter can affect the spring storage reservoir elevations. Hanford Reach spawning flows could be impacted by additional fall and winter water withdrawals. Water withdrawals in the fall could reduce flows for chum salmon spawning below Bonneville. Additional water withdrawals to refill Banks Lake could affect Grand Coulee spring reservoir elevations. It is important to note that at the present time, absent the proposed new water withdrawals for irrigation, that there are many years when the Biological Opinion, spring reservoir elevation targets for salmon and steelhead are not met at Columbia River storage reservoirs, specifically, Grand Coulee, Libby and Hungry Horse. Additional water withdrawals for irrigation could potentially exacerbate difficulties in meeting salmon and steelhead mitigation measures and limit flexibility to improve those measures.

## References

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Tuomikoski, J., J. McCann, T. Berggren, H. Schaller, P. Wilson, S. Haeseker, J. Fryer, C. Petrosky, E. Tinus, T. Dalton, and R. Ehlke. 2010. Comparative Survival Study (CSS) of PIT-Tagged Spring/Summer Chinook and Summer Steelhead 2010 Annual Report. Prepared by Comparative Survival Study Oversight Committee and Fish Passage Center, project leader Michele DeHart. 338 pp. BPA Contract #19960200.



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### MEMORANDUM

TO: Bob Heinith

FROM: Michele DeHart

DATE: January 13, 2011

RE: Draft Environmental Impact Statement, Odessa Subarea Special Study

In response to your request we have reviewed the Draft Environmental Impact Statement (EIS) for the Odessa Subarea Special Study. We hope that these comments are helpful to you in the development of your response to the Draft EIS. Our primary conclusions are listed below, followed by a more detailed discussion.

- The Draft EIS does not adequately address the importance of migration flow level on juvenile salmonid survival and adult salmon return.
- The Draft EIS alternatives include water withdrawals during which juvenile fish are migrating.
- By using monthly flow data the action alternatives could result in long periods of low flows, by not accounting for flow shaping or load following.



The Draft EIS considers the feasibility, acceptability, and environmental consequence of alternatives to replace groundwater currently used for irrigation on approximately 102,600 acres of land in the Odessa Ground Water Management Subarea with Columbia Basin Project surface water. A No Action Alternative, four partial-replacement alternatives, and four full replacement alternatives are evaluated. The Draft EIS incorporates the Columbia River flow objectives from the 2008 FCRPS Biological Opinion (BIOP) as constraints to the development of the action alternatives and implementation of alternatives occur when flows exceed the Biological Opinion average flows.

We have concerns regarding the approach taken in the Draft EIS regarding the impact of reductions of flows when the flow exceeds the BIOP flow objective. This approach assumes that there is no impact to fish survival at flows above the Biological Opinion flow objective and that the BIOP flow objectives represent maximum levels of flow. This falls back on the old paradigm of a “broken stick” model, where flow increases survival up to a certain level and above that level there are no benefits. This old model is not consistent with flow, fish travel time, migration timing and survival to adulthood (smolt to adult return rates) analyses that have been conducted.

There is also some concern that while the Biological Opinion flow objective is a seasonal average, the shaping of that seasonal average could dramatically affect fish survival. Seasonal shaping is only partly addressed in the EIS, since monthly averages are used for flow for all months except for April and August, when bi-monthly flows are used. In reality this could result in low flows and impacts on survival for long periods of time.

In addition, there are no BIOP flow objectives for September and October, when most of the impact of the groundwater replacement withdrawals occur under the various alternatives. This suggests that reductions in Columbia River flow can occur when some fish can still be migrating through the system and were not specifically addressed by the EIS. Juvenile fall Chinook are present in the Columbia in September and October.

The EIS significantly downplays the relation between flow and fish survival, and suggests that flow is only important during low flow years (page 4-131). The document uses a statement made by the Independent Scientific Advisory Board in 2003 to suggest that above a certain level of flow there are no additional benefits to fish survival in increasing flow. While the ISAB conducted a review of flow augmentation (ISAB 2003-1) and noted that many questions remained in regard to the relationships between river flows and salmonid production, studies and analysis have since been conducted based upon the questions raised in the 2003 ISAB review. Some of these questions included “whether instantaneous mortality rates are increased in a given reach as a result of low flow (or other factors such as temperature, water particle travel time, turbidity, and calendar date)” and “whether decreased travel time through a reach results in decreased mortality rates measured downstream.” The Comparative Survival Study of PIT tagged Spring /Summer Chinook and Steelhead In the Columbia Basin, Ten Year Retrospective Report (Schaller et al. 2007) analyzed the relationship between environmental variables such as water travel time (i.e. flow) and spill, on travel time, instantaneous mortality, and survival rates of juvenile yearling Chinook and steelhead through the Lower Snake and Columbia Rivers. This analysis concluded that simple models incorporating water travel time



(i.e. flow), average percent spill, and date (measured in Julian Day) explained 79-95% of the variation in median fish travel time. Variations in instantaneous mortality rates of juvenile Chinook in the Lower Granite-to-McNary reach were explained by date and water travel time (i.e. flow). For steelhead, variation in instantaneous mortality rate was explained by date, flow, and average percent spilled.

Although the relationship of flow level on migration timing is well established, the importance of juvenile passage conditions as measured by adult return is emerging from recent analysis. Additional analysis has indicated that migration timing affects smolt to adult return. Scheuerell et al. (2009) concluded that migration timing of juvenile Chinook and steelhead in the Columbia Basin affected survival to adult. Their conclusion supports a management objective of increasing the speed of migration and speeding arrival to the estuary by increasing springtime river flows.

The use of newer PIT tag technologies since this time has facilitated further studies on flow and survival of salmonids in upper Columbia River reaches. A recent analysis of ten years of PIT tag data for steelhead survival between Rock Island Dam and McNary Dam concluded that juvenile steelhead average survival for 2007-2008 was higher than previous years' averages and had the shortest combined average water travel time (i.e. higher average flow) than averages in the 1998-2006 period (FPC 2009). Recent analysis of subyearling fall Chinook survival and travel time has shown that increases in migration flow, increases in spill, and decreases in temperature result in higher juvenile survival and faster juvenile migration timing (FPC, 2005; Connor et al, 2003).



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### MEMORANDUM

TO: Liz Hamilton, NSIA

FROM: Michele DeHart, Fish Passage Center

DATE: February 10, 2012

RE: Summer migration, Columbia River

In response to your request the Fish Passage Center staff has summarized available data regarding anadromous fish summer migration through the Columbia River and conditions that effect their migration. Juvenile migration data has been collected through the Columbia/Snake River basin since 1985. An analysis of anadromous fish summer migration has continued through the Smolt Monitoring Program and also through the basinwide Comparative Survival Study, which began in 2000.

#### **Summer Migrants – Who are they?**

- The NOAA Biological Opinion developed under the auspices of the Endangered Species Act, designates the summer migration period in the Columbia River at McNary Dam, **from July 1 through August 31**, although monitoring data shows that juvenile salmon continue to migrate through the Columbia River well into the fall months. The NOAA

Biological Opinion has established a minimum target flow at McNary Dam of 200 Kcfs, from July 1 through August 31, for summer migrants based upon many years of monitoring data that showed that flow (Water Transit Time) is important for a successful fall Chinook migration.

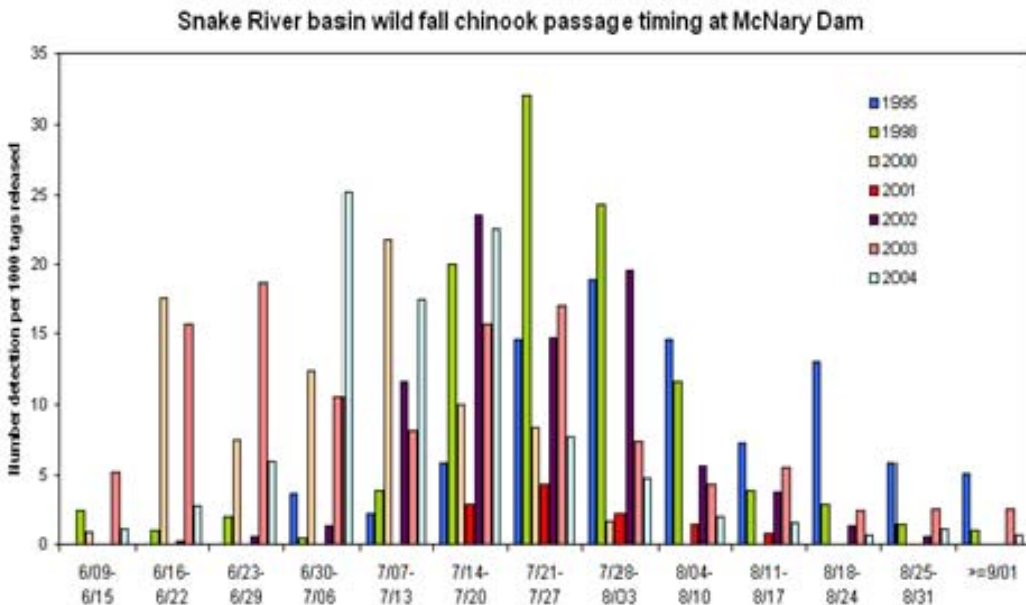
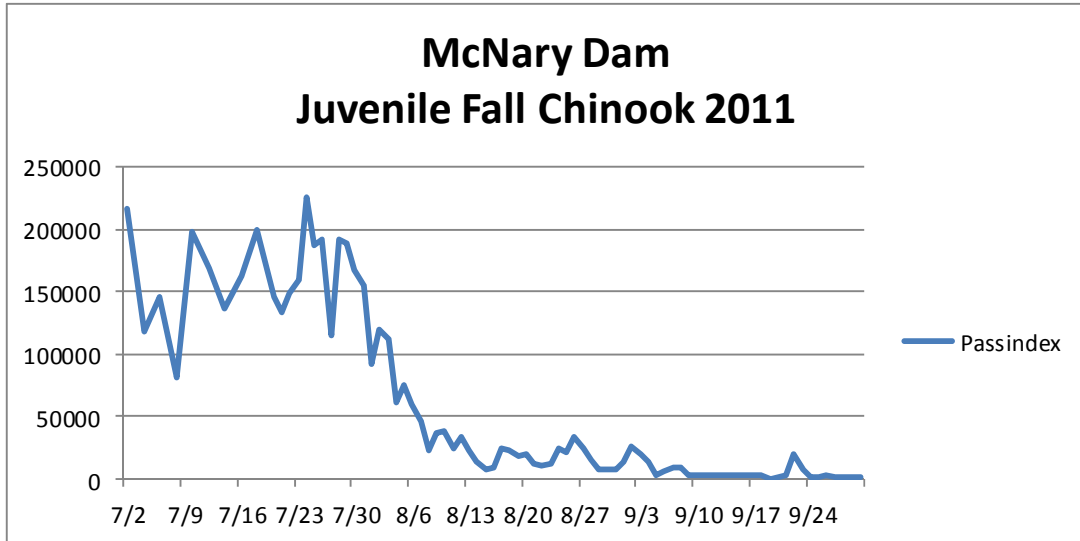
- The summer migration period is dominated by juvenile Fall Chinook salmon of wild and hatchery origin from the Columbia, and Snake River basins. Wild fall Chinook have an extended and protracted migration. Steelhead and spring/summer Chinook are also present during the summer period in smaller numbers.
- Fall Chinook represent a major component of the sport, commercial and tribal fisheries in fresh and salt water area of Washington and Oregon.

### **Factors limiting fall Chinook survival**

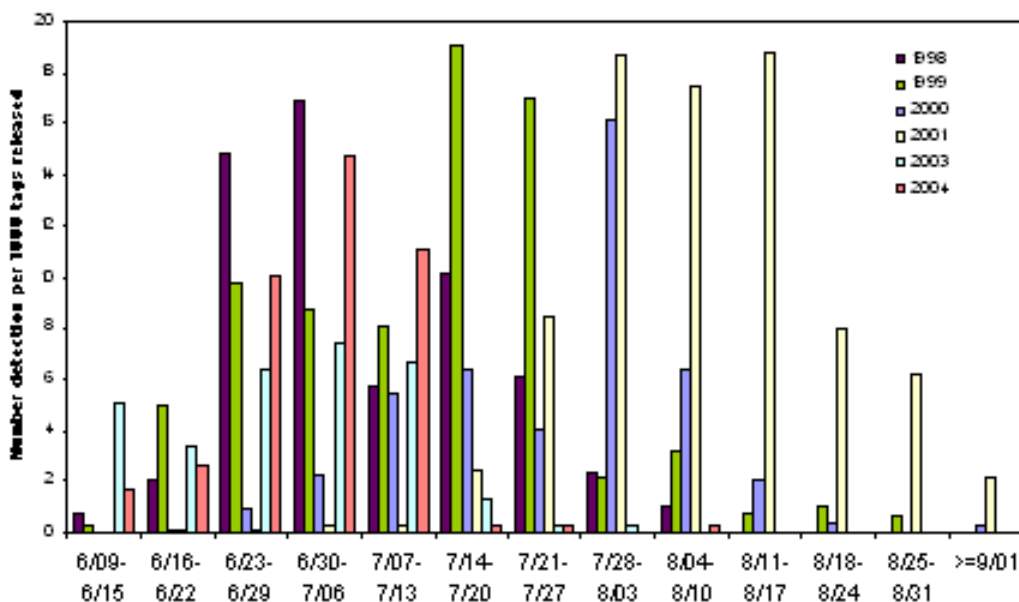
- **Migration flow targets are not being met.** Although the NOAA Biological Opinion establishes flow targets for fall Chinook at McNary Dam, of 200 Kcfs for juvenile salmon, the flow targets have only been met in extremely high run-off volume years such as 2011. The Biological Opinion flow target for the summer period has only been met in one of the last 12 years.
- **The development of the hydrosystem** has increased the cross sectional area of the Columbia River, resulting in lower water velocities. Juvenile salmon and steelhead migration travel time is dependent upon adequate velocities, in other words flow. Lower flow results in slower travel time, more exposure to predators, and higher water temperatures and disease.
- At the present time the **operation of upstream storage reservoirs for irrigation**, and power generation and water withdrawals for irrigation have limited the ability of the system to provide the Biological Opinion flow targets in the Columbia River during the summer migration period.
- The **cumulative additive effects** of many actions that alone might not seem significant have resulted in the present inability to meet Biological Opinion summer flow targets. For example; the region in 2008, elected to reduce the draft of Montana Reservoirs for fish migration, in all but the lowest flow years, reducing summer flows. In addition, the cross sectional area of the migration corridor is increased, and water velocity is decreased by operating reservoirs such as John Day at higher elevations to meet irrigation withdrawal pumping requirements. Water storage and withdrawal upstream reduces the summer flow in the lower river. The reduction in the summer draft of Montana Reservoirs in all but the lowest flow years increased the fish travel time across the reach by decreasing river flow an average of 7.3 Kcfs daily through the summer period.
- According to NOAA (2005) fish travel time depends on flow and flow changes had larger incremental effects on fish travel time at low flows than at high flows. Flows are lower in the summer so reductions or increases in flow have a larger effect.

### **When are summer migrants present in the McNary to Bonneville river reach?**

- Summer migrants, which are primarily fall Chinook, are present in the Columbia River below McNary Dam throughout the summer and fall months. The data for the run at large as well as the individual stock timing demonstrates the presence that time period.



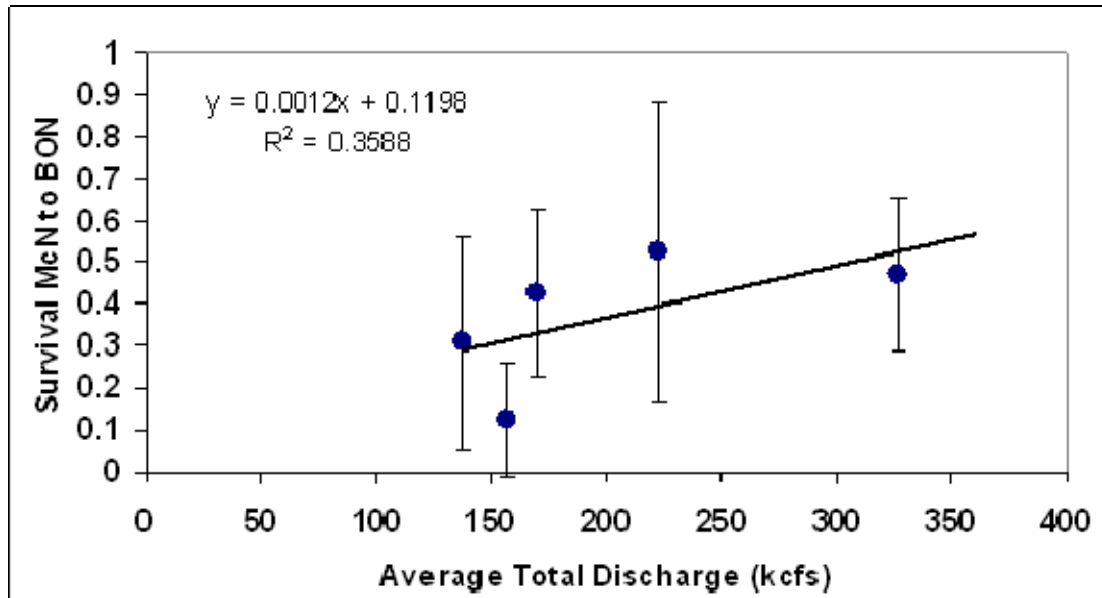
Hanford Reach wild fall chinook passage timing at John Day Dam



### Juvenile Survival of summer migrants

- Monitoring data and analyses show that the most important factors affecting juvenile salmon survival are flow (water travel time, velocity) and spill at hydroelectric projects. The Comparative Survival Study (CSS) is a collaborative study and analyses of the Idaho Department of Fish and Game, the Oregon Department of Fish and Wildlife, the Washington Department of Fish and Wildlife, the Columbia River Intertribal Fish Commission and the US Fish and Wildlife Service. The CSS Annual Report (2011) concluded that the most important variables affecting juvenile fall Chinook travel time and survival was flow (Water Travel Time) and spill at hydroelectric projects.
- Juvenile Fall Chinook survival increases as flow increases and as spill increases. Survival decreases when flow decreases and spill decreases. The importance of flow for juvenile fall Chinook migration was first documented in 1993, when researchers found that 65% of the variation in juvenile fall Chinook travel time was due to average river flow in the McNary to Bonneville River Reach. (Berggren and Filardo 1993).

- The available data from PIT tag recovery sites in the Lower Columbia (2008 -2009) indicate the apparent relation between flow and survival of sub-yearling fall Chinook. Survival decreases as flow decreases.

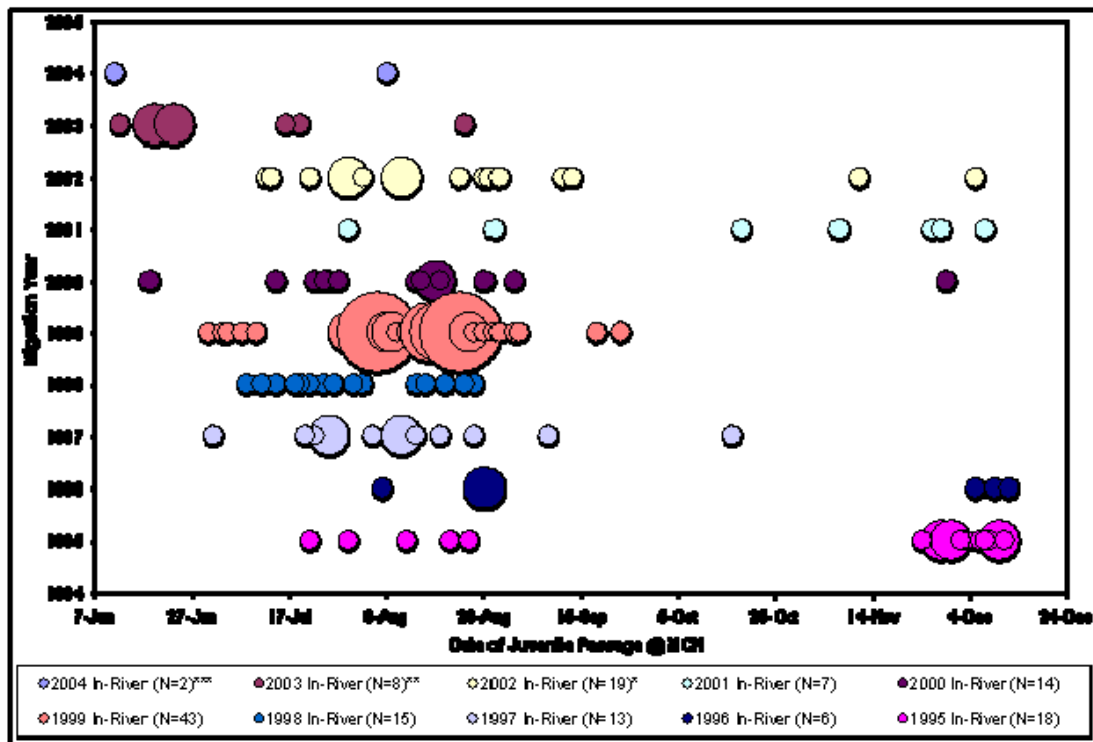


Subyearling Chinook survival in relation to average discharge from McNary Dam to Bonneville Dam during two-week intervals between June 16 and July 31, for the years 2008 and 2009.

- The Fish Passage Center (2006) analyzed the effect of flow on juvenile fall Chinook travel time between McNary and Bonneville Dam and concluded that based on the available data our analyses suggest that Snake River origin subyearling Chinook travel time is a function of flows throughout July and August. The longer travel times observed for fish migrating in August are likely explained by lower flows during that time period. Decreasing flows lower than the BIOP flow target would be expected to translate into increasing travel times for subyearling migrants in the lower River between McNary and Bonneville dams.

## Adult Returns of Summer Migrants

- PIT tag data indicates that Fall Chinook migrating through the Lower Columbia during the summer period make a significant contribution to adult returns (FPC 2007). For data from 1995 to 2004, most years (7 out of 10) showed that the majority of the returning adults that migrated in-river as juveniles were detected at McNary Dam between August and December.



Juvenile passage timing at McNary Dam for in-river sub-yearling fall Chinook that survived to adulthood (MY 1995-2004). Numbers of PIT-tagged adults returning for each migration year are shown in the figure legend in parentheses. Larger circles reflect larger number of PIT-tags passing on a particular date.

\* 5-year ocean fish from MY 2002 have not yet returned

\*\* 4 and 5-year ocean fish from MY 2003 and not yet returned

\*\*\* 3, 4, and 5-year ocean fish from MY 2004 have not yet returned



## References:

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DATA REQUEST FORM

Request Taken By: Michele Date: 11-26-2012

Data Requested By: Rob Lothrop Name: \_\_\_\_\_ Phone: \_\_\_\_\_  
Address: CRITFC Address: \_\_\_\_\_ Fax: \_\_\_\_\_  
Email: \_\_\_\_\_  
Email: \_\_\_\_\_

Data Requested:

review comments on Odessa water  
with drawal proposal - summarize  
potential impacts -  
provide by Monday - 12-3-2012

Data Format: Hardcopy  Text  Excel

Delivery: Mail  Email  Fax  Phone

Comments:

Data Compiled By: Michele Date: 12-1-2012

Request # 71