

# University of Washington

## School of Aquatic & Fishery Sciences

### Columbia Basin Research

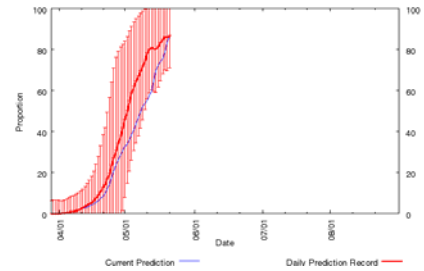
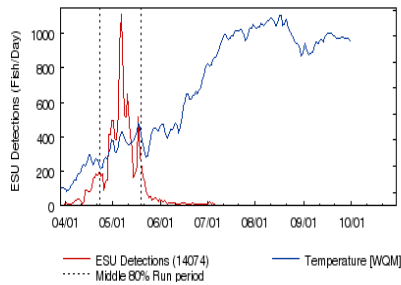
# Salmon Insider

Columbia Basin Research Newsletter

Spring 2009

Columbia Basin Research (CBR) is a scientific research group at the University of Washington, School of Aquatic & Fishery Sciences. We investigate salmon biology and survival in the Columbia and Snake river basins. We provide user-friendly data analysis and modeling tools, and maintain DART, an interactive secondary database, for the fisheries community and the general public.

## Inside . . . Migration Season 2009



## CBR Workshop and Subsequent PitPro Update

**Cormack/Jolly-Seber Estimates for "clw1W2008"**  
(Cormack 1964, Jolly 1965, Seber 1965)

Note: This report is only valid for juvenile life cycle data. Survival estimates to adult migration sites are not valid.

Date: 04/11/2009  
File: C:\Documents and Settings\user\Ply Documents\Projects\PitPro\Output\clw1W2008.dh

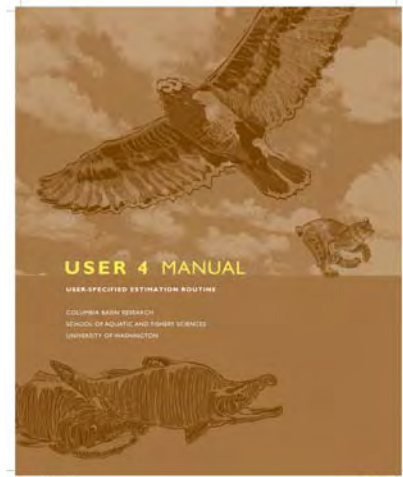
Population	S1	S2	S3	S4	S5	Overall S
04/11/2008	0.338 (0.0717)	0.400 (0.2363)	inf (nan)	0.000 (nan)	nan (nan)	nan (nan)

Population	P1	P2	P3	P4	P5
04/11/2008	0.293 (0.0630)	0.156 (0.0772)	0.000 (nan)	0.500 (0.3330)	nan (nan)

**Key**

- S1: Survival from release to g1.
- S2: Survival from g1 to g2.
- S3: Survival from g2 to inc.
- S4: Survival from inc to mc.
- S5: Survival from mc to j1.
- P1: Capture probability at g1.
- P2: Capture probability at g2.
- P3: Capture probability at inc.
- P4: Capture probability at mc.
- P5: Capture probability at j1.
- Overall S: Overall survival from release to j1.

## Program USER 4: Updated Manual Available



University of Washington  
School of Aquatic & Fishery Sciences  
Columbia Basin Research  
1325 Fourth Avenue, Suite 1820  
Seattle, Washington 98101-2509

newsletter@cbr.washington.edu  
www.cbr.washington.edu

## Columbia River DART: Migration Season 2009

[Columbia River DART \(Data Access in Real Time\)](#) provides data services throughout the year on the CBR website, particularly during the adult and juvenile salmonid migration seasons.

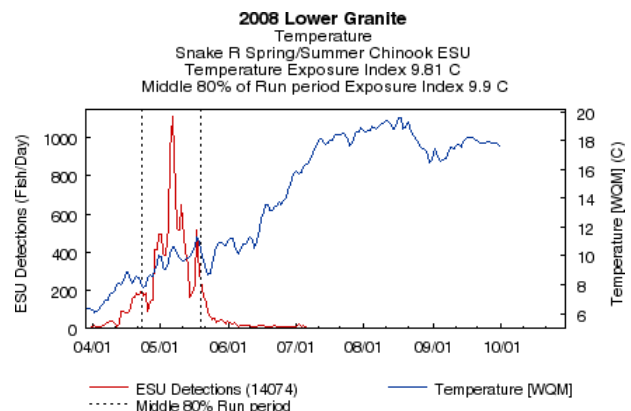
### Columbia Basin ESUs

DART aggregates PIT-tag release and detection information to provide year-to-date and detailed observation information for 9 Columbia Basin ESU (Evolutionarily Significant Unit) populations. DART offers multiple ways to investigate and analyze each specific Columbia Basin ESU population, based on data provided by the Pacific States Marine Fisheries Commission. This spring, DART updated and expanded the Columbia Basin ESU reports and analysis tools. The **Summary & Migration Timing** report includes the total observations to date for each component stock (Release Site, Species, Run, and Rear Type) at all projects with migration timing information for each project and linkages to river conditions (spill percent, outflow, and temperature) during migration. Table 1 and Fig. 1 were produced by the [Columbia Basin Performance Measures](#) analysis tool from links in the Summary & Migration Timing report output. [http://www.cbr.washington.edu/dart/esu\\_sum.html](http://www.cbr.washington.edu/dart/esu_sum.html)

**Figure 1.** Snake River spring/summer Chinook salmon ESU detections by date (red) and temperature exposures (blue) at Lower Granite Dam in 2008. Dotted lines demarcate the middle 80% of the run period.

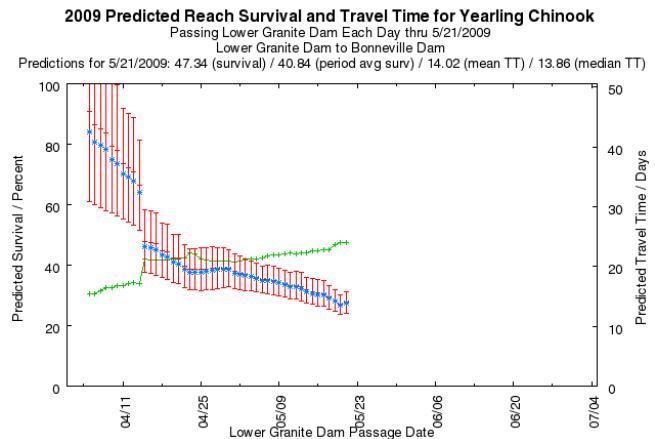
**Table 1.** ESU Detections/Exposure Results for Snake River spring/summer Chinook at Lower Granite Dam in 2008.

Snake R Spring/Summer Chinook ESU	
Year	2008
Project	Lower Granite
River Parameter	Temperature
Calculate Exposure	Summarize
River Parameter Data Fill	No
Total Run Period (Mar 29 - Oct 31)	
Total Number of Fish Observed	14074
Percent of Total Run Analyzed [Number Observed]	99.99 % [14073]
Temperature Exposure Index	9.81 C
Middle 80% of Run Period (Apr 23 - May 20)	
Number of Fish Observed	11539
Percent of Middle 80% of Run Analyzed [Number Observed]	100 % [11539]
Temperature Exposure Index	9.9 C
Run Dates	
First Day of Run	Mar 29
5% of Run passed	Apr 19
10% of Run passed	Apr 23
50% of Run passed	May 7
90% of Run passed	May 20
95% of Run passed	May 25
Last Day of Run	Oct 31



## 2009 Juvenile Reach Survival & Travel Time Forecasts

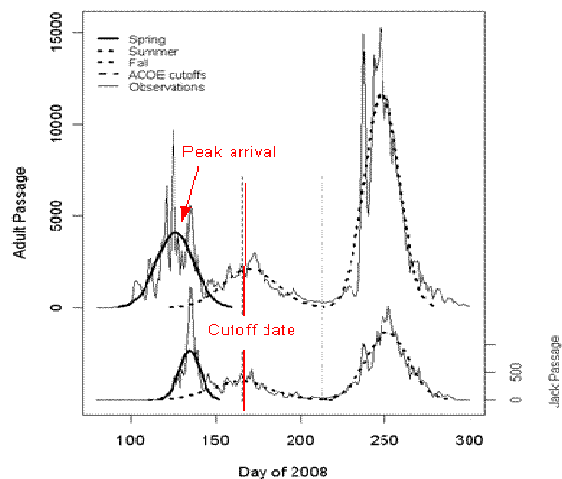
New this migration season, DART presents predictions of reach survival and travel time for juvenile salmonids passing Lower Granite Dam each day (Fig. 2) on the **Inseason Forecasts** page. Reach survival and reach travel time for each day are generated for fish passing Lower Granite Dam and McNary Dam using the **COMPASS** model with NOAA calibrations for Wild Snake River Yearling Chinook and Wild Snake River Steelhead. Observed river condition data up to the day of passage and forecasted river condition data for the rest of the season are used in model runs. See for more information: [http://www.cbr.washington.edu/crisprt/index\\_s\\_nake\\_pit.html](http://www.cbr.washington.edu/crisprt/index_s_nake_pit.html).



**Figure 2.** Reach Survival & Travel Time daily forecasts for wild yearling Chinook passing Lower Granite Dam.

## 2009 Adult Spring Chinook Forecasts

DART presents two methods for predicting the run size of the adult spring Chinook and the run-timing on the **Inseason Forecasts** page. The date-based method, which is used for management of in-river harvest, defines a run as the total number of adult spring Chinook salmon passing Bonneville Dam between March 15 and June 15. The Genetic Environmental Model (GEM) method (Anderson and Beer), which is a better ecological characterization of the spring run, simultaneously describes the distributions of the spring, summer, and fall runs by fitting three superimposed normal distributions to the combined Run (Fig. 3). The mean arrival date of each normal distribution characterizes the arrival peak independent of the method used to determine run size. [http://www.cbr.washington.edu/crisprt/index\\_adult.html](http://www.cbr.washington.edu/crisprt/index_adult.html)

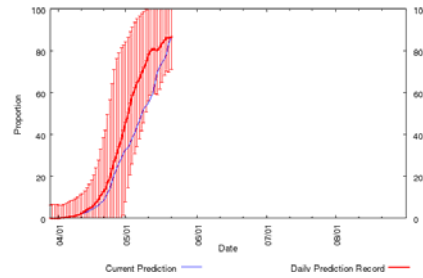


**Figure 3.** Adult and jack Chinook salmon passage showing the tri-modal pattern at Bonneville Dam in 2008. The thick lines depict fitted Gaussian functions for spring, summer and fall runs.

Anderson, JJ and WN Beer. Distal, proximal, and genetic influences on spring Chinook salmon migratory timing. *Ecological Applications* [in press].

## Program RealTime: 2009 Smolt Forecasts

Program RealTime provides predictions of run timing of 32 stocks of fish, 20 run-of-river and 12 from specific release sites above Lower Granite Dam. [Inseason Forecasts](#) are provided on a daily basis during the outmigration season for Rocky Reach, Rock Island, McNary, John Day, Bonneville, and Lowe Granite dams (Fig. 4).



**Figure 4.** Daily prediction of run timing of combined yearling Chinook salmon at Lower Granite Dam based on passage indices.

## CBR Training Workshop: Use of Analytical Software Programs

At the request of the Confederated Tribes of the Umatilla Reservation, CBR staff conducted a two-day training session on February 11-12, 2009, in Walla Walla, Washington. The main objective was to help fisheries biologists better use the statistical software tools developed by the University of Washington to design and analyze survival studies. The workshop included representatives from state and local agencies as well as from other First Nations. The first day of the workshop was spent demonstrating four programs:

- [Program SampleSize](#) – Showed use of the program to determine optimal release sizes to obtain a desired study precision; how to use the program to assist in the study design phase by constructing multiple “what-if” scenarios and observing the expected precision levels.
- [Program PitPro](#) – Discussed the utility of PitPro to process raw PIT-tag information using a number of pre-determined assumptions, and how to alter those assumptions with available options or manually. Demonstrated how to obtain Cormack-Jolly-Seber estimates and travel times for a release group.

- [Program SURPH](#) – Demonstrated SURPH’s capability to analyze PIT-tag data, perform Burnham tests of homogeneity between release groups and within a release group, various options available for modeling survival, and how to test the differences between models. Demonstrated the beta version of SURPH 3, showing improvements in the user interface.
- [Program USER](#) – Demonstrated the program’s improved capability to analyze more general and complicated likelihood models that are beyond the capacity of the SURPH program.

These programs can be downloaded at <http://www.cbr.washington.edu/analysis.html>.

The second day of the workshop was devoted to practical examples of survival analyses using data sets provided by participants and staff. This workshop was sponsored by the Bonneville Power Administration under Project 1989-107-00, Contract No. 39987. Agencies and other organizations interested in similar training workshops can contact Cindy Helfrich, [cindy@cbr.washington.edu](mailto:cindy@cbr.washington.edu), for more information.

## PitPro Updates

As a result of discussions at the Walla Walla workshop, version 4.12 of Program PitPro is now available online, [www.cbr.washington.edu/paramest/pitpro](http://www.cbr.washington.edu/paramest/pitpro). This update includes the following features.

- PitPro now generates SURPH data files with multiple individual covariates.
- Output functionality is much improved with the ability to cut and paste tables directly into external programs, such as Microsoft Excel, or to export reports, such as the Travel Time and Cormack-Jolly-Seber reports, to comma separated variable (CSV) output files.

### Individual Covariates

In the previous version of PitPro, the user could only add length as an individual covariate to the SURPH data file output. This data would be included as the last field in each row in the tag file. This basic idea has been expanded so that the user can now add columns in the tagging data which will be treated as individual covariate data.

To add additional individual covariates to the SURPH file, the user simply adds the data as the last fields in the tagging file. This data can be length, weight, coordinator id, etc. If the checkbox labeled **Include covariate(s) in SURPH file output** is checked, the program will add those data to the SURPH file. The covariate will simply be labeled icov 1, icov 2, icov 3, etc. (Fig. 5).

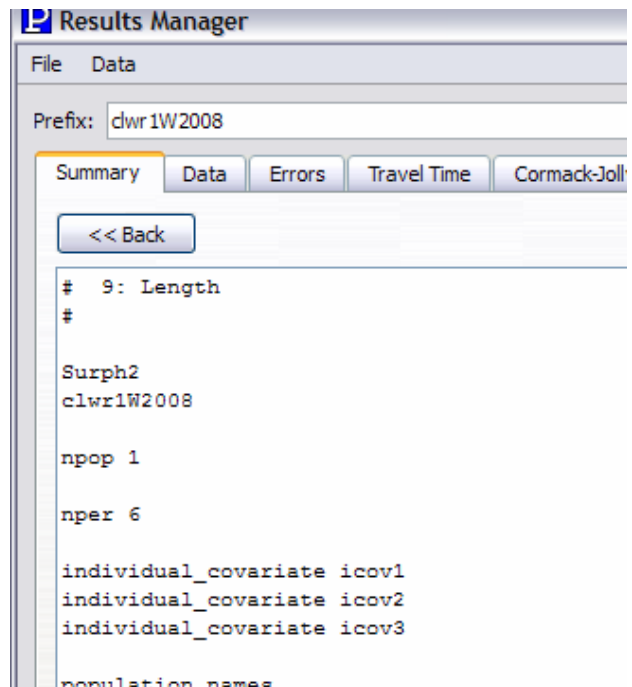
**Figure 5.** Results Manager tab in Program PitPro with additional covariate data displayed as "individual\_covariate icov1," "individual\_covariate icov2," etc.

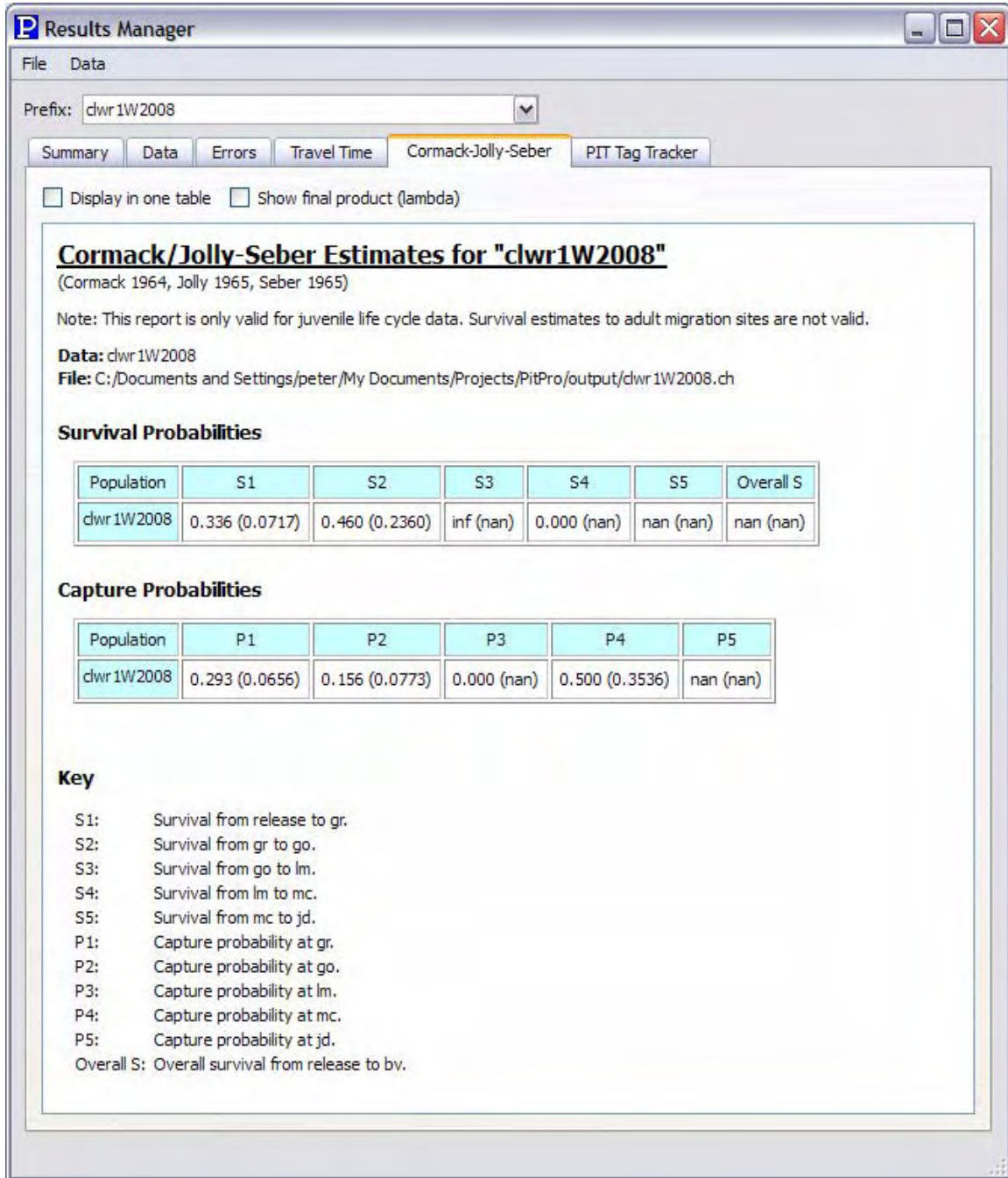
### Output Enhancements

The Cormack-Jolly-Seber and Travel Time reports can now be exported as CSV files with values of higher precision to facilitate further computation. In addition, the tables in the reports can be cut-and-pasted directly into Microsoft Excel or other supported spreadsheet software.

Under the Cormack-Jolly-Seber report tab, a new table format has been added that presents all parameter estimates on one table, instead of in three separate tables, one each for survival, capture history, and final product (lambda) (Fig. 6).

Although the lambda value may not be useful to investigators, it is included because it is required internally for the calculation of the other parameters. At the request of users, lambda is no longer displayed by default but is available as a display option.





**Figure 6.** Estimates of survival and capture probabilities are now provided in a single table in the Cormack-Jolly-Seber tab of the Program PitPro Results Manager.

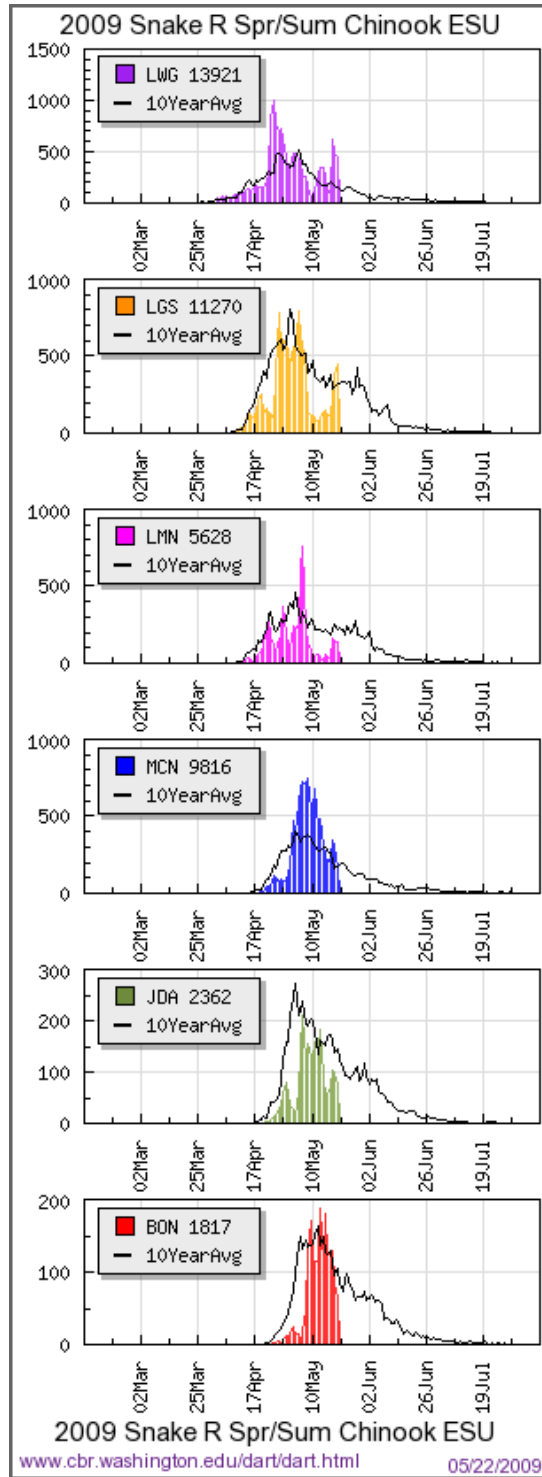
## Columbia Basin “Quick Look” Summary for 2009

New this year, DART developed the **Columbia Basin Quick Look** web pages to provide easy access to up-to-date basin-wide migration and river conditions from one page. The Columbia Basin Quick Look 2009 for [Adult Passage](#), [ESU Passage](#), [Smolt Passage](#), and [River Environment](#) pages present 2009 basin-wide current conditions for multiple species and river condition parameters with 10 Year Averages. Graphs are updated daily (Fig. 7).

### DART Assisting the Region

DART presents an integrated, web-accessible system for tracking and analyzing Columbia River fish passage that allows the public, fish managers, and researchers to explore and analyze historical passage seasons, track the status of current adult and juvenile fish passage through the Columbia River system, evaluate hydrosystem operations on anadromous and resident fish, and explore future and forecasted passage scenarios.

Various tools provide sub-basin-specific monitoring and evaluation analyses of salmonid passage, survival and adult returns. Through regional cooperation with numerous federal, state, tribal, and private entities, DART provides support for monitoring and evaluation of scientific research efforts; access to spatially and temporally integrated biological and environmental data; and integration and free exchange of information.



**Figure 7.** Current and 10-year average of Snake River spring/summer Chinook ESU at major Columbia Basin dams in 2009.

Beyond the basic data services that DART provides throughout the year, we are willing to provide services upon request. This spring, DART is providing the following services to the fisheries community.

- Assisting NOAA Fisheries in improving the Upper Columbia geometries in NOAA COMPASS Regional Juvenile Salmon Passage Model using data provided by the Upper Columbia PUDs.
- Providing NOAA with updated 1960s adult passage data to assist with passage predictions, specifically the impacts of climate change on migration timing and pre-spawn survival in the Columbia River.
- Providing Cargill—international producer and marketer of food, agricultural, financial and industrial products and services—specialized datasets for their modeling efforts.
- Providing daily reports of elevations for major U.S. reservoirs and river flow at key Lower Snake and Columbia dams for inclusion in the

Northwest Power and Conservation Council's Power Supply Outlook Update web page.

- Providing the primary public source for several trap datasets from WDFW, USFWS, Chelan County PUD, Douglas County PUD, Colville Tribes, and Yakama Nation.
- Providing database and web services for Entiat River traps from the US Fish & Wildlife Service. At the request of USFWS, we are developing PIT Tag Release Condition Factor analysis tool.
- Providing database and web services for adult passage data for Tumwater Dam (WDFW and Chelan PUD) and Zosel Dam (Colville Tribe Fish & Wildlife (OBMEP)).

How can we assist you? User feedback is essential to the development and relevancy of DART to the region. Please contact Chris Van Holmes, DART database administrator, [cvh@cbr.washington.edu](mailto:cvh@cbr.washington.edu), with your data and analysis tool requests.

## Program USER 4: New User's Manual

Enhancements to Program USER were introduced in detail in the Spring 2008 issue of the *Salmon Insider*. USER 4 provides two major enhancements over previous versions: (1) a more intuitive user interface, and (2) the capability to include total animal abundance as a parameter to be estimated. A new user's manual is now available on the CBR web site, [www.cbr.washington.edu/paramest/user/](http://www.cbr.washington.edu/paramest/user/). Paper copies can be requested from Cindy Helfrich, [cindy@cbr.washington.edu](mailto:cindy@cbr.washington.edu).

