**Fish Data Availability Discussion**

**Chehalis Flood Authority Fish Sub-Committee**

**July 20, 2011**

## Agenda

- Welcome and Introductions
- Overview of Fish Study and SHIRAZ
- Availability of Salmon Data
- Review of Action Items
- Next Meeting

## Purpose of Fish Study

- To characterize the magnitude of potential impacts that a flood storage facility on the upper mainstem Chehalis River could have on anadromous salmon populations

## Study Approach

- To use applicable existing and new data to characterize habitat conditions in the basin that contribute to salmon viability and would potentially be impacted by a dam
  - Hydrology and Hydraulics (water flow)
  - Water Quality (temperature)
  - Geomorphology (sediment transport)
  - Fish Habitat Mapping (PHABSIM)
- Three salmon species will be the studied: spring Chinook, coho, and winter steelhead

## Scope of Work Details

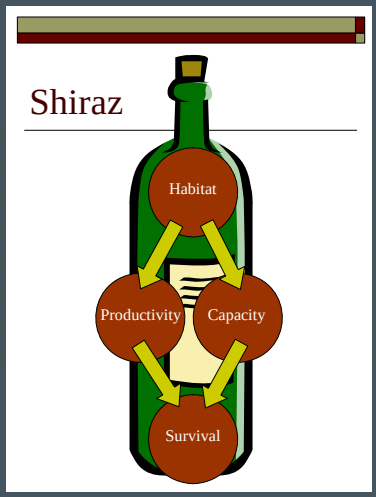
- Project Area is mainstem Chehalis River from headwaters to Porter (RM 33)
- Three salmon species will be the studied: spring Chinook, coho, and winter steelhead

## Understanding of Dam Structure and Operations

| Structure or Operational Element | Flood Storage | Multi-Purpose |
|---|---|---|
| Structure Location | 2 miles south of Pe Ell (RM 108.3) | 2 miles south of Pe Ell (RM 108.3) |
| Watershed Area above Structure | 68.8 square miles | 68.8 square miles |
| Structure Height | 238 feet | 288 feet |
| Base Width | 1,300 feet | 1,600 feet |
| Reservoir Surface Area when Full | 1,000 acres | 1,450 acres |
| Fish Passage Facilities | Yes | Yes |
| Sediment Transport Past Dam | No | No |
| Large Woody Debris Transport Past Dam | No | No |

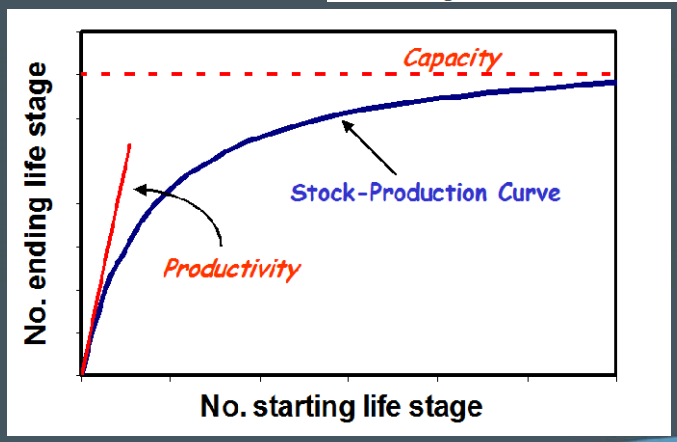
## Introduction to SHIRAZ

- Microsoft Excel-based model to relate habitat conditions to salmon production
  - Capacity
  - Productivity
- User-defined inputs to build the model, i.e., a transparent model
- Allows for year-to-year changes in habitat conditions (as well as marine survival, harvest, and hatcheries, if desired)

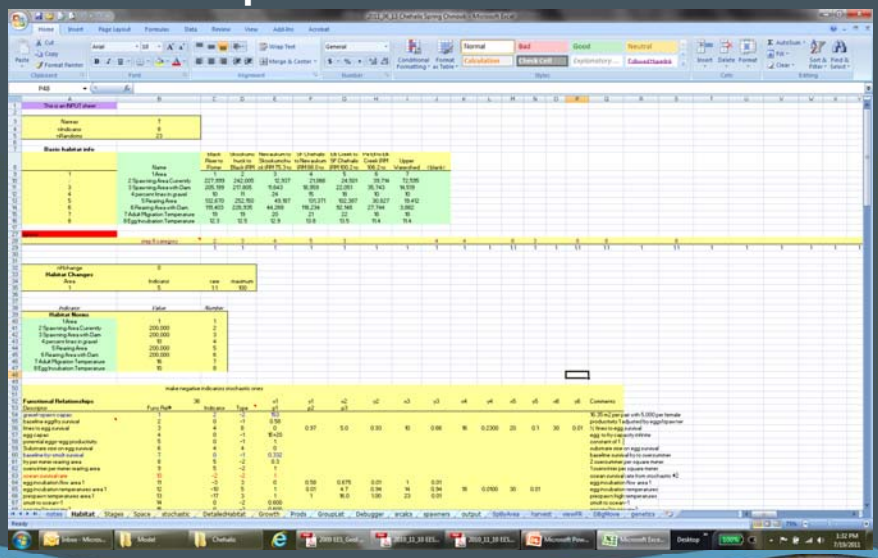



## Relies Upon Beverton-Holt Stock Recruitment Model

$$N_{s+1} = \frac{N_s}{\frac{1}{p} + \frac{1}{c} N_s} \quad \text{where} \begin{cases} p = \text{productivity} \\ c = \text{capacity} \end{cases}$$



## SHIRAZ Inputs



## SHIRAZ Inputs

- Three main types of data
  - Fisheries Resources
  - Habitat by Reach
  - Functional Linkages between fish survival and habitat conditions

## SHIRAZ Inputs

- Three main types of data
  - Fisheries Resources — Focus of today's discussion
  - Habitat by Reach
  - Functional Linkages between fish survival and habitat conditions

## SHIRAZ Inputs

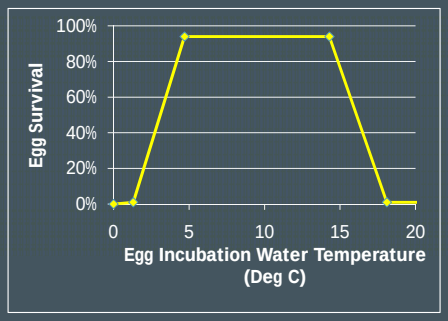
- Habitat by Reach
  - Adult migration temperature
  - Egg incubation temperature
  - Percent fine sediment
  - Spawning area quantity
  - Rearing area quantity
  - SHIRAZ accommodates year to year changes in the habitat parameters

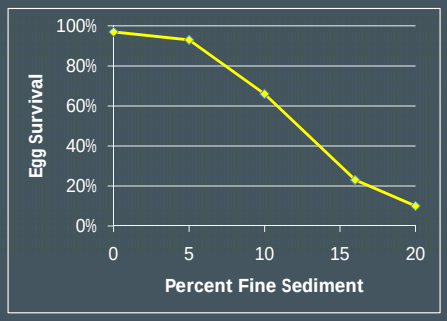
## SHIRAZ Inputs

- Functional Linkages – quantification of how fish survival rates vary depending on habitat conditions
- Empirically-based and peer review literature

## SHIRAZ Inputs

- Functional Linkages Examples



## SHIRAZ Inputs

- Fisheries Resources
  - Who? (species)
  - What? (freshwater lifestages)
  - Where? (river miles reaches occupied by species and lifestage)
  - When? (months of year)

## Example of One Life Stage – Current

- Eggs Deposited
  - In Fall 2015, 300,000 eggs are deposited in gravel in equal numbers among reaches 2, 3, 4
- Egg Survival
  - Survival rate in each reach based on fine sediment levels, water temperatures, and peak flow conditions
  - Assume egg survival in reach 2 is 50%, reach 3 is 30%, reach 4 is 10%
- Number of Fry Emergents
  - Reach 2 = 50,000, Reach 3 = 30,000, and Reach 4 = 10,000

## Example of One Life Stage – Future with Dam Constructed

- Eggs Deposited
  - In Fall 2030, 300,000 eggs are deposited in gravel in equal numbers among reaches 2, 3, 4
- Egg Survival
  - Survival rate in each reach based on fine sediment levels, water temperatures, and peak flow conditions
  - Assume egg survival in reach 2 is 40%, reach 3 is 30%, reach 4 is 30%
- Number of Fry Emergents
  - Reach 2 = 40,000, Reach 3 = 30,000, and Reach 4 = 30,000

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## Assessment Reaches

- Black River to Porter (RM 47.0 to 33.3)
- Skookumchuck to Black (RM 66.8 to 47.0)
- Newaukum to Skookumchuck (RM 75.3 to 66.8)
- SF Chehalis to Newaukum (RM 88.0 to 75.3)
- Elk Creek to SF Chehalis (RM 100.2 to 88.0) Pe
- Ell to Elk Creek (RM 108 to 100.2)Upper Watershed

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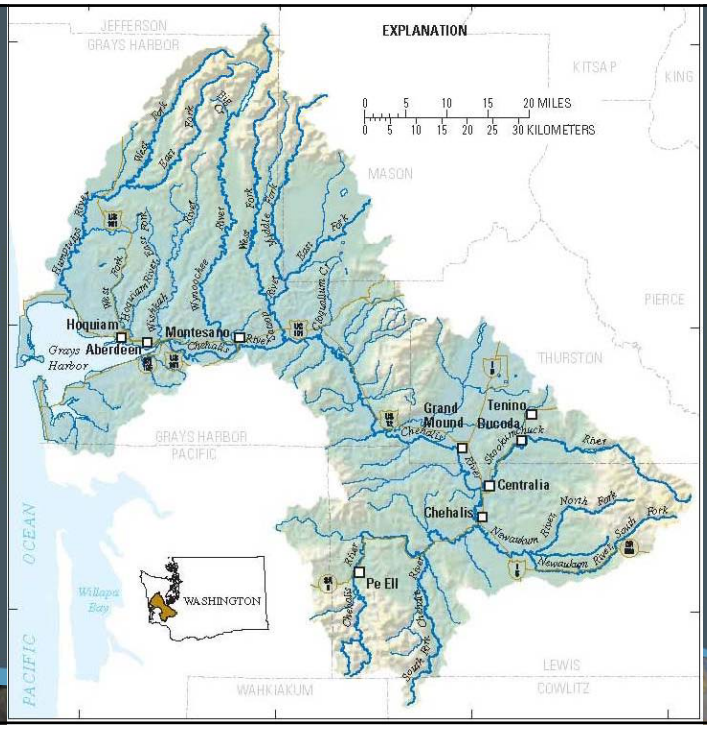
# Basin Map




# Fish Data – Spring Chinook

| Parameter | Data Sources | |
|---|---|---|
| Adult Escapement | WDFW SalmonScape/SASSI<br><br>WDFW (Holt) Spawning Ground Surveys | 1993 – 2007 Data; Holt data from 1998 – 2007 distinguishes upper and lower river spawning<br><br>Holt data show few spawners above proposed dam site |
| Adult Age-of-Return | WDFW (Ashbrook) | 1992 – 2010 Scale data |
| Spawning Distribution | WDFW SalmonScape/SASSI<br><br>WDFW (Holt) Spawning Ground Surveys | Identifies spawning reaches<br><br>1998 to 2007 Data Distinguishes Upper and Lower River Spawning |

## Fish Data – Spring Chinook

| Parameter | Data Sources | |
|---|---|---|
| Rearing Distributions (looking for information on how they distribute among reaches) | WDFW (Ackley pers. comm.)<br><br>Weyerhaeuser (Fransen) | |
| Age-of-Outmigration | WDFW (Ackley) | |
| Smolt Numbers | ??? | WDFW smolt trap removed (partial) |

## Fish Data – Coho

| Parameter | Data Sources | |
|---|---|---|
| Adult Escapement | WDFW SalmonScape/SASSI<br><br>WDFW (Holt) Spawning Ground Surveys | 1993 – 2007 Data; Holt data from 1998 – 2007 distinguishes upper and lower river spawning<br><br>Different numbers between sources |
| Adult Age-of-Return | | Assume typical 3 year life history |
| Spawning Distribution | WDFW SalmonScape/SASSI<br><br>WDFW (Holt) Spawning Ground Surveys | Holt data show 78% above proposed dam site |

## Fish Data – Coho

| Parameter | Data Sources | |
|---|---|---|
| Rearing Distributions (looking for information on how they distribute among reaches) | WDFW (Ackley pers. comm.)<br><br>Weyerhaeuser (Fransen)<br><br>Henning (Univ. Oregon MS thesis) | Mainstem too warm for coho rearing in summer; primarily tributary rearing |
| Age-of-Outmigration | | Assume typical 3 year life history |
| Smolt Numbers | WDFW (Ackley) | Production numbers calculated |

## Fish Data – Winter Steelhead

| Parameter | Data Sources | |
|---|---|---|
| Adult Escapement | WDFW SalmonScape/SASSI<br><br>WDFW (Holt) Spawning Ground Surveys | 1993 – 2007 Data; Holt data from 1998 – 2007 distinguishes upper and lower river spawning |
| Adult Age-of-Return | WDFW (Ashbrook) | 1992 – 2010 Scale data |
| Spawning Distribution | WDFW SalmonScape/SASSI<br><br>WDFW (Holt) Spawning Ground Surveys | Holt data show 83% above proposed dam site |

## Fish Data – Winter Steelhead

| Parameter | Data Sources | |
|---|---|---|
| Rearing Distributions (looking for information on how they distribute among reaches) | WDFW (Ackley pers. comm.)<br><br>Weyerhaeuser (Fransen) | |
| Age-of-Outmigration | NMFS/WDFW | |
| Smolt Numbers | ??? | WDFW smolt trap removed (partial) |

## Next Meeting

- Week of August 8 to 12