

# SALMOD

<b>Model Uses</b>	SALMOD is used to simulate the dynamics of freshwater anadromous and resident salmonid populations.	
<b>Major Categories</b>	Population Modeling; Habitat Classification	<u>Subject Knowledge Level</u> Intermediate
<b>Minor Categories</b>	Fish and Fish Habitat; Population Viability Analysis; Habitat Quality	<u>Technical Difficulty Level</u> Intermediate
<b>Model Type</b>	Physical Model	<u>Geographic in Nature?</u> Semi

## **Abstract**

SALMOD is a computer model that simulates the dynamics of freshwater salmonid populations, both anadromous and resident. The conceptual model was developed in a workshop setting (Williamson et al. 1993) using fish experts concerned with Trinity River Chinook restoration. The model builds on the foundation laid by similar models (see Cheslak and Jacobson 1990). The model's premise is that egg and fish mortality are directly related to spatially and temporally variable micro- and macrohabitat limitations, which themselves are related to the timing and amount of stream flow and other meteorological variables. Habitat quality and capacity are characterized by the hydraulic and thermal properties of individual mesohabitats, which were used as spatial "computation units" in the model. The model tracks a population of spatially distinct cohorts that originate as eggs and grow from one life stage to another as a function of local water temperature. Individual cohorts either remain in the computational unit in which they emerged or move, in whole or in part, to nearby units (see McCormick et al. 1998). Model processes include spawning (with redd superimposition and incubation losses), growth (including egg maturation), mortality, and movement (freshet-induced, habitat-induced, and seasonal). Model processes are implemented such that the user (modeler) has the ability to more-or-less program the model on the fly to create the dynamics thought to animate the population. SALMOD then tabulates the various causes of mortality and the whereabouts of fish.

SALMOD's premise is that physical habitat components (flow dependent micro-habitat and water temperature) are the principal factors limiting the freshwater production. The question of food resources looms as a large question. This model essentially assumes (1) that a stream's underlying food production and delivery processes are inherent to the stream, (2) that production and delivery have been accounted for in the quantification of mesohabitat versus flow relationships through depth, velocity, substrate, and cover requirements, and (3) that these relationships will not be altered by the flow and temperature scenarios explored by the model. In particular, acceptable or preferred habitats are assumed to be those that maximize fitness, including the benefits of maximizing growth potential and minimizing predation risk. Therefore, mesohabitat types with more quantifiably suitable habitat have a higher capacity than those that do not. When these assumptions are not appropriate, SALMOD should either not be the model of choice, or be modified to incorporate new relationships.

SALMOD is best explained by describing its fundamental structure in terms of temporal, spatial, and biological resolution. These three components are not independent; the size of any computational unit (spatial resolution) has a direct bearing on the distance a fish of a given size (biological resolution) needs to move within one time step (temporal resolution) to encounter alternate habitat conditions. The scale of resolution also affects the way model processes are envisioned and implemented, their assumptions, and their limitations.

## **Future Developments**

Unknown

## **Model Limitations**

Unknown

## **Model Features**

- Model processes are setup so the user can program the model for exactly their needs
- Built-in Model Checker

## **Required Data Types**

Data is read from a Windows Wordpad document and takes into account food resources and hydrologic characteristics.

## **Model Outputs**

Data is written to a Windows Wordpad file.

### Hardware Requirements

The executable files associated with SALMOD and its output may require up to 5 megabytes of disk space. We recommend that the user allot 10 megabytes of disk space just for safety's sake. The fastest machine available is recommended to decrease run times and make your use of SALMOD more enjoyable and efficient. A screen resolution of at least 1024 x 768 is recommended.

Supported Platforms			
DOS	<input checked="" type="checkbox"/>	UNIX	<input type="checkbox"/>
Windows	<input checked="" type="checkbox"/>	Macintosh	<input type="checkbox"/>

### Software Requirements

Windows 95 or DOS 3.0; Windows WordPad

### Cost, Licensing and Availability

Model is provided free of charge from link below.

### Source

US Geological Survey

### Source URL

<http://www.fort.usgs.gov/products/software/salmod/salmod.asp>