PHABSIM

Model Uses PHABSIM is a tool that offers prediction capabilities associated with flow changes such as microhabitat, physical habitat and life stage changes.

Major Categories Hydrology and Water Use; Decision Support

Subject Knowledge Level
Intermediate

Minor Categories Flow; Desired Future Conditions; Historical Conditons

Technical Difficulty Level
Intermediate

Model Type Physical Model

Geographic in Nature?
No

Abstract
PHABSIM predicts physical microhabitat changes associated with flow alterations (such as a reduction of stream flow from 125 cfs to 100 cfs in June). It provides a variety of simulation tools, which characterize the physical microhabitat structure of a stream and describe the flow-dependent characteristics of physical habitat in light of selected biological responses of target species and life stages. When interpreting PHABSIM results, an assumption is normally made that flow-dependent physical microhabitats are useful in determining carrying capacity and therefore are related to the in-stream flow needs or impacts of flow variations on fish or other aquatic organisms in streams.

PHABSIM estimates changes in physical microhabitat as a function of flow, but does not directly address other elements of stream systems such as water quality and energy inputs. However, inclusion of other components of interest such as changes in channel configuration can often be accommodated. PHABSIM describes flow-dependent changes in physical components of the system and translates them into an estimate of the quality and quantity of microhabitat for aquatic organisms. Incremental changes in stream flow are used to produce relationships between simulated depth and velocity, measured channel index (e.g., substrate and cover), and microhabitat for target species and life stages. Similar relationships can be produced for broader meso-habitat conditions such as low or high gradient riffles, adequate density of woody debris, pools greater than a specified depth, etc. that can be related to communities as well as individual species of aquatic organisms.

PHABSIM is intended for use in those situations where stream flow is one a limiting factor controlling aquatic resources and field conditions are compatible with the underlying theories and assumptions of the various habitat and hydraulic models.

**The most commonly used output from PHABSIM is Weighted Usable Area (WUA). This habitat measure is a combination of physical microhabitat quantity and quality. WUA is expressed in units of microhabitat area per unitized distance along a stream (e.g., square feet per 1000 feet of stream or m2 per 1,000 m). In IFIM, microhabitat values derived from PHABSIM serve as input to an assessment of alternative stream flow management proposals leading to negotiation of flow regimes. These values may also be used in establishment of mitigation targets and for spatial niche analysis.

Future Developments
Unknown

Model Limitations
Does not address other aspects of stream systems such as Water Quality or Energy Inputs.

Model Features
- Estimates changes in microhabitat as a function of flow
- Describes flow-dependent changes in physical system components

Required Data Types
PHABSIM data collection generally requires the following steps to be completed and reported:

1. Units of measurement must be chosen (metric or U.S. customary fps).

Model Outputs
The end product of the habitat modeling in PHABSIM is the production of habitat versus discharge functions for each target species and life stage. These relationships represent the starting point for assessment of alternative flow regimes or impacts of a proposed project. In many instances additional analyses of such factors as channel

2. The selection of target discharges (usually three or more) where field data are required, as well as the selection of the best time to get high, medium, or low flow measurements.

3. Survey headpins are used to provide a stable horizontal and vertical datum for the survey area.

4. A closed-loop survey through all headpins showing elevations and distances is required.

5. A topographic survey of channel morphology (bed elevation) at each cross section (selected above), relative to the fixed cross section headpin.

6. A record of channel index parameters (substrate, and cover) at each of the points where bed elevation was taken.

7. A temporary staff gage to check fluctuations in the water surface elevations during each discharge measurement.

8. Mean column velocities measured at each survey point across each cross section.

9. Wading rod depths at each flow point.

10. Survey of water surface levels at each cross section, relative to the cross section headpin.

11. Flow changes during fieldwork periods.

12. Field notes describing the stream and in particular every cross section.

FORT recommends that at least three complete sets of water surface levels and at least a single velocity data set be collected to ensure maximum flexibility in the hydraulic model calibrations.

and riparian maintenance flows, and/or water quality and temperature modeling will be needed to assess alternate flow regimes.

Hardware Requirements
None noted

Software Requirements
None noted

Supported Platforms

DOS	☐	**UNIX**	☐
Windows	☒	**Macintosh**	☐

Cost, Licensing and Availability
Free – available from link below.

Source
US Geological Survey

Source URL
http://www.fort.usgs.gov/products/Publications/15000/preface.html