

Appendix E

Fish Entrainment Models: Instructions, Model Code, Data Sets, and Results (on CD)¹

UMR-IWW System Navigation Study Larval Fish Entrainment Mortality Model Instructions

The larval fish entrainment model was developed using Digital's Visual FORTRAN 5.0 Developer Studio. Access to and familiarity with this software greatly facilitate the use of the model. The CD includes the files necessary to execute the larval fish entrainment model used to produce the results presented in this report. All files needed to run the model are located in the directory named Models. To run the model, several directories must first be created on c:\ drive:

- 1) Create the directory: `c:\nav_study\fish_models`

Copy the following files into the above directory from the CD:

<code>gofish.exe</code>	the fish model executable file,
<code>P_cntrl.dat</code>	a control file that you edit to set up a simulation,
<code>river.dat</code>	pool volumes for low, medium, and high stages,
<code>fsh_bas.out</code>	results file for 1992 baseline impacts,
<code>fsh_scn.out</code>	results file for % increase scenarios,
<code>fsh_scn.dlt</code>	results file of incremental impacts,
<code>nav_fish.dbg</code>	general debugging information file.

¹ References cited in this Appendix are included in the References at the end of the main text.

- 2) Create the directory: `c:\nav_study\fish_data`

Copy all the fish data files into this directory from the CD.
These files contain the data described for each fish species in Appendix A.

- 3) Create the directory: `c:\nav_study\traffic`

Copy the following files into the above directory from the CD:

<code>tr_scen.dat</code>	the tows/day files for the 1992 baseline and % increase traffic scenarios for each pool,
<code>um_tchar.out</code>	mean and sd values of entrainment rate and vessel speeds per pool and month,
<code>mo_pdis.dat</code>	probability of different stage heights for UMR-IWW System pool.

- 4) Create the directory: `c:\nav_study\results`

This directory is used to store the results for each species after each model simulation.

- 5) Once the directories have been properly established and the files copied, the user should be able to execute the model from within the `c:\nav_study\fish_model` directory by entering:

`gofish` followed by a carriage return, <CR>, i.e., the “Enter” key

- 6) To run the model for a particular species, the `P_cntrl.dat` file must be edited. For each species, change the name of the data set file on line 5 (see below) and save the file.
- 7) After each model run, rename the `fish_bas.out`, `fish_scn.out`, and `fish_scn.dlt` for the species that was run. For example, rename the `fish_bas.out` to `whitecrappie_bas.out`. These files must be renamed after each model run since the results of the most recent simulation are placed into these files, replacing previous results. Move all the results files to the Results directory (easiest done in Windows Explorer or File Manager).

The following lists the `P_cntrl.dat` file that is used to set up the simulation. For purposes of this report, the user would only have the opportunity to select the fish species to be modeled or the number of pools. This example points to the fish data file for the white crappie; consult the `c:\nav_study\fish_data\` directory to learn the file names for the other species.

Control file for Nav_Fish computations
Number of pools: 31 (Range:1-37)
Debug flag: 0 (0=no debug, 1=print debug file)
File designating the fish species to be modeled
`c:\nav_study\fish_data\whitecrappie.dat`

File designating traffic input data
c:\nav_study\traffic\tr_scen.dat
File designating fleet characteristics (Q_p , V_a)
c:\nav_study\traffic\um_tchar.out
File designating pool information
c:\nav_study\fish_models\river.dat
File designating monthly discharge probabilities
c:\nav_study\traffic\mo_pdis.dat
Number of standard deviations assigned to Q_p and V_a
SD's:1.0

Note that Pool 1 identifies Upper St. Anthony's Falls, not Pool 1. Pool 37 identifies the T. J. O'Brien Pool on the Illinois Waterway. The current assessment addresses mainly UMR Pools 4-27 and the IWW La Grange Pool.

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Instructions for Reading Model Results

The CD contains the results of the model simulations for all 30 species in a directory called Results. All of the files are in ASCII format. They are best read using MS-DOS; however, they can be opened using any type of software that can open files in ASCII format. In all of the tabulated results, the mean result refers to impacts estimated using the mean entrainment rates determined from the exposure assessment; the HQLS corresponds to the higher larval mortality rates produced by vessels with high entrainment rates traveling at slower speeds; and the LQHS identifies results obtained using the combination of lower entrainment rate and higher vessel speeds. For all of the results: Dlr_v = the number of larvae entrained; Percent = the percent of total available larvae entrained; Rs*T = monthly survivorship; CEM = condition entrainment mortality for the spawning season/year; EAL = equivalent adult fish lost; Rec_Frgn = recruitment forgone, number of fish; and Prd_Frgn = production forgone in tons per year.

There are three files for each species: _bas.out, _scn.out, and _scn.dlt. The _bas.out file contains the results for the baseline traffic scenario (1992) for each month for each pool in which the species occurs, with the CEM summed over the spawning season. The _scn.out file contains the results for the 25, 50, 75, and 100 percent increase in traffic scenarios for each month for each pool in which the species occurs, with the CEM summed over the spawning season. The _scn.dlt file contains the incremental (scenario minus baseline) results for the 25, 50, 75, and 100 percent increase in traffic scenarios for each month for each pool in which the species occurs. All results are summed for the spawning season. In

addition, EAL, RF, and PF are summed for each scenario for the UMR, the IWW, and the UMR-IWW System.