



AQUAMODEL: BENTHIC AND WATER COLUMN SIMULATION MODEL FOR AQUACULTURE SITE EVALUATION, PERMITTING AND RESEARCH

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We have developed a GIS-based simulation model to visualize and quantify temporal and spatial effects of fish farms. It is the only comprehensive model currently available, providing both benthic and water column estimates. AquaModel was designed for our use to assist operators and investors who are planning farm sites and applying for permits. It is also available for government regulators who need to easily quantify effects of proposed farms.

AquaModel provides a real-time, three-dimensional simulation of the growth and metabolic activity of penned fish as well as the associated flow and transformation of nutrients, oxygen, and particulate wastes in adjacent waters and sediments. It resides within the EASy Marine Geographic Information System (www.runeasy.com), and thus all environmental information, from field measurements to satellite imagery, are readily available for model use. AquaModel consists of a description of advective and turbulent flow, a PZN description of plankton dynamics, a carbon-based description of fish growth and metabolism within the farm, and description of particulate waste sedimentation, resuspension, and transformations by the benthos. AquaModel has been applied to salmon (*Salmo salar*) and cobia (*Rachycentron canadum*) farms, and we are conducting further validation by comparing its predictions to detailed field measurements of farm operation and environmental impact. In the near future we hope to extend the capabilities of AquaModel to include real-time operations of farms through the use of feedback sensors and probes. AquaModel details at <http://netviewer.usc.edu/aquamodel/>

Figure 1. Example simulation: selected here in main, center plot is carbon deposition. On left are 4 or several dozen transect or XY plots, on right is color scale for main plot, current velocity and simulation control options. Main plot shows a rectangular pen array, surrounding SIZ, blue current vector arrow and varying amounts of carbon deposited on the bottom.

