NEFMC's Omnibus Essential Fish Habitat Amendment 2 Phase II Analysis:
The Swept Area Seabed Impact (SASI) Model

1.0 Purpose of the Swept Area Seabed Impact model (SASI)

The Swept Area Seabed Impact model (SASI), currently under development by the New England Fishery Management Council's (NEFMC) Habitat Plan Development Team, is a tool for the NEFMC to use in assessing the adverse effects of fishing on fish habitats. Upon completion, the SASI model will be used to develop and analyze management alternatives intended to minimize the effects of fishing on Essential Fish Habitat to the extent practicable. The model, and the associated management alternatives that the Habitat Committee will consider, constitute phase II of the NEFMC's Omnibus Essential Fish Habitat Amendment 2. Phase I of the Amendment updated EFH designations, reviewed non-fishing impacts to EFH, and updated prey information for species managed by the NEFMC. Looking beyond the Omnibus EFH Amendment, the SASI model is intended for use in evaluating the impacts of future fishery management actions on essential fish habitat. The model can be updated as new sources of fishing effort and habitat data become available, or as underlying model assumptions are refined based on emerging research.

2.0 Summary of the SASI model

The SASI model is an adaptive tool used to evaluate the impacts of fishing gears on fish habitats in a spatial context. SASI has three underlying components: assessment of the vulnerability of habitats to gears, a conversion of fishing effort data to contact-adjusted swept area, and a substrate and energy based spatial grid. These are combined to generate spatially specific estimates of contact- and habitat-sensitivity-adjusted area swept. **Figure 1** summarizes the model components and shows how they fit together.

2.1 Vulnerability Assessment

Structural fish habitats are divided into two major components: geological and biological, which are in turn further disaggregated into habitat features. The Vulnerability Assessment uses a matrix-based evaluation to estimate qualitative susceptibility and recovery values, ranging from 0-3, for each feature by fishing gear type. Susceptibility is a measure of the percentage by which a feature is reduced in functional value due to the impact of a particular fishing gear. Recovery is a measure of the amount of time it would take for the functional value of the diminished habitat feature to be restored following the cessation of impact. Recovery is evaluated separately for high and low energy environments. Susceptibility and recovery values are assigned based on knowledge of the fishing gears and the habitat features, and informed by the scientific literature on gear impacts to the extent possible.

2.2 Fishing effort estimation

Fishing effort data is divided into major gear types, which include generic/groundfish trawls, shrimp trawls, squid trawls, raised footrope trawls, New Bedford-style scallop dredges, surf clam and ocean quahog hydraulic dredges, lobster and deep-sea red crab traps, bottom gill nets, and bottom longlines. These gear types are commonly used in areas designated as EFH for NEFMC-managed species. Fishing effort data is represented universally as area swept, and scaled based on a particular gear's contact with the seabed to obtain contact-adjusted area swept. Effort data is compiled from various fishery-dependent sources including observer, vessel trip report, and vessel monitoring system.

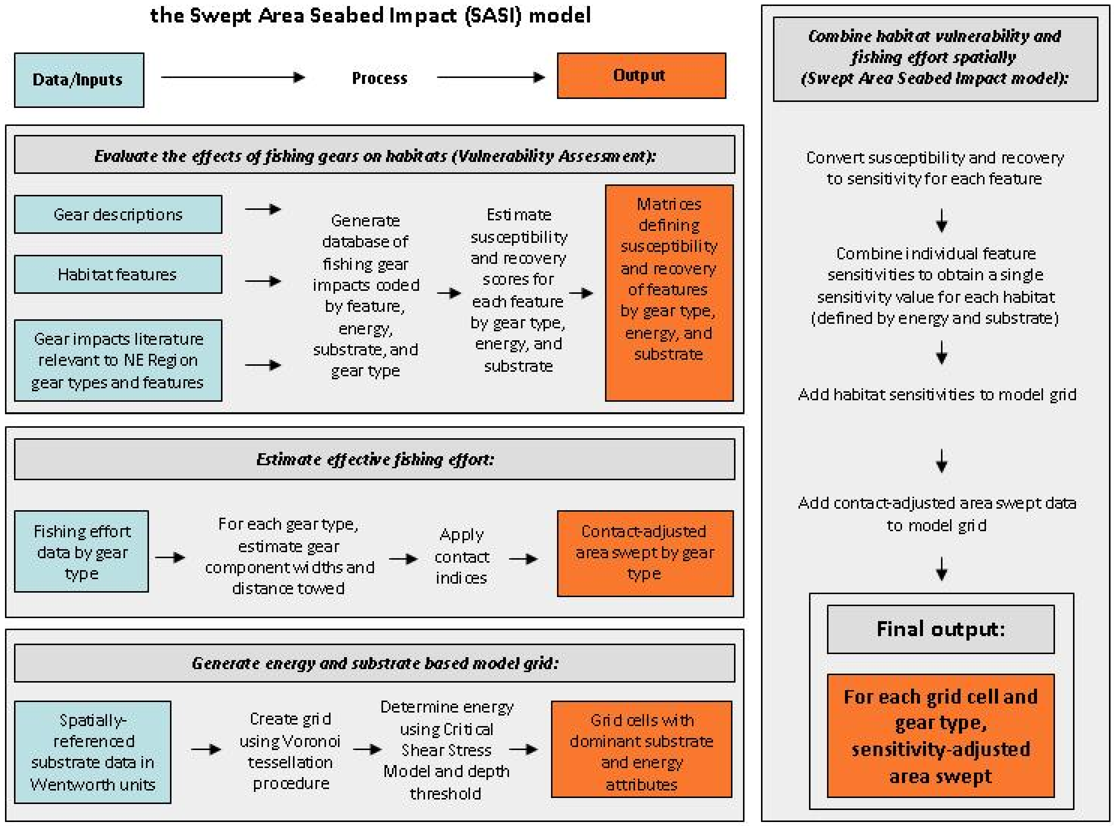
2.3 Model grid

Three sources of substrate data are used to generate a dominant-seafloor-substrate base grid on which to combine fishing effort data with habitat vulnerability, or sensitivity, which is a combination susceptibility and recovery. The grid is composed of cells of varying sizes and shapes based on the density of substrate data available throughout the region. Grid cells are classified as high or low energy using a combination of critical shear stress and depth.

2.4 Combination of components in SASI model

Finally, the SASI Model combines contact-adjusted area swept and habitat vulnerability with the spatial grid. Susceptibility and recovery scores from the Vulnerability Assessment (each ranging from 0-3) are combined using a functional relationship to generate a single sensitivity coefficient for each feature (ranging from 0-1). These individual feature sensitivities are then combined to produce a single sensitivity coefficient for a particular fishing gear/substrate/energy combination. Sensitivity coefficients are then applied to the appropriate type of fishing effort by spatial grid cell to obtain a sensitivity-adjusted area swept.

Figure 1 –SASI model flowchart



3.0 Applications and adaptability of the SASI model

These sensitivity-adjusted area swept values can be presented by individual gear type or for a combination of gear types, for example to represent a fishery. Effort data over time may be compared, and the FiGSI model can be integrated with other spatially specified projection models to forecast changes in sensitivity-adjusted area swept resulting from proposed regulations. Because SASI is disaggregated and quantitative, new information is easily integrated. For example, the contact coefficients for various gear components can be modified to model new gear designs, or to understand how assumptions about the contact indices affect area swept. Susceptibility and recovery values of various habitat features can be modified given a better understanding of how various gears interact with the seabed, or if new information about recovery times becomes available in the scientific literature.