ENV Report 16 - ***Ecological risk assessment of the effects of the incremental increases of commercial navigation traffic on larval fish entrainment*** by Steve Bartell and Kym Rouse-Campbell

ABSTRACT

This report describes the implementation of ecological models used to estimate larval fish mortality resulting from entrainment by commercial vessels operating on the Upper Mississippi River and Illinois Waterway (UMR-IW) System. The models were used to assess impacts of the average numbers of commercial vessels per day for each navigation pool based on 1992 data. Assessments were performed for alternative traffic scenarios that were developed as 25, 50, 75, and 100% increases over the 1992 data. Entrainment rates (m^3/s) were estimated for 108 different configurations of commercial vessels. Each configuration included the size, speed, direction, load, and presence of Kort nozzle technology. The relative frequency of each configuration was determined from the 1992 lockage records for each pool and month. This information was used to estimate the volume of water entrained per pool during the spawning months for 30 species of fish on the UMR-IW System. Entrainment mortality for each species was modeled in relation to the amount of water entrained by commercial vessels during the months of spawning, the corresponding monthly larval densities, the relative distribution of larvae in relation to the navigation channel, and the sensitivity of larvae to entrainment. Estimates of entrainment mortality were extrapolated to (1) losses of future adult fishes, (2) the number of fish that would not recruit to the recreational and commercial fisheries, and (3) losses in the future production of fish biomass. These extrapolations were made using models previously applied in fisheries impact assessments and included the Equivalent Adults Lost model, the Recruitment Forgone model, and the Production Forgone model. Model parameter values were developed for each model and species addressed in the assessment. The larval entrainment mortality estimates were reported as the incremental impacts of each traffic scenario compared to the 1992 baseline impacts.