



A Screening Level Ecorisk Assessment for Using Former Navy Vessels to Construct Artificial Reefs

FINAL REPORT

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Photo by SCDNR

ABSTRACT

Inactive U.S. Navy vessels would make excellent artificial reefs in U.S. coastal waters if preliminary data suggesting that they pose no threat to human health or the environment from contamination can be confirmed. A screening-level ecorisk assessment was conducted on data from artificial reefs located off the coast of South Carolina to assess the potential risk of sunken Navy vessels. Contaminants can enter the system from releases from the sunken vessel and inputs from coastal waters. Through transport, uptake, and bioaccumulation, the released chemicals may be present in water, sediment, and biota associated with the reef. The assessment endpoints for this study were the reef community and organisms that may frequent and forage on the reef. Primary exposure can occur to the reef community, which is composed of demersal fishes, epibenthic and benthic invertebrates, and primary producers and zooplankton. Indirect exposure can occur through bioaccumulation in the food chain to avian omnivores, avian piscivores, and marine mammals (food chain receptors). Benchmarks were developed for water exposure, sediment exposure, tissue residues, and dietary uptake for the food chain receptors. Estimates of exposure associated with (i) ex-Navy vessel reefs were compared to estimates of exposure associated with (ii) other artificial reefs, (iii) natural reefs, and (iv) regional background and compared to the appropriate ecological effects benchmarks.

The data used in the assessment included PCBs and metals measured in fish and invertebrate tissues collected from artificial reefs off the coast of South Carolina; PCBs measured in fish tissues collected from an ex-Navy ship reef (ex-VERMILLION LKA-190) and a reference reef; metals, PCBs, and PAHs measured in sediments from a deep water sunken vessel (ex-AGERHOLM DD 826); and data developed from laboratory leaching experiments on solid materials containing PCBs that could possibly be on ex-Navy warships. Background data for the ecorisk screening was obtained from the Environmental Monitoring and Assessment Program (EMAP) EMAP-Estuaries conducted for the Carolinian Province. The conclusions were based on evidence of potential ecological harm, comparison to reference and background levels, and the reliability of the data. The risk of sediment exposure was negligible for PCBs, PAHs, Cr, Hg, and Pb; low for Ag and Zn; medium for Cd and Cu; and adverse for Ni. Because the sediment benchmarks for Ni are overprotective (Long et al. 1995), the finding of adverse exposure for Ni may be overly conservative. Tissue residue data showed that exposure to PCBs, Pb, and Cd in tissues of fish and PCBs and Pb in invertebrates were higher in samples from Navy ship reefs than reference reefs, but most of the residue data were below conservative effects levels for the reef community suggesting that there was negligible to low risk of exposure to demersal fish and reef invertebrates. For food chain receptors most data for contaminant concentrations in prey were below dietary benchmarks suggesting that there was low risk of exposure to dolphins and fish eating birds, and negligible risk of exposure to diving birds. The data reliability for the sediment screening was good, but there was a fair amount of uncertainty associated with extrapolating from the deep-water reef. There was high confidence of negligible to low exposure to PCBs because supplemental fish sampling and analysis for PCBs was conducted for the assessment. Owing to limited data available for screening, the confidence in the conclusions for the other chemicals of concern was low. Based on the finding of negligible to low ecological risk of exposure to PCBs, creating artificial reefs with former Navy vessels containing PCBs in solid materials will not pose an unacceptable risk to the environment. [Read the full report](#)