Restoration of ecosystem services provided by seagrass habitats in estuaries requires a clear understanding of the modes of action of multiple interacting stressors including nutrients, climate change, coastal land-use change, and habitat modification. We have developed a geospatial modeling approach for predicting potential seagrass habitat; those results are demonstrated in a pilot project for Narragansett Bay, R.I. Variables tested in the predictive seagrass habitat model included: Secchi depth, wave mixing depth and relative wave energy, sediment particle size and organic carbon content, unsewered coastal development on high infiltration soils, density of Canada geese (potential grazers), and distance to marinas and hardened shorelines. We developed and compared two approaches to account for spatial autocorrelation in predictive models. First, a spatial coordinate system relevant to seagrass establishment and spread was established based on distance along the shoreline and the distance from shore. Spatial autocorrelation was built into models using either zonal averaging of residual autocorrelation terms or regression kriging. Scales of spatial autocorrelation in along-shore and off-shore directions were evaluated with spline correlograms. Prediction of seagrass absolute or average presence/absence at shoreline locations was very robust, with area-under-the-curve (AUC) values associated with receiver operator characteristic (ROC) curves of 0.95 – 0.98 following 10-fold cross-validation of models. The most influential predictor is sediment type, followed by sediment percent total organic carbon (at low Secchi depth), then salinity (as a proxy for gradients in water column total nitrogen). For all shorelines combined, our model predicts that following a 40% reduction in total Nitrogen (TN) loads (and concentration) the colonized area would increase from 12% of area in the 0 to 5 meter depth zone to about 63% of area in the short term and slightly more in the long term (as sediment organic carbon recovers). The modeling approach is being published as an EPA report with example R codes for mixed effects models and a tutorial on how to download relevant data for modeling other estuarine systems using EPA's Estuary Data Mapper application (www.epa.gov/edm).