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A Tidal Inundation Model of Shallow-water Availability (TiMSA)

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Wading birds are restricted to forage in shallow water because of their leg-length constraint, making them sensitive to small changes in water depth. In coastal systems this sensitivity is pronounced because tidal fluctuations control both the spatial and temporal extent of available foraging habitat. An understanding of tidal dynamics is thus required to assess any potential risk (e.g. sea-level rise) to species relying on the inter-tidal zone for survival. To help make these assessments, we developed a Tidal Inundation Model of Shallow-water Availability (TiMSA). We evaluated the model's ability to predict available foraging habitat using locations of foraging Little Blue Herons, Egretta caerulea, (N=125) observed during 14 surveys (Dec 2010 - Jul 2011). We then compared the predictions obtained from the TiMSA to those obtained using a static map of multi-annual water depths estimated at Mean Low Lower Water (MLLW), which is a commonly used method for estimating low-tide habitat. The TiMSA correctly predicted 92% of foraging locations as actual foraging habitat, while the MLLW maps provided similar results (95.2%). The usefulness of MLLW maps for predictions declines rapidly as water levels rise and fall. This is when the TiMSA provides clear advantages with its ability to provide estimates in both space and time. The temporal flexibility of the TiMSA (within tides, days and years) makes it useful for addressing short- and long-term stressors to multiple species relying on the inter-tidal zone. Continuing research now involves applying the TiMSA to wading bird foraging ecology in the Florida Keys.