Goddard Space Flight Center

Maryland Ecological Forecasting

Troubles among Turtles: Monitoring Maryland's Sea Turtles Using EOS

>>>DEVELOP intro

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[ocean sounds playing]

>> KIERSTEN: Loggerhead sea turtles are listed as threatened on the U.S. Endangered Species list. Loggerheads are distributed worldwide including our study area, the Chesapeake Bay and Atlantic Coast of Maryland. Loggerheads are prevalent here during the summer for foraging And occasional nesting.

Since 1991, there have been over 450 loggerhead strandings in our study region. The cause of these strandings include boat strikes, fishing equipment, or are otherwise unknown. The Maryland Department of Natural Resources wants to improve loggerhead survivorship through and nesting investigations. Our team, Chris Long, Erica Scaduto, and Kiersten Newtoff, researched relationships between stranding occurrences and oceanic variables and identified future suitable nesting sites using climatic models.

[pause]

>> ERICA: To better understand loggerhead strandings, 8-day composites of chlorophyll-a and sea surface temperatures were obtained from Earth Observation Satellites prior to each stranding date. Data acquisition, processing, and analysis were all automated using Python scripts. Values were then averaged within a 5 km region, representing the greatest likelihood of the point of death. As seen in the graph, there are apparent regional differences. For example, since 2008, sea turtles have been exposed to higher levels of chlorophyll-a particularly in the Chesapeake Bay. Finally, the Pearson’s Correlation Coefficients were calculated, revealing a strong, positive relationship between annual strandings and sea surface temperatures. These values were then used to create a risk map identifying potential areas of concern.

[pause]

>> KIERSTEN: Although loggerhead nesting is rare in Maryland, we investigated how climate change would shift large nesting events northward. We used the NCAR CCSM3 to forecast surface temperature until the year 2099 under four scenarios. The Commit scenario assumes constant emissions since the year 2000. The other scenarios assume low, medium, and high future emissions. We looked at the 2015 monthly temperature during the loggerhead breeding season at their current nesting sites. In May and June, only the highest emissions scenario increases Maryland’s temperatures to support nesting around 2070. Loggerheads nest most in July, in which most scenarios reach current breeding temperatures starting in 2040. The trend is similar in August, but reaching temperatures as early as 2030.

[pause]

>> CHRIS: Since climate change may cause a northward shift in their breeding range, we set out to identify suitable Loggerhead nesting habitat along Maryland’s coast. Loggerheads require terrestrial habitat for nesting, selecting beaches and sites upon on many factors. We selected four of these factors to create a general model of suitability. We used a LiDAR-derived DEM, satellite imagery, and road layers to identify areas and extents of potential nesting locations. We found that there are currently 5.4 square kilometers of highly suitable nesting habitat, mostly along Assateague Island. These areas are reduced by projected sea level rise, with a one and two meter rise resulting in five and ten percent loss, respectively. We identified several regions of highly suitable habitat that have lower risks of flooding from sea level rise; areas such as these should serve as the basis for future turtle conservation efforts in Maryland.

[pause]

>> ERICA: In conclusion, the Maryland Department of Natural Resources can use the stranding correlations to better understand the factors affecting sea turtle strandings, particularly sea surface temperature. The warm temperature itself may not be causing stress, but warmer temperatures provide great conditions for many bacteria, fungi, and viruses and may signal prey to leave typical loggerhead foraging grounds. Small increases in loggerhead nesting along Maryland’s Atlantic Coast have already been seen, and we can expect many more nests in the wake of climate change, particularly in July and August. Based upon calculations of sea level rise in the future, we identified the most suitable nesting sites to be conserved by our end-users.

>>>Credits

>>>DEVELOP outro