Saving Shorebirds:
Identifying important shorebird areas with remote sensing

BACKGROUND

Every year, millions of shorebirds in the Western Hemisphere migrate between their breeding and wintering grounds in search of ephemeral resources. Most North American shorebirds have complex life cycles requiring various habitat types across their breeding grounds, wintering grounds, and stopover sites during migration. This renders them particularly sensitive to human-induced development, habitat destruction and climate change, which has resulted in massive population declines since the early 20th century. The Western Hemisphere Shorebird Reserve Network (WHSRN) was founded in the 1970's with the goal of conserving shorebirds, and since its foundation has protected 105 important shorebird sites throughout North and South America. Despite these efforts, populations of many shorebird species continue to decline, highlighting the need to prioritize and protect additional important shorebird sites. However, acquiring accurate shorebird count data throughout all potential sites in the Western Hemisphere is not currently feasible, and remote sensing could serve as a useful alternative.

Spatial questions:

1) Using existing WHSRN sites as an input, is it possible to use Maximum Likelihood Classification to identify important shorebird areas outside of existing sites?

2) Do other existing WHSRN sites overlap with important areas identified by the Maximum Likelihood Classifier output?

METHODS

1. Selecting the study area

Choose an area with multiple existing WHSRN sites over a small geographical range = coast of TX and LA.

2. Building the study area

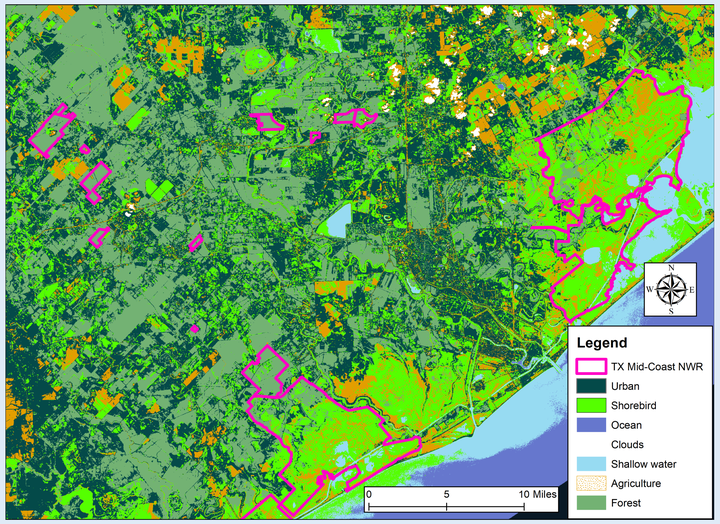
Download Landsat 8 scenes (106x115 mi). Choose band sequence to create composite rasters (band 1: coastal features; band 3: peak vegetation; band 5: biomass) and create a mosaic.

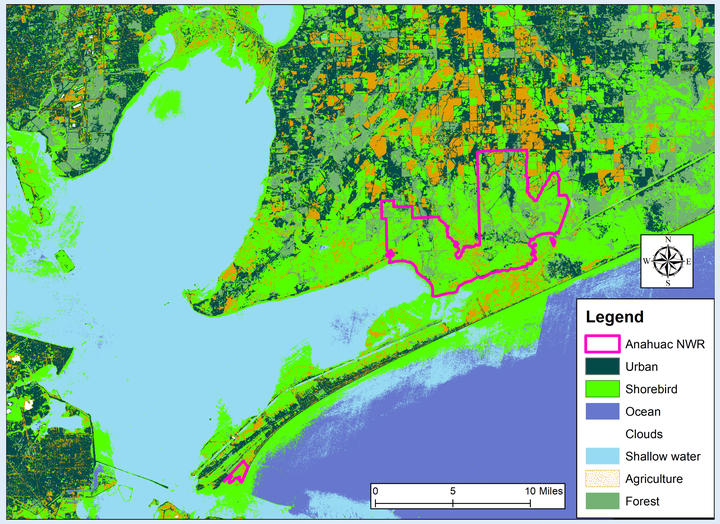
3. Training the classifier

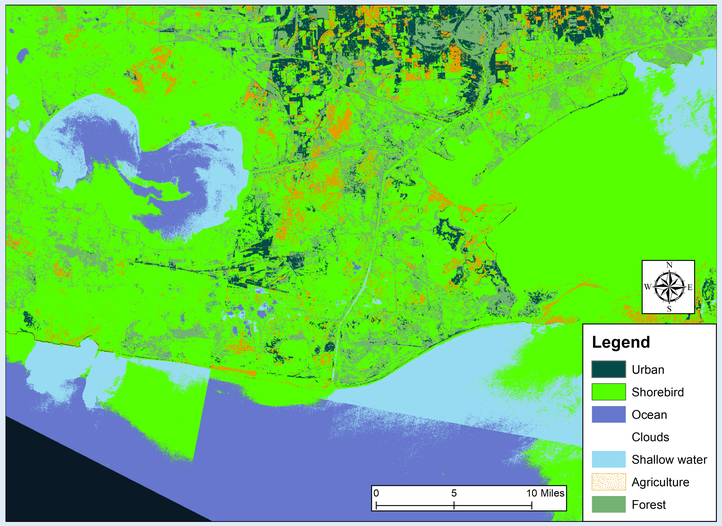
Use multi-zoned WHSRN site (Texas Mid-Coast NWR Complex) as training input for shorebird class. Choose samples from map for other land types (e.g. Urban, Ocean, Agriculture, etc.). Create training file.

4. Executing the classifier

Run Maximum Likelihood Classification on mosaic using training file as input.







RESULTS & CONCLUSIONS

Shorebird habitat was the predominate land type in the Anahuac NWR/Bolivar Flats and Texas Mid-Coast NWR Complex, but not in the South Texas Salt Lakes (Fig. 1). Agriculture was the predominate land type for the South Texas Salt Lakes site, but that may not necessarily indicate that the classifier was inaccurate in this area, especially because some shorebirds use flooded agricultural fields. Along the Louisiana coastline (no existing WHSRN sites), nearly the entire coastline was classified as suitable shorebird habitat, meaning the classifier likely lacked sufficient training information in this area. The entire classification analysis conducted in this study is contingent on a) the reflectance values portrayed in each of the original band rasters, and b) the amount of training information inputted into the Maximum Likelihood Classifier. The fact that important shorebird habitat is inherently complex and diverse further complicates our interpretation of the classification output, especially since some species of shorebird require both coastline and fields in their life cycle!

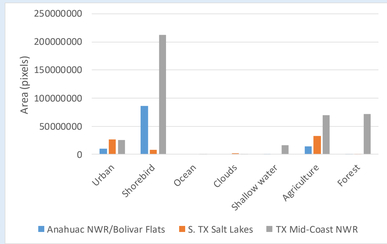
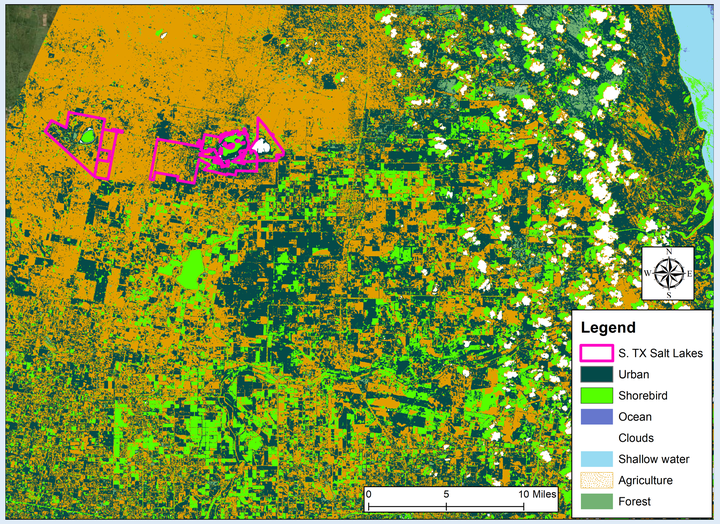


Figure 1. Number of pixels of each classified land type in each of the three existing WHSRN sites.



MAP GUIDE

Top: training area containing the TX Mid-Coast NWR Complex WHSRN site (pink outline). Other landscape feature samples also taken from this area.

Left: classification results around Anahuac NWR/Bolivar Flats WHRSN sites (pink outline), NE of training area.

Right: classification results around South Texas Salt Lakes WHSRN site (pink outline), SW of training area.

Bottom: classification results around W. Louisiana coastline (no WHSRN sites).

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Data sources: EarthExplorer (USGS),
Western Hemisphere Shorebird Reserve Network (WHSRN)

Scale: 1:200,000

Projection: WGS_1984_Albers