Spatiotemporal water availability during peak spring shorebird migration along the Pacific Flyway: a case study at Owens Lake, CA

Danica Schaffer-Smith*, Jennifer J. Swenson*, Matthew E. Reiter†
*Nicholas School of the Environment, †Point Blue Conservation Science, Contact: djs50@duke.edu

Pacific Flyway migration:
Shorebirds use a network of wetland stopovers to rest and feed as they journey along the Pacific Flyway, which stretches from Alaska to Patagonia. Over half of Western Hemisphere shorebird species are in decline, generally due to habitat loss. A better understanding of water availability at inland stopovers is critical for managing shorebirds and their habitat in the face of climate change.

Questions:
• What has been the extent and variability of inundation at inland stopover sites in California during Spring migration?
• Is there a core network of consistently available habitat?
• What explains the persistence of water at reliable stopovers?
• Do water extent and variability predict shorebird use?

Methods:
We tested five approaches to map inundation at Owens Lake during the peak of spring migration from Landsat Climate Data Record images:
• Modified normalized differential water index (MNDWI)‡
• Automated water extraction index (AWEI)§
• Unsupervised classification with the ISODATA algorithm
• Maximum likelihood
• Random forest.

Accuracy was assessed in wet (April 2005) and dry (April 2011) spring conditions using ASTER images. We then used the MNDWI to map inundation extent and variability in April from 1985-2011. Due to high cloud cover, we excluded 1990, 1992, 2002, and 2004 images.

Preliminary results:
• The MNDWI performed the most consistently in wet and dry conditions (Fig. 1).
• Inundation area (based on MNDWI) increased over time, largely due to the implementation of dust control beginning in 2001 (Fig. 2).
• The brine pool is the most consistently inundated area, however the pool has become drier over time (Fig. 3).

Figure 1.
Figure 2.
Figure 3.
Figure 4.

Future steps:
Future research (Fig. 4) will:
• Evaluate change vector analysis‡ to detect subtle changes in moisture.
• Analyze Sacramento Valley and Salton Sea stopovers.
• Map habitat distribution using LiDAR and water depth.
• Analyze the factors that explain patterns of habitat availability and shorebird use.

References:

Acknowledgements: