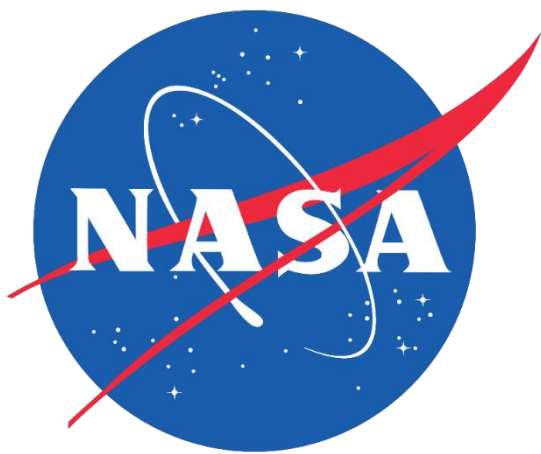


Cape Hatteras Ecological Conservation II



Defining Methodology for Shoreline Delineation Using SAR and Optical Imagery to Inform Conservation Decision Making

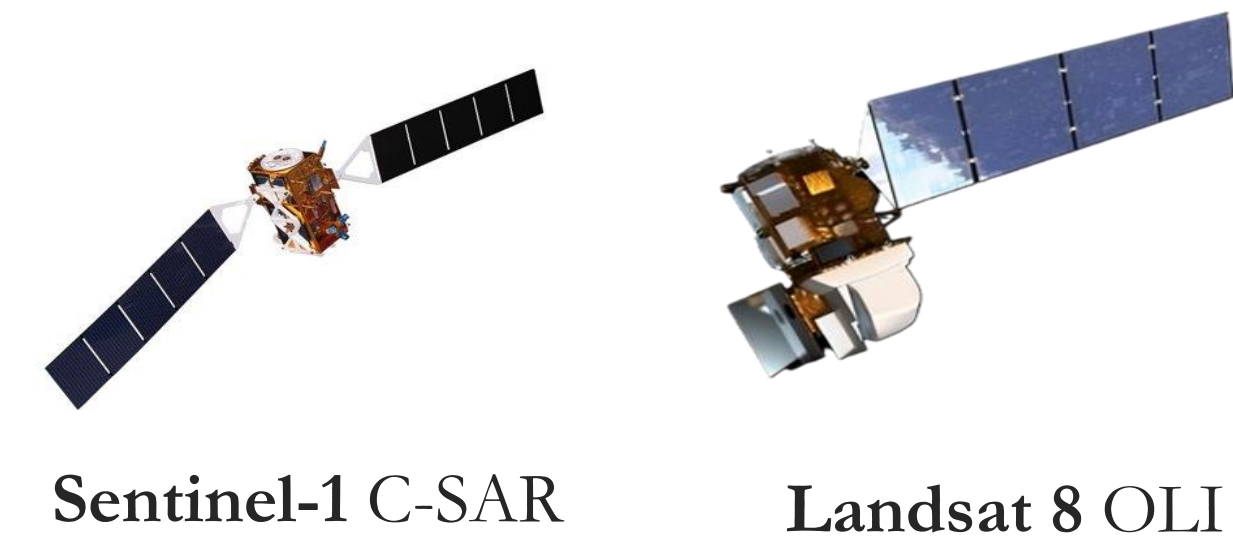
Project Synopsis

This project aimed to provide the National Park Service (NPS) at Cape Hatteras National Seashore with an accurate and replicable methodology for shoreline delineation. Currently, the NPS is unable to map shorelines regularly and only with time- and labor- intensive methods. We used Sentinel-1 C-band Synthetic Aperture Radar (SAR) and Landsat 8 Operational Land Imager (OLI) imagery to extract shorelines and validated the method by running the output shoreline and a reference shoreline provided by NPS through a confusion matrix. By defining a simplified methodology, the NPS officials can perform future analysis and make informed decisions regarding conservation, mitigation, and restorative efforts, as there are many areas that serve as recreational sites for visitors and prime nesting sites for endangered species such as sea turtles and nesting shorebirds.

Objectives

- **Develop** a replicable method for shoreline delineation on both the sea- and estuarine- shores of the Outer Banks
- **Analyze** the accuracy of our methodology using a confusion matrix
- **Assist** the NPS conservation initiatives by providing a method of shoreline delineation for future analysis of coastal vulnerability to inform decision-making

Earth Observations



Project Partner



Study Area

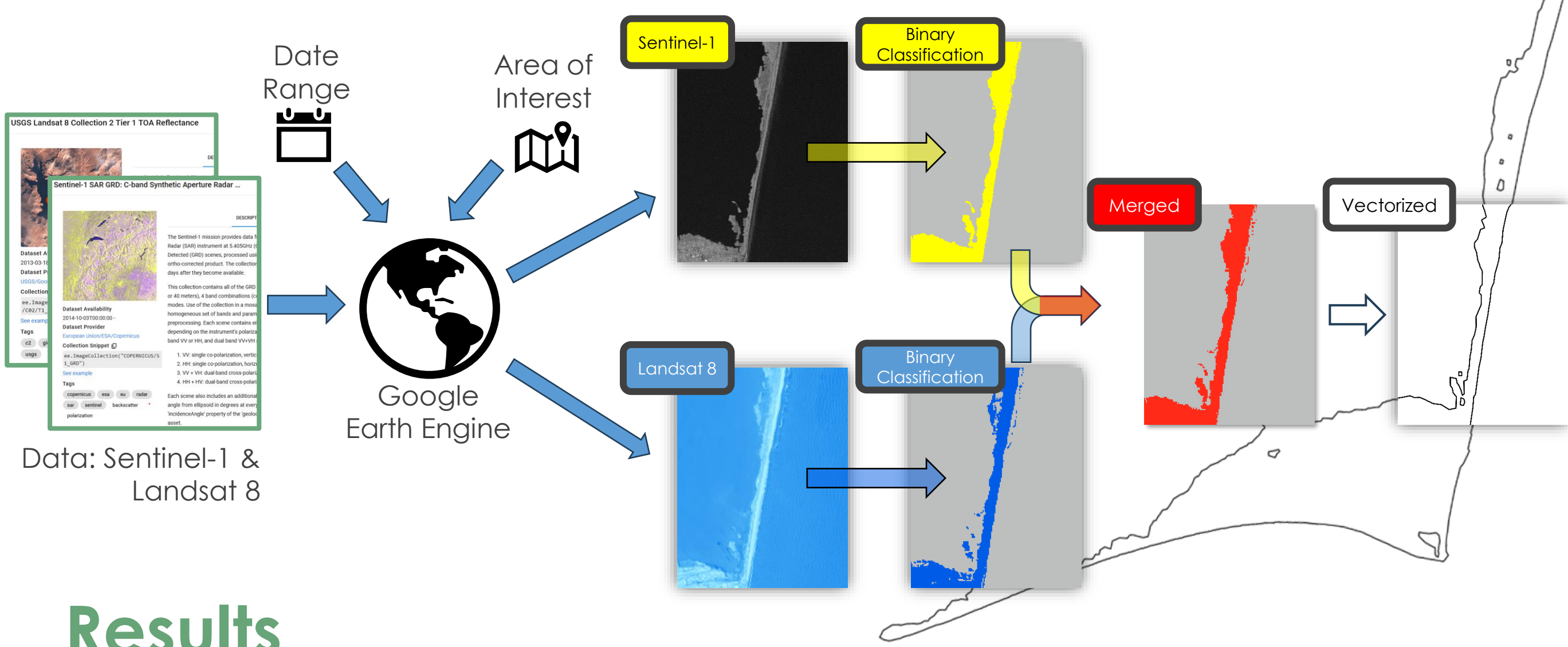


The above map depicts the original areas of interest designated by NPS. As the project progressed, we extended the focal area to create a methodology that captured the entire Cape Hatteras National Seashore.

Acknowledgements

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Olivia Landry | NASA DEVELOP Lead, Virginia – Langley
Dr. Kenton Ross | NASA DEVELOP Program Manager
Dr. Xia Cai | NASA DEVELOP Lead Science Advisor
Cape Hatteras Ecological Conservation Term I: **Ella Haugen, Alyson Bergamini, and Julian Alcantara.**

Methodology



Results



The above map depicts the delineated shorelines created with our proposed methodology.

User Accuracy	0.677083
Percent Accuracy	0.796053
Kappa	0.607071

The percent accuracy is approximately 80%, deeming our methodology statistically valid with a known bias.

Conclusions

- Using SAR alone for shoreline delineation at Cape Hatteras was infeasible for several reasons: In particular with SAR, the smooth texture of the Outer Banks’ sandy beaches is not a suitable texture to recognize sand as land. However, combining SAR data and optical data creates an accurate method of delineating shorelines.
- Creating an accurate methodology to delineate shorelines for NPS officials to monitor shoreline change over time is an improvement from their current methods of shoreline data collection and could be applied to other National Parks with similar topography.

Team Members



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Virginia – Langley | Summer 2024



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