# Evaluating the Atmosphere–Land Exchange Inverse Evaporative Stress Index for the Alaskan Environment to Determine Wildfire Likelihood

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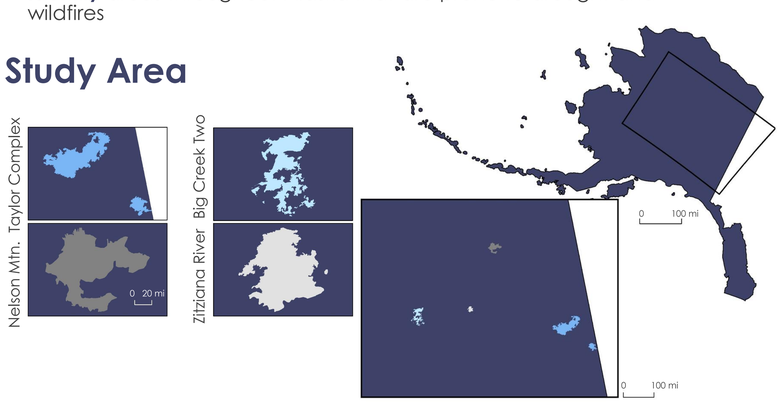
## Overview

Alaska's wildfire season has progressively increased in duration and intensity over the last decade, leaving forested areas subject to devastating destruction. These increases in wildfire occurrence are due to gradual rises in land surface temperature, decreases in precipitation levels, and lack of soil moisture throughout the state. This causes concerns for air pollution as well as the destruction of homes and wildlife habitats within or around forests. The Alaska Disasters project team used remotely sensed data obtained from Aqua Moderate Resolution Imaging Spectroradiometer (MODIS), Terra MODIS, Suomi National Polar-orbiting Partnership (NPP) Visible Infrared Imaging Radiometer Suite (VIIRS), and National Oceanic and Atmospheric Administration-20 (NOAA-20) VIIRS from April through September of 2004, 2005, 2015, and 2018 to observe vegetation and moisture changes in affected areas before and after wildfires.

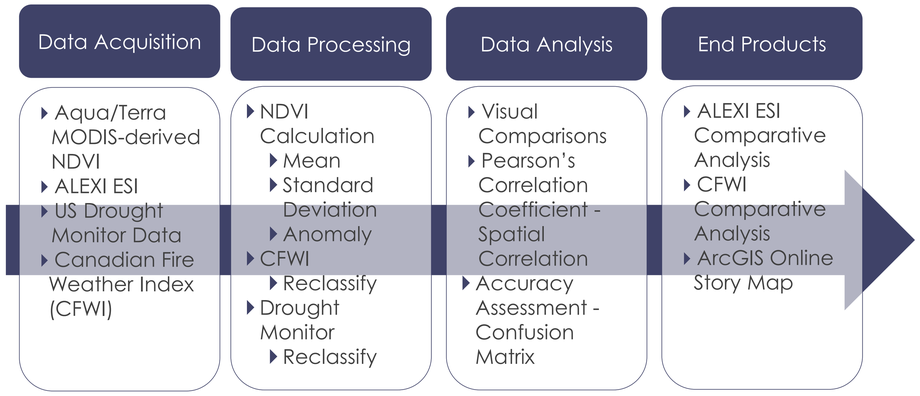
## Objectives

- **Utilize** MODIS and VIIRS sensors to introduce improved methods of evaluating vegetation stress and determining wildfire likelihood in Alaska
- **Evaluate** the Atmosphere-Land Exchange Inverse(ALEXI) Evaporative Stress Index (ESI) product and determine if it provides lead time over other drought indices when applied to the Alaskan environment
- **Identify** areas throughout Alaska that are prone to drought and wildfires

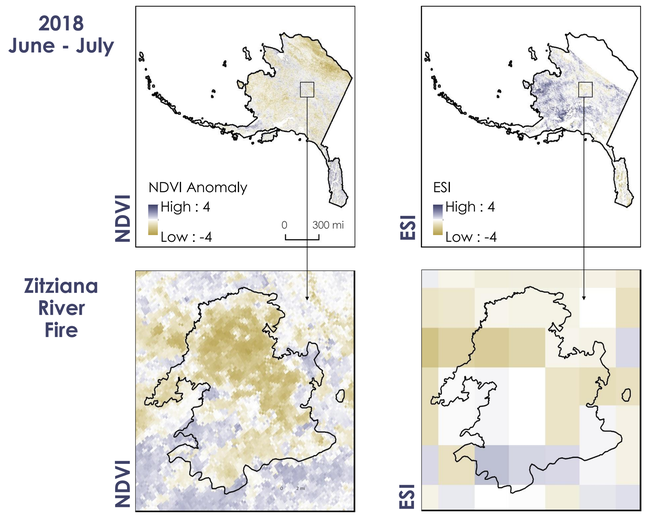
## Study Area

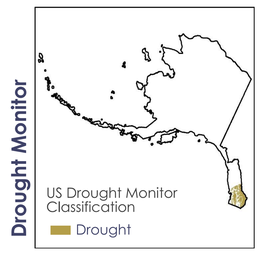



## Methodology

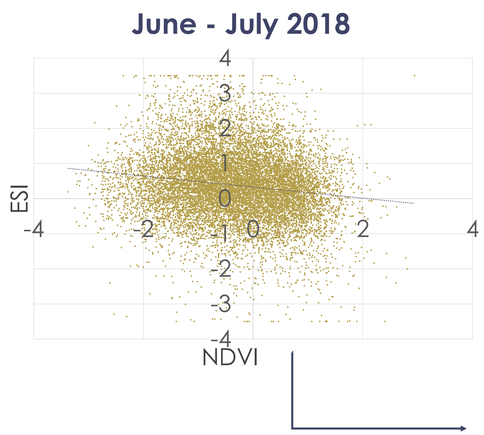



## Results – Visual Comparison




## Results – Spatial Correlation




Quantitative analysis displaying the relation between the ALEXI ESI and NDVI Anomaly

| Pearson's Correlation | |
|---|---|
| R | $R^2$ |
| -0.153 | 0.023 |

## Results – Accuracy Assessment

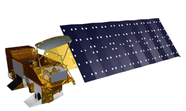
| | Overall Accuracy | Producer's Accuracy | User's Accuracy |
|---|---|---|---|
| 2004 | 0.9540 | 0.9540 | 1 |
| 2015 | 0.7524 | 0.7528 | 0.999 |
| 2018 | 0.6123 | 0.6128 | 0.998 |

An accuracy assessment to determine the ALEXI ESI accuracy against the USDA Drought Monitor Classifications

## Conclusions

The ALEXI ESI had a low correlation to the MODIS-derived NDVI products, which demonstrates that the ALEXI ESI product may be detecting stress in green vegetation, providing increased lead time in wildfire detection. The ALEXI ESI had an overall accuracy of 61% when compared to the USDA Drought Monitor drought classification areas during June and July of 2018, showing that in the areas classified as drought with the US Drought Monitor, the ALEXI ESI mostly agreed. Future work would incorporate the abnormally dry classification areas and recalculate the accuracy assessment to identify if this corresponds better with the ALEXI ESI data, incorporate lightning data to further analyze the occurrence and spread of wildfires, and identify various vegetation indices that could be compared to the ALEXI ESI product.

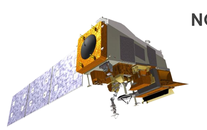
## Earth Observations



**Aqua MODIS**
- Land surface temperature
- Green vegetation cover
- Land cover

**Suomi NPP VIIRS**
- Land surface temperature

**Terra MODIS**
- Land surface temperature
- Green vegetation cover



**NOAA-20 VIIRS**
- Land surface temperature

## Acknowledgements

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## About DEVELOP

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**Questions?**
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