Mapping Treeline Rise and Wetland Conversion to Supplement Resource Management Actions in a Changing Alaskan Climate

Abstract
Rising temperatures alter growing conditions for vegetation that result in changes to habitat distribution and abundance. In Alaska, these ecological changes present challenges to land managers planning to accommodate species of interest such as Dall’s sheep and ptarmigan. NASA DEVELOP partnered with the Kenai National Wildlife Refuge (KENWR) to identify areas of wetland afforestation and treeline rise on the Kenai Peninsula from 1989 to 2016 and to forecast these trends into 2050 and 2100. The DEVELOP team generated historical land cover classification maps for the Kenai Peninsula from Earth observations acquired by Landsat 4 Thematic Mapper and Landsat 8 Operational Land Imager. We performed supervised classification of the Landsat imagery by training a maximum likelihood image classifier. We selected training areas for the classifier by referencing the USGS National Land Cover Database for 2001 and 2011 along with visual verification. We then analyzed the historical land cover maps to identify areas of wetland conversion and treeline rise. The team then created forecast maps of these trends to 2050 and 2100 using TerrSet Land Change Modeler (LCM) which can provide KENWR staff with a better understanding of how rates of afforestation vary across the landscape and inform future land management strategies.

Objectives
- Produce land cover time series maps to observe treeline movement and conversion of wetland ecosystems from 1989 to 2016
- Map areas where woody plants have encroached into alpine and wetland ecosystems
- Visualize historic rate of treeline advance and wetland afforestation
- Forecast wetland loss and treeline rise to 2050 and 2100

Study Area

Earth Observations

Team Members

Acknowledgements
Dr. John Bolten, NASA Goddard Space Flight Center
Dr. Adrianna Foster, Universities Space Research Association
Dr. Keith Gaddis, NASA
Dr. Dawn Magness, US Fish and Wildlife Service
Sean McCartney, Science Systems & Applications, Inc
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Methodology

Results

Conclusions
- Wildfires that occurred prior to, and during, the study period were responsible for the largest areas of land cover conversion on the Kenai Peninsulas.
- Wetland afforestation was most apparent in the northern lowlands of the Kenai Peninsula.
- Limited treeline rise was observed despite the slow pace of advance (~1 m/yr) relative to the spatial resolution of the data (30 m/pixel).
- If warming trends follow current patterns, afforestation will likely continue to 2050 and 2100.