



Remote Sensing in Support of the National Park Service



Parker Martyn

Regional Inventory Program Mgr.
NPS Inventory & Monitoring Program

SMAP/ICESat-2 Joint Mission Applications Tutorial
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“...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” - “National Park Service Organic Act “ - 1916





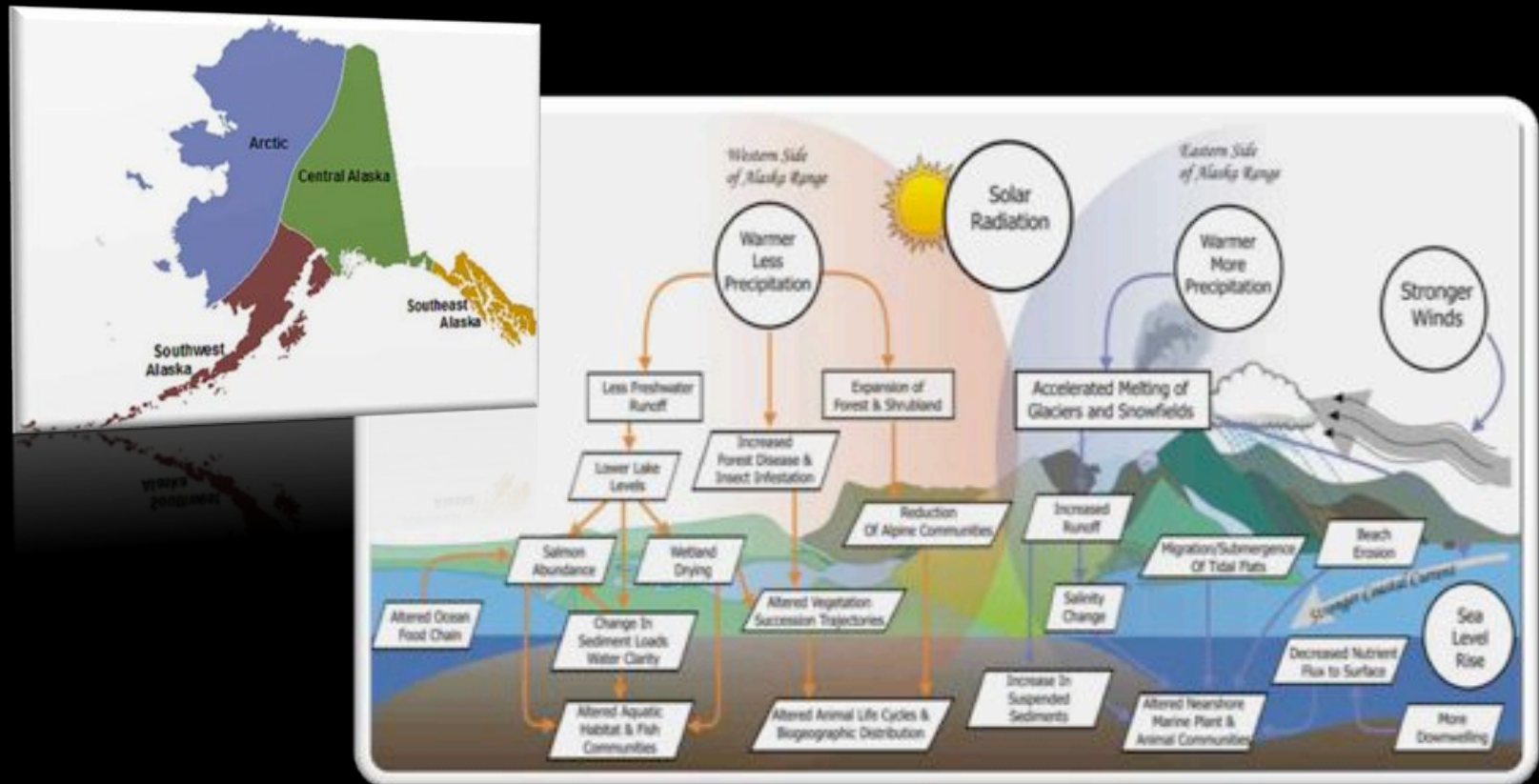
NPS Parks In Alaska





Using Science to Protect our Parks:

“... to improve park management through the greater reliance on scientific knowledge, the Inventory and Monitoring (I&M) Program collects, organizes, analyzes, and synthesizes natural resource data and information, and provides the results in a variety of useful formats.”





Inventories identify the resources we manage...

- Bibliography
- Water quality
- Water quantity
- Air quality
- Climate
- Species occurrence
- Species distribution and abundance
- Geology
- Base Cartography
- Vegetation
- Soils

Three Regional Inventories for Alaska's National Parks

National Park Service
Alaska Region Inventory and Monitoring



Landcover (Vegetation)



Soils



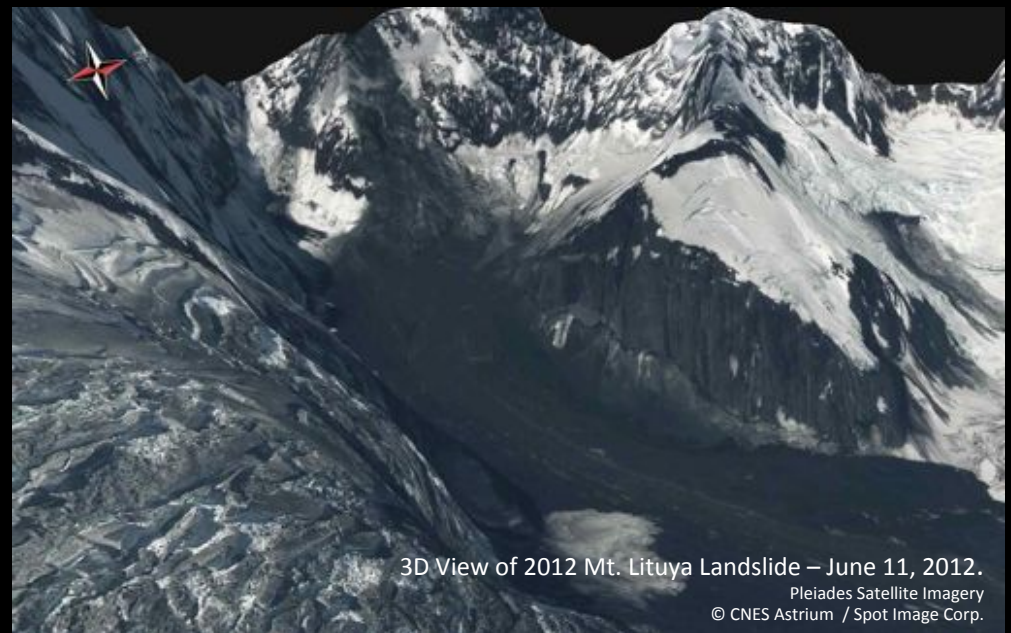
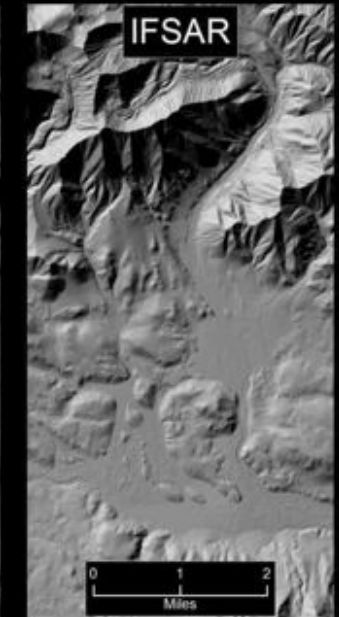
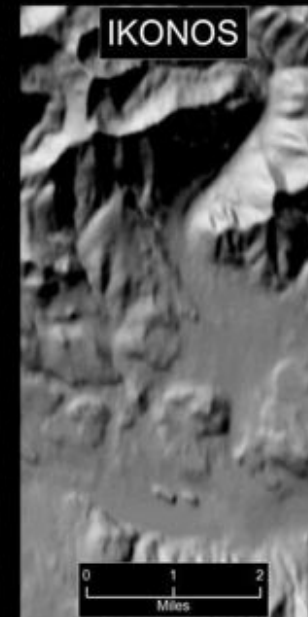
Base Cartography

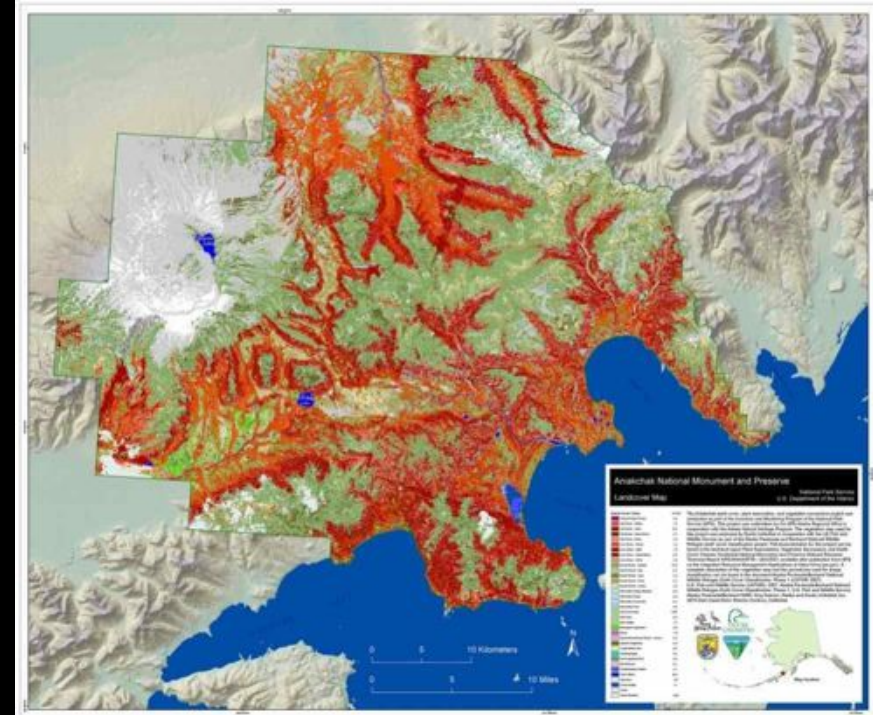
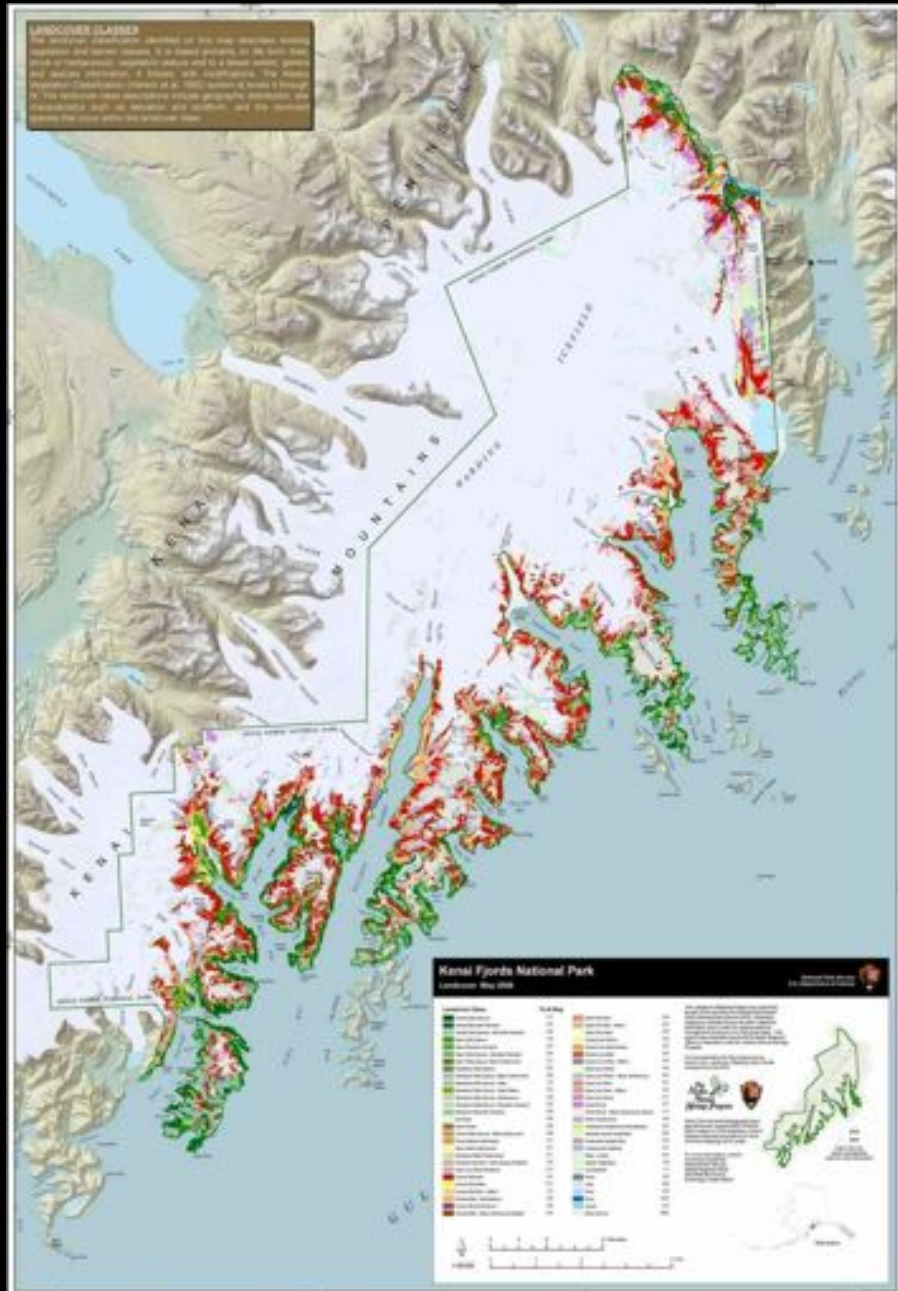


- Baseline Information
- What, Where, and How Much...

- Managed Regionally
- Produced at a park level
- Uses contractors/cooperators

Base Cartography: High Resolution Imagery & DEMs



National Park Service
Alaska Region Inventory and Monitoring

What's in a Soil Resource Inventory?



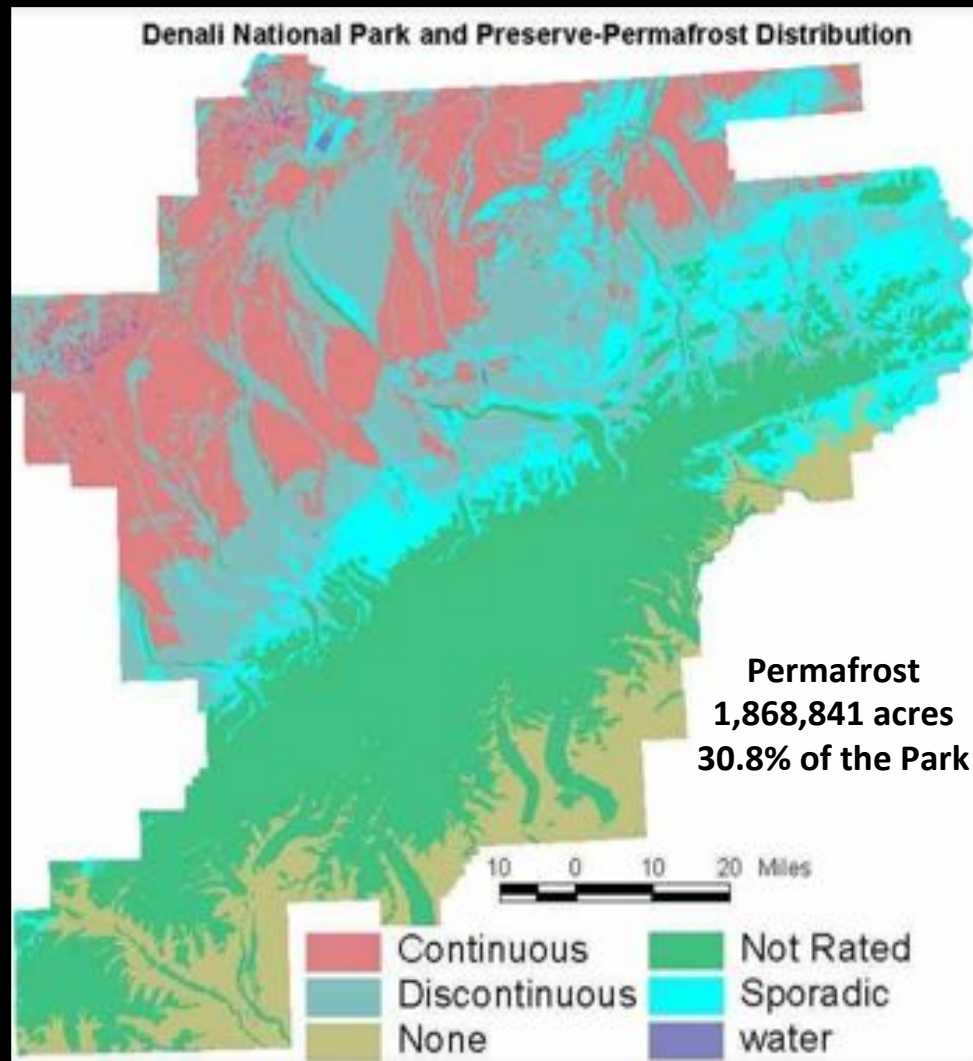
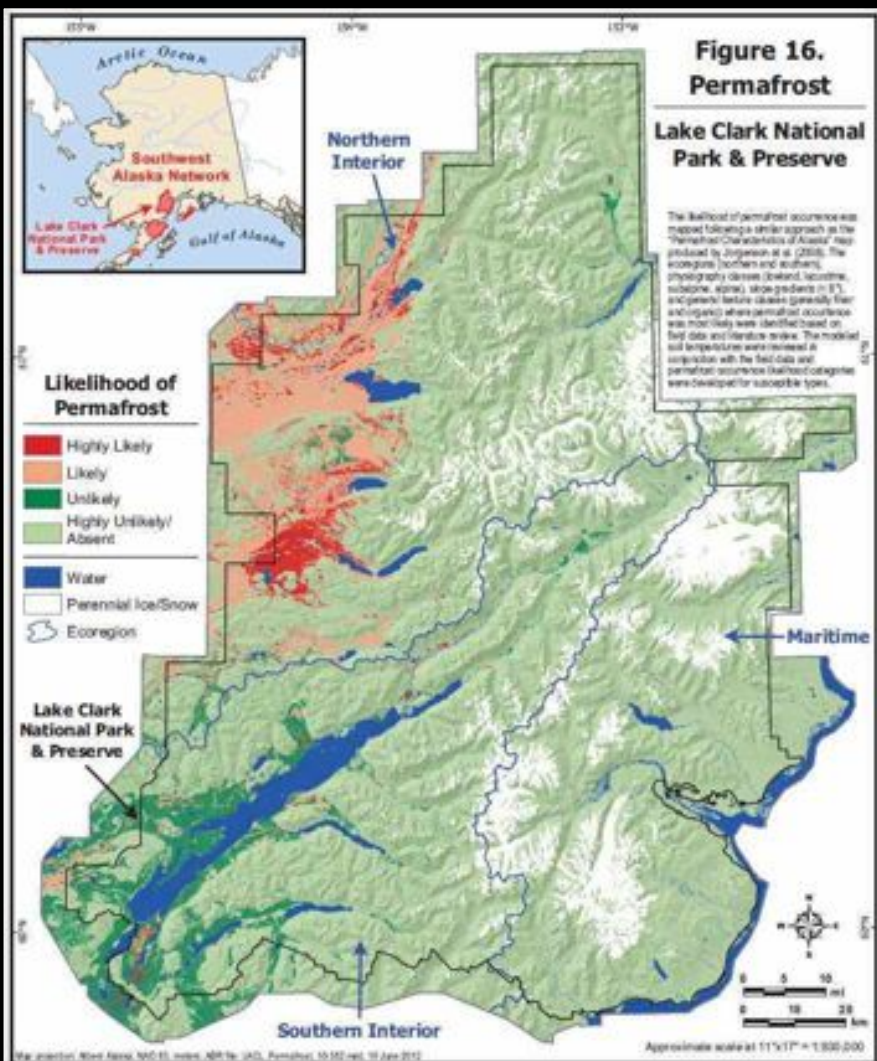
“A systematic examination, description, classification, and mapping of soils in an area.”

- General Soils map
- Soil Interpretations
- Soil Taxonomic Classifications
- Soil - Vegetation Relationships
- Soil -Water Relationships
- Geomorphic Information
- Physical, Chemical, and Biological Properties
- Literature Citations
- Glossary of Terms





Derivative products of soil inventories...



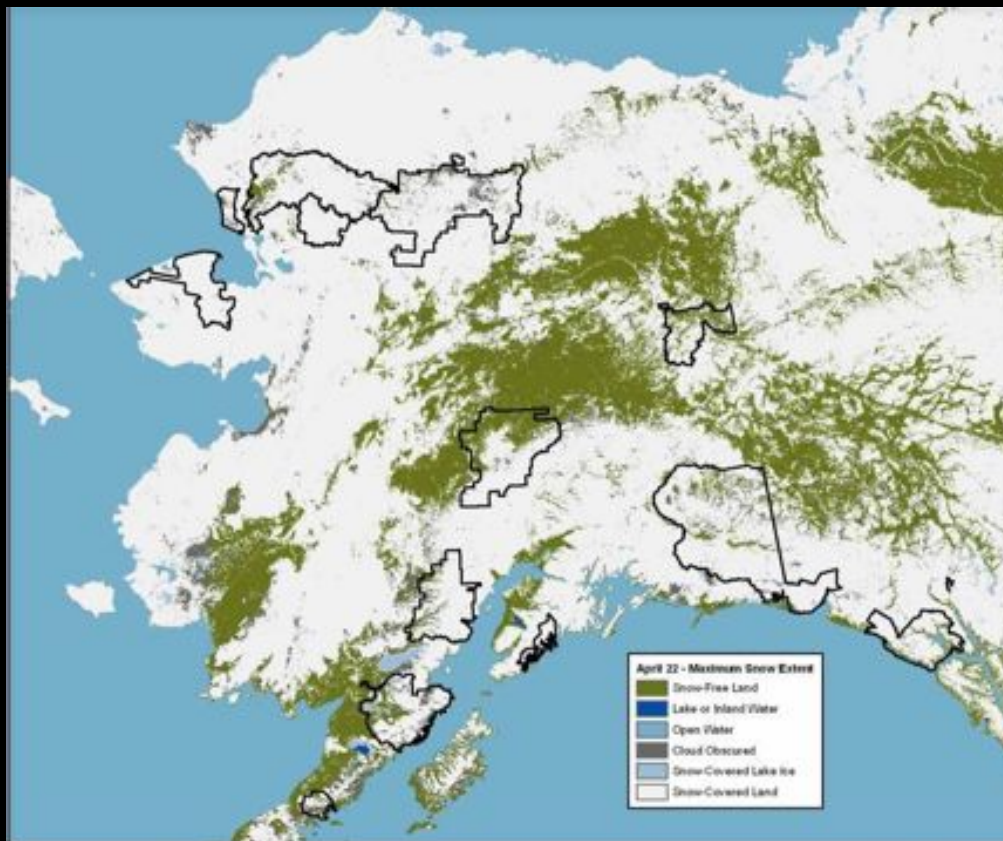


GOALS:

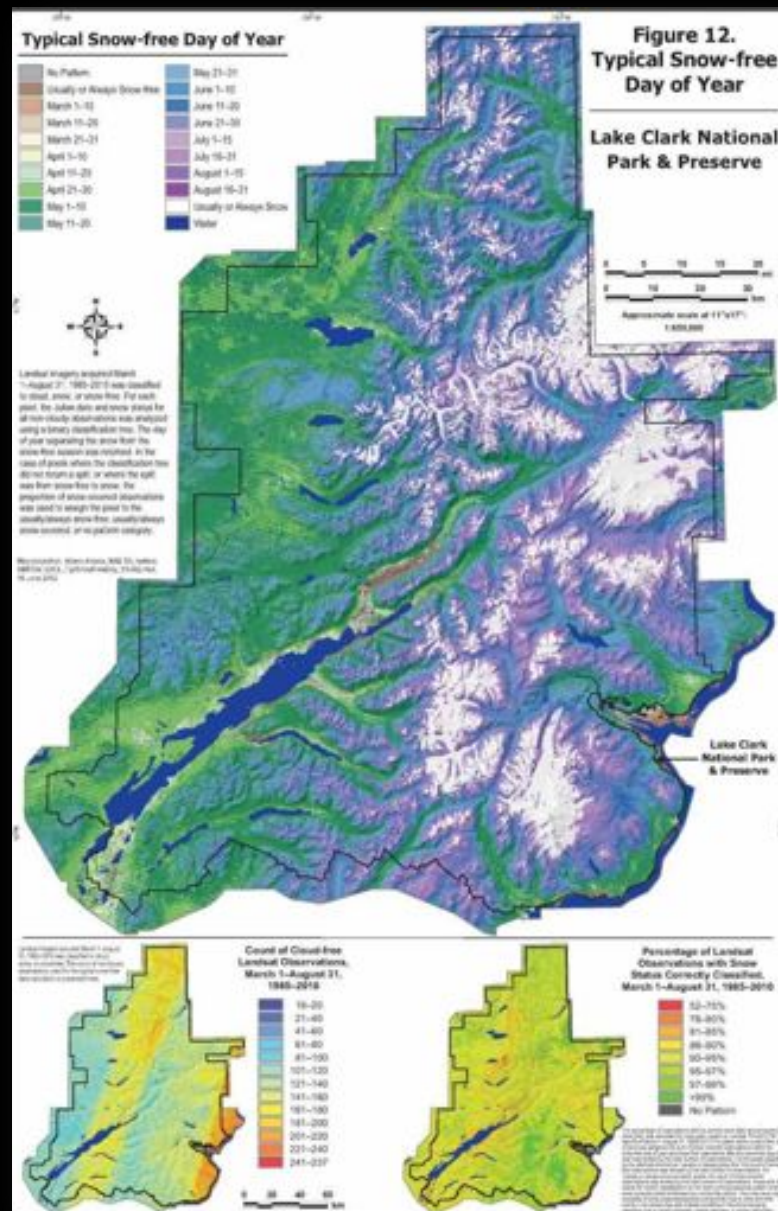
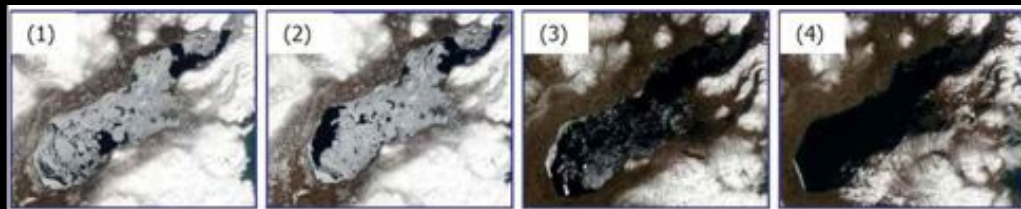
- Determine the status and trends in selected indicators
- Provide early warning of abnormal conditions of selected resources
- Provide data to understand the dynamic nature and condition of park ecosystems
- Provide data to meet legal and Congressional mandates related to natural resource protection and visitor enjoyment.

Long-Term Monitoring Projects...

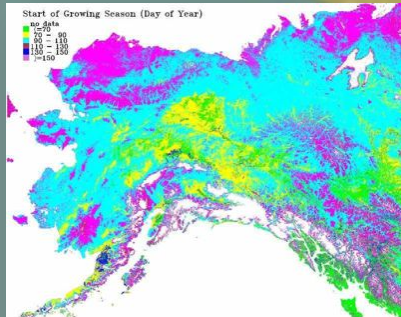
Snow Extent, Snow Free Days, Lake Ice & Snow Season



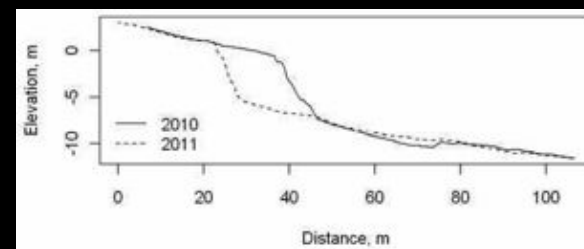
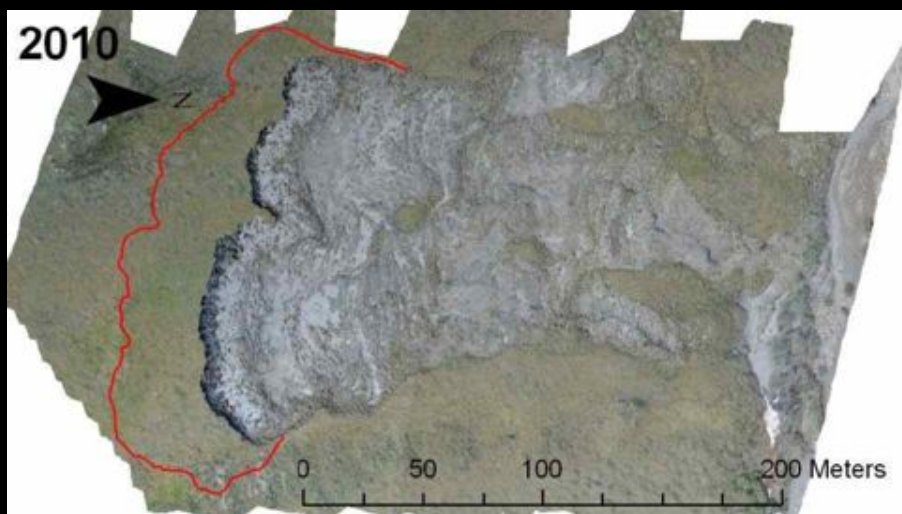
MODIS Satellite image time series of lake ice breakup on Lake Iliamna
April 15 – May 10, 2005



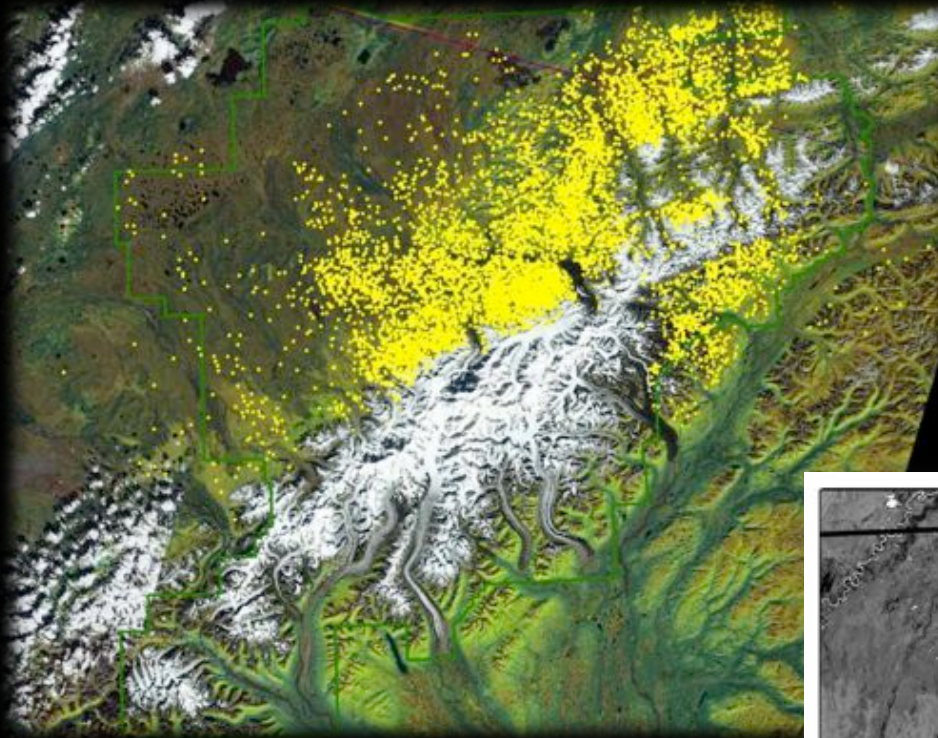
Growing Season Metrics From MODIS NDVI



ARCN Permafrost Thaw Slump Study



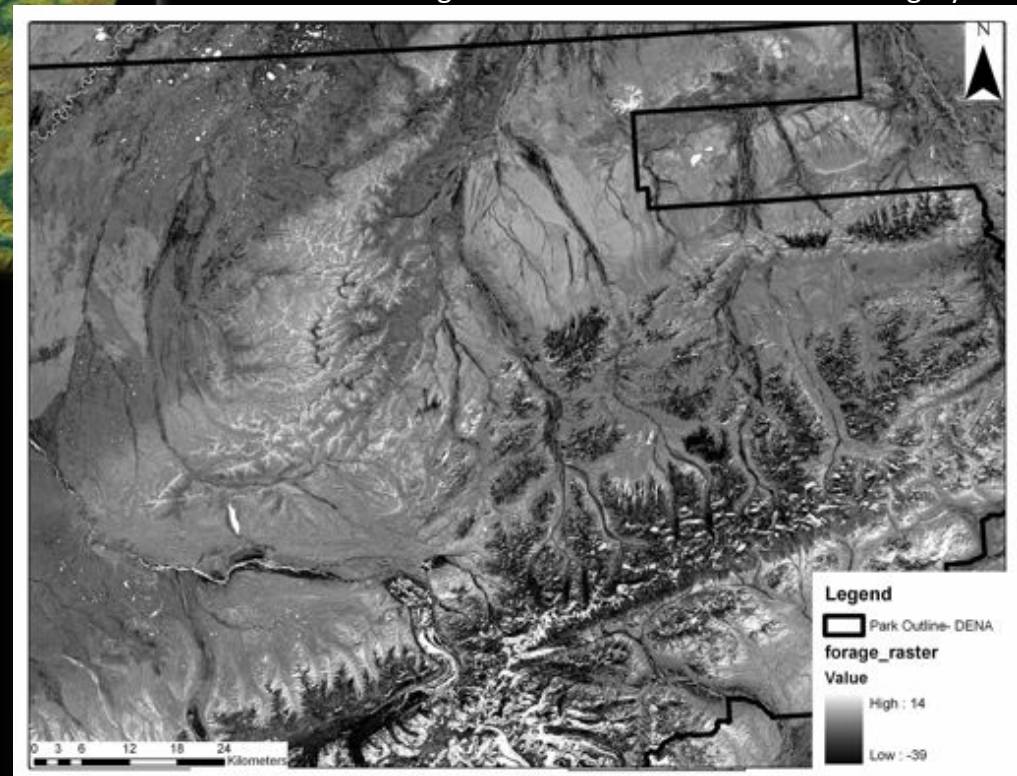
Denali caribou winter range study



Twenty years of caribou radiotelemetry location data in Denali NPPr



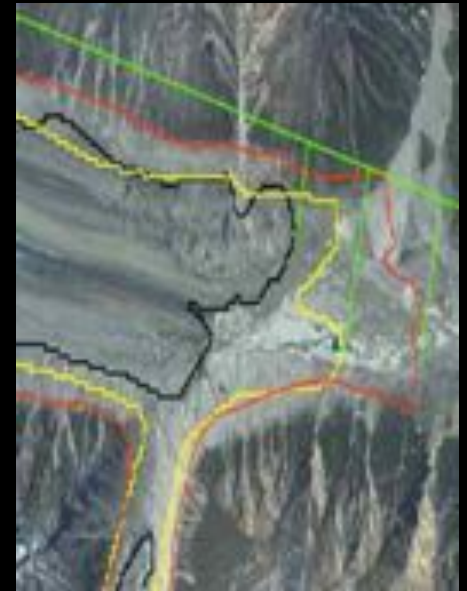
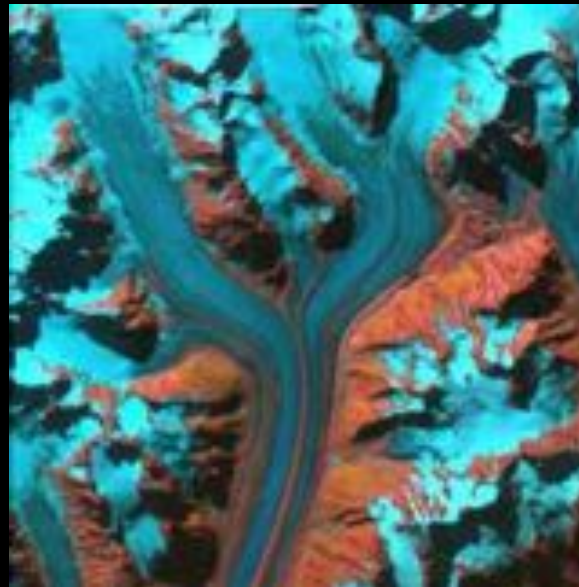
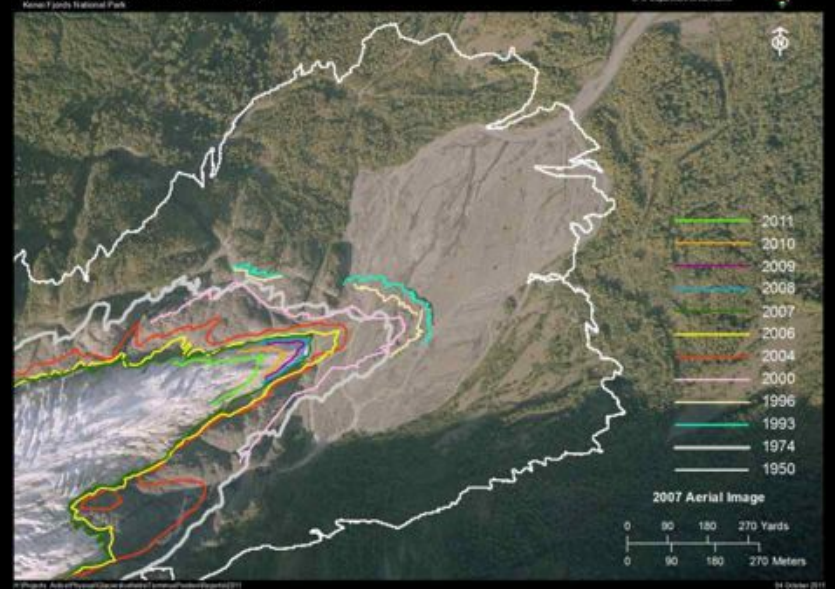
Caribou Forage Raster Derived From Landsat Imagery



1. Assign each lichen species a forage preference "score" based on caribou diet literature.
2. Calculate an integrated forage score for each vegetation monitoring plot based on the abundance of the lichen species that occur there, using forage preference score as a multiplier.
3. Determine the LANDSAT reflectance values for each plot location. Run a set of analyses to correlate the forage score with the image reflectance values for the entire dataset.
4. Extrapolate scores from plots to entire Denali landscape using the correlation between the LANDSAT satellite image scores (= winter forage quality map).
5. Analyze patterns in caribou radiotelemetry locations recorded over twenty years in relation to winter forage quality map. Can we predict their movement patterns based upon forage variables?
6. Perform vegetation change scenario to determine possible impacts of climate change on lichens and thus caribou winter forage.



Exit Glacier Terminus Positions





This monitoring project uses imagery (i.e., Landsat, IKONOS) to track the number, size, and distribution of shallow lakes and ponds on a landscape scale. On-the-ground field sampling is also conducted at a subset of lakes to track water quality, macroinvertebrate, and plant communities.



1. Sensors need to be able to support long term (20+ years) monitoring programs.
2. Inventory & monitoring varies in scale, resolution, and collection intervals, i.e., $MMU < 1$ ha, and daily observations, or MMUs = sqkms and decadal observations.
3. Topography and/or vegetation height would be useful information if they would allow observations over decade time scales.
4. SMAP products could augment on-going growing-season monitoring activities.
5. Having a statewide dataset on glacial ice thickness would be a major asset to the glacier monitoring projects.
6. The freeze/thaw product looks promising.



Parker Martyn

Regional Inventory Program Mgr.
NPS Inventory & Monitoring Program

Phone: 907.644.3697

E-Mail: Parker_Martyn@nps.gov

http://science.nature.nps.gov/im/units/akro/AKR_Inventories.cfm