Alaska Land Management and An Introduction to the North Slope Science Initiative

SMAP/ICESat-2 Joint Mission Applications Tutorial
September 18-20, 2012
Fairbanks, AK

Robert Shuchman, Ph.D.
Co-Director, MTRI
Michigan Technological University
Science Technical Advisory Panel,
North Slope Science Initiative Member

John Payne, Ph.D.
Director
North Slope Science Initiative
www.northslope.org

MichiganTech
Research Institute
www.mtri.org

NORTH SLOPE SCIENCE INITIATIVE
ALASKA

Alaska Land Management and NSSI

- North Slope Science Initiative (NSSI) Mission and Vision
- Summarize Emerging Issues as identified by NSSI Science Technical Advisory Panel (STAP)
- Summarize NSSI Land Cover Initiative
- NSSI Long-Term Monitoring Definition Study
- Use of SMAP and ICESat-2 products to support NSSI activities and initiatives
- Concluding Remarks

North Slope Science Initiative

- NSSI is an intergovernmental effort to increase collaboration at the local, state, and federal levels to address the research, inventory, and monitoring needs as they relate to development activities on the North Slope of Alaska

- **Mission** – To improve scientific and regulatory understanding of terrestrial, aquatic and marine ecosystems for consideration in the context of resource development activities and climate change

- **Vision** – Identify those data and information needs, management agencies and governments will need in the future to develop management scenarios using the best information and mitigation to conserve the environments of the North Slope

NSSI Member and Advisory Agencies

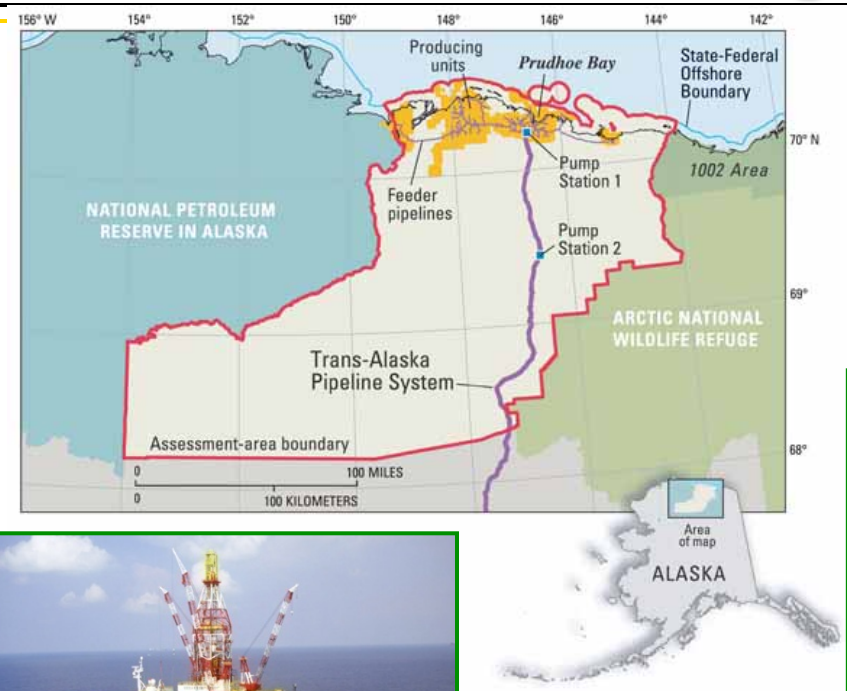
- NSSI Member Agencies (voting privileges):
  - Bureau of Land Management
  - Fish and Wildlife Service
  - National Park Service
  - National Marine Fisheries Service
  - Bureau of Ocean Energy Management, Regulation and Enforcement
  - Alaska Department of Natural Resources
  - Alaska Department of Fish and Game
  - Arctic Slope Regional Corporation
  - North Slope Borough

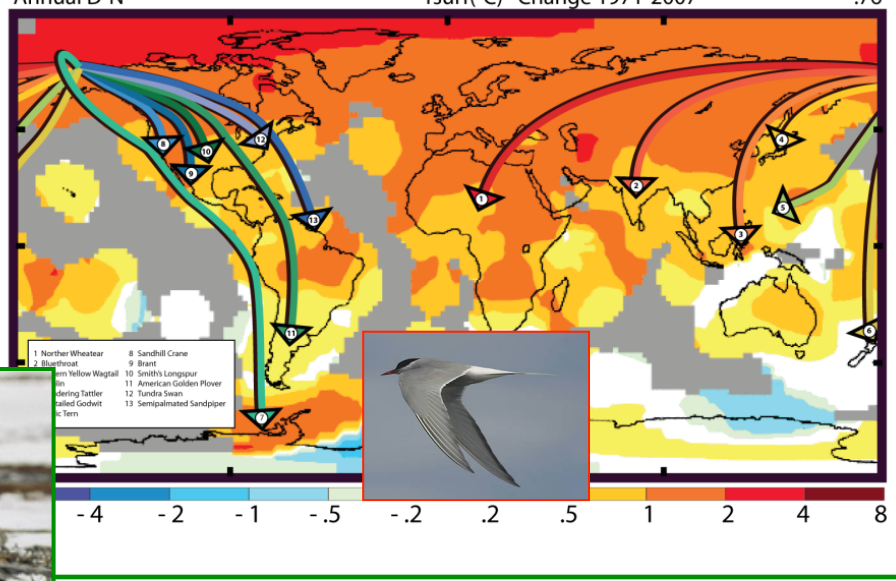
- NSSI Advisory Agencies (no voting privileges):
  - U.S. Geological Society
  - Department of Energy
  - U.S. Arctic Research Commission
  - National Weather Service

Big Area

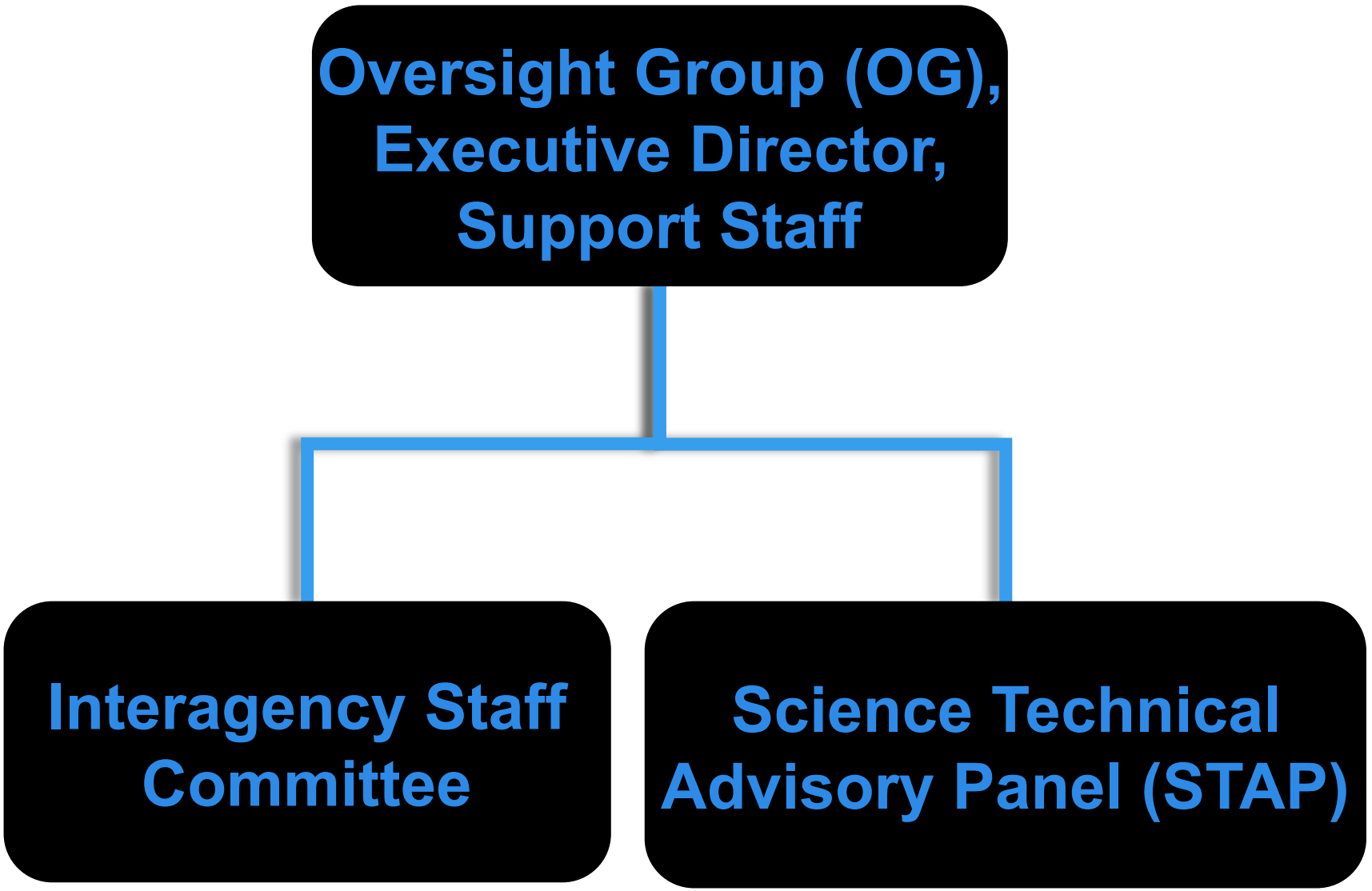

ARCTIC OCEAN
Barrow
NPR-A
Utukok River
Colville River
Alaska Maritime
National Wildlife
Refuge
Noatak National Preserve
Cape
Krusenstern
National
Monument
Kobuk Valley
Nat'l Park
Gates of the Arctic
National Park & Preserve
Brooks Range
Prudhoe
Bay
Kaktovik
Arctic
National Wildlife Refuge
(ANWR)
ALASKA
CANADA

Big Issues


156° W
154°
152°
150°
148°
146°
144°
142°
Producing units
Prudhoe Bay
State-Federal Offshore Boundary
70° N
Pump Station 1
1002 Area
NATIONAL PETROLEUM RESERVE IN ALASKA
Feeder pipelines
Pump Station 2
69°
ARCTIC NATIONAL WILDLIFE REFUGE
Trans-Alaska Pipeline System
Assessment-area boundary
68°
0
100 MILES
0
100 KILOMETERS
Area of map
ALASKA


Annual D-N
Tsurf(°C) Change 1971-2007
.76
- 4
- 2
- 1
- .5
- .2
.2
.5
1
2
4
8

NSSI Organization: Small & Functional



U.S. Energy Policy Act of 2005, Section 348: NSSI Objectives

- **Identify** and prioritize information **needs** to address the individual and cumulative effects of past, ongoing, and anticipated development activities and environmental change
- **Coordinate** ongoing and future inventory, monitoring, and research activities to minimize duplication of effort, share financial resources and expertise, and assure the collection of quality information
- **Maintain and improve access** to accumulated and ongoing research and contemporary and traditional local knowledge
- **Focus on pressing** resource management **needs**, coordination, and cooperation among agencies and organizations

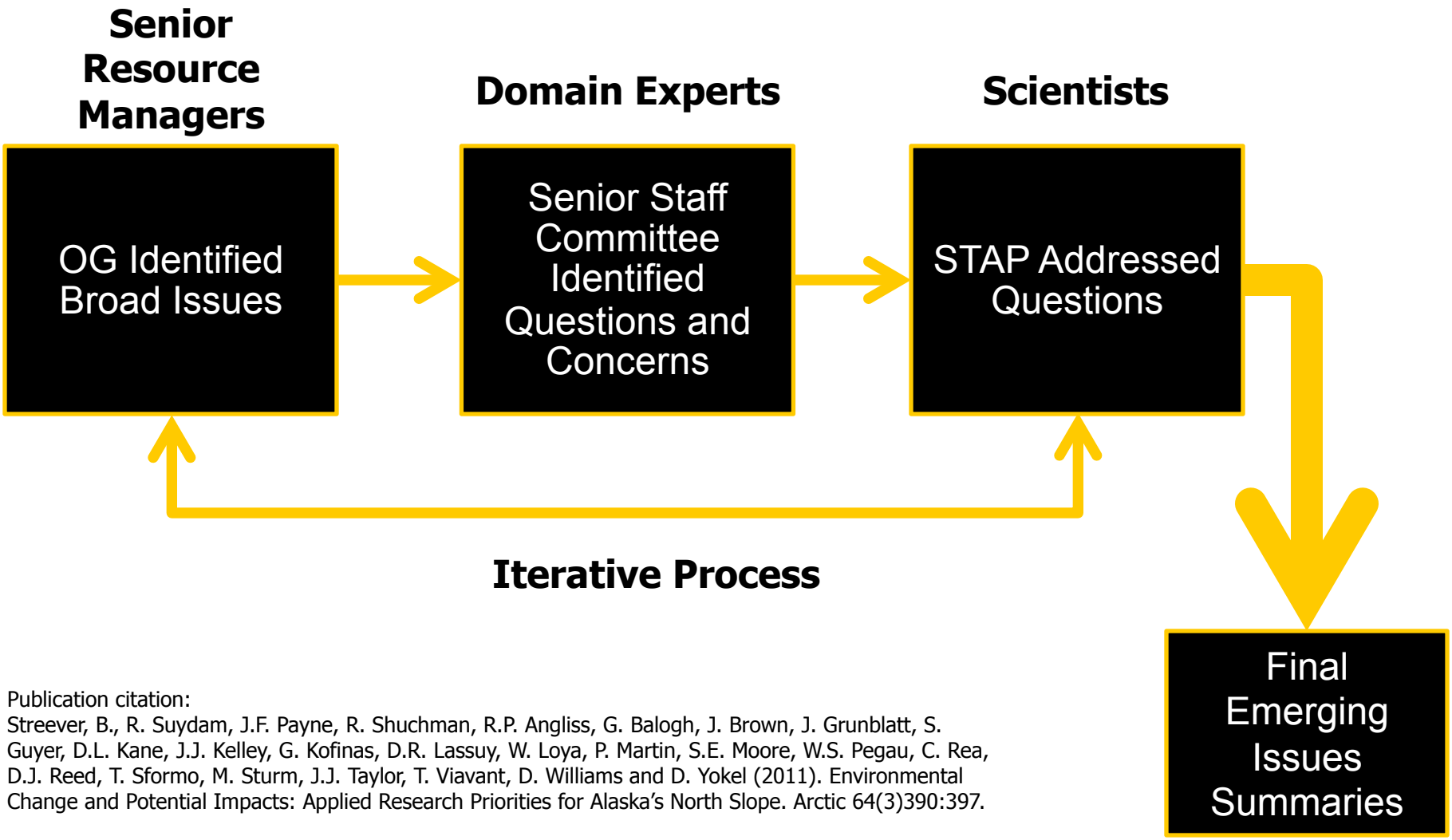
Actions to Meet NSSI Objectives

- Data information access through an agreement with UAF IARC GINA and MTRI
- NSSI Data Catalog and Project Tracking – now over 2,000 projects in the U.S. Arctic – 600 on the North Slope and off-shore areas and more than 100 monitoring (observing) (http://catalog.northslope.org/)
- Developed water quality & bathymetry remote sensing equipment now deployed by industry on the terrestrial environment (http://tundralakestudies.mtri.org/)
- Terrestrial baseline and change detection mapping (digital)
- Developed “Emerging Issue Summaries” to identify what decision makers need in the next 2, 5, 10, and 20 years to make informed decisions (http://www.northslope.org/issues/)

Actions (continued)

- 2011 Barrow, AK Workshop to bring together local residents, scientists, and managers to seek common understanding of needs
- Working with Canada to address common needs and share important scientific information between the two countries
- Co-leading with the Kingdom of Denmark on Terrestrial Circumpolar Biodiversity Monitoring Project
- U.S. Delegate to the Arctic Council Ecosystem-Based Management Expert Working Group
- Initiating Scenario Planning for the North Slope and Marine Environments for the next 20-years – relating to human activities and other drivers of change
- Identifying Long-Term Monitoring Projects and current monitoring gaps in relation to Scenario Planning

Emerging Issues: The Process



Publication citation:
Streever, B., R. Suydam, J.F. Payne, R. Shuchman, R.P. Angliss, G. Balogh, J. Brown, J. Grunblatt, S. Guyer, D.L. Kane, J.J. Kelley, G. Kofinas, D.R. Lassuy, W. Loya, P. Martin, S.E. Moore, W.S. Pegau, C. Rea, D.J. Reed, T. Sformo, M. Sturm, J.J. Taylor, T. Viavant, D. Williams and D. Yokel (2011). Environmental Change and Potential Impacts: Applied Research Priorities for Alaska's North Slope. Arctic 64(3)390:397.

NSSI Emerging Issues

Fire Regime

Vegetation Change

Species of Interest: Migratory Birds

Species of Interest: Caribou

Species of Interest: Marine Mammals and Their Prey

Species of Interest: Fisheries

Social and Economic Dimensions of North Slope Communities

Weather and Climate

Increasing Marine Activity

Changing Sea Ice Conditions

Contaminants

Permafrost

Coastal and Riverine Erosion

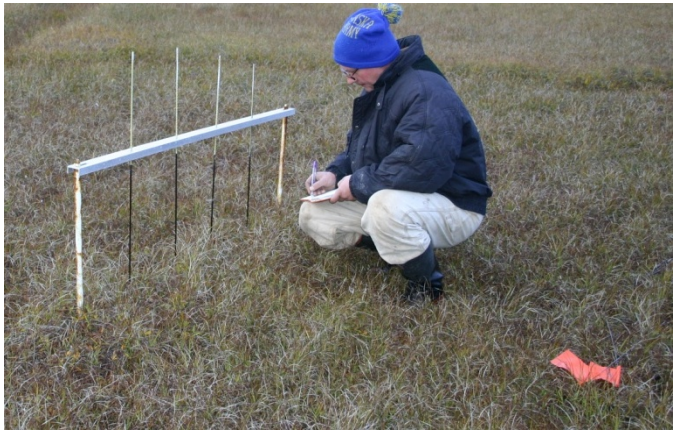
Hydrology and Lake Drying

Coastal Salinization

Emerging Issues: Weather and Climate

- Current data collection *ad hoc*
- Inventory existing stations
- Canvas user needs
- Pool resources to systematically improve network
- Make data accessible

Emerging Issues: Permafrost



- Main issue is active layer, NOT permafrost
- Recognize heterogeneity of soil (especially ice content)
- Existing data insufficient
- Data need to be centralized
- Combining ground and remote sensing data may be promising but needs work
- Start work on threshold conditions at which thawing accelerates

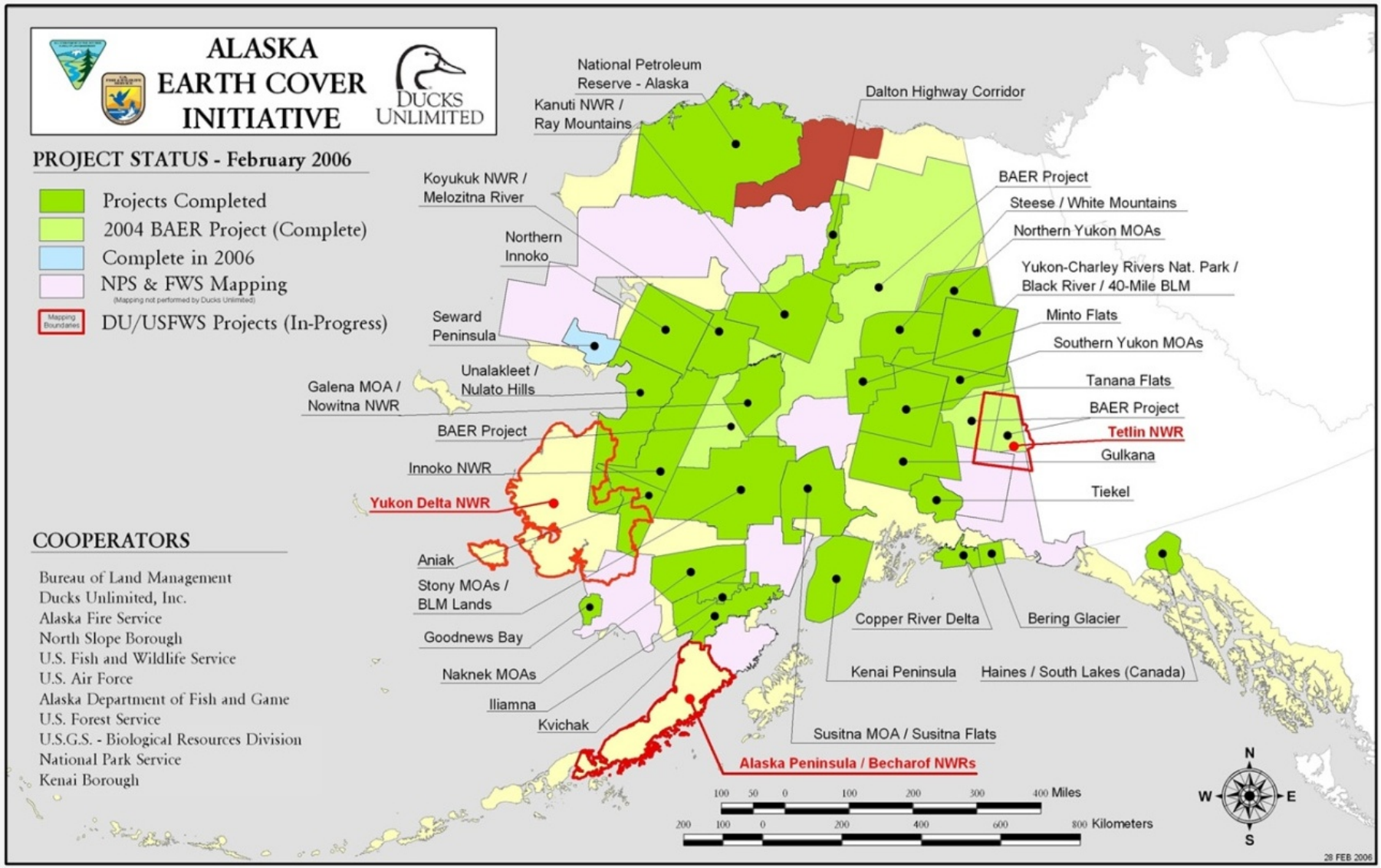
Emerging Issues: Coastal Salinization

- May change vegetation and reduce water availability for ice roads
- Need better understanding of vegetation tolerances
- Not known to have impacted large area
- Do not accept use of saline waters for onshore ice roads

NSSI Land Cover Initiative

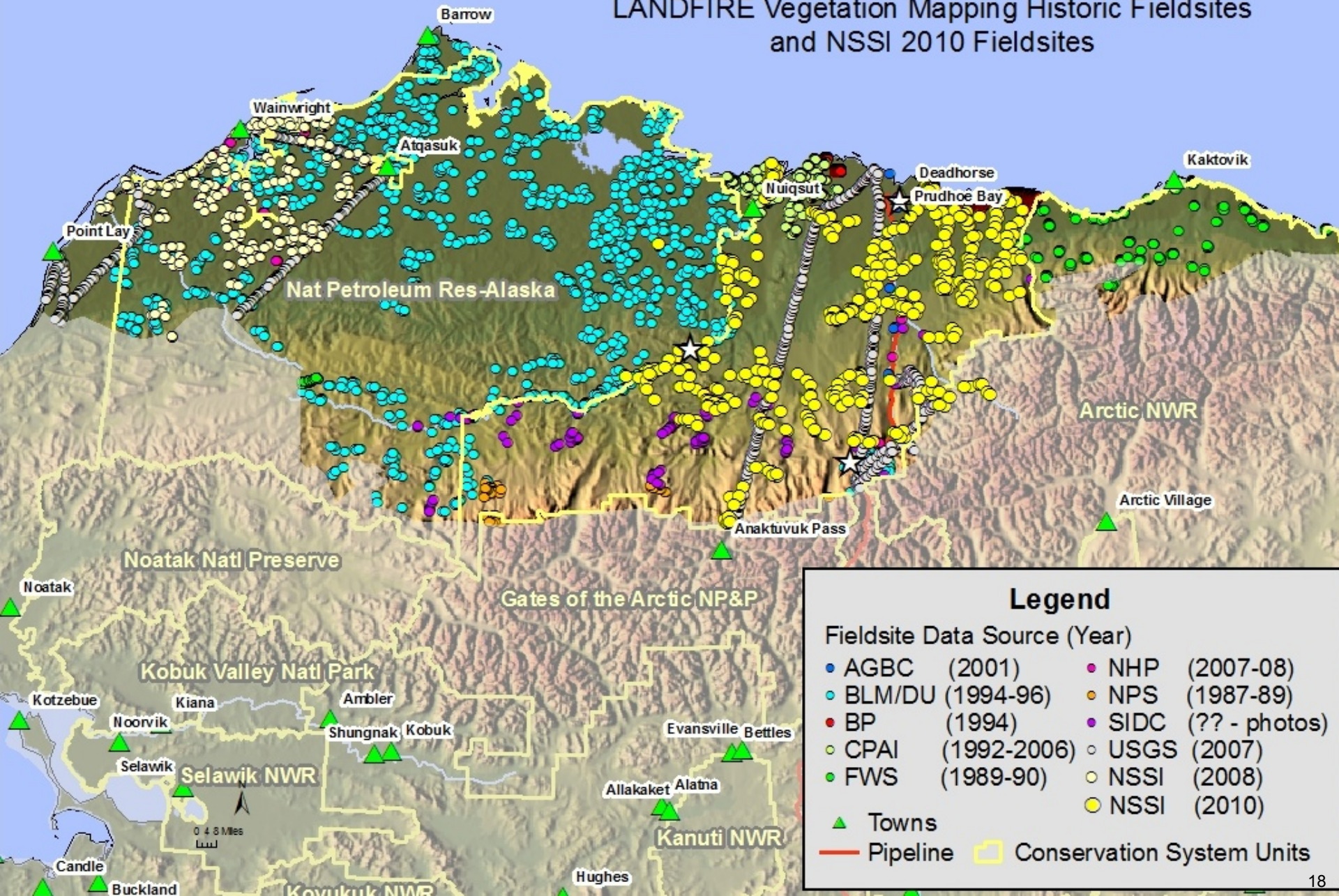
- Objective: use existing land cover datasets and field data, along with new field data campaigns in targeted areas to generate a comprehensive, updated land cover map of the North Slope
- Project Partners: NSSI and Ducks Unlimited
- Status:
  - Field data was collected in 2010, 2011, and 2012
  - Land cover maps will be available 2013

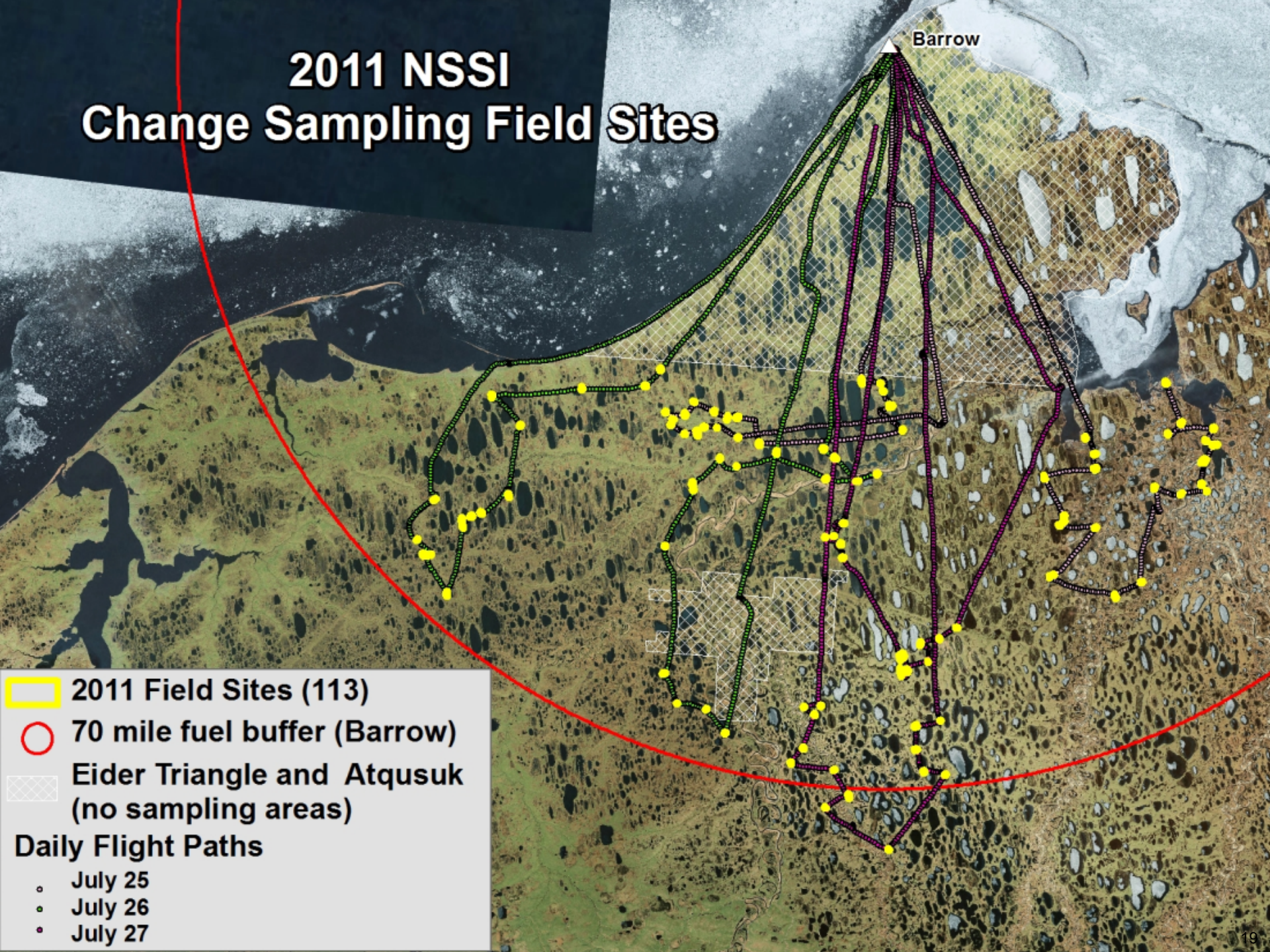
Alaska Earth Cover Initiative



2010 NSSI Fieldsite Distribution Map

LANDFIRE Vegetation Mapping Historic Fieldsites
and NSSI 2010 Fieldsites




2011 NSSI
Change Sampling Field Sites
Barrow
2011 Field Sites (113)
70 mile fuel buffer (Barrow)
Eider Triangle and Atqusuk
(no sampling areas)
Daily Flight Paths
July 25
July 26
July 27

NSSI Long-Term Monitoring Definition Study

- Identify and summarize ongoing long-term monitoring activities on North Slope (activities greater than 10 years or current activities expected to continue for a minimum of 10 years)
- Preliminary project list is available on the NSSI website (http://www.northslope.org/monitoring/)
- Next steps:
  - Identify gaps in current long-term monitoring activities, including the role satellite remote sensing can contribute to the monitoring effort
  - Generate a prioritized list of additional monitoring efforts needed

Potential Utility of SMAP Data to Support NSSI Initiatives

- Applications
  - Launch date 2014
  - Weather forecasting
  - Soil moisture
  - Freeze/thaw cycle
  - Terrestrial water/energy/carbon cycle

- Products
  - Freeze/thaw state……3 km
  - Carbon Net Ecosystem Exchange (NEE)……9 km
  - Radiometer TB ……36 km
  - Radar/radiometer, daily composite……9 km
  - High Resolution Radar σ0 ……1 km

Resolution

Potential Utility of ICESat-2 to Support NSSI Initiatives

- Launch date 2016
- Sea ice statistics (extent and thickness)
- Vegetation heights for biomass estimates (including the capture of shrubification of the North Slope?)
- Changes in topography over time
- Stratospheric clouds in polar regions
- Others

Concluding Remarks

- SMAP datasets can support several Emerging Issues and the long-term monitoring efforts
- Freeze/thaw SMAP product can provide input into ice road construction start date
- SMAP active/passive microwave data could be useful for snow cover estimation
- SMAP/ICESat-2 is useful for generation of sea ice information