The Arctic-Boreal Vulnerability Experiment (ABoVE)

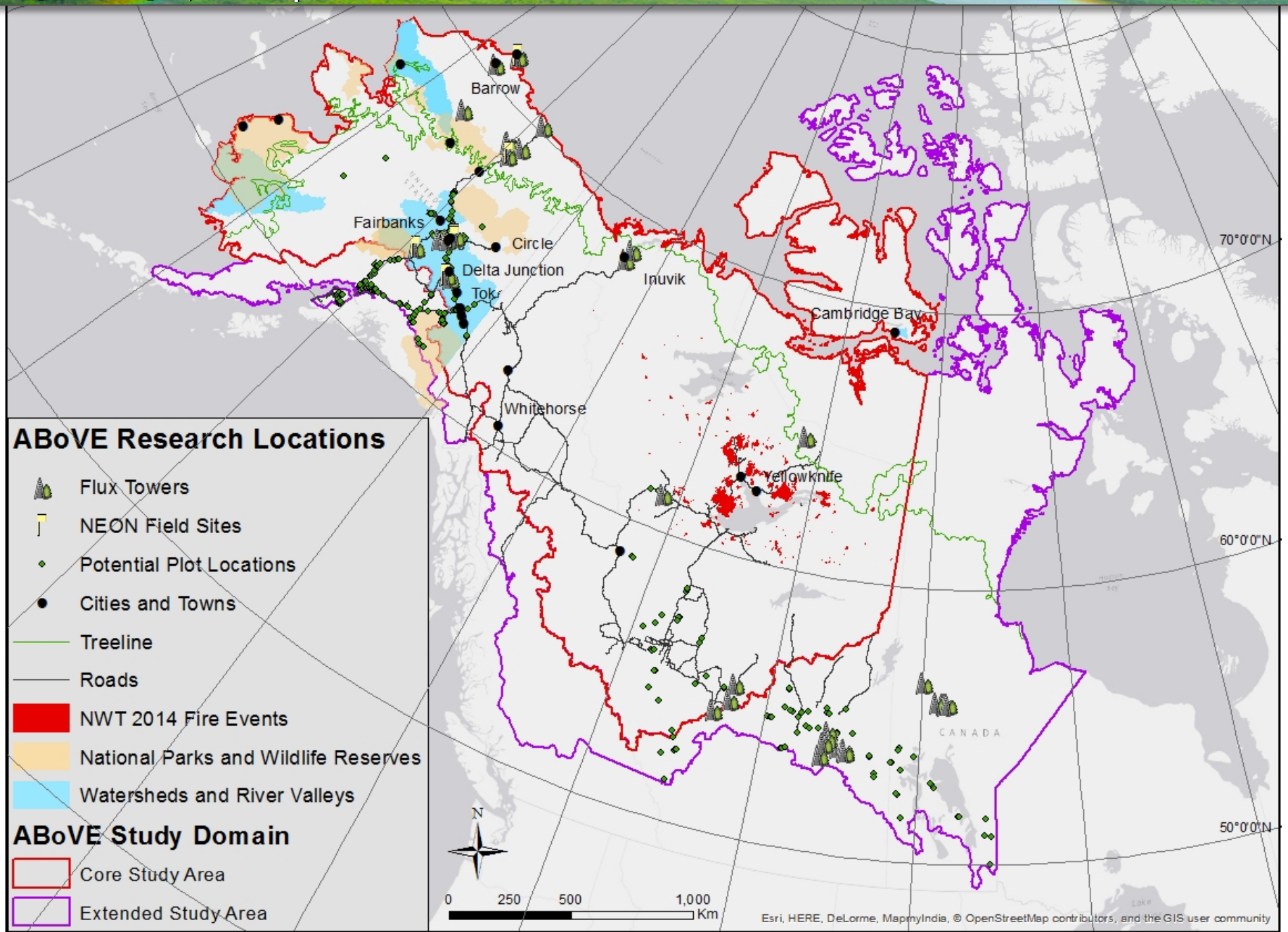
2015 Arctic Observing Open Science Meeting

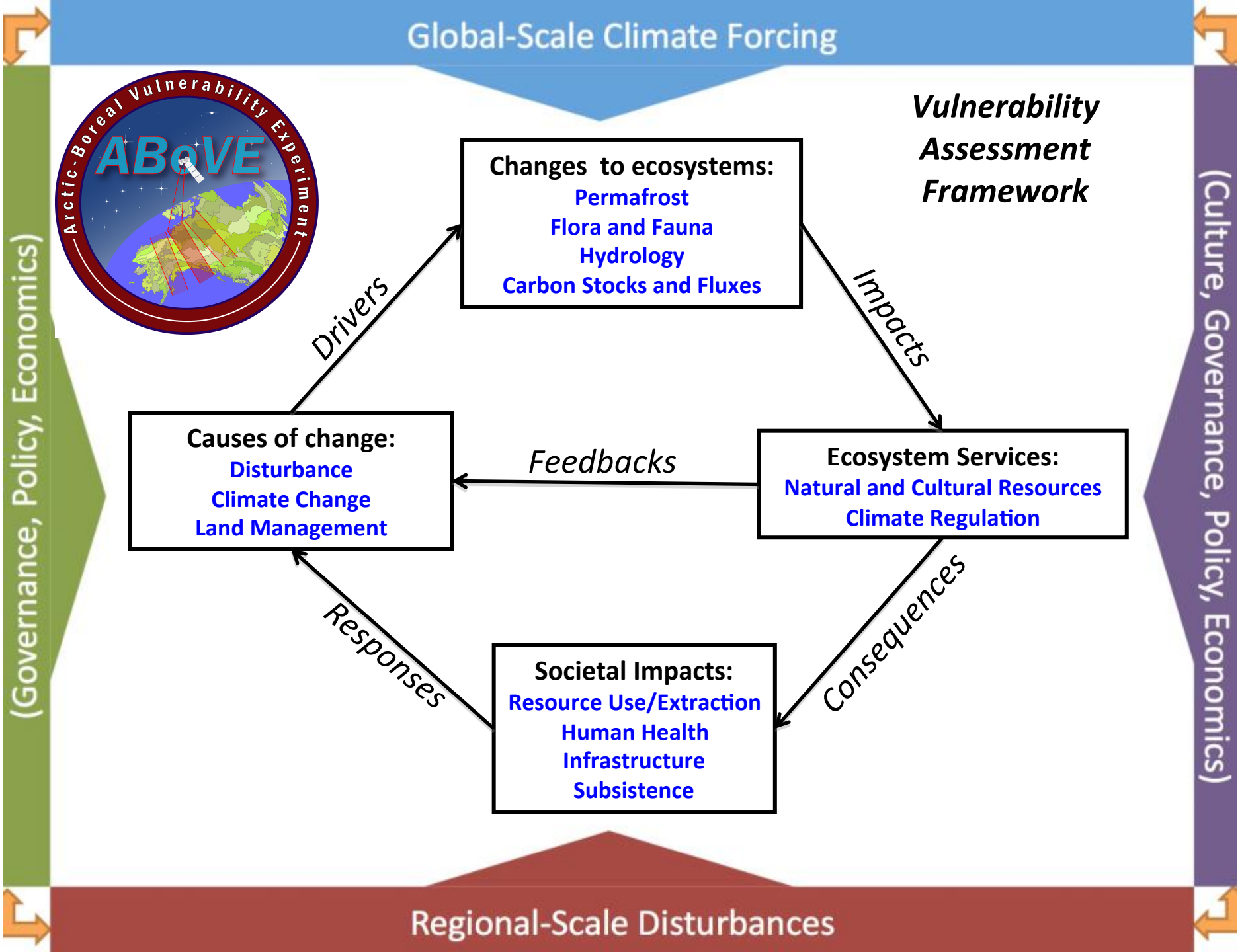
ABoVE is a large-scale NASA-led study of environmental change in arctic & boreal regions and the implications for ecological systems and society

Our overarching Science Question is

How vulnerable or resilient are ecosystems and society to environmental change in the arctic and boreal region of western North America?

Spatial domain & core site locations

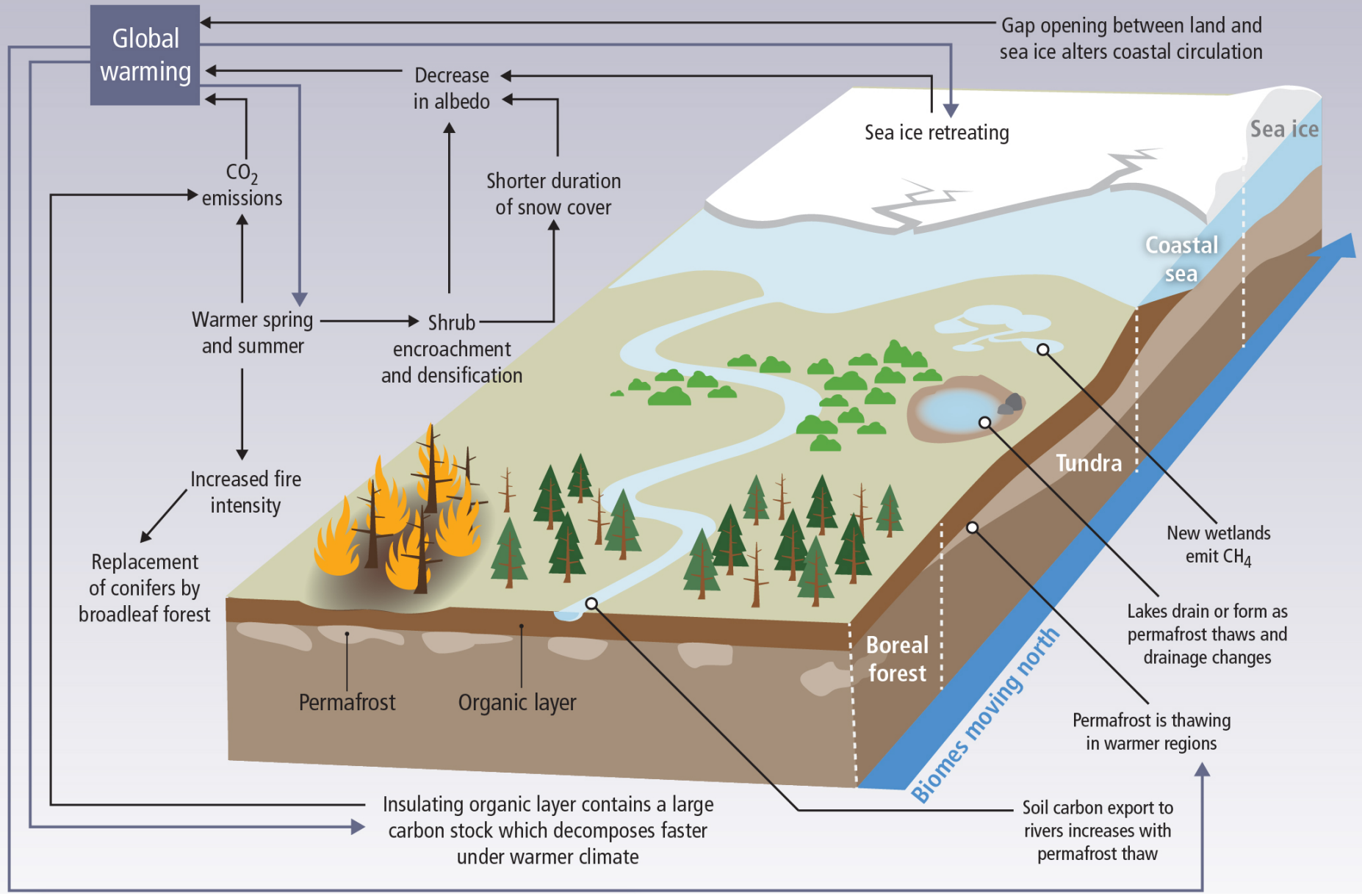



Global-Scale Climate Forcing
Vulnerability Assessment Framework
Changes to ecosystems:
Permafrost
Flora and Fauna
Hydrology
Carbon Stocks and Fluxes
Impacts
Ecosystem Services:
Natural and Cultural Resources
Climate Regulation
Consequences
Societal Impacts:
Resource Use/Extraction
Human Health
Infrastructure
Subsistence
Responses
Causes of change:
Disturbance
Climate Change
Land Management
Drivers
Feedbacks
(Governance, Policy, Economics)
(Culture, Governance, Policy, Economics)
Regional-Scale Disturbances

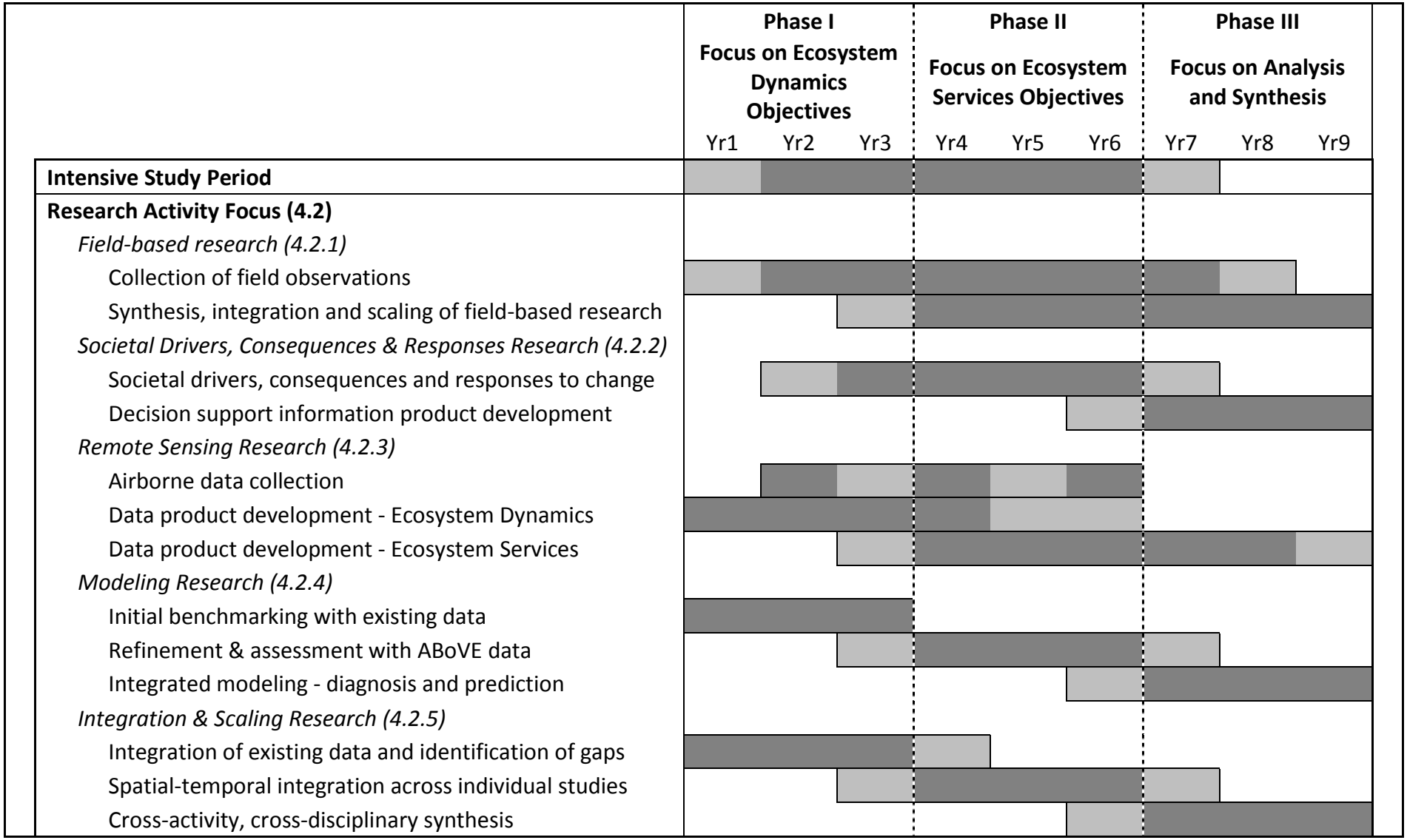
Science Objectives – Ecosystem Dynamics

1. Determine how interactions among vegetation, hydrology & disturbances **mediate permafrost vulnerability and resilience** to climate change.
2. Determine how **biological controls** influence **ecosystem responses** to climate change and disturbances.
3. Understand how **vegetation** attributes and **hydrologic** conditions interact and **influence disturbance**.
4. Quantify how changes in the spatial and temporal distribution of **snow properties** impact ecosystem structure and function.
5. Determine the causes of **vegetation productivity changes** and their **impacts** on ecosystem form and function.
6. Elucidate how climate change and disturbances interact.. to alter **carbon biogeochemistry**
7. Determine how.. **fish and wildlife habitat** co-vary across gradients of **climate and disturbance**.

Interdisciplinary research on climate feedbacks



Phases & Timing (2015 ~ 2024)



ARCTIC BOREAL VULNERABILITY EXPERIMENT

ABoVE development (much abbreviated)

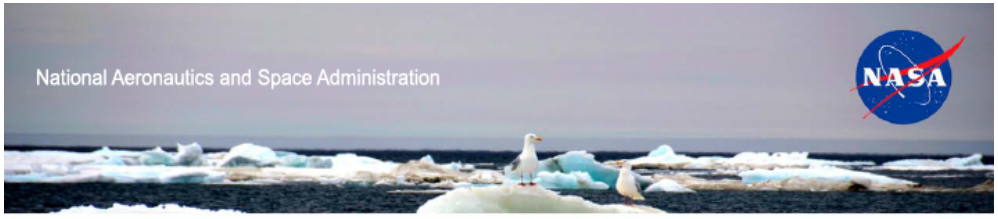
- Scoping proposal (Oct 2008) selected (Jan 2009)
- Workshop in Fairbanks with ~90 participants (Aug 2009)
- Scoping study submitted to NASA (Oct 2010)
- Science community feedback solicited (May-Aug 2011)

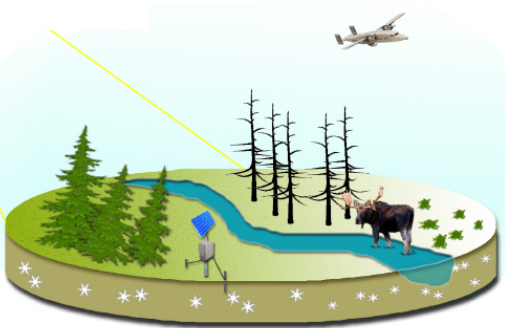
- NASA external expert committee review (Sept 2011)
- 2nd workshop in Boulder ~100 participants (June 2012)
- Report of Boulder workshop released (Sept 2012)

ABoVE development (SDT & CEP)

- *Science Definition Team* solicited & formed
  - 26 members across broad range of disciplines
  - 4 workshops held throughout 2013

- *Concise Experiment Plan* completed (Spring 2014)





NASA

ARCTIC BOREAL VULNERABILITY EXPERIMENT

ABoVE development (where we are now)

- Call for Phase1 team proposals (Dec 2014)
- Selection of 21 core science teams (Aug 2015)
- 1st Science Team meeting (held late Sept – early Oct 2015)

Current Science Team Project Summary

- 21 Projects from 2014 competition
- 7 Pre-ABoVE, NASA-funded Projects (data products)
- 7 related NASA-funded Projects from Study Domain
- 2 NASA Earth System Science Fellowships
- 1 Canadian High Arctic Research Station (CHARS) project

= 38 Total (as of Nov 2015)

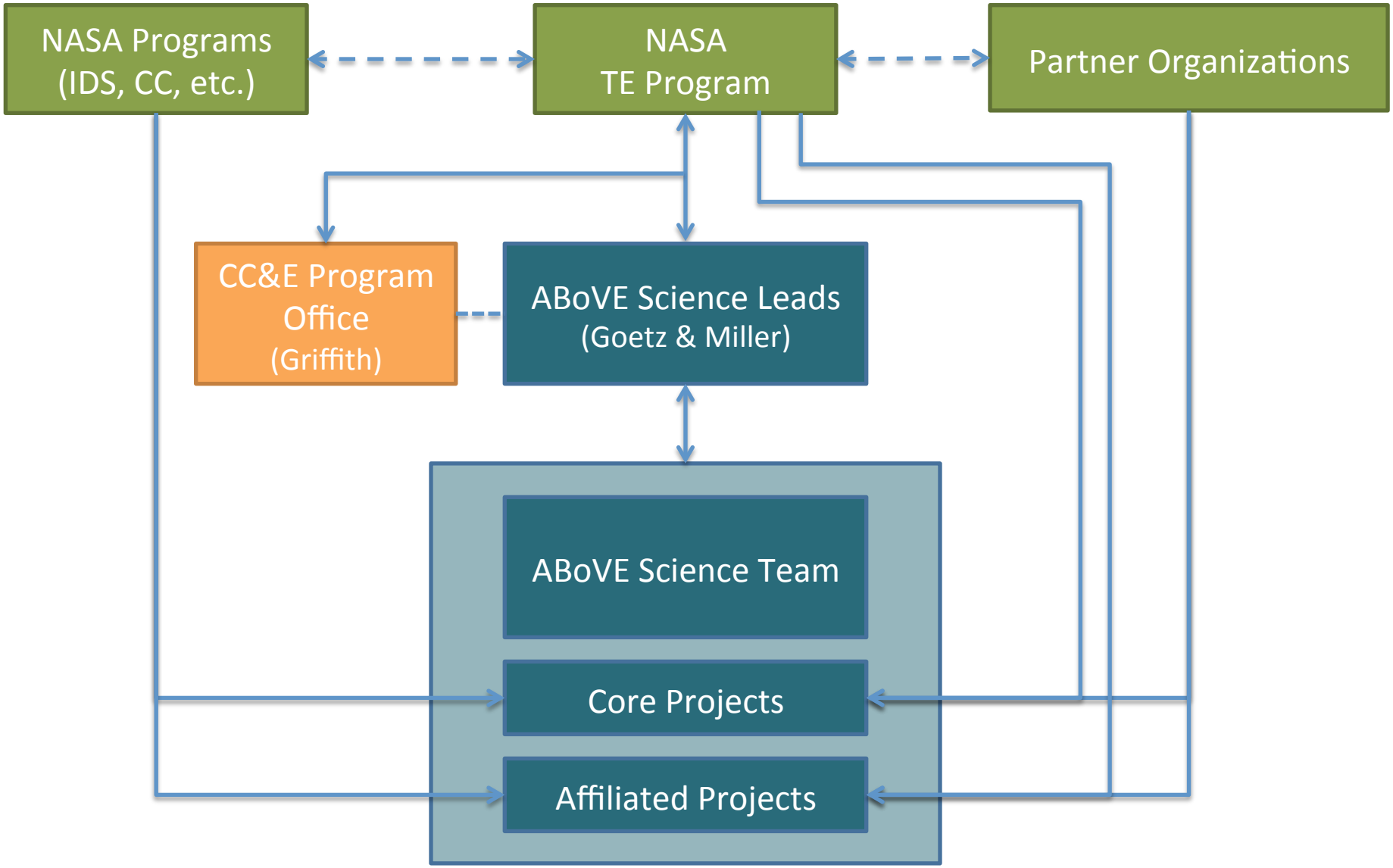
Current Science Team Membership

	Investigators	Organizations
Principal Investigators	34	21
Funded Investigators	100	58
Collaborators	131	55
Total	231	103

Organizations Represented

	U.S.	Canada	Europe	Japan	Total
University	43	10	3		56
National Agencies/Labs	17	6	4	1	27
State/Provincial/Territorial	2	8			10
Private	4	2			7
Native/Aboriginal Organizations	2	1			3
Total	68	27	7	1	103

Organizational Structure





Key Partners: Next-Generation Ecosystem Experiment (NGEE Arctic)

Oak Ridge National Laboratory
Brookhaven National Laboratory
Los Alamos National Laboratory
Lawrence Berkeley National Laboratory
University of Alaska Fairbanks

- Objective is better representation of permafrost in ESMs
- Field sites in Barrow AK (phase 1) & on the Seward Peninsula (phase 2)
- ABoVE will facilitate remote sensing, scaling & integration

ARCTIC BOREAL VULNERABILITY EXPERIMENT

Key Partners: Canadian High Arctic Research Station (CHARS)

Polar Knowledge Canada (PKC)

Disciplinary Working Groups (WGs)

- Flora
  - Vegetation dynamics & distribution
  - Vegetation structure & function
- Fauna
- Disturbance
  - Fire & insects
- Carbon dynamics / BGC
- Hydrology
- Permafrost
- Modeling framework
- Ecosystem Services
- Airborne science
- Other *ad hoc* WGs form as needed
  - Data, core variables, geospatial products, etc

Research Results, Outputs & Outcomes

ABoVE is about coordinating & facilitating interdisciplinary science in a vulnerability / resiliency framework

- Fauna – vegetation interactions
- Fire – vegetation recovery / interactions
- Permafrost – fire – BGC interactions
- Hydrology – permafrost interactions

Much more to come all on of this – stay tuned!

ARCTIC BOREAL VULNERABILITY EXPERIMENT