FACT SHEET

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# ARCTIC-BOREAL VULNERABILITY EXPERIMENT

**ABoVE** is a NASA Terrestrial Ecology Program field campaign being conducted in Alaska and western Canada over the next decade. It is a diverse large-scale study of the impacts of environmental change on Arctic and Boreal terrestrial and freshwater ecosystems, and the implications of these changes for social and ecological systems.

This interagency, international and multi-disciplinary effort is based on a coherent observing strategy designed to meet its overarching objective: to investigate the underlying processes and interactions that control vulnerability and resilience of Arctic and Boreal ecosystems of western North America to environmental change, and to assess how people within and beyond this region respond.

> ...to investigate the underlying processes and interactions that control vulnerability and resilience of Arctic and Boreal ecosystems...

Research is based on analysis of data from airborne and spaceborne remote sensing instruments, collection and analysis of field-based observations, and improvement and application of earth system models. The initial NASA-funded projects were selected in 2015. The international and interagency Science Team, which now consists of more than 50 projects, jointly develops and refines an Implementation Plan, a "living document" that provides the blueprint for research coordination. (above.nasa.gov/implementation_plan.html).

# ECOSYSTEM PROCESSES

## PROVIDE A FOCUS FOR ABoVE RESEARCH

The key ecosystem processes that dominate changes in the Arctic and provide a focus for ABoVE research include **PERMAFROST THAW**, **FIRE DISTURBANCE**, **VEGETATION CHANGES** affecting wildlife habitat, and the processes controlling **LAND FEEDBACKS TO CLIMATE**, in particular the processes regulating **RELEASE AND STORAGE OF GREENHOUSE GASES.**

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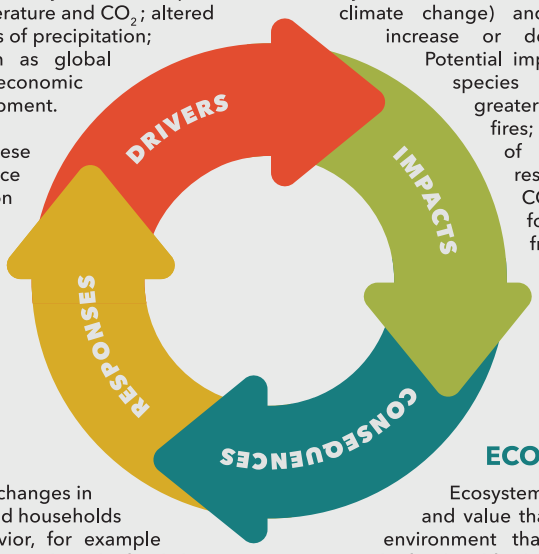
## VULNERABILITY AND RESILIENCE FRAMEWORK




### CAUSES OF CHANGE

Many factors from the local, to regional, to global scales drive changes to ecosystems. Examples include: increasing temperature and $CO_2$; altered timing, amount, and types of precipitation; and social factors such as global demand for fossil fuels, economic stability, and land development.

To varying degrees, these drivers interact to influence the structure and function of ecosystems.

### CHANGES TO ECOSYSTEMS

Ecosystem structure and function are impacted by drivers that are both external (e.g., global climate change) and internal (e.g., natural increase or decrease in population). Potential impacts include: changes in species range and biodiversity; greater intensity and frequency of fires; changes in the distribution of insects; increased soil respiration and production of $CO_2$ and methane; lake formation due to permafrost thaw.

### SOCIAL SYSTEMS

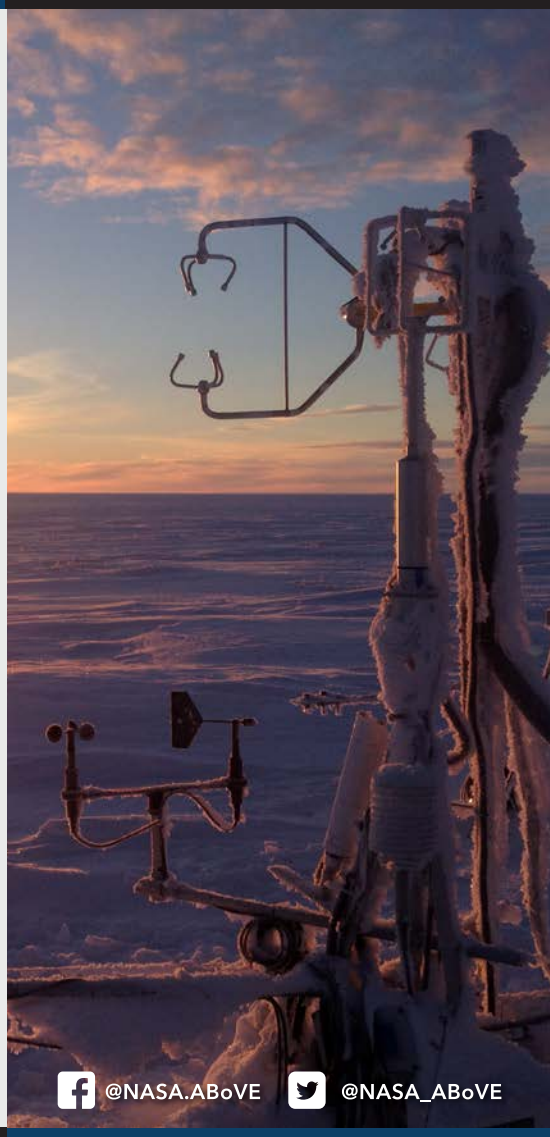
People respond to these changes in many ways. Individuals and households may change their behavior, for example relying more heavily on store-bought food than subsistence hunting. Communities may invest in new infrastructure or move to a new location. Governments may change wildfire suppression strategies or enact policies for reducing greenhouse gas emissions.

All of these responses may influence the drivers of change in both intended and unintended ways.

### ECOSYSTEM SERVICES

Ecosystem services are the benefits and value that people derive from the environment that sustains us. Examples include: food and freshwater production; solid soil foundations for building and transportation infrastructure; indigenous wildlife harvest for subsistence.

When ecosystem structure and function changes, there are consequences to the types, timing, and amount of ecosystem services available.





### The Arctic-Boreal Vulnerability Experiment Field Campaign

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