

# Linkages between CCRN and ABoVE

1<sup>st</sup> Annual CCRN Meeting  
23 October 2013

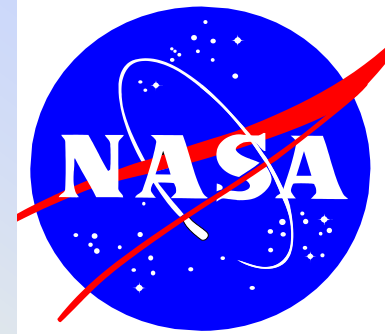
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<http://above.nasa.gov>



# The Arctic-Boreal Vulnerability Experiment – *A Study of Landscapes in Rapid Transition*

## Key Contacts:

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**Peter Griffith:** *NASA Carbon Cycle and Ecosystems Office* ([peter.c.griffith@nasa.gov](mailto:peter.c.griffith@nasa.gov))

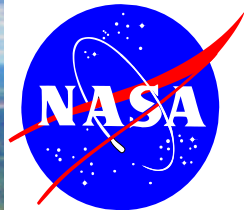
**Diane Wickland:** *NASA Headquarters* ([diane.e.wickland@nasa.gov](mailto:diane.e.wickland@nasa.gov))

# What is ABoVE?

- The Arctic-Boreal Vulnerability Experiment is a major field campaign sponsored by NASA's Terrestrial Ecology Program
- ABoVE will be a 5 to 7 year study beginning in ~2015
- ABoVE will focus on
  - *Developing a fuller understanding of ecosystem vulnerability to climate change in the Arctic and boreal regions of western North America*
  - *Providing the scientific understanding required for developing options for societal responses to the impacts of these changes*



The logo for the Arctic-Boreal Vulnerability Experiment (ABoVE) is displayed over a landscape background. It features the word 'ABoVE' in large, bold, white letters with a stylized tree icon integrated into the letter 'A'. To the right of 'ABoVE', the words 'Arctic-Boreal', 'Vulnerability', and 'Experiment' are stacked vertically in a smaller, white, sans-serif font.



# Timeline of Current Activities

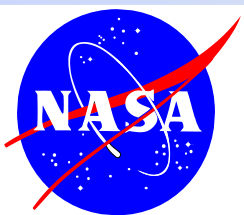
- February 2013 – NASA selects Science Definition Team to produce ABoVE Concise Experiment Plan (ACEP)
  - SDT Meetings in May, July, December, ????? to develop the ACEP
  - July 2013: Visits to key study areas (LTERS, NGEE) and meeting with potential partners/collaborators in Alaska
  - Aug/Sep 2013: Visits to key study areas and meetings with potential partners/collaborators in Alberta, Yukon, NWT (Strong participation by CCRN researchers/collaborators)
- April 2013 – NASA funds five pre-ABoVE projects to develop data products presumed to be of high relevance for ABoVE science
- *January/February 2014 – ABoVE Concise Experiment Plan completed*
- *Mid 2014 – Initial solicitation of proposals by NASA for ABoVE research. (ABoVE Concise Experiment Plan will serve as a resource to guide the development of this solicitation.)*



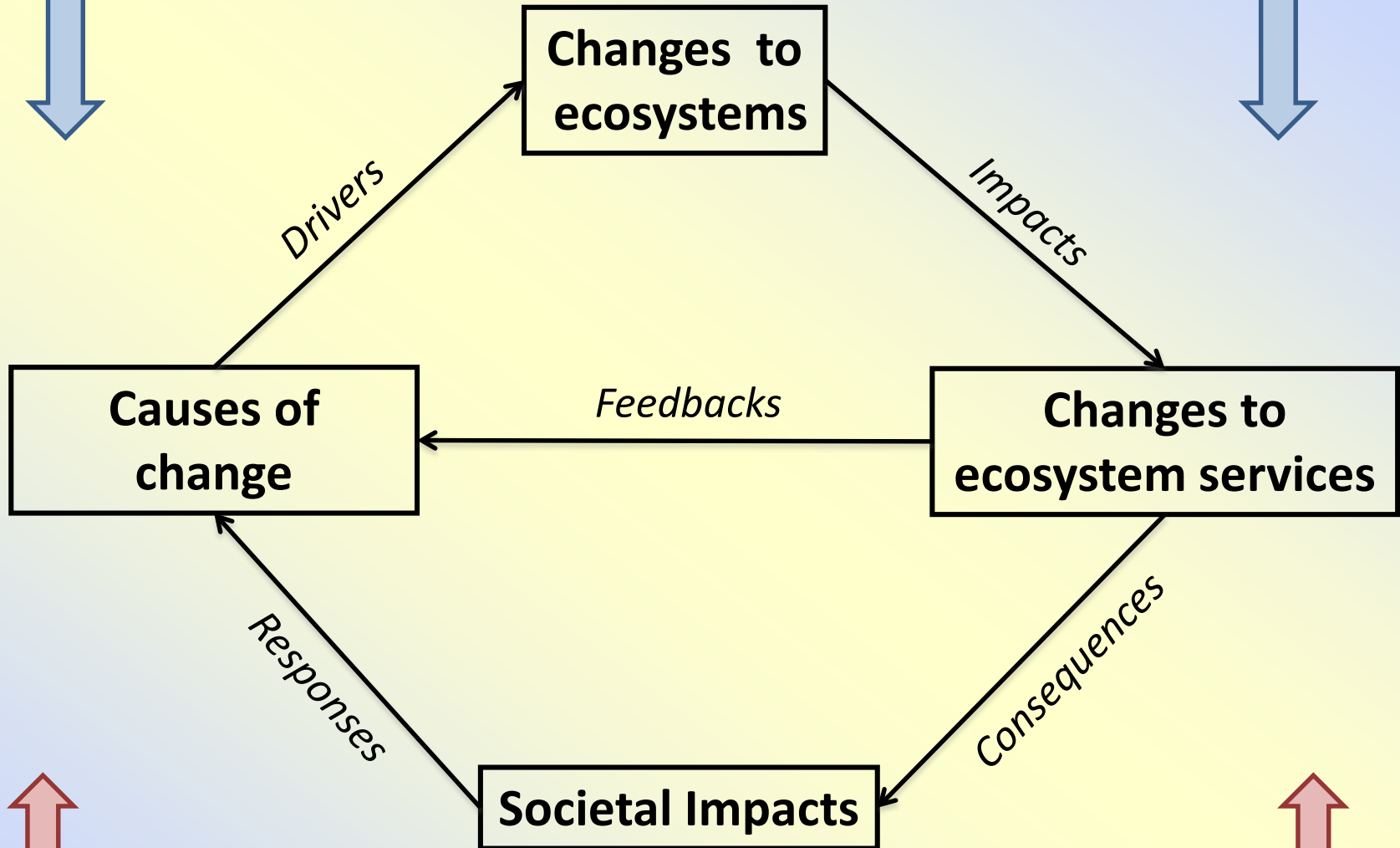
# Overarching Science Question and Objective for ABoVE

*How vulnerable and resilient are ecosystems and society to environmental change in Arctic and boreal regions?*

*To understand how complex interactions are controlling landscape transitions in Arctic-boreal ecosystems and how these changes are impacting human societies within and beyond this region*



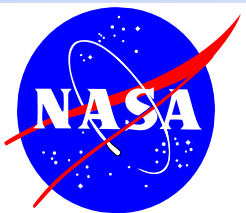
# Global-Scale Climate Forcing



# Regional-Scale Disturbances

# Tier 2 Science Questions (*Key Themes*)

1. How are *disturbance regimes* in ABR changing and what processes are controlling those changes?
2. What are the changes in the distribution and properties of *permafrost* in the ABR and what is controlling those changes?
3. What are the changes in the spatial distribution of *water*, and the amount and timing of *water discharge* in the ABR and what is controlling those changes?
4. How is the magnitude and fate of *soil organic carbon* pools in the ABR changing, and what are the processes controlling the rates of those changes?
5. How are ABR *flora and fauna* responding to changes in biotic and abiotic conditions, and what are the impacts on ecosystem structure and function?
6. How are environmental changes in the ABR affecting *natural and cultural resources, human health, and infrastructure* and how are *human societies* responding?

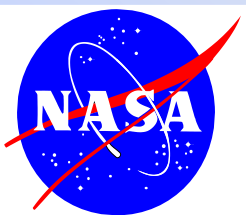


Theme	Objectives	
	<i>Thematic</i>	<i>Complex Interactions</i>
<b>Disturbance</b>	Determine the controls on the spatial and temporal patterns of the primary natural disturbance regimes in the ABR (fire, insects/pathogens, rapid permafrost thaw)	Understand the consequences of variations in disturbance regimes for ecosystems and landscapes
<b>Permafrost</b>		Improve understanding of how landscape-scale variations in air temperature, snow cover, disturbance, surface hydrology, soil properties, and vegetation cover interact to control the distribution of permafrost and permafrost degradation across the ABR
<b>Flora/Fauna</b>	Identify and understand the combination of factors driving longer-term temporal and spatial changes in vegetation characteristics, including habitat quality, productivity and extent, as observed in the satellite data record	<p>Determine to what degree variations in ABR disturbance regimes are driving direct and indirect changes at both the ecosystem and landscape-scale, including successional rates and pathways within ecosystems, age and compositional structure, and plant-animal interactions</p> <p>Document how changes in vegetation characteristics, surface water extent, and/or changes in faunal communities influence ecosystem processes and services, in particular net feedbacks to climate</p>



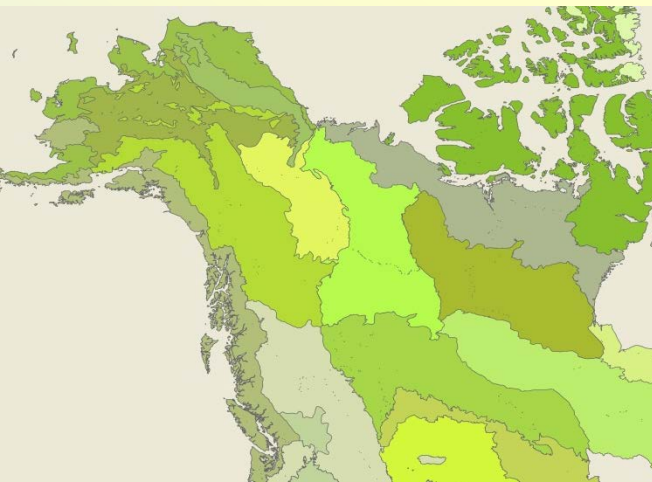
# Types of research activities supported by NASA through ABoVE

1. *Development and validation of information products from remotely-sensed data (spaceborne and airborne)*
2. Collection of field data (provide information to address critical uncertainties, including ecosystem processes and human-environment interactions, validation of remote sensing products)
3. Integration, analysis, and synthesis
4. Model development and validation and use of models for diagnosis and prognosis)

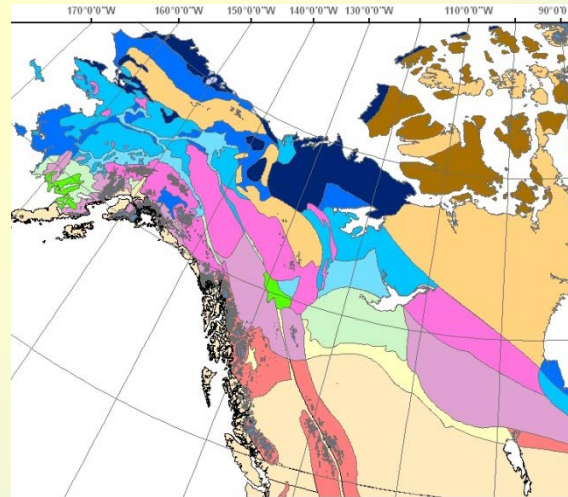


# ABoVE Study Region

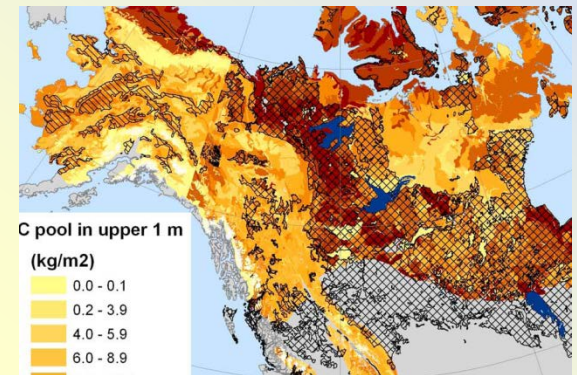
## Ecoregions



## Permafrost



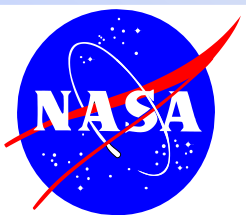
## Soil Carbon



***The ABoVE Study Region provides the opportunity to carry out research across gradients of ecosystems and land surface characteristics unique to the Arctic/Boreal Region that are controlled by climate and disturbances***

# Key steps in developing the ABoVE Concise Experiment Plan

- Insure that questions and objectives for ABoVE are consistent with those of other organizations
- Identify ongoing and planned monitoring activities being conducted by other organizations
- *Identify partnerships and potential collaborations with other organizations in the ABoVE study domain*
- Determine the research that needs to be carried out that will be funded by NASA



# Partnership with ABoVE

A partnership involves a *formal agreement* to jointly sponsor or coordinate research and monitoring being funded by NASA for ABoVE and that being supported by the partner organization

Examples of partnerships under discussion

- DOE – Next Generation Ecosystem Experiment
- Landscape Conservation Cooperatives (US/Canada)
- North Slope Science Initiative
- CarboNA (CFS, NRCan) → Looking to expand
- Japanese research community (coordinated through IARC)
- Government of the Northwest Territories

# Collaboration with ABoVE

*Informal agreement* to coordinate research with that being sponsored by NASA through ABoVE

- Research carried out by individual research projects sponsored by ABoVE
- Research carried out by larger research projects, e.g., CCRN, Bonanza Creek and Arctic LTER projects
- Informal coordination of monitoring and research activities being carried out by NGOS and governments

# Relationship between ABoVE and CCRN

1. ABoVE representatives visited CCRN WECC Observatories located in Yukon and the NWT in Aug/Sept (many thanks to CCRN researchers)
  - The ABOVE SDT recognizes the unique resources that the WECC Observatories represent for ABoVE
2. CCRN researchers can review and provide comments on the ABoVE Concise Experiment Plan
3. Discussions are being planned by NASA with potential Canadian partners with ABoVE in Ottawa in early December (possibilities for partnerships with NSERC/Environment Canada?)

# Relationship between ABoVE and CCRN

4. Numerous opportunities for collaboration
  - Use of data from pre-ABoVE projects funded by NASA in CCRN research
  - Expansion of CCRN research through collaboration on proposals submitted to NASA by U.S. Investigators, especially research involving the use of remote sensing data and research on modelling
  - Continuing use of WECC Observatories throughout the ABoVE Field Campaign (including support of instrumentation/infrastructure)
  - Data management activities



# Arctic-Boreal Vulnerability Experiment

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## NASA pre-ABOVE Funded Research Projects

Project Lead	Project Title <a href="#">(view profile)</a>
<a href="#">Carroll, Mark</a>	Carroll-01: Determining the Extent and Dynamics of Surface Water for the ABoVE Field Campaign <a href="#">(view)</a>
<a href="#">Loboda, Tatiana</a>	Loboda-01: Long-Term Multi-Sensor Record of Fire Disturbances in High Northern Latitudes <a href="#">(view)</a>
<a href="#">Munger, J. (Bill)</a>	Munger-03: Development of a Data-Assimilation Framework for Integrating 25 Years of Surface and Airborne observations to assess patterns of net CO2 Exchange from Arctic Ecosystems <a href="#">(view)</a>
<a href="#">Walker, Donald (Skip)</a>	Walker-01: Recovery and Archiving of Key Arctic Alaska Vegetation Map and Plot Data for Long-Term Vegetation Analyses <a href="#">(view)</a>
<a href="#">Zhang, Tingjun</a>	Zhang-02: Remotely-Sensed Active Layer Thickness (ReSALT) Product Derived from InSAR Data Over North American Arctic Regions <a href="#">(view)</a>