Developing SEARCH Knowledge Pyramids for the Permafrost Action Team

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What Is SEARCH?

The Study of Environmental Arctic Change (SEARCH) is a program that aims to advance scientific understanding and make this information accessible for decision makers. It is a collaborative effort between researchers, funding agencies and others to help society respond to rapid changes in the Arctic.

Three main action teams focus on topics related to land ice, sea ice and permafrost to understand how changes in these systems and cross-cutting impacts affect Arctic and global systems.

For more information visit the SEARCH website

www.arcus.org/search-program

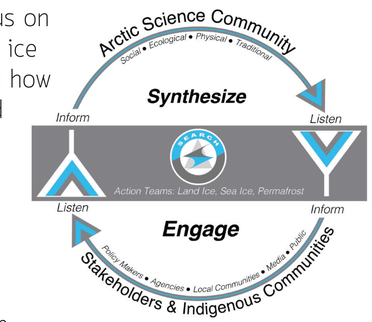


Figure 1: SEARCH goals and structure

What Is A Knowledge Pyramid?

A Knowledge Pyramid integrates the most up-to-date information to answer key questions which are societally relevant (Kelly, 2016). The aim is to provide a jargon free single page summary at the apex of the pyramid. The structrue of the pyramid allows information to be organized by the level of specificity to the topic. Scientific inquiry at the base drives research articles and technical reports on specific subjects. Synthesis studies, review articles and commentaries at the next level combine results, summarize findings and communicate broader impacts.

Knowledge pyramids are being produced by each of the SEARCH action teams and can be found under **Arctic Answers** found at www.arcus.org/search-program/arctic-answers.

The Permafrost Action Team is tasked with documenting, understanding and communicating how degrading near-surface permafrost will affect Arctic and global systems. We are developing knowledge pyramids on three main topics areas:

We are leveraging existing resources including the Permafrost Carbon Network effort to track existing literature and synthesis products to build these knowledge pyramids.

What is Key to Permafrost?

Permafrost degradation occurs due to the intersections between temperature and ice content of the ground. Thermal and mass fluxes (particularly water movement) can either individually or in combination produce thawing, water ponding, heave, subsidence, changes in adfreeze properties, creep and lateral instabilities.

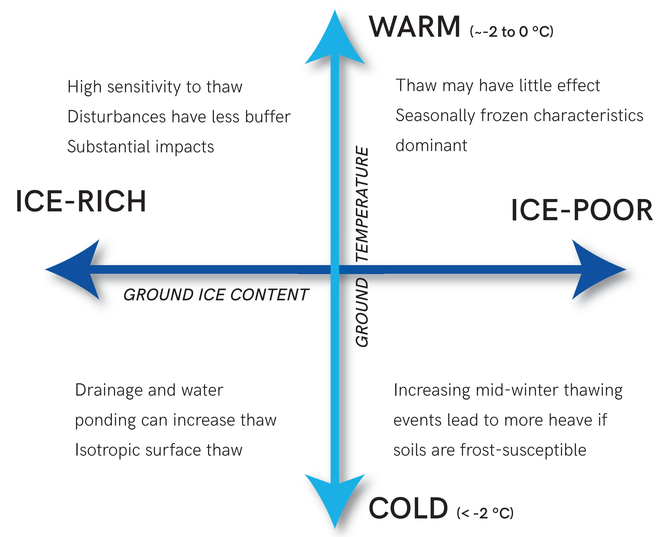
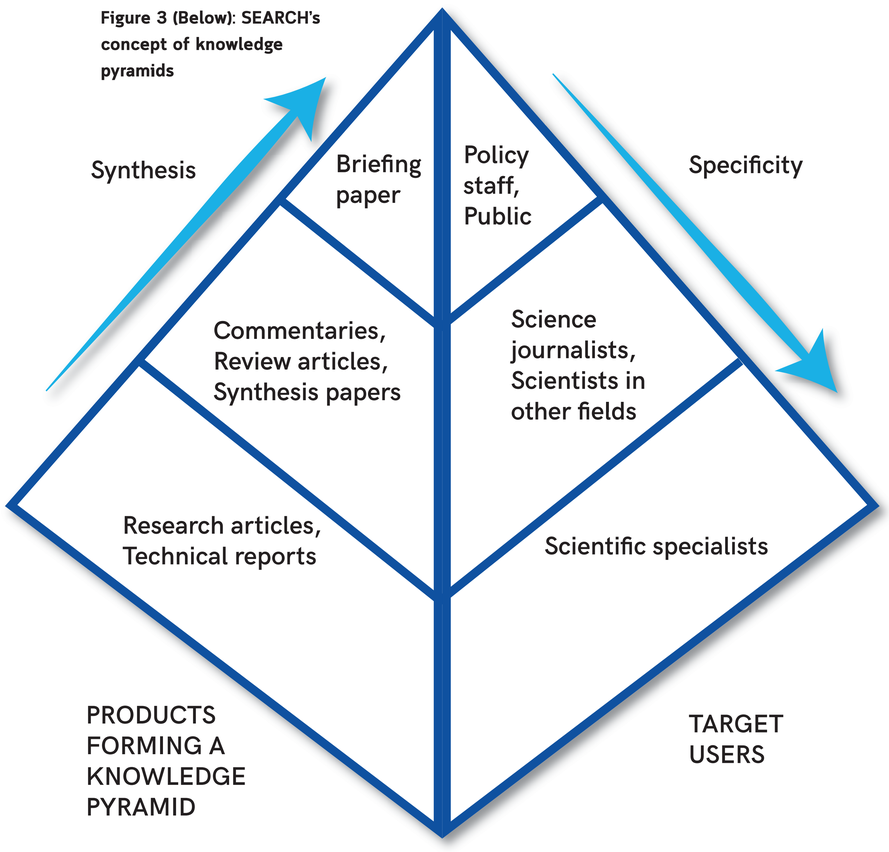


Figure 2 (Above): Potential outcomes due to permafrost degradation depending on the ground temperature and ground ice content.

Figure 3 (Below): SEARCH's concept of knowledge pyramids



Our Progress To Date

We started with breaking down the topic areas into main questions and a series subquestions for each knowledge pyramid. These are being used to more succinctly address complexity within the topics and make it easier to find supporting materials in the different levels of the knowledge pyramids.

What is the impact of permafrost carbon release on climate change?

How much permafrost carbon will be released to the atmosphere in a future warmer climate?

How much of permafrost carbon release will be as methane versus carbon dioxide?

How will disturbances such as fire and abrupt permafrost thaw affect the timing of permafrost carbon release?

How much permafrost carbon release can be offset by new plant growth?

How does permafrost degradation impact infrastruture?

What are the effects of infrastructure on permafrost?

How do regional drivers of permafrost change cause additional impacts to infrastructure?

What are the additional life-cycle (mitigation, maintenance, replacement and/or reclamation) costs as a result of permafrost thaw?

Where does permafrost thaw intersect with key issues of economic, social and cultural importance?
- Where is permafrost thaw causing relocation of communities?

How does permafrost degradation impact ecosystem services?

How is access to traditional areas including hunting impacted by thawing permafrost?
- Do changes in permafrost alter river access and transportation for communitities?
- Where are trail networks most sensitive to permafrost degradation?

How does thawing permafrost alter hunting, harvest and food storage?
- Is waterfowl habitat and migration altered by permafrost thaw?
- How does permafrost thaw change habitat availability for ungulates?
- How does thawing permafrost impact the harvest of traditional plants?
- How are changes in permafrost impacting ice cellars?

Are drinking water sources affected by changes in permafrost?

How will thawing permafrost impact biomass availability or fuel?

We welcome discussion of our current structure and would appreciate any assistance in identifying pertinent reports, publications and articles.

Please contact us by email:
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or using the QR code to the right.

References: Kelly, B.P. (2016) Faster glaciers and the search for faster science (in Arctic Report Card 2016): http://www.arctic.noaa.gov/Report-Card/Report-Card-2016