Bonanza Creek LTER

Changing Disturbances, Ecological Legacies, and the future of the Alaskan Boreal Forest

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Principal Investigator


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Figure by Victor Leshyk

Overarching Questions

- How do ecological legacies constrain the response of the Alaskan boreal forest to climate change?
- How will these legacies affect future ecosystem trajectories?
- What are the local, regional, and global impacts of these emergent ecosystem trajectories now and in the future?

CLIMATE WARMING

Legacies

- **Material:** Individuals or materials produced in a past ecosystem state and retained after a disturbance event.
- **Informational:** Responses (adaptations) to historical disturbance cycles described by the presence, frequency, and distribution of species traits in a population or community.
- **Thermal:** Frozen state of soil and water in permafrost out of equilibrium with current climate due to time lags in energy exchange.

Figure by Victor Leshyk

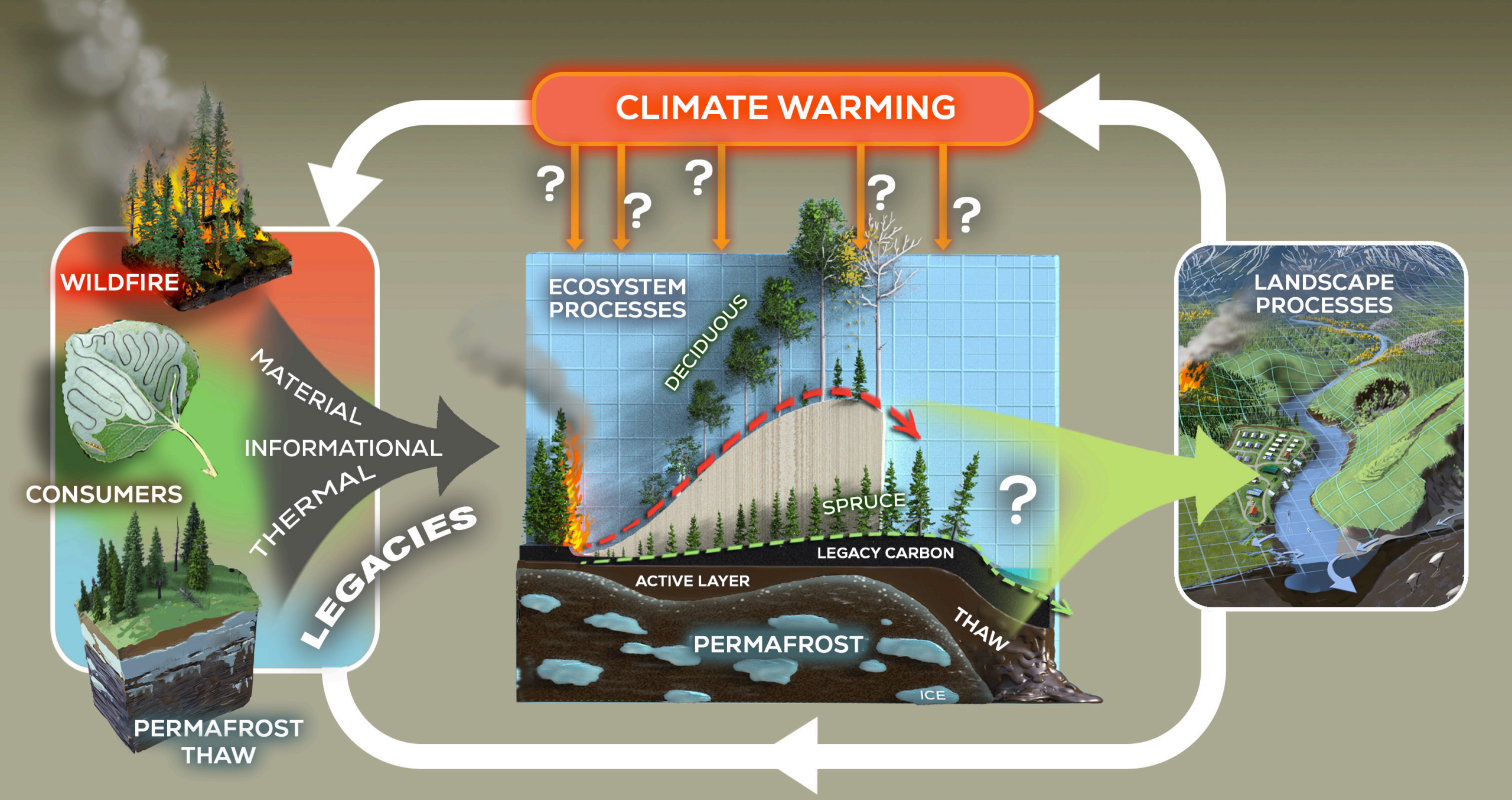
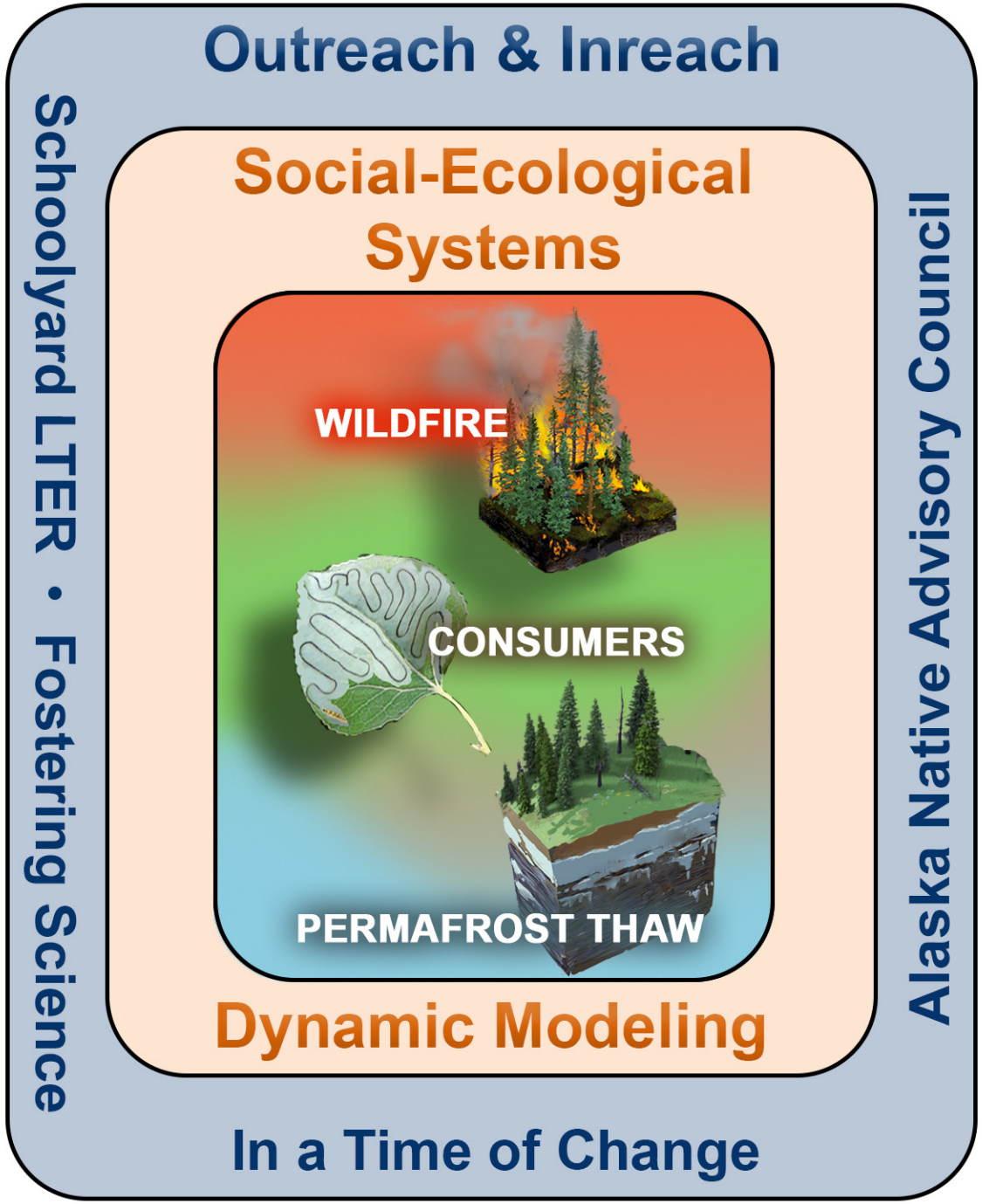


Figure by Victor Leshyk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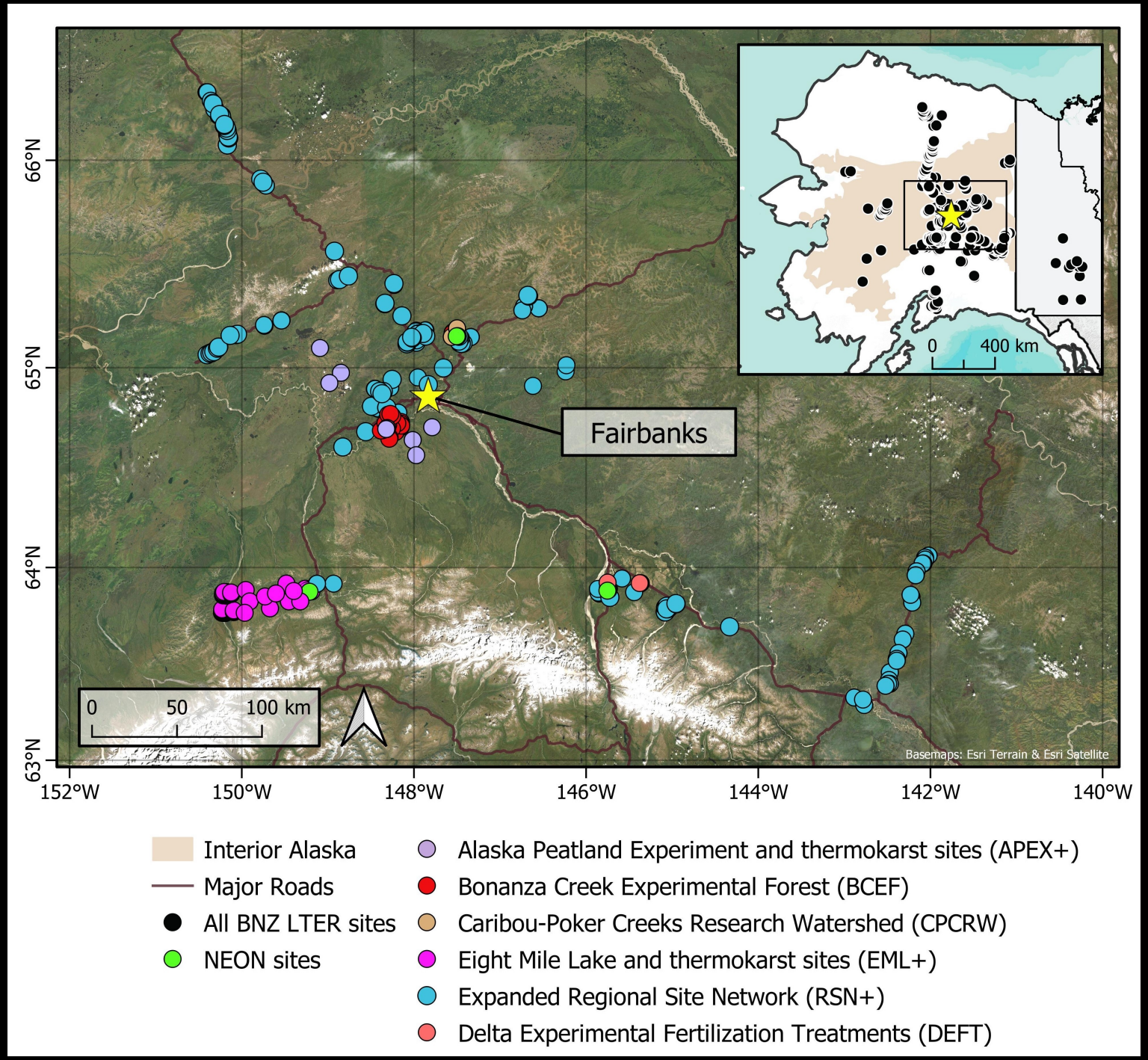
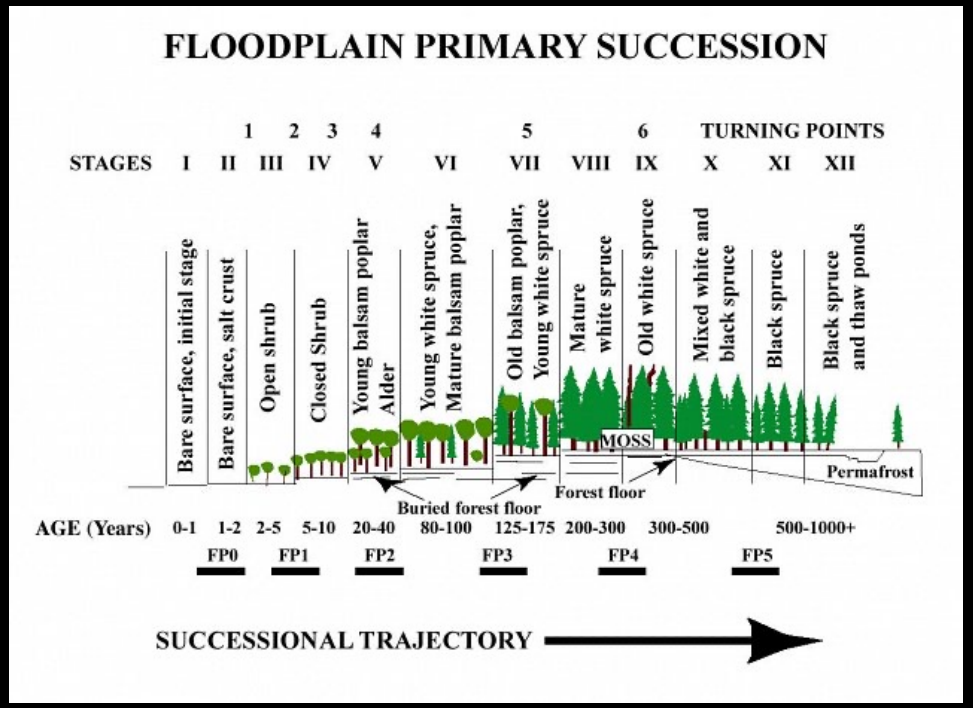
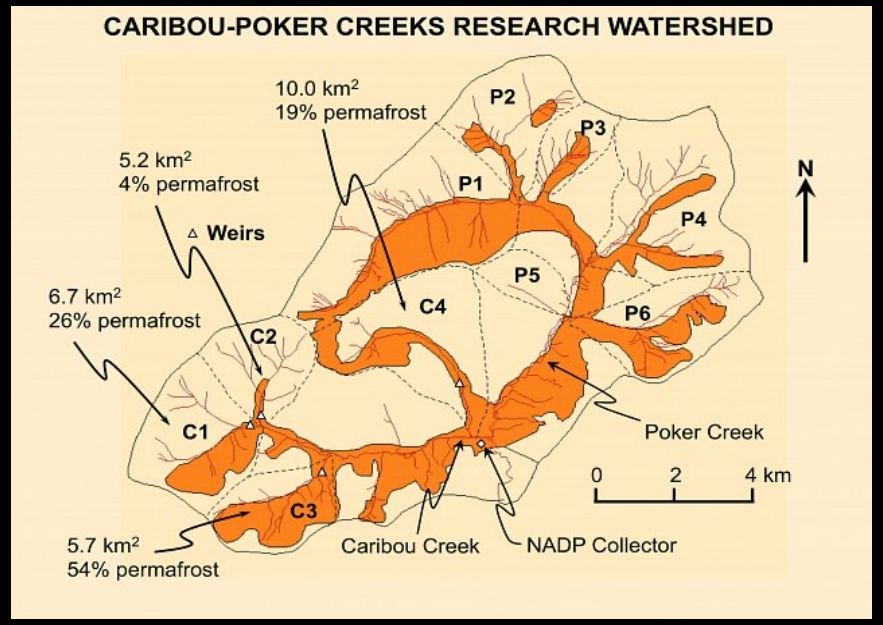

66°N
65°N
64°N
63°N
152°W
150°W
148°W
146°W
144°W
142°W
140°W
Fairbanks
0
50
100 km
0
400 km
Basemaps: Esri Terrain & Esri Satellite
Interior Alaska
Major Roads
All BNZ LTER sites
NEON sites
Alaska Peatland Experiment and thermokarst sites (APEX+)
Bonanza Creek Experimental Forest (BCEF)
Caribou-Poker Creeks Research Watershed (CPCRW)
Eight Mile Lake and thermokarst sites (EML+)
Expanded Regional Site Network (RSN+)
Delta Experimental Fertilization Treatments (DEFT)

Bonanza Creek Experimental Forest

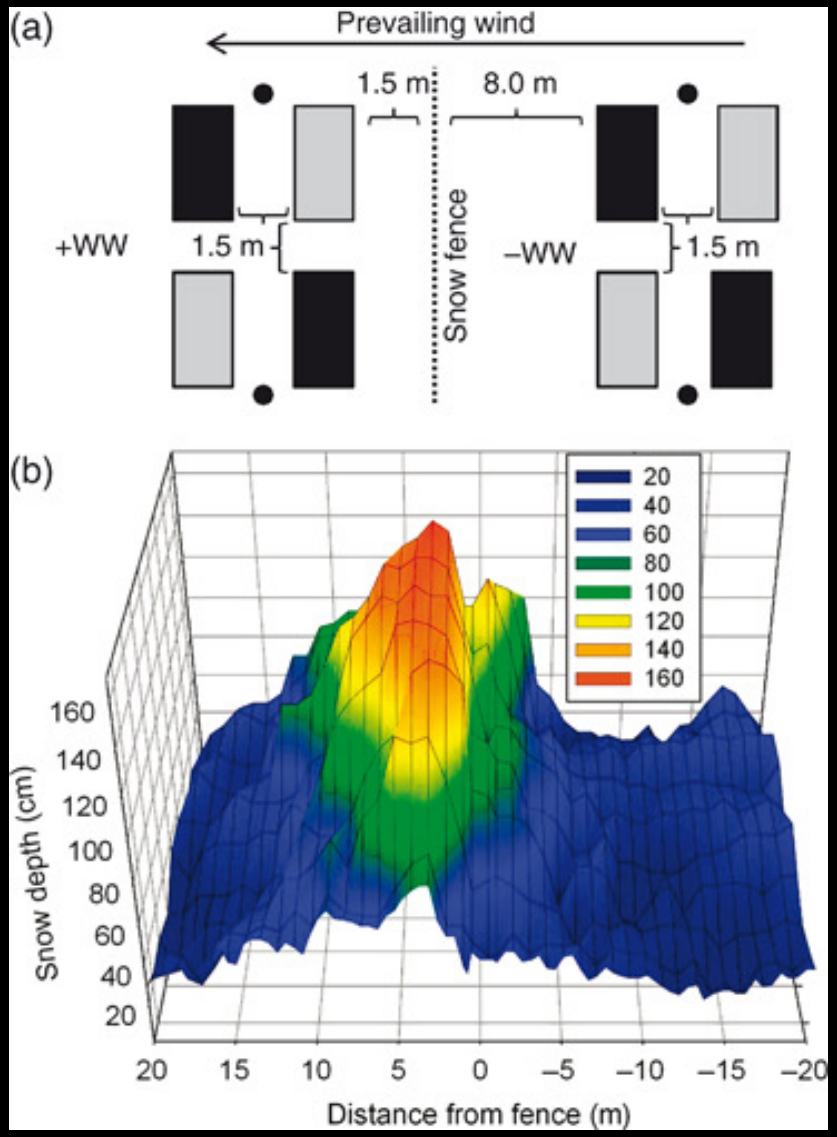


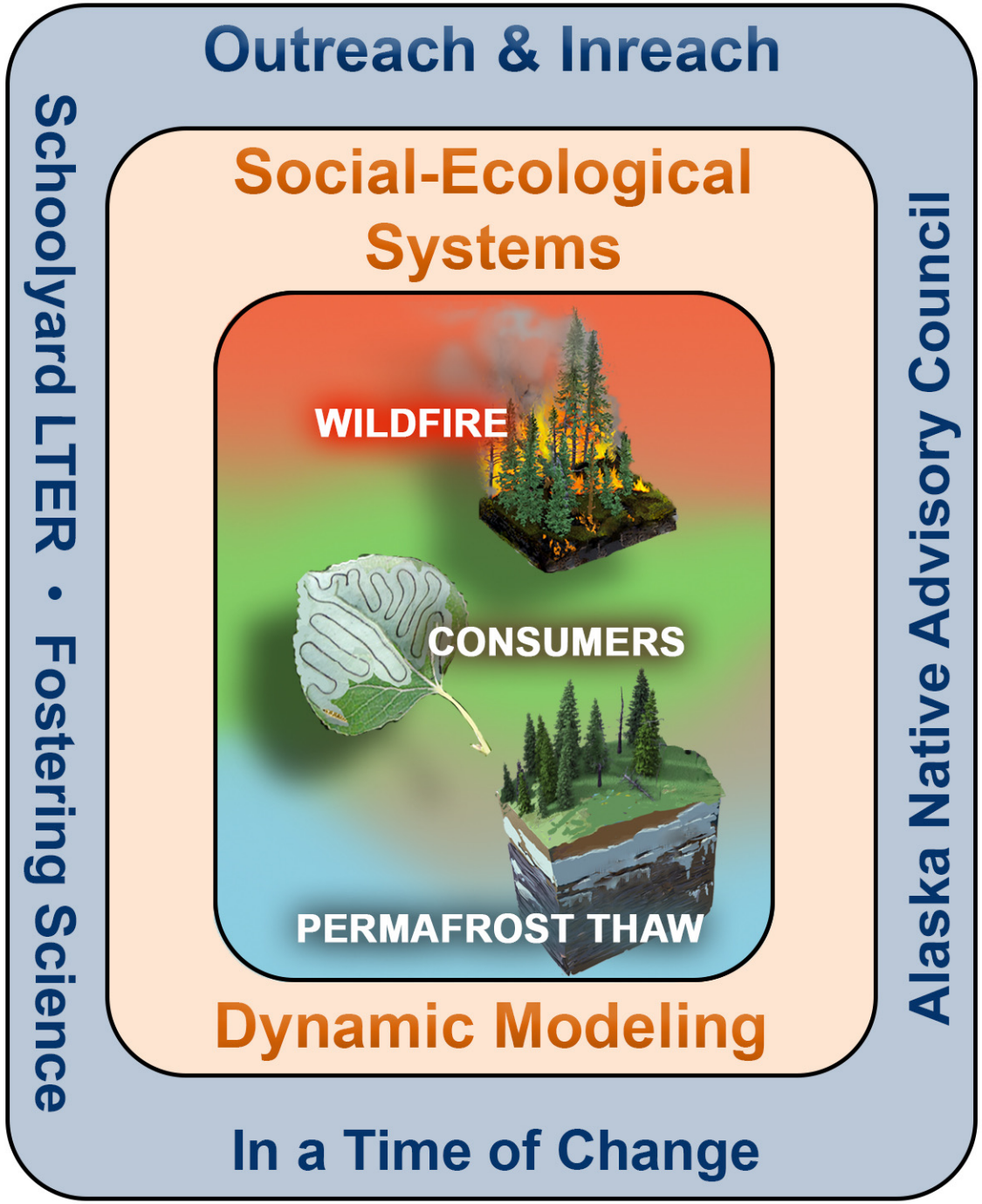
Caribou-Poker Creeks Research Watershed



Regional Site Network

Eight Mile Lake Research Watershed

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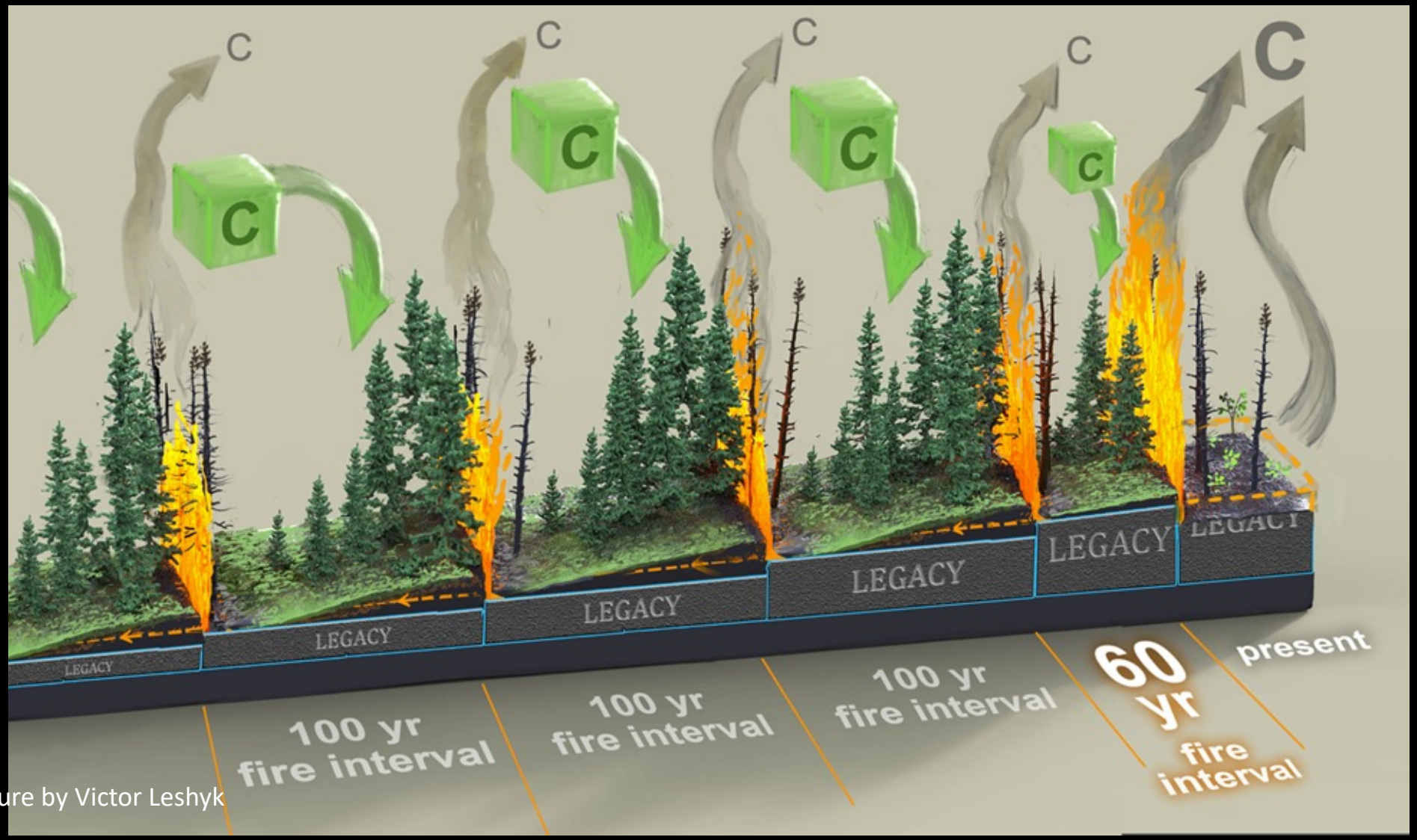


Figure by Victor Leshyk

Wildfire: How are intensifying fire regimes reshaping the structure and function of Alaskan boreal forests?

Figure by Victor Leshyk

Consumer Outbreaks:

How do population dynamics and activities of consumers interact with climate change to shape patterns of ecological succession?

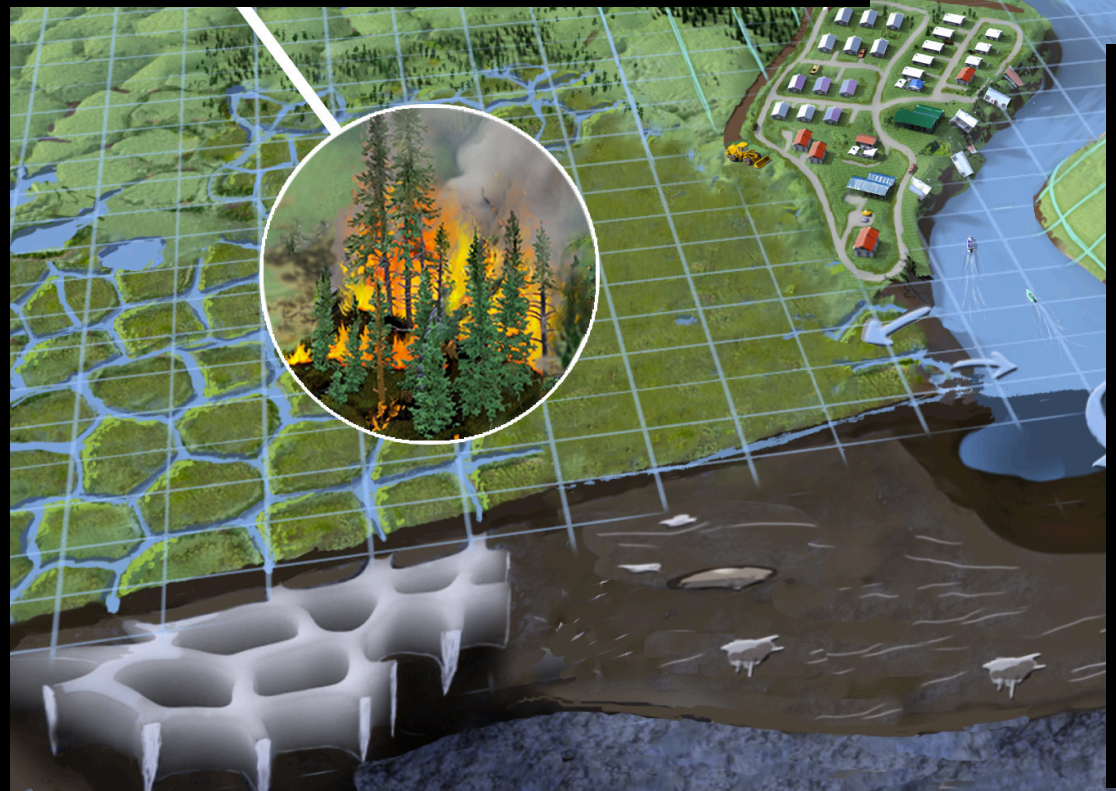
Permafrost Thaw:

How does thawing permafrost affect the distribution of water across the landscape, loss of C to the atmosphere, and export of C and nutrients to aquatic ecosystems?

Figure by Victor Leshyk

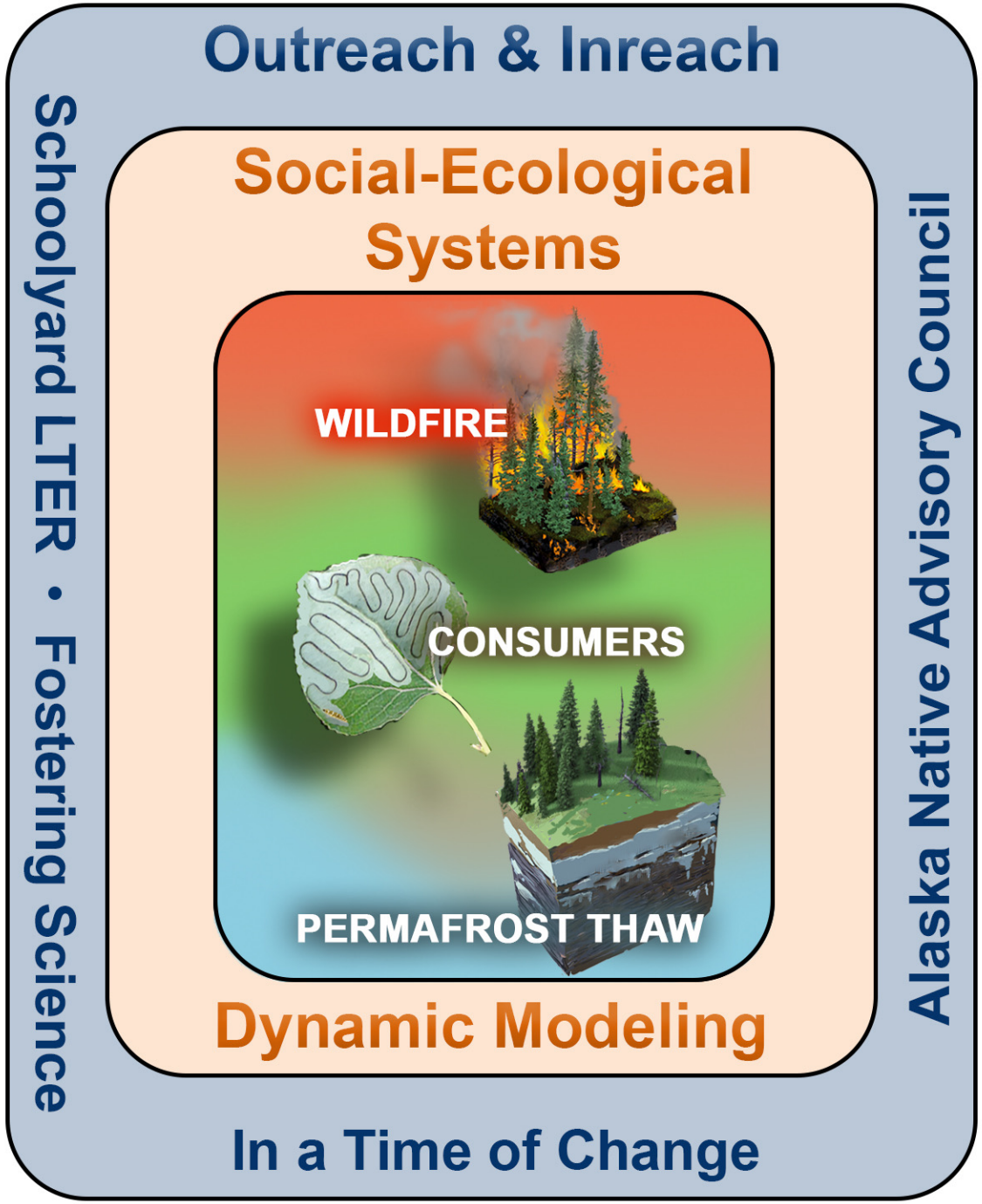
Modeling Integration:

Identify legacies and ecological processes that underpin boreal forest resilience and future trajectories at local and regional scales, from seasonal to centennial.



Social Ecological Systems Integration:

Assess residents' environmental value orientations (EVO) toward climate-driven changes to the boreal forest and use these findings to inform social-ecological research that addresses their concerns and needs.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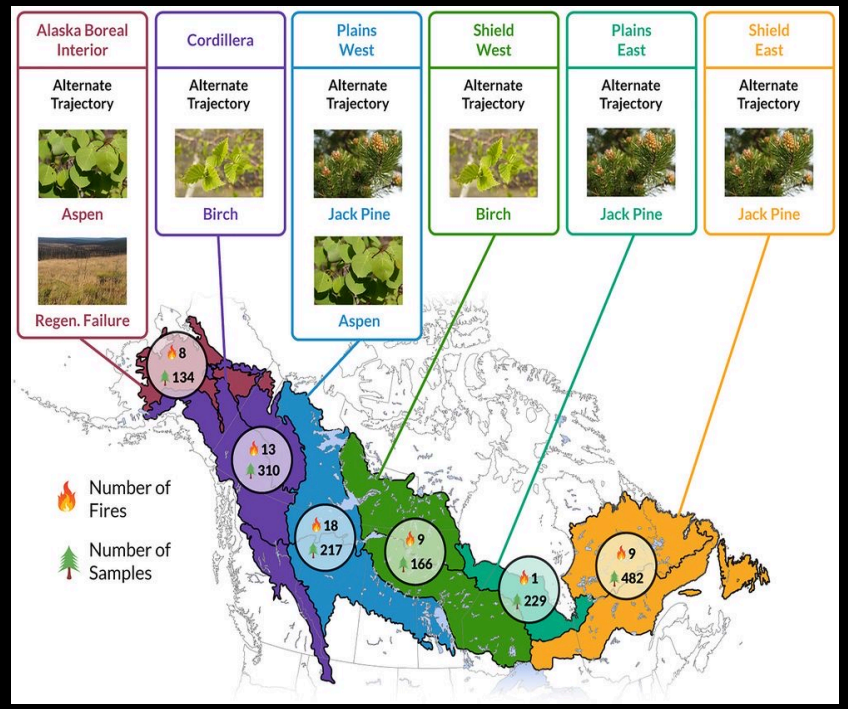
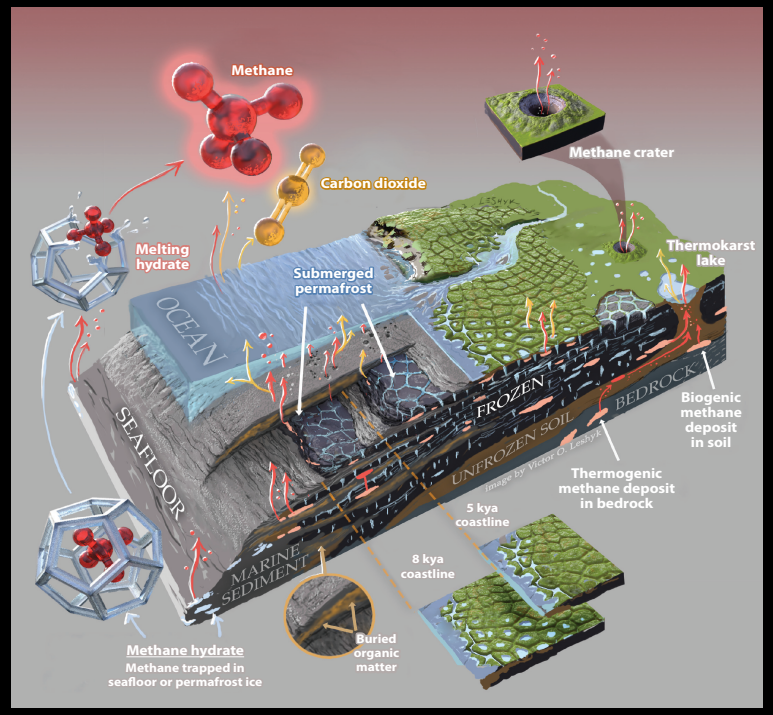
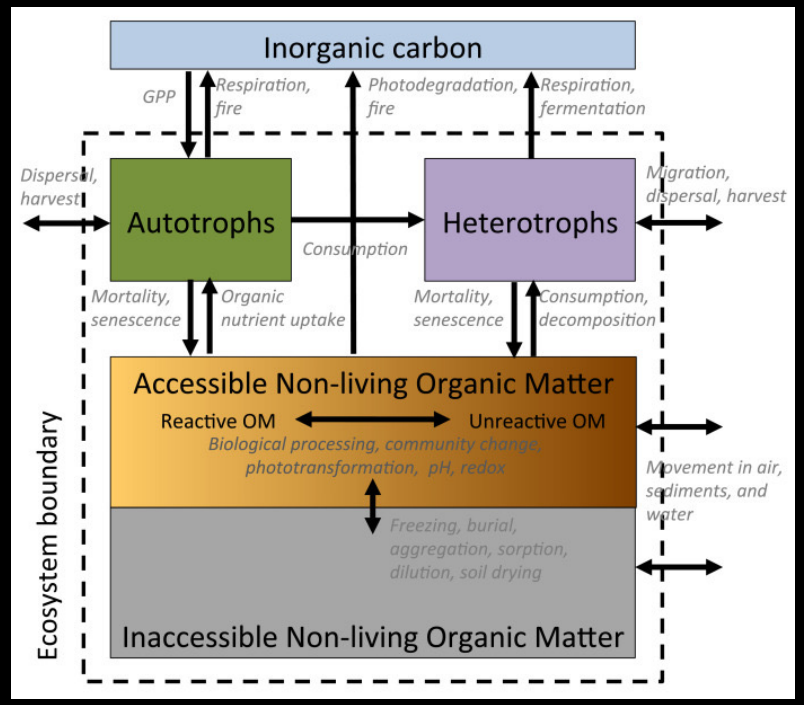
A decade of Synthesis



Regional forest dynamics; Baltzer et al. 2021



Role of the Arctic in the Earth System; Schuur et al. 2021



Ecological theory; Harms et al. 2021

New synthesis postdoctoral research fellowship funded by University of Alaska Fairbanks starting in 2023.

Contact: michelle.mack@nau.edu or right after this talk!

Bonanza Creek Alaska Native Advisory Council
Founding members

Freddy Olin IV, Tanana Tribal Council

Eva Burk, Nenana Tribal Council

Darcy Peter, Beaver Tribal Council

"Our vision is to leverage partnerships for program and project funding opportunities whether academic research or agency-led ecological, environmental, and/or fish and game management, while maintaining an Alaska Native perspective, focus, and benefit."

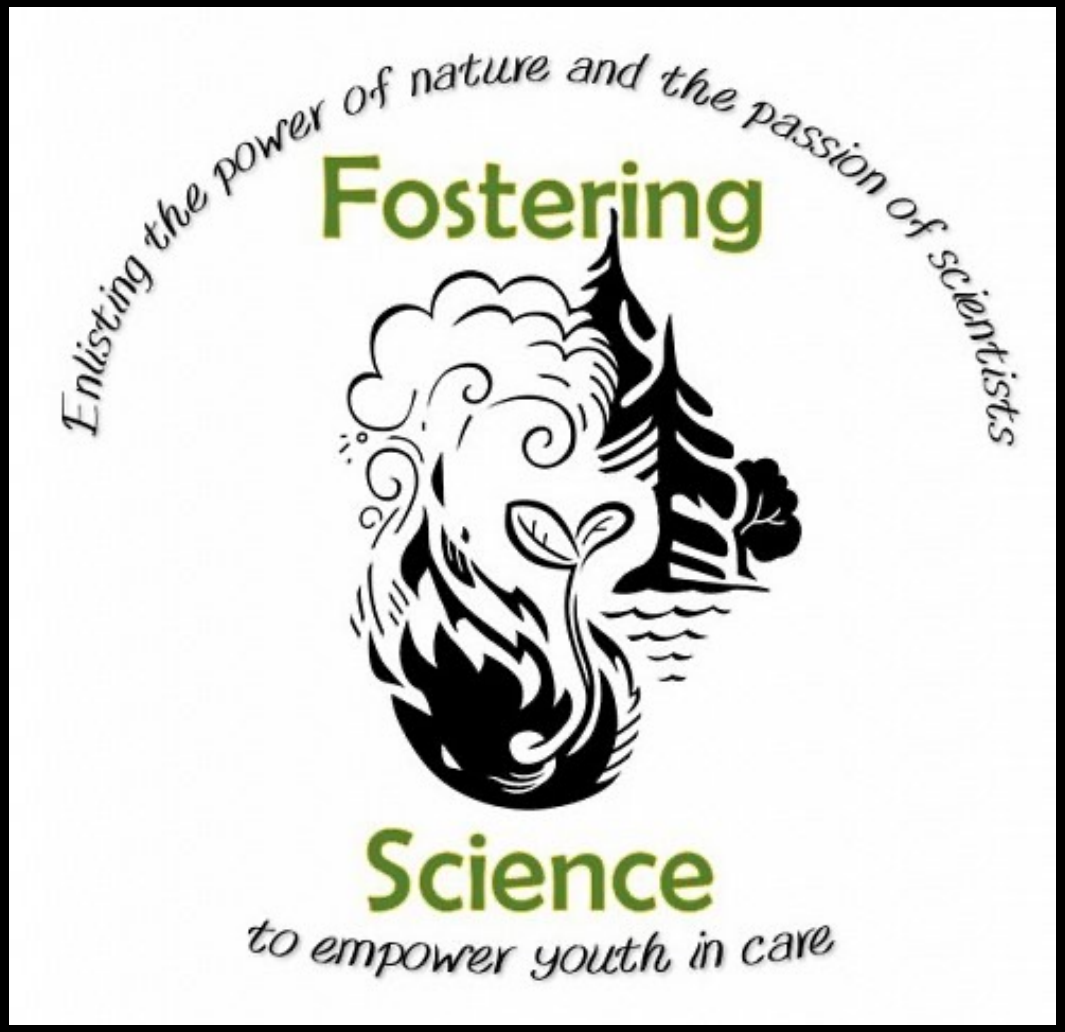
Arts, Humanities, and Sciences Collaborative

Mary Beth Leigh

Lissy Goralnik

https://itoc.alaska.edu/tag/bfs/

Summer Ecology Camps for Youth in Foster Care



Christa Mulder
and
Katie Spellman

Educational research, community science, and outreach to educators

Katie Spellman, Elena Sparrow and Christa Mulder

Connections to Toolik

- People!
- Diversity, equity, inclusion, and justice
- Disturbance ecology, syntheses for ecological theory and understanding of the Earth system
- Synthesis postdoctoral fellowships
- Arts, Humanities and Sciences *In a Time of Change*
- Educational research, outreach, and inreach

Thanks to the BNZ LTER Group

Leadership Team:
Michelle Mack
Mary Beth Leigh
Christa Mulder
Teresa Hollingsworth
Jay Jones

Site Manager:
Jamie Hollingsworth

Information Manager:
Jason Downing

Technicians:
Karl Olson
Mark Winterstein

--Senior scientists
--Many students, postdocs, and visiting researchers
--Artists, writers, scholars, and educators

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Boreal Forest Ecology

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