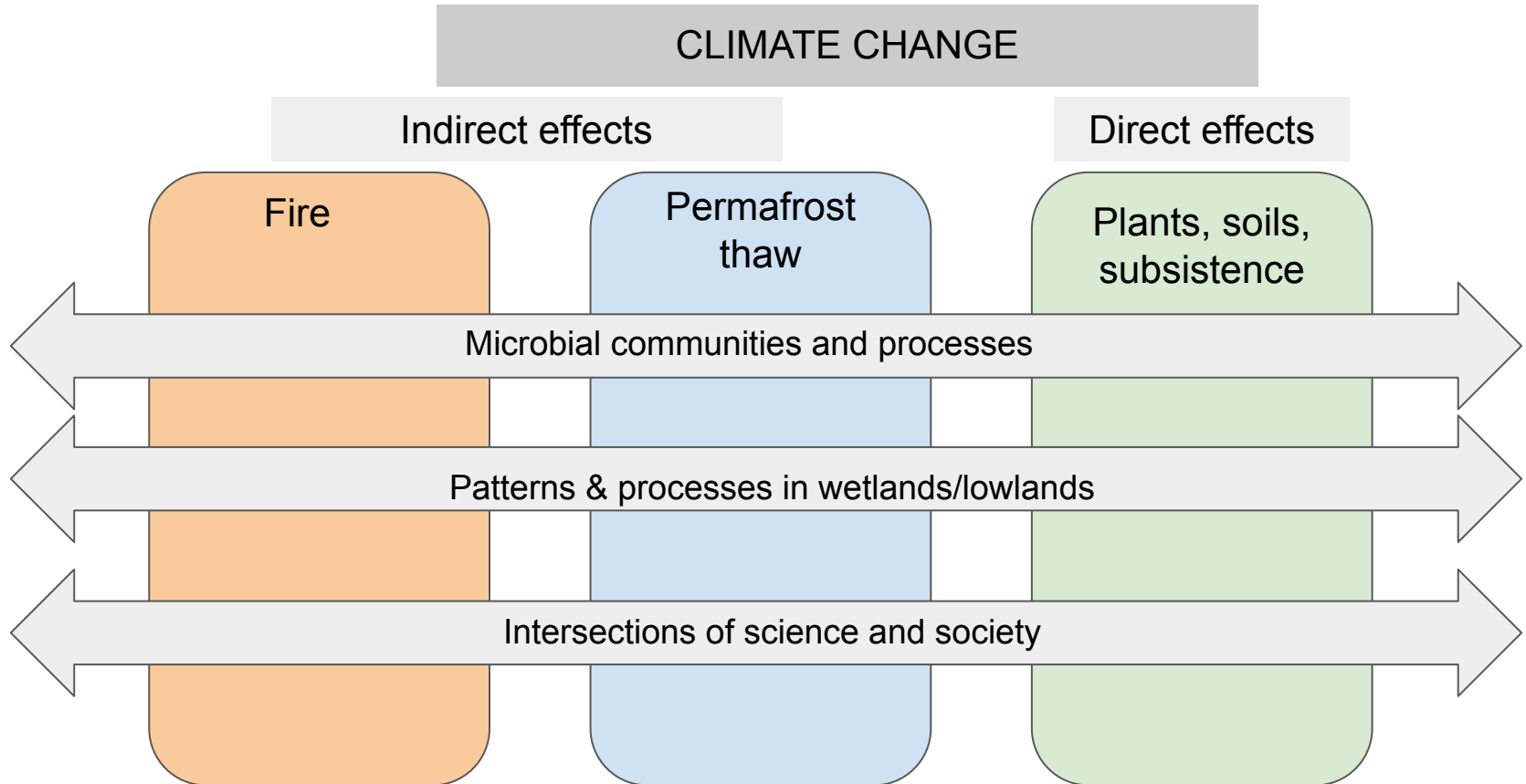


An aerial photograph of a wide, winding river, likely the Yellowstone River, flowing through a vast landscape. The river is a milky, light blue color, characteristic of glacial meltwater. It meanders through a mix of green coniferous forests and areas with yellow and orange autumn foliage. The surrounding terrain is rugged, with some areas appearing to be volcanic ash or sand. The sky is blue with scattered white clouds. A semi-transparent white rectangular box is overlaid on the center of the image, containing the title and subtitle text.

Yesterday on *The Boreal and the Beautiful...*

BNZ Symposium Day 1 Review
Teresa Hollingsworth and Mary Beth Leigh

Major themes and cross-cutting lines of inquiry



Major themes and cross-cutting lines of inquiry

CLIMATE CHANGE

Indirect effects

Fire

Conifer-deciduous transition

Transition from spruce to deciduous (or mixed) – small number of deciduous in a mixed stand pre-fire can result in more decid post-fire. Once established, deciduous trees are resilient to fire, like due to resprout potential of deciduous. This is altered with short-interval repeat fires, which alters successional trajectories to a more open/primary succession-like stand and increases soil C efflux and reduces GPP from ground vegetation

Burn severity affected which fungi colonized roots. This could alter successional trajectories.

Time-series mapping of boreal forests across N America could be used to look at patterns in wetlands/lowlands in the context of the C-D transition

Site level flammability is a function of quality and quantity of fuels, and varies along age and moisture gradients

Microbial communities and processes

Patterns & processes in wetlands/lowlands

Intersections of science and society

Major themes and cross-cutting lines of inquiry

CLIMATE CHANGE

Indirect effects

Permafrost thaw

Active layer was not frozen by end of 2017-2020 cold seasons for the first time since 1995 monitoring started. Soil C decreasing at higher rate than CO₂ and CH₄ emission. Lateral losses. Modeling efforts underway of species (tree, shrub, moss), hydrology, heat balance, and permafrost.

Microbial communities produce and consume GHG prior to complete permafrost thaw and modify SOM chemistry – within only 1 degree of warming N₂O, CH₄ and CO₂ change. Current permafrost carbon storage (no matter the age) is dependent on both microbial communities which are active below freezing over millennia and the climate present at the time of permafrost formation. C and N in streams changing, likely due to solute delivery to streams (and microbial transformations). N loss exceeds N fixation, but no correlates known yet for denitrification. In other aquatic systems, higher microbial production associated with higher C use efficiency, affected by ecosystem type, temp, N, and P.

Permafrost thaw responsible for up to 50% of hazards experienced by land users in AK communities.

Microbial communities and processes

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CLIMATE CHANGE

Direct effects

Plants, soils, subsistence

Long-term trends in soil moisture and temp have increased in freq. and magnitude over last 20 years. Warming has inhibitory and then stimulatory effects that cancel each other out on berry production. Aspen upregulates photosynthesis in undamaged portions of the leaf-mined canopy. Deciduous trees have more climate-sensitive water storage dynamics than spruce. White spruce competition, stress, herbivory, growth, mortality is controlled by annual weather extremes.

Aspen canker causes C starvation and hydraulic failure, driving widespread mortality. Young trees seem to be more immune. Thermal energy of rain can warm soils, facilitating plant and soil microbial processes that increase methane emissions by 30%.

Wet sites are getting wetter (lowlands, wetlands). Legacy effects of water table position can govern C sink strength in a rich fen by impacting algal biomass production during flooding

Changing environmental conditions are having a significant effect on hunter harvest. Every 1 m increase in water level decreases moose harvest by up to 50%. Every 1C increase in temp decreases moose harvest by 7%.

Microbial communities and processes

Patterns & processes in wetlands/lowlands

Intersections of science and society

Cross-cutting theme: Microbial communities and processes

Additional comments:

- NSF site review identified this as an area in need of growth at BNZ
- Yesterday's grand challenge submissions and chat thread revealed more microbial research ideas.
- Have more ideas? Add them to grand challenges - and discussion coming soon.

Cross-cutting theme: Patterns and processes in wetlands/lowlands

Additional comments:

- BNZ has been successful with upland fire and scenario work. Next, we could apply this to peatlands/wetlands/lowlands.
- Chat and grand challenge questions revealed more wetland/lowland ideas to pursue, including connectivity questions.
- Discussion coming soon.

Cross-cutting theme: Intersections of science and society

Additional elements and ideas:

- Ed/outreach research is building capacity, providing citizen science datasets across BNZ multiple science themes, & advancing fundamental ed research
- Arts/Humanities activities engaging society on multiple BNZ science themes, research is advancing informal science learning.
- More ideas emerged yesterday from group (chat and grand challenge questions) for science-society questions. Keep the ideas coming.
- More discussion coming soon.