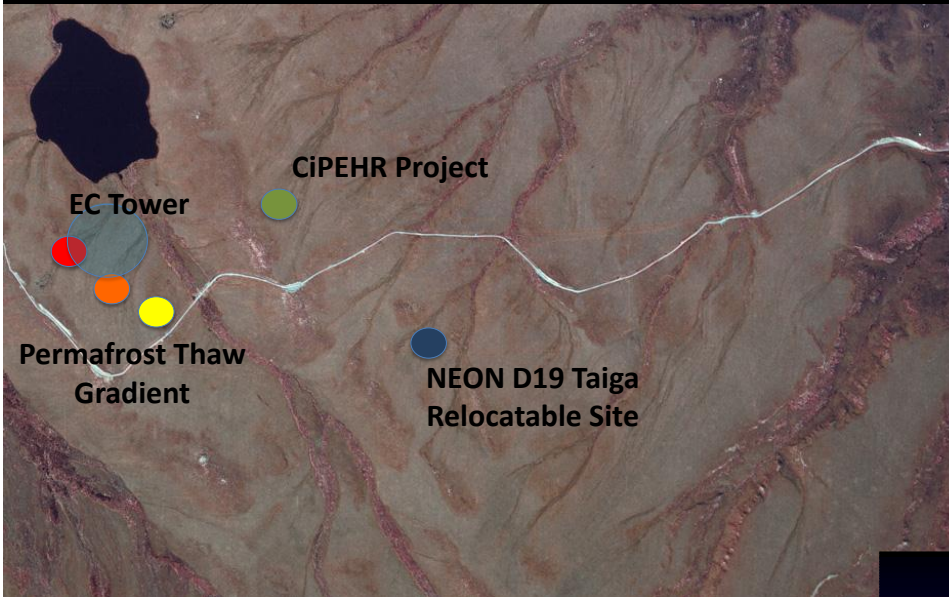


Eight Mile Lake Study Area

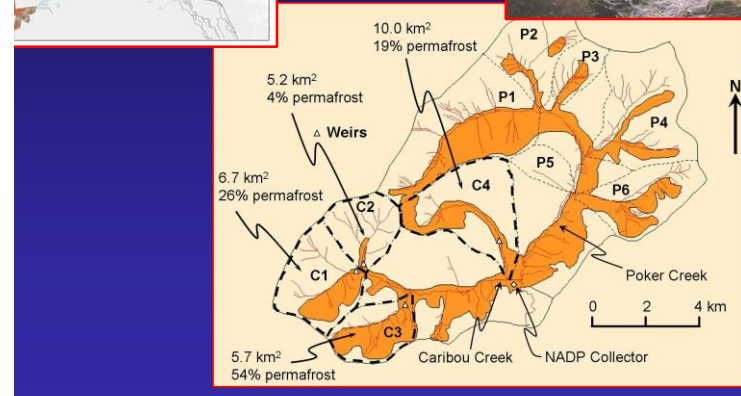
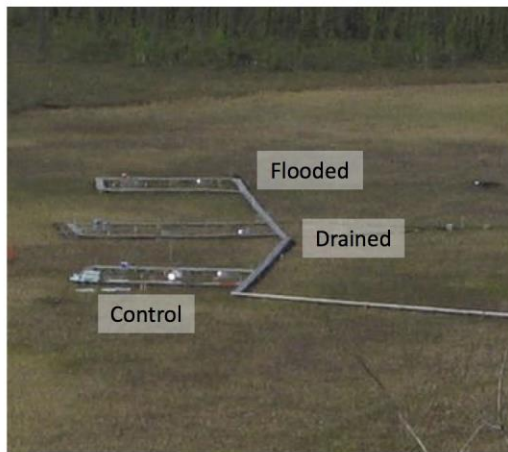


- Coupling between fire and permafrost
- Effects of permafrost thaw on surface hydrology between better- drained vs. poorly- drained ecosystems
- Consequences for ecosystem structure and function?

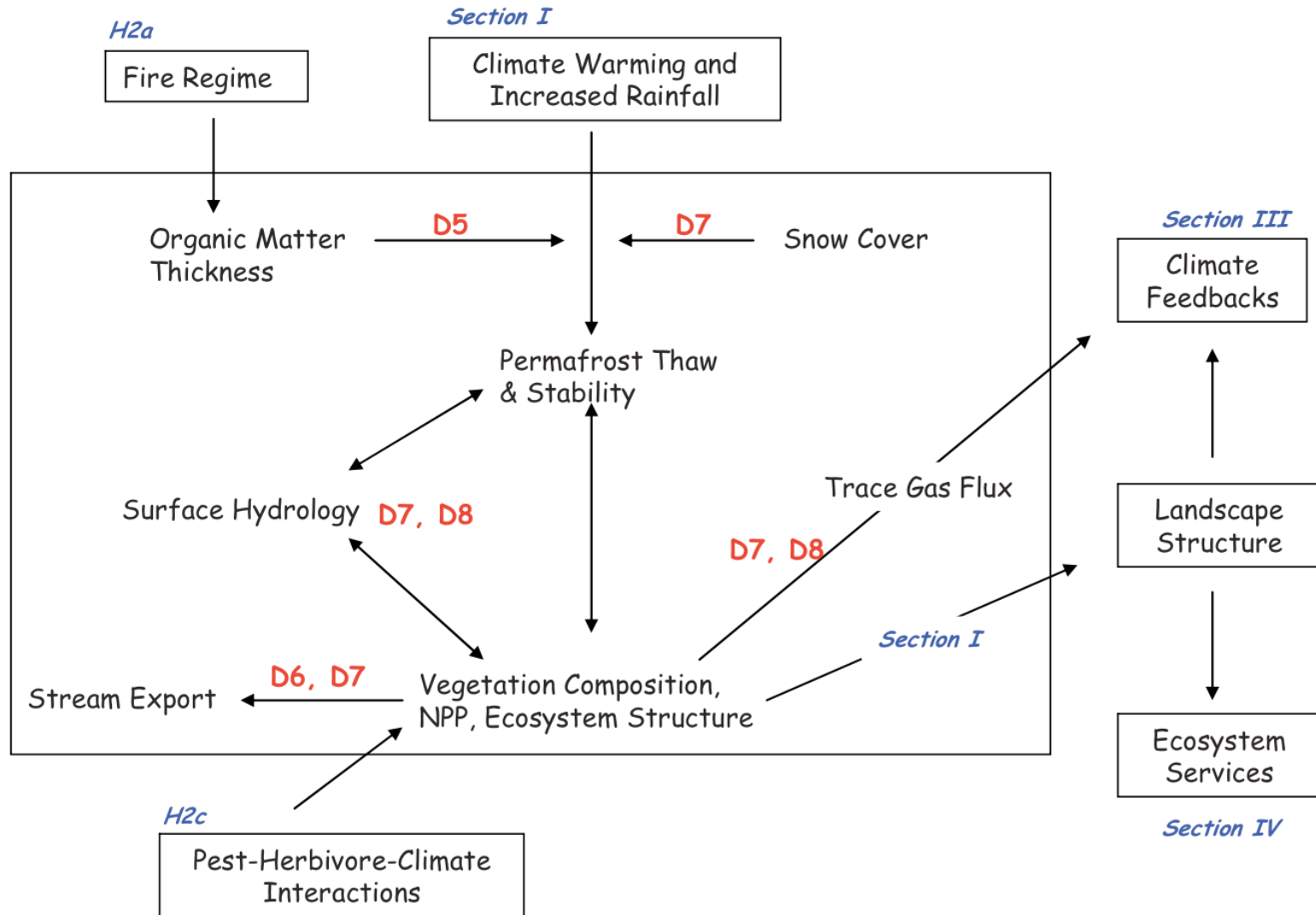
Common measurements:

- soil environment (temperature, moisture, water table, and active layer depth)
- radiocarbon age of DOC
- exchange of CO₂ and CH₄
- species composition and productivity

CARIBOU-POKER CREEKS RESEARCH WATERSHED



CURRENT DIRECTIONS



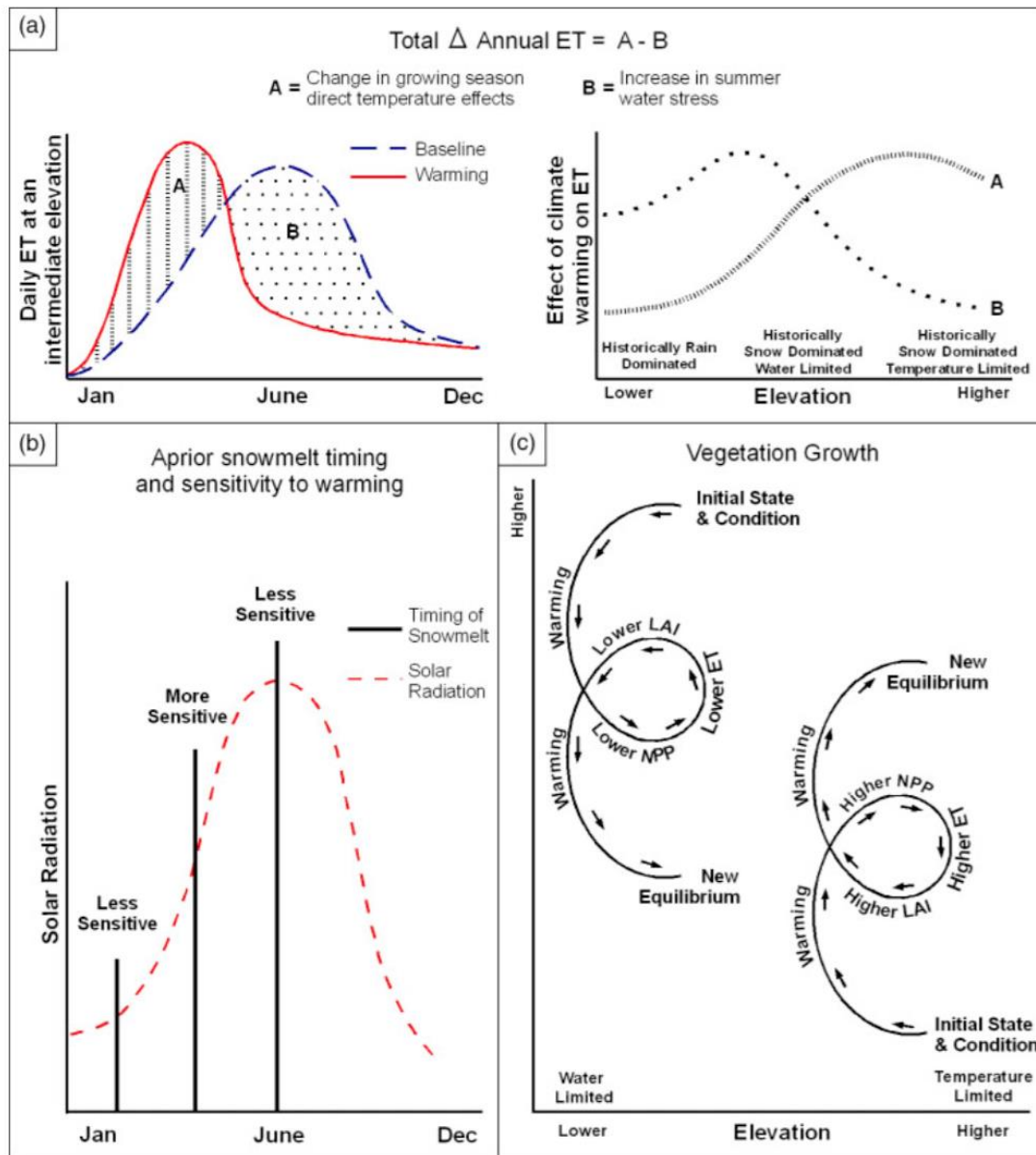
D5: Fire and permafrost

D7: Boreal tundra landscapes

D6: Upland catchment hydro-biogeochemistry

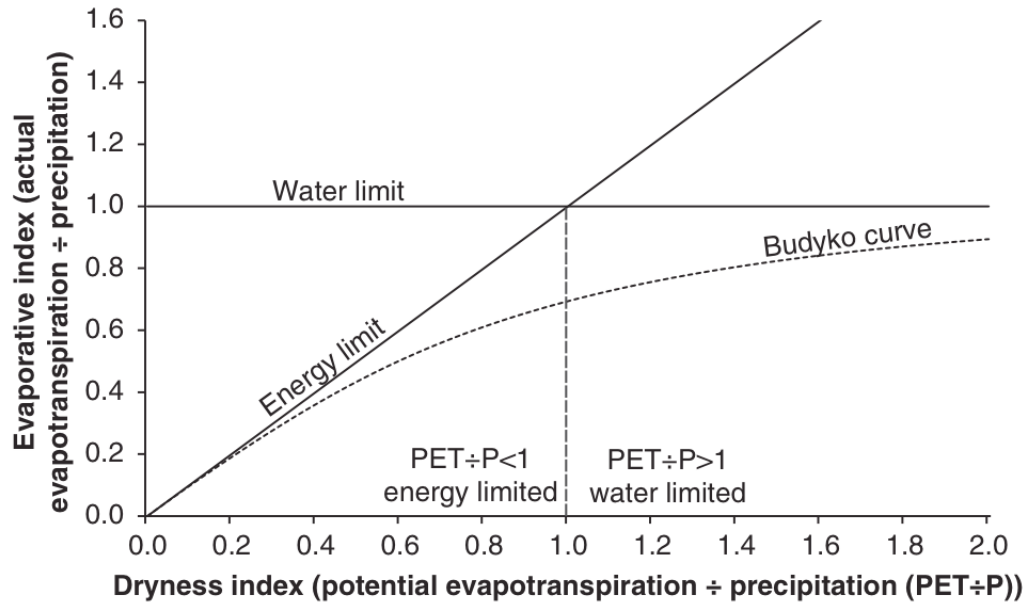
D8: Wetlands

ENERGY VERSUS WATER LIMITATION – MOTIVATING LITERATURE

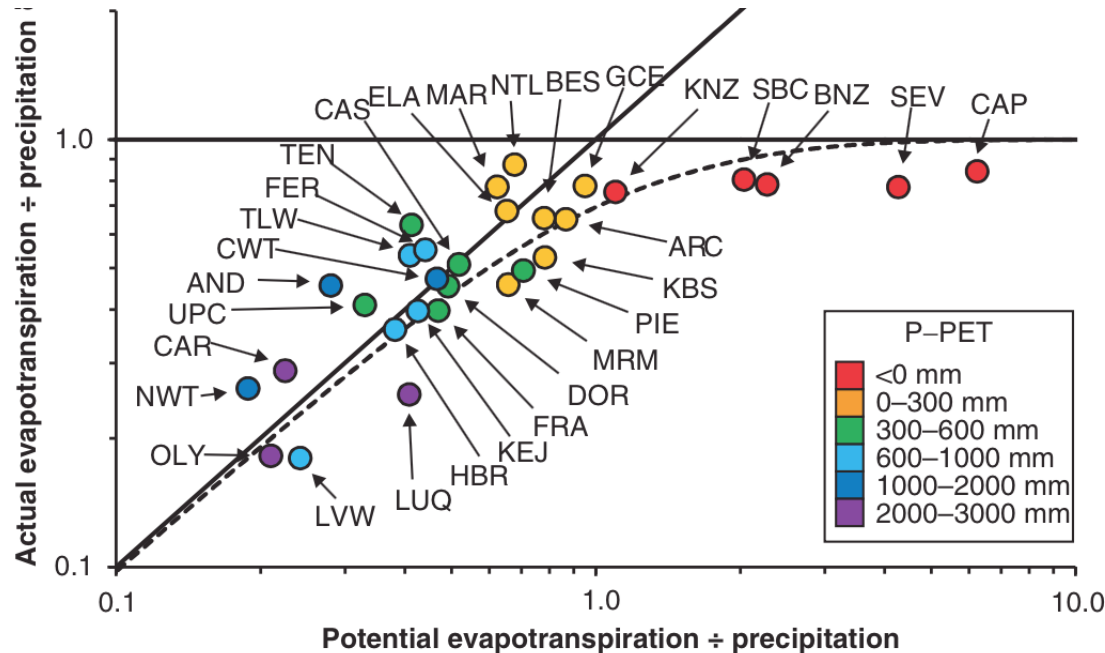


- ET and NPP along elevation gradient
- Earlier snowmelt/longer growing season
- Gradient: rain dominated → snow dominated/water limited → snow dominated/temperature limited
- With longer growing season, increased ET early in the season leading to increased water stress later in the summer
- Lower elevations/water limited:
 - Earlier snowmelt leads to greater water stress and decreased ET & NPP
- Higher elevations/energy limited:
 - Earlier snowmelt leads to increased ET & NPP

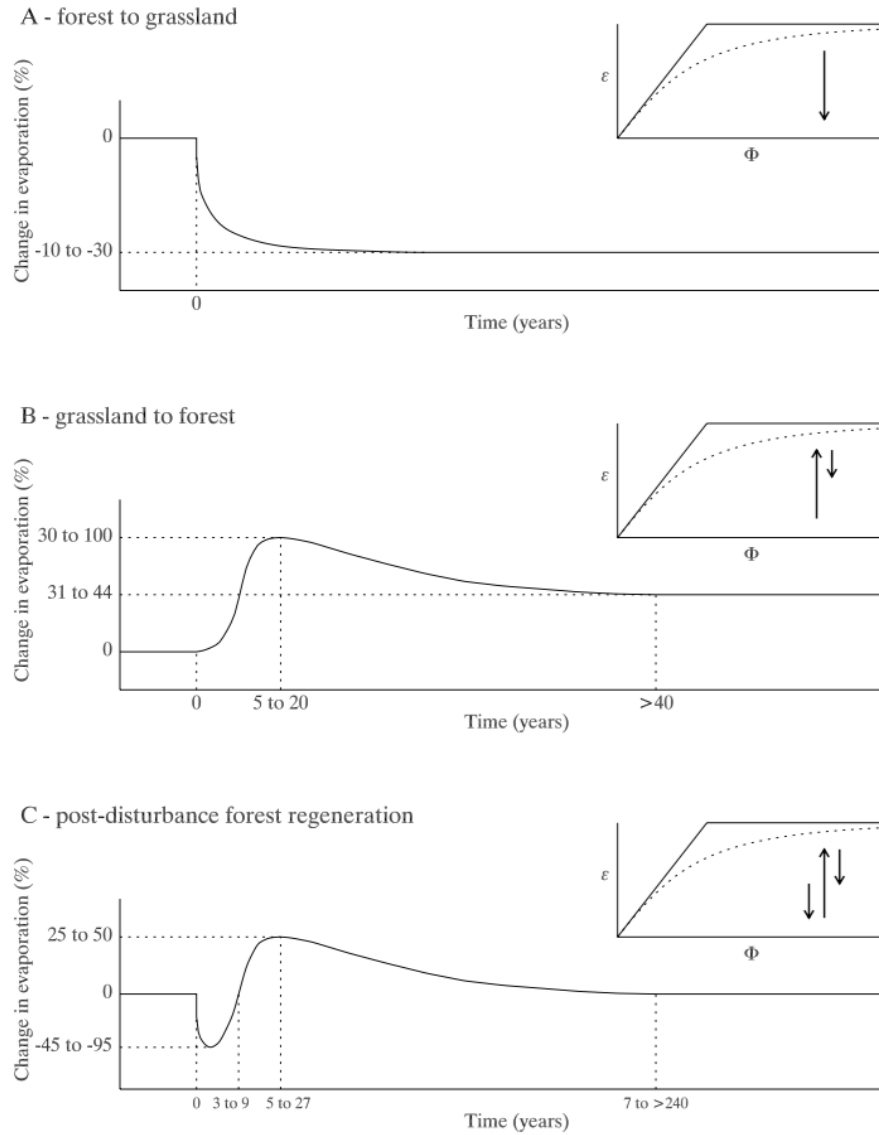
ENERGY VERSUS WATER LIMITATION



- Budyko framework: energy versus water limitation on hydrologic budgets
- AET/P vs. PET/P
- Deviations from line driven by:
 - Snow melt
 - Lateral fluxes of water
 - Fire



ENERGY VERSUS WATER LIMITATION

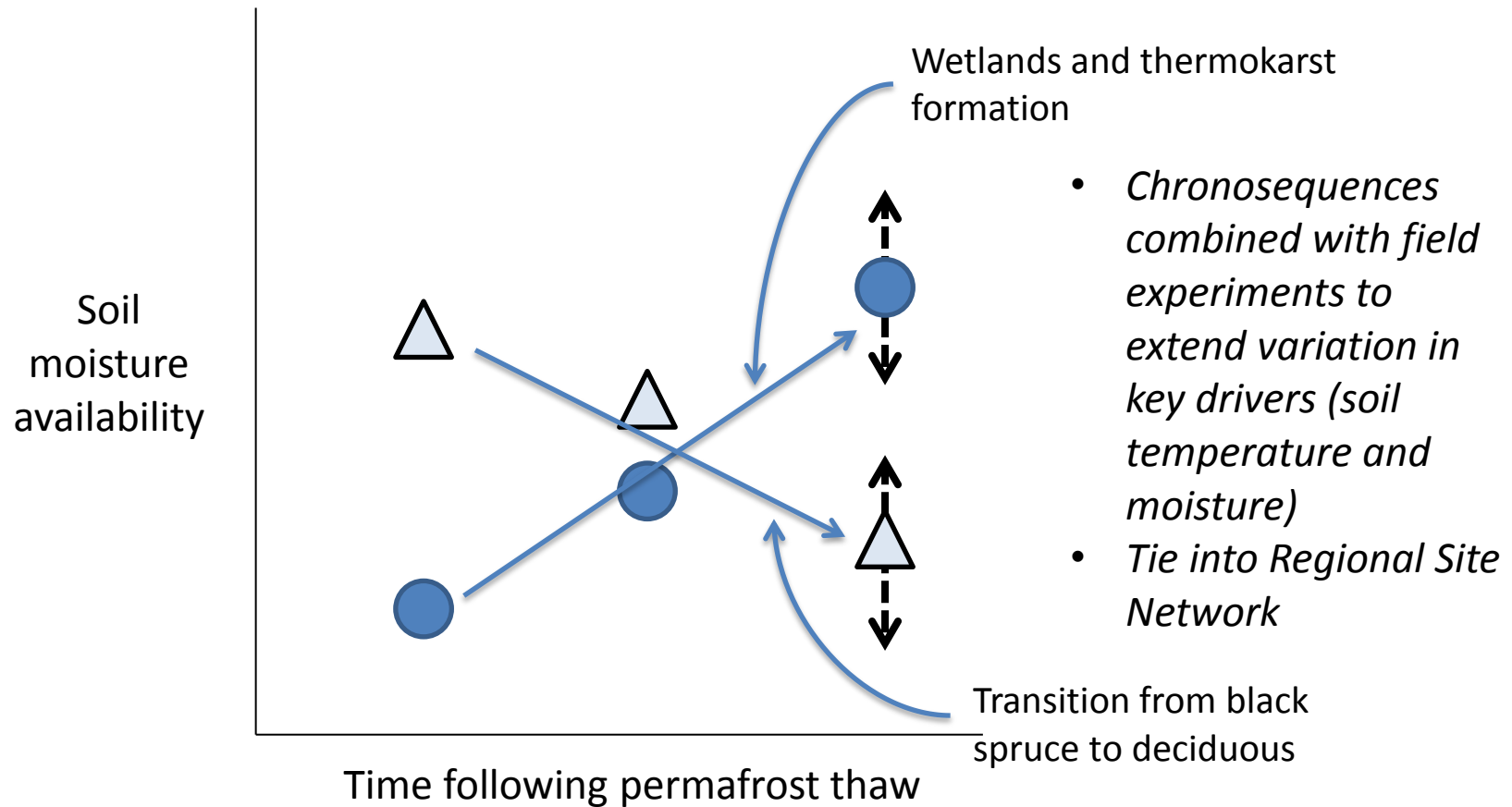


Departures:

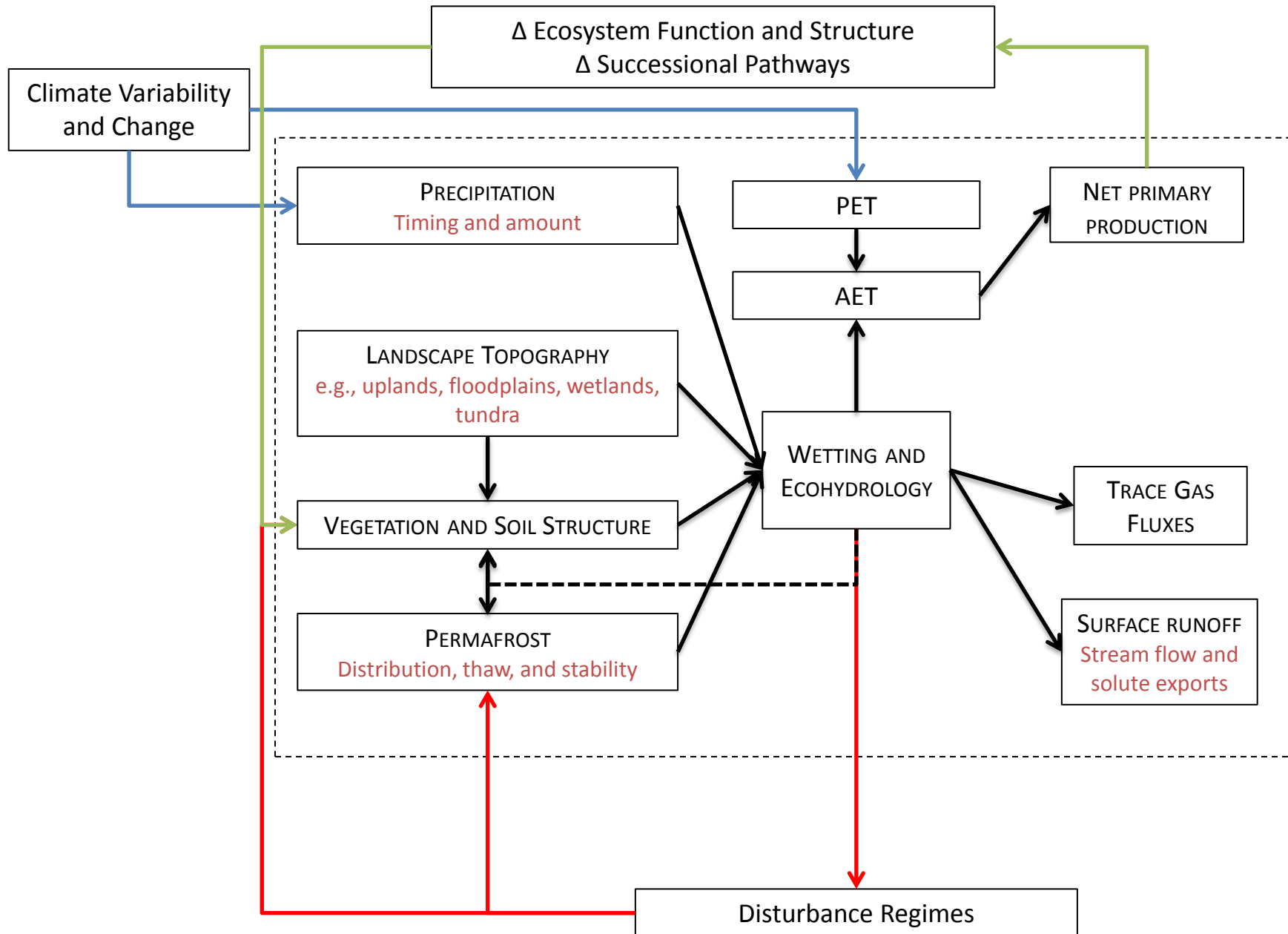
- Change in proportion of precipitation as snowfall
- Permafrost thawing and loss
- Fire

Fig. 6. Changes in catchment evapotranspiration following major vegetation changes.

LTER Research: Effects of permafrost thaw on forest and tundra ecosystems



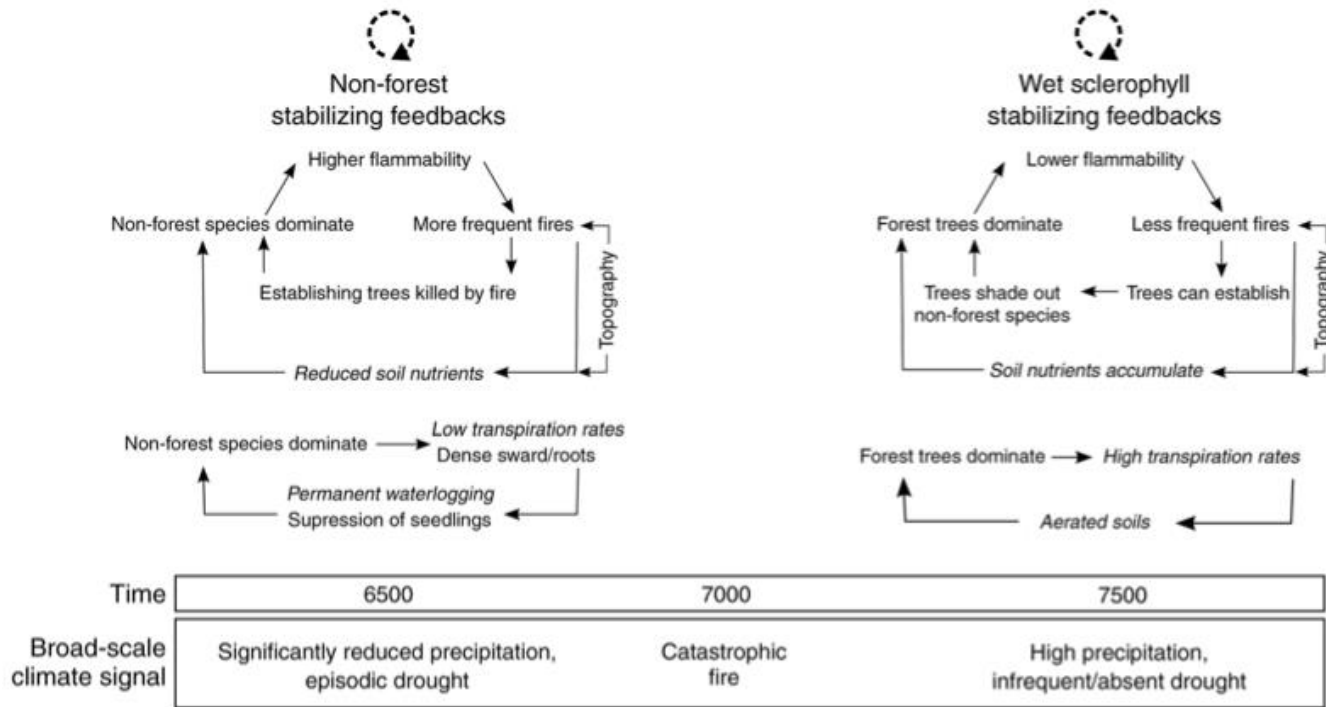
CLIMATE AND LANDSCAPE STRUCTURE INTERACTIONS



EFFECTS OF CHANGING WATER AVAILABILITY ACROSS LANDSCAPE HYDROLOGIC GRADIENTS

- ENERGY VERSUS WATER LIMITATION CONTROLS ON ECOSYSTEMS
 - CONSEQUENCES FOR CARBON STORAGE AND FLUXES
 - EFFECTS ON PRIMARY PRODUCTIVITY
- HOW HYDROLOGIC PARTITIONING AND CARBON FLUXES WILL RESPOND TO THAWING PERMAFROST AND WILDFIRE ACROSS THE LANDSCAPE
- SCALING FROM PLOT TO WATERSHED SCALES
- INCORPORATING LANDSCAPE TOPOGRAPHY (E.G., WETLANDS, BOREAL TUNDRA, UPLANDS) INTO A BROADER CONCEPTUAL FRAMEWORK
- INTEGRATING WITH THE REGIONAL SITE NETWORK

FIRE AND HYDROLOGIC PARTIONING – MOTIVATING LITERATURE



- Role of wildfire for altering vegetation feedbacks to soil moisture
- Initial condition: forest with high ET and aerated soil
- Post fire: loss of forest led to low ET and permanent water logging

LANDSCAPE WATER PARTITIONING

