Water Resources, Safety and Security

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Reliance on freshwater

Drinking, cleaning and cooking

Reliance on freshwater

Transportation

Reliance on freshwater

Transportation

Reliance on freshwater

Transportation

Freshwater accessibility

In spite of its large river valleys…

Freshwater accessibility

….and wetlands complexes…

Freshwater accessibility

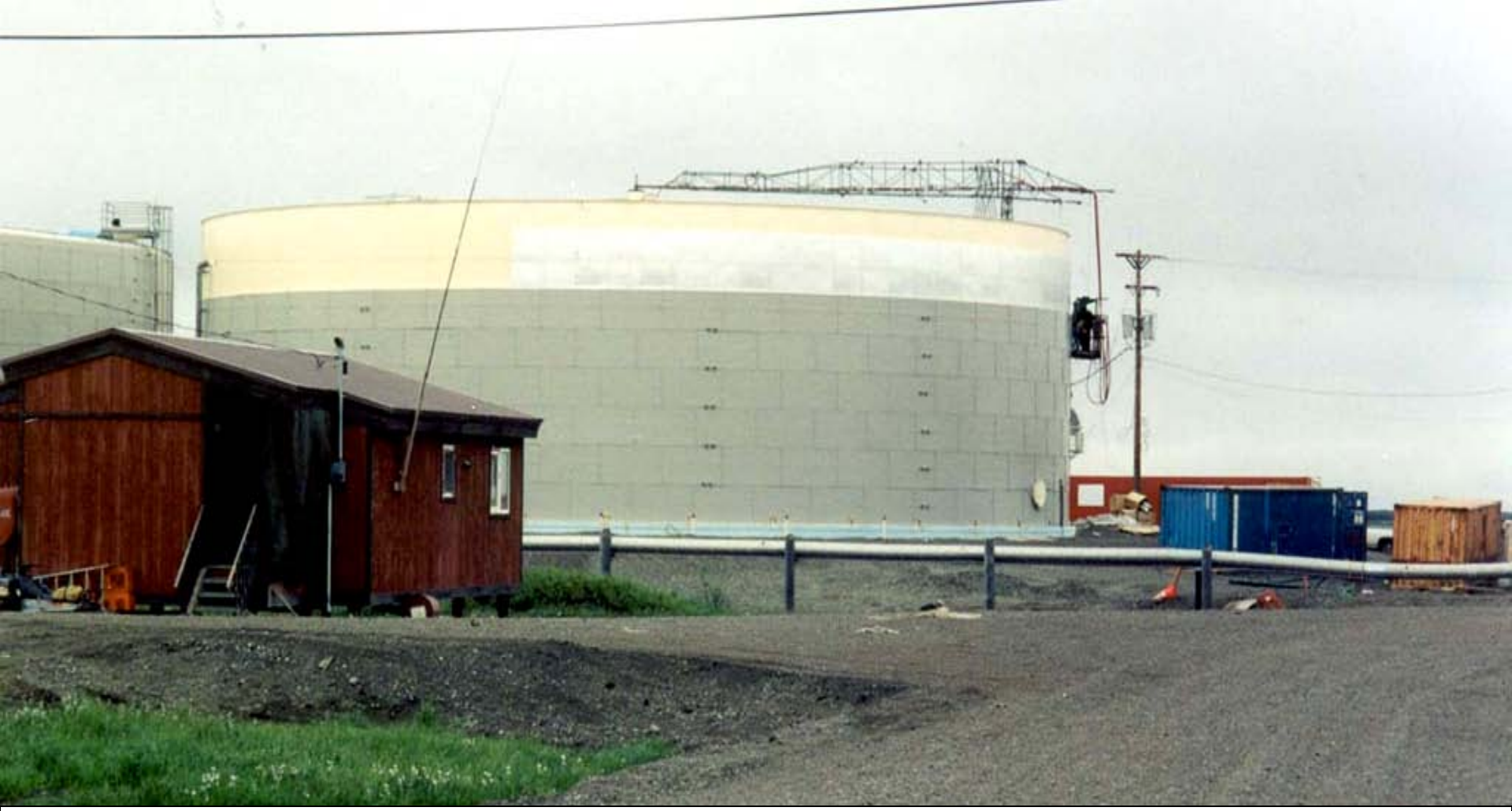
….much of Alaska is “arid” by measure of precipitation.

Freshwater accessibility

We have adapted to an “arid” landscape

Freshwater accessibility

…where the water remains frozen much of the year



Freshwater accessibility

We collect, store, and heat large volumes of water to last the winter period.

Freshwater accessibility

Still, tanks run empty if tanks are too small, the pumping season is too short,

Freshwater accessibility

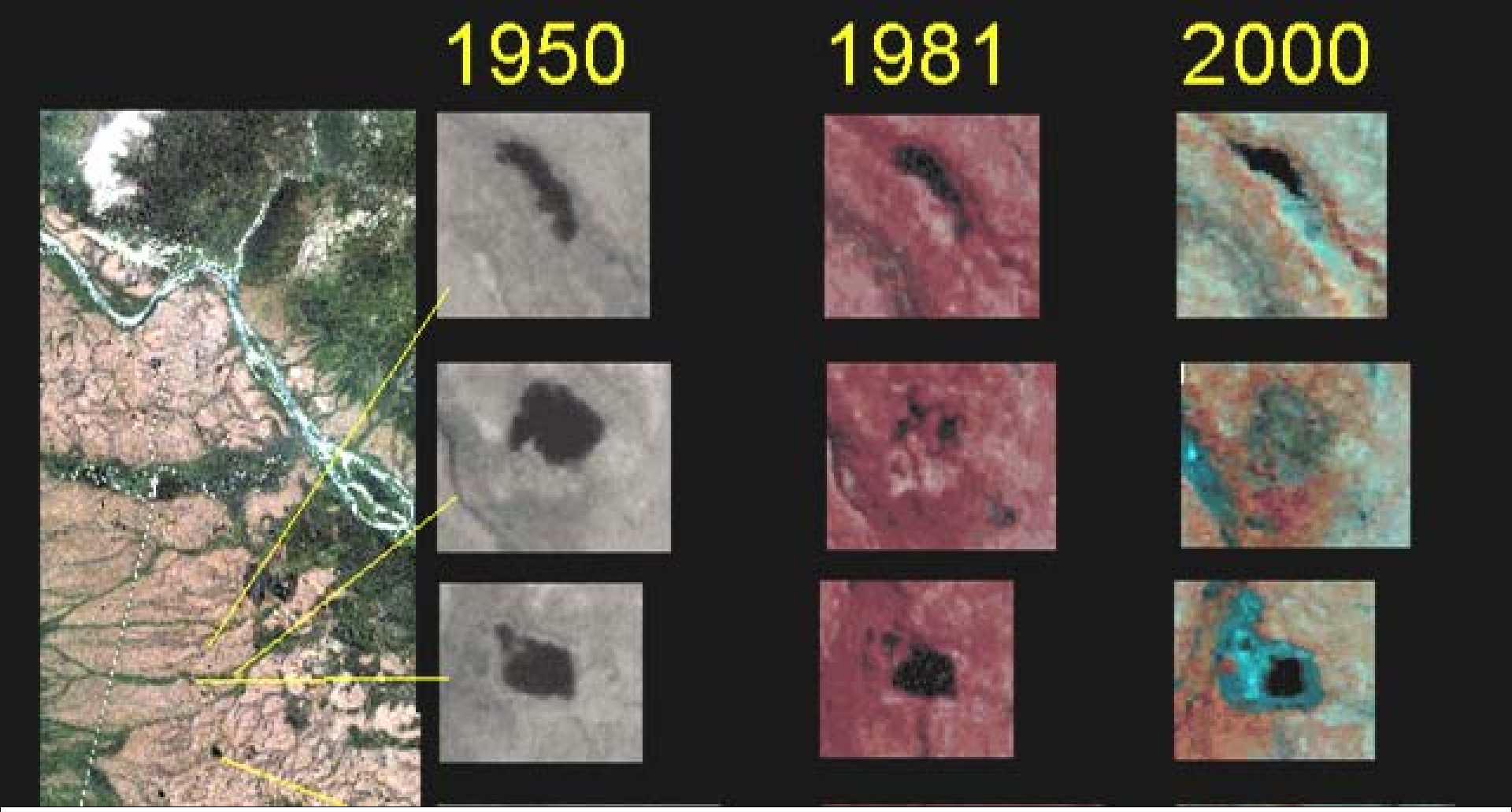
or there is simply not enough water to collect.

Climate change, water and people

A changing climate is having a major impact

Climate change, water and people

Much of the freshwater in the Arctic sits atop frozen, ice-rich ground.



Climate change, water and people

Water supported by permafrost is particularly vulnerable

Credit: Larry Hinzman

Vulnerability

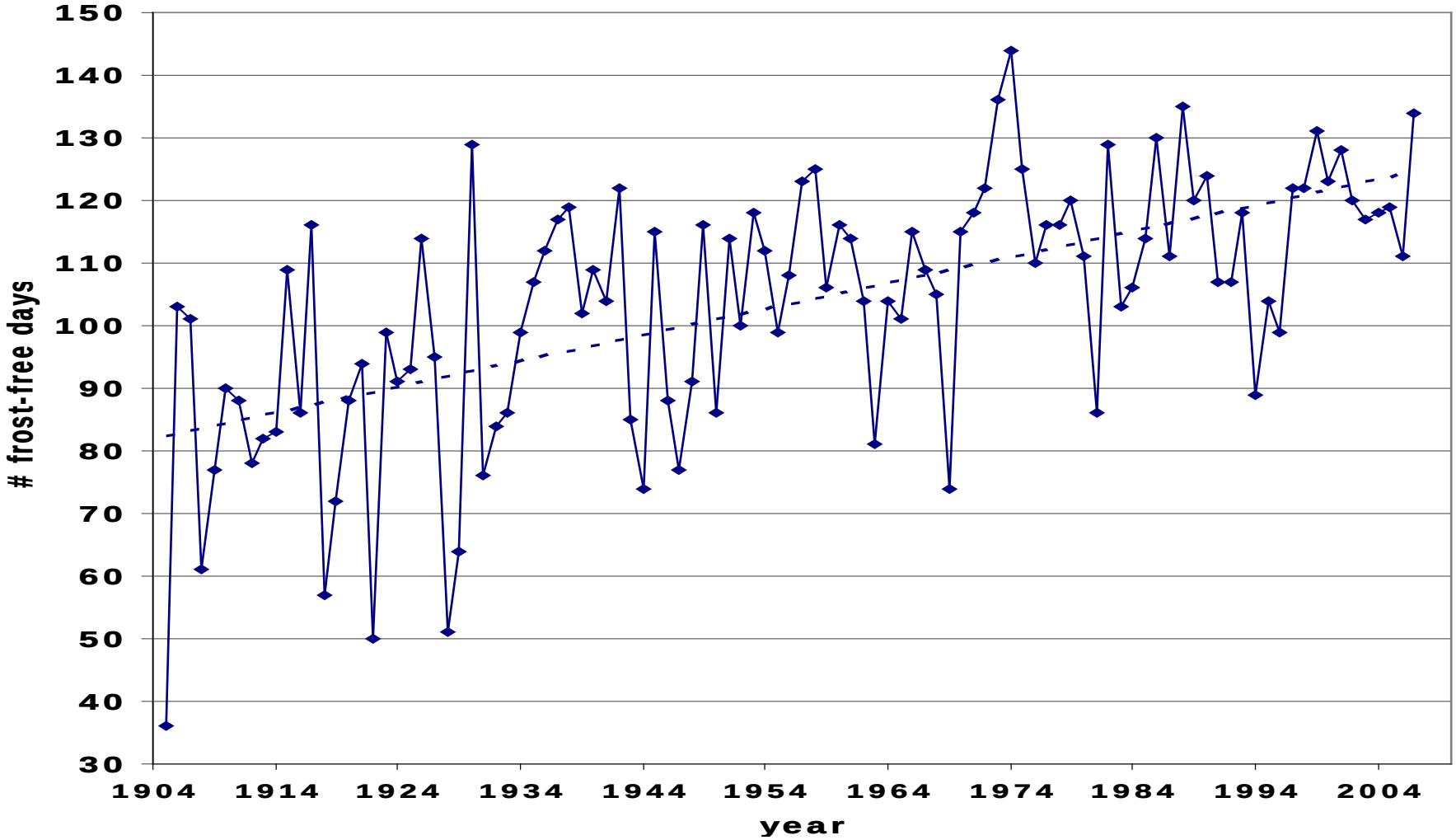
Continued loss of permafrost almost certainly means increased surface water vulnerability

Vulnerability

Shorter winters and more precipitation could reduce the need for water storage and the reliance on snow/ice

Vulnerability

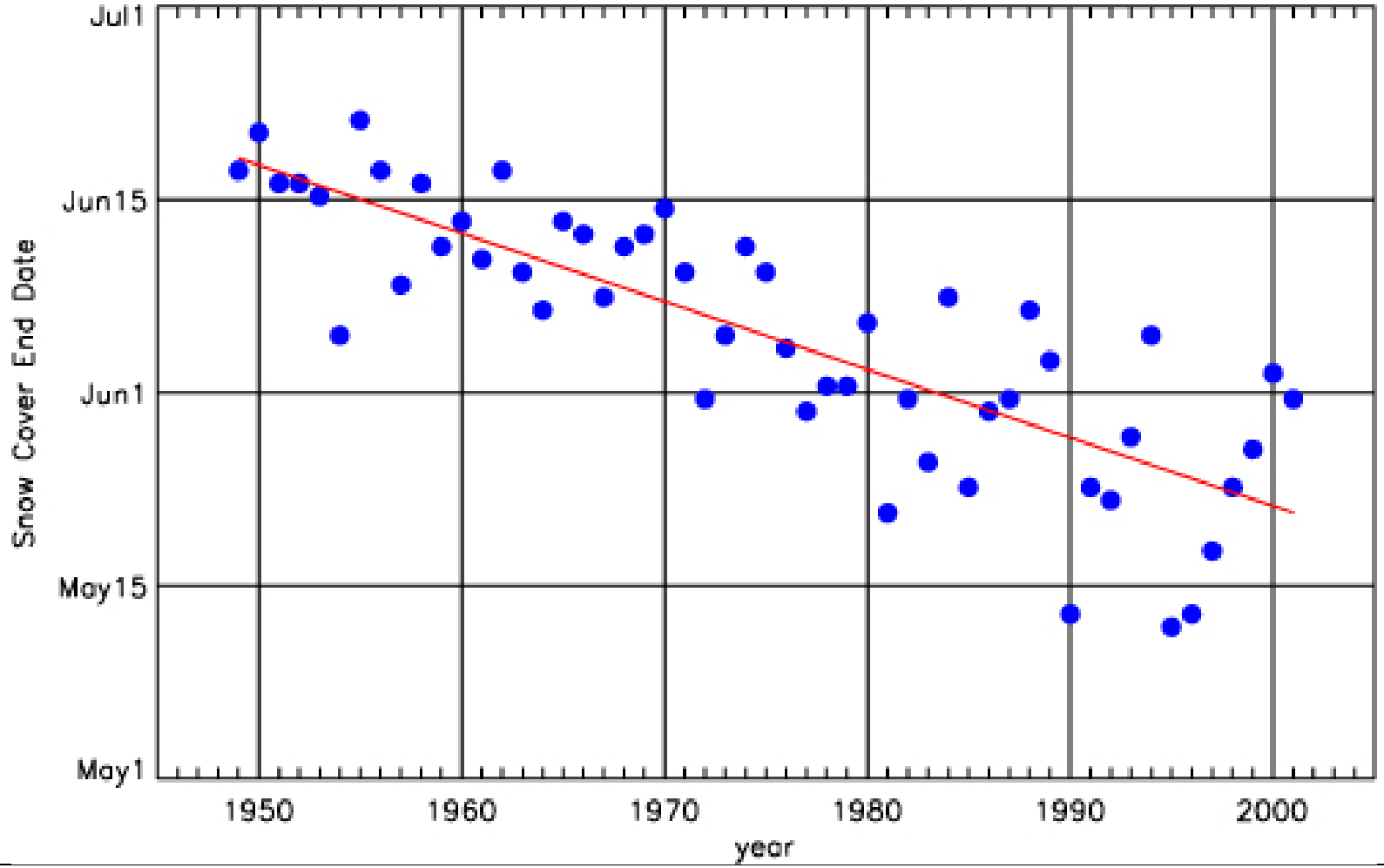
Increased evapotranspiration is likely to reduce the water available for harvesting



Vulnerability

The seasons are changing…

Credit: Glen Juday



Vulnerability

Increasing the snow-free period.

Stone, R.S., E.G. Dutton, J.M. Harris, and D. Longnecker (2002), Earlier spring snowmelt in northern Alaska as an indicator of climate change, Journal of Geophysical Research, 107 (D10) 10.1029/2000JD000286

Vulnerability

Reduced river flow due to decreased glacial input or increased ET decreases fish habitat, anadromous return behavior, and transportation

Vulnerability

An increased summer season can lead to more access to disease causing organisms

Vulnerability

Vulnerability lies in permafrost affected municipal water sources

Vulnerability

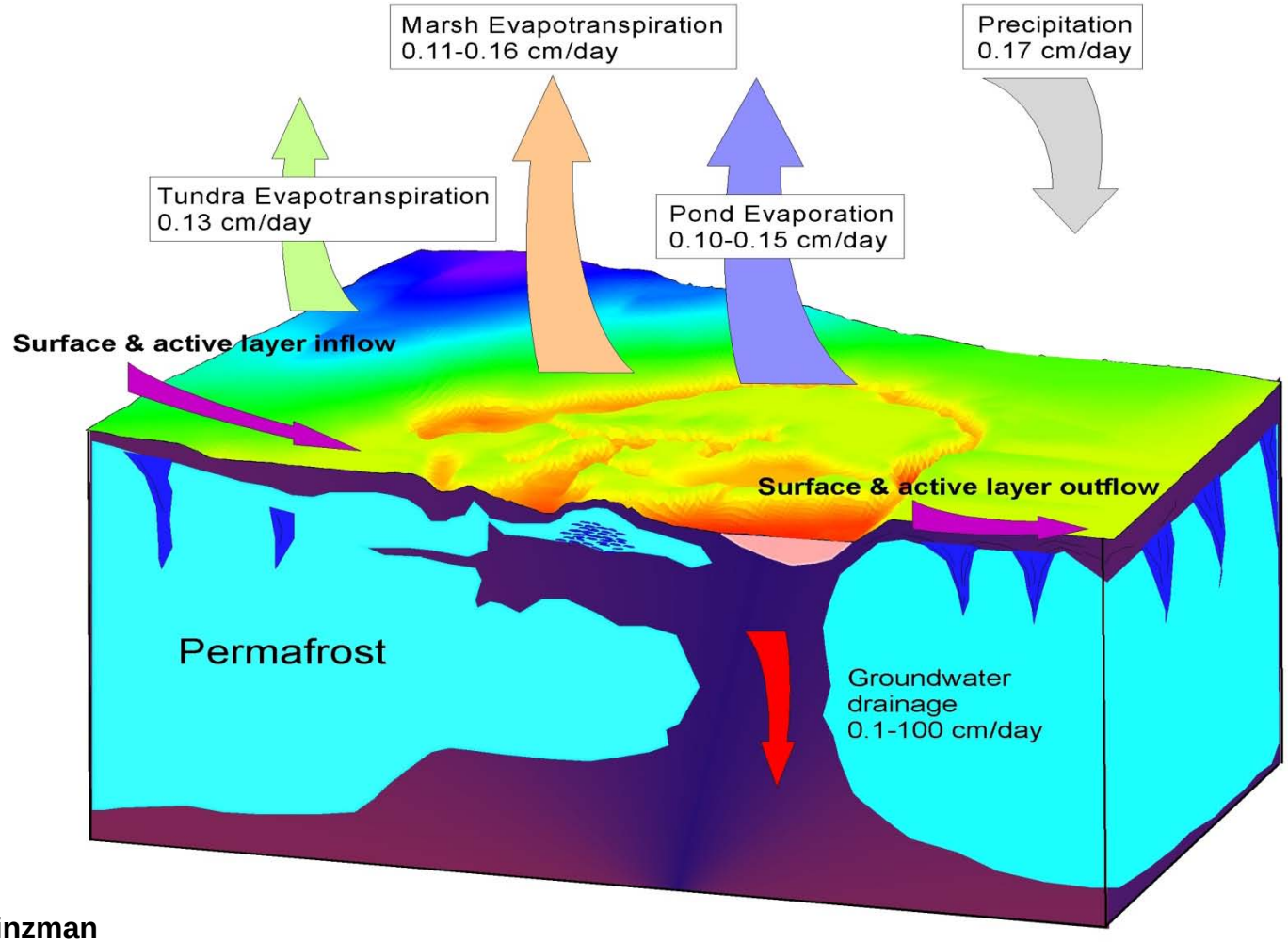
Snow catchments are a source of vulnerability in Alaska

Vulnerability

Aging or absent infrastructure is a source of vulnerability

Vulnerability

Groundwater is only occasionally used and generally limited to discontinuous or non-permafrost regions.



Credit: Larry Hinzman

Vulnerability

Groundwater in the Arctic is complicated by permafrost.

Credit: Greta Myerchin

Vulnerability

Little or no recharge occurs in winter…

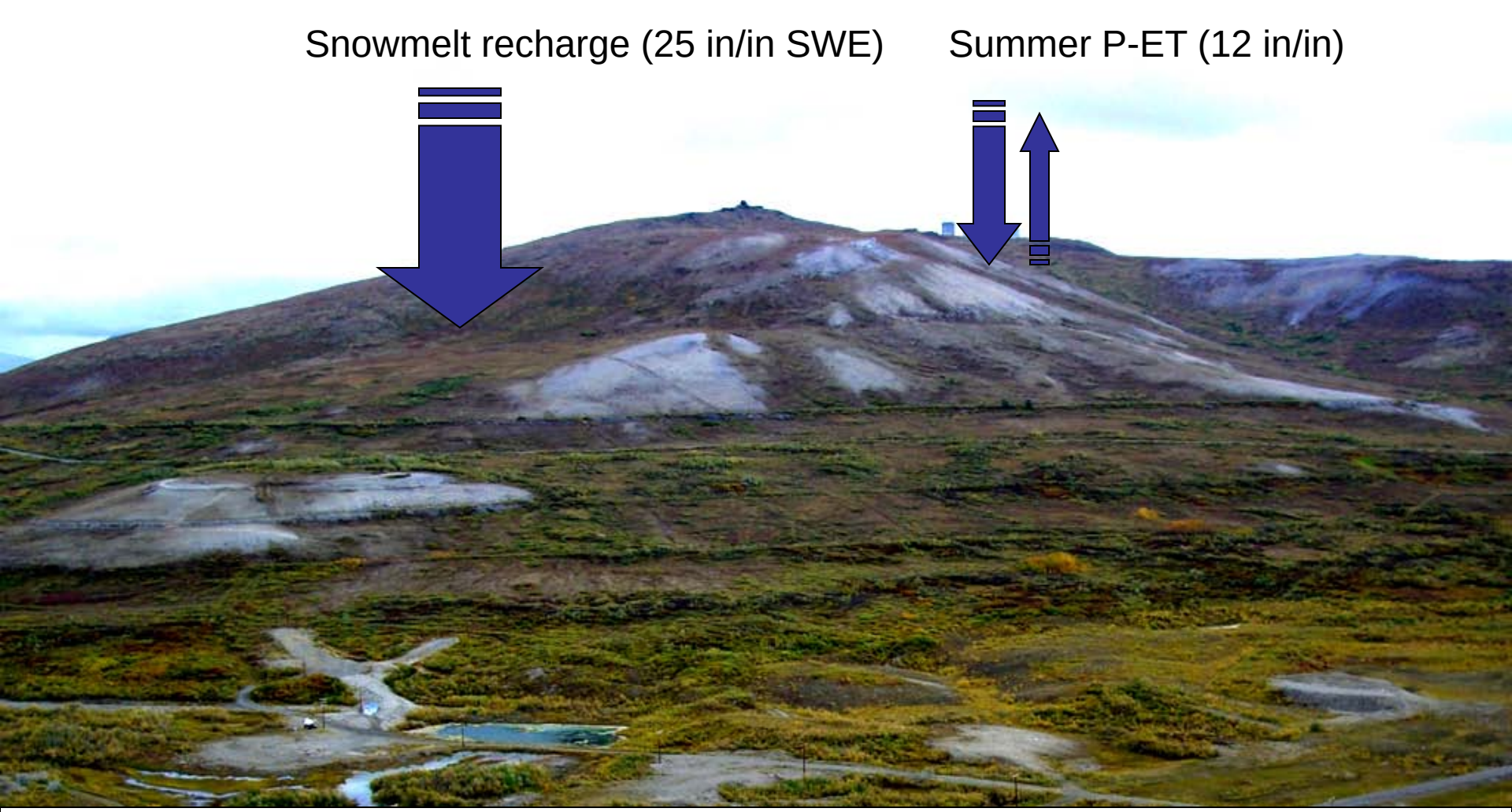
Credit: Greta Myerchin

Vulnerability

recharge is greatest during snowmelt…

Vulnerability

and in some areas, ET exceeds P, precluding summer recharge.



Vulnerability

If more of the annual precipitation were to fall as rain, instead of snow, additional precipitation would be needed to maintain the aquifer

Vulnerability

All along the pacific coast, snow storage is critical to freshwater use

Adaptation

In order to adapt we must understand the changing environment

Credit: Molly Chambers

Adaptation

Understand the complexity

Adaptation

Engage northern societies and workers

Adaptation

Put our collective knowledge into practice.

Credit: Molly Chambers

Thank You