

# *Alaska Climate Change Strategy*

## *Alaska Climate Change Adaptation Advisory Group*



### *Designing Essential Infrastructure in a Changing Climate*

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*Geo-Watersheds Scientific*

*April 3, 2009*  
*Alaska Pacific University*

# Changing Climate?

## Global - Regional - Local

- Regional models indicating warming globally, but variation down to local scale can vary

## Averages versus Extremes

- In most cases extremes are often the events you have to design for and respond to, not averages

## Current versus Future Conditions

- Our current understanding of some climate issues and the appropriate downscaling is limited, so estimating future conditions is a challenge



# What Technologies Can We Use to Adapt?

## Intergovernmental Panel on Climate Change (IPCC)

- **Technology** is defined as the practical application of knowledge to achieve particular tasks that employs both technical artifacts (hardware, equipment) and (social) information ('software', know-how for production and use of artifacts).
  - Climate Change 2007 Synthesis Report



# What Technologies Can We Use to Adapt?

## Frame in an “Adaptive Approach”

- **Adaptive Technology** is the practical application of **knowledge** to minimize climate-change impacts and take advantage of opportunities employing both technical **artifacts** (hardware, equipment) and (social) **information** (‘software’, **adaptive management**, **know-how** for production and use of artifacts).

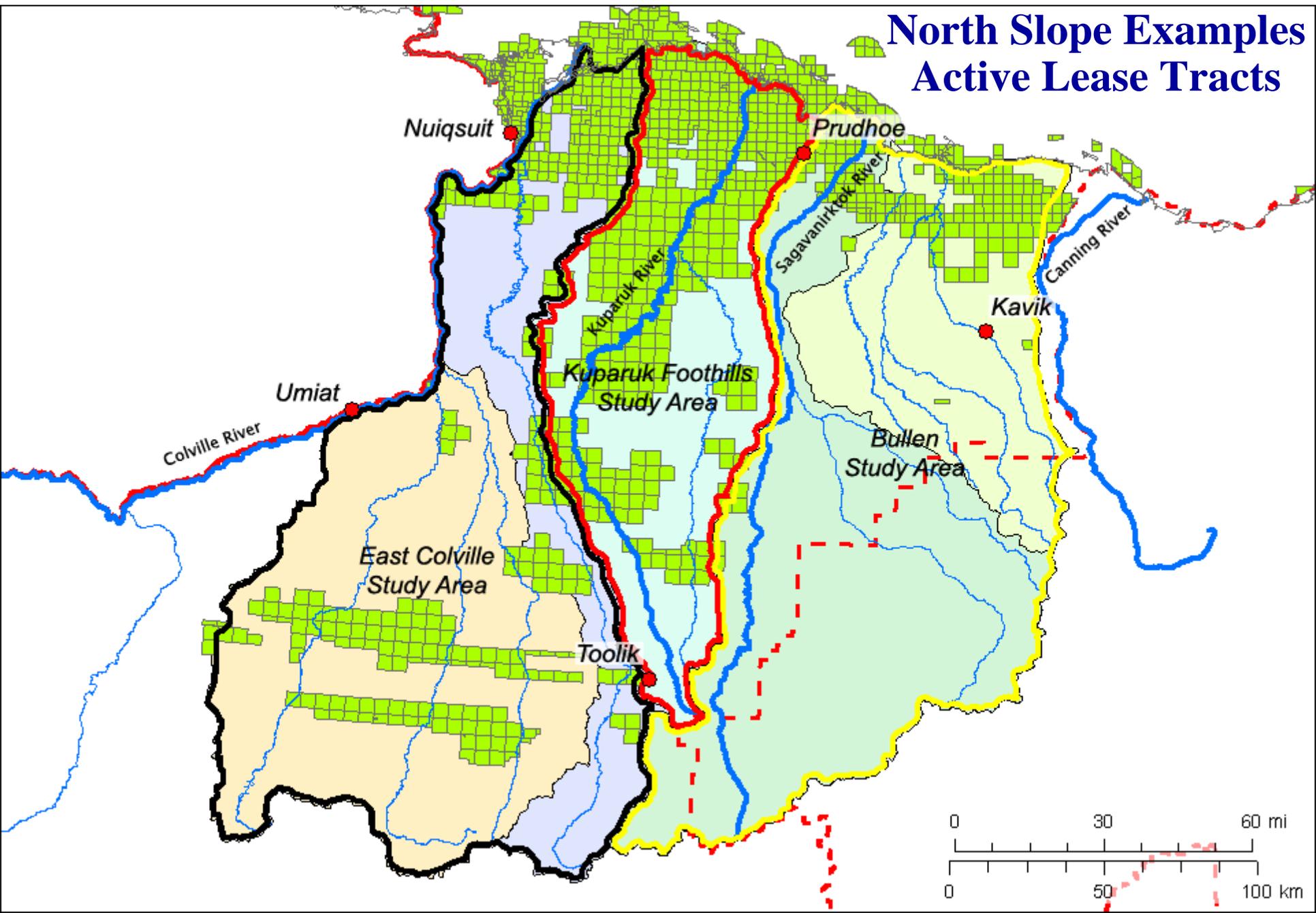


# Adaptive Technologies

- **Knowledge, Data**
  - Reduce Loss
  - Improve Useful Access
- **Adaptive Management**
  - We can not have all the answers now
  - Management approaches need to be able to incorporate future improvements in knowledge
- **Know-How**
  - Education for future workforces on both adaptive engineering and management, dealing with uncertainty



# North Slope Examples Active Lease Tracts

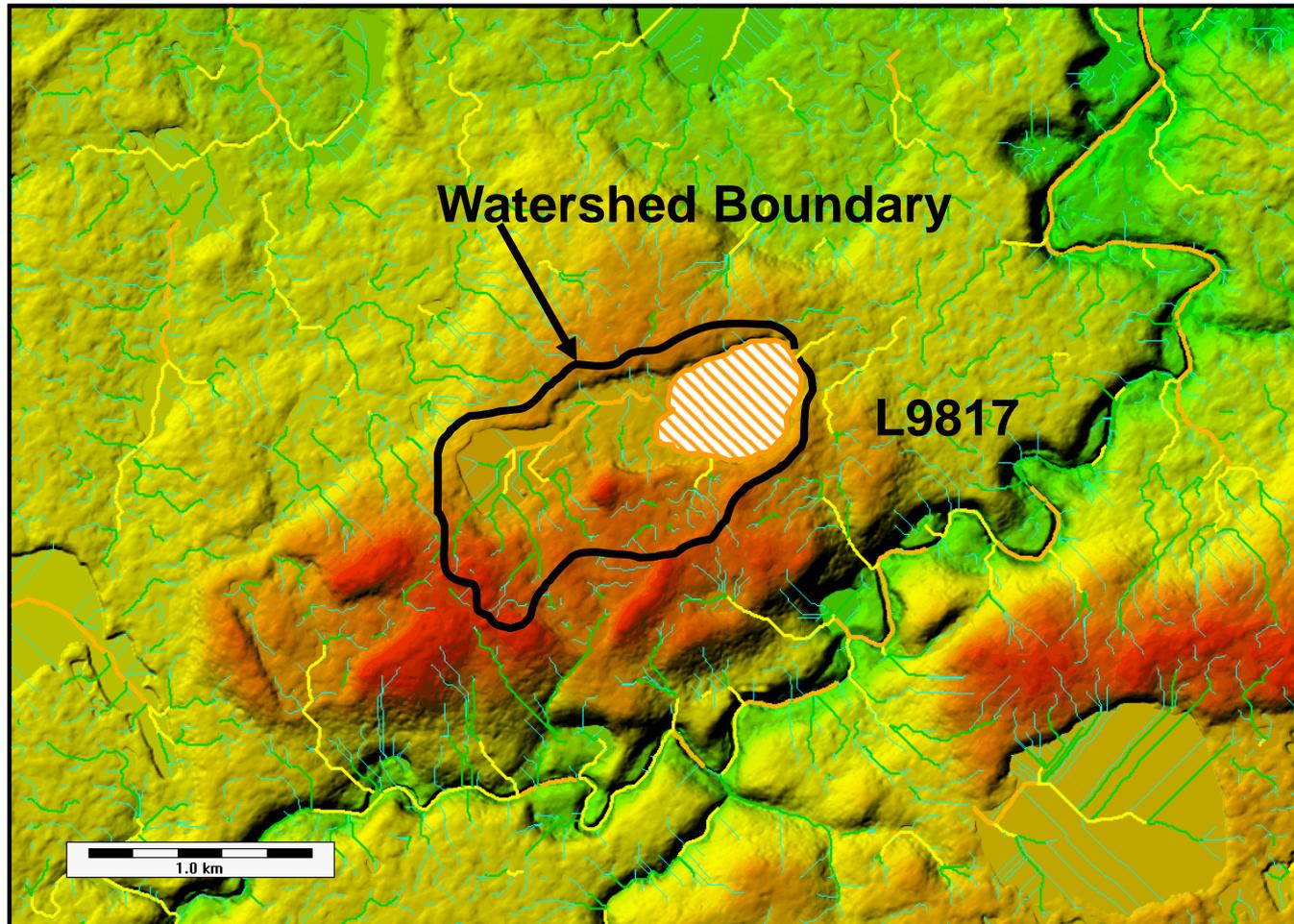


# Artifacts - Downsizing Production Pads, Roadless Development

- **Alpine Field Area**
  - CD3
  - Colville Delta
  - Aircraft Access Year-Round
  - Winter access with Ice Roads
  - Less Gravel Use
  - Lower Impact on Landscape
  - **Hybrid Transportation Networks (Gravel, Ice)**

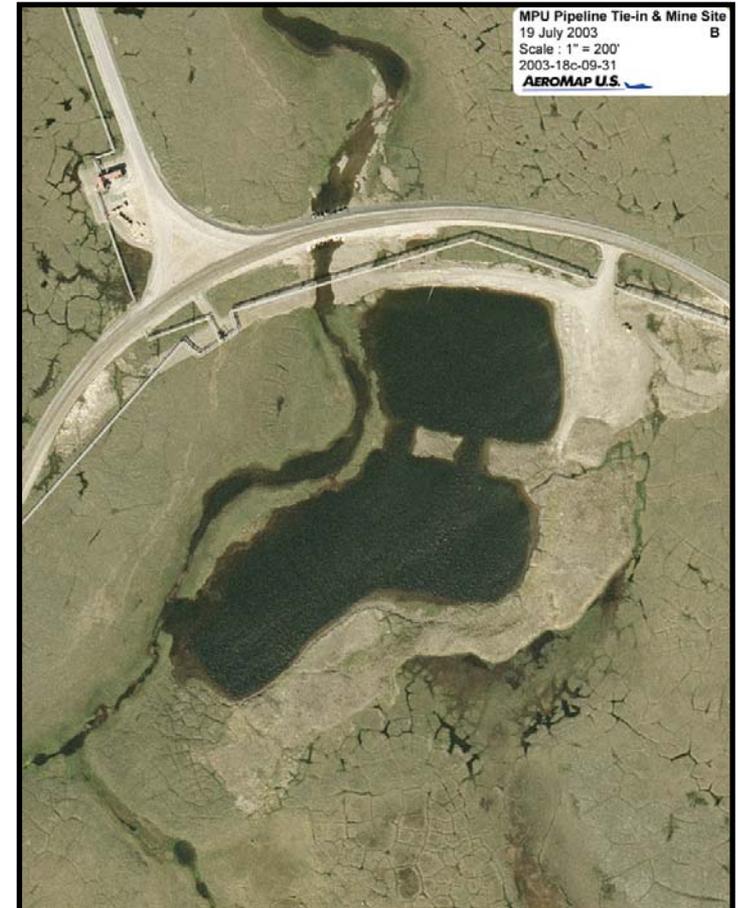


# Artifacts + Know-How = Improvements in Landscape Knowledge



# Know-How = Future Water Supplies in Water Poor Areas

- **Mine Site B Example**
  - Gravel Resource
  - Long-Term Water Resources
  - Deeper
  - Higher DO profiles
  - Overwintering Habitat
  - Better Recharge Control
  - **Solution in Water-Poor Areas?**



# Artifacts - Environmental Platforms

Potential applications for an inland platform include:

- Construction camps
- River and stream crossings for seasonal ice and snow roads
- Staging areas for logistics and construction support
  - Fueling station
  - Camp storage
  - Drilling equipment storage
  - Ice road construction equipment
  - Spill response equipment storage



- Rich Haut, Tom Williams

# Artifacts - Environmental Platforms/Roads

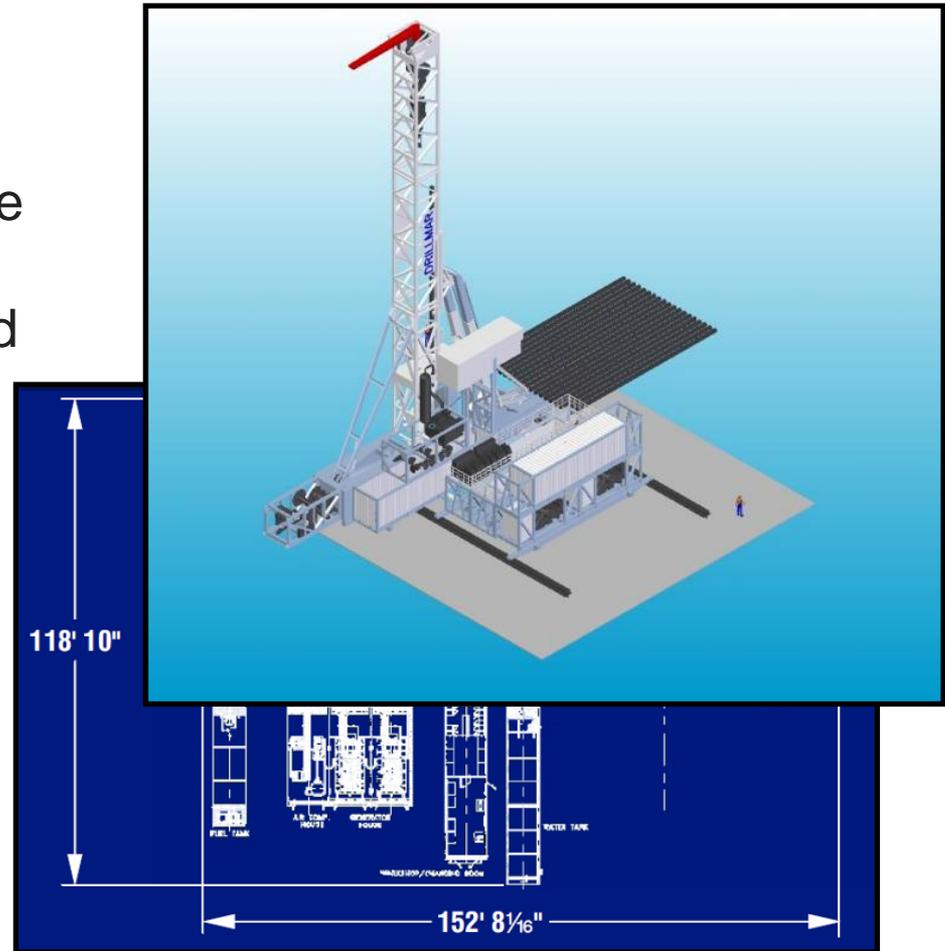
- Drilling pads
- Long-term production pads
- Camp for scientific work/summer field work
- Heliports
- Hybrid Road Networks
  - Potential combinations of ice, snow, and other forms in more complex terrain
- Extend Operating Season
- Reduce Weather Uncertainty



*- Rich Haut, Tom Williams*

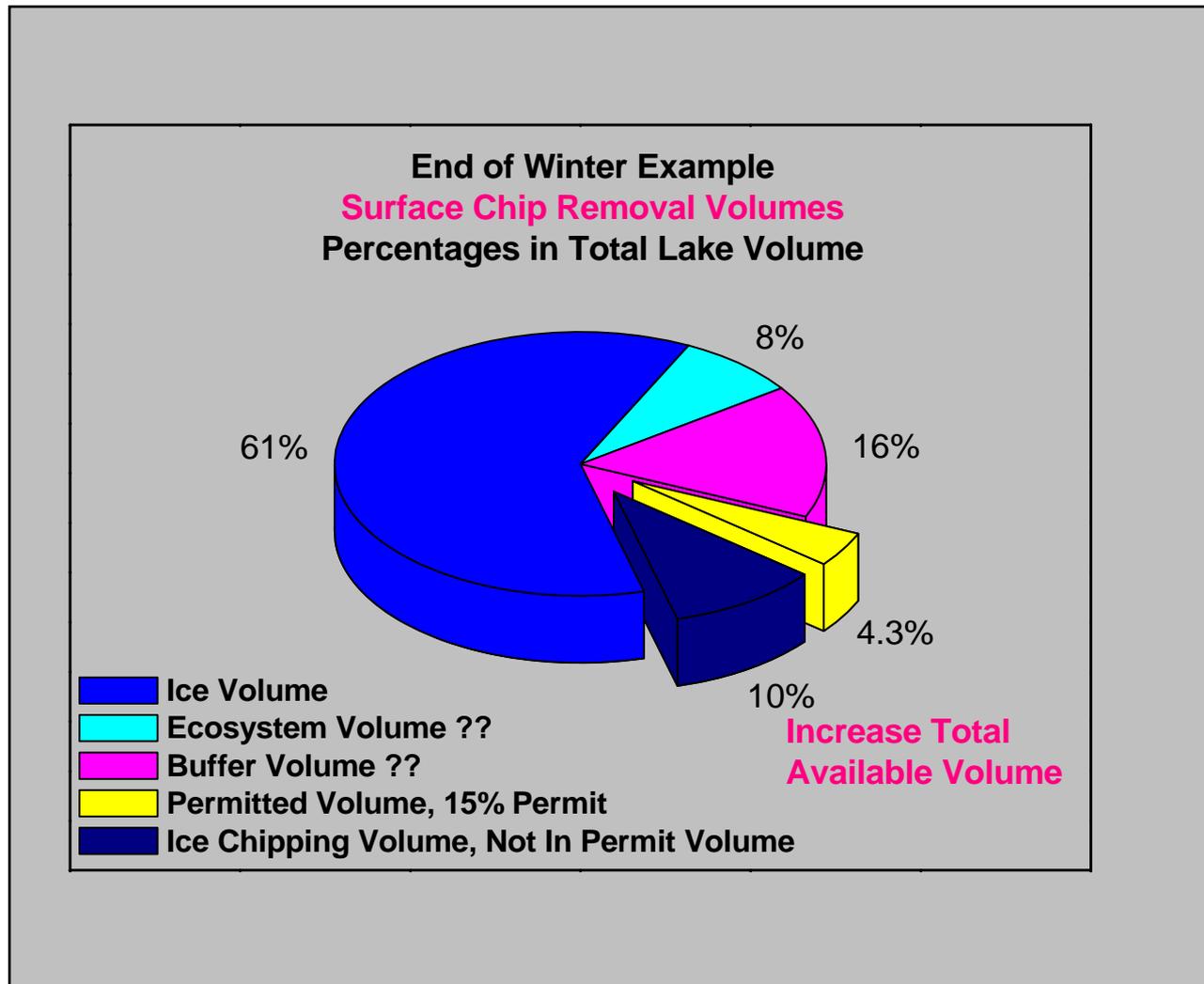
# Artifacts - Lighter Weight Drilling Platforms

- **Smaller Rigs Potentials**
  - Faster deployment
  - Less supporting infrastructure (smaller ice roads)
  - Easier over-summer field staging



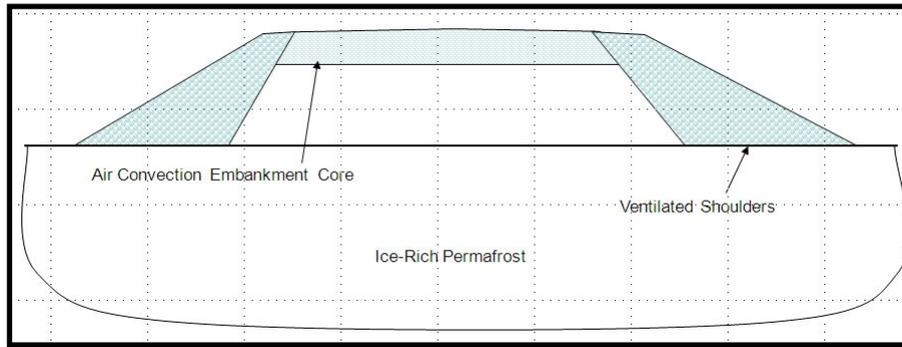
- Rich Haut, Tom Williams

# Improvements in Lake Knowledge : Management



# Artifacts – Roadway Designs

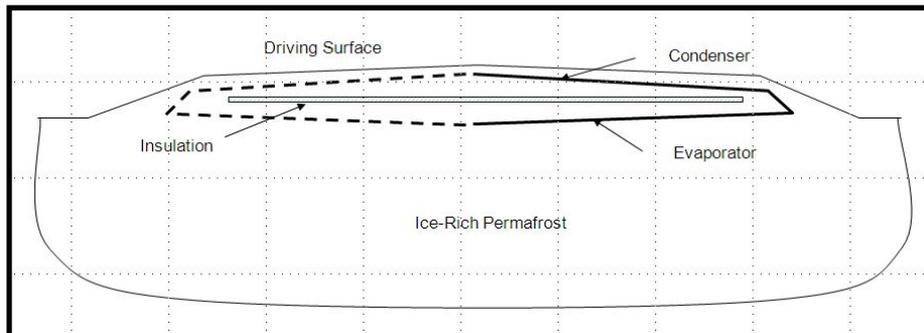
- **Maintaining Permafrost**
  - University of Alaska  
Fairbanks – Douglas Goering
  - Thompson Drive Test Area
  - **#1 Air Convection Core  
with Ventilated Shoulders**
  - #2 Hairpin Thermosyphons  
with Ventilated Shoulders
  - #3 Hairpin Thermosyphons



- © Douglas Goering, UAF, 2009

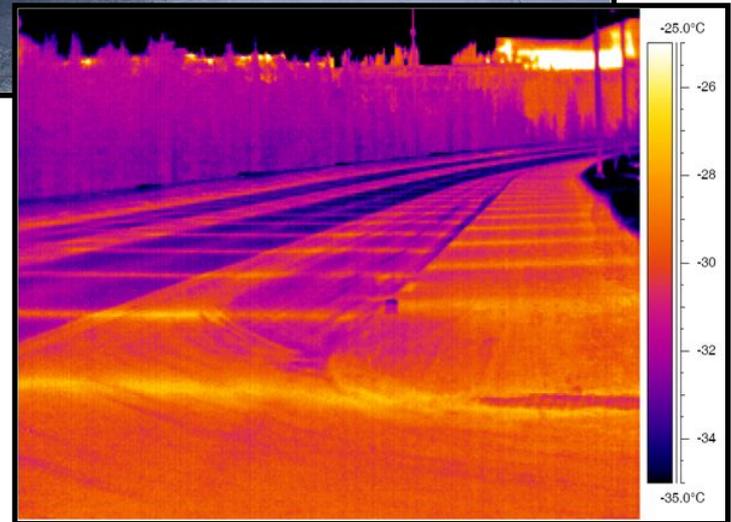
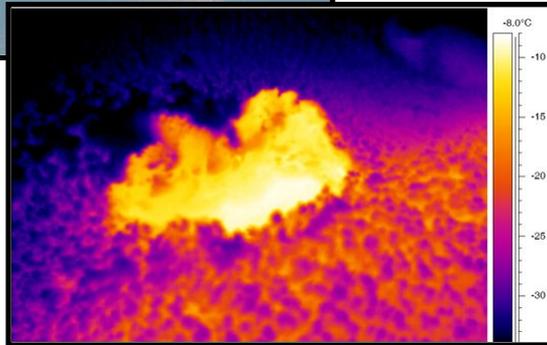
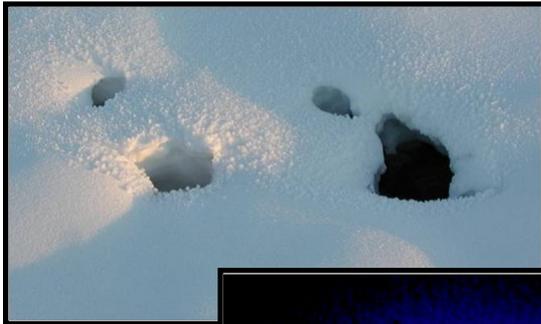
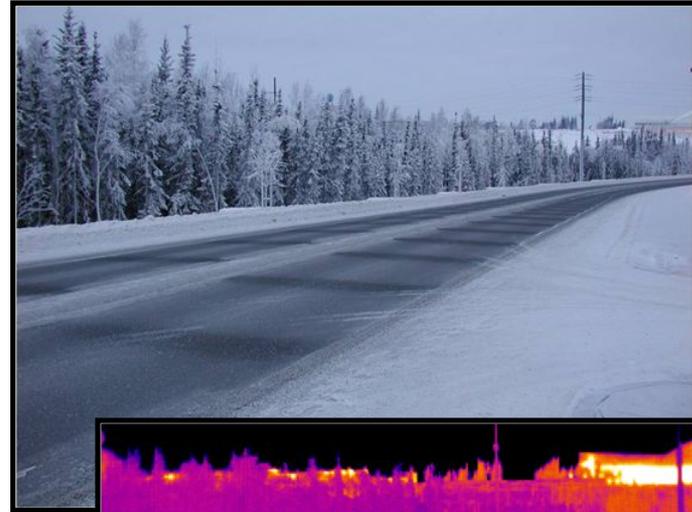
# Artifacts – Roadway Designs

- **Maintaining Permafrost**
  - Fairbanks, UAF
  - Thompson Drive Test Area
  - #1 Air Convection Core with Ventilated Shoulders
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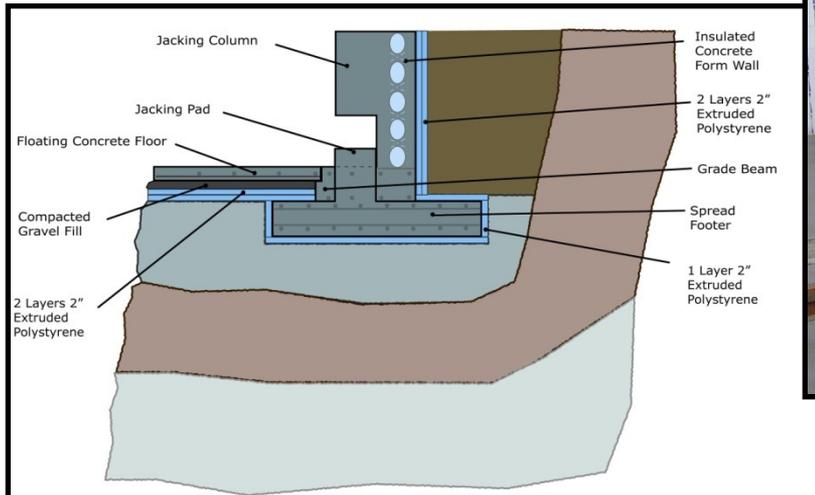
# Artifacts – Roadway Designs

- **Maintaining Permafrost**
  - Heat Output!
  - Permafrost Stability

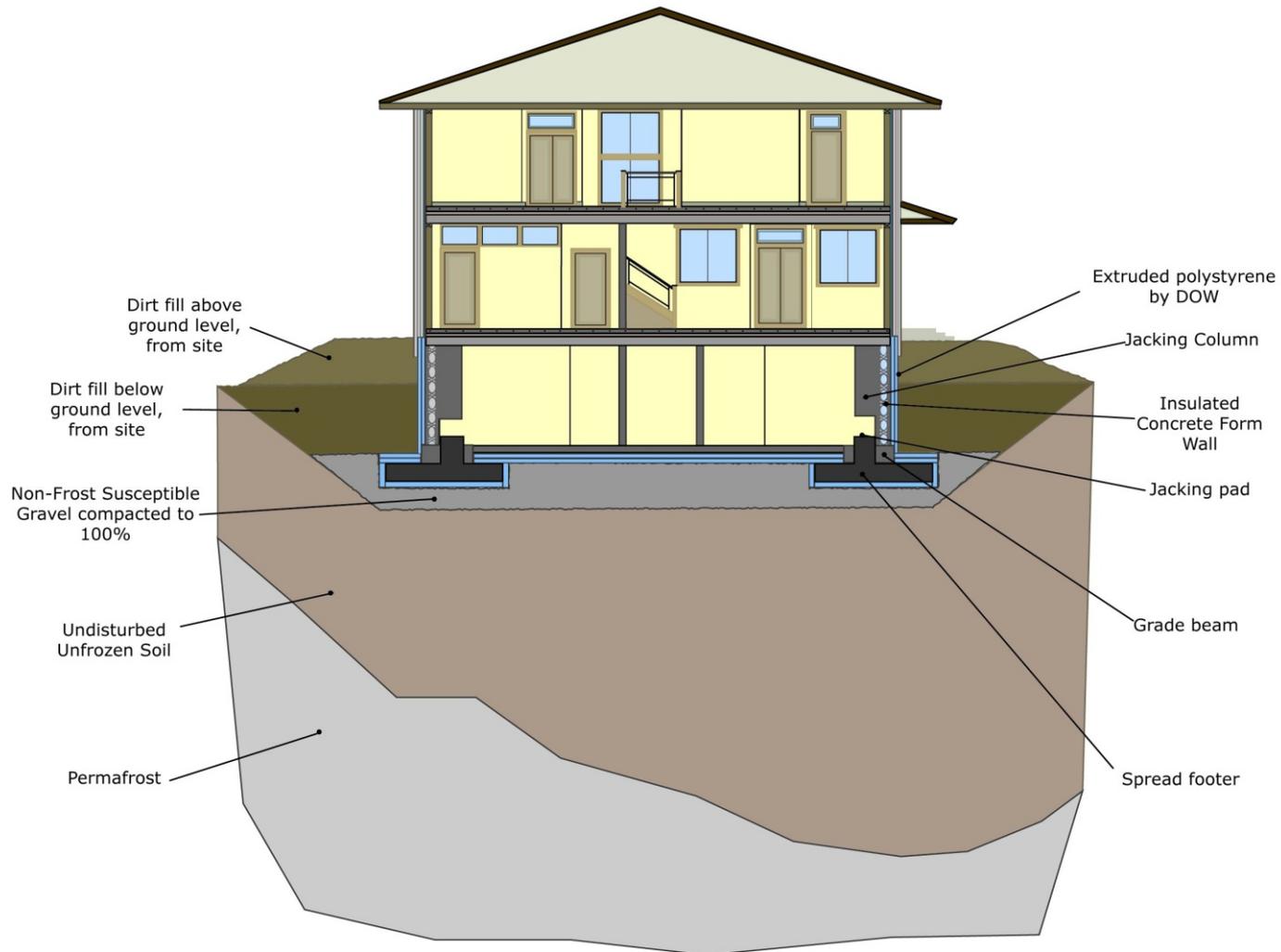


# Artifacts – Foundations

- Cold Climate Housing Research Center
  - Let it Thaw!
    - Then Deal with It
  - LEED - Measure, Verify
  - Adjust to Climate Change



# Artifacts – Cold Climate Housing Research Center - Foundations



# Artifacts – Cold Climate Housing Research Center - Foundations



**Spread Footers**



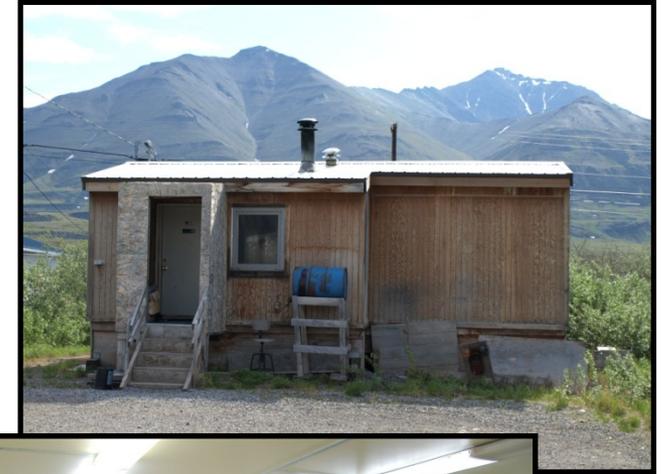
**Grade Beam,  
Jacking Pier**

**Insulated Concrete  
Foam Wall**



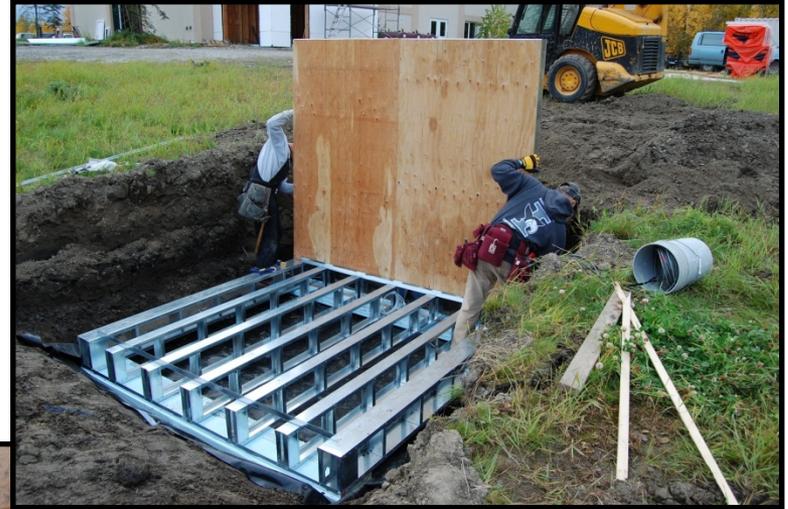
# Artifacts – Sustainable Northern Shelters

- **Cold Climate Housing Research Center**
  - Partners!
  - Build to the Environment, with the Environment
  - Build with Culture Knowledge



# Artifacts – Sustainable Northern Shelters

- **Cold Climate Housing Research Center**
  - Fairbanks Test Hut
  - Test
  - Demonstrate
  - Improve



# Artifacts – Sustainable Northern Shelters

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# Artifacts – Sustainable Northern Shelters

- **Cold Climate Housing Research Center**
  - Anaktuvuk Pass
  - Conceptual Design
  - Bold Goals
  - ~\$100K
  - < 200 gal heating fuel/yr
  - < 10 gal water/per/day



# Challenges?

## Multiple Effects

*(improved housing, but no food supply?)*

## New Engineering Design Approaches

*(longer life-spans, less confidence in past data, uncertainty?)*

## Environmental Assessments

*(making requirements before we have methods?)*

## Recognition of Information Needs

*(how will this be funded? and for the long-term?)*

**Strategy to Planning to Implementation – Professional Communities**

*(ASPE, ASCE, AWRA, AWWA, ITSAK, others)*



# **Can We Adapt?**

**Increased Knowledge**

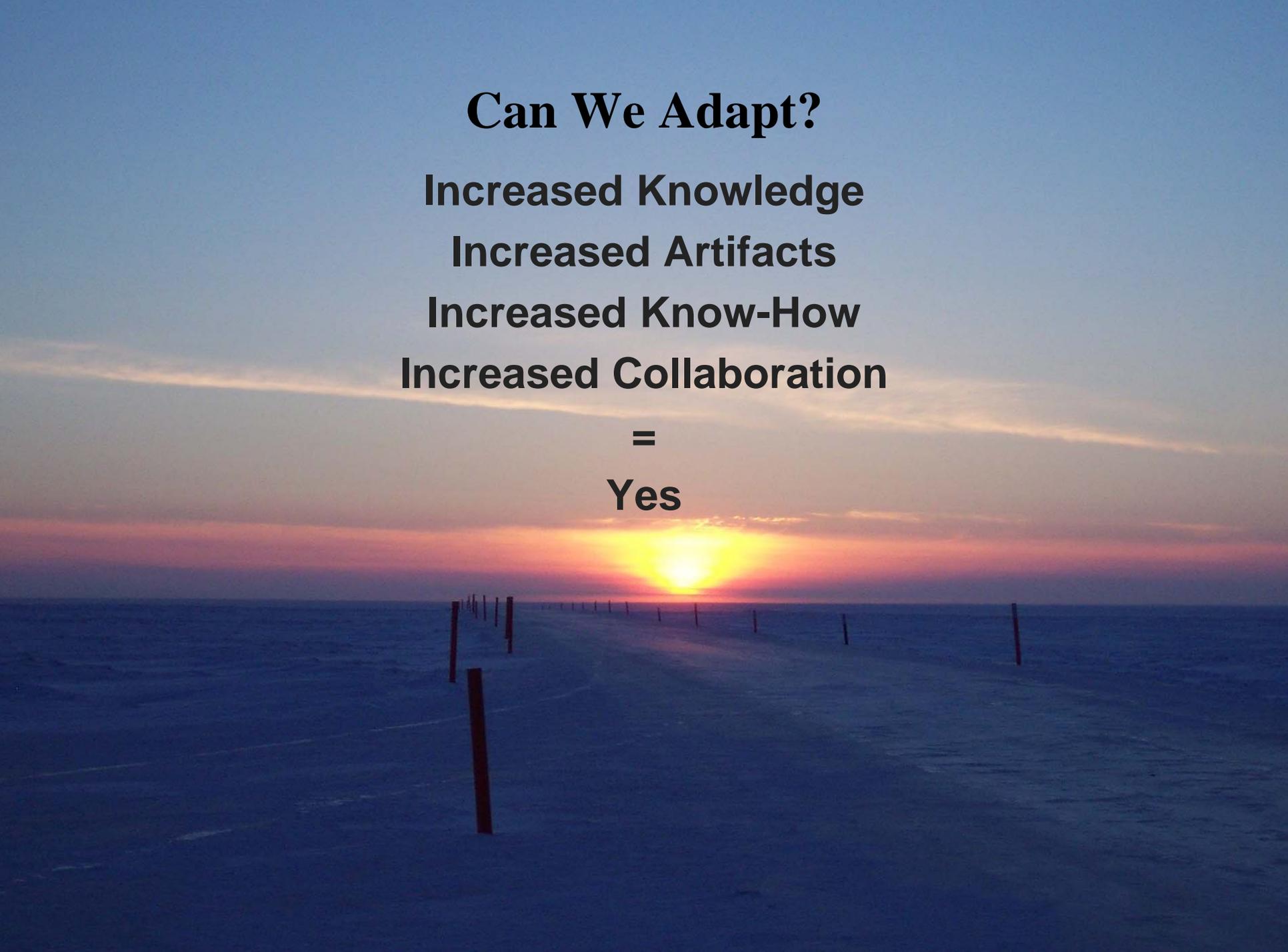
**Increased Artifacts**

**Increased Know-How**

**Increased Collaboration**

**=**

**Yes**



**Thank You**  
*Questions?*

