Alaska Forum on The Environment, 2009

Adapting to Changing Climate Conditions While Safely Developing Resources

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Geo-Watersheds Scientific

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Changing Climate?

Global - Regional - Local

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

Averages versus Extremes

- 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 are a challenge

What Technologies Can We Use to Adapt?

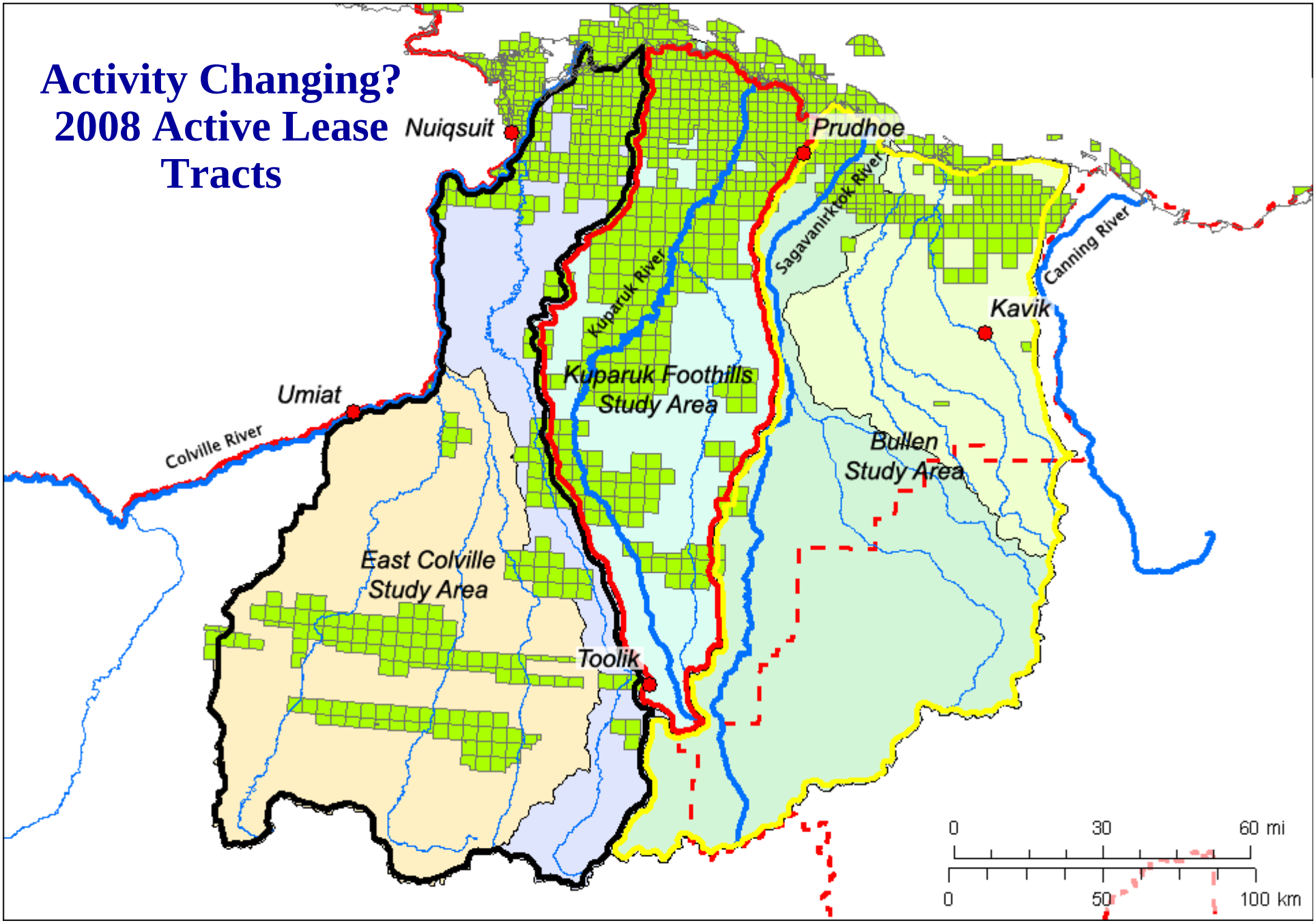
Intergovernmental Panel on Climate Change (IPCC)

- 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

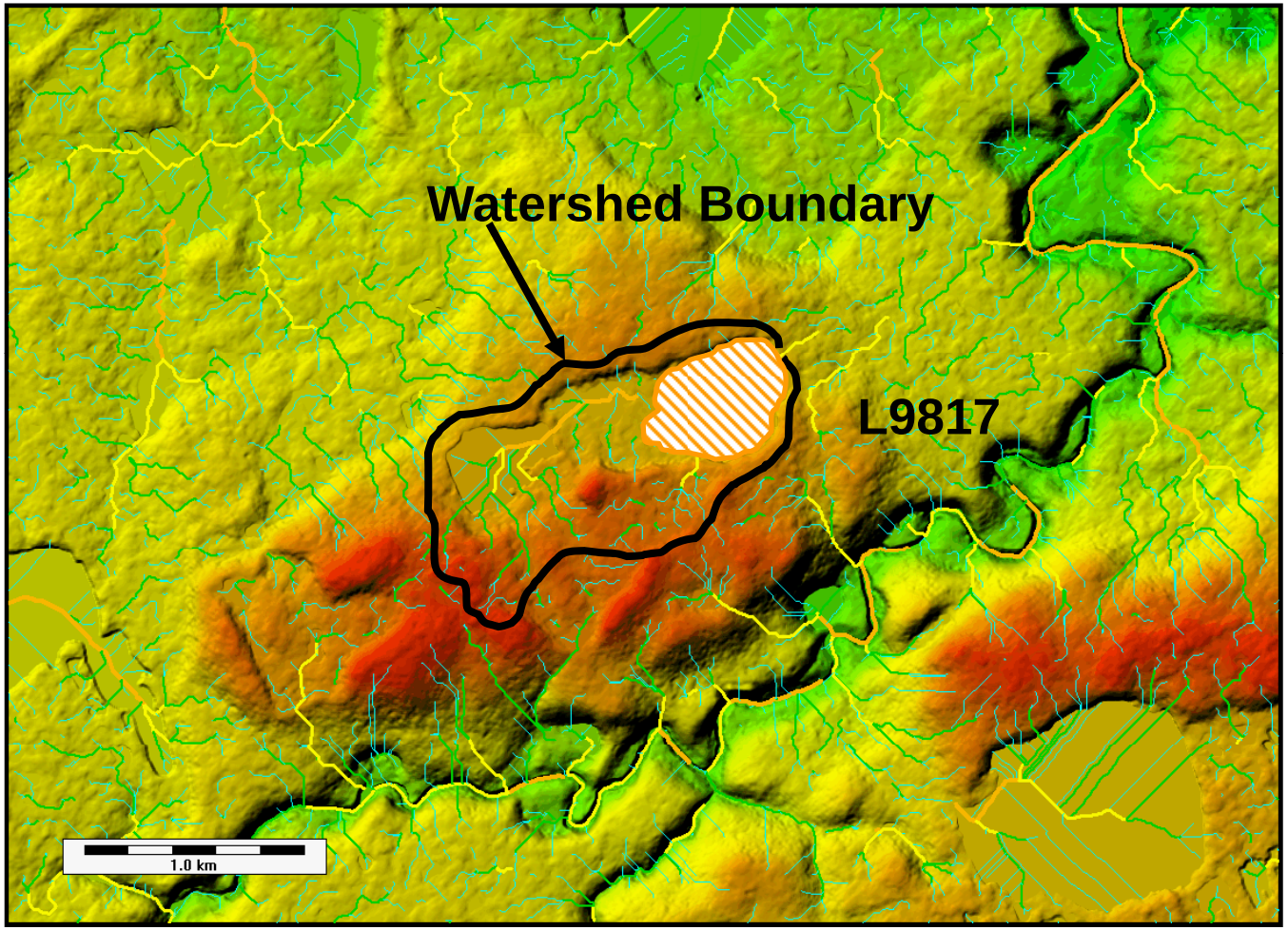
Technology Adaptation

- **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
- **How-To**
  - Education for future workforces on both adaptive engineering and management

Activity Changing?
2008 Active Lease Tracts

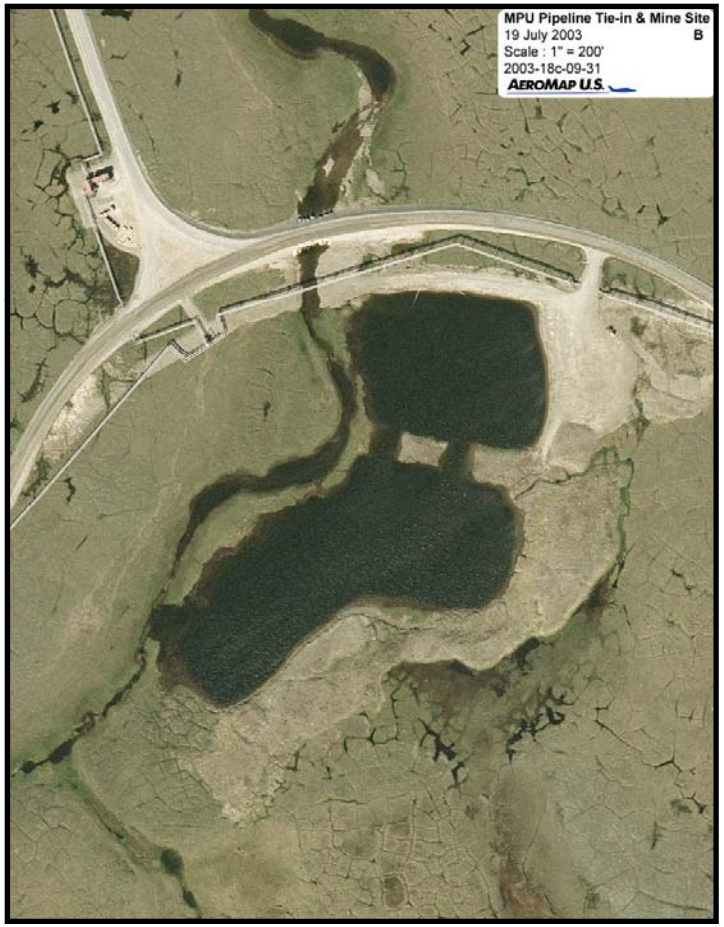


Improvements in Landscape Knowledge



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



Improvements in Lake Knowledge (Examples: Bathymetry and Management)

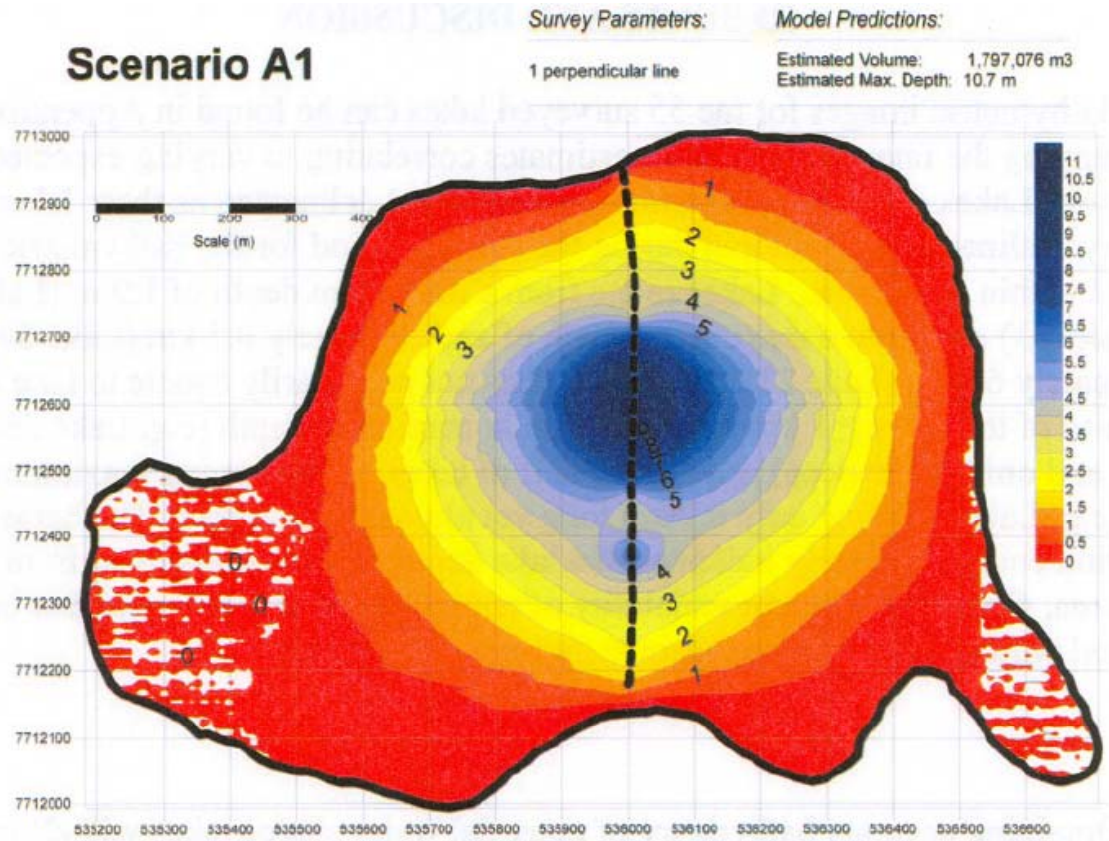


Figure 3. Scenario A1: Minimal sampling effort consisting of one vertical transect.

Cott and others, 2005

Improvements in Lake Knowledge (Examples: Bathymetry and Management)

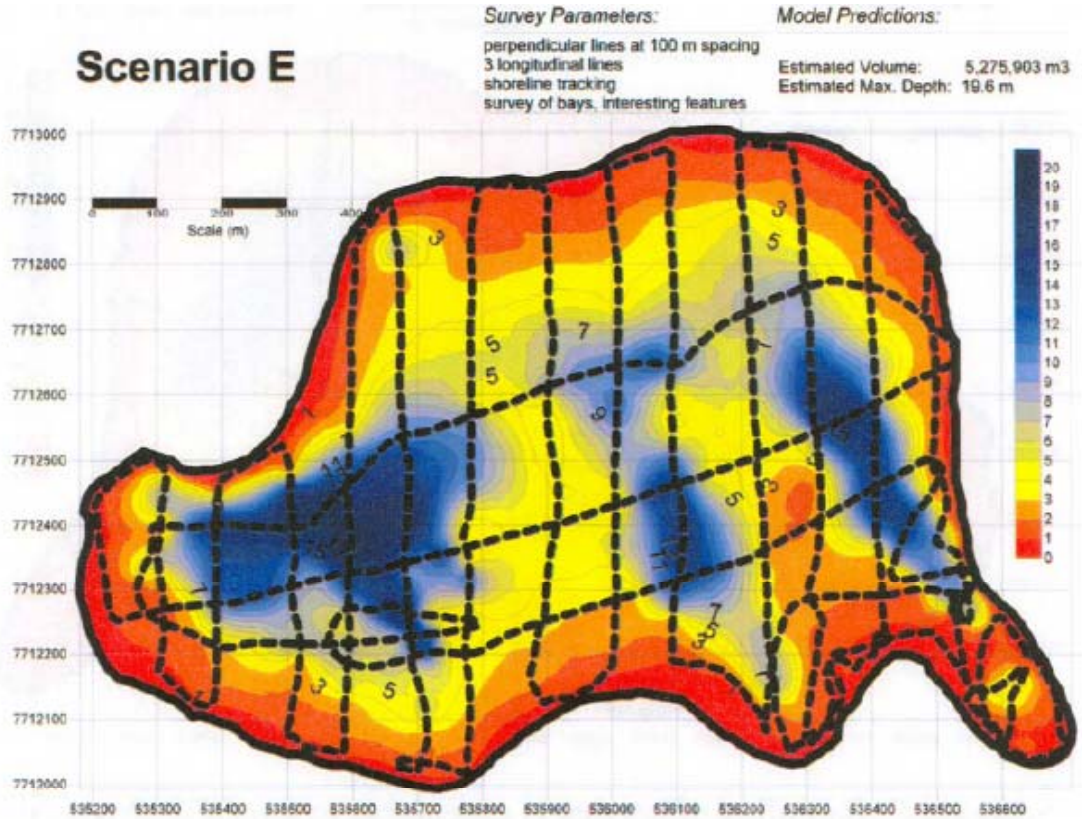
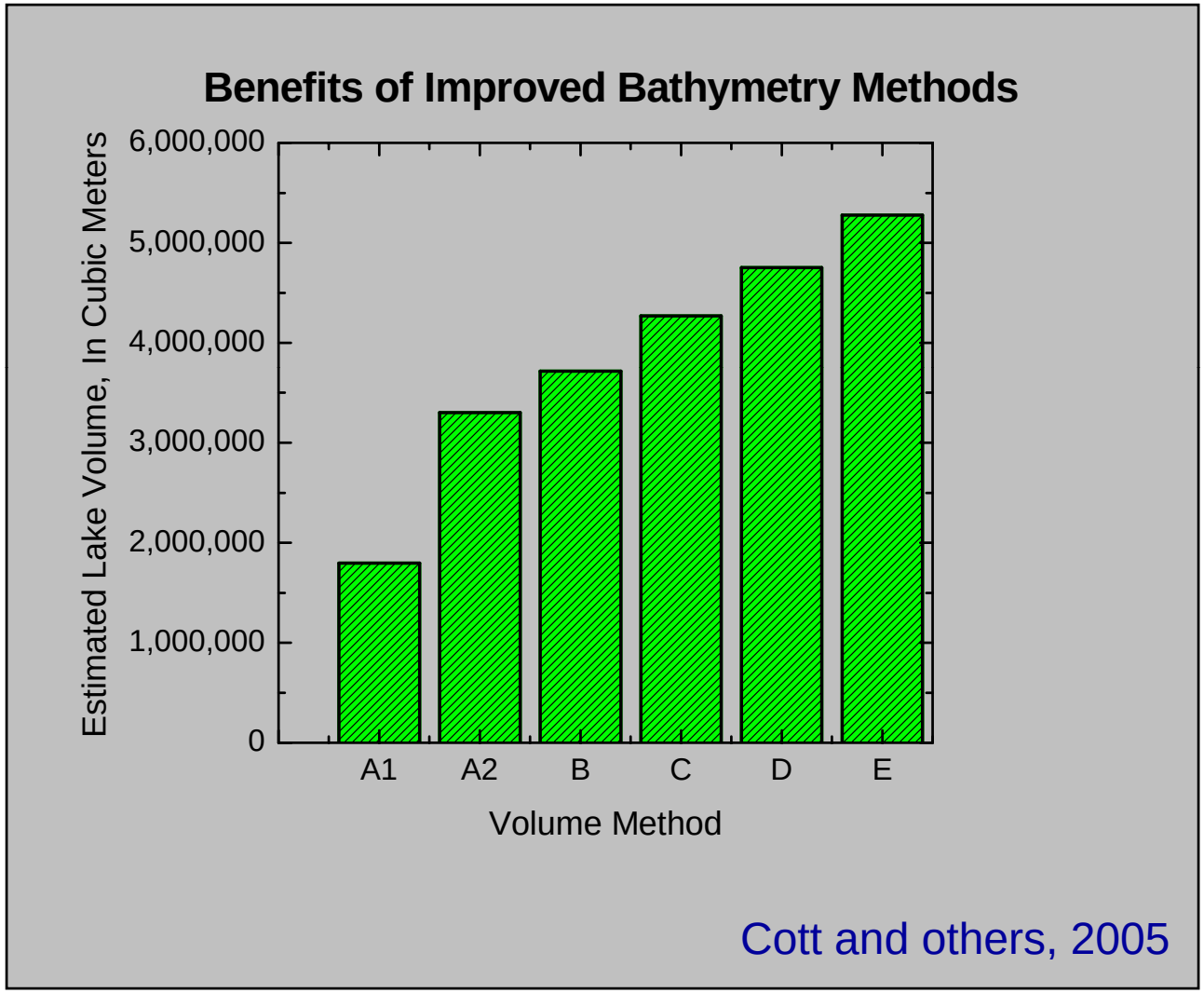


Figure 8. Scenario E: Depicts the gain in resolution, and correspondingly increased water volume estimate, achieved by decreasing the spacing of vertical transects to 100m, conducting 3 horizontal transects, incorporating shoreline tracking, and surveying bays and interesting features.

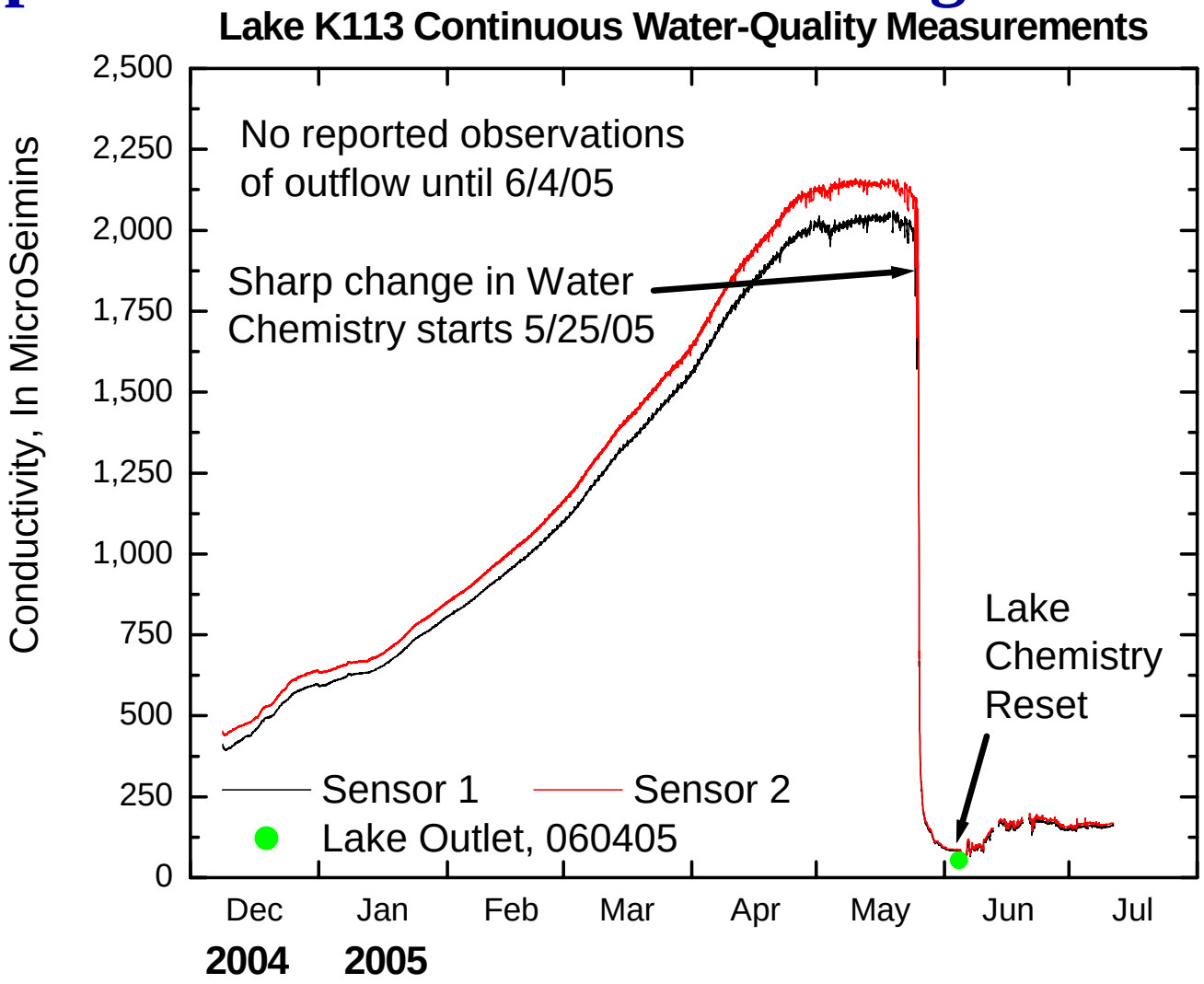
Cott and others, 2005

Improvements in Lake Knowledge : Bathymetry

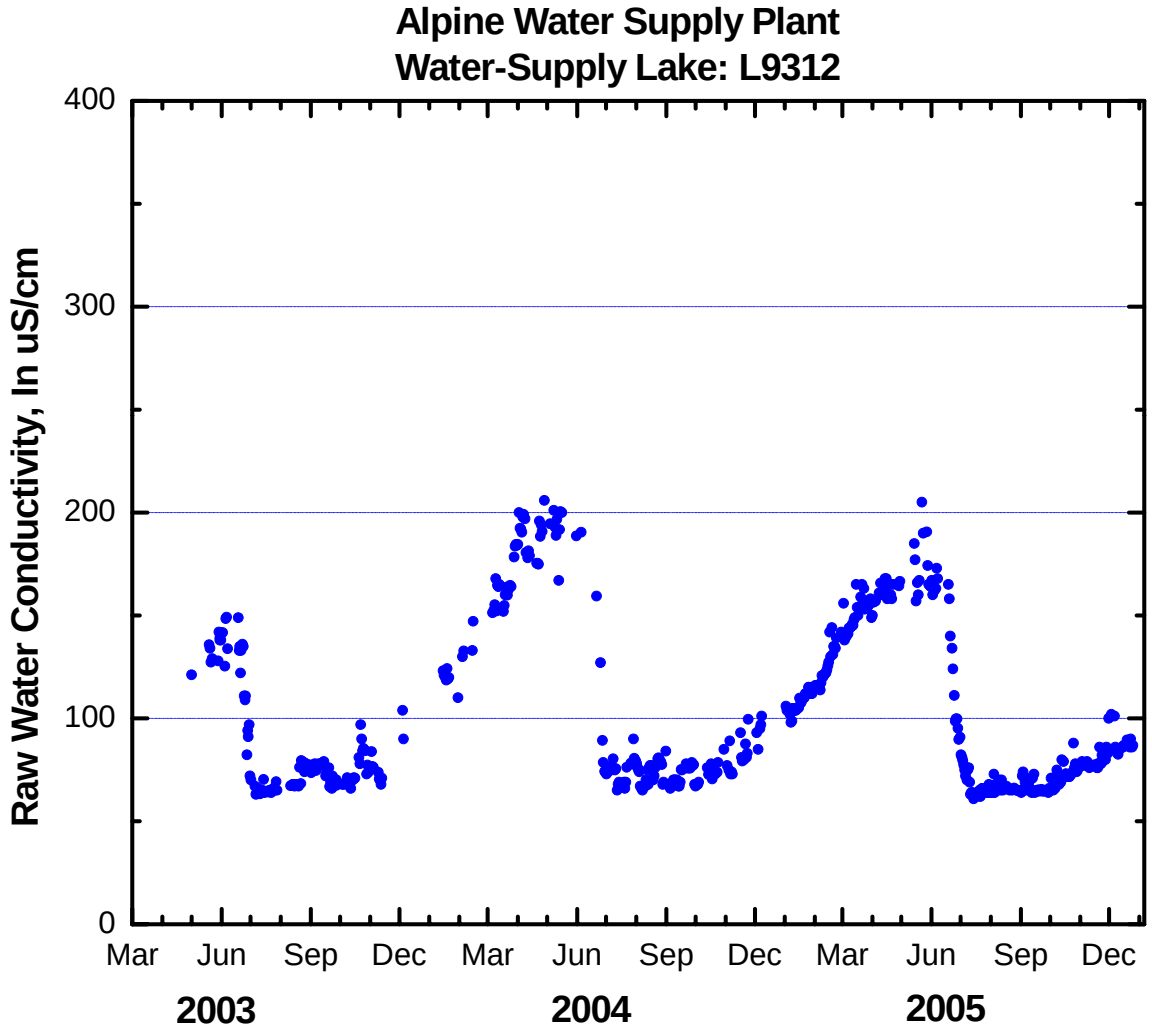


Cott and others, 2005

Improvements in Lake Knowledge : Chemistry

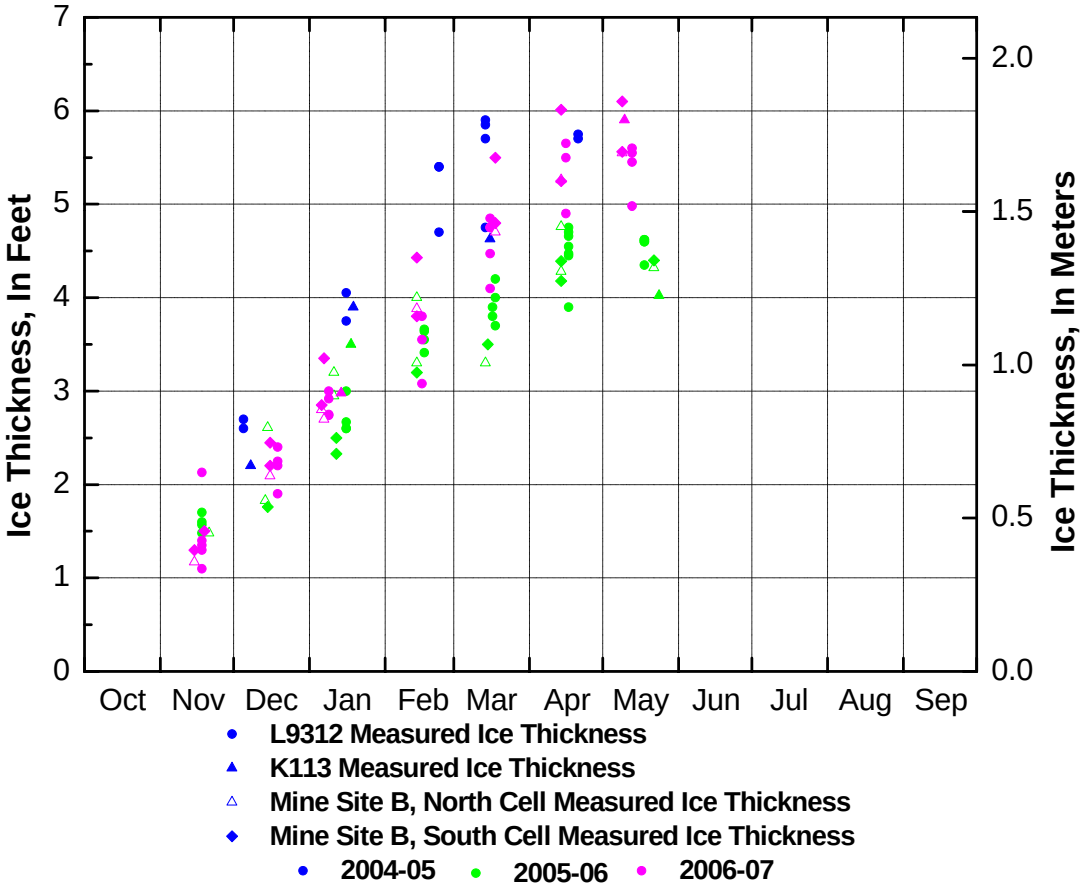


Improvements in Lake Knowledge : Chemistry

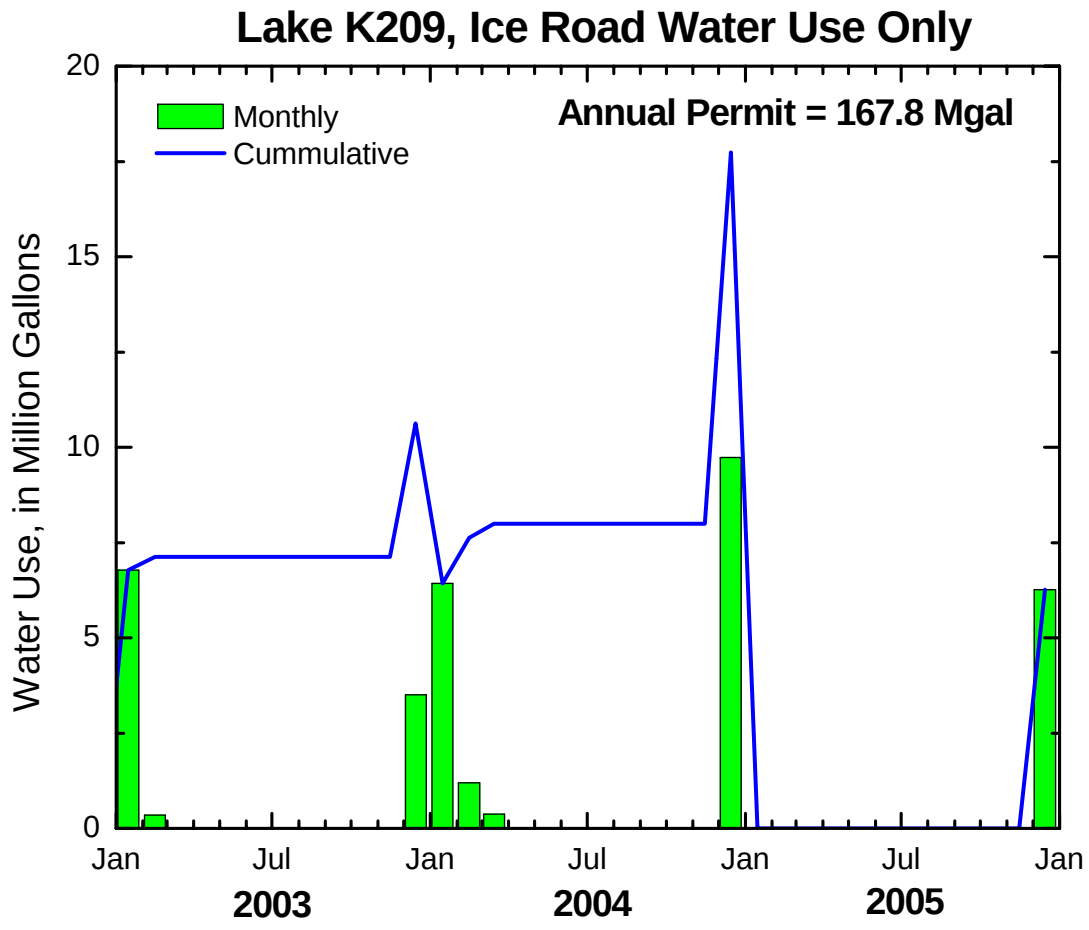


Improvements in Lake Knowledge : Ice Thickness

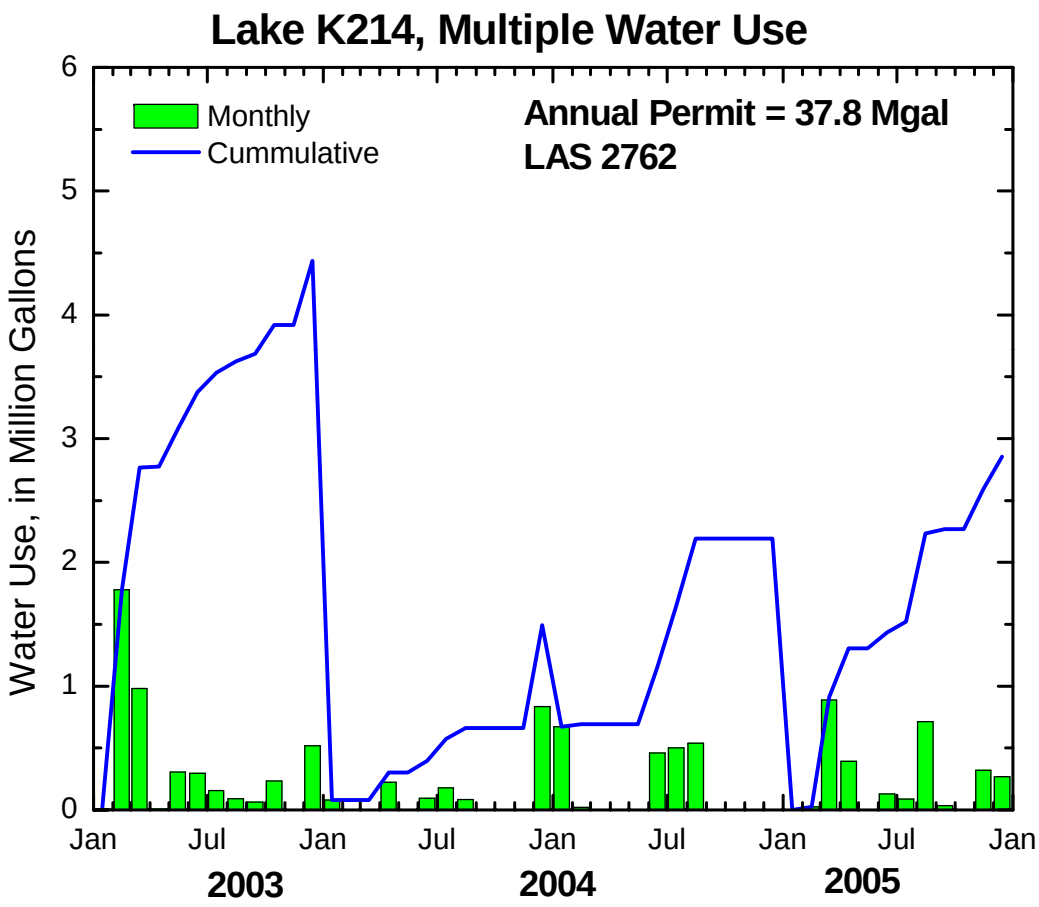
How Thick Does Lake Ice Grow?



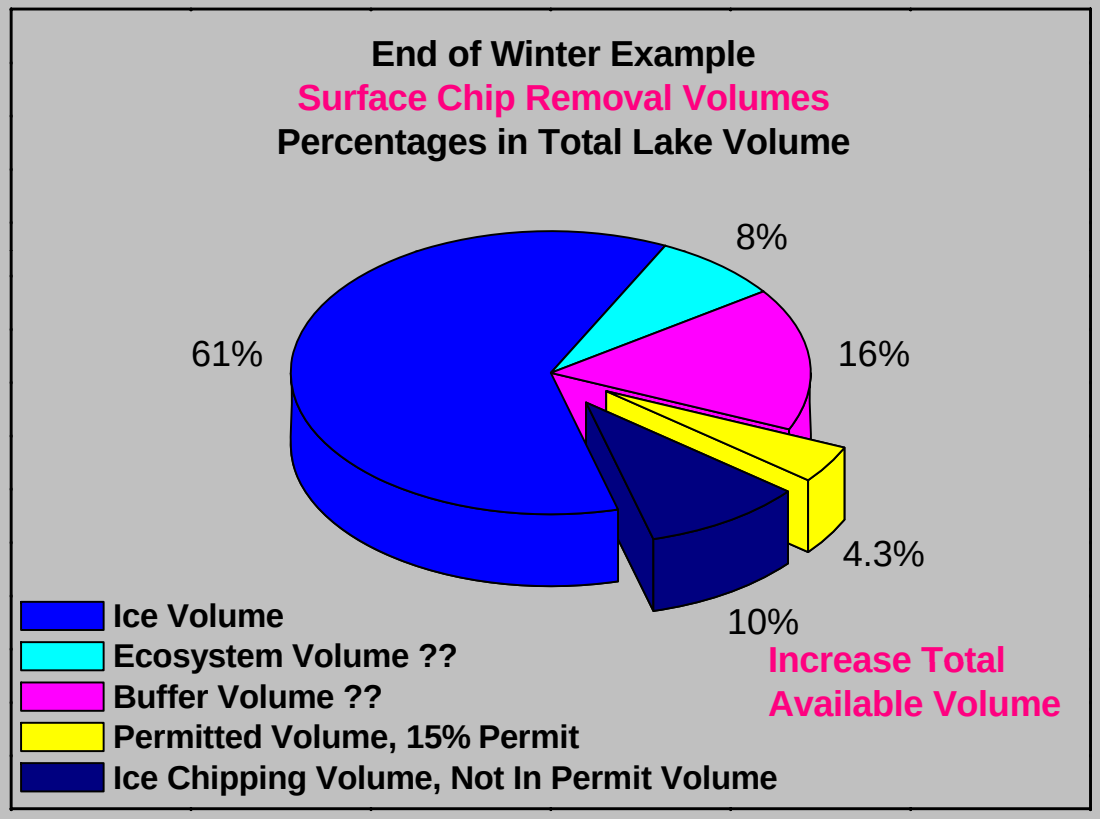
Improvements in Lake Knowledge : Usage

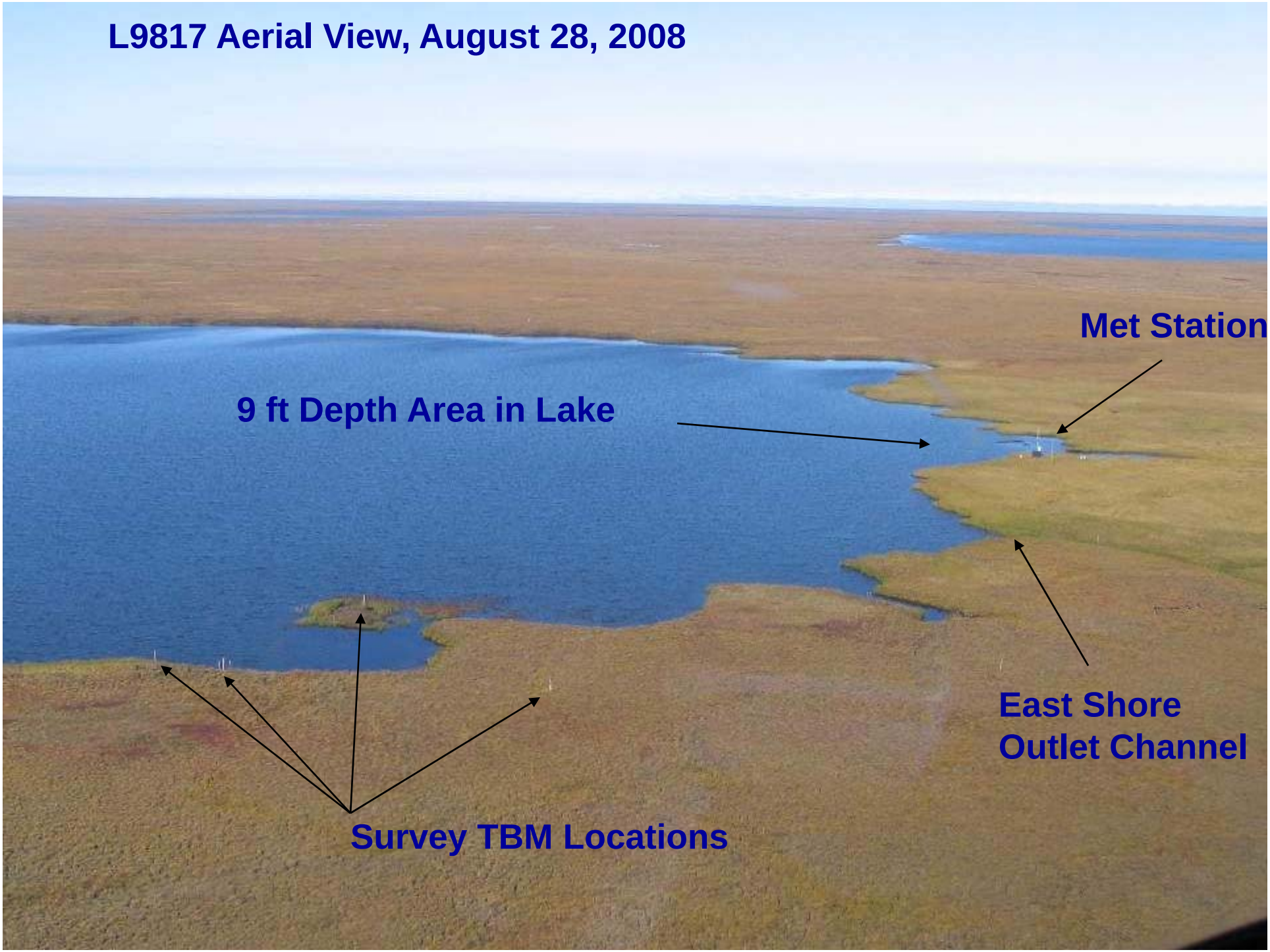


Improvements in Lake Knowledge : Usage



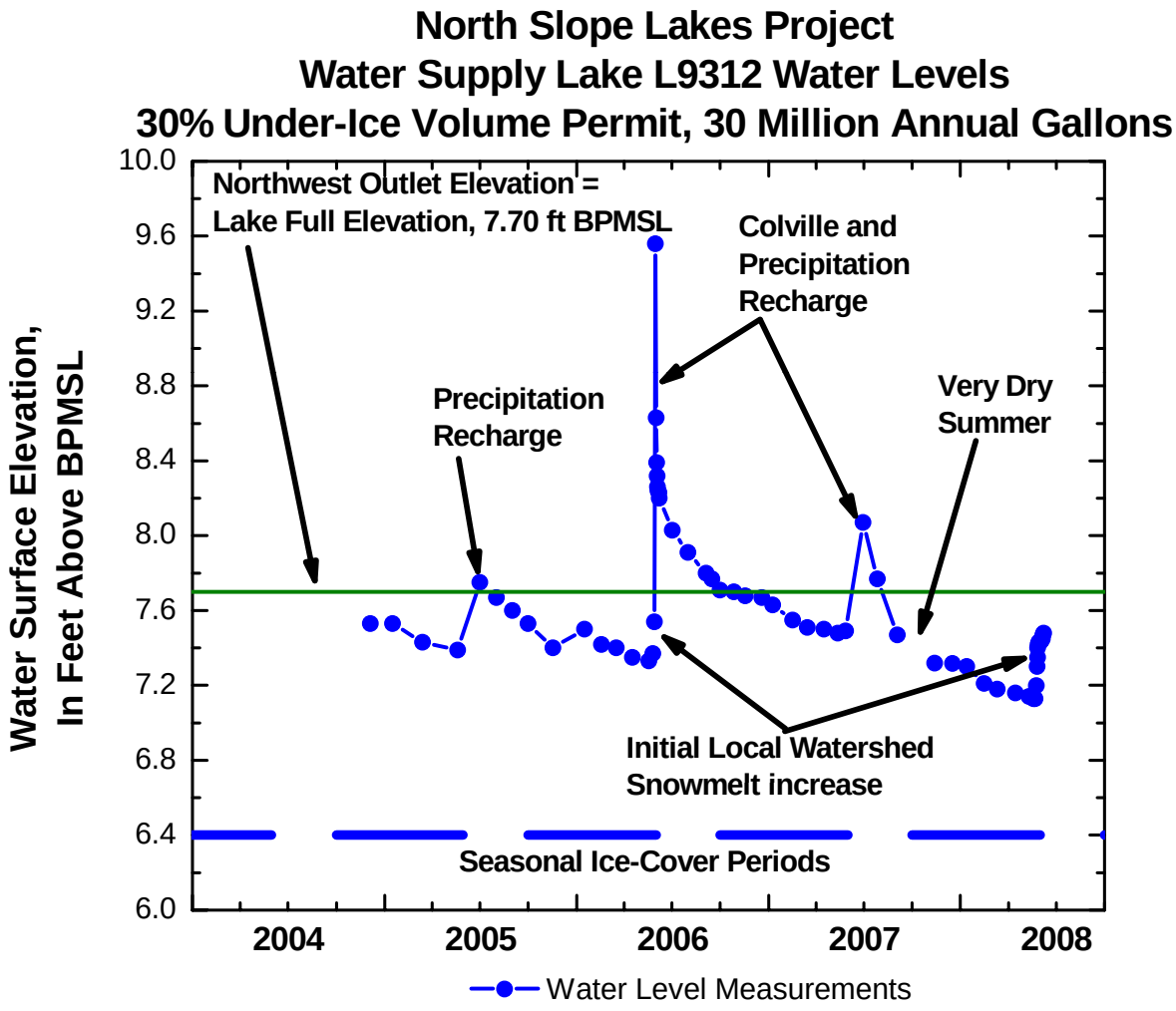
Improvements in Lake Knowledge : Management



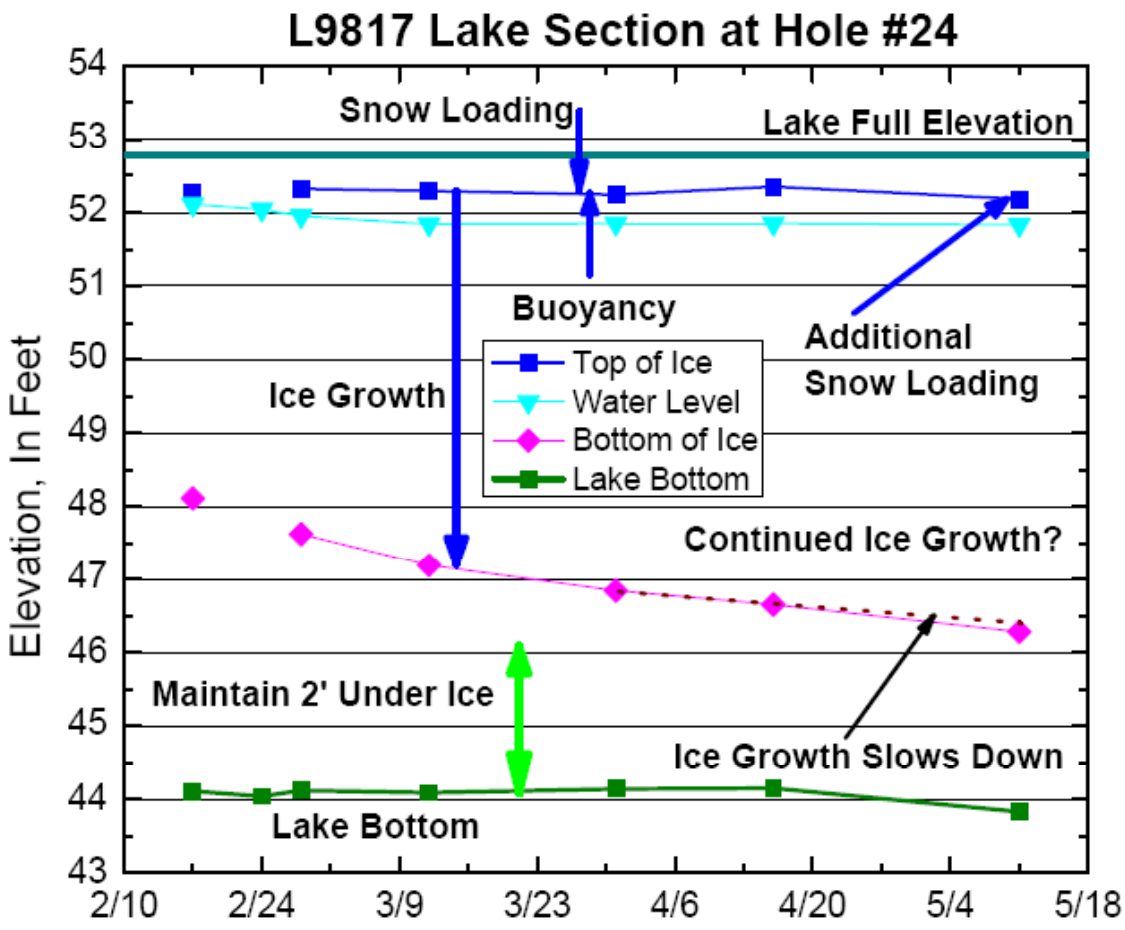

L9817 Aerial View, August 28, 2008
Met Station
9 ft Depth Area in Lake
East Shore
Outlet Channel
Survey TBM Locations

L9817, August 28, 2008, Outlet Channel, East Shore
Water Depth Approximately 0.1 to 0.2 feet

Improvements in Lake Knowledge : Management



Improvements in Lake Knowledge : Management



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

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

- Multi-Form Road Networks
  - Potential combinations of ice, snow, and other forms in more complex terrain

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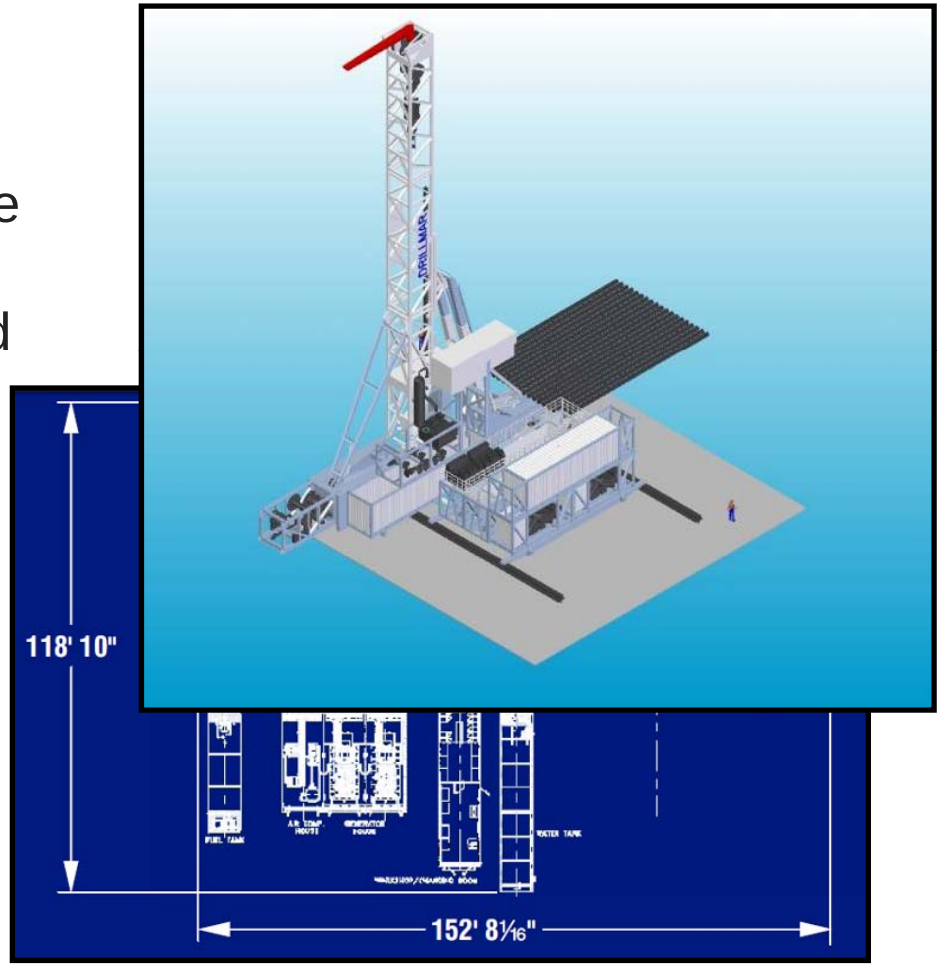
Artifacts - Lighter Weight Drilling Platforms

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



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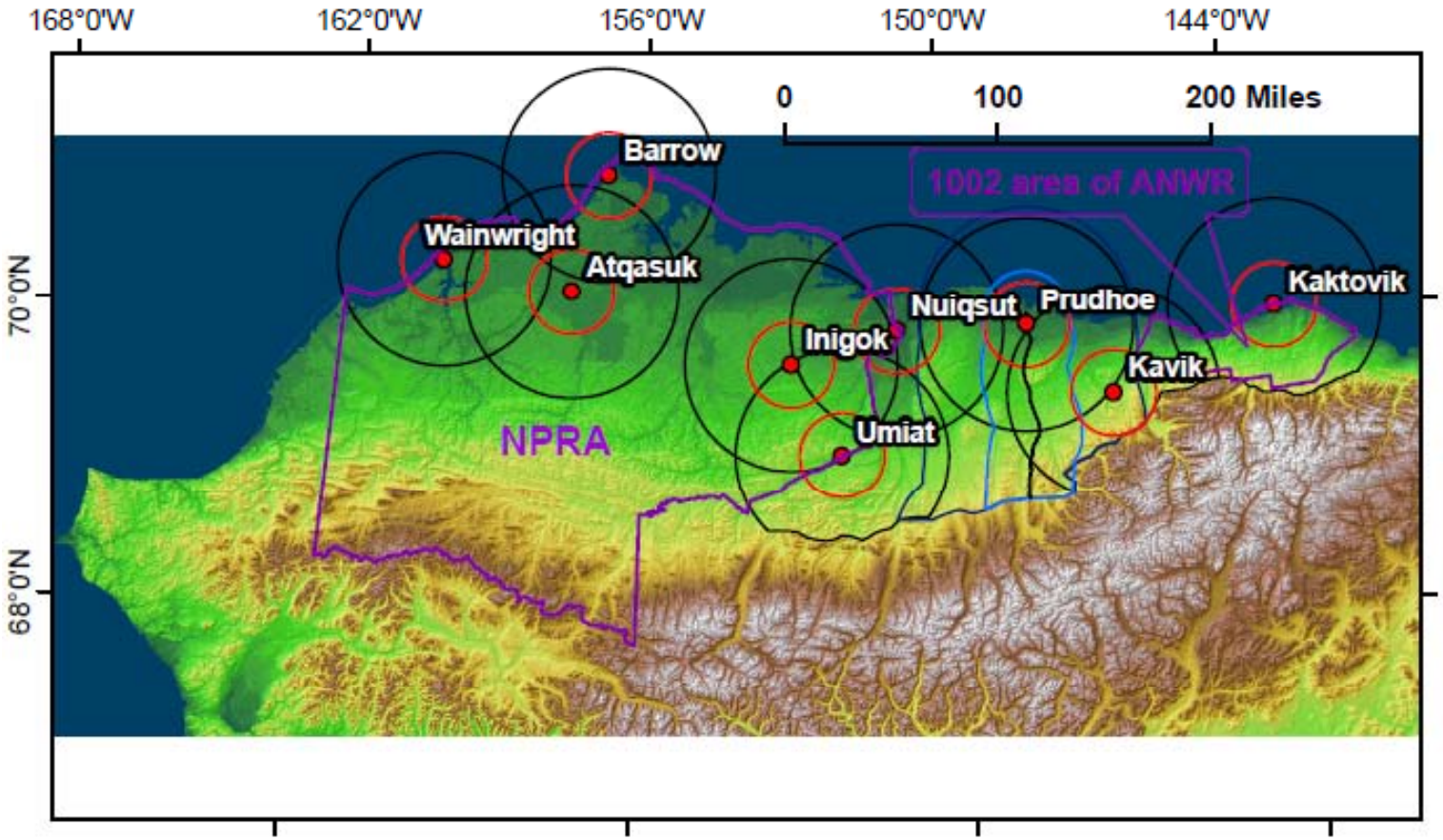
Applications of Environmental Platforms, Multi-Modal Transportation Networks



- Rich Haut, Tom Williams, Yuri Shur, Michael Lilly

Can We Adapt?

Increased Knowledge

Increased How-To

Increased Artifacts

Increased Collaboration

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Yes

Thank You
Questions?