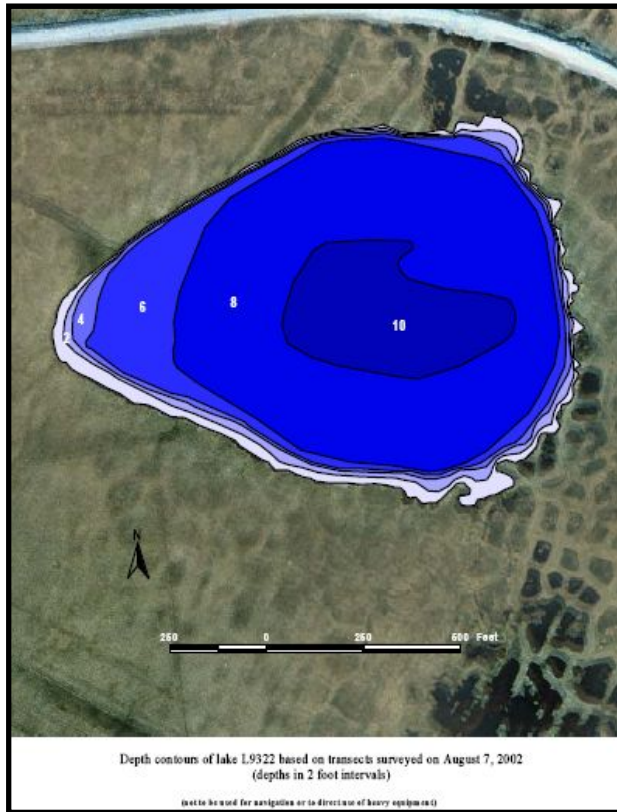


# *Alaska Section, AWRA, 2011 Annual Meeting*



## *Designing Adaptive Management Approaches for Summer Water Use of Arctic Lakes*

*Michael R. Lilly, Jeff Derry*

*Geo-Watersheds Scientific*

*Gerald Sehlke*

*Idaho National Laboratory*

*Horacio Toniolo*

*University of Alaska Fairbanks,  
Water and Environmental Research Center*

*April 4, 2011*



# Project Partners

- NETL/Arctic Energy Office (Main Funding)
- ConocoPhillips Alaska
- Alaska Department of Natural Resources
- Bureau of Land Management
- Geo-Watersheds Scientific
- University of Alaska Fairbanks
- NOAA, National Weather Service
- Alaska Department of Transportation and Public Facilities
- Alaska University Transportation Center
- Mineral Management Service
- North Slope Borough



# Presentation Outline

- Example Water Use Patterns
- Summer Water Uses
- Example L9322 Lake Water Use Applications
- Relationship to Winter Use
- Future Efforts

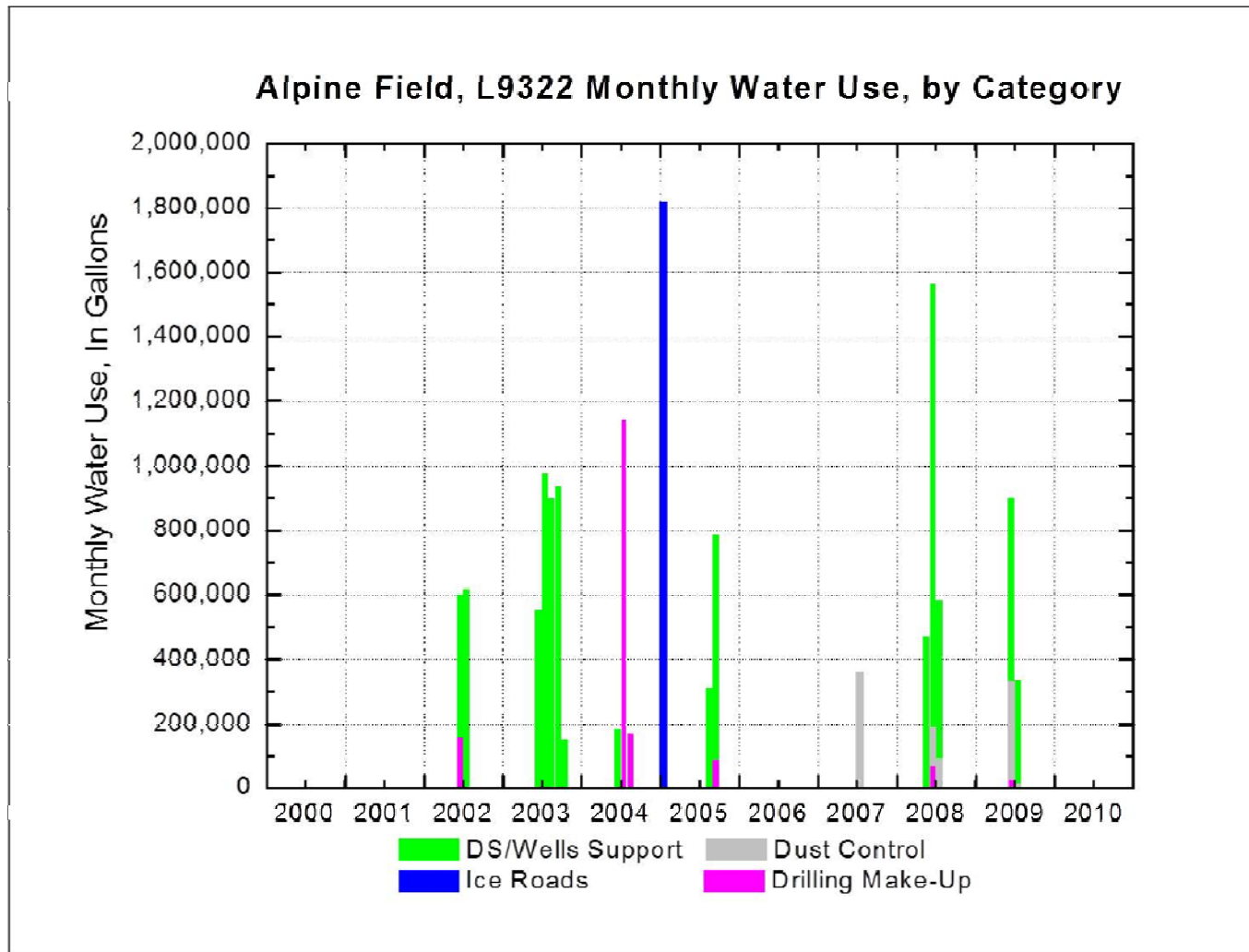


# Lake L9322 Background Information

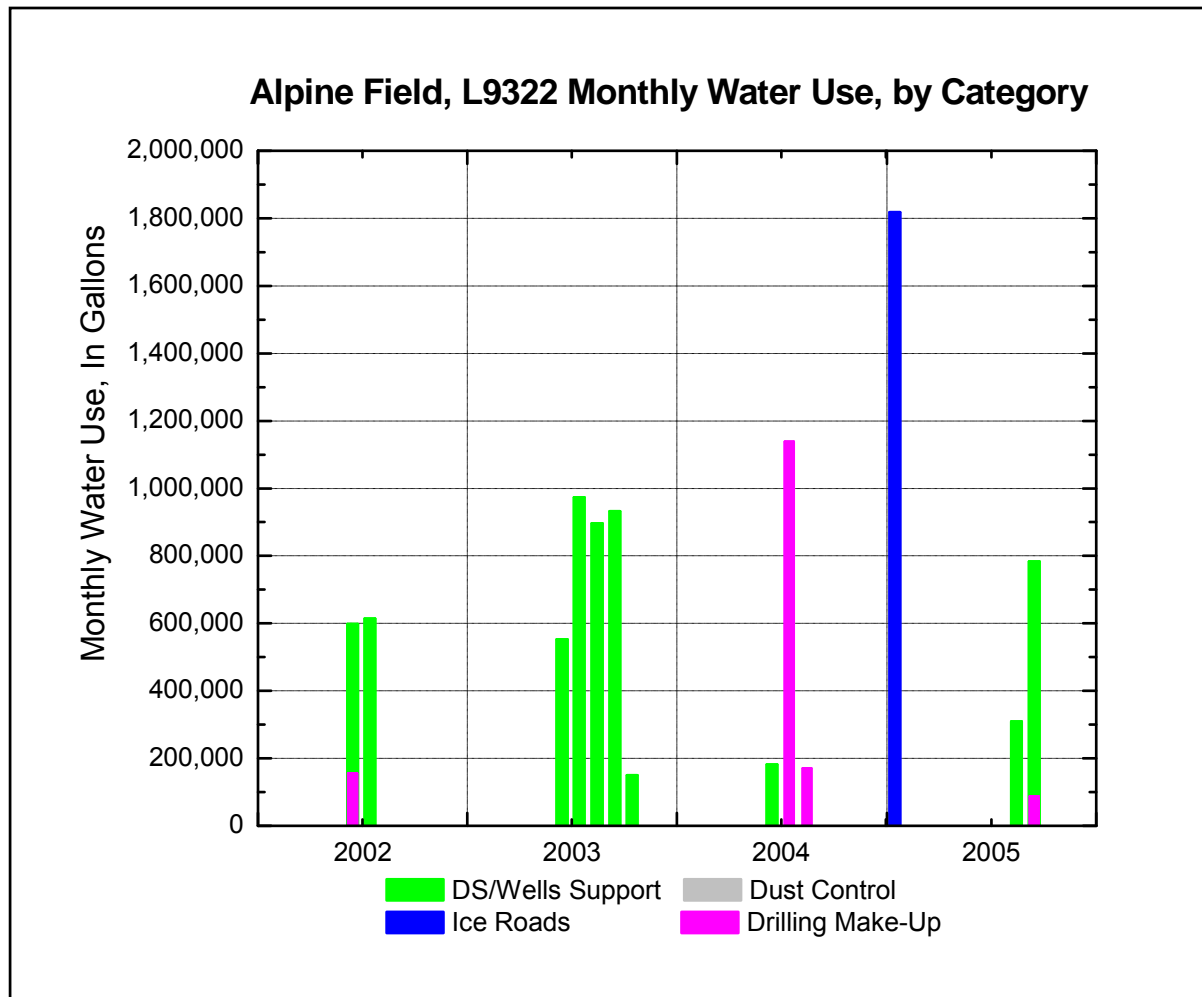
- Example Study Lakes
- ConocoPhillips Alpine Field area
- Lakes used for Ice Roads, Dust Control, Drilling
- Water Use Patterns?
- Lake Hydrology?
- Watersheds?
- Ice Growth?



# Lake L9322 Background Information

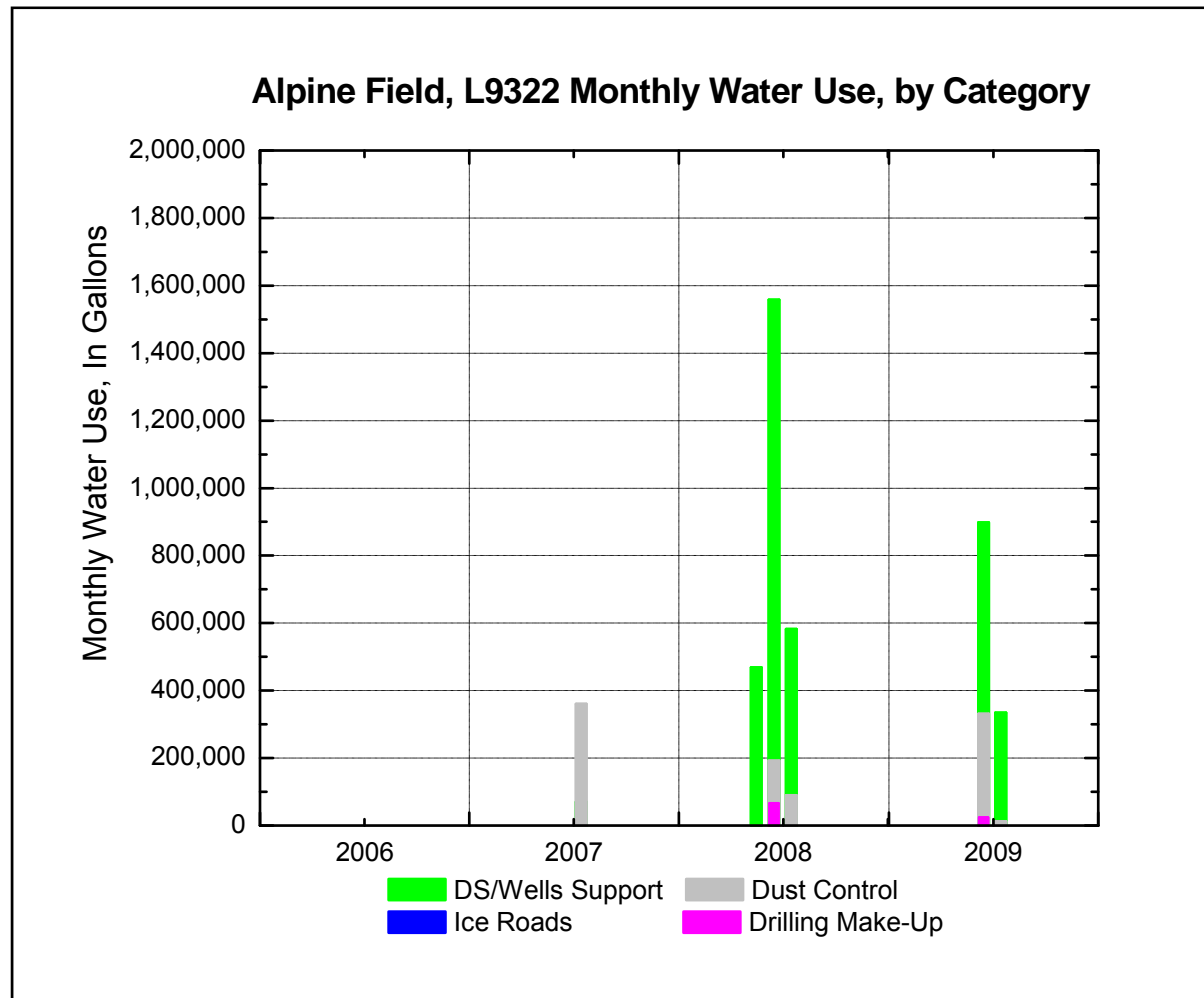


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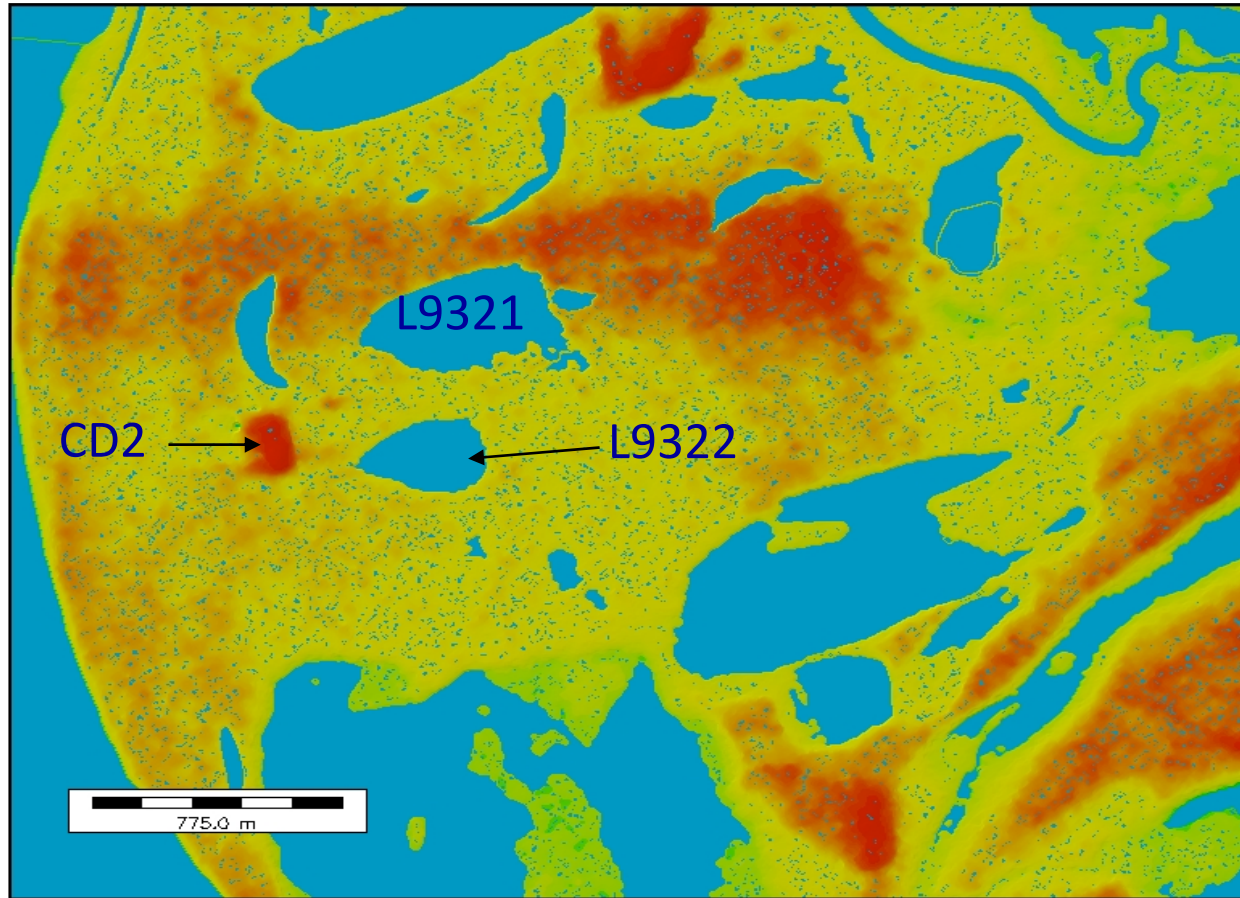




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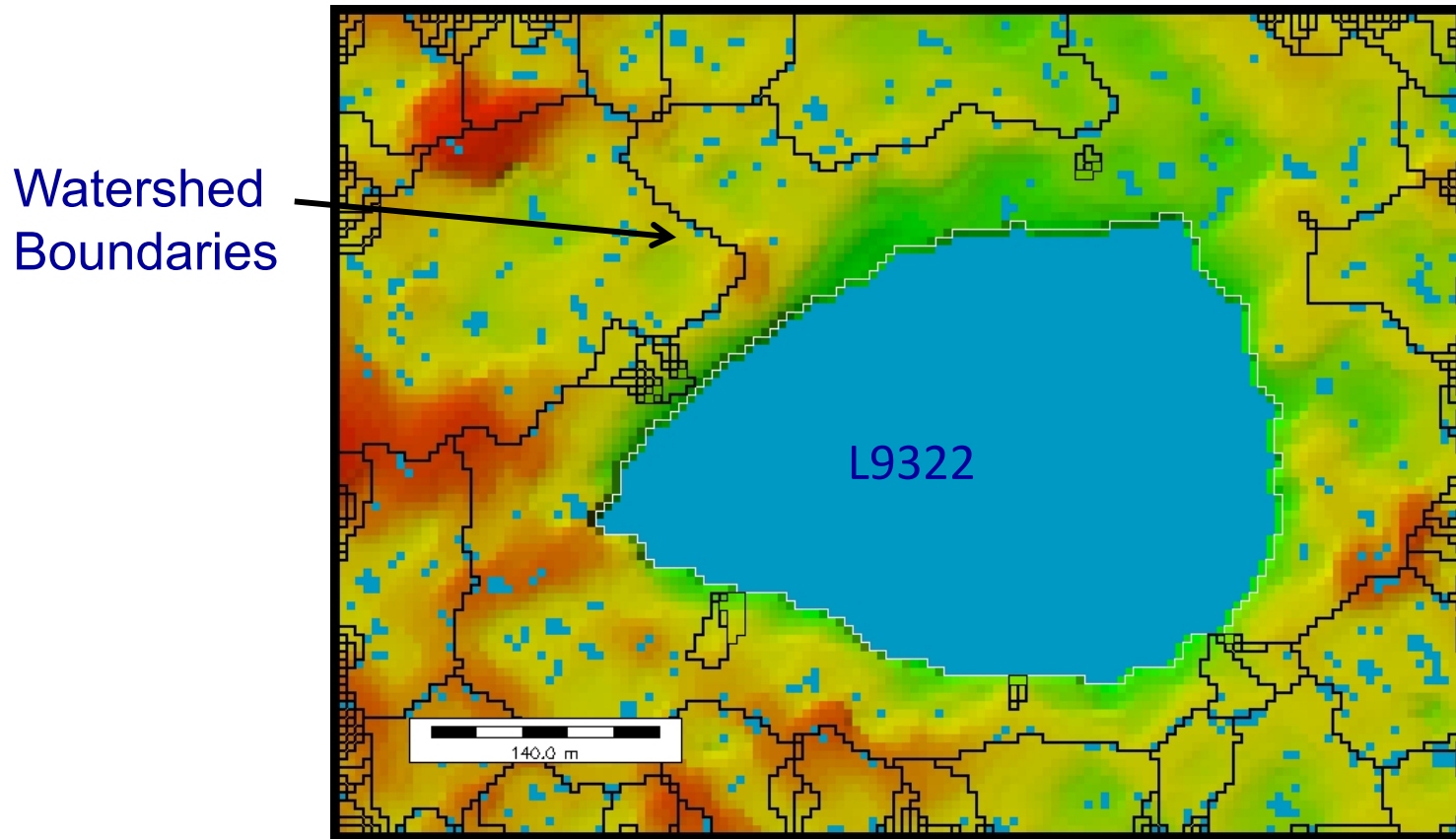
# Lake L9322 Background Information



DEM Processed with River Tools



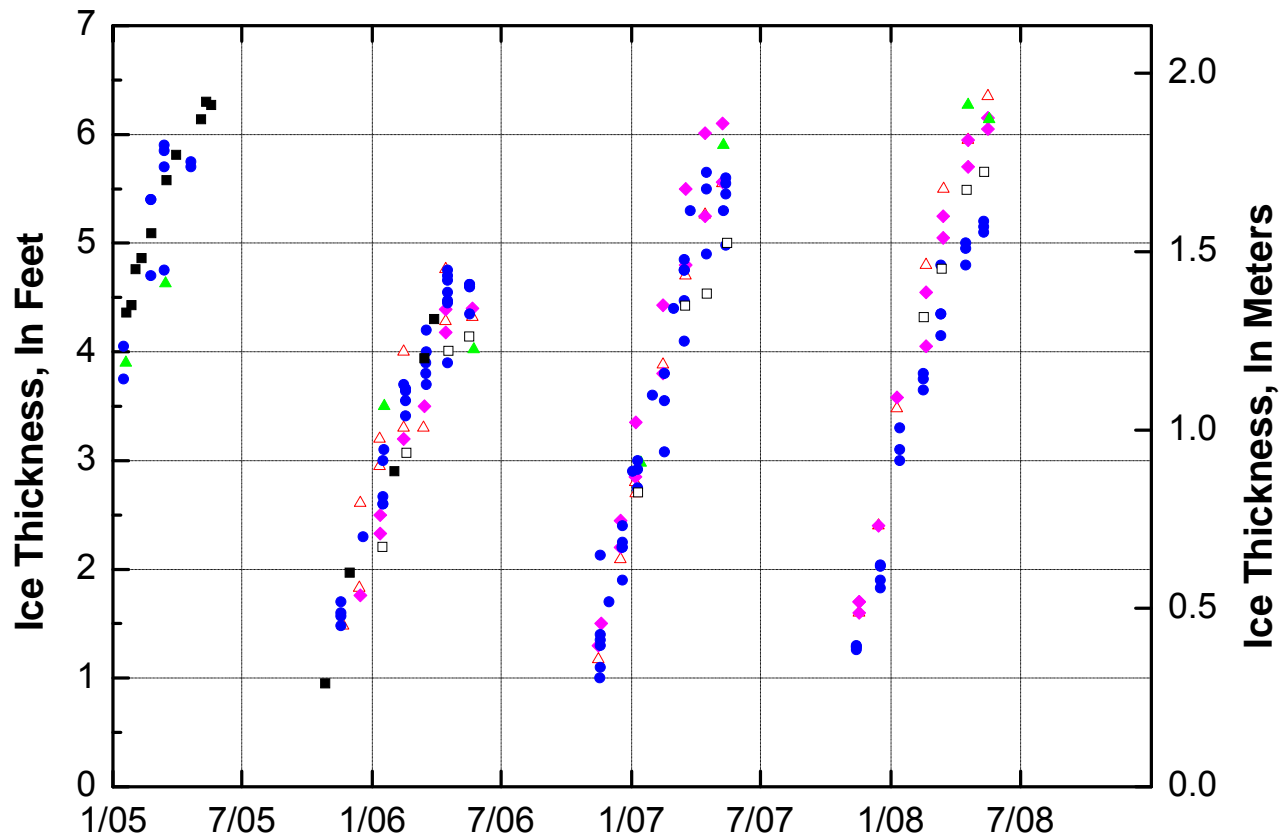
# Lake L9322 Background Information



DEM Processed with River Tools

# Lake Ice Thickness Characteristics

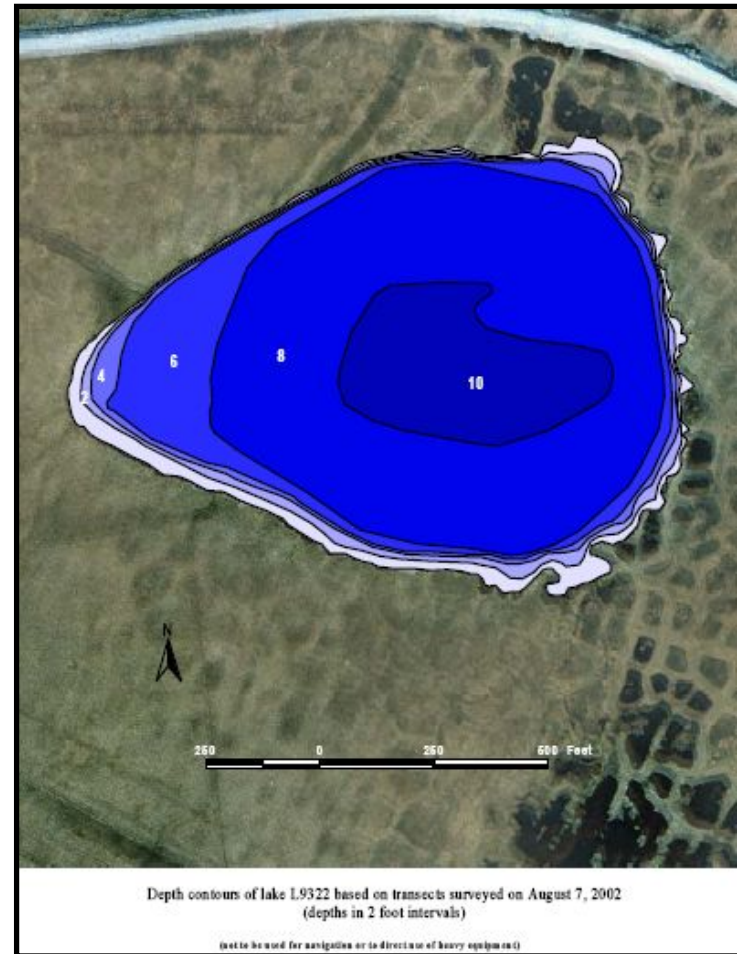
## Variation in Lake Ice Thickness



- △ Mine Site B, North Cell
- ◆ Mine Site B, South Cell
- ▲ K113
- L9312
- ▼ L9313
- L9817
- L9322
- ◄ L9321
- Imikpuk Lake

# Lake L9322 Background Information

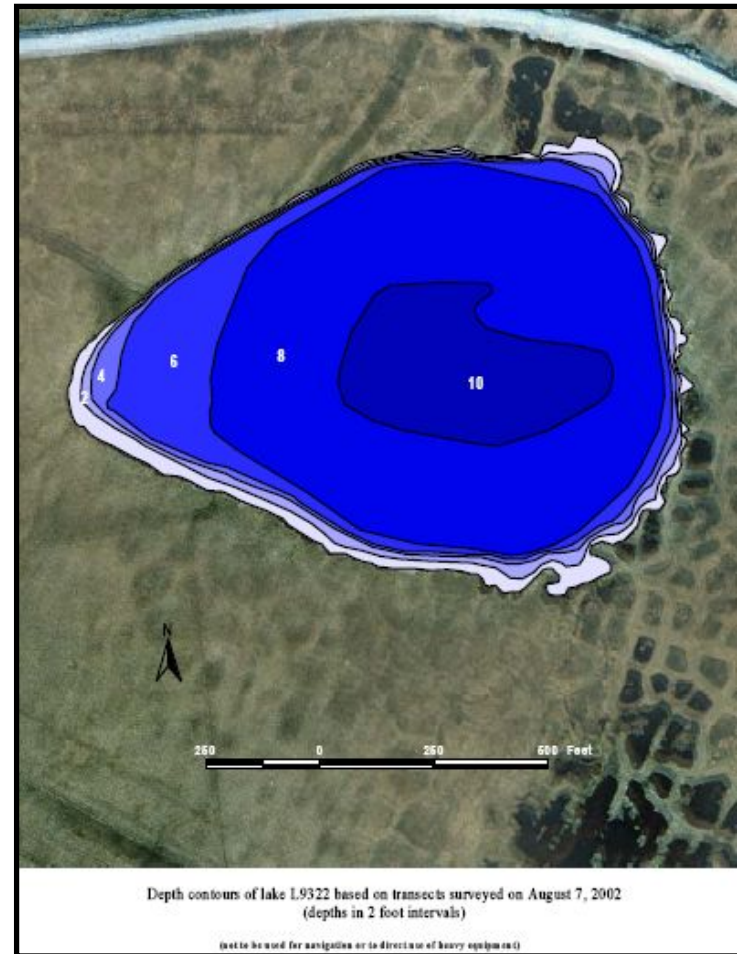
- Located next to Alpine CD2 Pad
- Historical water use includes;
  - Drilling/wells support
  - Road dust control
  - Drilling make-up
  - Ice roads
- Important summer season water source due to location and access
- Recharged by local watershed, frequent overbank flooding by Colville River
- Has sensitive fish species
- Has permanent water right,
  - LAS 23893, FG02-III-0108 #3



After L. Moulton, 2002

# Lake L9322 Background Information

- Some Key Questions
  - What is the safe limit of Summer water use for L9322?
  - How should the goals in water use permitting be stated to best meet the hydrology of the lake, and needs of the water user?
  - What information is needed by the user for safe water management and efficient oversight and compliance tracking?

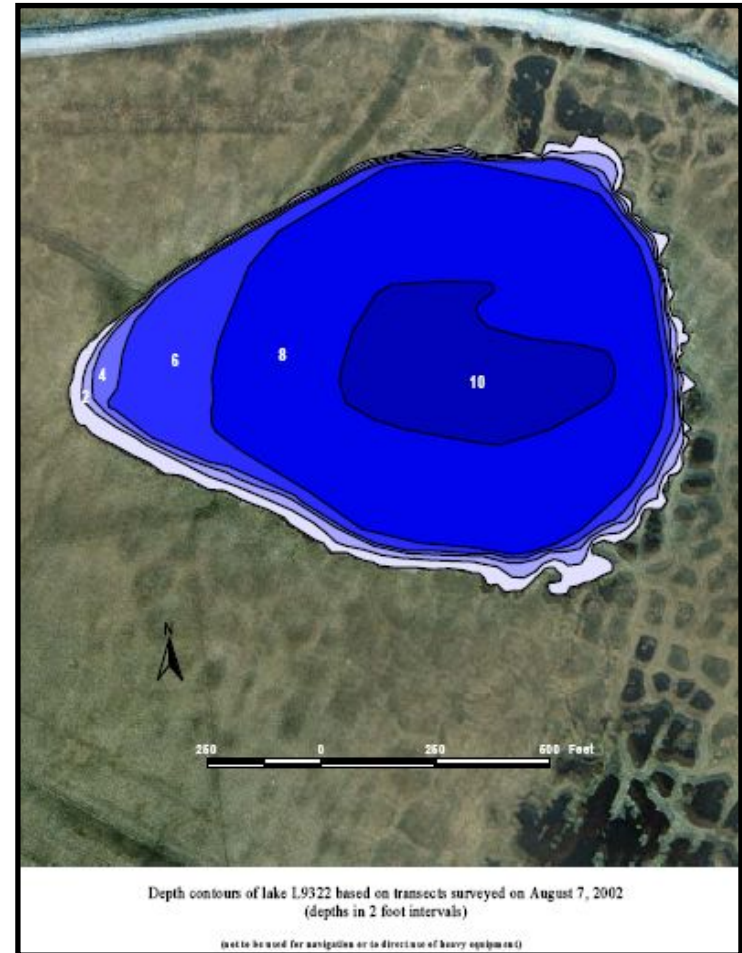


After L. Moulton, 2002



# Lake L9322 Background Information

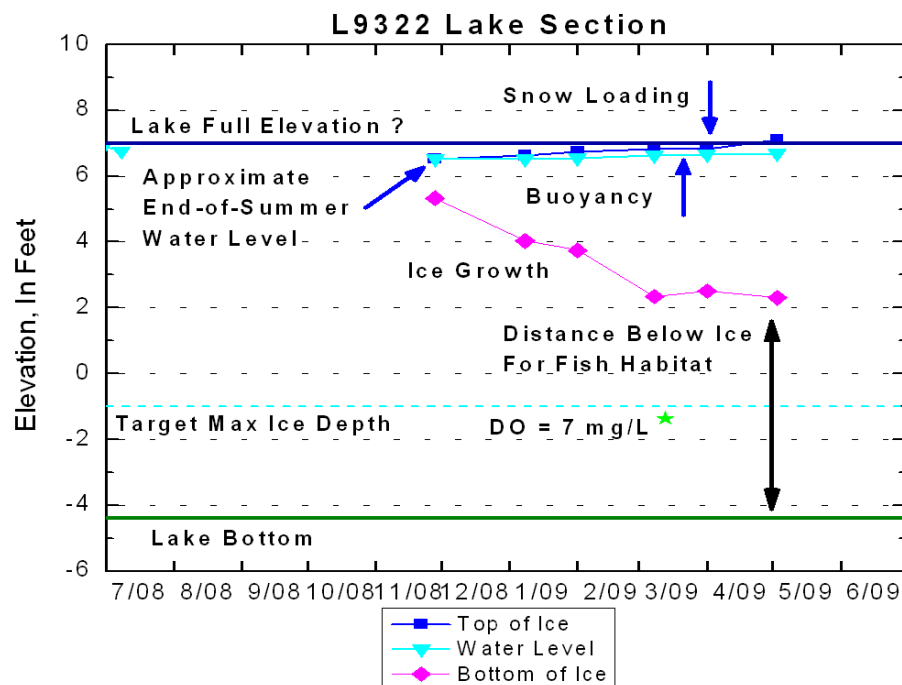
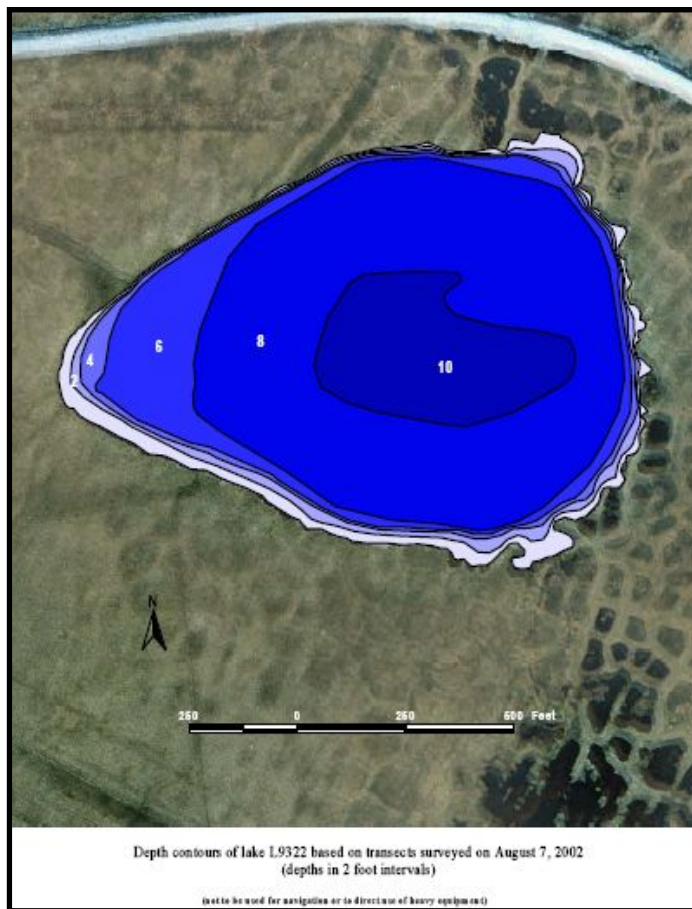
- **Water Use Notes**
  - Current permit limit 1.6 M gal
  - Dust control can use 100,000 gallons per day when hot
  - Need for more water demonstrated 3 different water permit years
  - Changing lakes requires pump moves, helicopter and staff time, fuel movements on tundra
  - Increasing permit volume would increase operational flexibility



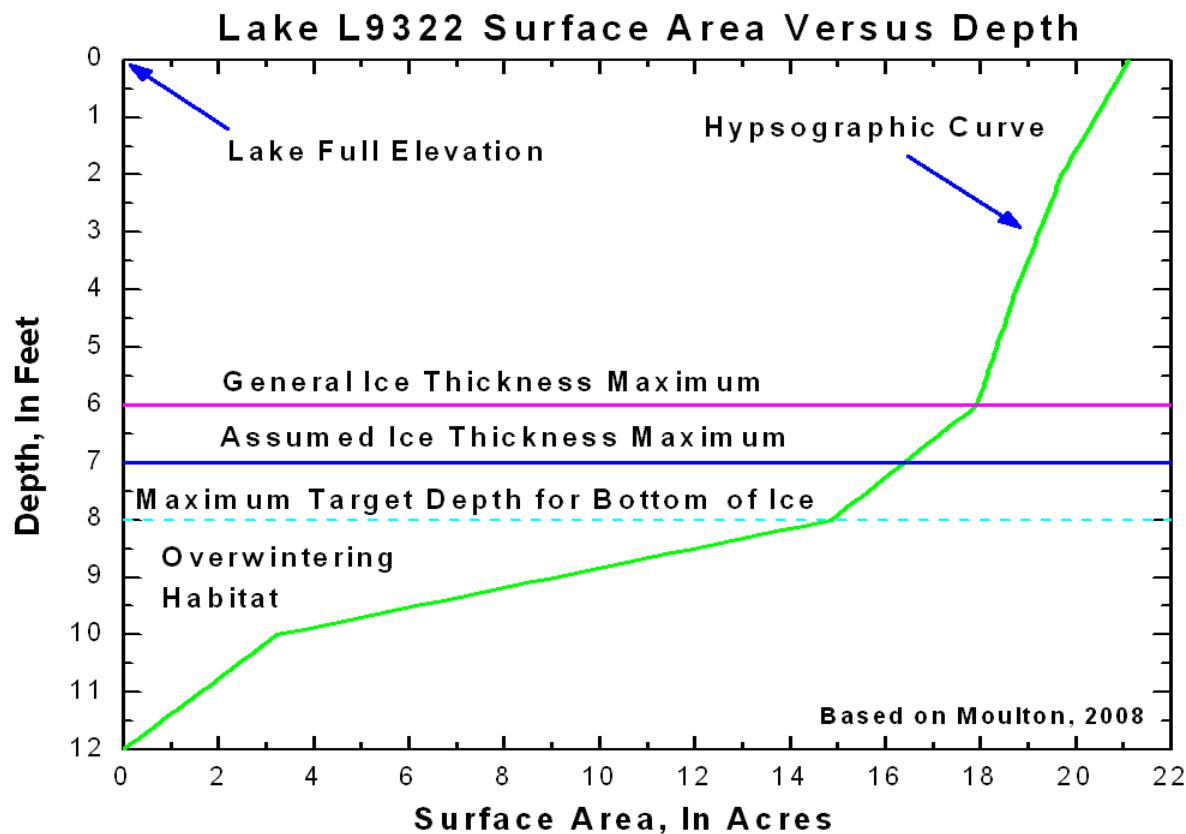
After L. Moulton, 2002



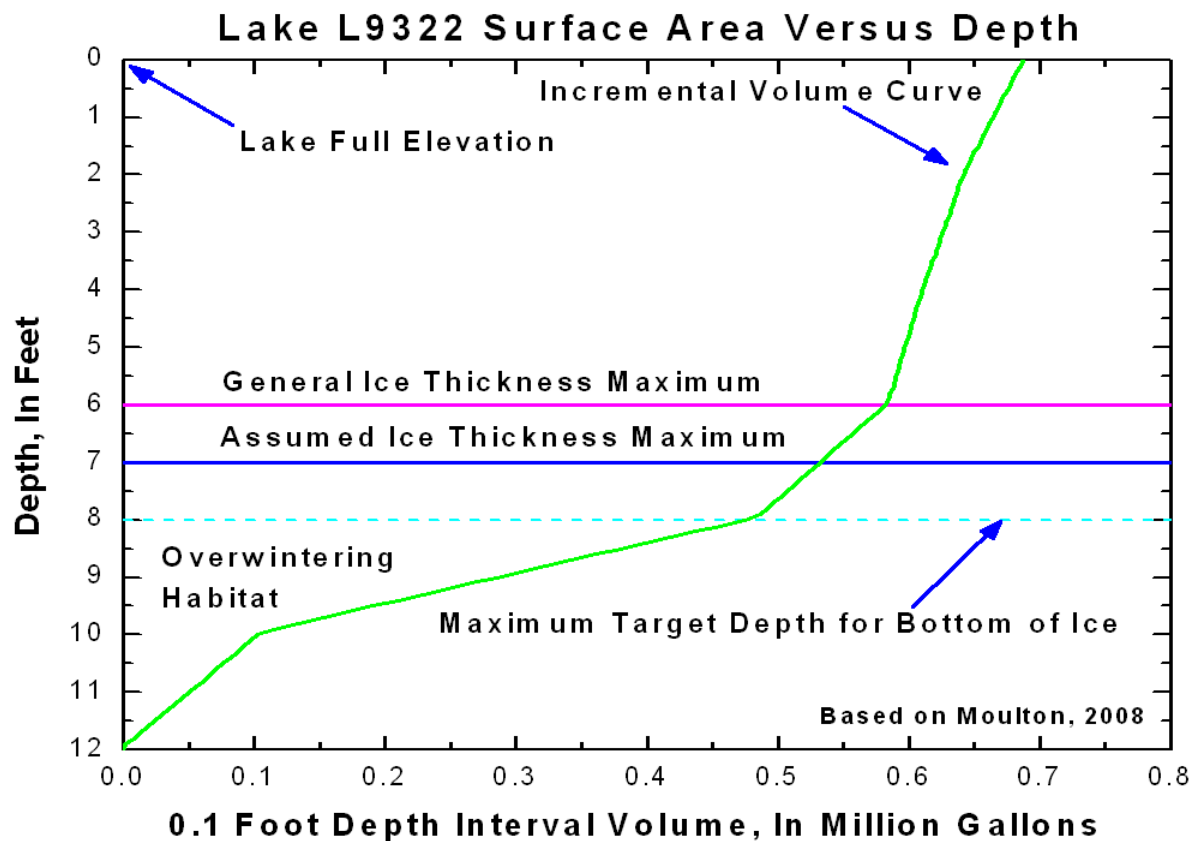
# Lake L9322 Background Information



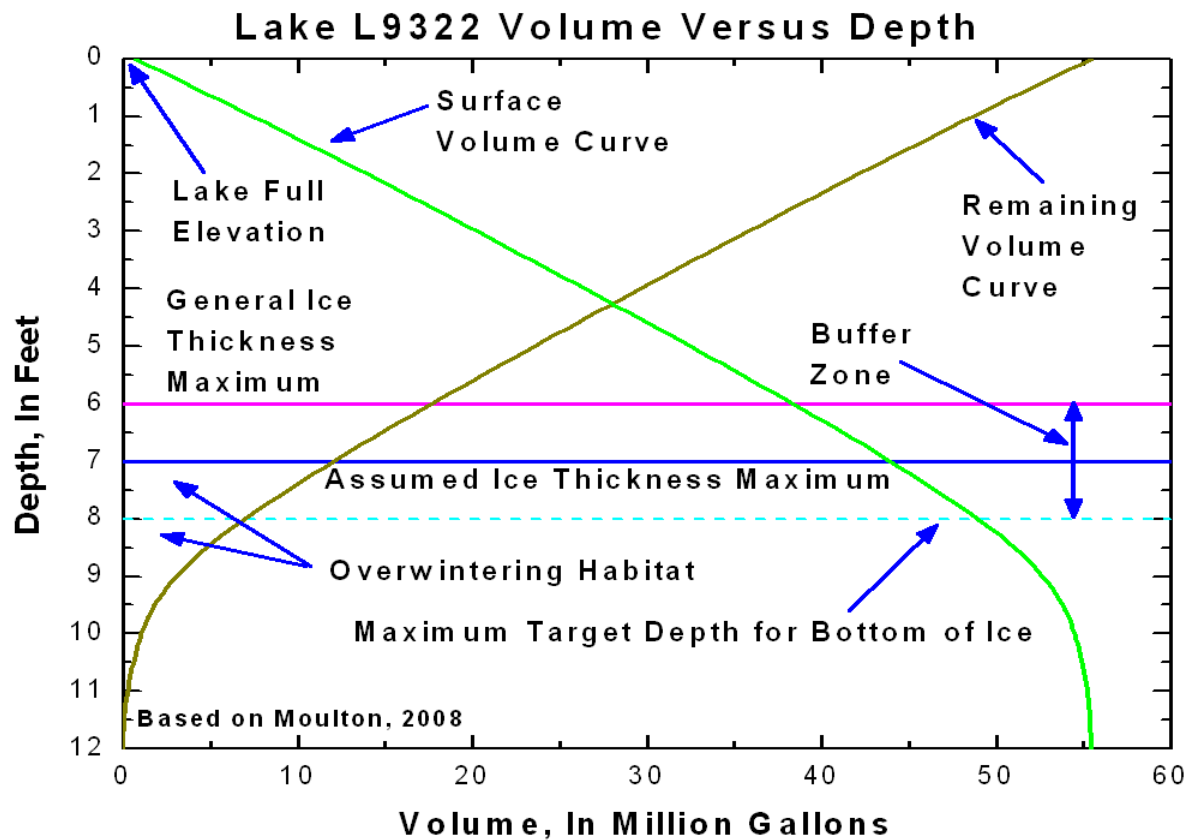
# L9322 Water-Use Example



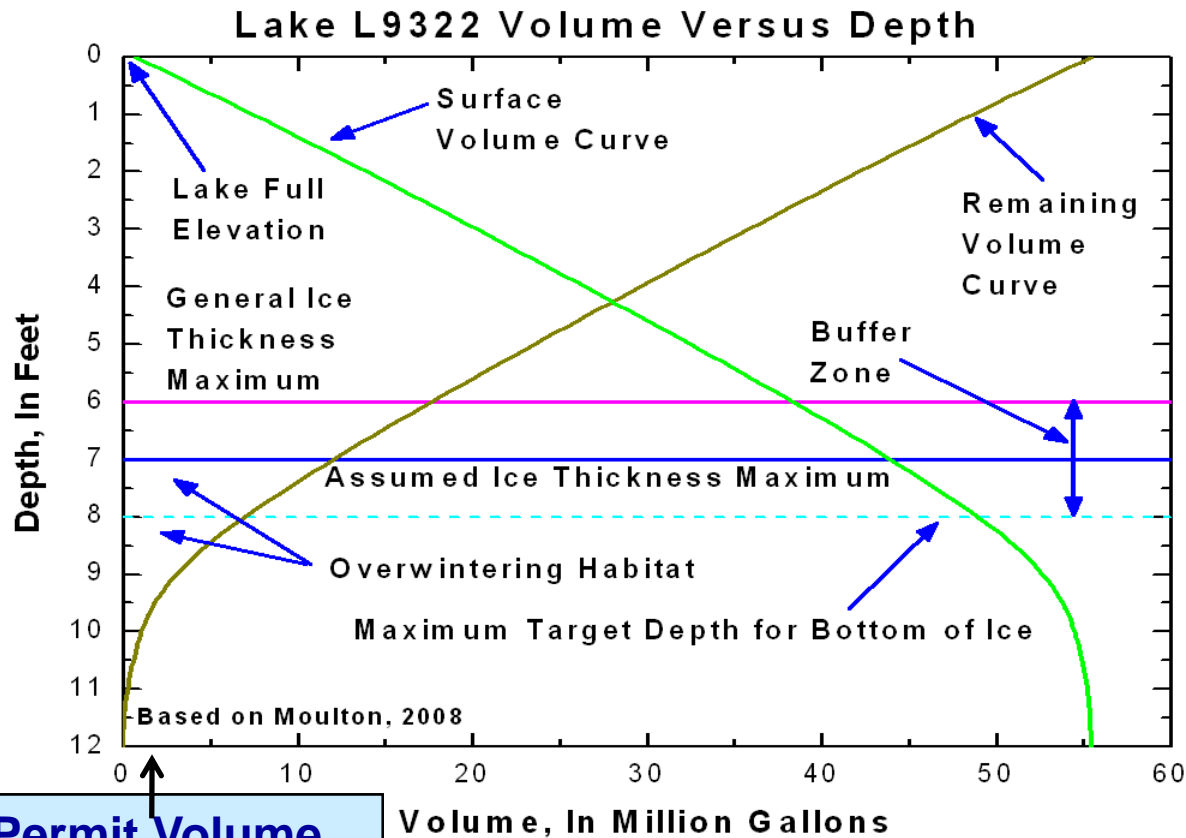
# L9322 Water-Use Example



# L9322 Water-Use Example



# L9322 Water-Use Example



**Current Permit Volume  
1.77 Million Gallons**

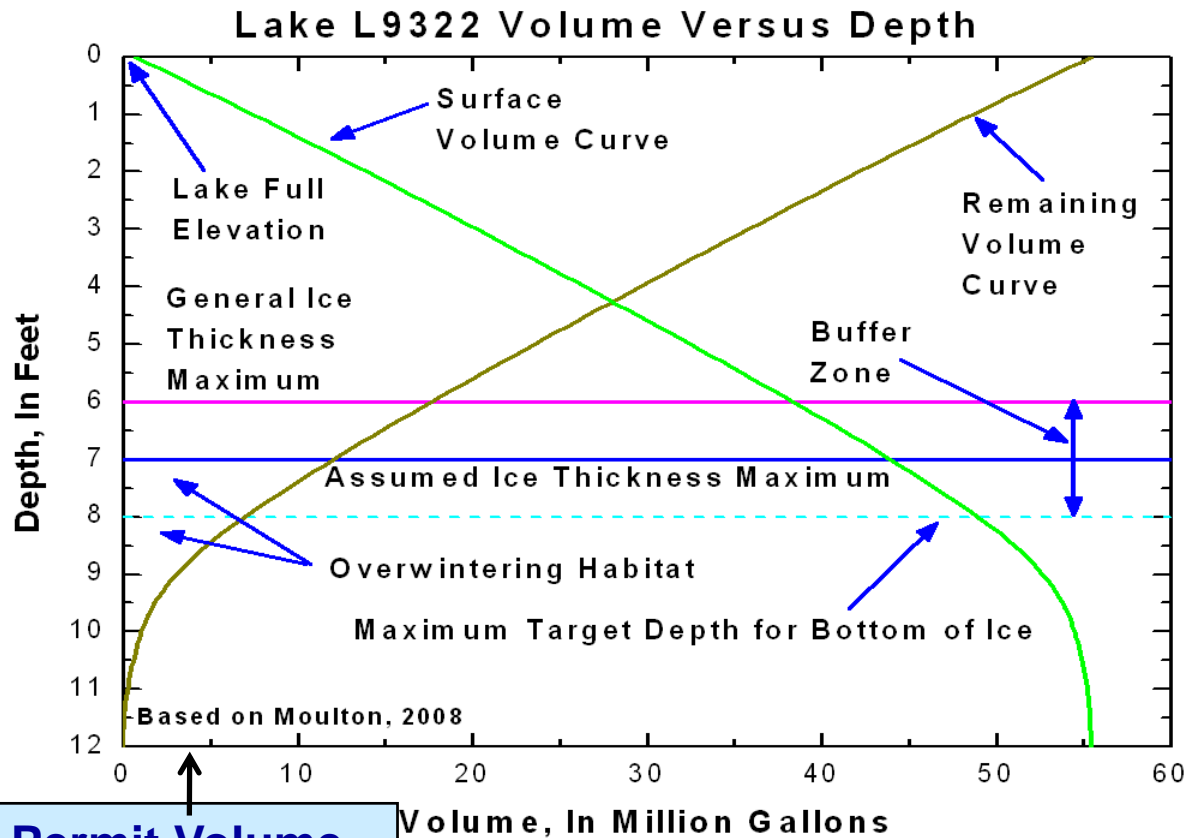


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# L9322 Test-Permit Example



**Example Permit Volume  
3.5 Million Gallons**



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# Adaptive Management Questions

- When Using Water In Summer, How Does Evaporation Matter
- Does Summer Use Impact End-of-Winter DO
- What Measurements are Needed by Water Use Managers?
- What Measurements are Needed by Permit Agencies?
- How Does Spring Recharge Factor Into Summer Water Use?



# Implications for Winter Water Use

- Lakes used for Summer and Winter Use
- Ice Chips Off Lakes
- Ice Road Winter Water Use
- Similar Management Goals
- Increased Use by Multiple Users on Single Water Sources



# Future Efforts

- ✓ **Develop Additional Water Use Examples**
- ✓ **Continue to Work with Water Users to Develop Test Applications**
- ✓ **Continue to Improve adaptive Water Management Tools for Industry and Agencies**



**Thank You**  
*Questions?*

**<http://www.arctic-transportation.org>**

