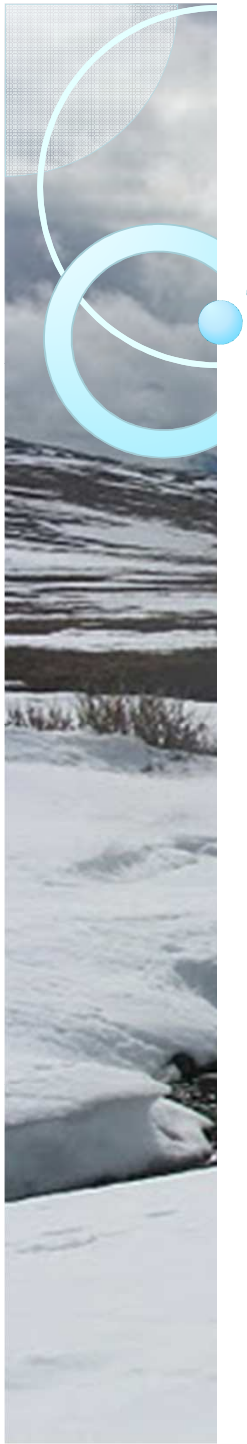


Linking North Slope Climate, Hydrology, and Fish Migration

Erica Betts

Water and Environmental Research Center

University of Alaska Fairbanks

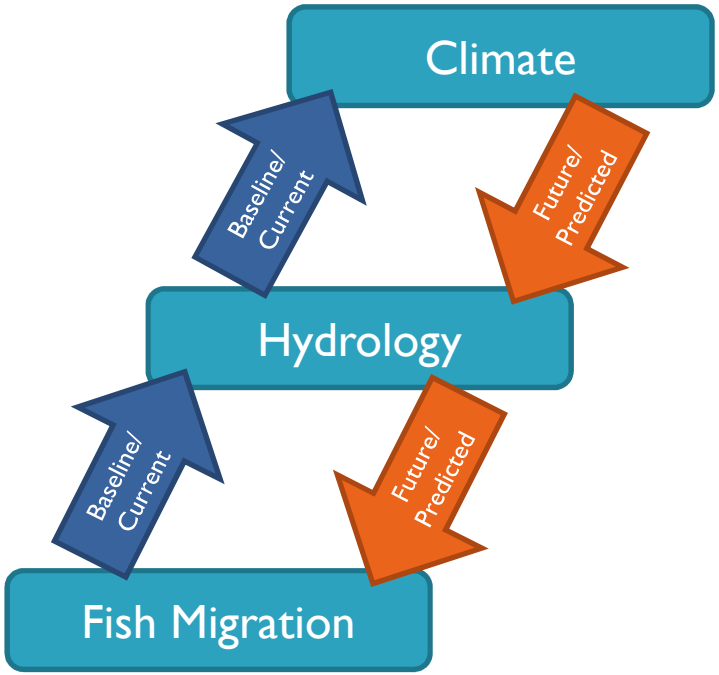
April 4, 2011

Outline

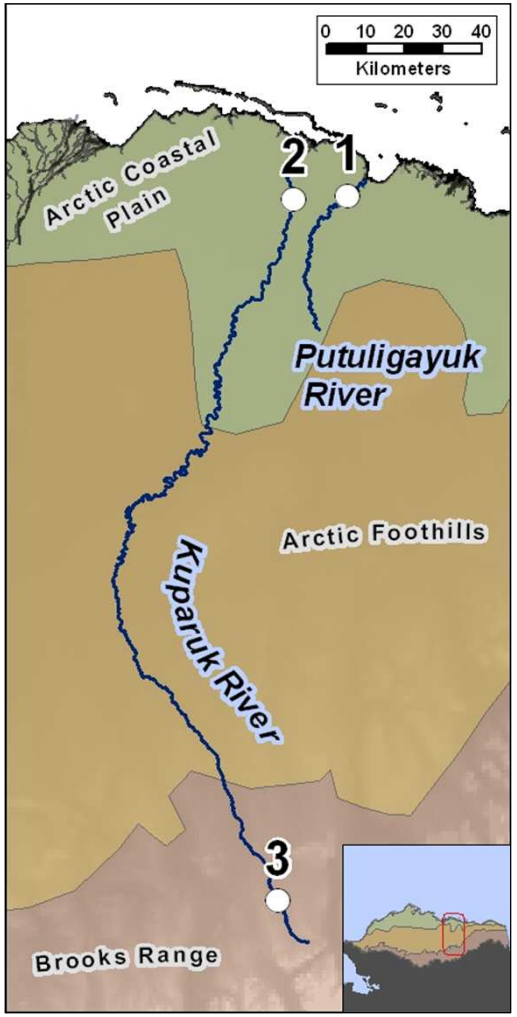
- Introduction
- Hydrology
- Fish Migration
- Climate Change
- Research
- Results
- Next Steps

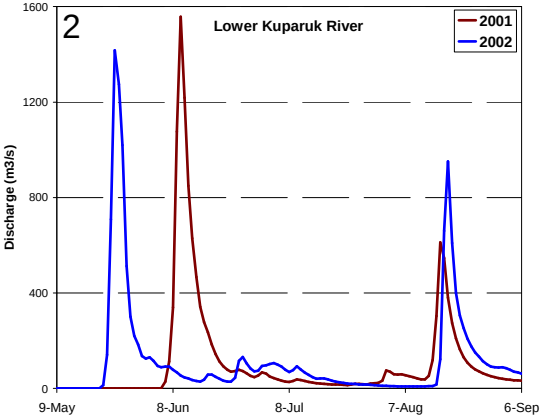
Background

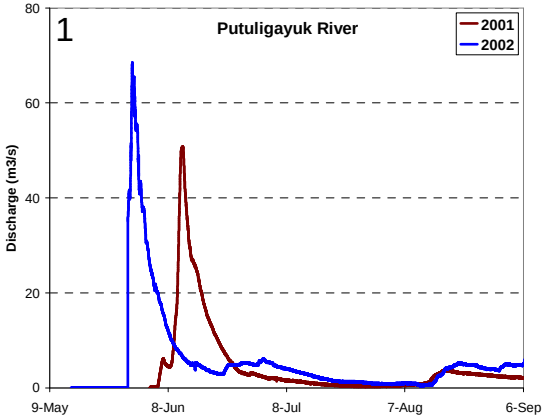
- Climate change impacts on fish and wildlife populations?
  - Important pathways?
  - Mechanisms?
- Linkages important to arctic environments

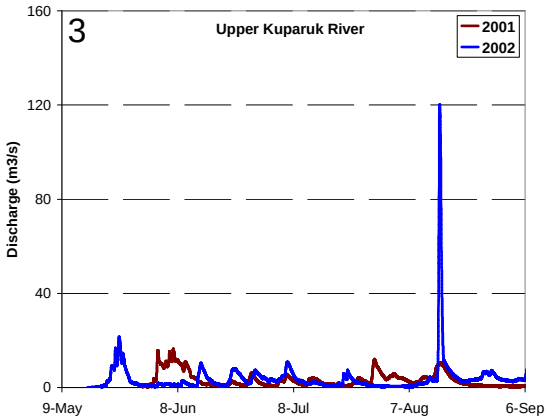


Hydrologic Response



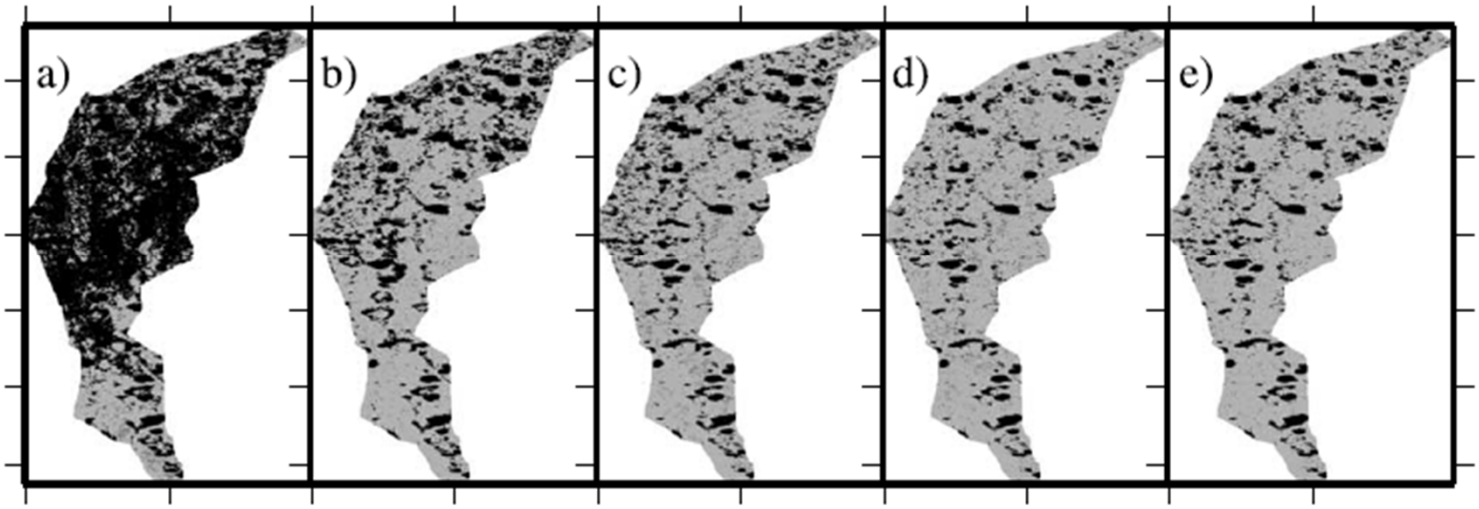






Kane, D.L. and Hinzman, L.D., 2008. Climate data from the North Slope Hydrology Research project. University of Alaska Fairbanks, Water and Environmental Research Center. http://www.uaf.edu/water/projects/NorthSlope/

Hydrologic Connectivity

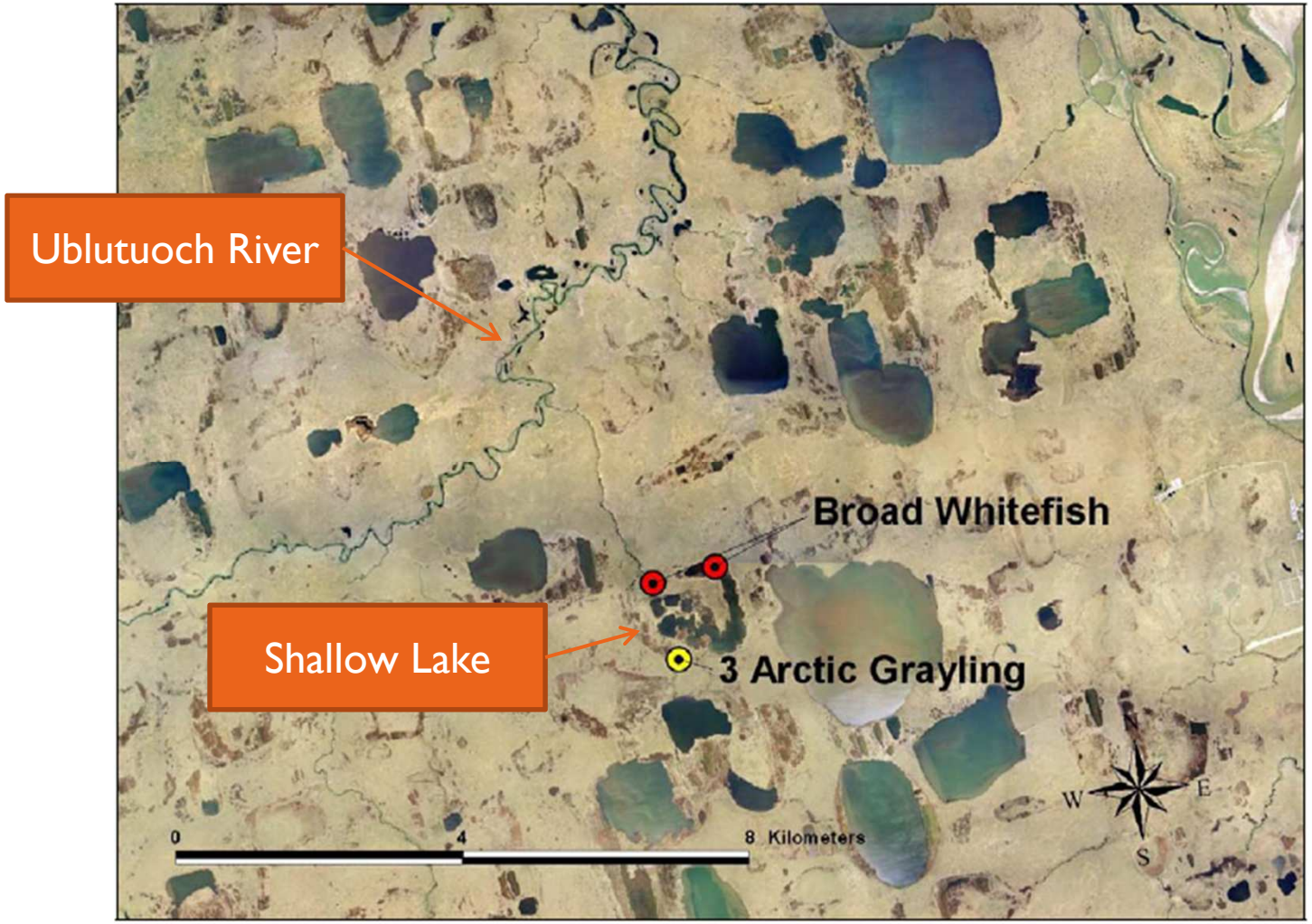


(a) 14 June 2000, (b) 21 June 2000, (c) 5 July 2000, (d) 22 July 2000, and (e) 7 September 2000

Date	Saturated Extent	Change
14 June 2000	315 km^2	
21 June 2000	129	73 percent
5 July 2000	98	
22 July 2000	72	
7 Sept. 2000	84	

Bowling, L.C., et al. (2003) The role of surface storage in a low-gradient Arctic watershed. *Water Resources Research*, 39(4), 1087

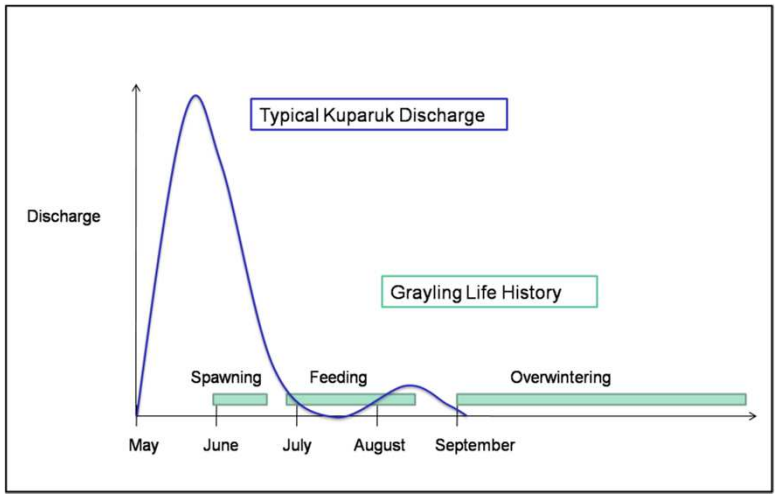
Fish Migration



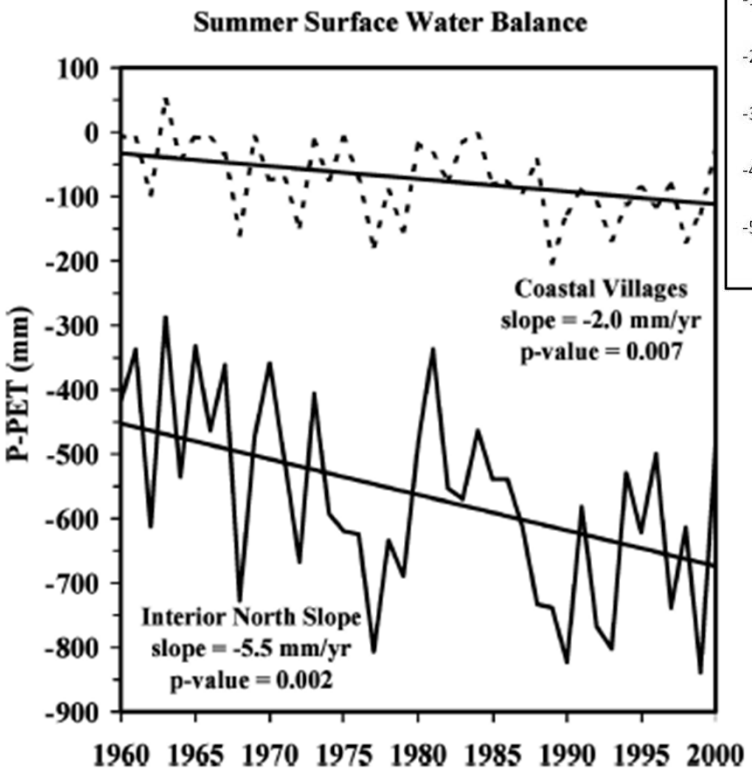
William Morris, Alaska DNR, Technical Report No. 03-02, November 2003

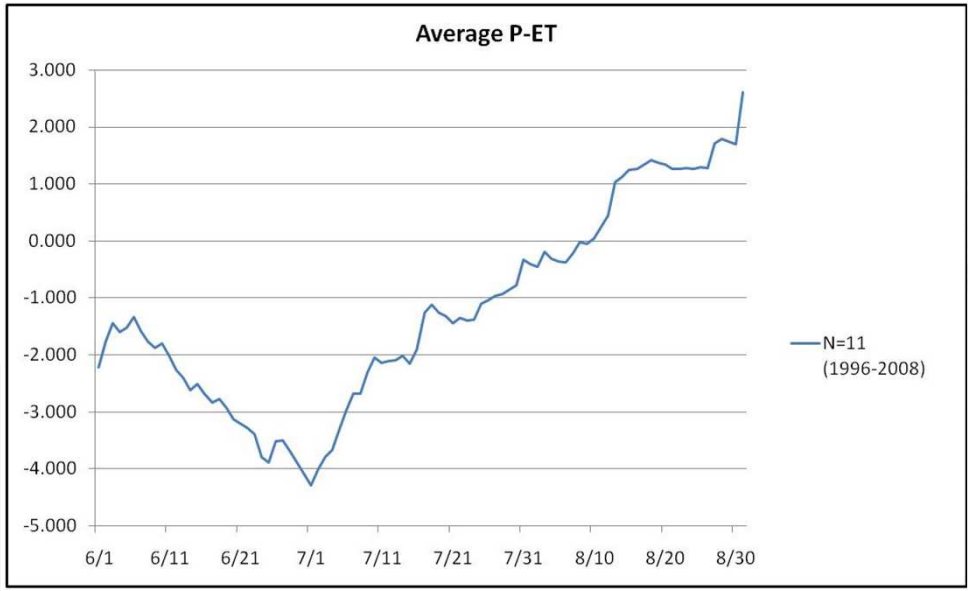
Arctic grayling migration

- After break-up grayling leave overwintering sites for spawning grounds
- Utilize smaller ponds and streams for rearing or feeding grounds
- Must migrate back to overwintering sites before freeze up



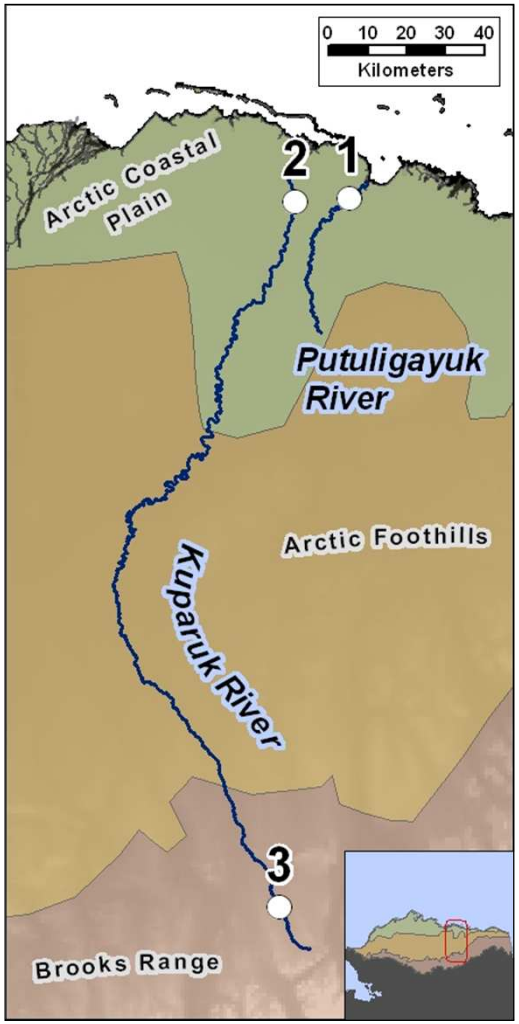
Climate Change



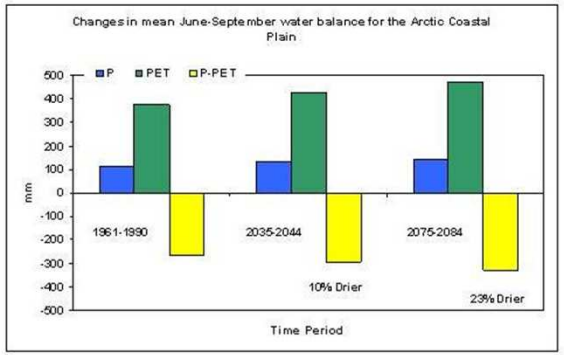


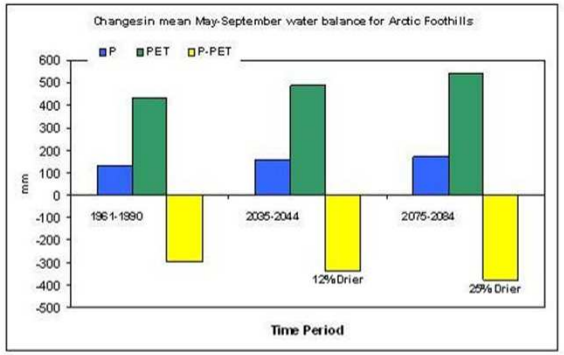
Hinzman, L.D. et al. (2005) *Climatic Change* 72, 251-298

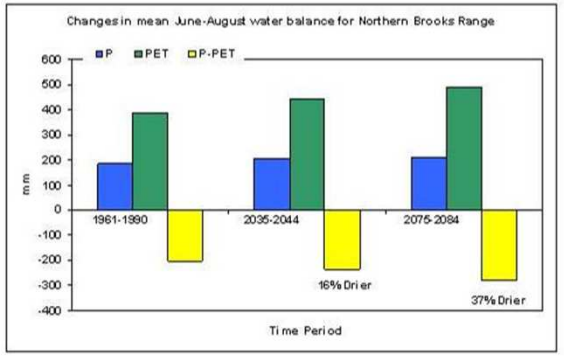
Climate Change



Kane, D.L. and Hinzman, L.D., 2008.
http://www.uaf.edu/water/projects/NorthSlope/

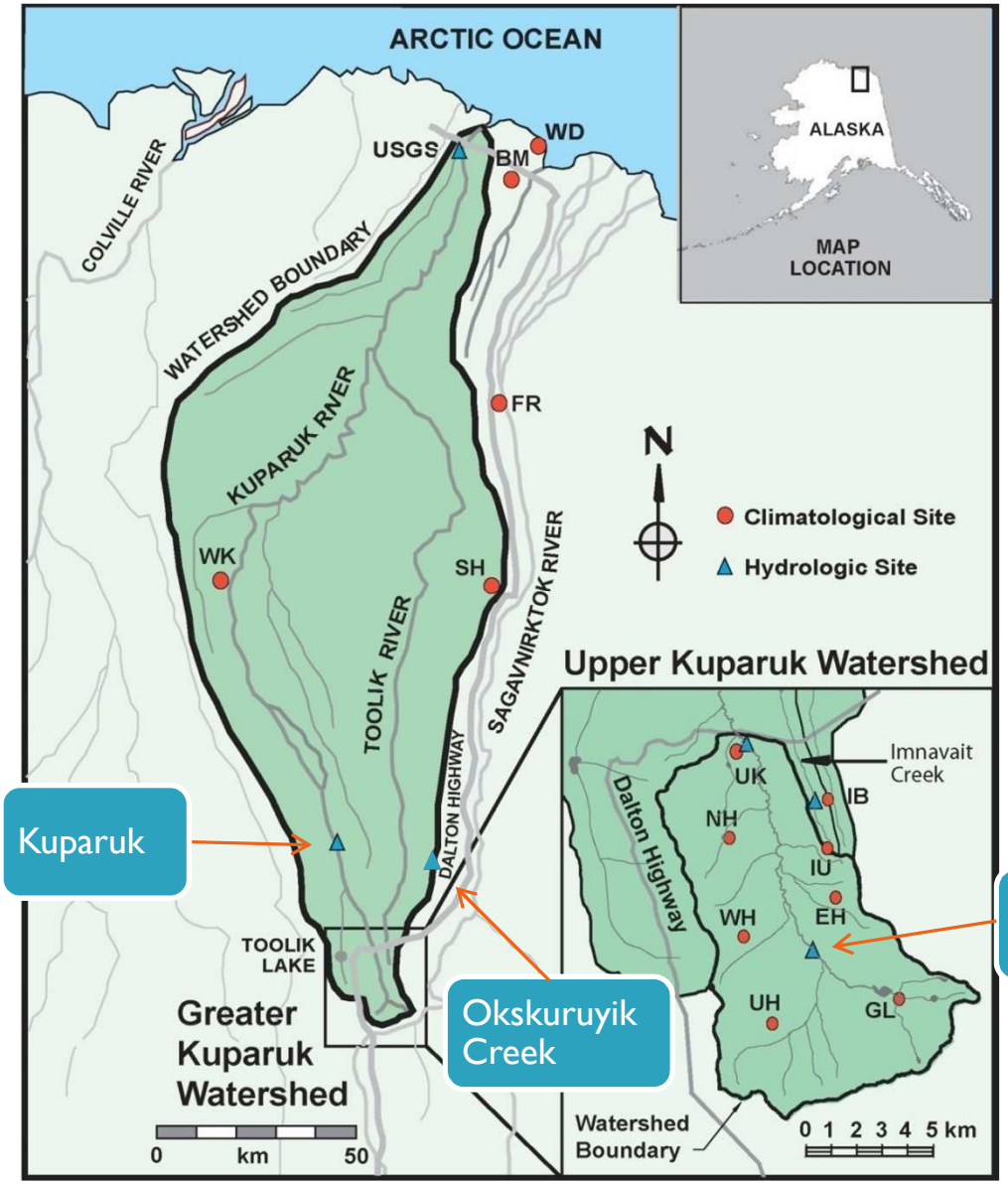






WildREACH conference proceedings, USFWS, November 17-18, 2008
http://www.arcus.org/alaskafws/, courtesy of Peter Larson

Research Location

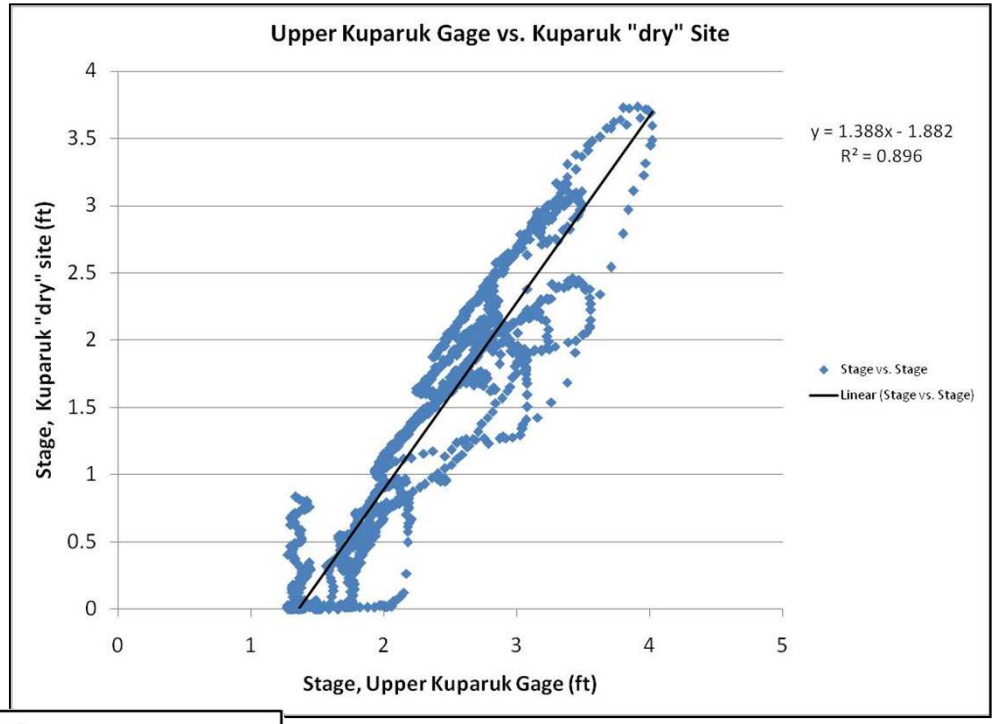


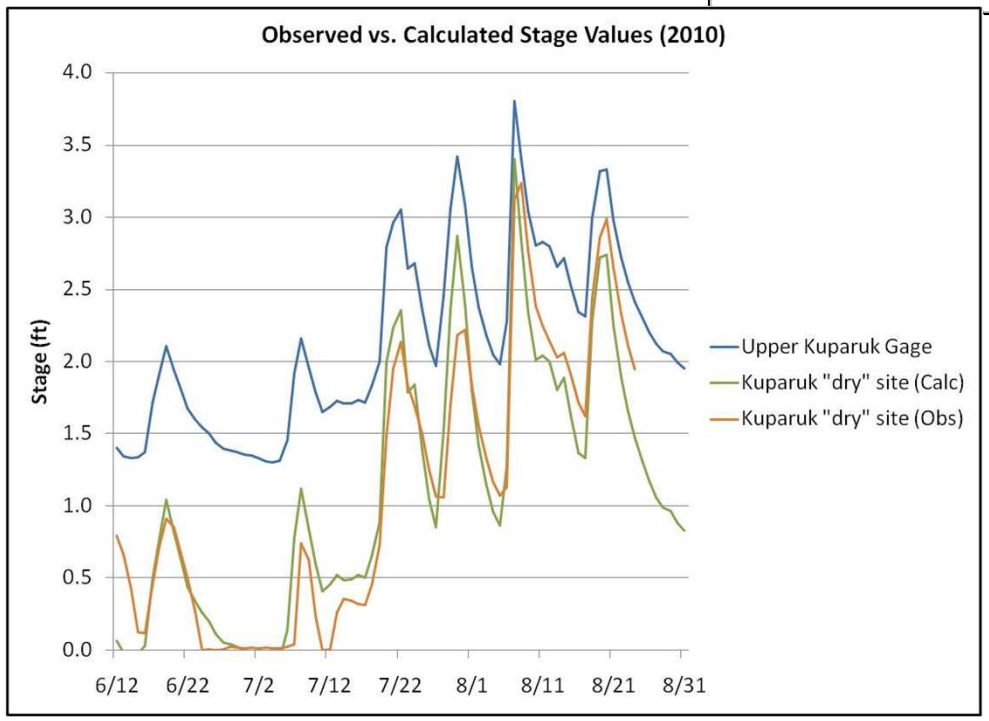
Barriers to Migration

- Hyporheic flow
  - Spatial and temporal exchange of channel water with associated riverine and floodplain sediments.
- In the arctic, hyporheic zone constrained by active layer depth below stream channel
- During periods of low stream flow – areas with strong hyporheic flow appear dry

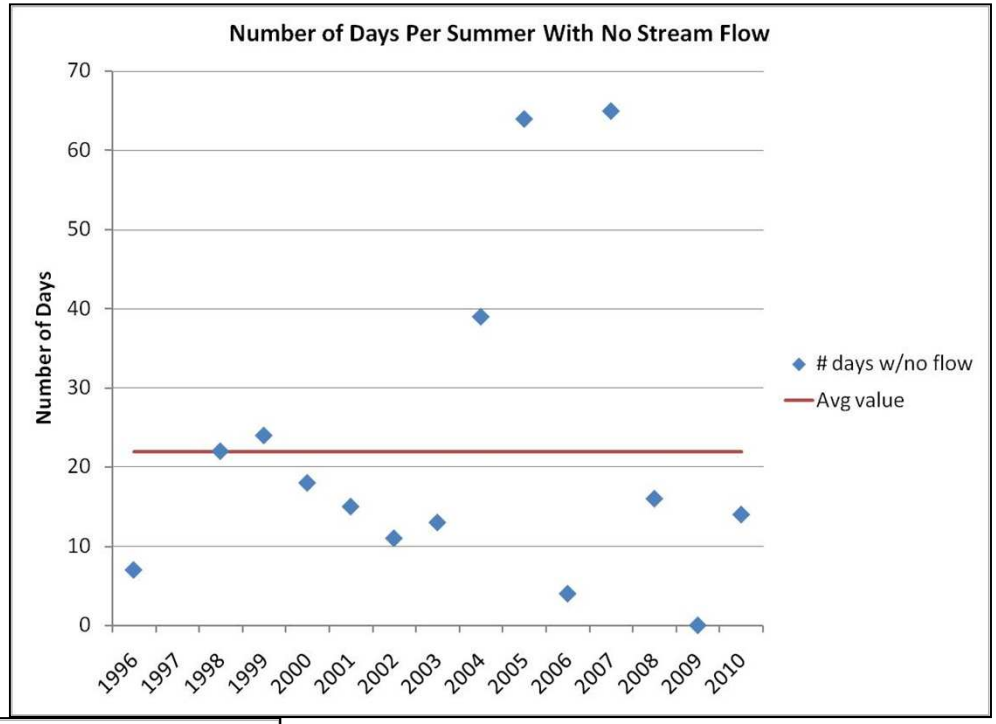
"Dry" event occurs when streamflow becomes 100% hyporheic

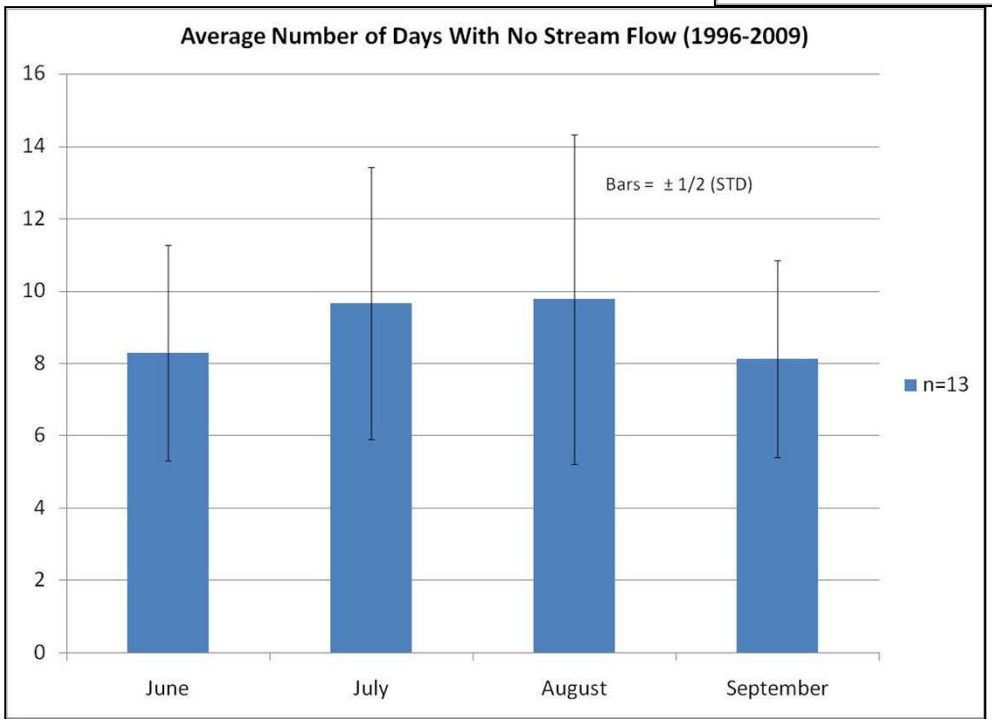
Results





Results

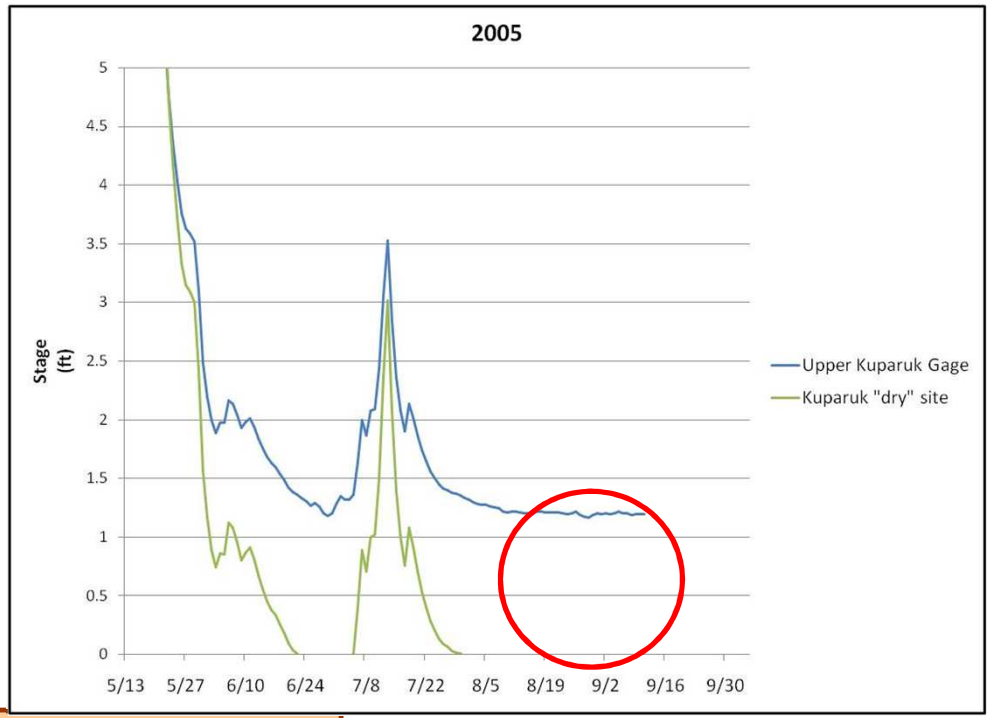


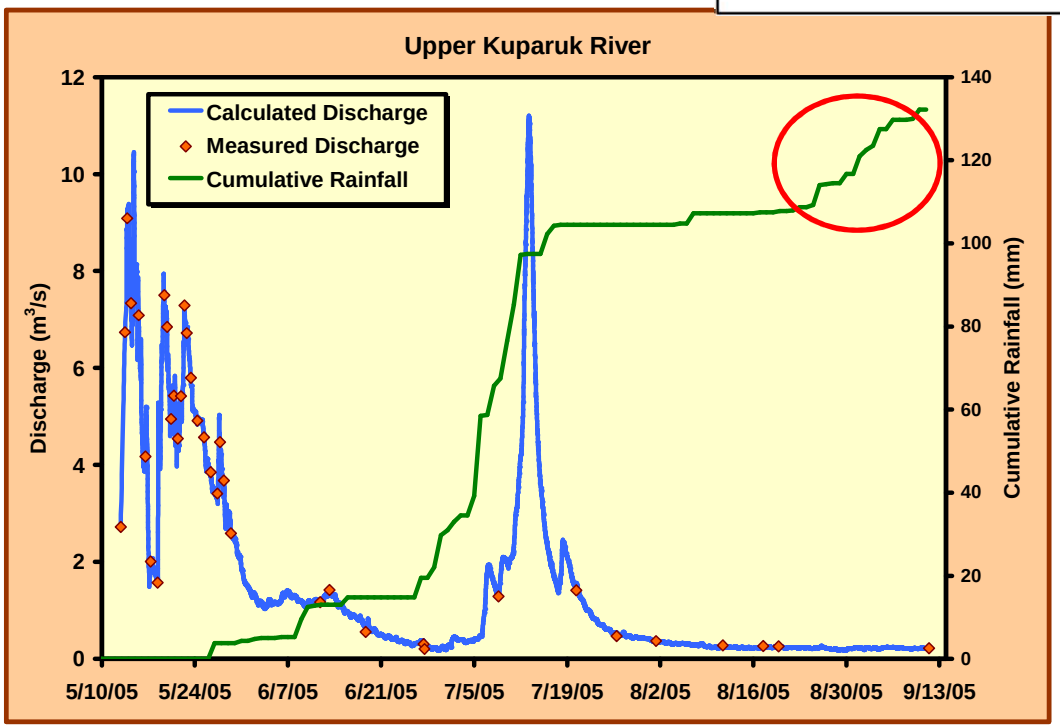


What's Next?

- Collect stage data from all three "dry" locations
- Install piezometers at one or more locations
- Determine atmospheric drivers of "dry" conditions
- Assess impact on Arctic grayling

Next Steps





Acknowledgements

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QUESTIONS?