

# Hydrology of Southeast Alaska

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July 26, 2011



# Collaborators and Contributors

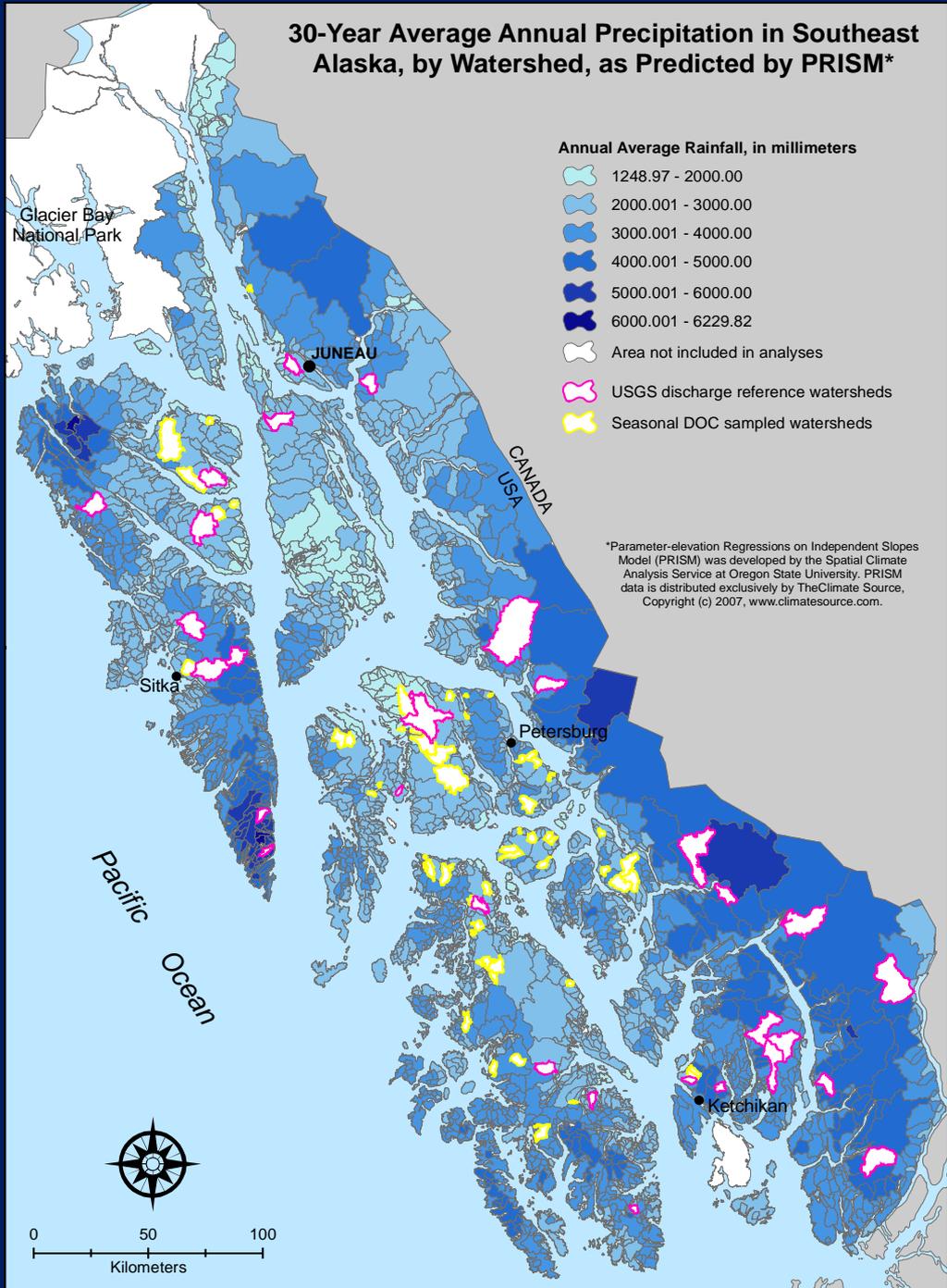
- Rick Edwards, Frances Biles and David D'Amore, USDA Forestry Science Lab
- Anthony Arendt and Roman Motyka, UAF Geophysical Institute
- Durelle Scott, Virginia Tech
- Ed Neal, USGS Juneau



# Key Questions

- What are the unique aspects/challenges to studying hydrology in southeast Alaska?
  - Dynamic snowline
  - Rapidly changing glaciers
- Can we improve estimates of precipitation?
  - Depth
  - Type: solid or liquid

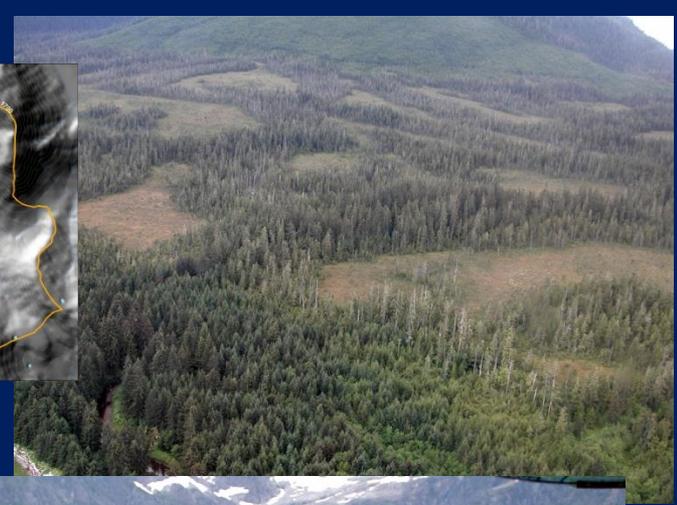
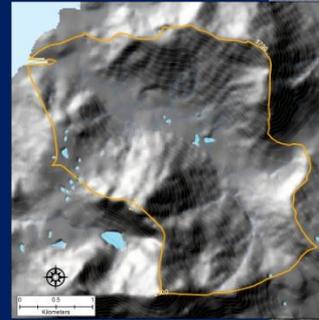
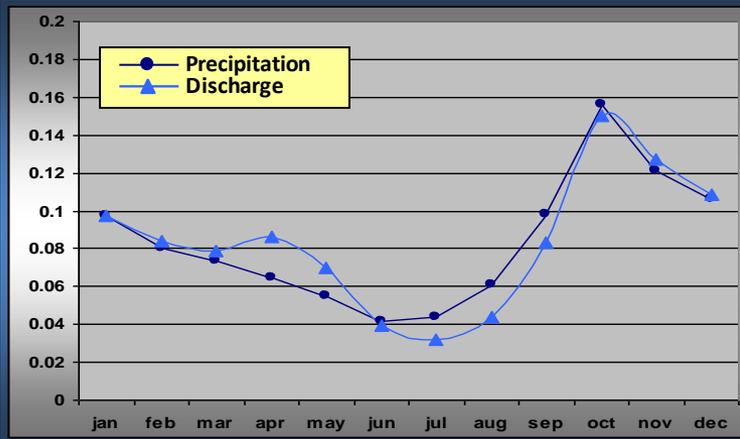
### 30-Year Average Annual Precipitation in Southeast Alaska, by Watershed, as Predicted by PRISM\*



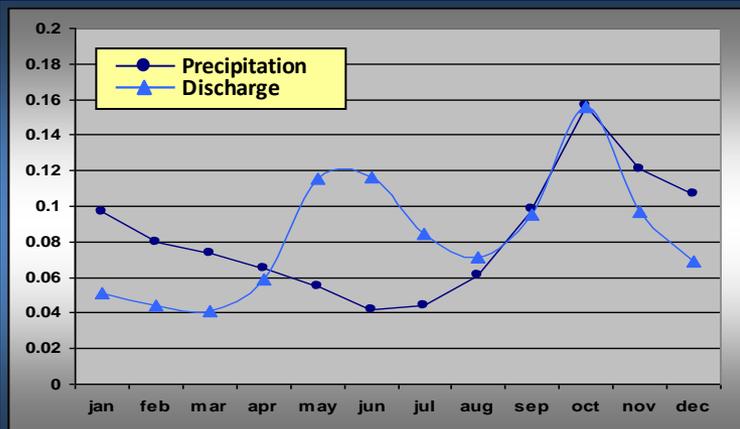
- Annual precipitation = 1 – 8 m

- Runoff patterns dependent on rain/snow/glacier balance

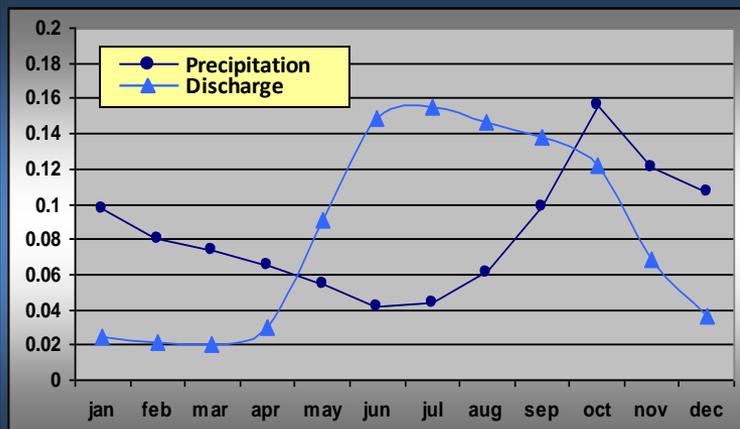
# Type I



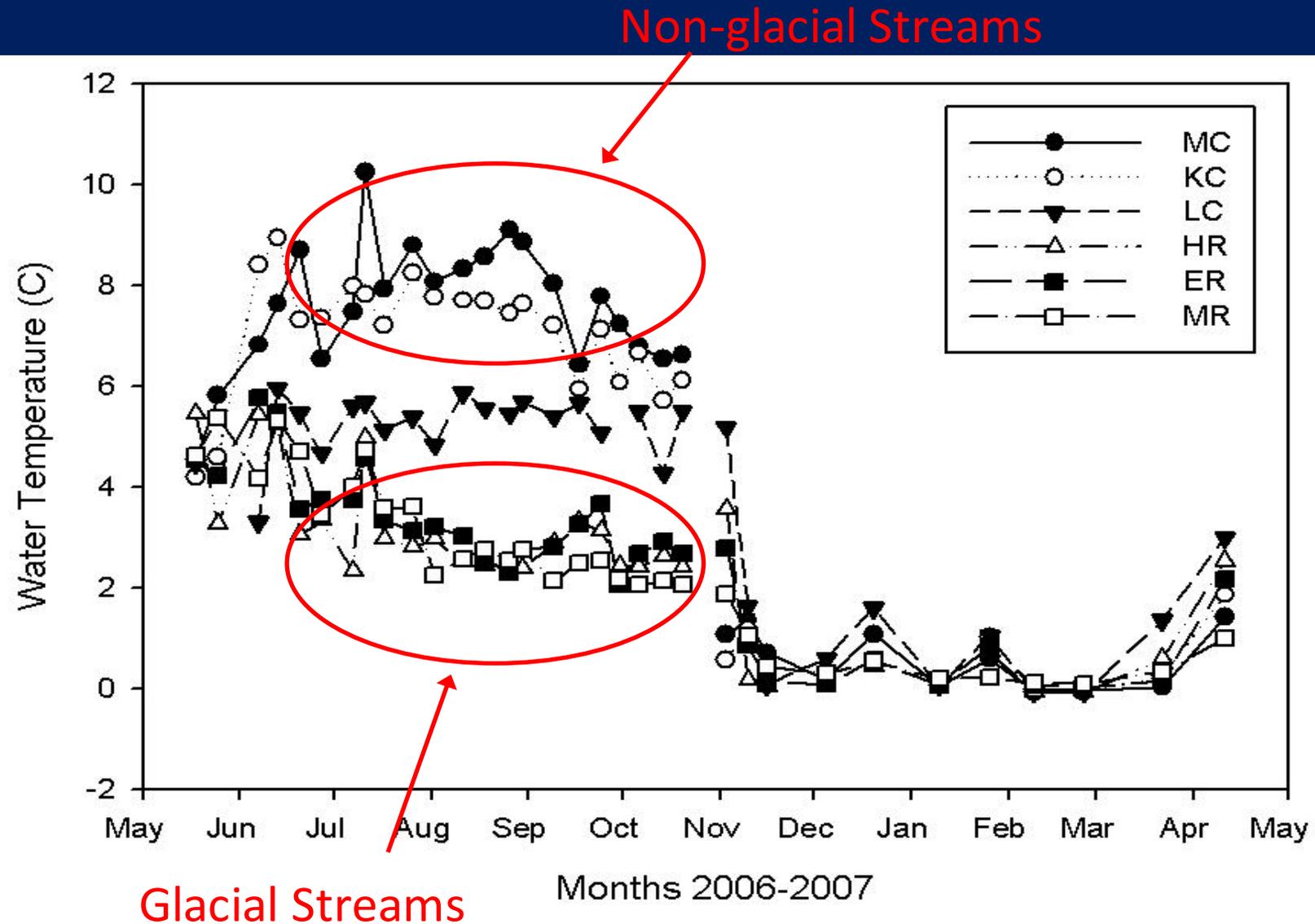
# Type II



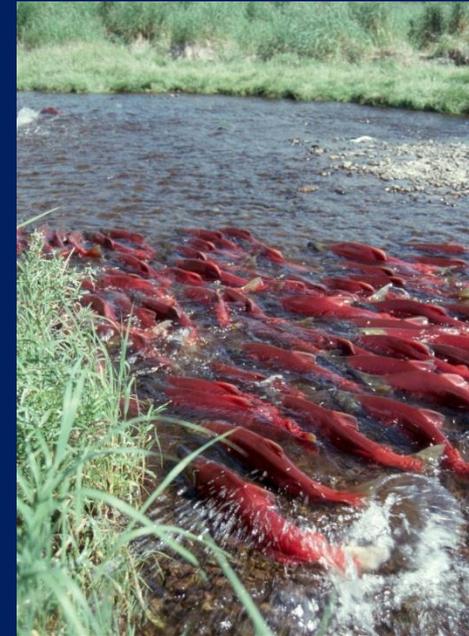
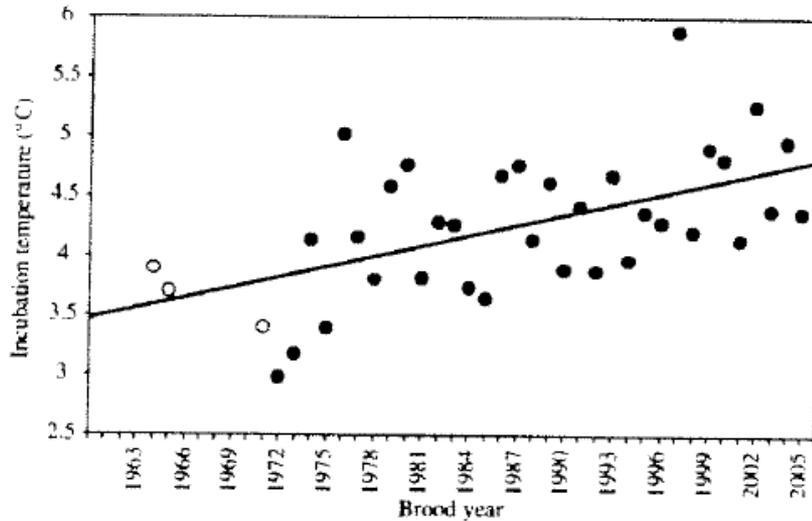
# Type III



# Stream temperature



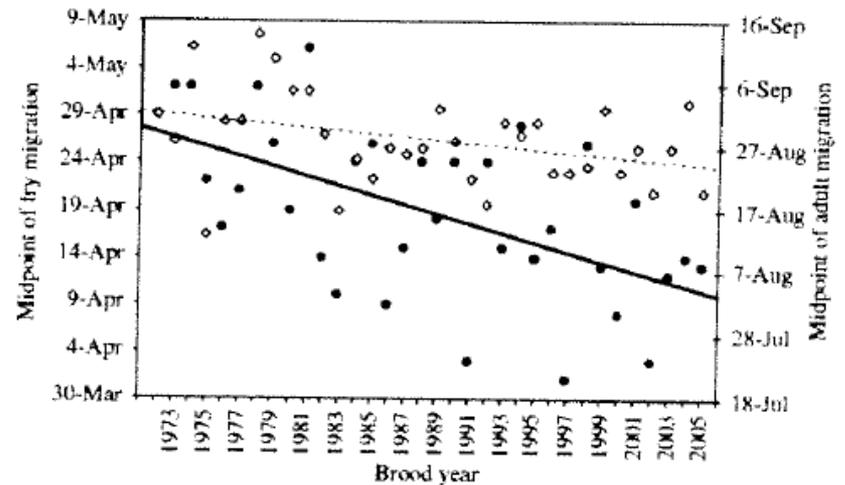
# Effects on salmon



## Auke Creek, Juneau

-Earlier migration may increase the mismatch with optimum environmental conditions

Taylor, 2008

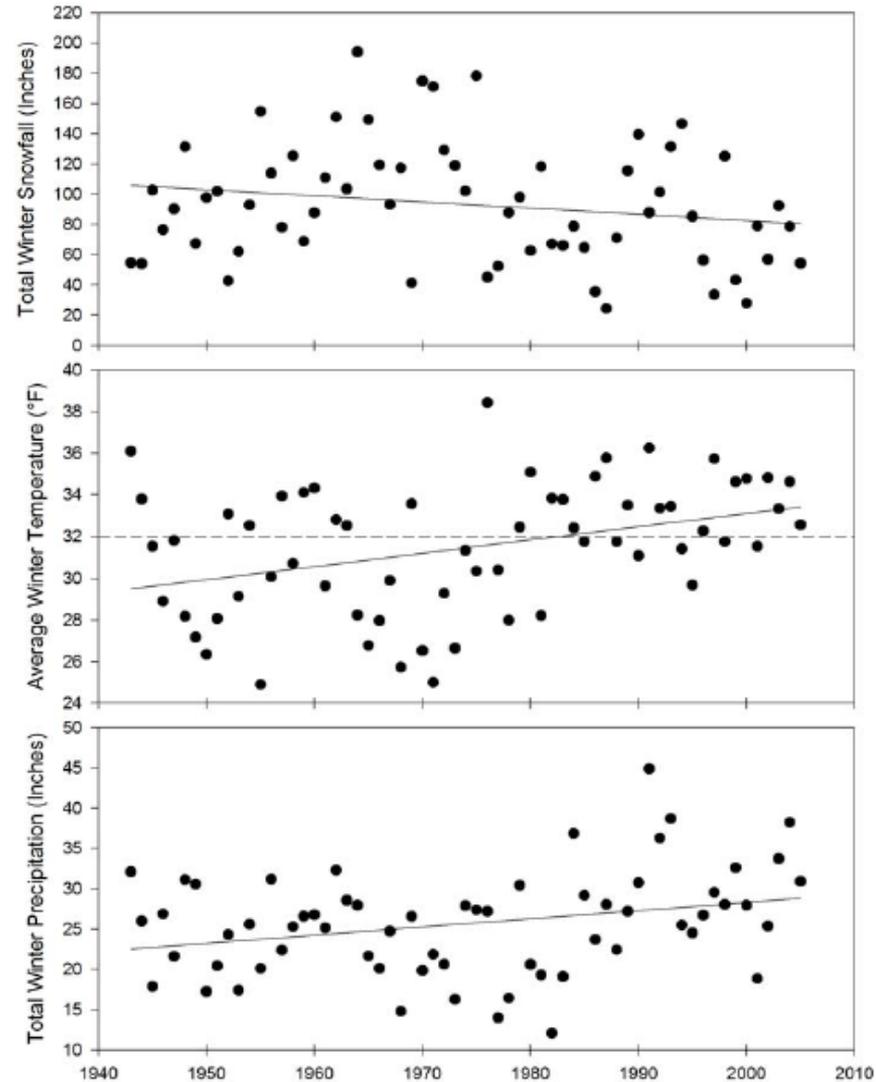


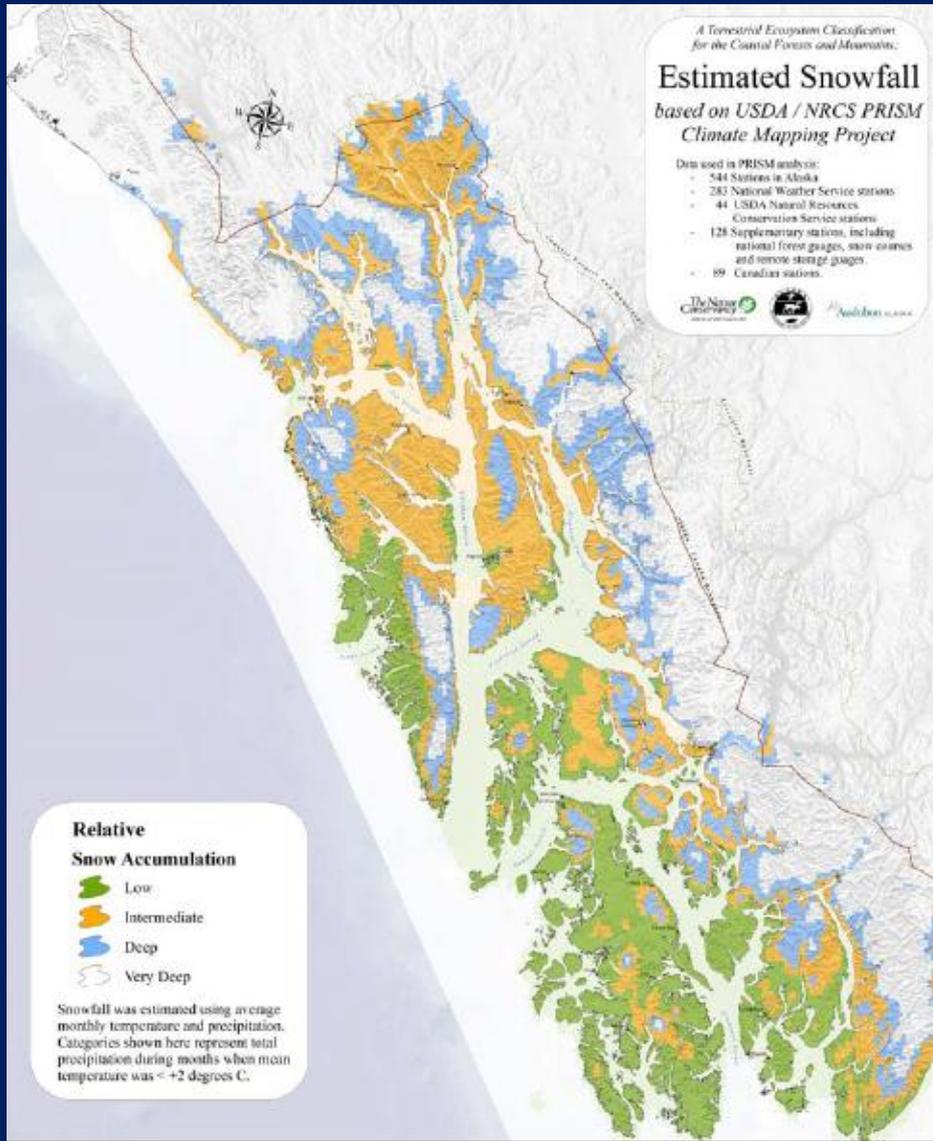
# Snowcover in southeast Alaska

- Changes in extent and duration
  - Hydrologic implications
  - Yellow cedar decline



# Juneau Snowfall





- Increase in regional snowline elevation

- Loss of snowcover at lower elevations and along the coast

- Change in seasonal water storage across the Tongass

# Climate change influence on forest structure

200,000 ha of yellow cedar declining

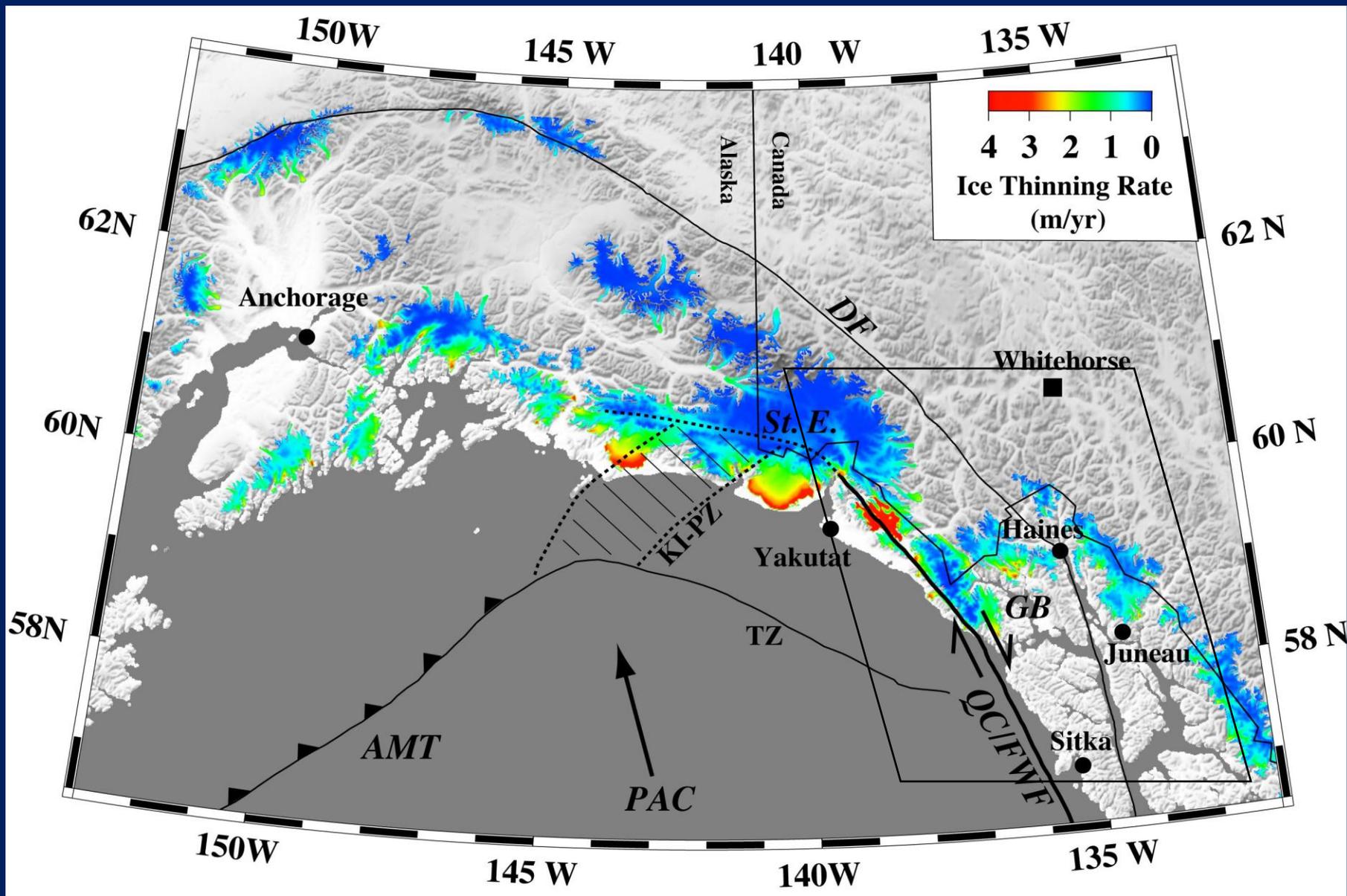


# Glacier Change and Hydrology

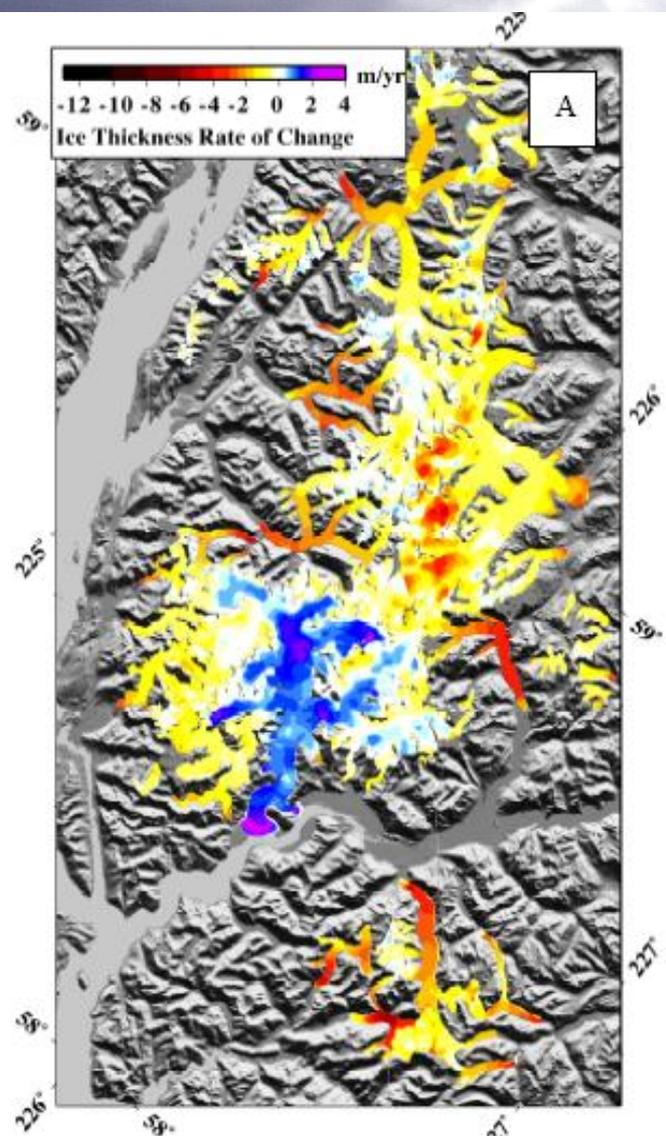
- Target monitoring to areas with greatest potential for change
- Link hydro-meteorological monitoring to glacier monitoring efforts



# ALASKA/YUKON ICE THICKNESS CHANGE



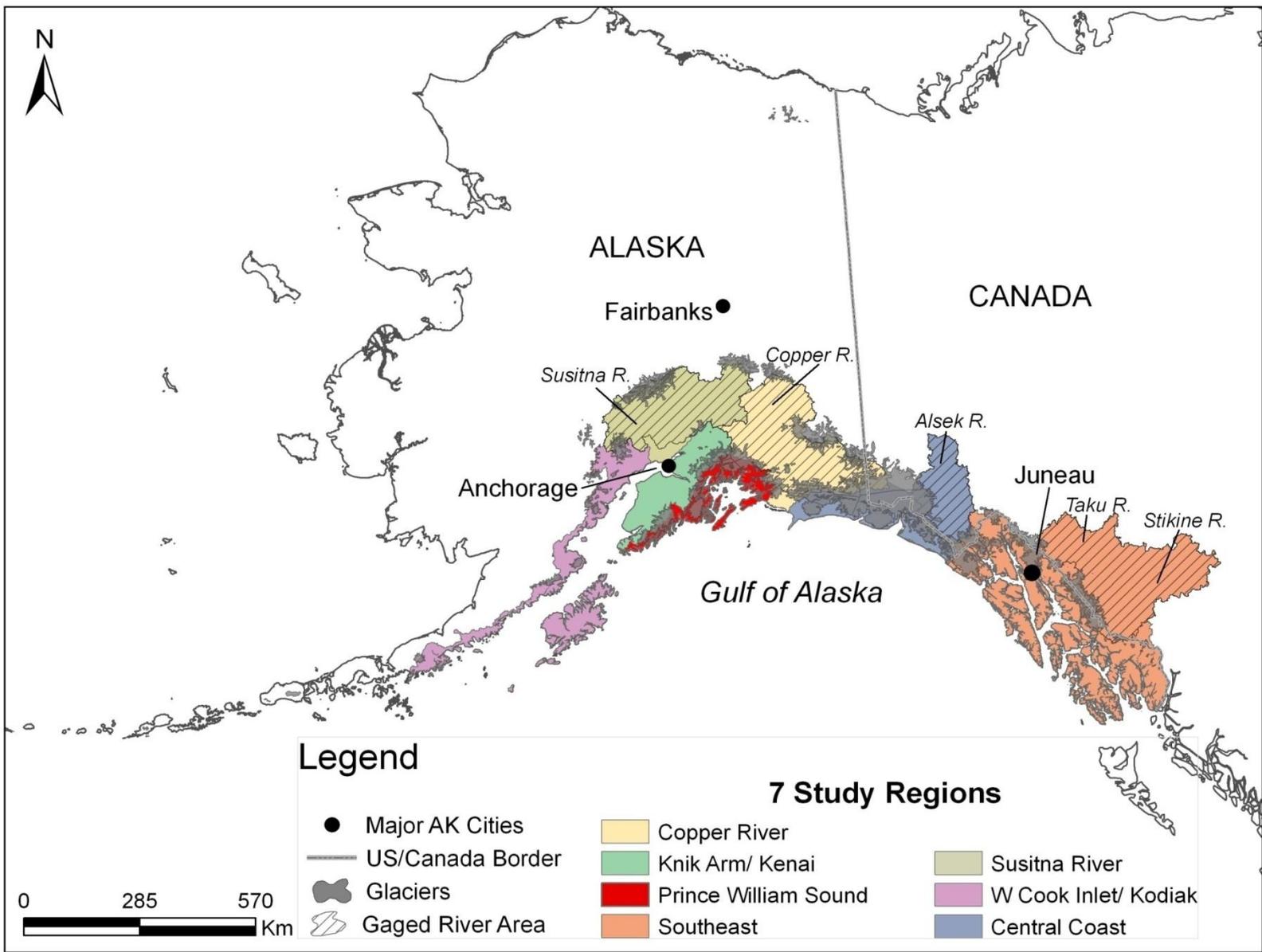




Juneau Icefield



Larsen et al., 2007



**Legend**

- Major AK Cities
- US/Canada Border
- Glaciers
- Gaged River Area
- Copper River
- Knik Arm/ Kenai
- Prince William Sound
- Southeast
- Susitna River
- W Cook Inlet/ Kodiak
- Central Coast

**7 Study Regions**

# Regional GOA FW Discharge

Region	Area (km <sup>2</sup> )	Percent GOA Basin Area	Mean Annual Runoff (km <sup>3</sup> )	Percent GOA Runoff	% from glaciers
Southeast Alaska/Canada	153,884	37%	370 ± 26	42%	26%
Central Coast	55,568	13%	200 ± 14	24%	87%
Copper River Region	65,056	15%	65 ± 5	8%	70%
Prince William Sound	19,898	5%	95 ± 6	10%	57%
W Cook Inlet/Kodiak	42,807	10%	54 ± 3	7%	15%
Knik Arm/Kenai	29,227	7%	36 ± 5	4%	45%
Susitna River Region	53,789	13%	46 ± 2	5%	26%
<b>Total GOA</b>	<b>420,229</b>	<b>100%</b>	<b>870 ± 61</b>	<b>100%</b>	<b>47%</b>

215 km<sup>3</sup> yr<sup>-1</sup>

2x GOA

870 km<sup>3</sup> yr<sup>-1</sup>  
(410 km<sup>3</sup> yr<sup>-1</sup>  
from glaciers)

7x GOA

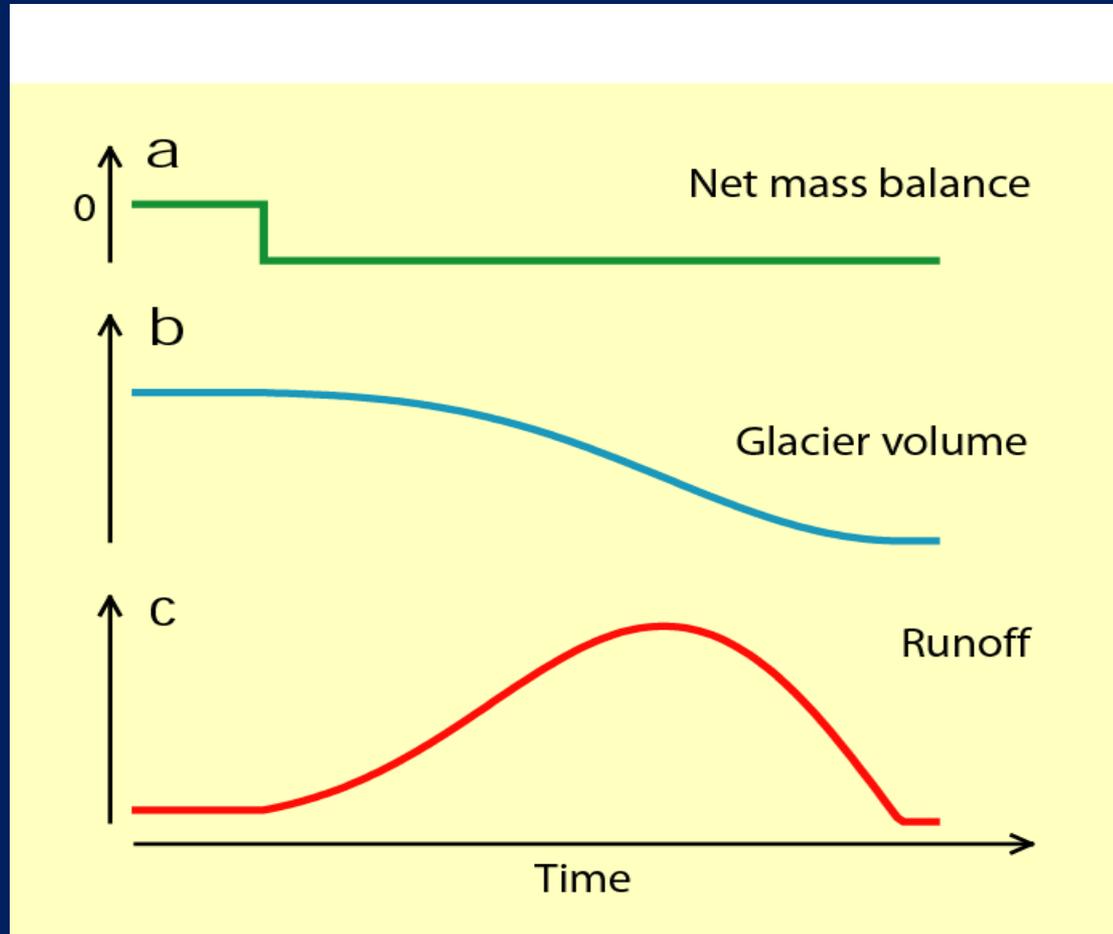
500 km<sup>3</sup> yr<sup>-1</sup>

Legend

-  Yukon River
-  Gulf of Alaska
-  Mississippi River



# Hydrological Monitoring of Glaciers



- Incorporate glacier runoff into hydrological models
- Increase capacity for hazard prediction

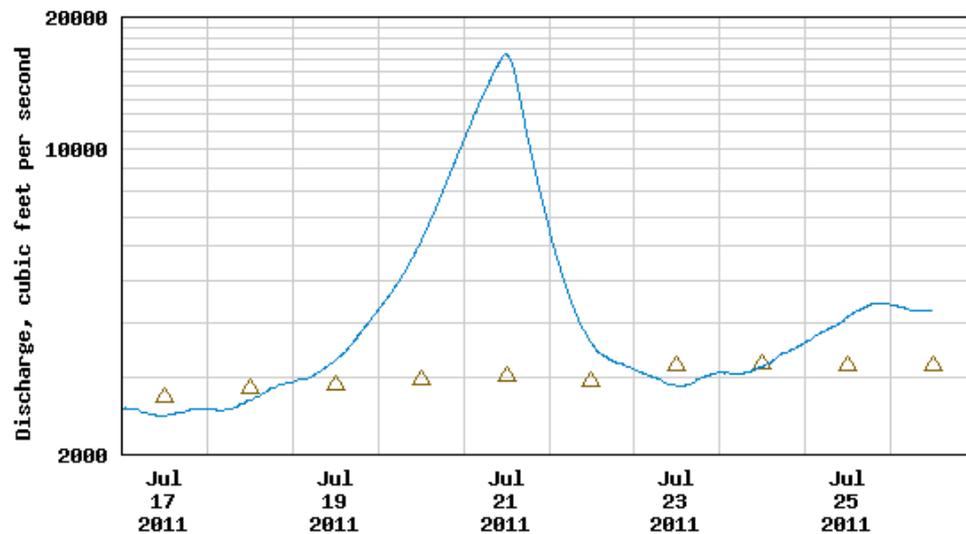


# Suicide Basin – Mendenhall Glacier





### USGS 15052500 MENDENHALL R NR AUKE BAY AK



----- Provisional Data Subject to Revision -----

△ Median daily statistic (44 years) — Discharge

# Questions?

