

Stream Temperatures:

Are our trout comfortably cold?

Deserae Hendrickson

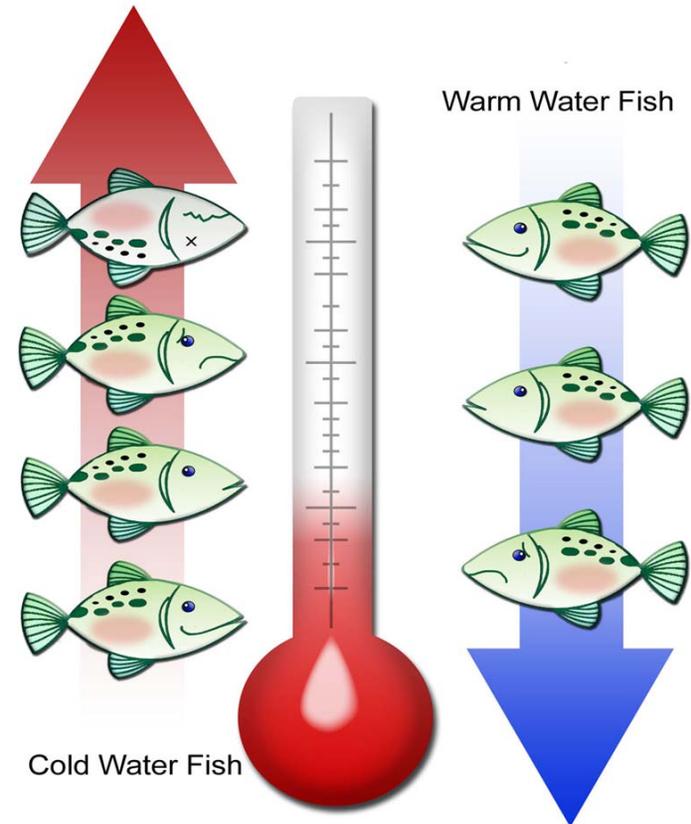
Duluth Area Fisheries Management

French River office



Why temperature?

- Trout streams
 - Brook trout
 - Rainbow trout
 - Brown trout
- Brook trout temperature limits
 - Stressful- 68° to 77° F(20°-25°C)
 - Lethal- above 77° (25°C)



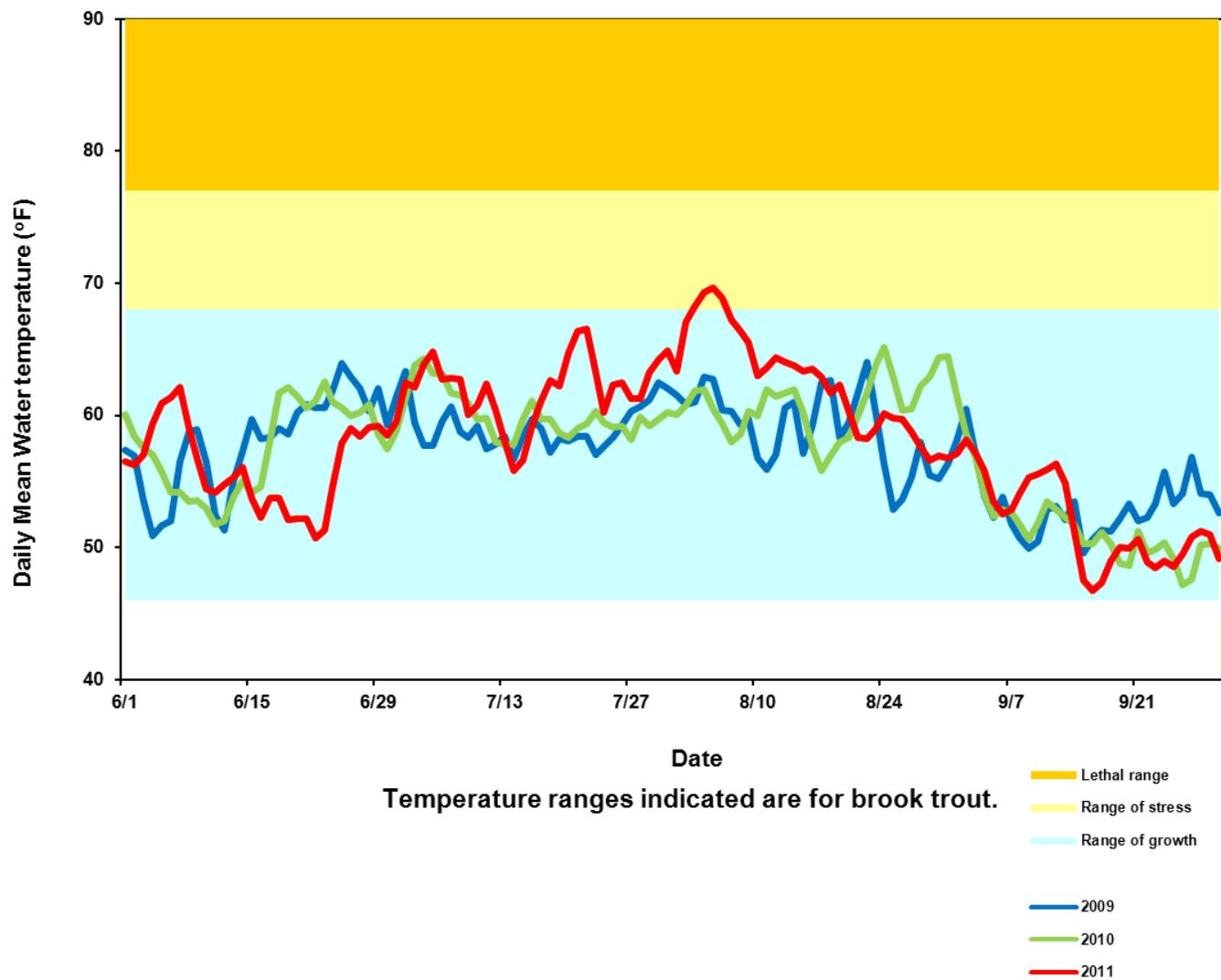
Temperature Monitoring



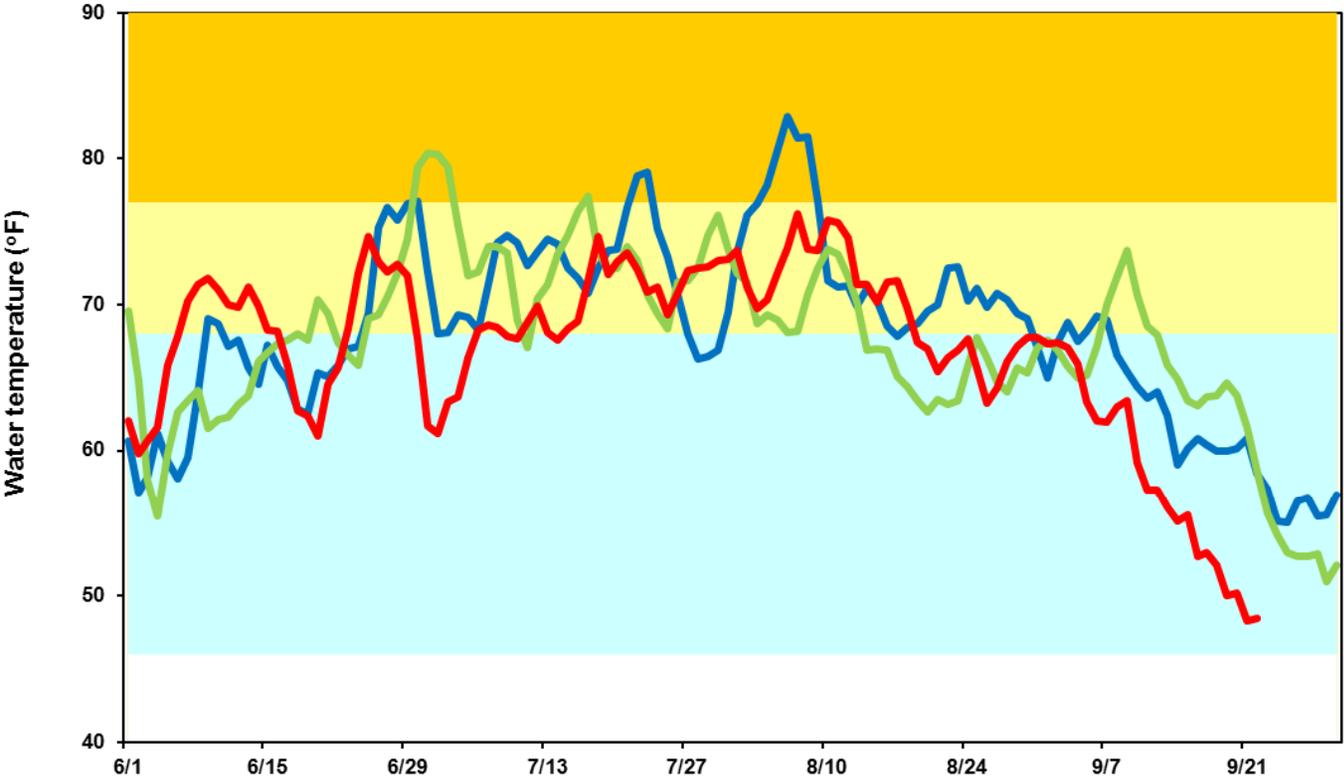
Record hourly temperatures
June through September



Blackhoof River: Mile 5.6



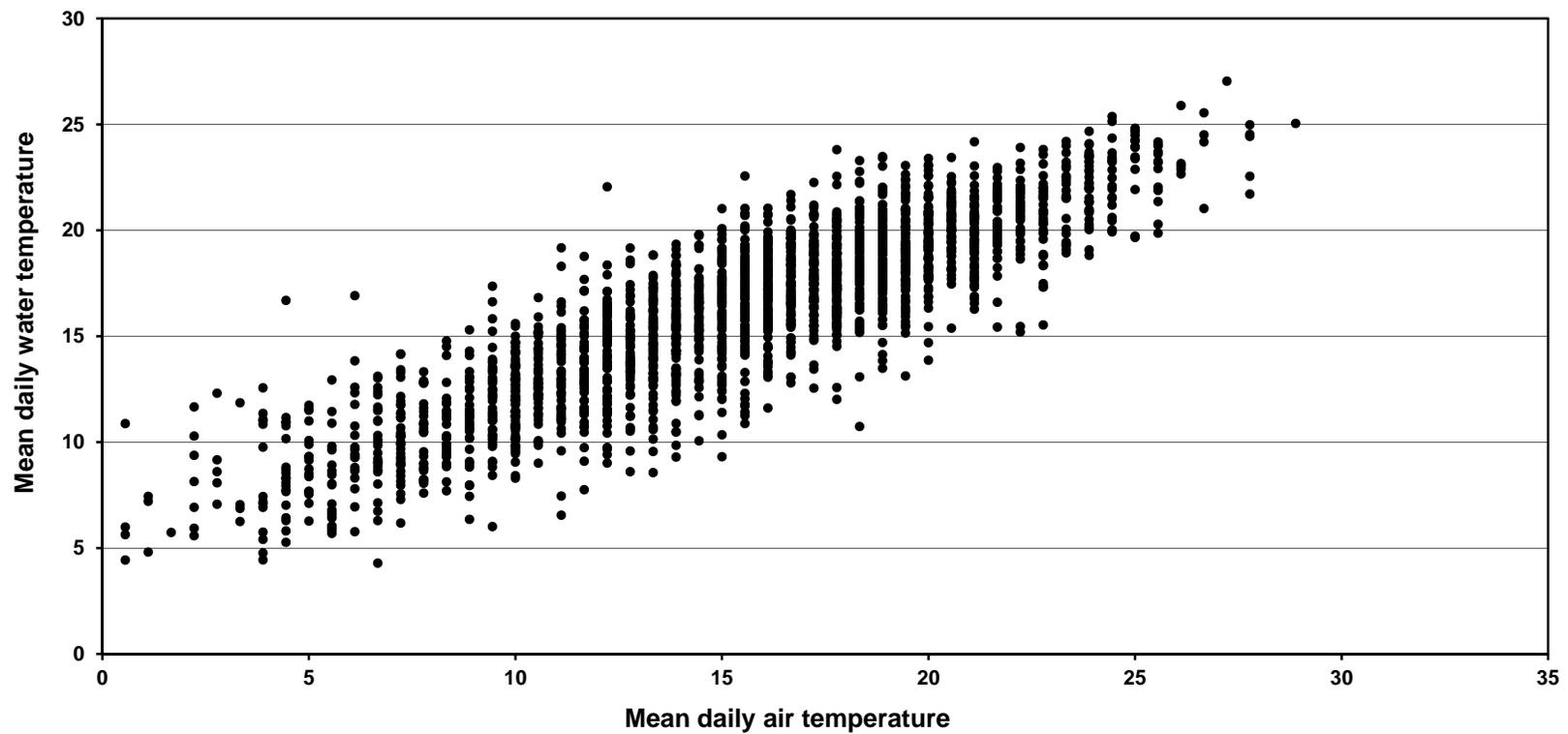
Blackhoof River: Mile 19.2



Temperature ranges indicated are for brook trout.

- Lethal range
- Range of stress
- Range of growth
- 2001
- 2002
- 2003

Air temperature (°C) National Climate Data Center in Duluth, MN vs. French River water temperature (°C) (1994-2008)



Temp Influences- Discharge

Baseflow is critical!

- thermal capacity
- groundwater input often limited
- % open land in watershed



Temp Influences- Rainfall

- Can create temperature spikes
- Impervious surface runoff
- High impact on urban streams

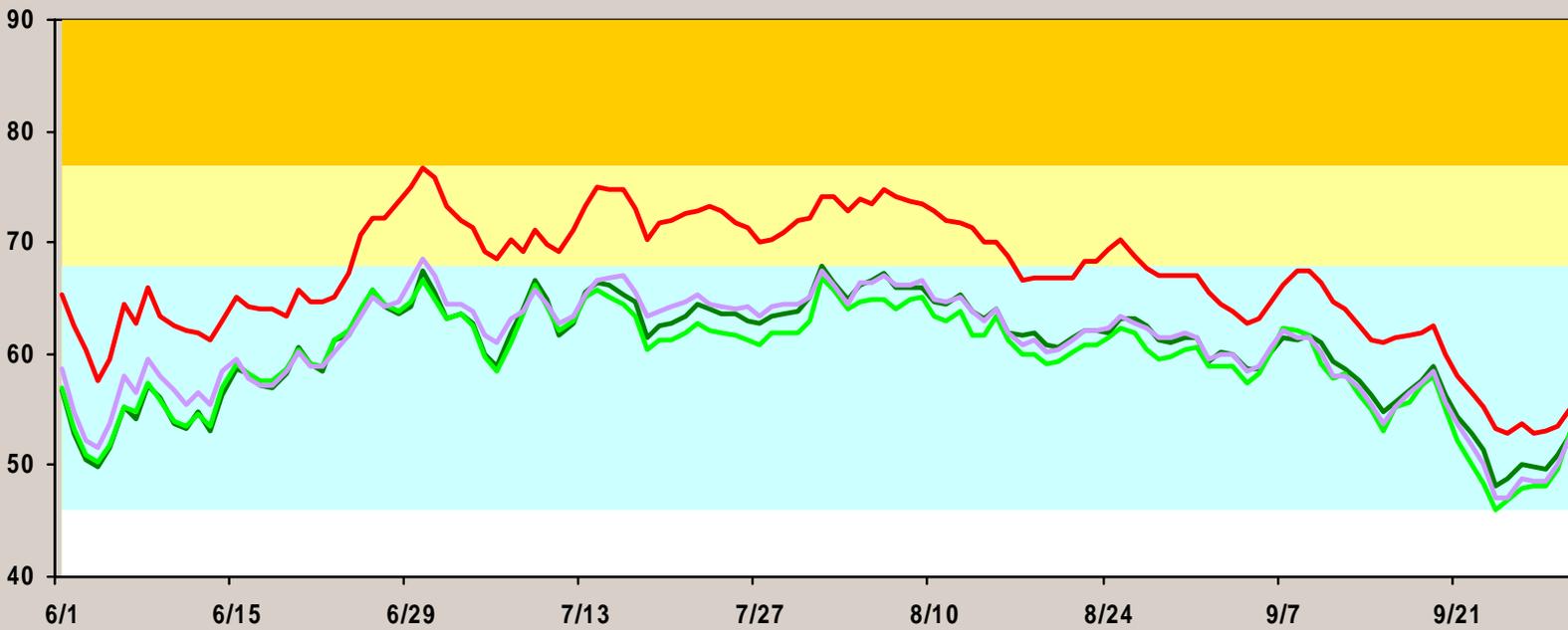


Temp Influences-Dams



Hartley Pond-10 acres
Tischer Creek

Location Variability



Date

- Lethal range
- Range of stress
- Range of growth
- Mile 0.1
- Mile 1.5
- Mile 3.3
- Mile 4.0

Daily mean water temperatures for all years sampled (2000-2002) at four Tischer Creek stations. Temperature ranges are for brook trout.

Tischer Creek Longitudinal Temperature Profile

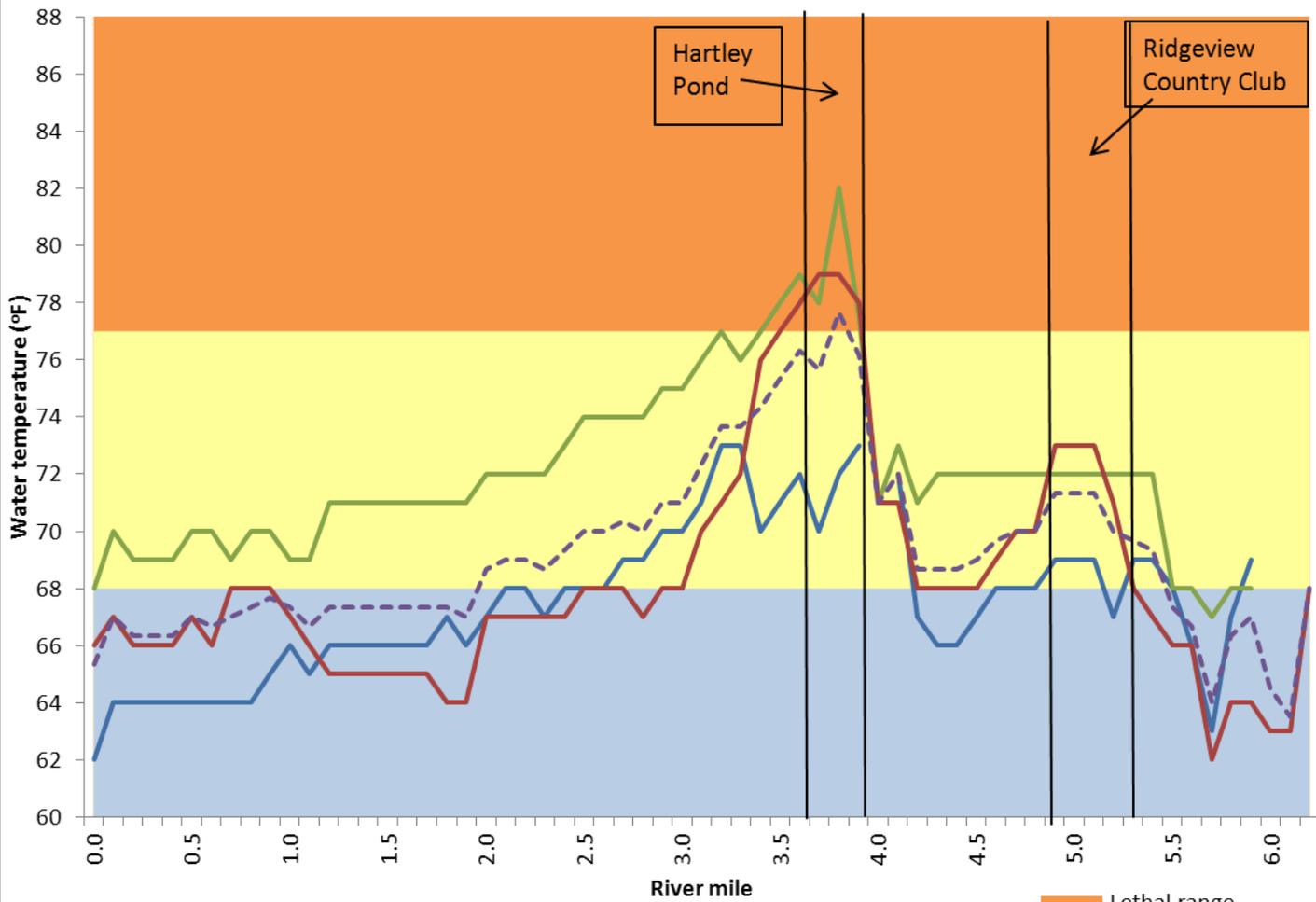


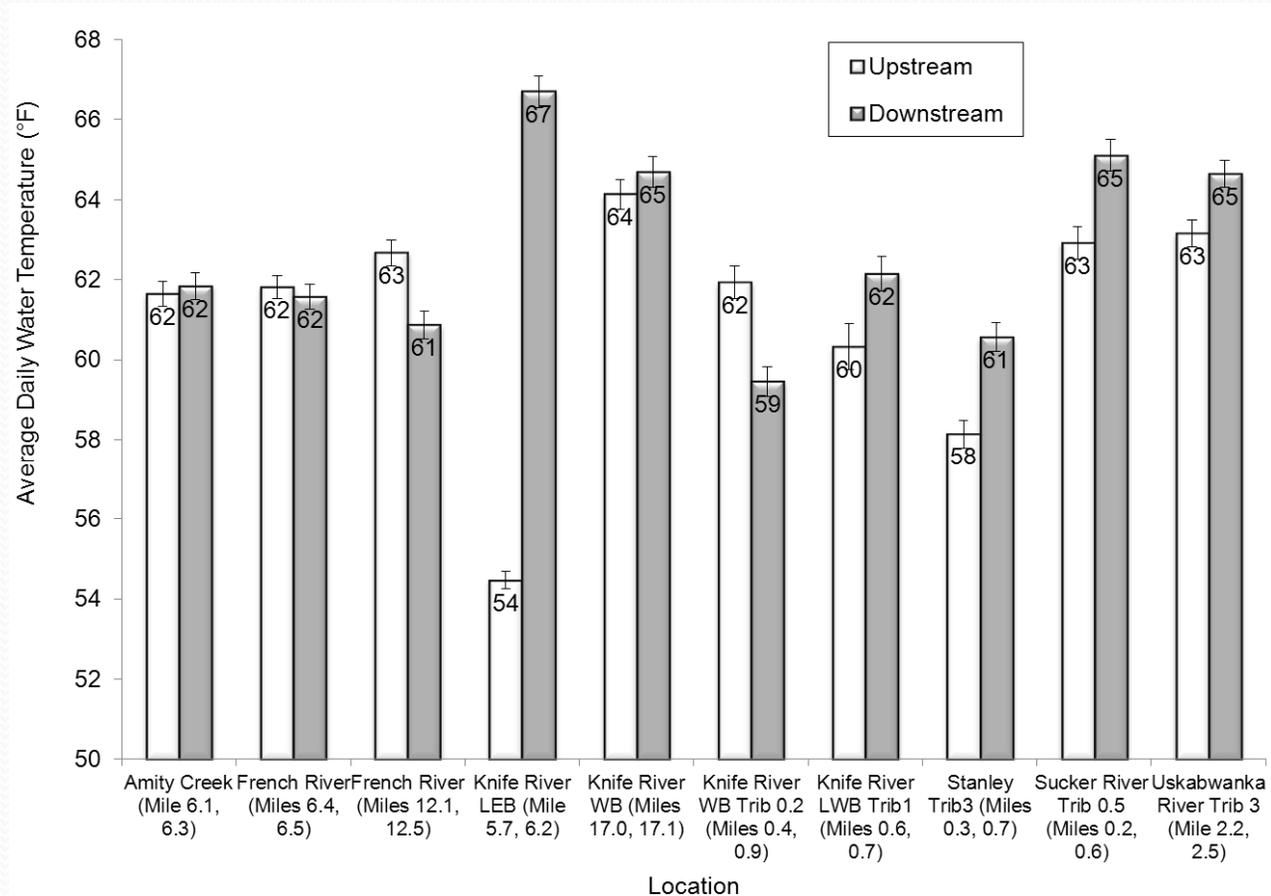
Figure 1. The longitudinal temperature profiles for three summer days on Tischer Creek. Temperature ranges indicated are for brook trout.

- Orange Lethal range
- Yellow Range of stress
- Blue Range of growth
- Blue line 8/5/2010 water
- Green line 8/12/2010 water
- Red line 8/30/2010 water
- Dashed purple line mean water



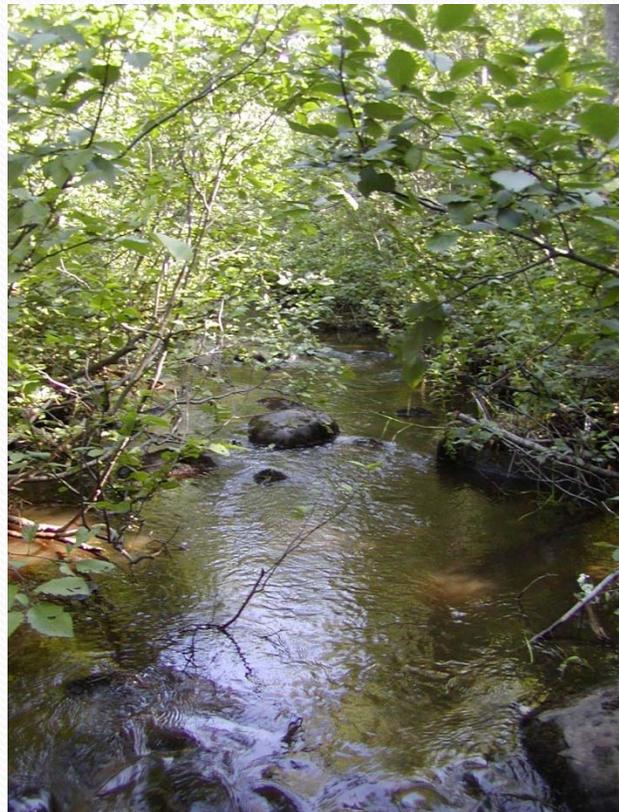
IT'S
JUST
ONE
DAM
PROJECT
AFTER
ANOTHER!

Beaver dam monitoring



Imp Influences-Riparian Management

- Riparian shade is essential in northeast MN!
- Radiant warming from sunlight



Human Influence-Riparian Management

Forest harvest



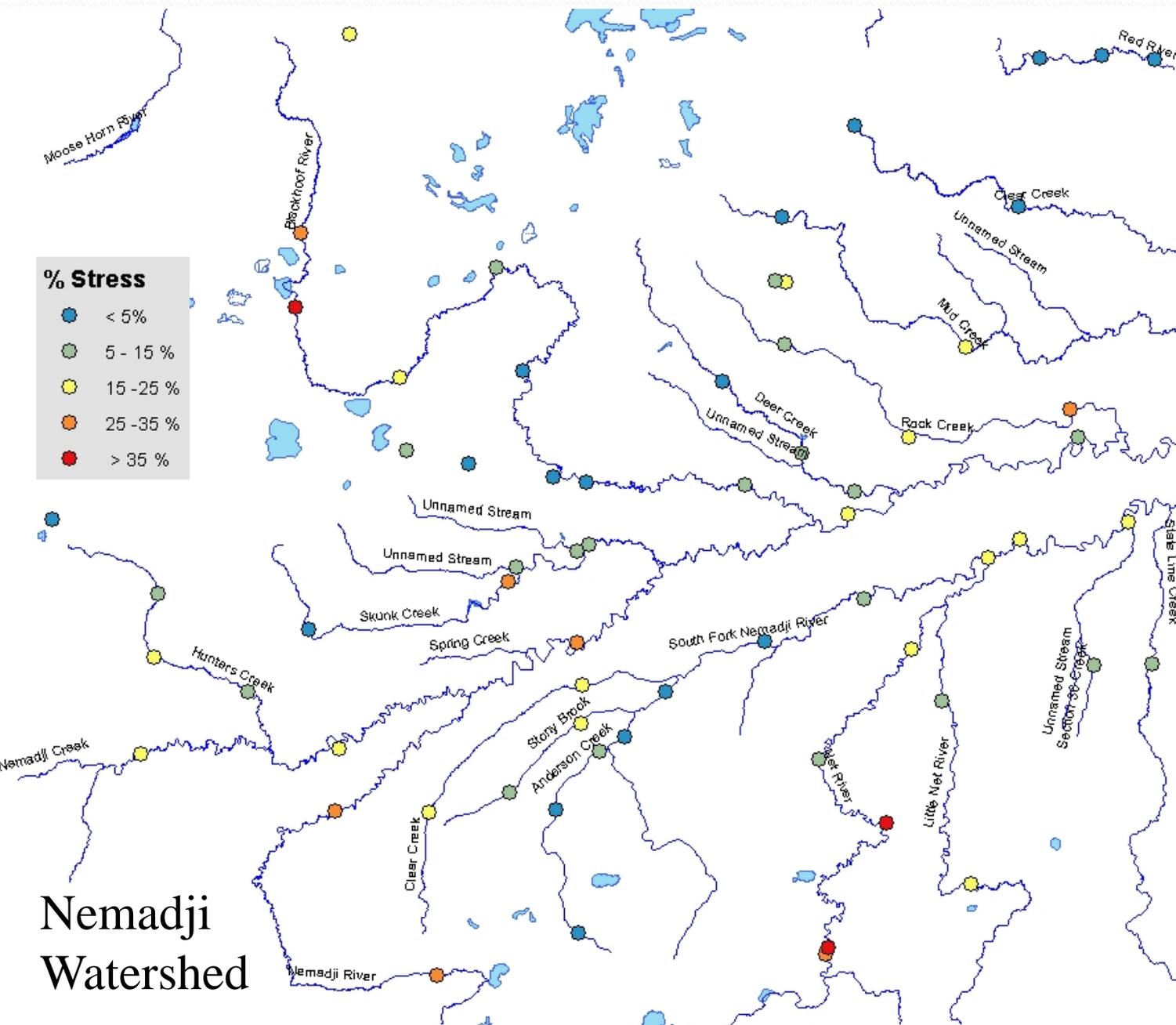
Clearing



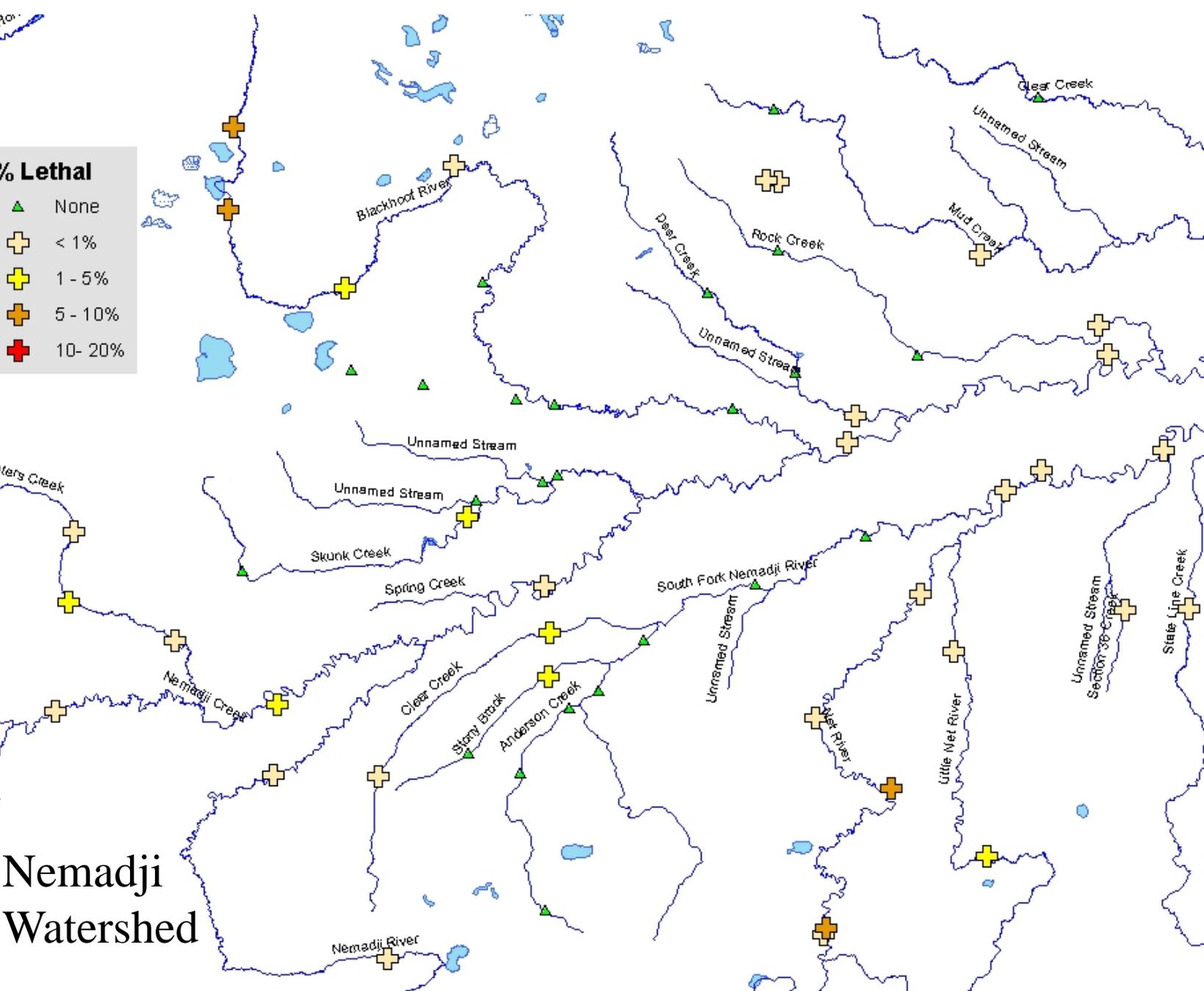
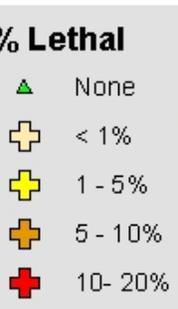


Don't forget winter!

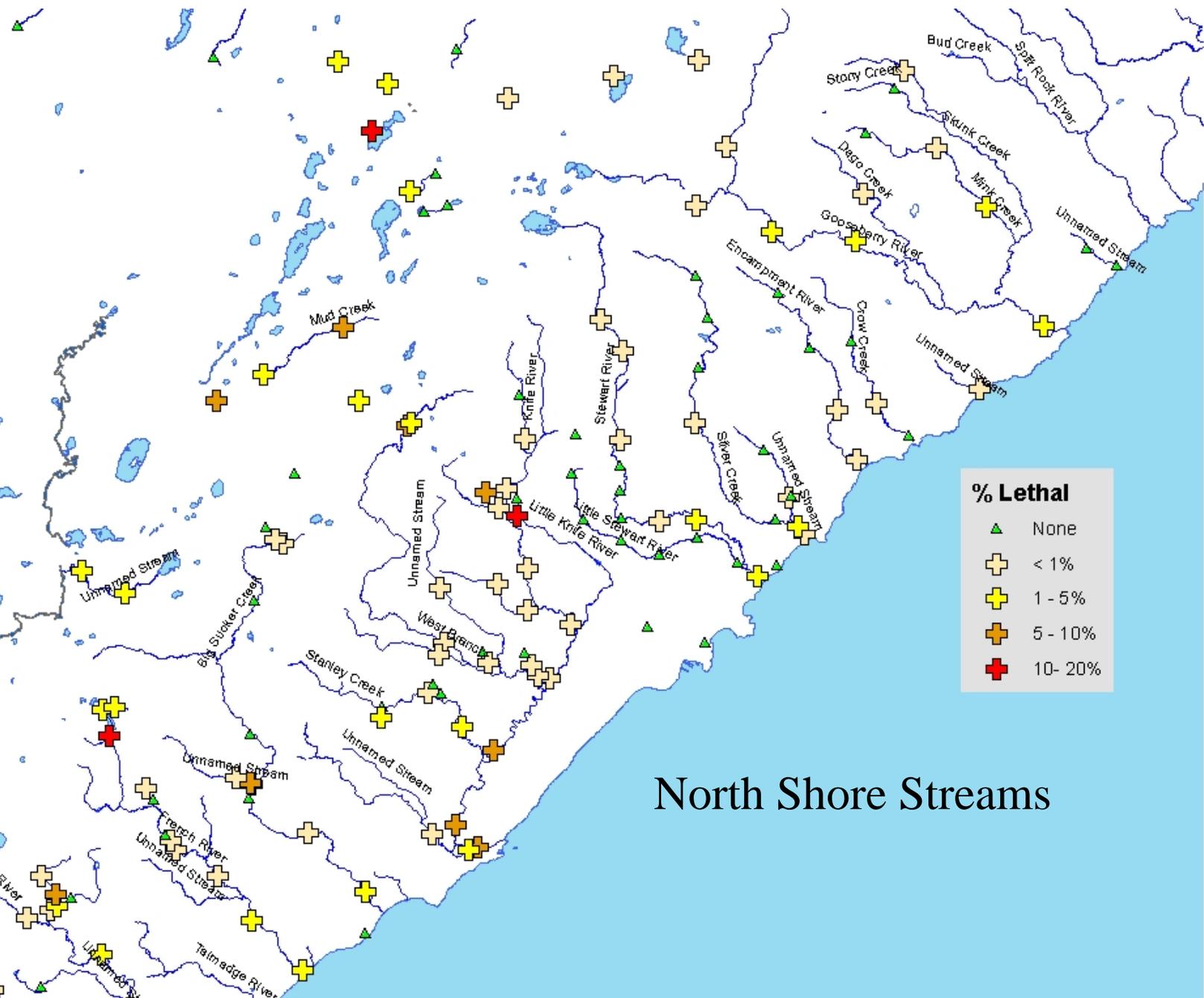
- incubating eggs
- loss of flow
- depleted oxygen



Nemadji Watershed



Nemadji
Watershed



% Lethal	
▲	None
+	< 1%
+	1 - 5%
+	5 - 10%
+	10 - 20%

North Shore Streams

Are our trout comfortably cold?

Lake Superior North Shore streams often on the thermal edge

Watershed and riparian management are critical to maintaining cool temperatures suitable for trout

Climate shifts likely to have significant impact

