NORTH BRANCH ADVISORY COMMITTEE

February 25, 2008

Luke, MD

AGENDA

- Review minutes & Update on letter
- Brief recap
- New Issues: Savage Repair and Westernport Withdrawal
- Water quality data and modeling
- Recreation data and modeling
- Next steps

Savage River Dam Repairs

- Update from Scott Shoemaker

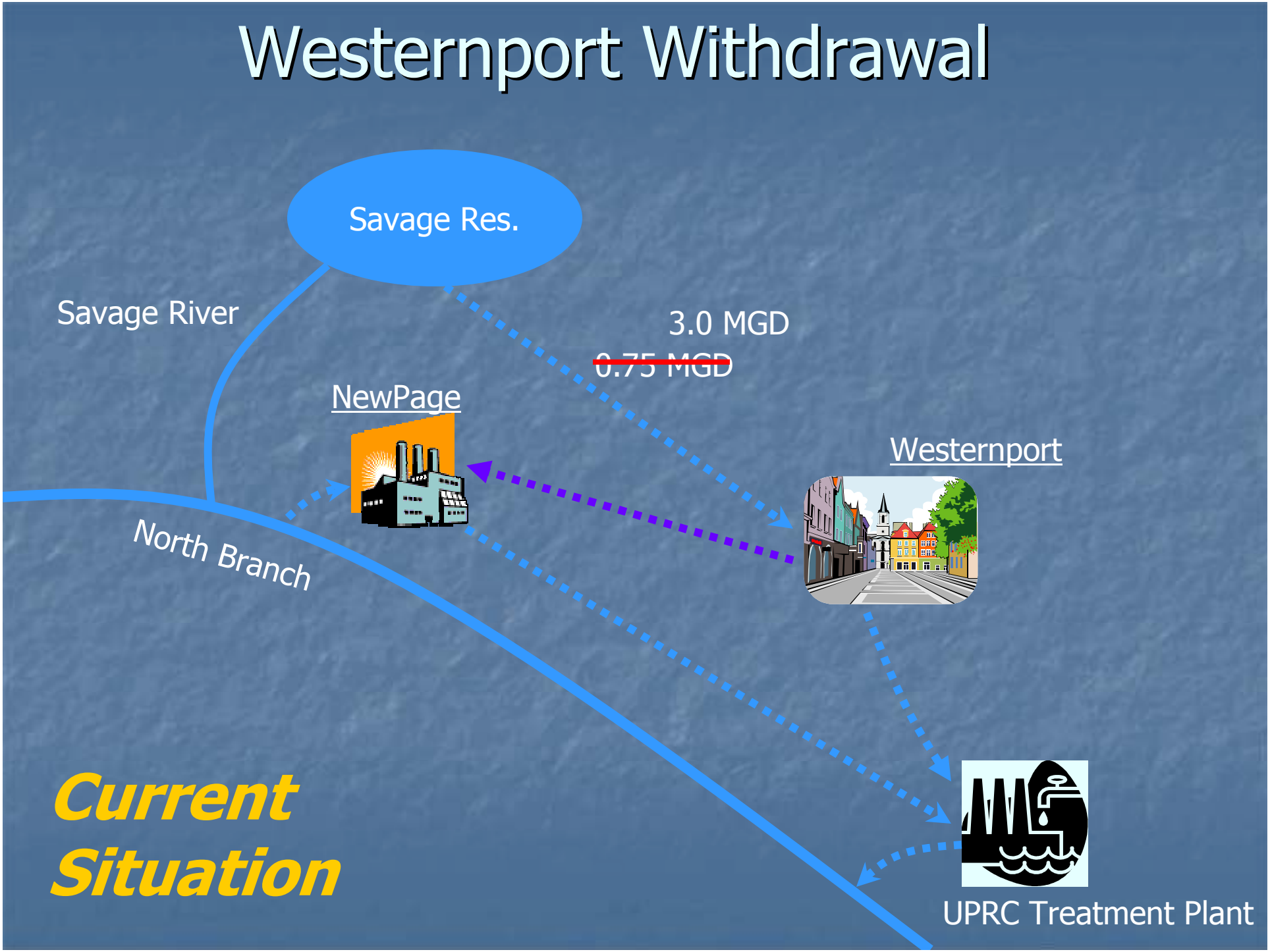
Westernport Withdrawal from Savage Reservoir

- Westernport's water supply comes from Savage Reservoir
- Westernport's original impoundment was inundated by Savage Reservoir
- 1943 agreement between UPRC and Westernport allowed for a pipeline and withdrawal from Savage

Westernport Withdrawal

- Current permitted withdrawal:
  - 0.75 MGD annual average, 1.0 MGD daily max
- Applied to MDE for an increase to:
  - 3.5 MGD annual average, 3.5 MGD daily max
- About 1.0 MGD is for town's water supply
- The rest is for the NewPage Mill
  - Higher quality water lowers operating costs for the Mill

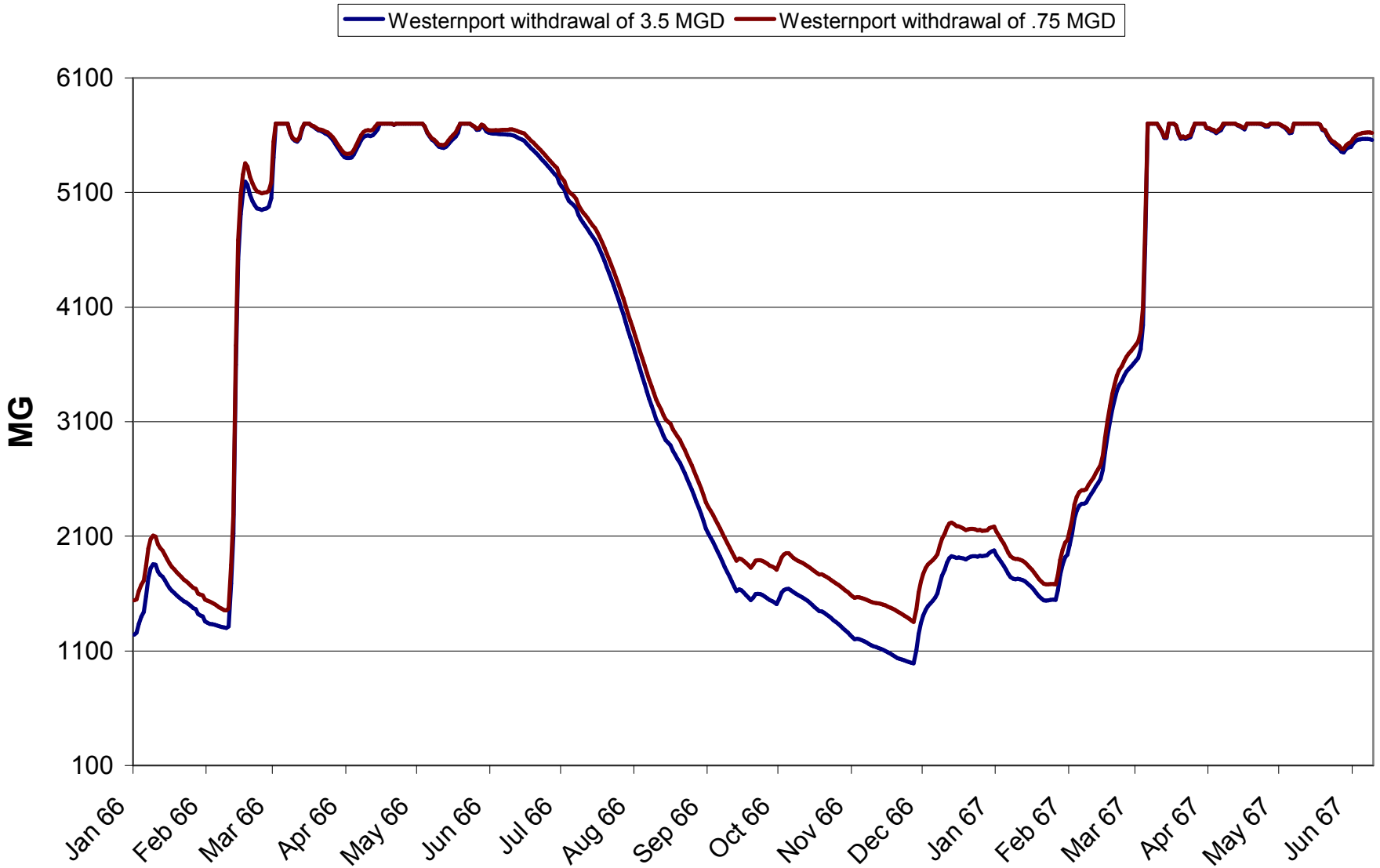
Westernport Withdrawal



ICPRB's Role

- CO-OP utilities help fund Savage operations
- Savage contributes to D.C. water supply
- MDE asked ICPRB to evaluate impact on CO-OP water suppliers
- ICPRB used PRRISM to evaluate impact on Savage storage and to develop drought triggers

Savage Storage Under Different Westerport Withdrawal Scenarios



Drought Triggers

- Use antecedent precipitation (last 9 months) and flows from last 45 days
- If either or both of those are less than a threshold, drought is pretty likely that summer
- In years that the trigger fires, Westernport withdrawal would be restricted to the amount needed for municipal supply and mill would go back to taking water from North Branch

Goal of the Triggers

- Cut back on withdrawals early in drought years in order to minimize impact on storage

Other Issues

- Frequency of low flows in Savage River
  - Less storage in droughts could mean lower releases in droughts
- Cold water storage (Westernport's withdrawal is from the bottom)
- Water quality protection

Next Steps

- MDE, UPRC, Westernport are discussing options
  - Interim permit until additional analysis can be done
  - *Evaluate temperature and low flow impacts as part of this modeling study*
- Resume temperature monitoring in Savage Reservoir

Temperature Data and Modeling

Temperature Data and Modeling

- Overview of available data
- Preliminary analysis and implications
- Next steps

Available Temp Data

Jennings Randolph

- Corps provided temperature profiles at 7 different locations
- Most records cover 1994-2006
- Some go back as far as 1983
- Have begun checking data
- No analysis yet

Available Temp Data

Savage Reservoir

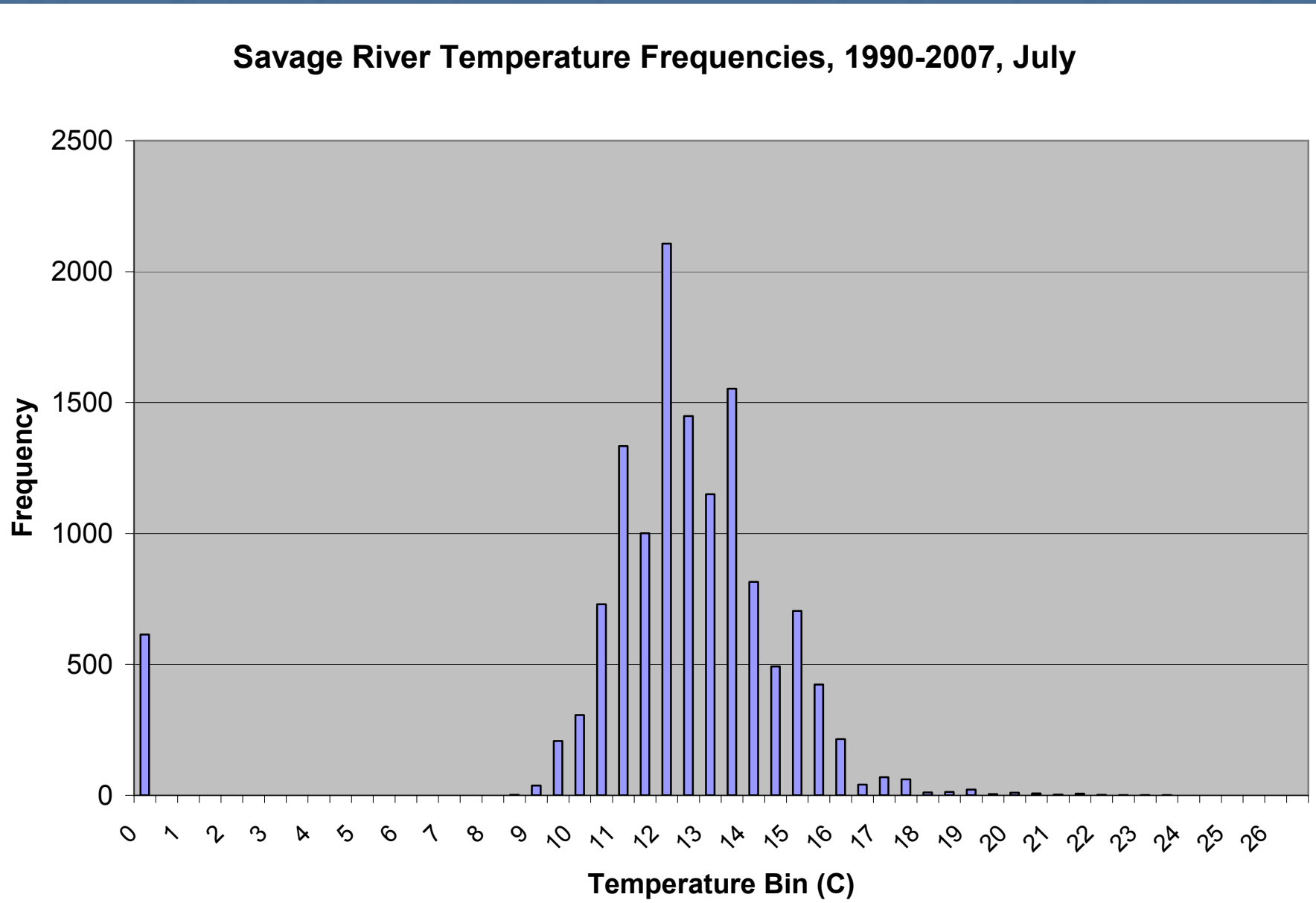
- UPRC measured temp profiles, 1988-1998
- About twice per month, April-Sept
- Will resume temp. measurements in 2008
- Data is in hard copy
- Frostburg State provided profiles for 2004-2005

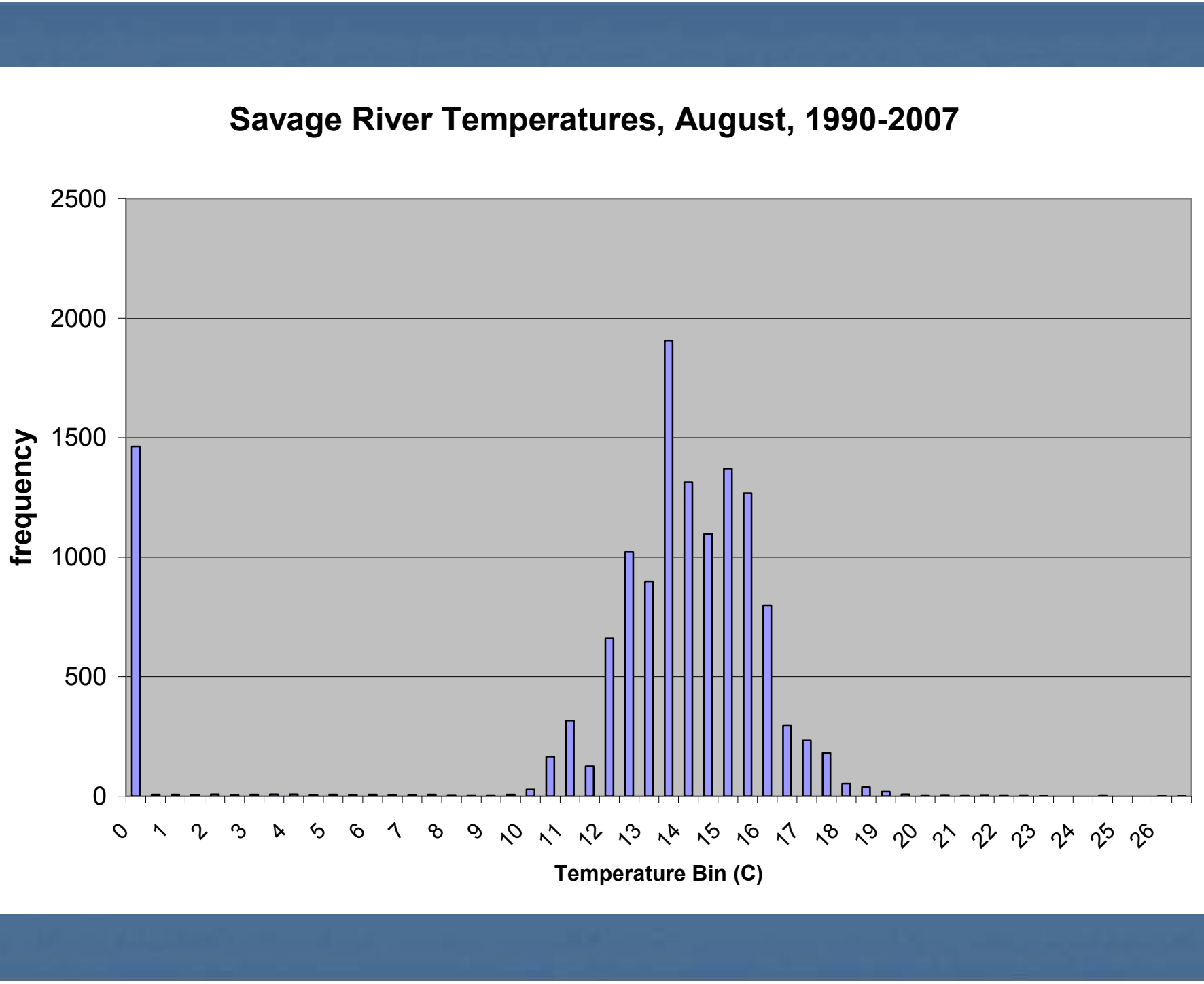
Available Temp Data

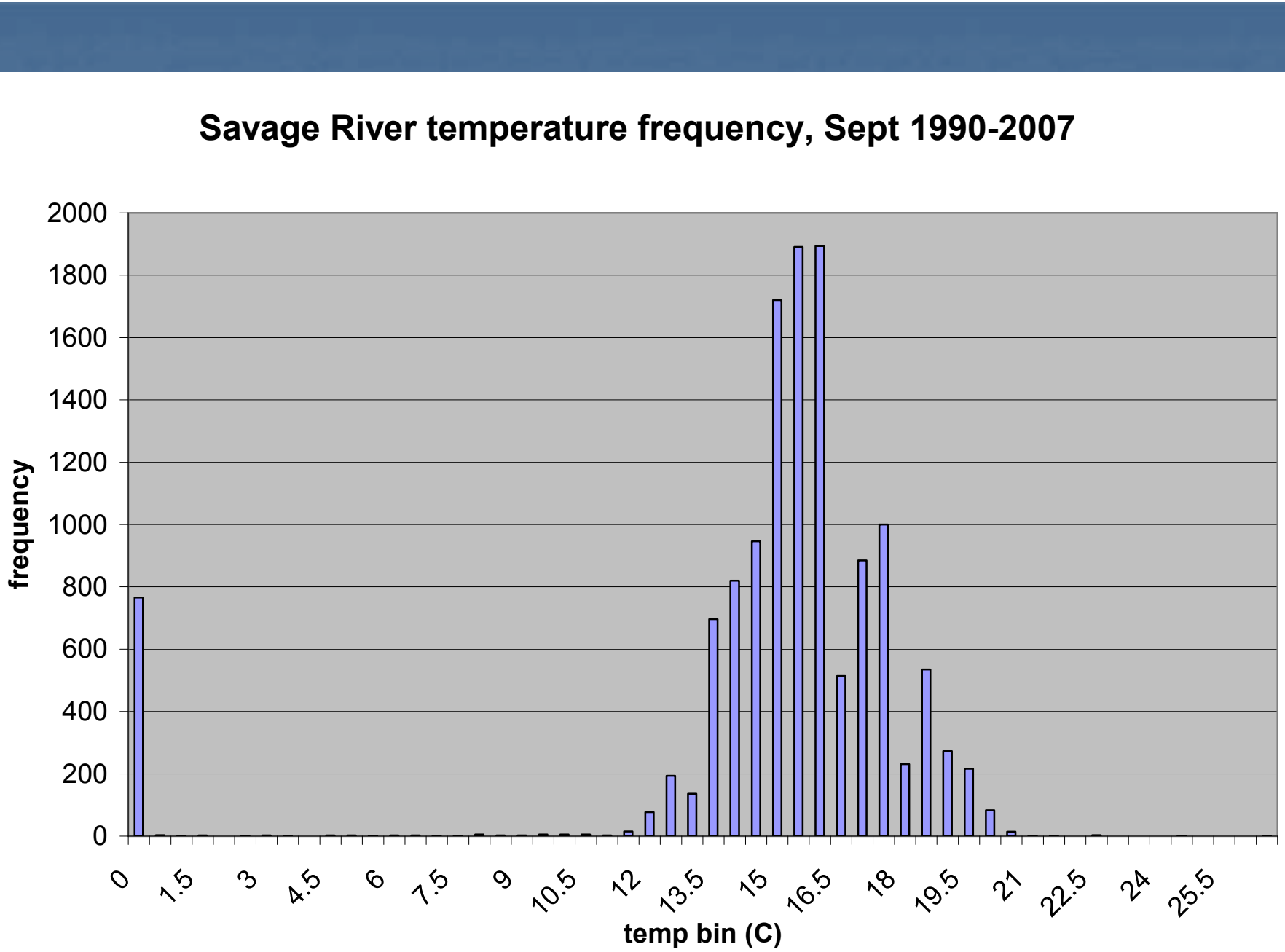
- The Corps archived hourly data from the USGS gages on NB and Savage River
  - Barnum: 1985-2007
  - Savage River: 1990-2007
  - Luke: 1990-2007
  - Pinto: 1990-2007
- DNR collected hourly temp data at McCoole, Black Oak in summers of 2005 & 2006

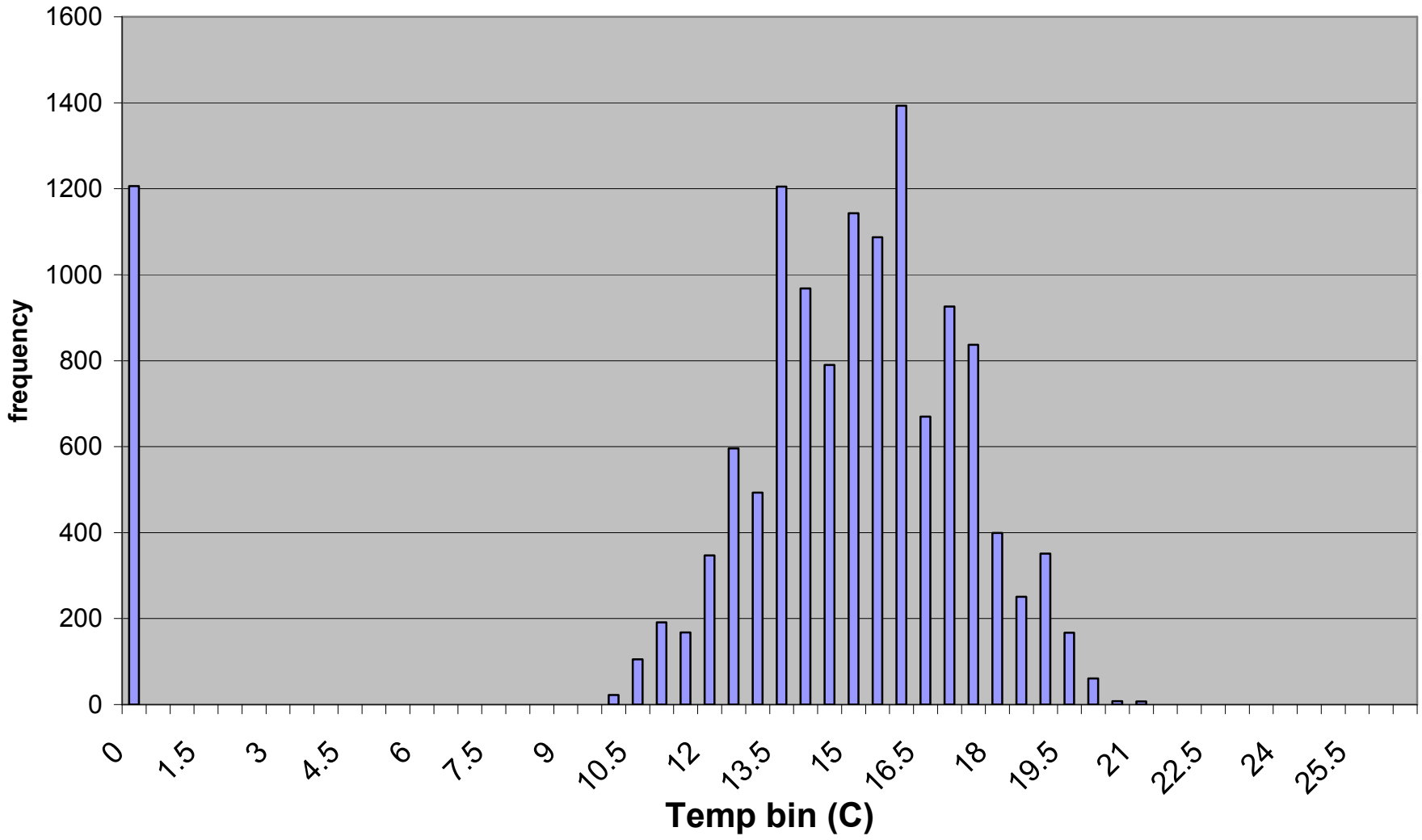
Initial Analysis of Savage River Temps

- Warm water temps are bad for trout
- So how often does Savage River get too warm?


Savage River Temperature Frequencies, 1990-2007, July
Frequency
2500
2000
1500
1000
500
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Temperature Bin (C)

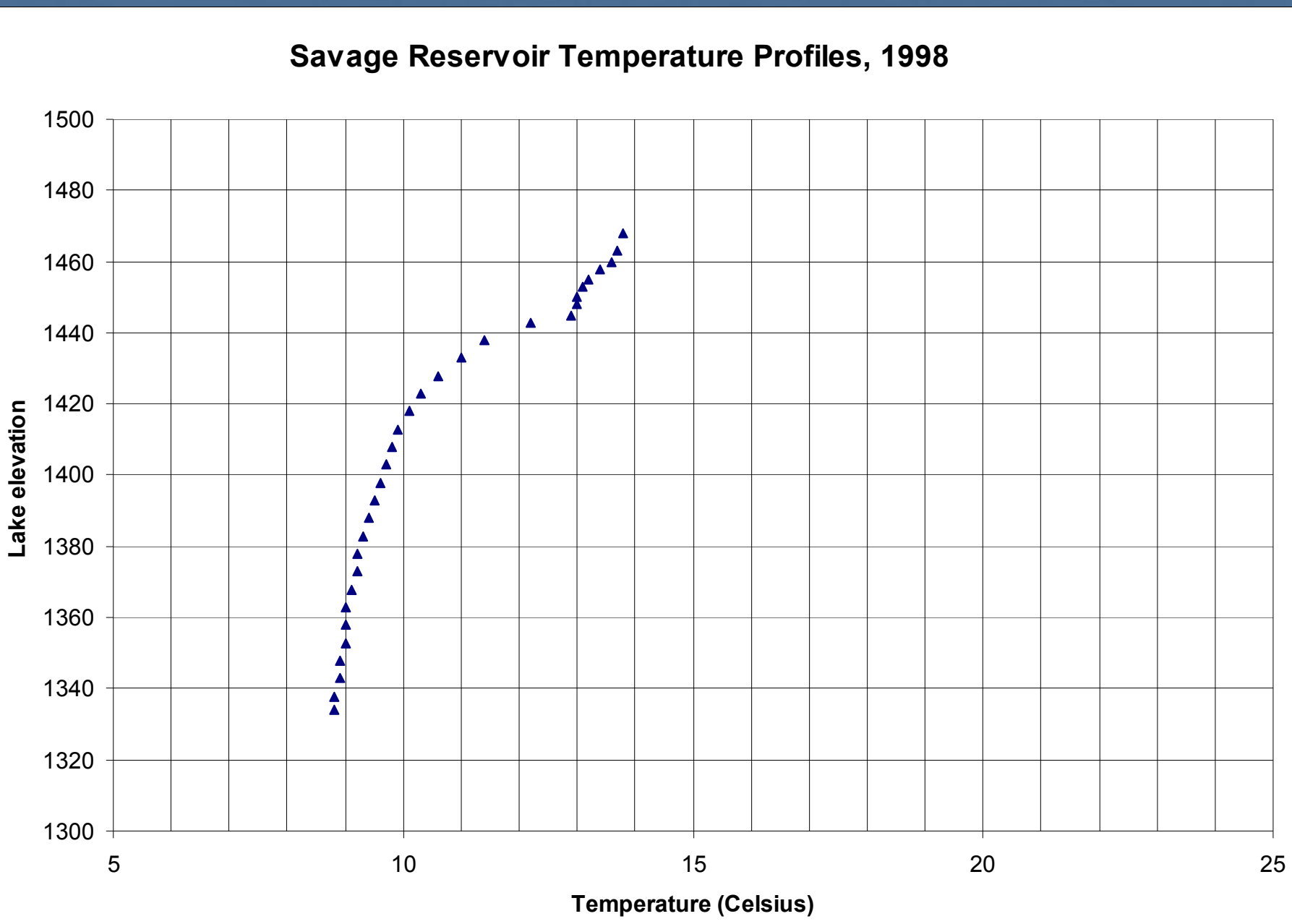

Savage River Temperatures, August, 1990-2007
frequency
2500
2000
1500
1000
500
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Temperature Bin (C)

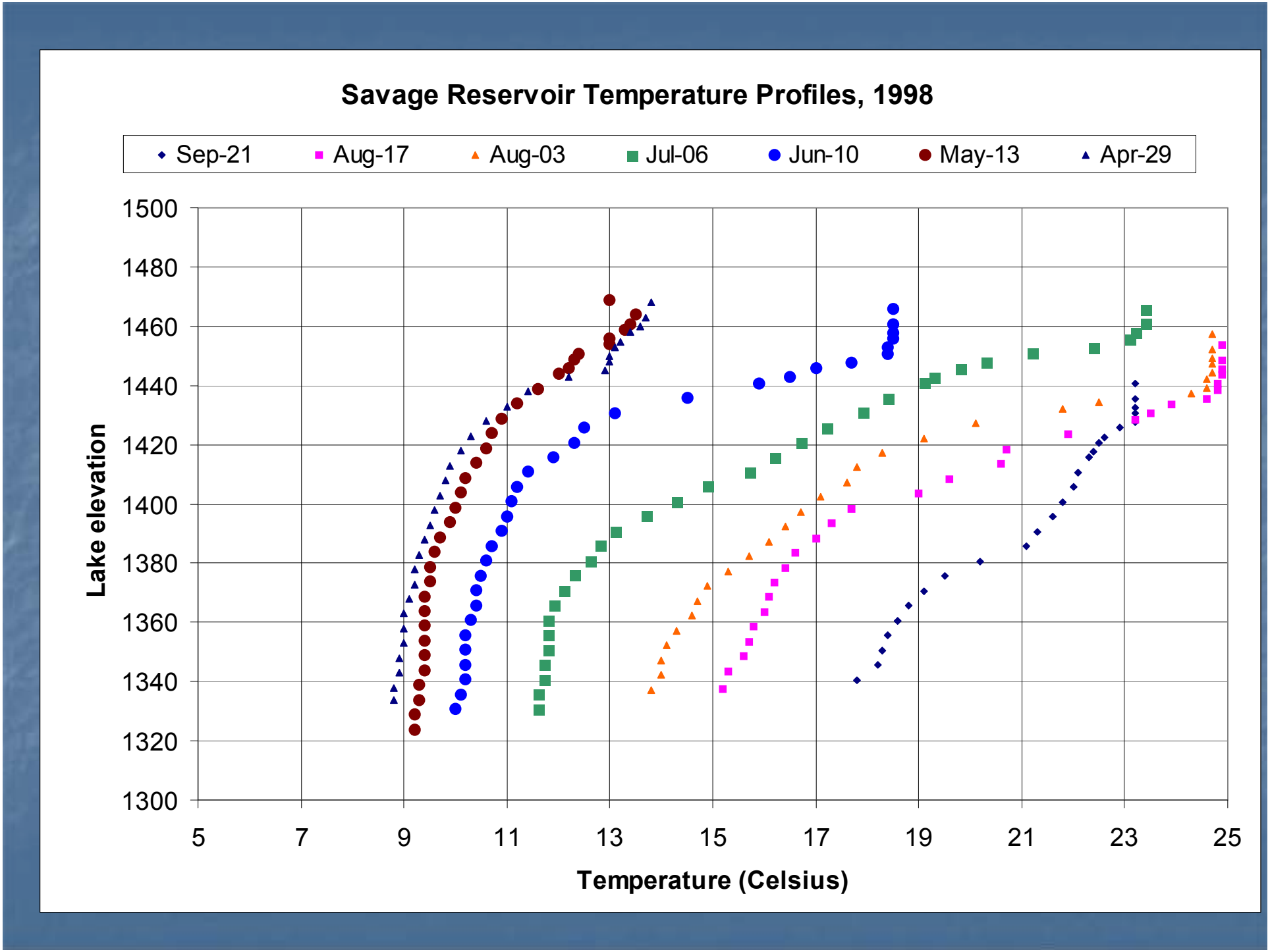

Savage River temperature frequency, Sept 1990-2007
frequency
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1.5
3
4.5
6
7.5
9
10.5
12
13.5
15
16.5
18
19.5
21
22.5
24
25.5
temp bin (C)

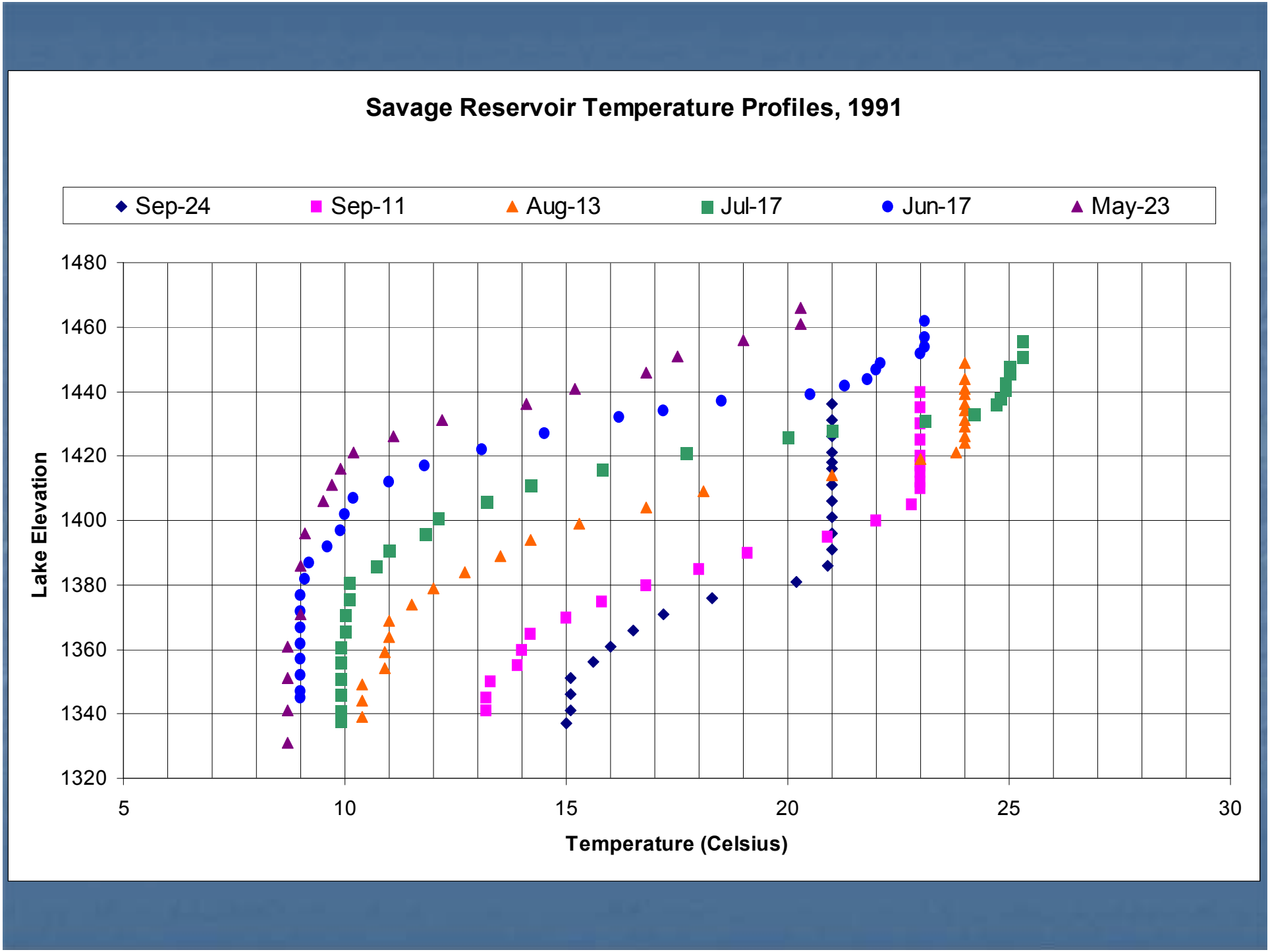

Savage River temperature frequency, Oct 1990-2007
frequency
1600
1400
1200
1000
800
600
400
200
0
0
1.5
3
4.5
6
7.5
9
10.5
12
13.5
15
16.5
18
19.5
21
22.5
24
25.5
Temp bin (C)

Preliminary Look at Savage Reservoir Stratification

- Entered data for 1998 and 1991 and plotted to examine stratification

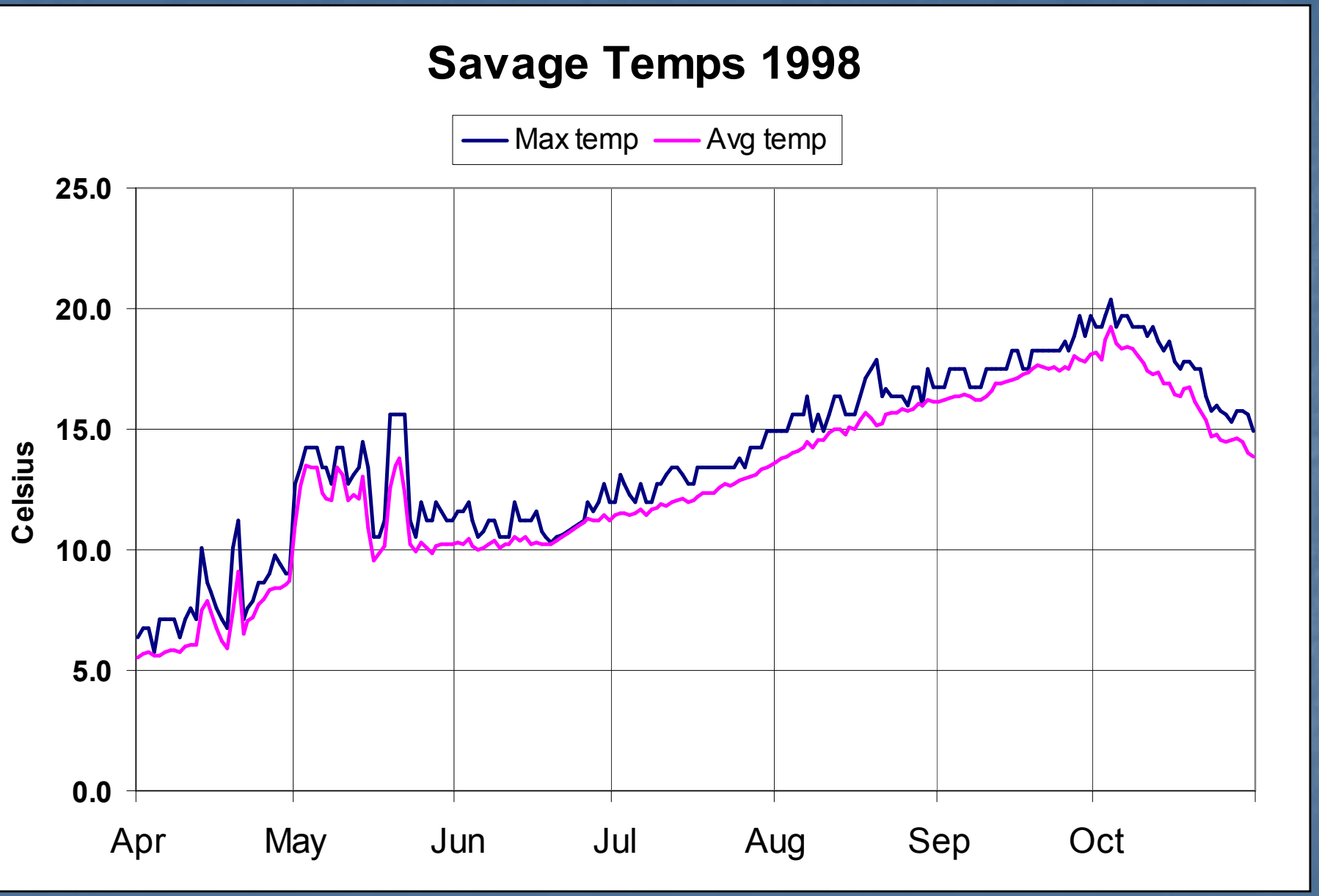

Savage Reservoir Temperature Profiles, 1998
Lake elevation
1500
1480
1460
1440
1420
1400
1380
1360
1340
1320
1300
5
10
15
20
25
Temperature (Celsius)

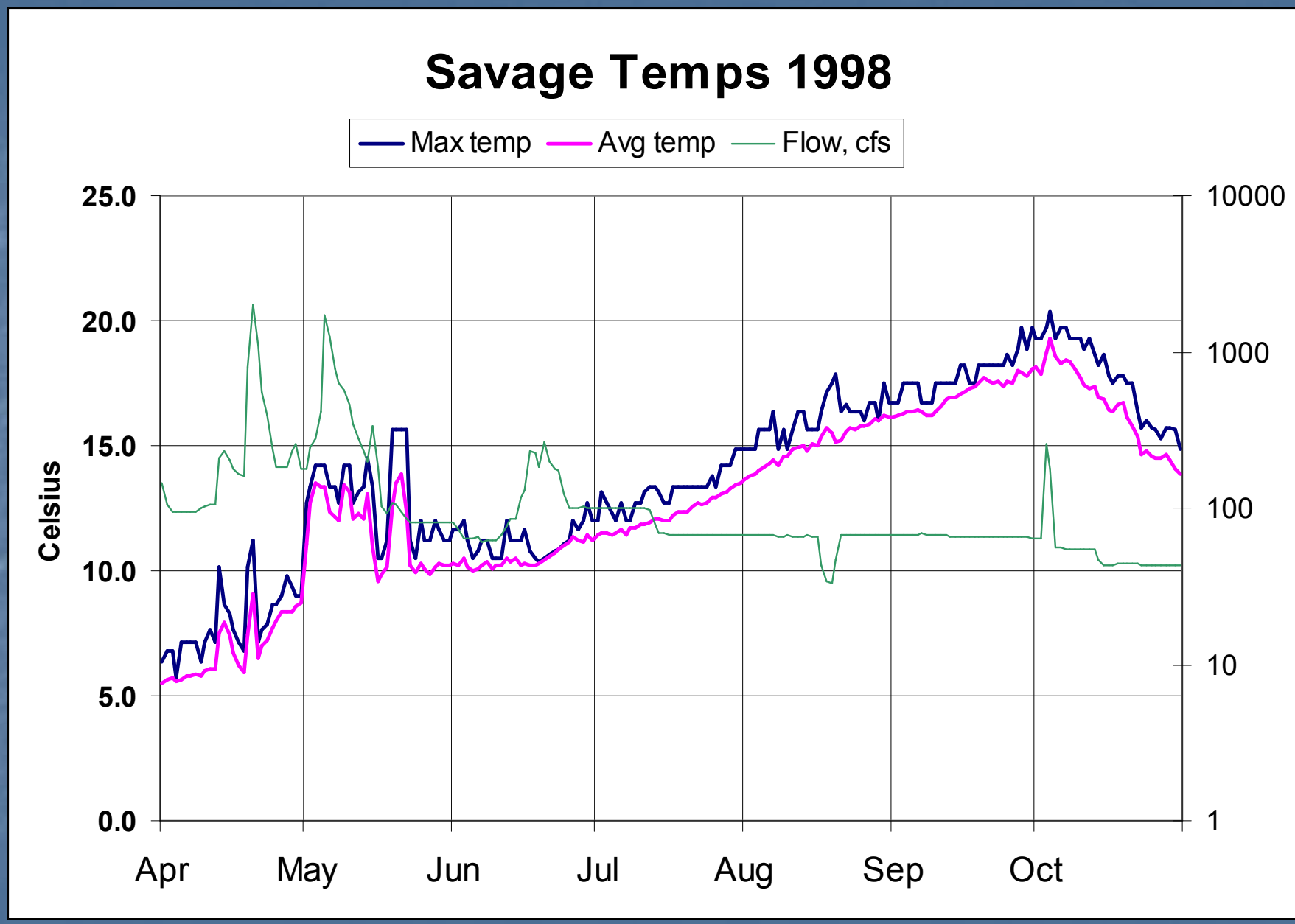

Savage Reservoir Temperature Profiles, 1998
Sep-21
Aug-17
Aug-03
Jul-06
Jun-10
May-13
Apr-29
Lake elevation
1500
1480
1460
1440
1420
1400
1380
1360
1340
1320
1300
5
7
9
11
13
15
17
19
21
23
25
Temperature (Celsius)

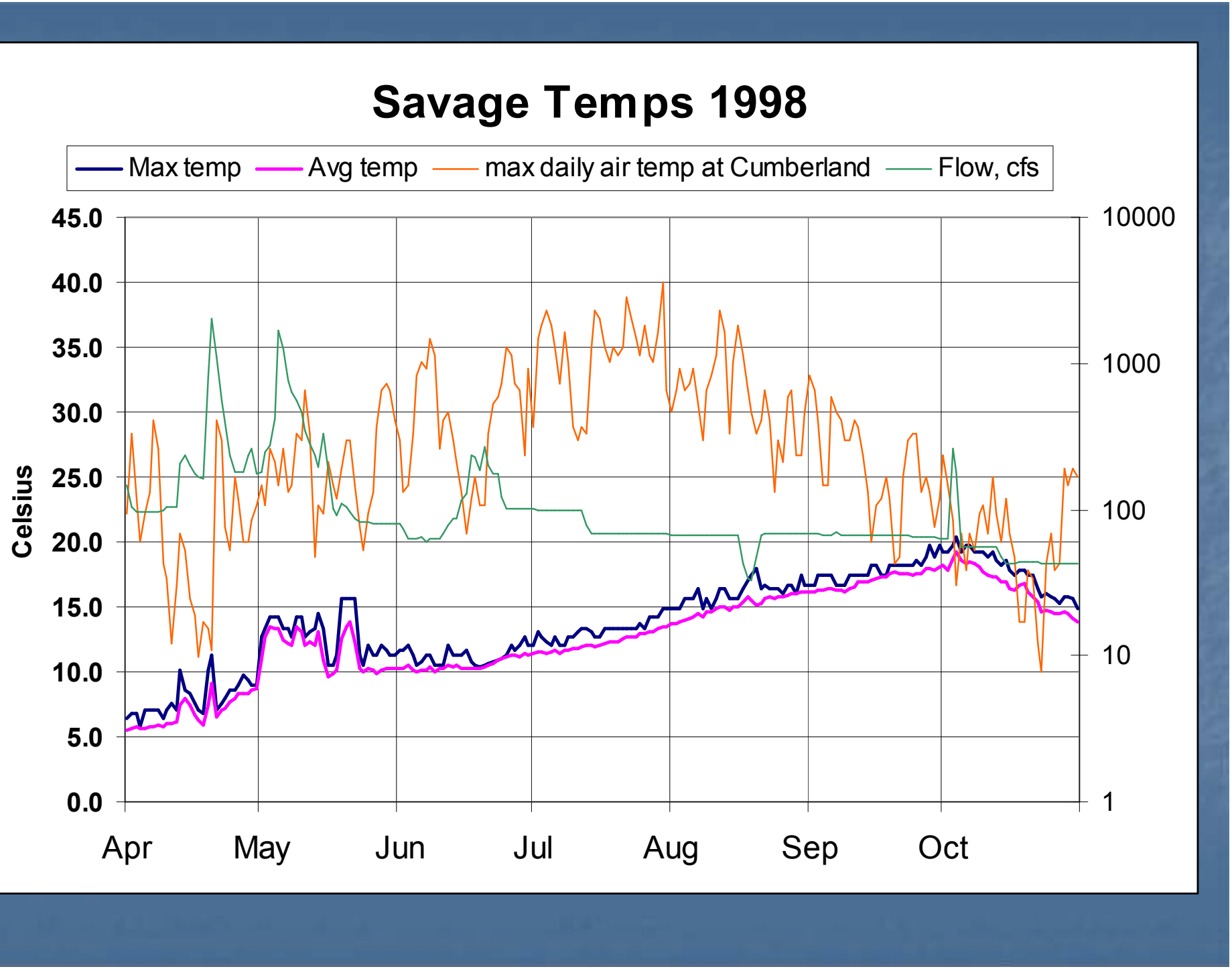

Savage Reservoir Temperature Profiles, 1991
Sep-24
Sep-11
Aug-13
Jul-17
Jun-17
May-23
Lake Elevation
1480
1460
1440
1420
1400
1380
1360
1340
1320
5
10
15
20
25
30
Temperature (Celsius)

Savage River Temps, 1998

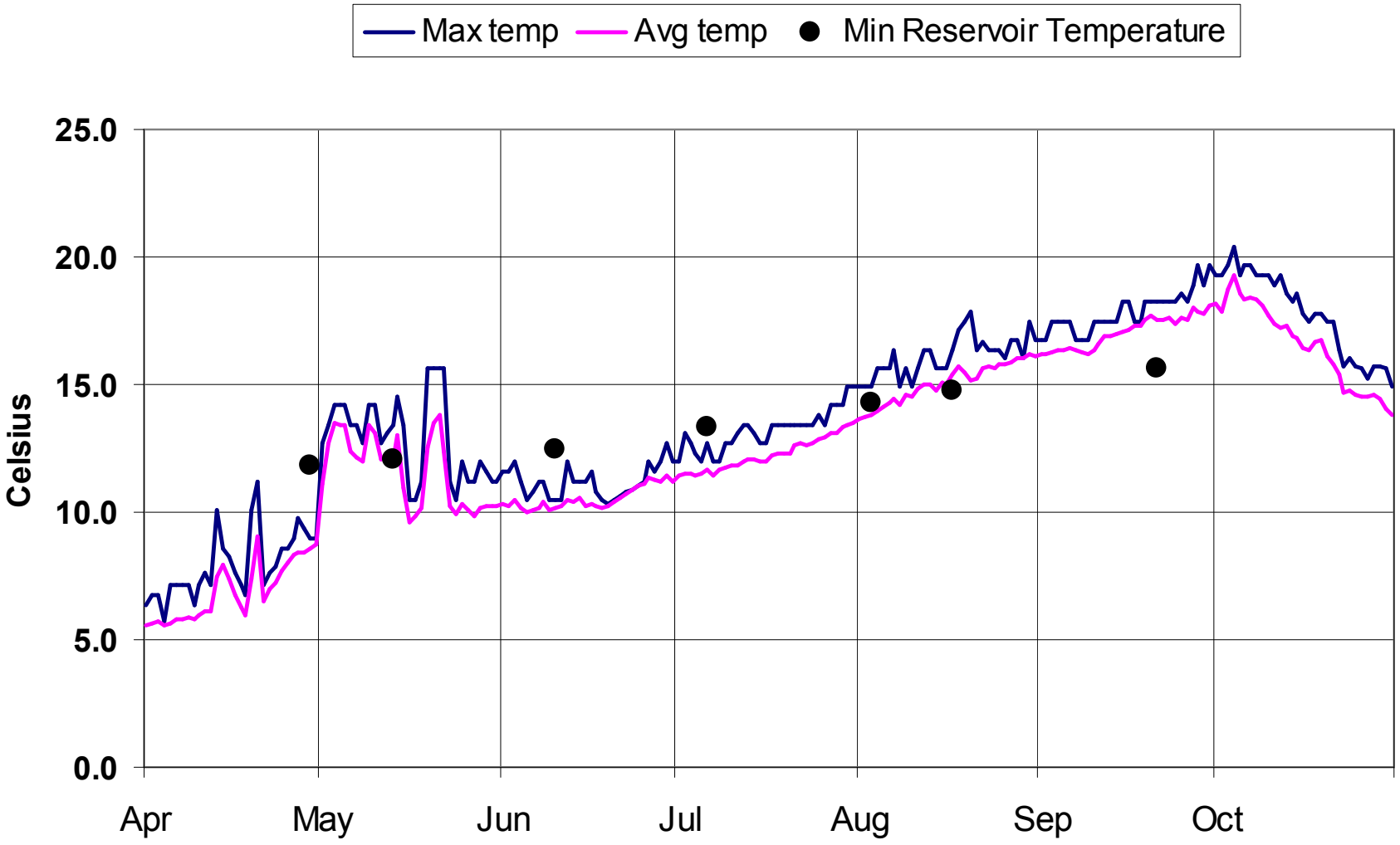
- Given reservoir stratification, look at River temps in a given year to investigate links with Reservoir cold water storage, air temps, flows


Savage Temps 1998
Max temp
Avg temp
Celsius
25.0
20.0
15.0
10.0
5.0
0.0
Apr
May
Jun
Jul
Aug
Sep
Oct


Savage Temps 1998
Max temp
Avg temp
Flow, cfs
Celsius
25.0
20.0
15.0
10.0
5.0
0.0
10000
1000
100
10
1
Apr
May
Jun
Jul
Aug
Sep
Oct


Savage Temps 1998
Max temp
Avg temp
max daily air temp at Cumberland
Flow, cfs
Celsius
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
10000
1000
100
10
1
Apr
May
Jun
Jul
Aug
Sep
Oct

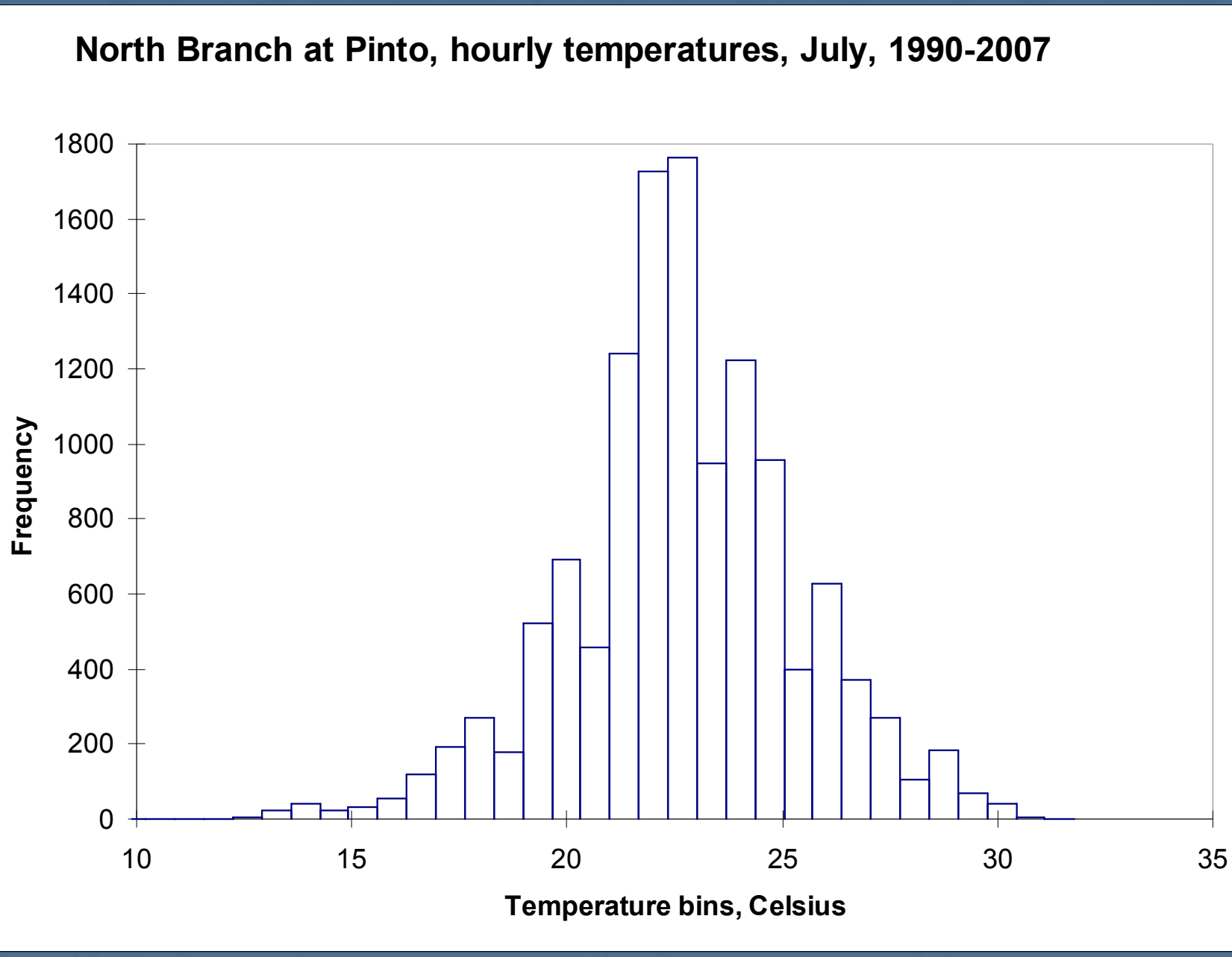
Savage Temps 1998

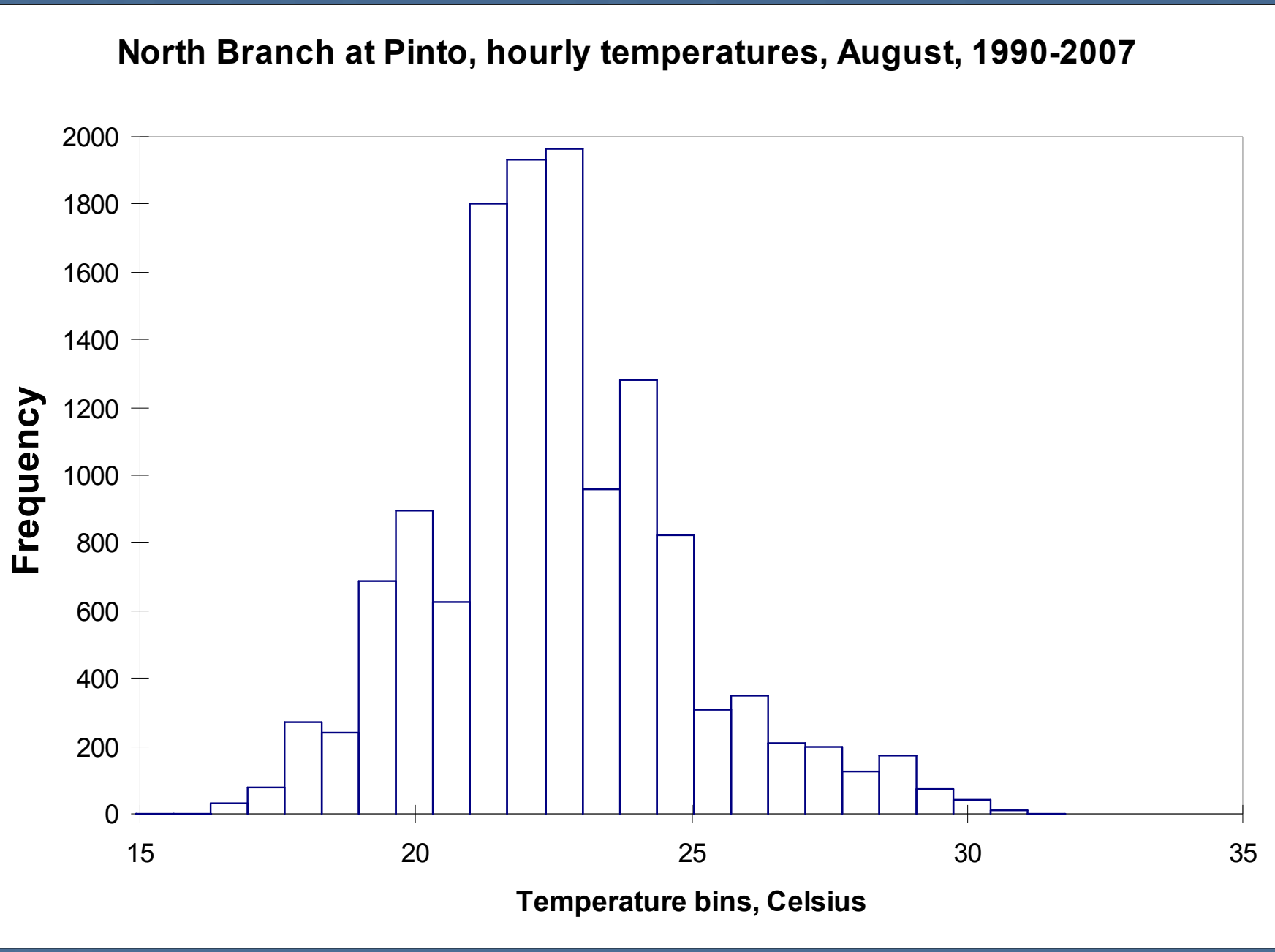


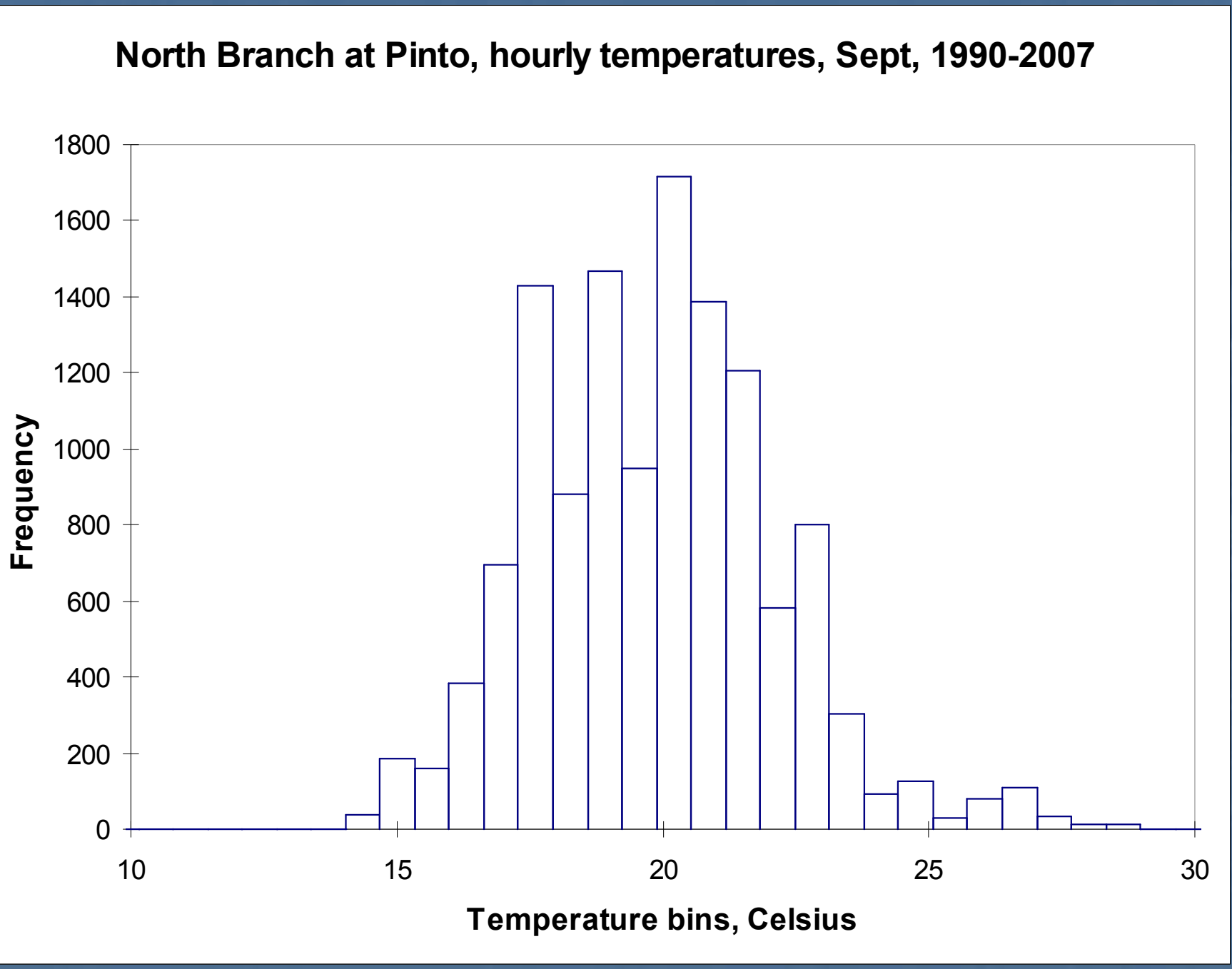
Preliminary Findings for Savage

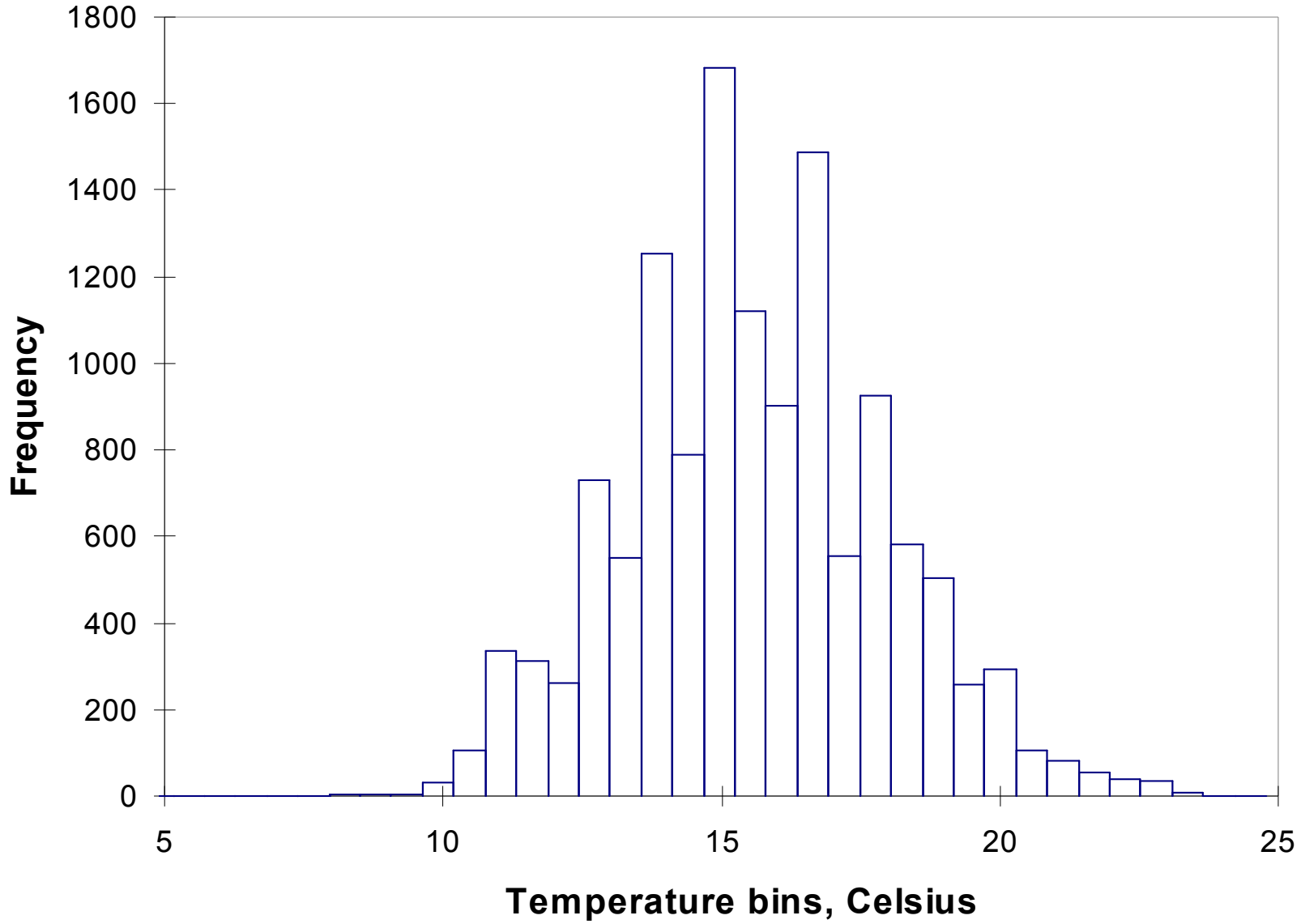
- Savage River temps seem to be primarily dependent on Savage Reservoir temps
- Model of reservoir stratification may be more important than a river temp model
- On-going monitoring will be very important

Some analysis for the North Branch at Pinto


North Branch at Pinto, hourly temperatures, July, 1990-2007
Frequency
1800
1600
1400
1200
1000
800
600
400
200
0
10
15
20
25
30
35
Temperature bins, Celsius

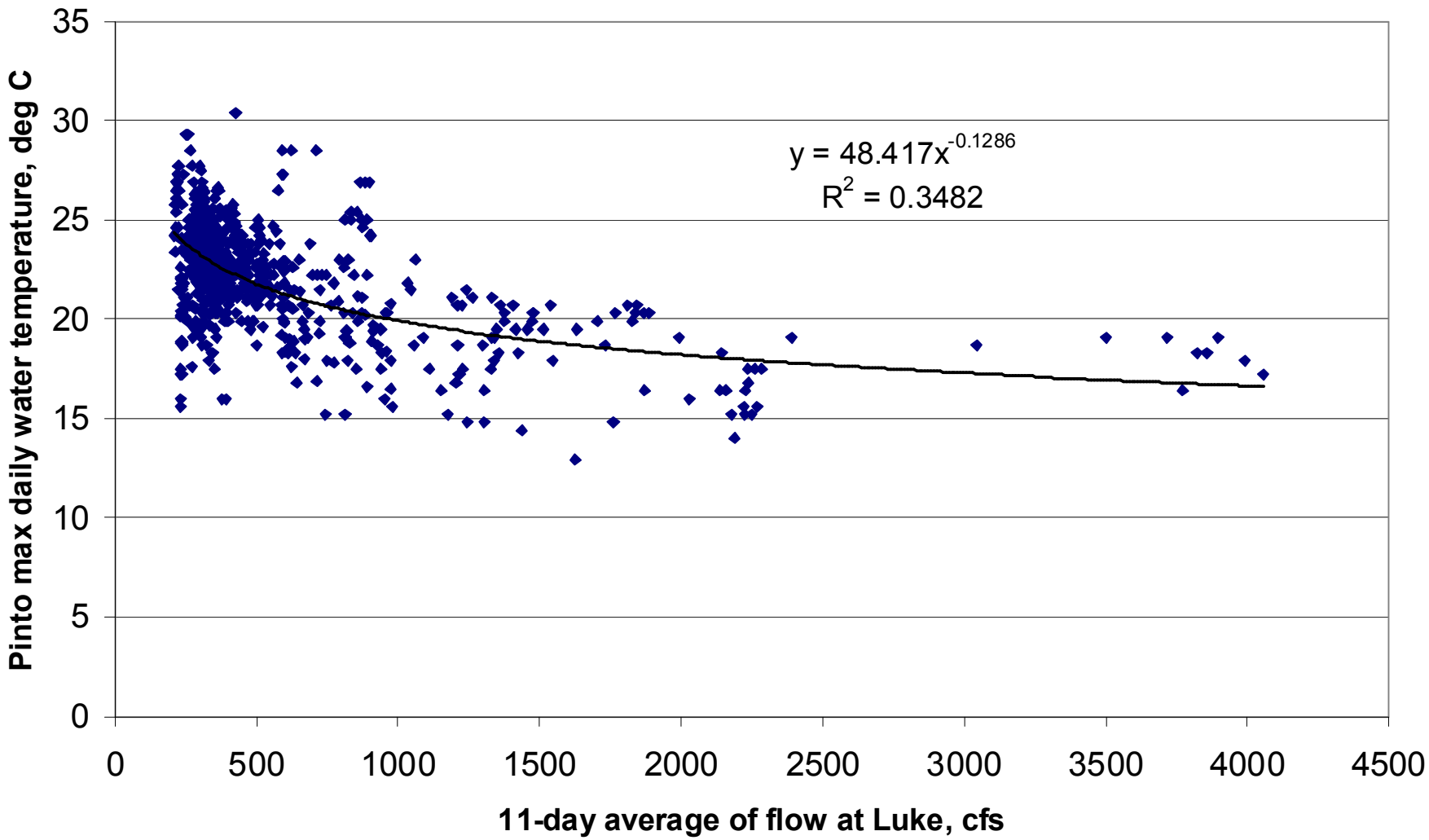

North Branch at Pinto, hourly temperatures, August, 1990-2007
Frequency
2000
1800
1600
1400
1200
1000
800
600
400
200
0
15
20
25
30
35
Temperature bins, Celsius


North Branch at Pinto, hourly temperatures, Sept, 1990-2007
Frequency
1800
1600
1400
1200
1000
800
600
400
200
0
10
15
20
25
30
Temperature bins, Celsius

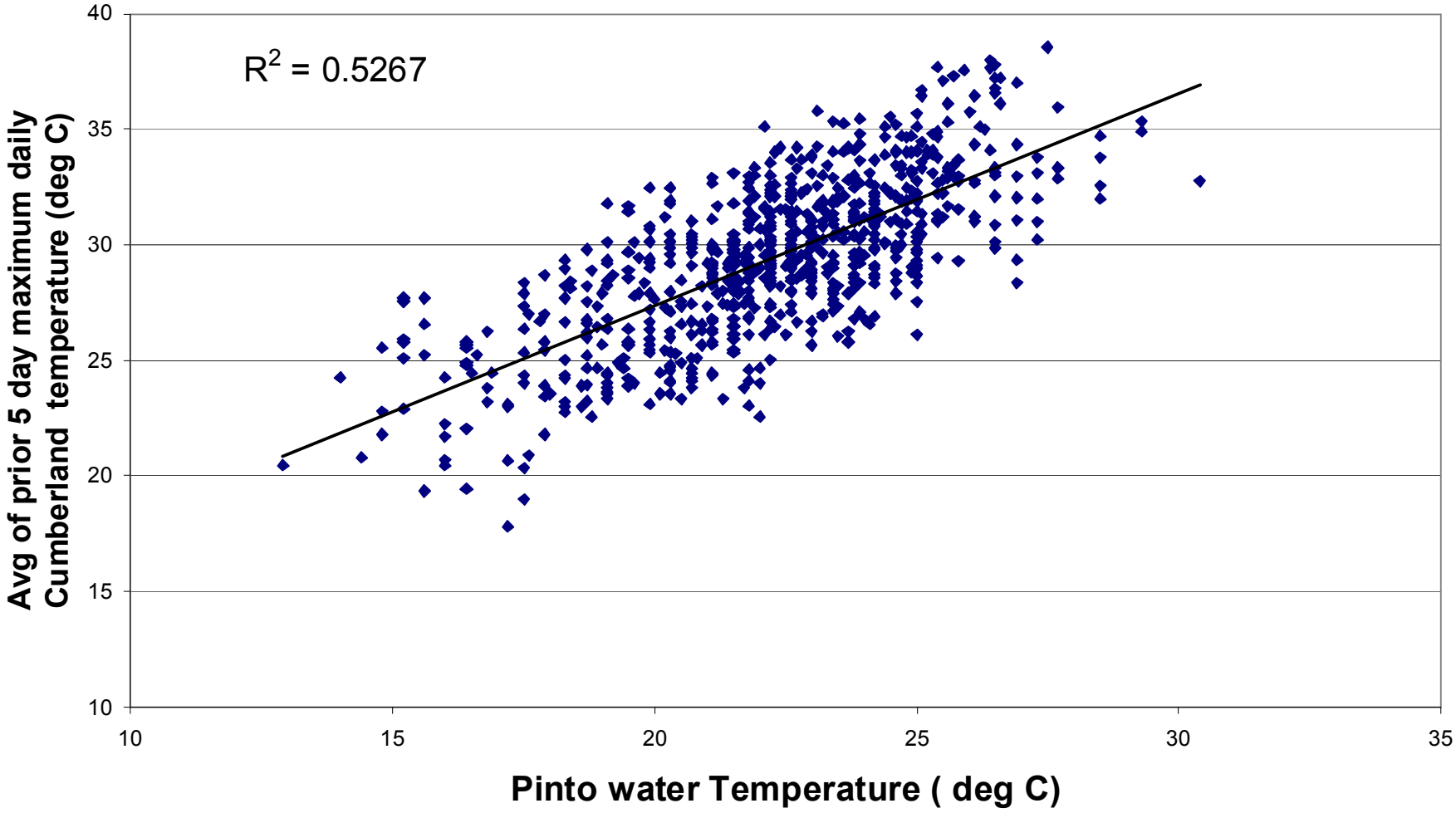

North Branch at Pinto, hourly temperatures, Oct, 1990-2007
Frequency
1800
1600
1400
1200
1000
800
600
400
200
0
5
10
15
20
25
Temperature bins, Celsius

Bottom Line for Pinto

- Temperatures that are too high for trout occur frequently
- *Probably unavoidable in many years, but in some years it may be possible*
- Need accurate prediction of temperature patterns


Luke flow and temperature at Pinto, June through September months of 2000-2006
Pinto max daily water temperature, deg C
11-day average of flow at Luke, cfs
y = 48.417x^-0.1286
R^2 = 0.3482
0
5
10
15
20
25
30
35
0
500
1000
1500
2000
2500
3000
3500
4000
4500

Pinto water temperature June through September and average of 5 day max air Temperature, Cumberland, 2000-2006



Next Steps

- ICPRB to analyze more Savage data to determine links between river temps and reservoir storage, outflows, air temps and other factors
- UPRC to monitor reservoir temps
- Develop model of reservoir limnology
  - Who can do it?
  - Who can fund it?

Next Steps

- ICPRB to analyze more NB data and Jennings temperature data
- Focus on Luke, Pinto, the reservoir
  - Use DNR data at McCoole, Black Oak to verify
- Use approach like Versar's Yough model
  - Statistical prediction of river temps as function of air temps, flows, reservoir temps
  - Will be used for evaluation
  - May help guide release decisions
- UMD student may be able to get it started as part of class project

North Branch and Savage Recreation

- Fishermen, whitewater boaters, beach users, boaters on the reservoir
- Email discussion between Advisory Group members and others
- Currently discussing a strawman description of potential study and looking for funds and experts to do the study

Overall Goals of Recreation Study

- How big are the rec communities that use the North Branch/Savage?
- How much of a socio-economic impact do these groups have on the region?
- How are the recreational activities affected by reservoir operations?
- *How will new reservoir operations affect the socio-economic impact?*

As currently described (by me), it will have four components

1. General description of recreation community/industry

- Overall description (kinds of activites, frequency of usage, number of people, number of businesses, estimate revenues)
- General description of how impacted by reservoir operations
- Use existing data as available
- NBAG members collect additional data?
- Provides overall context, could stand alone if lacking funds for larger study

2. Quantify size and economic impact of recreation community/industry

- Formal data gathering (surveys, other methods)
- Firmly establish # people, # businesses, regional and national economic impacts
- Funding needed to support expert (professor and a grad student) to conduct this part of the study

3. Project potential changes to recreation community/industry

- Need estimates of how recreation might changes over next 10-20 years
- Recreation is growing in general; NB region is near large, growing cities
- Based on national and regional trends
- Quantify in terms of component #2

4. Quantitative link between reservoir operations and recreation outcomes

- Close collaboration between group members, ICPRB, and recreation expert
- Quantitative link between reservoir operations (flows, temps etc) and recreation outcomes (usage, $)
- Difficult but crucial for comparing alternative operational strategies

Next Steps

- Discuss strawman ideas with Frostburg State professor
- Seek potential funding to support this work
- Decide on preliminary data gathering by this committee, develop plan if needed