Lessons learned on the Henry's Fork

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THE VOICE OF THE RIVER

SINCE 1984

HENRY'S FORK FOUNDATION

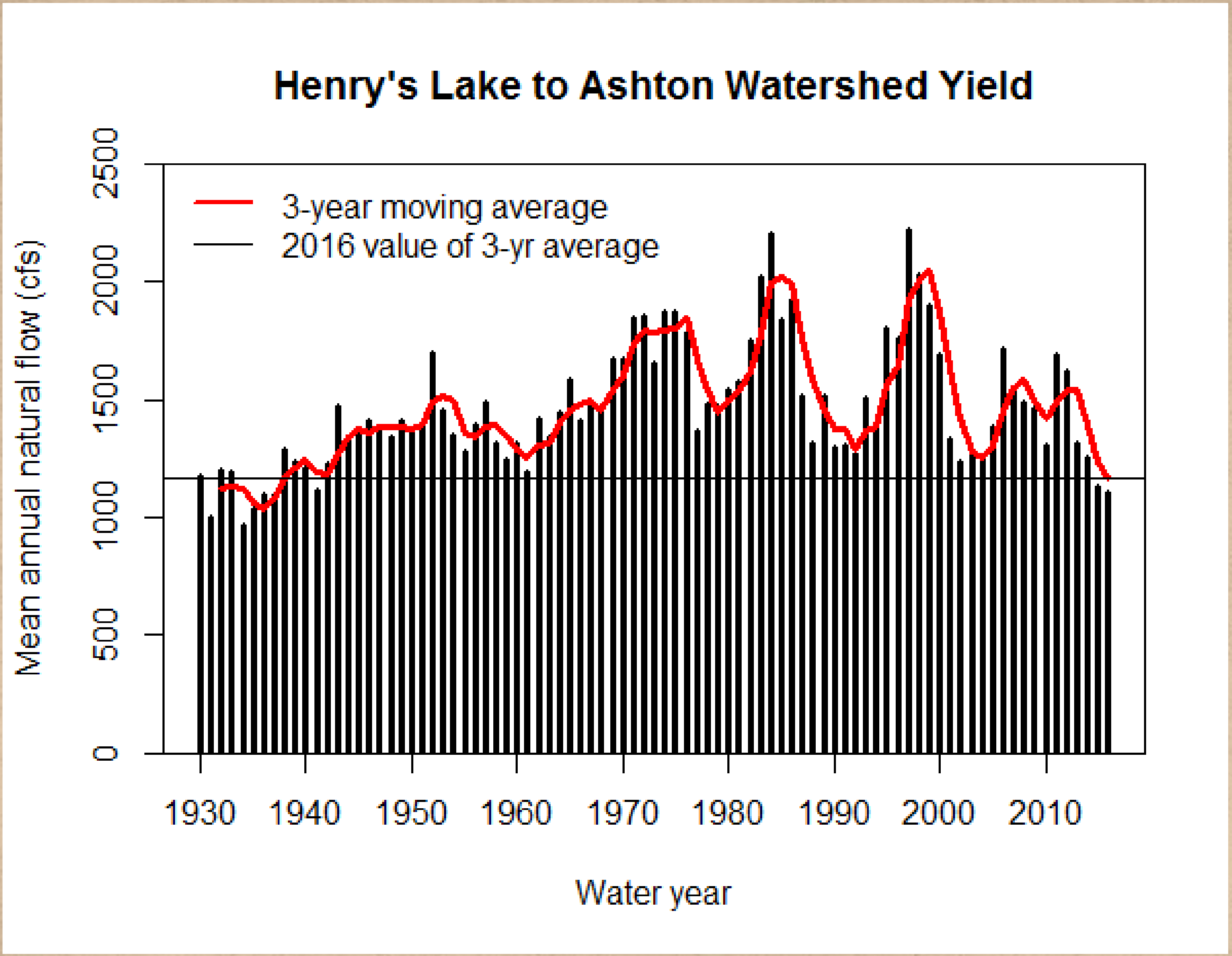
Outline

- Henry’s Fork streamflow in 2016: quantity and timing
- Casting for Answers: turbidity and suspended sediment trends in a world famous wild trout fishery
- Updating a 20-year data set: trout recruitment and flow downstream of Island Park Dam

Key streamflow patterns in 2016

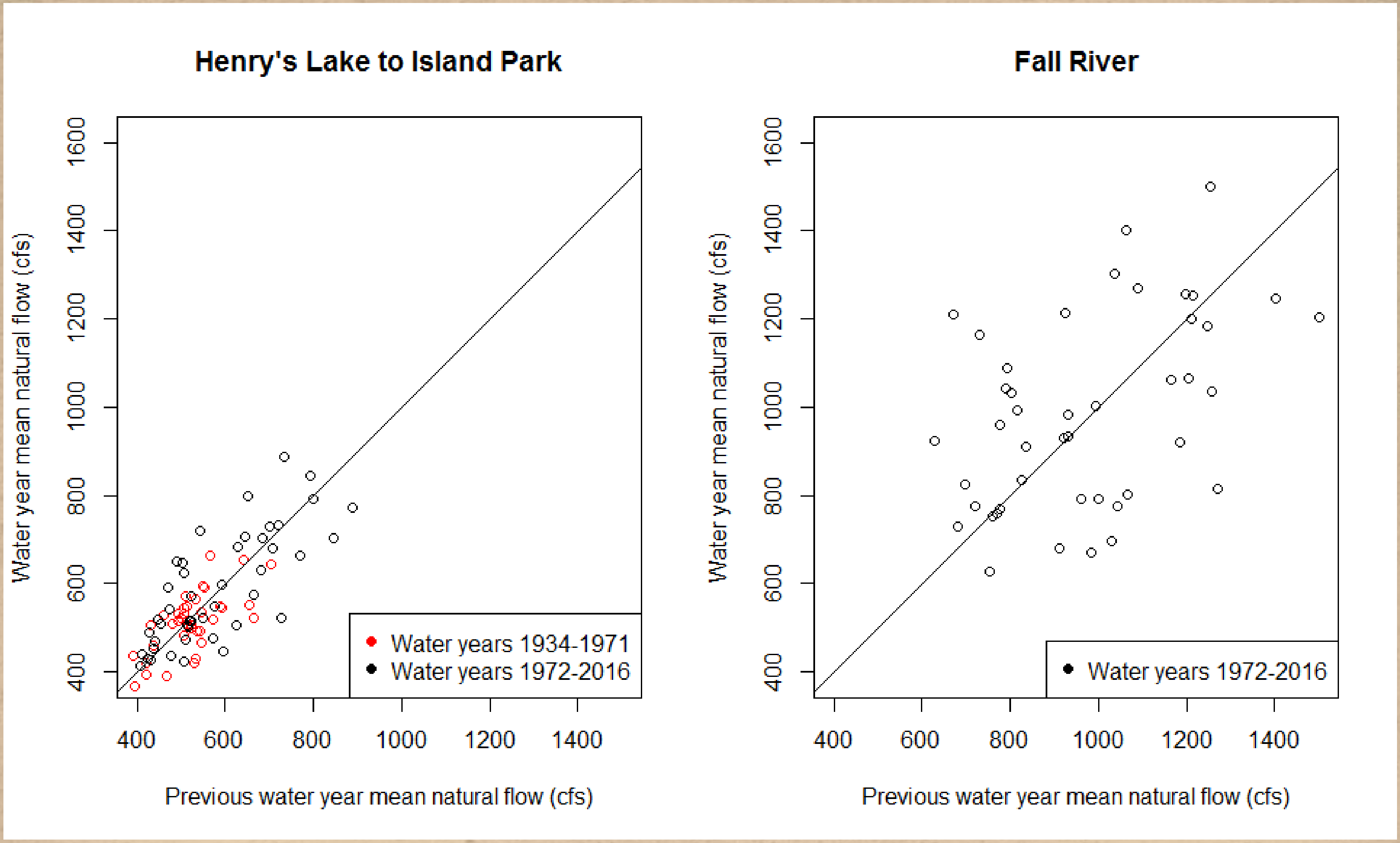
Dr. Rob Van Kirk

Water Year 2016: 6th driest since records began in 1930



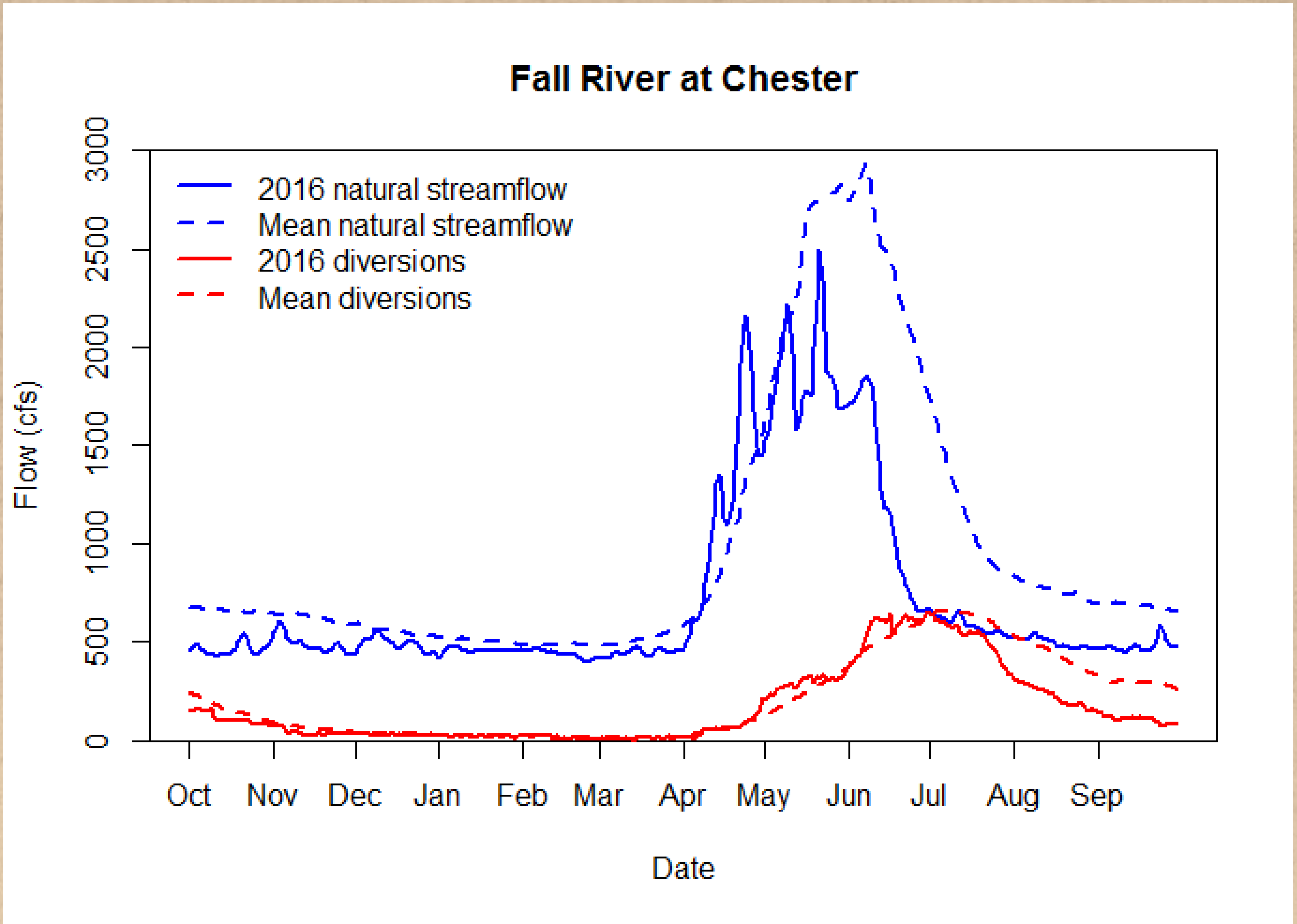
Three-year cumulative average was lowest since 1937.

- Why was 2016 so dry, when snowpack was around 85% of average?
- Why consider a three-year average? (aside from trout generation time)



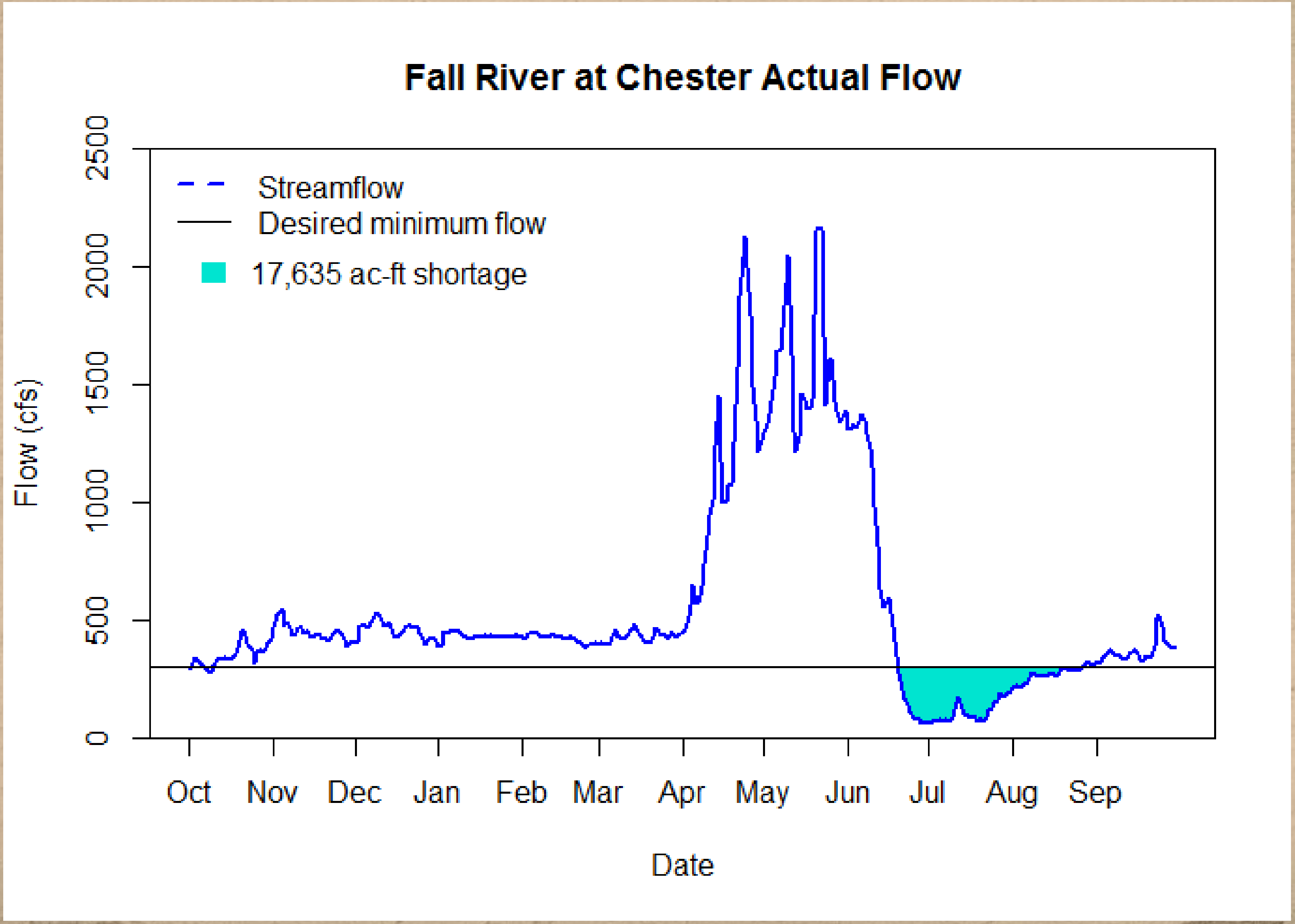
Groundwater springs in HF headwaters have a 3-4 year lag. Low streamflow persists for several years, unlike snowmelt-dominated rivers.

But even in Fall River, which experienced slightly better water supply, snowmelt was three weeks earlier than average…

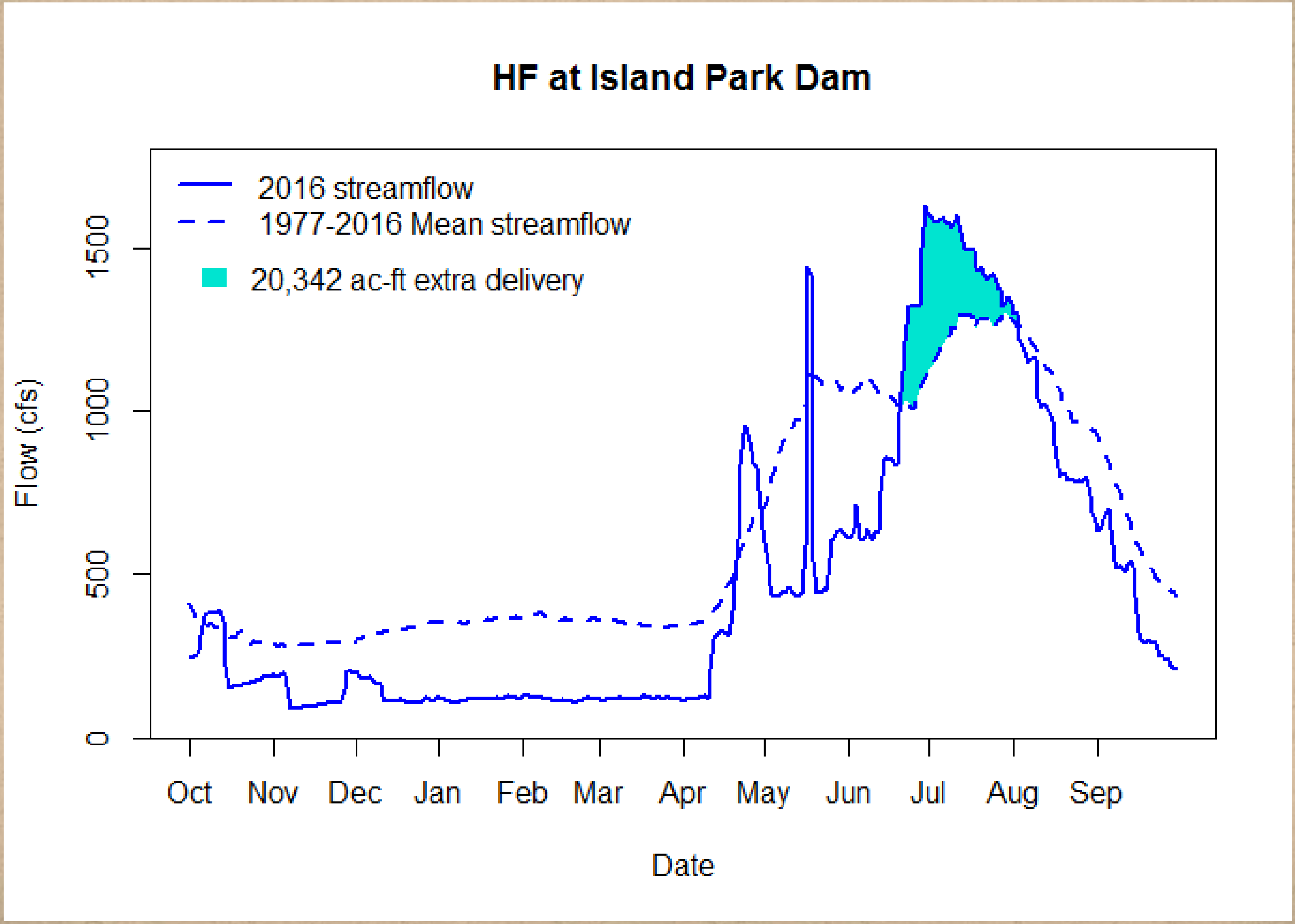


- Demand exceeded supply by mid-June
- 2016 diversion rate much lower than average late in the summer

Fall River flow dropped to 50 cfs in late June and spent 60 days below 300 cfs.



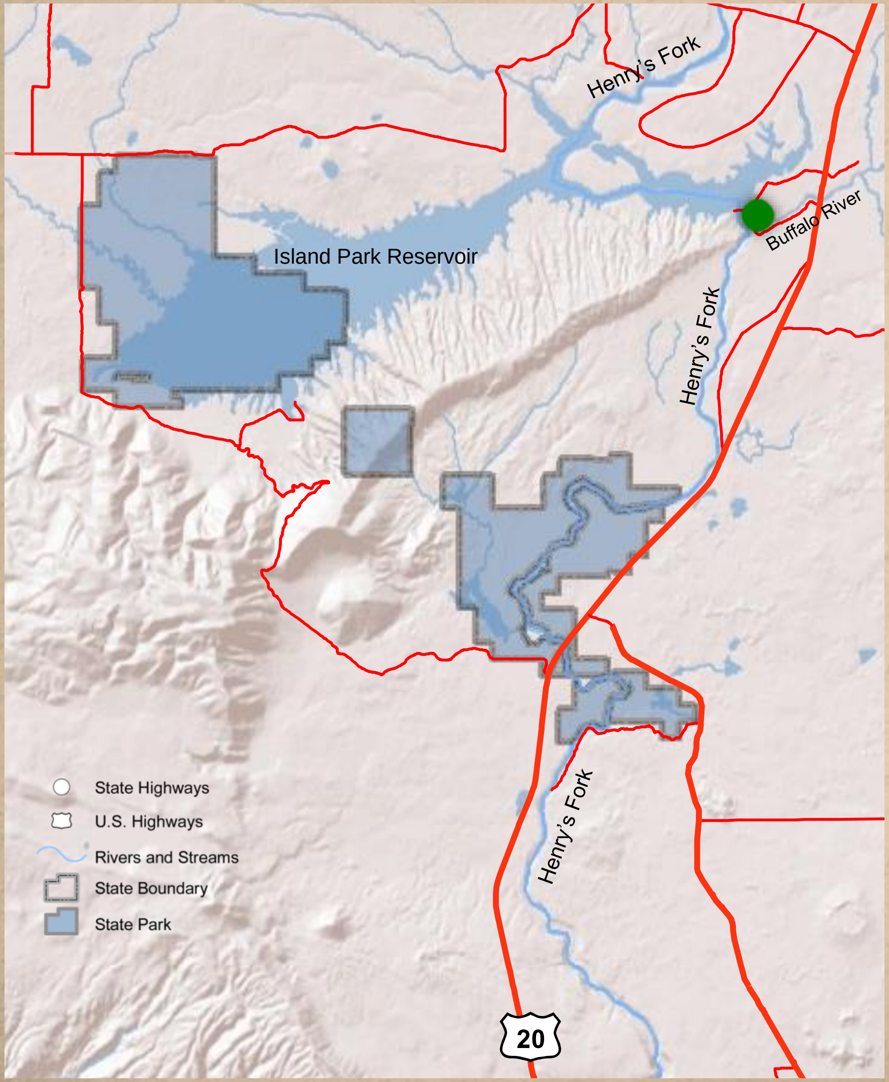
Above-average delivery from Island Park Reservoir in late June and July coincided in timing and magnitude with period when Fall River flow < 300.



Casting for Answers: turbidity and suspended sediment trends in a world famous wild trout fishery

Melissa L Muradian

Island Park Reservoir

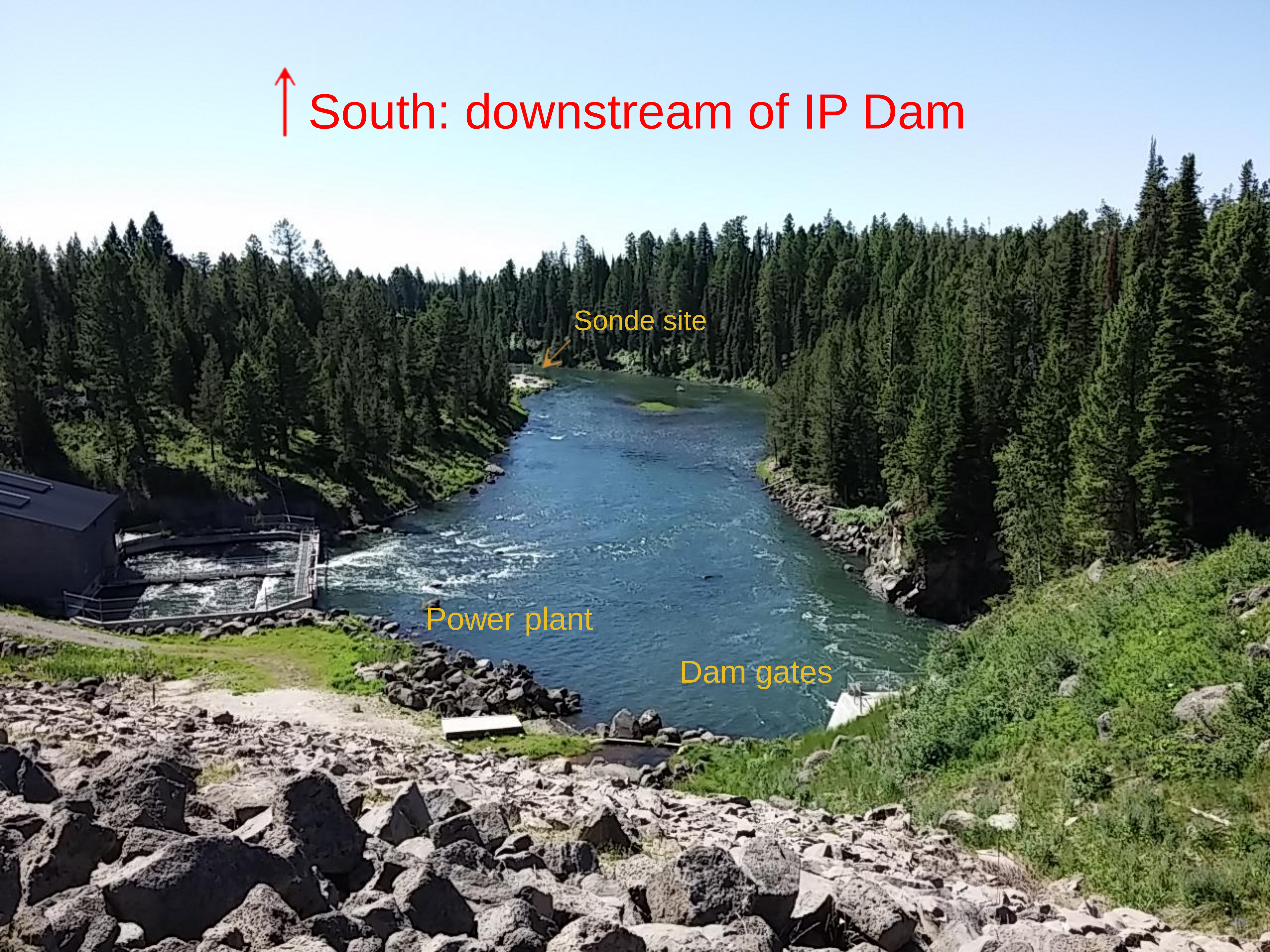


- 135,000 acre-foot storage capacity
- Upstream of the most famous and most heavily fished reaches of Harriman Ranch to Pinehaven
- Water-quality monitoring sonde downstream of IP reservoir (green dot)

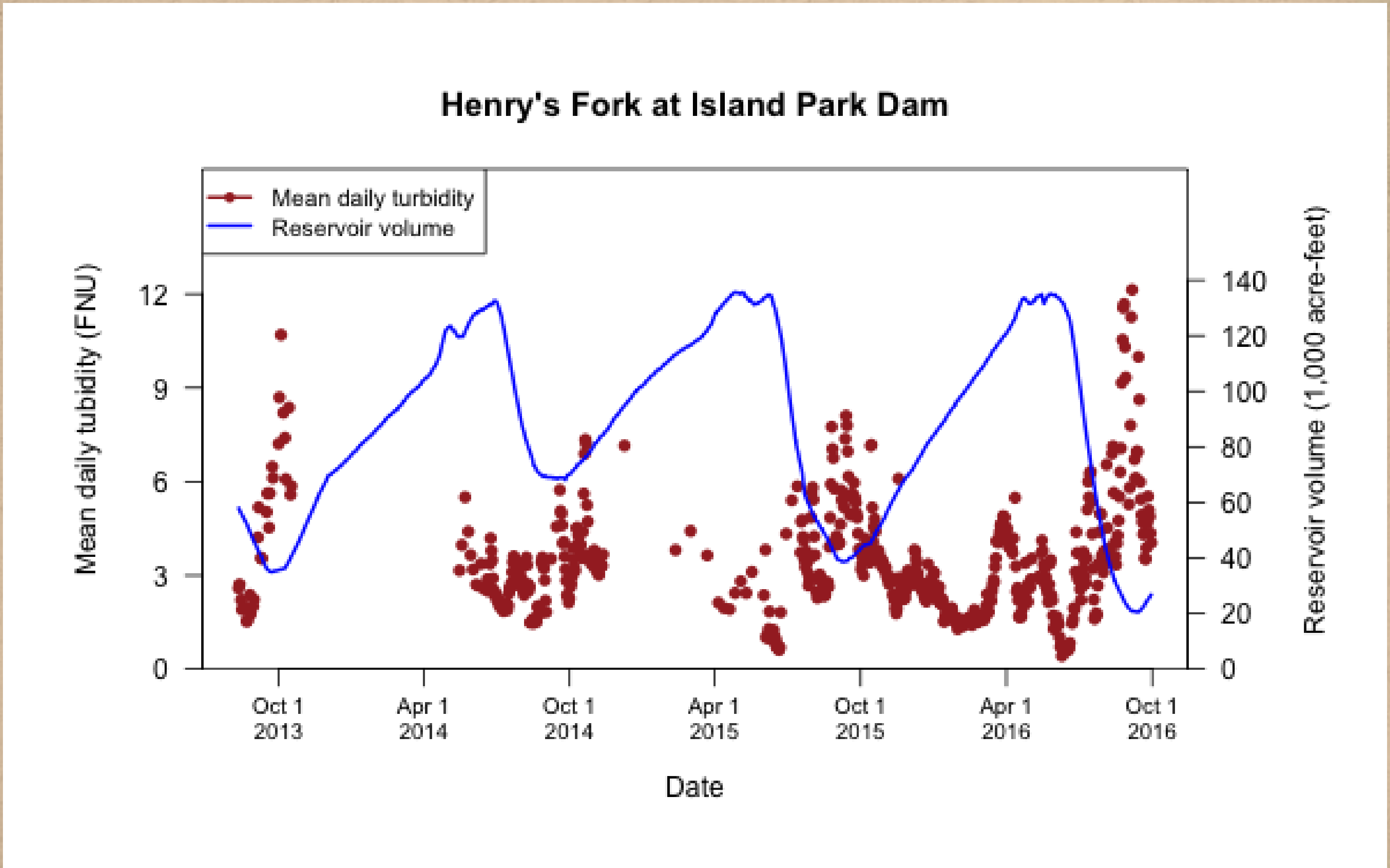
1. What factors influence turbidity in the reaches below Island Park Reservoir?

Potential factors:

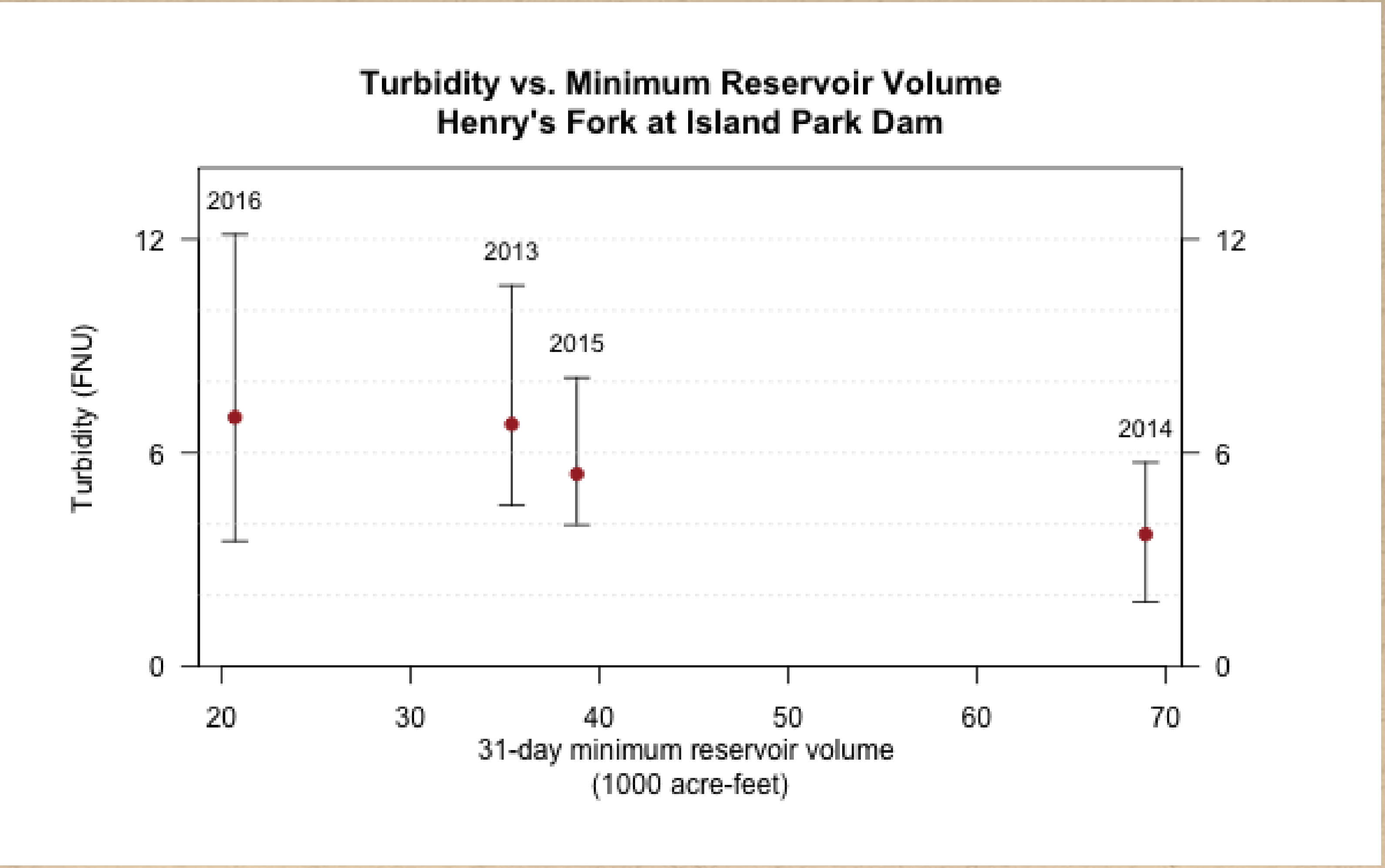
- Volume of Island Park (IP) Reservoir
- IP Reservoir inflow and outflow
- Air temperature
- Day length
- Solar radiation index
- A factor indicating reservoir outflow through:
  - Only the dam gates
  - Only the power plant
  - A combination of the two


South: downstream of IP Dam
Sonde site
Power plant
Dam gates

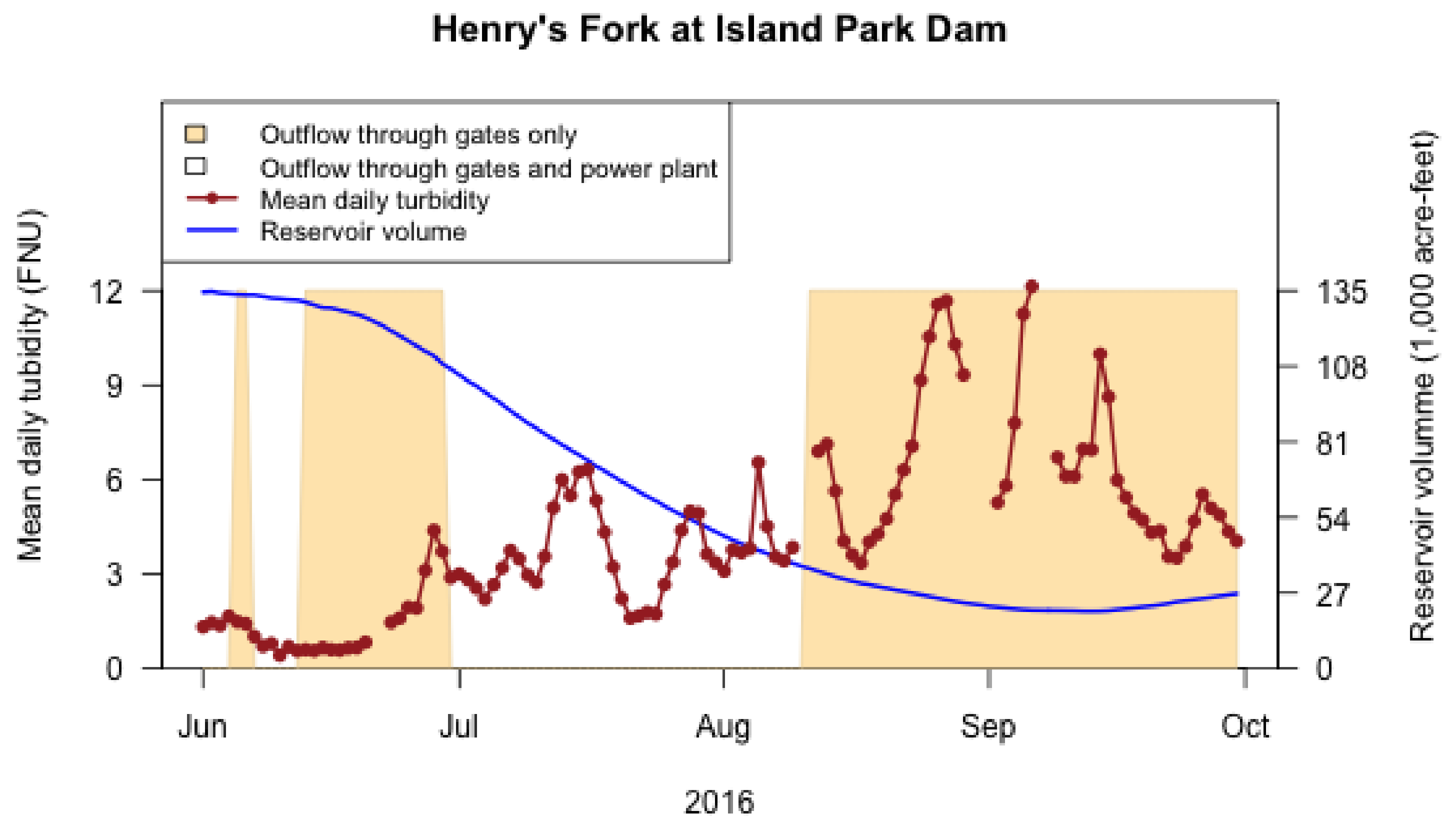
With over three years of water-quality monitoring data, we can now statistically document causes of high turbidity over multiple years.



By far the strongest predictor of high turbidity is low reservoir volume.



- Points are mean turbidity over the month of lowest reservoir volume.
- Bars show extremes over the month of lowest reservoir volume.

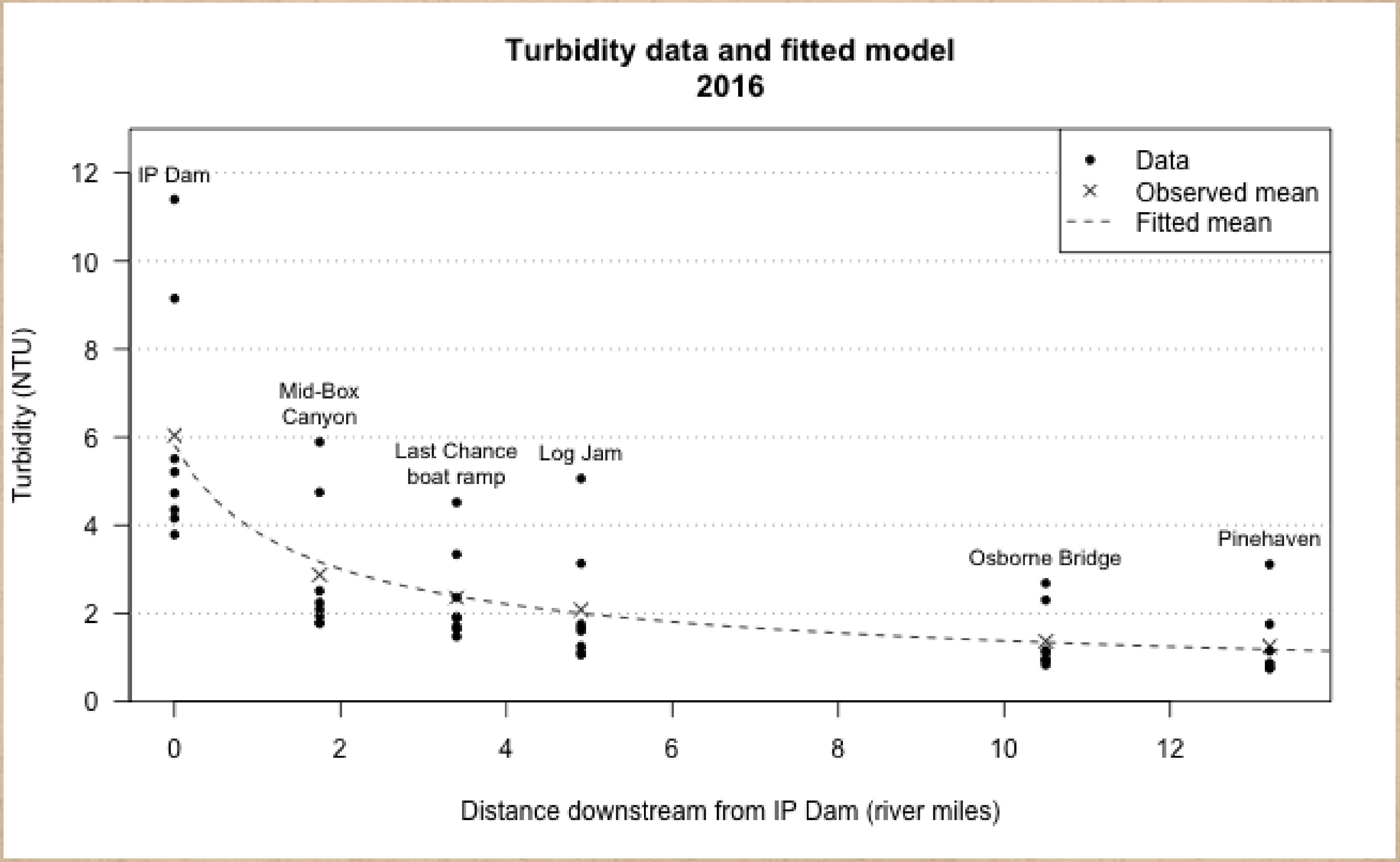


Within summer, Turbidity is highest when:

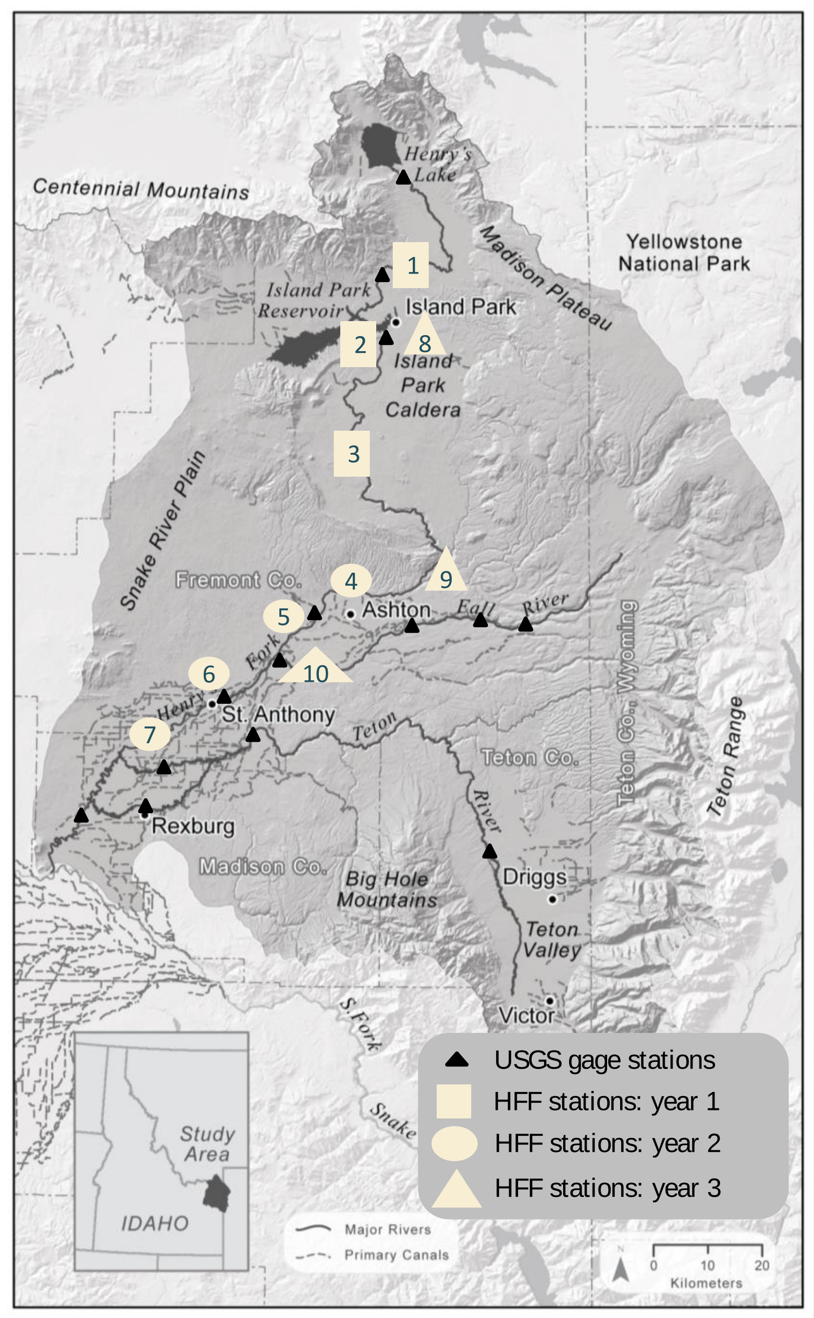
- Reservoir volume is low*
- Less outflow goes through gates and more through power plant*

*Indicates statistical significance.

2. How far downstream of IP Dam do high turbidity levels persist?

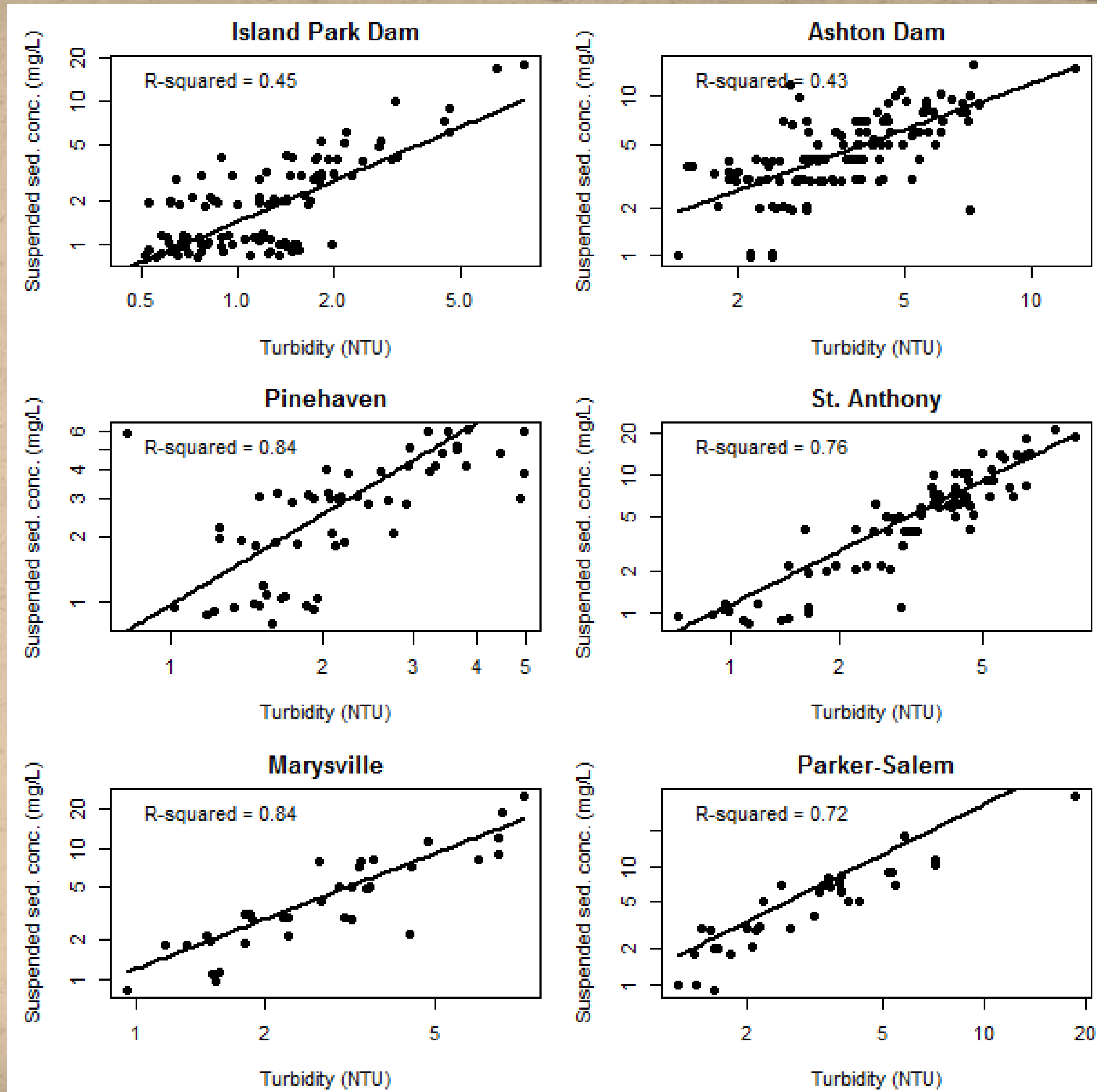


3. What are the ecological impacts of high turbidity downstream of IP Dam?



Turbidity and Suspended Sediment Concentration (SSC) sample sites:

1. Above IP Reservoir
2. Below IP Dam
3. Pinehaven/Riverside area
4. Above Ashton Reservoir
5. Below Ashton Reservoir
6. St. Anthony
7. Above NF Teton River


Island Park Dam
R-squared = 0.45
Suspended sed. conc. (mg/L)
Turbidity (NTU)
Ashton Dam
R-squared = 0.43
Suspended sed. conc. (mg/L)
Turbidity (NTU)
Pinehaven
R-squared = 0.84
Suspended sed. conc. (mg/L)
Turbidity (NTU)
St. Anthony
R-squared = 0.76
Suspended sed. conc. (mg/L)
Turbidity (NTU)
Marysville
R-squared = 0.84
Suspended sed. conc. (mg/L)
Turbidity (NTU)
Parker-Salem
R-squared = 0.72
Suspended sed. conc. (mg/L)
Turbidity (NTU)

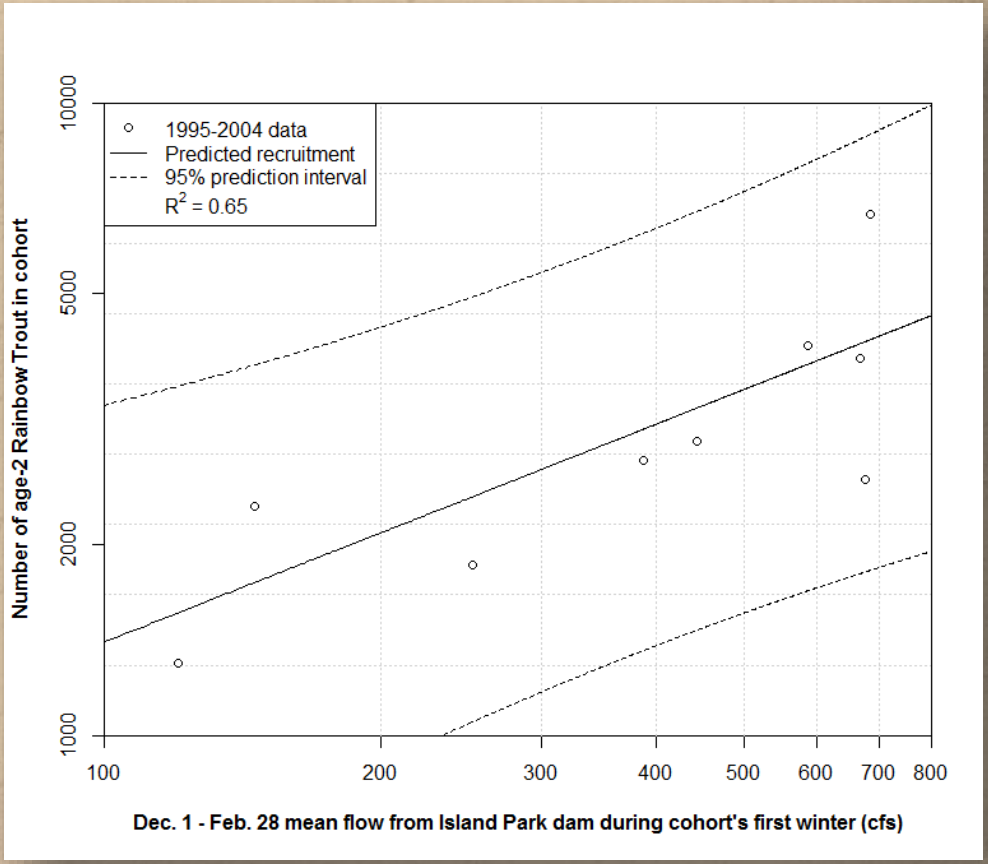
Summary of findings

- Low storage levels in IP Reservoir lead to higher turbidity downstream of the dam.
- We also statistically detected a gates effect: more water out of the gates = higher turbidity.
- High turbidity levels decrease sharply in the first few river miles below the reservoir.
- Turbidity is a reasonable indicator of SSC in river reaches far downstream of reservoirs.
- High turbidity levels do not imply high SSC imm. below the reservoirs.
- Regular, background levels of turbidity and SSC are too low to be of ecological concern (exception: when IP Reservoir is less than 30,000 to 40,000 acre-feet, which has historically been rare).
- High SSC imm. below Island Park Reservoir can be up to 50% organic, decomposable material.

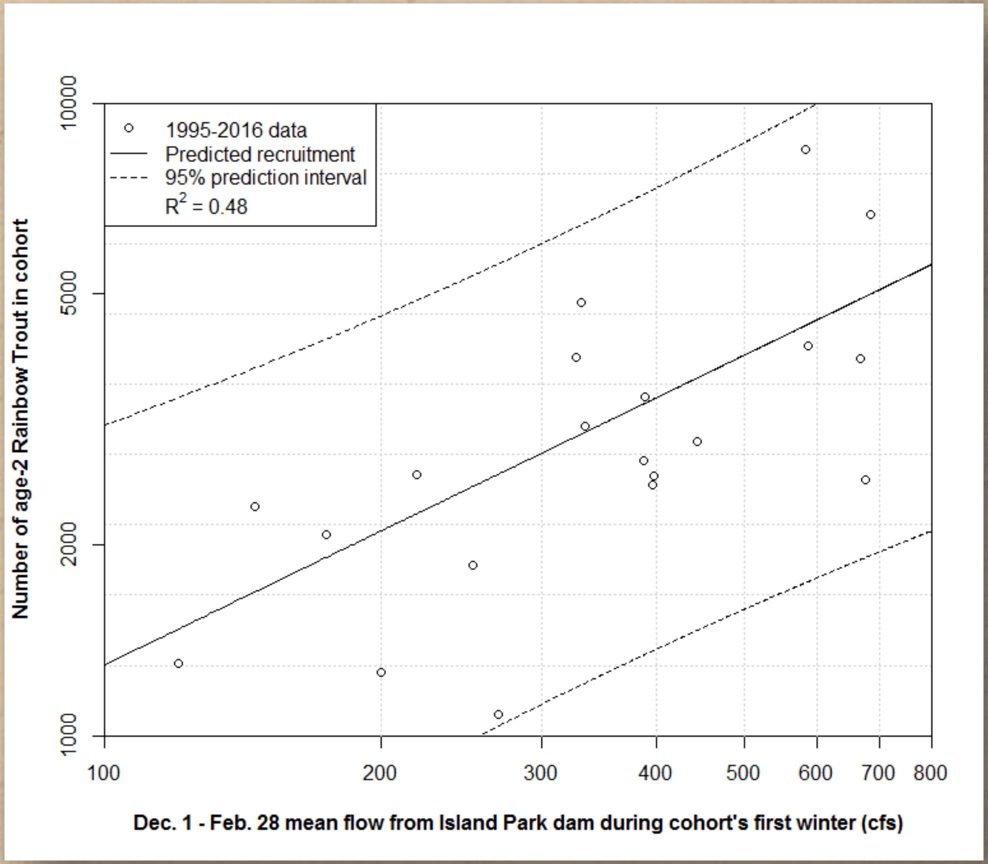
Updating a 20-year data set: trout recruitment and flow downstream of Island Park Dam

Bryce Oldemeyer

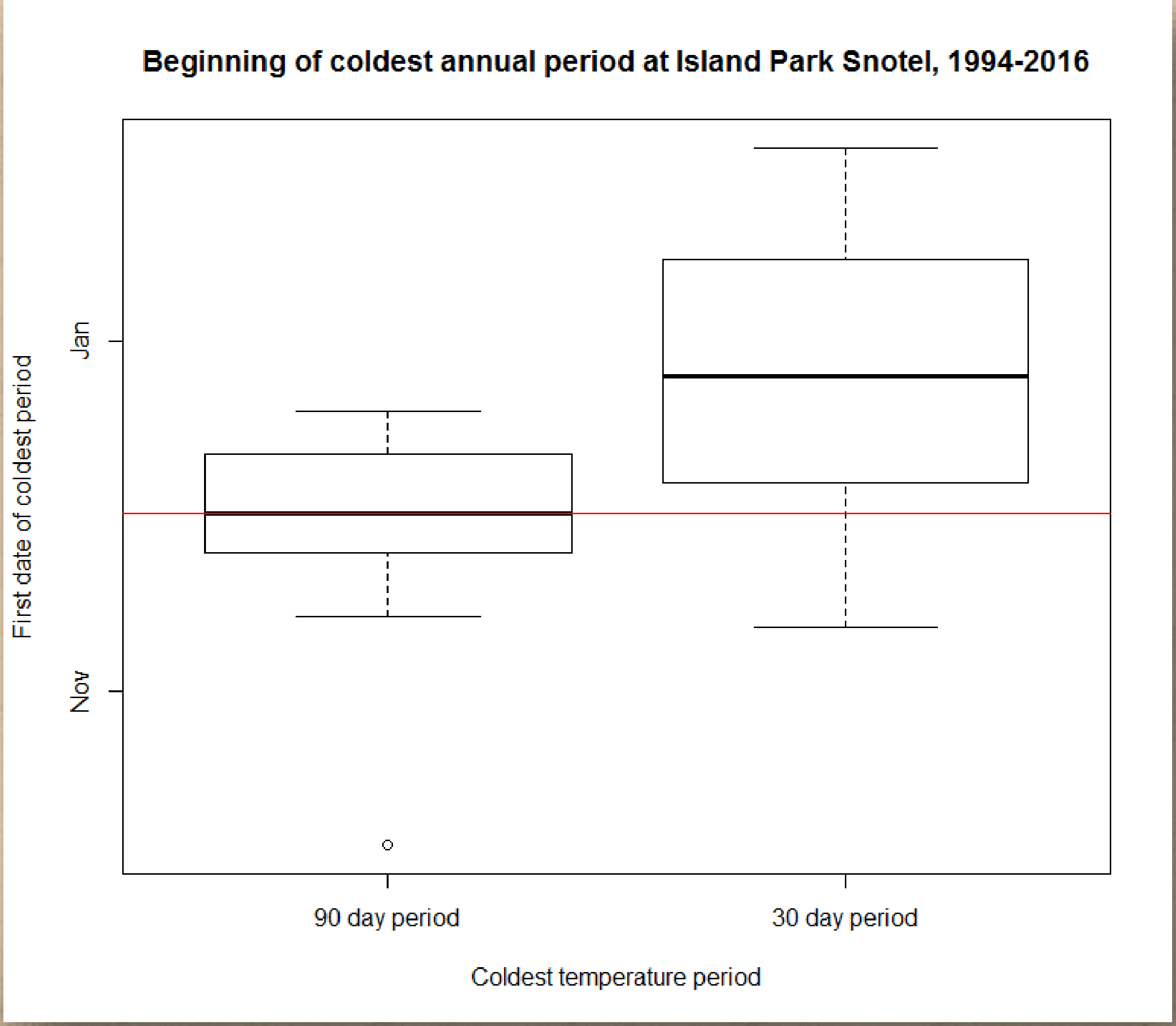
Introduction



Introduction



Coldest annual period



Predictor variables

- Composed a list of predictor variables for modeling:
  - Spawning mean flow (March 1 - May 30)
  - Fry emergence mean flow (May 1 - June 30)

  Early life-stage

  - Mean flow October 1 - November 30
  - Mean flow over coldest 90 day period
  - Mean flow over coldest 30 day period
  - Mean flow December 1 - February 28
  - Mean temperature during coldest 30 day period

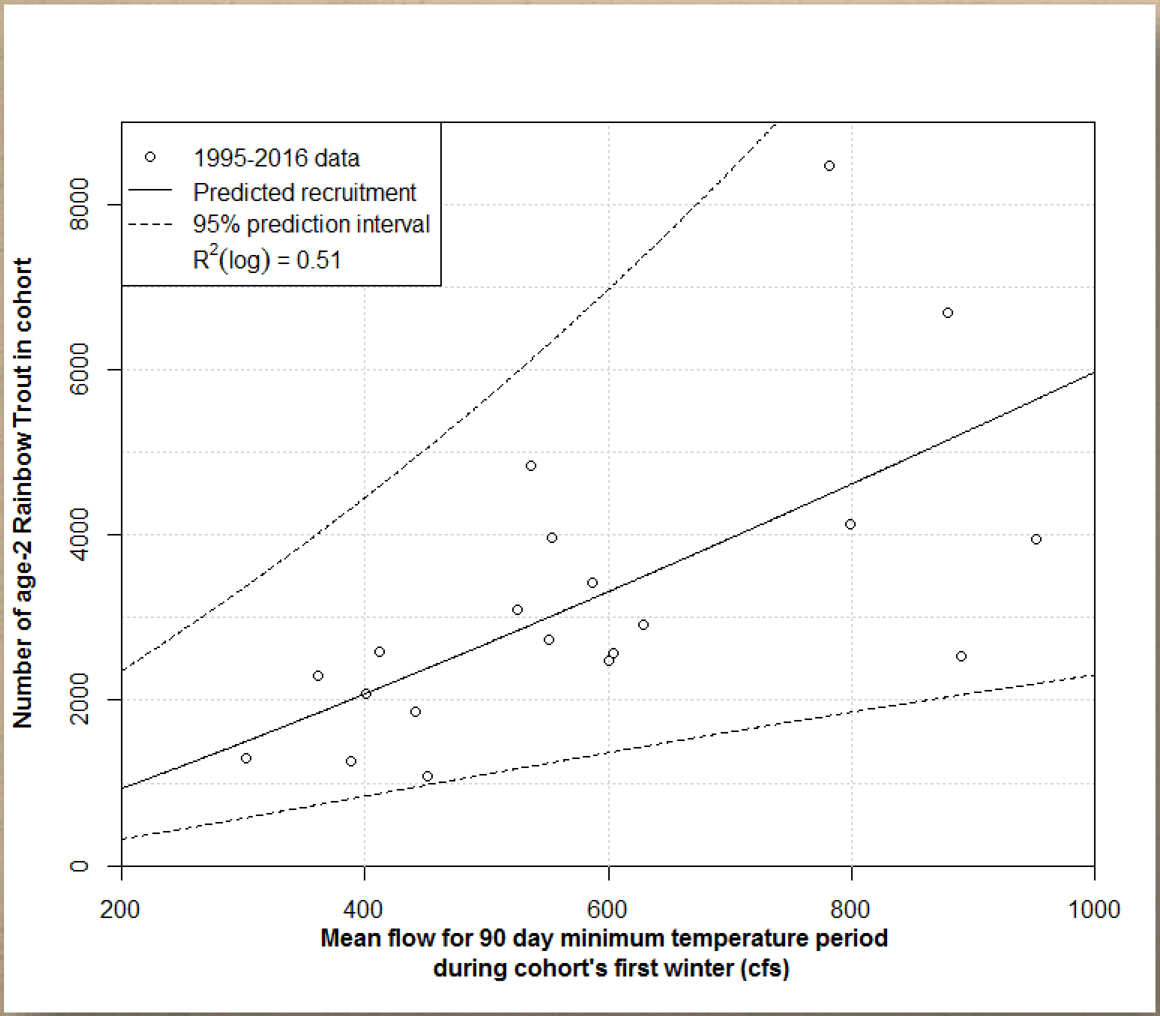
  First winter

  - Mean flow during second winter over coldest 90 day period

  Second winter

- In addition, we added Buffalo River mean flows during the same time period

Results



- Top models included Buffalo flow
- Top model:
  - Coldest 90 day mean flows (+)
- Next models include:
  - Spawning (-)
  - Temperature (+)

Summary

- Buffalo River flow contribution is important
- Coldest 90 day period is the best predictor
- December 1 - February 28 period is great for general management purposes
- Beginning to tease out other potentially important variables

Questions?

HFWC meeting, March 1995