

Little fish big river – dam operations and fish life history

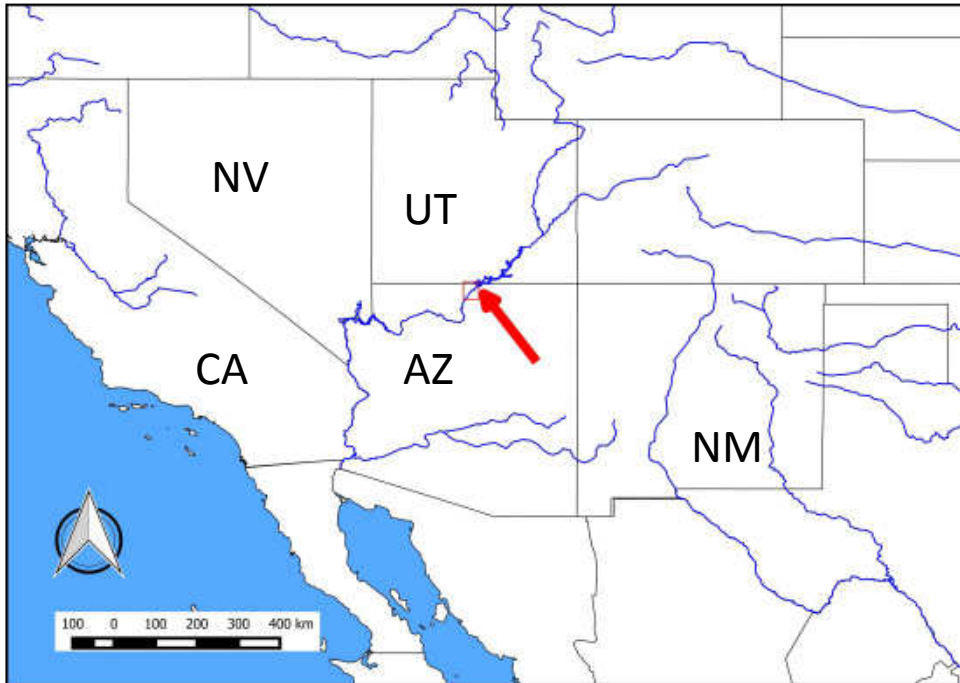


David L. Rogowski

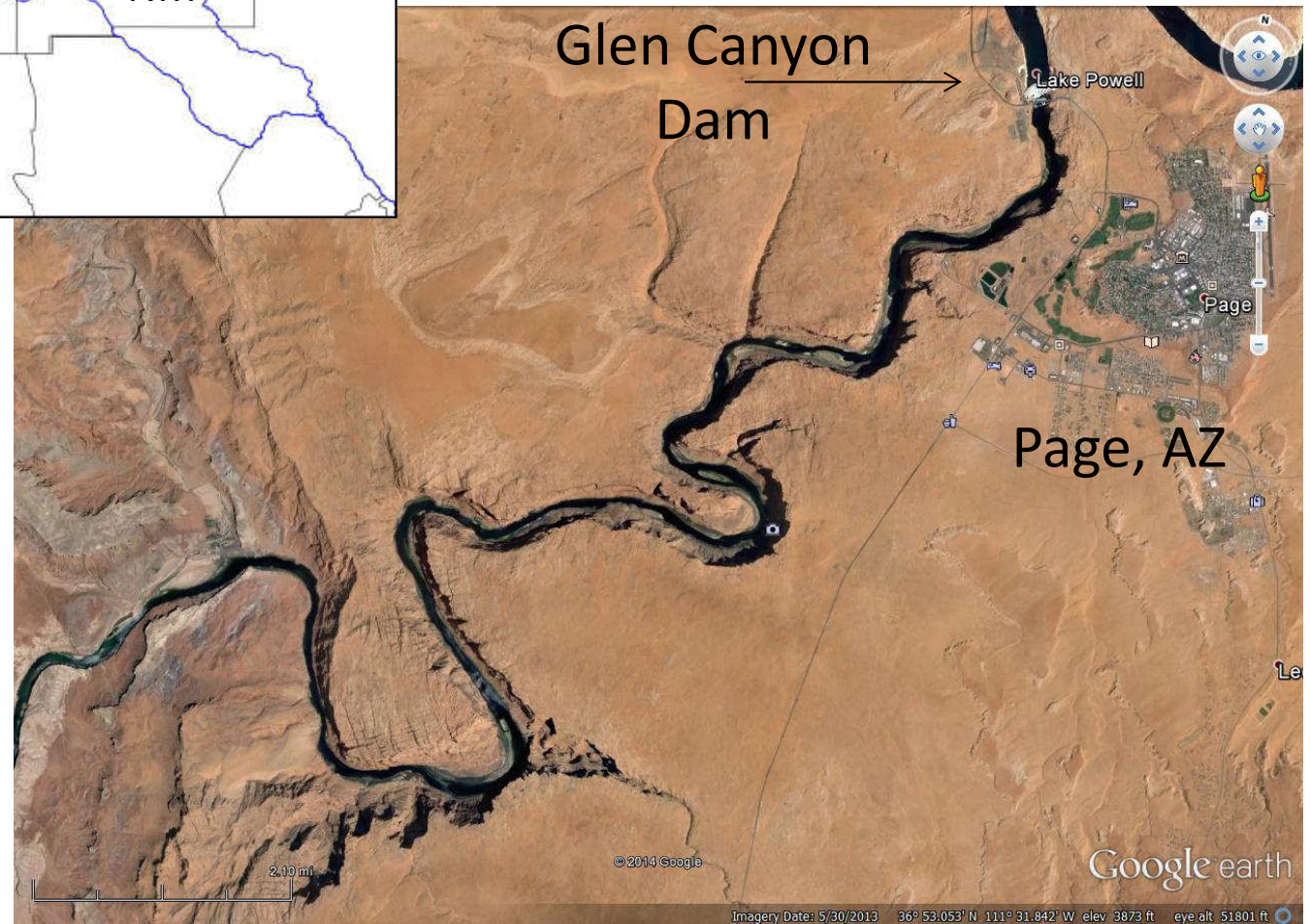
Arizona Game and Fish Department



Lees Ferry fishery Colorado River (30 km)



Cold tailwater
fishery Rainbow
trout
(*Oncorhynchus
mykiss*)



Lees Ferry
rainbow trout
*Oncorhynchus
mykiss*



~1978
Wayne Gustaveson



OCT 6 -7 1982; Larry Sneith holds a 15-pound rainbow trout he took at Lee's Ferry.;

Credit: Charile Meyers / Contributor



Average size rainbow trout currently (2000-2014)

<http://azwanderings.com/wp-content/uploads/Rainbow-3-1024x768.jpg>

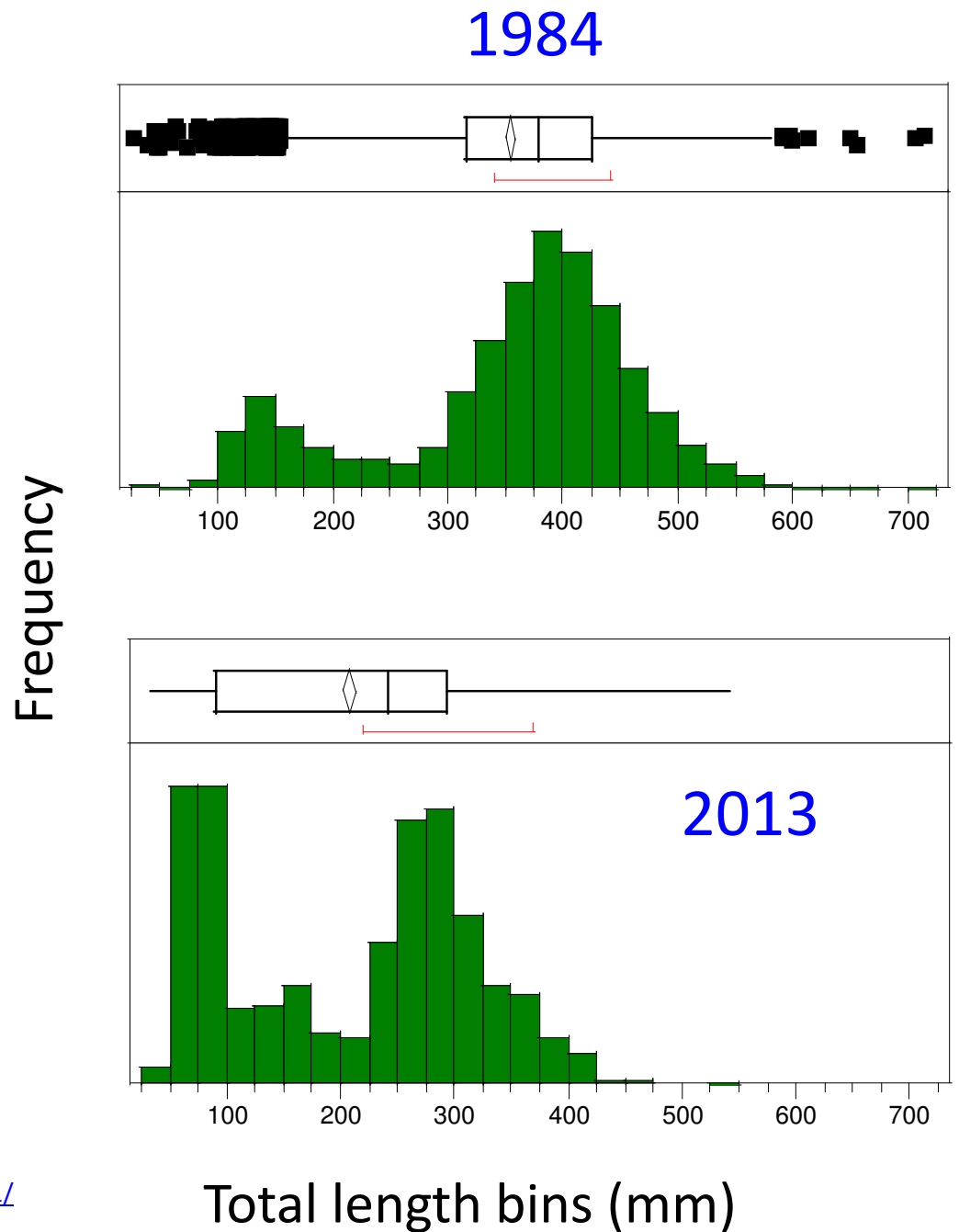


http://azgfd.net/artman/uploads/1/Lees_Ferry_Trout_1.JPG

Length Frequency histogram (electrofishing Fall)



<http://azwanderings.com/arizona-fly-fishing-lees-ferry-day-part-1/>



Lees Ferry Sampling

- Creel (angler) surveys year round
- Electrofishing: 3 trips (spring, summer, fall)
 - Stratified random sampling



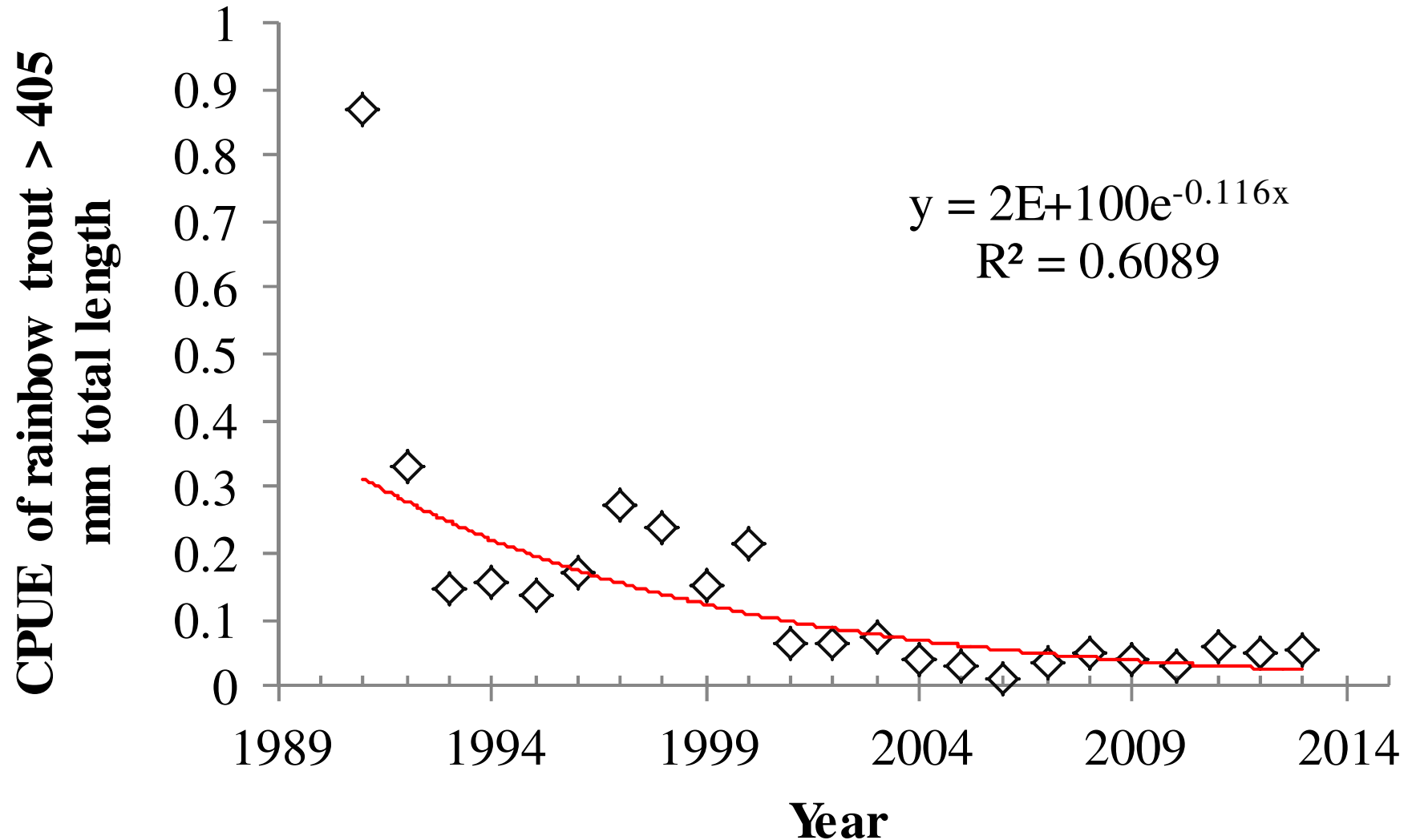
Photo. by Lisa Winters 2014

Problem

- larger fish were caught in the past – and not now, why?
 - Harvested (caught by fishermen: selected against)?
 - Natural mortality (disease, old age...)?
 - Density?
 - Lack of food?
 - Current rainbow trout strain grows slow?
 - Environmental factors (flow, ...)?

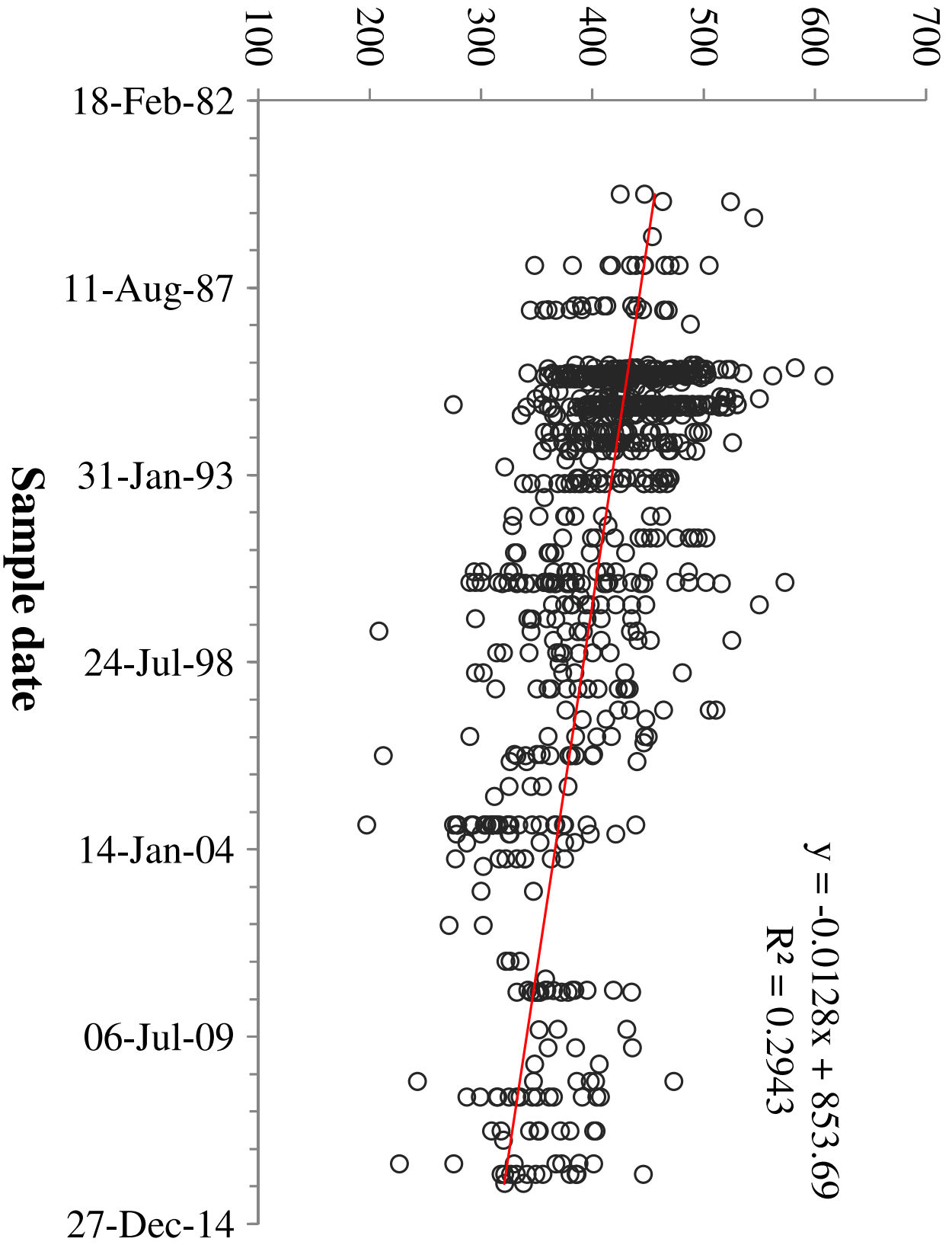


Decline in catch per unit effort (CPUE) of rainbow trout > 405 mm



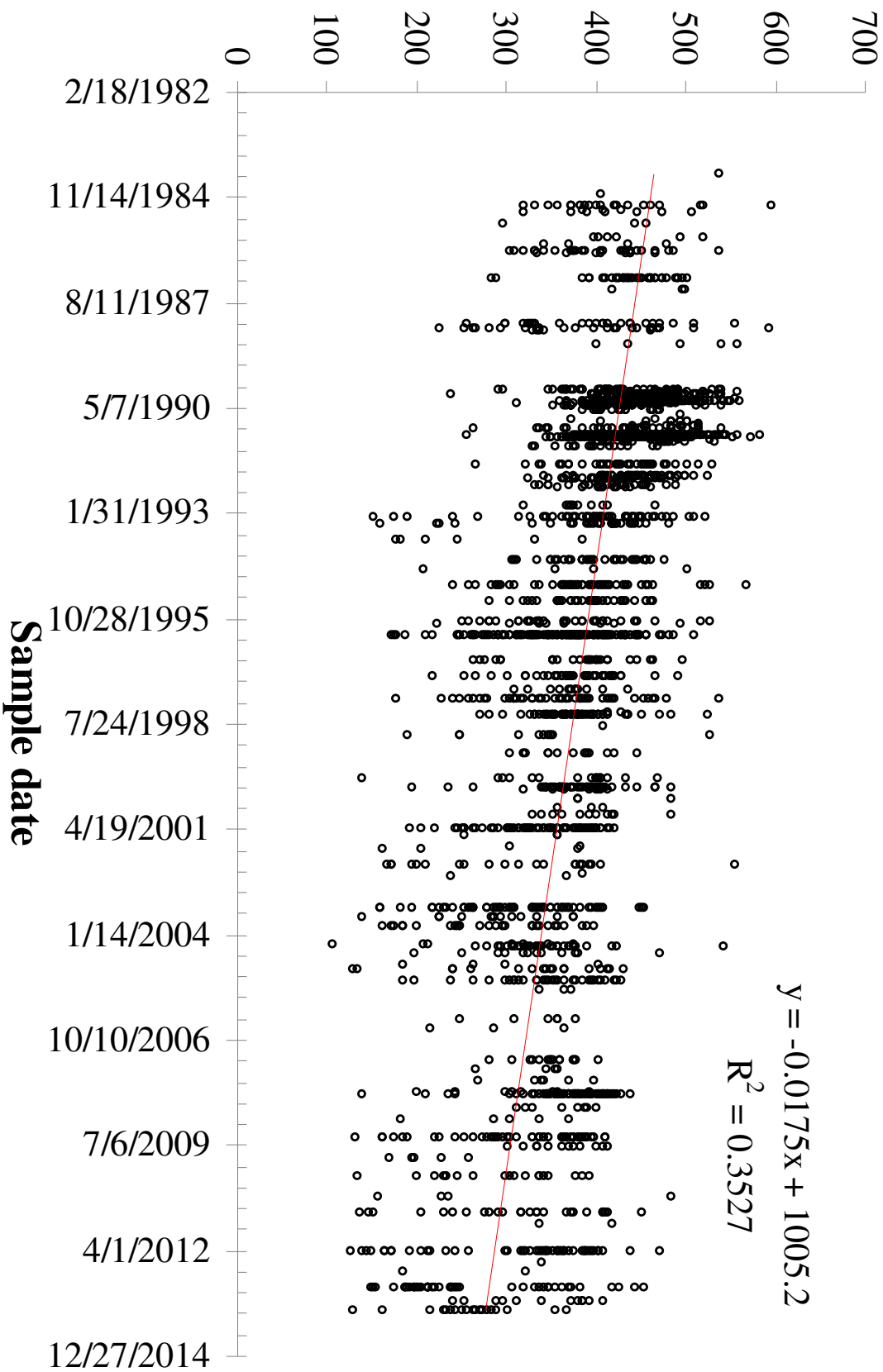
Lees Ferry ripe female rainbow trout

Total length (mm) of ripe female rainbow trout (expressed eggs)



Lees Ferry ripe male rainbow trout

Total length (mm) of ripe male rainbow trout



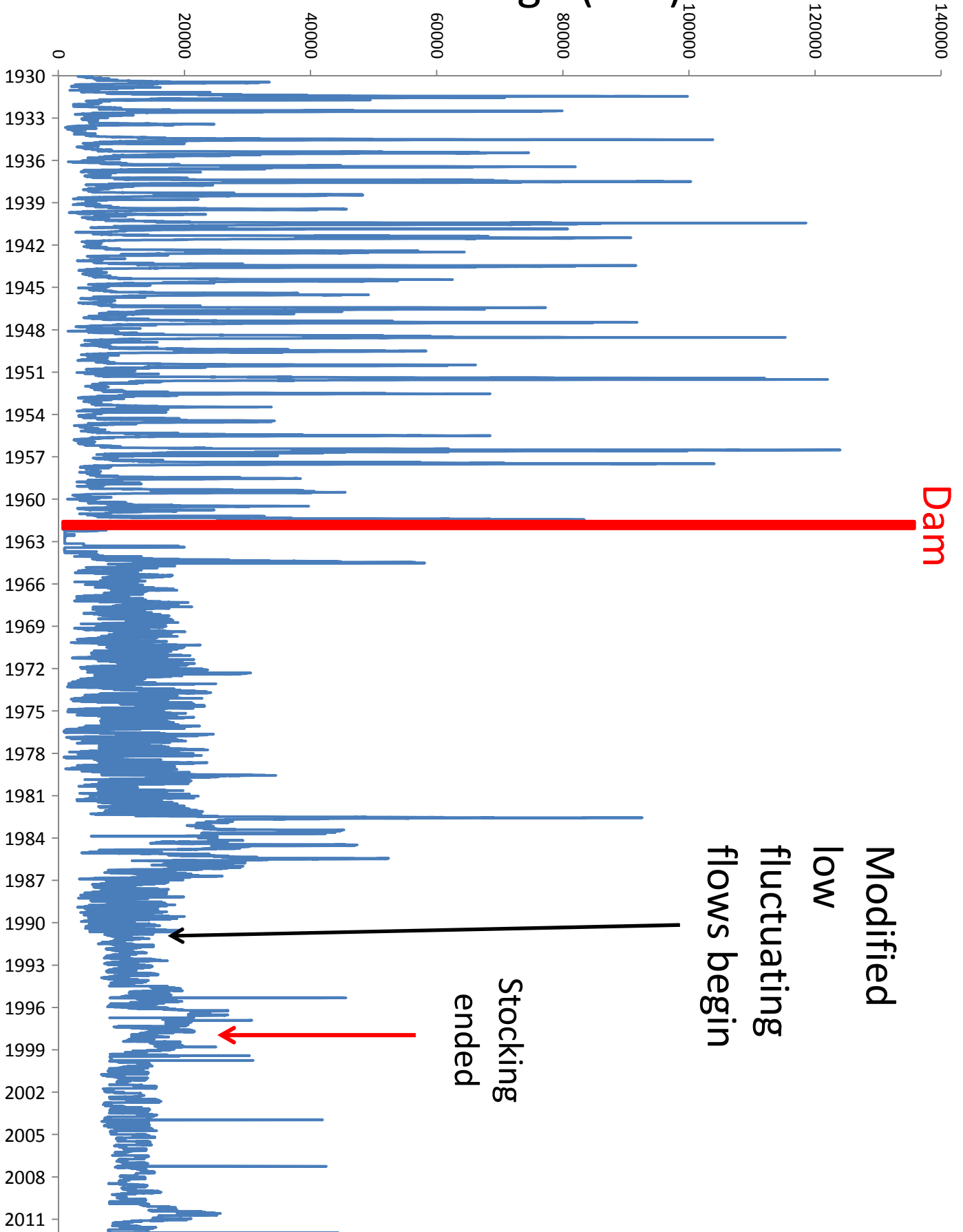
Reasons for smaller reproductive size

- Smaller fish are more successful at Lees Ferry- Why?
 - **Food limited:** gain weight, length and reproduce.
 - **Selective advantage:** no benefit to delay maturation and grow to a large size
 - **Dam flow regime:** less variable than in past, steady consistent conditions allow for reproduction to occur every year

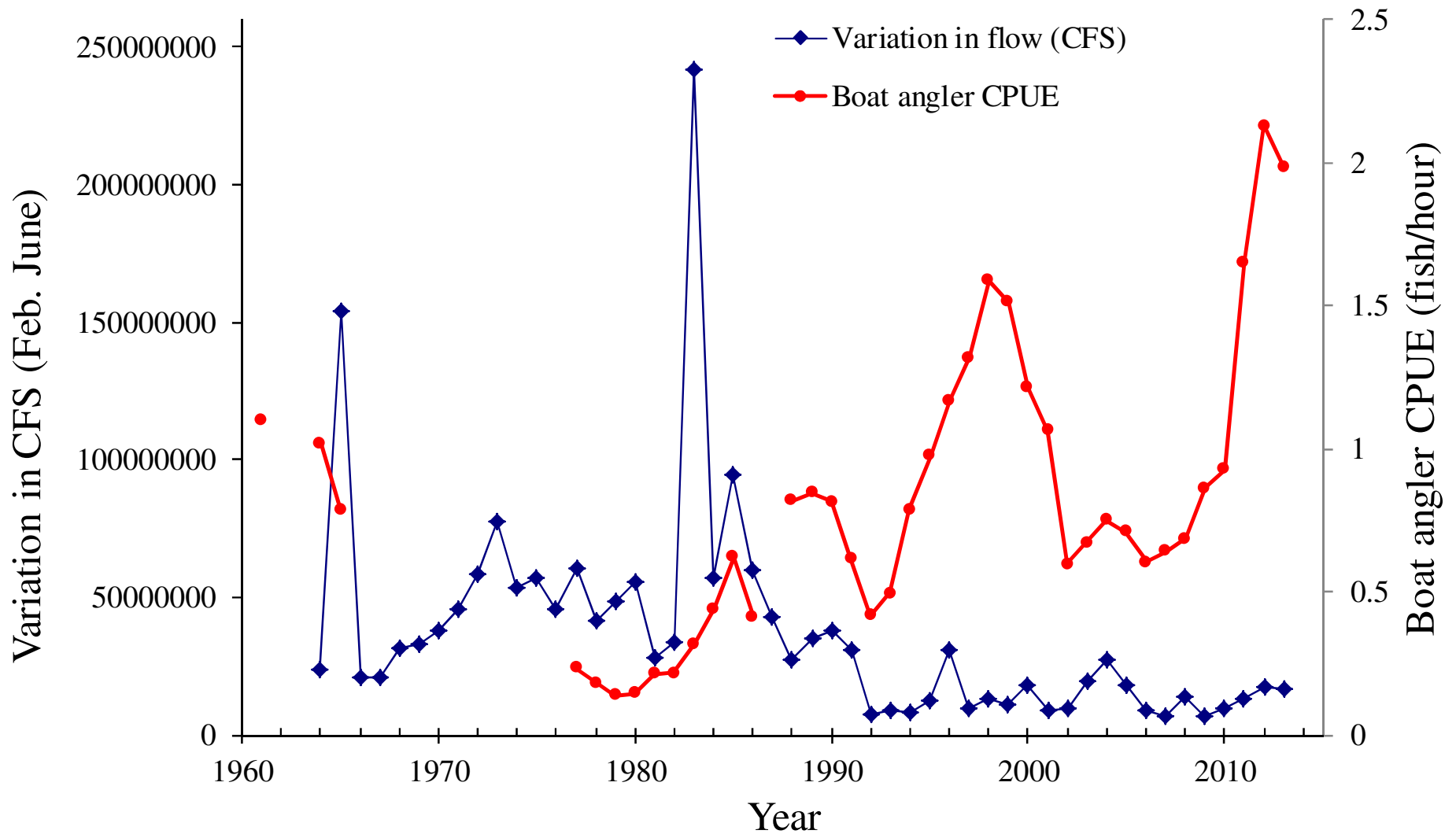


<http://www.ecogrow.ca/Aquaculture/images/small-Rainbows%5D.png>

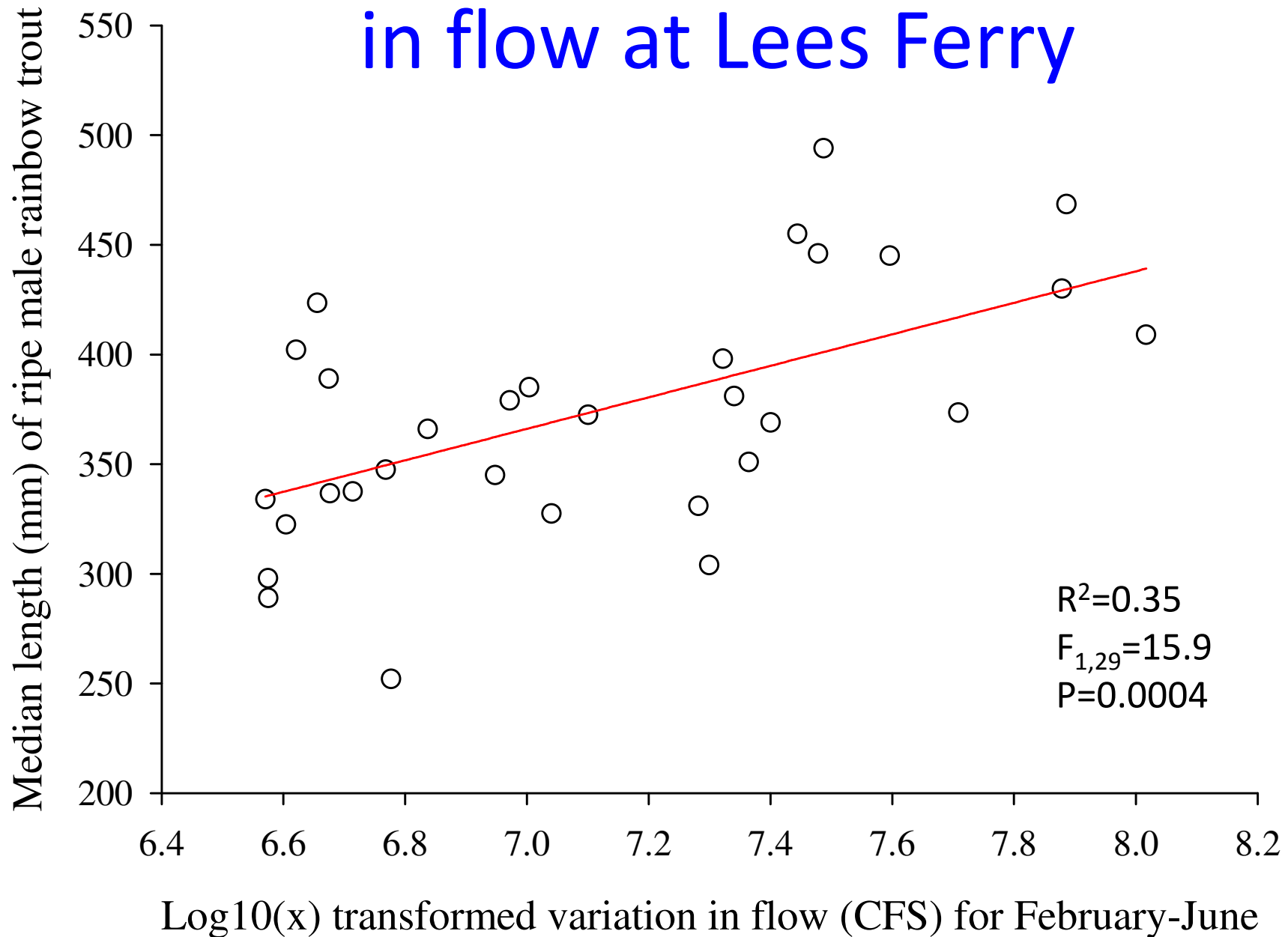
Discharge (CFS)



Boat angler CPUE and variance in flows (Feb.-June)



Size at reproduction and variation in flow at Lees Ferry



What can be done?

- If you want larger fish...
 - Stock fish
 - Triploids
 - Different strains
 - **change the selection pressure**
 - How? Is it possible?
 - Larger fish that reproduce at larger size:
 - difficult in an aquaculture and laboratory setting, let alone in a river



Stocking

- Triploids vs. diploids
 - Most studies showed no difference or less growth or size in actual field studies comparing triploid and haploid (normal) rainbow trout
 - Usually higher catch rates (creel returns) for triploids

- Different strains
 - Laboratory and aquaculture studies not very conclusive



If you want larger fish at Lees Ferry!



- **Change selection pressure** on life history characteristics
 - Optimize selection so that larger and older fish have an evolutionary advantage



How to change the selective pressure?

- Selection for fish to live longer and mature later (larger size)
 - Increase mortality of juveniles
 - Predators
 - Modification of flows
 - Increase variation in reproductive success



Downsides

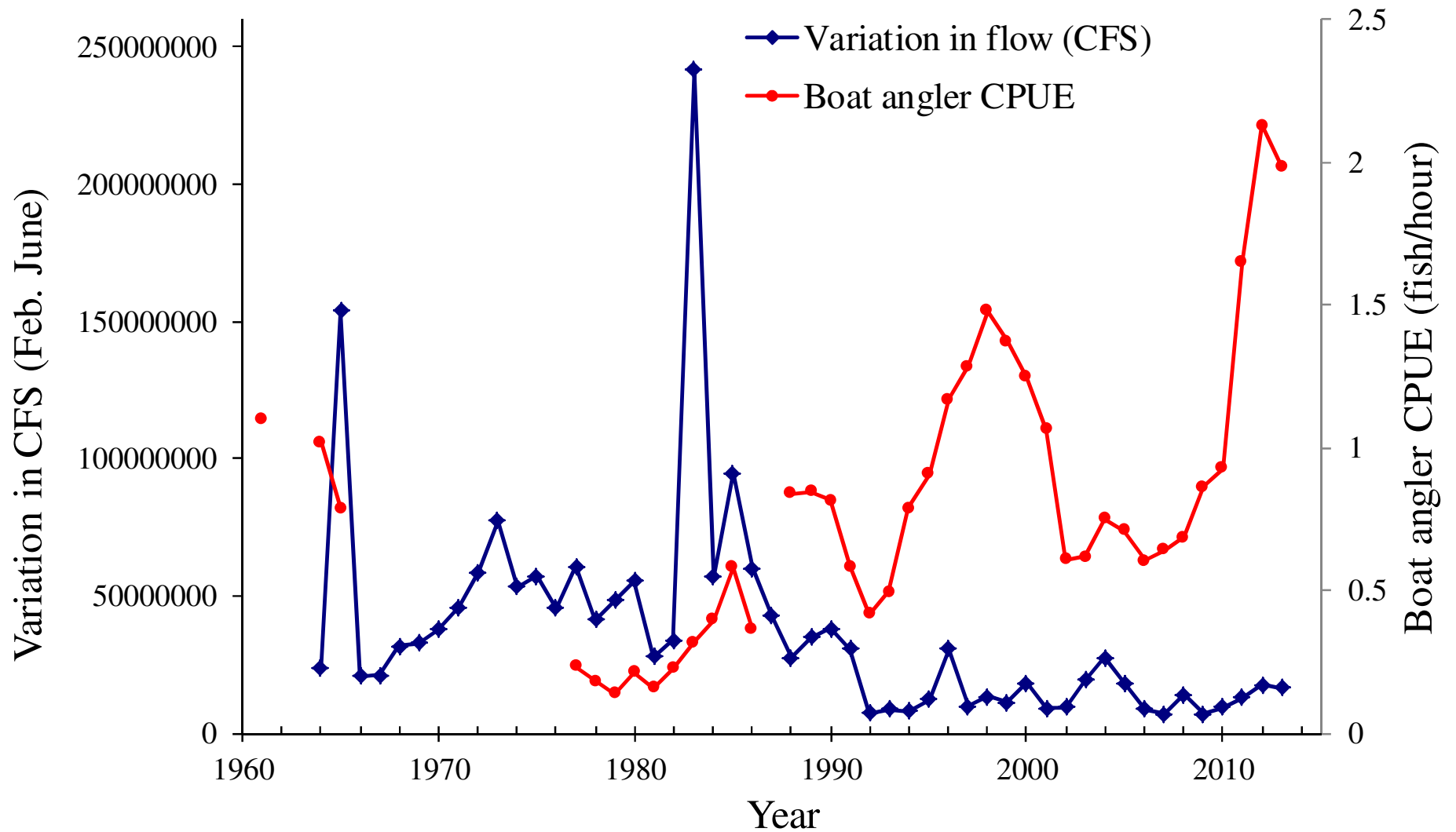
- Daily variation in flows back to historical levels (range of 15-25,000 cfs per day) during spawning season? **NOT LIKELY**
- Less fish (lower CPUE): most anglers want to catch more fish than a few large fish.



https://rrfw.org/RGCwiki/images/a/a5/Lee%27s_Ferry_1983.jpeg



Boat angler CPUE and variance in flows (Feb.-June)





Acknowledgements

- AZGFD: B. Stewart, L. Winters, R. Osterhoudt, P. Wolters, K. Manuell, A. Bunch, M. Anderson, D. Peterson, A. Makinster, S. Rogers, W. Lemon, R. Fullmuth, M. Mishler, and many others...
- USGS-Grand Canyon Monitoring and Research Center (GCMRC)
- Numerous volunteers
- Numerous boatmen:
 - USGS-GCMRC
 - Humphrey's Summit
 - St. Judes LLC.
- Steve Harding



Questions?

Variation in flow related to boat angler CPUE

