

Henrys Lake "Status of the fishery"



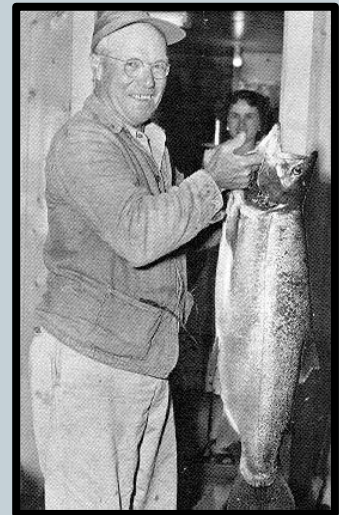
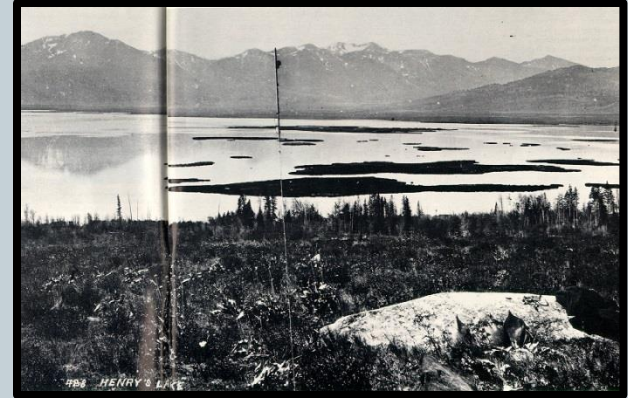
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Idaho Department of Fish and Game
Upper Snake Region



Henrys Lake fishery



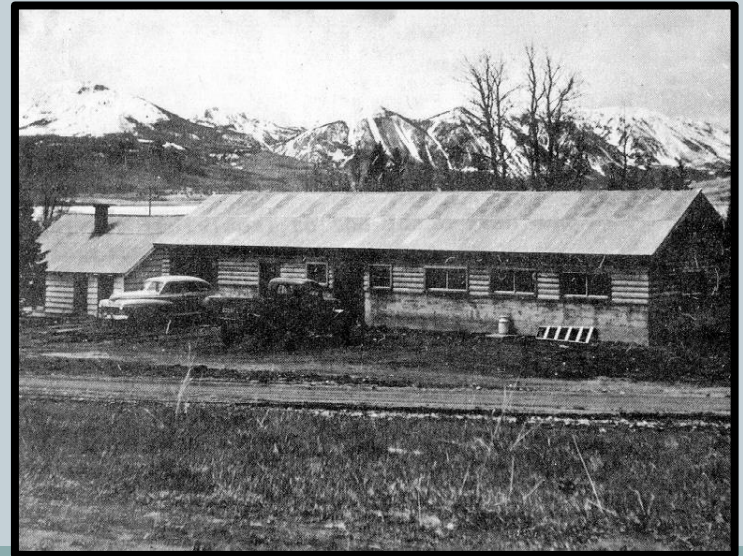
- Recreational fishery since the 1800's
- Quality fishery capable of producing trophy trout
- Most popular lentic fishery in state
 - ~190,000 h annual angling effort



Henry's Lake fishery



- Dam constructed in 1924 for irrigation storage capacity
- Hatchery built 1924
- Stronghold for native Yellowstone cutthroat trout
- Sterile Hybrids (cutthroat x rainbow) & Brook trout



Fish Management objectives

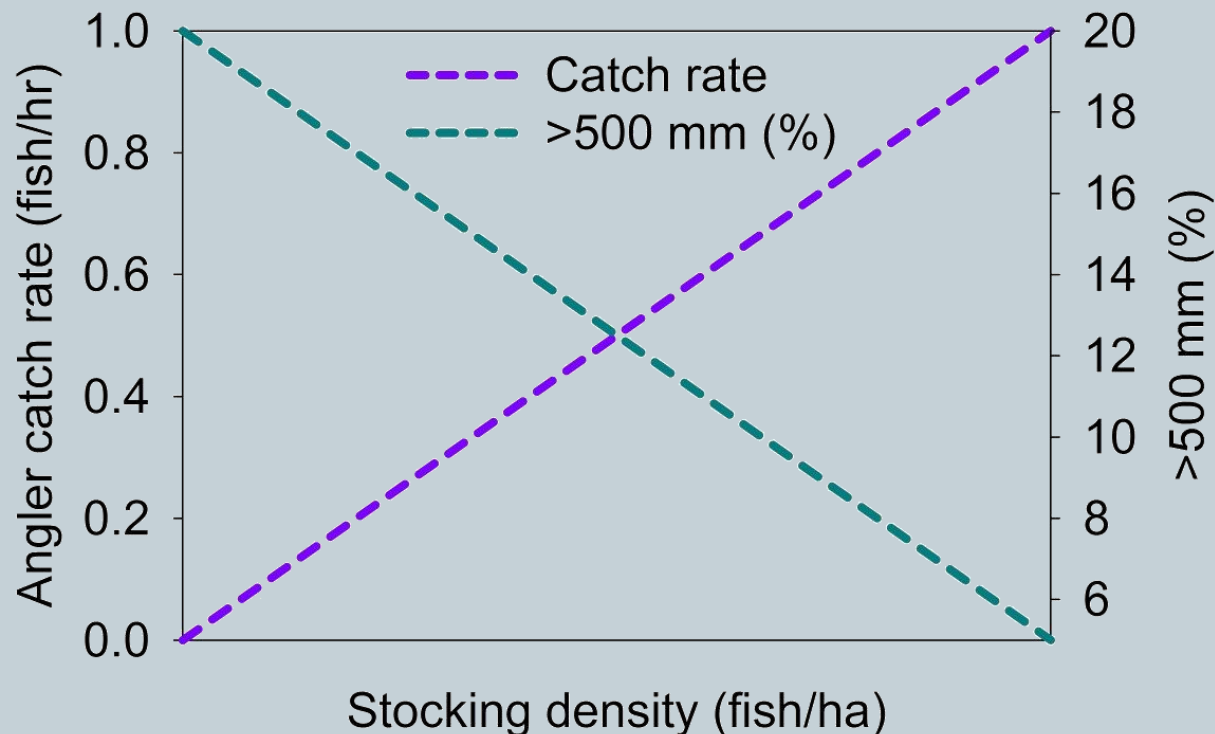
- Annual spring gillnetting effort - 50 nets
 - 11 trout per gillnet set
 - ✦ Index of trout abundance
 - ✦ Adjust stocking based on numbers
 - 10% cutthroat >20"
 - 20% hybrids >20"
 - 5% brooks >17 "
- Catch rate of 0.7 fish/hr
 - Creel surveys



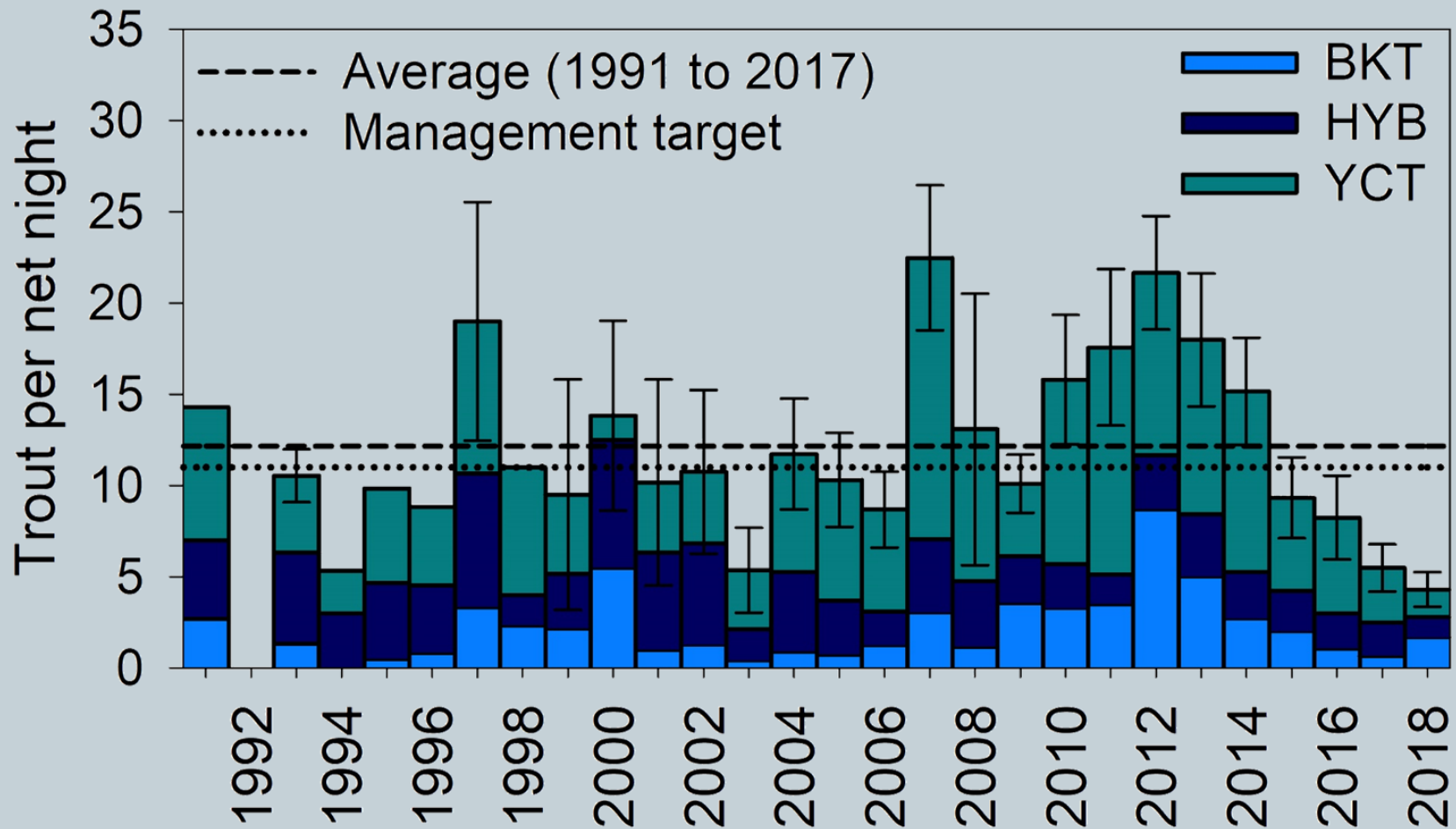
Catch rate vs size



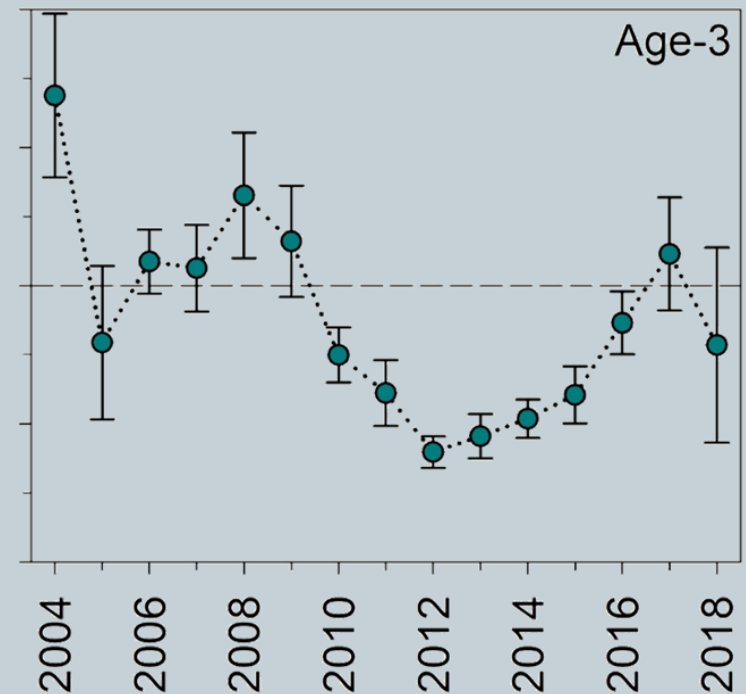
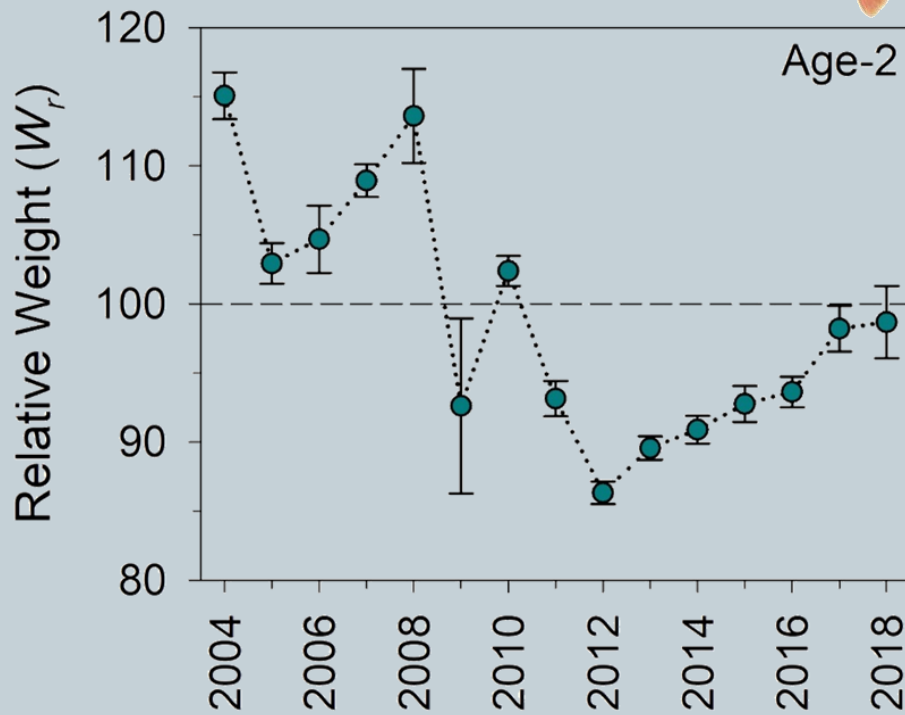
- Fisheries management attempts to provide good catch rates with adequate size



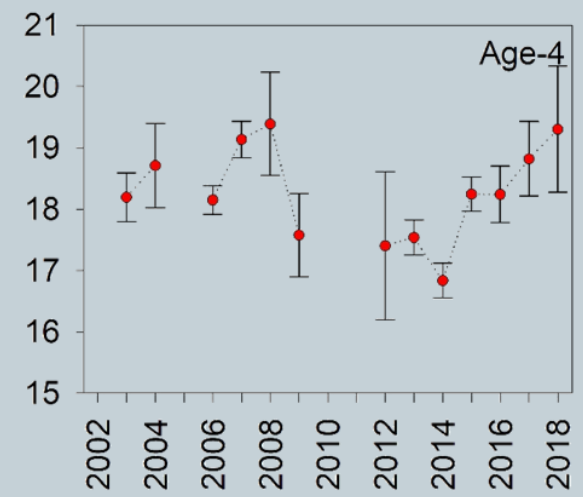
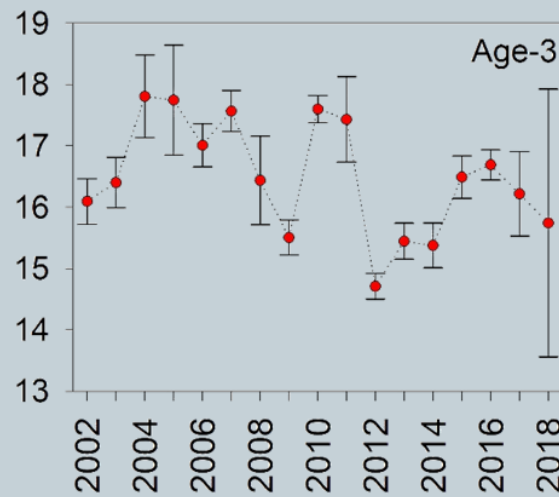
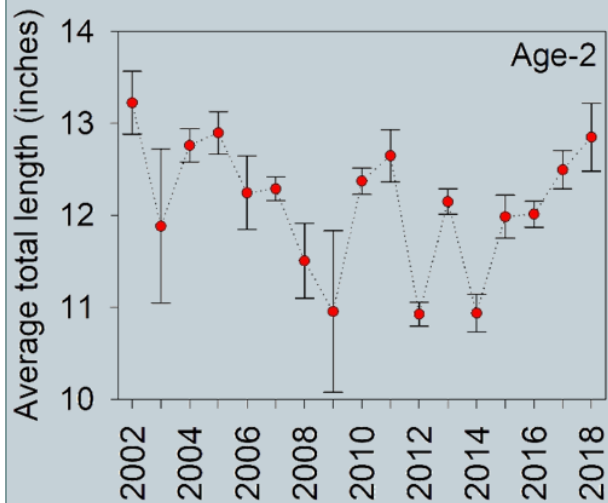
TRT CPUE



YCT - Condition "Fatness"



YCT - Length-at-age

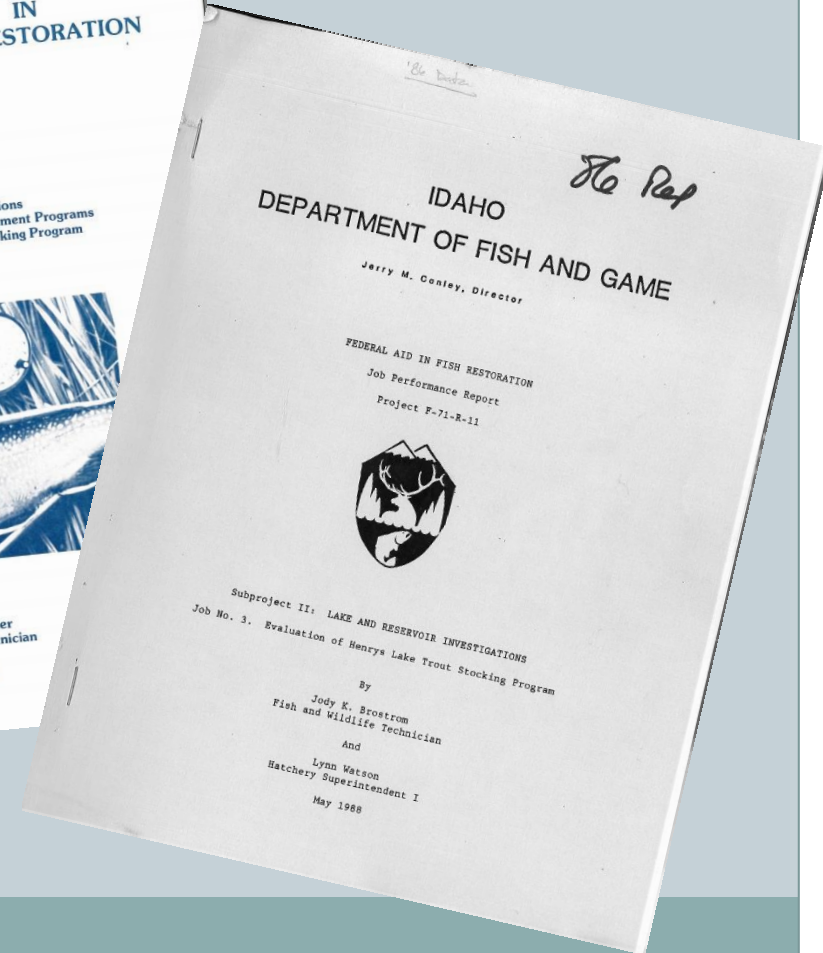
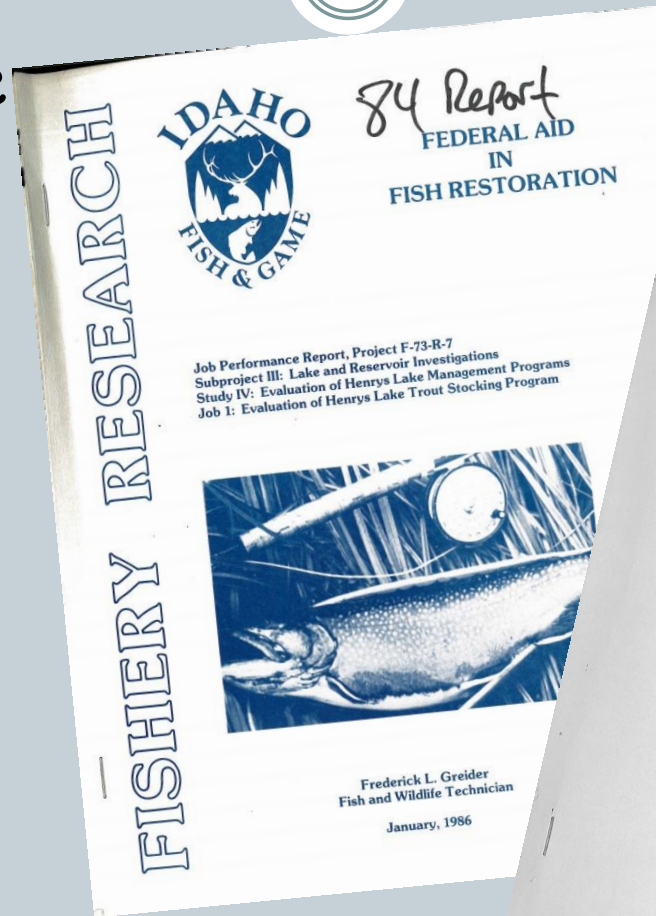


Historic length-at-age

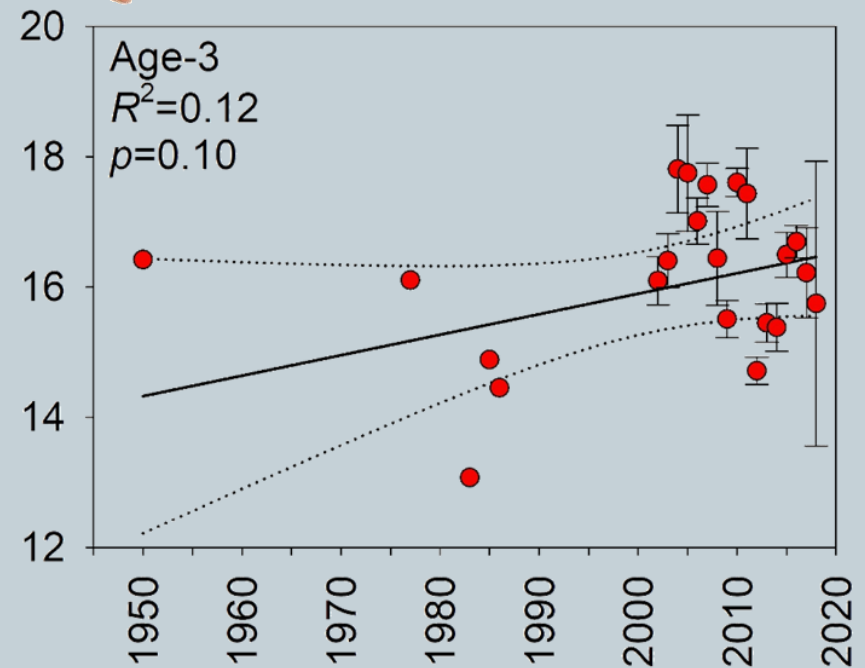
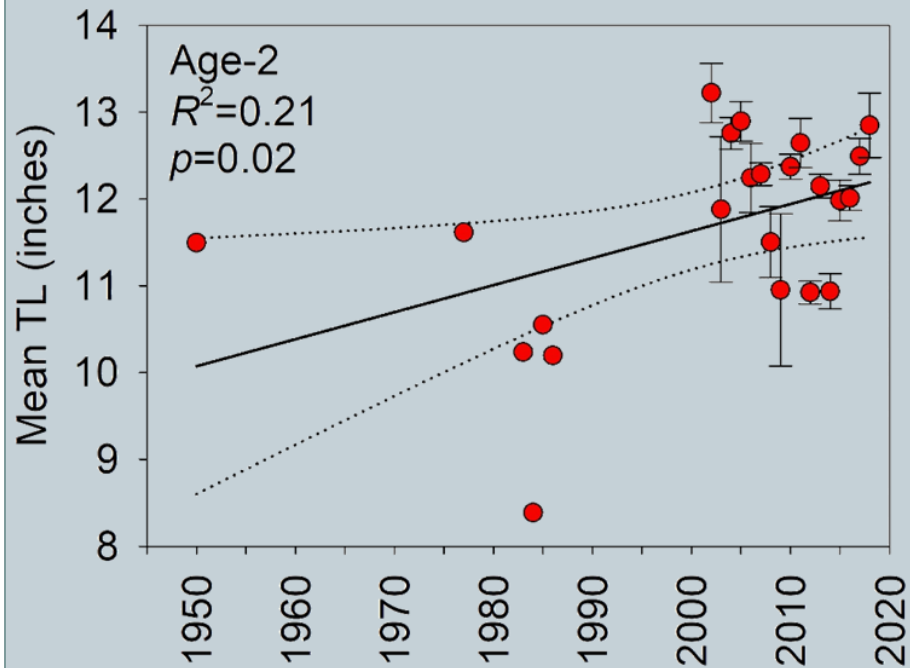
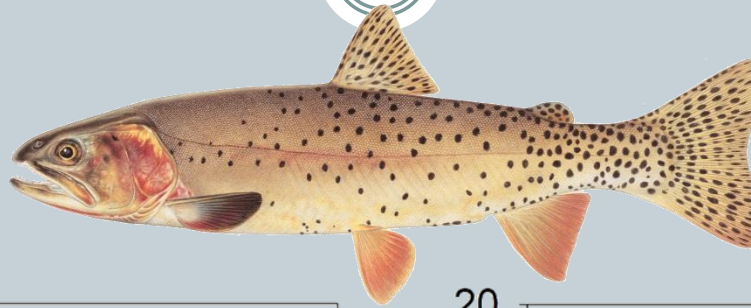
- Estimated age

- Scales

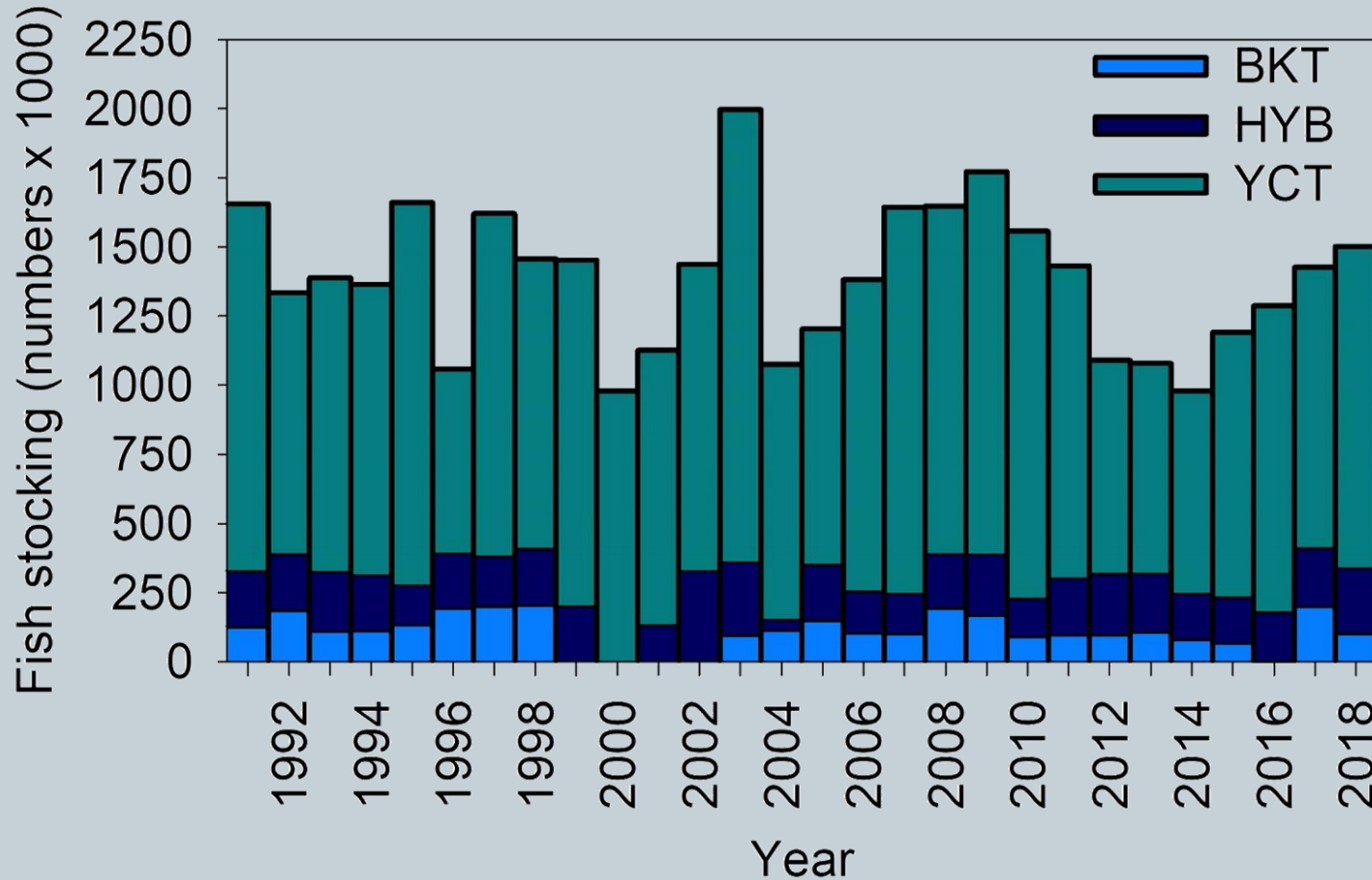
- 1950
 - 1977
 - 1983
 - 1984
 - 1985
 - 1986



YCT - Length-at-age



Stockings

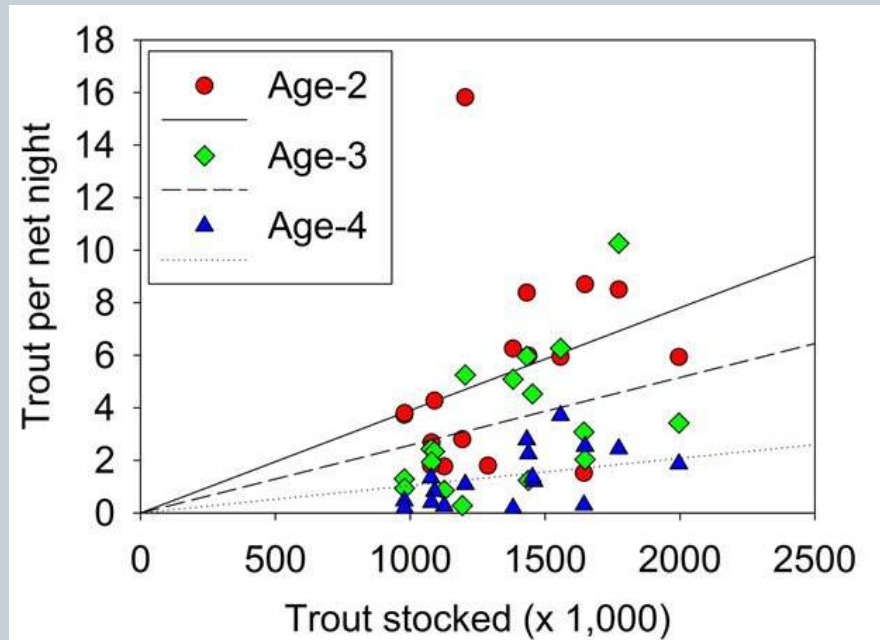


2018
BKT: 104,973
HYB: 237,538
YCT: 1,160,412

Stocking rates and conditions



- Aging data with CPUE from 2002-present
- Using regression equations
 - Estimated
 - ✦ 9.1 trout per net
 - Observed
 - ✦ 4.3 trout per net



Age-2
 $R^2=0.08$

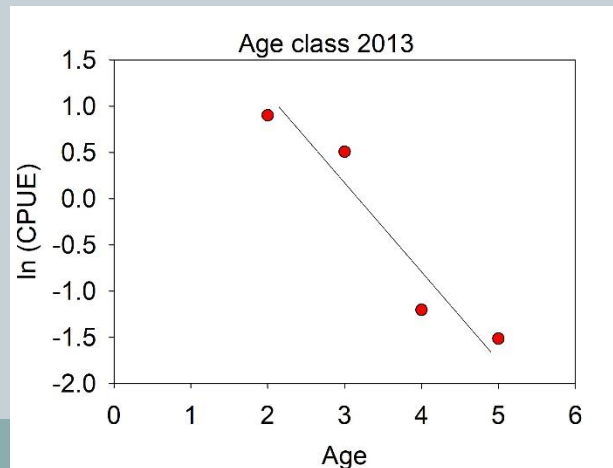
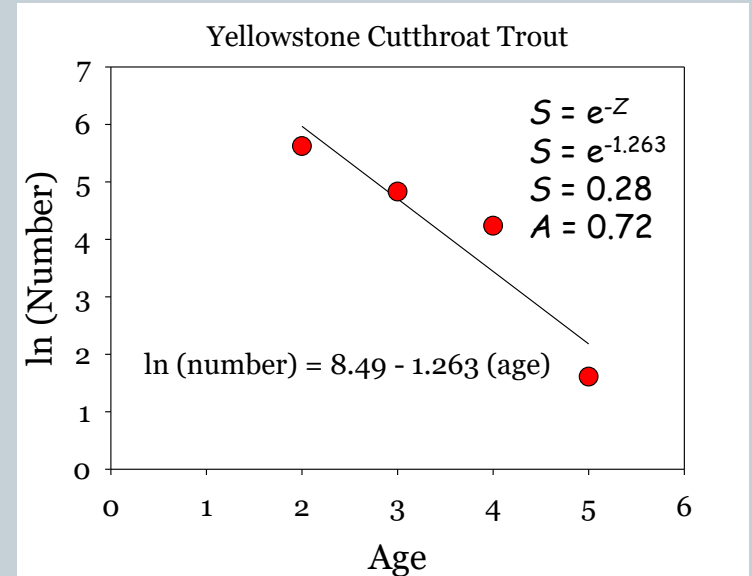
Age-3
 $R^2=0.23$

Age-4
 $R^2=0.24$

Mortality rates



- Catch curve
 - Use linear regression to estimate the slope parameter (i.e., Z)
 - Number by age
- Cohort
 - Catch per unit effort (CPUE) by age

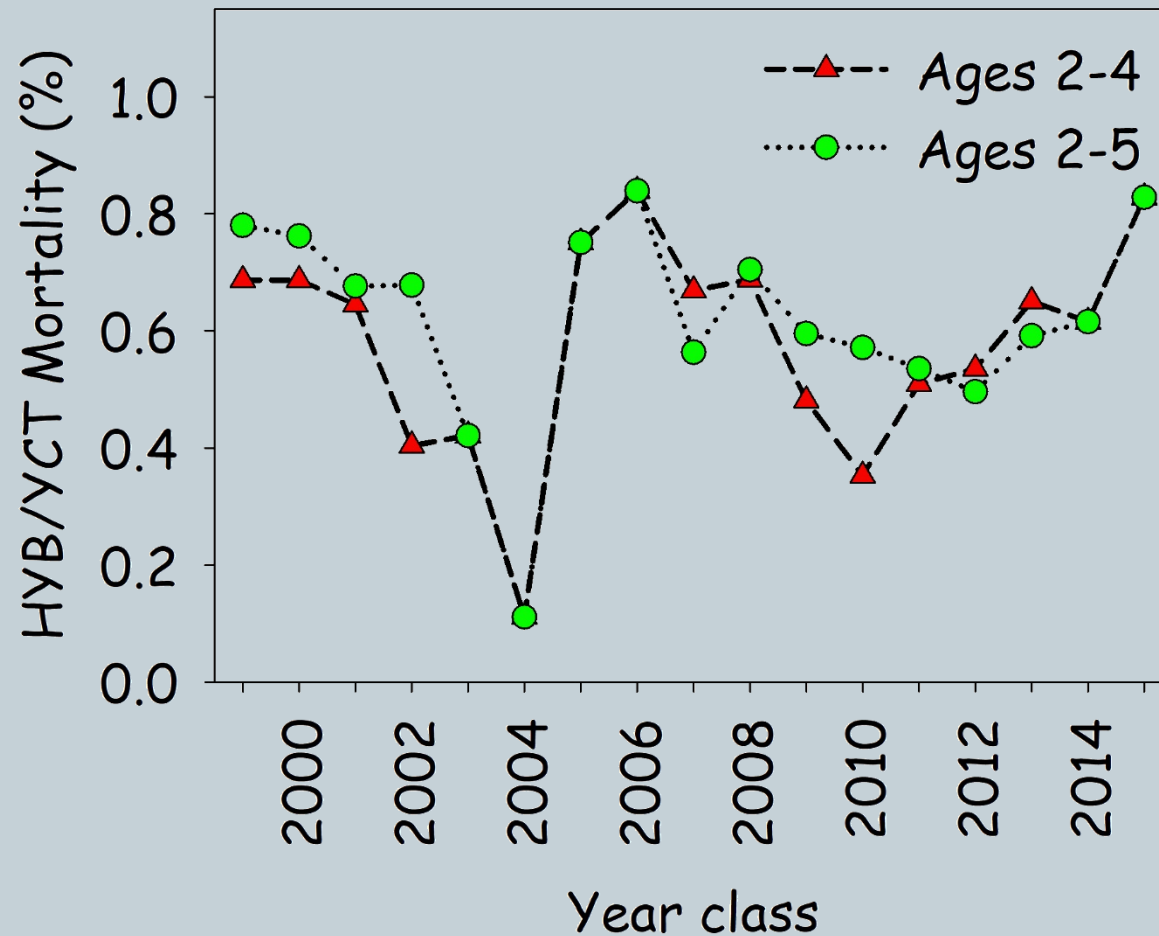


Mortality - Catch curve



AGES	AVE HYB/YCT	AVE YCT
2 to 4	0.52 (±0.14)	0.54 (±0.14)
2 to 5	0.57 (±0.10)	0.60 (±0.10)

Mortality - Cohort

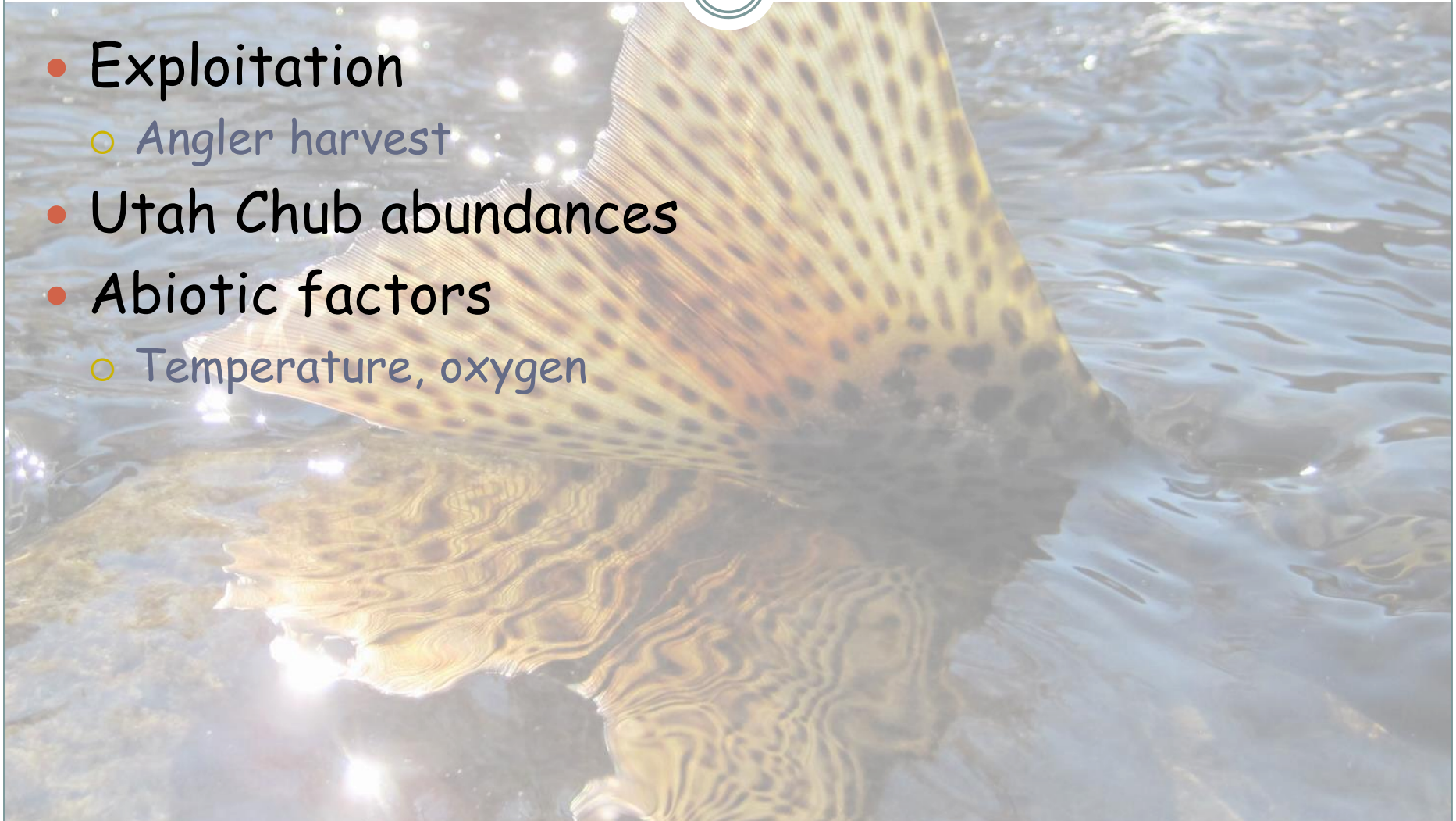


YC 2015 - 83%
Average= 58/62%

What may be influencing trout survival?



- Exploitation
 - Angler harvest
- Utah Chub abundances
- Abiotic factors
 - Temperature, oxygen



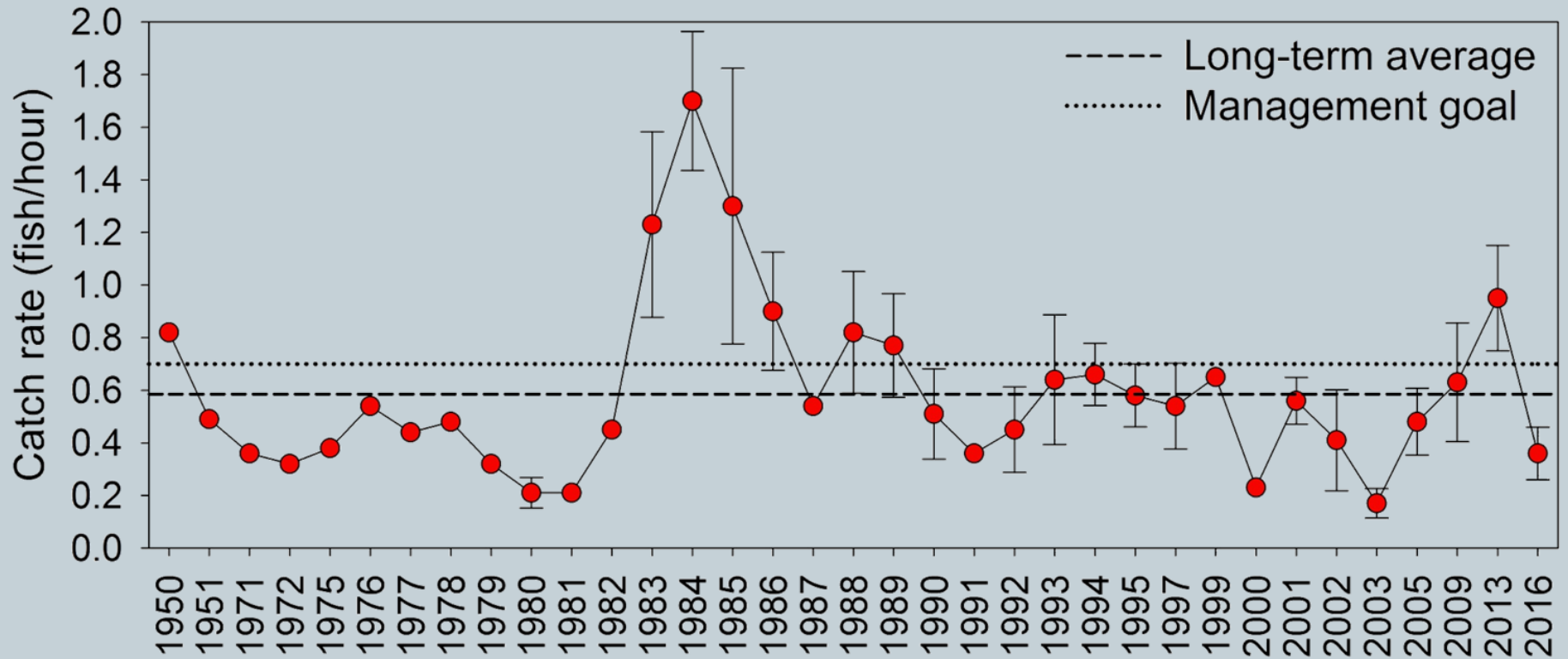
Exploitation - Creel surveys



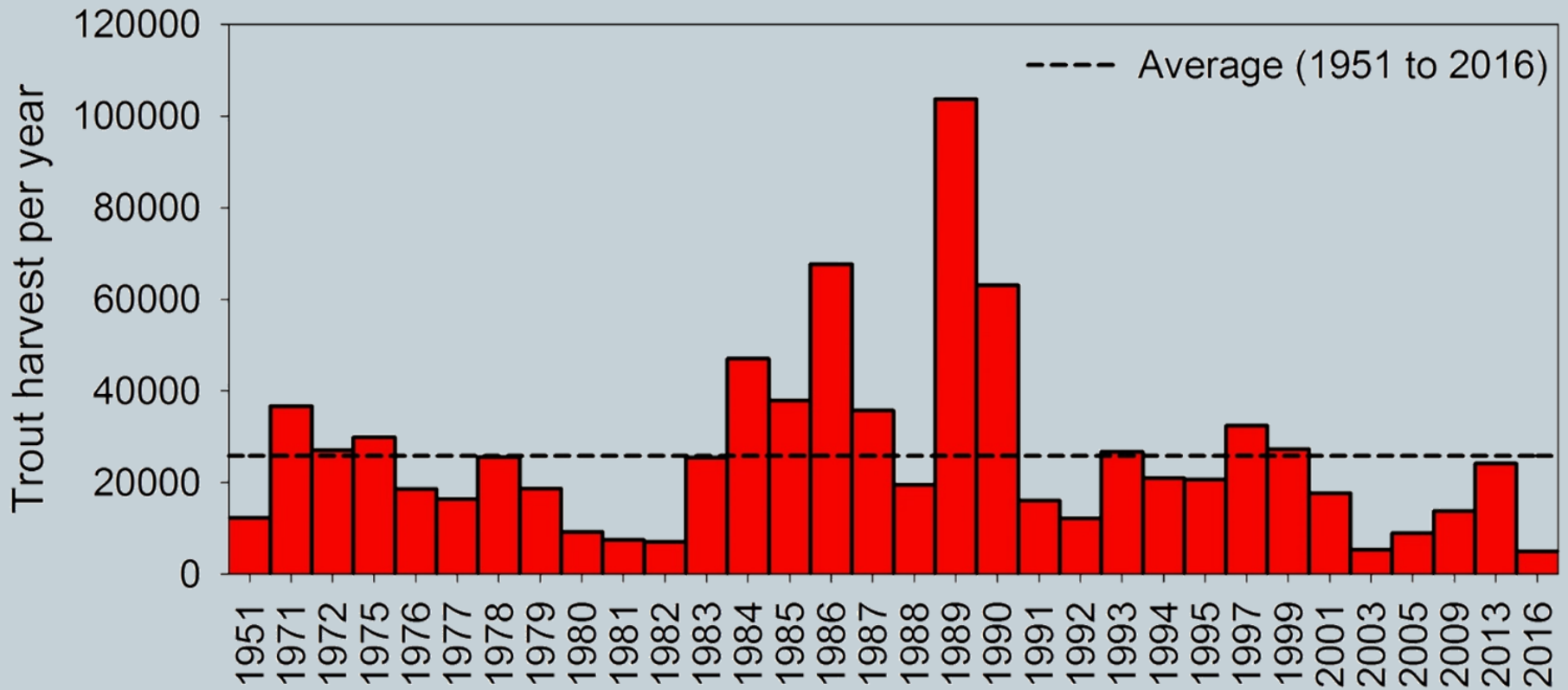
- 3 year rotation
- Last creel 2016
 - Effort
 - Catch rates
 - Harvest - Open water, ice fishery
- Creel survey in 2019



Creel - catch rates



Creel - harvest rates



Creel - Effort & Harvest

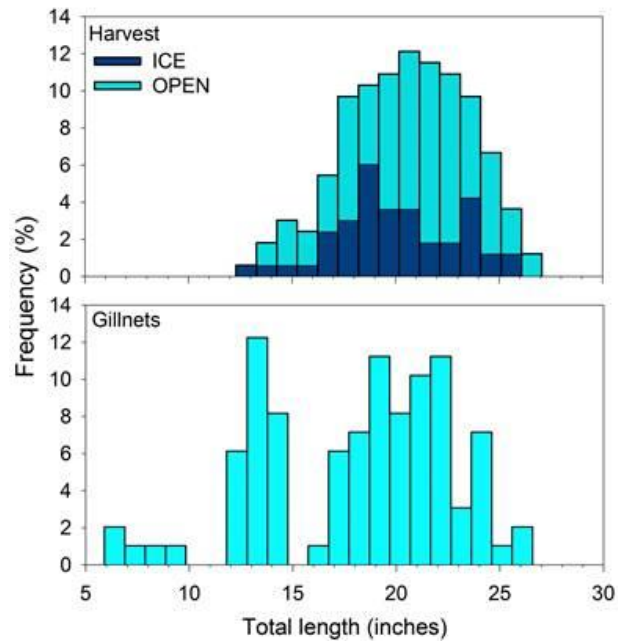


	2013			2016		
	OPENER	OPEN WATER	ICE	OPENER	OPEN WATER	ICE
Effort (hrs) (% Eff.)	20,920 (11%)	148,704 (78%)	21,833 (11%)	4,965 (7%)	61,114 (81%)	9,354 (12%)
Released (#) (% Rel.)	7,085 (69%)	124,936 (90%)	19,612 (76%)	374 (44%)	9,932 (70%)	654 (68%)
Harvested (#) (% Har.)	3,207 (31%)	14,585 (10%)	6,046 (24%)	485 (56%)	4,228 (30%)	308 (32%)

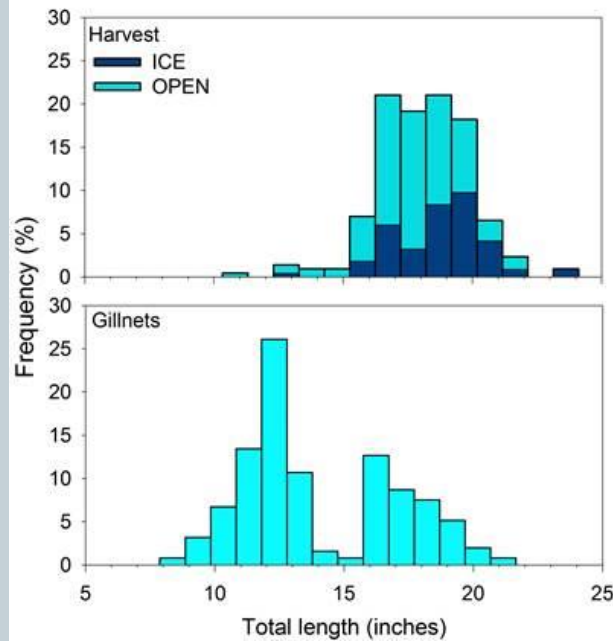
Size of fish harvested



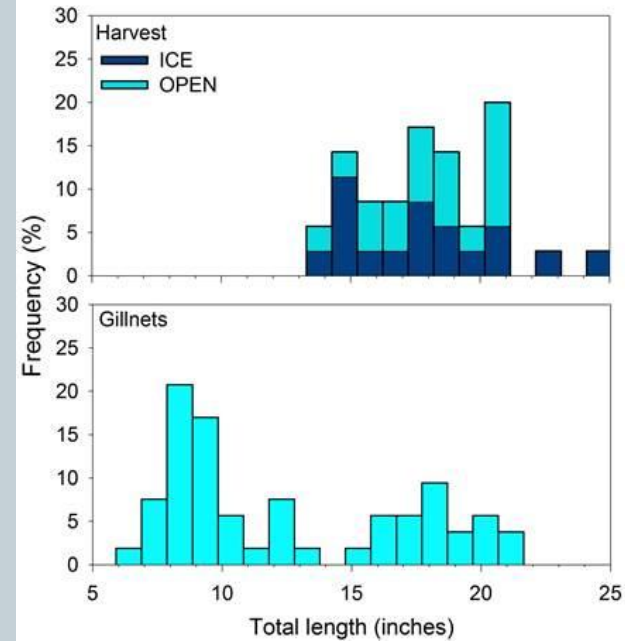
Hybrid Trout



Cutthroat Trout



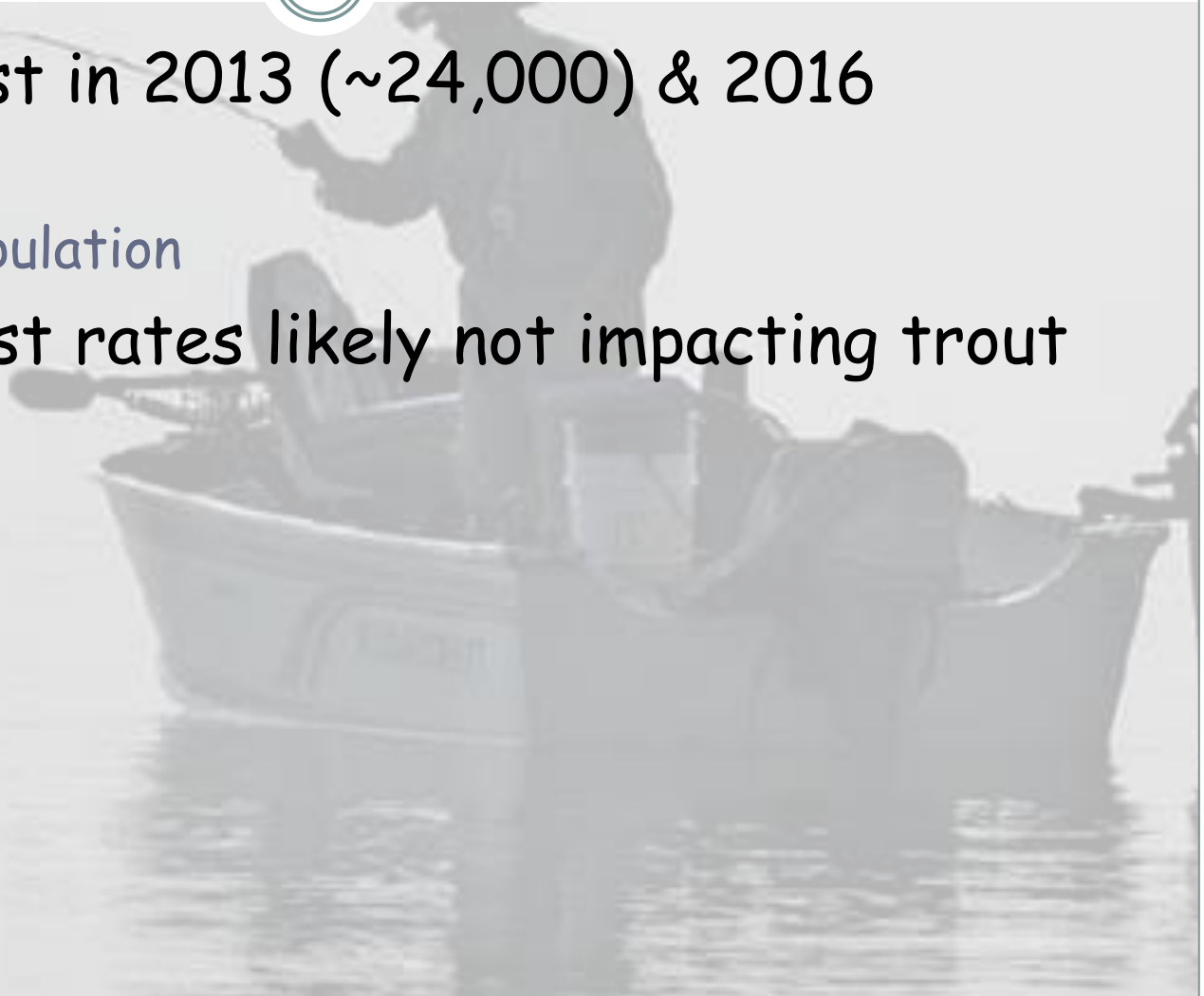
Brook Trout



Exploitation



- Limited harvest in 2013 (~24,000) & 2016 (~5,000)
 - 1-5% of the population
- Current harvest rates likely not impacting trout population



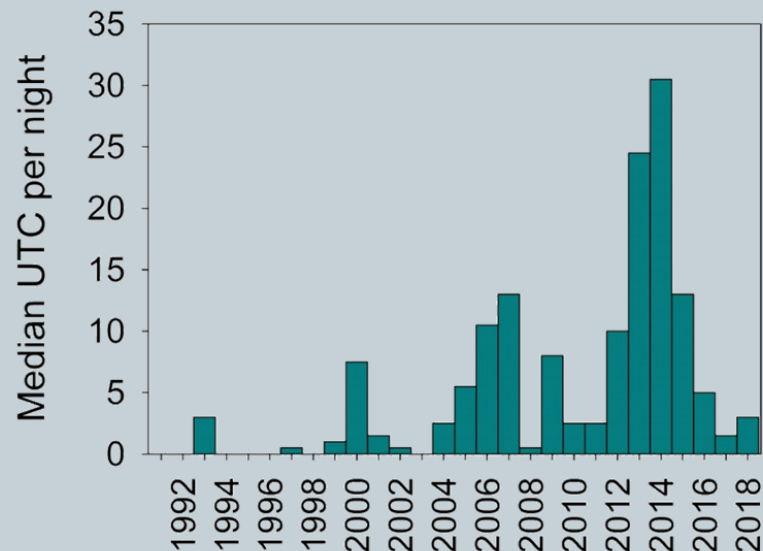
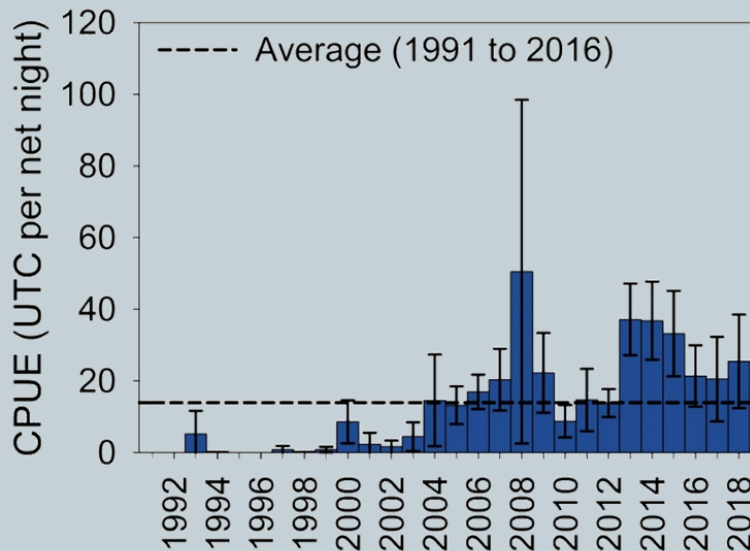
Utah Chubs (UTC)



UTC abundances



- UTC first detected in gillnet surveys - 1993
 - Bait introduction?
- Limited inferences on UTC abundances
 - High variance
 - ✦ Schooling behavior



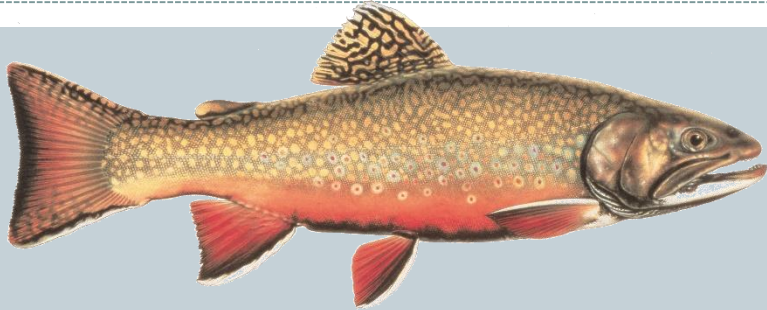
UTC Concerns



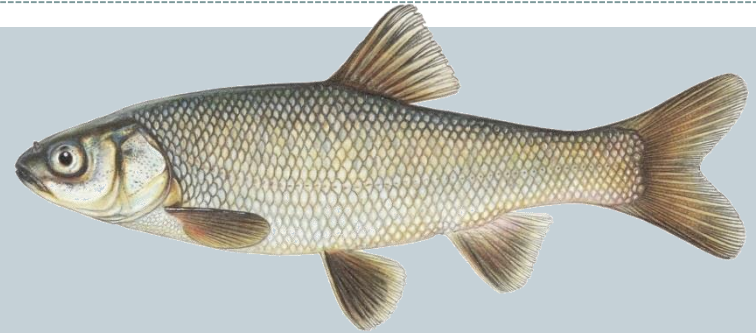
- Rapid invader
- Potential impacts from UTC
 - Predation on small trout
 - ✦ Spatial segregation
 - Competition
 - ✦ Prey resources
 - ✦ Space



Competition for food resources



vs



Gut content analysis & Stable isotope analysis



Diet overlap - GCA and SIA

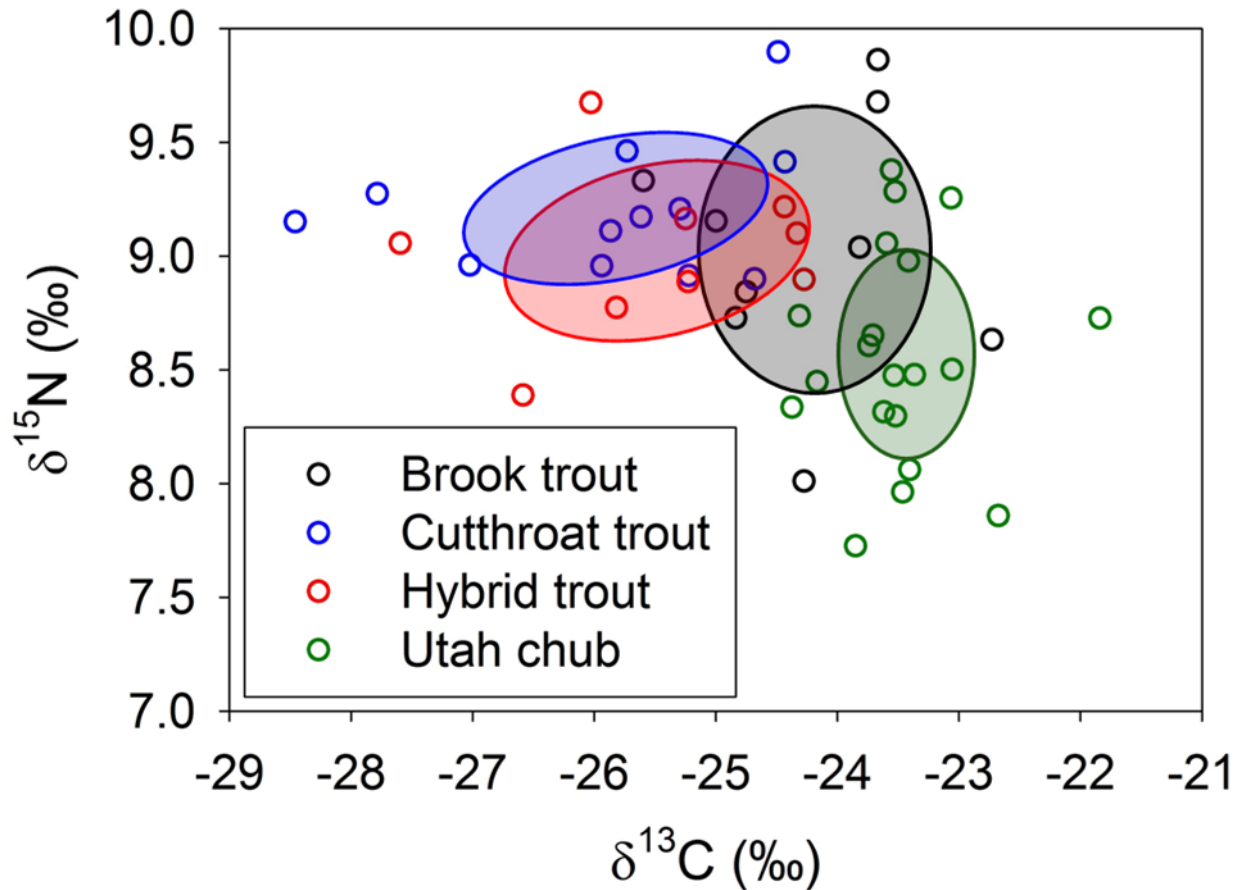


- Schoener's index; $D = 0$ (no) to 1 (complete)

$$D = 1 - 0.5 \left(\sum_{i=1}^s |p_{ij} - p_{ik}| \right)$$

- Overlap ecologically significant
 - ✦ $D > 0.60$
- Stable isotope Bayesian ellipses in R (SIBER)
 - Standard ellipse areas (SEA_c)
 - ~40% of the isotopic distribution and core dietary niche

Diet overlap - GCA



SEA_c

BKT = 1.77

HYB = 1.22

UTC = 0.87

YCT = 1.40

Do trout and chub diets overlap?



Species		SIBER Isotopes	Schoener Diets
Brook trout	Cutthroat trout	0.19	0.51
Brook trout	Hybrid trout	0.43	0.74
Brook trout	Utah chub	0.26	0.41
Hybrid trout	Utah chub	0.00	0.52
Hybrid trout	Cutthroat trout	0.76	0.70
Utah chub	Cutthroat trout	0.00	0.55

***Significant diet overlap (>0.60)**

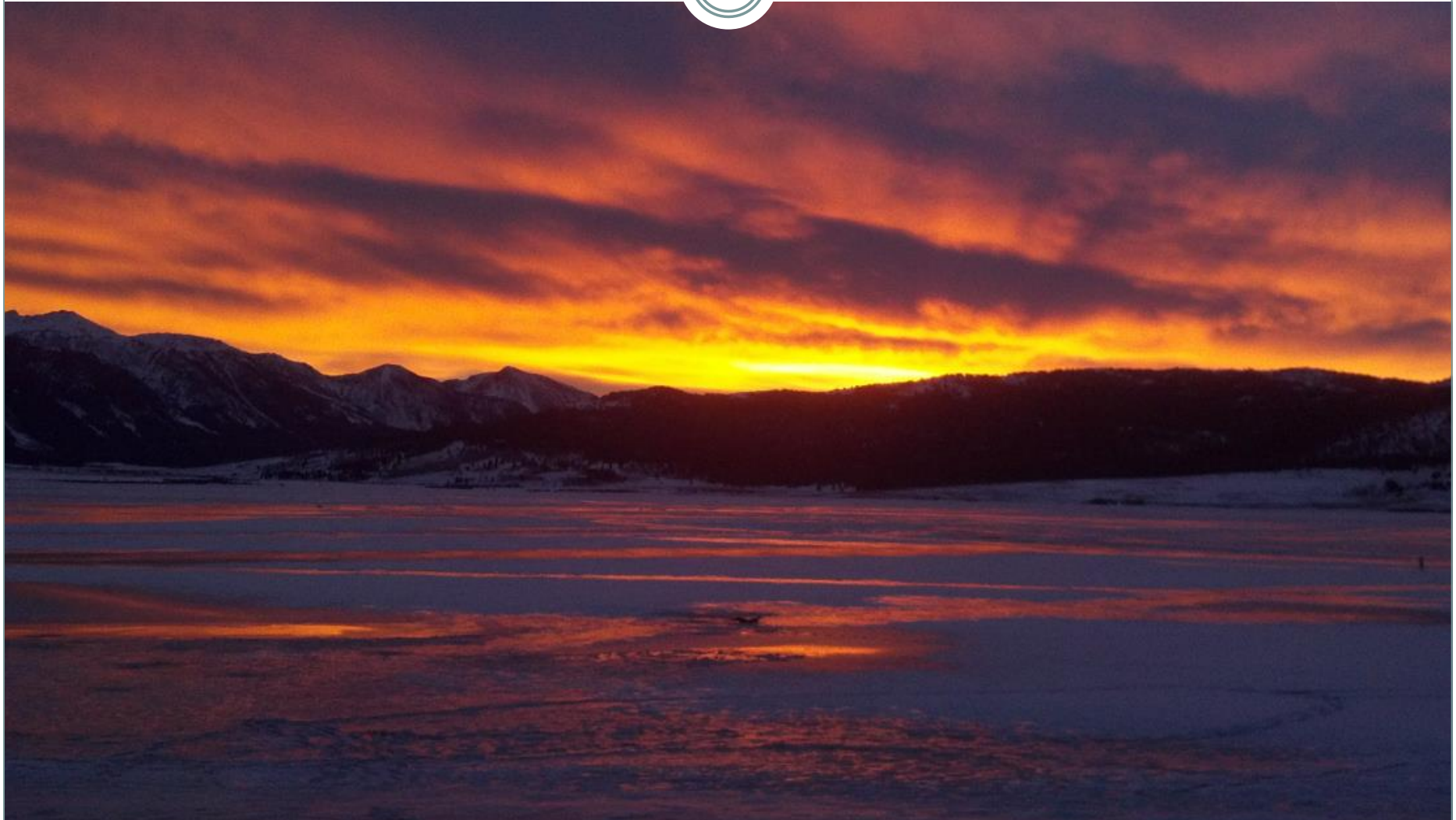
Competition for food resources



- Competition for food resources may be minimal
 - No biologically-significant diet overlap
 - ✦ Highly productive lake
 - ✦ Abundant food sources
 - Suggests limited impacts on trout growth and condition

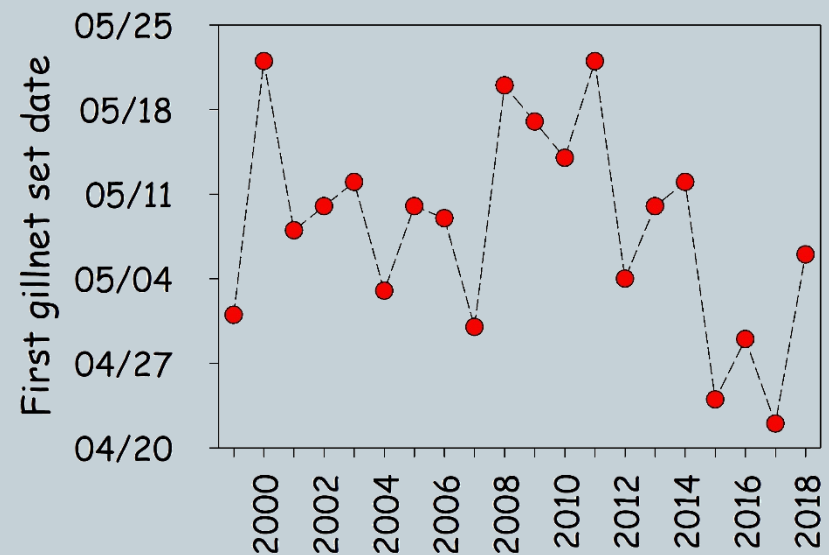


Water quality



Ice-off conditions

- Warming trends observed more frequently
 - ✦ Earlier ice-off
 - ✦ Lake warms faster each year
 - Increased solar radiation
 - ✦ "Good fishing" is more commonly missed



Water quality



- Water quality potential to influence trout growth and survival
- Limited data on water quality in HL
 - Water temperatures 2017
 - Winter oxygen conditions 2003-Present
 - Total phosphorus budgets
 - ✦ 1992-1994

UPPER HENRY'S FORK SUBBASIN ASSESSMENT

Final

December 1998

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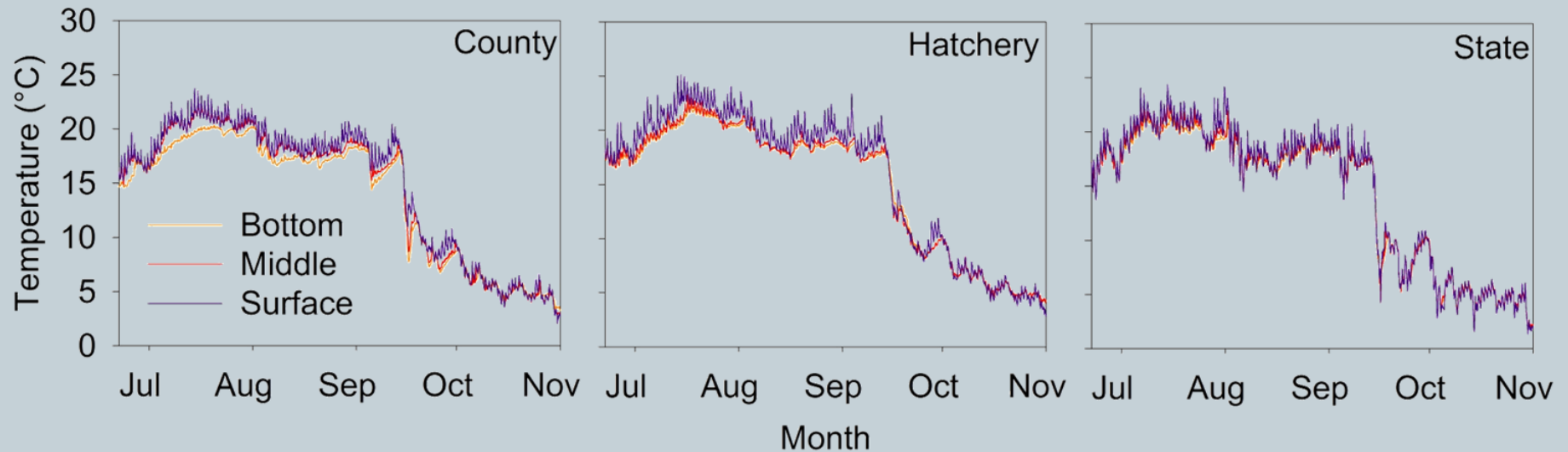
Water temperatures



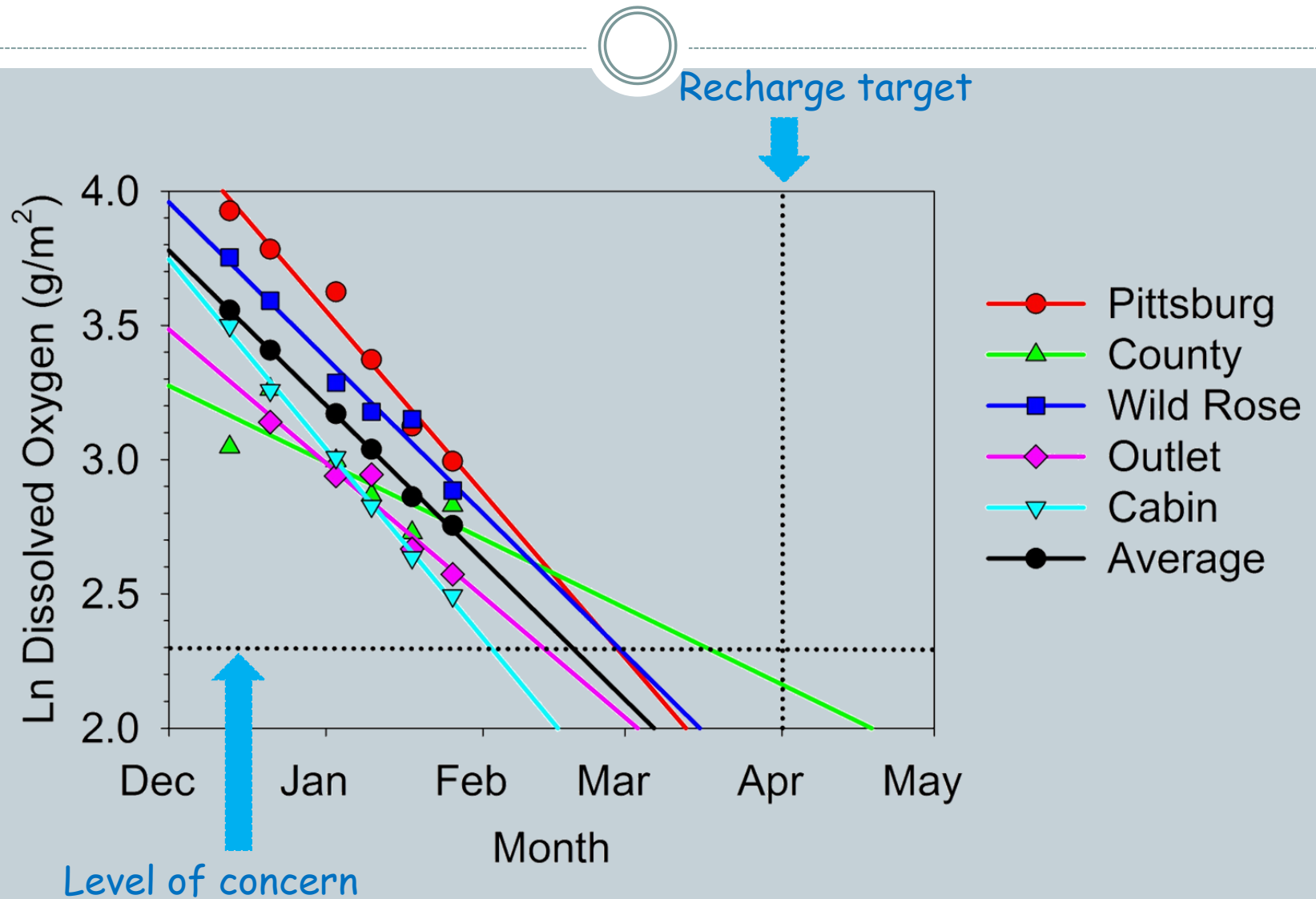
- Water temperatures 2017

- Maximum 25.1 °C

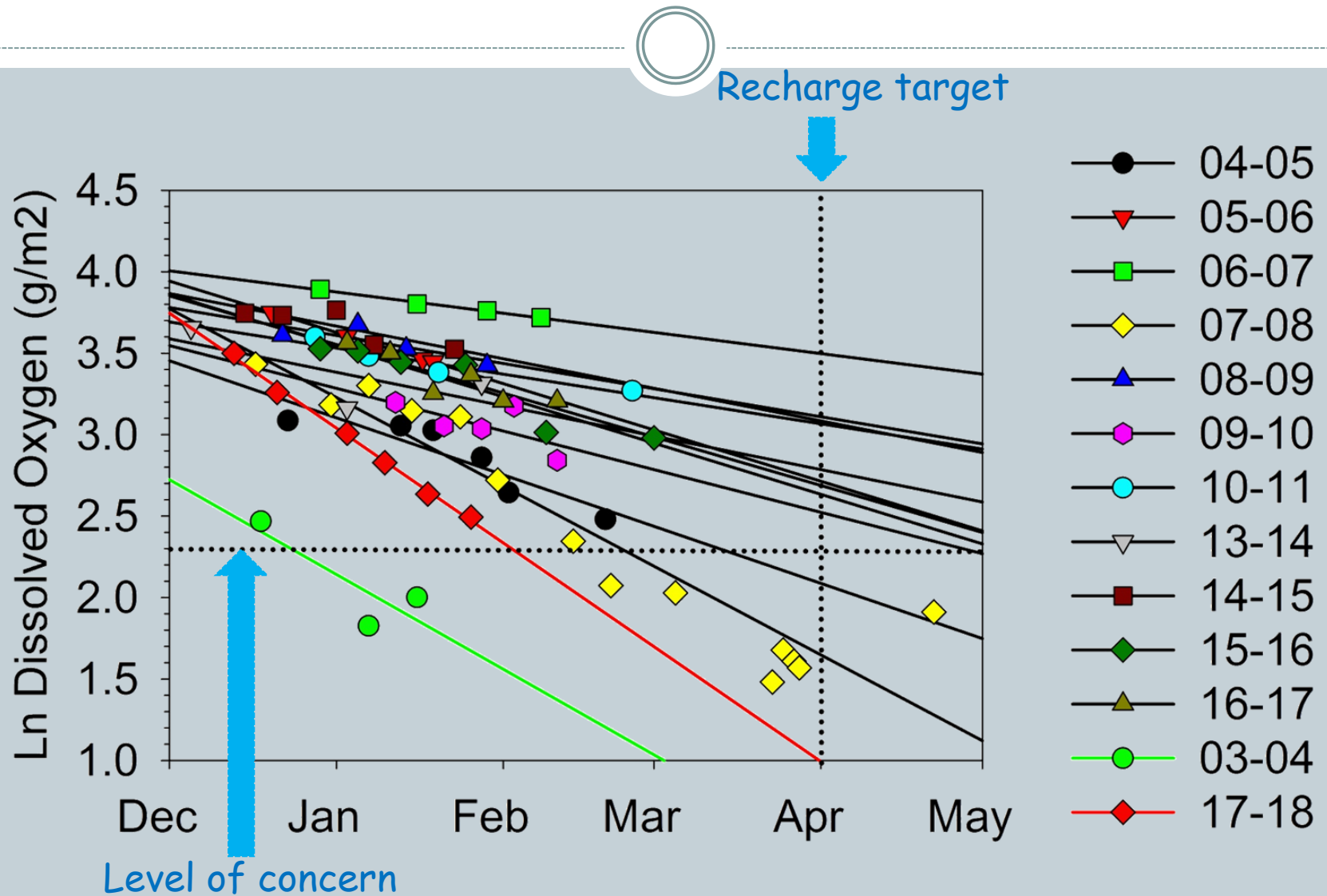
- ✦ July at hatchery



Winter oxygen conditions 2017-2018



Winter oxygen conditions 2004-2018



Water quality



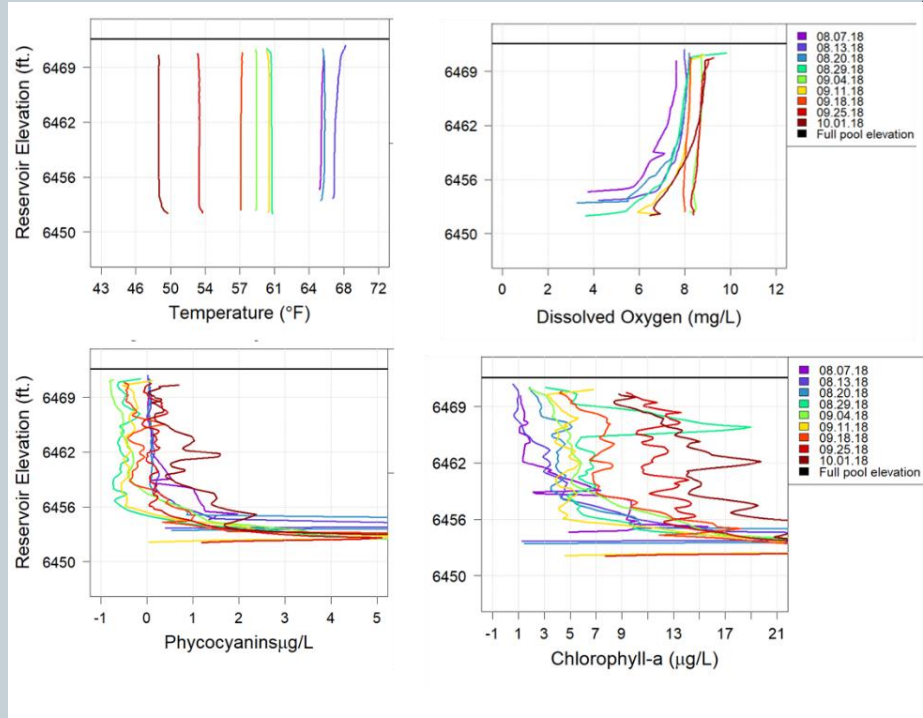
- Lower winter oxygen and warm summer temperatures
 - May be limiting trout survival
- Need for long-term robust water quality and zooplankton monitoring
 - Influence on fall fingerling stocking
 - Summer thermal stress
 - Algal loading for winter oxygen conditions

Water quality

- In-depth water quality monitoring (July)
 - Temperatures
 - Dissolved oxygen
 - Phosphate/nitrogen ratios
 - Algal loading
- Collaboration with HFF and HLF



Water quality results



- No algal blooms observed
- Temperature decreasing
- Dissolved oxygen levels are currently high
- Current conditions appear good going into the fall/winter

Stocking conditions 2018



- Favorable stocking conditions
 - Lake temp = 11.4 °C
 - Hatchery temp = 12.4 °C
- Winter oxygen
 - Lack of algal blooms
 - Remain adequate >6 mg/L



Current status of the fishery

- Numbers have decreased
- Size and "fatness" has increased
- 2015 age class experienced high mortality (i.e. poor survival)
 - Water quality
- Increased stocking 2018
 - ~1.5 million trout fingerlings
- Trout abundance should improve in 2019
 - Increased stocking
 - Higher numbers of age-1



The End

