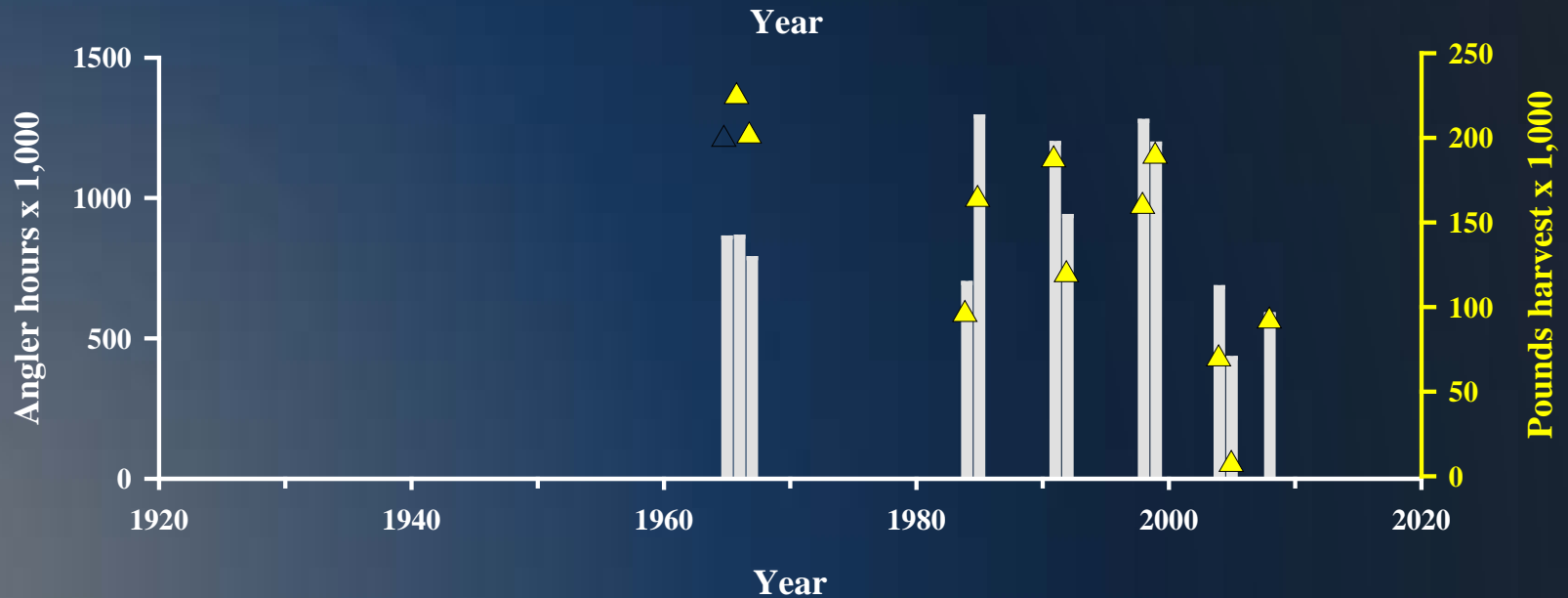


History of Leech Lake Walleye Management

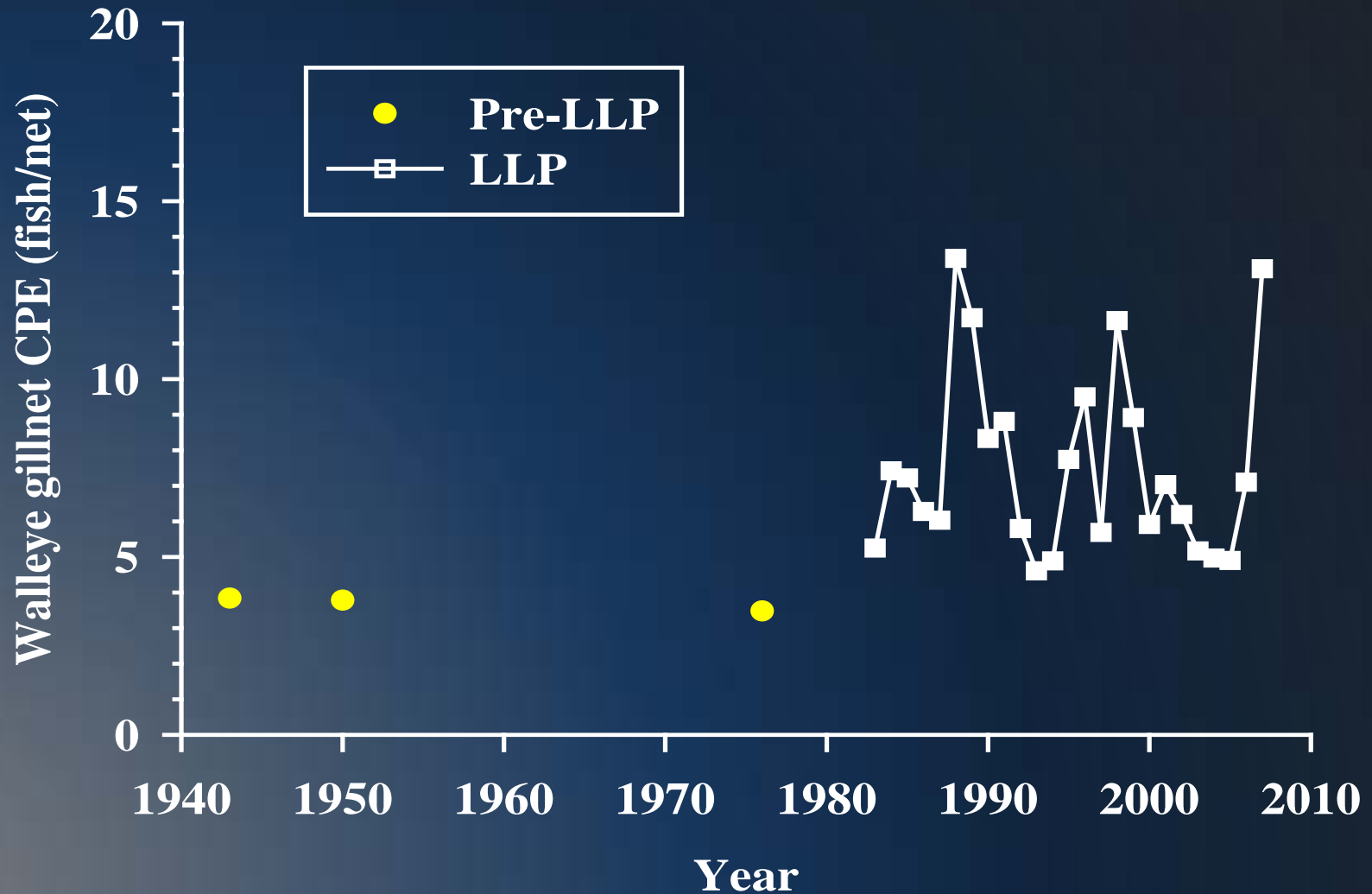
Before the Large Lake Program...



Sampling was...

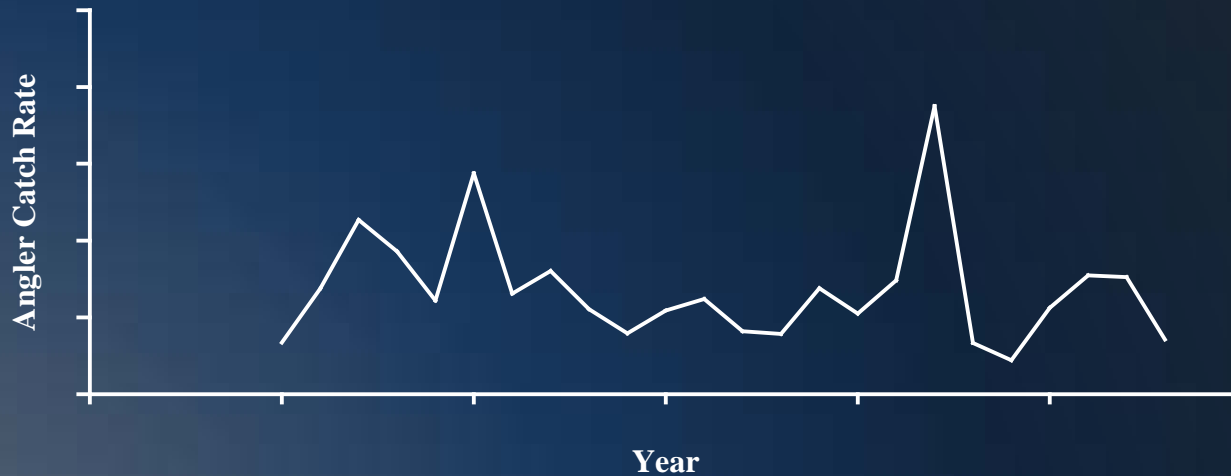
- Infrequent and not standardized
 - Different times of year & locations
 - Different gears & techniques
- Catch did not necessarily reflect population trends
- Not comparable to current methods

Gill Nets Before & After LLP



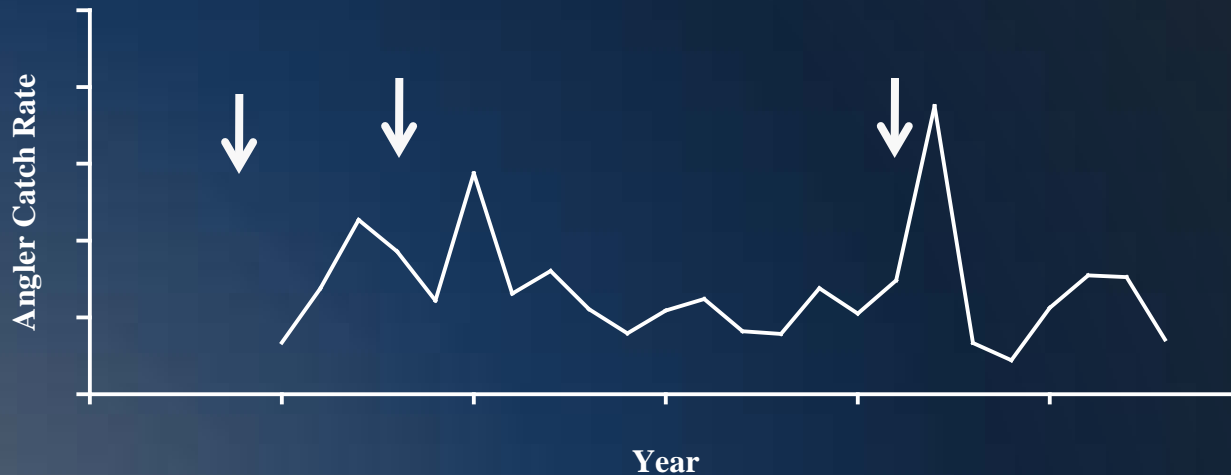
Denny Schupp's Work

- Up's and down's in fishing



Denny Schupp's Work

- Up's and down's in fishing
- Big year classes = good fishing a few years later



Denny Schupp's Work

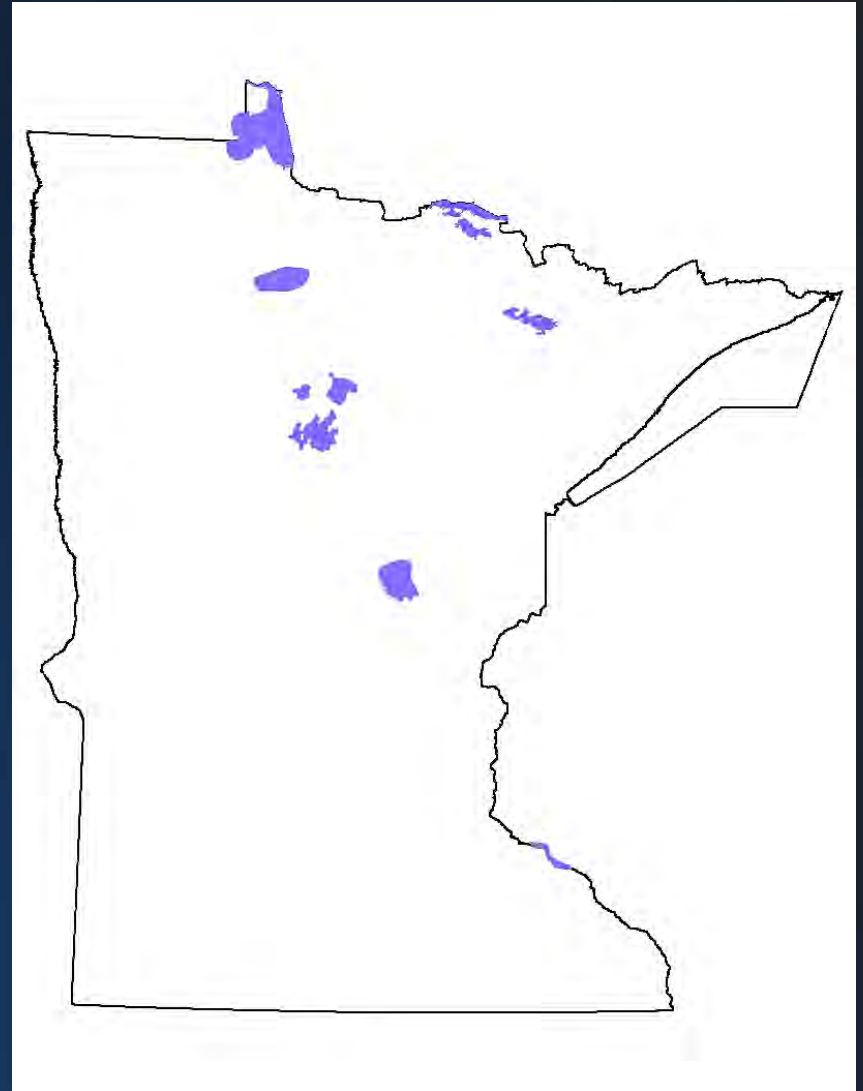
- Up's and down's in fishing
- Big year classes = good fishing a few years later



- What makes lakes different?
- What causes recruitment variability?

Large Lake Program

- Most recognizable walleye fisheries
- Standardized annual sampling
- Observe and utilize trends
- Develop management recommendations



The Large Lakes

Lake	Acres	Max. Depth (ft)	Chlor-a (ppb)	Phosph. (ppb)
LOTW	951,337	38	22.7	37.3
Rainy	220,800	161	4.6	14.0
Mille Lacs	132,516	42	7.0	30.8
Leech	111,527	156	4.8	21.0
Upper Red	108,000	18	18.0	58.0
Winnibigoshish	58,444	70	10.3	32.4
Vermillion	40,557	76	10.8	24.0
Kabetogama	25,760	80	11.8	25.5
Pepin	25,060	60	18.7	210.0
Cass	15,600	120	6.2	27.6

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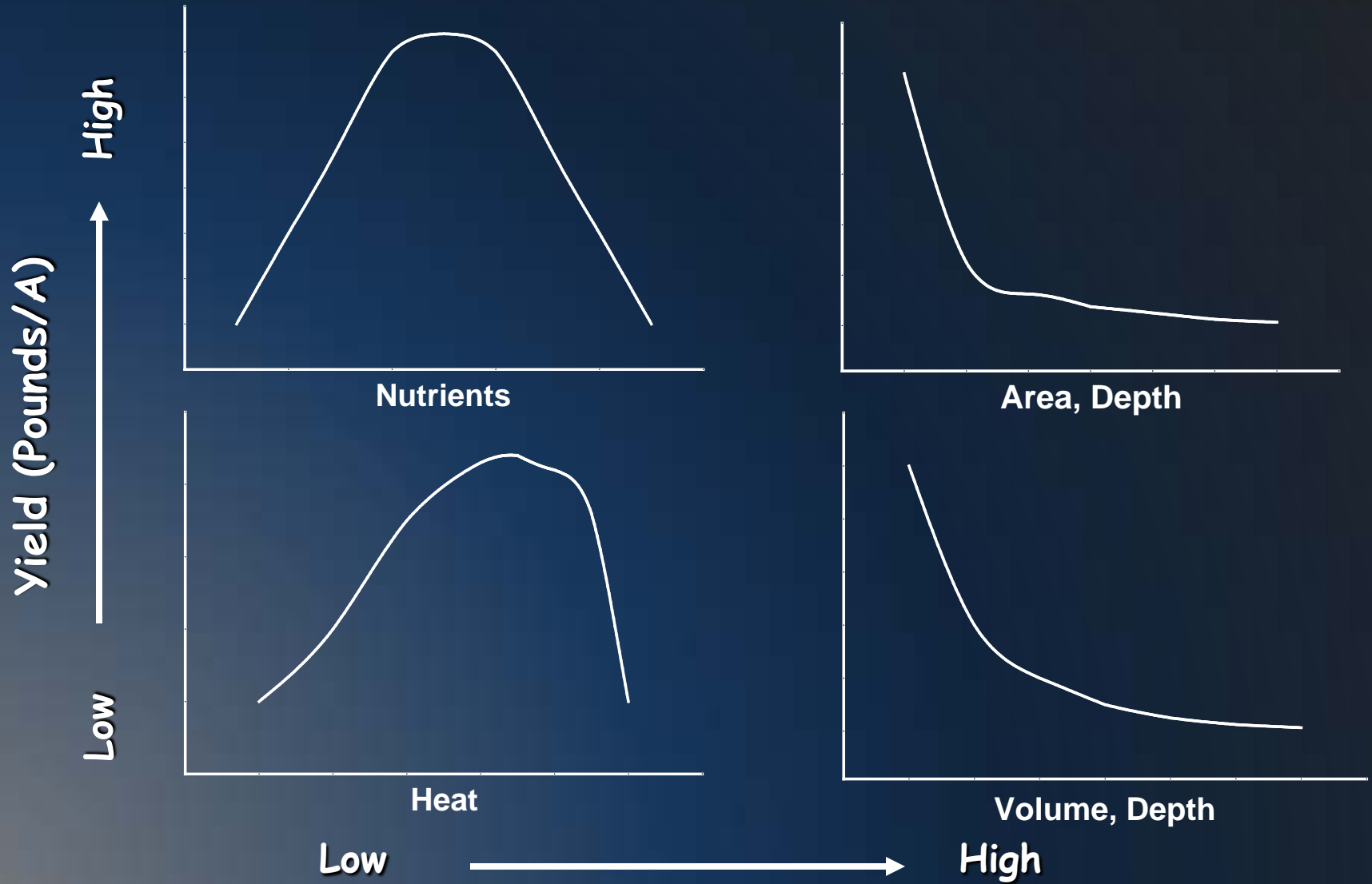
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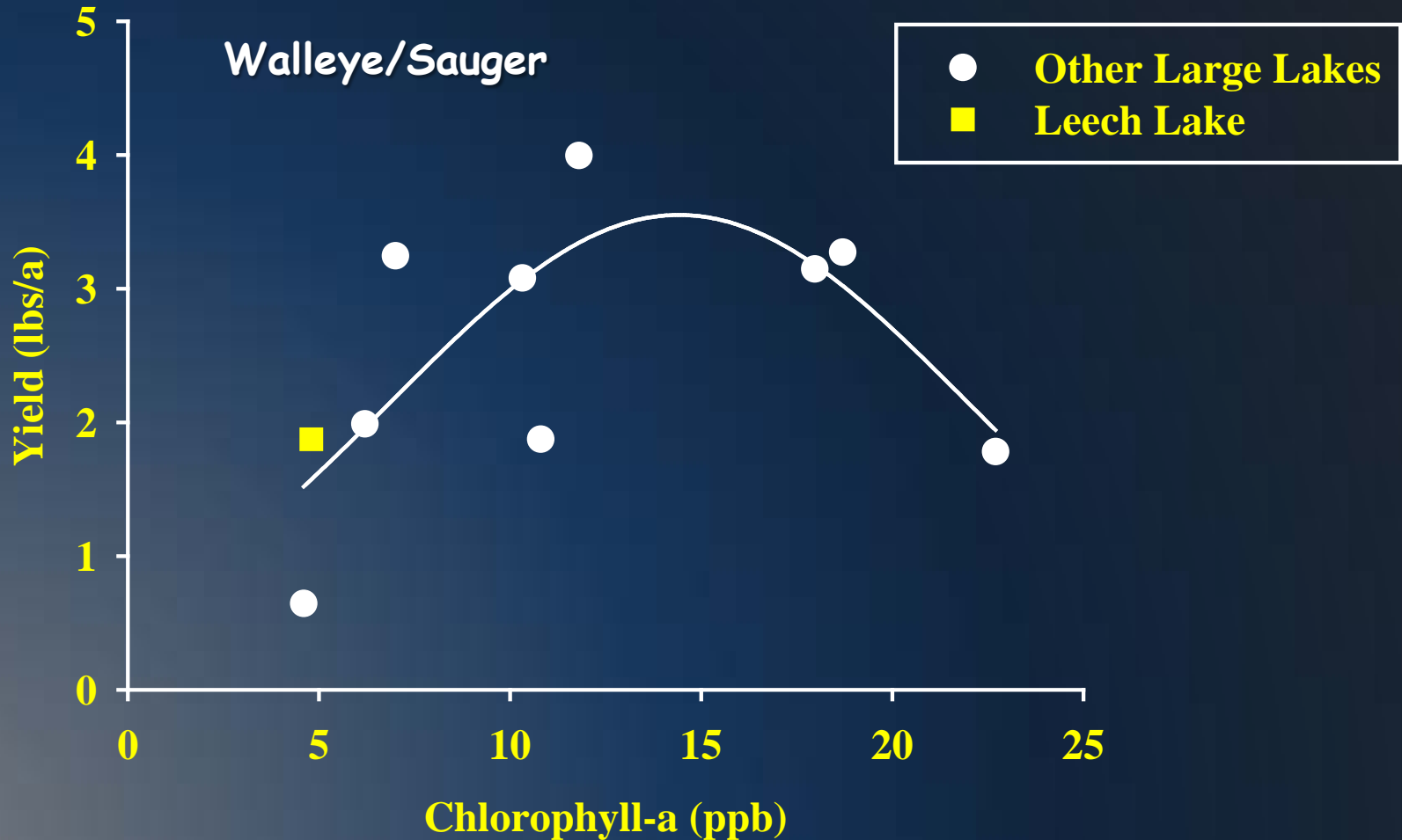
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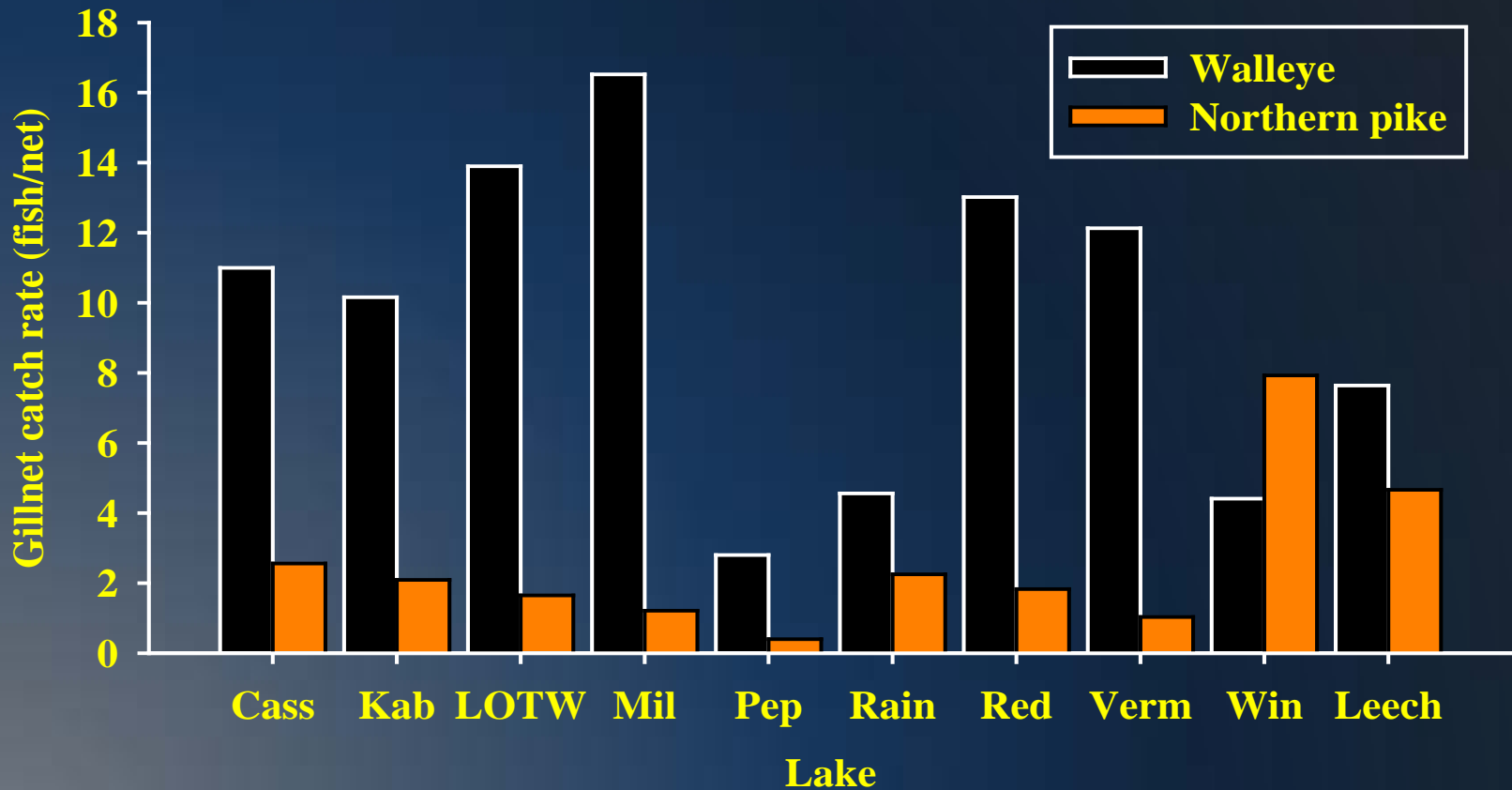
Habitat and Yield



Large Lake Productivity



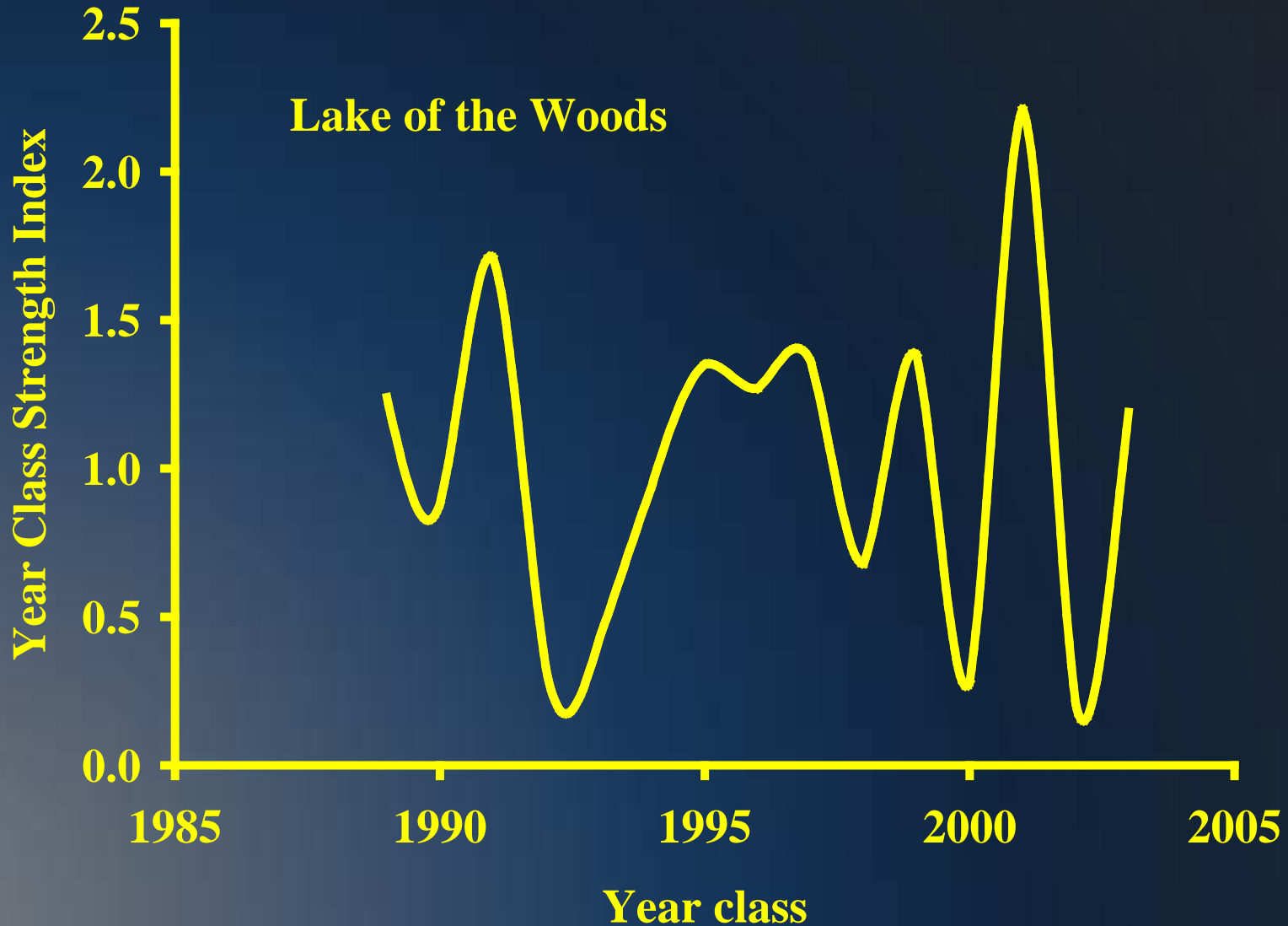
Average Gillnet Catch Rates



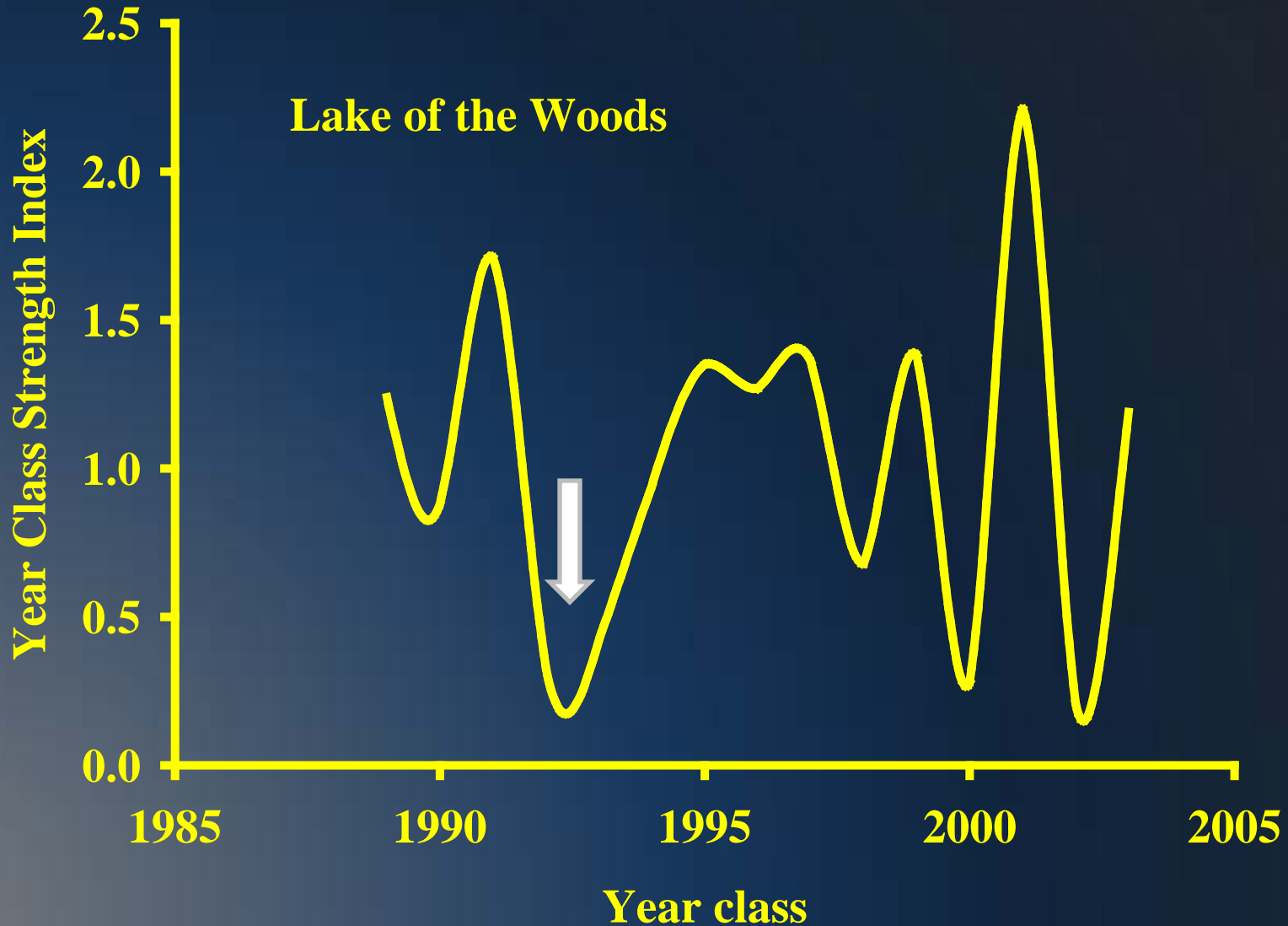
Why Annual Sampling?

- Each lake is unique
- Populations are not constant
- Trends informative at local and regional levels
- Use to make informed decisions

Walleye Year Class Strength is Variable



Walleye Year Class Strength is Variable



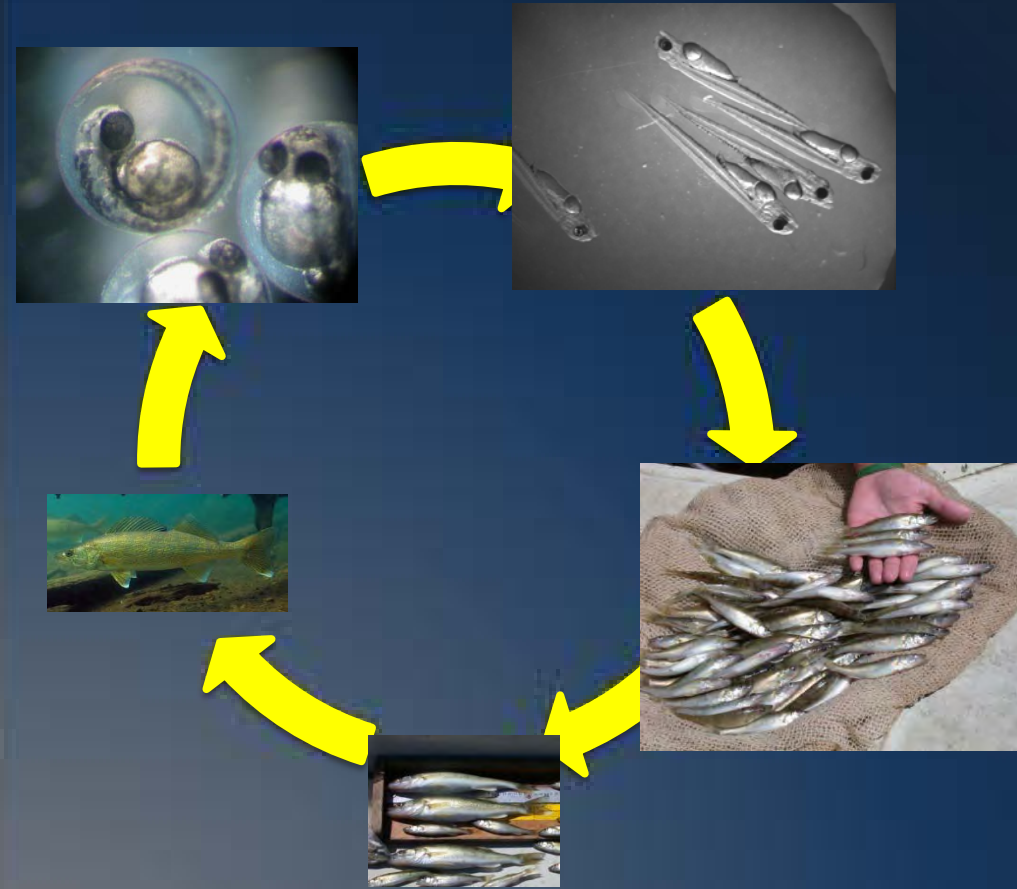
Fishery biologists generally consider **recruitment** instead of births (number of fry hatched)

Number of fish hatched in any year that survive to **population**

WHY???

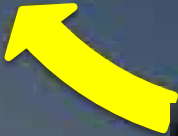
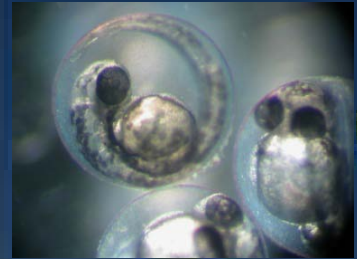
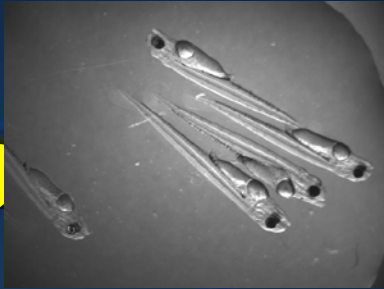
Number that survive to reproductive size influences future reproduction & harvest

Growth and mortality interact to determine recruitment of young fish



Growth and mortality interact to determine recruitment of young fish

1. Egg fertilization
2. Egg destruction
3. Weather
4. Disease
5. Predation/cannibalism
6. Starvation
7. Winter survival
8. Competition/suppression



Sockeye salmon



Courtesy of Dept. Wildlife & Fisheries Sciences, South Dakota State University

Sockeye salmon: anadromous species

3,000 eggs

-2,970 99% freshwater mortality

30 fish enter ocean

Sockeye salmon: anadromous species

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30 fish enter ocean

-24 80% ocean mortality

6 adults enter rivers

Sockeye salmon: anadromous species

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6 adults enter rivers

-3 commercial or sport fishing

3 reach spawning grounds

Sockeye salmon: anadromous species

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30 fish enter ocean

-24 80% ocean mortality

6 adults enter rivers

-3 commercial or sport fishing

3 reach spawning grounds

-1 eaten by bear

2 spawn and replace selves

Sockeye salmon: anadromous species

4,000 eggs

-3,960 **99%** freshwater mortality

40 fish enter ocean

-34 **85%** ocean mortality

6 adults enter rivers

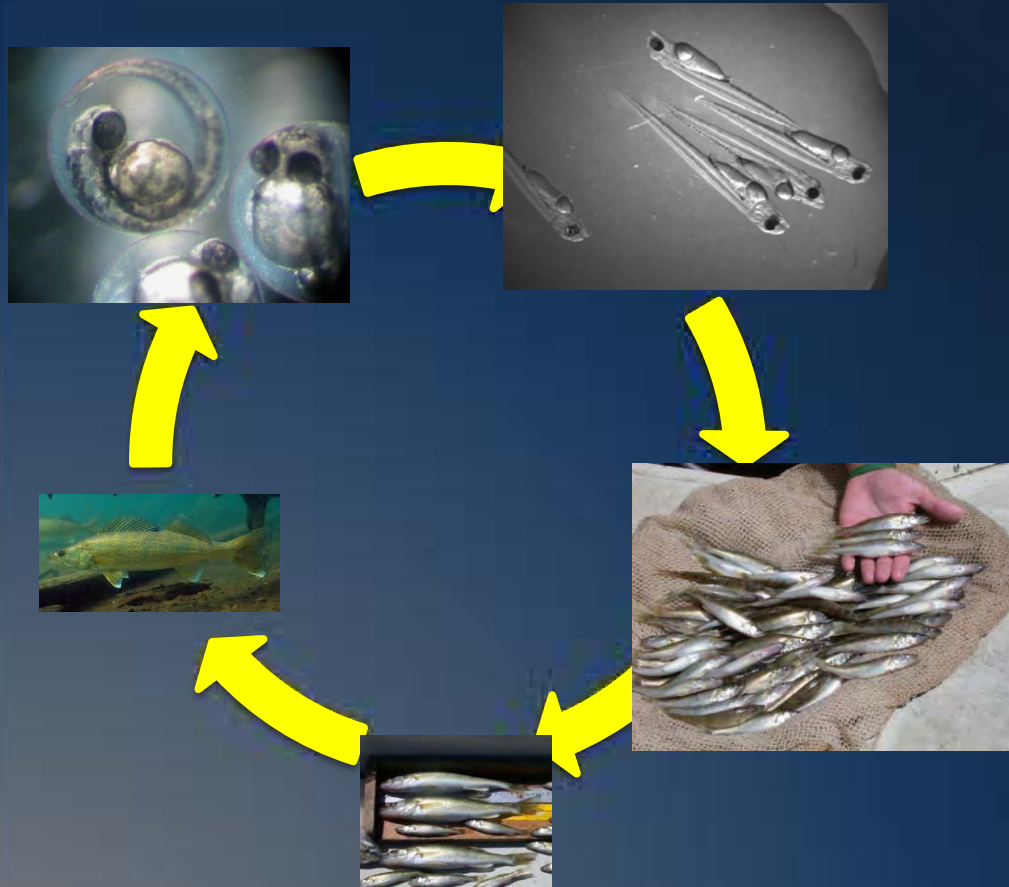
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-1 eaten by bear

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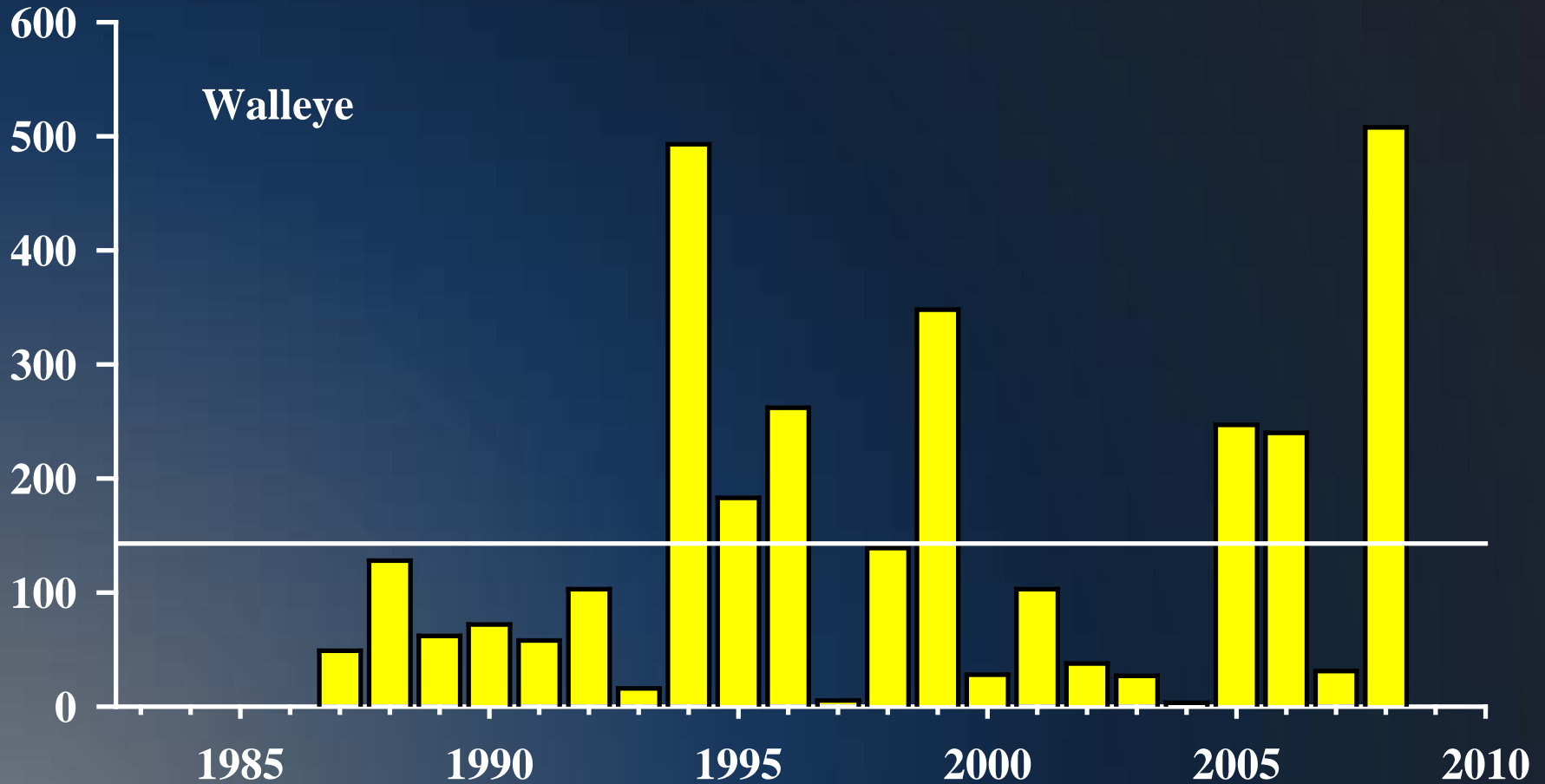
Growth and mortality interact to determine recruitment of young fish



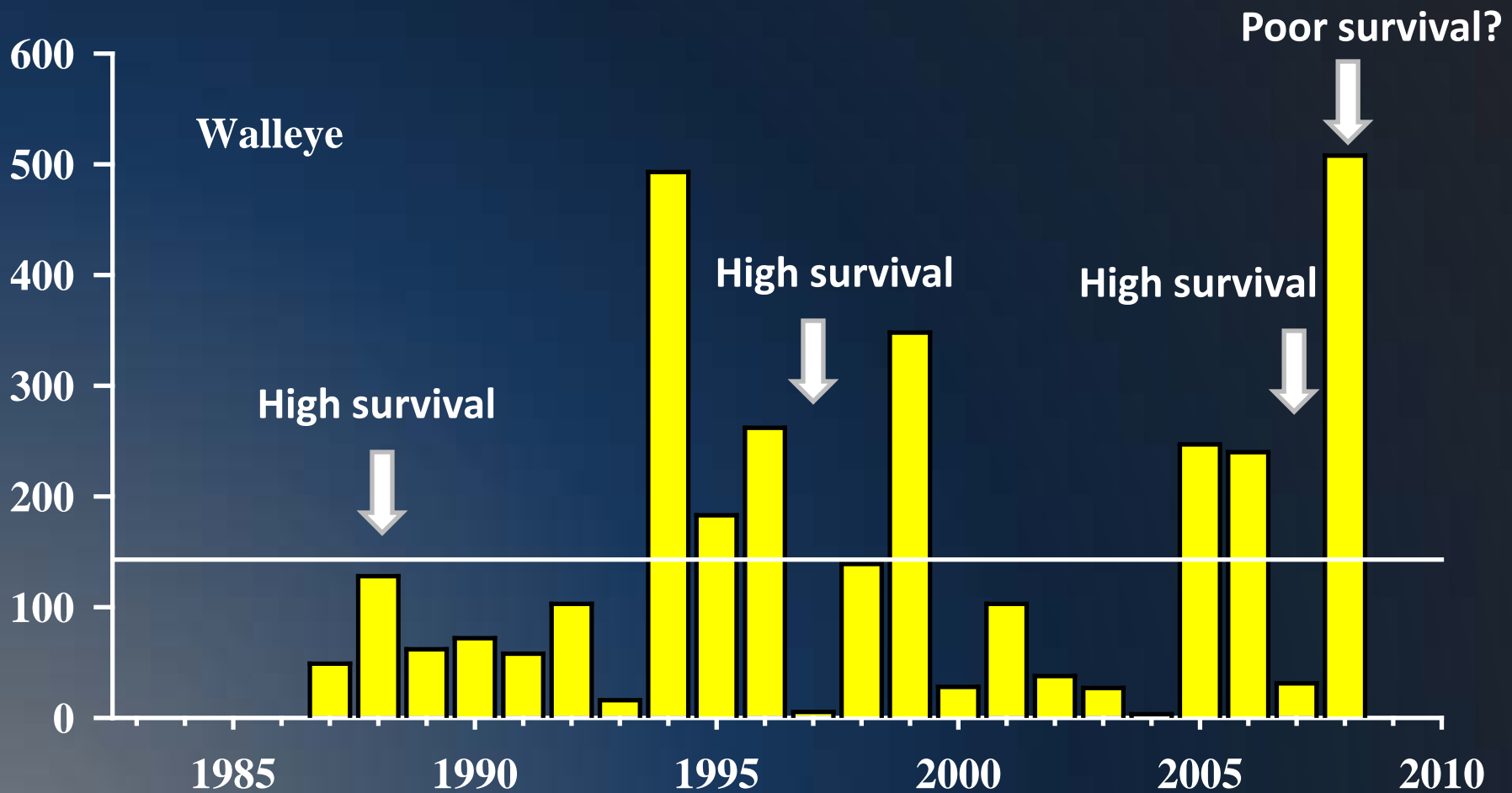
1. Egg fertilization
2. Egg destruction
3. Weather
4. Disease
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6. Starvation
7. Winter survival
8. Competition/suppression

SURVIVAL is the key to recruitment

Trawling YOY Walleye (fish/hour)



Trawling YOY Walleye (fish/hour)

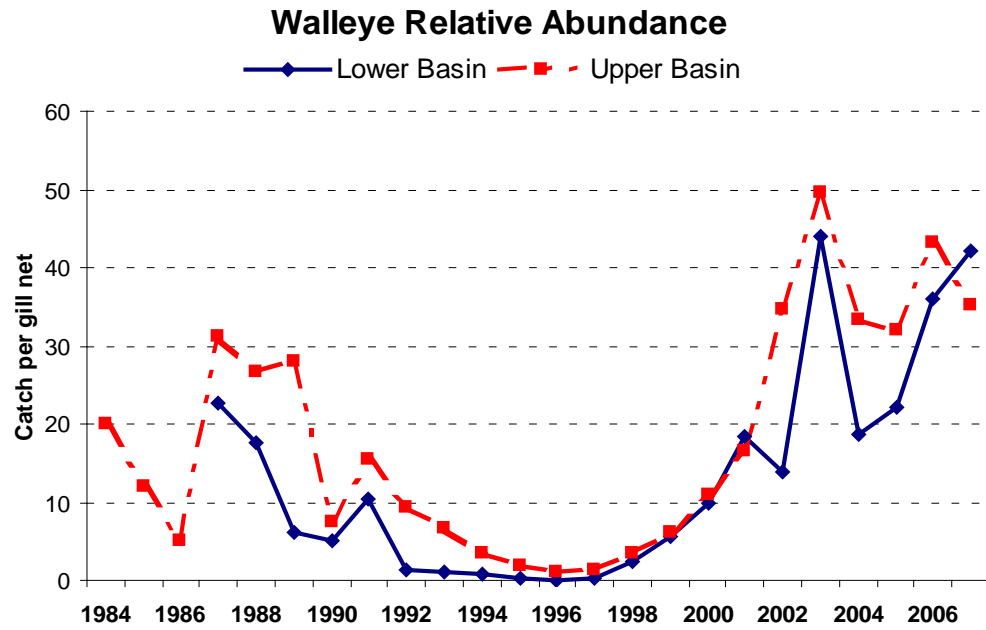


Density-Dependent Feedback

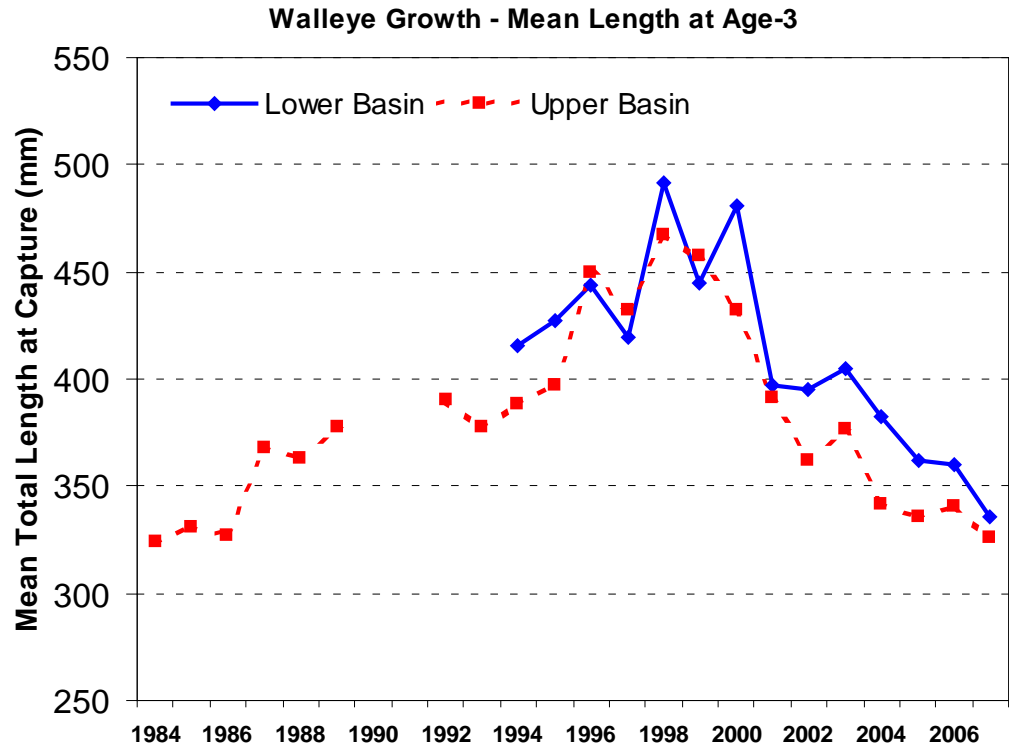
Fish populations tend to self-regulate through density-dependence, or the "give-and-take" as abundance changes

Ex. As abundance goes down, more food is available, growth & survival increase

As walleye abundance in the Red Lakes increased during recovery...



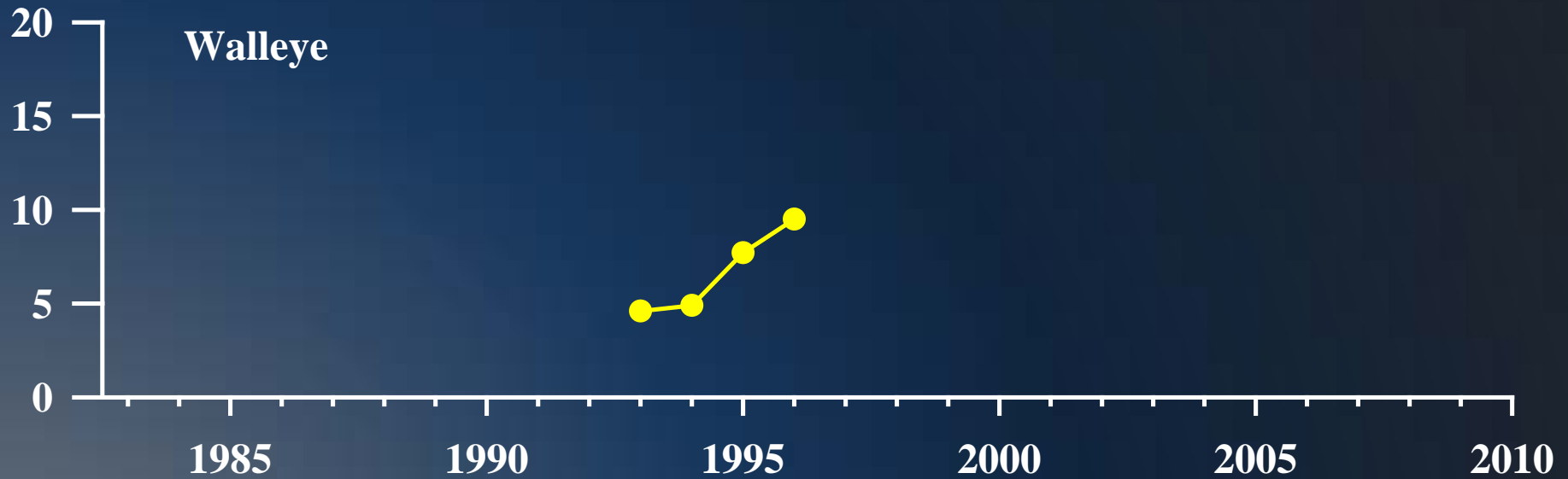
... growth rates slowed down



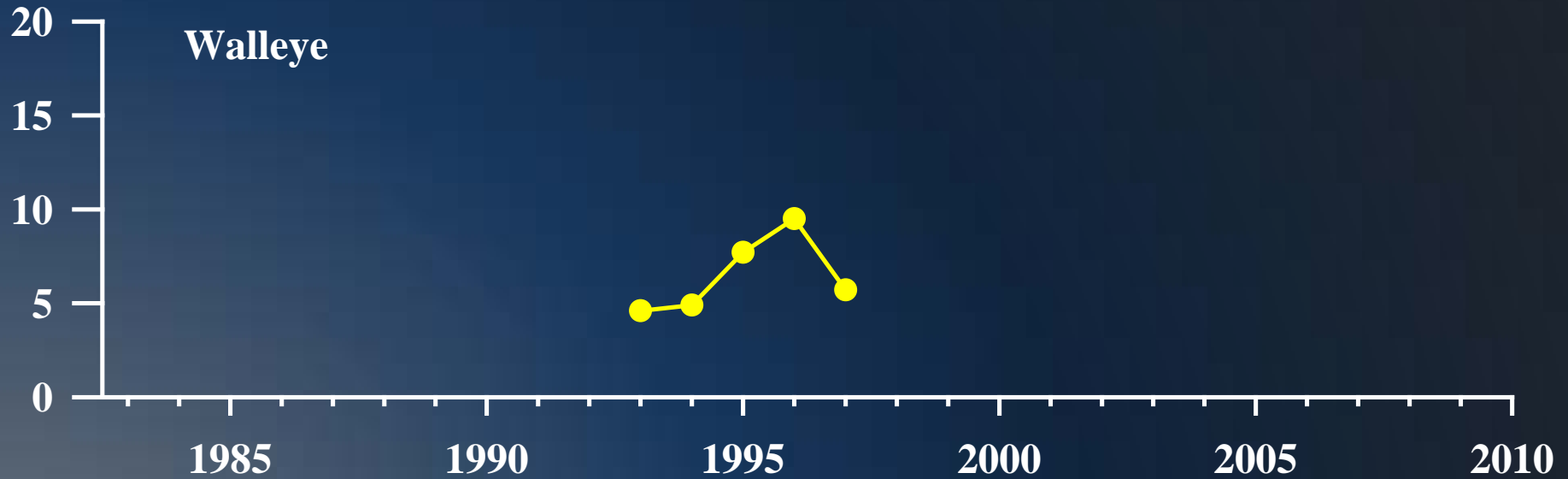
Applications of the LLP

- Trends within and among lakes
- Longer time series is more informative
- Single points should be viewed within appropriate context

Gillnet Time Series



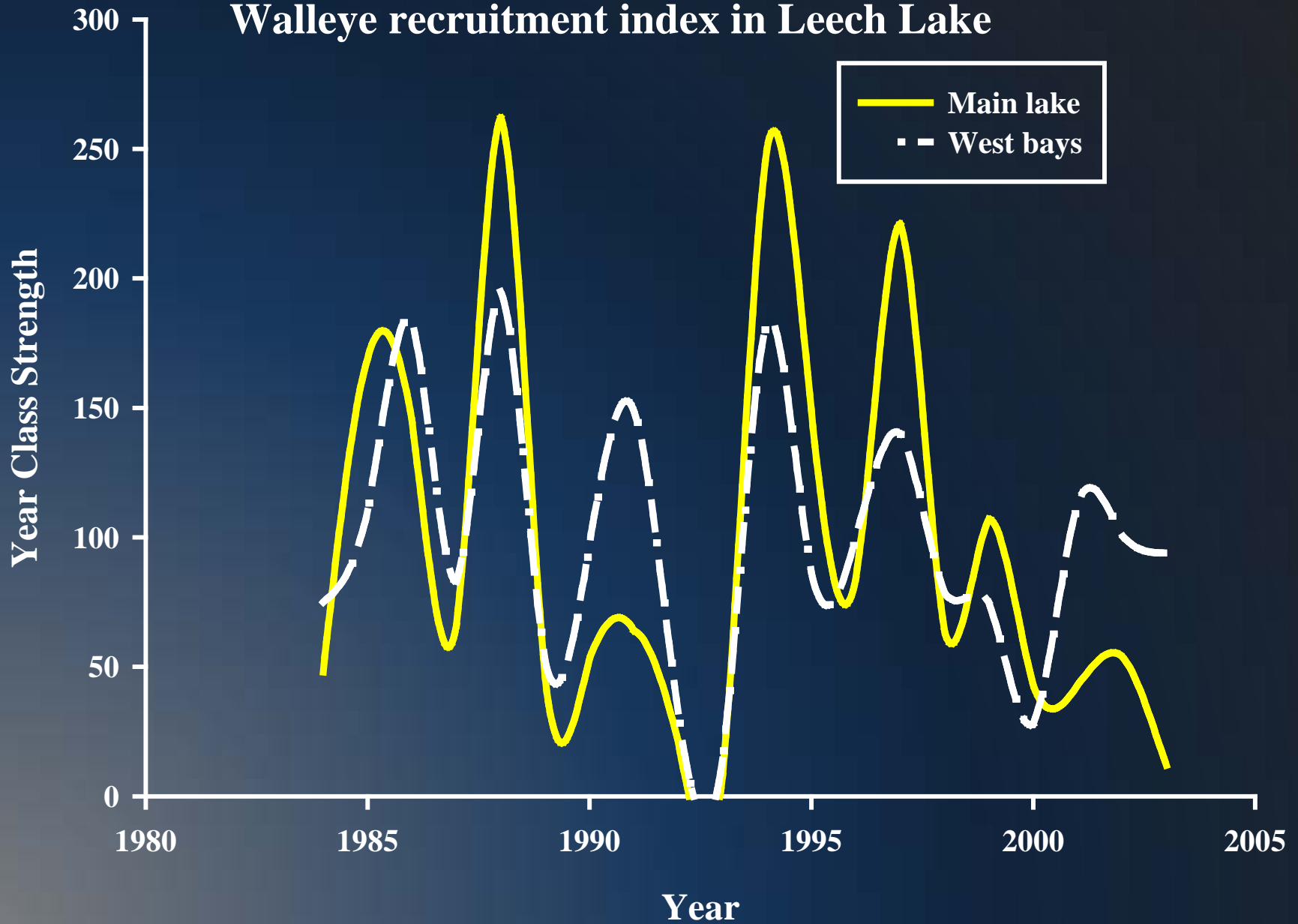
Gillnet Time Series

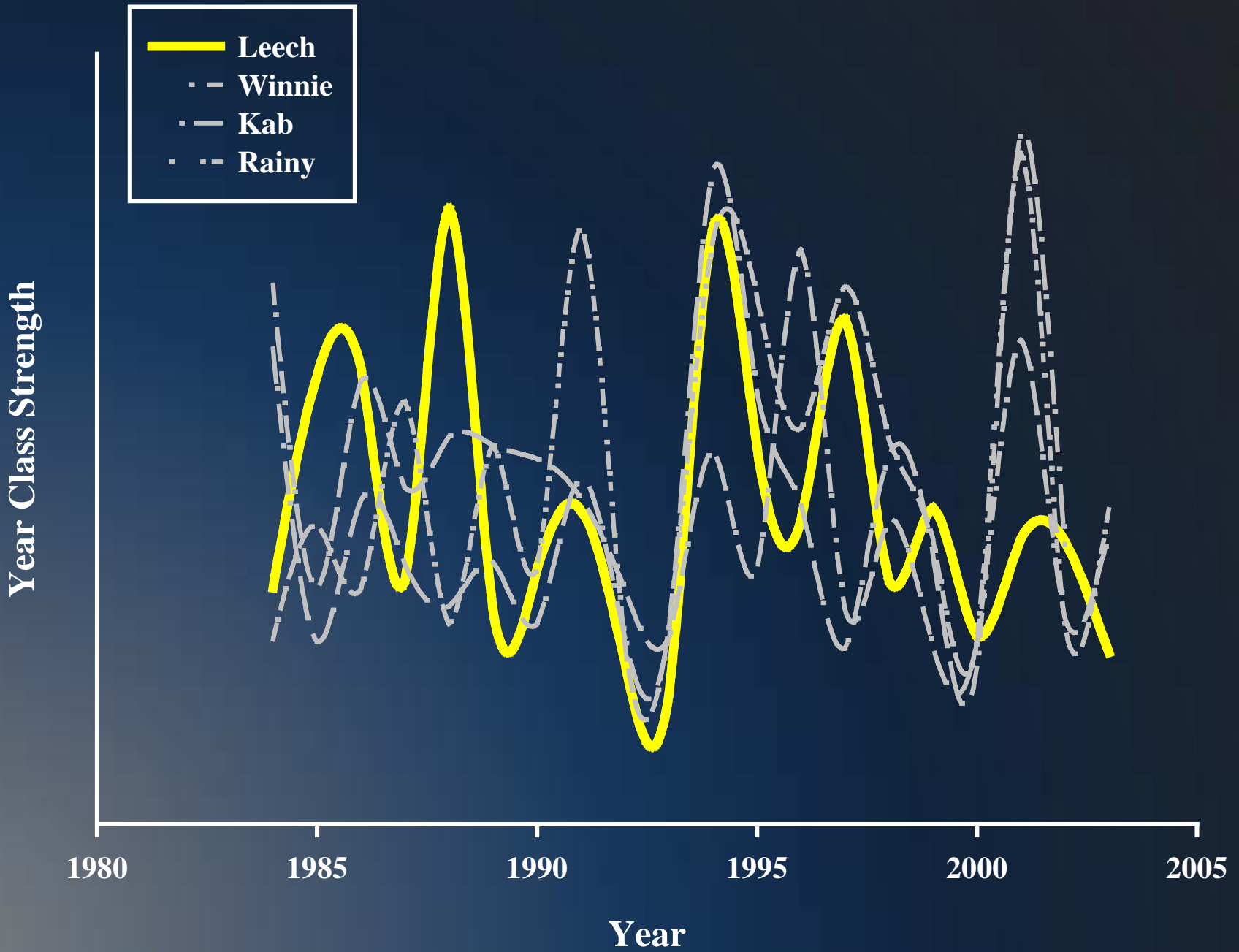


Gillnet Time Series



Walleye recruitment index in Leech Lake





Comparing Apples to Apples

Within lakes

- Compare the actual rates (eg. gillnet catch rate) and trends they comprise
- Ex: “Average gillnet catch rate of 7.4 wae/net”

Among lakes

- Compare trends among similar metrics (values ignored)
- Ex: “Establish two strong YCs in 5-y period”

Questions?

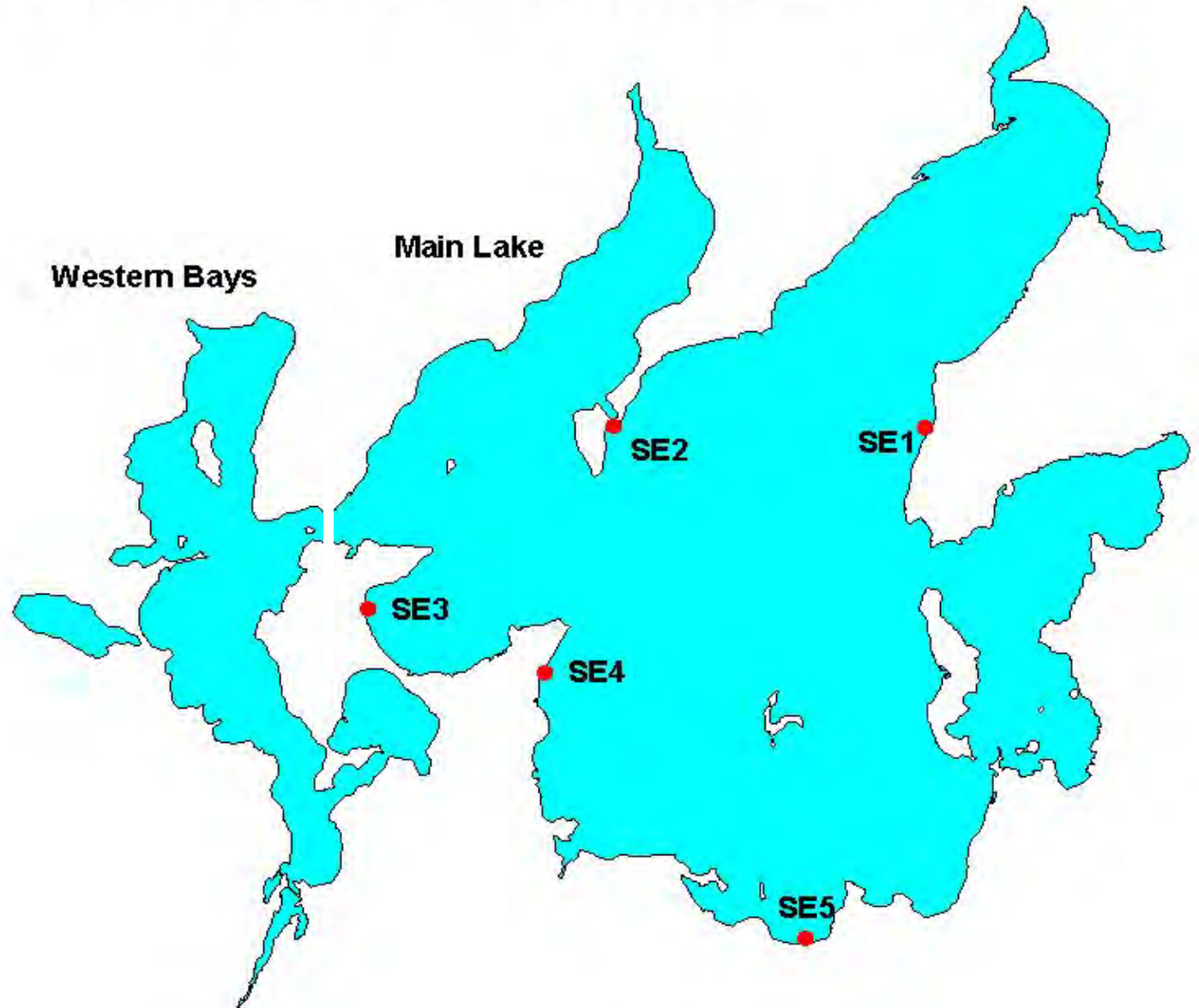
Current Status of the Leech Lake Walleye Fishery

Young-of-Year Sampling

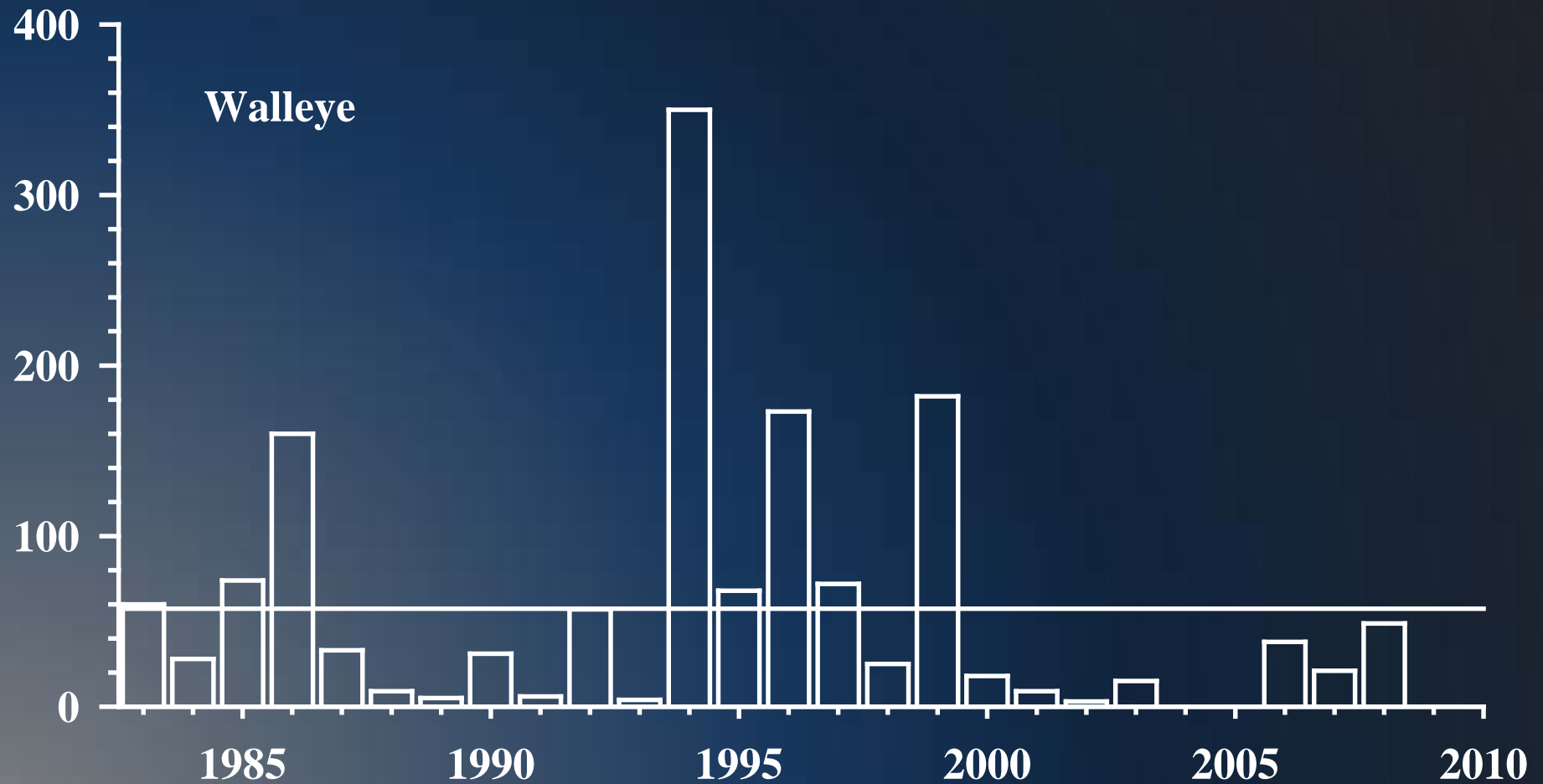
- Seining (July) - YOY growth, forage abundance



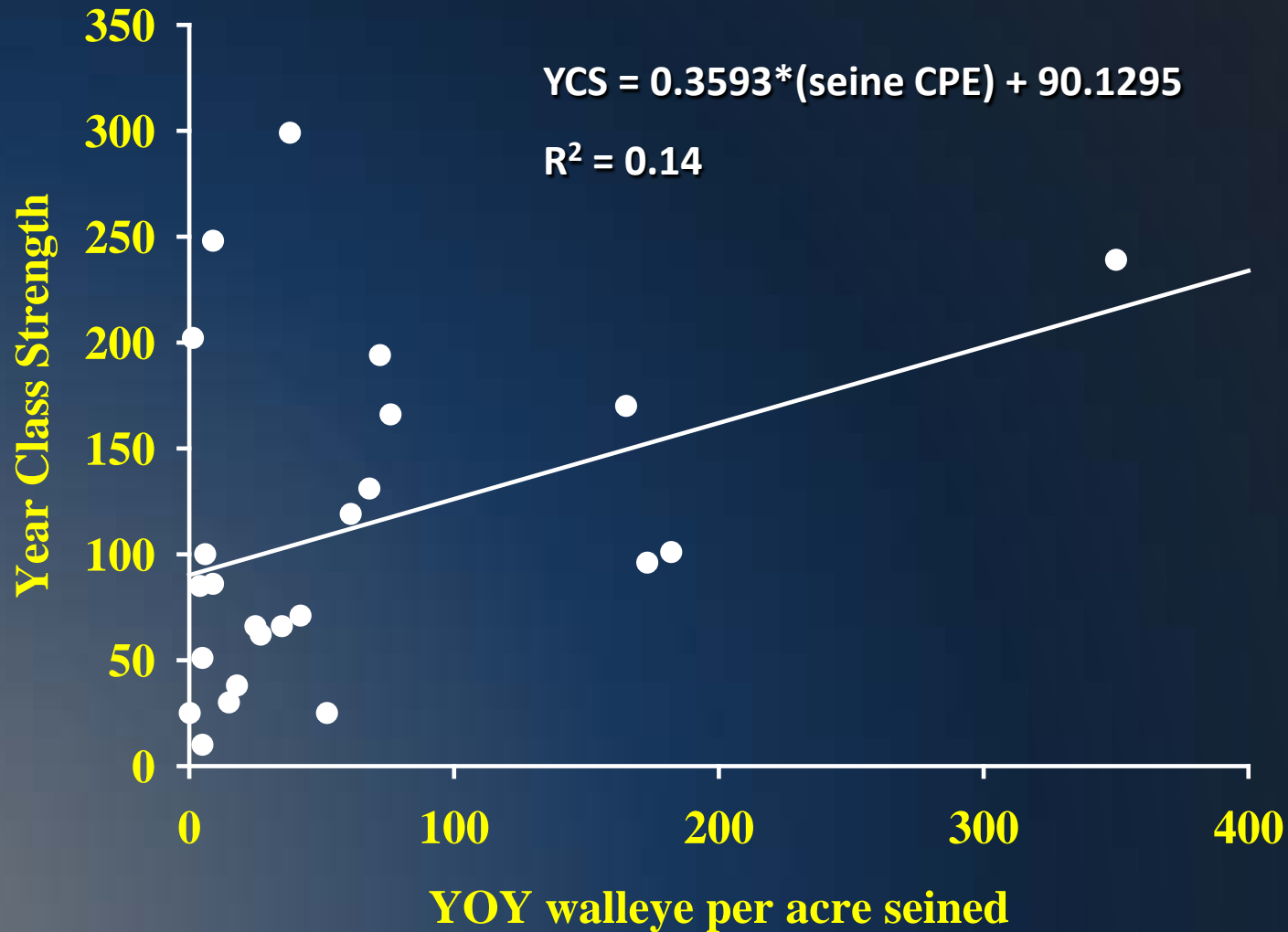
Seine Stations - Leech Lake



Seine Catch Rates (fish/acre)

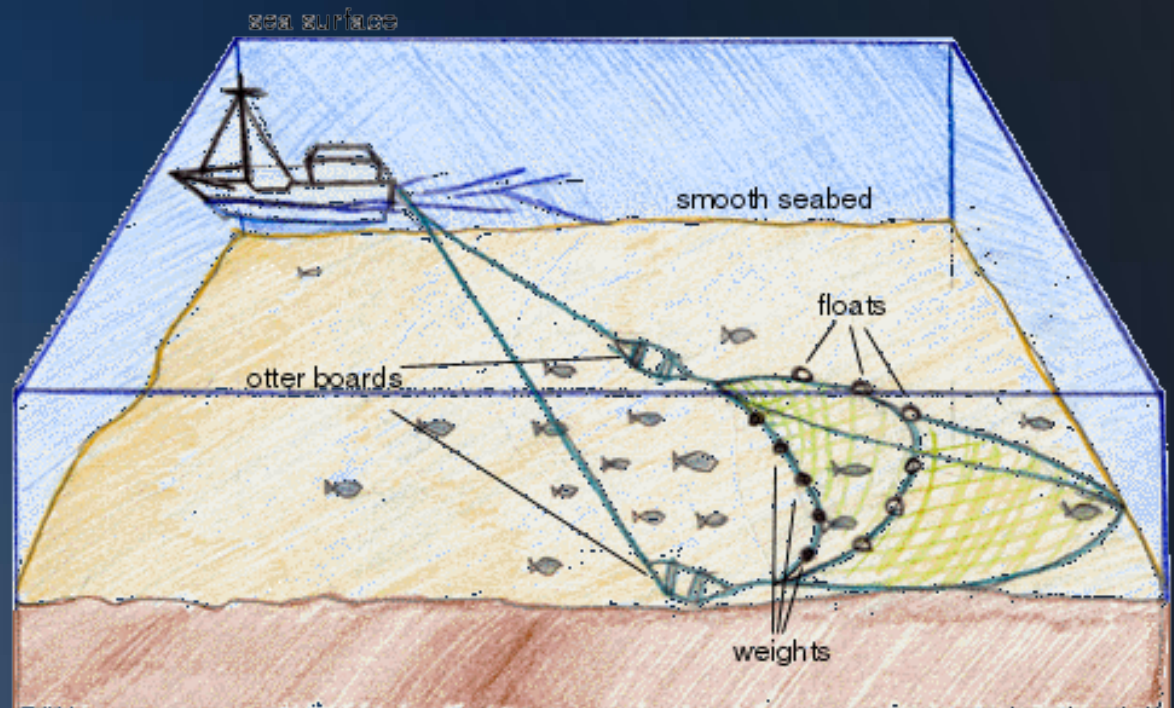


Seining is not a good predictor of walleye year class strength.



Young-of-Year Sampling

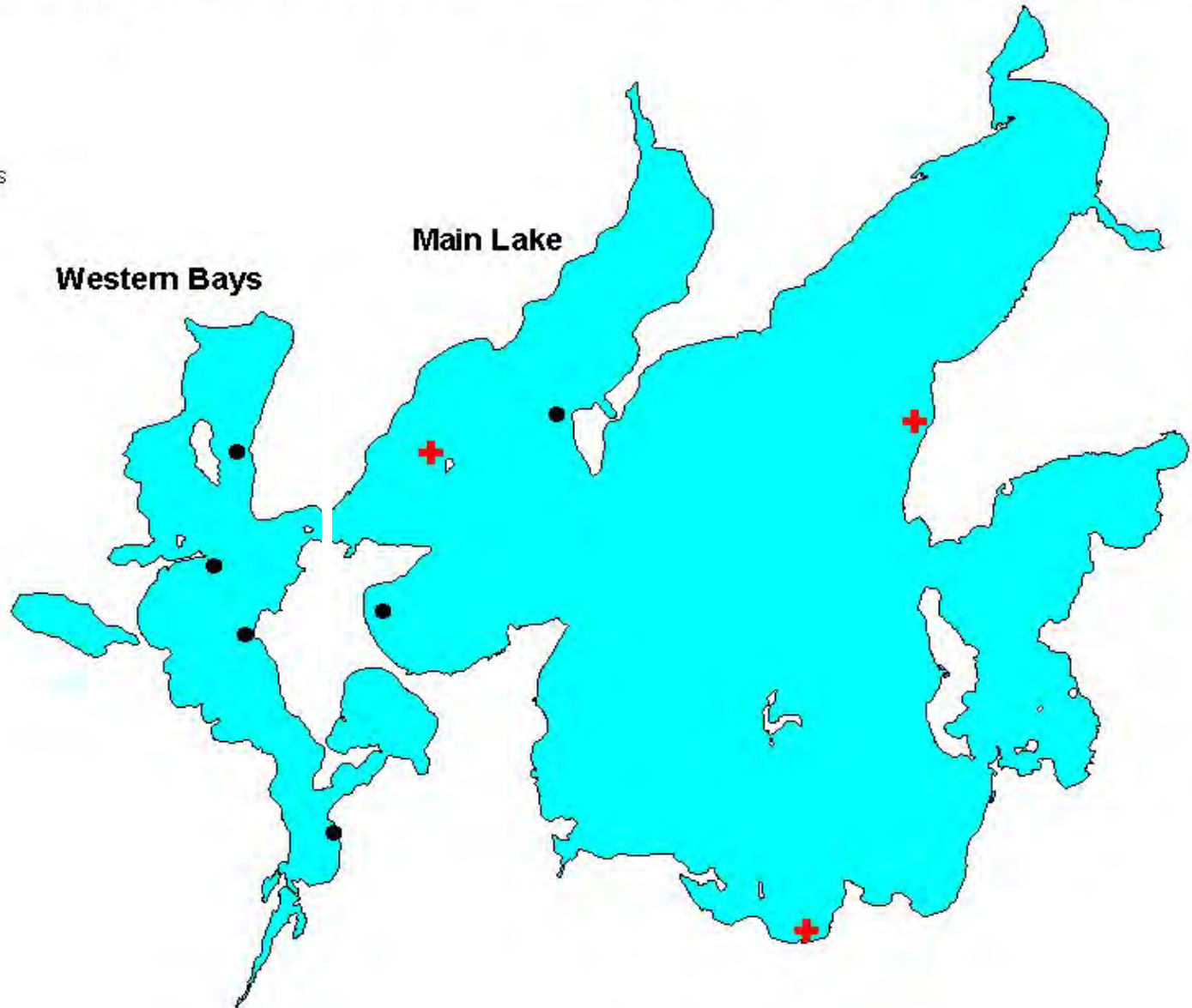
- Seining (July)
- Trawling (August) - YOY growth, index recruitment



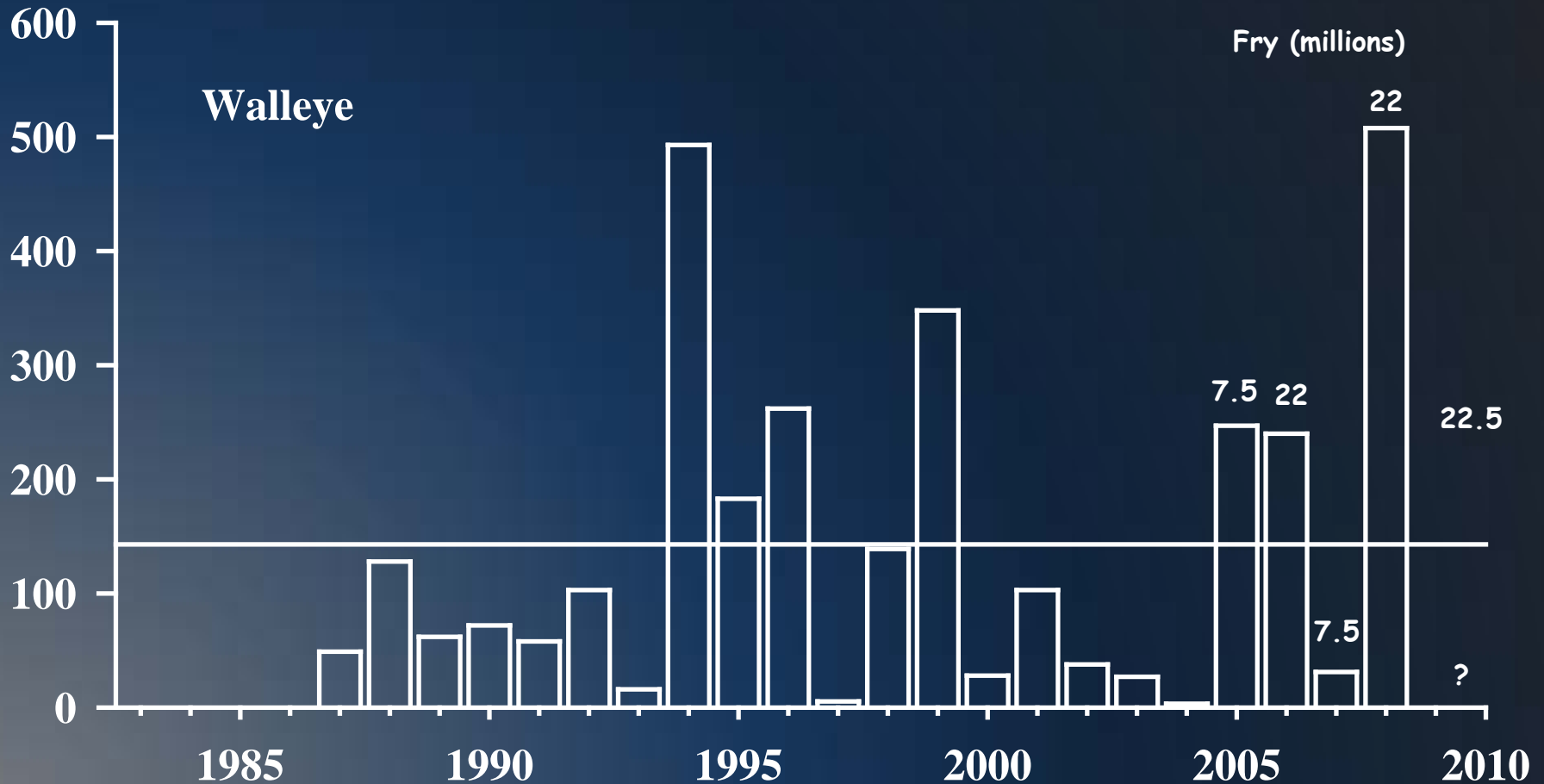
TRAWLING

Trawling Stations - Leech Lake

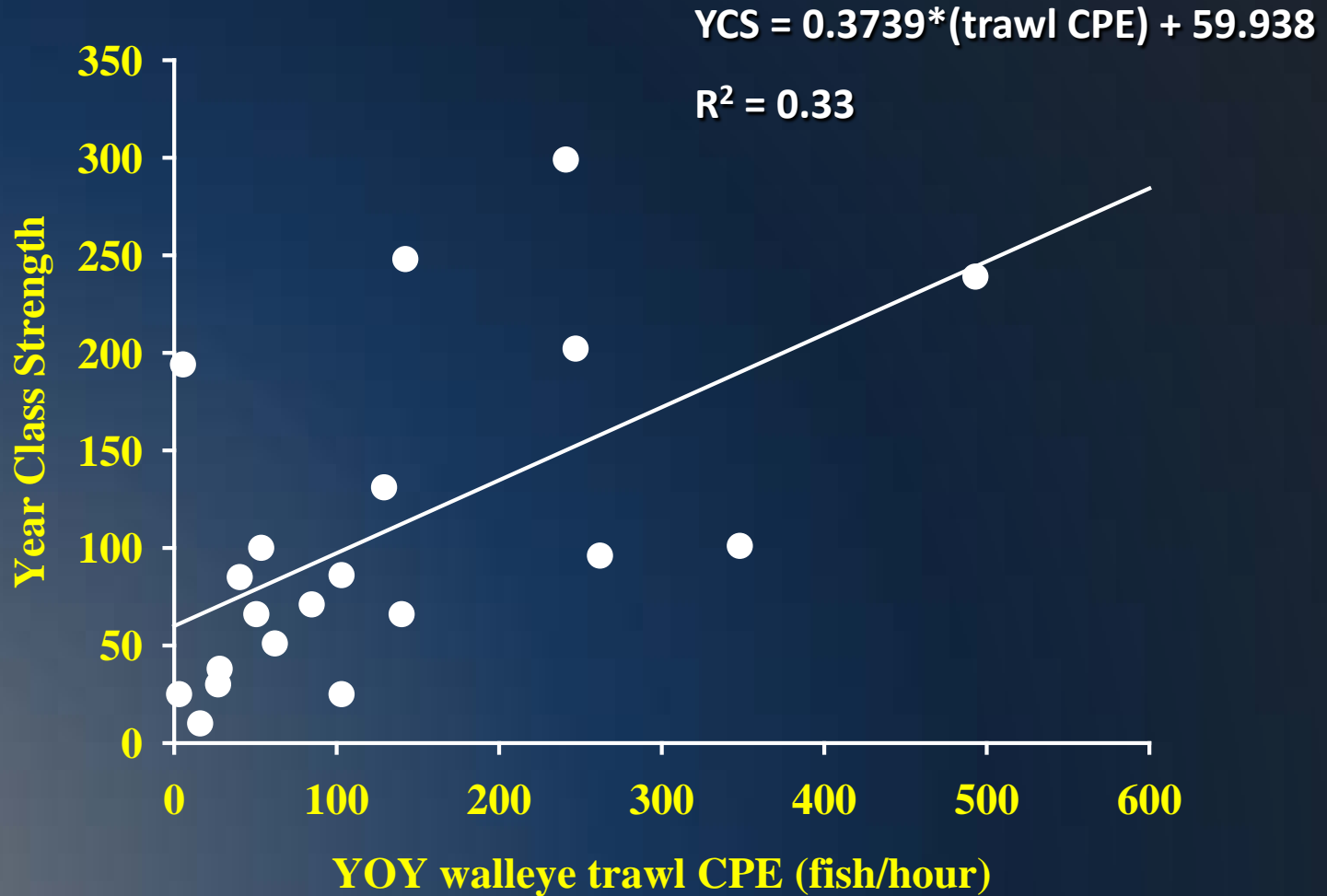
- Discontinued stations
- ✚ Current stations



Trawl Catch Rates (fish/hour)



Trawling is a better predictor of walleye year class strength.



Trawling is a better predictor of walleye year class strength

Predictability improves when trawling is combined with gillnet catch rates ($R^2=0.60$)

Why???

High catch rates of age-0 fish in gillnets suggests good survival because they are big

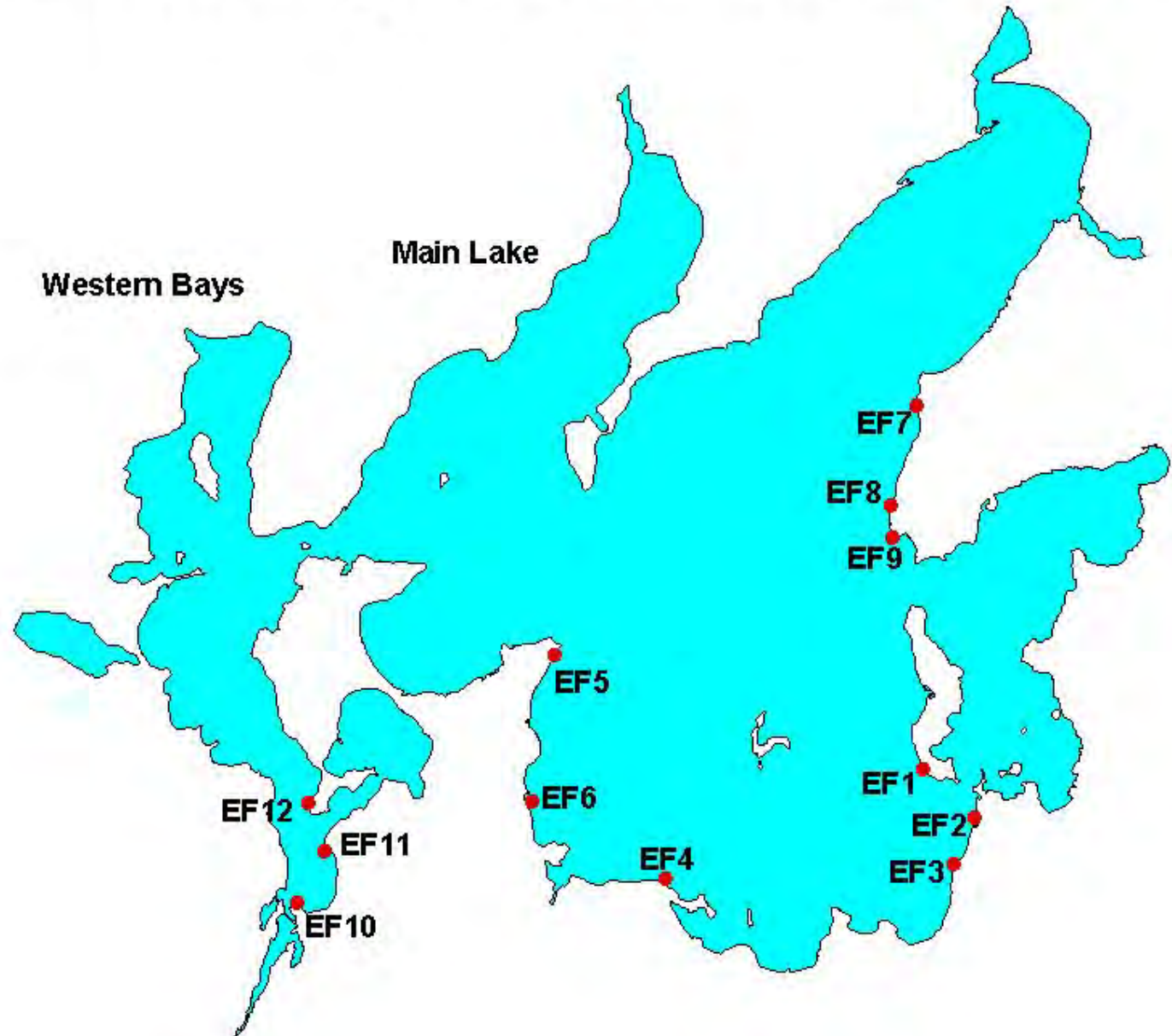
Electrofishing may improve on ability to predict YCS

Young-of-Year Sampling

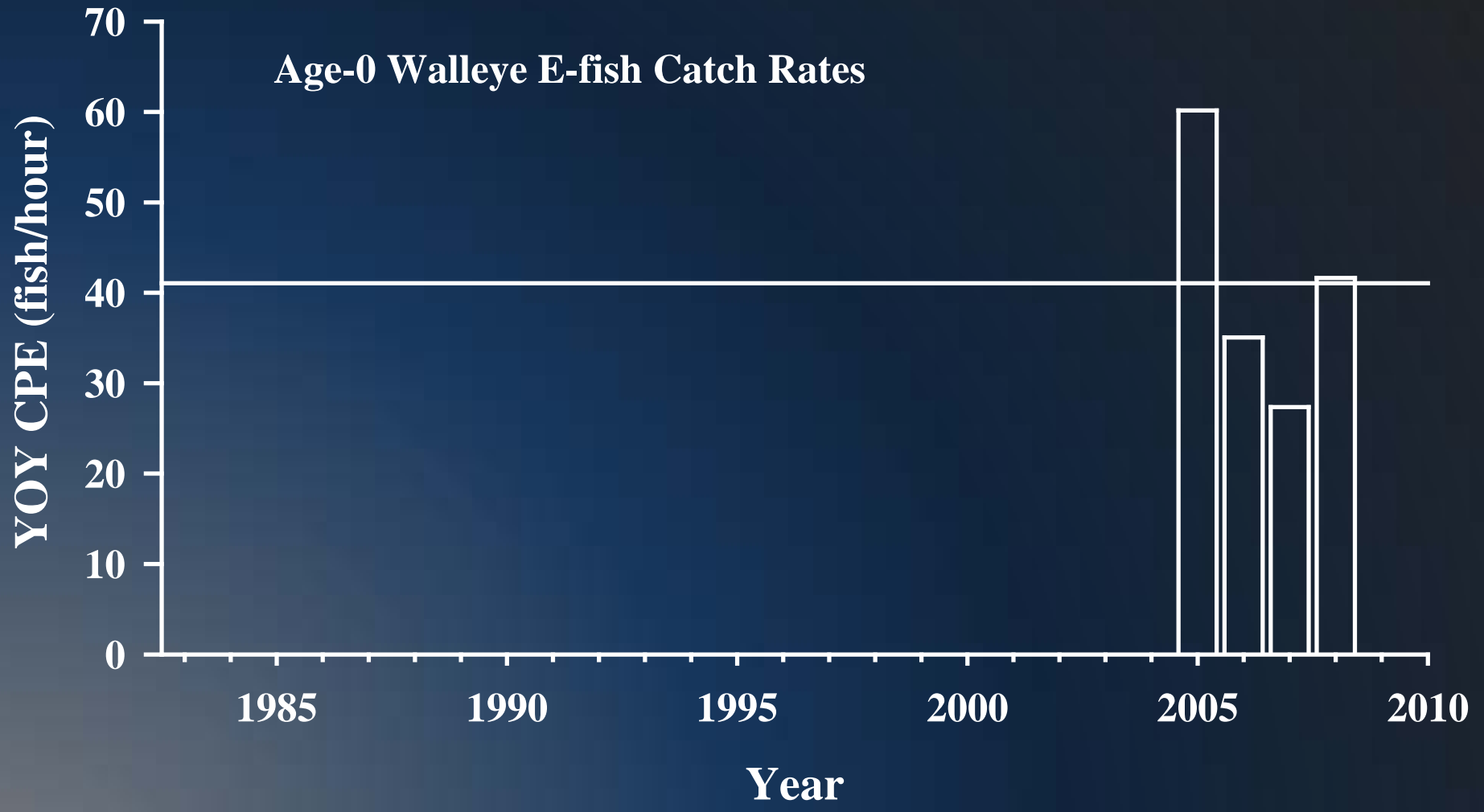
- Seining (July)
- Trawling (August)
- Electrofishing (September) - potential recruitment index, size at end of fall



Electrofishing Areas - Leech Lake



Age-0 Walleye E-fish Catch Rates

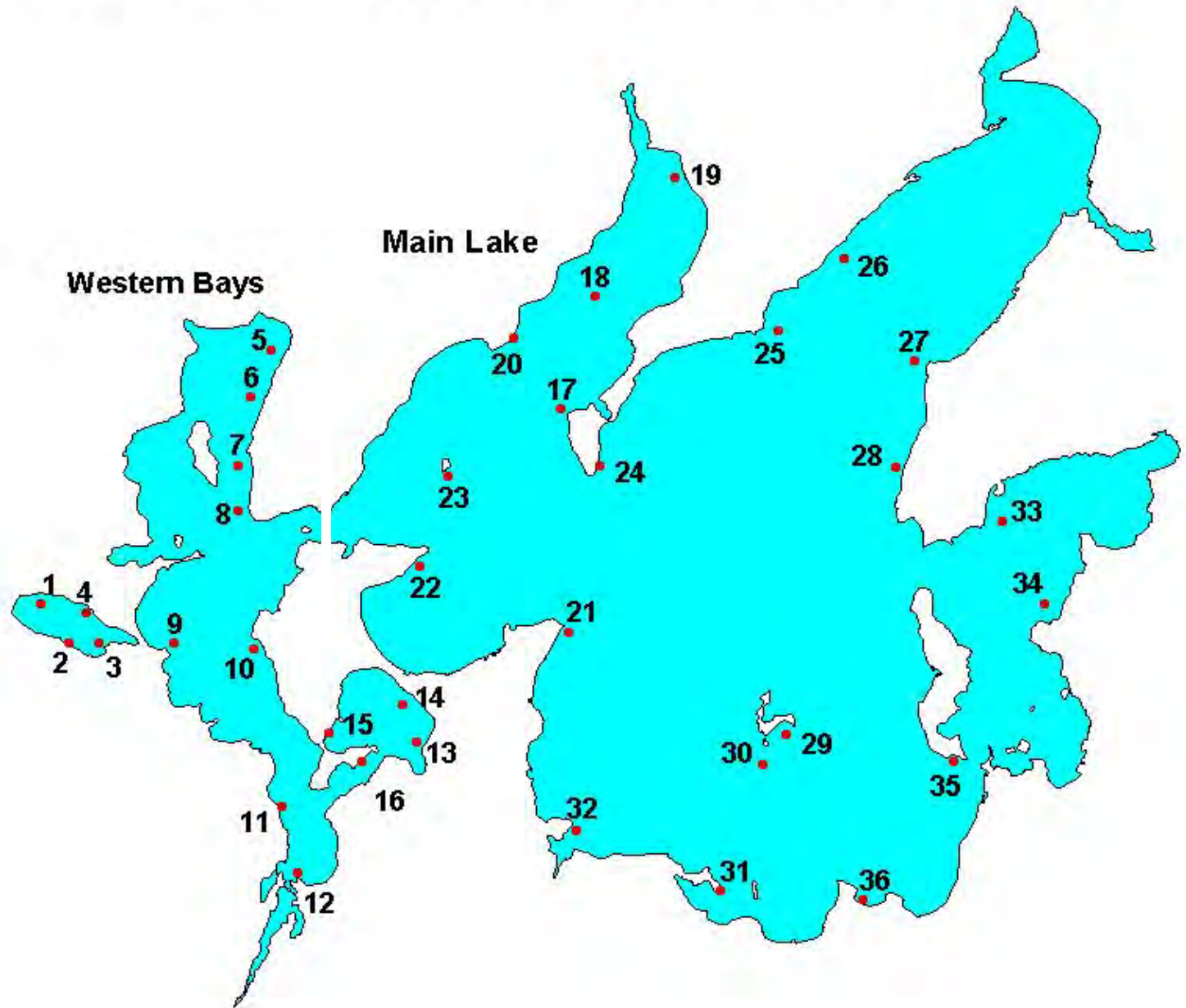


Sampling Adult Population

- Gill nets
 - Composition – length, age, & sex
 - Growth
 - Measure recruits



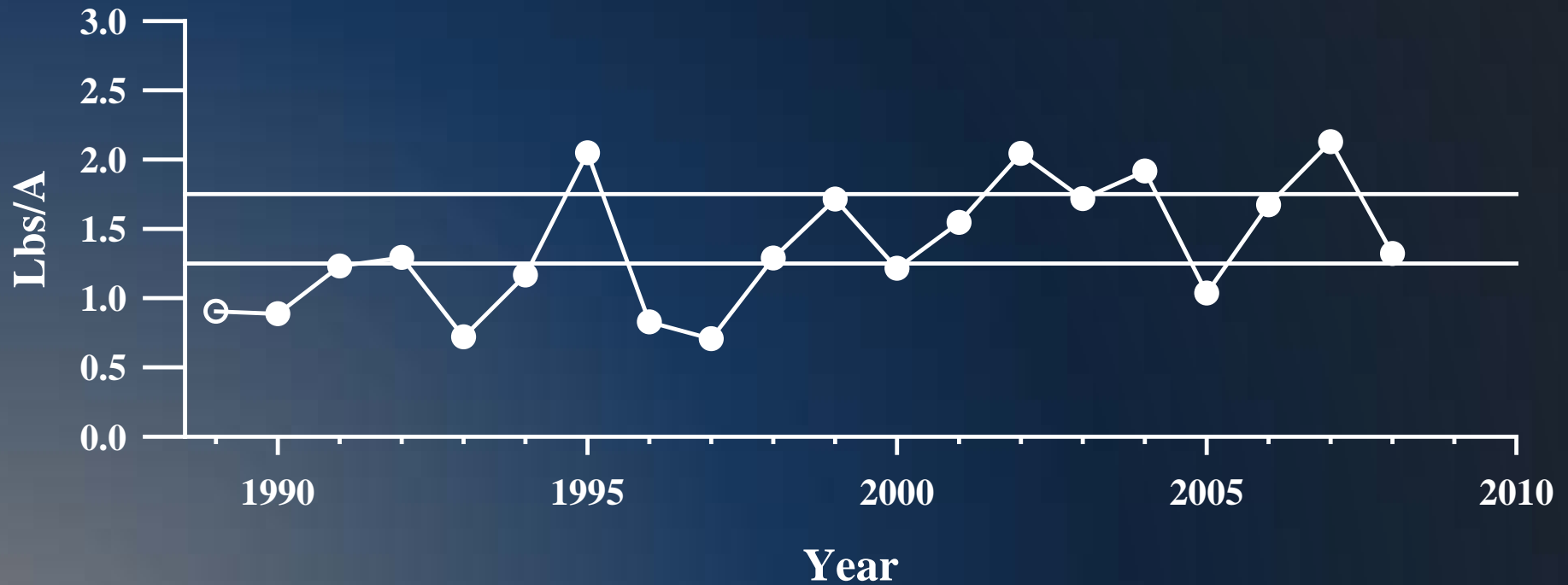
Gillnet Locations - Leech Lake



2005-2010 Walleye Objectives

- **Spawner biomass 1.25-1.75 lbs/a**

Walleye Spawner Biomass



2005-2010 Walleye Objectives

- ✓ Spawner biomass 1.25-1.75 lbs/a
- Gillnet catch rate 7.4 fish/net

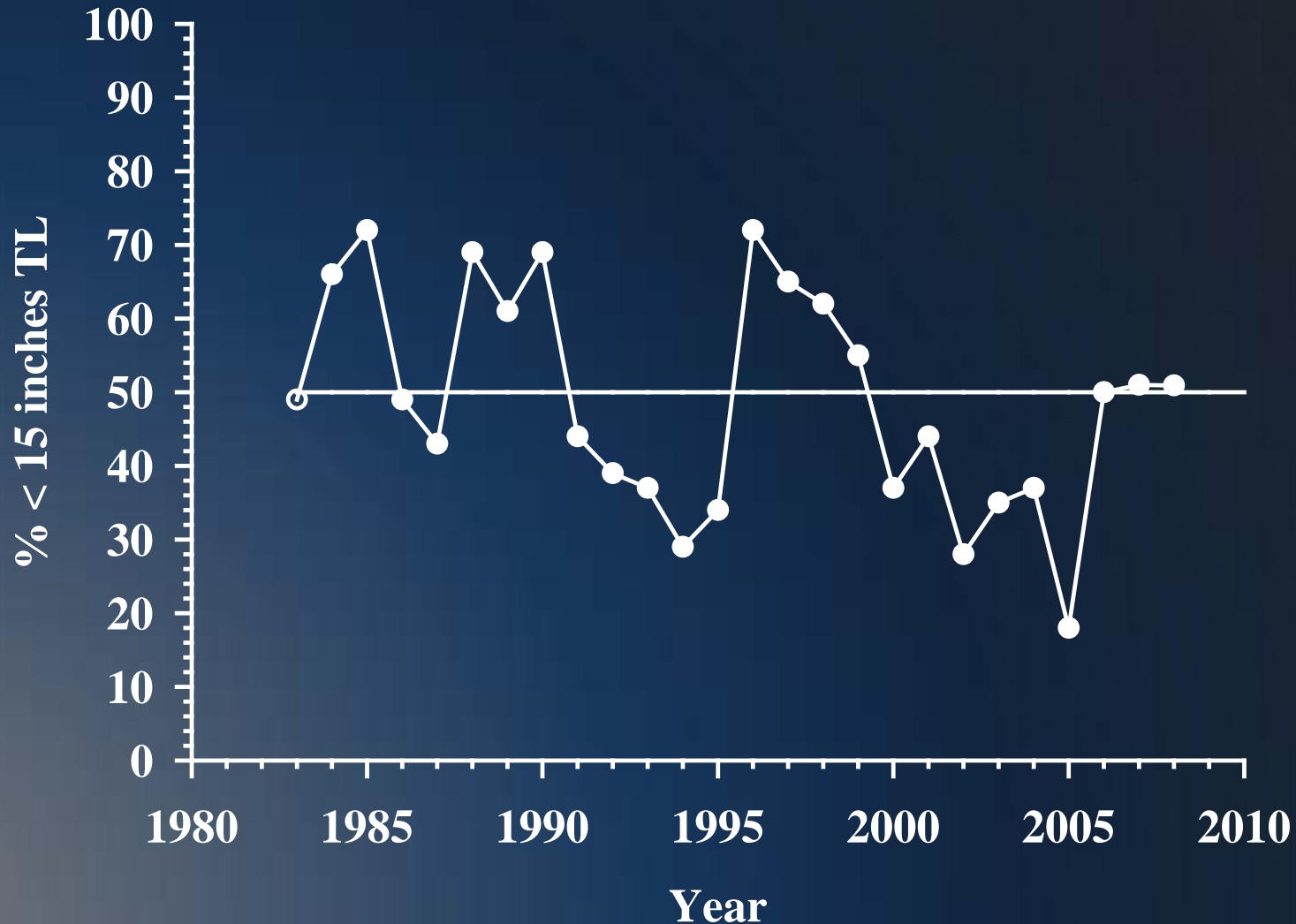
Gillnet Catch Rate (fish/net)



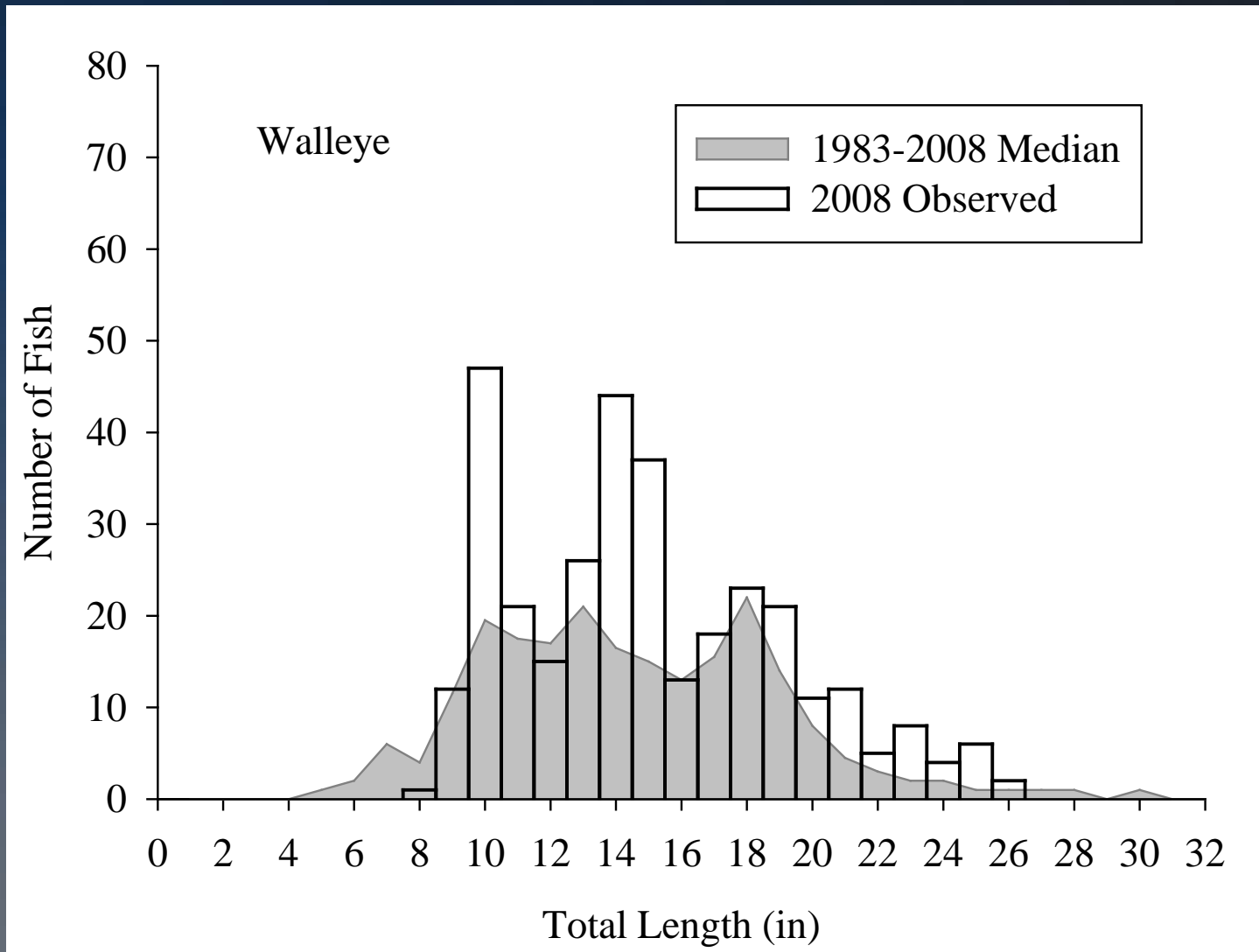
2005-2010 Walleye Objectives

- ✓ Spawner biomass 1.25-1.75 lbs/a
- ✓ Gillnet catch rate 7.4 fish/net
- 50% of gillnetted walleye < 15.0"

% Walleye < 15 inches



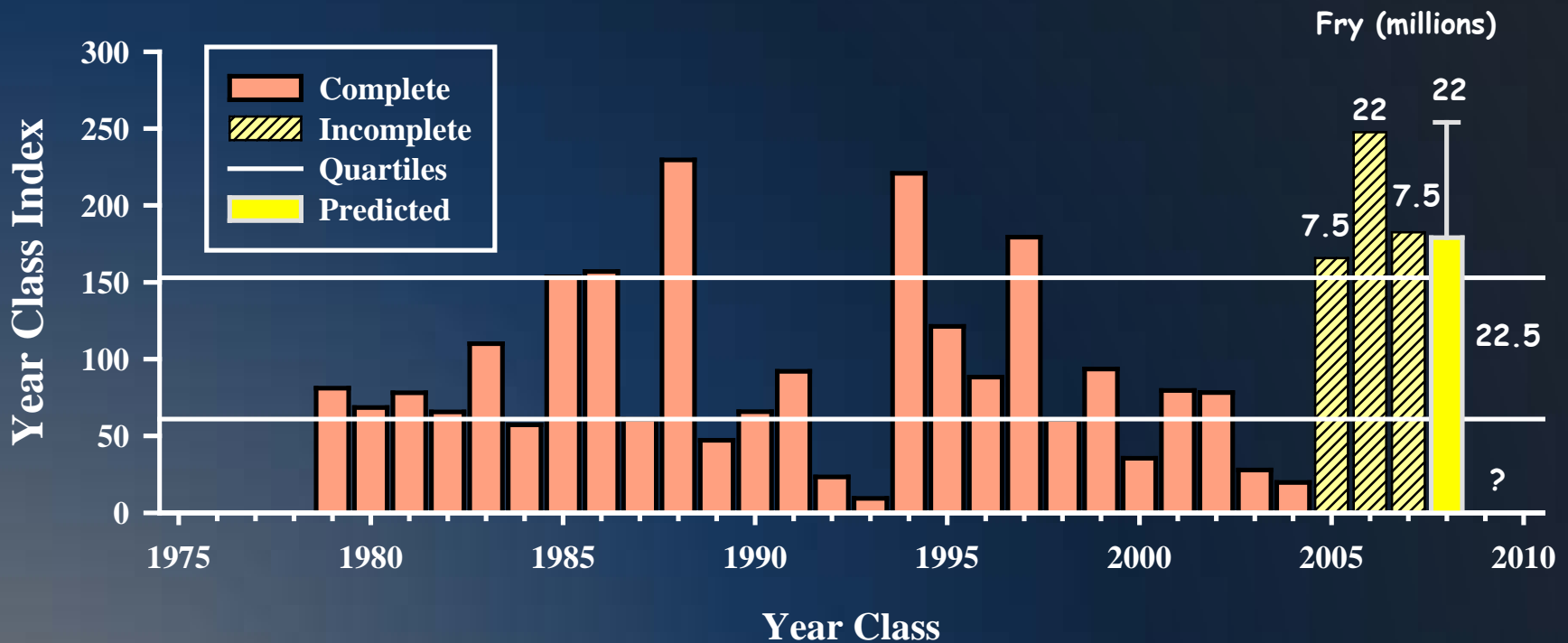
Length-Frequency Distribution



2005-2010 Walleye Objectives

- ✓ Spawner biomass 1.25-1.75 lbs/a
- ✓ Gillnet catch rate 7.4 fish/net
- ✓ 50% of gillnetted walleye < 15.0"
- Two strong YCs by 2009

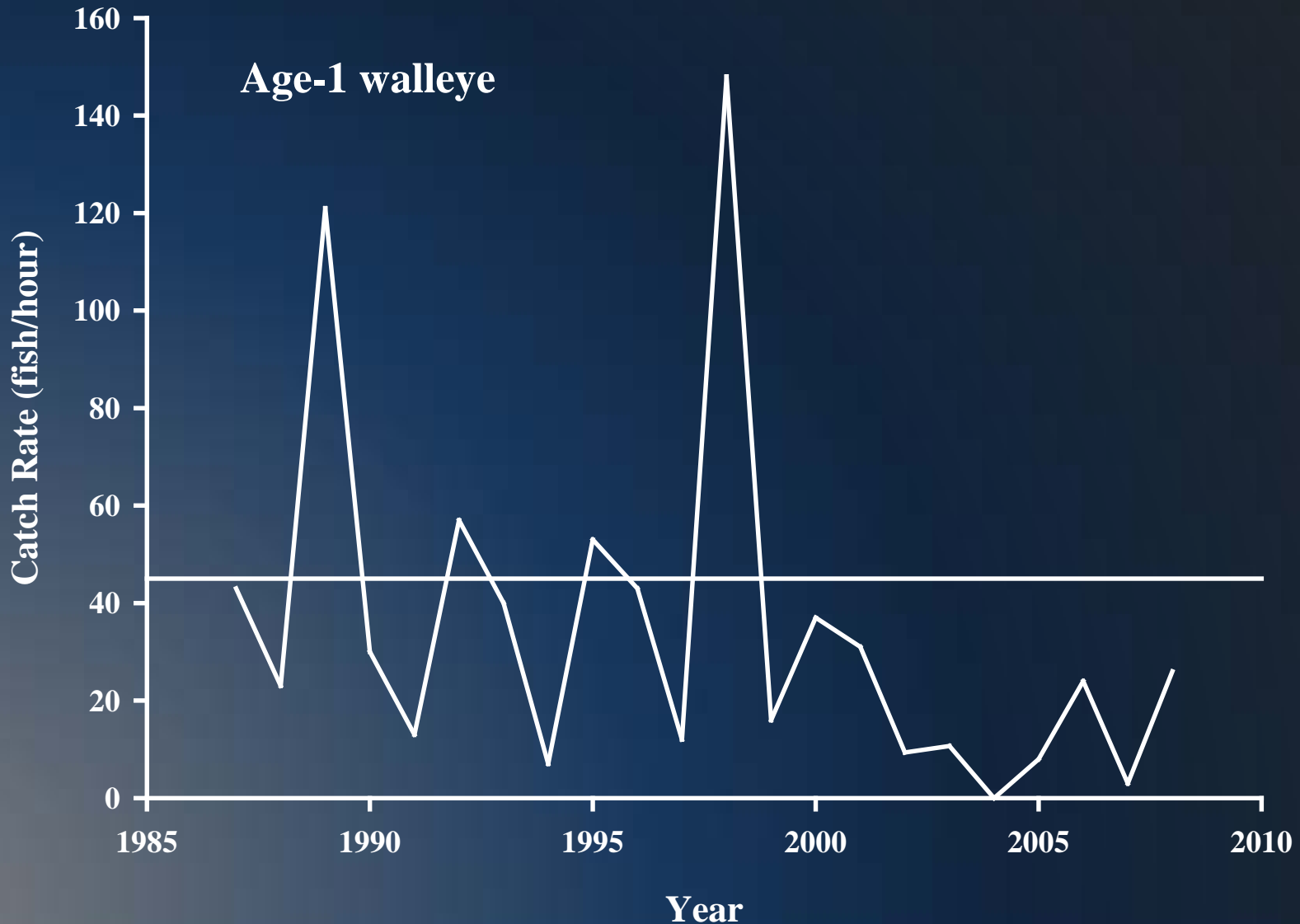
Year Class Strength



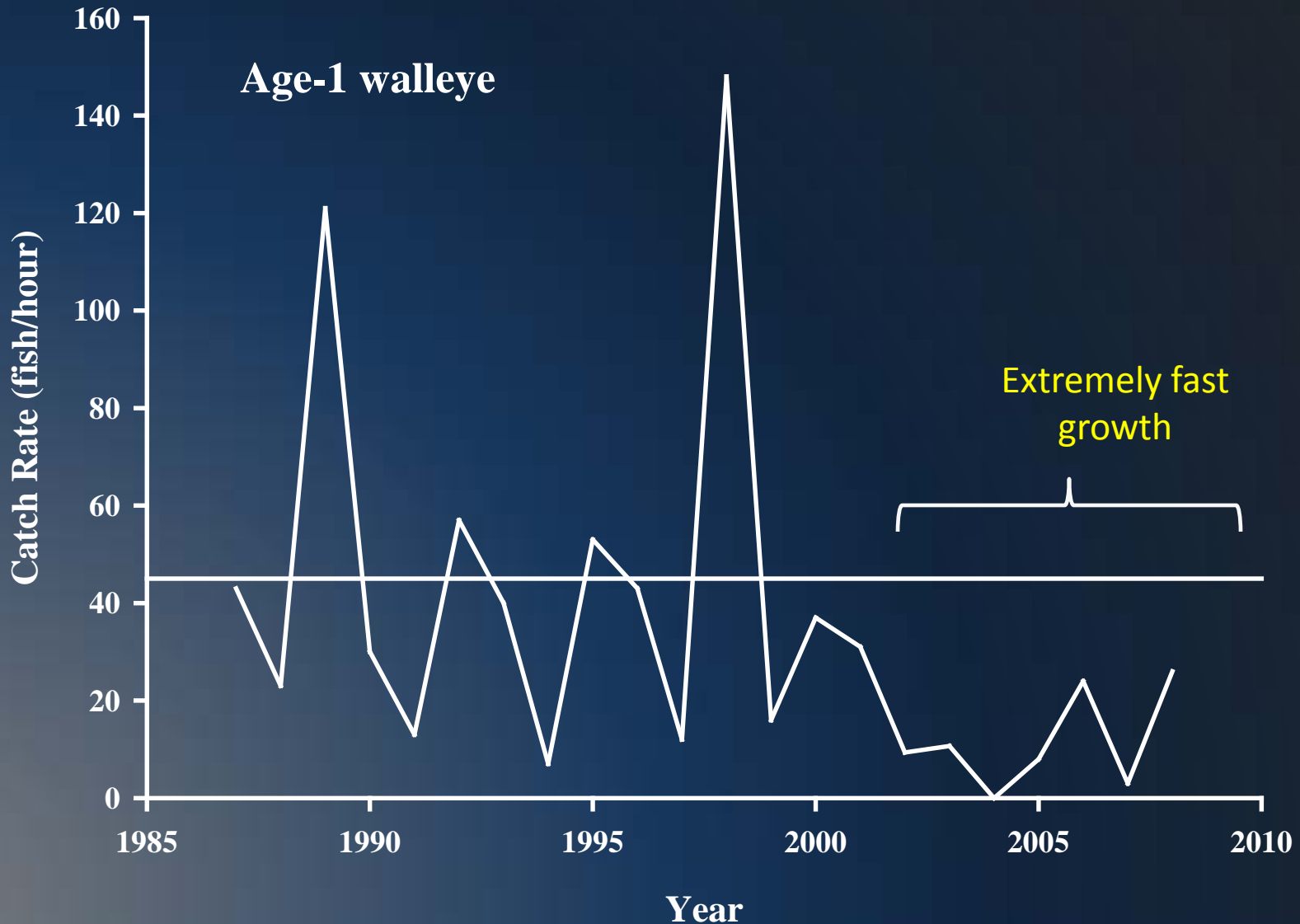
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- ✓ Gillnet catch rate 7.4 fish/net
- ✓ 50% of gillnetted walleye < 15.0"
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- Age-1 trawl catch rate 45 fish/hour

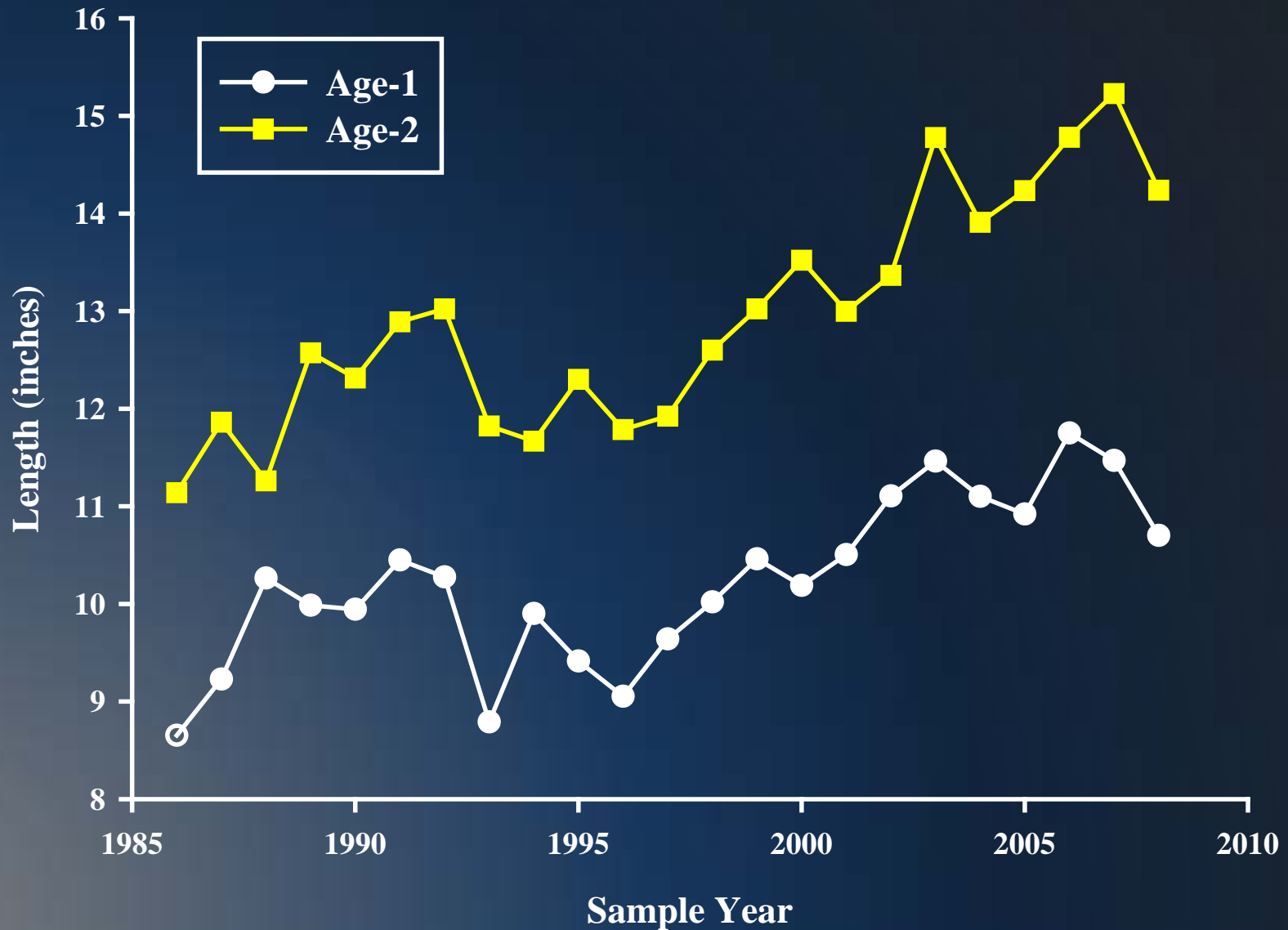
Trawling Age-1 Walleye



Trawling Age-1 Walleye

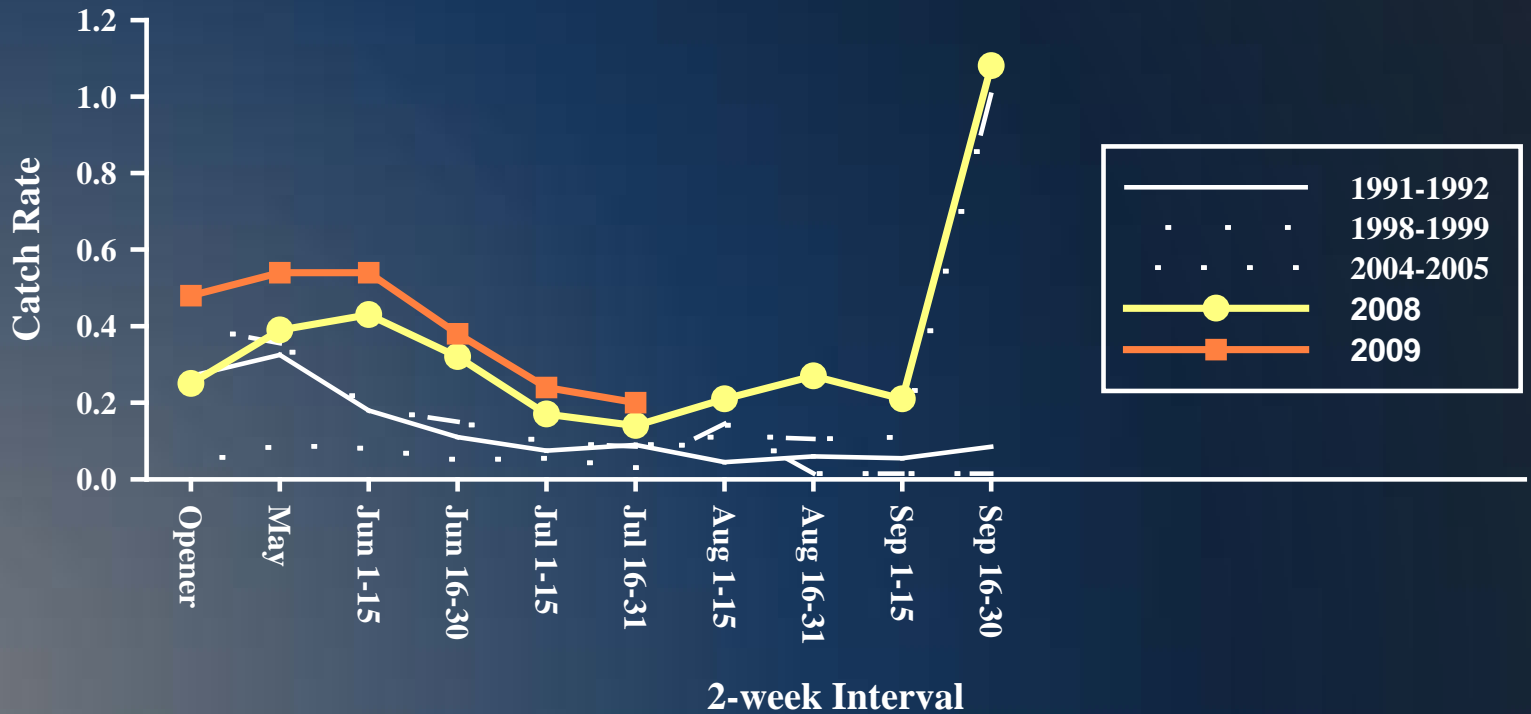
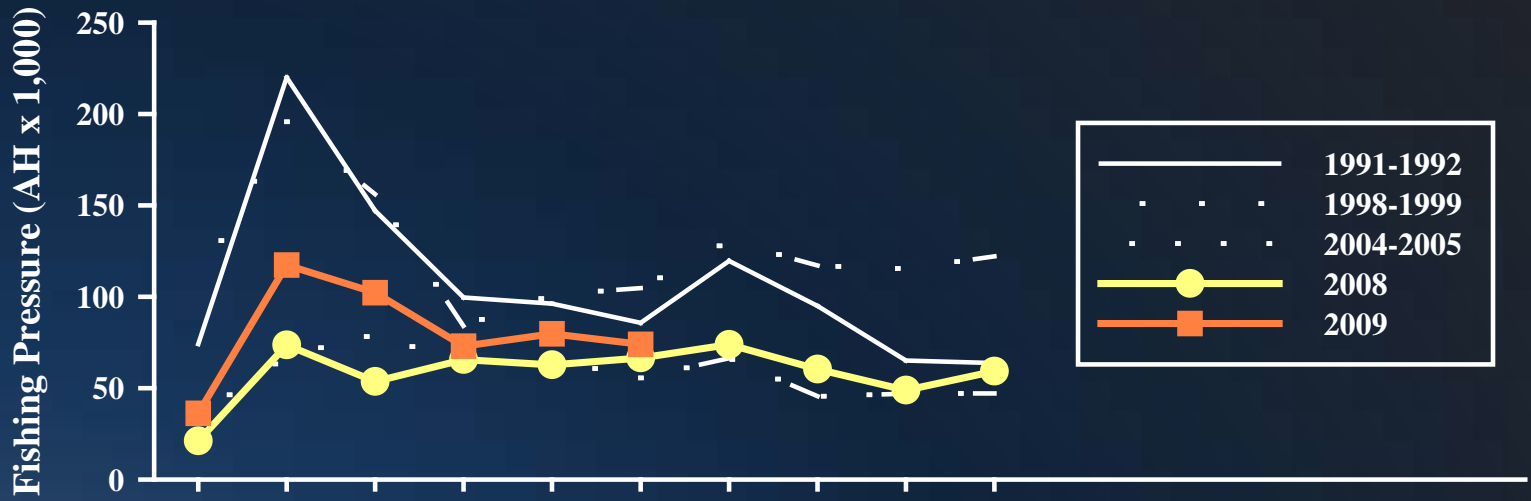


Walleye Growth



Summary - Walleye Objectives

- ✓ Spawner biomass 1.25-1.75 lbs/a
- ✓ Gillnet catch rate 7.4 fish/net
- ✓ 50% of gillnetted walleye < 15.0"
- ✓ Two strong YCs by 2009
- Age-1 trawl catch rate 45 fish/hour
 - Influenced by growth rates?



Questions?