



# Columbia River Treaty Tribes Sturgeon Hatchery Plan

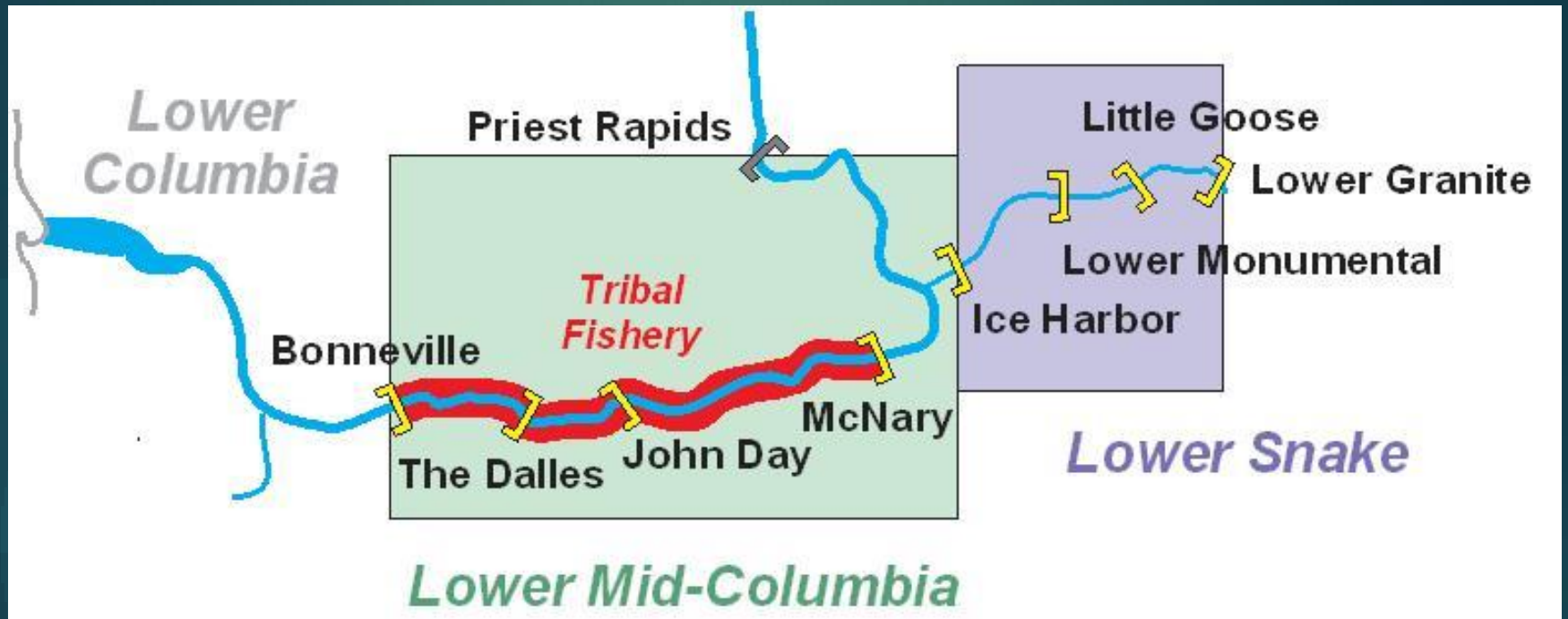
LOWER COLUMBIA & LOWER SNAKE RIVER  
IMPOUNDMENTS

# Today's Topics

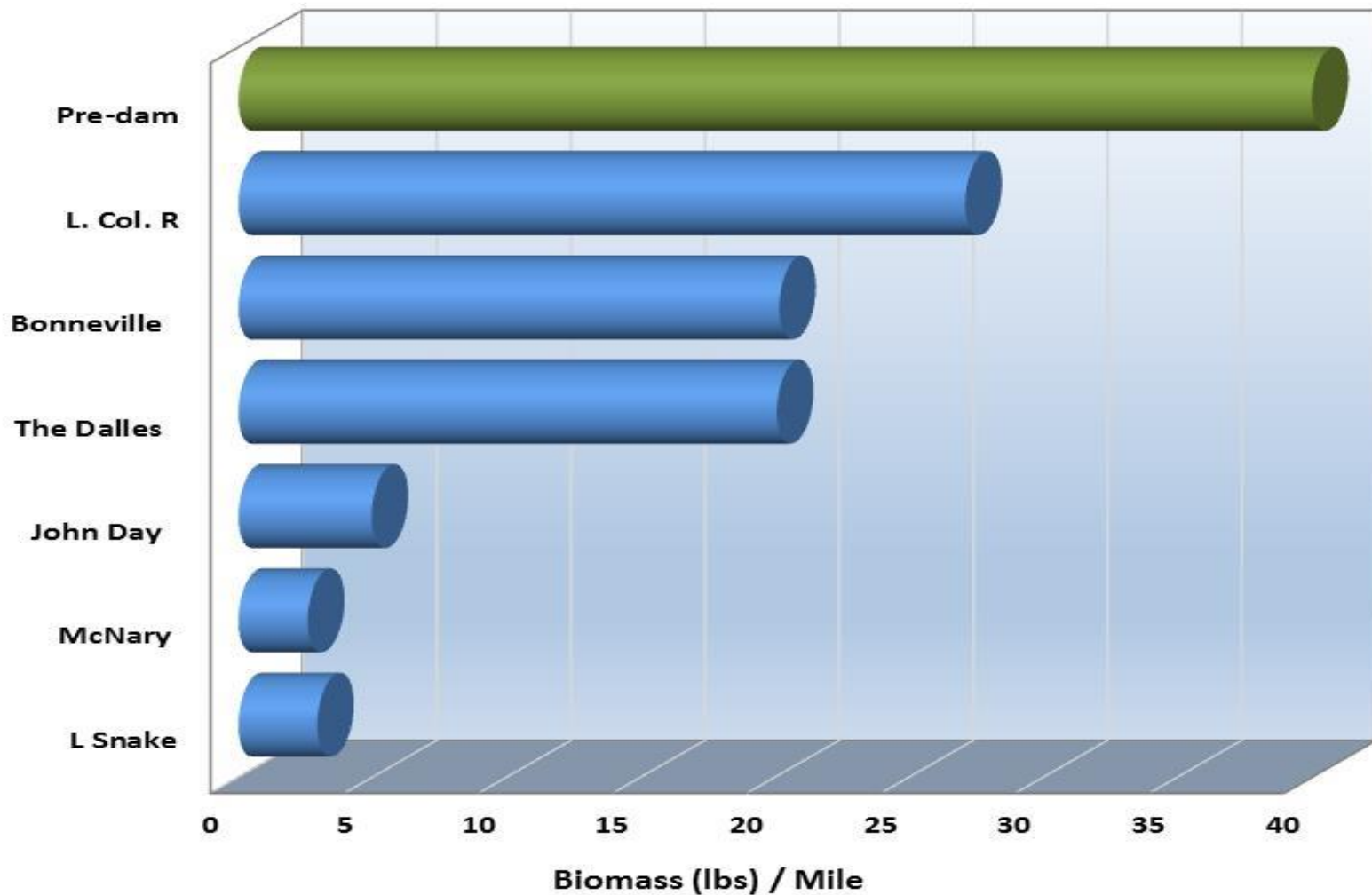
- ▶ **Program Description**
- ▶ **Density Dependence**
- ▶ **Monitoring & Evaluation**

# Program Description





# Standing Stock







**Population**

Unimpounded

Habitat Capacity  
Natural Equilibrium  
Minimum Viable  
Remnant  
Extirpated



Historical

Optimum Sustained Harvest  
Sustained Harvest  
Limited  
Incidental  
None

**Fishery**



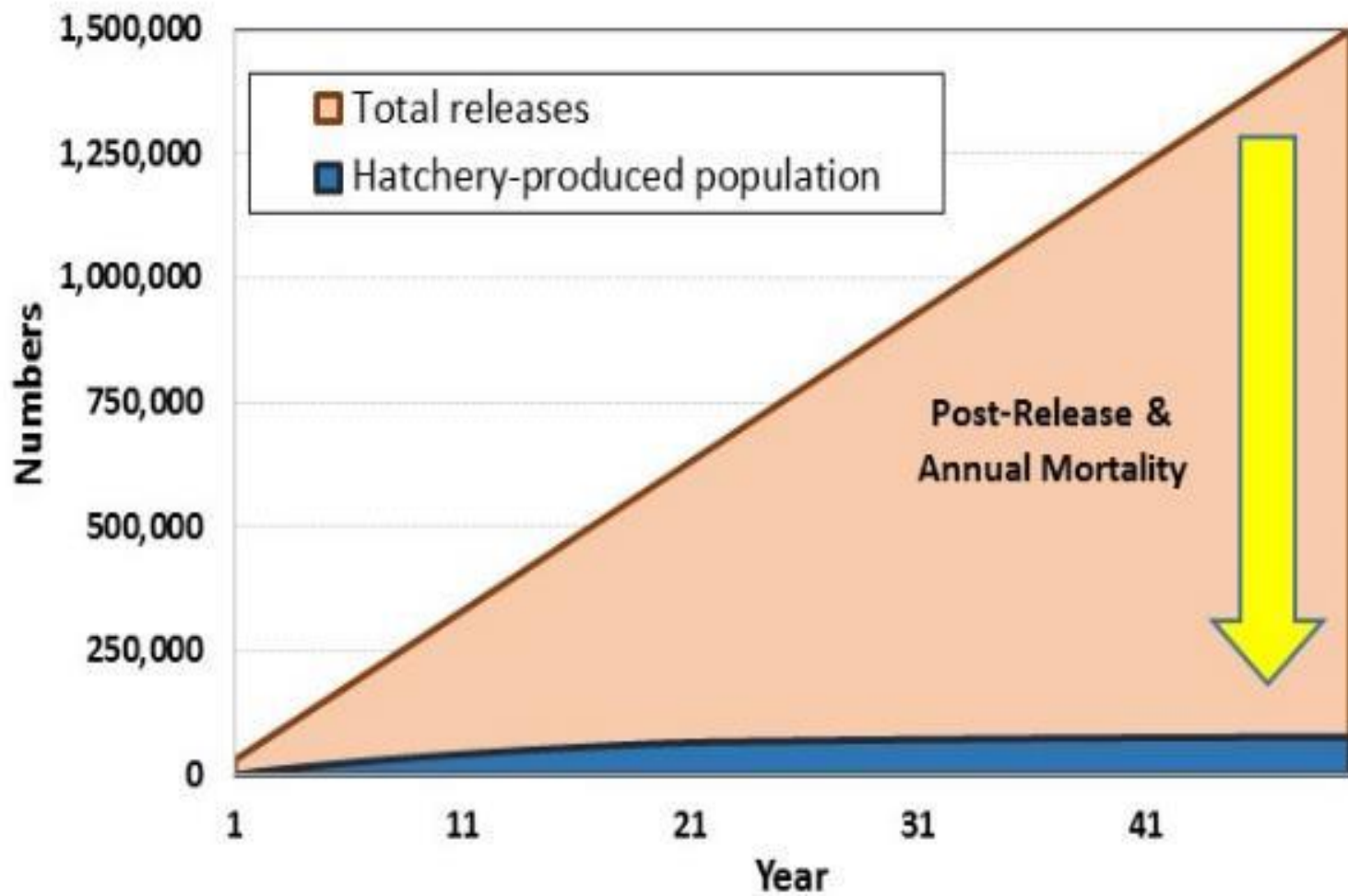
# Production

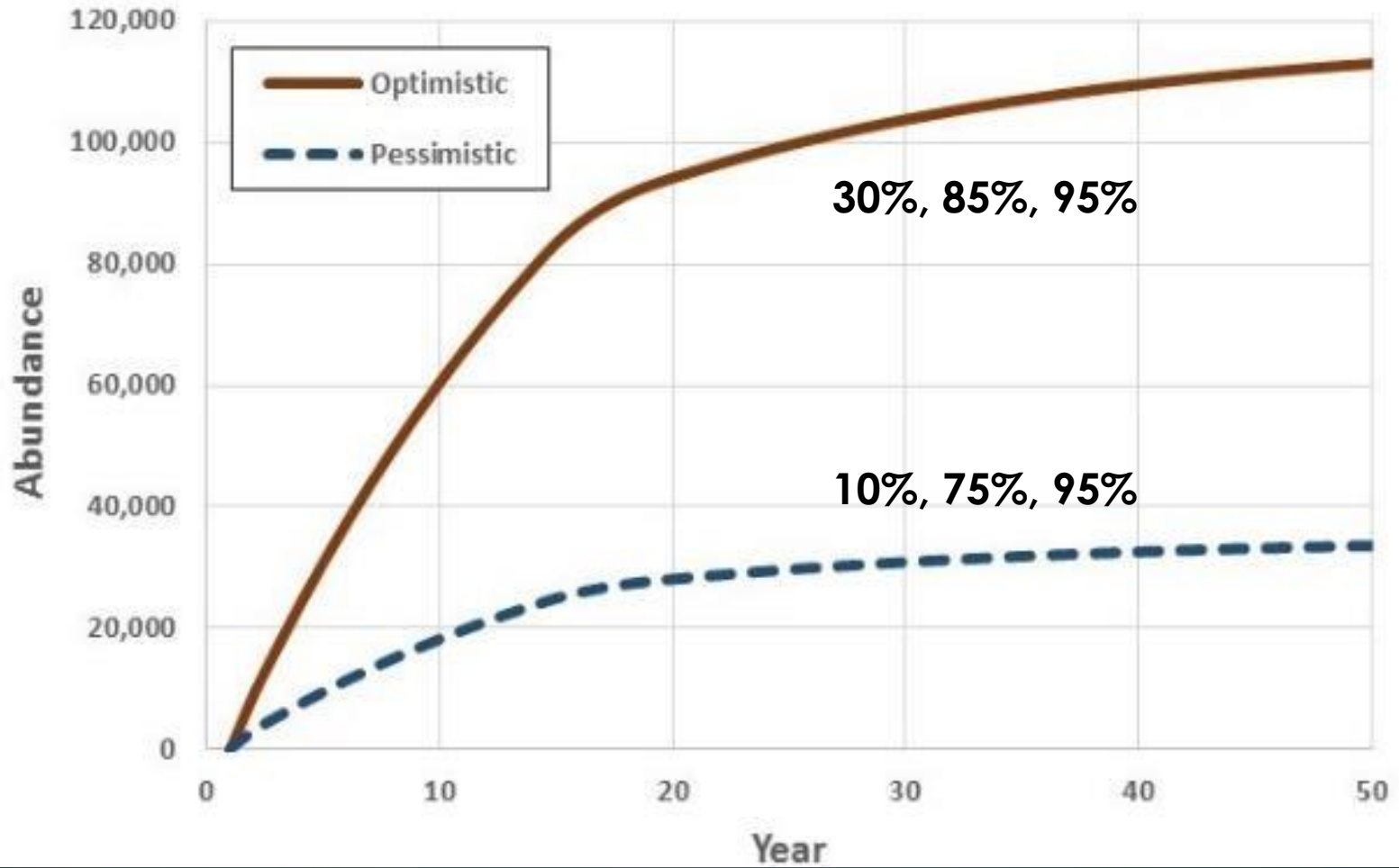
	Conventional	Wild larvae
Annual releases	$\leq 5,000$ (Fall @ age 0), $\leq 20,000$ (Spring @ age 0+), $\leq 1,500$ (Fall @ age 1+)	
Size at release	50-70 g (age 0), 100-150 grams (age 0+), 300 grams (age 1+)	
Broodstock	20 per year	--
Families	50 total (2 x 5 $\text{♂}$ x5 $\text{♀}$ ) 10 maternal / year	To be determined experimentally
Eggs	$\leq 1,000,000$	--
Fry	$\leq 75,000$	$\leq 20,000$
Fish / family	$\leq 1,500$	(few)

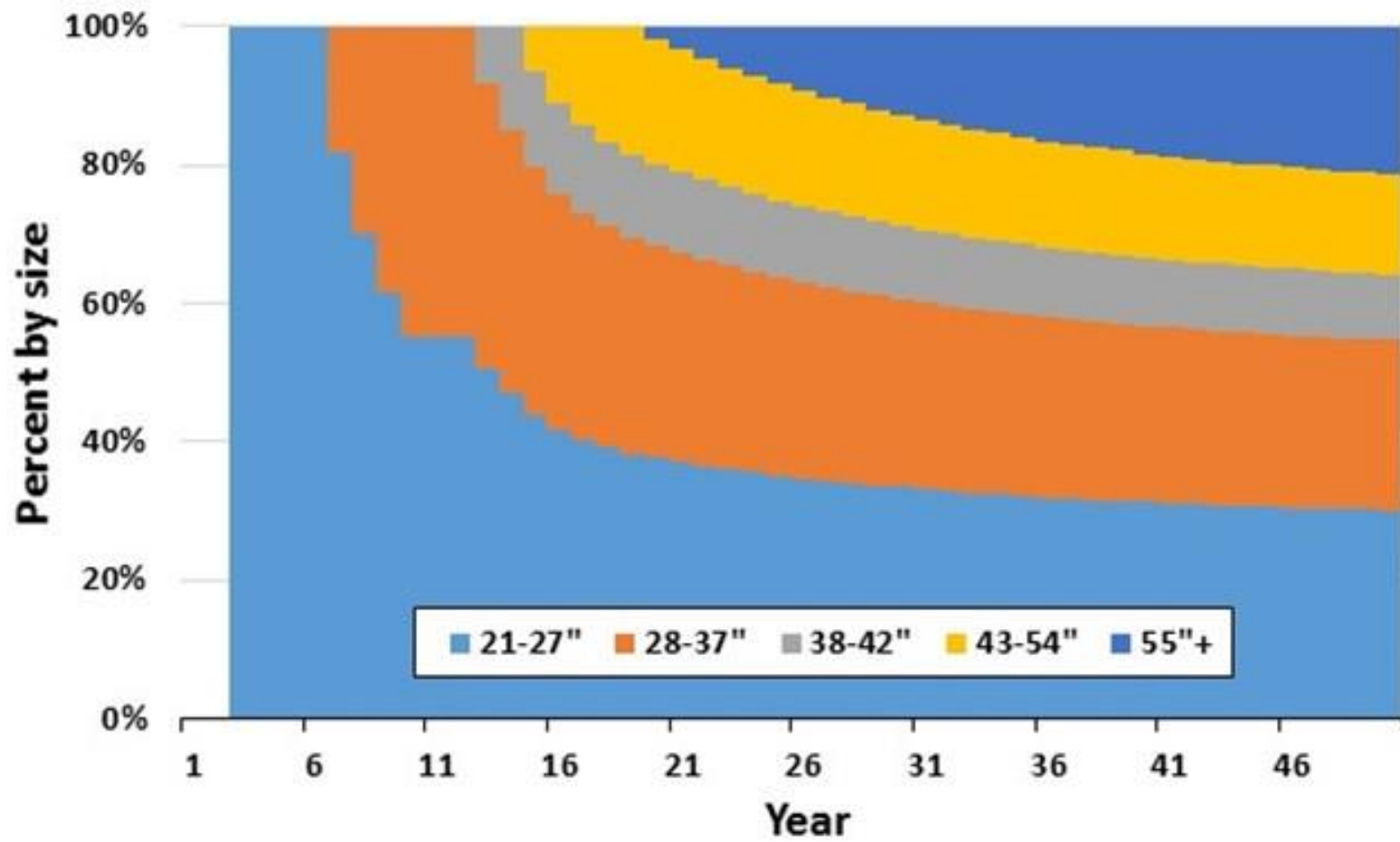
# Program Strategies

1. Existing capacity
2. Optimize benefit-risk balance
3. Annual, marked releases
4. Conventional & wild larvae
5. Mid-Columbia GMU brood
6. Integrated program
7. Hatchery practices
8. Two facilities
9. Experimental framework
10. Broodstock recruitment
11. Complementary measures





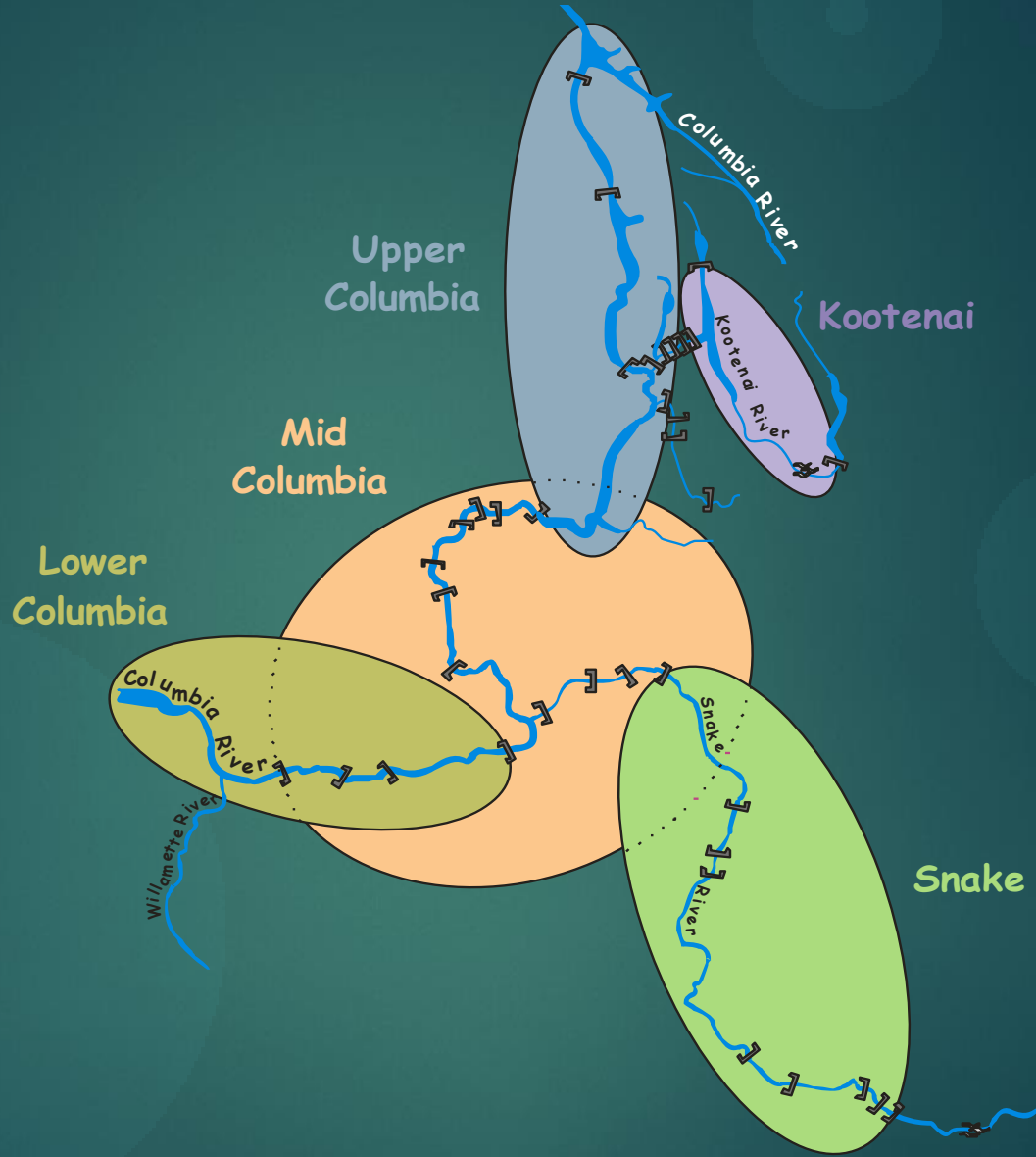




# Population Numbers

	Bonneville	The Dalles	John Day						
	Wild	Wild	Wild	Hatchery		Total			
<b>Abundance</b>	220,000	110,000	40,000	35,000	-	120,000	75,000	-	160,000
<b>Fish / acre</b>	10.6	9.9	0.8	0.7	-	2.3	1.4	-	3.1
<b>Biomass (t)</b>	900	500	429	860	-	2,900	1,289	-	3,329
<b>lb/acre</b>	87	90	17	33	-	112	50	-	128
<b>Harvest / year</b>	2,200	1,300	1,500	700	-	2,300	2,200	-	3,800

# GMUS



# Hatchery Contributions

	Population	Designation	Rel.	PNI	pHOS	pNOB	Fitness
Col.	Bonneville	Primary	--	1.0	0	0	1.00
	The Dalles	Primary	--	0.95	<5% <sup>a</sup>	1.0	0.99
	John Day	Contrib	26,500	0.6 - 0.7	0.4 - 0.7	1.0	0.76 - 0.85
	McNary	Contrib	--	0.95	<5%	1.0	0.99
Snake	Ice Harbor	Stabilizing	5,000	0.6-0.8	0.3-0.6	1.0	0.80 - 0.89
	Lo. Mo	Stabilizing					
	Lit. Goose	Stabilizing					



A large school of fish, possibly salmon, swimming in clear water. The fish are densely packed and moving in a coordinated manner. The word "Capacity" is overlaid in the center of the image.

**Capacity**

# Risk Analysis

## Ecological

- Intraspecific interactions
- Interspecific interactions
- Disease magnification

## Demographic

- Broodstock mining
- Spawner mortality or disruption
- Recruitment overfishing

## Genetic

- Loss of diversity
- Inbreeding depression
- Selection

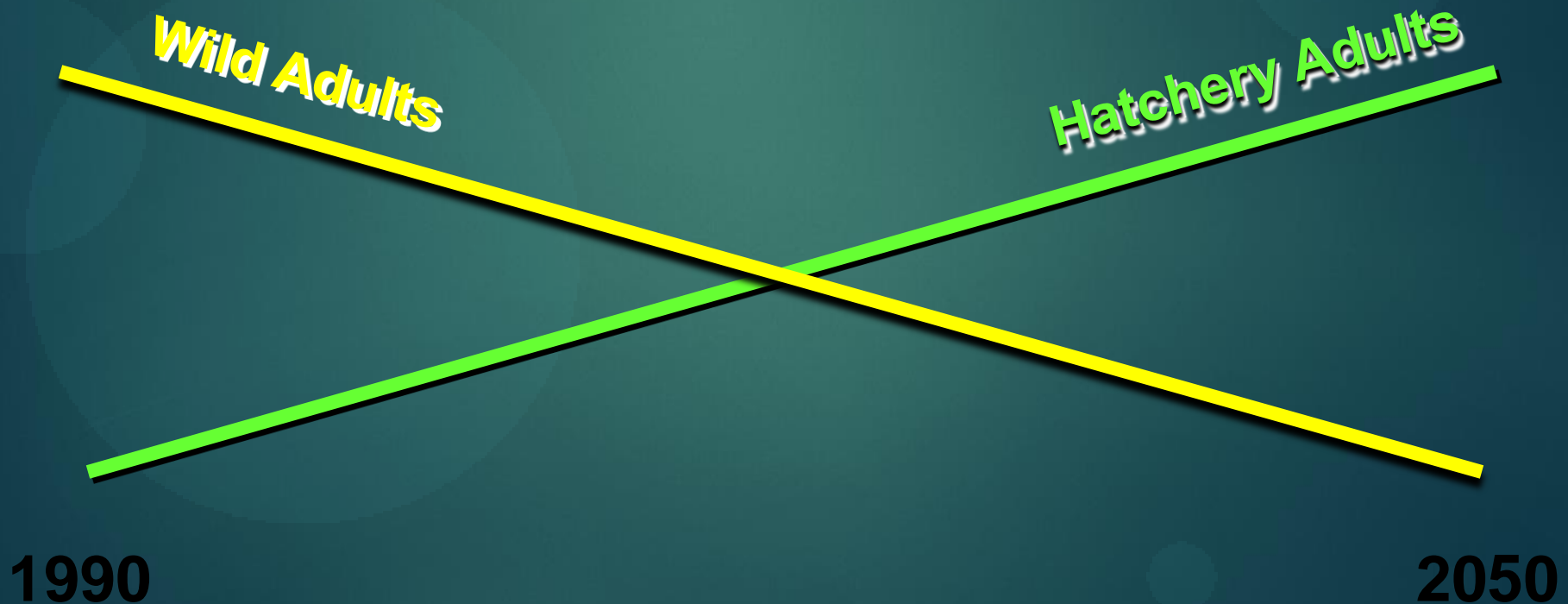
## Uncertainty

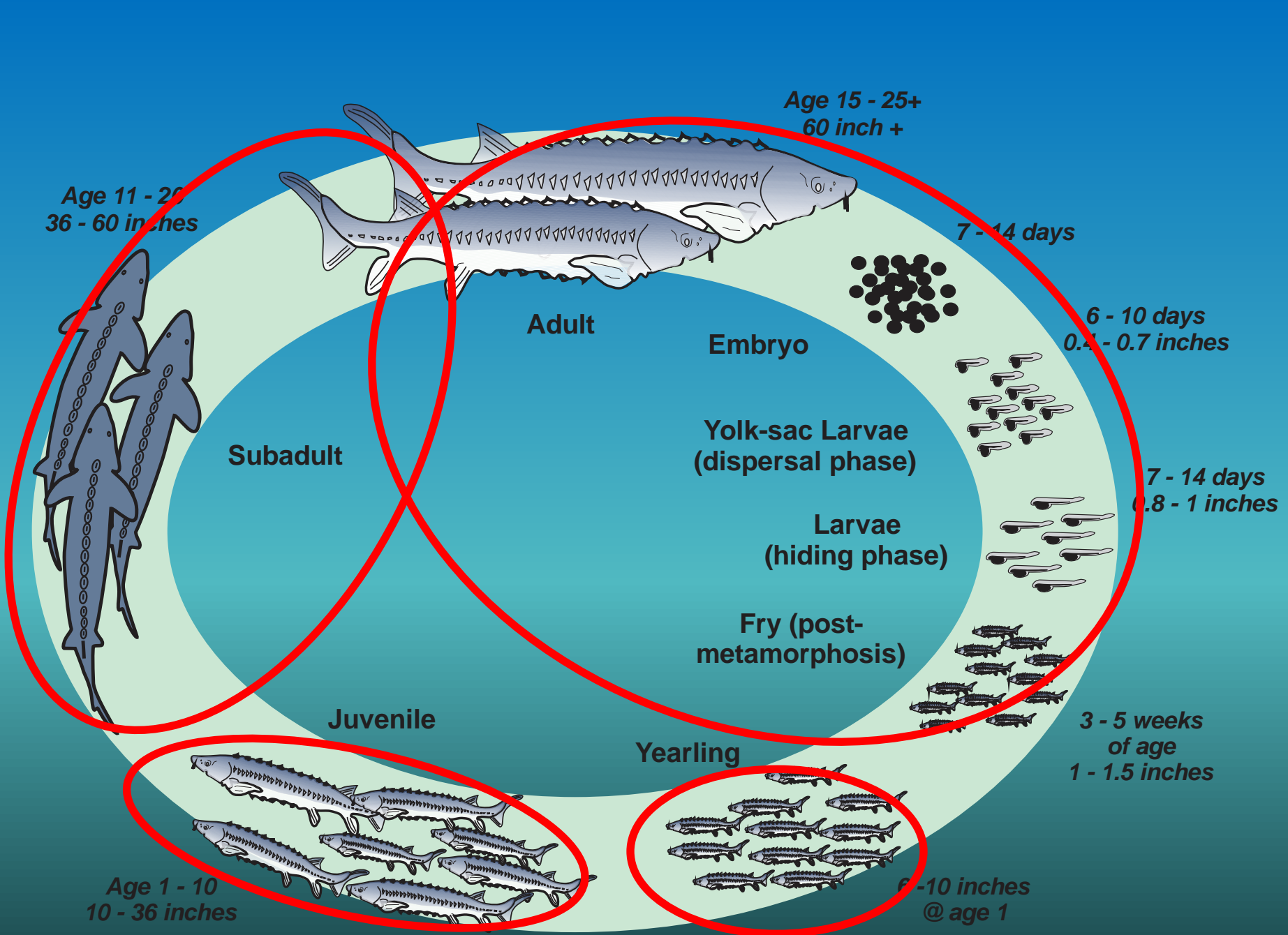
- Measurement
- Process

# Temporal Risk Analysis



Genetic → Demographic → Ecological





Age 15 - 25+  
60 inch +

Age 11 - 20  
36 - 60 inches

7 - 14 days

6 - 10 days  
0.4 - 0.7 inches

7 - 14 days  
0.8 - 1 inches

3 - 5 weeks  
of age  
1 - 1.5 inches

6-10 inches  
@ age 1

Adult

Embryo

Yolk-sac Larvae  
(dispersal phase)

Larvae  
(hiding phase)

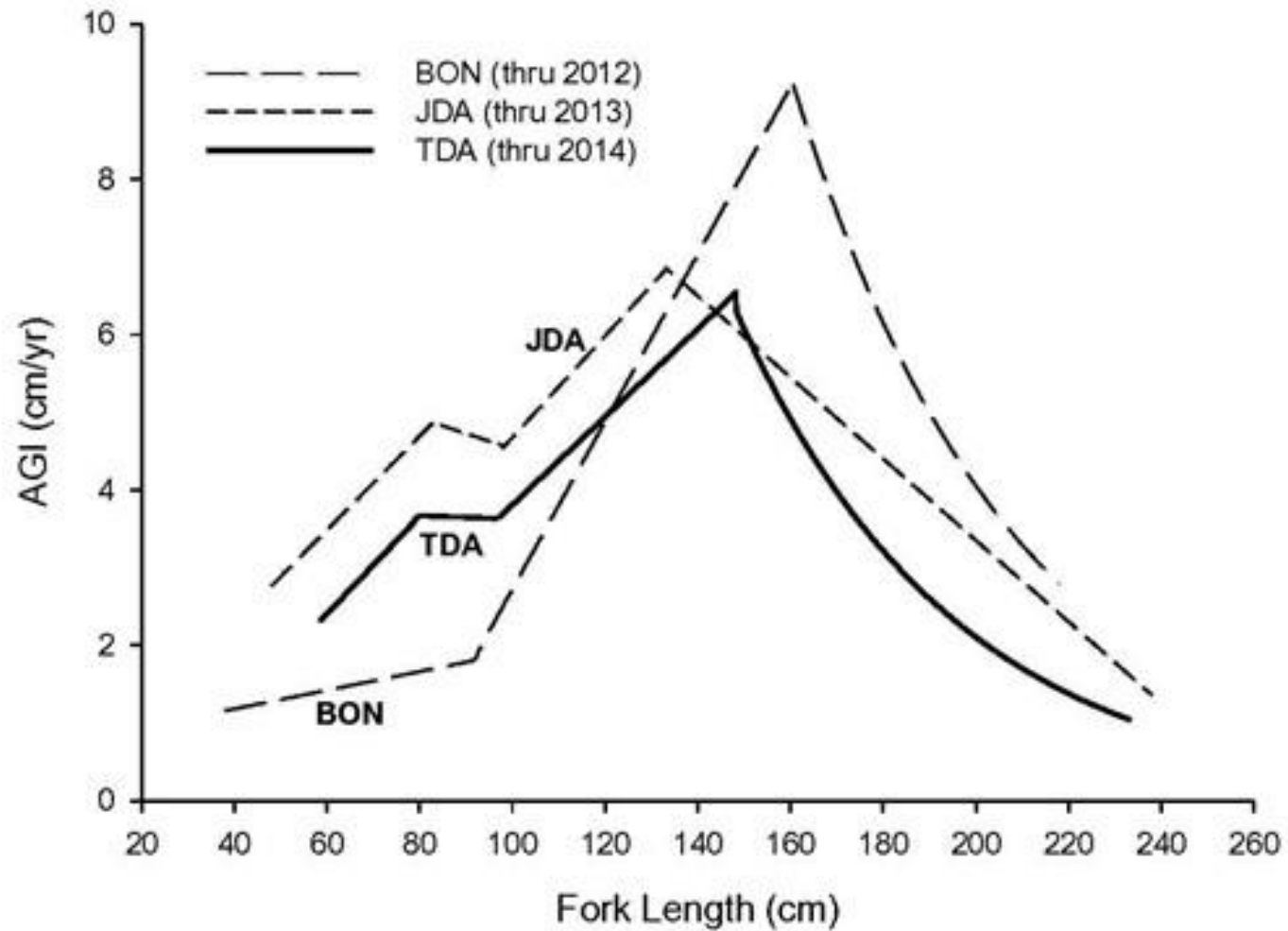
Fry (post-  
metamorphosis)

Yearling

Juvenile

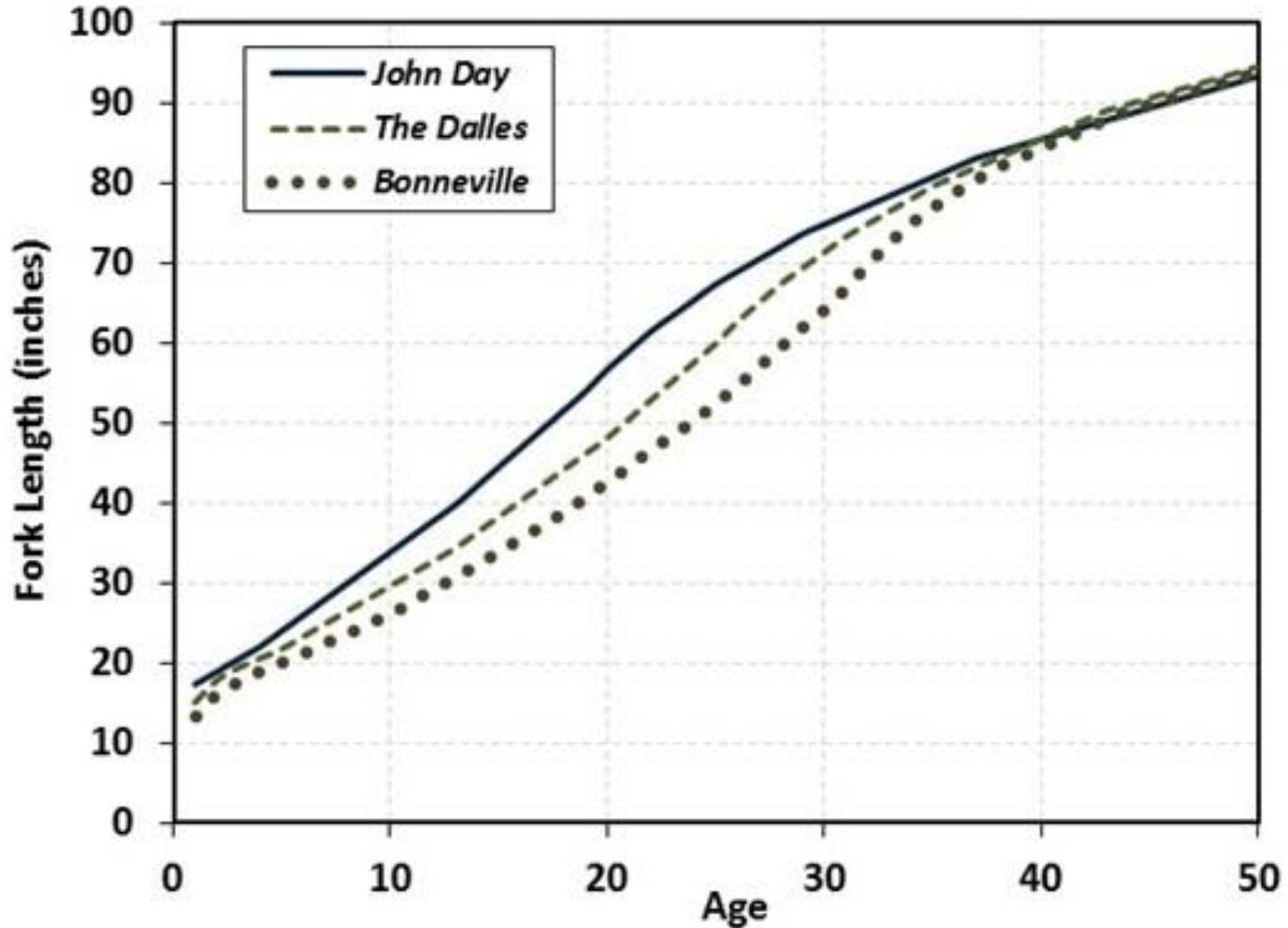
Subadult

# Growth



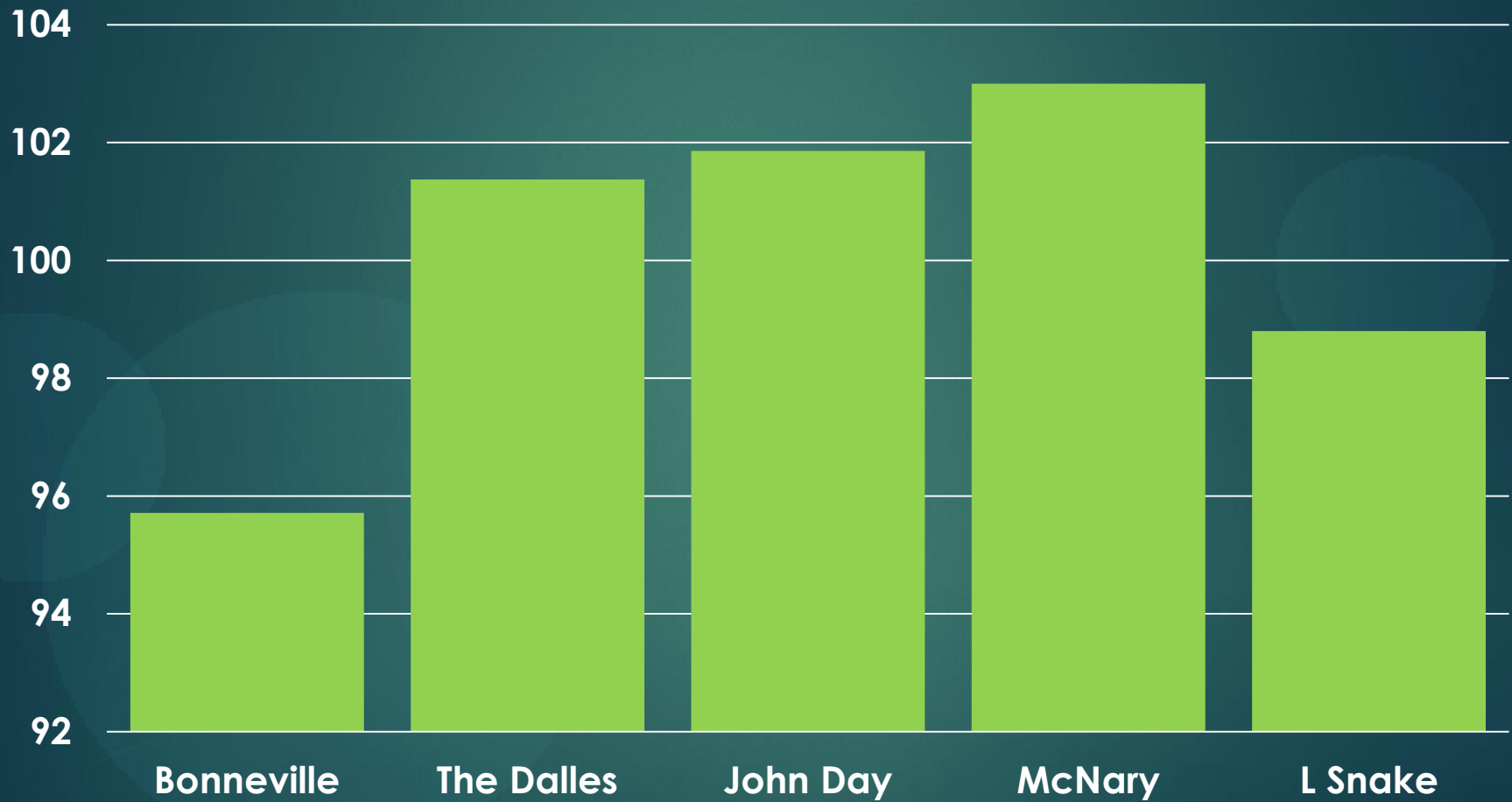


# Size at Age

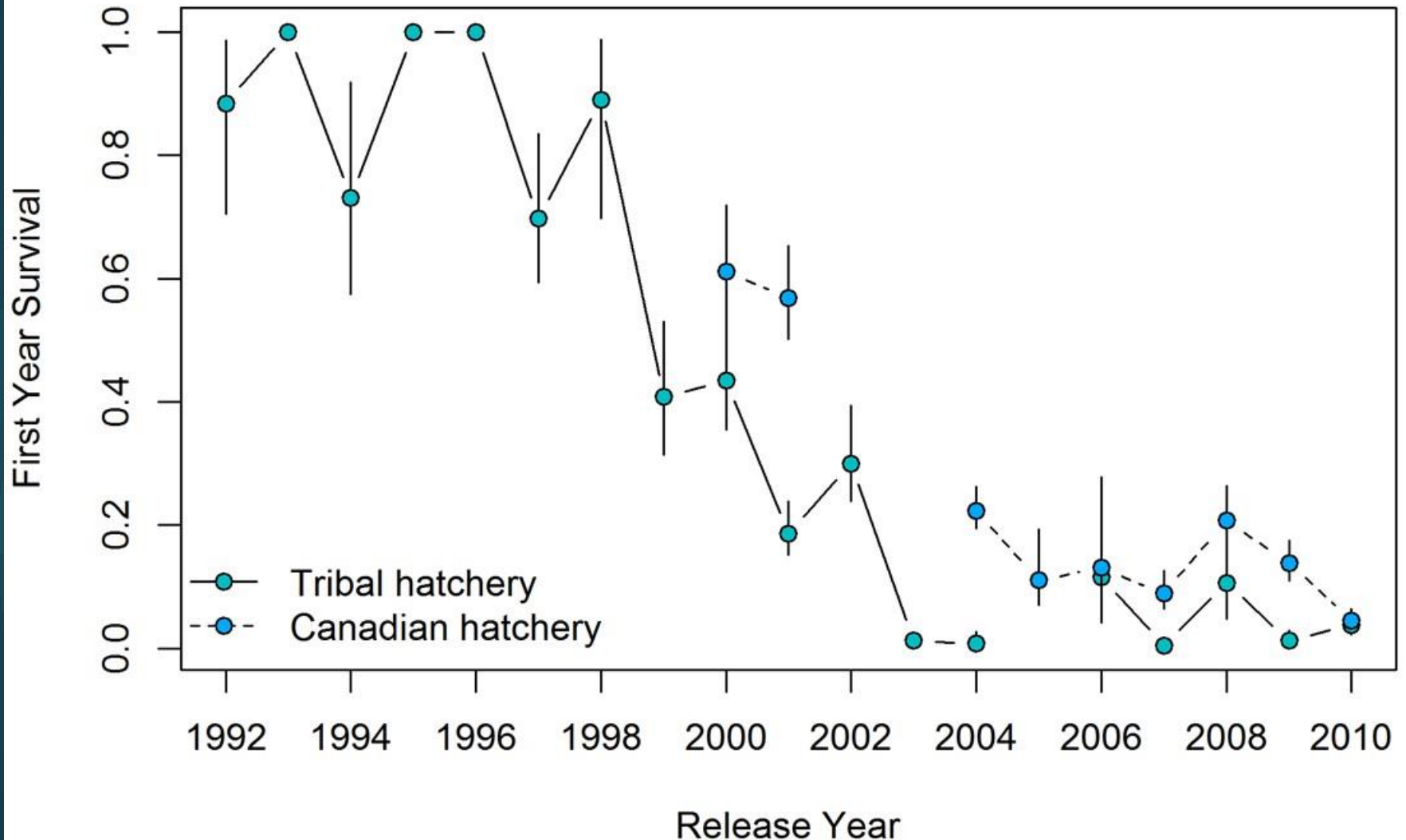




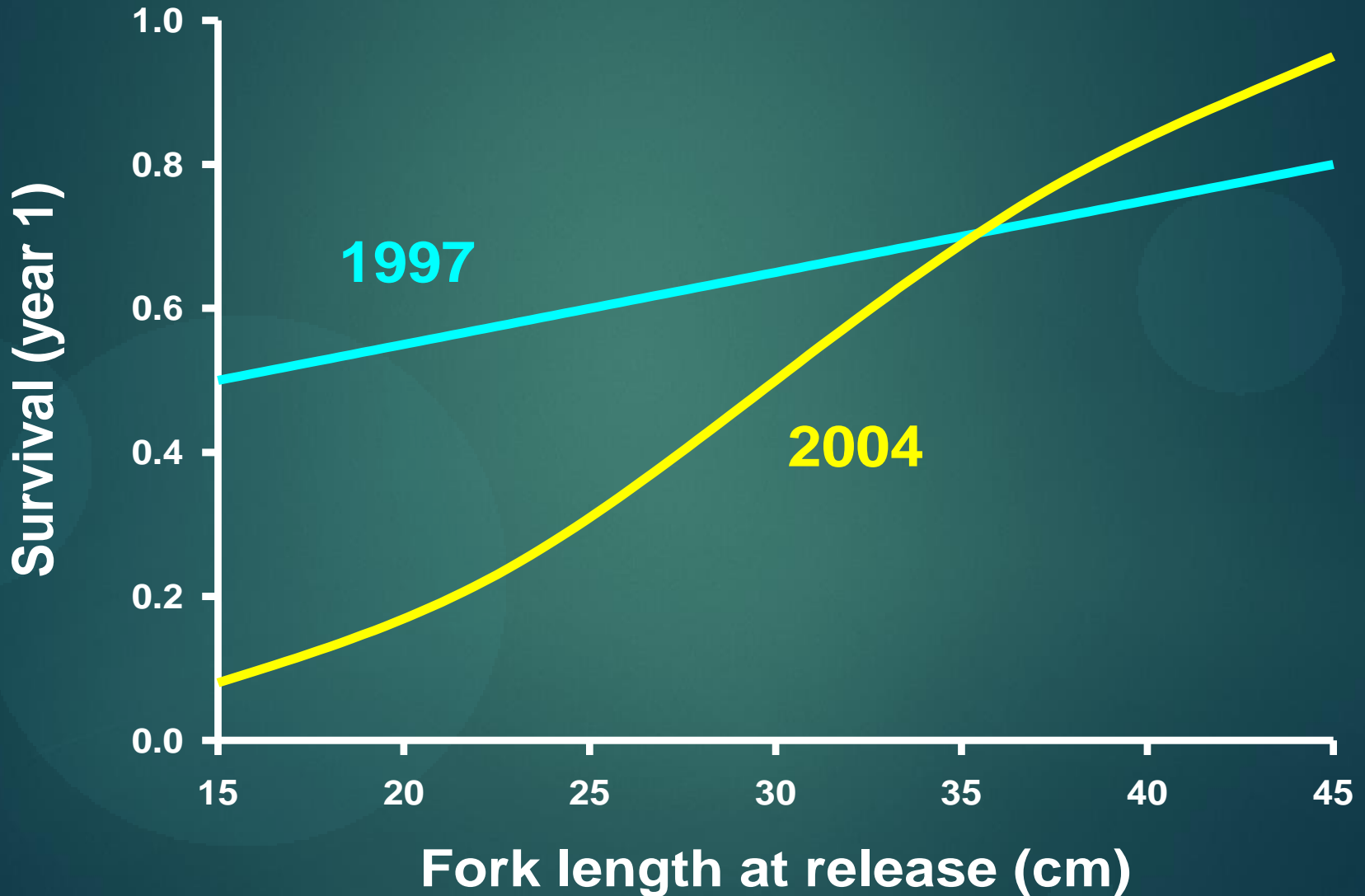
# Condition factor

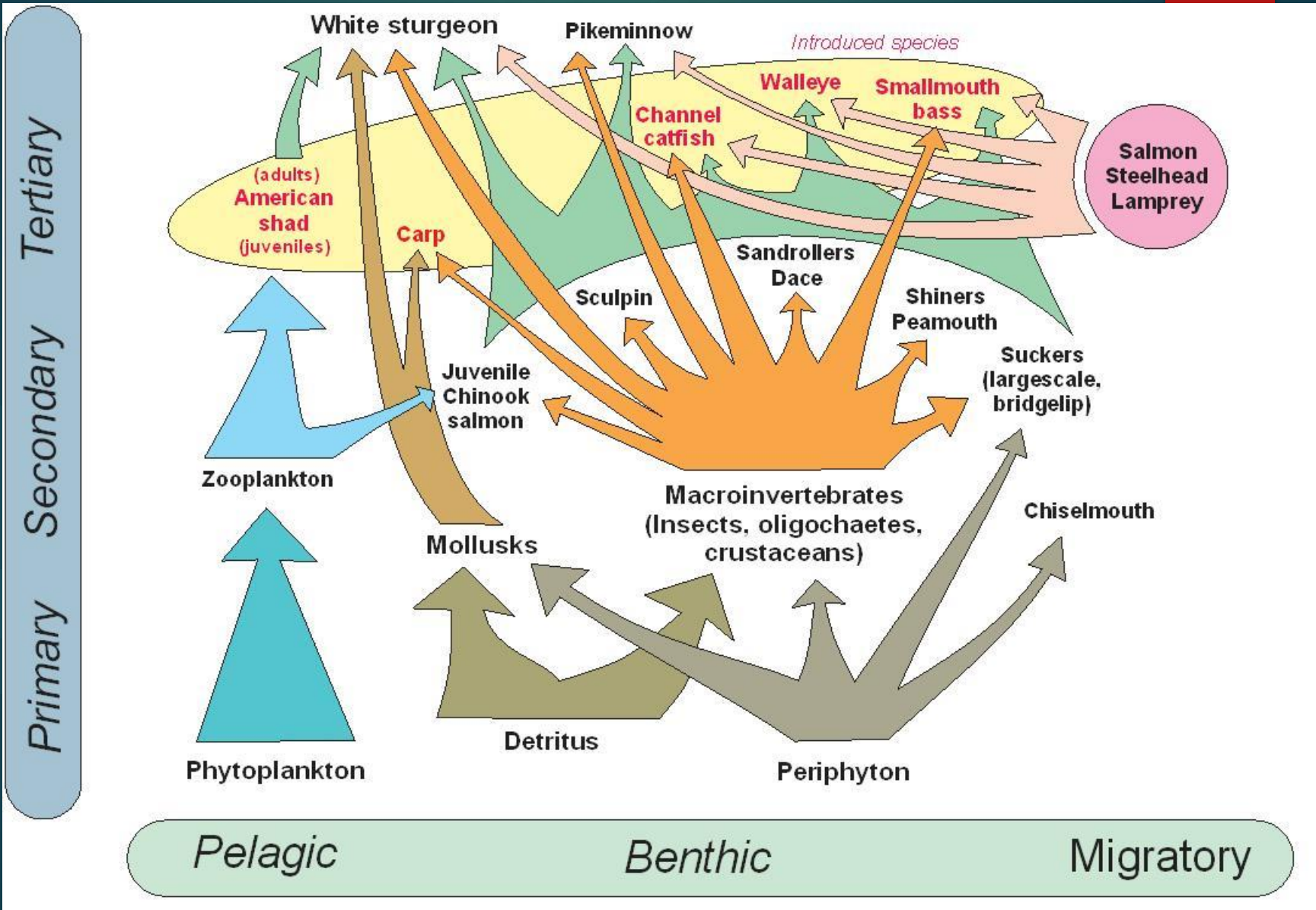


# Kootenai Hatchery Survival



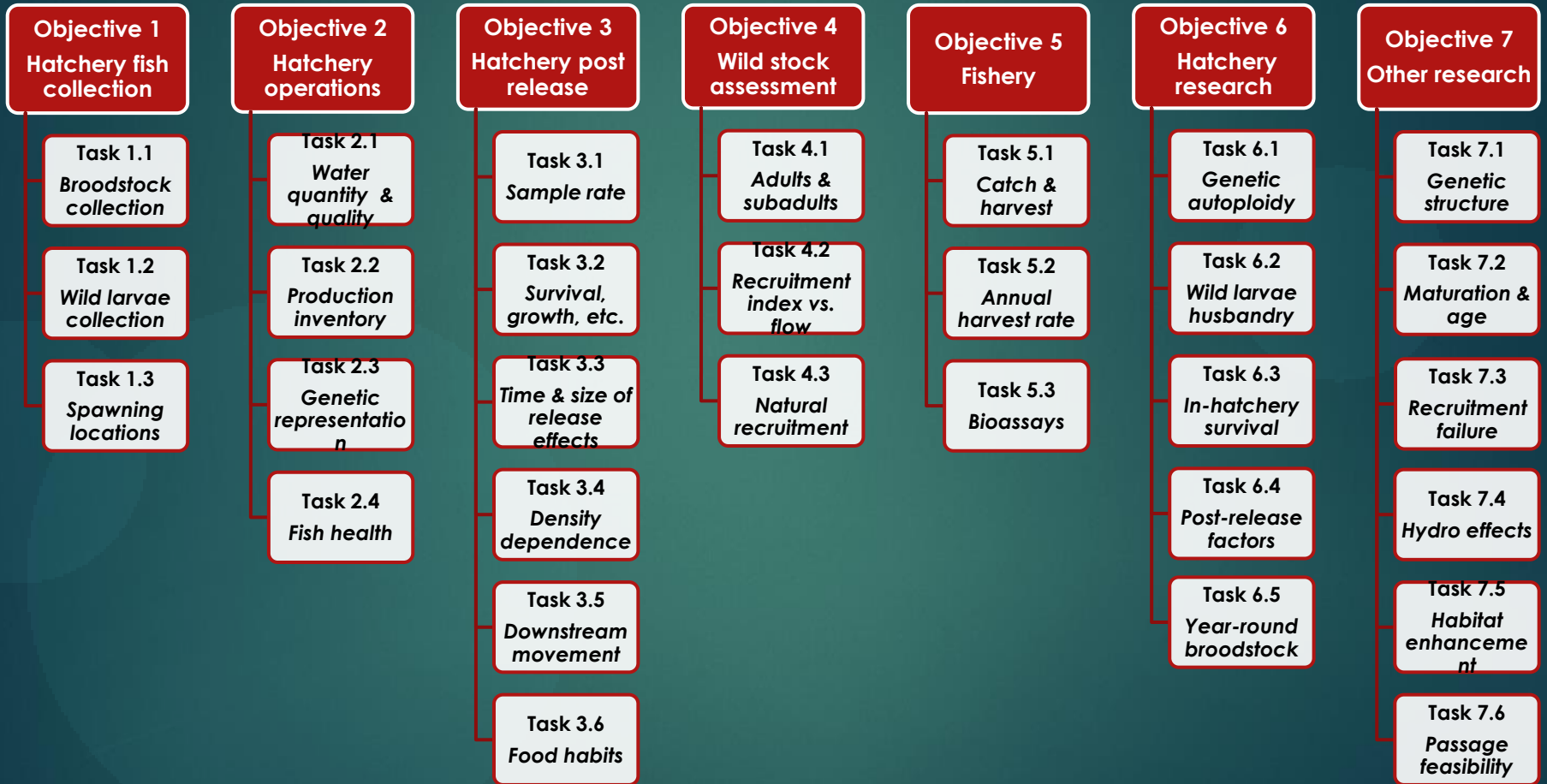
# Kootenai Size v. Survival







# Monitoring & Evaluation

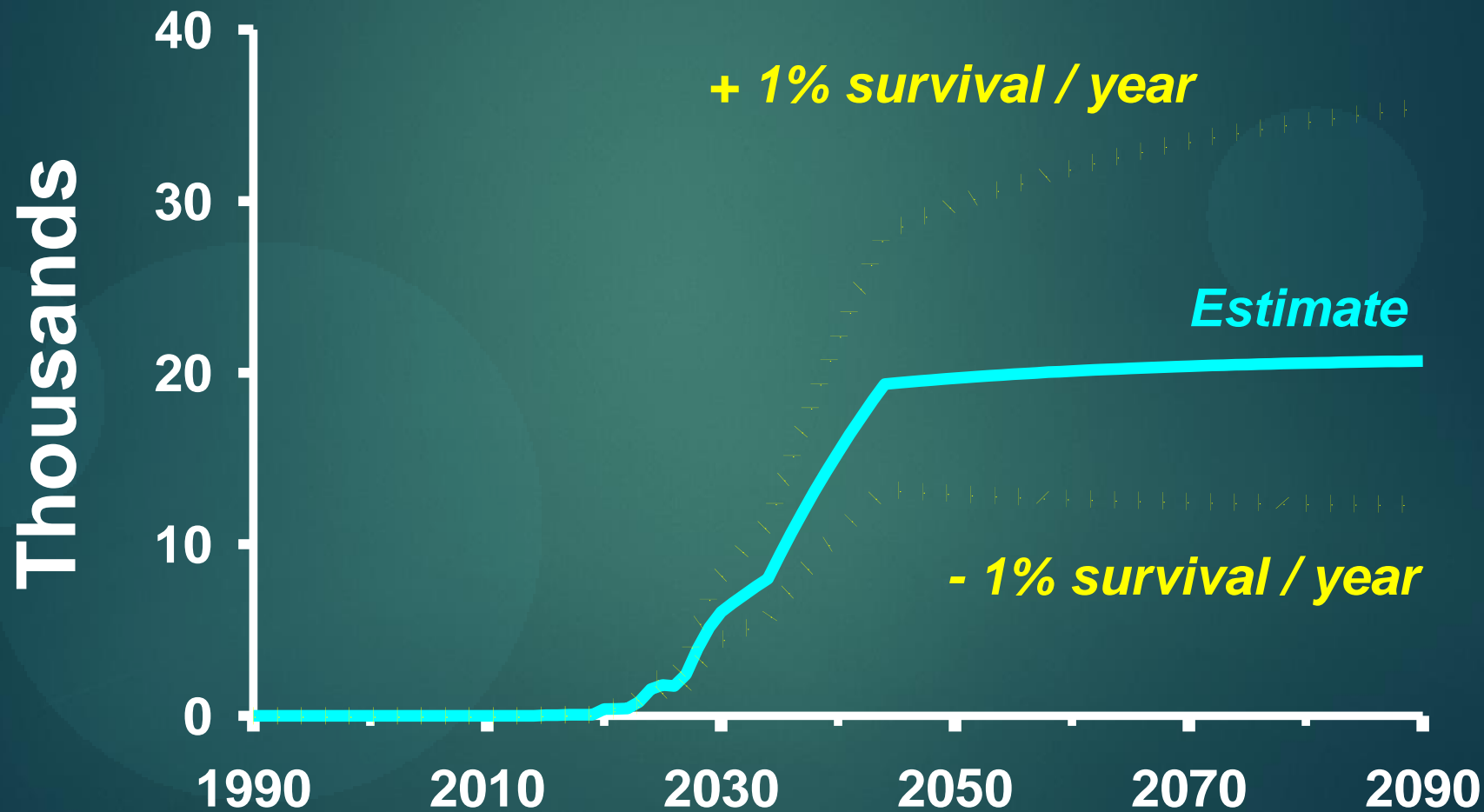


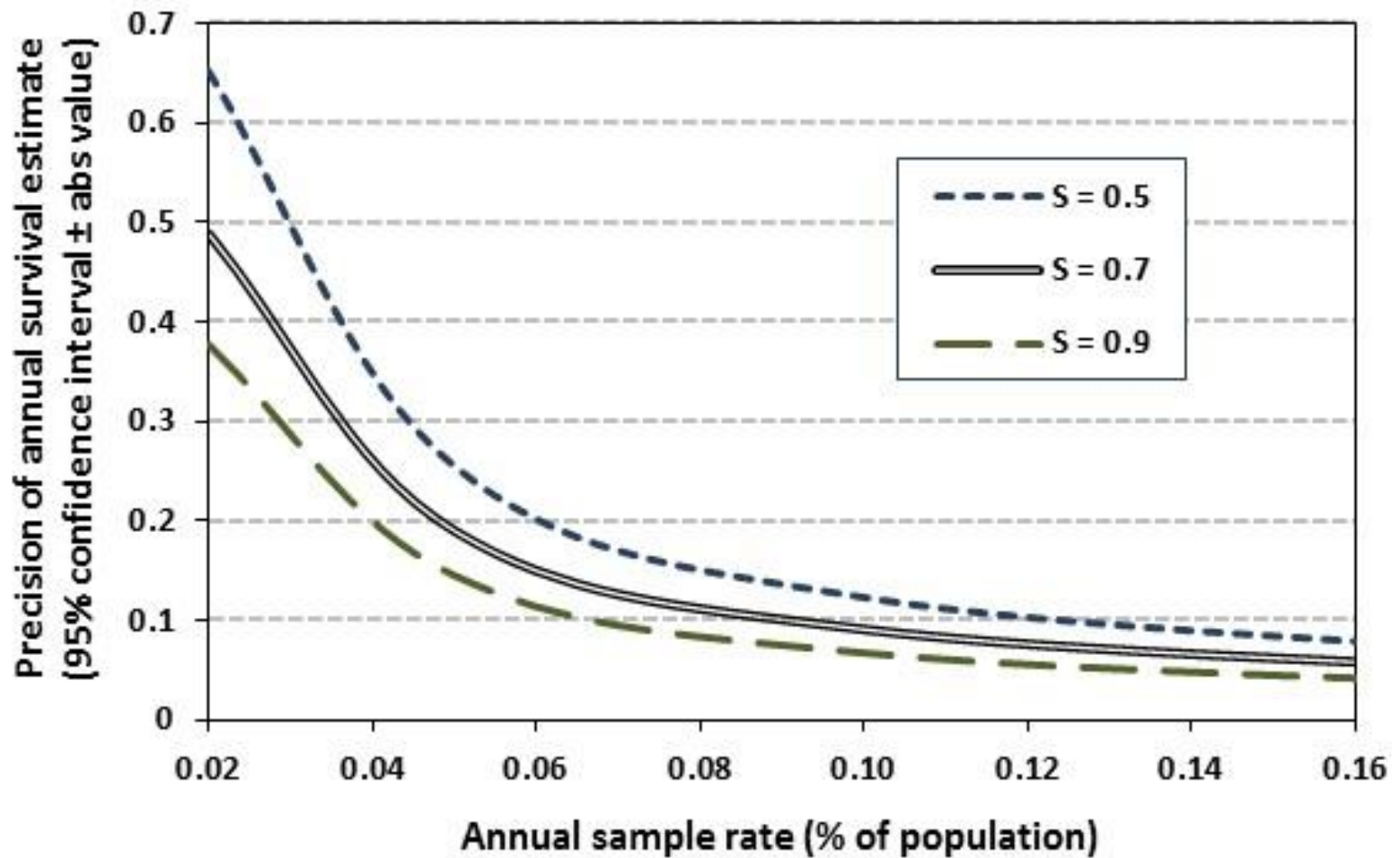


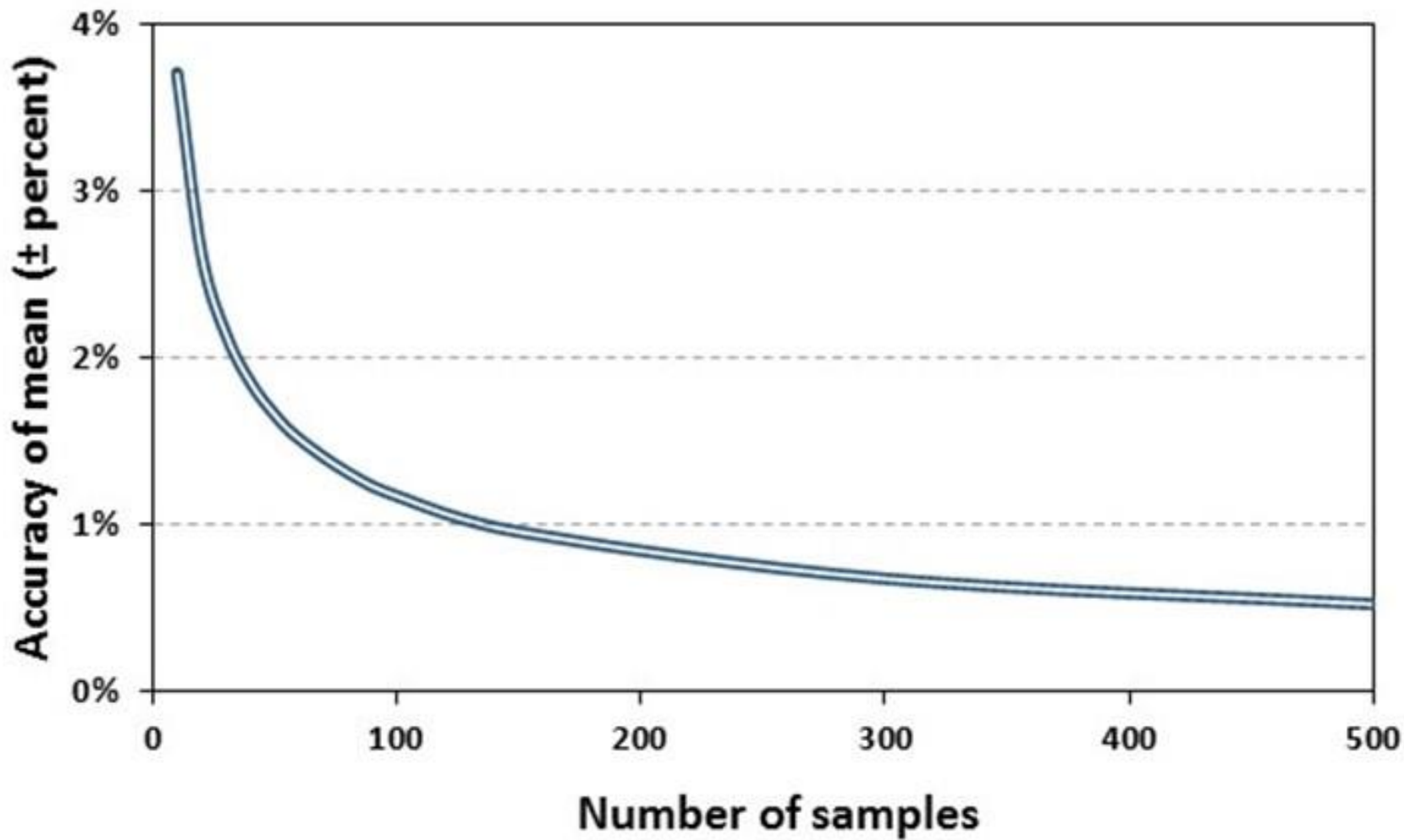
# Post-release hatchery monitoring

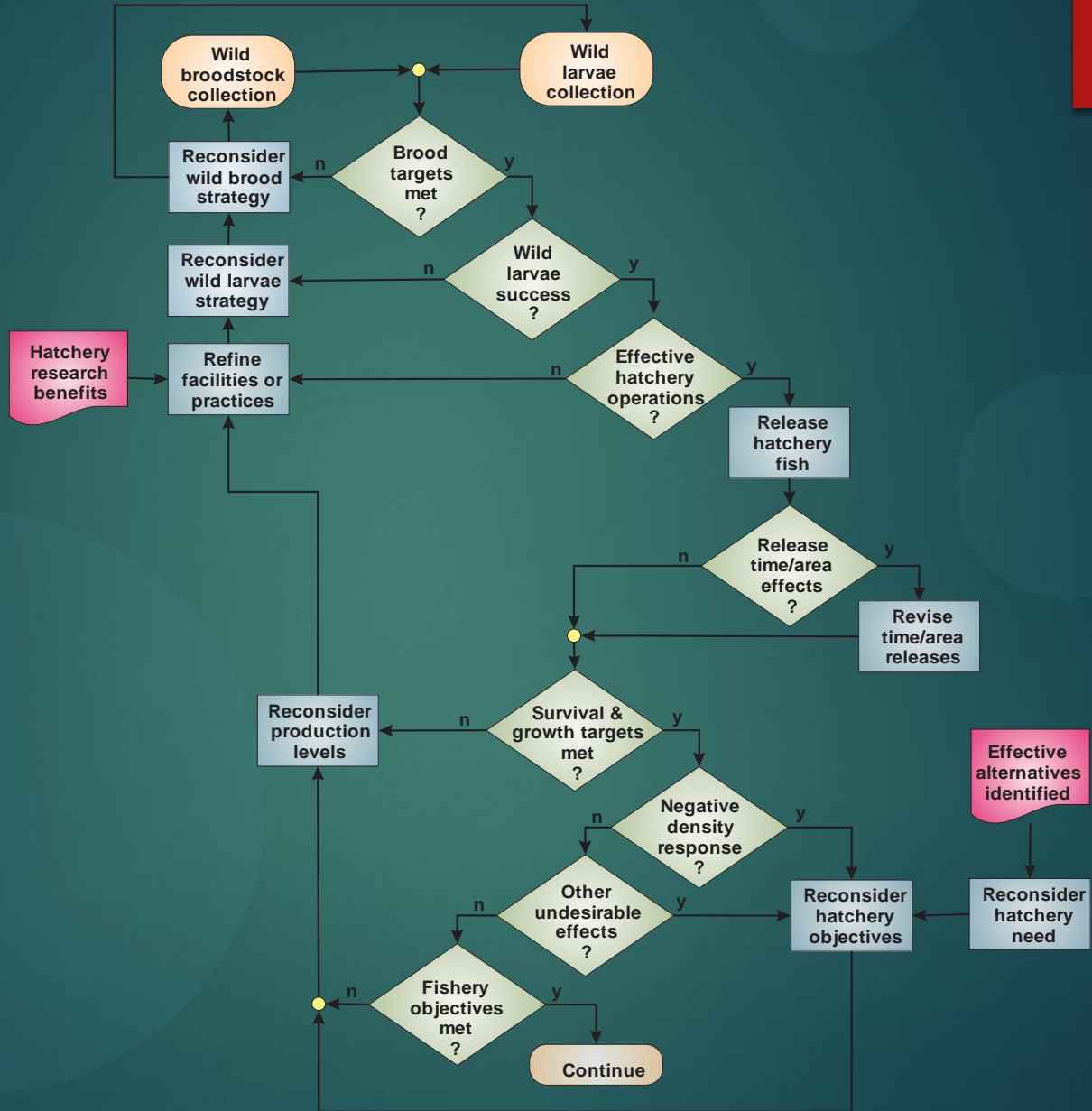
Metric	Reference value
Annual recapture rate	$\geq 5\%$
1 <sup>st</sup> - year survival	$\geq 20\%$
2 <sup>nd</sup> - survival	$\geq 80\%$
3+ year survival	$\geq 95\%$
Abundance	Significant Increasing trend
Growth rate	2-3 in. / year
Condition factor (Wr)	$\geq 100\%$
Emigration to adjacent reservoirs	$\leq 5\%$ in aggregate

# Sensitivity Analysis



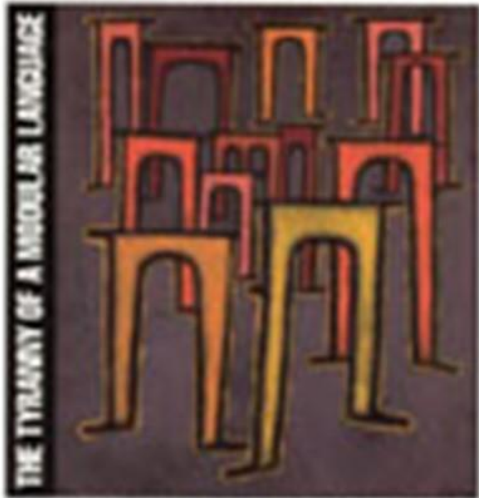






# Pretend v. Real Adaptive Management

## PLASTIC WORDS



UWE POERKSEN  
Translated by Jutta Mason and David Cayley

*We'll implement the project, monitor & adapt as we go if problems are evident*

*A systematic, rigorous approach for learning through designing management actions as experiments*