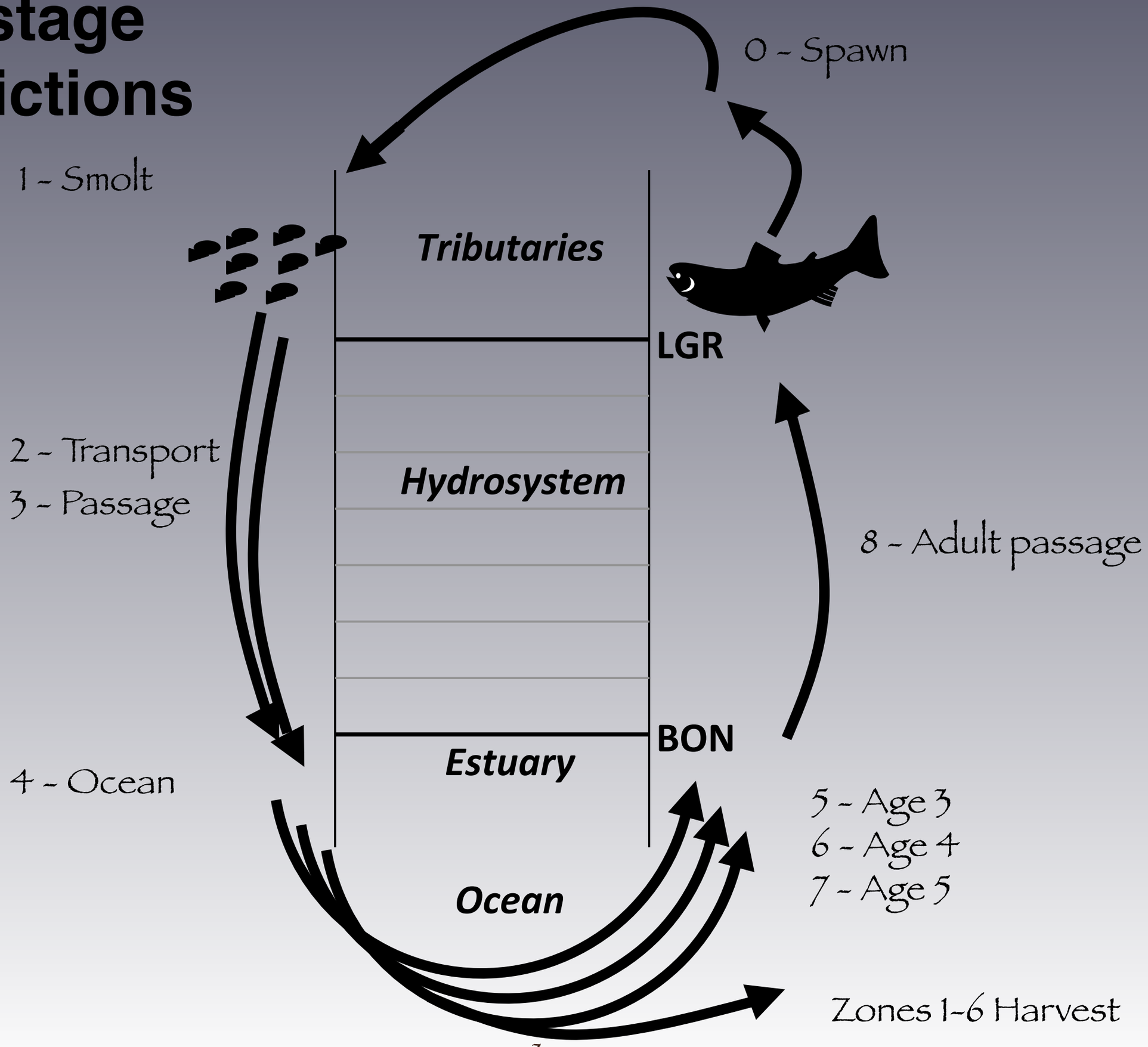
Life cycle model evaluation of Snake River spring/summer chinook under alternative spill and breach scenarios

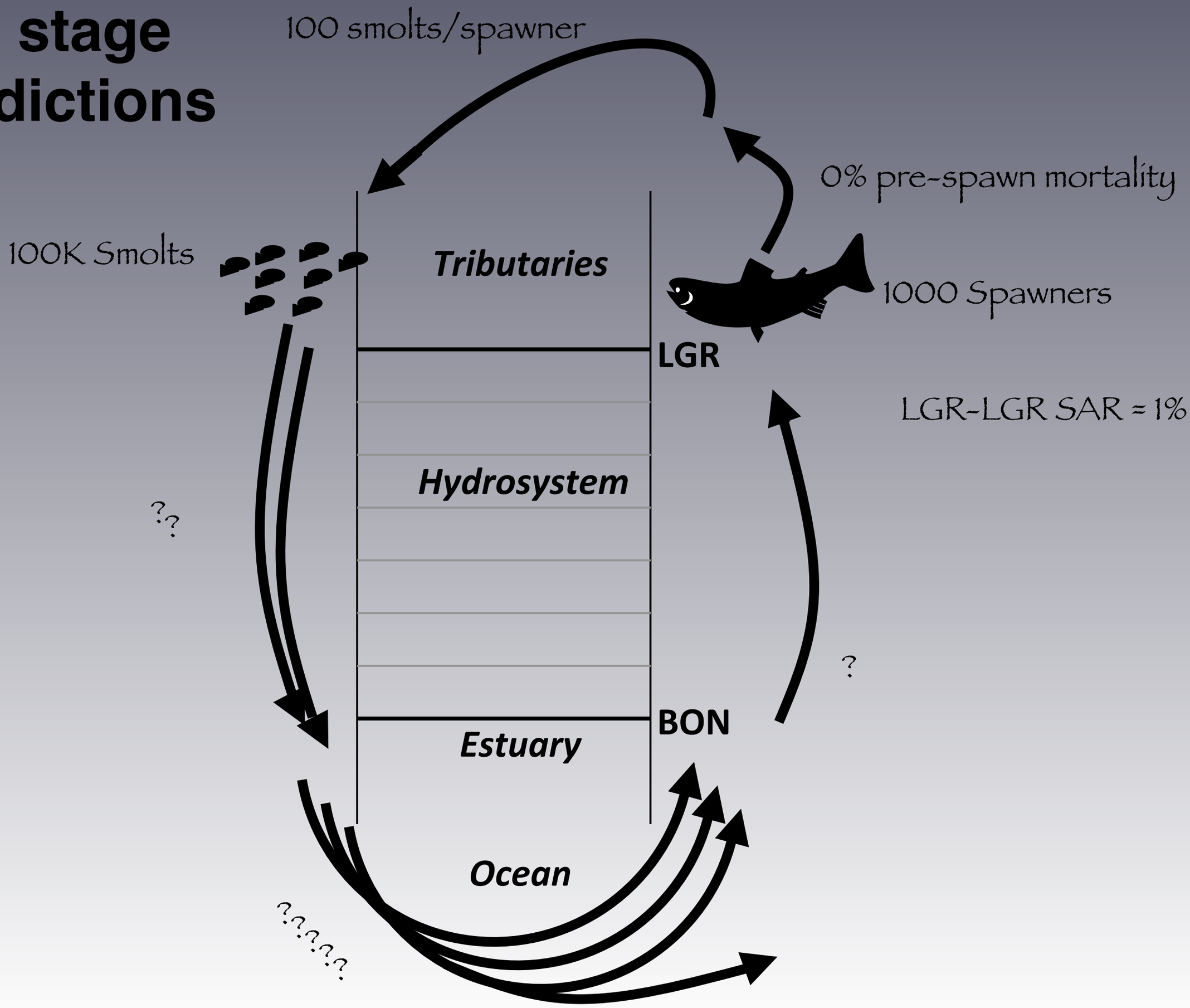
Objective

- Evaluate relative survival and recovery benefits of different Spill and Breach scenarios
  - Predict life stage survivals
  - Predict long term abundances

Life stage Predictions



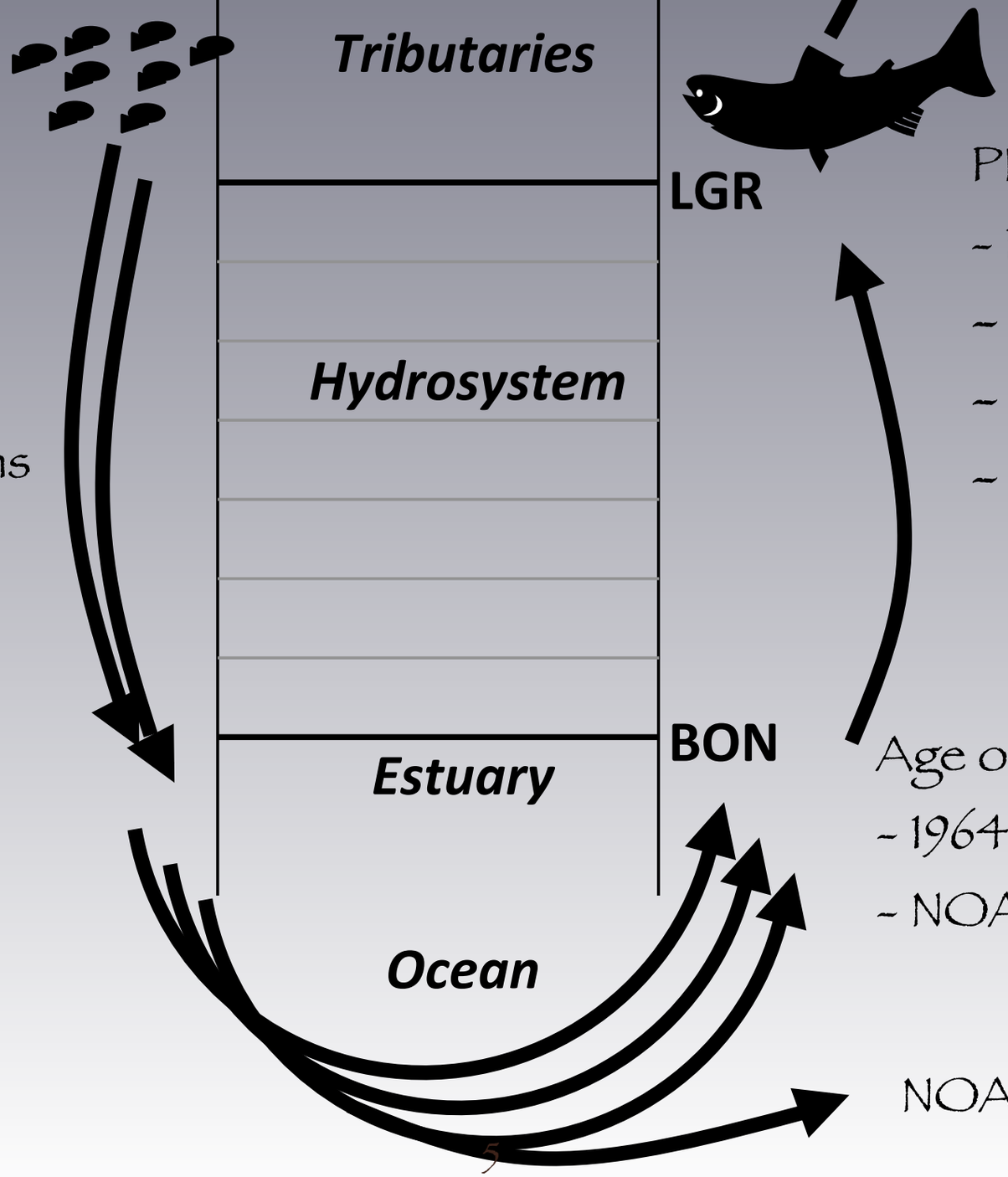
Life stage Predictions



Grande Ronde / Imnaha MPG

Spawners 1964-2010

Smolts 1992-2010
- screw traps



PIT tag LGR SARs
- 1992-2010
- In river
- Transport
- Combined

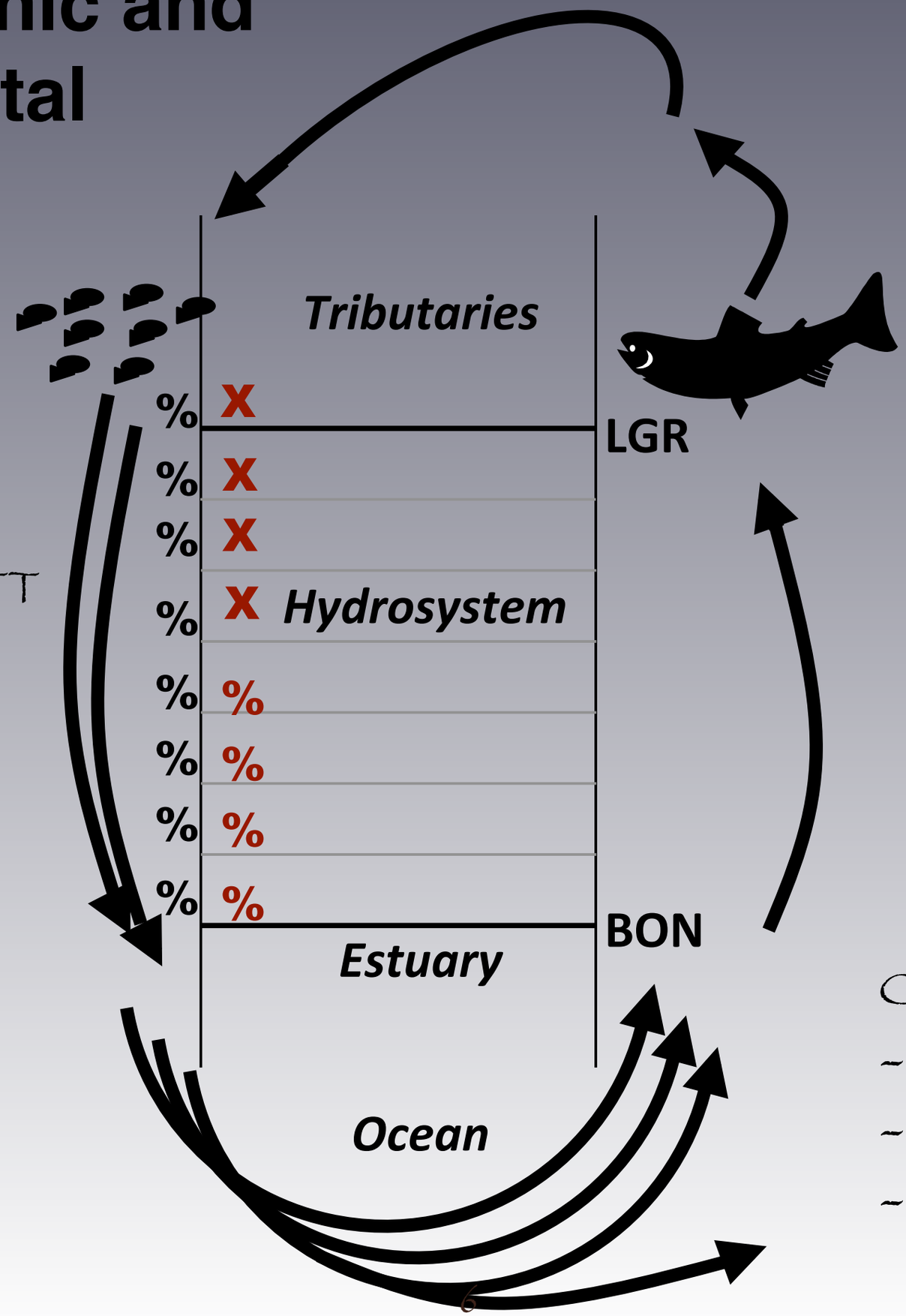
In river survival
- 1992-2010
- PIT tag detections

Age of adult returns
- 1964-2010
- NOAA reconstructions

NOAA SPS harvest

Anthropogenic and Environmental Effects

Hydro system
- Water transit time WTT
- Powerhouse PITPH

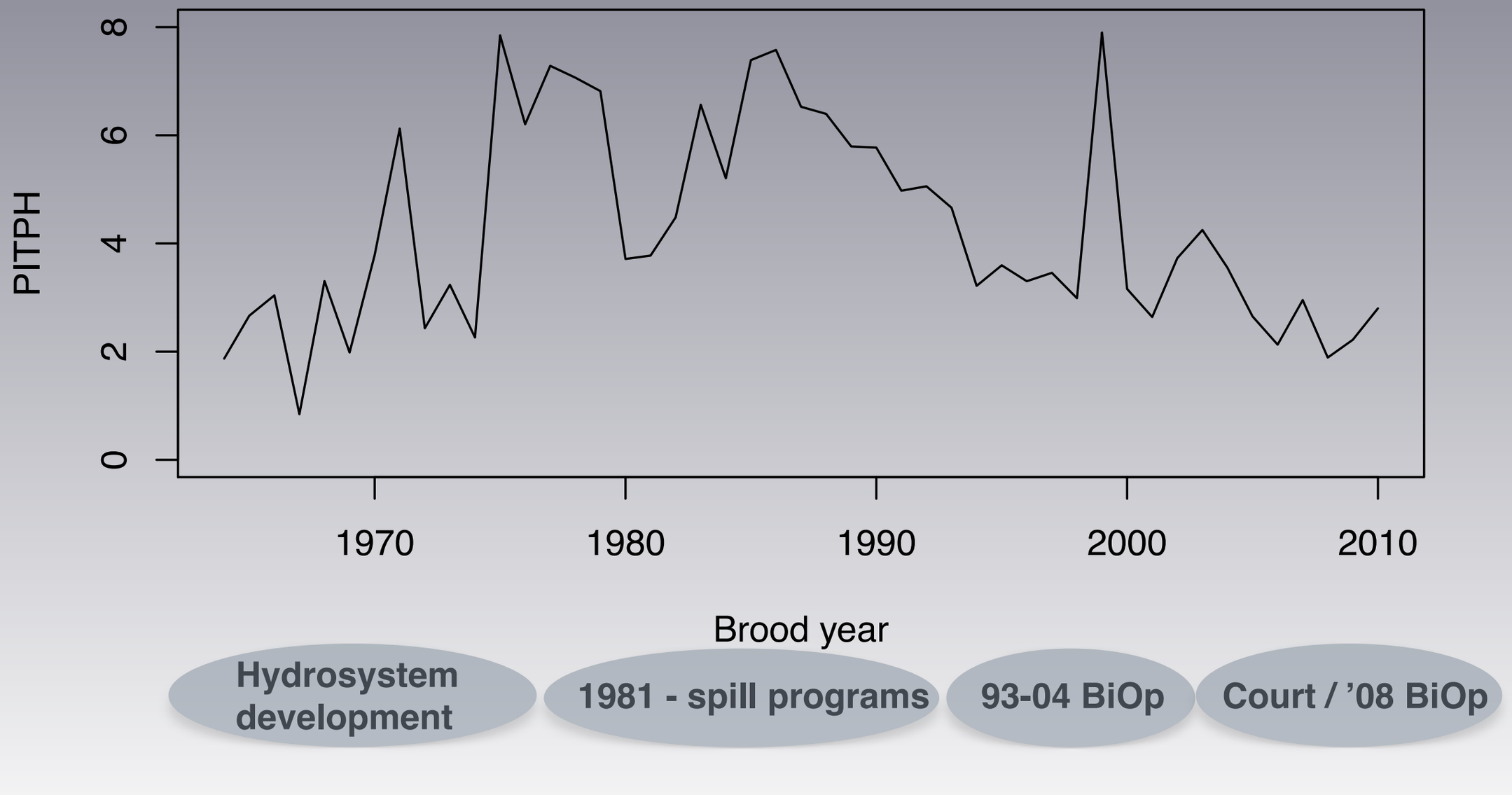


Ocean
- Temperature PDO
- Upwelling UPW
- Powerhouse PITPH

Mainstem environment

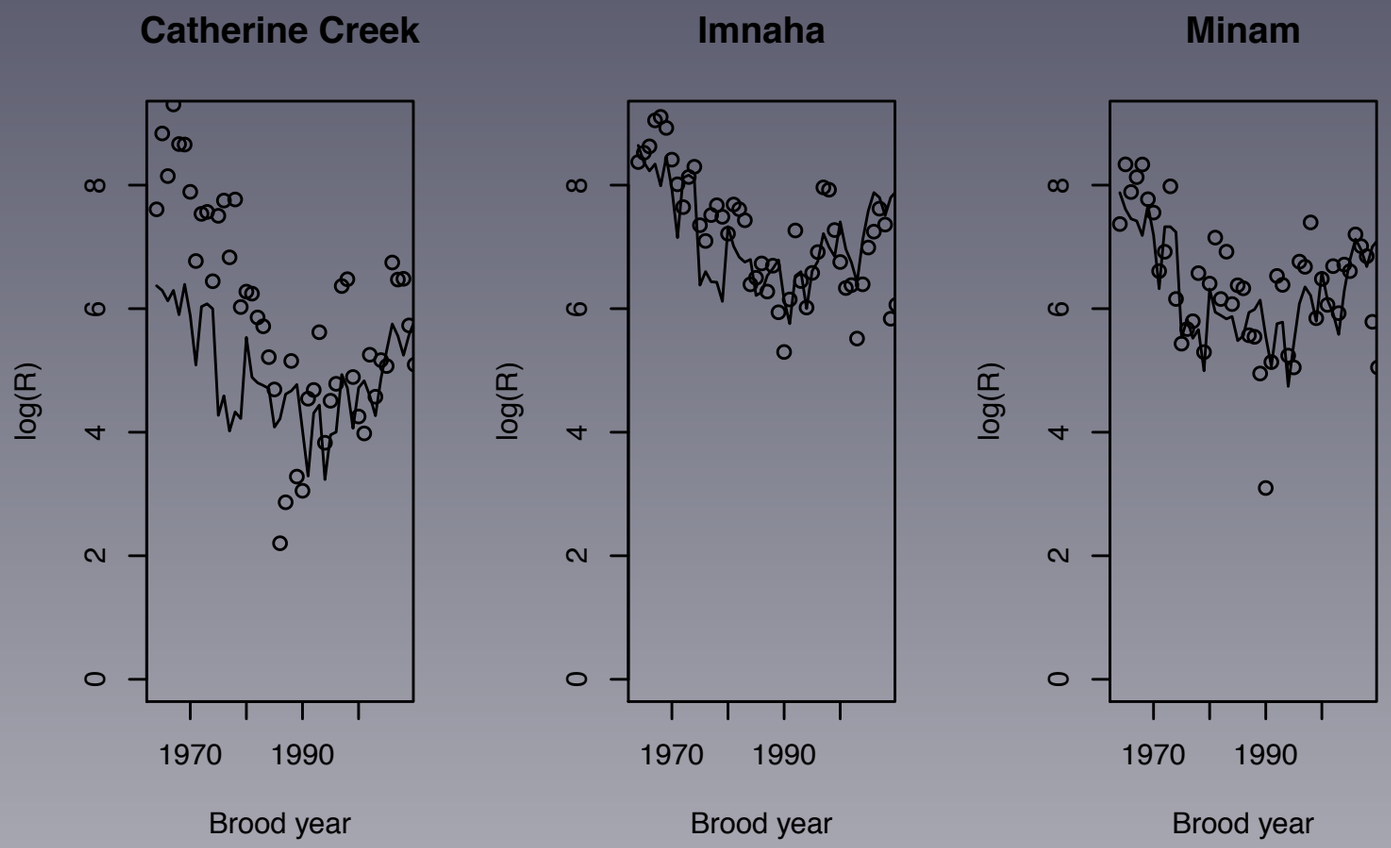
- PIT tag derived index of cummulative powerhouse passage (across 8 or 4 dams)
- Water transit time (all reservoirs)
  - Volume/discharge calculation at flow

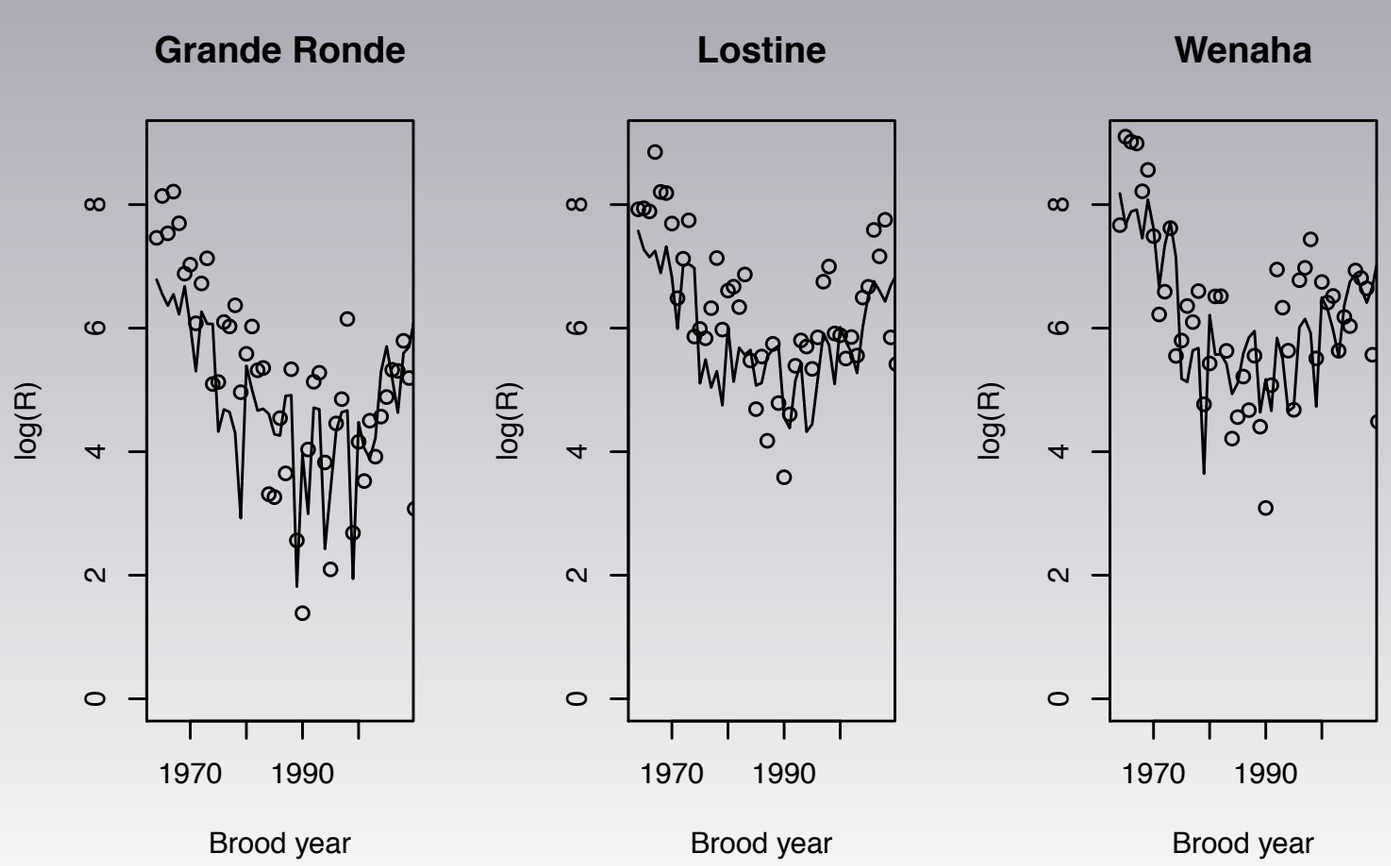
Powerhouse passage



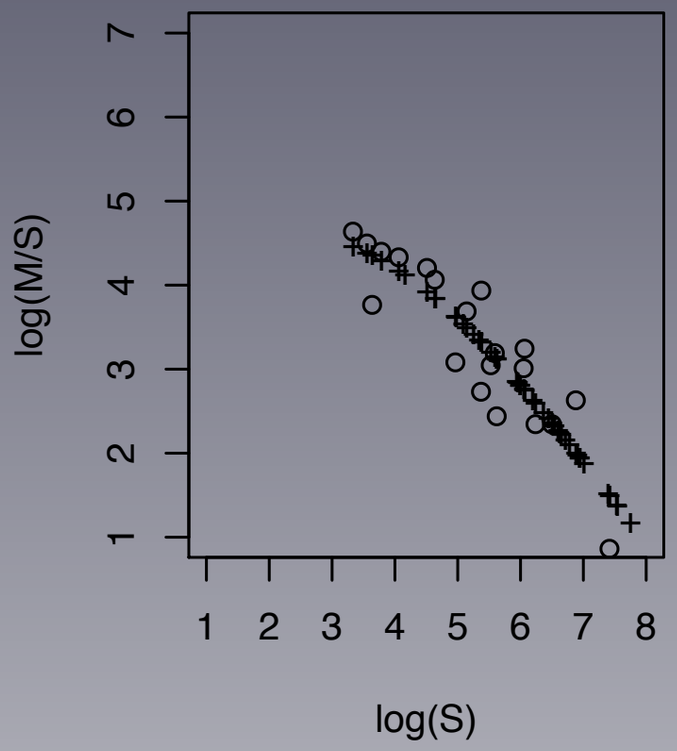
Statistical reconstruction

- Predict all life cycle stage abundances
  - Smolts
  - Age class returns (+30 years)
  - Survival rates, SARs
- Estimate uncertainty in predictions

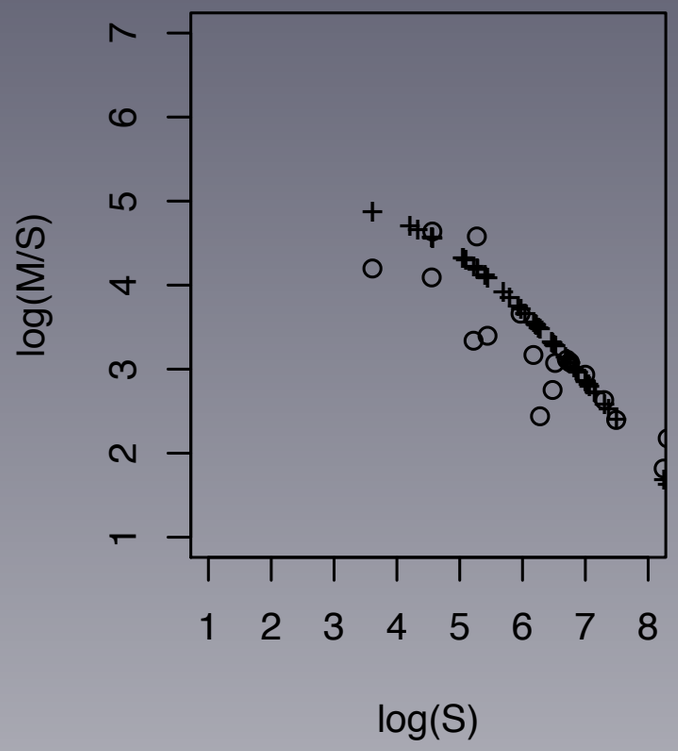

Catherine Creek
Imnaha
Minam
log(R)
0
2
4
6
8
1970
1990
Brood year


Grande Ronde
Lostine
Wenaha
log(R)
0
2
4
6
8
1970
1990
Brood year

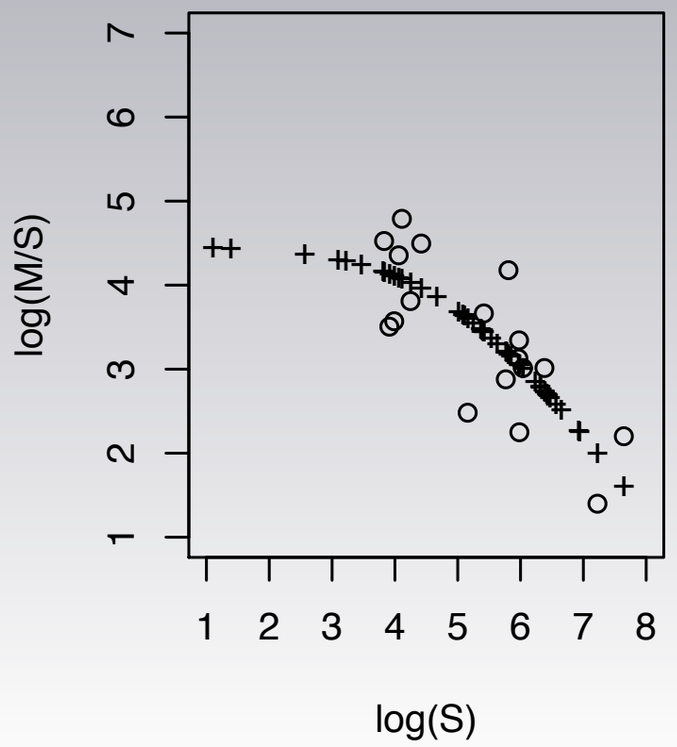
Catherine Creek



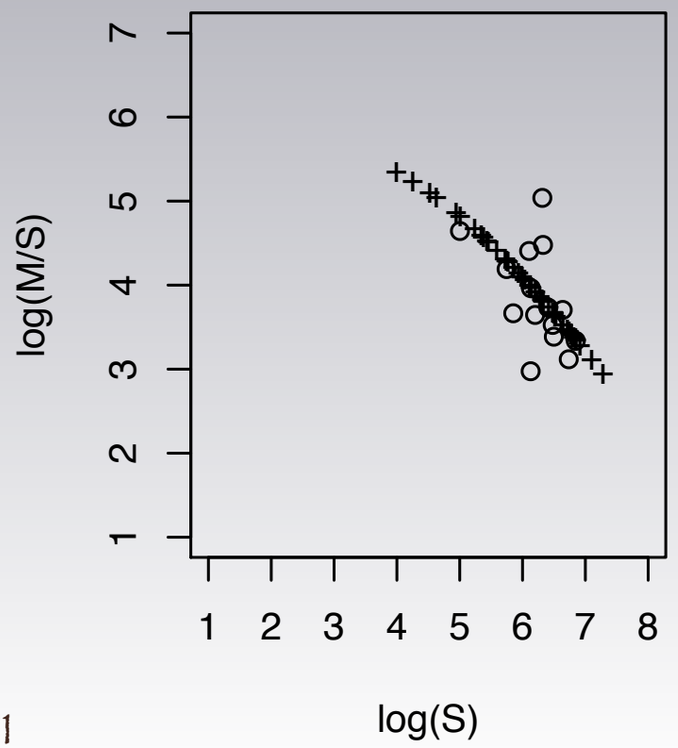
Lostine

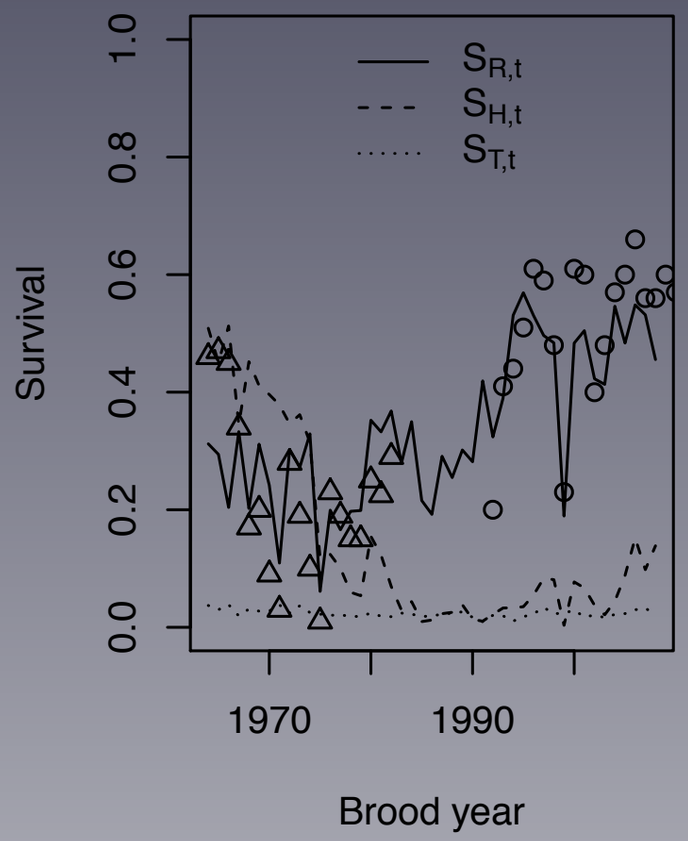


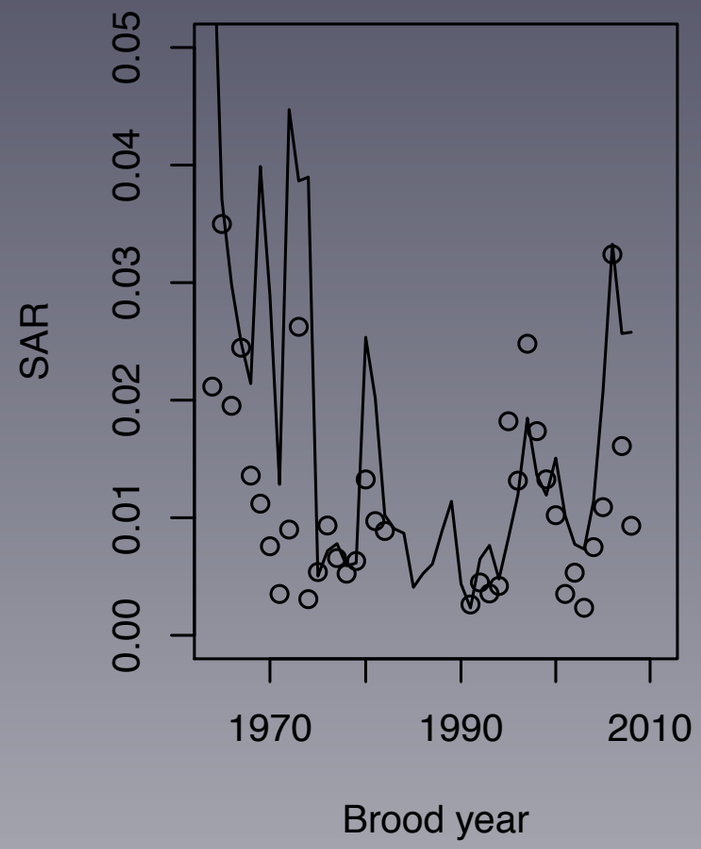
Grande Ronde

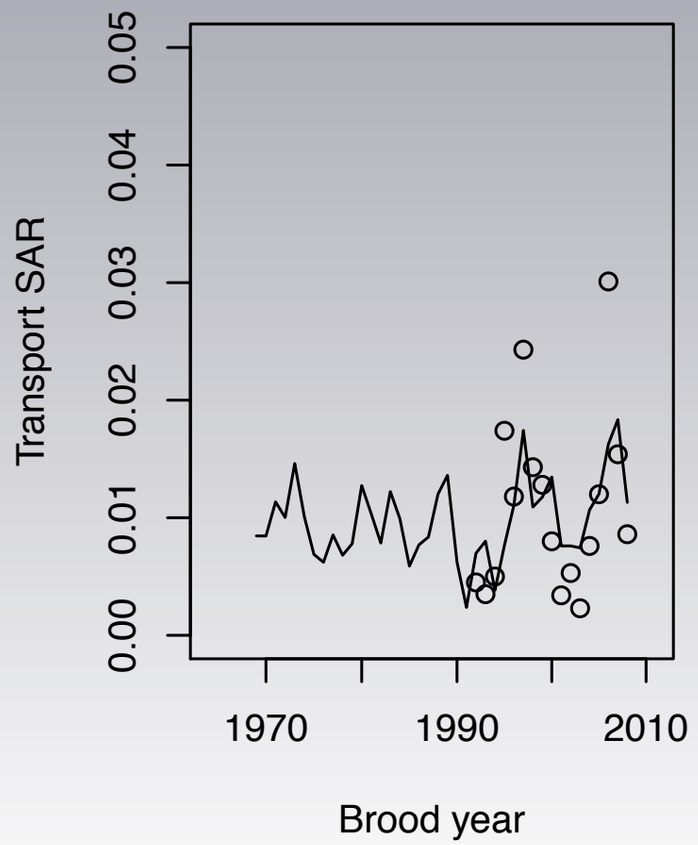


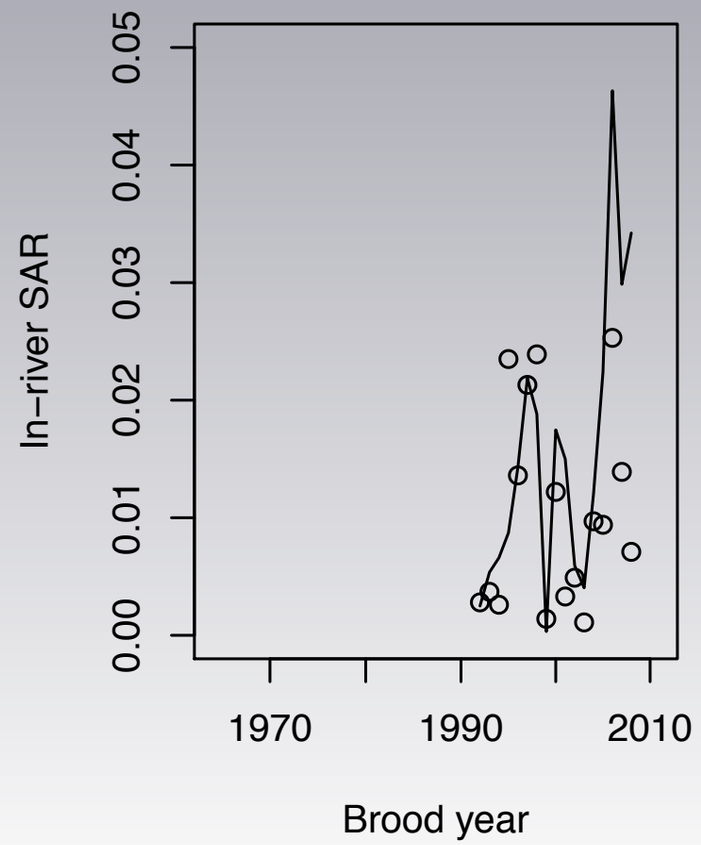
Minam



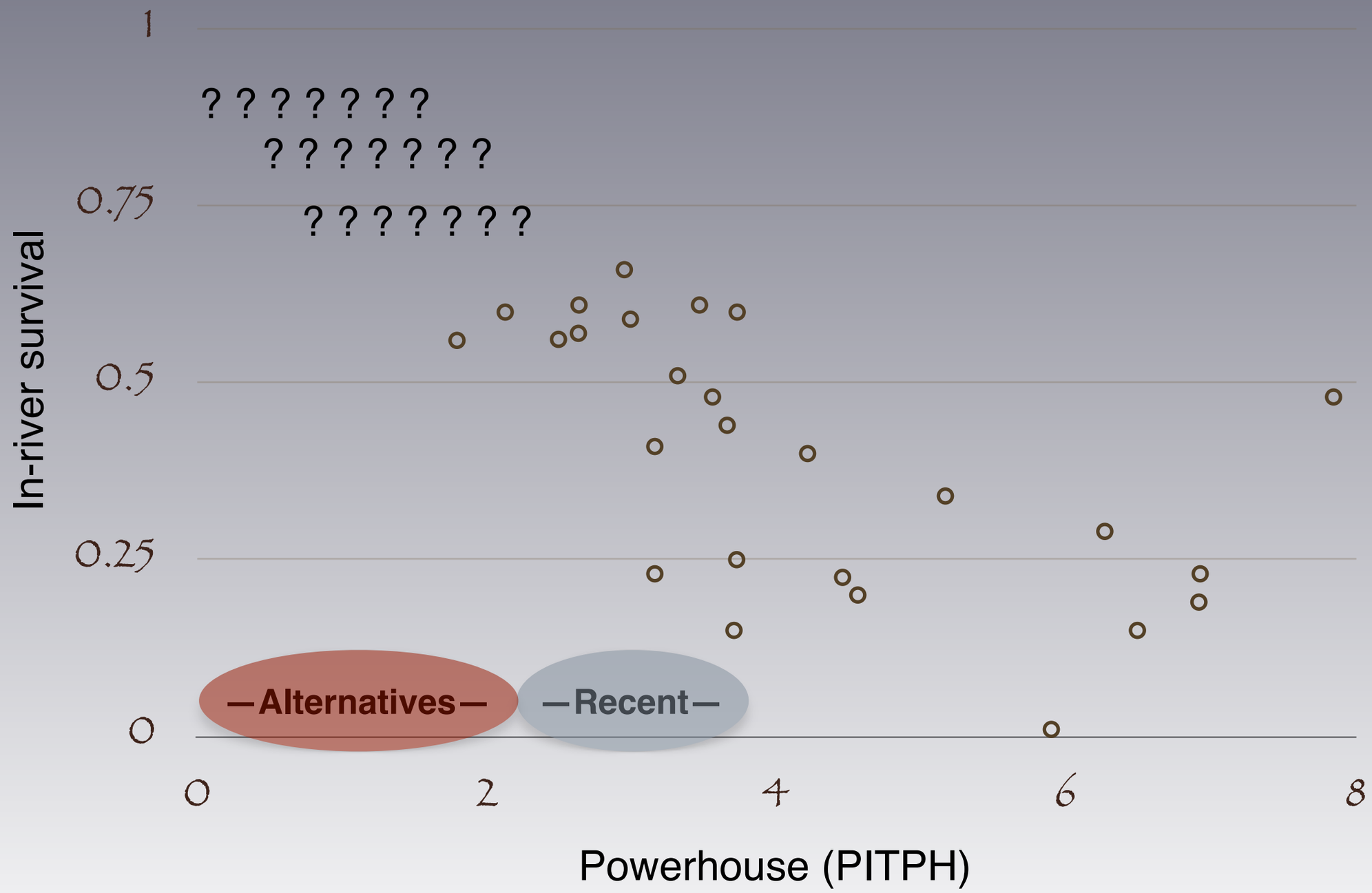

Survival
0.0
0.2
0.4
0.6
0.8
1.0
$S_{R,t}$
$S_{H,t}$
$S_{T,t}$
1970
1990
Brood year


SAR
0.00
0.01
0.02
0.03
0.04
0.05
1970
1990
2010
Brood year


Transport SAR
0.00
0.01
0.02
0.03
0.04
0.05
1970
1990
2010
Brood year


In−river SAR
0.00
0.01
0.02
0.03
0.04
0.05
1970
1990
2010
Brood year

In-river survival



Contrasts

- Spill contrast
  - BiOp, 115/120, 120, 125% TDG
- Flow contrast
  - High 2011
  - Average 2009
  - Low 2010

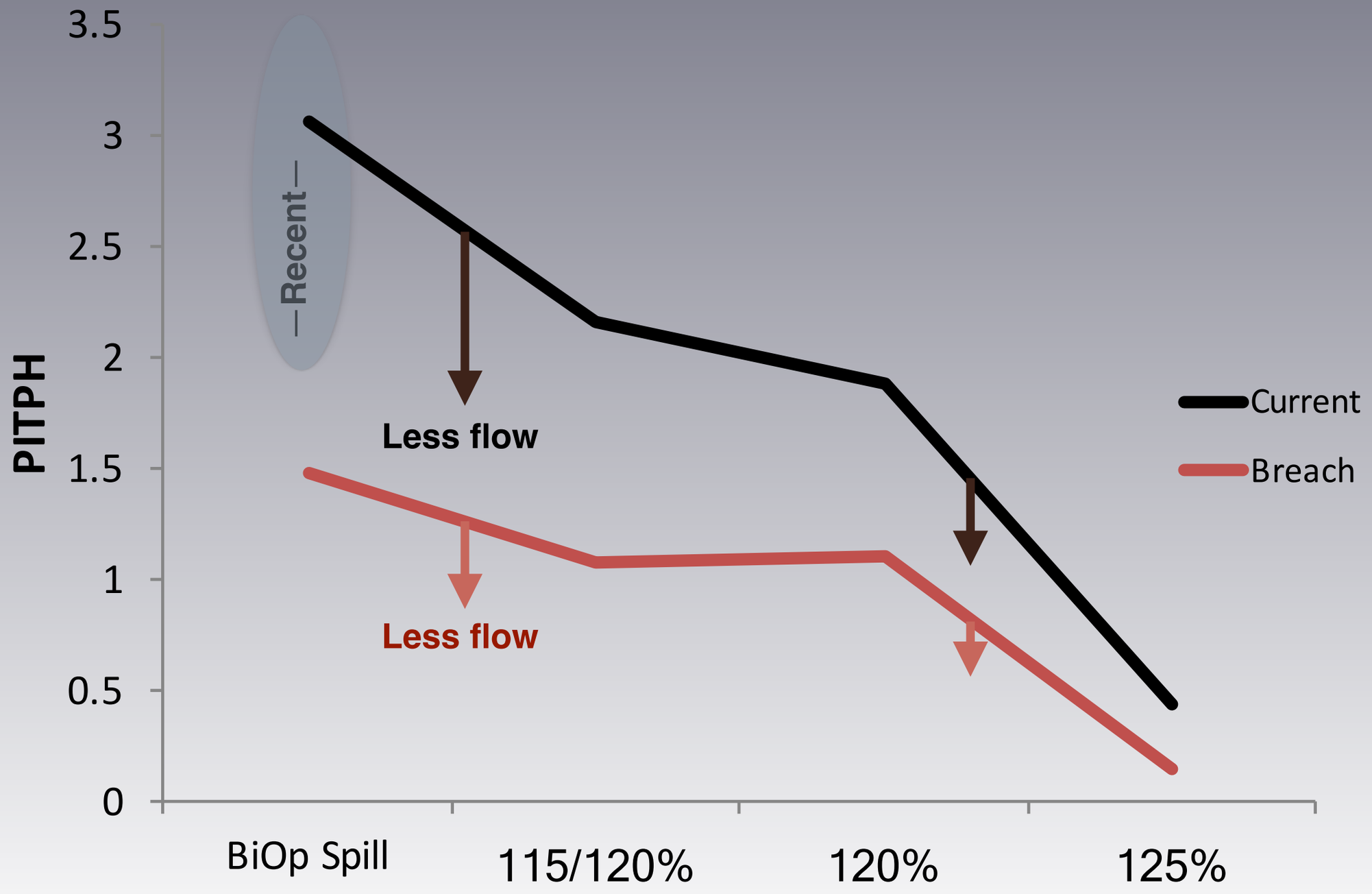
Current configuration

	High	Average	Low
8 dams BiOp	- Predicted Water Travel Time (WTT) - Predicted powerhouse (PITPH)		
115/120 %			
120%			
125%			

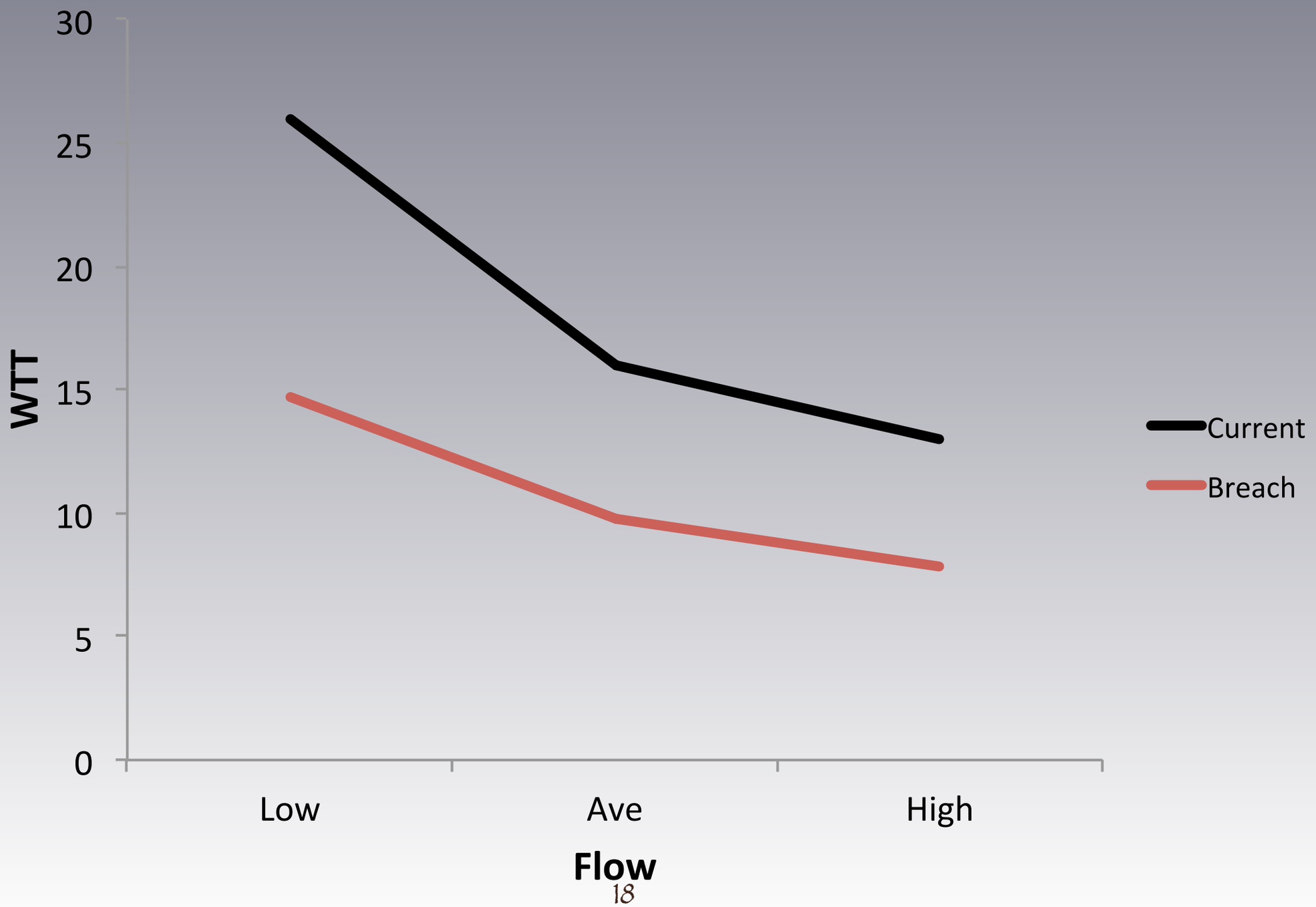
Breach configuration

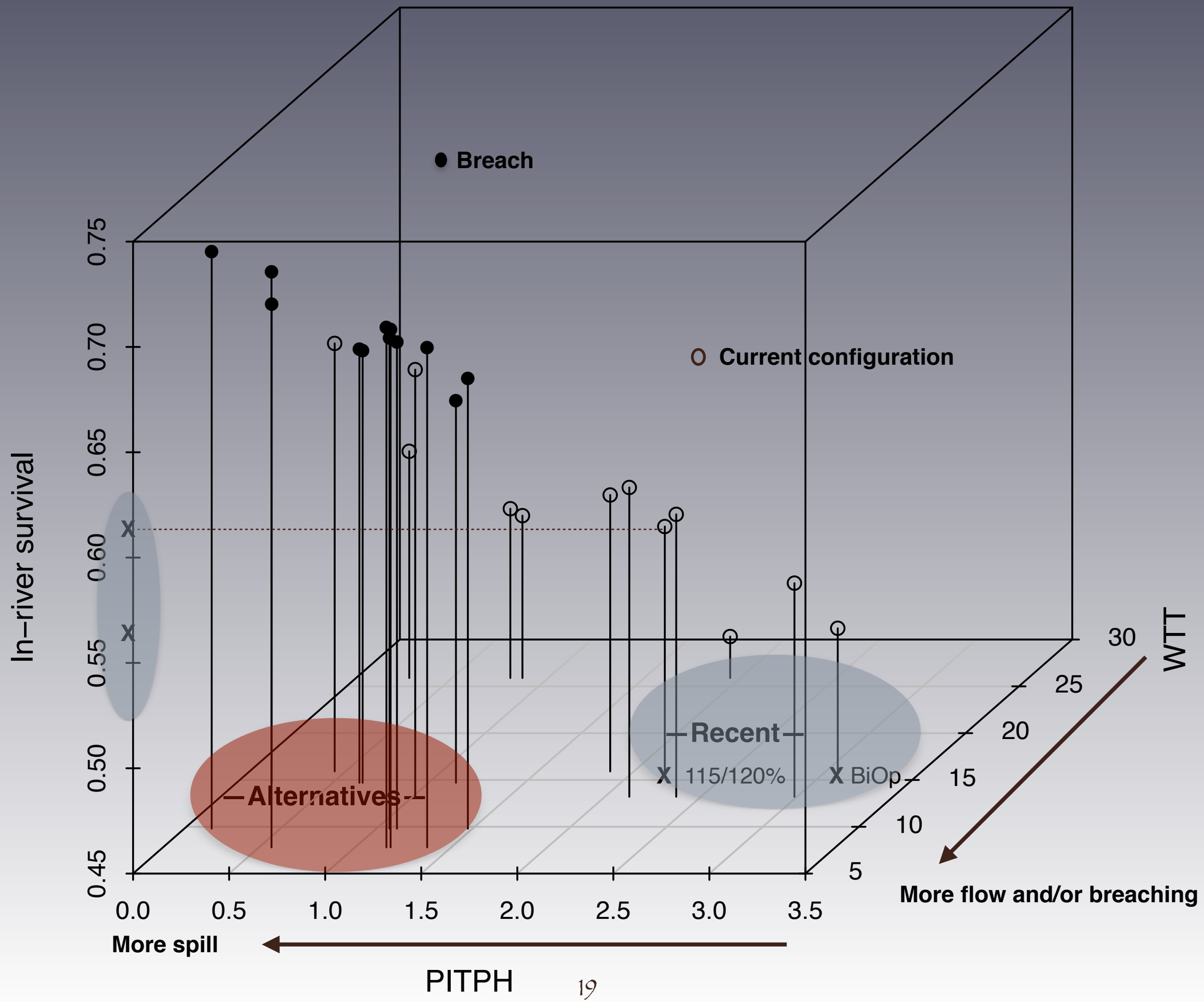
	High	Average	Low
4 dams	BiOp	- Removed lower 4 Snake dams - Spill on lower 4 Columbia dams only - Lower WTT and PITPH	
115/120 %			
120%			
125%			

Scenarios & PITPH



Scenarios & WTT

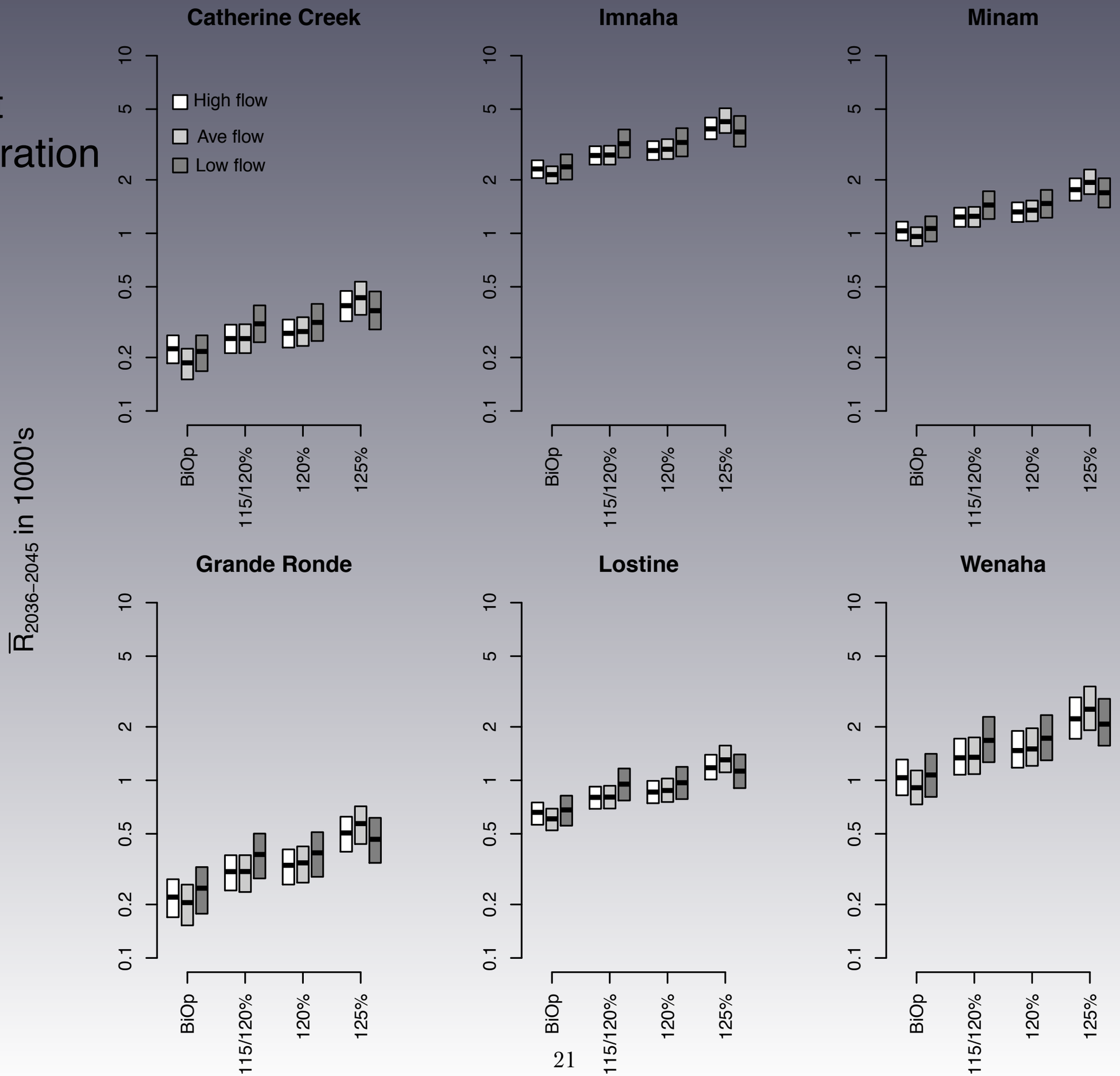



Breach
Current configuration
ln−river survival
0.75
0.70
0.65
0.60
0.55
0.50
0.45
Recent
115/120%
BiOp
Alternatives
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
More spill
PITPH
30
25
20
15
10
5
WTT
More flow and/or breaching

Simulation assumptions

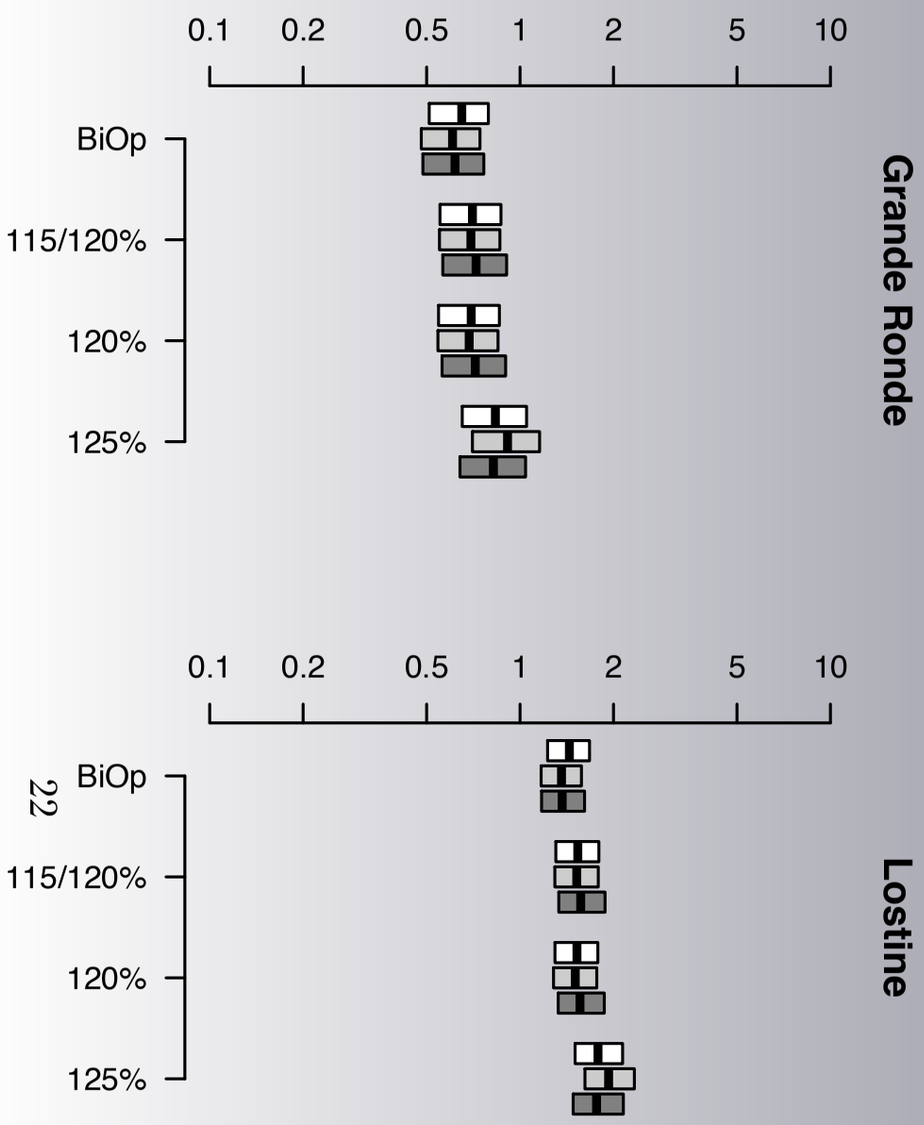
- Harvest rate increasing to 20% at 5000
  - Zone 6 < 17% currently
- Fixed transportation (20% vs 0%)
- Simulated ocean and migration variability

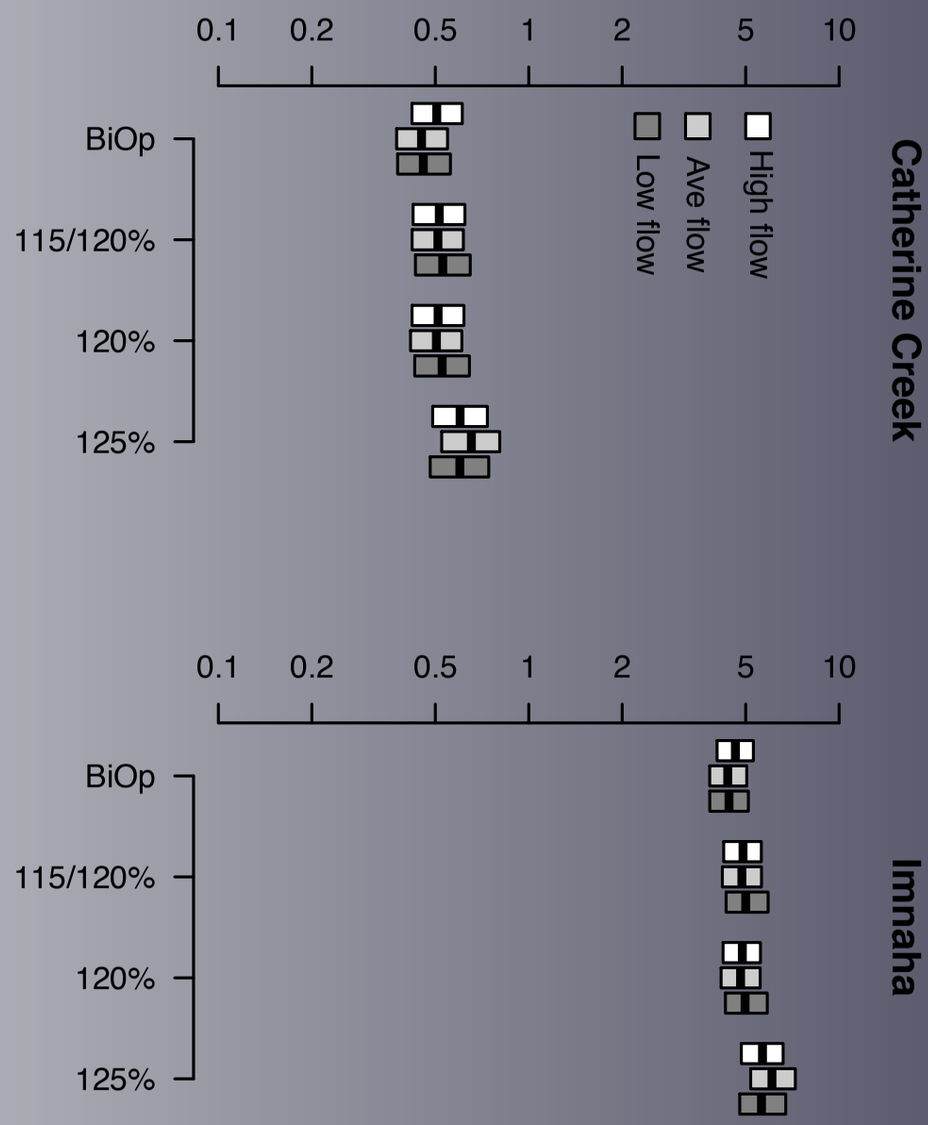
Current configuration

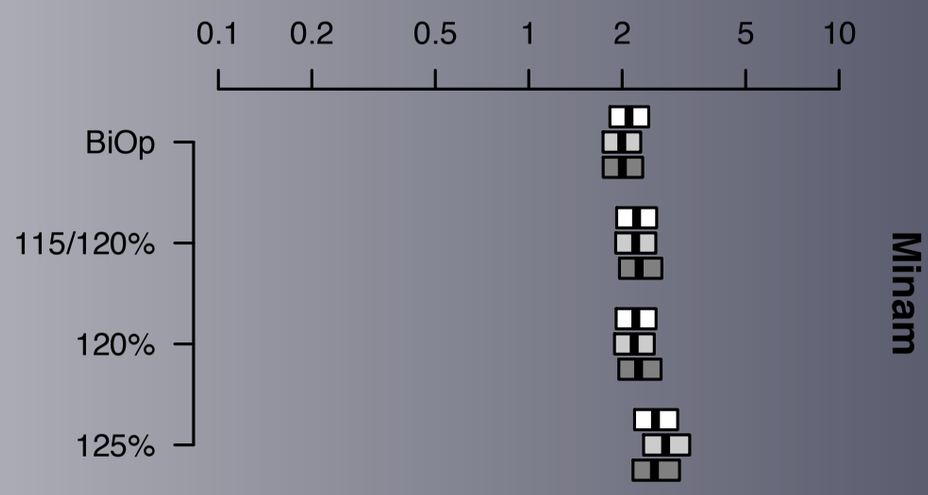


Breach

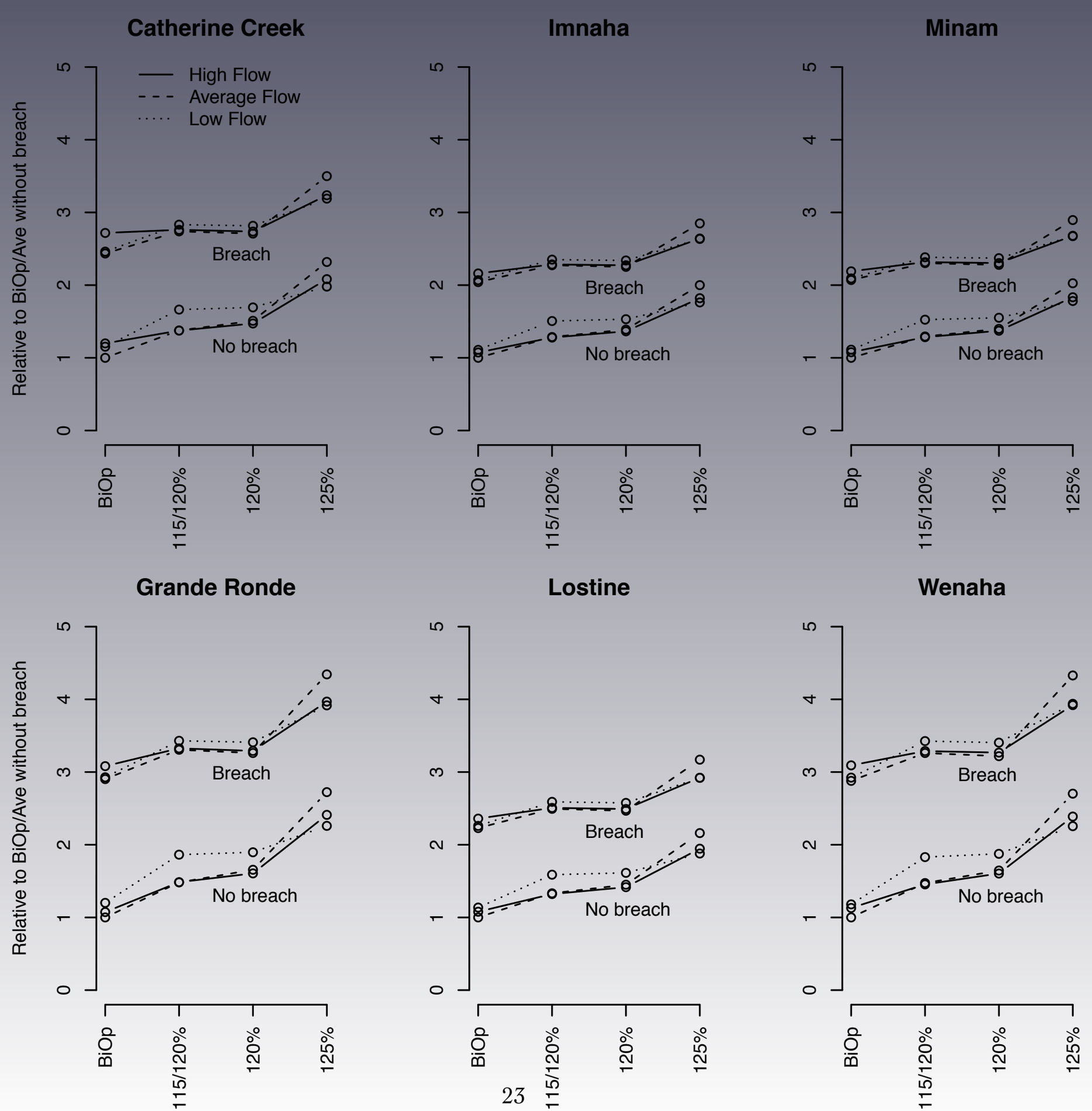
$\overline{R}_{2036-2045}$ in 1000's

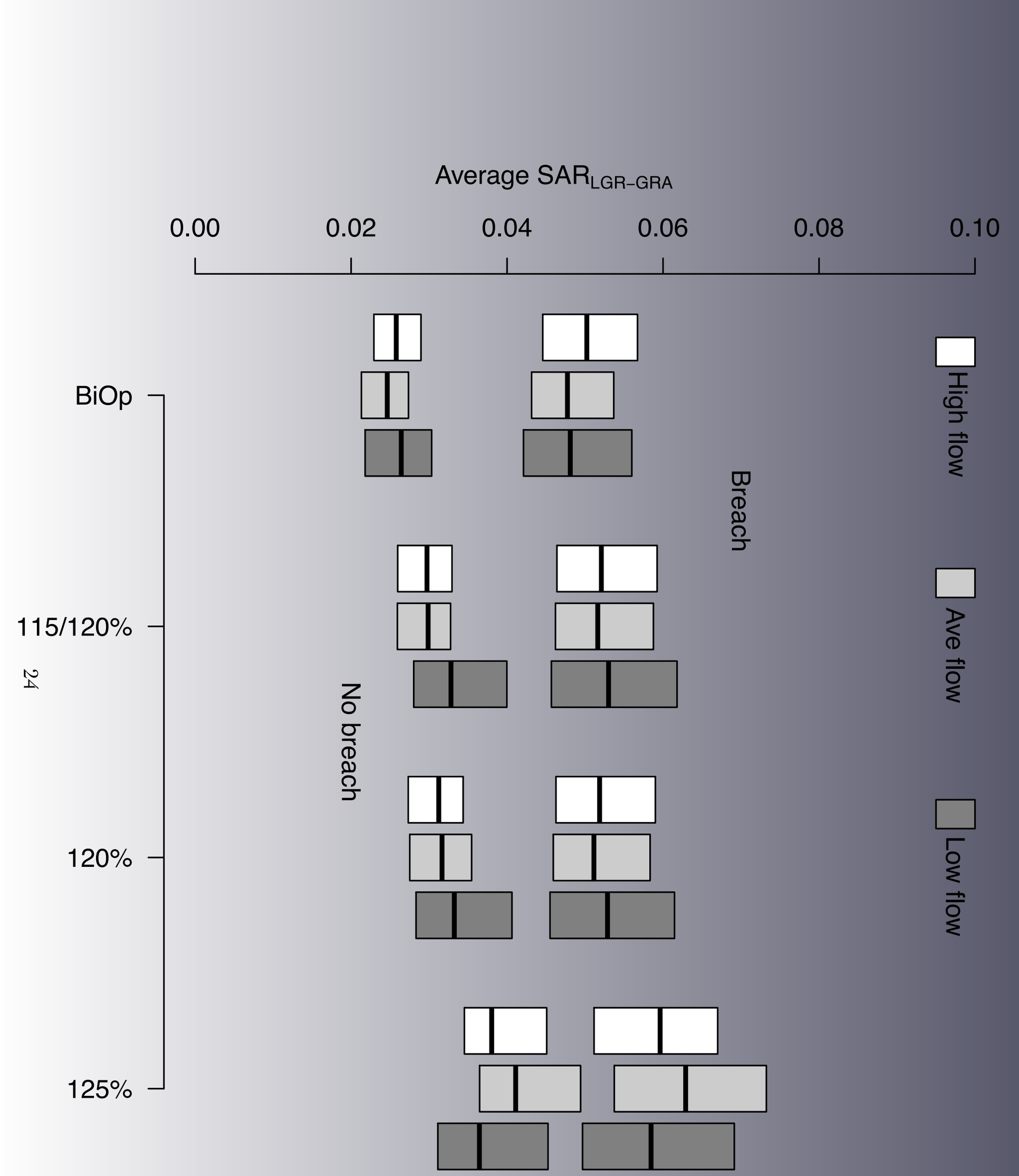






Return abundance




Average SAR$_{LGR-GRA}$
0.00
0.02
0.04
0.06
0.08
0.10
BiOp
115/120%
120%
125%
No breach
Breach
High flow
Low flow
24

Key findings

- More spill always predicts higher survival and abundance, regardless of flow.
- Breach/BiOp >= Current/125%
- Potential for 4X abundance with 125% and Breach
- Approximately 2-3X improvements in SARs