

# Cowichan Water Use Plan

Public Advisory Group  
Meeting # 3

March 8, 2018



# Short-listing environmental PMs

## Short-listing PMs improves decision-making



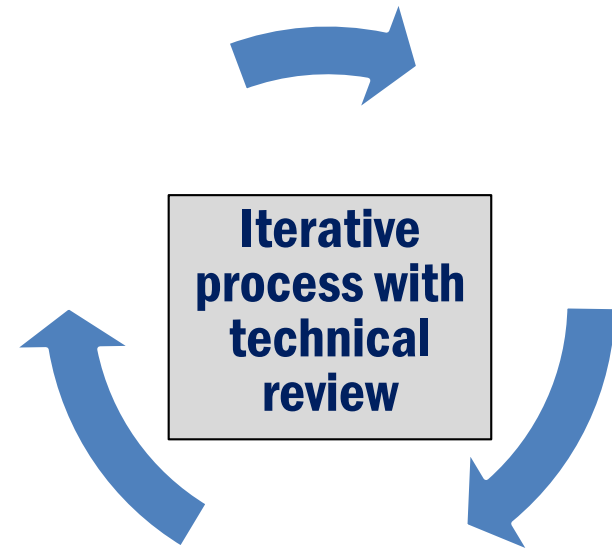
# Short-listing environmental PMs

## Short-listing process

1. Assess sensitivity
2. Assess redundancy

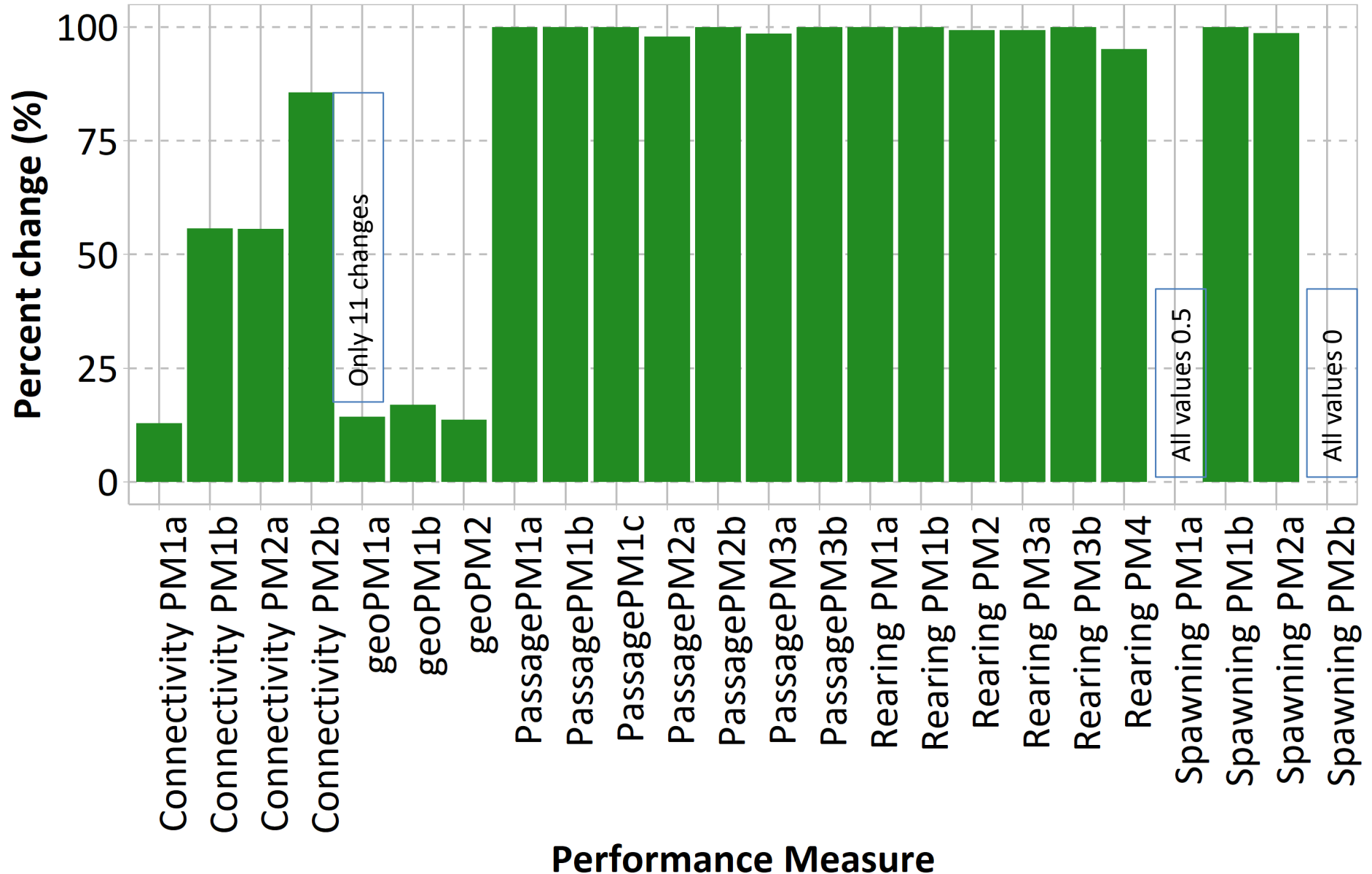
### We also considered:

- Desire to include different PM groups
- Conservation priorities for different species



# Shortlist Cowichan River PMs

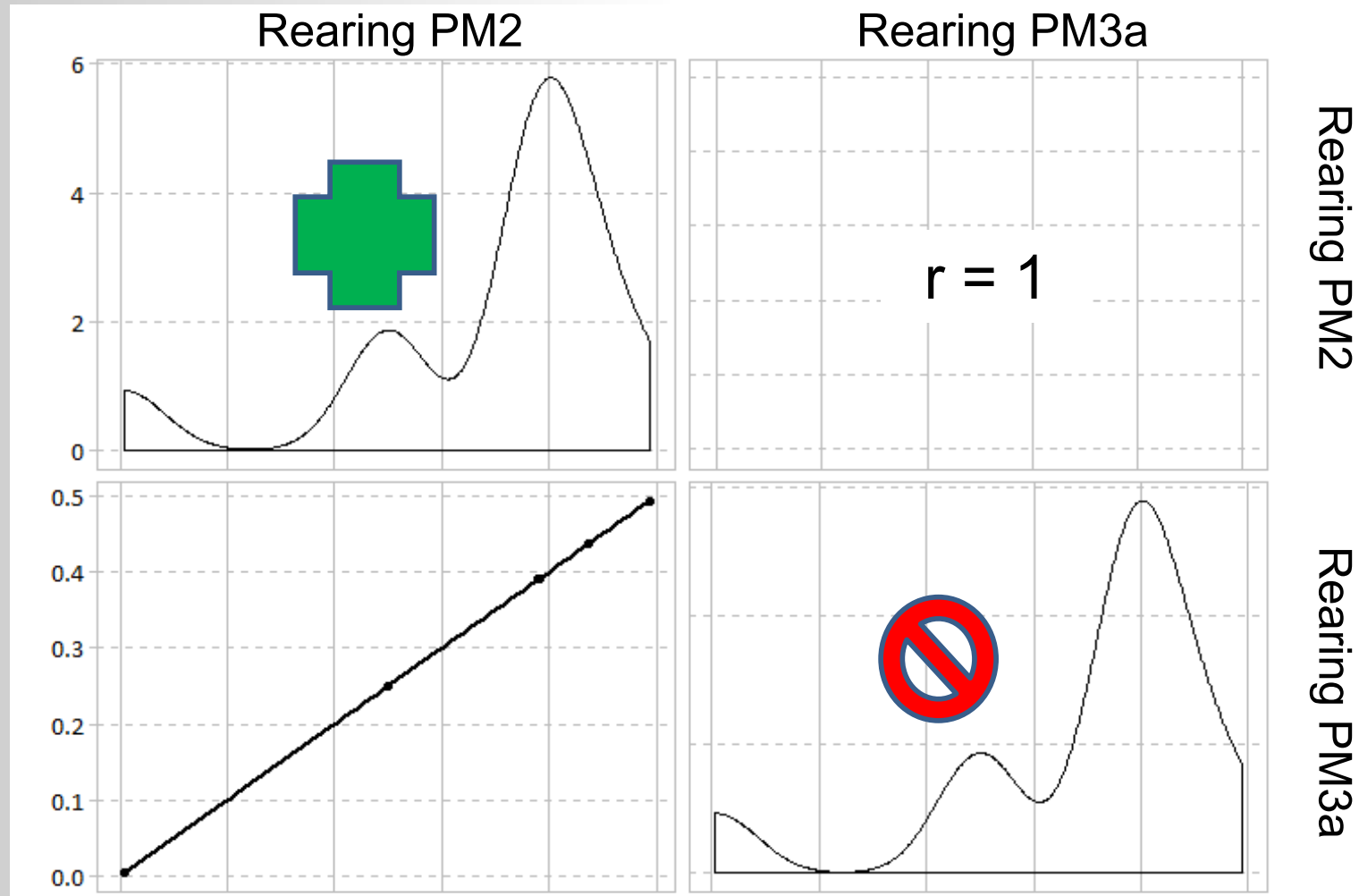
Step 1, Sensitivity:  $\frac{\text{max} - \text{min}}{\text{max}} \times 100$





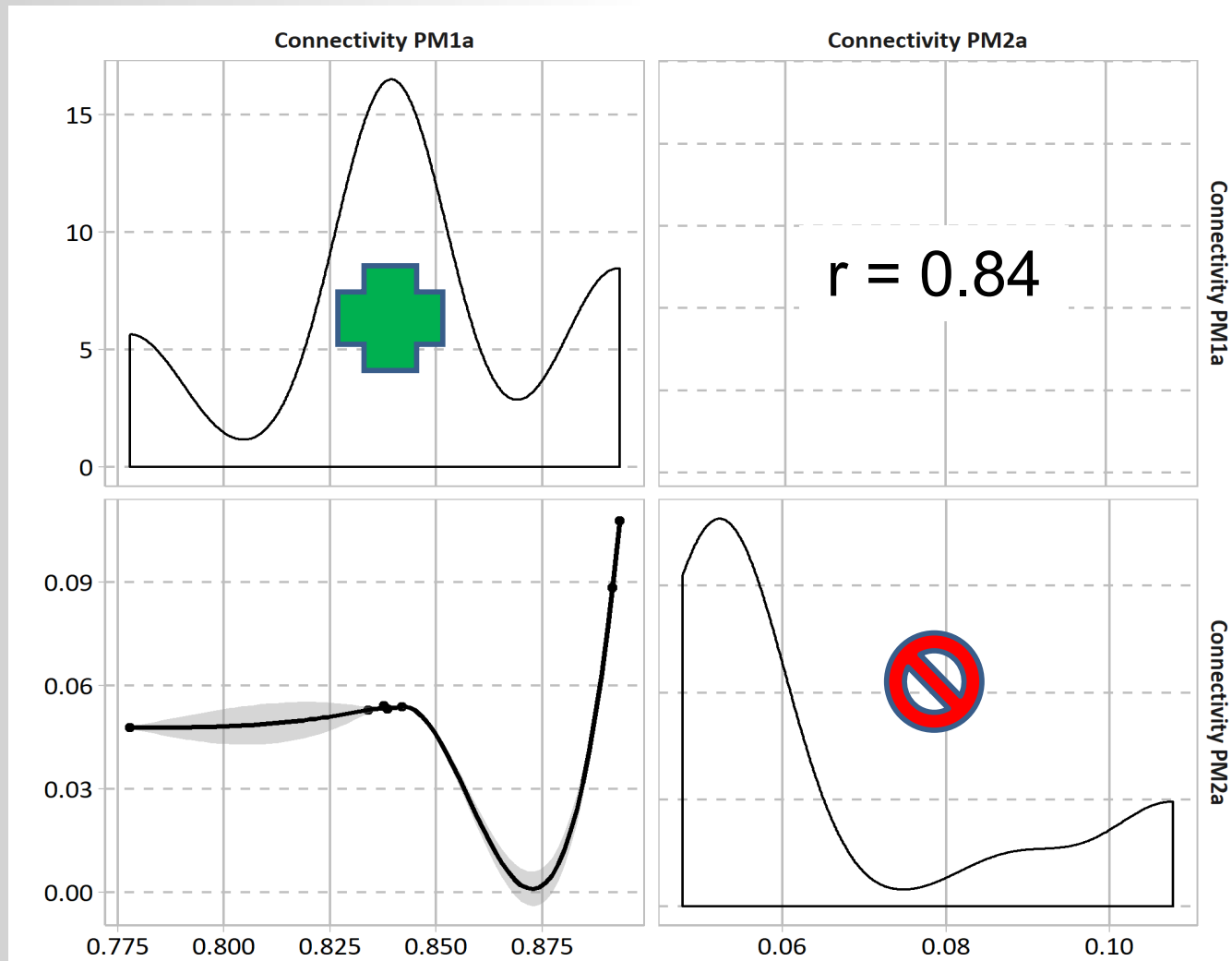
# Shortlist Cowichan River PMs

## Step 2, redundancy



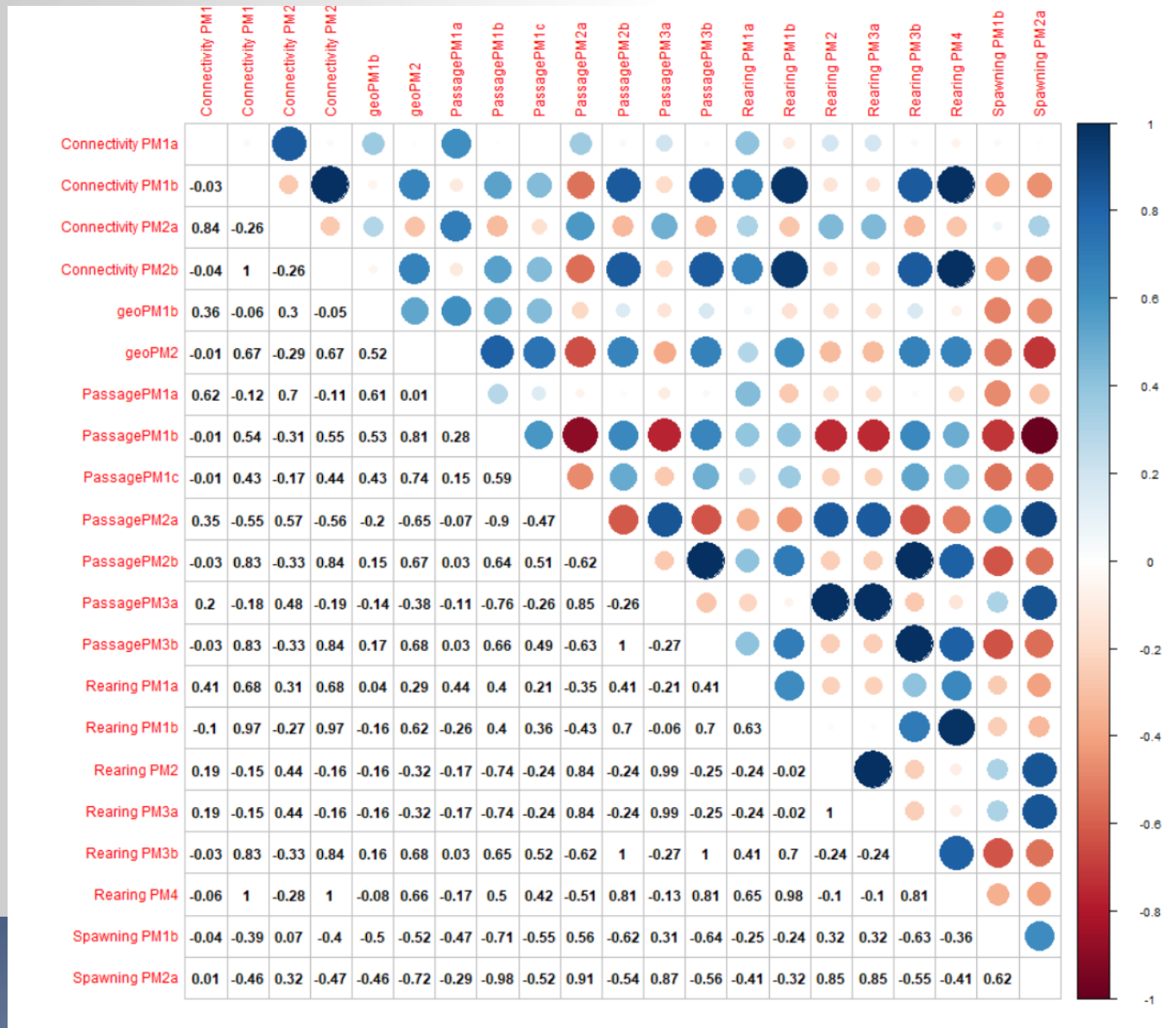
# Shortlist Cowichan River PMs

## Step 2, redundancy



# Shortlist Cowichan River PMs

## Step 2, redundancy



# Shortlist Cowichan River PMs

## Removed by sensitivity

- Geo 1a
- Spawning 1a, 1b

## Removed by redundancy

- Connectivity 1b, 2a, 2b
- Passage 2a, 2b, 3a, 3b
- Rearing 1b, 3a, 4
- Spawning 2a

## Keep (round 1)

- Connectivity 1a
- Geomorphology 1b, 2
- Passage 1a, 1b, 1c
- Rearing 1a, 2, 3b
- Spawning 1b

# Shortlist Cowichan River PMs

## Revised Performance Measure subset

- Connectivity 1a (juvenile CH + CO, April 1 – June 15)
- Passage 1b (adult summer CH, April 1 – July 31)
- Passage 1c (adult fall CH, Sept 1 – November 30)
- Rearing 1b (ST parr, March 1 – Dec 31)
- Rearing 2 (CH fry, March 1 – April 30)
- Spawning 1b (early ST incubation, Jan 15 – March 31)



# Shortlist Cowichan Lake PMs

## Status of Lamprey PM

- Vancouver Lamprey is an important consideration for the ARTSG
- Vancouver Lamprey is endemic to the upper Cowichan watershed and has a SARA Status of Schedule 1, Threatened
- Larval ammocoetes rear in shallow habitats that include tributary fans, for up to 7 years
- Our knowledge of the ecology of this species is poor
- Lake drawdown is assumed to have an adverse effect on the rearing life stage
- We have insufficient bathymetry data (and biological knowledge) to develop a quantitative PM for lamprey
- Effects to lamprey have been considered qualitatively by reviewing minimum modelled lake elevations for alternatives

# Shortlist Cowichan Lake PMs

- ~~Connectivity (lake tributaries)~~
- ~~Water quality~~
- Biology (lamprey) **Qualitative**
- Biology (littoral rearing habitats) **Relative littoral productivity**
- ~~Wildlife and riparian~~





# Shortlist of Environmental PMs

## River PMs

- Connectivity 1a (juvenile CH + CO, April 1 – June 15)
- Passage 1b (adult summer CH, April 1 – July 31)
- Passage 1c (adult fall CH, Sept 1 – November 30)
- Rearing 1b (ST parr, March 1 – Dec 31)
- Rearing 2 (CH fry, March 1 – April 30)
- Spawning 1b (early ST incubation, Jan 15 – March 31)

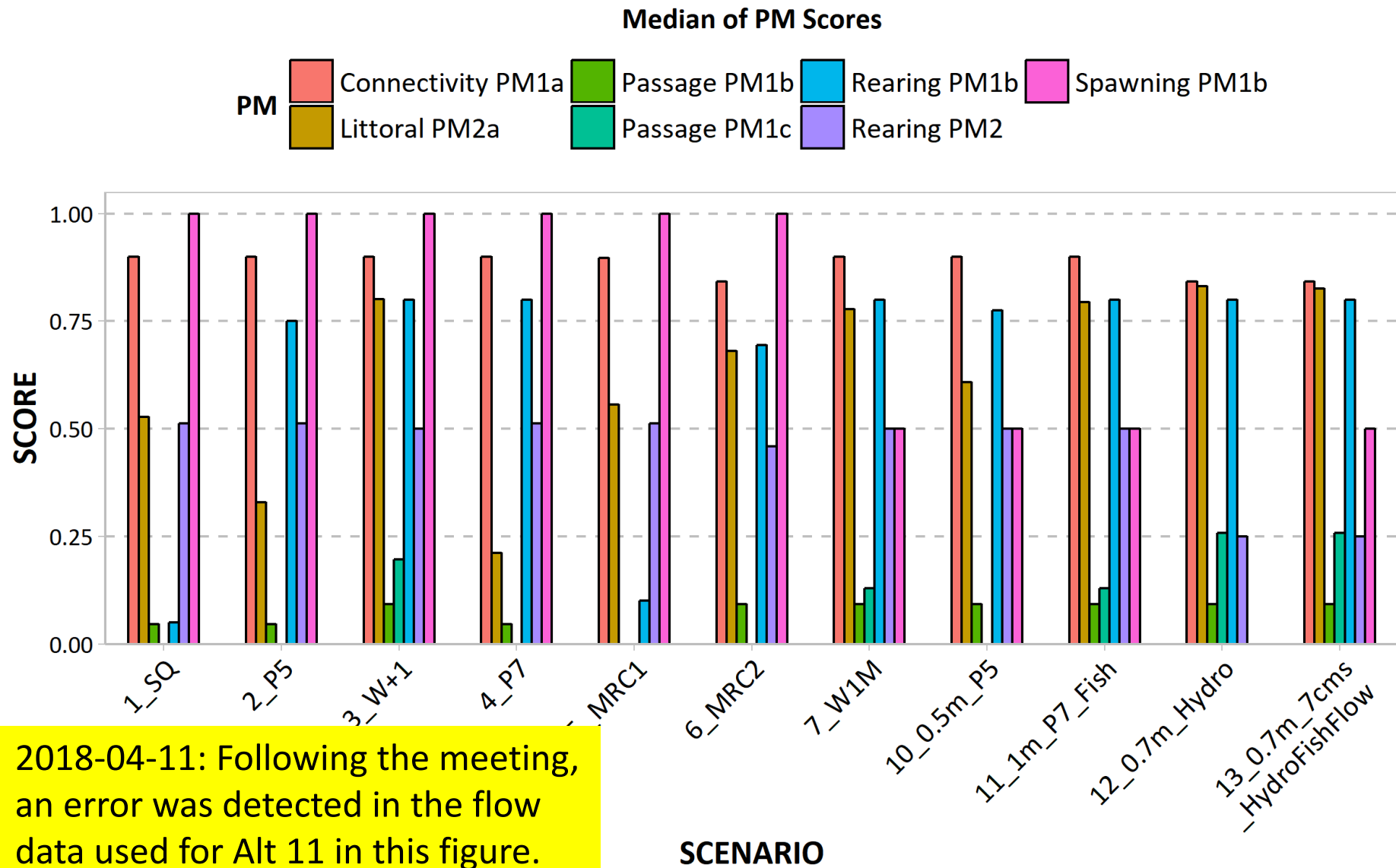
## Lake PMs

- Littoral 2a (juvenile salmonids, April 1 – Nov 5)
- Lamprey (qualitative)

			Jan				Feb				Mar				Apr				May				Jun				Jul				Aug				Sep				Oct				Nov				Dec			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
River	Connectivity PM1a	CH, CO (juv)													x	x	x	x	x	x	x	x	x	x																										
	Passage PM1b	CH (sum)													x	x	x	x	x	x	x	x	x	x	x	x																								
	Passage PM1c	CH (fall)																																																
	Rearing PM1b	ST (parr)													x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
	Rearing PM2	CH (fry)													x	x	x	x	x	x	x	x																												
	Spawning PM1b	ST (incub)				x	x		x	x	x	x			x	x	x	x	x																															
Lake	Littoral PM2a	juv salmonids													x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x													
	Lamprey	qualitative																																																
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
			Jan				Feb				Mar				Apr				May				Jun				Jul				Aug				Sep				Oct				Nov				Dec			

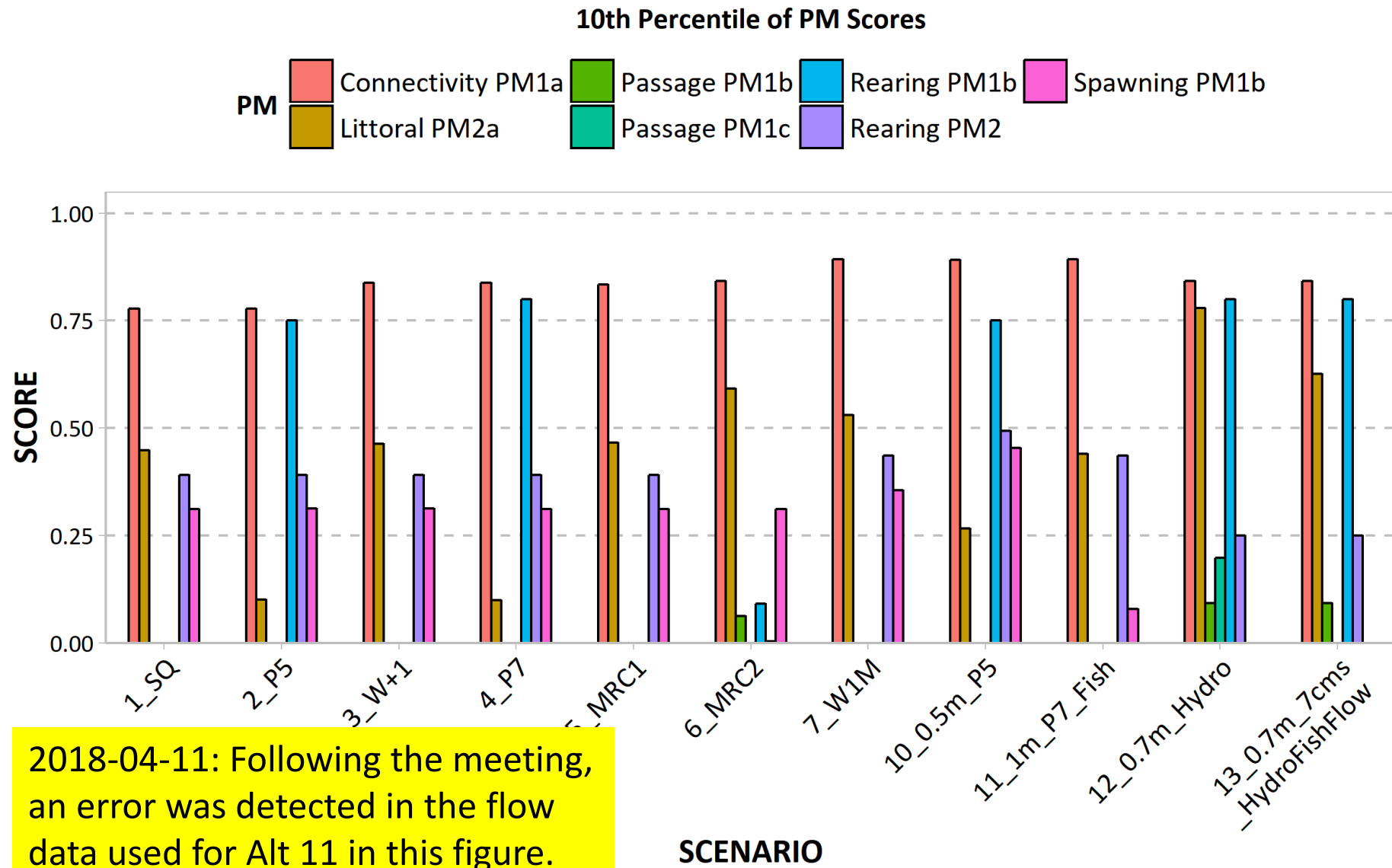


# Summary of Environment PM Results



2018-04-11: Following the meeting, an error was detected in the flow data used for Alt 11 in this figure.

# Summary of Environment PM Results



# Summary of Environment PM Results

**River Connectivity** – least sensitive. In a median year, values for alts. are similar to the status quo. In a dry year, #7, #10 and #11 are best (focus on providing spring flows).

**River Fish Passage** – values are generally low, indicating significant biological constraints for adult Chinook Salmon passage in the future. #12 and #13 are generally best.

## **River Rearing**

– For PM1b (ST parr), all alts. are substantially better than the status quo in the median year, except for #5. In a dry year, #2, #3, #4, #10, #12 and #13 are best. These include pumps (except #12).

– For PM2 (CH fry), all alts. are better than the status quo. Values are lower for #12 and #13 because they involve increasing lake storage in March. Also, #6 fails in a dry year.

**River Spawning** – #11 to #13 are worse than the status quo for both the median and the 10<sup>th</sup> %iles. #12 is particularly poor (increasing lake storage on March 1, during ST incubation).

**Lake Littoral:** #2 and #4 are consistently worse than the status quo (involve pumps). #10 is also poor in a dry year.

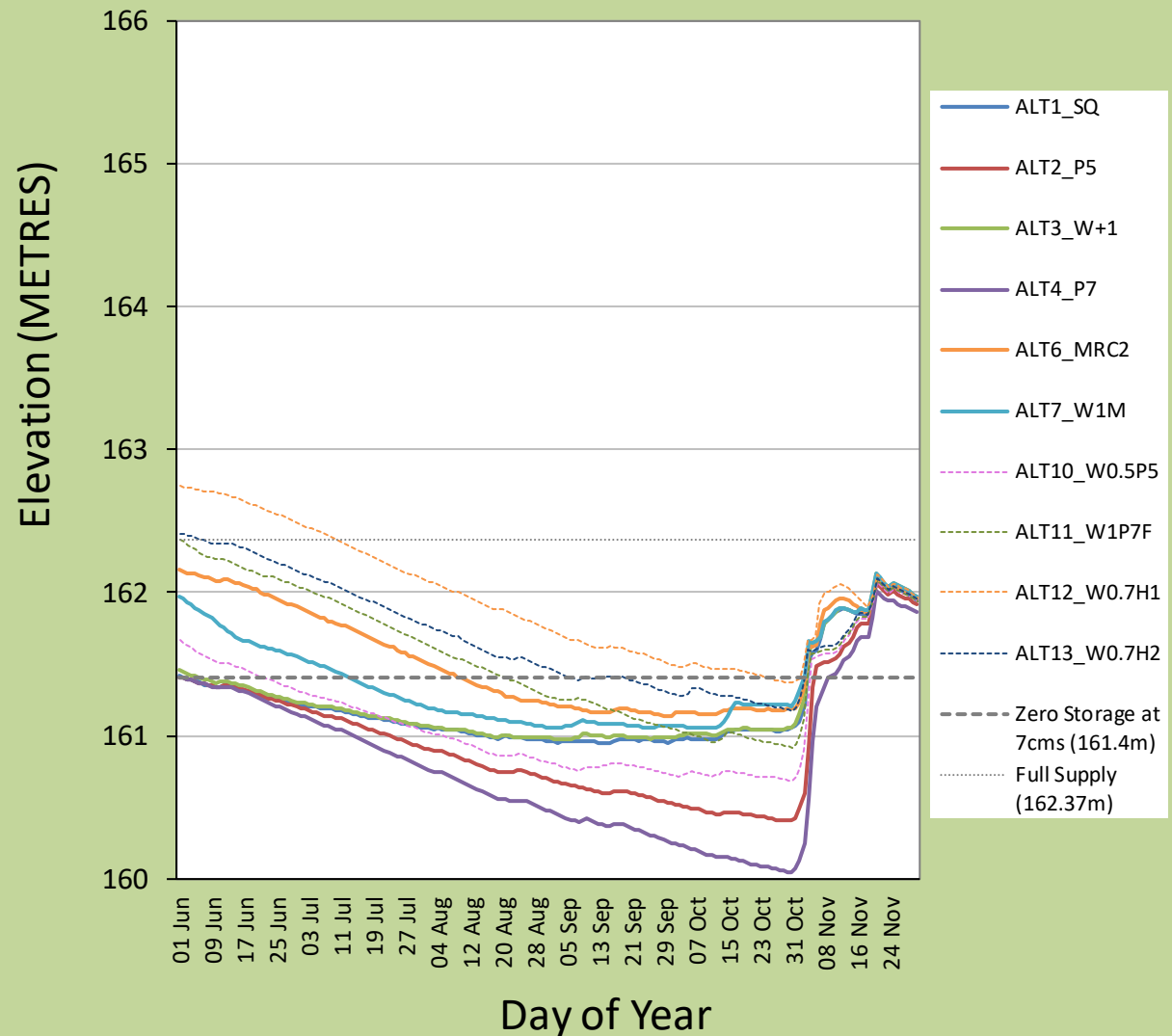
# Summary of Environment PM Results

17

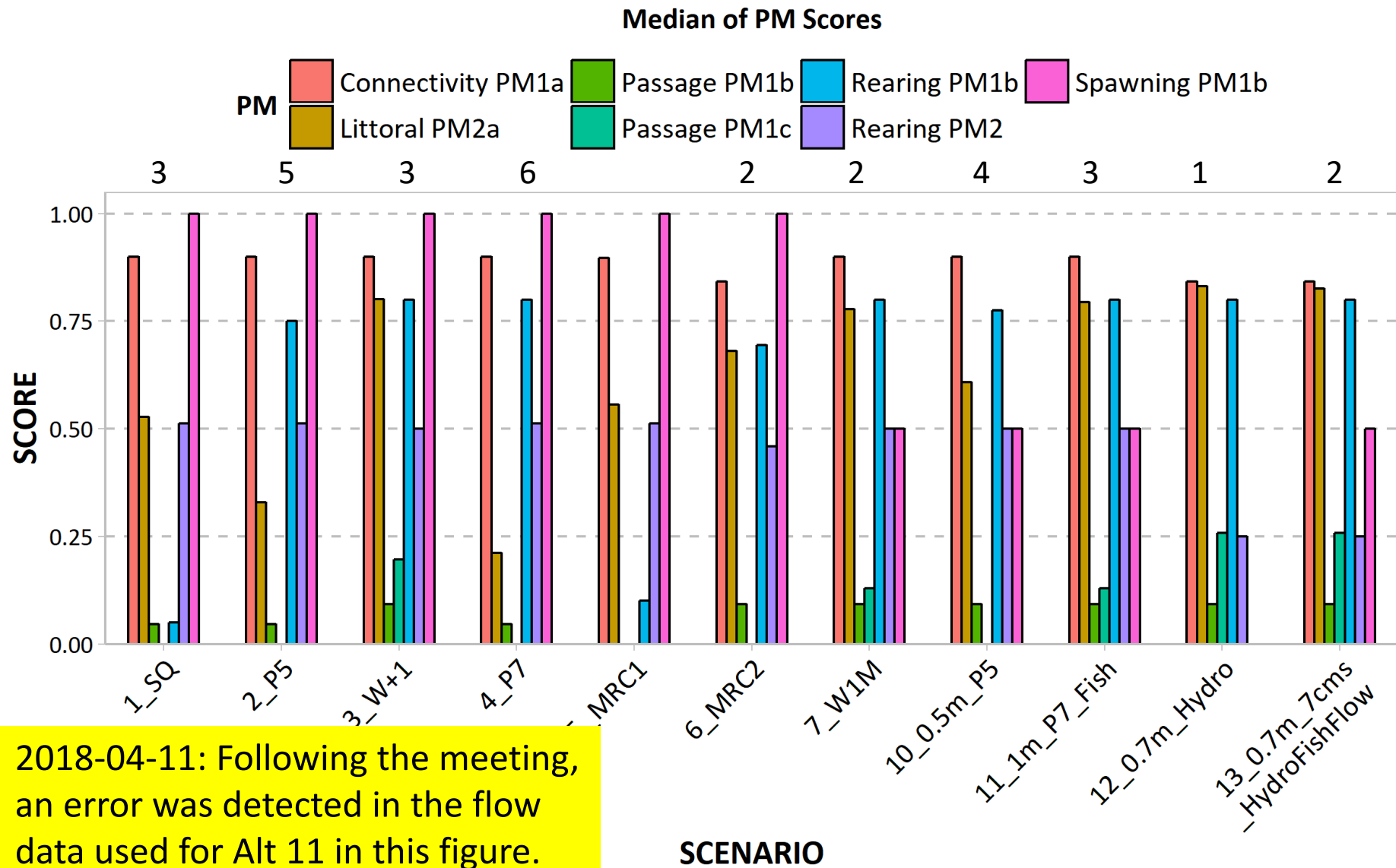
## Lamprey (qualitative)

- Minimum annual lake level used to make a qualitative assessment
- For the 10<sup>th</sup> %ile, the minimum lake level is lowest for #4
- #4, #2, #10, and #11 (just), are worse than the status quo
- #12 performs best
- Impacts are likely greatest for options with pumping but no increased lake storage

Cowichan, Elevation, 10th Percentile

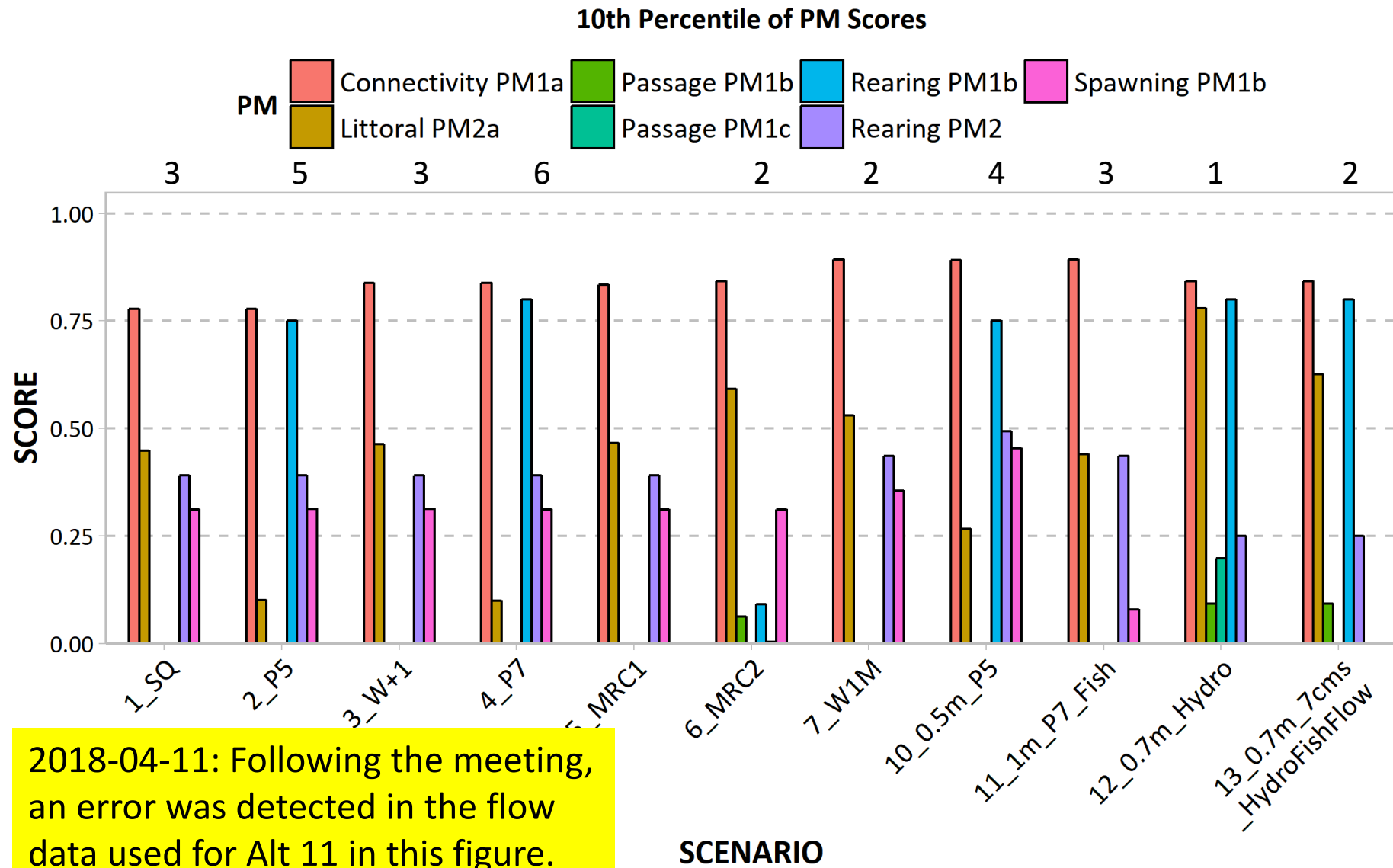


# Summary of Environment PM Results





# Summary of Environment PM Results



# Thank you!



2018-04-26

Month	Target (m <sup>3</sup> /s)	Min. (m <sup>3</sup> /s)	Alt. 12	New Alt.?
April (1-15)	40	25	15	20
April (16-30)	35	25	15	20
May (1-15)	35	20	7	15
May (16-31)	30	20	7	15
June (1-15)	30	15	7	7
June (16-30)	30	7	7	6
July (1-15)	10	7	7	5
July (16-31)	10	7	7	5
Aug (1-15)	10	7	7	5
Aug (16-31)	10	7	7	5
Sept (1-15)	10	7	7	5
Sept (16-30)	10	7	7	5
Oct (1-15)	15	7	7	5*
Oct (16-31)	15	7	7	5*
SUM	290	168	114	123
SUM (M m <sup>3</sup> )	381.5	221.3		

(\* Implement passage flows if available)