Environmental flow calculation techniques: Past, Present, and Future

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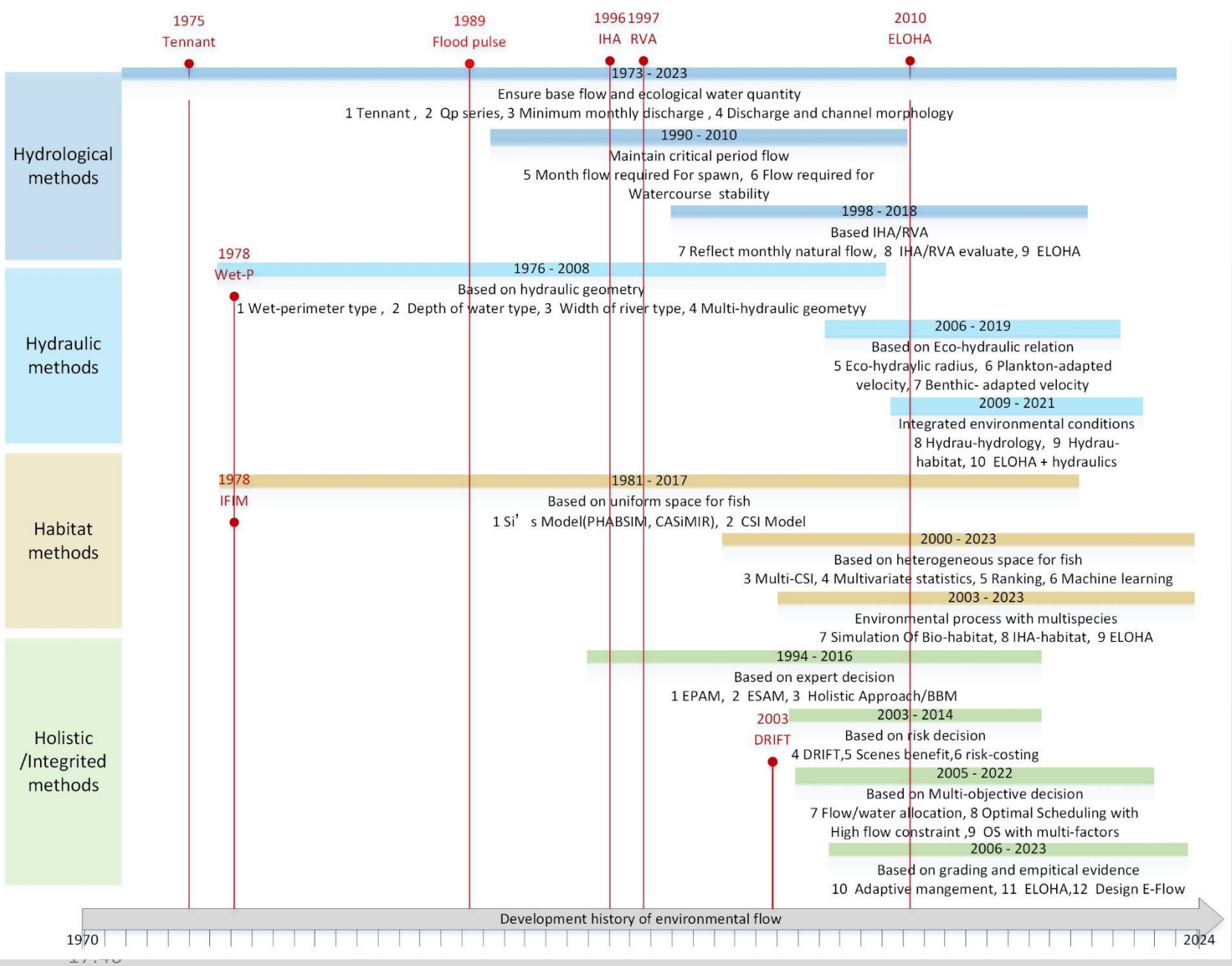
Past of E-Flow



4 major methods,

40 subclasses,

170 kinds.

Before Flood Pulse Theory:

Tennent;

Weted–perimeter;

IFIM.

After Flood Pulse Theory:

IHA/RVA;

DRIFT;

ELOHA.

Important node

NODE 1 **Flood Pulse Theory ,** Junk W.,1989

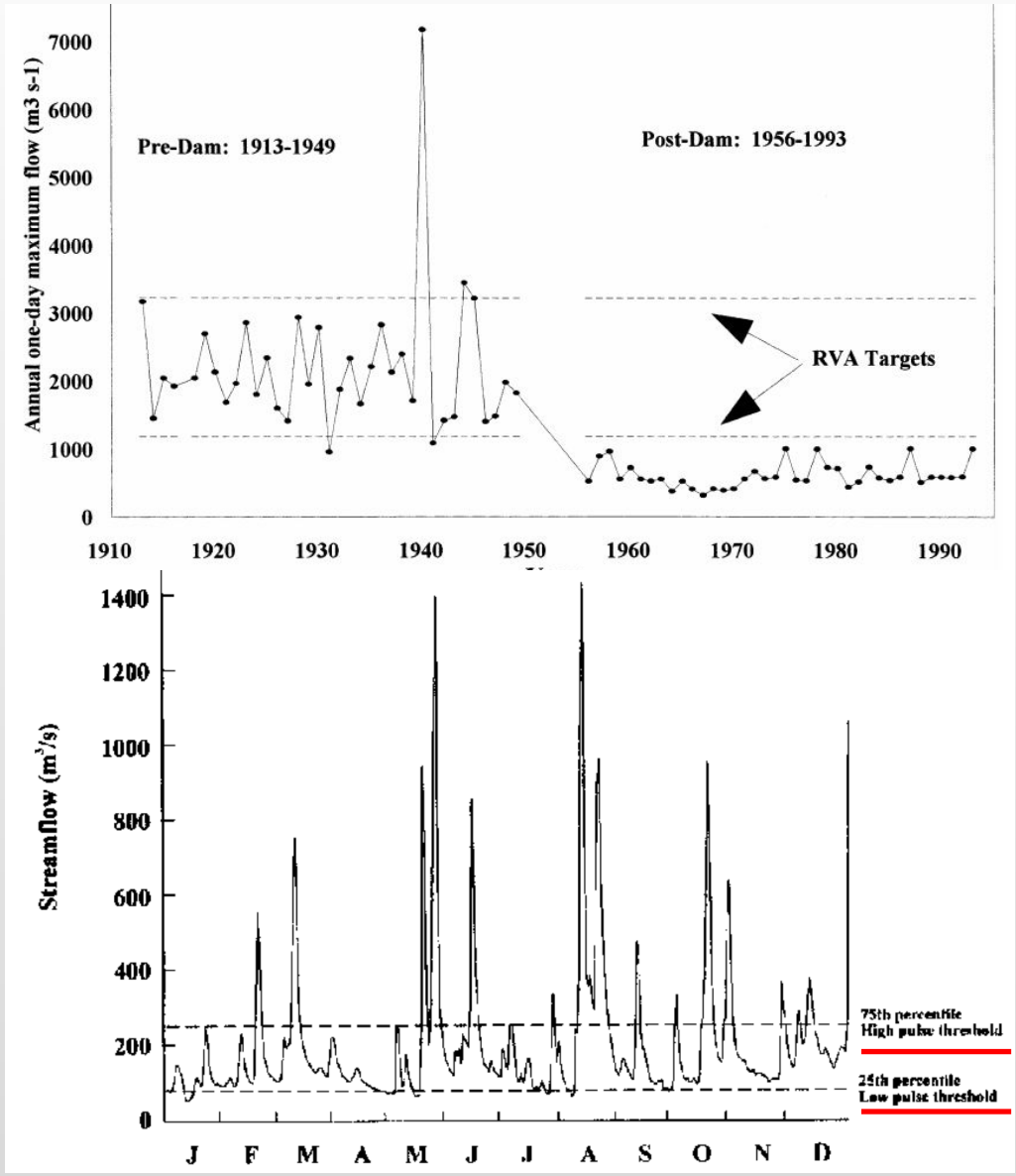
The flood pulse theory states that the pulsing of river discharge and water level variation is the major driving force responsible for the existence, productivity, and interactions of biota in river-floodplain systems.

NODE 2 IHA/RVA Brian D. Richter, 1996/1997

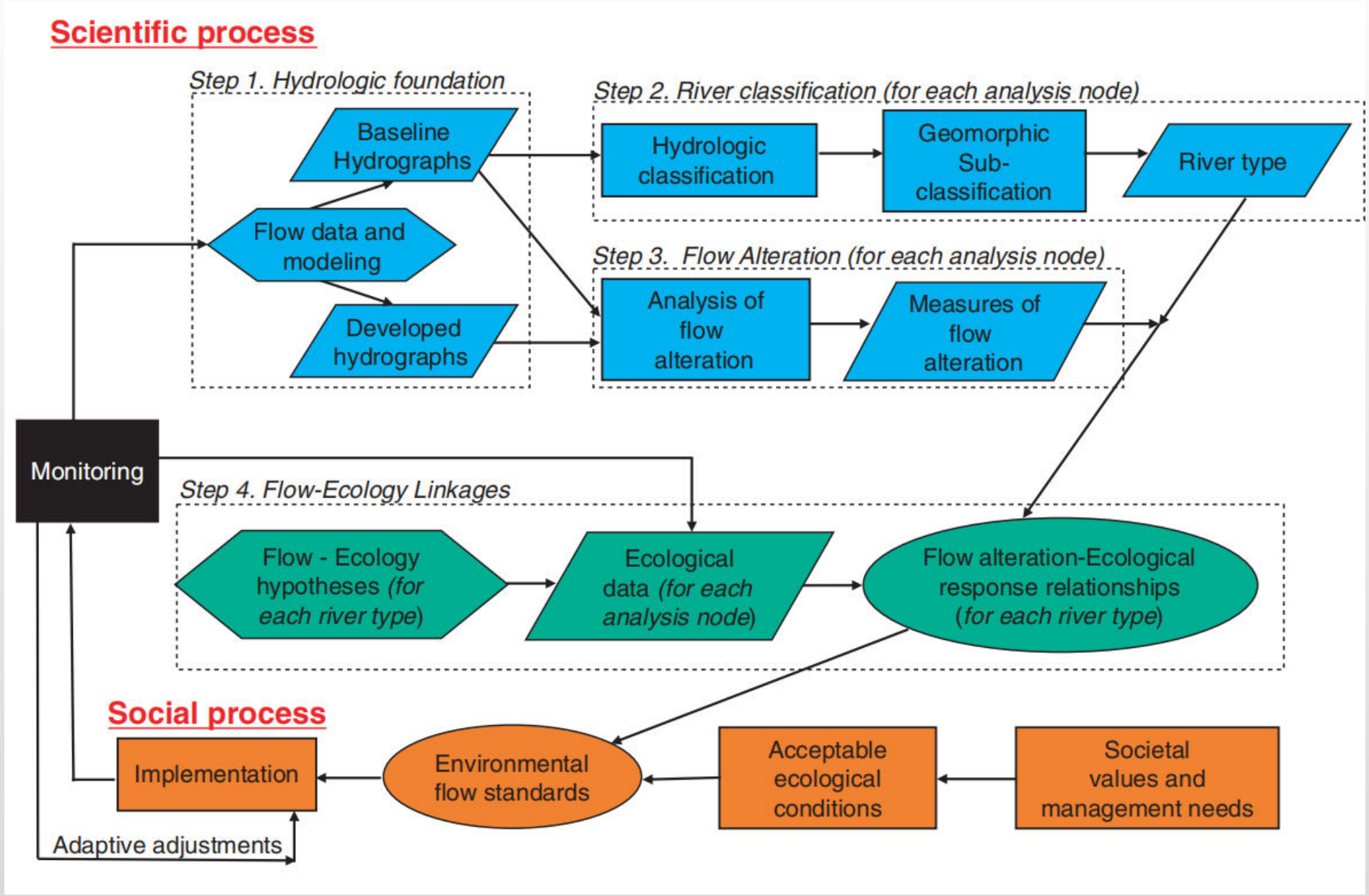
Indicators of Hydrologic Alteration, IHA

Group 1: Magnitude of monthly water conditions	Magnitude Timing	Mean value for each calendar month
Group 2: Magnitude and duration of annual extreme water conditions	Magnitude Duration	Annual minima 1-day means Annual maxima 1-day means Annual minima 3-day means Annual maxima 3-day means Annual minima 7-day means Annual maxima 7-day means Annual minima 30-day means Annual maxima 30-day means Annual minima 90-day means Annual maxima 90-day means
Group 3: Timing of Annual Extreme Water Conditions	Timing	Julian date of each annual 1-day maximum Julian date of each annual 1-day minimum
Group 4: Frequency and Duration of High/Low Pulses	Frequency Duration	No. of high pulses each year No. of low pulses each year Mean duration of high pulses within each year (days) Mean duration of low pulses within each year (days)
Group 5: Rate/Frequency of water condition changes	Rates of change Frequency	Means of all positive differences between consecutive daily values Means of all negative differences between consecutive daily values No. of rises No. of falls

Range of Variability Approach, RVA



NODE 3 **ELOHA, the Ecological Limits of Hydrologic Alteration ,** POFF et al 19 scientists, 2010



Present of E-Flow

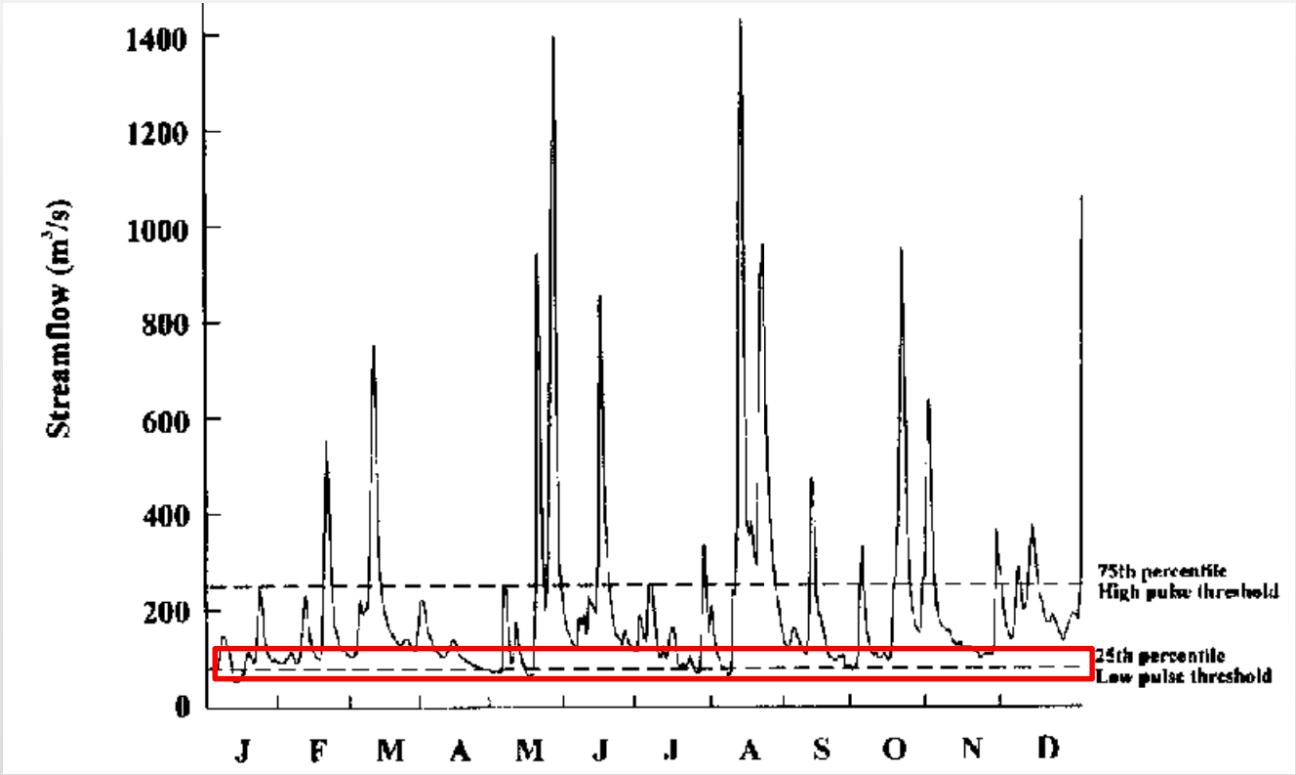
Question 1

ELOHA has been used for more than 10 years.

What is the effect?

10 years of application, most research reduce the peak of flood pulse.

IHA → 25%RVA → ε（Adjustment factor for water project optimize scheduling）



Question 2

We have some very common method of calculating the minimum environmental flow in dry season, are the methods scientific?

Tennant

Using 10% annual runoff to calculate base flow cannot reflect the difference of adjustment capacity of aquifers (good overwintering conditions for fish).

Qp

The proportion of Qp methods on rivers of different grades is inconsistent, and the smaller the river, the smaller the proportion(LI xiuyun, 1993). If Qp method is used to determine the ecological discharge, the smaller the river will be, and the ecological discharge in dry season will be more than the minimum monthly discharge, which is not conducive to the protection of river ecology.

Future of E-Flow

Evaluation Standards for global proximity

Monitoring of Ecohydrology response

E-flow processes

Despatching of reservoires

Nature hydrology processes + **Global sharing the knowledges of Ecohydrology response**

Advoact: Continue to lead

Leading countries in Ecohydrology:

America,

Australia,

South Africa,

England.

Leading countries in Reservior dispatching:

China.

Thanks !