Palaeoflood Hydrology - An overview

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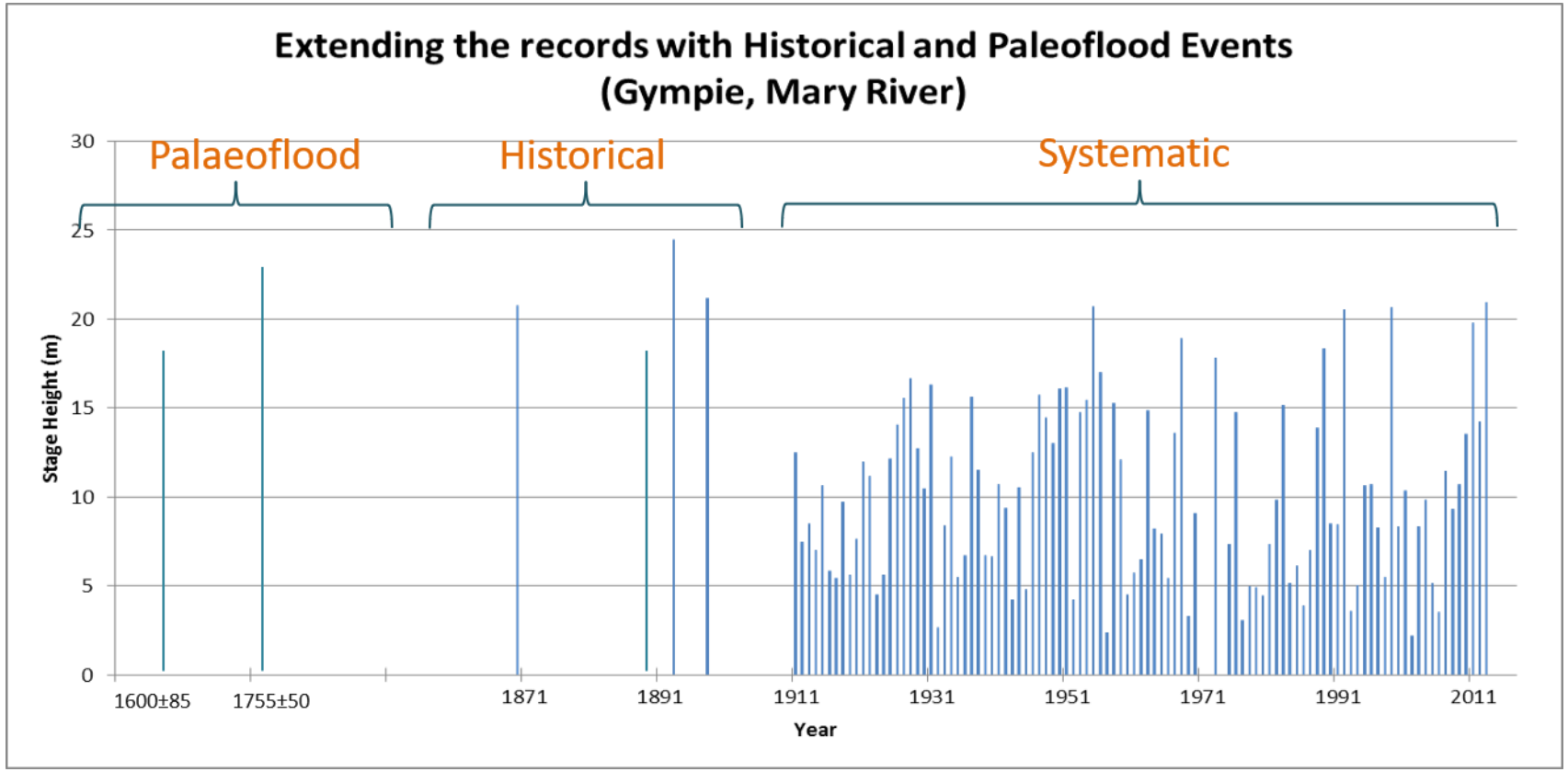
- What is Palaeoflood/ Palaeoflood Hydrology?
- Where to look out for?
- How do we use it?

Palaeofloods

Floods that occur prior to historical and systematic observation



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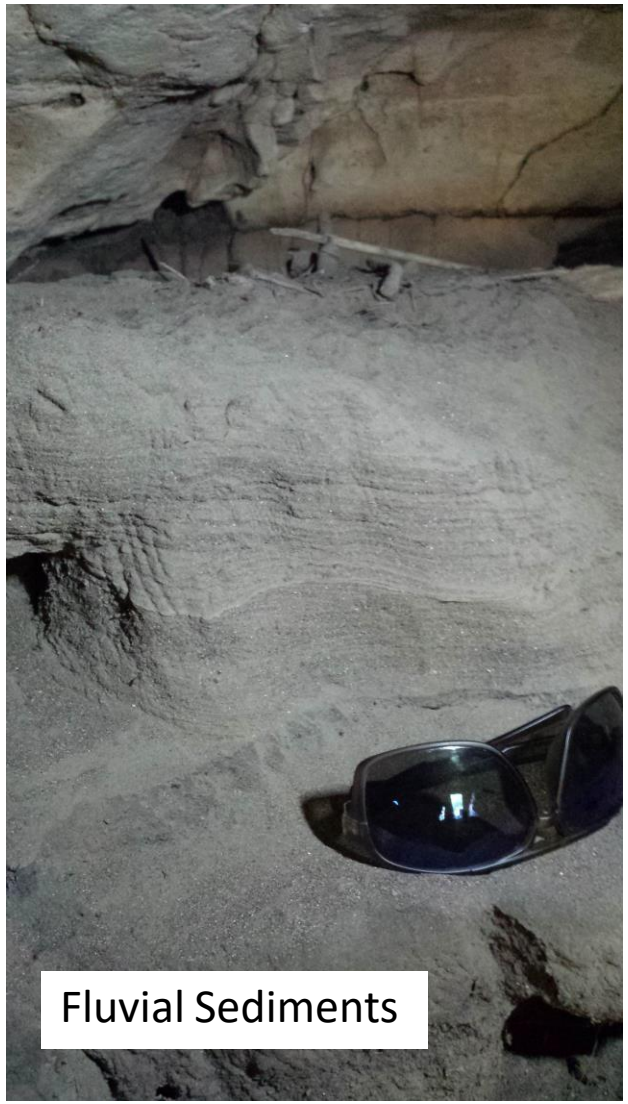
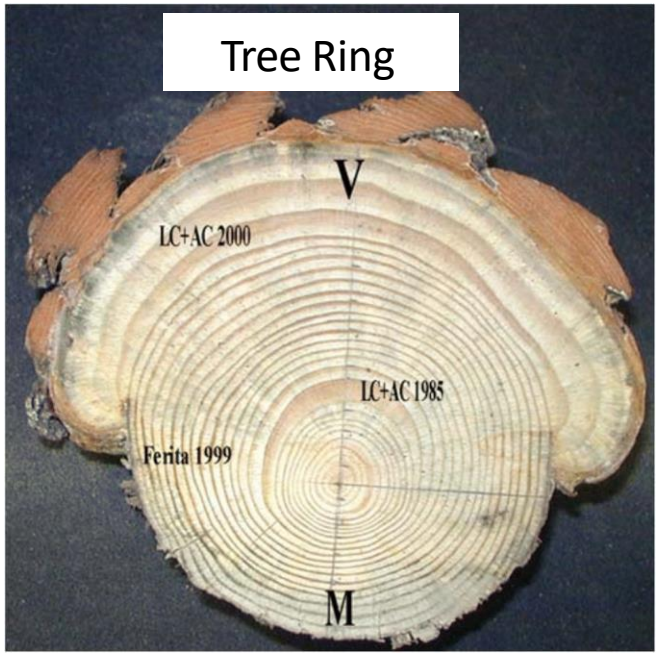
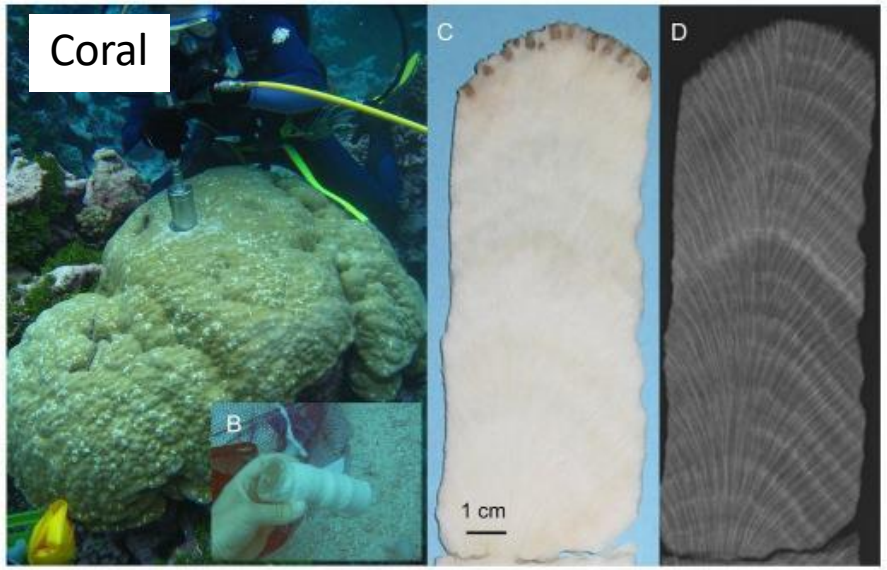
Palaeoflood Hydrology

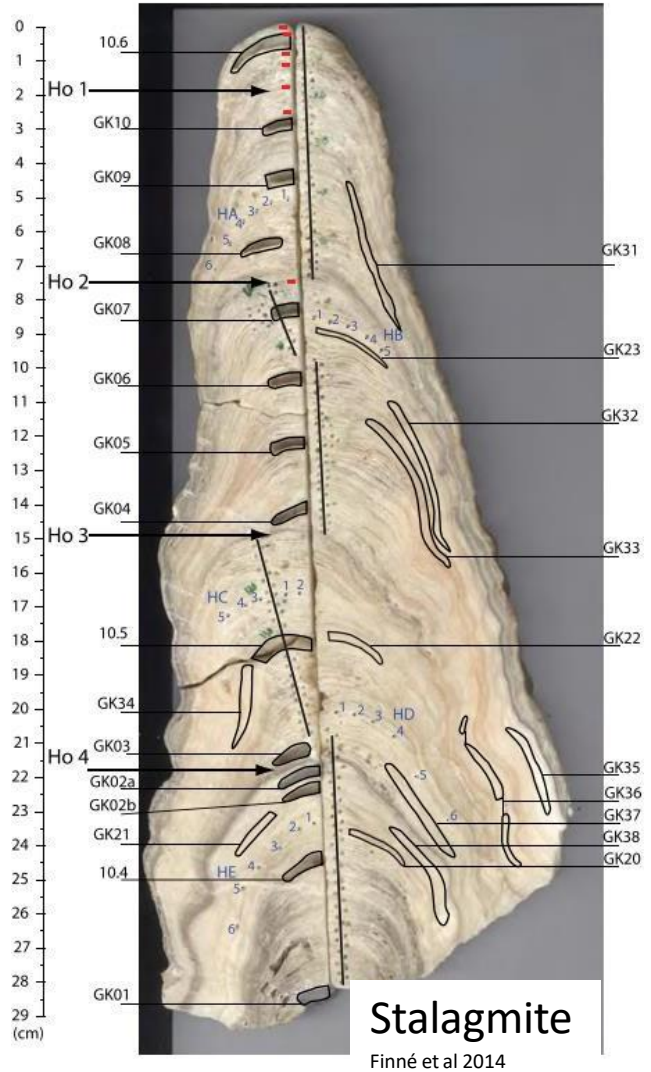
- Interdisciplinary science of reconstructing large flood events from the past (Baker, 1987)
- Palaeoflood analysis involves determining the timing and magnitude of past flood events
- Typically involves fluvial sedimentary evidence, with new sources of information in recent years







https://ageofrocks.wordpress.com/2015/09/10/coral-reefs-and-the-age-of-the-earth/



Finné et al 2014

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in Space and Time

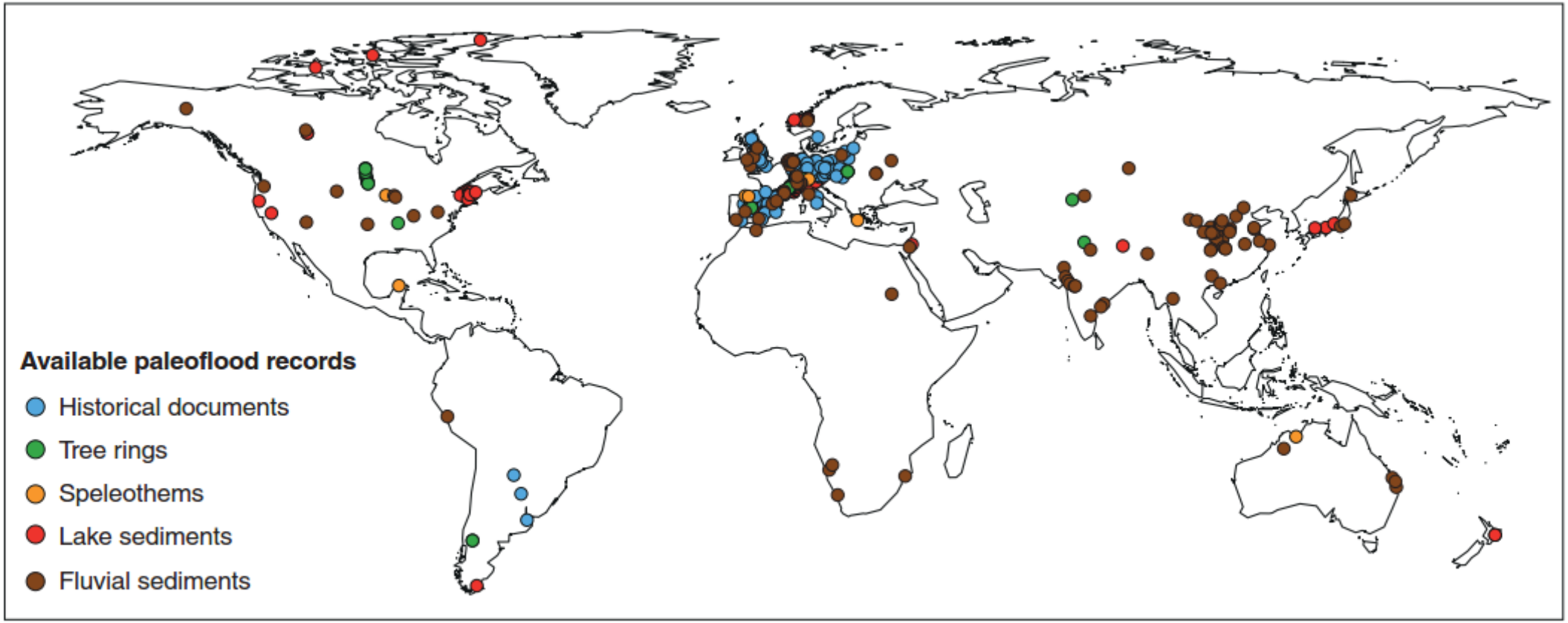
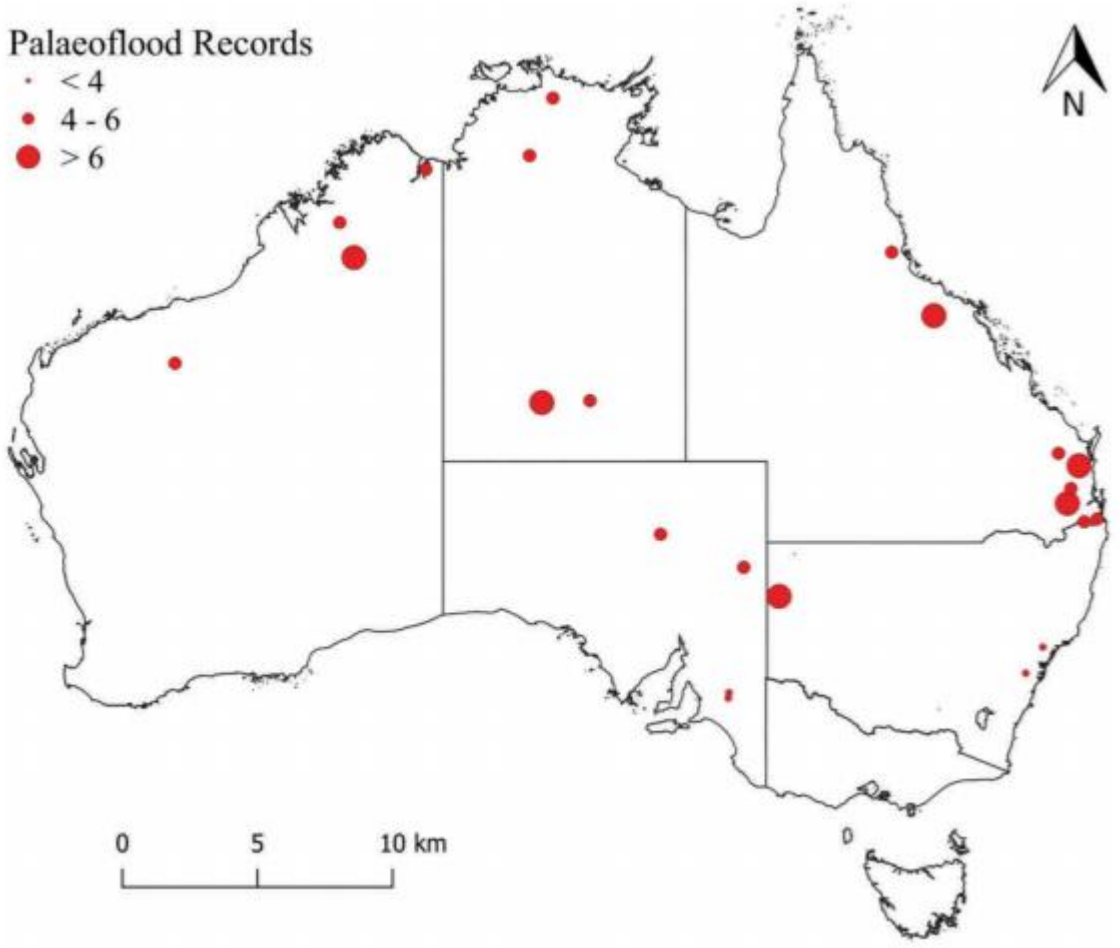


FIGURE 6 Global distribution of historical, botanical and geological flood data. Details of this regularly-updated dataset and its interactive mapping can be found at: http://pastglobalchanges.org/ini/wg/floods/data

Wilhelm et al 2018



Allen et al 2020

What do we look out for?

- Fluvial Deposits
- Palaeostage Indicators (PSIs)
  - Physical evidences of flood stage height

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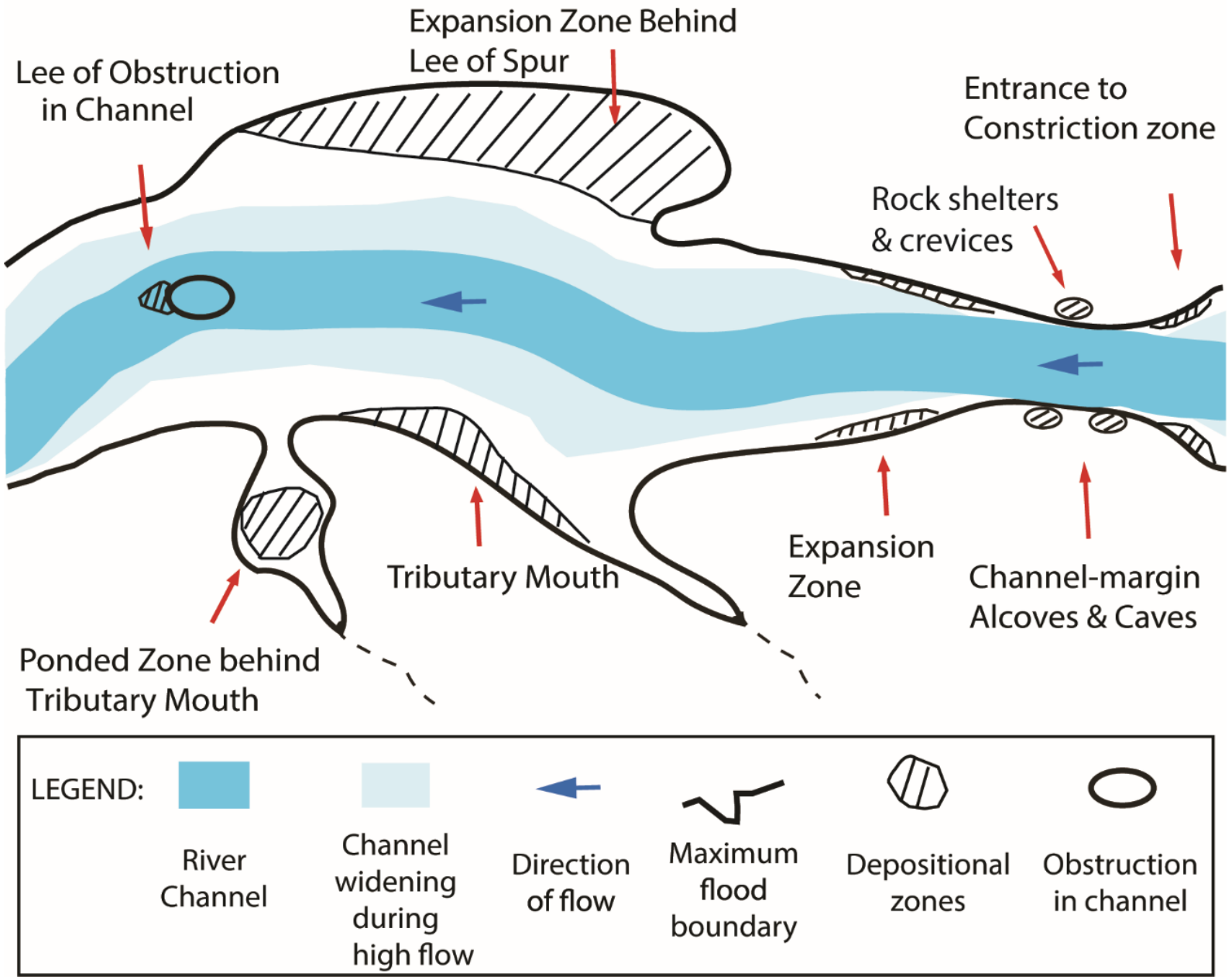
Catchment Connections 2017


2018/05/28
Catchment Connections 2017



Lam et al, 2017

Fluvial sediments as Natural Archives

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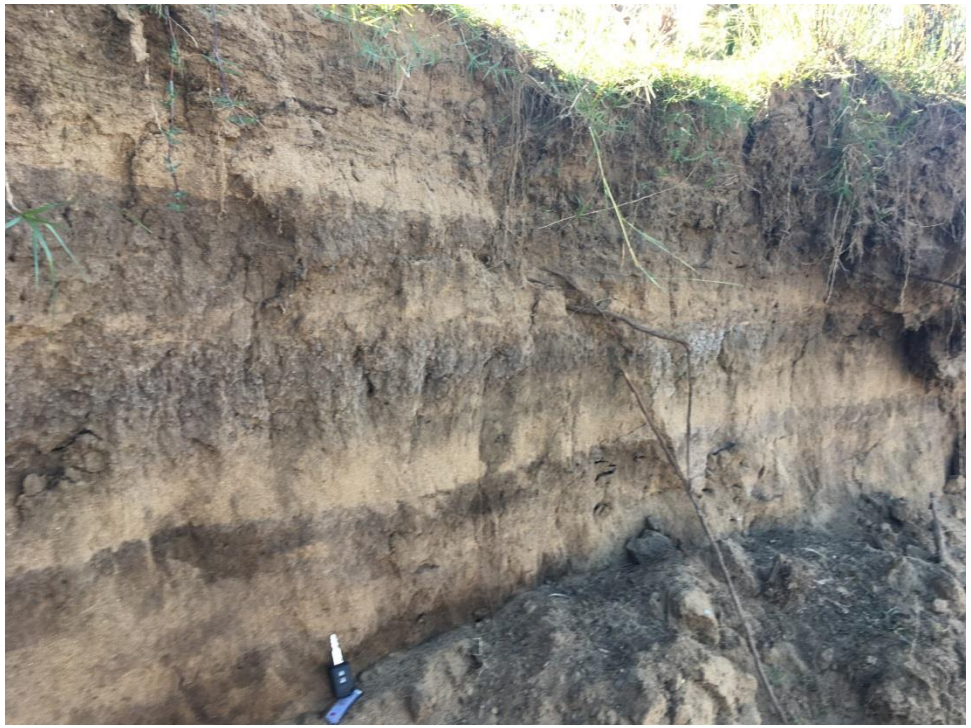
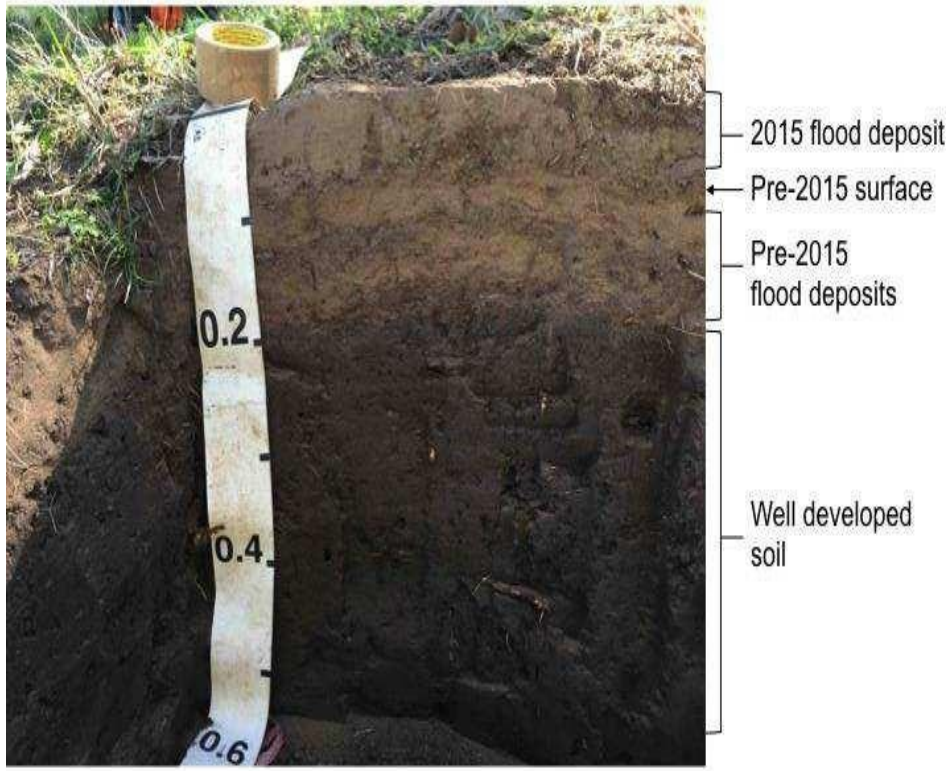
Flood couplets



Catchment Connections 2017

How can Palaeofloods help?

- Provide records of extreme floods where they are few or none available
- Place extreme outlier(s) into temporal context
- Reduce uncertainty in Flood Frequency Analysis
- Give context to the PMP/PMF



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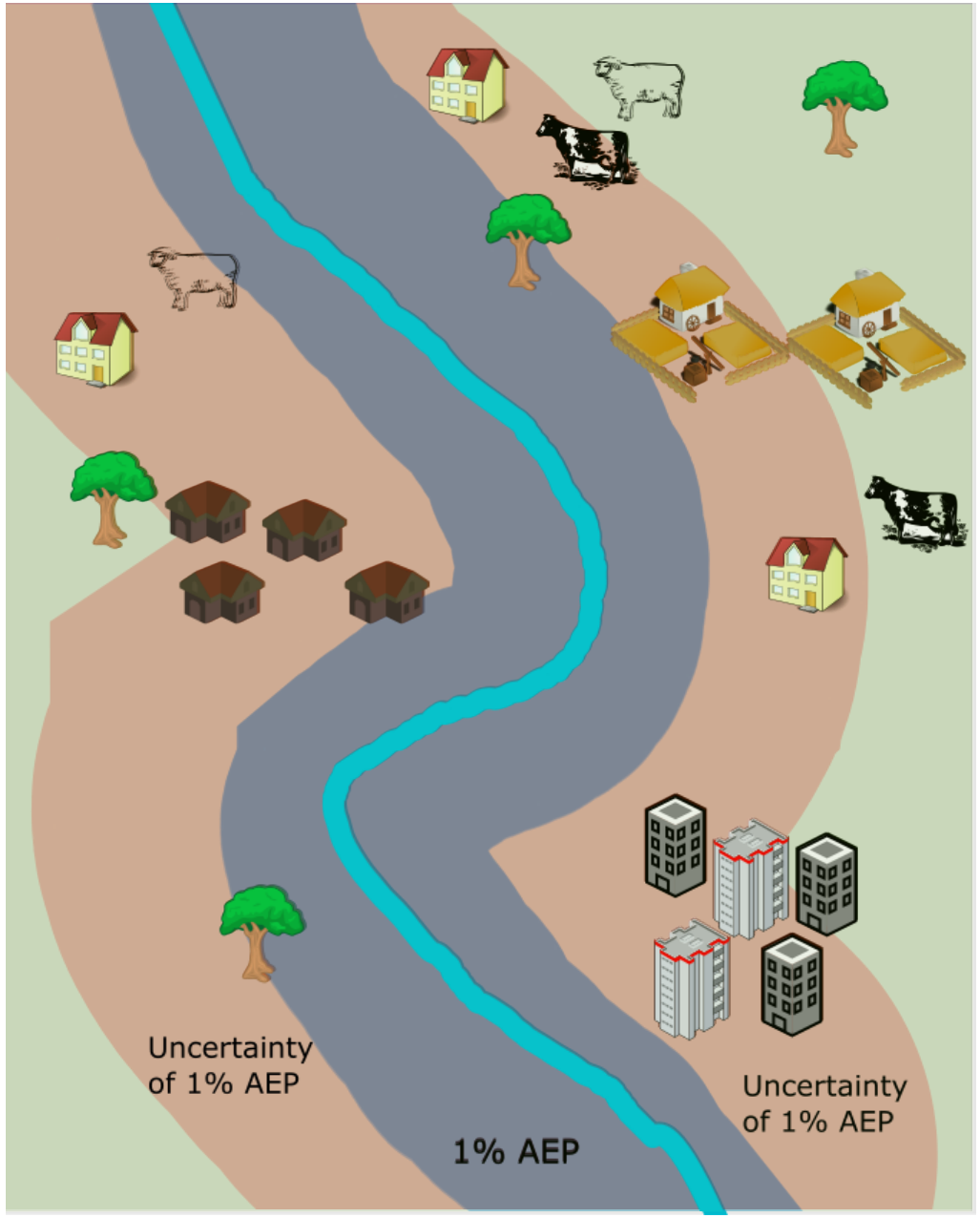
Uncertainty of **1% AEP**



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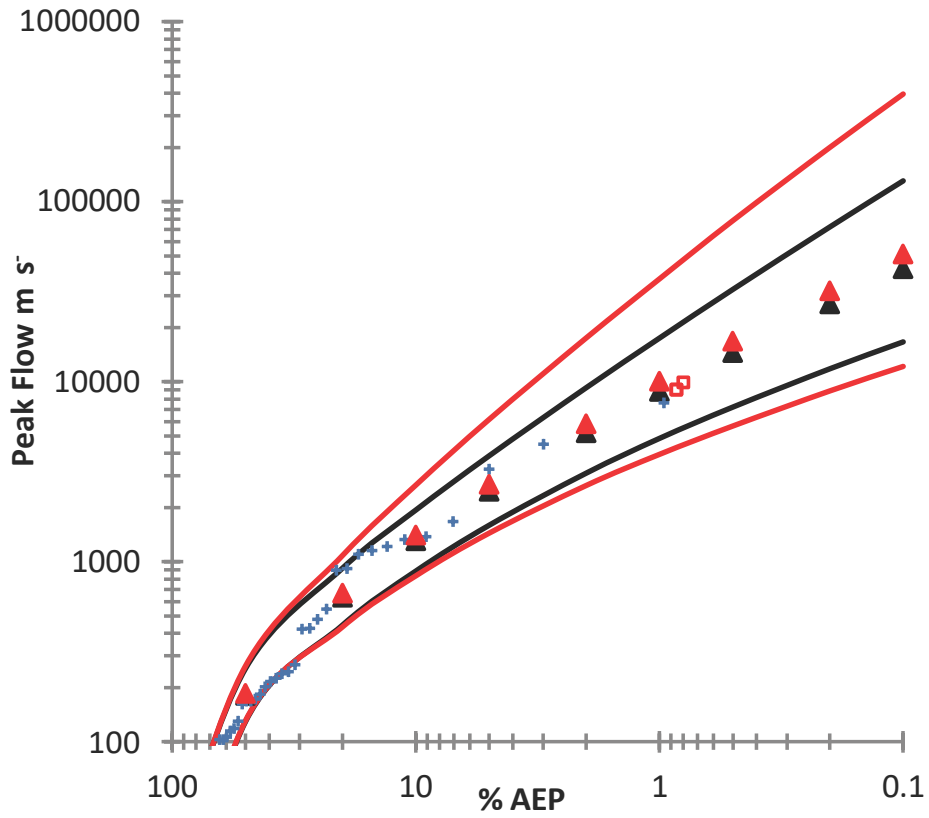

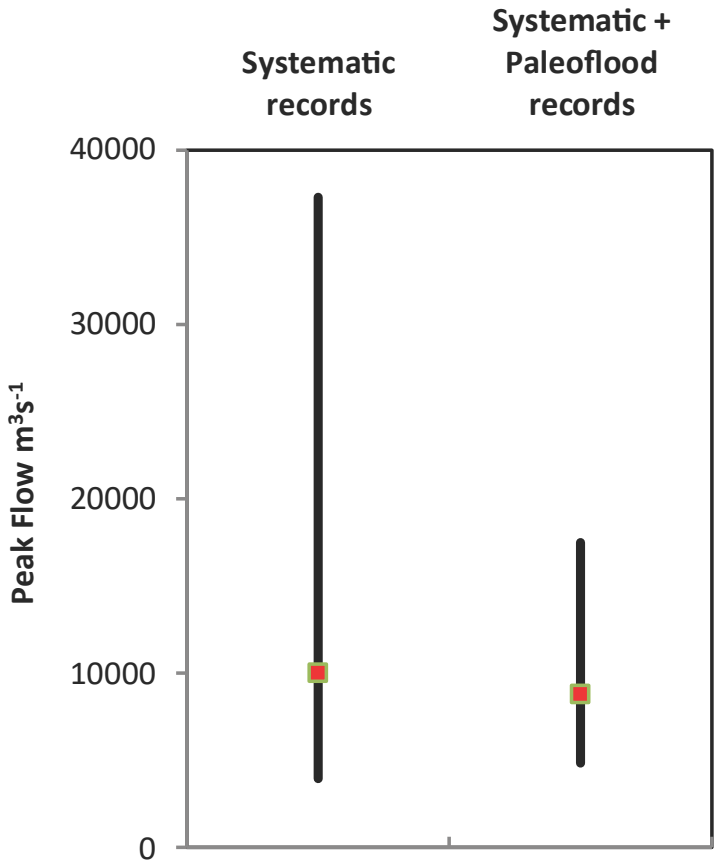

Gauge Records
Palaeoflood Records
Expected Quantile (Systematic)
90% limits (Systematic)
Expected Quantile (systematic + palaeoflood)
90% limits (Systematic + palaeoflood)

90% probaility limit
Exp parmater Quantile

Lam et al, 2017

Alternative to PMF?

Cuenca de la Rambla de la Viuda (Reservoir of María Cristina)

Flows in m^3s^{-1}

Return Periods (years)	100	500	1000	5000	10 000
Gauging station	1300	1975	2250	2895	3100
Gauging + Palaeoflood	1570	2305	2615	3310	3560
	PMF = 10700				

Source: Hydrology and Climate Change Laboratory

Palaeofloods & Mine Rehabilitation

- 9 extreme palaeofloods found in East Alligator River, NT have similar specific discharges to the PMF estimate for the mine closure rehabilitation of the Ranger Uranium Mine (Saynor et al., 2020)
  - Coincidence?
  - Estimates of PMPs and PMFs has uncertainties of several order of magnitudes
  - PMF is more frequent than expected

Conclusion

- Flood information is out there.
- Palaeoflood records can improve flood risk assessment and design flood estimates
- Understanding geomorphology (landforms, their processes and sediments) can provide key information of extreme floods from the past.