

An aerial photograph showing a wide, muddy river flowing through a valley. The river has overflowed its banks, inundating the surrounding landscape. On the left, a paved road runs parallel to the river, with a grassy field and some trees to its left. The river itself is filled with many bare, standing trees that appear to be part of a riparian forest. The water is a turbid, brownish-grey color. In the background, rolling green hills are visible under a clear sky. The overall scene depicts a significant flood event in a rural, hilly area.

River Morphology, Floods & Sediment – An Introduction

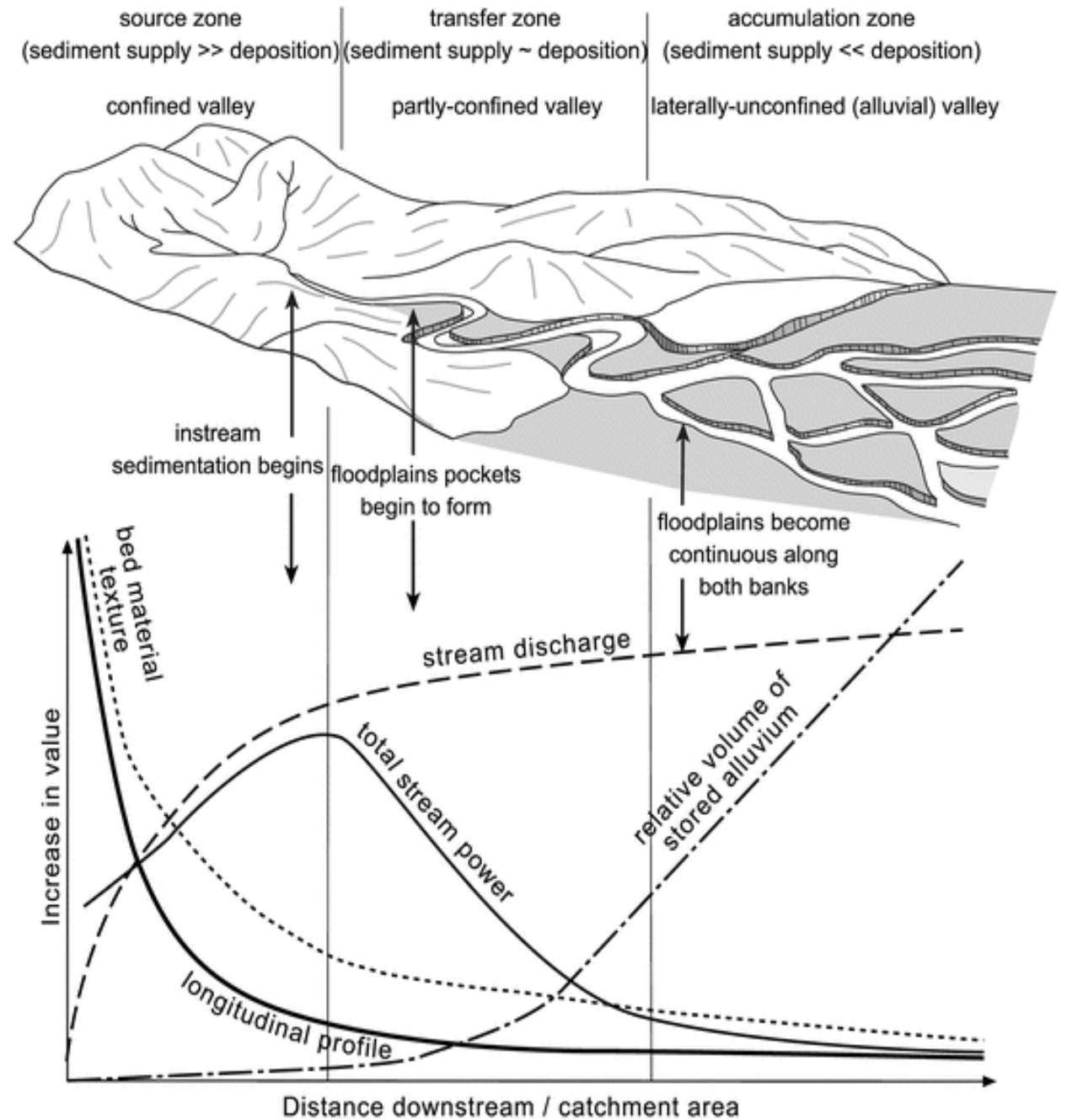
Mike Harvey, Ph.D.

18-09-2025

Motueka Catchment Collective:

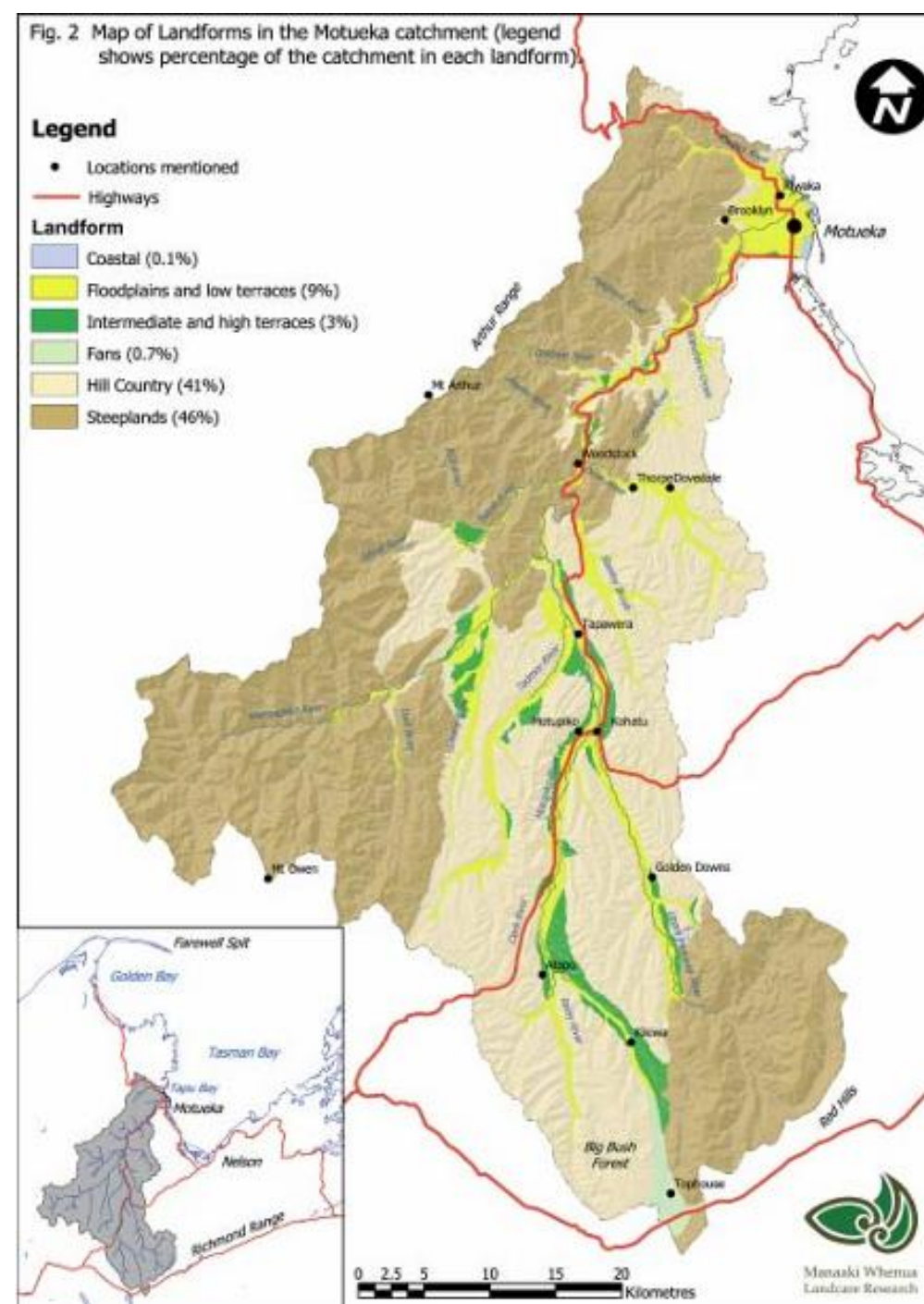
Living River: Ki Uta Ki Tai

Typical, Idealized Catchment



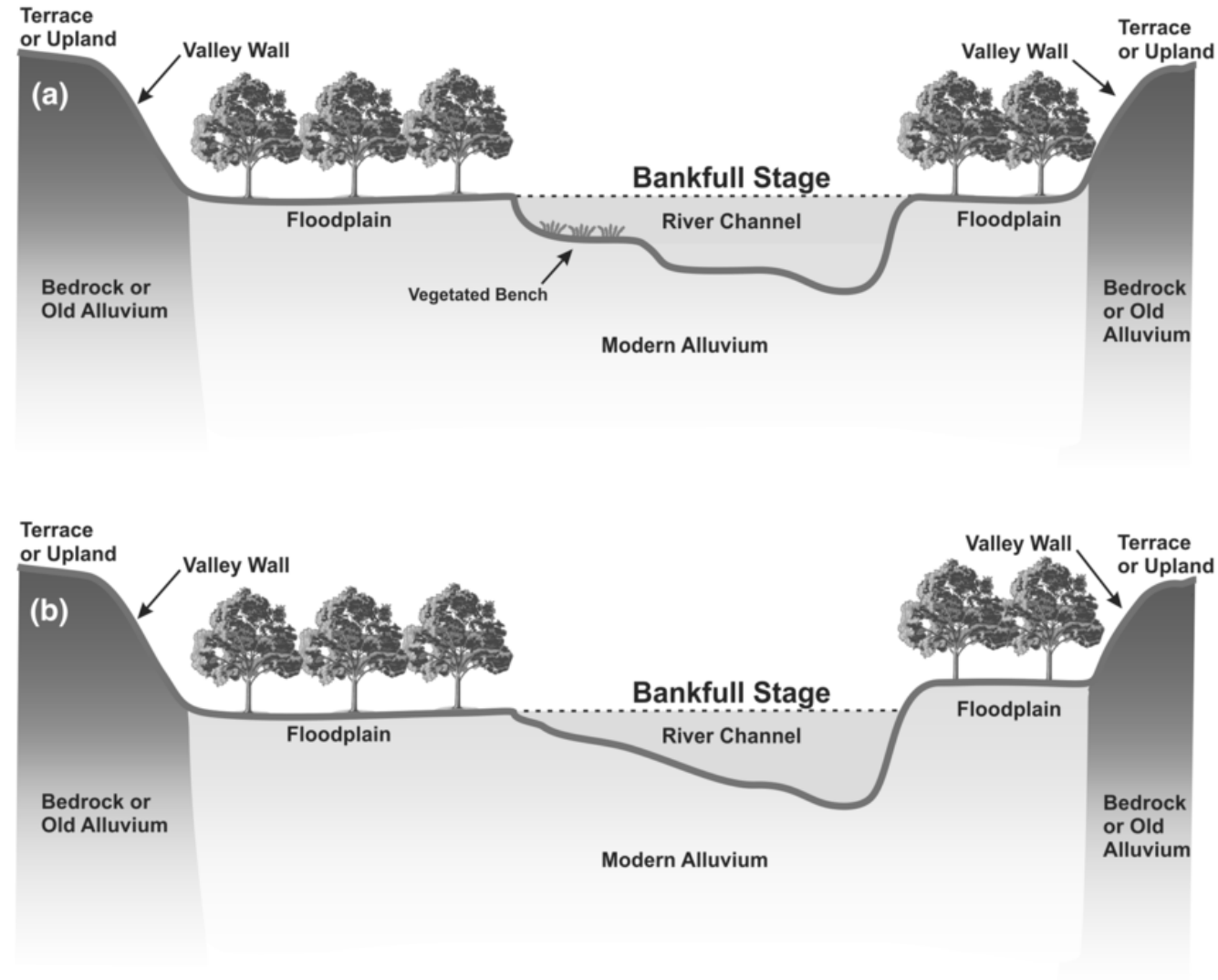
Motueka River (ICM, 2003)

NOT
LONGITUDINALLY
THE TYPICAL RIVER!
– COMPLEX
GEOLOGY



Typical River and Valley Cross Sections

**The Average
Recurrence
Interval for
Bankfull
Discharge is
about the 2-yr
flood (50% AEP)**



SIGNIFICANCE OF BANKFUL DISCHARGE

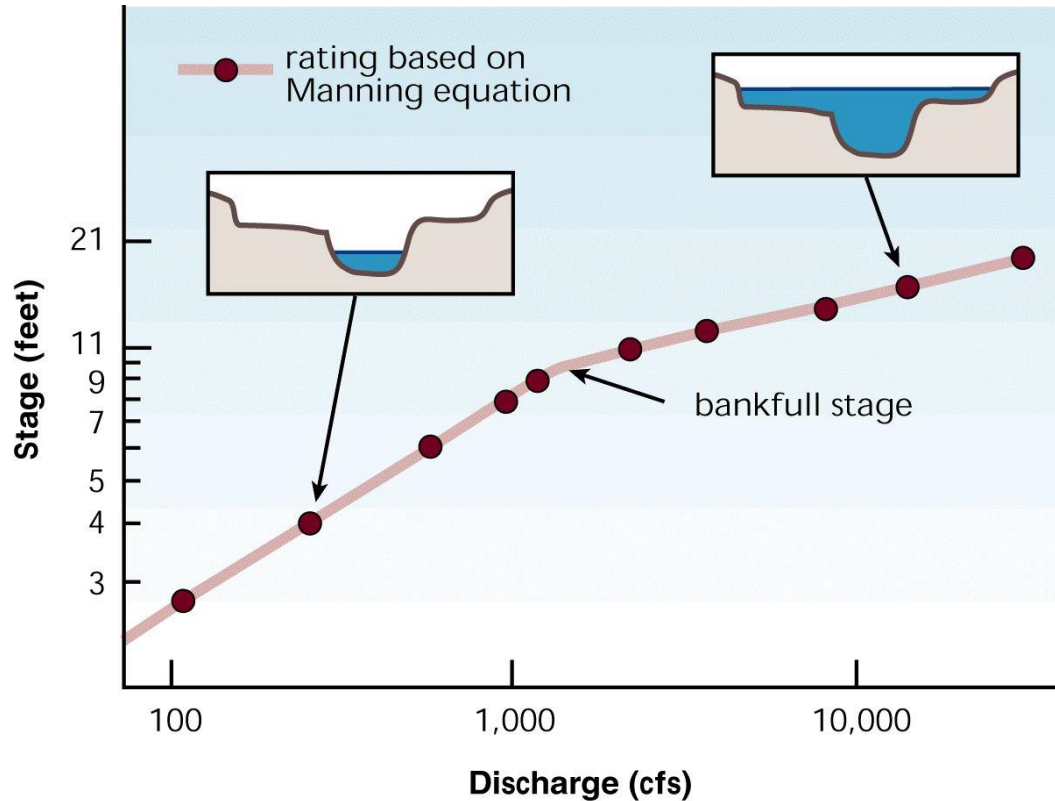
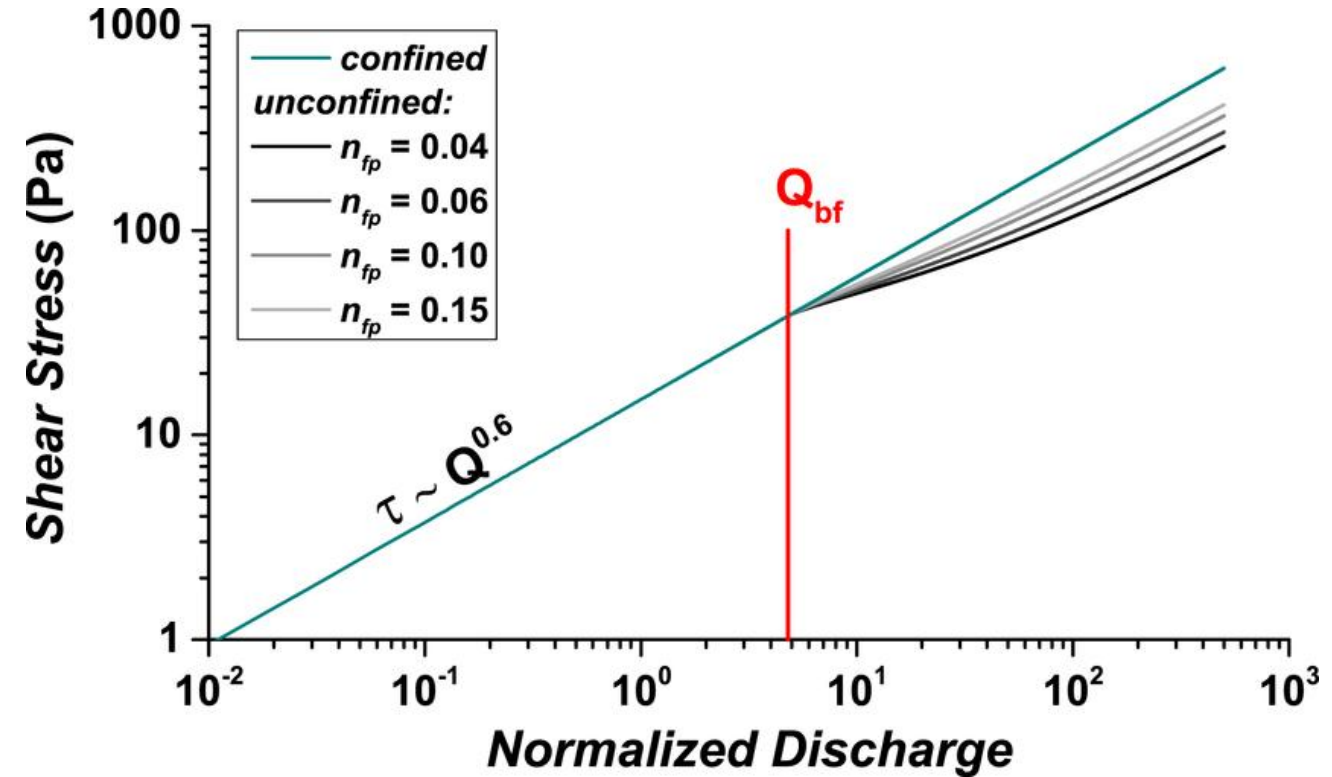
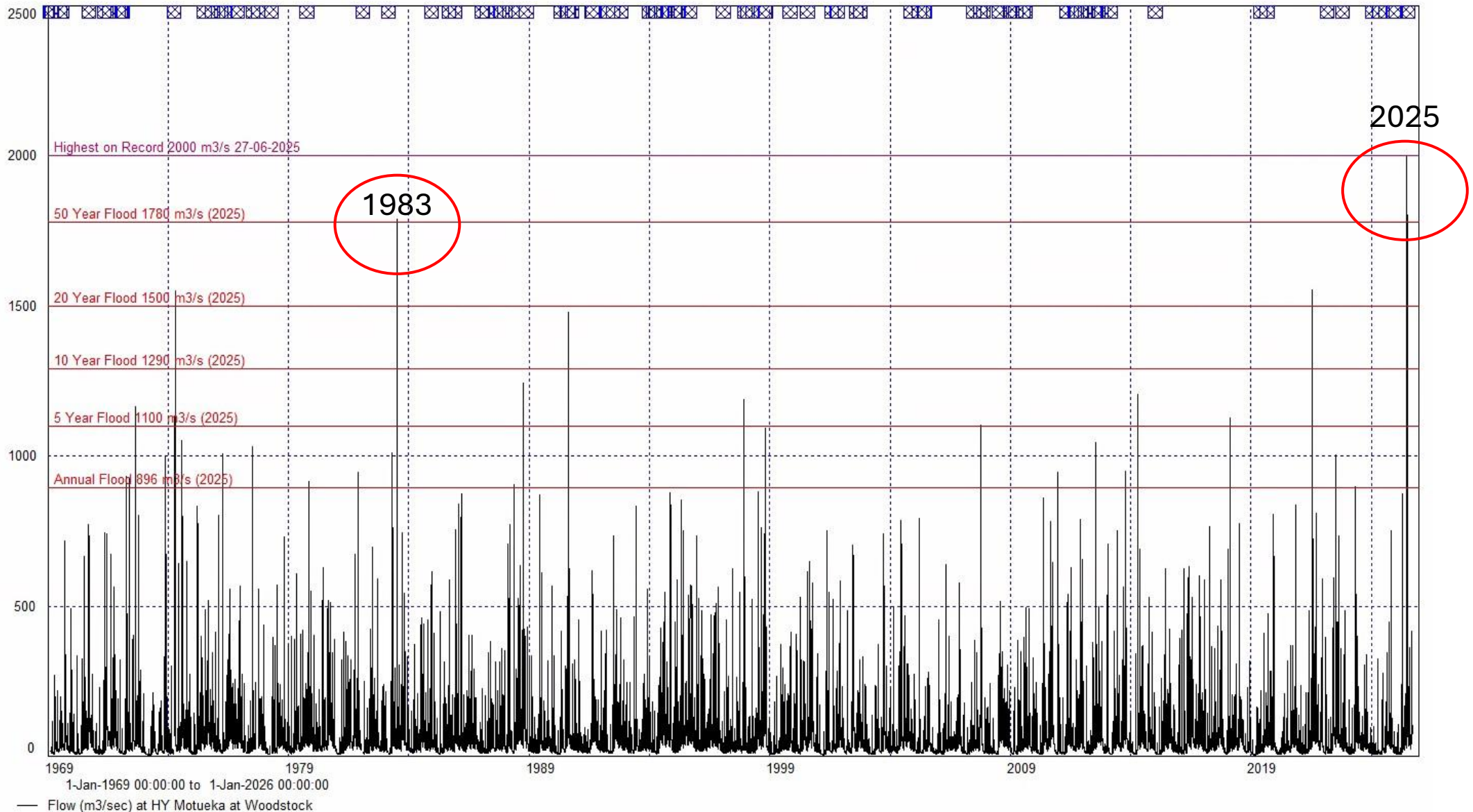


Fig. 7.4 -- Determination of bankfull stage from a rating curve. The discharge that corresponds to the elevation of the first flat depositional surface is the bankfull discharge.
In Stream Corridor Restoration: Principles, Processes, and Practices, 10/98.
Interagency Stream Restoration Working Group (FISRWG)(15 Federal agencies of the US).



HYDROLOGY: Motueka @ Woodstock Flood Record (1969-2025)



1957

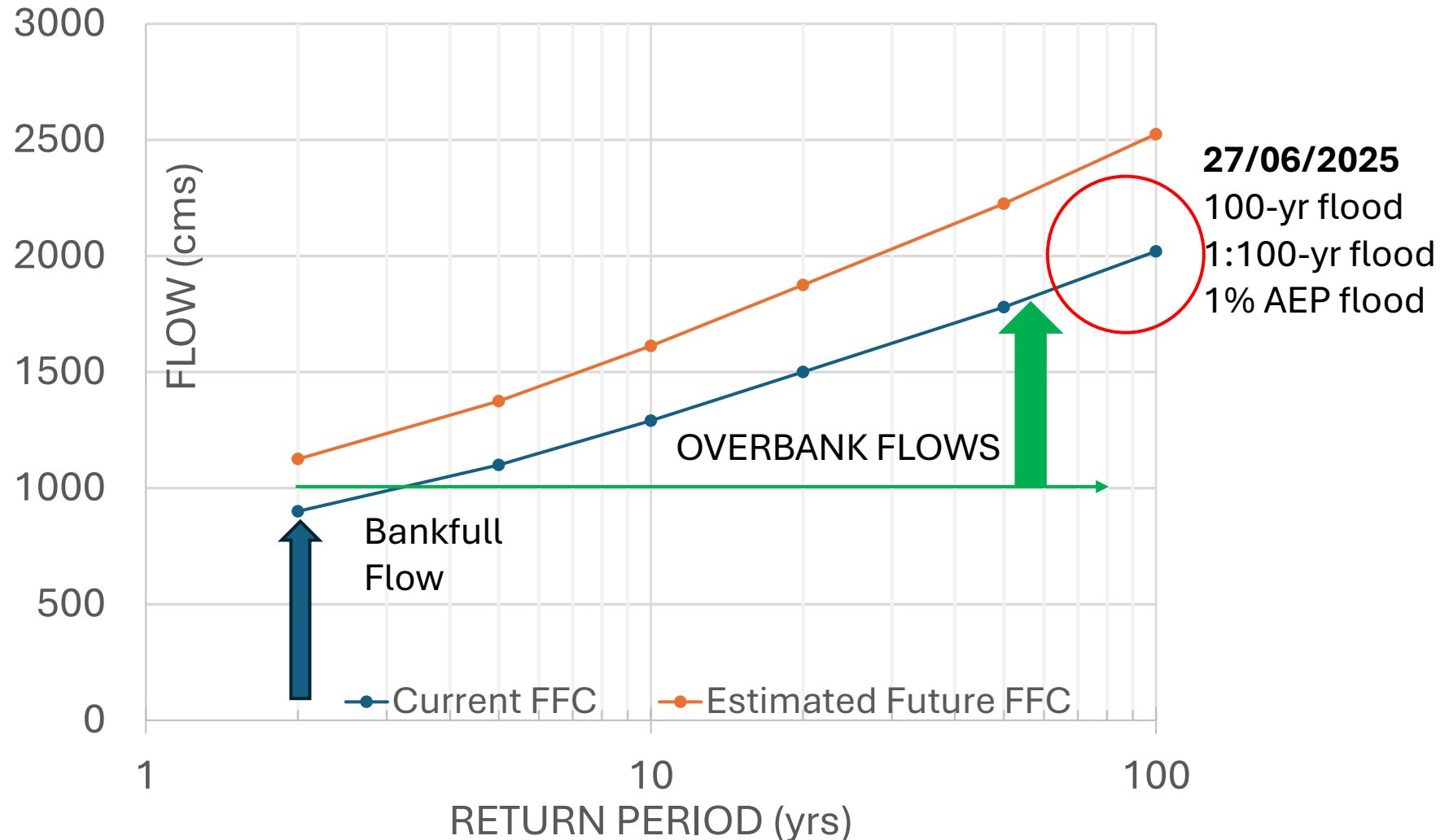
HISTORICAL FLOODS

Year	Estimated Peak Flow (cms)	Estimated Recurrence Interval (yrs)	Probability of Occurrence in 50 yrs (%)
1877	~2500	>100	35
1957	~1800	50	63
1983	1780	50	63
06/2025	2000	100	40
07/2025	1800	50	63

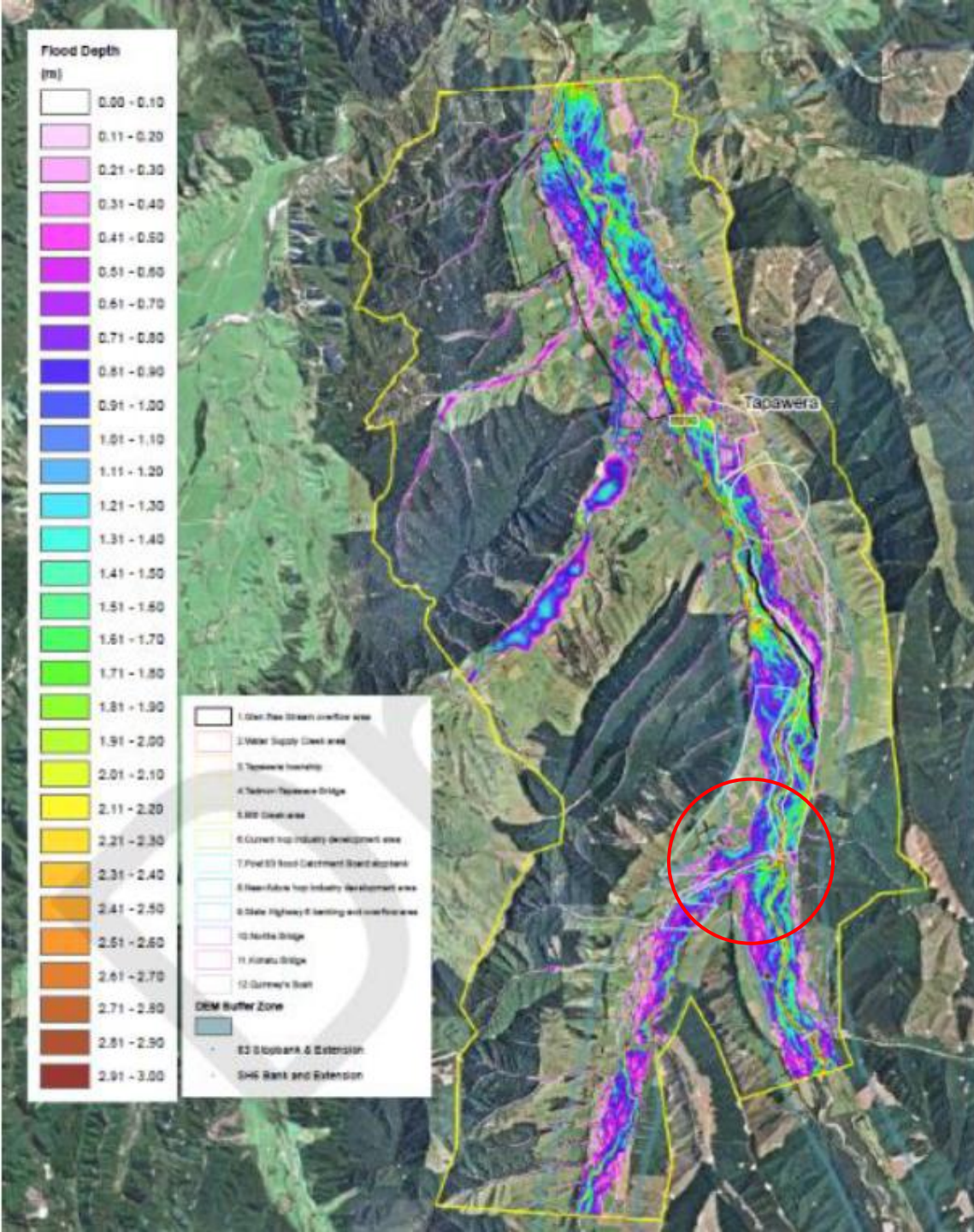
CLIMATE CHANGE AND FLOODS

14-20% Increase per $^{\circ}\text{C}$ Rise in Temperature

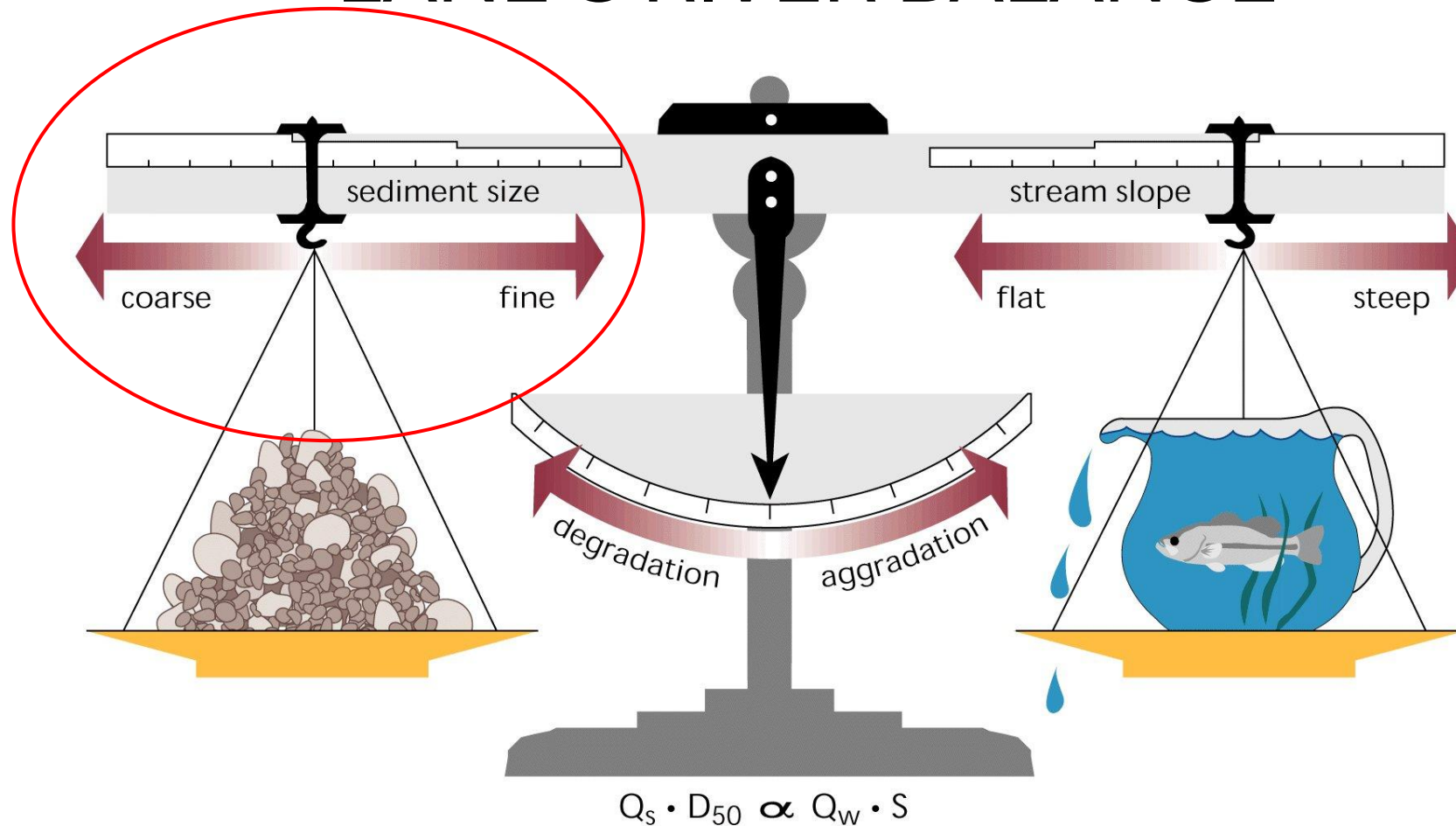
Motueka @ Woodstock FFC (1969-2025)



Upper Motueka River; 100-yr (1% AEP) Flood Depths; We Have Modelling Tools to Predict Flood RISK



LANE'S RIVER BALANCE



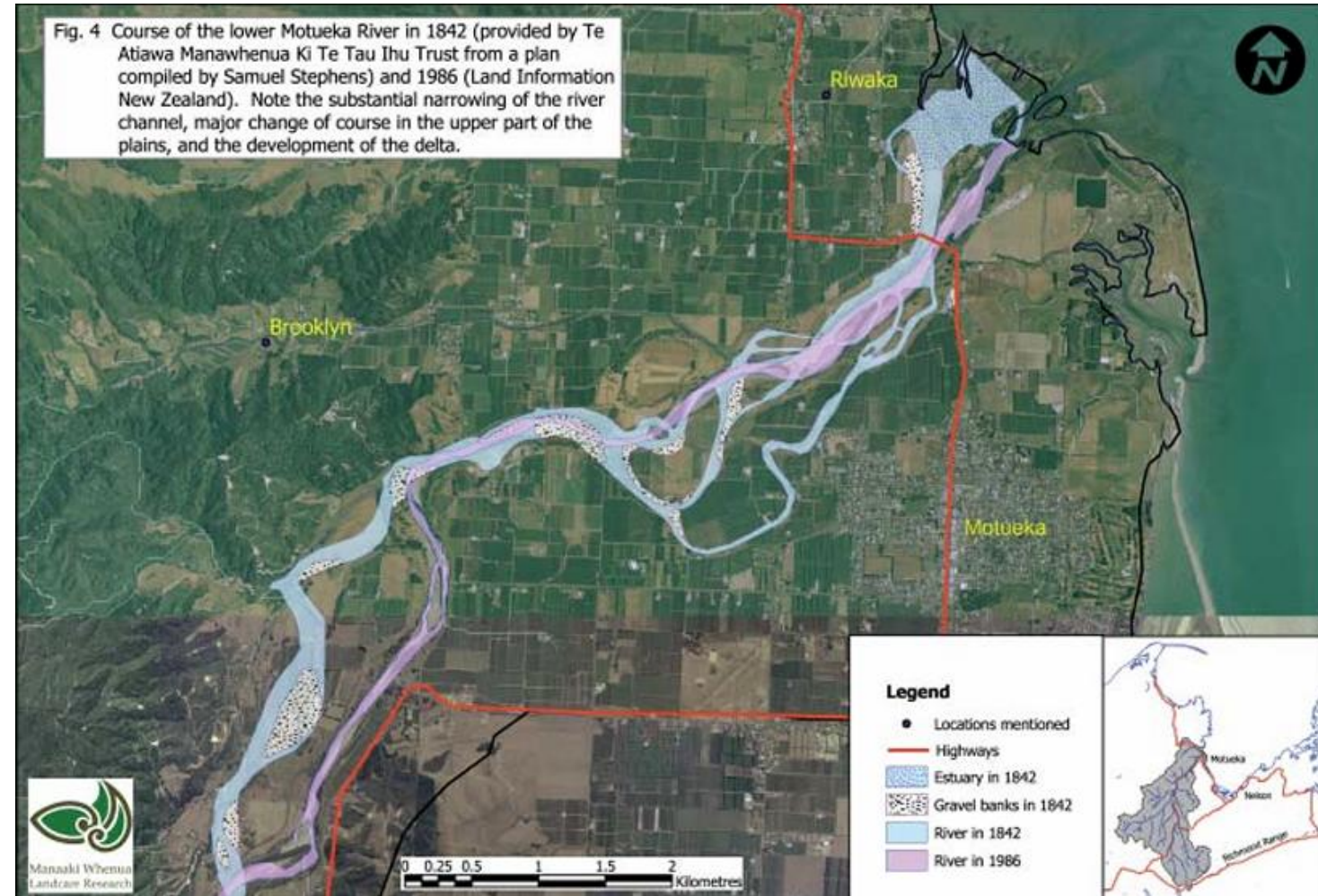
From Rosgen (1996), from Lane, Proceedings, 1955.
Published with the permission of American Society of Civil Engineers.

Fig. 1.13 – Factors affecting channel degradation and aggradation: Concept of "Stream Balance."
In Stream Corridor Restoration: Principles, Processes, and Practices, 10/98.
Interagency Stream Restoration Working Group (15 Federal Agencies of the US).

Bedrock Controls: What do they tell us about sediment supply?

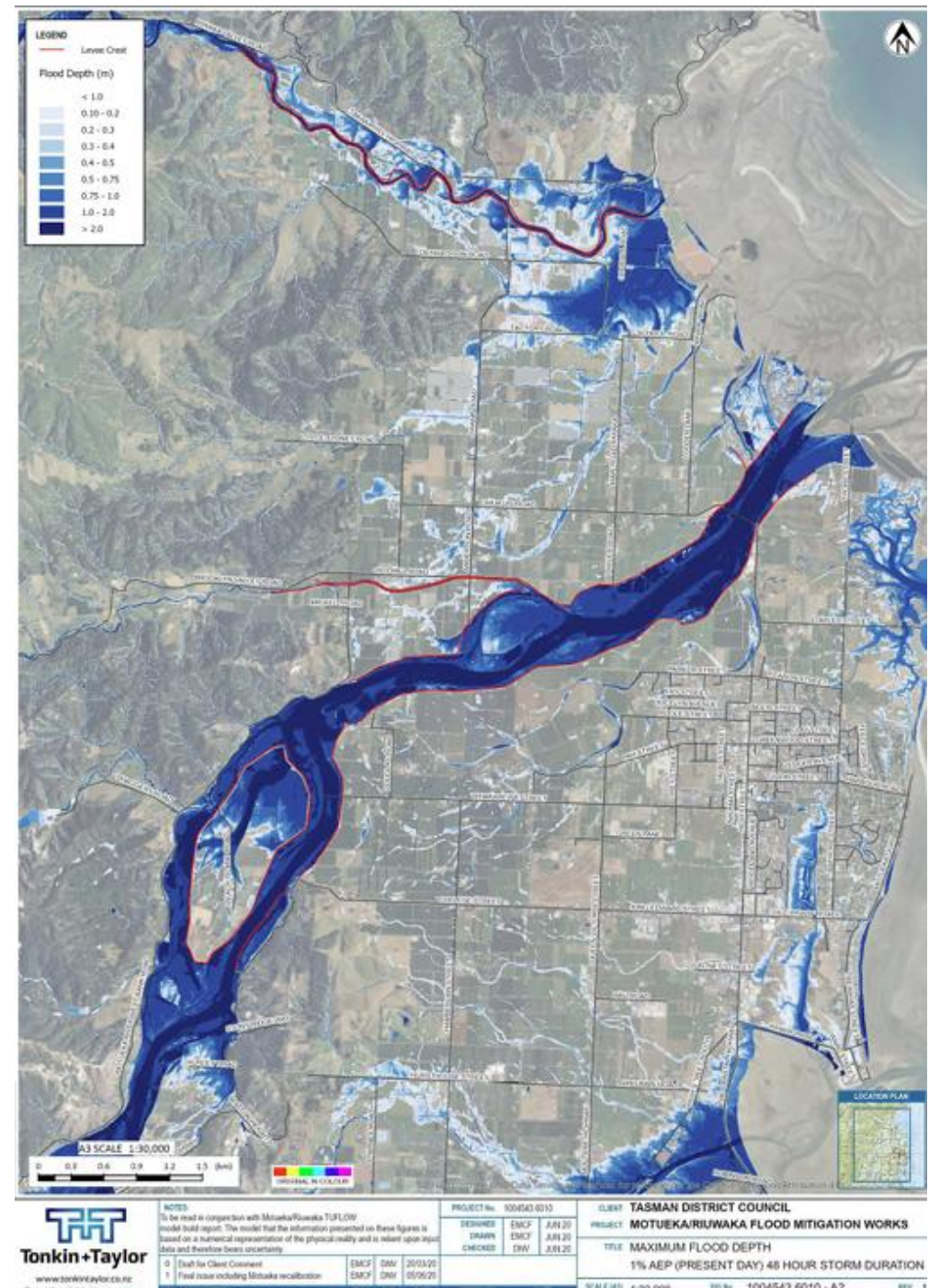


CHANNEL MODIFICATIONS

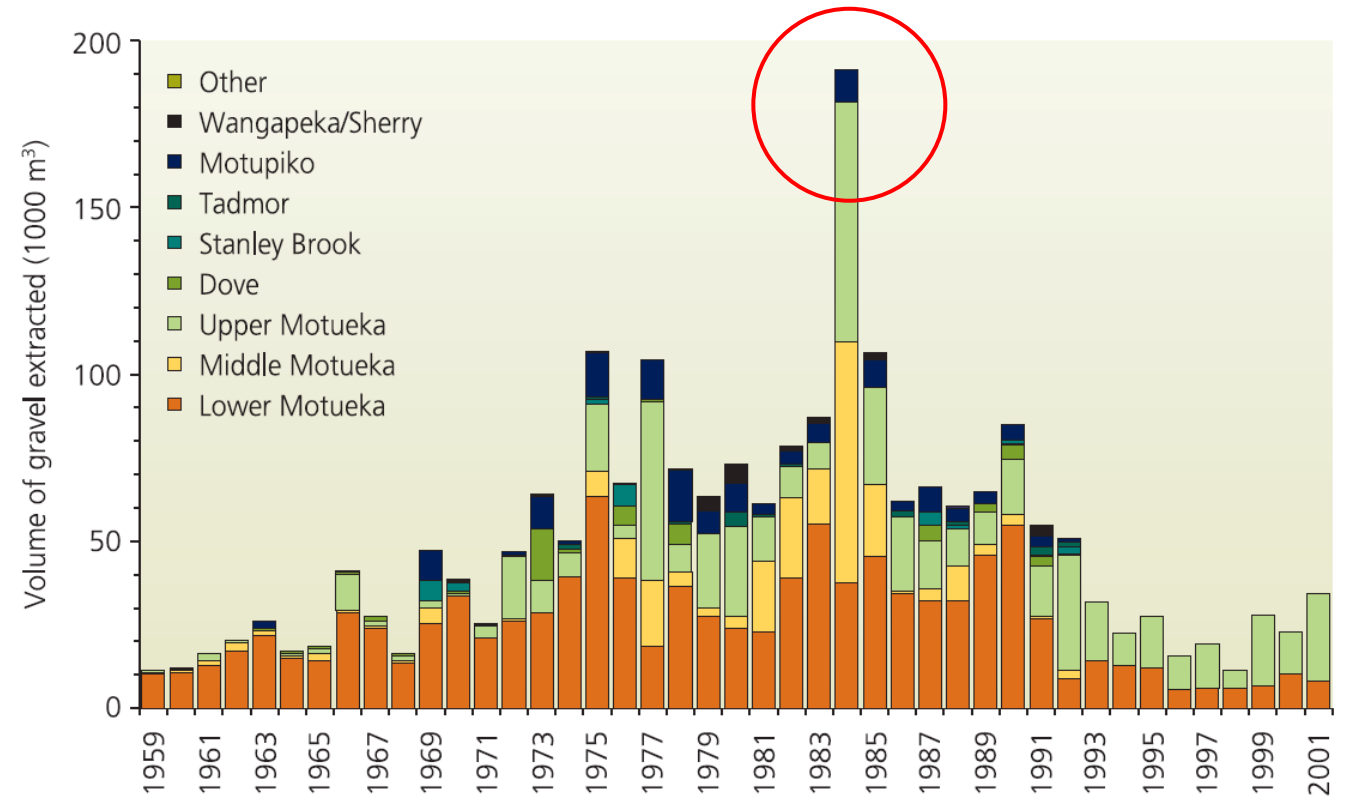


Lower River Stopbanks: 1%AEP Event:

Design Level of Protection is 2% AEP (50-yr) + 500mm of Freeboard.



SAND AND GRAVEL EXTRACTION FOR FLOOD CONTROL



POST-FLOOD COLLECTIVE MEMORY:

Vltava River, Czech
Republic
(Ridolfi et al, 2021)

HOW DO WE LEARN FROM PREVIOUS EVENTS???

7 Large Floods in ~ 700 yrs

