

Effects of Debris-Flow Deposits on Channel Morphology of Fish-bearing Streams (Oregon Coast Range)



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Headwater Channels and Debris Flows

Steep and narrow



Episodic delivery to
larger channels

Accumulate sediment and wood
Little fluvial transport

(Benda, Hassan, Church, and May. JAWRA 2005)

Effects on Larger Channels

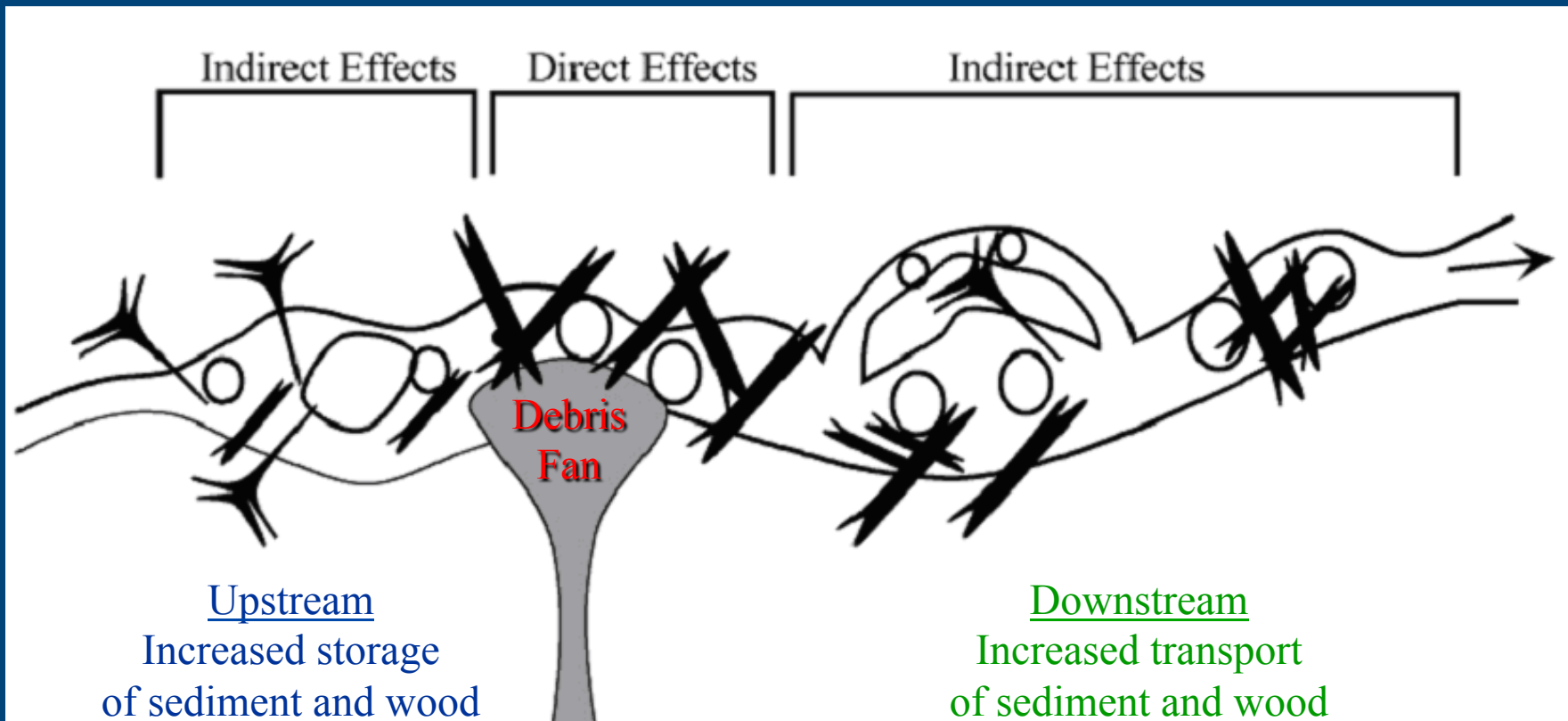


Short-term Negative



Long-term Constructive

Direct and Indirect Effects



(Benda et al. GSA Bull. 2003)

Study Objective

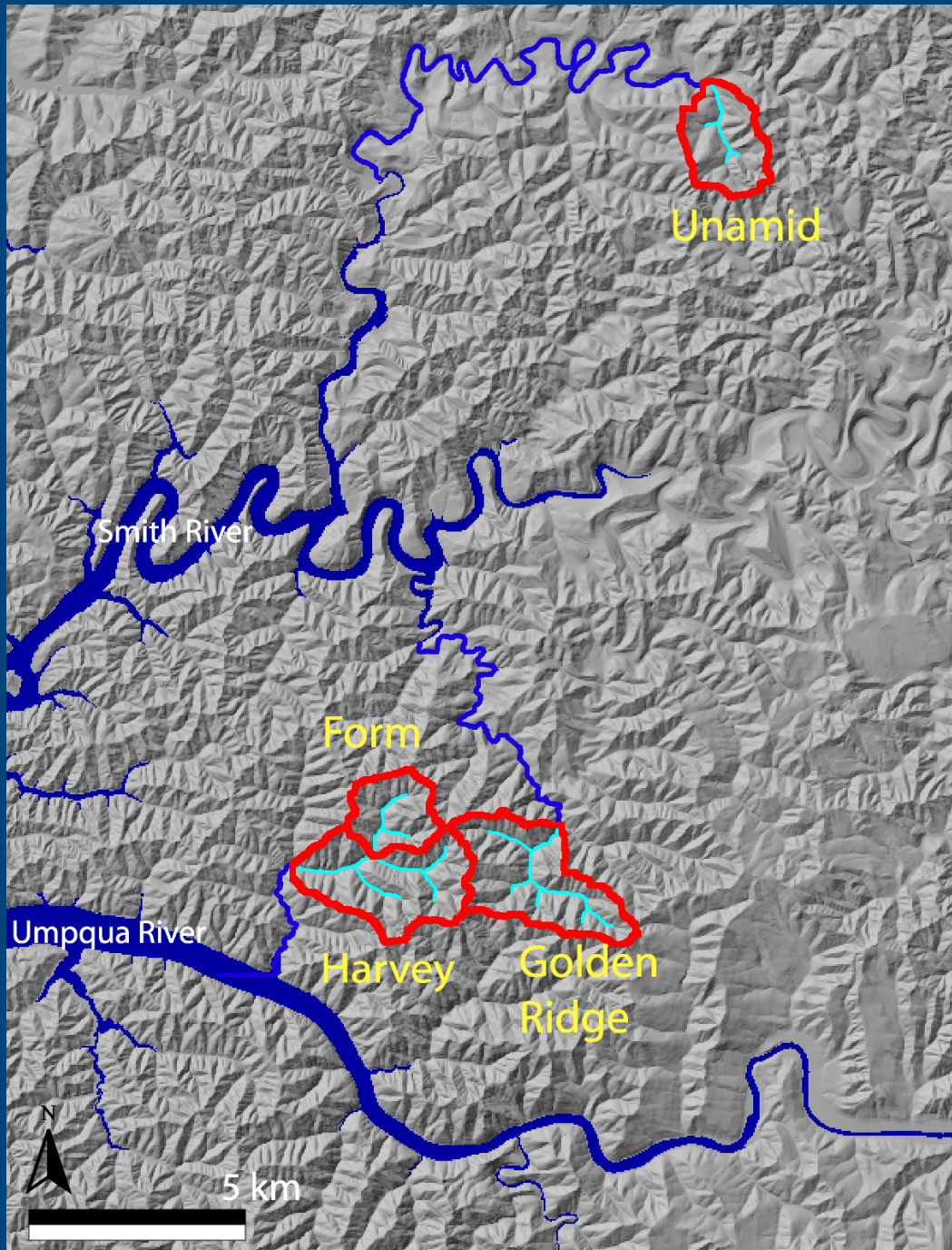
Examine direct and indirect effects
of debris-flow deposits on
the morphology of fish-bearing streams

In Relatively Unmanaged Basins

Location

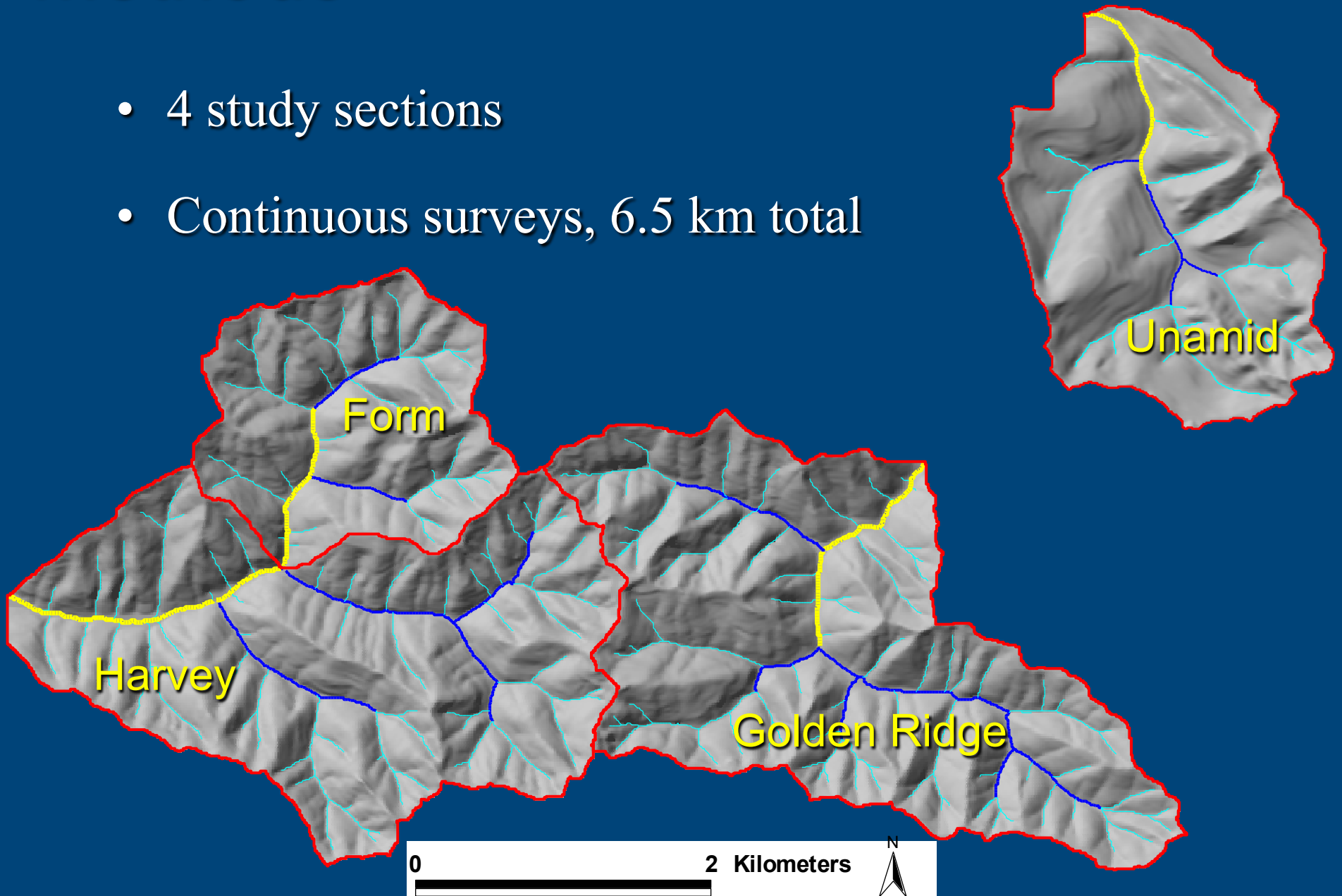


- 52% of recent debris flows reach the mainstem (May & Gresswell 2003)
- All low-order tribs have a debris fan at confluence
- 67% of Coho Habitat in basins $< 10 \text{ km}^2$



Methods

- 4 study sections
- Continuous surveys, 6.5 km total



Parameters

Reach average length 30 m

- Channel Gradient
- Boulders
- Sediment Depth
- Large Wood (pieces and recruit process)
- Pools
- Fan Age (recent, old)

Analysis

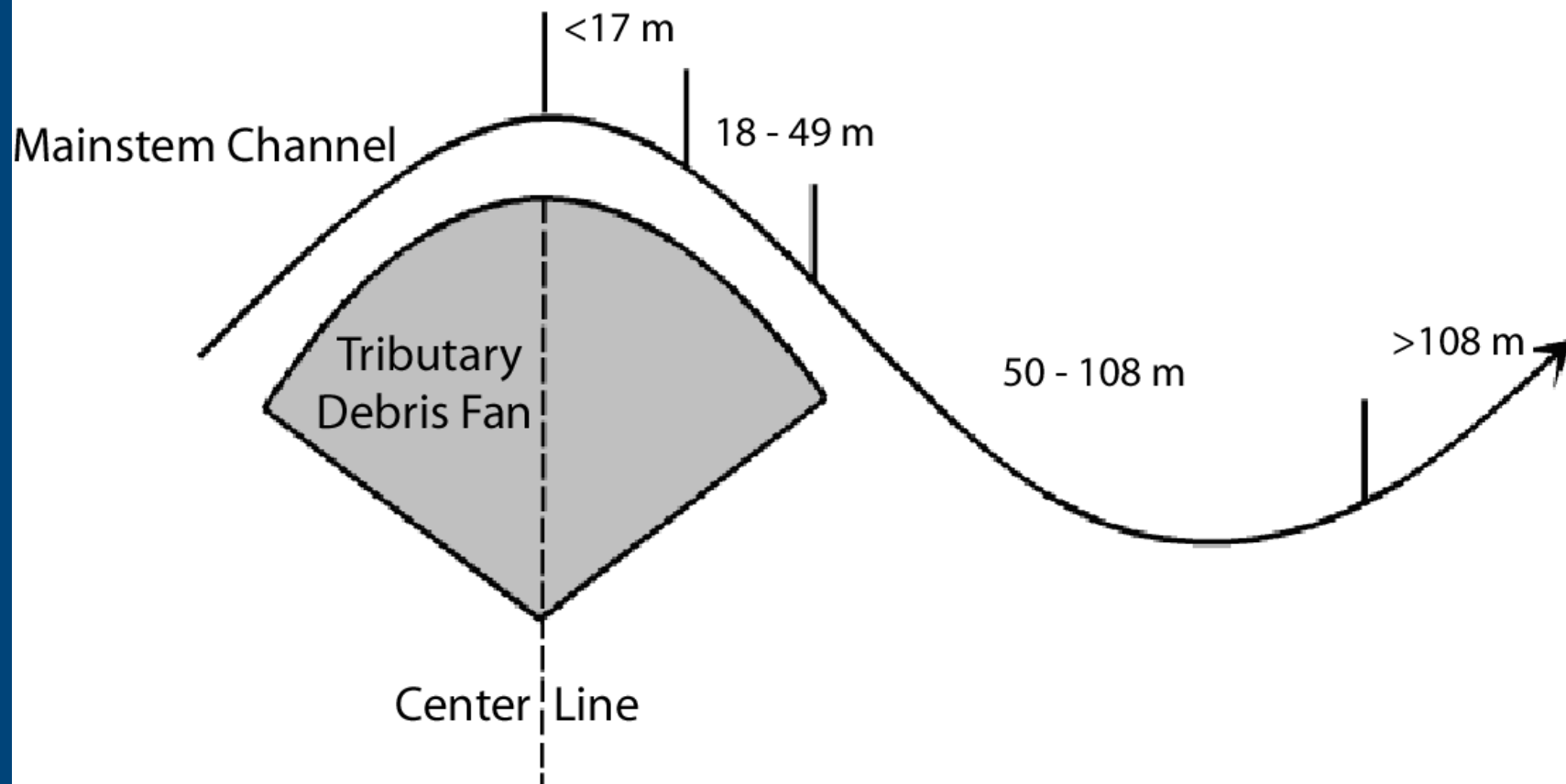
Visual:

- Plot long profiles of parameters and fans

Statistical:

- Lump data into Small or Medium basins
- Group reach data by distance from fans
- Statistical comparison of distance groups

Distance Groups

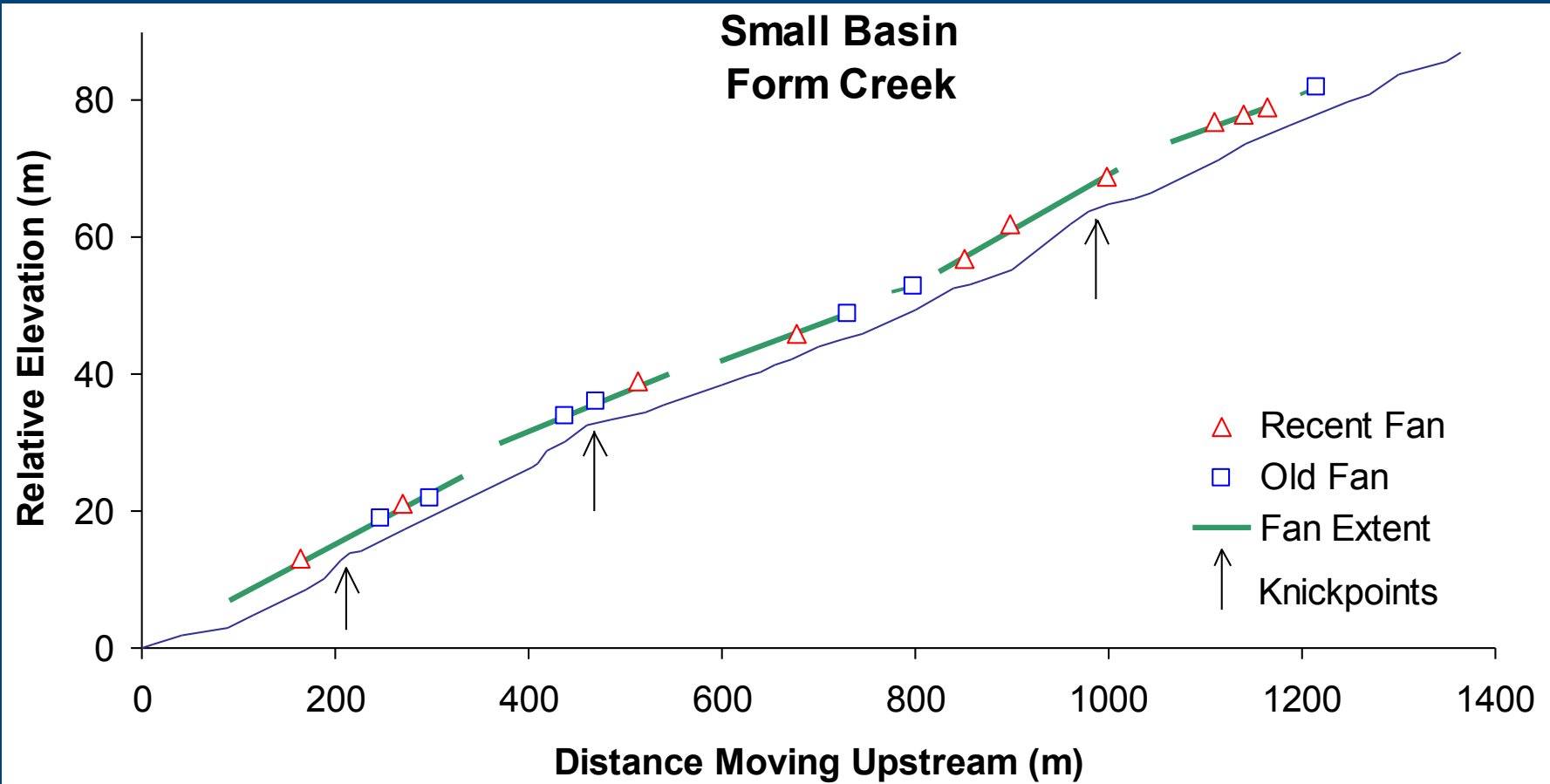


Boulders and Large Wood

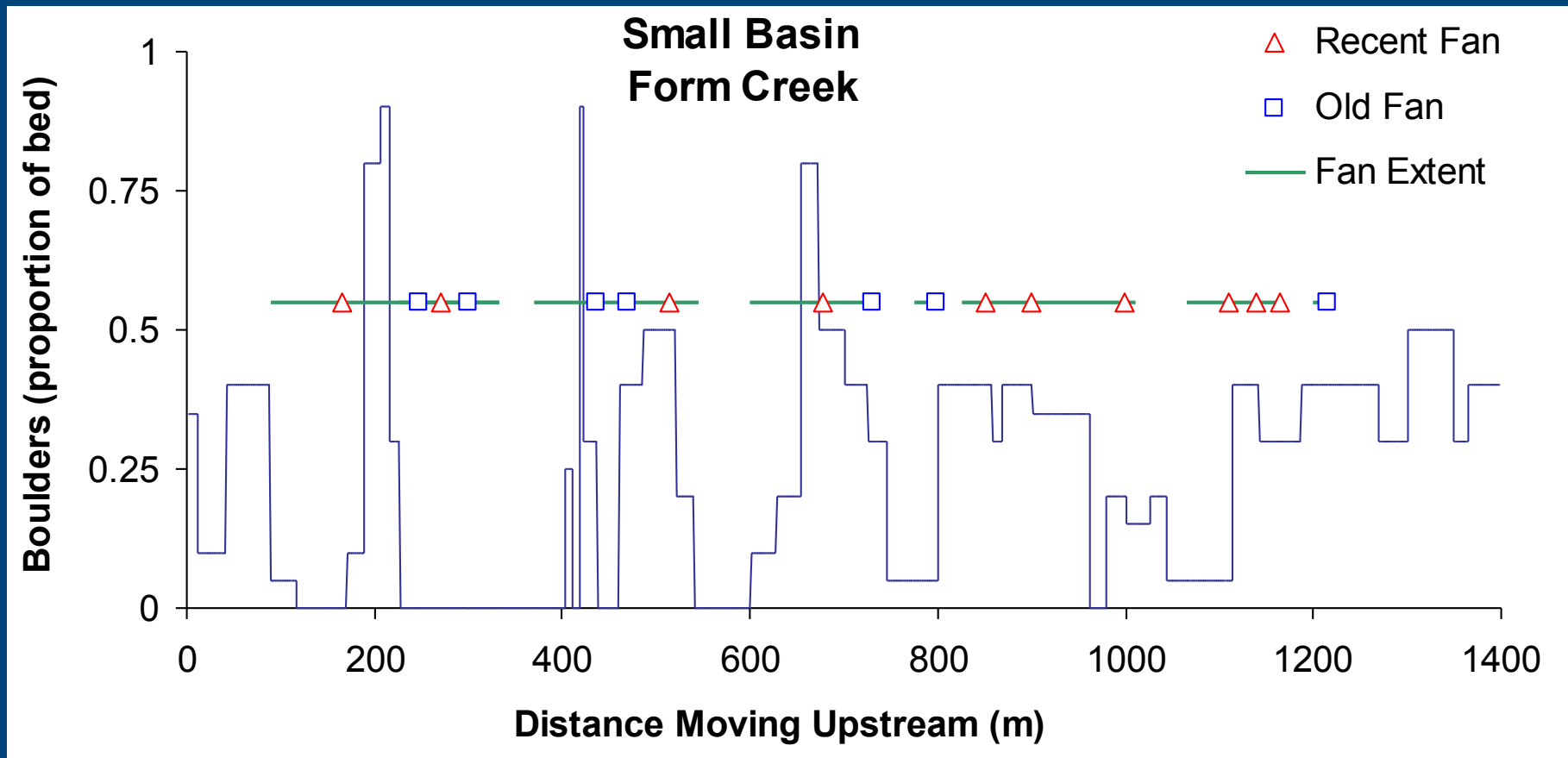


Fan Deposits in Golden Ridge Creek

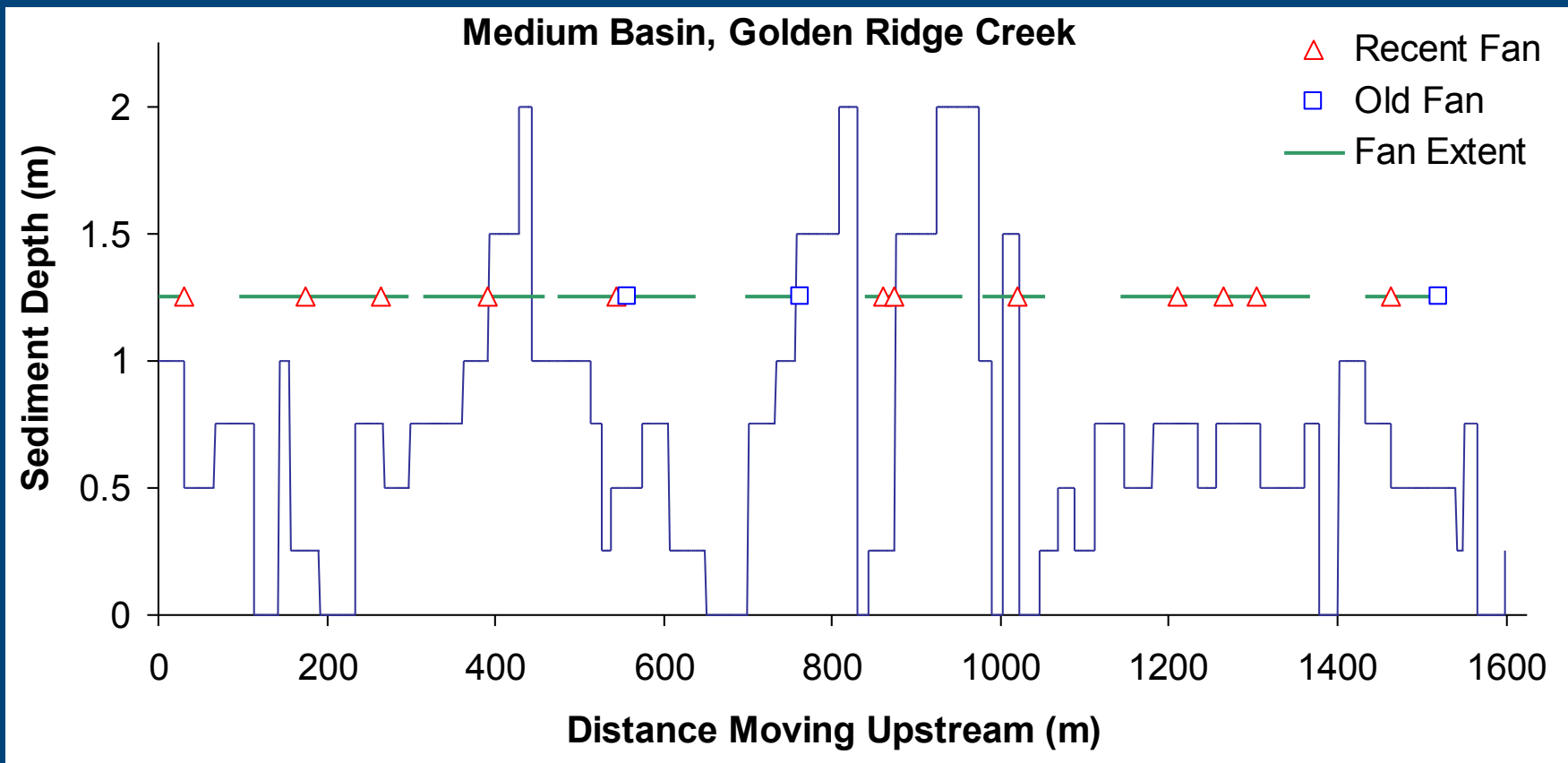
Long Profile



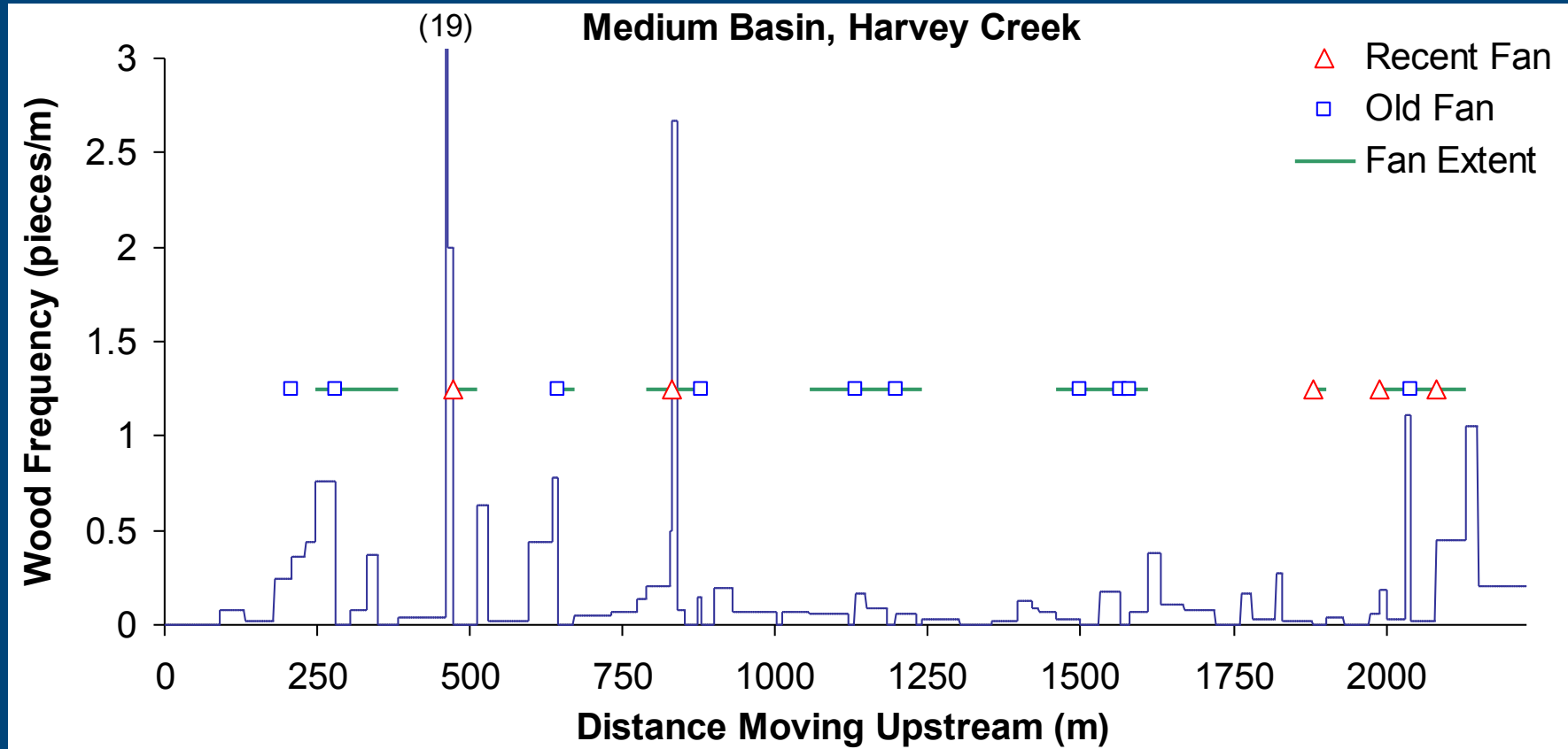
Boulders



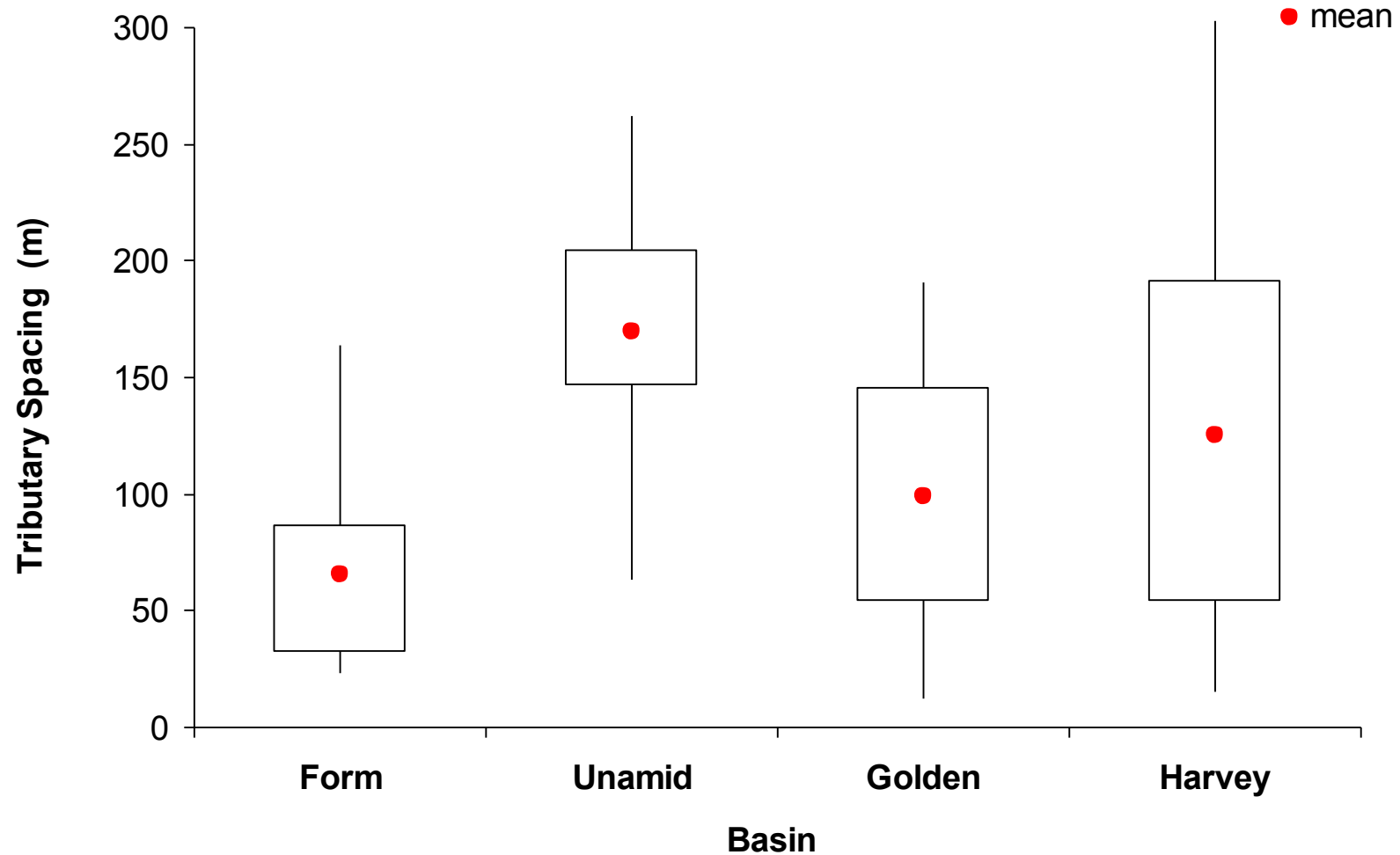
Sediment Depth



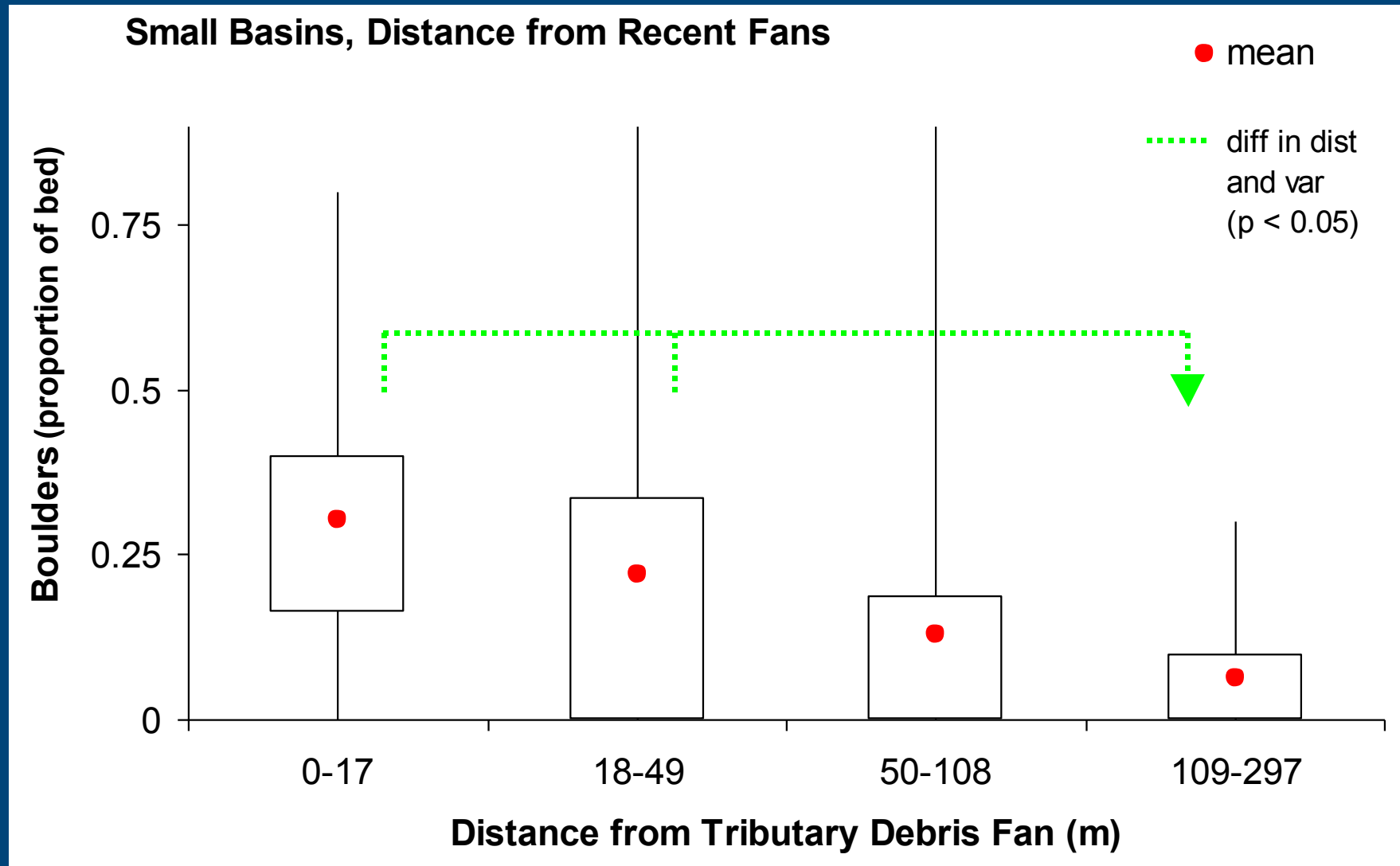
Large Wood



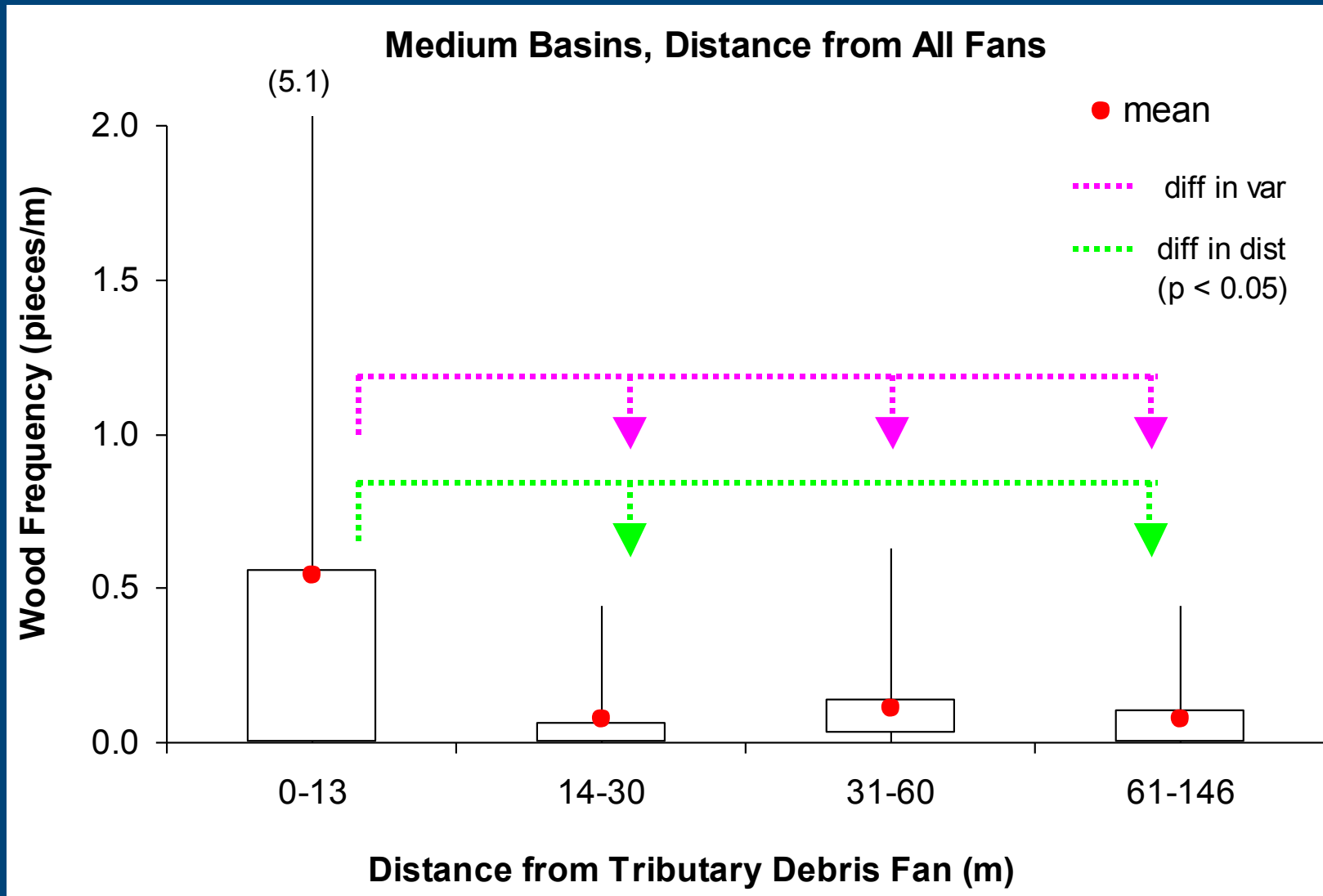
Habitat Patches and Tributary Spacing



Box Plots - Boulders

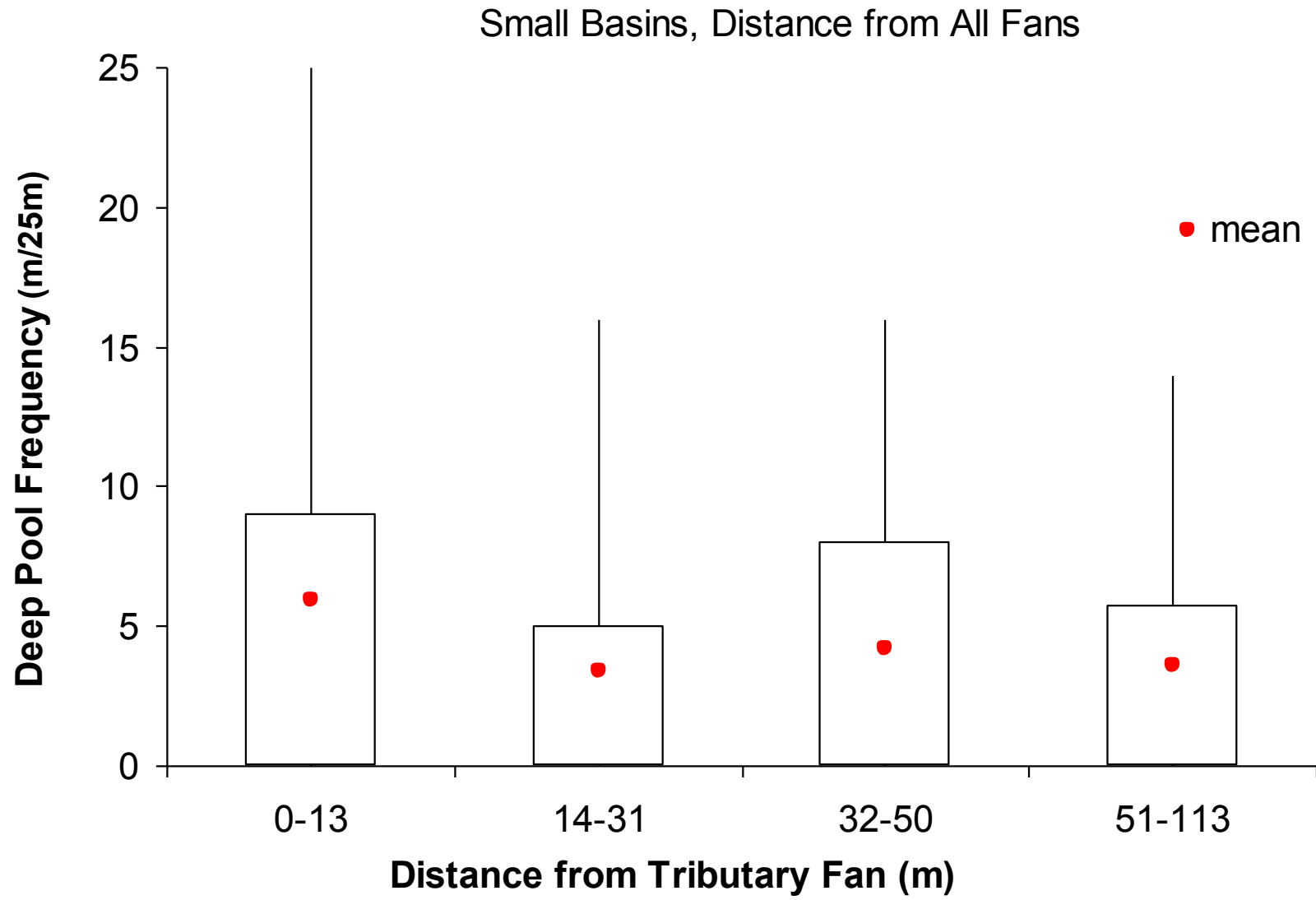


Large Wood

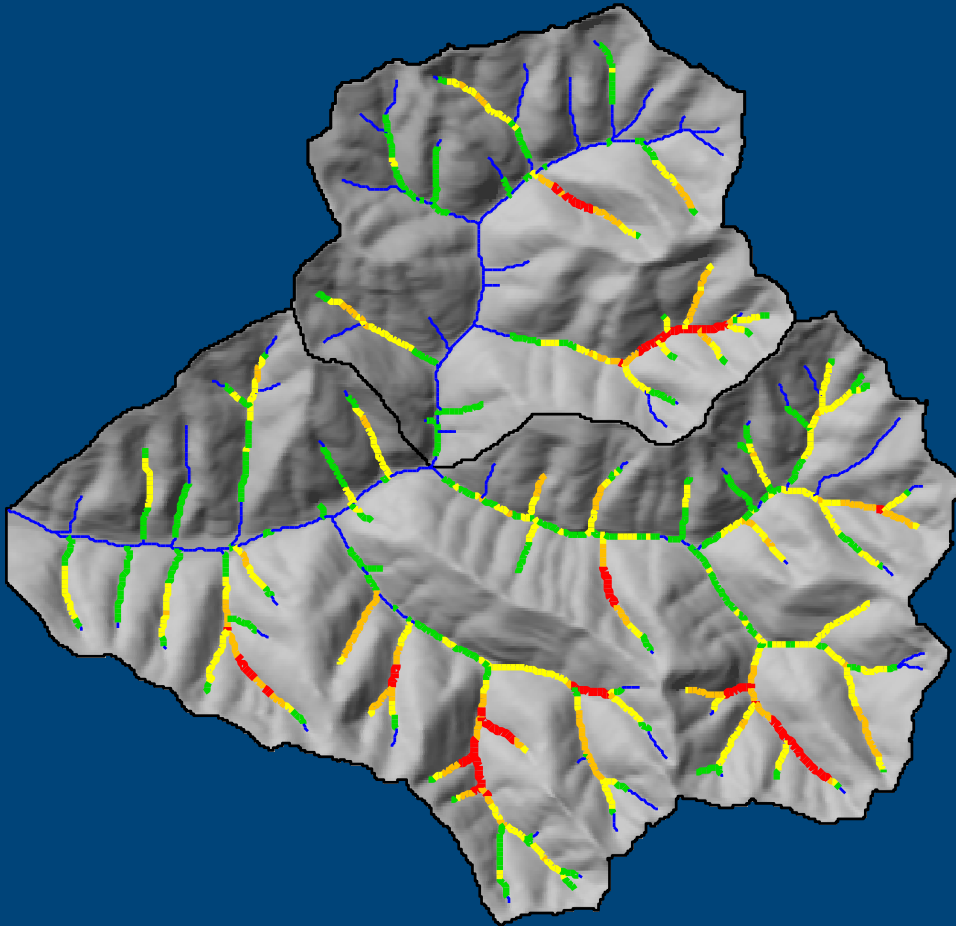
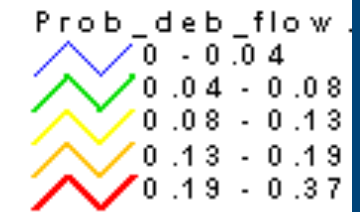


80% of recruited pieces from debris flows

Pools

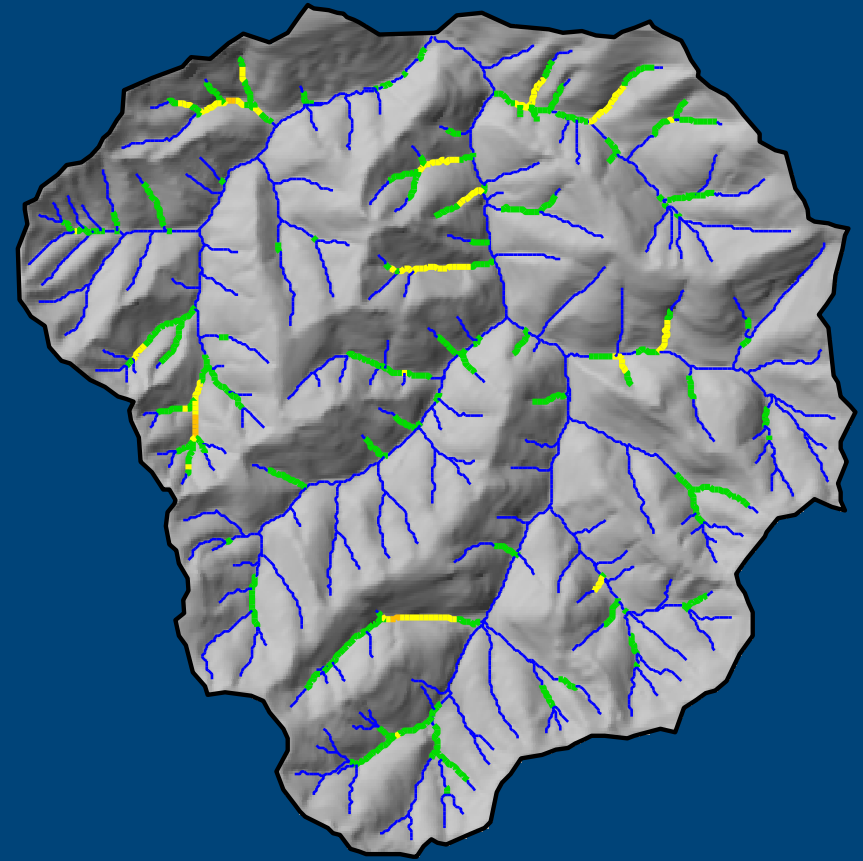


Variation in Landscape and Debris Flow Probability



0 2 Kilometers

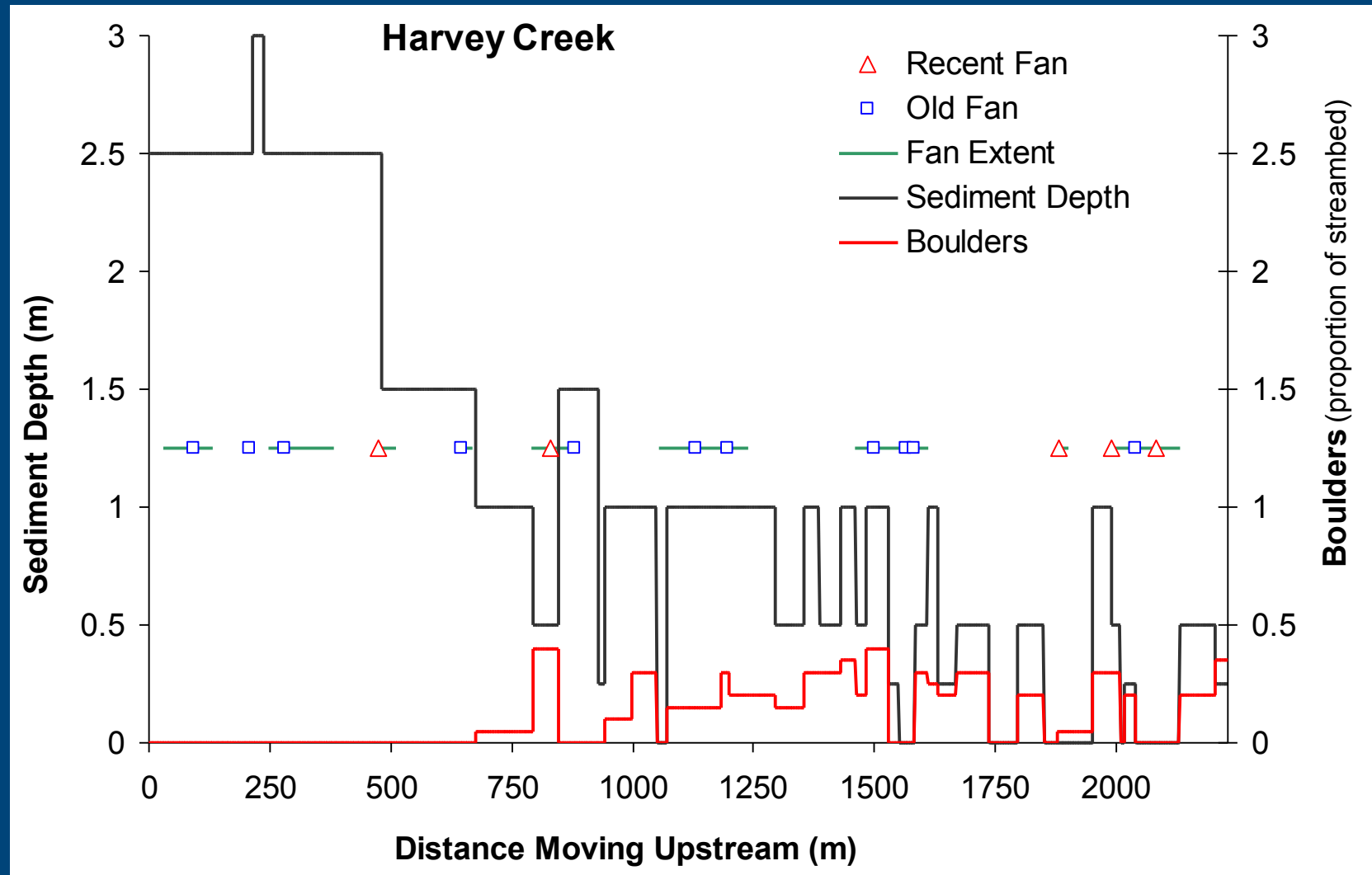
Harvey Ck



0 2 Kilometers

Hoffman Ck

Network-wide Aggradation after Large Events



In Summary

- Parameters increased with proximity to fans
- Higher variation near fans, higher aquatic diversity
- Scale of habitat patches set by tributary spacing
- Variation in landscape drives the influence debris flows

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