

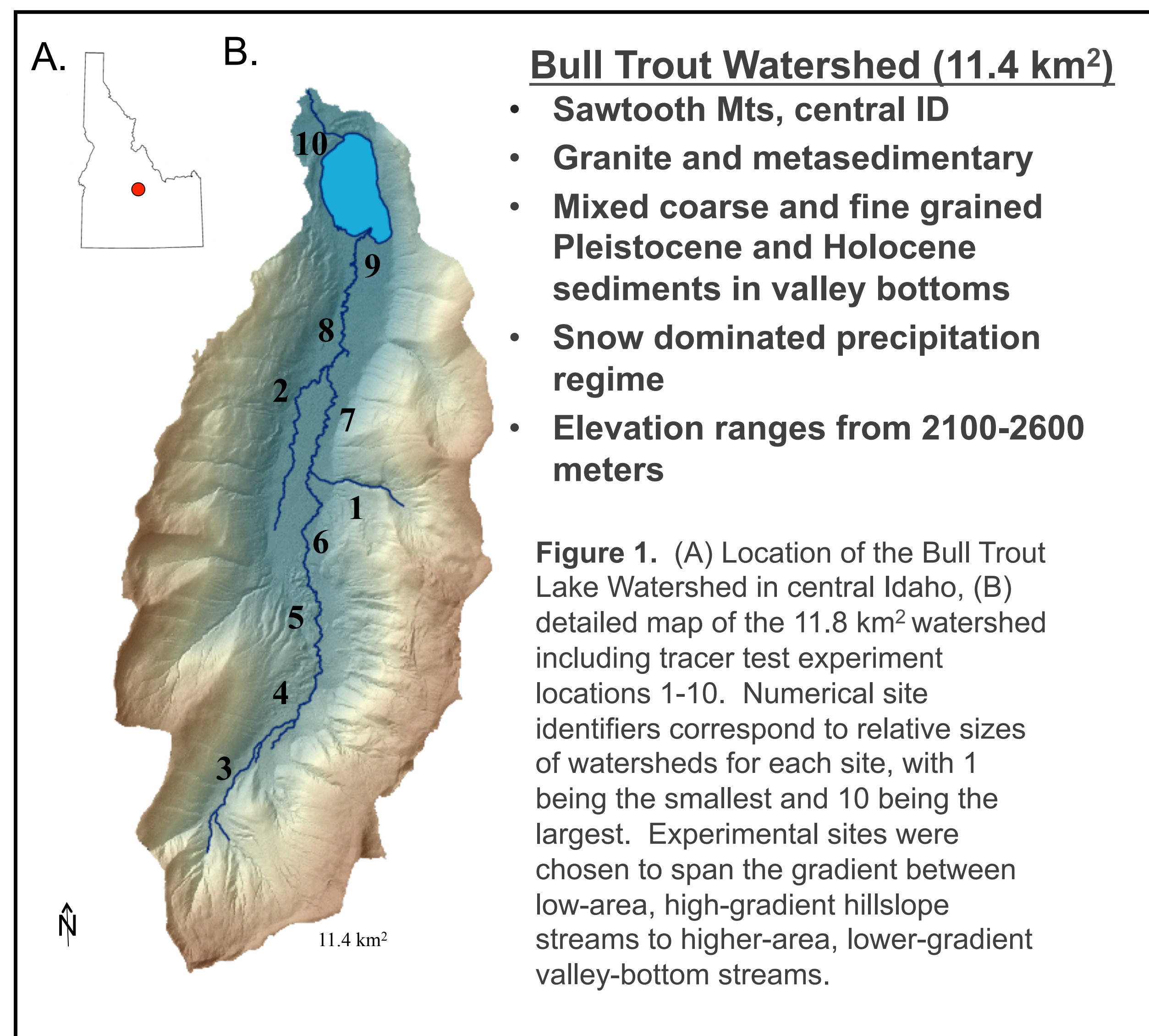
Hydrologic and biologic influences on stream network nutrient concentrations: Interactions of hydrologic turnover and concentration-dependent nutrient uptake

MOTIVATION

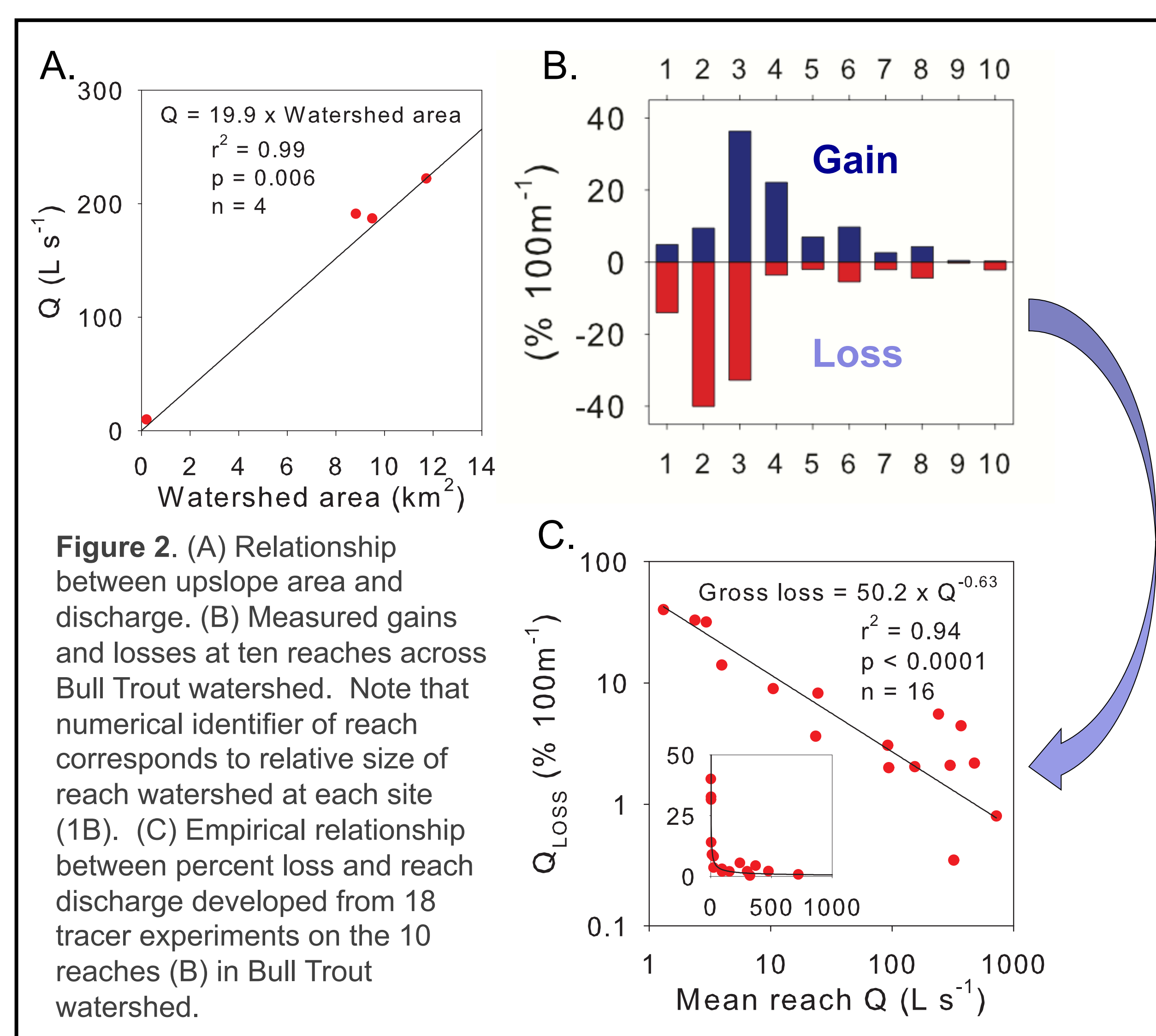
How do stream – groundwater exchange and concentration-dependent nutrient uptake interact to control stream water nutrient concentrations?

- Streams lose and gain water and associated nutrients to and from the groundwater.
- In-stream nutrients are removed from the water column by biologically-mediated uptake processes.
- How do these processes interact at the watershed scale to modify and stabilize stream chemistry?

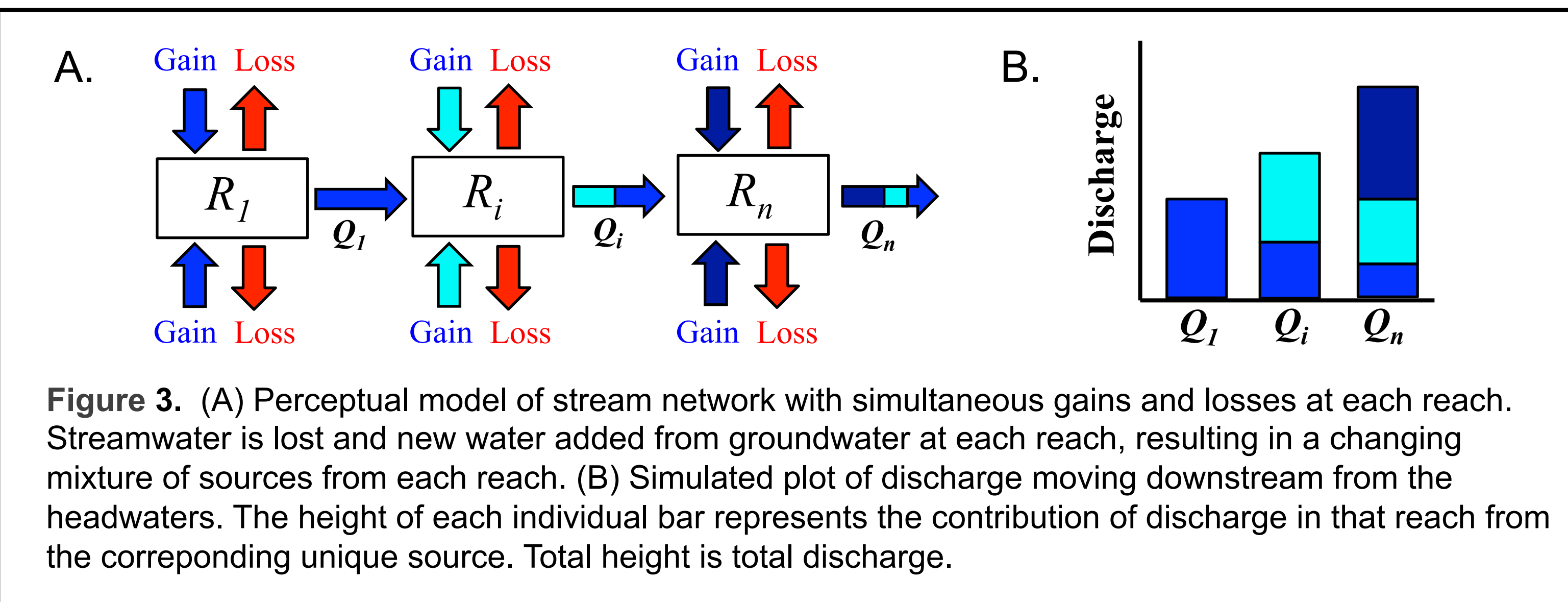
STUDY SITE: Bull Trout Watershed



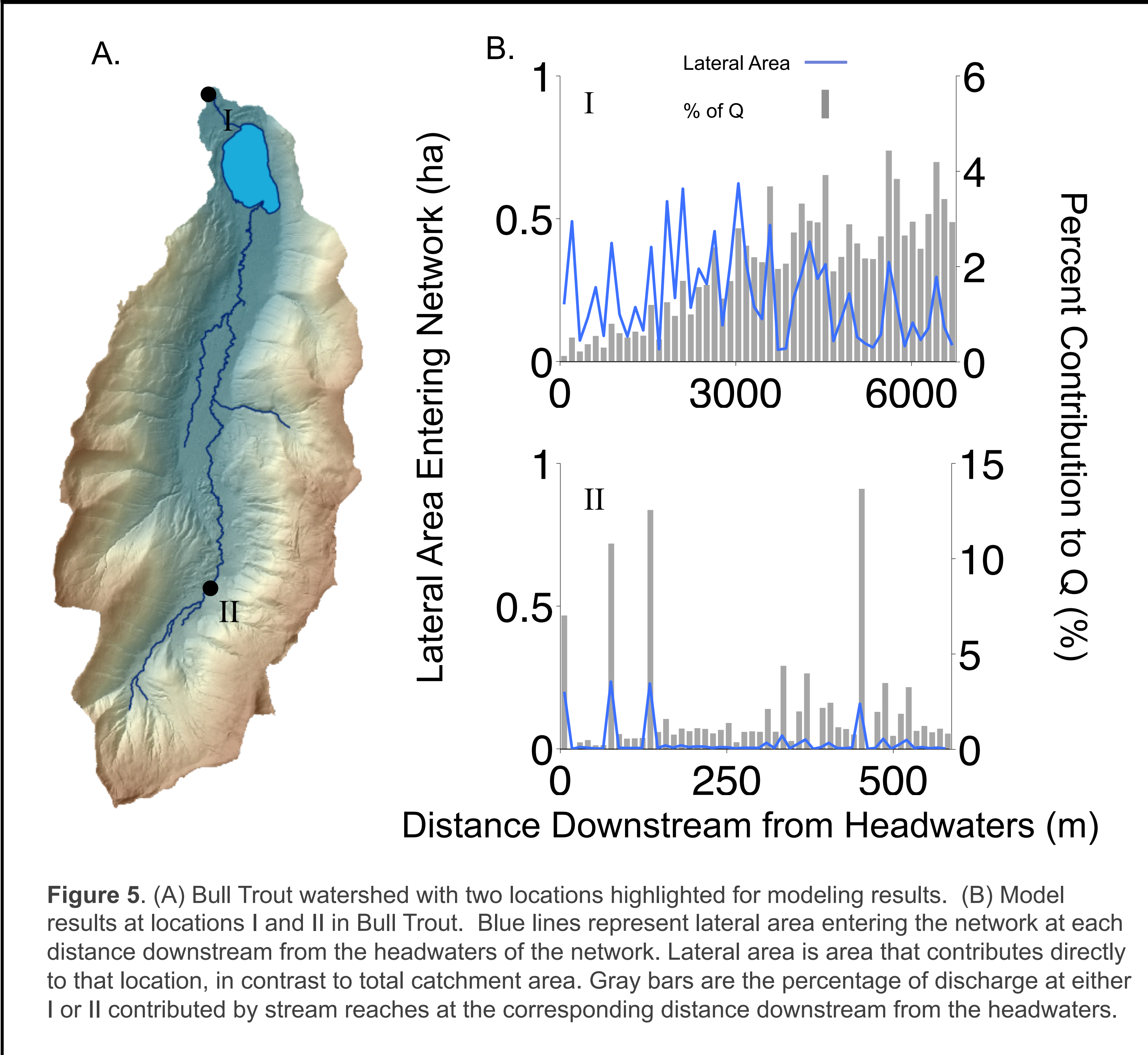
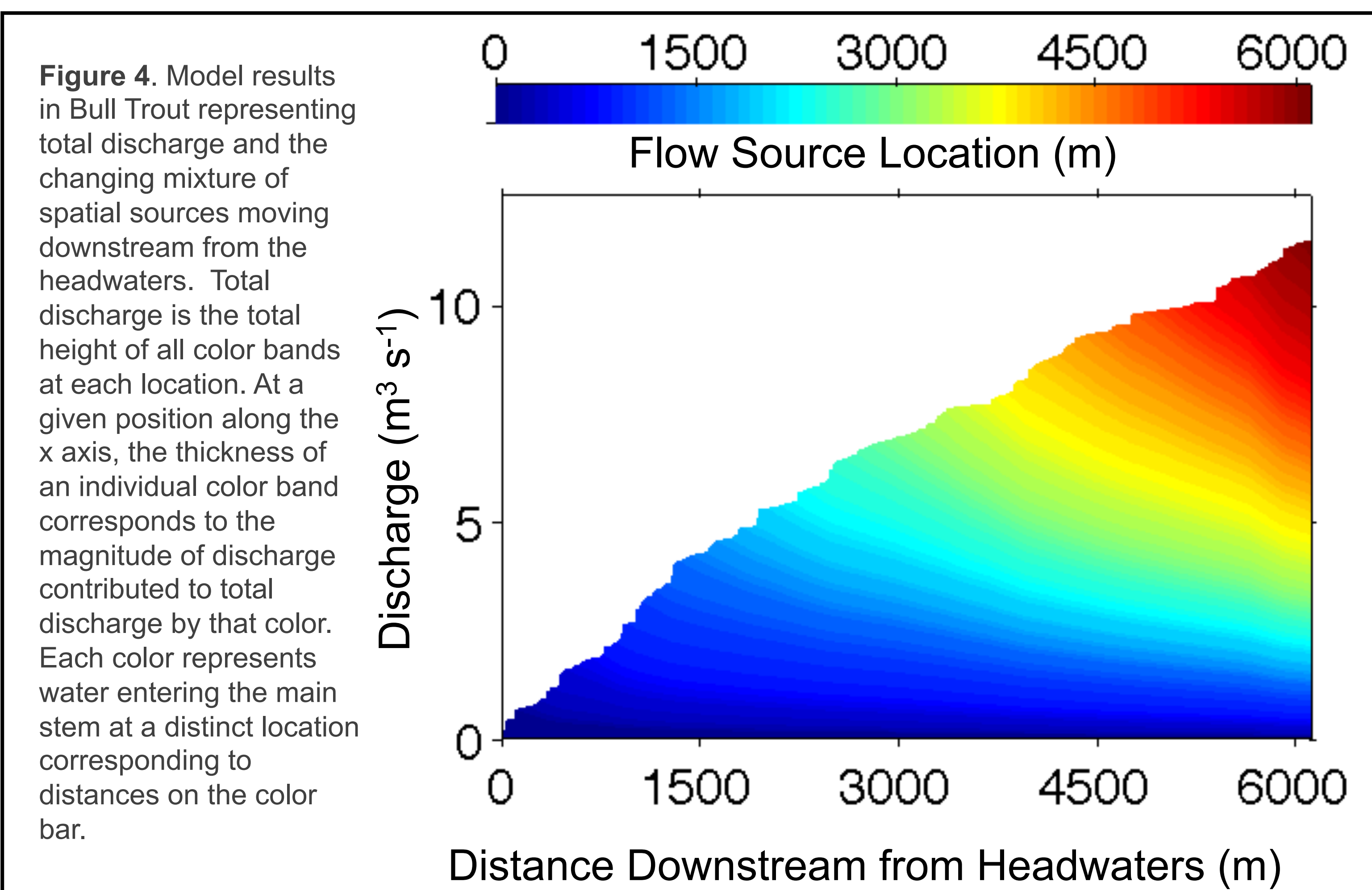
EMPIRICAL FINDINGS: tracer tests



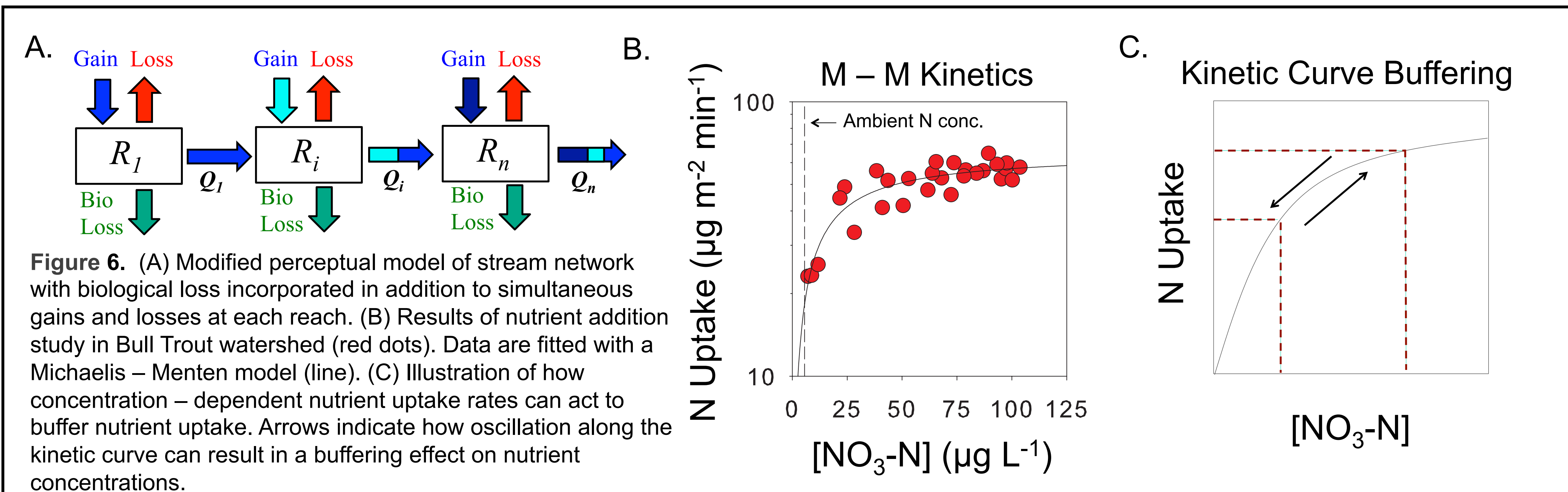
PERCEPTUAL MODEL OF HYDROLOGIC TURNOVER



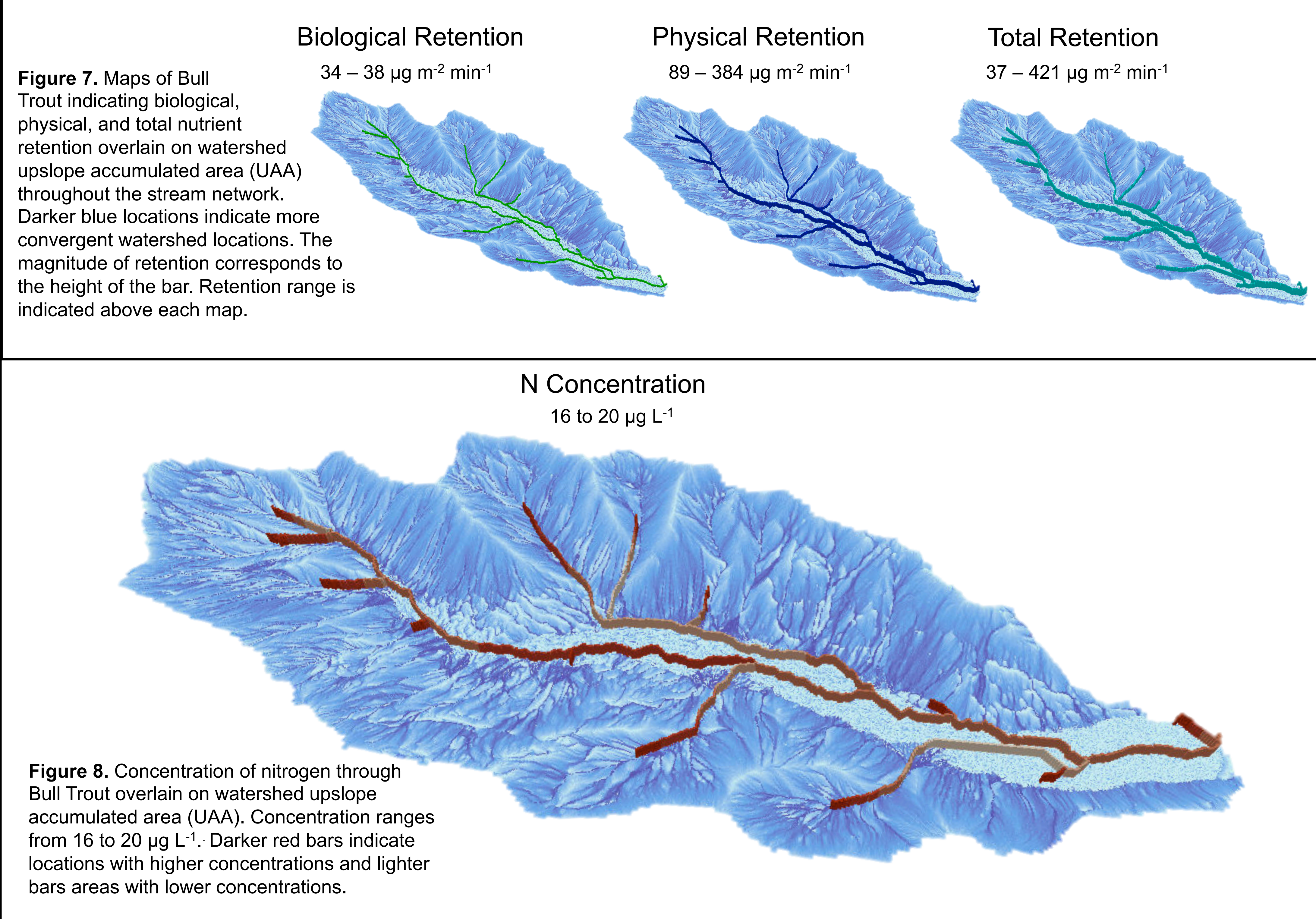
MODEL RESULTS FROM BULL TROUT



COMBINATION OF HYDROLOGIC TURNOVER WITH BIOLOGICAL UPTAKE



MODEL RESULTS FROM BULL TROUT: Incorporation of Biological Uptake



1. Simultaneous losses and gains to and from the stream network lead to *hydrologic turnover* moving through stream network.
2. This turnover process results in shifting mixtures of streamwater source locations moving through the network.
3. Biological uptake varies within the network with concentration -> this variability can be modeled with a Michaelis-Menten model where uptake increases at a decreasing rate with concentration.
4. The interaction of hydrologic turnover and concentration-dependent nutrient uptake result in spatially variable but overall stable nutrient concentrations throughout this stream network.
5. What are possible interactions of the physical retention controlled by hydrologic turnover and biologically mediated retention of solutes in watersheds within the context of land use/land change or seasonal variability?