Freshwater Ecosystems
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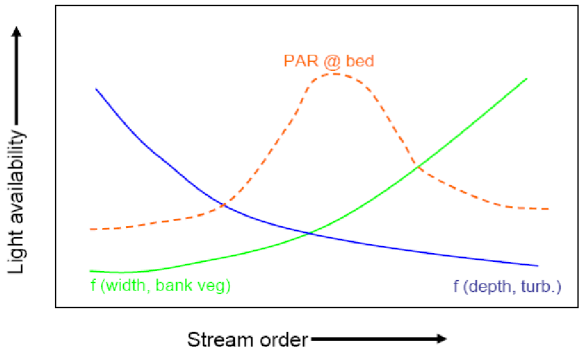
Lentic – Lotic – Libs

(a play on Madlibs)

Part I: Rollin' on a River

In large watersheds, _____ is often the limiting factor in forested _____ streams. These streams are typically first to third order streams and only contribute 10% to 20% of total PP yet comprise 80% of total stream length.

The larger the stream order, the less the light availability because of an increase in water _____ and turbidity.



Light influences primary productivity rates. The solar radiation reaching plants depends upon _____, _____, _____ (list 3 variables).

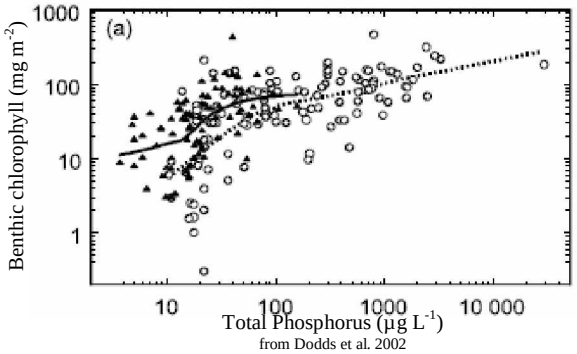
For every 10 degree Celsius increase in water temperature, stream metabolism rate doubles.

Nutrient relationships in streams/rivers are different than those in lakes. The productivity of stream producers is influenced by _____, _____ (insert 2 nutrients) but sometimes light limitation is more important.

If light and micronutrients are abundant, _____ often becomes the limiting factor before _____.

A key feature of lotic systems is nutrient spiraling. Nutrients are taken up by organisms and released—in a storage-cycle-release pattern of _____ and _____.

Streams with deciduous trees receive _____ inputs (C/FPOM and DOM) that stimulate PP and can offset light limitations (i.e. supplant photosynthesis as energy base for aquatic food webs).



from Dodds et al. 2002

The flood pulse concept (FPC) suggests periodic changes in water level transports _____ and _____ matter from the lateral floodplain downstream. This pulse serves as a primary source of productivity to lowland rivers.

Water can be _____ in headwaters streams where current changes rapidly and erratically.

Suggested Readings:

Dodds, W.K., Smith, V.H., and K. Lohman. 2002. Nitrogen and phosphorus relationships to benthic algal biomass in temperate streams. Can. J. Fish. Aquat. Sci. 59: p.865-874.

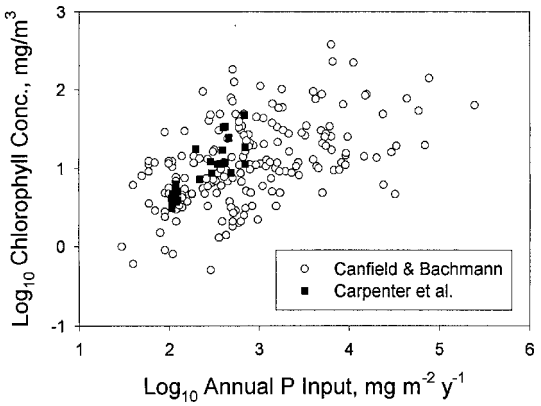
Giller, P.S. and B. Malmqvist. 1998. The Biology of Streams and Rivers. Oxford University Press, New York, p.296.

Naiman, R.J. and Bilby, R.E. (eds.) 1998. River Ecology and Management. Springer-Verlag, New York, p.705.

Ward, J.V. 1985. Thermal characteristics of running waters. Hydrobiologia 125: p.31-46.

Part II: Sittin' on the Dock of Monona Bay

_____ is often cited as the most limiting factor for primary productivity in freshwater lakes.



(from Carpenter et al, 1999)

The two main inputs of _____ into freshwater systems, often considered the second most limiting factor for primary productivity in lake systems, include anthropogenic sources and fixation by _____.

Beneath the euphotic zone is the aphotic zone, where it is not possible to obtain enough net accumulation of light energy to allow photosynthesis to occur. The depth that delineates these two zones is the _____.

Originally thought to be important because of its role as an electron receptor in the electron transport chain and nitrogen fixing, recent studies show that the addition of _____ in oligitrophic lakes low in total organic carbon and total _____ has stimulated primary productivity.

In highly eutrophic/nutrient-rich, exceptionally turbid systems, and benthic processes _____ can be the most limiting factor affecting primary productivity in freshwater ecosystems.

_____has two important influences on primary productivity of lakes: first, through its influence on the basic physiological uptake of nutrients and photosynthetic rates of phytoplankton, and second, through its driving of lake mixing which brings _____ up from the substrate and _____ down from the surface of the lake.

Phosphorus is highly _____ within aquatic ecosystems, this is in contrast to Nitrogen, which is highly _____ and can cause depletions from areas where it was found in abundance in short time scales.

Suggested Reading:

Carpenter, S. R., Kitchell, J.F., Cole, J.J., and Pace, M.L. 1999. Predicting responses of chlorophyll and primary production to changes in phosphorus, grazing and dissolved organic carbon (reply to comment by Nurnberg). Limnology and Oceanography 44: 1179-1182.

Dodson, Stanley I., 2005, *Introduction to Limnology*, 1st ed. New York: McGraw-Hill.

Houser, J. N. 1998. Food web structure and experimental enrichment: Effects on phosphorus sedimentation and retention. M. S. thesis, University of Wisconsin-Madison.

Kitchell, J. 1998. Physiological Ecology: Tradeoffs for individuals, in *Ecology*, edited by S. Dodson, 163-198. New York: Oxford University Press.

Pielou, E. C. 1998. *Fresh Water*, 149-184. Chicago: The University of Chicago Press.

Vrede, T. and Tranvik, L.J. 2006. Iron constraints on planktonic primary production in oligotrophic lakes. Ecosystems 9: 1094-1105.