10/27/04

Salmon Nitrogen Workshop

Forests Through Time and Space Fall/ Winter, 2004/05

1. Pre-European runs of salmon in the Columbia drainage have been estimated to be 9.6-16.3 million fish weighing about 67,700 mt (metric tons). The escapement after fishing was estimated to be 45,150 mt. Current runs are less than 2 million fish with an escapement of about 0.5 million fish weighing about 3,400 mt. A recent study in Bristol Bay found that 5.4×10^7 kg of salmon delivered 2.4×10^4 kg P, 1.8×10^5 kg N, and 2.7×10^5 kg Ca into the local ecosystems. 1 mt = 1,000 kg
   a. Calculate the amount of P, N, and Ca delivered to the Columbia River in the pre-European times.

   b. Calculate the amount of P, N, and Ca delivered to the Columbia River currently.

   c. What percentage of the historical amounts are currently being delivered?

2. The carbon/nitrogen (C/N) ratio of protozoa is about 20/1 and the C/N ratio of bacteria is about 5/1. The average protozoan weighs 10^{-8} g and an average soil bacterium weighs about 10^{-12} g and half of both their weights is carbon. The efficiency of the protozoan is about 45%.
   a. If a protozoan eats about 10,000 bacteria/day, how many grams of nitrogen will be released by a single protozoan in a day?

3. If a free-living diazotroph consumes about 35 g of carbon to fix 1 g of N, how much carbon would have to be supplied to fix 45 kg (about 100 pounds) of nitrogen? Give your answer in kilograms.