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Subject: RE: Composition of organic matter in Great Bay

Ru has already described some of the relationships that link organic matter in the bay to organic matter in the watershed. As we have seen in previous presentations by Ru, the CDOM in the bay is very tightly correlated with the measured dissolved organic carbon (DOC) in the Lamprey River at Packers Falls (Note that the measured DOC does not include any contribution by Newmarket sewage treatment plant). So there is a strong terrestrial signal in the Bay. A budgetary analysis could be conducted to estimate the sources of organic matter entering the Bay.

DOC in sub-basins of the Lamprey River is tightly correlated with wetland coverage in the sub-basins, and shows no effects at all from population density, road network, soils, or anything else we have measured. Very unlike nitrate, which shows strong increases with various measures of human impact in the sub-basins. Thus, it seems very likely that DOC delivered to the bay, at least at present human population levels, is driven by wetlands and not people. Although we have not seen differences in total concentrations, we have seen strong differences in the fluorescence signal of the DOC from different sub-basins, suggesting that there may be qualitative differences in DOC associated with human presence in the landscape, despite the fact that there is no quantitative signal that we can find.

Globally, increases in DOC have been occurring over the last 20 years. The mechanisms are uncertain, but we might expect DOC to increase in the Lamprey, and thus in the bay, too.

These observations do not directly answer the question Phil has asked. Given the strong correlation between CDOM in the bay and the DOC in the Lamprey, and the DOC concentrations in the Bay, I would guess that the great majority of the DOC in the bay is from the watershed, with minor contributions from the eelgrass, etc. For the particulate matter, given the relatively low levels of TSS in the Lamprey above Newmarket that my lab has measured, I would suspect/guess that at least half is generated within the Bay or from the towns right on the bay (sewage, urban runoff).

We have data on TSS and particulate C and N in the Lamprey over last 4-6 years, and perhaps they could be used to do a more careful assessment, if there are also comparable data for the Bay itself.

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