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Interactions among Time, Depth, Dissolved Organic Matter and Inorganic Nutrients on Algal Biomass and UVR Attenuation in Water from Enclosures

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Experiments were conducted in enclosures to assess interactions among depth, dissolved organic matter, inorganic nutrients and time on the biomass of phytoplankton and the UV transparency of water. Experiments were conducted in closed bottom enclosures at the Experimental Lakes Area (northwestern Ontario). Depth was manipulated using different length of enclosures (0.5 and 3.0 m). DOM was manipulated by filling enclosures with waters from different sources (an inflow stream, a humic lake, a and two clearwater lakes). Nutrients were manipulated by addition of inorganic nitrogen and phosphorus to levels consistent with eutrophic conditions. Phytoplankton biomass, dissolved organic carbon and UV Absorbance were measured at weekly intervals for 10 weeks in two summers.

Response of phytoplankton biomass was consistent with photoinhibition at low DOC concentration and shallowest depth, and with light limitation at highest DOC concentration and greatest depth. DOC concentration increased in enclosures ammended with nutrients. Loss rates for UVR attenuation from enclosures decreased with decreasing DOC concentration and depended directly on depth. Nutrient loading did not affect loss rates of UVR attenuation. Thus, climatic change resulting in decreases in DOM loading and decreases in depth interact positively to increase the exposure of aquatic organisms to UVR. Eutrophication-enhanced DOC concentration will not affect the exposure of aquatic organisms to UVR because the autochthonous DOM attenuates poorly in the environmental UVR range.