BATHTUB RING-A-DING-DING: TURBIDITY MAKES ALGAL COMMUNITIES SING (IN AN ARIDLAND RIVER)

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Turbidity influences primary production and algal communities in aridland rivers. In the Middle Rio Grande, increased tributary inputs in the summer months are associated with extremely high turbidity levels that create a light-limited environment. Because of this, primary production can be limited to a littoral zone "bathtub ring." We tested the idea of a bathtub ring of primary production in relation to turbidity and light availability. Our objectives were 1) to describe the extent of the bathtub ring of primary producers in this southwestern aridland river and 2) to determine seasonal patterns (cell densities, species assemblages) of this bathtub ring, given differing flow velocity and turbidity levels.

In 2010, we conducted three detailed transverse transects across reaches at one site to document the relationships among turbidity, depth and algal parameters in different seasons (spring, summer, fall). With a standard sampling protocol, physical variables were recorded at each sampling point along a transect: distance from the river edge (m), depth (cm) and flow velocity ($m\ s^{-1}$). Turbidity was also measured at each survey time. Samples were also collected for chlorophyll *a* and diatom species identification. Chlorophyll *a* and diatom densities were analyzed using one-way ANOVAs while temporal and spatial patterns in the diatom communities were examined using non-metric multi-dimensional scaling and indicator species analysis.

In periods of relatively high flow (spring and fall), there was evidence of an algal bathtub ring with higher chlorophyll *a* concentrations and greater diatom densities at the edge, compared to the center of the channel. This bathtub ring was restricted to water depths of < 12 cm and flow velocity < 0.2 $m\ s^{-1}$. Diatom communities were the least diverse in the spring, when suitable habitat was constrained by high turbidity levels and high flow velocity that limited the extent of the ring. In the fall, turbidity and flow velocity were relatively reduced and communities were much more diverse. There were a number of indicator taxa (*Aulacoseira italica*, *Cymatopleura solea*, *Diadesmis* spp., *Gyrosigma scalproides*, *Hantzschia amphioxys*, *Hippodonta* spp., and *Luticola muticoides*). However, in a period of relatively low flow (summer) the water was shallow and clear, so there was no bathtub ring as primary production occurred across the entire transect. Diatom cell densities were high but diversity was very low; the community was dominated by *Navicula rostellata*, *Navicula* sp. 1 and *Nitzschia* spp.

From a broader perspective, this information can be used to identify energy sources for aridland river food webs which can have limited primary production in the water column. These data can also be used to quantify relationships between the presence of high-quality food sources (high algal abundance and high invertebrate densities) and estimated fish densities.

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