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Title: *Didymosphenia geminata* invasion in South America: ecosystem impacts and potential biogeochemical state change in Patagonian streams

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Abstract: The diatom *Didymosphenia geminata* (DG), an aggressive invader of rivers and streams worldwide, has become a major concern as a dynamic microbial invasive and for its ability to form nuisance blooms in oligotrophic systems. Following the first documented South American DG blooms in May 2010, range expansion and bloom frequency in Patagonia has been comparable to the previous decade in New Zealand. The Patagonian invasion represents a distinct challenge in that not only are affected systems poorly characterized, but also a general global understanding of the mechanisms and magnitude of ecosystem impacts of DG is still lacking. The latter is essential in characterizing the effects of an invasive on various ecosystem services, which in turn determines the focus and extent of the management response. Based on a revision of the recent literature, the most significant impacts are probably mediated through physical changes (substantially increased algal biomass, sediment trapping, and altered hydrodynamics) and biogeochemical processes (pH, phosphorus uptake) within DG mats, and the two categories are probably not independent. Baseline surveys during the early invasion in Chile showed that benthic biomass and associated fine sediments were one to two orders of magnitude higher within DG blooms. Experimental phosphorous amendments showed significant abiotic uptake, while interstitial water had nearly 10 to 20 fold higher soluble reactive phosphorous, and showed a pronounced diel pH cycle spanning one to two log units. A dominant and aggressive stalk-forming diatom with this combination of characteristics is in sharp contrast to the colonial cyanobacteria that characterize many Patagonian streams, and the potential displacement of native communities and contrasting functional groups may have a significant effect on stream nutrient cycling and ecosystem function.