Cladophora body of knowledge built; still awaiting policy

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I BECAME A LIMNOLOGIST for a purely personal reason: I love to explore lakes. My training included exposure to the grassroots environmental movement of the 1970s, which nurtured an interest in lake research as a means of serving society's needs. I learned that lake restoration and protection were accomplished in stepwise fashion: science → policy → regulation. I came to see the process as one where scientists would build a body of knowledge from which policy and regulation could evolve. *If scientists build it, policy will come*.

Since 1978, I have been part of a community of Great Lakes scientists focusing their research on the filamentous, benthic macroalga *Cladophora*. Where stimulated by increased phosphorus availability, the alga grows to nuisance proportions fouling beaches, clogging water intakes, and resulting in lost beneficial use. Abundant growth was observed in Lake Erie in the 19th century. Complaints of beach fouling were reported in lakes Erie and Ontario in the 1930s, and extended to lakes Huron and Michigan in a few decades. In 1975, the International Join Commission (IJC) hosted a research needs workshop to foster efforts in support of *Cladophora* management—a clear call to *build* the body of knowledge.

The call has been well received. Studies on Lake Huron in the 1970s and 1980s saw several firsts: application of remote sensing for monitoring *Cladophora* distribution, development of the Great Lakes *Cladophora* Model (GLCM v1), and demonstration of the efficacy of nuisance growth management through point source phosphorus control. The first decade of the 21st century saw teams of scientists publishing on *Cladophora* in lakes Erie and Ontario, with applications to invasive mussels, climate change, and development of the *Cladophora* Growth Model (CGM). The next decade featured a collaborative examination of the response of *Cladophora* to invasive mussels and development of an upgraded model (GLCM v2). More recently, agency scientists in Canada have published the results of *Cladophora* surveys in Lake Ontario, and monitoring and modeling are underway for Lake Michigan. The results of a 5-year study of *Cladophora* at a site on Lake Ontario that describes the role of invasive mussels in mediating the resurgence, the introduction of an advanced model (GLCM v3), and an analysis of the efficacy of point source control on nuisance growth are being rolled out. The bibliography on *Cladophora* in the Great Lakes compiled in the 1980s has grown by more than 100 references. The body of knowledge has been *built*.



Metroland file photo by Ryan Pfeiffer

Cladophora has plagued the Great Lakes nearshore for over a century. Yet, the problem described in 1975 by the IJC as "deserted bathing beaches covered with layers of rotting *Cladophora*; bulldozers pushing *Cladophora* into mountains; and the accompanying flies and pig-pen odor which go hand in hand with rotting protein" remains, having received little policy and regulatory attention. Annex 4 of the Great Lakes Water Quality Agreement (2012 Protocol) has adopted a Lake Ecosystem Objective to maintain levels of algal biomass below those constituting a nuisance condition. But, as of this writing, the level of algal biomass constituting a nuisance condition has not been defined. The agreement further calls for establishment of Substance Objectives for nearshore phosphorus concentrations that would achieve the Lake Ecosystem Objective. Again as of this writing, there is no Substance Objective in place.

Science and policy. *We built it; nobody came.* Why? Certainly policy makers are exposed to significant pushback from those who will carry the economic responsibility for maintaining sustainable water quality. However, work needs to be done at the interface between science and policy. Scientists need access to policy discussions and assistance in communicating the essence of their findings within the context of policy development. We cannot expect policy makers to comb through 100 technical manuscripts to inform decisions. We also cannot expect scientists to intuit the needs of the policy community. This exchange needs to happen in real time with both domain experts present at the table and assisted by communicators who operate at the boundary between science and policy. I believe that IAGLR is well positioned to mediate this partnering of people with complementary strengths. *If you build it well, they will come.*