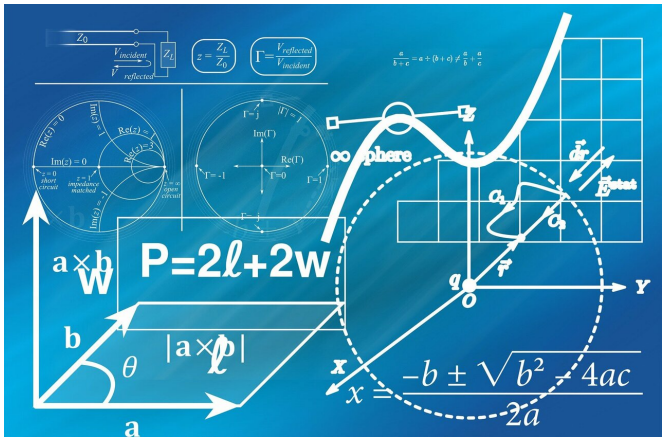
Developing a richer understanding of natural sciences critical to making better policy decisions

4 September 2019, by Bert Gambini



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To fully understand the challenges of progressive environmental transformation requires that policy makers develop a more sophisticated and nuanced relationship with the various sciences and the kinds of knowledge their work can provide, according to the results of a new study by a University at Buffalo sociologist.

Jordan Besek, an assistant professor in UB's Department of Sociology, interviewed 32 biologists, ecologists, engineers, industry experts and government officials about their inability to guarantee whether or not Asian carp would invade the Great Lakes, an invasion that, if successful, would have enormous ramifications for environmental politics in the region.

"There's an expectation that science is a black-and-white, either-or enterprise. That's not always the case," says Besek, an expert in how globalized social processes relate to environmental processes.

"The scientists who study invasive species problems do invaluable work, but the systems they are dealing with are so complex that they cannot always answer the million-dollar question for policy makers: whether or not an invasion is successful. This fact is of enormous political importance," Besek said.

The findings, published in the journal *Environmental Sociology*, suggest an inherent tension between the politicians seeking answers and the scientists conducting the research necessary to understand complex ecological systems.

To engage with science is to engage with its limitations as well as its possibilities, limitations and possibilities that may change depending upon the scientific knowledge at issue. Law-seeking disciplines like chemistry and astrophysics often address orderly systems, but other natural sciences are probabilistic, providing a range of possible outcomes rather than exact answers.

"Consider that ecosystem transformations over 100 years are much less predictable than the movement of celestial bodies over one billion years," says Besek. "That means an astrophysicist can make predictions on a level that differs greatly from what's possible in ecology—and we shouldn't expect these ecologists to do so."

Any failure to think deeply about the different sciences, and how they operate, according to Besek's research, creates the opportunity to politicize that middle ground of uncertainty.

"Rather than acknowledging the difficulties of predicting an ecological outcome, political actors often use the uncertainty to say what they want," says Besek.

How the probabilistic sciences interact with the politics of environmental change is at the core of Besek's research. His interviews suggest working toward an appreciation for the distinctions between the various scientific disciplines.

For Besek, the migration of Asian carp clearly illustrates the interactions between politicians and ecologists because it represents qualities often present in environmental challenges: a threat to a valued ecosystem and uncertainty surrounding the threat's magnitude.

"The Asian carp problem is a great proxy for talking about environmental change and its effect on social systems, from the economic, to the cultural and the political," he says.

Resource managers in the 1960s introduced four species of fish from Asia (collectively known as Asian carp) to U.S. waters in Arkansas in order to clean wastewater systems. These fish are filter feeders, and therefore could provide an alternative to chemically cleaning waterways. But they eventually escaped confinement and entered the Mississippi River basin.

If a reproducing population of the carp took hold in the Great Lakes, some estimates predict that the result could devastate a $7 billion commercial and recreational fishing industry.

But few scientists could confidently provide exact answers about migration patterns because of the complexity of the variables. Asian carp display rapidly changing and often unexpected behavioral patterns. Furthermore, the matter of where they are and where they could move involves two totally different systems: the warm shallow environment of river waters versus the deeper and colder Great Lakes.

There was a turning point in a University of Notre Dame study that suggested the carp had moved much further into the Great Lakes than previously thought. But the research model's novel method was equally embraced and dismissed.

"That created the middle ground that's so troublesome," says Besek.

To prevent this in the future involves shifting away from thinking of science as a uniform, generic category.

"Environmental change is going to be a larger part of our reality," says Besek. "A better appreciation of how to apply the knowledge we gain through research will allow for better decisions in the future—politically, economically, and culturally."

Provided by University at Buffalo