

Study puts freshwater biodiversity on the map for planners and policymakers

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When it comes to economic growth and environmental impacts, it can seem like Newton's third law of motion is the rule—for every action, there is an equal and opposite reaction—and that in most cases, the economy prospers and the environment suffers.

A team of UW-Madison researchers is hoping to help change that narrative and add a little ecology to economic decision making by forecasting how future policies regarding [urban development](#) and agricultural cultivation may impact [aquatic ecosystems](#), which harbor astounding amounts of biodiversity and provide humans with vital goods and services.

"The idea is to see what future land use changes may look like under different policies, and think about where potential threats to freshwater would be most severe," says Sebastián Martinuzzi, a post-doctoral researcher at the University of Wisconsin-Madison. "We are not trying to predict the 'true' future, but rather to visualize potential economic trends and their environmental consequences."

Martinuzzi, who works in Professor Volker Radeloff's lab in the Department of Forest and Wildlife Ecology, is lead author of a report entitled "Land Use Change and Freshwater Conservation," published Oct. 15 in the journal "*Global Change Biology*." In the study, a team of UW ecologists and collaborating economists mapped out various economic development scenarios and connected them to impacts on freshwater species diversity across the United States.

Every acre of crops put into production and each paved cul-de-sac in a new subdivision can change how water moves across the land, its temperature, and the levels of sediment and pollutants flowing into downstream [freshwater ecosystems](#).

Using computer modeling and GIS mapping, Martinuzzi and the team developed four different scenarios to help illustrate future human endeavors. In their models, the researchers found that the news isn't all bad. Crop cover is actually projected to go down under certain policy scenarios in the Midwest, which could signal an opportunity to purchase fallow fields for conservation purposes. However, in places like California and the southeastern U.S., urbanization is likely going to be a big stressor that could portend a tough future for fishes and amphibians.

The study was also able to put a number on the give-and-take of economic and ecological considerations. For example, under a "business as usual" scenario where policies remain as they are today, 34 percent of watersheds are expected to be impacted by urban development while, in an "urban containment" scenario, only 13 percent of watersheds would be affected as the spread of urban areas is minimized.

"At a minimum, we hope this can help policy makers or planners think about ways we could minimize the impact from future land development," says Stephanie Januchowski-Hartley, from UW-Madison's Center for Limnology and a contributing author of the paper. "If a certain amount [of urban development or crop cover] is going to push 10 or 20 percent of [freshwater](#) ecosystems beyond a healthy threshold, then we, as a society, have to start asking ourselves if that is something that we're all willing to live with."

Provided by University of Wisconsin-Madison

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