

Why saving the Amazon means saving more than just trees

By Chelsea Harvey, Washington Post on 01.11.16

Word Count **1,402**



A man navigates his boat along the Lorencillo River in the municipality of Ciudad Constitucion in Peru's Amazon, Oct. 27, 2015. Photo: AP/Rodrigo Abd

When it comes to conservation efforts, few regions of the Earth have garnered as much attention as the Amazon. Considering that it's home to the world's largest remaining rain forest and some of the highest levels of biodiversity on the planet, halting deforestation in the Amazon basin has been a major priority of environmentalists around the globe. But while preserving the trees is undoubtedly important, there's another equally significant, but often less talked-about aspect of the Amazon that scientists believe is in trouble.

Freshwater ecosystems are critical to the overall health of the Amazon basin -- but they're facing a variety of threats, ranging from dam-building to climate change, according to a major paper just published in the journal *Global Change Biology*. And the authors argue that finding better ways to protect these water systems is crucial, not just for the plants and animals that rely on them, but also for the humans who call the Amazon home.

"Working with fish conservation in the Amazon, I was always frustrated with the largely disproportionate emphasis that has been on the scientific, the media and even the policy developments surrounding conservation issues in the Amazon on terrestrial issues," said the new paper's lead author Leandro Castello, an assistant professor of fisheries at Virginia Tech.

In fact, freshwater ecosystems in the Amazon -- a vast, interconnected network of rivers, streams and lakes covering a million square kilometers of space -- provide countless important services to the plants, animals and people who live in the basin. These systems transport water throughout the rain forest, cycle nutrients in the soil, help regulate microclimates and play host to a variety of organisms, including thousands of fish species alone. They also represent a life source for many indigenous peoples in the Amazon, who rely on these systems for both water and food.

But in spite of their critical importance, these freshwater ecosystems are under siege. The new paper highlights a variety of threats contributing to the degradation of these water systems and interrupting their connectivity by changing or obstructing water as it flows from one system to the next.

Such changes in hydrology -- that is, the way water moves around -- are "probably one of the worst things that can happen to a freshwater ecosystem," Castello noted. "If you change the amount of water in either a lake or river or stream, you will change a lot of processes."

Dams, for instance, interrupt natural water flow and cause water to collect in reservoirs, preventing fish and other animals from moving through and preventing the downstream transport of nutrients. Previous studies have already shown that damming can have serious effects on fisheries, which is not only an economic threat to people who rely on fishing for their income, but also a threat to the food security of populations whose diet consists heavily of fish.

This is a serious concern, as dams are widespread in the region already, and many more future projects are being considered. As the authors point out, if all currently planned dams in the Amazon were to proceed with construction -- 277 in all -- only three free-flowing tributaries would be left in the entire basin.

Mining is another human activity that can have direct physical impacts on freshwater systems. Gold mining, for example, often requires dredging of rivers and streams, which can disrupt the sediments in the water, physically alter river beds and introduce pollutants -- most notably heavy metals, such as mercury -- into the water.

But some of the most serious threats to freshwater ecosystems are actually activities taking place on land.

"Available evidence suggests deforestation has very strong effects on freshwater ecosystems," Castello said. Trees perform an important step of the water cycle known as evapotranspiration -- this is when trees suck up water from the soil, draw it into their

branches and then allow it to evaporate into the air through their leaves. On small local scales, deforestation means there are fewer trees around to perform evapotranspiration, which causes extra water to trickle back into the rivers, increasing surface runoff.

Deforestation that occurs on large regional scales, on the other hand, can actually cause the microclimate to become drier, exacerbating droughts and reducing the rainfall that helps feed freshwater systems. Trees and other vegetation are also important for upholding the soil structure on land. As they are removed, soil can become looser, so to speak, and erode more easily. Increased erosion can change the types of sediments flowing into the water systems and could even change the shape of rivers and streams.

And all of these issues are likely to be compounded by the future effects of climate change. In general, temperatures in the Amazon basin are expected to continue rising, and extreme weather events such as droughts and severe storms will become more frequent and intense. Warmer, drier conditions in the Amazon will likely lead to an increase in "low-water events" in large rivers, the authors point out, and some smaller streams could at times disappear altogether.

With so many challenges at hand, the question that remains is how policymakers can best protect freshwater ecosystems. While the Amazon basin includes a myriad of protected land areas, Castello argues that the key to better conservation practices will be to develop a more holistic strategy -- one that doesn't focus only on terrestrial ecosystems, but includes the water systems as well.

"If we were to look at the issue of conserving the Amazon from a broader, more holistic perspective, thinking of freshwater ecosystems and terrestrial ecosystems at once, we should be able to develop the tools or the policy mechanisms to conserve the entire basin," Castello said.

The authors note in the paper that despite the large proportion of protected land in the Amazon, "a large proportion of headwater streams, rivers, and other wetland types are unprotected, and many freshwater ecosystems within protected areas are vulnerable to upstream threats (e.g. dams) outside their boundaries." Furthermore, they add, some protected areas include exceptions for certain activities, such as mining.

Policymakers should also consider development projects in the context of their cumulative impact on the environment, said Marcia Macedo, co-author on the paper and a scientist with the Woods Hole Research Center. "(Policies) are generally set up to consider the impact of a single dam and not the incremental effect of that dam in the context of all the other dams in the watershed," she said.

And policymakers should also remember that, in water systems, "the impacts don't stay in one place," Macedo said. "You have the impacts moving downstream in the river, across official boundaries, across state and country lines." This means national governments in the Amazon will need to work together to monitor the impacts that activity in one location might have in another place.

"The most important thing is to build the information across borders -- looking for similar policies in order to protect the resources of the species and ecosystems across the borders," said Claudio Maretti, president of the Brazilian Institute of Biodiversity Conservation and Protected Areas.

Remote sensing using satellites is likely to be one useful method for monitoring freshwater ecosystems, Castello said. Satellite data has already been immensely helpful in allowing national governments, particularly the Brazilian government, to keep an eye on where illegal deforestation is taking place in the Amazon.

And greater research into the impacts of certain environmental disturbances on the ecosystems -- particularly climate change -- will be useful as well. "The vulnerability of freshwater species and ecosystems to climate change is something that we need to be developing much more in order to have adequate, well-established adaptation strategies for biodiversity conservation," Maretti said.

But despite the challenges ahead, Maretti added that totally halting development in the Amazon would not be advisable, either.

"Avoiding economic interest is not a good answer," Maretti said. "Trying to protect everything would not lead us to a stable sustainable condition. At the same time, we cannot just accept activities that are bringing damage to these ecosystems."

Policymakers and conservationists must find ways to balance economic development with healthy conservation practices, he said -- and they must do so in a way that includes all aspects of the Amazon, both terrestrial and aquatic.

"Basically, if we stop thinking about just the forest and start thinking about forest and freshwater ecosystems, as the Amazon is - you cannot separate those things -- the benefits that we are going to get are likely to be much greater," Castello said.

Quiz

- 1 Which of the following selections from the article BEST shows why conservation efforts made by just one country do not always work?
- (A) Deforestation that occurs on large regional scales, on the other hand, can actually cause the microclimate to become drier, exacerbating droughts and reducing the rainfall that helps feed freshwater systems.
 - (B) "If we were to look at the issue of conserving the Amazon from a broader, more holistic perspective, thinking of freshwater ecosystems and terrestrial ecosystems at once, we should be able to develop the tools or the policy mechanisms to conserve the entire basin," Castello said.
 - (C) And policymakers should also remember that, in water systems, "the impacts don't stay in one place," Macedo said. "You have the impacts moving downstream in the river, across official boundaries, across state and country lines."
 - (D) "The most important thing is to build the information across borders -- looking for similar policies in order to protect the resources of the species and ecosystems across the borders," said Claudio Maretti, president of the Brazilian Institute of Biodiversity Conservation and Protected Areas.
- 2 Which of the following aspects of the article is NOT thoroughly discussed?
- (A) the impact of dams and mining on water systems
 - (B) the impact of global warming on the Amazon basin
 - (C) tips for policymakers as they try to address water problems
 - (D) strategies to increase public awareness of water issues
- 3 Which selection from the article provides the BEST summary of Castello's main point?
- (A) "Working with fish conservation in the Amazon, I was always frustrated with the largely disproportionate emphasis that has been on the scientific, the media and even the policy developments surrounding conservation issues in the Amazon on terrestrial issues," said the new paper's lead author Leandro Castello, an assistant professor of fisheries at Virginia Tech.
 - (B) Such changes in hydrology -- that is, the way water moves around -- are "probably one of the worst things that can happen to a freshwater ecosystem," Castello noted.
 - (C) While the Amazon basin includes a myriad of protected land areas, Castello argues that the key to better conservation practices will be to develop a more holistic strategy -- one that doesn't focus only on terrestrial ecosystems, but includes the water systems as well.
 - (D) Remote sensing using satellites is likely to be one useful method for monitoring freshwater ecosystems, Castello said.

- 4 How would Claudio Maretti MOST LIKELY respond to the criticism that preservation is not feasible because it will hurt economic interests in the region?
- (A) I am not advocating for total conservation, but a balanced approach between conservation and development.
 - (B) All conservation efforts can be done with a result of making money, if done in a creative and forward-thinking way.
 - (C) This criticism is political and without merit. Conservation efforts do not necessarily have an impact on economic progress and development.
 - (D) I recognize the economic cost of combatting global warming and halting mining, but the environmental cost of ignoring these issues is too great.

Answer Key

- 1 Which of the following selections from the article BEST shows why conservation efforts made by just one country do not always work?
- (A) Deforestation that occurs on large regional scales, on the other hand, can actually cause the microclimate to become drier, exacerbating droughts and reducing the rainfall that helps feed freshwater systems.
 - (B) "If we were to look at the issue of conserving the Amazon from a broader, more holistic perspective, thinking of freshwater ecosystems and terrestrial ecosystems at once, we should be able to develop the tools or the policy mechanisms to conserve the entire basin," Castello said.
 - (C) And policymakers should also remember that, in water systems, "the impacts don't stay in one place," Macedo said. "You have the impacts moving downstream in the river, across official boundaries, across state and country lines."**
 - (D) "The most important thing is to build the information across borders -- looking for similar policies in order to protect the resources of the species and ecosystems across the borders," said Claudio Maretti, president of the Brazilian Institute of Biodiversity Conservation and Protected Areas.
- 2 Which of the following aspects of the article is NOT thoroughly discussed?
- (A) the impact of dams and mining on water systems
 - (B) the impact of global warming on the Amazon basin
 - (C) tips for policymakers as they try to address water problems
 - (D) strategies to increase public awareness of water issues**
- 3 Which selection from the article provides the BEST summary of Castello's main point?
- (A) "Working with fish conservation in the Amazon, I was always frustrated with the largely disproportionate emphasis that has been on the scientific, the media and even the policy developments surrounding conservation issues in the Amazon on terrestrial issues," said the new paper's lead author Leandro Castello, an assistant professor of fisheries at Virginia Tech.
 - (B) Such changes in hydrology -- that is, the way water moves around -- are "probably one of the worst things that can happen to a freshwater ecosystem," Castello noted.
 - (C) While the Amazon basin includes a myriad of protected land areas, Castello argues that the key to better conservation practices will be to develop a more holistic strategy -- one that doesn't focus only on terrestrial ecosystems, but includes the water systems as well.**
 - (D) Remote sensing using satellites is likely to be one useful method for monitoring freshwater ecosystems, Castello said.

4 How would Claudio Maretti MOST LIKELY respond to the criticism that preservation is not feasible because it will hurt economic interests in the region?

(A) I am not advocating for total conservation, but a balanced approach between conservation and development.

(B) All conservation efforts can be done with a result of making money, if done in a creative and forward-thinking way.

(C) This criticism is political and without merit. Conservation efforts do not necessarily have an impact on economic progress and development.

(D) I recognize the economic cost of combatting global warming and halting mining, but the environmental cost of ignoring these issues is too great.