When the climate change conversation turns to storing carbon emissions in plant materials, people tend to think about forests and other large, often woody plants. But some researchers have found that wetlands, which are often more commonly known as marshes and swamps, may be much more effective in storing atmospheric carbon in its inactive forms.

Dr. William J. Mitsch, Distinguished Professor in the Department of Environment & Natural Resources at the Ohio State University, has been studying wetlands across the world for more than thirty years, and his research results suggest that, in a freshwater wetland like Old Woman Creek in Huron, Ohio, the accumulation of carbon in the soil alone adds up to a substantial amount of carbon removed from the atmosphere. “We had an average wetland like Old Woman Creek with about 140 grams of carbon per square meter per year,” Mitsch says. “That’s a good number, that’s high.”

To put that number into perspective, one needs to know that one hectare or 2.5 acres of swampland, consisting of 10,000 square meters, would then store 1400 kilograms of carbon per year. That’s the equivalent of the carbon emissions from one passenger vehicle in a year, according to the EPA. In the grand scheme of things, even that does not sound like much, but as with many topics in the climate change conversation, every little bit counts.

“I can’t prove that with the 140g of carbon per year that my wetlands are sucking up, the average temperature of the world is therefore going to be .001 degrees Celsius cooler,” Mitsch says. “But for wetlands of the world, we have some calculations that suggest that carbon sequestration in wetlands on a global scale could be on the order of more than 10% of the carbon coming out of the smokestacks,” he adds. And that number is quite a bit more impressive.

Two of those hectares of swamp land taking in carbon from the atmosphere can be found right in Columbus on OSU’s campus. The Olentangy River Wetlands Research Park is the only facility of its kind in the world, providing OSU students and visiting
researchers with unique access to large wetlands study sites since its creation. The park officially opened with the flooding of two experimental wetlands basins in 1994, and has continued to grow and develop.

Building the two wetlands became its own experiment when the researchers decided to plant one wetland and leave the other one to populate on its own. “The plants we put into the planted wetland were cute, they’re little plants,” Mitsch says. “Those tend to be the ones that some wetland ecologists favor. We knew the big boys like cattails and some of the other big plant varieties would come in on their own, so we didn’t plant those,” he adds.

It turned out that leaving wetlands to plant themselves led to a more productive wetland than the one that was planted—“grabbing carbon out of the air and making plants out of it,” Mitsch says. The planted wetland, on the other hand, has always been more diverse, at least in terms of the number of different plants present there. “At the end of 15 years, you’re left pondering the question of which is a better wetland, and my answer to that is, it depends on what you want,” Mitsch summarizes the result of the long-term experiment which will be published in early 2012 in the journal BioScience. But if carbon sequestration (binding atmospheric carbon into a nonreactive form in the soil) is the main goal of creating a new wetland, leaving the area to plant itself is definitely the way to go.

In addition to being a very good carbon sink, wetlands also remove other nutrients from the water that flows through them, removing nitrogen and phosphorus from agricultural runoff that would otherwise end up in lakes or the ocean, causing algal blooms there. Mitsch and his colleagues have found that the Olentangy River wetlands continue to remove both nutrients, but the removal of phosphorus, while continuing to happen, has decreased over the past 15 years. “Nitrogen, on the other hand, does not show a very significant trend either way,” Mitsch says. “In fact if you look at just the last five years, if it hasn’t become steady state, it looks like it might even start removing more nitrogen the older the wetland gets,” he adds.

In the future, these findings may become a good argument for creating wetlands as a “buffer” between agricultural areas and large bodies of water affected by algal blooms. “These wetlands clean up water, they’re nature’s kidney,” Mitsch summarizes.

While wetlands have been shown to effectively sequester atmospheric carbon, they do also produce some methane as part of the natural anaerobic processes that also bind carbon into the soil. “Our studies suggest the more carbon the wetlands sequester, the more methane you get too,” Mitsch says. However, “on a carbon balance, a lot more carbon goes into the wetlands than is coming out,” he adds. “I’m not saying
methane doesn’t matter. If it comes off a landfill, then it does matter because the landfill is not sequestering carbon as well, but in a wetland, the sequestration of carbon trumps the creation of methane gigantically."

In the end, all climate change arguments in favor of wetlands won’t make a difference if the public isn’t interested in maintaining and visiting them. Ecosystem services – the concept of nature providing a service – always makes more sense when put into a local context, after all. “Let’s talk about flood mitigation,” Mitsch explains. “If the water ends up stored in the wetland instead of in your basement, that’s a pretty ideal example. I think on a big flood, the water we store temporarily on the site would stand something like 20 feet deep in Ohio Stadium,” he adds. “That’s a lot of water.”

And last but certainly not least, a lot of people appreciate the biodiversity that these wetlands bring into the city, and to the world at large. “That’s why we’re so loved by the community,” Mitsch says. “It’s an incredibly diverse landscape in wetlands because they tend to be where the land and the water meet. The aesthetics and the appreciation of nature, to be able to see it without being behind bars like in a zoo, I think humans understand that.”

To hear more about Dr. Mitsch’s research into wetlands and climate change, you can attend his Global Change, Local Impact webinar on November 8 or view the archived webinar at changingclimate.osu.edu. More information about the Olentangy Wetlands Research Park is available at swamp.osu.edu, which includes opportunities for groups to schedule a tour of the facility and learn more about the importance of the area to the local community.

William J. Mitsch is a Distinguished Professor within the School of Environment and Natural Resources at The Ohio State University. His research and teaching over his 37-year career have focused on wetland ecology and biogeochemistry, wetland creation and restoration, ecological engineering, ecosystem restoration and modeling. He has authored or co-authored over 300 peer-reviewed publications and has edited or co-authored 17 books including 4 editions of the popular textbook Wetlands and two versions of Ecological Engineering. He is founder and editor-in-chief of the international journal Ecological Engineering. He founded the Olentangy River Wetland Research Park on OSU’s campus in 1991 and continues to be its Director. In August 2004 he was awarded the 2004 Stockholm Water Prize for lifetime achievements in the modeling, management, and conservation of lakes and wetlands.

Dr. William Mitsch studies wetland ecosystems in Ohio, the United States, and across the world. Pictured here is Corkscrew Swamp near Naples in southwest Florida.