Point Blue Publication Brief

Maximizing the carbon and biodiversity benefits of habitat restoration along rivers and streams

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Restoring forests has become a world-wide strategy for simultaneously addressing the challenges of climate change and biodiversity conservation. Forests store tremendous amounts of carbon in the trees and soil, and they can provide valuable habitat for wildlife. But reforestations designed to maximize carbon storage may not be as successful at providing habitat. We studied carbon storage and bird communities in the Cosumnes River Preserve to understand how carbon and biodiversity benefits relate to forest density, canopy and understory cover, and forest age.

In May-July 2017, we surveyed bird populations, collected soil samples, and measured vegetation cover, tree density, and tree biomass in 4 large study areas of in the Preserve. Study areas included remnant forest (at least 80 years old), a planted forest (30 years old), a forest that is naturally regenerating after levee breaches (22-32 years old), and an area currently undergoing restoration (0-3 years old).

We found that after 20-30 years, restored riparian forests were similar to the remnant forest, storing twice as much soil carbon and providing habitat to 4 times as many birds as the youngest study area. Even so, there was a lot of variability within these forests, suggesting an opportunity to optimize restoration design and management to maximize the carbon and biodiversity benefits.

We found that areas with more understory (shrub) cover tended to have higher bird density and diversity, as well as more soil carbon storage. So, planting and encouraging more understory cover is likely a no-regrets strategy that could help maximize these benefits.

We also found that areas with the highest densities of trees had more carbon stored in trees (as expected), but that bird density and diversity were lower. So, decisions about planting density, thinning, burning, and other actions may increase one benefit at the expense of the other.

This trade-off should be carefully considered, along with other restoration goals, to increase the effectiveness of riparian forest restoration in contributing to climate change mitigation and biodiversity conservation.

Main Points

Restoring streamside forests can help address the global challenges of climate change and biodiversity loss by storing carbon in the trees and soil and providing habitat for wildlife.

However, we found a trade-off in tree density, where bird abundance and diversity decreased in very dense forests but carbon storage was high.

Understanding trade-offs will help optimize restoration design and management to maximize the multiple benefits of forest restoration.

Dybala KE, Steger K, Walsh RG, Smart DR, Gardali T, Seavy NE. (2018) Optimizing carbon storage and biodiversity co-benefits in reforested riparian zones. *Journal of Applied Ecology*. doi: 10.1111/1365-2664.13272

Data from: Optimizing carbon storage and biodiversity co-benefits in reforested riparian zones *Dryad Digital Repository*. doi: 10.5061/dryad.2h63d10