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Integrating wildlife conservation into ecosystem service payments and carbon offsets: A case study from Costa Rica

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Abstract

Wildlife conservation is challenged by the expensive and cost prohibitive strategy of directly purchasing land to protect habitat at the landscape scale. An alternative mechanism used to protect habitat includes payments for ecosystem-services (PES), where farmers and landowners are paid to manage their lands for a particular ecological service. Some of these easements are used to conserve a diversity of resources (i.e., water, soil, nutrient cycling, and biodiversity); however, the largest PES easement programs focus on carbon sequestration and are sold on international carbon markets as offsets. Here, we demonstrate that successfully protecting vulnerable habitat for wildlife can be achieved through partnerships with programs that trade in carbon offsets by focusing landowner recruitment activities in areas with ecologically valuable habitat. This collaborative strategy represents a cost effective and efficient model to protect wildlife at landscape scales. As proof of concept, in 2015 we successfully protected and restored habitats used by golden-winged warblers, a species being considered by the United States Fish and Wildlife Service for protection under the Endangered Species Act, by partnering with organizations responsible for managing carbon offsets in Costa Rica. Through these partnerships, we successfully protected 790 ha of valuable habitat, within a single year, by recruiting farmers and landowners into an easement program in the heart of the warbler's winter range. We present our efforts as a model for similar collaborative partnerships in the tropics and beyond.

KEYWORDS

carbon offsets, Costa Rica, easements, Golden-winged warbler, migratory birds, wintering grounds

1 | INTRODUCTION

Continued proliferation of greenhouse gases and rampant habitat degradation directly contribute to the ongoing global biodiversity crisis by reducing habitat available for threatened species (Bellard, Bertelsmeier,

Leadley, Thuiller, & Courchamp, 2012; Maxwell, Fuller, Brooks, & Watson, 2016; Singh, 2002). Such challenges have driven conservation biologists and governments to develop new programmatic paradigms to mitigate global climate change and degradation of natural systems. Payments for ecosystem services (PES) are one such

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strategy whereby landowners enter into contractual agreements and receive monetary payments to manage their lands for a particular ecological service. A common form of PES includes the establishment of conservation easements to protect a variety of resources such as air, water, soil, nutrient cycling, and biodiversity from development on private lands (de Vries & Hanley, 2016; Drechsler, Johst, & Wätzold, 2017; United Nations Development Programme [UNDP], 2017a). The largest PES programs focus on carbon sequestration because offsets can be traded on carbon markets (UNDP, 2017b). Although these large programs focus on carbon offsets, bundling ecosystem services has been suggested as a mechanism to leverage the financial power of carbon markets to achieve additional objectives (Grieg-Gran,

Porras, & Wunder, 2005), including habitat protection for vulnerable wildlife species.

One such species of wildlife dependent on forested landscapes is the golden-winged warbler (*Vermivora chrysoptera*), a migratory species of bird that breeds in North America and winters in montane environments throughout Central America and northern South America (Figure 1; Confer et al., 2011). The warbler has been subject to precipitous population declines: approximately an annual 2.8% reduction in population size, causing the United States Fish and Wildlife Service to consider legal protection for the warbler under the Endangered Species Act (Buehler et al., 2007). Recent research suggests the warbler's population declines are associated with habitat loss and forest degradation on

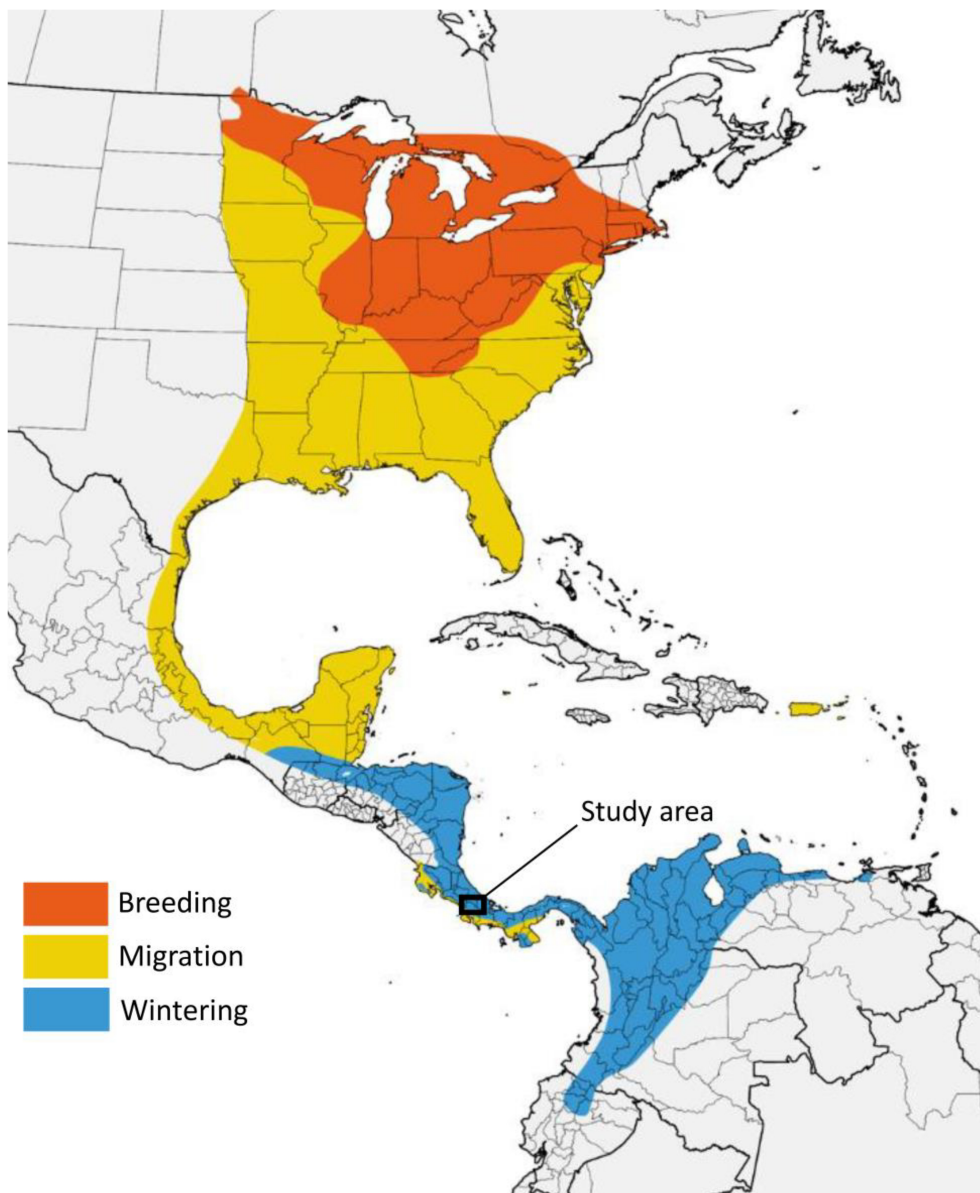


FIGURE 1 Distribution of golden-winged warblers throughout the breeding, migratory, and winter periods, and the location of our study area. Map taken from Confer, Hartman, and Roth (2011)

their tropical wintering grounds (Kramer et al., 2018). Thus, establishing mechanisms to protect winter habitat for the warbler is a necessary step toward population-level recovery.

Protecting wintering habitat for golden-winged warblers by directly purchasing land can be cost prohibitive. For example, the cost of a single hectare of undeveloped land in the Cordillera de Talamanca in Costa Rica in 2018 varied between \$10,000 and \$20,000 (Figure 1). Thus, conservation practitioners should consider other mechanisms to protect tropical habitat, including partnerships with organizations that trade offsets on carbon markets to help guide acquisition of focal habitat through landowner recruitment efforts. This strategy provides opportunity for conservation at the landscape scale. Here, we detail our partnership with local landowners and the governmental organization responsible for administering carbon offsets, or easements in Costa Rica—the National Forestry Fund (FONAFIFO)—to protect existing forest and restore degraded winter habitat for golden-winged warblers. Specifically, we aimed to protect golden-winged warbler habitat at the landscape scale by recruiting farmers in the heart of the warbler's winter range into an easement program. We suggest our use of

carbon sequestration easements to protect wildlife and their habitats can serve as a model across the globe (Figure 2).

2 | HISTORY OF CONSERVATION EASEMENTS IN COSTA RICA

Conservation easements came to prominence in Costa Rica during the late 1980s, when the country had one of the highest deforestation rates in the Americas (Sader & Joyce, 1988). Conservation easements were more cost effective at mitigating habitat loss and facilitating forest regeneration because private land is protected without directly purchasing it, resulting in a larger conservation footprint for less money. One major drawback is the finite time horizon of easements, as they typically expire in 5- or 10-year intervals. However, regulatory legislation passed in the mid-1990's makes it burdensome for landowners to obtain the necessary permission to clear mature forest for agricultural purposes (Ley 7575, 1996). Thus, much of the forest within existing easements will avoid development even after easements expire.



FIGURE 2 Community outreach program focused on landowner recruitment into a payment for ecosystem services (PES) program used to sequester carbon and protect golden-winged warbler habitat in Dota County, Costa Rica

3 | RECRUITING FARMERS INTO EASEMENT PROGRAMS

We recruited farmers from the Cordillera de Talamanca into FONAFIFO carbon sequestration easements by conducting public outreach events at the local city hall in the Municipalidad de Dota, where we hosted 345 adults between 2016 and 2017. Our outreach activities resulted in a close relationship with a local coffee cooperative (Coopedota) in the coffee valley of Santa Maria de Dota. The cooperative has over 800 members who own small farms, averaging 10 ha in Dota county. Our outreach activities focused on the importance of maintaining forests on farms to maximize the removal of pests from crops through ecosystem services provided by migrant birds, such as the golden-winged warbler (Karp et al., 2013). After farmers and landowners were introduced to pest removal from forest-dwelling birds, we discussed additional financial incentives for forest protection through the easement program (Figure 2).

4 | OUTCOMES AND LESSONS

Through our outreach and recruitment activities, we established additional easements, totaling 790 ha of forested habitat. Including the 600 ha (through FONAFIFO) of habitat protected under previous easements within the Cordillera de Talamanca, there are currently 1,390 ha of forest protected from development. Based on golden-winged warbler density estimates of 0.61 birds per hectare, we estimated that our partnership resulted in the protection of habitat for approximately 440 individual golden-winged warblers (roughly 0.20% of the U.S. population). In addition to protecting habitat for species of conservation concern, leveraging offsets to protect mature forest will have profound cascading effects on other species, most notably resident birds that appear sensitive to habitat loss and fragmentation.

Protecting habitat at large spatial scales is often limited by financial constraints. Emerging international carbon markets provide opportunities for conservationists to guide and develop easement recruitment programs targeting focal habitat. Our recruitment efforts and partnerships with local and governmental organizations that administer carbon offsets can serve as a model for similar efforts aimed at protecting wildlife habitat in the tropics and beyond.

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CONFLICT OF INTEREST

The authors have no conflict of interest.

AUTHORS' CONTRIBUTIONS

P.E. and J.W. conceptualized the study and conducted landowner recruitment efforts. J.W. and P.E. wrote the manuscript.

ETHICS STATEMENT

No ethical approval was required for this research.

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