

OUR COFFEE
OUR BIRDS



The Sounds of Sustainability



Scan code or click in the icon to listen

Andean Cock-of-the-rock
Rupicola peruvianus
sanguinolentus



Photo: © Jose Fernando Castano
Audio: © Ted Parker

The Sounds of Sustainability

What does sustainability sound like? Understanding Nespresso's efforts in sustainability by experiencing it through bird songs and their beauty.

Communicating the meaning of sustainability can often be challenging and requires engaging people and nature in meaningful ways. However, one can easily listen to the sounds of sustainability every morning, in every coffee farm, by listening to the dawn chorus of birds. Birds are the ideal bridge between people, sustainability and their coffee. Birds have the power to reach > 40 million birdwatchers in the US alone, and appeal to the millions more for whom birds represent a meaningful connection to the natural world. We are working to accomplish this through scientific research and innovative technologies, with the goal of leveraging audiovisual communication tools to connect consumers to effective sustainability efforts on coffee.



Project sites 2020

-  Matagalpa, Nicaragua
-  San Ramón, Costa Rica
-  Jardín, Colombia



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Our Goals



Quantify Nespresso's benefits to sustainability: people and birds

Develop a Biodiversity Progress Index: Birds as Indicators (Phase 1)

Empower communities through citizen science, sustainable avitourism and youth engagement

Connect Nespresso's consumers to sustainability outcomes: Bird sounds and images
Bird and coffee tours

Birds as indicators of biodiversity

Engaging, cost-effective and reliable indicators of biodiversity and environmental sustainability.

Birds use a wide range of natural and human-managed environments, and many species respond quickly to changes in their surroundings. This makes them highly reliable and scalable (e.g., farm-level to landscape) indicators of environmental health. Furthermore, birds are majestic, sing melodious songs and are easily identifiable with a minimum amount of training. This means that producers and community members can actively contribute alongside scientists to the knowledge-base we are developing to understand how bird populations are affected by regenerative practices in productive landscapes. Our strength comes from our ability to make scalable inferences on bird populations from the farm to the landscape level by using eBird, the world's largest biodiversity database, alongside user-friendly tools for outreach and data collection (eBird, Merlin, BirdNet, SWIFT automated recorders) developed by the Cornell Lab of Ornithology.

The Biodiversity Progress Index

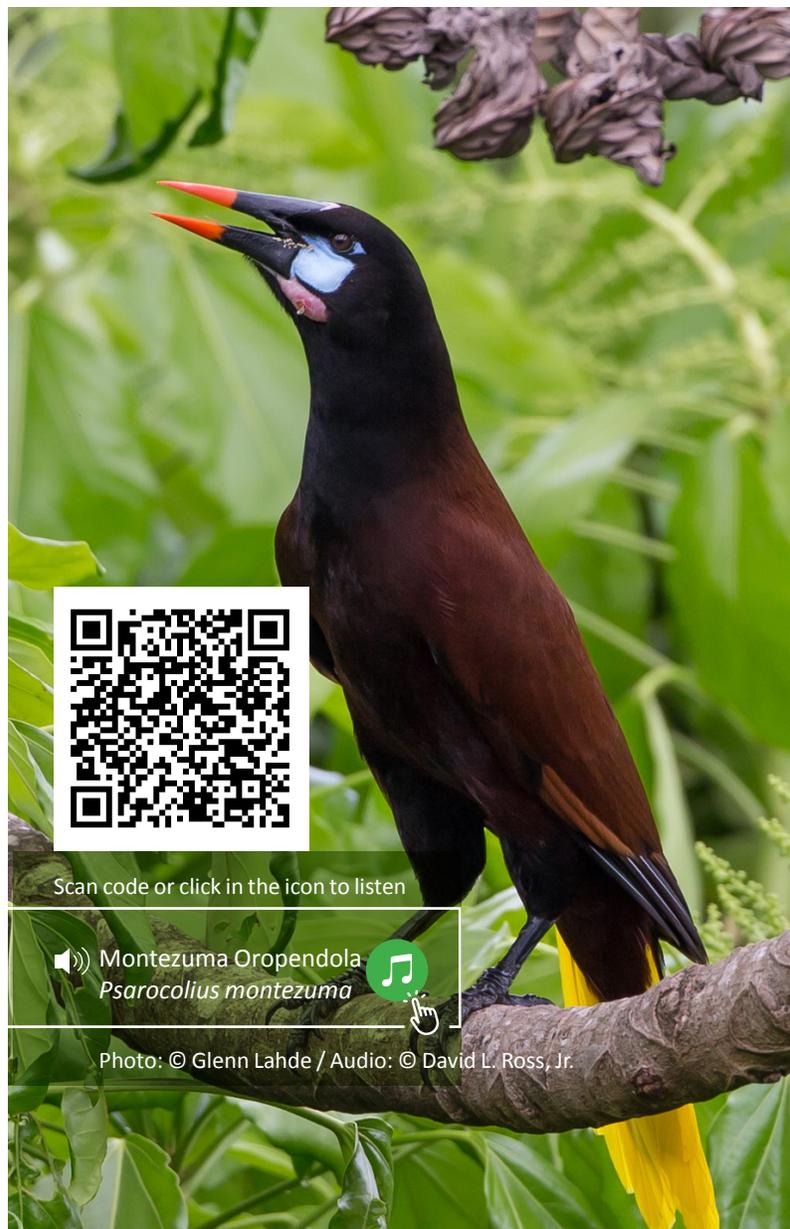
We are developing a tool for measuring the contribution of regenerative agriculture to biodiversity that facilitates multi-stakeholder communication and informed decision-making.

Nespresso has achieved multiple sustainability goals through its AAA Sustainable Quality™ Program. However, sustainability is multi-dimensional and often difficult to communicate in an engaging and effective manner. The Cornell Lab of Ornithology, the Center for Computational Sustainability and the INCAE Business School have joined efforts to develop the Biodiversity Progress Index: a cost-effective and reliable tool for quantifying biodiversity that is useful to governments, businesses, non-profit organizations, and academia. The BPI can be used to monitor the progress of sustainability goals, inform restoration, summarize impacts at the landscape level, and allow for multi-stakeholder conversations and decision-making.

A holistic vision of sustainability

From farm to landscapes, we examine the positive effects of Nespresso's sustainability efforts on society and the environment.

Biodiversity and environmental health only tell a part of the sustainability story. We are partnering with the INCAE Business School to apply the Social Progress Index to better understand the social and economic situation of farmer households for each project cluster. Sustainability is about achieving a balance between human needs and ecosystem health, and we will be using our results to help inform Nespresso's efforts to address socio-economic barriers, and inform effective ways to contribute towards improving the livelihoods of their farmers and surrounding communities.



Scan code or click in the icon to listen

Montezuma Oropendola
Psarocolius montezuma

Photo: © Glenn Lahde / Audio: © David L. Ross, Jr.

Avian Research

© Jose Fernando Castanor

We are using a multi-scale approach to evaluate the impact of Nespresso's sustainability efforts on biodiversity through birds

We have completed one pilot season in 2019, and two complete survey seasons in 2020. The survey seasons are carried out twice a year to be able to capture how species are using the coffee landscape when both Neotropical resident and migratory birds are present (Nov-Mar), and around the peak of the breeding season for resident birds (April-Jun). We survey Nespresso AAA farms, as well as non-AAA coffee farms and prevalent land uses in the landscape (e.g. small forest reserves, pastures).

Most coffee landscapes in Latin America are composed of a matrix of riparian forest, small to medium forest remnants, pastures, and small-holder agriculture (e.g. tomatoes). This is considered an *intermediate* disturbance gradient and provides the ideal conditions for restoration efforts to have the maximum return on investment for biodiversity. Our goal for the

data with the structured surveys to explore how specific sustainability management practices are influencing the habitat use of the available avian community through the specific objectives of the Masters' Thesis (*Ingrid Molina and Fernando Cediell, Page 15*). We will then integrate these surveys will all of the information collected through **eBird** for each region and inform the development of a landscape-level Biodiversity Progress Index (*Courtney Davis, Page 16*) to measure how much bird diversity Nespresso's AAA Farms are contributing to the overall landscape.

Our multi-scale approach will allow us to evaluate two key levels: 1) the influence of specific management practices (e.g. restoring riparian corridors) or other potential initiatives (e.g. protecting forest outside of AAA Farms), and 2) the aggregated impact of all AAA farms in the landscape.

<i>IUCN Species</i>	Costa Rica	CR AAA Farms	Colombia	CO AAA Farms
Near Threatened (NT)	5	5	4	2
Vulnerable (VU)	1	1	4	4
Endangered (EN)	0	0	1	1

2019-2020	Costa Rica	CR AAA Farms	Colombia	CO AAA Farms
Total survey seasons	3		3	
Total survey locations	161		154	
Total # of species records	19,781		7,778	
Total # species observed	212	187	207	196
Number of families	46	43	44	38

© Jose Fernando Castanor

Costa Rica

We detected 212 species of birds from 2019-2020, including 6 species on the IUCN Red List, and 48 species on the regional Partners in Flight (PIF) Watch List (*Summary Table*). Of these, we found 187 total species in Nespresso's AAA farms, including all IUCN Red List and 39 PIF Red Watch List species.

However, there is room for improvement to include about 9 of the PIF Yellow Watch List species that were not present in the AAA farms, and 9 PIF Watch List species. The species we found represent an impressive 46 families, with the following being the most well represented: *Tyrannidae* (25 species)- the tyrant flycatchers; *Parulidae* (23 species)- New World warblers; *Thraupidae* (17 species)- colorful tanagers and their allies; *Trochilidae* (15 species)- the gems of the forest- hummingbirds.



Three-wattled Bellbird
© Sanford Sorkin

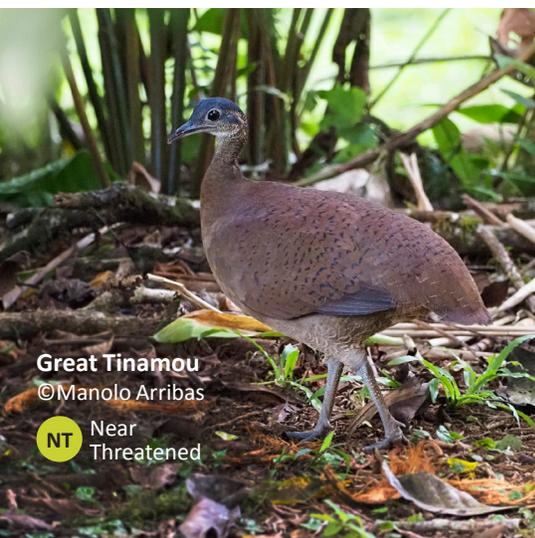
VU Vulnerable

Costa Rica

Partners in Flight Watch List	All sites	AAA Farms
Yellow Watchlist (D)	18	14
Yellow Watchlist (R)	21	16
Red Watchlist	9	9



Black Guan
© Jessy Lopez Herra
NT Near Threatened



Great Tinamou
© Manolo Arribas
NT Near Threatened



Olive-sided Flycatcher
© Rio Dante
NT Near Threatened



Magenta-throated Woodstar
© Maria Jose Lou
NT Near Threatened



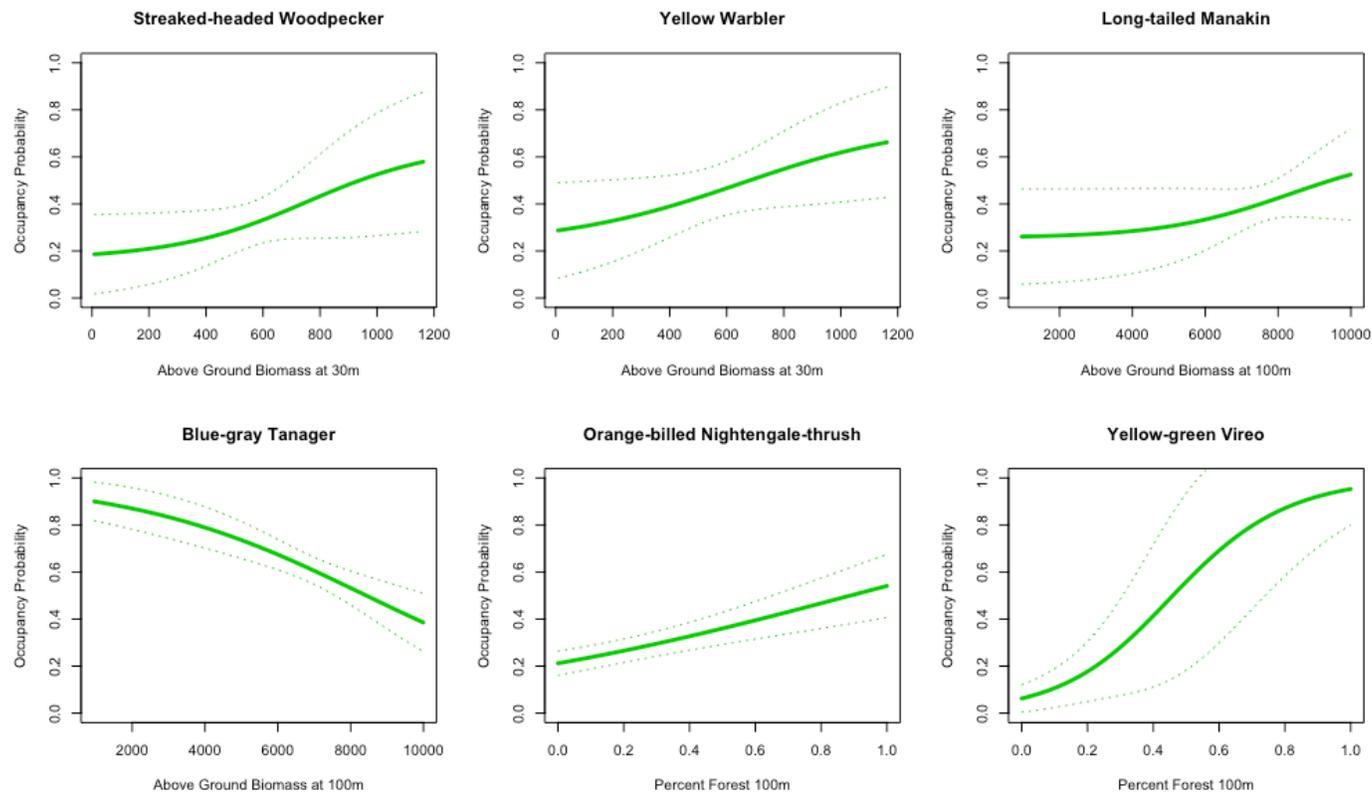
Golden-winged Warbler
© Leandro Arias
NT Near Threatened

Overall, we are finding that many species on the landscape are responding to variables associated with above ground biomass (e.g. tree cover) and the presence of forest, highlighting the positive benefit of regenerative practices that help increase biomass, such as improving tree cover and restoring riparian forest corridors (Figure 5).

Species that are more closely associated with forest habitats, such as the Streaked-headed Woodcreeper and the Long-tailed Manakin, are more likely to occur with increased above ground biomass in the coffee landscape. Neotropical migrants, such as the Yellow Warbler, also respond positively to increases in

biomass in the landscape, even though they can use habitats such as town plazas and gardens. In contrast, species that are commonly found in more urban areas and gardens, such as the Blue-gray Tanager, have the opposite response to an increase in above ground biomass. Other species respond more strongly to factors related to protecting other habitats in the landscape (e.g. native forest cover), such as the Orange-billed Nightingale-thrush- a frequent visitor to coffee plantations when there is forest cover nearby- and the Yellow-green Vireo- a long-distance Neotropical migrant that can also use more open habitats provided that sufficient forest cover is nearby.

Figure 5.



Study Region Maps

Please click on the links below to explore maps of our study regions, including locations of our point count and bioacoustics sampling sites.

 [Jardín, Colombia](#) 

 [San Ramón, Costa Rica](#) 



Colombia

The Yellow-eared Parrot is listed as endangered (EN) in the IUCN Red List. This is a large, extremely rare parrot that used to be found in all three Andean ranges in Colombia to NW Ecuador. Now, this species only survives in scattered localities in Colombia, and likely Extinct from Ecuador. It feeds on and nests in wax palms (*Ceroxylon quindiuense*, *Ceroxylon alpinum*), and the large-scale clearance of these trees has precipitated a major decline. In the Jardin area, *C. alpinum* is also known as the “coffee wax palm”, and grows from 1,500-2000 m, while *C. quindiuense* grows between 2,500 – 3,000 m. The inclusion of both these palms as part of tree planting initiatives in Nespresso’s AAA coffee farms could significantly contribute to the conservation of this endangered and charismatic species. In addition, including known fruiting trees that the Parrot uses for food below 2000 m would be highly beneficial to include in related tree planting efforts (e.g. *Pur Projet*). Our project coordinator Jose Castaño, is one of the conservation champions credited for much of the awareness and conservation of this species and could inform efforts.



Yellow-eared parrot

©Jurgen Beckers

EN Endangered

Colombia

Colombian Red Book

Near Threatened (NT)	1	1
Vulnerable (VU)	2	2
Endangered (EN)	1	1

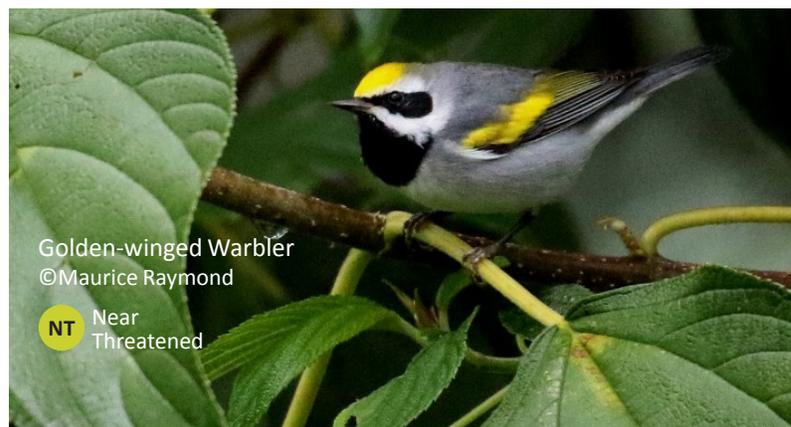
We detected 196 species of birds from 2019-2020, including 9 species on the IUCN Red List, and 4 species on the Colombian Red Book List (Summary Table). Of these, we found 152 total species in Nespresso’s AAA farms, 7 out of 9 IUCN Red List species, and all Red Book List species. However, there is room for improvement to include 2 of the IUCN Near Threatened species that were not present in the AAA farms- the declining Golden-winged warbler and the Chestnut wood-quail. The species we found across all sites represent an impressive 45 families, with the following being the most well represented: Tyrannidae (30 species)- the tyrant flycatchers; Thraupidae (27 species)- colorful tanagers and their allies; Parulidae (18 species)- New World warblers; Trochilidae (13 species)- the gems of the forest- hummingbirds.



Chestnut Wood-Quail

© Mauricio Ossa

NT Near Threatened



Golden-winged Warbler

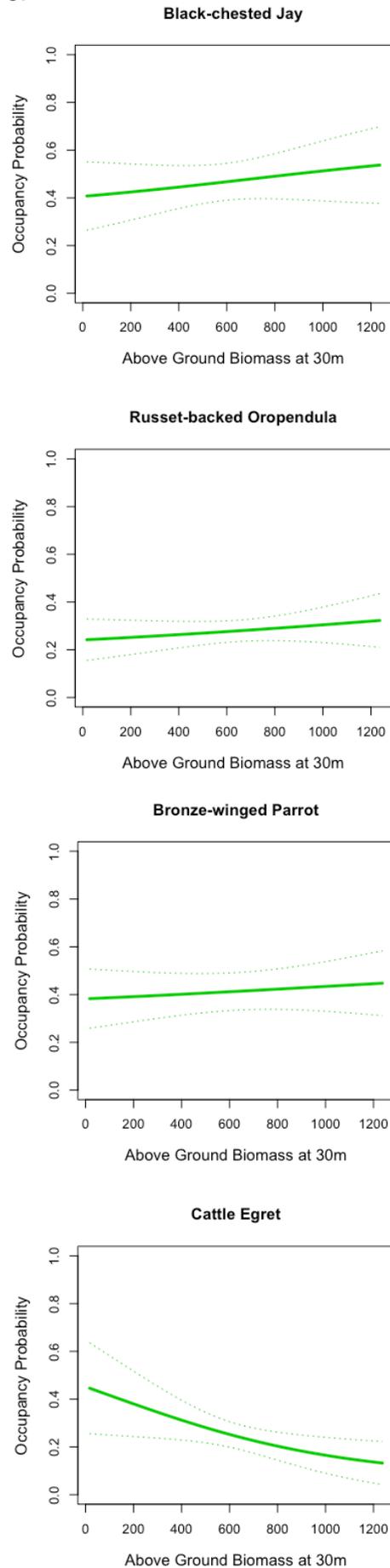
©Maurice Raymond

NT Near Threatened

For Colombia, the information on Land Cover classes was not as high resolution as the one we found for Costa Rica. However, we are still finding that species on the landscape are responding to variables associated with above ground biomass (e.g. tree cover), highlighting mainly the positive benefit of regenerative practices that help increase such as increasing tree and shrub cover (Figure 6).

We found positive responses, although not as strong as for species in Costa Rica, for species that are known to use more forested and shaded habitats, such as the Black-chested Jay, the Bronzed-winged Parrot, and the Russet-backed Oropendola- although the latter can occupy a wide range of habitats. We found that these species are more likely to occur with increased above ground biomass in the coffee landscape. In contrast, species that are commonly found in more disturbed areas, such as the Cattle egret, was found to have the opposite response to an increase in above ground biomass.

Figure 6.



Scarlet-fronted Parakeet

©Butch Carter

NT Near Threatened

White-capped Tanager

© Andrés Posada

VU Vulnerable



Improving the accuracy of our results

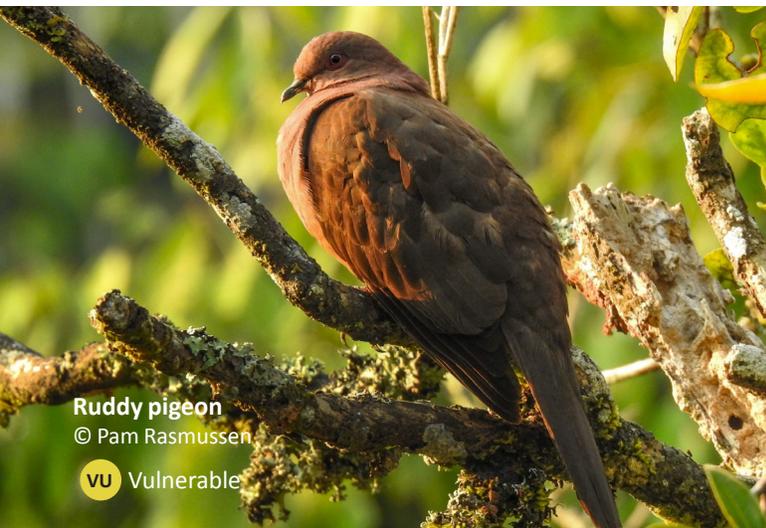
The accuracy and applicability of all our results are only as good as the explanatory variables we use in our analysis. If we collect manual field data, it will be difficult to scale and replicate this project from the farm-level to the landscape level. We need improved explanatory variables that most accurately represent the gradient of restoration efforts and habitat quality on the ground, from a row of planted trees, to a riparian forest corridor. Coffee is also a highly dynamic system, and we need to be able to pick up any annual changes in habitat at high spatial and temporal resolutions. Our aim is to explore the use of Global Ecosystem Dynamics Investigation (GEDI) products by early 2021, to include this information in our analyses. Below are the current GEDI products we're exploring further:

- » GIS coffee layer for each landscape
 - » CIAT/Rainforest Alliance/CI pilot project for Jardín, Colombia
 - » ICAFE/IUCN for Costa Rica
- » GIS information on habitat quality
 - » Primary productivity, Canopy Cover, Vertical Forest Profile (GEDI L2B- 25m)
 - » Woody above ground biomass (GEDI L4A- 25m)
 - » Vegetation Canopy Height (ATL08 ICESAT-2 L3A- 100m)

Ruddy pigeon

© Pam Rasmussen

VU Vulnerable



Cerulean Warbler

© Blair Dudeck

VU Vulnerable



Red-bellied Grackle

© Jorge Muñoz García

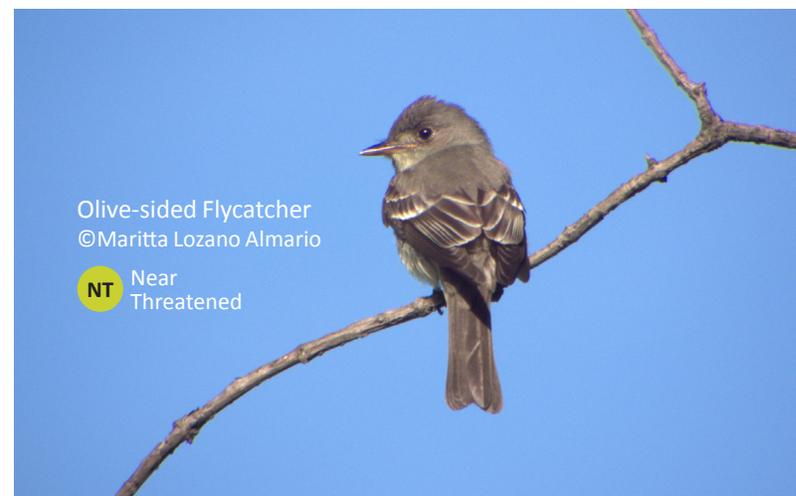
VU Vulnerable



Olive-sided Flycatcher

© Maritta Lozano Almario

NT Near Threatened



Bioacustics Research

To complement avian field surveys, we have deployed 82 Automated Sound Recording Units (Swift recorders) twice a year during critical moments for bird migration and the peak of the breeding season for resident birds. The first two seasons yielded > 46,000 hours of recordings of AAA Nespresso farms and other habitats in the project clusters. The field teams are working to “annotate” -manually identify bird songs using specialized **software**. These annotations will be used by the Center for Conservation Bioacoustics and the Macaulay Library of Natural Sounds at the Cornell Lab to inform Artificial Intelligence (AI) and machine learning approaches to auto-detect bird species. These detections will be used to inform Phase 1 Biodiversity Progress Index, and can be used to inform the detection of frogs, mammals and insects during Phase 2 of BPI development.

Led by computational biologist Álvaro Vega, the project is resulting in innovative technologies for efficient approaches for scalable Bioacoustic research:

- » Swift recorders sample a wide range of bird species, including nocturnal birds, generating an unprecedented amount of information for coffee plantations.
- » To address the large quantities of collected data, the team has developed an automatized data-management and storage system that leverages capacity in high-speed data transfer.
- » The process of annotating the recordings requires a large investment of individual time. However, annotations are needed to apply artificial intelligence approaches for automated species identification. In order to accomplish this, we require large annotated data sets. To achieve this in a time and cost-efficient manner, the project is developing a mobile app (Turdus Game) that allows the eBird community to identify birds in our recordings. The app relies on this already established community and will promote its use through gamification and other incentives.



Hours of recording

 24050  22500

Deployed Swift Recorders

 42  40



Bioacoustic Research

We are using the most up-to-date methods for bioacoustic research generated by The Cornell Lab of Ornithology

Automatic Sound Recorder setup

Manual annotation of bird songs

Analysis of databases

We are developing new innovative technologies for resource-efficient scaling by removing data processing bottle-necks

Automatized data-management systems

Increase the total number of annotations through mobile apps and the eBird community

AI - Neural networks for automatized bird songs identification

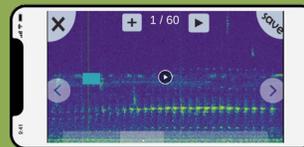


See this video to hear the sounds of a sustainable coffee farm in San Ramón, Costa Rica. You can simultaneously visualize the sounds as a spectrogram with bird songs already identified. The top spectrogram shows sound you hear.

🔊 Farm in San Ramón, Costa Rica



Curious about the Turdus Game? Check this demo video of the beta version of the mobile app, which allows eBirders to help us identify bird songs in our recordings.



Turdus Game



Academic research



The project has leveraged resources to support academic research for two Master students and two Bachelor students. Advisors and their students are based at the University of Costa Rica and the University of Antioquia (Colombia), and co-advised by Dr. Ruiz-Gutierrez. In addition, The Cornell Lab of Ornithology is funding a 2 year post-doctoral scientists Dr. Courtney Davis to lead the development of the Biodiversity Progress Index under the supervision of Dr. Ruiz-Gutierrez.



1 Post-doctoral researcher
2 MSc students
2 BSc students



MSc Research: Effects of agricultural practices avian communities in coffee landscapes

Ingrid Molina
University of Costa Rica,
San Jose, Costa Rica

[Open Link](#) 

The main objective of the research is to evaluate the effect of regenerative agricultural practices that are implemented as part sustainability efforts on coffee farms on avian communities. The specific objectives are:

1. Identify thresholds of management practices where the occupancy probability of priority bird species for conservation increases as a function of the contribution to structural vegetation complexity of the landscape.
2. Estimate changes in bird activity before and after three agricultural practices in coffee plantations: pruning, harvest and the application of agrochemicals.
3. Analyze the relationships between producers' perception of well-being with the responses of avian communities, controlling for household, farm and landscape variables (Joint paper w/ Fernando Cediel).



MSc Research: Changes in habitat use and diversity of avian communities in coffee landscapes

Fernando Cediel
University of Antioquia,
Medellin, Colombia

[Open Link](#) 

The main objective of the research is to estimate the response of the avian community to landscape-level changes in habitat characteristics with coffee production in Jardín, Antioquia. The specific objectives are:

1. Characterize the variation in habitat use by bird species across a gradient of management practices in coffee farms at the landscape-level.
2. Characterize the diversity of the bird community in response to variation in forest conservation and agricultural practices.
3. Determine at what degree of intensity in agricultural practices the homogenization of biodiversity is promoted.
4. Analyze the relationships between producers' perception of well-being with the responses of avian communities, controlling for household, farm and landscape variables (Joint paper with Ingrid Molina).



Open Link

Post-Doctoral Research: *The Biodiversity Progress Index: a cost-effective approach to measure and communicate ecosystem health in multi-functional landscapes*

Courtney L. Davis
PhD, Cornell Lab of Ornithology, USA.

Courtney Davis, a conservation biologist specialized in complex ecological modelling. Courtney was awarded a competitive 2-yr Rose Postdoctoral Fellowship to collaborate with the Cornell Institute for Computational Sustainability to advance joint-species distribution models that will inform the Biodiversity Progress Index. Her work will provide a framework for how birds can be used as indicators of ecosystem health at different scales and changing environments. Collaborators include Dr. Daniel Fink (Cornell Lab) and the Lab of Dr. Carla Gomes (Cornell- ICS), and Juan Diego Román (Nespresso).

Community engagement & Outreach



Farm and producers involved in the project:

- CR 40
- COL 40
- NIC 40



Children engaged in environmental education

- CR 210
- COL 250
- NIC 180

Outreach material

We have designed and printed outreach material to share with community members. These materials provide general information about key bird species in their communities, as well their habitat requirements, migration patterns and vulnerability status. To date, we have developed and distributed pocket guides of the most iconic birds of Jardín, Colombia and San Ramón, Costa Rica; as well as a poster for Nicaragua.



Community engagement during COVID-19

Since the beginning of 2020, the local teams of Colombia and Costa Rica have adapted work plans to adhere to local COVID restrictions. In addition, they have created a communication strategy to stay connected with the farmers and families participating in the project that includes SMS, Whatsapp and other social media outlets, which account for smartphone/internet availability.

Two examples of this communication strategy include:

The Bird of the Week: farmers receive a weekly message (through Whatsapp or SMS) with information and a picture of a key bird within their landscapes.

Bird photography contest: a contest was carried out for farmers and family members interested in sharing pictures of Bird Nests found on their farms. We received over 60 photos from 27 families. In each country, the winner and a runner-up received the newest edition of the most used Field-guide of the birds of their country. You can follow the links to see a selection of the 10 most interesting pictures and their description for Colombia and Costa Rica. Follow the next links to see pictures of the winners for Colombia and Costa Rica!



BSc Thesis: The role of birds in community engagement in Coffee farms of Costa Rica

Alejandro Quesada Murillo
Universidad de Costa Rica

Open Link



The objective of this thesis is to prepare a proposal for community engagement in coffee plantations through citizen science on birds in San Ramón de Alajuela, Costa Rica. The specific objectives are:

- » Engage local producers in all aspects of participatory bird community monitoring.
- » Assess the effectiveness of participating in the collection of information on birds to better understand the impact of sustainable coffee practices on biodiversity.
- » Develop dissemination materials on birds to reach other farmers and community members about the overall benefits of birds.

Project Staff and Contributors

Social & Biodiversity Progress Indices



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Data collection leader
+ MSc student



Dr. Lina Sánchez
Academic partner

Alejandro Suárez
Field assistant

■ Team members / project staff supported with project funds

■ Collaborators providing in-kind contribution to the project

Next Milestones

- » Final Report of the Social Progress Index baseline results, including specific recommendations for each country, and adaptations in methodology to improve applicability and reproducibility.
- » Results on the first objectives of the MSc Thesis for Ingrid Molina and Fernando Cediél, on the effects of specific, farm-level regenerative practices on avian communities.
- » Alvaro Vega will be collaborating with the developers of Merlin at Macaulay Library at Cornell to finalize and release the Turdus app. We will be able to jointly engage eBirders in the process of annotating bird calls, which will be stored and freely accessible in the Cornell Library of Natural Sounds archive.
- » Courtney Davis will be publishing the first paper describing the methodology that will inform Biodiversity Index. This methodology, which is the result of collaboration with the ICS at Cornell and involving Alvaro Vega, will revolutionize how ecologists' model diverse animal communities worldwide. We will then apply this methodology to all eBird data in the coffee landscapes and assess the contribution of specific habitat features related to AAA Nespresso farms on the landscape and use this to inform the BPI.
- » Explore opportunities to pilot our outreach efforts of guide training and educational materials while following all social distancing rules and restrictions.

Adjusting timeline due to Covid-19

We have adapted the project activities to the reality of the current global crisis by focusing on digital outreach to the communities and the development of technologies, methodologies, capacity building and education curricula. Still, some on-the-ground outreach to the community activities and the academic studies is delayed indefinitely.

- » To realize the impact and potential of the project given current conditions and restrictions, we propose a project extension until the end of 2021 (+ 7 months).

Scaling Impact 2021-2025:

- » In collaboration with the Humboldt Institute for Biodiversity (Colombia), the Institute for Computational Sustainability (Cornell), and the Center for Conservation Bioacoustics (Cornell), we want to design a pipeline of development for automated detections of bird songs, and propose Phase 2 to include mammals, insects and frogs. This pipeline will leverage the strength of all institutions involved and advance our goal of developing a scalable online platform for processing large volumes of recordings for the Neotropics to inform a multi-taxa Biodiversity Index.
- » Adjust the Social Progress Index protocols to incorporate feedback to be most useful for coffee producing regions, allowing for better results interpretation. (i.e. improve the tool from excellent to perfect fit)
- » Scaling-up the project potential the **Nicaraguan** Black-honey cluster in 2021. Currently, work started in Nicaragua by doing remote sensing analysis, selecting and approaching farmers, and carrying out the environmental education and avian surveys. The unique sustainability work that Nespresso does in Nicaragua makes it highly relevant to expand all project components to this landscape.
- » Scaling-up to key coffee landscapes of special relevance to biodiversity and Nespresso from 2022. All methodologies of the current pilot have been designed for reproducibility and scalability. Based on existing networks, scaling to countries like Brazil, Mexico, Guatemala or other regions of Colombia and Costa Rica would be feasible beyond 2021.
- » Implement research on practical questions for Nespresso to generate the evidence-based that is needed to inform decision-making related to regenerative agricultural practices, sustainability and biodiversity goal setting (e.g., *what conditions would qualify a product as sustainable?*), and the use of biodiversity as an agroecological input to coffee production.

Sustaining the good life

Birds in Coffee Landscapes
The good life is healthy forest cover, streams and environment.



Coffee Consumers
The good life is a fresh cup of Nespresso in the morning and listening to the birds - both outside, and in the coffee farm that generated their cup.

Coffee Growers
The good life is working to make a good living, sharing the fruit of their labor with their families, communities, and the rest of the world, all while being stewards of the coffee landscape and dependent ecosystems.

At its core, sustainability recognizes that nature is the basis for the well-being of people around the world. The *Sound of Sustainability* initiative seeks to understand the outcomes of Nespresso’s commitment to support coffee production that aligns with promoting healthy habitats for birds, while also providing better livelihoods for the people that grow it. Articulating the pathways that sustainable coffee production improves the *good life* not only for birds and growers, but also for coffee consumers, is a nascent research discipline that embraces the premise that there are many ways people value sustainability. While sustainable coffee supports the *good life* for birds, growers, and consumers, we still do not know

how to best connect these different components. We are interested in carrying out research on coffee consumers, to see if they value sustainable coffee as a preference over other options because it promotes bird conservation and supports coffee growers. Or, if they value Nespresso because it fits into their own value system. These different pathways have real-world implications on how to understand, improve, and communicate the roles of sustainable coffee. While the *Sound of Sustainability* initiative has been focused on understanding the good life of the birds and coffee growers, an important next step is research to understand how Nespresso sustainability efforts are elevating the *good life* for coffee consumers.

Social Media

You can follow updates of the project on Instagram and see the bird observations growing on our eBird accounts.



COLOMBIA

COSTA RICA

eBird

COLOMBIA

COSTA RICA

We invite you to please share with us all questions, ideas and feedback!



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Social & Biodiversity Progress Indices




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Bioacoustics



BSc. Álvaro Vega <i>Bioacoustics leader</i>	<i>Bioacoustics program interns</i>
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Community capacity building



Dr. Rubén Ortega <i>Community capacity building program dev & exe</i>	Lic. Rafael Calderón <i>Community capacity building program dev & exe</i>
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Environmental education



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Environmental education program developer

Nicaragua




MSc. Teresa Ruiz <i>Social impact partner</i>	Dr. Liliana Chavarría <i>Bird data collection leader</i>
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<i>Environmental education and social impact team</i>	<i>Bird data collection team</i>
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Costa Rica




Alejandro Quesada <i>Coordinator</i>	Luis Sandoval <i>Scientific supervisor & Academic partner</i>
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<i>Bachelor interns</i>	Ingrid Molina <i>MSc student</i>
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Colombia





Dr. Nick Bayly <i>Scientific supervisory, Chief coordinator</i>	Dr. Juan Luis Parras <i>Academic partner</i>	Dr. Lina Sánchez <i>Academic partner</i>
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José Castaño <i>Field coordinator</i>	BSc. Fernando Cediel <i>Data collection leader + MSc student</i>	Alejandro Suárez <i>Field assistant</i>
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■ Team members / project staff supported with project funds
 ■ Collaborators providing in-kind contribution to the project