



EDUCATION

The National Aviary Promotes Chocolate that Supports Birds

by Patricia O'Neill, Director of Education and Visitor Engagement

Because industrial agriculture destroys natural habitats, promoting agricultural approaches that preserve or provide critical habitat for birds is an important part of any conservation strategy. *Agroforestry*, a strategy in which trees, shrubs and food crops are co-planted, can provide habitat for many animal species, including resident and migratory birds. In particular, crops like coffee and cacao (the source of culinary chocolate), when grown under the cover of shade trees (especially native tree species), are of real value to many birds.

Studies in the 1980s spearheaded by the father of Neotropical migratory bird population monitoring, Chandler Robbins, showed that in Costa Rica, where cacao is grown in a manner similar to shade-grown coffee, bird populations were closest to matching those in surrounding native broadleaf forests. Despite this early indication, few follow-up studies have identified specific bird-supportive management guidelines for cacao, or a scheme for certifying it in a manner similar to what has been done with coffee.

With its lush hillsides, rich soil, and a warm climate, the Dominican Republic is ideal for growing cacao. It is also home to more than 300 species of birds, including 32 endemic species found nowhere else in the world. For many years, conflicts have existed between farmers and wildlife. Some farmers have hunted birds they thought were damaging their crops, and removed

continued on page 4

HUMAN POPULATION IMPACTS

Industrial Agriculture: A Growing Problem for Birds

by Steven Latta

Regular readers of *Flightpaths* and other bird conservation magazines know that many birds around the world are in trouble. But what are the causes, and which causes are having the biggest negative impact?

A recent report from *BirdLife International* reveals that >12% of the world's >10,000 bird species are in immediate danger of becoming extinct; another 40% are declining, including many common species. This means that the future of more than half of the planet's bird species is in doubt.

Our human population — specifically, our consumption of resources and production of wastes — are behind these bird population trends. In particular, *BirdLife* lists the global spread of industrial-scale agriculture as the leading factor contributing to bird population declines. More than 33% of earth's land surface is dedicated to agriculture; however, the expansion and intensification of agriculture in many parts of the world is now impacting almost three-quarters of the world's threatened bird species.

Industrial agriculture has radically changed how the vast majority of food is

produced in the U.S. and around the world. It has transformed formerly sustainable and biologically diversified areas (i.e., small-scale family farms scattered throughout a matrix of other habitats) into expansive, genetically uniform monocultures dependent on increasing mechanization and use of fossil fuels, synthetic fertilizers, chemical pesticides, and even pharmaceuticals.

Vast monocultures are frequently dedicated to the cultivation of crops for export, often for use as animal feed. In one recent example in Brazil, 40,000 square miles of tropical dry forest have been converted to soybeans for export primarily to fatten hogs and chickens overseas.

Industrial agriculture destroys and fragments diverse natural habitats for land birds, while agricultural runoff impacts watersheds, riparian birds, and human health. Agricultural expansion contributes to global warming because it requires large amounts of fossil fuels for cultivation, fertilizers, harvesting, and export. It exacerbates climate change by diminishing forest cover that provides crucial, long-term storage of carbon.

continued on page 7



Industrial-scale agriculture has been cited as the most important threat to birds globally... but alternatives do exist.



NATIONAL AVIARY

The National Aviary inspires respect for nature through an appreciation of birds.

Editor

Steven Latta, Ph.D.
Director, Conservation and Field Research
steven.latta@aviary.org

Managing Editor

Robert Mulvihill, M.Sc.
Ornithologist
robert.mulvihill@aviary.org

Allegheny Commons West
700 Arch Street
Pittsburgh, PA 15212-5201
412-323-7235



**ASSOCIATION
OF ZOOS &
AQUARIUMS**



Printed on recycled paper
FSC and post-consumer mark here

www.aviary.org

Follow us on Twitter: @National_Aviary
Facebook.com/NationalAviary

FROM THE EDITOR

Our Everyday Choices Have Global Effects

When multiplied, relatively simple actions can have profound impacts.

At the National Aviary, we have long recognized the powerful impact agriculture can have on birds and their habitats. But only recently has industrial-scale agriculture been widely recognized as one of the most serious contributors to the decline of bird populations around the world.

In this issue we report on ways that National Aviary researchers have been seeking to understand how agriculture is contributing to these declines, and how we are promoting changes and choices consumers can make that will benefit smaller scale, more sustainable agriculture that is far less detrimental to birds and their habitats than industrial agriculture.

For example, our early studies showed increased bird use of coffee when grown under a diverse shade overstory compared to full sun. So today we partner with another Pittsburgh nonprofit to support small-scale, organic coffee growing, and alternative models of food production and distribution, that are simply better for birds.

Based on the success of similar bird-friendly coffee promoted by the Smithsonian Institution, recently I collaborated with Dominican colleagues to help cacao farms to better support wild birds. Working with small-scale cacao growers and their agricultural cooperative, we have promoted organic cacao-growing practices and other changes which increase the diversity of vegetation on the farms — a change benefiting migratory and resident birds alike.

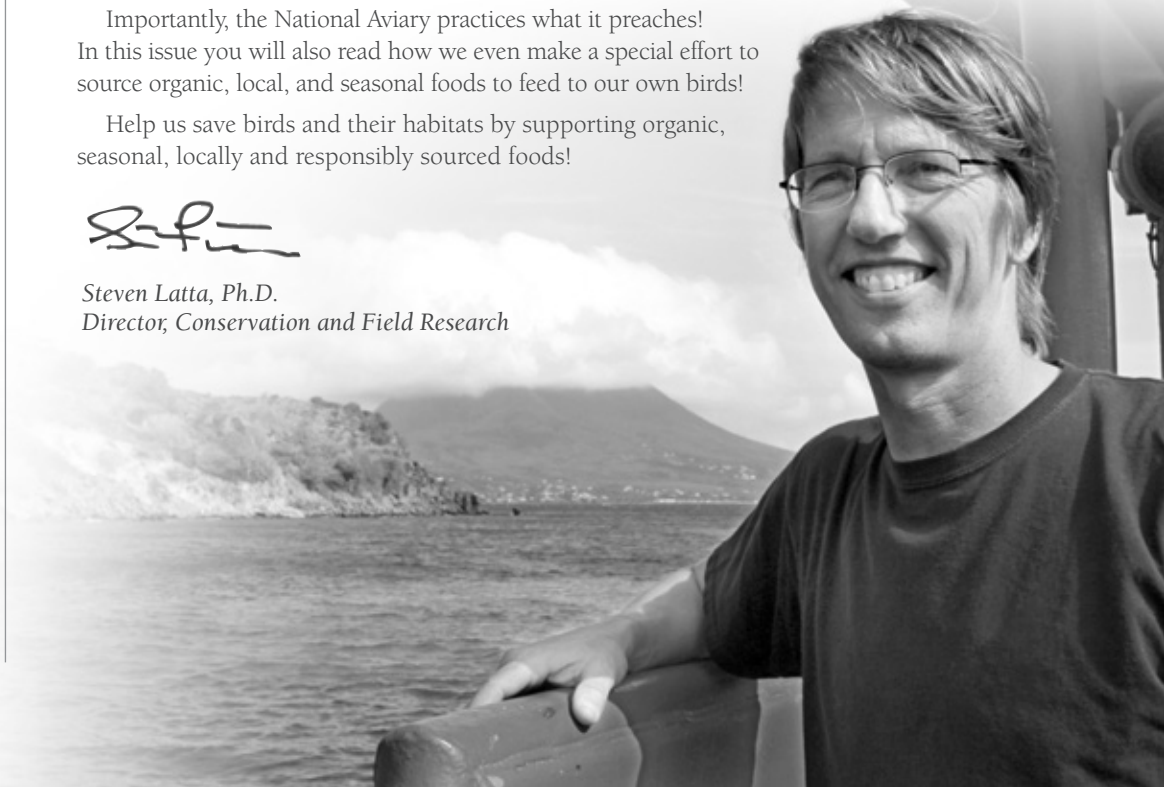
And when social or economic activities result in the retirement of farmlands, other research results from the National Aviary show how we can help promote the conversion of abandoned agricultural land to forested habitat in ways that are more beneficial to birds.

Every time that you choose to pay a few more pennies per cup or per candy bar to purchase coffee or chocolate grown in a non-industrial manner, you are casting your vote for smaller scale agricultural systems that value and welcome birds. As individuals and as families, when we buy organic, locally grown, seasonal foods, we are doing something that translates into tangible protection for birds and other wildlife, and for the future of sustainable small-scale family farms.

Importantly, the National Aviary practices what it preaches! In this issue you will also read how we even make a special effort to source organic, local, and seasonal foods to feed to our own birds!

Help us save birds and their habitats by supporting organic, seasonal, locally and responsibly sourced foods!

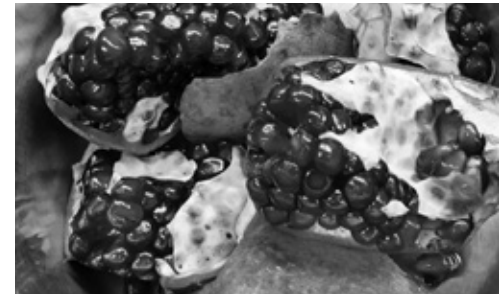
Steven Latta, Ph.D.
Director, Conservation and Field Research



ANIMAL PROGRAMS



Not only does the National Aviary prepare food that is healthy for our birds, we also pay close attention to how the food was produced and sourced so that it is also healthy for the environment.



We Fix the Finest Fare for our Feathered Friends

by Anna Steffenauer, Senior Aviculturist, Commissary

The National Aviary not only conducts research and education about the ecological benefits of locally and sustainably sourced foods — it practices what it preaches!

Feeding more than 500 birds of 150 species every single day presents many challenges, but we always strive to serve our birds the freshest, most nutritious, most sustainably sourced food possible. Like the kitchen of a major restaurant, our commissary is clean, well-organized and efficiently run. There we daily prepare and provide a wide range of delectable seasonal foods for all of our fine feathered friends, from *Anodorhynchus hyacinthinus* (Hyacinth Macaw) to *Zosterops saypani* (Bridled White-eye)!

The diets we prepare for our animals take into account species-specific natural feeding behaviors and nutritional needs, as well as the individual preferences of picky eaters, seasonal food availability, and food costs. Importantly, for the health of our birds and the environment, we also pay very close attention to how the foods we feed to our animals have been produced and sourced.

One of our principal suppliers is a premier distributor of fresh, specialty foods to the restaurant and food service industry in Western Pennsylvania. It operates out of a state-of-the-art, green-certified facility less than 20 miles from the National Aviary, and it is a member of *PRO*ACT*, a national network of local distributors that requires the highest commitment to food safety, quality and service while employing business practices focused on sustainability, community responsibility and integrity. By sourcing our produce locally and seasonally, we not only reduce the carbon footprint associated with transporting food items to us, we maximize the nutritional quality and minimize the amount of chemical additives needed to grow and store those foods.

For our *piscivorous* (i.e., fish-eating) species, such as our African Penguins and Inca Terns, we order very large bulk shipments (6-12 month's supply) of a wide variety of whole frozen fish from a distributor that subscribes to *Seafood Watch*, *Ocean Wise*, and *NOAA Fisheries FSSI* programs, and which advocates for

sustainable practices across its entire supply chain.

For feeding our other carnivorous birds, such as our owls, hawks, and kookaburras, we only source animal protein that has been ethically obtained. For the many birds at the National Aviary that naturally feed on live insects, we supply live crickets, mealworms, wax worms, and super worms that have been raised by local suppliers.

Our very deliberate provisioning of local and sustainable foods allows us to not only meet the nutritional needs of all the animals at the National Aviary, but also to minimize our impact on the environment.

Our commitment to continually provide high quality diets for our birds, sourced with environmental and animal welfare impacts in mind, is neither easy nor inexpensive. For example, we purchase 500 lbs of fresh produce each month (at a cost of \$2,000), and we prepare an additional \$9,000 worth of food for our carnivorous birds every month. But, we think it is well worth the cost to keep our fine feathered friends healthy and happy!" ■



PHOTOS BY ANDREA THOMEN

The National Aviary Promotes Chocolate that Supports Birds

continued from page 1

native overstory trees even though their cacao crops required shade. Now, thanks to efforts supported by the National Aviary, conservationists, farmers, and organic cacao certification technicians are working side by side in the Dominican Republic to create and preserve cacao farms that support native birds.

An initiative started by the National Aviary in 2013 has begun to educate cacao farmers and community members in the Dominican Republic about the benefits of shade-grown cacao. The Dominican Republic is the world's largest producer of organic cacao; cacao is grown under a shade tree canopy by 40,000 farmers there.

Working in partnership with local community organizations and conservationists, our bird-safe cacao initiative, headed up by National Aviary Research Associate, Andrea Thomen, comprises collaborative education efforts with farmers, a nascent bird-safe cacao certification program, tree plantings, and more. Our message focuses on the value of native shade trees in cacao plantations, the importance of a shrub understory

and vegetation along streams, and dispelling myths regarding bird damage to cacao crops.

We also work with a local nonprofit organization, Grupo Acción Ecológica (GAE), which is dedicated to community education focused on the need to protect habitats, biodiversity, and human health. In addition to offering conservation educational activities to cacao growers and producers, Thomen and GAE have organized workshops for school children, community groups, tour guides, and others about the benefits of biodiversity and the important role of native vegetation within cacao plantations for supporting the country's bird life.

As a result of these efforts, technicians who inspect cacao plantations have become certified as knowledgeable in techniques to make cacao growing more compatible with native bird populations, and they pass their knowledge on to the hundreds of small-scale growers in the country. In the next few years, we hope to take the project nationwide, working in new areas where many birds are at risk. ■



ABOVE: When cacao is grown under a diverse shade overstory it can provide excellent habitat for a wide variety of birds.

TOP: Pods of cacao trees contain seeds that are fermented, dried, and ground to make chocolate.

PARTNERING FOR CONSERVATION

Bird-Compatible Coffee Builds New Hope

by Steven Latta

Coffee grown in a manner that supports bird diversity is another alternative to industrial agriculture. The National Aviary partners with a Pittsburgh nonprofit called Building New Hope to promote and sell coffee grown in a manner that benefits birds.

Building New Hope is a volunteer-driven nonprofit based in Pittsburgh and Nicaragua that partners with El Porvenir, a worker-owned organic coffee cooperative that promotes and sells bird-compatible coffee. Coffee from the cooperative is grown on a mountainside near Leon, Nicaragua, where a community of 300 people collectively owns the land they farm and live on. They pride themselves on their shared dedication to preserving the biodiversity around them. El Porvenir's Arabica coffee beans are hand-picked,

dried in the sun on community patios, and carefully selected by the farmers for roasting and sale.

Sustainable eco-friendly agriculture involves more than providing consumers with a great product — it requires attention to the needs of the grower community. Building New Hope has built long-term relationships with its growers, offers them fair prices for their crop irrespective of market prices, and gives them support for community development projects.

At El Porvenir, they have developed arts, education and skills training programs for young children and at-risk youth, and high school scholarships for students in need. With their support, the community has built and staffed a primary school that has sent its first generation of students on to



high school and university. The community has also preserved 2,000 acres of native tropical dry forest, providing critical habitat for migrating birds and other species, and helping to safeguard the watershed from pesticides and herbicides.

The National Aviary is proud to partner with Building New Hope to sell coffee that promotes healthy ecosystems, and to spread awareness about how fair trade relationships can help to reduce poverty and social inequalities, while benefitting birds. ■

RECENT PUBLICATIONS

Regenerating Tropical Dry Forest: Older is Better for Birds

by Nathan Brouwer, *Research Associate*

In the bird-rich tropics, crop and ranch lands are often abandoned as soil fertility declines or economic demands shift. While these farmlands can become rapidly covered in fast growing trees, shrubs and vines, relatively little is known about how quickly animals take up residence in these regenerating forests. Do birds and other wildlife benefit from these very young, actively growing forests, or do they require more mature stands?

Tropical dry forest has been labeled the most endangered of the tropical forest types, in part because their fertile soil makes them an ideal place to grow cash crops, and the hardwood trees are prized as a source of charcoal. An estimated 90-95% of the world's dry forest has been cleared for farming, raising cattle and other human activities, reducing the amount of habitat available for birds and other wildlife.

Working in the dry forests of southern Dominican Republic, the National Aviary's

The Greater Antillean Bullfinch is one of many species dependent upon mature tropical dry forest in the Dominican Republic.

Dr. Steven Latta and co-authors compared bird species and abundance of birds occurring in four young forests previously used for pasture with birds in mature, relatively undisturbed forests. Importantly, the young forests studied spanned three decades in age, with the youngest having still been used for grazing just two years prior, and the oldest not being used for pasture for almost 25 years.

Only a few species of birds are seen in tropical pastures while they are in use, but our analysis showed that this changes rapidly when the farm is abandoned. While the return of birds in newly grown forests seems promising, most of the species returning to these sites proved to be primarily the more common and widespread species. It was only at the oldest of the four reforesting sites that birds of conservation concern, including many of the unique birds found only on the island of Hispaniola, began to be detected.

This study shows that it can take 25 years or more of forest regrowth to provide adequate habitat for some of the unique endemic species and other birds of conservation concern. Even then, the bird community in 25-year old forest remained very different from the mature forest we used as a reference site. So, while some forest may be better than no forest, our research highlights the conservation importance of protecting as much remaining mature forest as possible. ■



PHOTO BY DAX ROMÁN E.

NOTES FROM THE FIELD

A Fruitful Relationship Between Birds and Habitat Restoration

by Steven Latta

While ornithologists frequently spend many hours catching birds, harnessing the latest technology, and diving deep into DNA, we sometimes still sit back and observe and record bird behavior, such as what they are eating.

A bird's diet can have profound impacts not only on its health, but also on the habitats it uses. In this case, I was interested in whether a fruiting tree which

commonly springs up in disturbed areas attracted birds and, if so, which species?

Globally, habitat disturbance by humans is nearly ubiquitous and very frequently related to agriculture. Knowing what trees naturally grow in disturbed areas, and determining if birds are attracted to those trees, can help us design ways to quickly restore degraded habitats in a way that is beneficial to birds and other wildlife.

Sitting quietly and watching nature unfold has its own rewards. One becomes hyper-attuned to movements: the rustle of wind in the leaves, flies alighting, the glimmering wings of a dragonfly. Birds came and went, sallied or hawked for insects, hung upside down or hovered to glean the tiny *Trema* fruits. Small but significant dramas developed among the birds: there were continual evictions and displacements from the most productive foraging sites on the trees. Personalities emerged: some birds were skulkers, some sneakers, some bullies, and some thieves.

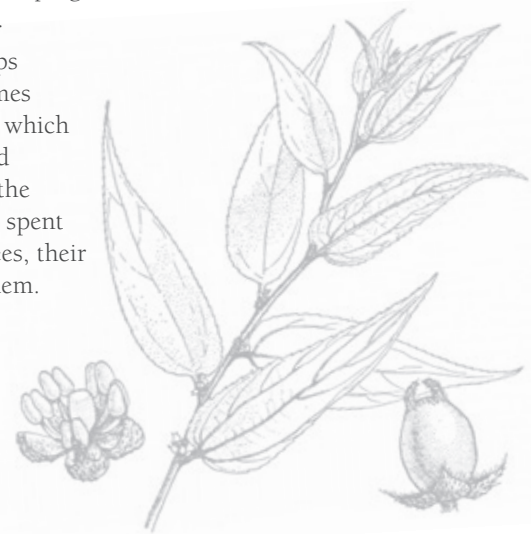
In all, I recorded 513 bird visits to the *Trema* trees under my observation. The most frequent consumer of *Trema* fruits was the migratory Cape May Warbler (*Setophaga tigrina*), but other visitors included the Black-throated Blue Warbler (*S. caerulescens*), and the endemic Palmchat (*Dulus dominicus*) and Hispaniolan Highland-Tanager (*Xenoligea montana*). I recorded a total of 85 aggressive interactions, with female Cape May Warblers involved in most of these, suggesting that *Trema* fruits are an important and defensible source of food for them.

I found that *Trema* trees not only benefit many bird species as a food resource, but that they also function as a landing target for as many as two dozen species moving across the landscape. By attracting birds, *Trema* actually facilitates the dispersal of a wide variety of native seeds — a clear benefit to restoration of deforested sites. ■

Trema trees, which frequently grow in abandoned farmland in the tropics, will attract many birds like this Northern Mockingbird with their abundant fruit and long fruiting season.

Fruit-eating birds (called frugivores) play an important role in habitat restoration, because when they perch they will often defecate and drop seeds from fruiting trees they visited earlier, in the process helping to diversify the recovering habitat.

I wanted to explore relationships between *Trema micrantha*, sometimes known as the Jamaican nettletree, which produces superabundant fruit, and the birds that feed on its fruits in the Dominican Republic. To do this, I spent about 175 hours observing the trees, their fruits, and the birds that fed on them.



RECENT PUBLICATIONS

Decoding DNA in Droppings to Diagnose Dietary Shifts in a Riparian Bird

by Brian Trevelline, Research Associate

Changes in land use, urban and agricultural run-off, and water diversion efforts can all have profound and unexpected impacts on birds dependent on riparian systems.

Early studies by National Aviary ornithologist Bob Mulvihill and colleagues showed that acid pollution from abandoned mine drainage or episodic atmospheric deposition (i.e., acid rain) negatively impacts productivity of an obligate riparian migratory songbird, the Louisiana Waterthrush. With many of their preferred aquatic invertebrate prey unable to survive in the low pH water, it was hypothesized that waterthrushes nesting on acidified streams mitigated the absence of their preferred prey by commuting to peripheral non-acidified aquatic sites for foraging, or by feeding more frequently on non-aquatic prey.

Consequently, as part of my Ph.D. research, I took on the challenge of testing this hypothesis by using advanced molecular techniques. Bird diets are notoriously difficult to study, often requiring invasive collection methods or tedious microscopic identification of prey fragments

in fecal samples, so instead I relied on a novel approach, known as DNA metabarcoding. This enabled me to obtain a very detailed description of the diets of waterthrushes from “crumbs” of genetic information in their feces.



PHOTO BY DANILO MEJIA

Results of my genetic analysis of fecal samples showed that waterthrushes consumed significantly less of their preferred prey (e.g., acid-sensitive mayflies), on streams with low pH. Results showed further that waterthrushes did, in fact, consume greater quantities of terrestrial prey, such as crickets, moths and spiders. Together, these results suggest that commuting to non-acidified aquatic habitats may not be as frequent a strategy as shifting to a more terrestrial diet for waterthrushes nesting on acidified streams.

Although our findings confirmed that waterthrushes can adjust to some levels of environmental degradation, such behavioral shifts may well carry additional costs. For example, having to fly farther away from the nest to find prey might expose the birds or their nestlings to higher rates of predation. Also, the nutritional value of these alternate foods may be lower, a possibility suggested by the earlier finding of smaller clutch sizes and lower nestling weights of waterthrushes nesting along acidified streams. New studies by our research team are seeking to more fully assess the nature and impacts of these costs. ■

Dr. Brian Trevelline prepares a Louisiana Waterthrush fecal sample for analysis to better understand how water pollution changes the bird's diet.

Industrial Agriculture: A Growing Problem for Birds

continued from page 1

While drugs in agriculture may be surprising, consider for example the use of pharmaceuticals in the meat industry. As just one example, the decimation of vulture populations across much of Asia and Africa can be traced to the widespread use of diclofenac, a potent non-steroidal anti-inflammatory drug used to treat joint inflammation in cattle. Diclofenac remains persistent in the tissues of cattle that have died, and it enters the food chain of scavengers like vultures, for which diclofenac is almost always fatal, even in small amounts.

Chemical inputs from industrial agriculture can also be poisonous to birds. Toxicology studies have identified pesticides, such as neonicotinoids, as the

leading cause of the decline in grassland bird numbers in the U.S. Evidence also suggests that widespread use of toxic pesticides has so impacted insect numbers that populations of aerial insectivores — birds that capture insects while flying — are falling precipitously. Among these species is the Common Nighthawk, which is the subject of ongoing research by National Aviary ornithologists.

Luckily, it is possible to farm in a way that is sustainable and compatible with nature, while still providing a prosperous livelihood. Examples can be found among the millions of farmers who struggle around the world to pursue traditional-style agriculture, free of the pressures of industrialization. These farmers need our support, as do

food sovereignty organizations that advocate for the rights of people to have healthy and culturally appropriate food that is produced using ecologically sound and sustainable methods.

Our colleagues at National Geographic summarized it very well in their special “2018: Year of the Bird” issue: **Agriculture must be remade in nature's image: less dependent on the addition of chemicals, more diverse in its flora, and more hospitable to local fauna.** ■





NATIONAL AVIARY
PITTSBURGH, PA

National Aviary in Pittsburgh, Inc.
Allegheny Commons West
700 Arch Street
Pittsburgh, PA 15212-5201

NON-PROFIT ORG.
U.S. POSTAGE
PAID
PITTSBURGH, PA
PERMIT NO. 3316

In this issue:

- A Growing Problem for Birds
- Everyday Choices Have Global Effects
- Fine Fare for Our Feathered Friends
- Promoting Chocolate that Supports Birds
- Building New Hope
- Regenerating Forest: Older is Better
- A Fruitful Bird-Habitat Relationship
- DNA Confirms Dietary Shifts in a Riparian Bird

10 Bird-Friendly New Year's Resolutions!

In 2019, I will...

- 1 ALWAYS keep my pet cat indoors and encourage others to do that, too.** 1.4 - 3.7 billion birds are killed each year by domestic cats allowed outdoors.
- 2 Reduce my lawn by at least 25%, replacing it with native trees, shrubs, and flowers.** Native plants support a great diversity of birds, because they are natural links in food webs.
- 3 Protect birds from striking my windows by applying UV-reflective bird tape or hanging strings outside of windows where strikes have occurred.** 1 billion + birds are killed by striking windows each year.
- 4 Drink only certified shade-grown and bird-friendly coffee, and encourage local coffee shops and establishments to provide it, too.** Nearly 150 species of birds were found in shade coffee farms compared to fewer than 10 in sun-coffee farms.
- 5 Increase my patronage of local food producers.** Eating only locally grown food for one year would save the greenhouse gas equivalent of driving 1,000 miles!
- 6 Eat more plant-based foods and A LOT LESS red meat.** About 60% of tropical forest is removed in Central and South America for cattle pasture with much of the meat sent to U.S. markets. Eating a vegetarian meal one day a week would save the greenhouse gas equivalent of driving 1,160 miles!
- 7 Reduce my family's use of and reliance on fossil fuels by turning out lights, adjusting thermostats seasonally, switching to renewable energy, and using public transportation.** Per person, average Americans require 8.2 Global Hectares (GHa) of the planet's resources (land required to produce a person's needs and dispose of the waste they create), whereas, in some other developed countries people use three or fewer GHa.
- 8 Eschew single-use plastic containers, plastic bags and straws.** Billions of pounds of plastic converge in "gyres" that cover 40% of ocean surfaces and are expected to outweigh all fish in the sea by 2050. Hundreds of thousands of seabirds ingest plastic every year.
- 9 NOT use chemical pesticides or herbicides in my home or yard.** Numerous negative health effects associated with these products exist. Levels deemed "safe" underestimate real-world health effects due to exposure to multiple chemical substances.
- 10 Contribute to or become a member of one or more organizations devoted to bird conservation or environmental protection.** The National Aviary supports programs to preserve endangered birds in the wild all around the world — through breeding and education programming. Your membership and extra donations help the National Aviary save birds and protect their habitats. ■