conservation & research updates from the national aviary **Fightpaths** FALL 2022

FROM THE EDITOR

2022 marks the 70th year of the conservation mission of inspiring respect for nature through an appreciation of birds. In this issue of FlightPaths, we look back over the years to highlight just a few of the many research projects and conservation programs that our staff have pursued in making the National Aviary a leader in avian conservation.

Conservation at the National Aviary takes many forms. As with most members of the Association for Zoos and Aquariums (AZA), we have participated in many breeding programs for threatened and endangered species. Here you can read about our leadership in breeding the Bridled White-eye and Red Siskin, and our contributions to releasing in the Andes Mountains Andean Condors that had been bred and raised here at the National Aviary.

But avian conservation at the National Aviary has grown into a program that extends beyond these impressive breeding programs. The Department of Conservation and Field Research has pursued avian monitoring programs, targeted research to identify factors affecting bird populations of conservation concern, and community outreach activities to share our love for birds and their habitats. For example, here you can read about how our long-term monitoring program in Costa Rica - one of the longest monitoring programs in the Neotropics - has led to a better understanding of the importance of forests restored after agricultural clearing.

In research, our groundbreaking studies have established the Louisiana Waterthrush as a key indicator of the ecological condition of streams and their riparian habitats. Studies of the waterthrush have been instrumental in guiding an understanding of how multiple stressors such as sedimentation, acid precipitation, acid mine drainage, and hydraulic fracturing affect riparian habitats, and how events in one season can affect the welfare of migratory birds throughout the year.

Field research programs also impart opportunities for education and outreach. In this retrospective collection of articles from avian conservation at the National Aviary, you can read how we have used our field research programs to inform educational habitats at the Aviary. In Canary's Call, we focus on how birds can be seen as bioindicators of broader environmental problems, and how the increase in human population and resource consumption have impacted birds and their habitats. Beyond the Aviary, we also draw on our research to promote ecotourism to benefit rural communities in the Dominican Republic through the creation of the Ruta Barrancoli, a national trail of birdwatching sites.

In this issue of FlightPaths we invite you to celebrate with us, and reflect on the National Aviary's successes in over 70 years of work in avian conservation. With your support, we look forward to many more years and many more successes as we pursue breeding programs, research, monitoring, and education to better conserve our world's birds and their habitats.

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



FROM 2000



n 1998, the National Aviary was presented with a great challenge to create an educational program that would engage at-risk middle school students in the sciences. A group of approximately thirty students from Columbus Middle School was selected to participate in a three-year scientific research and conservation project based on the science and art of modern aviculture. This comprehensive project focuses on the plight of a highly endangered species of bird called the Red Siskin (Carduelis cucullata).

The Red Siskin has become an extremely rare species due to its relentless and excessive persecution by bird-trappers and to its hybridization with canaries, which produce Red Factor Canaries (Serinus canaria). This offshoot species is usually infertile and leads to the necessity for trappers to catch more birds to satisfy the demand of both aviculture and the caged bird trade. The Red Siskins' habitat consists of open edges of evergreen forests or dry scrub and grassy areas, and can be found in Trinidad and Venezuela. The species has also been seen in Puerto Rico, although it is not native to that area.

The ultimate goals of this project are for the middle school students to obtain a solid education in the skills of research and global conservation, to develop a continued interest in scientific pursuits, and to produce genetically diverse birds in captivity to aid in any future insitu conservation efforts.



Red Siskin Support Team Members

Columbus Middle School was chosen by the National Aviary and the project's funder for several reasons, the most important being the school's proximity on the North Side. It is the only comprehensive middle school serving the location and drawing students from nine different elementary schools. The Red Siskin Recovery Team project, through its scientific research and conservation program, will illustrate the global connection in conjunction with the students' ability to play a major part in helping to address some of the world's challenges.

The three-year program, now ending its second year, began in the fall of 1998 with thirty sixth grade students who demonstrated great aptitude and interest in science. There are now 19 pupils remaining that have progressed through the seventh grade. Some of the original participants have moved away from the North Side, and others have transitioned out of the program. The students are in an all-inclusive classroom, where they meet with the same teachers and staff daily. The curriculum incorporates all subjects, based on the project, as well as intensive Spanish language and culture studies.

Although this research program has used the Red Siskins as a focal point, the students and their teachers have been exposed to a multitude of species and associated programs at the National Aviary. During the summer component of the first year, the students were taught animal husbandry techniques involved with providing the proper care for avian species. Within the next few months, the students will be taking a great conservation leap in their education of endangered animals during a visit to Puerto Rico. This will allow the students to see and understand first-hand the effects of introduced species, and to practice the skills they have been building for the past two years.

RED SISKIN PROJECT | Then and Now

Our work with Red Siskin conservation efforts continues today. In 2019, we welcomed several of these endangered birds to the National Aviary's state-of-the-art breeding center. We are one of only a handful of zoological institutions where Red Siskins have fledged young, and the advances made at the National Aviary have helped inform practices for other facilities caring for these special birds. A new population of Red Siskins was discovered in Guyana in 2000, but their numbers remain very low—some estimates place the total population in the wild at only several hundred birds. The work to bolster the population of this iconic species has never been more critical.

Aviary's Andean Condor Released into the Wild

by Jim Dunster, Curator of Birds

n June of 2003, the Andean Condors at the National Aviary successfully bred for the second time. The Andean Condor, a threatened species, is found high in the Andean Mountains throughout South America. Condors are scavengers, feeding mainly on carrion, usually that of guanacos and domestic livestock. Along the coast, they will also feed on dead marine mammals and take eggs from the nests of seabirds. Andean Condors average over 20 pounds in weight with large males tipping the scales at 30 pounds, making them one of the heaviest flying birds in the world. They also have a wingspan of up to 10 feet. Condors lay a single egg in a shallow cave on a cliff ledge. The egg takes about 60 days to hatch. Andean Condors are threatened due to shooting

and poisoning because it was believed that they kill livestock. Farmers have observed condors feeding on the dead carcass of their livestock and believe the condor actually killed the animal.

Our condor pair, located in an outdoor exhibit, made a scrape in the dirt and laid their egg on the ground. The chick hatched on June 26, 2003 and we knew immediately that it was a male because it had a small comb visible on top of its head. We found out soon after that the Andean Condor Species Survival Plan (SSP) had slated him to be a candidate for release into the wild. The SSP is a closely managed breeding program overseen by the American Zoo and Aquarium Association (AZA). For him to be a good candidate for release, we had to be certain that he didn't see us feeding him or his parents. If the chick saw us as the source of food, he would relate humans to food and, upon release, possibly approach people looking for a meal. We created a complete visual barrier on one side of the exhibit with a small hinged door. A tube was inserted through the door to slide the food into the exhibit. This method kept the chick from seeing even our hands. We fed the condors in this manner for over two years.

In June of 2005, the SSP notified us that we would be sending our bird to Colombia in late July for release back into the wild. He had to be separated him from his parents (which would have happened even earlier in the wild) and underwent several veterinary tests before he could be shipped.



andean condor release *Then and Now*

N early 20 years have passed since this wild release, and the National Aviary's involvement in Andean Condor conservation has only deepened in that time. We maintained a long-term monitoring program in Ecuador that led to the creation of new protected areas of critical habitat.

We've also collaborated with colleagues there, allowing for the exchange of expertise and best practices to improve the success rate for breeding Andean Condors in human care. Bioparque Amaru, a zoo based in Cuenca, has become an important partner: the staff of our respective institutions have traveled to learn from one another, and the Aviary was proud to donate materials to help establish their veterinary hospital and a new outdoor flight enclosure. Just recently, in the summer of 2022, we welcomed Marijo, a chick hatched to Lianni and Lurch, and the first to hatch since the 2015 renovation of Condor Court.

FROM 2013

New exhibit asks, "Are we listening?"



Canary's Call has beautiful mixed media content and brand new bird displays that will provide many new education opportunities at the National Aviary.

The proverbial "canary in a coal mine," is anything that forewarns us of danger. A century and a half ago the caged canary that miners carried deep into mine shafts could be a literal life-saver. In the poorly ventilated tunnels where toxic coal gases could accumulate, the canary's call assured miners that the air was fit to breathe. If the more sensitive birds suddenly stopped calling, this provided the miners advance warning to evacuate the mine before they, too, succumbed.

This vivid, historical example of people's knowledge that birds are reliable and sensitive barometers of the environments we share with them inspired the name for the National Aviary's newest exhibit: *Canary's Call*. Earth is an island where humans, birds and other living things compete with one another for limited natural resources. Like the canary in a coal mine, birds show earlier symptoms of an unhealthy environment and of the effects of our unsustainable use of resources. But, are we listening to their calls? Through living birds and other animals, beautiful photography, thoughtful messages, and interactive games, *Canary's Call* is designed to engage, teach, and remind visitors that our own survival depends on heeding the call to preserve biodiversity by reducing our individual and collective impacts on the environment. Habitat loss, invasive species, pollution, population growth, and overconsumption all need to be reduced if we hope to live in a world where "canaries" always call.

We are currently developing new school programs that will link the messages of *Canary's Call* with state and national academic standards for environment and ecology. The programs will support study of important ecological concepts, like carrying capacity, as well as provide opportunities for students to address environmental ethics and decision-making.

NEW EXHIBIT ASKS, "ARE WE LISTENING?" Then and Now

Close to a decade since we opened the doors to Canary's Call, the story communicated by this museum-style exhibit grows ever more relevant as we see the effects of a continually growing human population on the environment come into sharp relief.

Birds have been telling us that through habitat loss, the introduction of invasive species, pollution, and overconsumption, we are making life untenable for a great many species, and they are vanishing. Recognized as the cause of the "Sixth Great Extinction" by many scientists, we have earned a place usually reserved for massive yet slow geological processes or sudden catastrophes like asteroid impacts—welcome to the Anthropocene.

Now it is time to act and to live in ways that will enable us to share Earth's resources fairly and equitably with all species, ensuring a future for birds and people alike.

New Study Uses Songbird as Bioindicator of Potential Impacts of Hydraulic Fracturing

Steven Latta, Director of Conservation and Field Research

S ince the days when canaries were used in coal mines to warn workers of dangerous fumes, to the observations of Rachel Carson in identifying the role of pesticides in raptor population declines, birds are known to be valuable indicators of changes in our natural environment.

Building upon research begun in 1996, The National Aviary's Department of Conservation and Field Research has been studying the Louisiana Waterthrush as an indicator species for the health of Pennsylvania's watersheds.

Based on this proven sensitivity to water quality, the Pennsylvania Game Commission formally recognized the Louisiana Waterthrush as a "Species of Greatest Conservation Need" in its Wildlife Action Plan, and as an indicator of high quality forested headwaters in the state. Similarly, the National Park Service employed the waterthrush as a "Vital Sign" of stream ecosystem integrity across its entire Eastern Rivers and Mountain Network.

Once the waterthrush was established as a bioindicator of the health of riparian ecosystems, National Aviary researchers recognized that as a top predator, the waterthrush would be an excellent sentinel species.

Over the past several years my colleagues and I have dedicated research to better understand possible risks to surface waters from hydraulic fracturing activities. Building on our previous Louisiana Waterthrush research studies, this new study is based on feathers collected from waterthrushes inhabiting dozens of headwater streams in three states overlying the Marcellus and Fayetteville shale regions. The feathers were analyzed for the presence of barium and strontium. two metals that are not harmful to humans but can act as markers because they are elements that occur naturally and abundantly in the shale layer but are not common in surface waters.

In both the Marcellus and Fayetteville shale regions, barium and strontium were found at statistically significant higher levels in feathers of birds in sites with fracking activity than at sites without fracking.

The question of what pathway these metals followed from the shale layers to enter the food chain was not examined by this study. Our data suggest, however, a recent origin for these metals in the riparian systems we studied; levels of barium and strontium in feather samples from reference sites in the Marcellus Region without fracking activity did not differ from historical samples of waterthrush feathers from the 1990s gathered prior to any fracking in the region.

Our finding of similarly elevated levels of metals associated with fracking in two geographically distant shale formations suggests hydraulic fracturing may be affecting surface waters, and underscores the need for additional monitoring and study to further assess whether any ecological or human health risks are posed by the increasingly widespread development of unconventional sources of natural gas around the world. Our study was limited to the base line analysis described above, and extensive further testing and analysis would be required to determine the levels, if any, of any dangerous substances in the watershed.

As human populations increase, our demand for natural resources also increases. Water quality and energy development increasingly are critical issues to people across Pennsylvania, the U.S. and the world. Understanding the environmental impacts of energy development and the impact of development and land use decisions on water quality in particular, are absolutely needed. My hope is that the Louisiana Waterthrush will be understood as a biological 'canary in the coal mine.'

BIRDS AS BIOINDICATORS | Then and Now

The National Aviary's work with the riparian habitat specialist Louisiana Waterthrush goes back more than 25 years, building on the work of Ornithologist Robert Mulvihill from his days at Powdermill Nature Reserve. Studying this small songbird continues to yield important insights into the species' sensitivity to environmental changes brought about by the cumulative demands for energy, food, and living space of a human population that is growing in size and per capita ecological footprint. We have already documented that waterthrushes are negatively affected by 1) acidification of stream water due to abandoned mine drainage; 2) acid deposition from fossil-fuel burning power plants; 3) hydraulic fracturing (fracking) for shale gas; 4) sedimentation from soil erosion associated with agriculture and residential and commercial development; and, 5) loss of forested riparian habitat.

Our approach of studying the bird on both its breeding territory and where it overwinters has enabled us to get a clearer view of its full annual cycle—something that is notoriously difficult to accomplish with Neotropical migrants. From this single species, we have gleaned insights into the potential epigenetic responses of birds to shale gas development and demonstrated that poor conditions on wintering grounds can carry over to a bird's breeding grounds, affecting their reproductive success. What we are learning from the Louisiana Waterthrush can provide clues into changes that other animals—and that includes humans (remember, the canary in the coalmine story is not apocryphal, it is true)—potentially may experience whenever human-caused actions create environmental shifts.

Ten Years Monitoring Birds in Costa Rica

Steven Latta

n a scenic coffee-producing area in the L southern highlands of Costa Rica, National Aviary collaborators from the San Vito Bird Club (SVBC) recently reached a milestone: completion of ten years of year-round bird population monitoring. This biologically rich region has many endemic bird species, like a spectacular toucan, the Fiery-billed Aracari; but it also is home to throngs of North American migrant songbirds for up to six months of the year.

10 YEARS OF MONITORING IN COSTA RICA Then and Now

easuring changes in avian Mpopulations over time is of critical importance to conservation biologists, as well as land and resource managers.

Without long-term monitoring data, we are unable to effectively assess the impacts of natural habitat change, management practices, or-most critically-human-caused changes to the environment. This may include anything such as shifts in agricultural practices, forestry operations, water pollution, industrialization, or human-caused climate change. Long-term monitoring programs are very rare in the Americas, but at the National Aviary, we have led three such constant-effort monitoring efforts with one each in Costa Rica, Ecuador, and Dominican Republic.

In our first look at data from ten years of monitoring in Costa Rica, we are able to explore some positive aspects of reforestation following agricultural abandonment: an unusually optimistic view of the resiliency of birds if given the opportunity to thrive!

The bird monitoring has been done at three privately-owned fincas, or ranches, containing second-growth forests typical of this region. SVBC co-investigators, Judy Richardson, Alison Olivieri, and Julie Girard, often lead local volunteers and visitors through an array of mist nets set up in the forest understory to capture birds for their bird-banding studies. On occasion they are thrilled to recapture birds banded months or even years earlier, which provides vital data concerning survival rates of birds.

The club not only monitors birds, it sponsors regular bird walks for community members, conducts birding outreach (Detectivos de Pajaros, or Bird Detectives) for local schools, participates in an annual Eco-Cultural Festival, and more. The National Aviary salutes its friends from the San Vito Bird Club and applauds all they have accomplished in a decade of bird population monitoring and conservation education!

An Aracari Toucan of

the Costa Rican highlands

Bridled White-eye Breeding Breaks New Ground Season. There, our aviculturists have created a controlled microhabitat th. simulates their native forest, adjustin things like nesting materials and food, to the temperature in the room to give the birds the best chance of success.

fter almost two years of encouragement, countless nests being built, and dozens of eggs laid, a pair of Bridled White-eyes successfully fledged a chick in our breeding center. Only the second successful fledging in a North American zoo, this breeding is a breakthrough that has significant implications for international conservation.

Since 2006, six different zoo programs have tried establishing successful breeding protocols for this endangered species, to no avail. Breeding is a complex process of managing countless variables. For example, our aviculturists manage a group of Bridled Whiteeyes in same-sex flocks in the breeding center, but then set them up in pairs during breeding

season. There, our aviculturists have created a controlled microhabitat that simulates their native forest, adjusting temperature in the room to give the birds the

On previous rearing attempts, staff documented excellent parental rearing behaviors but noticed that the chicks would be strong one day and weak the following morning. As they discussed all the possible reasons for this decrease in strength, our aviculturists realized the issue might be simple. Knowing that chicks had huge energy requirements and that parents feed a chick only during the day, staff believed that they could encourage the parents to feed the chick more by exposing the birds to light for longer periods of time — up to 18 hours per day.

This extended light exposure increased feeding and appears to be the key to success for this fledging, though it may take another breeding cycle or two to know for sure. It's an extremely promising breakthrough that complements

years of fieldwork we have conducted in the South Pacific as part of the Marianas Avifauna Conservation project. Our aim is to establish sustainable breeding programs where parents rear their own young, to give the Bridled Whiteeyes the best long-term chance for survival.

Our aviculturists will repeat this technique with other hatchings and share what they learn with other participating zoos, contributing to the body of knowledge to protect and preserve species worldwide.

BRIDLED WHITE-EYE BREEDING Then and Now

ridled White-eyes, now called Saipan DWhite-eyes, are a focal species of the Marianas Avifauna Conservation (MAC) project, which is working very hard to protect the island chain's endemic birds from the potential spread of the invasive brown tree snake.

The behind-the-scenes work that takes place in Association of Zoos and Aquariumsaccredited zoos like the National Aviary is bolstering the in situ conservation work that is helping save species from imminent threats. The complementary approach of breeding vulnerable species in human care ensures that they have a long-term future.

Not only do our aviculturists work creatively behind the scenes to simulate natural habitats and environmental conditions that will encourage natural breeding behaviors in birds like the Saipan White-eye, they also share these advances with a community of professionals dedicated to protecting these species from suffering the same sad fate that so many of Guam's endemic birds did.

Guam Rail Conservation: A Milestone 30 Years in the Making

by Kurt Hundgen, Director of Animal Collections

A t the end of 2019 the conservation world celebrated a momentous achievement: Guam Rail, once 'Extinct in the Wild,' was elevated to 'Critically Endangered' status thanks to the recent successful reintroduction of the species to the wild. This conservation milestone is more than thirty years in the making the hoped-for result of intensive collaboration among multiple zoos and government agencies separated by oceans and continents. It is an extremely rare conservation success story, shared by only one other bird: the iconic California Condor.

The Brown Tree Snake (Boiga irregularis), which was accidentally introduced on Guam in the mid-twentieth century, underwent a population explosion, reaching densities of up to 30,000 snakes per square mile by the late 1980s. They rapidly decimated populations of nine of Guam's 11 endemic forest bird species. In 1987, wildlife biologists managed to rescue the few remaining Guam Rails a mere 21 birds—and place them in the care of a handful of Association of Zoos and Aquariums (AZA) accredited zoos. a mere 21 birds—and place them in the care of a handful of Association of Zoos and Aquariums (AZA) accredited zoos.

Working together through the Guam Rail Species Survival Plan® (SSP), some twenty zoos strategized ways to ensure the genetic diversity and health of this small population of Guam Rails in human care. Their goal was to increase the size of the zoo population and eventually introduce the species onto islands near Guam that remained free of Brown Tree Snakes.

Guam wildlife officials have slowly returned Guam Rails to the wild on the small neighboring islands of Cocos and Rota. Reintroduction programs are most successful when local governments and citizens invest in and drive the efforts. Reestablishing wild populations of ko'ko' birds, as the species is called on Guam, has been a tremendous source of pride for the people of Guam.

Even during the COVID-19 pandemic, the work of conserving the species has continued. In October 2020, 49 more rails were introduced on Rota, eight of which hatched at the National Aviary. The National Aviary has hatched more Guam Rails for reintroduction than any other North American zoo. Birds are thriving in their new island homes, and, best of all, recent sightings of unbanded rails there confirm that the species has already successfully reproduced in the wild for the first time in almost 40 years.

The international collaboration that made the success of the Guam Rail reintroduction possible likely will go down in conservation history. Behind every ko'ko' once again living in the wild is the very successful collaboration among many organizations and hundreds of dedicated conservationists.

And we hope that there will be another headline-grabbing story to share: after decades of work in select zoos, the population of Guam Kingfishers—another 'Extinct in the Wild' species—may soon be large enough to support another historic reintroduction effort. Our partners continue to focus on preventing further spread of Brown Tree Snakes so that the restored population of Guam Rails (and, potentially, of Guam Kingfishers, too) will be able to once again thrive in the wild.



A Guam Rail and her recently hatched chicks in the National Aviary's Tropical Rainforest. More Guam Rails have hatched at the National Aviary than any other North American zoo.

GUAM RAIL IUCN | Then and Now

The status change from Extinct in the Wild to Critically Endangered for the Guam Rail was a major feat of conservation that spanned decades and continents.

With Guam Rails once again thriving in the wild and reproducing, conservationists' sights are now set on the Guam Kingfisher. Biologists are taking preliminary steps now for the birds' eventual return to the wild as they develop and test monitoring equipment and ready habitats for their arrival. Birds hatched here at the National Aviary in Pittsburgh undoubtedly will help that once extinct-in-the-wild species make history, too!

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