



2021

ANNUAL CONSERVATION REPORT

BRANDYWINE ZOO

ACCREDITED BY THE
**ASSOCIATION
OF ZOOS &
AQUARIUMS**



DELAWARE STATE PARKS
YOUR OUTDOOR ADVENTURE STARTS HERE

CONSERVATION IN ACTION



Above: American kestrel chick during banding

INTRODUCTION

The Brandywine Zoo's vision is to **inspire awe and action for wildlife**, and, as such, the opportunities that we cultivate throughout our organization through our Conservation Action Plan aim to contribute to the long-term survival of animals and their ecosystems. Wildlife here in Delaware and around the world are under threat because of human activities, and without action many species, including some of those in our care here at Brandywine Zoo, may disappear from the wild in our lifetime. Conservation, to the Brandywine Zoo, is threefold for wildlife and wild places: educating the public to inspire awe for animals, actively engaging communities to take action for wildlife, and studying and protecting wildlife both in- and ex-situ.

Zoos are capable of incredible conservation. Leveraging our unique combination of living animals, visitor education, community engagement, and scientific research, zoos are capable of making substantial contributions to save animals from extinction. Modern zoos accredited by the Association of Zoos and Aquariums are leaders in both ex-situ and in-situ wildlife conservation and research. Accredited organizations such as Brandywine Zoo have a great opportunity, and responsibility, to play a role in saving animals from extinction. They also provide top-quality care through state of the art animal habitats, and advanced welfare, husbandry procedures, and modern zoological practices. Furthermore, zoos like Brandywine are able to mobilize large audiences to care about and act on behalf of wildlife.

Through a demonstrated commitment to conservation, education, research, and community engagement, Brandywine Zoo is a recognized leader in wildlife conservation for the State of Delaware and our region. Already, the Zoo has formed ongoing and lasting partnerships with government and nonprofit entities across the state and region, and in bringing together expertise across multiple platforms, the Zoo aims to further enhance these partnerships to save wildlife threatened with extinction by habitat loss, climate change, or human-wildlife conflict.

The zoo's Conservation Action Plan supports the mission of the Brandywine Zoo to **promote wildlife conservation** through immersive, extraordinary, inclusive, and relevant educational experiences that empower people to engage in conservation within their own communities, through **participation** in regional and international programs for endangered species, and through **collaboration** with community and conservation partners. This Conservation Action Plan will allow Brandywine Zoo to address multiple issues and wildlife crises through the species living at Brandywine Zoo, through interactive features of their animal habitat, through programming and community engagement, and through conservation action.

WHO WE ARE

Mission

The Delaware Zoological Society is a dedicated partner of the Brandywine Zoo and supports its mission to engage in and inspire wildlife conservation.

Vision

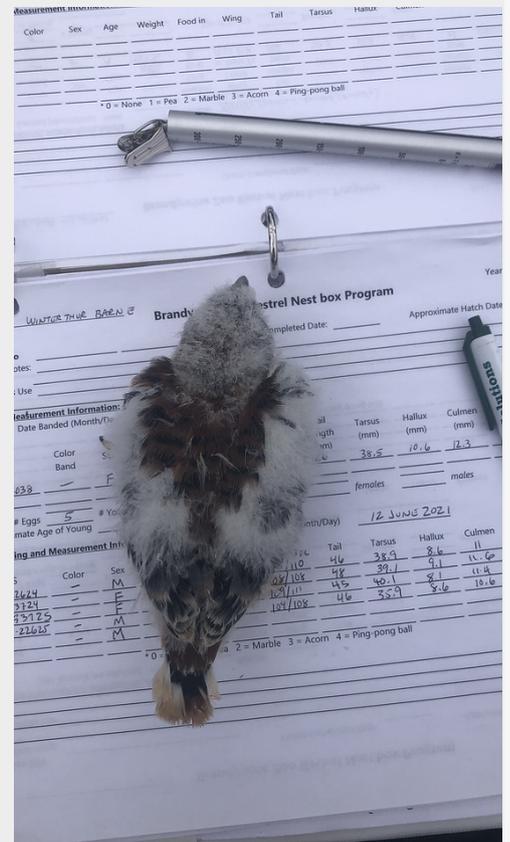
For every guest and every visit, we strive to inspire awe and action for wildlife.

Conservation Focus

The conservation programs we support, through staff-involvement, community engagement, and financially, focus on themes that both align with our organizational core values and address the complexities of wildlife conservation through a social lens. **Our main themed areas of focus are:**

- **Urban Conservation, Social, and Environmental Justice** - with particular focus to climate change and urban environmental justice, we recognize that for conservation to be impactful, it must be relevant, integrate stewardship, and social justice in order to be comprehensive,
- **Community Engagement** - it is time we reach beyond our gates to foster and support community-driven conservation projects that are initiated and organized by our local communities.
- **Human-Wildlife Coexistence** - we will focus on ways to improve human-wildlife relationships and affect conservation that positively benefits wildlife and humans.

Below: American kestrel chick during banding



FIELD WORK



AMERICAN KESTRELS

Since 2014 - present

Nest box and population monitoring conducted by zoo staff, interns, and community volunteers of this state-listed Endangered Species. The Zoo is a founding member and project leader of the **Delaware Kestrel Partnership**, a joint venture working group. Working in partnership with DE Fish and Wildlife, the American Kestrel Partnership, and dozens of public and private landowners, the DKP monitors American kestrel nest boxes across the state, bands kestrels, collects samples, and shares data with various research projects in order to better understand their decline here in Delaware and across North America.

2021 Activities

This year, we continued to monitor active nest boxes and band adults and chicks in their boxes. Community Scientists are annually used and monitor their assigned nest boxes and collect data and **volunteers contributed 242.5 hours** of service this year.

For the second year in a row, we collected blood samples from adults and chicks to check for toxicology. Blood samples were collected by Dr. Erica Miller, of Wildlife Futures (University of Pennsylvania) and submitted to a Masters student researcher working with Hawk Mountain Sanctuary. For this same project, we additionally used footprint track tubes to detect small mammal abundance at nest locations. Zoo staff also trained with Hawk Mountain in deploying radio telemetry devices on kestrels.

Additionally, we began adding colored leg bands to birds this year to make individual identification from a distance easier. This will hopefully increase detections of birds banded at nest boxes in Delaware by everyday birders, landowners, and the general public, who can report their sightings to the USGS Bird Banding Lab.

Finally, the American Kestrel Fully Cycle Phenology project, which we submitted feather samples to in previous years for the genoscape, finally published its findings this year in the journal *Ornithology*.

Publications

- Ruegg, K. C., Brinkmeyer, M., Bossu, C. M., Bay, R. A., Anderson, E. C., Boal, C. W., Dawson, R. D., Eschenbauch, A., McClure, C. J., Miller, K. E., Morrow, L., Morrow, J., Oleyar, M. D., Ralph, B., Schulwitz, S., Swem, T., Therrien, J.-F., Van Buskirk, R., Smith, T. B., & Heath, J. A. (2021). **The American kestrel (*Falco Sparverius*) genoscape: Implications for monitoring, management, and subspecies boundaries.** *Ornithology*, 138(2). <https://doi.org/10.1093/auk/ukaa051>



Dr. Erica Miller, DVM, and Conservation Research Apprentice Abigail McBride blood sampling an American kestrel



American kestrel "003" with colored leg band



Full Cycle Phenology

Using genetic-to-landscape approaches to study the timing of avian life cycles from a year-round and range-wide perspective



URBAN WILDLIFE

Since 2017 - present

The Zoo's Urban Wild project monitors urban wildlife across New Castle County, DE and southeastern Pennsylvania. Focusing primarily on urban terrestrial mammals, this program consists of a camera trap transect across New Castle County with additional satellite cameras at select locations of interest. Our data collected are shared with numerous international research projects, which resulted in several publications using Wilmington data in late 2020-2021. This program utilizes community scientists for camera deployment and data tagging.

Data Sharing

Urban Wildlife Information Network (UWIN)- Our primary passive monitoring camera trap project is in partnership with Lincoln Park Zoo's *Urban Wildlife Institute*, which coordinates UWIN, a network of 38 and counting cities across North America and (new in 2021) Europe. This project monitors terrestrial mammal populations via camera traps at more than 30 locations across New Castle County, DE, and Chester County, PA. Our Curator of Education and Conservation sits on the Administration Committee for the UWIN network.

Snapshot Mammal (formerly Snapshot USA) - We conduct an annual survey each September to submit to this terrestrial mammal study, which is coordinated with Wildlife Insights and the North Carolina Museum of Natural Sciences and the Smithsonian Conservation and Biology Institute.

2021 Activities

In spring, 2021, we piloted, with 11 other UWIN cities, the co-deployment of AudioMoth acoustic monitors at camera sites. These were deployed as a beta test as the network looks to expand beyond mammal surveys with cameras. Our devices were set to a frequency to detect songbirds and deployed during peak spring migration for a period of two weeks. We've also been testing and designing 3D printed cases for the AudioMoths.

Additionally, we shared data with the University of Delaware's professor Dr. Kyle McCarthy, associate professor in the Department of Entomology and Wildlife Ecology. Dr. McCarthy and a student began to analyze data from our ongoing carcass dump-site surveys, looking at scavenging succession.

Finally, we launched an iNaturalist project to collect coyote sightings in Delaware, called Delaware Coyotes. Great thanks to our team of community science **volunteers who contributed over 250 hours** to this project this year deploying cameras and tagging data.

We also created teacher loan kits and developed curriculum for a new program, **Urban Wildlife Labs**, thanks to funding from the Greenville Zoo.

Publications

- Cove, M. V., Kays, R., Bontrager, H., Bresnan, C., Lasky, M., Frerichs, T., Klann, R., Lee, T. E., Crockett, S. C., Crupi, A. P., Weiss, K. C., Rowe, H., Sprague, T., Schipper, J., Tellez, C., Lepczyk, C. A., Fantle-Lepczyk, J. E., LaPoint, S., Williamson, J., ... McShea, W. J. (2021). Snapshot USA 2019: A Coordinated National Camera Trap Survey of the United States. *Ecology*, 102(6). <https://doi.org/10.1002/ecy.3353>
- Fidino, M., Gallo, T., Lehrer, E. W., Murray, M. H., Kay, C. A., Sander, H. A., MacDougall, B., Salsbury, C. M., Ryan, T. J., Angstmann, J. L., Amy Belaire, J., Dugelby, B., Schell, C. J., Stankowich, T., Amaya, M., Drake, D., Hursh, S. H., Ahlers, A. A., Williamson, J., ... Magle, S. B. (2020). Landscape-scale differences among cities alter common species' responses to urbanization. *Ecological Applications*, 31(2). <https://doi.org/10.1002/eap.2253>
- Magle, S. B., Fidino, M., Sander, H. A., Rohnke, A. T., Larson, K. L., Gallo, T., Kay, C. A., Lehrer, E. W., Murray, M. H., Adalsteinsson, S. A., Ahlers, A. A., Anthonyamy, W. J., Gramza, A. R., Green, A. M., Jordan, M. J., Lewis, J. S., Long, R. A., MacDougall, B., Pendergast, M. E., ... Schell, C. J. (2021). Wealth and urbanization shape medium and large terrestrial mammal communities. *Global Change Biology*, 27(21), 5446–5459. <https://doi.org/10.1111/gcb.15800>



Coyote at Sunset Lake, Delaware



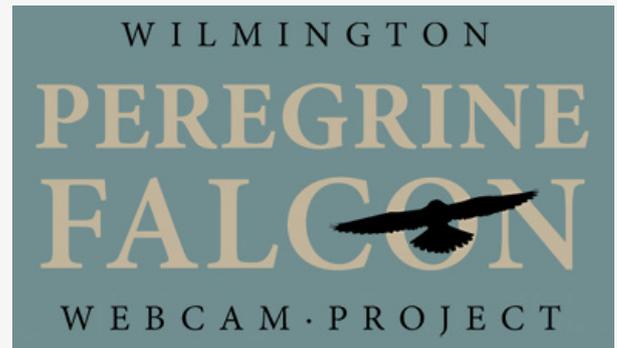
AudioMoth device ready for deployment



PEREGRINE FALCONS

Since 2020 - present

In 2020, the Brandywine Zoo became the primary coordinator for a longstanding peregrine falcon nest box project in downtown Wilmington. This project, started and run by a local Delaware Ornithological Society volunteer Kim Steininger, takes place for a two-week window each spring as that year's chicks begin to fledge. Community science volunteers monitor chicks from sunrise to sunset to monitor for fledglings in trouble.



2021 Activities

In 2021, over 23 volunteers helped monitor the peregrines during Fledge Watch with hundreds of viewers watching the live nest cam on Youtube and highlights via Facebook. This year, the returning peregrine pair, Red Girl and Trinity, had a clutch of five eggs, four of which hatched. Volunteers began monitoring the chicks after one early fledge attempt that landed the fledgling in a parking garage where she was captured and taken back to the top of the Brandywine building. Almost two weeks after the first fledge, all four females, successfully fledged.

Zoo staff, Delaware Fish and Wildlife, and U.S. Fish and Wildlife took part in the banding of the peregrine chicks this year at the Brandywine Building in downtown Wilmington.

Volunteers contributed 254.5 hours of their time monitoring this year's fledglings during Fledge Watch 2021.



2021 peregrine falcon chicks in their nest box after banding.

This project is possible with a supporting partnership with Chemours, who funds the live nest box webcam through the Delaware Ornithological Society.



OTHER RAPTORS

Since 2019 - present

Our conservation staff began working with DE Fish and Wildlife staff in 2019 to assist in banding barn owls in their long-standing nest box program. We also began sending staff to assist at the Cape May Raptor Banding Station, in Cape May New Jersey, in the fall of the same year. These projects both involve raptor banding experience for our conservation intern but also help to advance raptor research in the region.



Left: barn owl chick after banding in Delaware; Right: juvenile red-tailed hawk at the Cape May banding station.

2021 Activities

In 2021, zoo staff attended the **Cape May Raptor Banding Project's** banding station for three days in November. Our year-long research apprentice was able to develop experience setting up the station, using different traps, and handling various raptors.

Additionally, our field staff assisted **DE Fish and Wildlife** for two days to band barn owls in May and June 2021. Our conservation research apprentice also shadowed researchers at **Hawk Mountain Sanctuary** when they were deploying telemetry devices on American kestrels on two occasions.



2021 barn owl banding in central Delaware.



AZA SAFE PROGRAMS

ASSOCIATION
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PARTNERSHIPS TO SAVE ANIMALS FROM EXTINCTION



AFRICAN VULTURES



**NORTH AMERICAN
MONARCH
BUTTERFLY**



**NORTH AMERICAN
SONGBIRD**



Vultures play a key role in disease control and waste removal that is critical for the stability of the ecosystems in which they live. The threats to their survival, mainly poisoning and collisions, and their conservation needs also overlap heavily with a number of other key species and an ideal species to focus on for wide-reaching, landscape-level conservation efforts. The main goals of this program focus on reducing poaching and poisoning incidents, training rangers and community members, research, and reintroduction.



Monarch butterflies are experiencing steep declines. Since the 1980s, Eastern overwintering populations of monarch butterflies have decreased by over 80%. This dramatic population decline is due to habitat loss, pesticides, and climate change throughout the continent. Some of the main initiatives of Monarch SAFE include citizen science and public education on monarchs and their plight, habitat creation and restoration, and research.



North American Songbird SAFE focuses on some of the main threats to songbirds here in North America. Among them, the program goals address or engage the public on: Reducing bird strikes, keeping cats indoors to prevent predation of songbirds, Bird Friendly Coffee® certification, grass-fed beef to help save grassland birds, certified sustainable paper products to help preserve the nesting grounds of boreal forest songbirds, native songbird citizen science projects, and celebrating World Migratory Bird Day annually.

NORTH AMERICAN MONARCH



Since 2020 - present

In 2020, Brandywine Zoo became part of the Monarch SAFE initiative. Brandywine Zoo is working to save monarchs by planting native milkweed, selling or giving away milkweed during some events, encouraging citizen/community science participation in our guests, and educating our guests on what they can do at home to help monarchs and spread our mission of increasing local biodiversity beyond larger areas that are suitable for prairie installations.



2021 Activities

Brandywine Zoo currently has multiple areas on site zoo where we grow butterfly weed (*Asclepias tuberosa*) as well as other native plants to promote pollinators on grounds. For the first time, we collected butterfly weed seeds to propagate our own seedlings or to sell or give away in seed packs. We hope to start a community seed-saving program in 2022.

Migration Study

In 2021, we participated in the **M3 Monarch Migration Study** by University of Michigan utilizing Onset HOBO MX 2202 data loggers to collect light, pressure, and temperature data on zoo grounds. This information will help researchers determine the daily flight paths of individual monarch butterflies for the first time ever! By using new technologies such as this, we can better track Monarchs' migration and protect their migration routes.



Onset HOBO MX 2202 data logger deployed on zoo grounds



2021 Fall Native Plant Sale

Pollinator Plant Sale

This fall, Education and Conservation interns organized a native plant sale with messaging for Monarch SAFE and fall migration to spread the importance of having native plants in every backyard. This sale raised **\$1454.42** for our conservation programs. Thanks to *Total Wine and More!* for the donation of cardboard 6-packs to hold our plants! We hope to repeat this sale in 2022. We sold butterfly weed, ironweed, echinacea, and goldenrod in this year's sale.



NORTH AMERICAN SONGBIRD

Since 2021- present

In 2021, the Brandywine Zoo became the 40th program partner of the North American Songbird SAFE program. We are messaging about songbird plights on zoo grounds through education and interpretation and working with community partners to reduce risks to songbirds.



2021 Activities

This year, we began efforts to revitalize Wilmington's dormant Lights Out Wilmington project by meeting with old and new partners for the program. We also coordinated volunteers to patrol downtown Wilmington and log bird strikes in a new project on iNaturalist for Wilmington bird strikes, called **Lights Out Wilmington Bird Strike Data**.

We also purchased new styles of bird feeders for our nature playground for demonstrations for the public.

We also partnered with **Brandywine Coffee Roasters** (BCR) and **Brew Ha Ha** (BHH) cafes to begin selling Brandywine Zoo Brew, a Bird Friendly© coffee from Honduras that is certified by the Smithsonian Migratory Bird Center's **Bird Friendly**© program and is one of the initiatives of the NAS SAFE program. \$2 from every bag goes toward the Brandywine Zoo's conservation programs, and \$0.10 to the Bird Friendly program and is available at Brew Ha Ha cafes, online at Brandywine Coffee Roasters' website, and in the Zootique. Already, this program has raised than **\$1,257** from coffee sales between July and December 2021 at BHH and BCR, and **\$50** from bags sold in the Zootique.



\$1,316 RAISED FROM SALES

We also partnered with **Double Spiral Chocolate**, a local artisan, to make a chocolate bar with Brandywine Zoo Brew Bird Friendly coffee. \$0.25 from each bar goes to our conservation programs and it is available in our Zootique. While this program started late in the year, it raised **\$9** already!



AFRICAN VULTURES

Since 2018 - present

We have been leaders in this SAFE program since 2018, developing content for International Vulture Awareness Day and Vultures SAFE education and engagement toolkits used by AZA zoos and aquariums as well as nonprofits, teachers, and families.

We annually coordinate a T-shirt fundraiser, which has raised over \$10,000 to date.



2021 Activities

This year, we again developed a resource toolkit for IVAD 2022, including social media graphics used to celebrate on the conservation holiday.

This year, we added Bitly links to online resources to better track community usage of the toolkit, which was accessed over 250 times by at least 46 organizations (who chose to note their affiliation when accessing the kit).

We also are leading the way for developing a new team of subcommittees within the Education and Engagement committee.

We again coordinated a T-shirt fundraiser for the SAFE program. This year's fundraiser made \$1,192 in sales by December 2021 from the online shop. 100% of the proceeds goes toward our the Vultures SAFE program.



AZA ANIMAL PROGRAMS



In 2021, our Madagascar exhibit officially opened, which added four new Species Survival Plan Program species to the Brandywine Zoo: **black and white ruffed lemurs**, **ring-tailed lemurs**, **crowned lemurs**, and **radiated tortoises**. While we are not a formal program partner, radiated tortoises also have an AZA SAFE program.

We additionally added, **southern pudu** and returned back on exhibit our **toco toucans** in one of our South American exhibits.



CONSERVATION GRANTS

IN 2021, WE DONATED **\$7,115** TO PARTNERS THROUGH OUR CONSERVATION GRANTS PROGRAM

In 2021, we began a formal conservation grants program to be able to better support projects around the world who align with our mission and goals.



\$3,000

Forest connectivity for biodiversity: Jaguars in jeopardy

Location: Nargana Wildlands - Guna Yala Indigenous Territory, Panama

Kaminando Habitat Connectivity Initiative (Kaminando) is a non-profit organization striving to maintain habitat connectivity and biodiversity within the Indigenous Guna Yala territory and adjacent lands in Panama. With an emphasis on the threatened jaguar, Kaminando embraces advanced biological research and community engagement, merging applied science with traditional ecological knowledge to create a collaborative conservation effort. The project's research component deploys a network of motion-activated camera traps to capture images of jaguars and prey to bridge the knowledge gap on jaguar ecology and prey availability in the region. Further, the project cultivates social awareness, behavioral change, and leadership skills as catalysts for systematic change and human-wildlife coexistence.



\$1,550

Lemurs, Learning & Livelihoods - Inspiring Global Conservation Action

Location: Andavakoera, Madagascar

Funds will support community income generation by securing raw materials for basket-weaving, safeguarding palms from cattle with fencing, hosting workshops for Vehivay Mandroso Women's Association, conservation-education focused art projects, habitat restoration efforts that mitigate climate change and provide income, and data collection for program analysis.



MADAGASCAR
Biodiversity Partnership

\$2,065

Alley cropping in reforestation – a pilot project in Madagascar

Location: Sangasanga Mountain, Kianjavato, Madagascar

Funding will allow MBP to explore the experimental use of alley cropping reforestation efforts and will go toward the installation of the first phase of the alley cropping system. Phase one, which planting the rows of fast-growing species and alleys of cover crops will be completed in the first year and slower-growing native trees in phase two. The harvested "crop" trees will help native trees go and provide economic benefits when harvested. Funding will also be used to purchase shovels and to buy locally made baskets to transport seedlings to Sangasanga mountain, cover the cost of labor to clear the area of invasive weeds, and labor to plant the trees.



\$500

Location: Wilmington, Delaware

We also donated to DE Wildlife Rehabilitator Hillary Taylor for her continued rehabilitation efforts in Delaware.



SUSTAINABILITY

2021 ACCOMPLISHMENTS

Nature Playground

Our *Backyard Academy* got some recycled upgrades this year! We worked with Eco Plastic Products of Delaware to build a raised garden bed out of lumber made from recycled plastic bags.

Plastic Trash Bags

Grounds work switched to reusable yard waste bags for cleaning leaf litter this year. Previously, heavy duty trash bags were filled and emptied in the park, then reused, but eventually the bags would be disposed of after inevitable wear and tear.

Programming

Our camps switched to sponges instead of water balloons for water games during recess. We also purchased reusable sleeves for flyers in our kiosks instead of laminating ads that get eventually thrown away.

Field Work

Our wildlife game cameras run on batteries! All our field cameras use rechargeable batteries instead of single-use batteries.

Events and Retail

All candy purchased for Boo at the Zoo was from RSPO businesses. We switched to canned sodas and water instead of plastic-bottled beverages.

Plant Sale

We used recycled beer 6-packs as carriers for our native plant sale.

2022 GOALS

Community Engagement

In 2022, we hope to build on initiatives involving local communities in Wilmington through our new Earth Agents and Conservation Leadership Academy programs.

Electronics Recycling

Next year, we are planning to start a small electronics and gadgets recycling program with Eco-Cell, an electronics recycling program that partners with zoos and aquariums to recycle electronics with proceeds benefitting gorilla conservation.

Green Practices Purchasing

We hope to develop a green purchasing, best practices document in 2022 that will guide our decisions on items we make when purchasing supplies.



Left: Zoo kiosks prior to new, reusable holders (with laminated flyers). Right: prepped native plant 6-pack.

CONSERVATION ON SALE

Blurb about why we sell conservation-themed items in the gift shop

2021 Activities

This year, our retail "Zootique" gift shop carried many *conservation marketplace* items. These items typically either come directly from local communities from range countries of species at Brandywine Zoo to support them economically, are fair trade or certified with other green certifications, support conservation organizations, or promote environmentally responsible behaviors. Below are the organizations or groups that the products we sold this year support.



- **Lemur Conservation Foundation** - a nonprofit organization dedicated to saving lemurs through habitat protection, sustainable livelihood initiatives, managed breeding, research, education, and art.
- **Beyond Good** - Fair-trade company that makes chocolate bars from Madagascar. They work closely with farmers to ensure an ethically sourced, sustainable and fair-trade product.
- **Lucuma Designs** - Through artistic collaboration, craftsmanship and sustainable design, Lucuma Designs has created a successful and empowering business. They create opportunities for Peruvian artists, who are mostly women, to help themselves and their communities. We sell a lot of their ornaments that have an animal theme.
- **Stoneage Arts** - Hand crafted items from Africa. Supports fair-trade, uses a lot of recycled material and supports artisans.
- **Eeboo** - Woman owned company that make products that reflect our commitment to family, community, cooperation, inclusion, respect, and the power of honest communication. Use minimal packaging, recycled materials and vegetable based inks
- **Bird Friendly Coffee** - roasted by Brandywine Coffee Roasters, Bird Friendly Coffee is the gold standard for green coffee certifications, and is 100% organic, 100% shade-grown, and scientifically measured for supporting biodiversity. \$2 from every bag goes to the Zoo's conservation programs as well.
- We began carrying t-shirts made from **recycled plastic bottles**.
- Our plush stuffed animals from companies that use **carbon offsets** for shipping, donate to wildlife conservation organizations, and use recycled plastic bottles to make their plush.

BRANDYWINE AAZK



The Brandywine Zoo's chapter of the American Association of Zookeepers hosted two successful fundraisers this year. The first being a Delaware native plant sale in March for an organization called Trees for you and Me: a program that educates individuals about climate issues and supplies a forest based carbon-offset grant to qualified entities in an effort to help polar bears and the loss of their sea ice habitat. Brandywine AAZK was able to make a donation of **\$328** to this great cause!



WINOS FOR RHINOS

The second fundraiser was a wine tasting held in May benefitting Bowling for Rhinos. Since 1990, this organization has donated over \$8 million in the name of rhino conservation - aiding research and conservation benefiting rhino, their ecosystems, or the communities supporting them. A donation of **\$777.90** was made in the fight to protect rhino species and their habitats!

