The Association of Zoos and Aquariums and its accredited members envision a world where, as a result of their work, all people respect, value and conserve wildlife and wild places.

The 2016 Annual Report on Conservation and Science Highlights publication celebrates the cumulative impact of AZA-accredited zoos and aquariums and certified related facilities in the following areas:

- field conservation
- education programming
- green (sustainable) business practices
- mission-related research

This publication underscores what the AZA community can accomplish together. Visit AZA’s website to learn about what each member facility is doing individually.

www.aza.org/annual-report-on-conservation-and-science
field conservation

$216,000,000 spent by all institutions (approx.)

27% of projects led by AZA members

127 countries

823 species & subspecies benefitted from conservation action

42% of projects took place in the U.S.

58% of projects took place outside the U.S. and around the world

Projects most frequently occurred in the United States, Indonesia, Kenya, China and Canada

217 facilities reporting

207 accredited zoos and aquariums

10 certified related facilities

OVER 1,000 partners in conservation

192 + 39 = 231 listed under U.S. Endangered Species Act
Field Conservation

Association of Zoos and Aquariums-accredited zoos and aquariums and certified related facilities directly contributed to the long-term survival of species in natural ecosystems and habitats through both species-specific and habitat-focused conservation projects. 935 species, subspecies and species groups benefitted from targeted projects.

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species™ indicates that 121 of these species and subspecies are critically endangered and 144 are endangered. At least seven species listed as extinct in the wild benefitted from AZA-community conservation, including the Guam rail, Guam kingfisher, Kihansi spray toad, partula snail, scimitar-horned oryx, Socorro dove and the Wyoming toad.

### Most Frequently Targeted Species

#### MAMMALS
- Cheetah
- Tiger
- African Elephant
- Asian Elephant
- Lion

#### BIRDS
- African Penguin
- Whooping Crane
- Piping Plover
- Humboldt Penguin and Ostrich (tied)
- African White-backed Vulture and California Condor (tied)

#### REPTILES
- Western Pond Turtle
- Green Turtle
- Massasauga Rattlesnake
- Loggerhead Turtle
- Komodo Dragon

#### AMPHIBIANS
- Hellbender
- Puerto Rican Crested Toad
- Panamanian Golden Frog
- Wyoming Toad
- Dusky Gopher Frog

#### INVERTEBRATES
- Monarch Butterfly
- Atlantic Horseshoe Crab
- Elkhorn Coral
- Staghorn Coral
- American Burying Beetle

#### FISHES
- Lake Sturgeon
- Blue Rockfish and Sand Tiger Shark (tied)
- Bonnethead Shark, Brook Trout, Great White Shark, Pacific Bluefin Tuna, Tidewater Goby, Whale Shark (tied)

#### Multi-species Conservation

AZA members supported conservation organizations or participated in multi-species or taxon-wide field conservation projects, in addition to species-specific efforts. The most frequently targeted species groups were:

- Frogs
- Rhinoceros
- Freshwater Turtles
- Sea Turtles
- Terrestrial Turtles (tortoises)
- Salamanders
- Sharks
- Gorillas
- Elephants
- Orangutans
“Saving whooping cranes is about so much more than helping one of the most beautiful, emblematic and imperiled species on this planet. It’s about courage, innovation, tenacity and an unflinching commitment to make a difference. In the face of tremendous ecological, financial and political obstacles, resilience comes through the power of partnerships. The Calgary Zoological Society has treasured partners in the International Crane Foundation, Patuxent Wildlife Research Centre, Audubon Nature Institute and San Antonio Zoo; without such collaboration whooping cranes would likely be extinct. Saving species like this means there is hope. It means conservation works. It also means that we can and must do so much more. Let us work together to combine science with imminent action, so that more species will be saved through reintroductions across the world.”

Axel Moehrenschlager, PhD  
Director of Conservation and Science, Calgary Zoological Society  
Chair, IUCN Reintroduction Specialist Group  
Recipient of one of the 2016 Top Honors for AZA’s North American Conservation Award

Collaborative Conservation

AZA members worked collaboratively with one another and 73 Animal Programs, including Taxon Advisory Groups, Species Survival Plans®, and the Avian Scientific Advisory Group on field conservation projects. More than ten members reported working with each of the following Animal Programs: Tiger SSP, Ape TAG, Komodo Dragon SSP, Puerto Rican Crested Toad SSP and Eastern Massasauga Rattlesnake SSP.
What Did AZA Zoos and Aquariums Do?

Field conservation projects worked directly with animals, their habitats and the people living with or impacting the targeted animals. The majority of field conservation projects in 2016 focused on:

» Population Biology/Monitoring
» Reintroduction
» Conservation/Environmental Education
» Community Participation
» Habitat Protection
» Awareness
» Rescue, Rehabilitation and Sanctuary
» Conservation Biology
» Habitat Restoration
» Population Management

SAFE: Saving Animals From Extinction

In 2016, SAFE began realizing its potential. Conservation Action Plans identifying 35 priority projects were developed for five SAFE Signature Species—African penguin, cheetah, sharks and rays, vaquita and western pond turtle. Implementation began on 16 projects; each coordinated by staff at AZA-accredited zoos and aquariums.

Highlights included:

» Purchase of the equipment (4,800 PIT tags, 6 hand-held readers, 7 ground readers) and tag individual African penguins so that management decisions incorporate penguin longevity, nest and natal site selection, mate choice and inter-colony movement patterns

» Distribution of consistent materials for use on International Cheetah Day; the hashtag “Loud4Cheetah” reached more than 450,000 individuals with more than 680,000 impressions

» Development of a SSP project to optimize husbandry, collaborative breeding programs, health management and welfare of sharks and rays in human care

» A letter writing effort on change.org with 6,049 supporters and social media campaigns to make permanent a gillnet ban in vaquita habitat (made permanent by Mexican President Peña Nieto in July 2016!) and ongoing support for enforcement

» Development of a Western Pond Turtle Range-Wide Conservation Coalition

Download the 2016 SAFE Annual Report and learn more at: www.aza.org/aza-safe.
TOP 5 “HOT TOPICS” INCLUDED IN PROGRAMS

1. Connecting to Nature
2. Habitat Loss
3. Human-wildlife Conflict
4. Careers
5. Sustainable Living

90 MILLION+ audience-driven education engagements

These include visitor-initiated engagements with hands-on learning environments like nature play spaces, interpreters at exhibits, discovery carts and more

2,600+ FTE educators employed by AZA-accredited institutions

2 MILLION HOURS OF SERVICE contributed by over 21,500 education volunteers

2,748 EDUCATION PROGRAMS REPORTED

146 FACILITIES REPORTING
143 accredited zoos and aquariums
3 certified related facilities
5 MOST FREQUENTLY REPORTED CONSERVATION ACTIONS

1. Learn about the issue and teach others / Encourage collective action
2. Make informed purchasing decisions / Be a conscious consumer
3. Spend time in nature
4. Create safe environments for wildlife and Support conservation efforts and organizations (tied)
5. Practice watershed maintenance / Reduce runoff

Inspiring Conservation Action

When delivering conservation education programs, AZA-accredited facilities raise awareness about conservation issues and promote actions visitors can take that help save wildlife and wild places.

» Programs that focus on actions to address conservation issues had a reach of 111 million

» More than 98 percent of responding facilities offer education programs that engage participants on a conservation issue and promote a related action

How Are We Reaching Visitors?

PERCENTAGE OF INDIVIDUALS REACHED BY DELIVERY METHOD

*Note: Other delivery methods were not included in this chart because they represented less than one percent of individuals reached through reported programs.
Supporting Classroom-based Learning

The integrated fields of science, technology, engineering and mathematics (STEM) are readily incorporated into informal education settings to reinforce classroom learning. Through hands-on, problem-based learning, students are challenged to apply STEM knowledge and skills to construct solutions that can help save wildlife.

» **Half of reporting facilities** offered STEM education programs reaching more than **5.6 million people on-site and online**

AZA-accredited aquariums and zoos provide valuable learning experiences for students and teachers through on-site field trip programs, classroom outreach and teacher trainings.

» **45 facilities** reported providing teacher trainings, curriculum resources and free planning visits that reached more than **79,000 teachers**

Connecting People to Nature

An opportunity for family bonding, learning and fun begins with every trip to an AZA-accredited zoo or aquarium. A trip to the zoo or the aquarium also represents a nature experience for many families. It is a means of connecting with animals and the natural world while in a familiar and safe environment. AZA-accredited zoos and aquariums are gateways through which millions of people learn about and value the diversity of the natural world.

» **135 facilities** reported more than **1,000 education programs** that include content about connecting to nature

“We are proud to foster new stewards of Long Island Sound and the global environments of the world. We utilize our educational resources to connect purposefully with the community in the development of deep and dynamic relationships. Through our program called TeMPEST (Teen Maritime Program Emphasizing Science & Technology), underserved high-school teens engage in projects that enhance their STEM learning to help them today and also experience career and college opportunities to influence tomorrow. Conservation depends on an engaged and knowledgeable citizenry and TeMPEST teens are prepared to fulfill that role. The Maritime Aquarium is truly honored to utilize education and conservation to play a role in the preservation of Long Island Sound and all of the waters of the world.”

*Brian Davis  
President and CEO  
Maritime Aquarium at Norwalk*
green (sustainable) business practices

**ENERGY + WATER** = the resource categories most commonly documented

Percent of respondents that documented annual resource use:

- **76** ENERGY
- **73** WATER
- **57** FUEL
- **47** WASTE

**52** facilities purchased renewable energy or generated it on site

**106** FTE staff dedicated to coordinating the green business practices at **60 FACILITIES**

**60%** SOURCED LOCAL FOOD OR GREW SOME ON-SITE

Reducing waste through commingled recycling and composting were the most frequently reported green practices
A Community of Practice Conserving Natural Resources

AZA-accredited zoos and aquariums and certified related facilities are increasingly careful stewards of the natural resources utilized in their business operations and are developing and implementing an array of innovative strategies to meet their green goals. Under the leadership of the Green Scientific Advisory Group, the AZA community actively mentors and challenges one another in this field.

The mission of the Green SAG is to lead the AZA community in reducing human impact on natural resources and wildlife through sustainable business operations.

In 2016, the Green SAG published their 2016-2020 Action Plan, reflecting a vision of operational sustainability embedded in the culture and implemented through the strategic plan of every AZA institution.

Become involved in and help advance this community of practice by connecting at workshops like the Green Summit at AZA’s annual Mid-Year Meeting, exploring resources like the Green Guides and reading and sharing your stories in the Green Tales article in AZA’s monthly member magazine, Connect. Learn more at: www.aza.org/green-practices.

“The Akron Zoo is excited to have received Top Honors in the AZA Green Award category for 2016! Our commitment to sustainability and green practices allows every staff member to participate in our conservation mission every day. No matter what position you hold, no matter how long you have been with the organization, you have a way to contribute to saving species by addressing the root causes of species endangerment through your own choices and actions. It is the unsustainable consumption of resources that interferes with the healthy function of ecological systems because of generated waste that is ejected into the air, water and land. By modeling the change we wish to see in the world at our own facility, and being that local example, we build value for wildlife and wild places. The choices we make every day, at home and at work, either help us save species, or contribute to the root causes of species endangerment. As an organization concerned about conservation, we have no choice but to recognize sustainability and green practices as the equivalent of a “wellness program” for our planet. In similar fashion, field conservation could be considered the “emergency room.” Investing in wellness is a long term commitment that reduces emergency room visits, so too would an investment in sustainability and green practices logically reduce the causes of species and systems endangerment. This is why sustainability and green practices are critically important to the authenticity of our broader conservation mission.”

Doug Piekarz
President and CEO
Akron Zoological Park
Recipient of 2016 Top Honors for the Green Award
Primary Managed Resources

- Energy
- Waste
- Fuel
- Water

Green Power

In 2016, 52 facilities reported generating renewable energy on-site or purchasing it for their business operations. Twenty-six AZA-accredited facilities reported the amount of renewable energy generated or purchased, which totaled over 42.4 megawatts (MW)—enough to power nearly 3,884 homes for a year.

Waste Not

Waste management integrates proactively minimizing the amount of waste that would be generated, recycling and composting materials and sending waste to landfill. Fifty-six facilities reported recycling nearly 103,000 tons of waste, while 44 facilities reported composting 578,000 tons of materials.

Third-party Verification

Independent organizations confirm the green practices at AZA facilities. Twenty facilities reported having certified wildlife habitat on-site, 16 facilities reported buildings that are LEED-certified by the U.S. Green Building Council and 10 were certified as “Dine Green” through the Green Restaurant Association. Additionally, facilities reported receiving their state or city’s Green Travel, Hospitality, or Green Business/Building-related certifications in Alaska, Arkansas, California, Georgia, Missouri, North Carolina, Tennessee and Wisconsin.
mission-focused research

$26.8 MILLION
spent by all institutions (approx.)

1,249 projects reported

237
peer-reviewed papers, technical reports, book chapters or graduate theses published

57% of research projects
led by AZA members

180 facilities reporting

441 FTE researchers on staff at 102 reporting facilities

554 species and subspecies studied
“It has been an honor to have been both an observer and participant in the development of the science of small population management since the late 1970s. It began with concerns over inbreeding in zoo collections but has expanded to a broad-based concern over the many challenges small populations confront both in zoos and the wild. The current frontiers we face include incorporating the data from the rapidly developing genomic technologies into population management, fully implementing then expanding Species360’s ZIMS and developing the science and tools to manage “groups” – populations where we might not be able to manage and/or individually identify animals (think fish tanks or flocks of birds). Fun stuff! The role of research centers in zoos is critical for this development to proceed. The Smithsonian Conservation Biology Institute, the Conservation Planning Specialist Group and the Chicago Zoological Society have formed the Species Conservation Tools Initiative to ensure the continuation of support and development of the software currently being used for species management and risk assessment. However, a longer-term permanent Global Center for Population Management should be established to meet these science and management needs at a global level.”

Jonathan D. Ballou, PhD
Research Scientist Emeritus, Smithsonian Institution
2016 honoree of the Devra Kleiman Scientific Advancement Award

Research Focus

Contemporary animal management, husbandry, veterinary care and conservation should be based in science, and a commitment to scientific research is a trademark of the modern zoological park and aquarium.

Animal care, health and welfare are the AZA community’s most common focus of research. Species and habitat conservation, focused primarily on populations in the wild, or those being prepared for reintroduction into the wild, is the second most common area of research, and is the area where the most research funds are directed. Together, these two focus areas describe 63 percent of the AZA community’s research, while other areas of focus include basic biology (21 percent), sustainable animal collections (focused primarily on populations held in human care; 12%) and conservation education and public engagement (4 percent).

Species Studied

More than half of all research focused on mammals, with chimpanzees, western gorillas, African elephants, polar bears and Asian elephants being the most frequently studied. Research focused on:

- **Mammals** – 62%
- **Birds** – 15%
- **Reptiles** – 10%
- **Fishes** – 7%
- **Amphibians** – 4%
- **Invertebrates** – 2%
- **Flora** – <1%
Where is Research Done?

Research by staff at AZA-accredited zoos and aquariums took place in 55 countries around the world, with the vast majority occurring in the United States, distantly followed by research in Canada, China and Peru. Nearly 600 projects were conducted on-grounds at AZA-accredited zoos and aquariums or certified related facilities, although research also took place in tropical rainforests, wetlands, coastal regions and in many other habitats.

Find Our Findings

In 2016, 237 peer-reviewed papers, technical reports, book chapters or graduate theses were reported. Peer-reviewed publications related to this research most frequently appeared in:

> Journal of Zoo and Wildlife Medicine
> PLOS ONE
> Zoo Biology
> PeerJ
> Journal of Wildlife Diseases
> Reproduction, Fertility and Development
> Herpetological Review
> Journal of Zoo and Aquarium Research
> Applied Animal Behaviour Science
> Biological Conservation
> In Vitro Cellular & Developmental Biology – Plant

Keywords Used to Describe Each Research Project

Environmental Education  Ecology/Natural History
Welfare/Wellness  Sensory Biology
Reproductive Biology  Physiology
Population Biology  Non-Native Species
Biology  Genetics  Population Management
Animal Training
Nutrition  Ethics  Behavior
Husbandry  Reintroduction and Translocation
Conservation Education  Pathology  Botany  Life History
Habitat Preservation and Restoration
Exhibit Design/Evaluation  Visitor Studies
Animal Health  Cognition
Enrichment  Disease/Epidemiology
Program Evaluation  Biotic Survey  Pharmacology
Habitat Assessment/Monitoring
Citizen Science  Conservation Status Assessment
Endocrinology  Assurance Populations
Taxonomy
Human-Wildlife Conflict  Habitat Demography
By the end of 2016, the Association of Zoos and Aquariums community included 232 accredited zoos and aquariums and 12 certified related facilities. Members’ survey response rate varied by topic: 89 percent responded about their field conservation activities, 62 percent for education programming, 52 percent for green business practices and 74 percent for mission-focused research. AZA is grateful to each member that responded to these surveys.

These Highlights were compiled by Arslan Ahmad (AZA Conservation and Science Program Assistant), Shelly Grow (AZA Vice President of Conservation and Science) and Amy Rutherford (AZA Director of Professional Development and Education).