

# State of the Apes

## Disease, Health and Ape Conservation

**In memory of Steve Ross, who was a part of every volume in the *State of the Apes* series and whose death is a profound loss to the captive ape community. He will be dearly missed.**

As the Anthropocene unfolds, the impact of humanity on all ecosystems on the planet is becoming more visible and better understood. Deforestation, encroachment into natural habitat and other human activities are driving an increase in the frequency of interactions between people and wildlife, including viruses, parasites and bacteria. One consequence is a heightened risk of disease transmission, with serious implications for biodiversity protection and human health. Indeed, infectious disease is often listed among the principal threats to ape conservation, along with habitat loss and hunting, which can also expose apes to health risks. In captive settings such as sanctuaries and zoos, apes face similar health risks from increased human contact, as well as geriatric and psychological disorders. Spillover of wildlife pathogens into sanctuaries can also occur.

This volume of *State of the Apes* brings together original research and analysis with topical case studies and emerging best practice to further the ape conservation agenda around disease and health. It provides an overview of relevant disease and health issues and explores factors such as the ethics of intervening in and managing ape health; the impact of research and tourism on apes; the One Health approach; and disaster management and the protection of apes. It shows how the welfare of apes is interrelated with that of the people who share their habitats, while also demonstrating the benefits of integrating ape conservation in health, socioeconomic activities (such as in the extractive industries, industrial agriculture and infrastructure development), and regulatory policy and practice at all levels, from the local to the international.

This volume is available as an open access eBook via Cambridge Core and at [www.stateoftheapes.com](http://www.stateoftheapes.com).

## State of the Apes

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The world's primates are among the most endangered of all tropical species. All great ape species – gorilla, chimpanzee, bonobo and orangutan – are classified as either Endangered or Critically Endangered. Furthermore, nearly all gibbon species are threatened with extinction. Whilst linkages between ape conservation and economic development, ethics and wider environmental processes have been acknowledged, more needs to be done to integrate biodiversity conservation within broader economic, social and environmental communities if those connections are to be fully realized and addressed.

Intended for a broad range of policy-makers, industry experts and decision-makers, academics, researchers and NGOs, the *State of the Apes* series looks at the threats to these animals and their habitats within the broader context of economic and community development. Each publication presents a different theme, providing an overview of how these factors interrelate and affect the current and future status of apes, with robust statistics, welfare indicators, official and various other reports providing an objective and rigorous analysis of relevant issues.

# State of the Apes

Disease, Health and Ape Conservation



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## Foreword

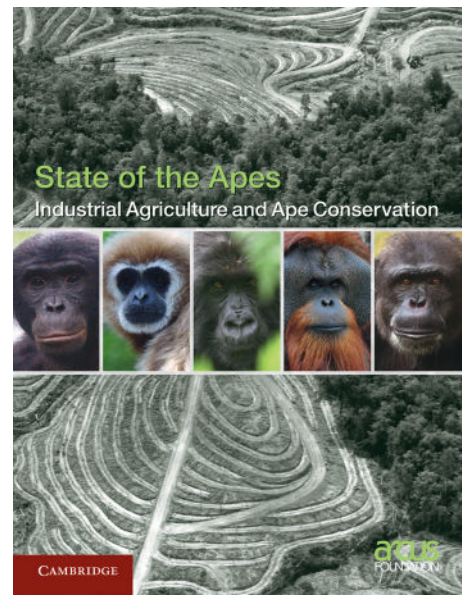
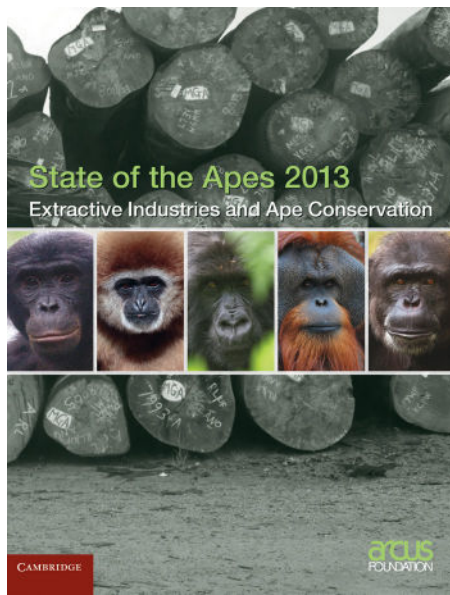
Over ten years ago, the ape conservation team at the Arcus Foundation came to me with the innovative idea to develop a series of reports regarding the *State of the Apes*. This was inspired by their work with our many grantees and partners around the world who had invaluable insights into the huge spectrum of complex issues impacting ape populations, but whose knowledge was widely dispersed and difficult to access. In addition, many industry leaders, investors, government agencies and other stakeholders were making decisions that had serious, deleterious impacts on apes and their habitats. This was due to a lack of awareness, poor access to information and analysis that would enable them to make more informed, sustainable choices, and a lack of signposting to help them source that information and identify relevant experts to advise them.

I had always envisioned that Arcus could do more than simply provide financial support to our grantees on the frontlines. This project seemed to me a useful opportunity to invest in collective action to help turbocharge the generation of knowledge in the field and thus truly advance great and small ape conservation. The Arcus Foundation had never undertaken a project like this, and there was certainly an element of risk in the proposition; but it seemed a risk well worth taking. It has been our hope that the series would become an important and well used compendium of knowledge for the field, but it was also envisioned for the series to be a resource that would help inform key global-level financial, governmental and industry leaders who often make extremely influential decisions that impact ape populations around the world.

Just months after those early conversations, we forged a partnership with

Cambridge University Press, and here we are: 10 years and five volumes later. I couldn't be more thrilled to have been a part of this project, particularly this final volume, the timeliness of which is breathtaking. It often seems that many among the world's population who live in large cities of highly developed countries feel little connection with non-human animals beyond their domesticated pets. For them, at least, before the beginning of the COVID-19 pandemic, the threat that disease posed to non-human animals had hardly been top-of-mind or even relevant to the lives they were living. The principal editors and their collaborators began developing this latest book in the series in 2020, just four years after the Ebola pandemic of 2014–2016 and just as the global debate raged regarding whether the novel SARS-CoV-2 virus had originated in a Chinese market, a laboratory, or through other means. Our species was getting a refresher course on the connections between human and non-human health on a greater scale than at any other moment, certainly in my lifetime. We humans were confronted with the fact that our health and that of other species are intertwined in an extremely high-stakes fashion.

Of course, conservationists, scientists and ecologists have long been interested in understanding and addressing the threat that disease represents to the health and survival of millions of species who define and sustain critical ecosystems that support all life on earth and define the world as we know it. Each day, we lose between 150 and 200 species to extinction, and climate change is unquestionably accelerating that pace. Their loss is colossal in terms of both the intrinsic value of the species and of the role they play in ensuring the biological diversity and integrity of the planet. The magnificent and charismatic nature of endangered apes, who share precarious landscapes with



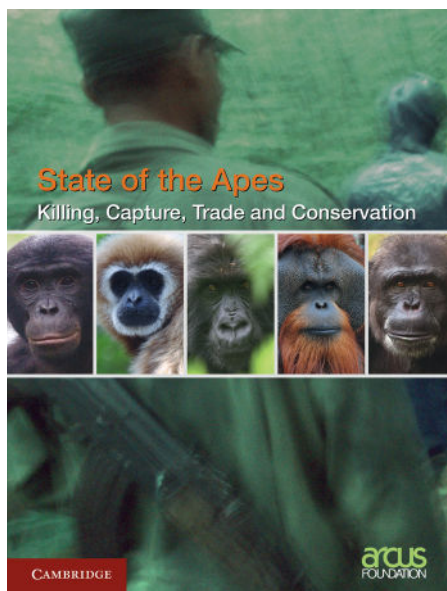
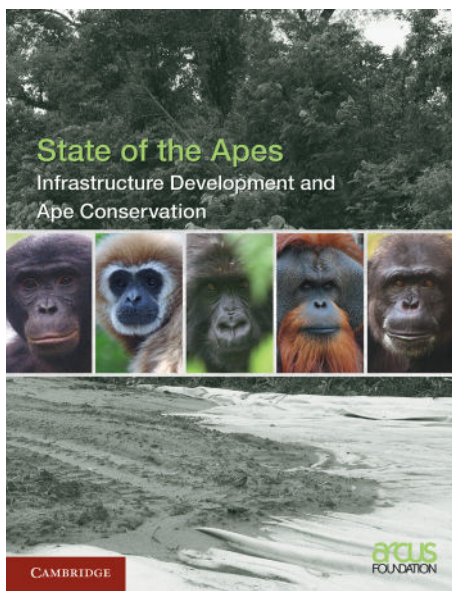
countless other endangered species and marginalized human communities, and who are particularly vulnerable to extinction due to their slow reproductive rate, make them compelling subjects for a series like this one. The importance of this volume and those that preceded it—to ape conservationists like its authors, to me and to anyone committed to building a sustainable future—cannot be exaggerated.

The contributing authors have done an amazing job of presenting the complexity of threats to ape health and wellbeing, as well as the trade-offs presented by the matrix of approaches to managing these threats. The authors present important information about the similarities between human and non-human ape susceptibility to disease, the differences between disease and disease management scenarios in captive apes and wild apes, the role of non-infectious threats to ape health, and the infectious risks that a strategy like tourism or research can introduce, even as it serves to mitigate other negative forces affecting ape health.

Throughout each chapter, the authors share actionable insights, but they also iden-

tify knowledge gaps and critical questions worthy of further research and inquiry and present frameworks and constructs that will serve future work. For example, Chapter 2 on the One Health movement explains in compelling detail how the health of humans, non-human animals, and every element of the natural environment from plants to oceans is just that—one health. Like a kinetic sculpture, any disturbance in its design has the potential to wreak havoc. Ensuring its function is a delicate imperative that will require the kind of disciplined, fact-based approaches reflected in the case studies of this volume.

Of course, attending to One Health is not just about science. It requires the engagement and collective action of an inestimable number of people and institutions, and the authors rightly emphasize the importance of forging and leveraging alignment with the 2030 Sustainable Development Goals adopted by all member states of the United Nations in 2015. The beauty of this publication is that it bundles science, strategy and hope into a single package comprising baseline data and analysis to support work



toward progress that no single individual or entity can achieve alone.

As a committed ape conservationist and philanthropist, I have been proud and excited to support this series through the foundation I founded more than 20 years ago. I am confident that *State of the Apes* will be an important resource for years to come, and I offer my congratulations and thanks to all who brought their extraordinary brains and hearts to this project.

**Jon Stryker**

President and Founder,  
Arcus Foundation

IUCN Patron of Nature (International  
Union for the Conservation of Nature)

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## Other Titles in this Series

Arcus Foundation. 2020. *State of the Apes: Killing, Capture, Trade and Conservation*. Cambridge: Cambridge University Press.

Arcus Foundation. 2018. *State of the Apes: Infrastructure Development and Ape Conservation*. Cambridge: Cambridge University Press.

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## Other Language Editions

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### Bahasa Indonesia

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### Chinese

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类人猿现状：采掘业与类人猿保护

### French

Arcus Foundation. 2020. *La planète des grands singes : La destruction, la capture, le trafic et la conservation*.

Arcus Foundation. 2018. *La planète des grands singes : Le développement des infrastructures et la conservation des grands singes*.

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Arcus Foundation. 2014. *La planète des grands singes : Les industries extractives et la conservation des grands singes*.

## The Arcus Foundation

The Arcus Foundation is a private grant-making foundation that advances social justice and conservation goals. The Foundation works globally and has offices in New York City, USA and Cambridge, UK. For more information visit:

- [arcusfoundation.org](http://arcusfoundation.org).

Or connect with Arcus at:

- [twitter.com/ArcusGreatApes](https://twitter.com/ArcusGreatApes) and
- [facebook.com/ArcusGreatApes](https://facebook.com/ArcusGreatApes).

### Great Apes and Gibbons Program

The long-term survival of humans and the great apes is dependent on how we respect and care for other animals and our shared natural resources. The Arcus Foundation seeks to increase respect for and recognition of the rights and value of the great apes and gibbons, and to strengthen protection from threats to their habitats. The Arcus Great Apes Program supports conservation and policy advocacy efforts that promote the survival of great apes and gibbons in the wild and in sanctuaries that offer high-quality care, safety and freedom from invasive research and exploitation.

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## Notes to Readers

### Acronyms and Abbreviations

A list of acronyms and abbreviations can be found at the back of the book, starting on p. 314.

### Annexes

All annexes can be found at the back of the book, starting on p. 274, except for the Abundance Annex, which is available from the *State of the Apes* website:

- [www.stateoftheapes.com](http://www.stateoftheapes.com).

### Glossary

There is a glossary of scientific terms and keywords at the back of the book, starting on p. 317.

### Chapter Cross-referencing

Chapter cross-references appear throughout the book, either as direct references in the body text or in brackets.

### Human and Non-human Apes

To simplify and enhance the flow of the text, this volume uses the term “apes” to refer exclusively to non-human apes, unless noted otherwise.

### Pathogens and Disease

While this volume identifies pathogens, it places more emphasis on the diseases they cause. For example, Chapter 1 mentions that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes COVID-19, but the book focuses more generally on the health impacts of the disease and options for mitigating transmission risks.

Since the content of this volume was drafted, following a directive from the World Health Organization owing to issues around the use of racist and stigmatizing language, the nomenclature for monkeypox

has changed. The term ‘monkeypox’ is being phased out and the preferred term is now ‘mpox’.

### Ape Abundance Estimates

Definitive, up-to-date abundance estimates are not available for all ape species. The most recent Abundance Annex—available at [www.stateoftheapes.org](http://www.stateoftheapes.org)—presents estimates at the site level. For great apes, it uses abundance classes to indicate population ranges; for gibbons, it employs a mix of abundance classes and density estimates. In this volume, the Apes Overview and some chapters feature abundance information based on other geographic scales, drawn from a variety of sources, including forthcoming Red List assessments. Consequently, some figures may not align exactly.

### Ape Range Maps

The ape range maps throughout this volume show the extent of occurrence (EOO) of each species. An EOO includes all known populations of a species contained within the shortest possible continuous imaginary boundary. Some areas within these boundaries may be unsuitable for apes or unoccupied.

The Arcus Foundation commissioned the ape distribution maps in the Apes Overview, Figures AO1 and AO2, to provide the most accurate and up-to-date illustration of range data. These maps were created by the IUCN Primate Specialist Group, which manages the A.P.E.S. portal and database. This volume also features maps created by contributors who used ape range data from other sources. As a consequence, the maps may not all align exactly.

## Acknowledgments

Pulling together the contents of a volume of *State of the Apes* is an extensive undertaking. As we embarked on this volume, the 5th in the series, the COVID-19 pandemic complicated the task further, adding significant delays. We extend special thanks to all involved for their understanding, flexibility and support in bringing this volume to completion.

Our aim is not only to encourage the critical engagement of all stakeholders—including conservation organizations, medical institutions, wider civil society, industry, donor and financial institutions, and government—but also to increase support for great apes and gibbons.

Jon Stryker and the Arcus Foundation Board of Directors have been instrumental in enabling the production of the *State of the Apes* series. We are grateful to them for their invaluable support over the past decade, particularly in the face of the unforeseen circumstances that affected this volume’s publication schedule. We also thank Megan Keirnan, Jenny van der Meijden and the team at Cambridge University Press for their commitment to the series.

As this is the final volume in the series, we would like to take this opportunity to express our deep gratitude to our colleagues in the Arcus Great Apes & Gibbons Program—Matthew Lewis, Adam Phillipson and Marie Stevenson—for their input, help and patience. We are also extremely grateful to the production consultants who have worked with us on the series from the start: Sarah Binns, proofreader; Eva Fairnell, reference editor; Tania Inowlocki, editorial consultant and copy-editor; Caroline Jones at Osprey Indexing, indexer; Rick Jones at StudioExile, graphic designer; and Jillian Luff at MAP*grafix*, cartographer. You have all been amazing.

In addition to the thematic content, each publication provides an overview of the

status of apes, both in their natural habitats and in captivity. Our sincere appreciation goes to all the great ape and gibbon scientists who contribute their valuable data to build the A.P.E.S. database and to Tenekwetche Sop who manages it. Such collaborative efforts are key to effective conservation action. Thanks also go out to the rescue and rehabilitation centers, sanctuaries, zoos and other captive-ape organizations that provided detailed information and data.

This volume would not exist without the essential input of the *State of the Apes* Publication Committee and those who participated in the preparatory stakeholder meeting. In addition to refining the contents and structure of the book, these experts helped us to identify potential authors and contributors. They are Peter Apell, Caroline Asimwe, Dirck Byler, Anne-Lise Chaber, Susan Cheyne, Elizabeth (Annie) Cook, Tom Gillespie, Gladys Kalema-Zikusoka, Fabian Leendertz, Elizabeth Lonsdorf, Linda May, Sen Nathan, Joachim Nieuwland, George Omondi Paul, Joshua Rukundo, Benard Ssebide and Chris Walzer.

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To ensure that the *State of the Apes* series is accessible to as many stakeholders as possible, it is published under an open access agreement with Cambridge University Press. Each volume is also available in multiple languages. For the translated editions of this volume—in Bahasa Indonesia, Chinese (Mandarin) and French—we wish to recognize our team of translators, graphic designers and proofreaders: Alboum Translation Services, Nelly Aubaud Davies, Xuezhong (Bamboo) Huff, MAP*grafix*, Anton Nurcahyo, OWLingua, Hélène Piantone Beaudin, StudioExile, Erica Taube, Beth Varley and Rumanti Wasturini. Much gratitude goes to the Arcus Communications team—Heather Antonissen, Angela Cave, Jovahn Huertas, Sebastian Naidoo and Bryan Simmons—for managing the website and for coordinating launch activities for each volume in the series.

Many others contributed in various ways, including by providing introductions, anonymous input, strategic advice and essential, if sometimes tedious, administrative tasks. We also thank all those who provided much-appreciated moral support.

The Arcus Foundation is pleased to pass the baton on to the International Union for the Conservation of Nature (IUCN) Section on Great Apes and Section on Small Apes. *State of the Apes* will continue in a mix of formats under their expert coordination and guidance. We look forward to seeing how it develops.

**Alison White, Steve Unwin,  
Annette Lanjouw, Katy Scholfield  
and Helga Rainer**  
Editors