



# African Elephant Status Report 2016

An update from the African Elephant Database

C.R. Thouless, H.T. Dublin, J.J. Blanc, D.P. Skinner, T.E. Daniel, R.D. Taylor, F. Maisels, H. L. Frederick and P. Bouché



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An update from the African Elephant Database

C.R. Thouless, H.T. Dublin, J.J. Blanc, D.P. Skinner, T.E. Daniel, R.D. Taylor, F. Maisels, H. L. Frederick and P. Bouché

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IUCN East and Southern Africa Regional Office  
P.O. Box 68200-00200  
Nairobi  
Kenya  
afesg@iucn.org

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PAPER NO. 60

# African Elephant Status Report 2016

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# Acknowledgments

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The information contained within the African Elephant Status Report 2016 derives from hundreds of sources; too many to thank by name. We have tried to capture and attribute their contributions in individual personal communications throughout the text.

We would like to extend a special thank you to: Peter Mwangi for helping to keep data flowing into the African Elephant Database between status reports; Colin Craig and John Hart from the AfESG's Data Review Working Group, who provided insights on Namibia and the Democratic Republic of Congo, respectively. Dave Balfour and Justine Cordingley for stepping in to help with editing, referencing, fact-finding and just about everything we threw their way. Blake Abel, and his team at Flint, for their professionalism, patience and willingness to respond to our feedback each and every time. Rob Heittman and Carl Scott of Solertium for driving the back-end of the African Elephant Database in order to deliver the final numbers and tables. Selwyn Willoughby and Reuben Roberts of Refleqt for their tireless efforts on all the mapping issues, especially the extensive new range changes.

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Lastly, we wish to thank all the governments of the range states of Africa's elephants. While we have worked with some more closely than others on this report, we are grateful for the continued commitment of all these countries to conserving and managing the African elephant across its range.

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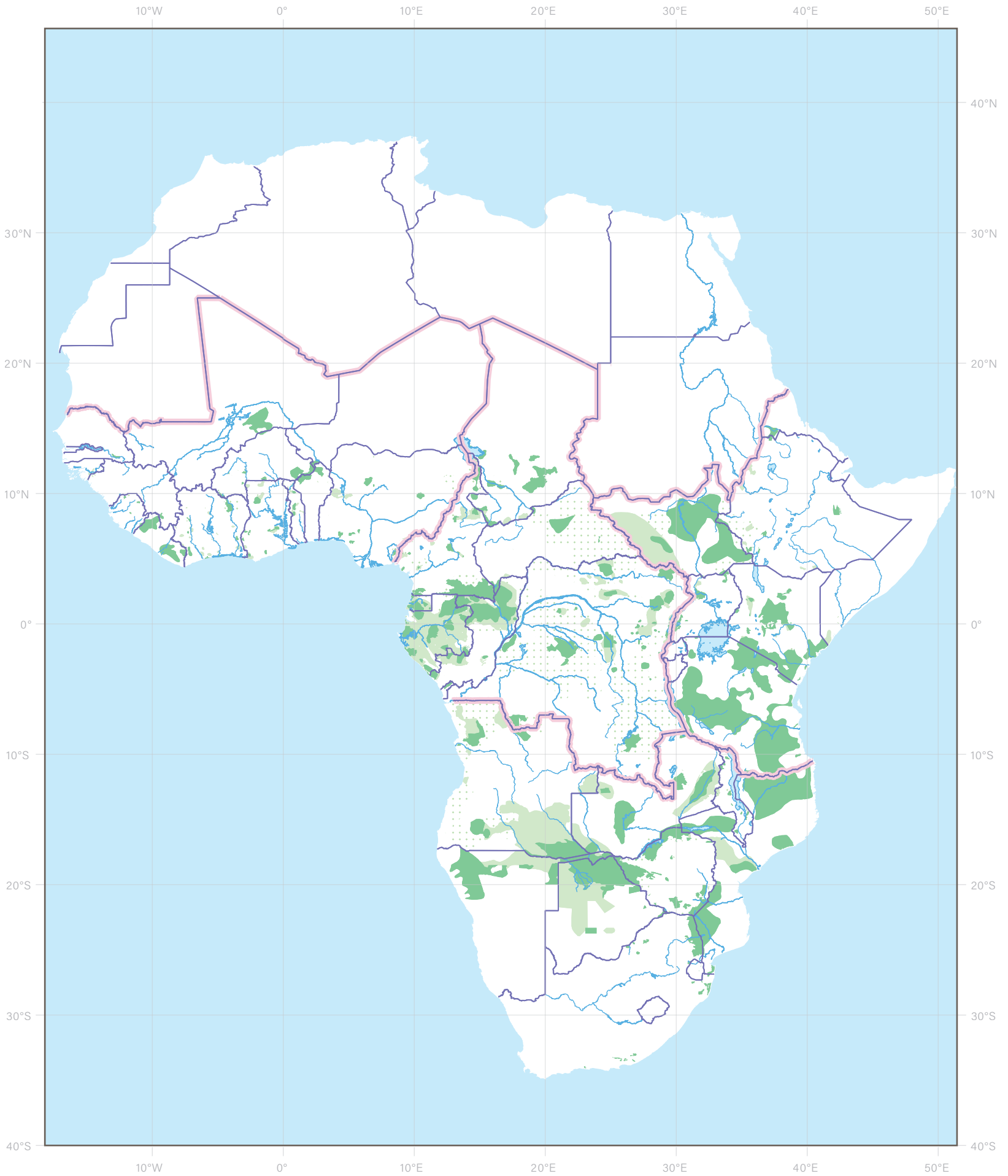
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# Executive Summary

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This is the fifth printed African Elephant Status Report (AESR) produced by the African Elephant Specialist Group (AfESG) of the IUCN Species Survival Commission (SSC). Like its predecessors, the AESR 2016 is based on data from the African Elephant Database (AED), the most comprehensive database on the status of any species of mammal in the wild. This is the first comparison of continental populations between 2006 and 2015 across the 37 range states of the African elephant. Importantly this report not only provides information on changes in elephant numbers but also, because it is spatial, shows where these changes have taken place.

The AESR 2016 is the most authoritative and up-to-date compilation of information on the numbers and distribution of the African elephant at national, regional and continental levels across all range states in sub-Saharan Africa. The last year of data collected for this report is 2015. The title follows the convention of using the year of publication rather than the last year of data collection. We hope this report contributes to a wider discussion about the value of monitoring to conservation and to addressing the needs of the African Elephant Action Plan (AEAP), ensuring that policy decisions and the assessment of conservation activities and their performance are evidence-based, and that new conservation initiatives budget for support to monitoring programmes including the AED.

Status reports are intended to help address contemporary elephant management and conservation needs and, therefore, a key question is how the estimates and guesses in the AESR 2016 relate to the true number of elephants in Africa at the end of 2015. When populations are declining, any time difference between the date of surveys and the cut-off date for the report will lead to the true number being lower than the recorded figure. This is more of an issue with the guesses than with estimates, since the largest savanna populations have all been surveyed within the last two years. There are also reasons why the AED may under-record the true number of elephants: aerial counts, which make up the majority of the estimates, tend to undercount the true number of elephants; many of the guesses come from areas which are known to contain substantial elephant populations but have just not been surveyed to the standard required for an estimate; and there are areas of elephant range for which there are no estimates or guesses. On balance the true number of elephants are likely greater than the estimates based on surveys alone, though not necessarily greater than the combined estimates and guesses.

The AESR 2016 provides sound scientific evidence, a deep understanding of the context and a strong technical base to support the management and conservation of Africa's elephants across their range.

## THE CONTINENTAL OVERVIEW

The desire to conserve and manage elephants is widespread, and even if opinions differ as to how best this goal can be achieved, it is widely agreed that decisions should be informed by the most up-to-date and reliable information available on the numbers and distribution of Africa's elephants.

Since the publication of the AESR 2007, this goal has been furthered among the African elephant range states through their joint development and adoption by consensus of the African Elephant Action Plan (African elephant range states, 2010), which provides objectives, strategies, and activities for the conservation and management of Africa's elephants. The AEAP recognizes the fundamental importance of monitoring progress and performance through constant reassessment of information on the status of the species throughout its range.

The AfESG and its AED occupy a unique and pivotal position with regard to this need, having been designated as the repository for information on the conservation status of the species by the parties to CITES (CITES Conference of the Parties, 2013a).

This report presents more than 275 new or updated estimates for elephant populations across Africa, with over 180 of these arising from systematic surveys. All aerial survey data from the Great Elephant Census, ([greatelephantcensus.com](http://greatelephantcensus.com)), a Paul G. Allen project, and data from dung counts in Central Africa carried out primarily by the Wildlife Conservation Society (WCS) and World Wide Fund for Nature (WWF) were submitted through the AED for inclusion in this report.

In the AESR 2016, the estimated number of elephants in areas surveyed in the last ten years in Africa is  $415,428 \pm 20,111$  at the time of the last survey for each area. There may be an additional 117,127 to 135,384 elephants in areas not systematically surveyed. Together, this estimate and guess apply to 1,932,732 km<sup>2</sup>, which is 62% of the estimated known and possible elephant range. There remains an additional 38% of range for which no elephant population estimates are available, although it is likely that average elephant densities in this range are much lower than in the surveyed areas.

This is the first AESR in 25 years that has reported a continental decline in elephant numbers. Between the AESR 2007 and this report, there has been a reduction of approximately 118,000 in estimates for populations where comparable surveys have been carried out. However, some populations have been surveyed for the first time, particularly in Central Africa, and this has led to an increase of approximately 18,000 in the "new population" category. The result is that the total estimated number of elephants from surveys has decreased by a smaller figure of about 93,000 since the AESR 2007. The estimated number of elephants from surveys and guesses combined has decreased since the AESR 2007 by about 104,000-114,000.

The decline is largely caused by the surge in poaching for ivory that began around 2006 (CITES, 2016), the worst that Africa has experienced since the 1970s and 1980s. Losses in Tanzania account for the major share of this decline. Other underlying drivers of population decline, such as loss of habitat and increasing human elephant conflict, are still of critical conservation importance but have been receiving less attention from managers, conservationists and policy-makers due to the immediacy of the poaching crisis.

Continuing uncertainties about the number of elephants in Botswana have a substantial potential impact on continental population estimates. Botswana holds the single largest population but national estimates since 2006 have differed by as much as 80,000 elephants. In order to better understand the current status of this critically important population, which is shared with four neighbouring countries, a coordinated survey of the entire cross-border population of Angola, Botswana, Namibia, Zambia and Zimbabwe remains a high priority.

The proportion of elephant range for which elephant estimates are available currently stands at 62%, which has increased from 51% since the previous report. The overall reliability of estimates has increased considerably, with estimates from systematic surveys now accounting for 37% of total range, compared to 29% in the previous report.

Holding over 70% of the estimated elephants in Africa (56% of estimated and guessed elephants) in 42% of the total range area for the species, Southern Africa has by far the largest number of elephants in any of the four regions. Eastern Africa comes second, with 20% of estimated elephants (18% of estimated and guessed elephants) in 28% of the range, while Central Africa is an even more distant third (6%) for estimated elephants in 25% of the range. There remain a high proportion of guesses for Central Africa, giving a total of 23% of estimated and guessed elephants. West Africa continues to hold the smallest regional population with under 3% of both categories in the remaining 5% of range.

Improved knowledge of elephant distribution is reflected by the proportion of range categorised as known, which has increased from 63% to 67%. Significant range expansion has occurred in Botswana and Kenya. The actual distribution of elephants across this range varies considerably across the four regions – from small, fragmented populations in West Africa to large, virtually undisturbed tracts of elephant range in Central and Southern Africa, with a mixture in Eastern Africa.

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## THE REGIONAL OVERVIEW

### CENTRAL AFRICA

Central Africa's elephants have been severely affected by ivory poaching over the past ten years (CITES, 2015b; Maisels, Strindberg et al., 2013b; UNEP et al., 2013; Wittemyer et al., 2014). Evidence from the carcass reports sent to MIKE shows that poaching was already a problem in this region by 2003, long before it became unsustainable in Eastern Africa (CITES Secretariat, 2016).

The estimated number of elephants in areas surveyed in the last ten years in Central Africa is  $24,119 \pm 2,865$  at the time of the last survey for each area. There may be an additional 87,190 to 103,355 elephants in areas not systematically surveyed. Together, this estimate and guess apply to 546,471 km<sup>2</sup>, which is 70% of the estimated known and possible elephant range in the region. The number of elephants estimated from systematic surveys in Central Africa increased by about 10,000 between the AESR 2007 and the present. However, this was largely a consequence of "new populations" being surveyed and in some cases there have been major reductions in these populations in subsequent surveys.

Gabon and Congo still hold Africa's most important forest elephant populations but both have been affected by heavy poaching in recent years. Some populations in Cameroon have also been badly impacted, as has Chad's largest remaining population in Zakouma National Park, which has now stabilized. The savanna populations of the Central African Republic have almost completely disappeared, with the only remaining populations occurring in the forested south-west. There are only small remnant populations in Democratic Republic of Congo and Equatorial Guinea.

Populations recorded as having been lost in the last ten years have included one in Chad and another in the DRC. However, since populations in the extensive Central African forests are much less clearly defined than in other parts of Africa, loss of numbers and range is more likely to be recorded than that of discrete populations.

Substantial changes have been made to the range maps, but these are mostly the result of improved information, rather than real changes in range. There has been a decrease of recorded range from about 975,000 km<sup>2</sup> to about 780,000 km<sup>2</sup> with known range decreasing from 82% to 58%.

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#### EASTERN AFRICA

Eastern Africa has been the region most affected by poaching, having experienced an approximately 50% population decline in estimates from surveys since the AESR 2007, largely attributed to a greater than 60% decline in Tanzania's elephant numbers.

The estimated number of elephants in areas surveyed in the last ten years in Eastern Africa is 86,373 ± 10,549 at the time of the last survey for each area. There may be an additional 11,973 to 12,060 elephants in areas not systematically surveyed.

Together, this estimate and guess apply to 548,587 km<sup>2</sup>, which is 62% of the estimated known and possible elephant range in the region, a significant improvement on the 45% of estimated known and possible elephant range assessed in the AESR 2007, that resulted in reported survey estimates of 165,151 ± 27,990 and an additional 10,722 to 12,066 guesses in areas not systematically surveyed.

Between the AESR 2007 and this report, elephant numbers in Eastern Africa have declined by almost 87,000, on the basis of updated estimates for sites where comparable survey techniques were employed. However, some populations have been surveyed for the first time and this has led to an increase of approximately 9,000 in the "new population" category. The result is that the current total number of elephants from surveyed populations represents a smaller estimated reduction of about 79,000 elephants, still close to a 50% loss, during the period from late 2006 to the end of 2015.

Elephant numbers have been stable or increasing since the AESR 2007 in Uganda, Kenya, Rwanda and Ethiopia, although these national level figures include reductions in some of their populations. Significant losses have been recorded in Tanzania. There has been an apparent increase in elephant numbers in South Sudan, because the major populations were surveyed for the first time in 30 years after 2006, and it is suspected that there is no longer a resident elephant population in Somalia.

No populations are recorded as having been lost in Eastern Africa.

While there has been no net increase in range, known range has increased from 57% to 85% of total range in 2015. Range expansion is reported in two areas of Kenya.

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## SOUTHERN AFRICA

Southern Africa continues to hold by far the largest number of elephants on the continent, and nearly 75% of these elephants form part of a single population in the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA), some 520,000 km<sup>2</sup> in extent. Whereas conservation challenges associated with high elephant densities in large protected areas were common in the region a decade ago, contemporary elephant conservation in southern Africa is now also faced with the emergence of a growing poaching threat (UNEP et al., 2013). While overall, poaching has not had the same impact in Southern Africa as in other regions it has severely affected populations in Zimbabwe, Angola, Mozambique and to a lesser extent, Zambia.

The estimated number of elephants in areas surveyed in the last ten years in Southern Africa is 293,447 ± 16,682 at the time of the last survey for each area. There may be an additional 15,157 to 16,672 elephants in areas not systematically surveyed. These guesses likely represent a minimum number, and actual numbers could be higher than those reported. Together, this estimate and guess apply to 734,824 km<sup>2</sup>, which is 55% of the estimated known and possible elephant range in the region.

Between the AESR 2007 and this report, elephant numbers in Southern Africa have declined by almost 30,000, on the basis of updated estimates for sites where comparable survey techniques were employed. However, some populations have been surveyed for the first time and this has led to an increase of approximately 3,000 in the "new population" category. The result is that the current total number of elephants from surveyed populations represents a smaller estimated reduction of about 27,000 elephants. Although there have been real declines in Mozambique and Zimbabwe, the main contributor to this decline is a reduction in the estimate for Botswana, which may be the result of uncounted elephants, range expansion, increased poaching or methodological differences between surveys. Some major populations in Namibia (Zambezi, Etosha NP and Khaudum NP), South Africa (Kruger NP) and Zimbabwe (South-east Lowveld and North-west Matabeleland) are stable or increasing.

Southern Africa has a relatively high reliability and quantity of elephant information, especially for the larger populations. Although overall survey coverage has increased since 2007, largely as a result of the Great Elephant Census carried out in 2014-2015, there is still wide variation amongst countries.

One population is reported as having been lost from Angola.

The current range area for Southern Africa is 1,325,998 km<sup>2</sup>, a slight increase from the 1,305,140 km<sup>2</sup> recorded in the AESR 2007, and the percentage of this which is known range has increased from 53% to 60%. There has been no major loss of elephant range, and one notable southern expansion of range in Botswana. Other changes result from improved information, particularly in Angola.

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## WEST AFRICA

West Africa's elephant populations are mostly small, fragmented and isolated. With increasing human populations and infrastructural development, many countries in West Africa are experiencing increased pressure on natural areas from mining, logging and rapid transformation of land to agriculture.

The AESR 2016 provides more information than previous status reports on countries known to have small, isolated and highly vulnerable populations, with some stark results. Although numbers are small relative to continental levels, West Africa reported losing twelve populations of elephants since the AESR 2007: one each in Côte d'Ivoire, Ghana, Guinea Bissau, Sierra Leone and Togo; two in Guinea and five in Nigeria. It is surprising, however, that there is recent evidence for the continued survival of a number of populations that were already at a very low level 10-20 years ago. The transfrontier "WAP" complex that straddles the border between Benin, Burkina Faso and Niger remains the region's largest population and of great significance as one of West Africa's few populations with potential long-term viability.

The estimated number of elephants in areas surveyed within the last ten years in West Africa is  $11,489 \pm 2,583$  at the time of the last survey for each area. There may be an additional 2,886 to 3,376 elephants in areas not systematically surveyed. These guesses likely represent a minimum number, and actual numbers could be higher than those reported. Together, this estimate and guess apply to 102,850 km<sup>2</sup>, which is 72% of the estimated known and possible elephant range in the region.

The overall numbers of elephants in West Africa appear to have increased since 2006. This is largely due to the apparent growth in the WAP complex population.

At the national level, population estimates for both Benin and Burkina Faso suggest increases in the WAP complex. Estimates for Côte d'Ivoire, Ghana, Guinea Bissau, Senegal, Sierra Leone and Togo have stayed more or less constant with some higher and lower guesses, while estimates for Guinea, Mali and Nigeria have declined since 2006. Guinea's elephants are now reduced to a single small population. Niger's few remaining elephants are thought to still move in and out of the country as part of the WAP complex. Information on Liberia's elephants has been substantially improved in this report, adding a small number to guesses originating from 1989/90.

A substantial update of the West African elephant range has been completed for this report, and this has the effect of reducing the total range (known and possible) from around 176,000 km<sup>2</sup> to approximately 143,000 km<sup>2</sup>, but the percentage of known range has increased from 71% to 79%.

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## THE AED ONLINE

Since the AESR 2007, the AED has moved to an online, web-based platform [africanelephantdatabase.org](http://africanelephantdatabase.org). This online resource, which was launched initially in 2012 and has been substantially redesigned and updated to coincide with the production of this report, not only offers a platform for displaying data between the published status reports, but also provides new ways to view the data from all the status reports and access more detailed information on new surveys than are presented in this report. Readers are encouraged to visit the website to further explore the data.

With the transition to an online platform, the AED has undergone a very significant change. This has been both challenging and rewarding and lessons we have learnt are being used by other groups working on species databases. In the years to come, we hope to demonstrate meaningful advances in the analytical potential of the AED to provide a strong and relevant evidence base for the management and conservation of the African elephant.

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# Introduction





# Background

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## HISTORY OF THE AFRICAN ELEPHANT DATABASE AND STATUS REPORTS

The African Elephant Database (AED) originated from the African Elephant Survey carried out by Iain Douglas-Hamilton in the late 1970s, which led to the first continental estimate for elephant numbers, produced in 1979 (Douglas-Hamilton, 1979). In 1986, Douglas-Hamilton and colleagues started to compile this information into a geographical information system. Using data accumulated from questionnaire replies, surveys and interviews, a database of elephant population estimates and distribution was assembled (Burrill & Douglas-Hamilton, 1987). An updated version was produced in 1992 (Douglas-Hamilton et al., 1992), which included the use of spatial models to estimate populations for the central African forests, as only a very small proportion of this area had been surveyed at that time.

In 1992, the AED became the direct responsibility of the IUCN Species Survival Commission's African Elephant Specialist Group (AfESG). Since that time, the structure and management of the AED has been overseen by a group of technical experts from within the AfESG known as the Data Review Working Group (DRWG), and chaired since mid-2014 by Dr. Chris Thouless. The DRWG oversees the selection and categorisation of data to be included in the AED; agrees on new features, tools and analyses; and reviews the content of the AESR. Decisions made by the DRWG and additional reviewers are coordinated and implemented by AfESG Secretariat staff and contracted consultants. For this report, additional reviewers were added to focus on and strengthen specific areas. The authorship of this report reflects these contributions.

Initially housed at the United Nations Environment Programme (UNEP) headquarters in Nairobi, Kenya, the AED was until April 1998 a collaborative effort of the Global Environment Monitoring System (GEMS), the Global Resource Information Database (GRID) of UNEP and the IUCN/SSC AfESG. In April 1998 the AED was moved from UNEP to its present location in the AfESG offices in Nairobi. Although the AED was transitioned to a web-based platform in 2012 it continues to be managed by the AfESG Secretariat from Nairobi through its website at [africanelephantdatabase.org](http://africanelephantdatabase.org), where data from all earlier AED updates is publicly accessible, and more recent data is provisionally released whenever possible.

Today the AED is the most comprehensive database on the status of any single species of mammal in the wild.

The AfESG's preparation of African Elephant Status Reports (AESR) began in the mid-1990s. Status reports are published to provide a complete picture of the status of the species based on the data within the database up to a certain point in time. Prior to the present report, four reports of the AED were published: the African Elephant Database 1995 (Said et al., 1995), the African Elephant Database 1998 (Barnes et al., 1999), the African Elephant Status Report 2002 (Blanc et al., 2003), and the African Elephant Status Report 2007 (Blanc et al., 2007). These reports are freely accessible as well as available for download, in PDF format, on the AED website. Other provisional data were posted on the AED website between the AESR 2007 and the AESR 2016, but this report replaces them.

With the transition to an online platform ([www.africanelephantdatabase.org](http://www.africanelephantdatabase.org)), the AED has undergone its most significant change in over 20 years. This has been both challenging and rewarding, with many lessons we have learned now being used by other groups working on species databases. We hope this report contributes to a wider discussion about the value of monitoring to conservation, ensuring that policy decisions and the assessment of conservation activities are evidence-based whenever possible and that new initiatives plan and budget for support to databases to better enable the monitoring of progress and evaluation of performance.

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#### THE CONTINUING NEED FOR A CONTINENTAL APPROACH

A key issue in African elephant conservation is the variation in the status of the species across the 37 range states in which elephants occur. The desire to conserve and manage elephants is widespread, and even if opinions differ as to how best this goal can be achieved, it is widely agreed that decisions should rely on the best and most recent available information on the status of Africa's elephants.

Since the publication of the African Elephant Status Report 2007, this goal has been furthered among the African elephant range states through their joint development and adoption by consensus of the African Elephant Action Plan (African elephant range states, 2010a), which provides objectives, strategies, and activities for the conservation and management of Africa's elephants. The AEAP recognizes the fundamental importance of monitoring progress and performance through constant reassessment of information on the status of the species throughout its range.

IUCN SSC's African Elephant Specialist Group (AfESG) and its African Elephant Database (AED) occupy a unique and pivotal position with regard to this need, having been designated as the repository for information on the conservation status of the species by the parties to CITES (CITES Conference of the Parties, 2013b). The AfESG has had a specific mandate since CITES CoP15 in 2010 to provide the CITES Standing Committee "any new and relevant information on the conservation status of elephants" (CITES Conference of the Parties, 2013a) along with information and analyses from the CITES MIKE and ETIS monitoring programmes. This reporting, completed for four meetings of the CITES Standing Committee to date, draws heavily on the AED and has been proposed to CITES CoP17 in September 2016 to be adopted as a permanent reporting mandate. The AEAP also recognizes the vital contribution of the AED in one of its component activities to "maintain and update databases on elephant populations for management purposes".

Such management information is required not only at the site and national level, but also regionally and continentally. Many elephant populations occur across international borders and a policy or management decision made in one country can affect elephant populations elsewhere. Changing land-use patterns or different approaches to tourism, such as trophy hunting in border areas, may have impacts beyond national boundaries. Likewise, the impact of policies concerned with ivory management and trade may affect elephants elsewhere. Civil instability and wars in Africa have sometimes led to a shift in populations across national boundaries. A regional and continental perspective is critical to identify and understand these ongoing dynamics and to support international and regional decision-making, including management of transfrontier conservation areas (TFCAs).

These issues become all the more important as African elephants have faced a devastating new wave of illegal killing over the last decade (CITES Secretariat, 2016). Despite the intense pressures of illegal killing, with some results detailed later in this report, African elephants continue to live outside protected areas and the majority of elephant range may still be found in unprotected areas. This poses additional challenges for wildlife authorities and wildlife managers, as levels of human-elephant conflict continue to be high, increasing and politically charged in many parts of the continent, and especially where human and agricultural expansion moves into new areas already occupied by African elephants. Many lessons have been learned regarding the challenges in mitigating this conflict (Hoare, 2000, 2015), the importance of broader landscape level land-use planning and what will be required in the future if elephants are to persist in the long term.

All these issues highlight the need to census and manage elephants across borders and the need to keep this information up to date and available in the AED in support of conservation action across the continent. The demand for and continued use of publications like the AESR and other analyses enabled by the AED demonstrate the ongoing need for this type of data even after the current pressures from illegal wildlife trafficking have been reduced. Conservation efforts, including implementation and monitoring of national, regional and continental strategies and action plans, should be informed by up-to-date and reliable data on elephant numbers and distribution. The AED and AESRs can also provide invaluable insights into the effectiveness of conservation responses.

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# About this Report

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## THE AFRICAN ELEPHANT STATUS REPORT 2016

The AESR 2016 is the fifth printed AESR produced by the AfESG. Like its predecessors, it aims to provide the most authoritative, comprehensive and up-to-date information on the numbers and distribution of the African elephant at national, regional and continental levels. The last year of admissible data collected for this report was 2015. The title refers to the year of publication rather than the last year of data included. This is the first status report since the AESR 2007 and some modifications have been implemented since that publication.

In preparing the AESR 2016, the AfESG has enjoyed a close collaboration with the technical staff of Vulcan Inc to ensure that data from the Great Elephant Census ([greatelephantcensus.com](http://greatelephantcensus.com)), sponsored by Paul G. Allen, were captured and presented in this report. Vulcan colleagues have also helped with the further development of the database, its web-based platform and in particular streamlining the system for adding new data. All elephant survey data from the GEC were submitted through the AED for inclusion in this report.

Status reports are intended to help address contemporary elephant management and conservation needs and, therefore, a key question is how the estimates and guesses in the AESR 2016 relate to the true number of elephants in Africa at the end of 2015. When populations are declining, any time difference between the date of surveys and the cut-off date for the report will lead to the true number being lower than the recorded figure. This is more of an issue with the guesses than with the estimates in this report since the largest savanna populations have all been surveyed within the last two years. There are also reasons why the AED may under-record the true number of elephants: aerial counts, which make up the majority of the estimates, tend to undercount the true number of elephants; many of the guesses come from areas which are known to contain substantial elephant populations but have not been surveyed to the standard required for an estimate; and there are areas of elephant range for which there are no estimates or guesses. On balance the true number of elephants are likely greater than the estimates based on surveys alone, though not necessarily greater than the combined estimates and guesses. It is the continuing need to improve the accuracy and coverage of these numbers and ensure that they are as up to date as possible that make survey efforts such as the Great Elephant Census and periodic national surveys so important.

Since the fourth report, the AESR 2007, the AED has moved to a web-based platform. Provisional, online-only updates have filled the gaps between the AESR 2007 and this report, and have been published on the AED website. Launched in 2012, the website is a platform for displaying new information incorporated into the database between full status reports, and also provides new ways to access the data from all the status reports as well as more detailed information on new surveys than is available in the AESR 2016. Readers are encouraged to visit the website to further explore the database.

A system for categorising and tracking changes in numbers was first introduced in the AESR 2007, resulting in the display of a “Cause of Change” for each area and an Interpretation of Changes table for each country and region as well as the continent. (“Cause of Change” has been renamed “Reason for Change” in this report; see below.) This system is intended to distinguish between real changes in numbers and changes in survey techniques or area of survey coverage, thus limiting inappropriate extrapolations about trends over time.

The Definite, Probable, Possible, and Speculative (DPPS) system, in use since 1995, was designed to describe uncertainty and data quality. However the calculations underpinning it are complex and its display of population numbers difficult to understand and interpret. Although the AESR 2007 emphasizes that “comparing guesses to derive population trends is a meaningless exercise,” the four-category “DPPS” itself does not explicitly articulate the proportion of elephant numbers that are guesses (i.e. population figures that do not meet the criteria required to qualify as population estimates).

To simplify the presentation of elephant numbers and clearly demonstrate the calculations leading to the totals at the national, regional, and continental levels, the DPPS has been replaced in this report by the Alternative Data Display (ADD), which classifies numbers either as estimates or guesses, and distinguishes what kinds of surveys have provided the figures. In contrast to the DPPS, the estimates derived from surveys in the AESR 2016 are additive, so that the rows, listed by survey types, total to the country totals and the country level totals add to the regional totals, and so forth. Very small differences in the totals in the tables may occur due to rounding of decimal places. Guesses are not completely additive because they include upper and lower confidence limits from certain types of survey. Columns involving confidence limits (CL) remain the necessary exception, as adding CLs requires the pooling of variances to derive a new CL appropriate for the sum total. Furthermore, population estimates are now aligned with the range area (km<sup>2</sup>) they cover in the same table. While the printed AESR 2016 only uses the ADD, the DPPS has been retained on the online platform for comparative purposes.

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## DATA TYPES AND CATEGORISATION

The AED contains both spatial and non-spatial (attribute) data, managed using GIS software and a relational database management system. Spatial and relational data are both maintained in a PostgreSQL database with the PostGIS extension. These data sets are combined with base map data derived from the Digital Chart of the World (ESRI, Inc., 1992) a widely available global geographical dataset, the World Database of Protected Areas (UNEP-WCMC & IUCN, n.d.), the World Resource Institute's protected area data set (WRI, 2016) and a variety of other sources. Each of these background datasets is used as appropriate for the production of this report and none are considered authoritative datasets produced by the AfESG.

Data in a variety of formats are collected and received into the AED. Survey reports are obtained from wildlife management agencies and other organizations, and non survey-report data are shared in many formats by individuals and organizations with expert knowledge of an area. Preliminary range maps are shared with relevant experts to aid in modifying and revising.

Data regarding an estimate or a guess are entered into the database using a submission form specific to the type of survey. Every estimate or guess is linked to spatial data, which is digitized and geo-referenced if not supplied by the data provider. Each submission consists of spatial data accompanied by appropriate attribute data manually extracted from the source material, such as transect length, flight speed, or dung decay rate. The source material (survey report, map, email, etc.) is then uploaded and linked to the submission.

Area measurements in the tables are calculated using geodetic coordinates on the WGS84 spheroid, for consistency across the African continent without projection-related errors. The surface areas of input zones, protected areas and elephant range are tallied at national, regional and continental levels. The overlay capabilities of GIS are used to determine percentages of both protected and surveyed elephant range.

The AED stores data on two basic variables reflecting the conservation status of African elephants, namely, numbers (abundance) and distribution (range). There are specific challenges associated with these kinds of data, related to their reliability and the availability and timing of new surveys. The ways that these issues are handled in this report are described in the following sections.

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### ELEPHANT NUMBERS

Although there are many different ways to count elephants, no single method is perfect. Possible sources of bias include the choice of survey technique, surveyor skill, quality and availability of adequate equipment, financial constraints, climatic conditions and vegetation cover. Ideally, data on elephants in any country should be collected by a wildlife management authority using qualified staff and standardized methods for collecting, recording and analysing data (Craig, 2012c; Hedges & Lawson, 2006). In reality very few countries have the means, either financial or in the form of expertise, to conduct systematic surveys on a regular basis and political strife in many range states sometimes makes survey work impossible.

As a result, elephant population data is collected by a variety of agencies and individuals, often without any direct linkage to one another and using a variety of different techniques. It is sometimes necessary to combine data from different types of surveys and different habitats to calculate a national estimate. Seasonal and cross-border movements of elephants are additional factors that can lead to inaccurate national estimates. Few cross-border surveys are conducted simultaneously to accurately estimate the size of such populations. Instead, they are generally treated as separate populations on either side of the border, which may occasionally result in either under- or over-counting. The end result is a collection of data of variable quality for most countries, and no data from formal surveys for many populations.

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## METHODS OF ESTIMATING ELEPHANT NUMBERS

While there is no single or ideal method for counting elephants, each method has its advantages and disadvantages under different conditions. The brief description of some of the most important methods below is not intended to be detailed or exhaustive. For more details, the reader is referred to the specialized treatments of these subjects (Barnes, 1993; Craig, 1993, 2004, 2012c; Douglas-Hamilton, 1996; Hedges et al., 2013; Hedges & Lawson, 2006; Kangwana, 1996; Norton-Griffiths, 1978).

Methods for establishing elephant numbers fall into three broad categories: estimates from total counts, estimates from sample counts, and guesses.

**Total Counts** aim to see and record all the elephants in a defined area, either from the air or from the ground. Aerial total counts are conducted from fixed-wing aircraft or helicopters. The speed at which the aircraft is flown influences the accuracy of the count, with high speeds usually leading to undercounts (Norton-Griffiths, 1978). Aerial total counts are commonly used in open, savanna habitats, where elephants are unlikely to be hidden by forest or thick bush, especially but not exclusively in Eastern and Southern Africa.

Total counts of a limited area can also be conducted at ground level by teams in vehicles or on foot. These are uncommon in Africa, but in a handful of places, total ground counts have been accomplished by attempting to identify every individual in the population. This is only possible for intensively studied populations where animals can be observed readily. For such individual recognition studies to provide high quality data for the AED, every individual in the population must be registered. Many ongoing studies have so far covered only a fraction of these focal populations, and cannot therefore provide reliable estimates of entire populations. If elephants are being identified in a place where they concentrate for a specific resource (such as the Amboseli swamps in Kenya and Dzanga Bai in the Central African Republic), it may be difficult to work out how large an area is covered by the identified elephants, and the estimate will be affected by the timescale over which elephants have been enumerated (if too short it will not include occasionally seen individuals, if too long it may include ones that have already died).

**Sample Counts**, in which only a sample of the area is counted (usually between 3% and 20%), are generally conducted along transects which may be randomly distributed or systematically placed across the study area. The resulting data are used to calculate a population estimate with

confidence limits. In contrast with total counts, which tend to produce underestimates of the true population, sample counts have in principle an equal chance of underestimating or overestimating the true population, provided that sampling error is the main source of error. In practice, however, factors such as high aircraft speed or dense vegetation cover lead to undercounts.

**Direct Sample Counts** are most commonly made from the air, but may also be conducted on the ground, either on foot or from vehicles. Aerial sample counts require considerable technical expertise and coordination, as well as the use of expensive additional equipment such as radar altimeters. Aerial sample counts are the most commonly employed survey technique in Eastern and Southern Africa.

**Indirect Sample Counts** are also referred to as dung counts. In low-visibility tropical forests, elephant abundance estimates typically use elephant dung density as a proxy for elephant density. Distance sampling (Buckland et al., 2001, 2015) along line transects estimates dung density and CLs within the area of interest (Hedges, 2012a; Strindberg, 2012). DISTANCE software (Thomas et al., 2010) is used for both survey design and analysis. Careful field protocol ensures accurate and precise estimates (Hedges et al., 2012a; Hedges & Lawson, 2006). Dung density is converted to elephant abundance using estimates of the rates of elephant defecation and dung decay and the surface area of the area surveyed. Dung decay rates can vary considerably across space and time: site and time-specific estimates of decay rates greatly improve accuracy in elephant abundance estimates (Hedges et al., 2012b; Laing et al., 2003). Estimates from well-conducted dung counts can be as accurate as those from direct methods, and more precise than those of aerial sample counts (Barnes, 2001, 2002).

At sites < 5,000km<sup>2</sup> and where elephant numbers are between a few tens and a few thousand, DNA-based capture-recapture methods have been used (Eggert et al., 2003; Gray et al., 2014; Hedges, 2012b; Hedges et al., 2013; Karanth et al., 2012b; Karanth et al., 2012c). Elephant DNA is extracted from as many dung piles as possible within the area of interest, and genetic fingerprinting is used to identify the number of unique genotypes (individuals) in the samples. The rates of repeat samples obtained can then be used to estimate the population size (Karanth et al., 2012a).

Often, it is not possible to carry out a systematic survey and the only type of information available for many areas is either an informed or other guess.

### **Survey Reliability**

Population estimate data entered into the AED varies in quality from the identification of individual animals to plain guesswork. The addition of population numbers of varying quality into national, regional and continental totals is, from a statistical viewpoint, invalid and produces misleading results. On the other hand, discarding low-quality numbers can produce equally misleading estimates, as high-quality survey estimates are not available for many areas in which elephants are found.

In order to solve this problem, the AED incorporates a system to accommodate all types of numbers by classifying them according to their type and designating them as estimates and guesses.

As with the previous data aggregation system, which separated numbers into Definite, Probable,



Possible, and Speculative, the new ADD system uses a scale of survey reliability, ranging from A (highest) to E (lowest). Survey reliability gives an indication of the level of certainty that can be placed on a given number, as determined by the method employed and how it was carried out.

Tables 1 and 2 show the different types of surveys with the range of reliabilities that could be assigned to them and how each number contributes to the columns of estimates and guesses depending on its reliability and other criteria. How the columns are then summed to create country, regional, and continental totals is detailed in the next section, "Integration and Presentation of Data."

The unit of analysis for assigning these categories is the "input zone" and these are listed in each country table. An input zone has only one source of information and may align with a protected area or other land unit, or simply with an area for which there was previous information, better enabling comparison to previous AESRs. Each input zone is assigned a reliability category, and the figure associated with that input zone contributes to the estimates and guesses as shown in Table 2.

### **Carcass Ratios**

The carcass ratio, a measure often calculated in aerial total and sample counts, is the estimated number of dead elephants divided by the sum of estimated dead plus live elephants. Carcass ratios can provide supporting information to changes in numbers in successive surveys and thus are included in the narrative text alongside survey estimates where available and appropriate. Douglas-Hamilton and Burrill (1991) showed that carcass ratios in excess of 8% for sample counts or 3.3% for total counts were indicative of declining populations.

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## **ELEPHANT DISTRIBUTION**

African elephants occur in a wide variety of habitats, from tropical swamp forests to deserts. They often move extensively in search of food, water and minerals or in response to disturbance, and the extent to which they move may depend on a large number of factors. In certain areas, seasonal movements are predictable, while in others, movement patterns are far more difficult to decipher. These factors, together with the scarcity of animals at the edges of their distribution, make elephant range a difficult concept to articulate and map. For these reasons, elephant range is broadly defined by the AfESG as the entire area where the species occurs in the wild at any time.

Collecting precise distribution information on such a wide-ranging species as the African elephant presents a number of practical problems, often related to the inaccessibility of some of the habitats in which elephants are found. As a result, the quality of information varies considerably from one area to another and its mapping heavily relies on expert opinion. The range map for a particular country is often updated by a single individual, and thus has a subjective element. Trying to draw a precise range boundary on maps of varying quality and scale is an inexact exercise. Neat, rounded lines may be indicative of scanty knowledge in comparison to the fragmented, more detailed pictures which emerge from countries where more precise information is available. Elephant range often appears to coincide directly with the boundaries of protected areas, because that is where most population surveys are carried out, and elephant movements in and out of protected areas are often unknown or unaccounted for.

**TABLE 1. CATEGORISATION OF ELEPHANT ABUNDANCE DATA IN THE AED**

SURVEY TYPE	RELIABILITY	CATEGORISATION
Aerial Total Count	<b>A</b>	Reliability A if well-designed and implemented*; downgraded to an informed guess of reliability D if there are concerns about whether the count was well designed or implemented or if a range of estimates is provided
Ground Total Count		
Individual Registration	<b>A</b>	Reliability A; downgraded to an informed guess of reliability D if a range of estimates is given, or other information suggesting the individual registration estimate does not include the entire population
Aerial Sample Count	<b>B</b>	Reliability B if 95% confidence intervals or other measures of precision are provided; otherwise, or if there are other concerns about survey design or implementation*, the estimate is downgraded to an informed guess of reliability D
Ground Sample Count		
Reliable Dung Count	<b>B</b>	Reliability B; as “reliable” dung counts are defined by having 95% confidence limits and a dung decay rate obtained on site
Other Dung Count	<b>C</b>	Reliability C; as “other” dung counts are defined by having 95% confidence limits but no on-site measurement of dung decay rate
Informed Guess	<b>D</b>	Reliability D; includes aerial sample counts, ground sample counts, and dung counts without 95% confidence limits or other methodological details or information and guesses that are based on a clearly explained logic for extrapolating from observations
Other Guess	<b>E</b>	Reliability E; any guess that does not fulfill the requirements for an Informed Guess
Degraded Data	<b>E</b>	Reliability E; any estimate or guess that is at least ten years old. For this report this includes any estimates from 2005 or earlier
Modeled Extrapolations	<b>E</b>	Reliability E; guesses derived from models that do not rely on elephant survey data at a site level but use instead other data such as habitat type, land use or human population density to extrapolate from elephant densities measured in other areas.

\* The AfESG’s Data Review Working Group (DRWG) reviews all surveys to ensure that key standards have been met and parameters included in the report to allow determination of the quality of survey design and implementation. The AfESG and its DRWG make every effort to engage with data providers to secure any essential missing information.

**TABLE 2. CATEGORISATION OF ELEPHANT NUMBERS BY SURVEY TYPE & CONTRIBUTION TO ESTIMATES AND GUESSES**

SURVEY TYPE	RELIABILITY	# OF ELEPHANTS		GUESSES	
		ESTIMATE	± 95 % CL	FROM	TO
Aerial Total Counts*	<b>A</b>	Estimate	—	—	—
Ground Total Counts*					
Individual Registrations*					
Aerial Sample Counts*	<b>B</b>	Estimate, if given; or else, number seen	95% confidence interval divided by two	—	—
Ground Sample Counts*					
Reliable Dung Counts					
Other Dung Counts	<b>C</b>	Number Seen	—	Lower confidence limit minus number seen	Upper confidence limit minus number seen
Informed Guesses	<b>D</b>	Number Seen	—	Lower limit of guess minus number seen	Upper limit of guess minus number seen
Other Guesses	<b>E</b>	—	—	Lower limit of guess	Upper limit of guess
Degraded Data				Estimate	Estimate
Modeled Extrapolations				Modeled Estimate	Modeled Estimate

\* These survey types may be downgraded to lower reliabilities and thus treated as informed or other guesses. See the criteria in Table 1.

Frequently, the depiction of range is also delimited by a natural boundary such as a river or a mountain range for convenience rather than accuracy. When range information in one country extends to a national border, it does not always match the adjacent range in the neighbouring country. While this is sometimes due to different human population densities or land uses across a border, more often lack of reliable information is the cause of what appear to be hard boundaries.

In order to address some of these difficulties, the AED classifies and maps elephant range information into four levels of certainty, as described in Table 3. In addition, range information in the AED is documented and referenced to original sources of data wherever possible to allow some evaluation of the reliability of range information and the reasons why range has either increased or decreased. In some cases these are real changes, while in others they are the result of improved knowledge. Where possible these distinctions have been mentioned in the text.

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## INTEGRATION AND PRESENTATION OF DATA

### DERIVATION OF NATIONAL, REGIONAL AND CONTINENTAL TOTALS

The categorisation system described on the previous page is implemented in the AED through a series of algorithms applied to input zones, or each area for which an individual number is listed in the country tables displaying Elephant Estimates. When executed, these algorithms categorise each input zone in terms of survey type and reliability. The categorised records are then used to produce national, regional and continental totals.

It is important to note that the totals presented for each country and region are minimum numbers, based on the areas that have been surveyed or for which guesses are available. It should also be noted, however, that the totals can include relatively old estimates and if the population is declining, this will yield an overestimate, while it will understate the true number of elephants in an increasing population. In many countries, and in all regions, there are large areas of elephant range where neither surveys nor guesses are available. In the case of Gabon, a modeled extrapolation has been used to generate a guess for unsurveyed areas of the country. This is because there is a large proportion of known range in Gabon that has not been surveyed, but the factors affecting elephant numbers are well known. As the available estimates generally represent only a proportion of the elephant range in a country, they cannot be considered total estimates of the national population. Likewise, the estimates given for the regions and for the continent cannot be interpreted as total regional and continental estimates either.

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### CHANGES IN ELEPHANT NUMBERS AND DISTRIBUTION OVER TIME

A key question for African elephant conservation and management is whether elephant populations are increasing, decreasing or stable. Comparing estimates from different AESRs to derive continental trends is often attempted but can be invalid and potentially misleading for a number of reasons.

Many of the continent's elephant populations have never been systematically surveyed. Thus any differences reported between the AESRs refer to a subset of all elephant populations, and may

therefore not reflect overall changes, including those in unsurveyed populations. While it is likely that elephant densities in unsurveyed range are lower on average than in surveyed areas, there still may be significant numbers of elephants in areas for which there are no currently estimates or guesses.

Populations surveyed for the first time or populations newly added to the AED (i.e. “new populations” in Table 4) contribute to an apparent overall increase in numbers, even though these do not reflect a true increase in elephants, but rather an improvement in knowledge. Repeated surveys of the same area may use different techniques or cover different areas, so the results are not directly comparable between different time periods. Where new surveys have not been carried out recently, old estimates will be retained and, over time, degraded to guesses. Retention of these numbers for a significant proportion of the population can lead to a situation where the extent of real change is not reflected in the AESR totals.

In order to disentangle these confounding factors from real changes in elephant numbers, the AED relies on a system that links figures contained in the current version of the AED to the corresponding figures in the previous report, and assigns a “reason for change” to each pair, as described in Table 4. The AESR then displays the numbers associated with these reasons for change at the national, regional and continental levels.

Where the more recent surveys in methodologically comparable survey pairs account for a large proportion of the estimate column for a given region, a statistical comparison of elephant numbers over time for those populations can be performed (see Blanc et al., 2005 for details). A list of methodologically comparable surveys featured in this and the previous report is provided in Appendix I.

This report refers to the reason for change “population lost”, or PL, more than it did in the AESR 2007 because of a focus on more deeply investigating the current status of small, isolated populations. The authors recognize the significance of this label and apply it only where there is reliable evidence regarding the loss of a population that is distinct and isolated from other populations.

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#### OVERALL QUALITY OF INFORMATION AND SURVEY PRIORITIES

The state of knowledge on elephant numbers and distribution varies widely across the continent. Some populations have never been surveyed, or are only surveyed rarely, while others are counted more frequently. The objectives of the AED include promoting the use of standardized, reliable survey techniques, as well as facilitating the task of donors, wildlife authorities and decision-makers in prioritizing their efforts to monitor elephant populations.

In order to assist in meeting these objectives, a simple index measures the quality of elephant population data available at the national, regional and continental levels. Based on this index, a system to identify and prioritize the areas where systematic surveys are most needed has been developed. These measures, both of which are calculated from data contained in the AED, are described below.

The **Information Quality Index (IQI)** is an unbiased, normalized and scalable index of the overall quality of information on elephant population estimates and guesses. The IQI ranges from zero (no reliable information) to one (full range coverage using good-quality estimates) and is the product of two key variables: a measure of the quality of available data and a measure of the completeness of estimate coverage. The data quality measure is based on the ratio of good quality population data (estimates) to total population data (estimates + guesses); the data completeness measure is based on the ratio of assessed range to total known and possible range.

The **Priority for Future Surveys (PFS)** index is designed as an unbiased system for setting priorities for future surveys in order to improve the accuracy of the continental estimate. For a truly accurate continental picture of elephant abundance to emerge, reliable estimates would have to be available for all elephant range. Countries accounting for a larger proportion of total continental range should therefore be prioritized more highly.

PFS is therefore based on the IQI (as described above) together with a measure of continental range coverage represented by each country. When calculated for each country, the PFS provides a measure, ranging from one (highest priority) to five (lowest priority), of the countries where population surveys are needed. At the input zone level, the PFS is based on the proportion of national range accounted for by each area. All areas of elephant range that have never been surveyed, i.e. those for which estimates are currently unavailable, are automatically assigned a priority of one. Systematic surveys should be conducted in areas of unsurveyed known range. In areas of doubtful range and unsurveyed possible range, elephant presence/absence should be established prior to conducting systematic population surveys.

It is important to stress that neither the IQI nor the PFS are measures of the health of elephant populations, or of overall elephant conservation priorities, but rather of the quality of elephant population data and of the need to conduct systematic surveys in the future. For instance, range loss in a country will often result in a decline in the proportion of unassessed range, thus causing the IQI to increase and the priority ranking to decline. A list of all African elephant range states with their IQI and PFS scores is shown in Appendix II.

While it is hoped that the PFS system will prove useful for prioritizing populations needing to be surveyed, the system is not intended to be prescriptive. Individual range states may have good reasons to use different criteria and different systems for prioritizing elephant population surveys.

Further details on how the IQI and PFS are calculated are available in the "Data Types and Categories" section of the AESR 2007.

**TABLE 3. CATEGORISATION OF ELEPHANT RANGE DATA IN THE AED**

RANGE CATEGORY	DEFINITION
<b>Known</b>	Areas in suitable habitat, which, if searched with reasonable intensity, are likely to yield signs of elephant presence. If no information is obtained confirming presence of elephants for a 10-year period, known range is downgraded to possible range (below).
<b>Possible</b>	Areas within previous elephant range, including former areas of known range where the source information is more than 10 years old where there is no confirmation that elephants still occur, but no evidence that they have been lost. Areas of possible range are considered to be a priority for studies to establish the presence or absence of elephants.
<b>Doubtful</b>	Areas where there are reasons to believe that elephants are no longer present, but for which there is no recent positive or negative information. Areas of doubtful range are also a priority for presence/absence studies.
<b>Non-Range</b>	Areas that are believed to hold no elephants. A change to non-range ideally requires a clear statement from a knowledgeable person who has actually visited the area, though sometimes range is classified this way as a result of known habitat transformation or high human population densities.
<b>Point Records</b>	Sightings of elephants or evidence of their occasional presence outside of known elephant range, shown as crosses on the map.

**TABLE 4. CODES & DESCRIPTIONS OF REASONS FOR CHANGE AS IMPLEMENTED IN THE AED**

CODE	REASON FOR CHANGE	DEFINITION
RS	<b>Repeat Survey</b>	Both surveys were conducted using comparable methodologies and covering the same area
NP	<b>New Population</b>	A new entry into the AED; i.e. no previous survey or guess to compare with
DT	<b>Different Technique</b>	The most recent survey uses a different survey methodology, or replaces a guess
DA	<b>Different Area</b>	Both surveys were conducted using the same methodology, but the extent of the areas covered differed by 10% or more*
NG	<b>New Guess</b>	A guess replaces an older guess or a survey estimate that was degraded data
PL	<b>Population Lost</b>	A distinct population is known to have disappeared from an area, be it through translocation or local extinction
DD	<b>Data Degraded</b>	The estimate or guess has been degraded after 10 years
—	<b>No Change</b>	The estimate or guess has been retained unchanged from the previous report

\* The 10% difference is a guideline; at times, differences in areas deemed to be non-significant by reviewers in terms of capturing elephant populations (e.g. in the case of other recent surveys showing no elephants in the omitted area), may result in the assignment of other causes of change.

# How this Report is Organised

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Information in this report is presented at three levels—continental, regional and national. The continental section is followed by the regional sections, Central, Eastern, Southern and West. Each of these contains the relevant individual country sections. All sections follow the format described below.

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## NARRATIVE OVERVIEW

Each continental, regional, and national section begins with a brief narrative overview intended to supplement the information provided by the maps and tables that follow. The overviews are not intended to provide the reader with exhaustive information on each country, but simply to describe the current situation and to highlight any factors that may have contributed to it or notable changes in these factors since the AESR 2007.

*The overview contains the three following sub-sections:*

**General Statistics.** This section provides summary statistics of country area, area of elephant range, proportion of elephant range in protected areas, and the amount of range which has been surveyed or has elephant population estimates, IQI, CITES Appendix and year of that listing for each range state.

**Current Issues.** This section covers any issues that may, directly or indirectly, affect elephant populations and their conservation and management. These may include poaching, political stability, land use changes, large infrastructure developments or relevant new wildlife policies or management arrangements.

**Numbers and Distribution.** This section starts by describing the total population estimates and guesses before discussing individual areas that have been surveyed, the methods employed, and how the data and information were interpreted to result in changes to the tables and maps since the last report. The former sub-sections on “Range Data,” “Population Data” and “Cross-border movements” from the AESR 2007 have been integrated under this heading.

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## TABLES

**Summary Totals.** These tables (see Table 5) present numbers at the national, regional and continental levels, separated into estimates and guesses. These tables depict the contribution of each survey type to the total area (in km<sup>2</sup>) for which estimates and guesses are available. In addition, areas of unassessed known and possible range are also shown.

Total numbers from the previous report are also displayed in the table; the AESR 2007 data was

converted into the AED's new data display format for direct comparability, after first correcting AESR 2007 errata. For further explorations of the AESR 2007 dataset, and for comparisons between the former and the new data display approaches visit the AED website ([www.africanelephantdatabase.org](http://www.africanelephantdatabase.org)).

**The Interpretation of Changes in Elephant Estimates from the Previous Report.** These tables show the breakdown and net changes in the estimates and guesses, grouped by the categorised reason for change described in Table 4.

**Elephant Estimates.** These tables display the detailed inputs for each country that contribute to the summary totals and interpretation of changes tables. At the national level the table shows results for individual input zones. The centroid of each input zone is provided in decimal geographic coordinates to assist the reader in locating the areas on the accompanying maps. In addition, these input zone tables within each country present details on estimates, their reliability and other metadata, as described in Table 6. Input zones are, as a general rule, listed alphabetically. Where there are many input zones distributed across many parts of a country, sets of geographically adjoining input zones that indicate contiguous elephant populations or other geographically defined subsets are grouped into populations for ease of review and interpretation.

**TABLE 5. DETAILS SHOWN IN REGIONAL & CONTINENTAL TABLES OF ESTIMATES IN THIS REPORT**

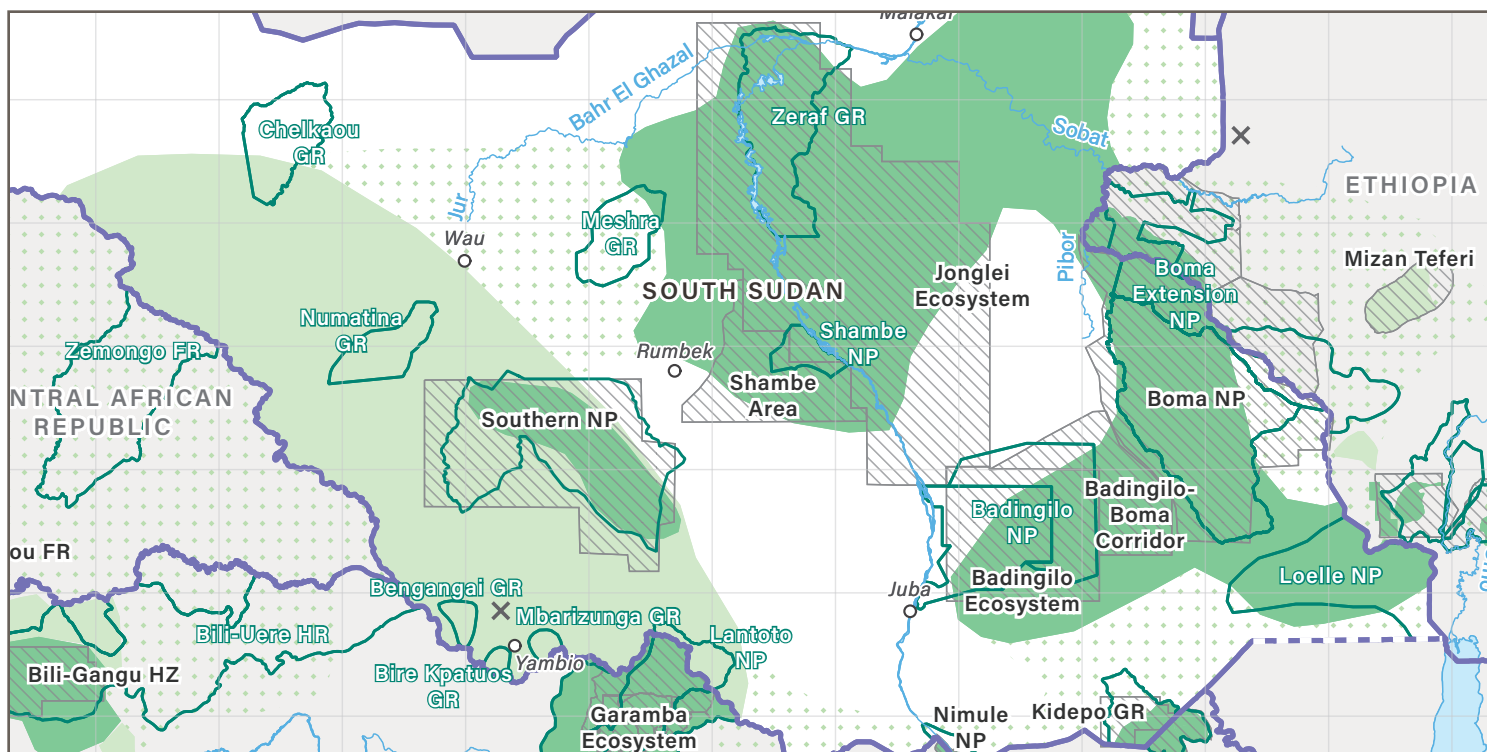
COLUMN	DESCRIPTION
<b>Country/Region</b>	Name of the country or region
<b>Elephant Numbers</b>	Elephant numbers in terms of estimates and guesses
<b>Range Area (km<sup>2</sup>)</b>	Estimate total range area (known plus possible range) in the country or region
<b>% of Regional Range</b>	Percentage of the regional/continental range accounted for by the country/region in question, rounded to the nearest integer
<b>% of Range Assessed</b>	Percentage of elephant range in the country or region for which estimates and guesses are available
<b>Information Quality Index (IQI)</b>	Number from zero (lowest) to one (highest) that gives an index of the overall quality of information on elephant population estimates and guesses (as described in the Overall Quality of Information and Survey Priorities section)
<b>Priority for Future Surveys (PFS)</b>	Number from one (highest) to five (lowest) indicating urgency and need for future systematic surveys, based on the precision of estimates and the proportion of regional/continental range accounted for by the region's/continent's estimates and guesses



**TABLE 6. DETAILS & SURVEY PARAMETERS PROVIDED IN NATIONAL TABLES OF ESTIMATES AND GUESSES**

COLUMN	DESCRIPTION
<b>Populations</b>	A grouping of adjacent input zones to indicate contiguous elephant populations or other geographically defined subsets. These designations have been made for some countries only, particularly those with many input zones
<b>Input Zone</b>	Name of the input zone
<b>Reliability</b>	Category (A, B, C, D, and E) to which the estimate or guess is assigned; dependent on survey type and additional criteria (as described in the Data Types and Categorisation section, Table 1)
<b>Survey Type</b>	Type of survey conducted (as described in the Data Types and Categorisation section, Table 2)
<b>Reason for Change</b>	Attributed reason for change with respect to the previous report (as described in the Integration and Presentation of Data section, Table 4)
<b>Survey Year</b>	Year in which the survey was conducted or to which the guess applies
<b>Number of Elephants</b>	Elephant population estimate or guess
<b>95 % C.L.</b>	Where available, the 95% confidence limit for the estimate (in the case of asymmetric confidence intervals, the difference between the lower and upper confidence interval divided by two). For informed guesses, the upper range of the guess, marked with an asterisk
<b>Source</b>	Author and year of the source material (full citations given in the list of references)
<b>Priority for Future Surveys (PFS)</b>	Number from one (highest) to five (lowest) indicating urgency and need for future systematic surveys, based on the precision of estimates and the proportion of national range accounted for by the input zone
<b>Area</b>	Size of the input zone in square kilometers (km <sup>2</sup> ); when available, the area given is that reported in the source material; if unreported, the area is calculated from the spatial data for the input zone
<b>Map Location</b>	Longitude and latitude of the centroid of the input zone, given in decimal degrees

EXAMPLE MAP



Section of country map shown for visual reference in context to the map legend.

MAPS

A map is shown for the continent, each region and each country, showing elephant distribution, input zones, protected areas within elephant range, national and/or regional boundaries, major towns, rivers and lakes. Countries of adjacent regions are shown to highlight important transfrontier populations, as well as the spatial relationships between elephant populations in neighbouring countries.

MAP LEGEND

Int'l Boundaries	<b>ELEPHANT RANGE</b>
Rivers & Lakes	Known
Towns	Possible
Protected Areas	Doubtful
Input Zones	Sighting

EDITORIAL CONVENTIONS AND REFERENCING

In these overviews, several conventions have been adopted for ease of reading. Survey types are marked in bold when referring to the data included in this report, aligning with the tables. Range categories are also marked in bold in reference to the current range, not the category assigned in 2007. Estimates from sample counts are given with 95% confidence limits in the form  $xx \pm yy$ . Asymmetrical confidence limits are shown in parentheses following the survey estimate. Abbreviations are used for protected areas after they are first named as a "National Park," (NP), "Forest Reserve," (FR) or other conservation area.

The AED relies on a huge number of discrete pieces of information, in the form of maps, survey reports, management plans, emails, phone calls, and news reports, among others. In addition to their inclusion in this report, these references are all eventually housed in the African Elephant Library, an invaluable and growing archive of over 7,500 references on the African elephant.



# Continental Overview



## ESTIMATED TOTAL ELEPHANTS

**415,428 ± 20,111**

## GUESSES

**117,127 - 135,384**

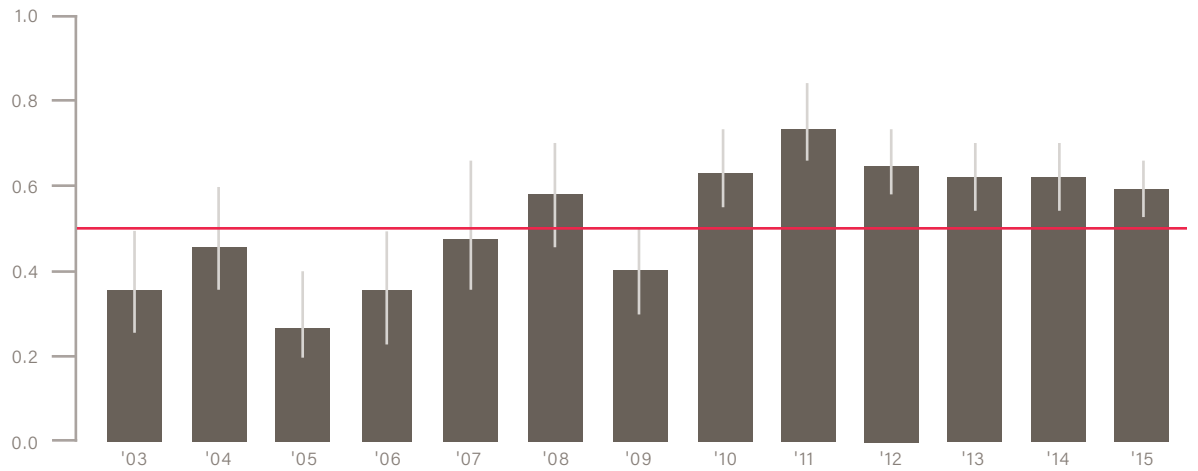
## GENERAL STATISTICS

Total Area	20,731,202 km <sup>2</sup>
Range Area	3,132,238 km <sup>2</sup> (15%)
Protected Range	30 %
Information Quality Index (IQI)	0.45

## CURRENT ISSUES

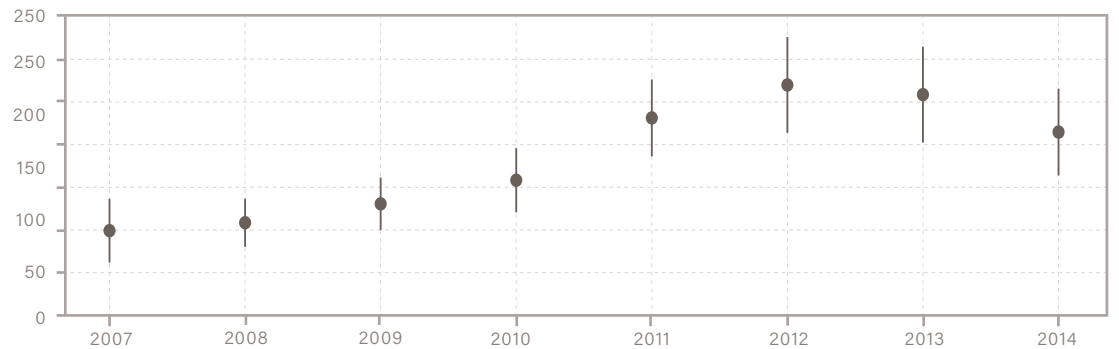
This is the first African Elephant Status Report in 25 years which has reported a continental decline in elephant numbers. The decline is largely caused by the surge in poaching for ivory that began around 2006 (CITES, 2016), the worst that Africa has experienced since the 1970s and 1980s. Underlying conservation issues, particularly loss of habitat and increasing human elephant conflict, are still of critical significance but are receiving less attention because of the poaching crisis.

Systematic information on elephant poaching comes from the programme for Monitoring the Illegal Killing of Elephants (MIKE). This was established at the 10th Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Harare in 1997 and subsequently modified in accordance with the provisions in Resolution 10.10 (Rev. CoP16) on Trade in elephant specimens (CITES Secretariat, 2013). MIKE covers sites in 30 of the 37 African elephant range states, and 13 Asian elephant range states. In Africa, 60 MIKE sites together hold an estimated 30 to 40% of the African elephant population (CITES Secretariat, 2016). MIKE relies on ranger-based monitoring of elephant carcasses. When an elephant carcass is located, rangers record, if possible, the cause of death, allowing the calculation of the Proportion of Illegally Killed Elephants (PIKE). The dataset used for the 2016 analysis of MIKE data consisted of 14,606 records of elephant carcasses found in 54 MIKE sites in 29 African elephant range states from 2003 to 2015 (CITES Secretariat, 2016). PIKE levels above 0.5 (i.e. where half of dead elephants found are deemed to have been illegally killed) are considered to be unsustainable. Continental poaching levels have remained above this sustainability threshold since 2010 (Figure A). Further details are provided in the regional summaries.



**FIGURE A:** PIKE trends in Africa from 2003 - 2015 with 95% confidence intervals (CITES Secretariat, 2016)

There has been much discussion as to whether one or two species of elephant should be recognized, with the forest elephant being acknowledged as a distinct species from the savanna elephant. The general opinion of taxonomists, particularly those with genetic expertise, is that two species should be recognized. However, this is complicated by lack of exact knowledge about where each species occurs and the presence of an unknown number of hybrid populations in areas around the fringe of the Congo Basin forests, including in Uganda (Mondol et al., 2015). Because of these uncertainties the African elephant is treated as a single species in this report. The use of the terms savanna and forest elephant is relevant at national and site level, and the terms are used in this report. Savanna elephants are found predominantly in Eastern and Southern Africa, while forest elephants occur primarily in the Congo Basin of Central Africa. In West Africa elephants live in both forest and savanna habitats; it is believed, however, that they are genetically forest elephants (Roca et al., 2015).



**FIGURE B:** The overall trend of illegal ivory trade activity globally where all ivory types and weight classes are consolidated with mean (bold dot) and 90% confidence intervals, 2007-2014. (Milliken et al., 2016)

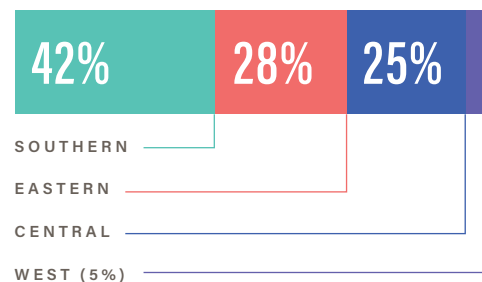
The African Elephant Action Plan (AEAP) was developed to respond to the needs of African elephant range states for the conservation and management of Africa's elephants. It was adopted in March 2010 at the 15th meeting of the Conference of the Parties to CITES (African elephant range states, 2010). The AEAP was developed over two years through a consultative process, facilitated by the IUCN SSC African Elephant Specialist Group and the CITES Secretariat, and is a consensus document fully owned and managed by the African elephant range states. It is intended to provide an overarching framework and a clear statement of shared objectives, to be achieved through activities implemented by the range states and their partners. The African Elephant Fund and the African Elephant Fund Steering Committee were established in accordance with CITES Decision 14.79 (Rev. CoP15) in 2010 to support and facilitate implementation of the action plan. As a follow

on to the AEAP development, national and regional level planning exercises are meant to highlight those actions urgently in need of funding if Africa's elephants are to be protected from the threats they face. The development of regional and national level plans, including those developed under the Elephant Protection Initiative, is described in the regional and national summaries.

All African elephant range states, except for South Sudan, are parties to CITES. Most range states have been parties to CITES for well over 20 years, except Angola, which joined the Convention in 2013. The elephant populations of four countries are in Appendix II of CITES: Botswana, Namibia, South Africa and Zimbabwe (CITES, 2015a). International trade in elephants and elephant specimens is allowed from these four countries under restricted conditions that differ slightly between the four countries, and there is currently a moratorium on international ivory sales until 2017. Elephant populations from the other range states are listed in Appendix I of CITES, and the trade in elephants and elephant specimens regulated accordingly.

In addition to the listing of the African elephant in the CITES Appendices, there is a CITES resolution governing trade in elephant specimens. Resolution Conf. 10.10 (Rev. CoP16) outlines a number of important provisions and regulations regarding trade in elephants and elephant specimens, as well as important reporting and monitoring responsibilities, such as the submission of data to the CITES monitoring systems MIKE and the Elephant Trade Information System (ETIS) (CITES Conference of the Parties, 2013b). CITES Decision 14.78 (Rev. CoP16) calls on the IUCN SSC's African and Asian Elephant Specialist Groups, MIKE, ETIS and the United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC) to prepare a joint analysis on the conservation

FIGURE C. ELEPHANT RANGE PER REGION



*Southern Africa has the largest extent of elephant range of any region, and accounts for 42% of the species' total range area. Eastern and Central Africa follow with 28% and 25% of the continental total respectively, while West Africa accounts for only 5%.*

status and management of live elephants, illegal killing, ivory trafficking and trade. The CITES Standing Committee has recommended that this decision be enshrined in Resolution Conf. 10.10 (Rev CoP16) at the CoP17 in September 2016 (CITES, 2016).

ETIS measures and records the levels and trends of illegal trade in ivory and other elephant specimens. The most recent analysis, produced for the 66th meeting of the CITES Standing Committee, demonstrates a trend in illegal ivory trade activity (Figure B) that parallels the illegal killing of elephants reported by MIKE since 2008, with a possible leveling and even a decline in recent years (CITES Secretariat, 2016; Milliken et al., 2016).

Recent analyses of ivory seizure data prepared by ETIS for CITES have identified those countries of most concern in relation to the illegal ivory trade (CITES Secretariat, 2012; Milliken et al., 2013,

2016). A number of countries were tasked by the CITES Standing Committee to prepare, implement and report on National Ivory Action Plans, a set of specific, time bound activities related to the control of poaching and the illegal ivory trade and compliance with Resolution Conf. 10.10 (Rev. CoP16). The CITES Secretariat has established a website devoted to tracking progress on National Ivory Action Plans, available at [cites.org/niaps](http://cites.org/niaps) (CITES, n.d.-a).

**TABLE 1:** *Hunting quotas submitted to CITES (2007 – 2015), converted here to equivalent numbers of animals.*  
\* No quota reported, therefore a zero quota was automatically allocated

EXPORT QUOTAS FOR ELEPHANT HUNTING TROPHIES									
COUNTRY	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Botswana</b>	300	330	400	400	400	400	400	400	0
<b>Cameroon</b>	80	80	80	80	80	80	80	80	0*
<b>Gabon</b>	50	50	0*	0*	0*	0*	0*	0*	0*
<b>Mozambique</b>	40	40	60	100	100	100	100	100	100
<b>Nambia</b>	90	90	90	90	90	90	90	90	90
<b>South Africa</b>	100	100	150	150	150	150	150	150	150
<b>Tanzania</b>	200	200	200	200	200	200	200	100	100
<b>Zambia</b>	20	20	20	20	80	80	0	0	80
<b>Zimbabwe</b>	500	500	500	500	500	500	500	500	500

**TABLE 2. IVORY STOCKPILE DESTRUCTION**

YEAR	COUNTRY	ESTIMATED WEIGHT (TONNES)	REFERENCE
2011	Kenya*	5.0	BBC News, 2011
2012	Gabon*	4.8	Jones, 2012
2013	Phillipines	4.2	Press, 2013
2013	USA	5.4	Goldenberg, 2013
2014	Belgium	1.7	Reuters, 2014
2014	Chad*	1.1	Godard, 2014
2014	China	6.2	Vaughan, 2014
2014	France	3.1	Willsher, 2014
2014	Hong Kong SAR	28.0	AFP, 2014
2015	Congo*	4.7	Smith, 2015
2015	China	0.7	Mathiesen, 2015
2015	Ethiopia*	6.1	BBC News, 2015b
2015	Kenya*	15.0	BBC News, 2015a
2015	Mozambique*	2.4	Vaughan, 2015
2015	Thailand	2.1	Reuters, 2015
2015	United Ared Emirates	10.0	Scanlon, 2015
2015	USA	1.2	Keim & Howard, 2015
2016	Malawi*	2.6	Reuters, 2016
2016	Sri Lanka	1.5	AFP, 2016
2016	Kenya*	105.0	CITES, 2016
Total		210.8	

*Reported ivory stockpile destructions (2011 - August 2016.)*

*\* African elephant range states*

Since 2007, there have been a number of destructions of ivory stockpiles, either by burning or crushing (Table 2). Three additional countries were known to have carried out stock destructions, Japan (2.8 tonnes in 2008) and unknown amounts in India and Portugal in 2014.

The nine range states listed above have submitted elephant hunting trophy quotas to CITES and these are shown below as the equivalent number of animals taken on quota derived from tusks and other trophies. In 2015 the United States imposed a suspension on permits for the import of African elephant trophies from Zimbabwe and Tanzania (USFWS, 2015a, 2015b) and the European Union imposed a suspension on the permits for the import of African elephant trophies from Mozambique (EU, 2015).

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## NUMBERS AND DISTRIBUTION

The estimated number of elephants in areas surveyed in the last ten years in Africa is  $415,428 \pm 20,111$  at the time of the last survey for each area. There may be an additional 117,127 to 135,384 elephants in areas not systematically surveyed. Together, this estimate and guess apply to 1,932,732 km<sup>2</sup>, which is 62% of the estimated known and possible elephant range, an increase from 51% in the previous report. There remains an additional 38% of range for which no elephant population estimates are available, although it is likely that average elephant densities are much lower than in the surveyed areas. The overall reliability of estimates has increased considerably, with estimates from systematic surveys now accounting for 37% of total range, versus 29% in the previous report. The overall quality of information, as measured by the Information Quality Index (IQI), has not changed.

This report presents more than 275 new or updated estimates for elephant populations across Africa, with over 180 of these arising from systematic surveys. All aerial survey data from the Great Elephant Census, a Paul G. Allen project, and data from dung counts in Central Africa carried out primarily by the Wildlife Conservation Society (WCS) and World Wide Fund for Nature (WWF) were submitted through the AED for inclusion in this report.

Holding over 70% of the estimated elephants in Africa (56% of estimated and guessed elephants), Southern Africa has by far the largest number of elephants in any of the four regions. Botswana continues to have the largest national population. Eastern Africa comes second, with 20% of estimated elephants (18% of estimated and guessed elephants), while Central Africa is an even more distant third (6%) for estimated elephants. There is a high proportion of guesses for Central Africa, giving a total of 23% of estimated and guessed elephants. This is because most Central African surveys are dung counts, and many of these are recorded as guesses, since dung decay studies have not been done on site. West Africa continues to hold the smallest regional population with under 3% of both categories.

Between the AESR 2007 and this report, there has been a reduction of 118,000 in estimates for populations across Africa where comparable surveys have been carried out. However some populations have been surveyed for the first time, particularly in Central Africa, and this has led to an increase of approximately 18,000 in the 'new population' category. The result is that the current total estimated number of elephants from surveys has decreased by a smaller figure of about 93,000 since the AESR 2007. Continued uncertainties about the number of elephants in Botswana have



a substantial potential impact on the continental population, because Botswana holds the single largest population but national estimates since 2006 have differed greatly, by as much as 80,000 elephants. In order to better understand the current status of this critically important population, which extends into neighbouring countries, a well-coordinated survey of the entire cross-border population of Angola, Botswana, Namibia, Zambia and Zimbabwe remains a very high priority.

The estimated number of elephants from surveys and guesses has decreased since the AESR 2007 by 104,000 to 114,000.

Elephants are found in 37 range states in sub-Saharan Africa. There has been one change since the AESR 2007, as South Sudan became independent from Sudan and all of former Sudan's confirmed elephant populations occurred in the south. It is still possible that small numbers of elephants either visit seasonally or reside in Dinder National Park in Sudan (Mohammad, pers. comm., 2016). There have been no national level extinctions since the AESR 2007, although the populations in Guinea Bissau and Senegal are so small that they are in imminent danger of extinction. It was widely reported in 2009 that elephants had gone extinct in Sierra Leone as a result of a single poaching incident (AFP, 2009) but this was not correct and there are still at least four small populations surviving in the country.

The distribution of elephants varies considerably across the four regions from small, fragmented populations in West Africa to large, virtually undisturbed tracts of elephant range in Central and Southern Africa, with a mixture in Eastern Africa. Detailed knowledge of the status of elephant distribution is scanty in many parts of the continent, particularly in Central Africa and in countries that are emerging from armed conflict, such as Angola, Sudan and Sierra Leone.

The total area of known and possible elephant range at the continental level is currently estimated at slightly over 3.1 million km<sup>2</sup>. This is hardly changed since the previous report. This is because most of the changes since the AESR 2007 were minor modifications rather than large scale changes. Improved knowledge of elephant distribution is reflected by the proportion of range categorized as known, which has increased from 63% to 67%. Significant range expansion has occurred in Botswana and Kenya.

## SUMMARY TOTALS

SURVEY CATEGORY	ESTIMATES FROM SURVEYS		GUESSES		KNOWN AND POSSIBLE RANGE	
	ESTIMATE	± 95% CL	FROM	TO	PERCENT (%)	AREA (km <sup>2</sup> )
Aerial Total Counts	58,005	—	—	—	6 %	198,431
Ground Total Counts	133	—	—	—	0 %	136
Individual Registrations	1,695	—	—	—	0 %	3,576
Aerial Sample Counts	330,748	19,902	—	—	27 %	847,236
Ground Sample Counts	893	507	—	—	0 %	990
Reliable Dung Counts	20,555	2,854	—	—	3 %	96,670
Other Dung Counts	1	—	37,837	46,507	3 %	88,271
Informed Guesses	3,398	—	19,274	26,926	8 %	245,870
Other Guesses	—	—	10,145	12,080	7 %	218,187
Degraded Data	—	—	17,494	17,494	2 %	69,735
Modeled Extrapolation	—	—	32,378	32,378	5 %	163,629
<b>Totals 2015</b>	<b>415,428</b>	<b>20,111</b>	<b>117,127</b>	<b>135,384</b>		
<b>Totals 2006</b>	<b>508,325</b>	<b>36,563</b>	<b>138,651</b>	<b>146,700</b>		
Assessed Range					62 %	1,932,732
Unassessed Range					38 %	1,199,506
Total Range					100 %	3,132,238

## INTERPRETATION OF CHANGES IN ESTIMATES FROM PREVIOUS REPORT

REASON FOR CHANGE	ESTIMATES FROM SURVEYS		GUESSES		KNOWN AND POSSIBLE RANGE	
	ESTIMATE	± 95% CL	FROM	TO	PERCENT (%)	AREA (km <sup>2</sup> )
Repeat Survey	-118,477	±40,682	-8,691	-2,896	23 %	714,065
New Population	+17,992	±6,858	+13,975	+15,235	11 %	335,754
Different Technique	+11,369	±5,180	-22,998	-26,192	5 %	145,318
Different Area	+4,165	±3,449	-16,248	-14,565	5 %	170,682
New Guess	-4,482	±333	+12,958	+19,389	15 %	483,766
Population Lost	-129	±167	-998	-1,138	0 %	837
Data Degraded	-3,335	±642	+3,335	+1,708	0 %	0
No Change	0	±76	0	0	3 %	82,310
Totals	-92,897	±41,729	-18,667	-8,459	62 %	1,932,732

## AREA OF RANGE COVERED BY EACH DATA CATEGORY

DATA CATEGORY	KNOWN RANGE (km <sup>2</sup> )	POSSIBLE RANGE (km <sup>2</sup> )	TOTAL RANGE (km <sup>2</sup> )
Aerial or Ground Total Counts	197,060	5,083	202,143
Direct Sample and Reliable Dung	841,678	103,218	944,896
Informed Guesses	230,720	178,779	409,499
Other Dung Counts	84,265	4,007	88,271
Other Guesses	229,086	54,266	283,353
Unassessed Range	515,413	682,070	1,198,197
Totals	2,098,222	1,027,424	3,126,359

## REGIONAL ELEPHANT ESTIMATES

REGION	# OF ELEPHANTS		GUESSES		RANGE		
	ESTIMATE	± 95% CL	MIN	MAX	AREA (km <sup>2</sup> )	% REGIONAL	% ASSESSED
Central Africa	24,119	2,865	87,190	103,355	783,085	25 %	70 %
Eastern Africa	86,373	10,549	11,973	12,060	880,648	28 %	62 %
Southern Africa	293,447	16,683	15,157	16,672	1,325,998	42 %	55 %
West Africa	11,489	2,584	2,887	3,377	142,500	5 %	72 %
<b>Total</b>	<b>415,428</b>	<b>20,112</b>	<b>117,128</b>	<b>135,385</b>	<b>3,132,238</b>	<b>100 %</b>	<b>62 %</b>

\*RANGE OF INFORMED GUESS

<sup>1</sup>KEY TO REASONS FOR CHANGE

DA: Different Area; DD: Data Degraded; DT: Different Technique; NA: New Analysis; NG: New Guess; NP: New population; PL: Population Lost; RS: Repeat Survey (RS denotes a repeat survey that is not statistically comparable for reasons such as different season);  
 — : No Change

<sup>3</sup>PFS

Priority for Future Surveys (PFS) is ranked from 1 to 5 (highest to lowest). Based on the precision of estimates and the proportion of national range accounted for by the site in question, PFS is a measure of the importance and urgency for future population surveys. All areas of unassessed range have a priority of 1. See Introduction for details on how the PFS is derived.

<sup>2</sup>KEY TO SURVEY REPORT

AS: Aerial Sample Count; AT: Aerial Total Count; DC: Dung Count; GD: Genetic Dung Count; GS: Ground Sample Count; GT: Ground Total Count; IG: Informed Guess; IR: Individual Registration; OG: Other Guess. Survey Reliability is keyed A-E (best to worst).

# Africa



### ABBREVIATIONS AND ACRONYMS

See Appendix III for map abbreviations and acronyms.



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Int'l Boundaries	<b>ELEPHANT RANGE</b>
Rivers & Lakes	Known
Towns	Possible
Protected Areas	Doubtful
Input Zones	Sighting