

THE MESSENGERS

What birds tell us about threats from climate change and solutions for nature and people



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 $\textbf{BirdLife International} \ is \ the \ world's \ largest \ nature \ conservation \ Partnership. \ Together \ we \ are \ 119 \ BirdLife \ Partners \ worldwide - \ one \ per \ and \ Partnership. \ Together \ we \ are \ 119 \ BirdLife \ Partners \ worldwide - \ one \ per \ Partnership.$ $country- and\ growing\ with\ 13\ million\ members\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ 7,400\ staff.\ Bird\ Life's\ vision\ is\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ respective to the supporters and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ respective\ groups\ and\ supporters, over\ 7,000\ local\ conservation\ groups\ and\ supporters, over\ 7,000\ loc$ world rich in biodiversity, where people and nature live in harmony. We are driven by our belief that local people, working for nature in their own places and connected nationally and internationally through our global Partnership, are the key to sustaining all life on this planet. This unique local-to-global approach delivers high impact and long-term conservation for the benefit of nature and people. BirdLife is widely recognised as the world leader in bird conservation. Rigorous science informed by practical feedback from projects on the ground in important sites and habitats enables us to implement successful conservation programmes for birds and all nature

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The National Audubon Society saves birds and their habitats throughout the Americas using science, advocacy, education and on-the-ground conservation. Audubon's state programs, nature centers, chanters and partners have an unparalleled wingspan that reaches millions of people each year to inform, inspire, and unite diverse communities in conservation action. Since 1905, Audubon's vision has been a world in which $people and \textit{wildlife} thrive. \\ In 2014, Audubon published research showing climate change threatens hundreds of North American bird species; \\$ its Climate Initiative aims to create greater demand for climate solutions - while protecting the places on the ground birds need now and in a warmer future. Audubon is a nonprofit conservation organization and is the official BirdLife International Partner in the United States.

Learn more at www.audubon.org/climate and @audubonsociety

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Over time and across cultures, birds have sent us signals about the health of our environment. The canary in the coal mine offered that most precious resource, time – a small window in which humans could escape toxic gases. Miners no longer use songbirds as early warning systems, but birds are our closest connection to wildlife on the planet and they still tell us about the health of the places people and birds share. Never before has their message - climate change is here and a threat to the survival of birds and people – been as clear or as urgent.

This first-ever global synthesis by the 119-nation BirdLife International Partnership draws on research from multiple disciplines and every continent. The findings are consistent across both: climate change attacks the natural systems that birds and people rely upon. This synthesis emphasizes solutions to both buy us more time and to build natural resilience for generations of people to come.

This report highlights the cost efficiency, importance and practical benefits of nature-based solutions that can be implemented now, everywhere. While birds and other wildlife tell us compelling stories about the impacts of climate change, only people can act as nature's negotiators. We can contribute to a set of solutions that humankind will need to employ if we are to avoid the worst impacts of climate change.

We decided to collect and share examples of such solutions now because we are at a critical juncture in the climate change conversation. The 21st Conference of the Parties COP for the United Nations Framework Convention on Climate Change, to be held in Paris, shines a spotlight on how world leaders plan to help societies adapt to and limit future warming. Technologies to speed up the clean energy transition and policies to reduce carbon emissions will, of course, be critical parts of the response. But nature itself can contribute common sense, locally-appropriate solutions.

Right before this report went to press Paris was wounded by terrorists. For people like us, who strive to protect life in all its forms, the attack on human life is an atrocity that we condemn. The COP gathering, which aims to build a brighter and safer future for all, is a unique opportunity to emphasize our message: we cherish, nurture and protect life. Because this is our Nature.

Patricia Zurita CEO BirdLife International

David Yarnold CEO National Audubon Society

BIRDLIFE INTERNATIONAL & NATIONAL AUDUBON SOCIETY THE MESSENGERS



THE MESSENGERS

WHAT BIRDS TELL US ABOUT THREATS FROM CLIMATE CHANGE AND SOLUTIONS FOR NATURE AND PEOPLE

Birds are far better known than most other animals, and they are powerful messengers for the natural world. They are telling us how climate change poses risks to nature and people worldwide. This synthesis of hundreds of scientific studies illustrates the many ways by which climate change threatens birds and other wildlife. It describes actions underway to help nature adapt, and also shows for the first time how the BirdLife Partnership is implementing nature-based solutions across the world to reduce climate risks and build people's resilience.

CLIMATE CHANGE IS ALREADY HAVING NEGATIVE IMPACTS ON NATURE

Many species are already struggling to adapt to the pace of warming. Rising temperatures are driving species' distributions poleward and toward higher ground. Migration and breeding cycles are changing, leading to disrupted relationships with prey, predators and competitors. In many cases, these effects have driven population declines.

AS TEMPERATURES RISE, THREATS TO PEOPLE AND NATURE WILL INCREASE

As warming continues, negative impacts on bird and human populations will multiply and intensify. While some species may benefit from rising temperatures, it's likely that more than twice as many species will lose out than will thrive. The key problems are:

Smaller living spaces

The majority of species are expected to experience shrinking ranges, which will increase the risk of extinction.

Population declines

Many species will not be able to shift their distributions as fast as climate changes, or advance their breeding to match seasonal changes.

New communities and interactions

The composition of ecological communities will be disrupted. Changes in predators, competitors and habitats will all pose significant threats.

Current threats exacerbated

Climate change will exacerbate existing threats, such as habitat fragmentation, diseases and invasive alien species.

Impacts on human health and well-being

People's lives and livelihoods will be increasingly threatened by climate change, with diverse impacts including loss of homes, shortages of food and freshwater and increased incidence of disease.

Human responses could exacerbate climate impacts

People will have to mitigate and adapt to climate change, deploying new energy sources, migrating, and creating new farmland. This could have substantial negative impacts for nature and people who depend on it.

CLIMATE-SMART CONSERVATION AND NATURE-BASED SOLUTIONS REDUCE CLIMATE RISKS AND BUILD RESILIENCE FOR BIRDS AND PEOPLE

Despite the multiple threats climate change creates and exacerbates, this report sends a message of hope: we can reduce the severity of climate change, and help species and people adapt to a changing world.

As leaders of nature-based solutions, BirdLife International Partners have the tools to ensure that climate solutions benefit nature and the human communities that depend on it for their livelihoods, protection and recreation.

From tropical forests in Indonesia to peatlands in Belarus, the BirdLife Partnership is conserving and restoring carbon-rich ecosystems, cutting global greenhouse gas emissions, and reducing the impacts of climate change on people and nature.

Mitigating climate change is imperative, but not sufficient: helping life to adapt to a changing world is also crucial. BirdLife's network of Important Bird and Biodiversity Areas (IBAs) will be ever more important as climate change shifts and shrinks many species' ranges, while protecting other intact natural habitats and interconnecting corridors will also help life to move and adapt.

BirdLife Partners across the globe are promoting and implementing ecosystem-based adaptation to build people's resilience to storm surges, drought, flooding and other hazards, and ensure ecosystems continue to support livelihoods in the face of climate change.

Birds help people to engage with nature and understand the impacts of climate change. They are sending us powerful messages:

-) Cut emissions.
-) Help species adapt.
-) Invest in nature-based solutions for people.
-) Act now.

61

64

64

65

67

68

70



CURRENT IMPACTS

CASE STUDY 1

Recent bird population trends in Europe show a strong signal of climate change.

CASE STUDY 2

More species have responded negatively than positively to recent climate change.

CASE STUDY 3

Temperature changes explain the declines in endemic bird populations in Mexico.

CASE STUDY 4

Species are shifting their ranges polewards.

CASE STUDY 5

Rising temperatures are forcing montane species to move to higher altitudes.

CASE STUDY 6

Bird communities are becoming more dominated by warm-adapted species.

CASE STUDY 7

Mismatches between the timing of breeding and food supply are affecting Arctic shorebirds.

CASE STUDY 8

Hosts of brood-parasitic Common Cuckoos are breeding earlier than migratory cuckoos arrive.

CASE STUDY 9

Higher temperatures have increased predation by edible dormice on woodland birds.

CASE STUDY 10

Climate-driven reductions in krill numbers have caused Adélie Penguin declines.



PROJECTED IMPACTS

CASE STUDY 11

Some species have traits that make them particularly susceptible to climate change. 22

CASE STUDY 12

Climate change will increase the number of species under threat.

CASE STUDY 13

There are projected to be more losers than winners under climate change.

CASE STUDY 14

Bird species richness in South Africa is projected to decline across different habitats.

CASE STUDY 15

Half of North American species are threatened by climate-induced range loss.

CASE STUDY 16

Most species will experience range contraction and shifts.

CASE STUDY 17

Some East African species are projected to lose all their suitable habitat by 2085.

CASE STUDY 18

Sea level rise will cause trouble for birds on low-lying islands in the Pacific.

CASE STUDY 19

Extreme weather will lead to more frequent mass mortality in European Shags.

CASE STUDY 20

Catastrophic bird mortality events will increase during extreme heat waves.

CASE STUDY 21

The threat from avian malaria will increase for Hawaiian birds. 31

CASE STUDY 22

South-East Asian forest birds will decline due to climate change and deforestation.

CASE STUDY 23

Many IBAs are projected to experience high turnover in bird species of conservation concern. 34

CASE STUDY 24

The degree of disruption to bird communities in IBAs will increase through the 21st century. 34

CASE STUDY 25

Bird communities in California will undergo substantial disruption under climate change. 35

CASE STUDY 26

Widespread and substantial shifts are projected for Colombian bird communities. 35

CASE STUDY 27

23

26

Extreme weather events will increase in frequency and intensity.

CASE STUDY 28

Exposure to infectious disease is likely to increase.

CASE STUDY 29

Impacts on food production may be substantial.

CASE STUDY 30

Climate change is expected to drive mass migration of people. 39

CASE STUDY 31

The impact of climate change on human communities alters the assessment of the vulnerability of IBAs.

CASE STUDY 32

Bioenergy expansion without careful planning will drive biodiversity loss.

CASE STUDY 33

Poorly planned responses to coastal flooding have negatively impacted waterbirds in the Netherlands. 43

CASE STUDY 34

Converting natural habitats to oil palm for bioenergy is bad for birds and climate change. 43



SOLUTIONS FOR PEOPLE AND NATURE

CASE STUDY 35

Promoting smart, clean energy helps avoid negative impacts. 46

CASE STUDY 36

Promoting bird-friendly energy infrastructure on the Red Sea flyway benefits migratory birds. 46

CASE STUDY 37

Strategically deploying power lines minimises bird electrocutions.

CASE STUDY 38

Promoting environmental safeguards for bioenergy helps avoid detrimental outcomes. 47

CASE STUDY 39

Restoring peatlands in Belarus reduces carbon emissions and saves waterbirds.

CASE STUDY 40

A new approach to forest conservation has been developed in Indonesia. 48

CASE STUDY 41

Conserving forests in Paraguay benefits climate, wildlife and local communities.

CASE STUDY 42

Restoring forests in the Philippines' Sierra Madre provides benefits for people and nature. 49

CASE STUDY 43

Implementing REDD+ in Sierra Leone reduces emissions while benefitting birds and people.

CASE STUDY 44

Restoring mangroves in Mexico enhances carbon sequestration and benefits the community. 49

CASE STUDY 45

Conservation planning is incorporating climate change. 52

CASE STUDY 46

Climate change is being incorporated into conservation spatial planning. 52

CASE STUDY 47

Mobilising citizen scientists is aiding climate planning in Washington, USA.

CASE STUDY 48

Monitoring is even more important under climate change. 53

CASE STUDY 49

Protected areas are helping species to persist within existing ranges and to colonise new areas. 54

CASE STUDY 50

Identifying new sites increases the resilience of the IBA network.

CASE STUDY 51

Creating new wetland habitat helps Bitterns adapt in the UK. ss

CASE STUDY 52

Managing the hydrology of peatland sites could help Golden Plovers adapt to climate change.

CASE STUDY 53

Enhancing habitat corridors allows species to move among key sites.

CASE STUDY 54

Creating stepping stone habitat patches may aid range expansion.

CASE STUDY 55

Managing the matrix of suitable habitat between key sites will aid movement of species.

CASE STUDY 56

Assisting colonisation will help African Penguins impacted by climate change.

CASE STUDY 57

Conserving mangroves in the Neotropics provides a natural sea defence.

CASE STUDY 58

Realigning coasts helps protect communities.

CASE STUDY 59

Climate Resilient Altitudinal
Gradients (CRAGs) provide
a focus for action in East Africa. 61

CASE STUDY 60

Restoring tidal marshes in San Pablo Bay, USA, benefits people and birds.

CASE STUDY 61

Enhancing the resilience of Sahel habitats provides long-term benefits.

CASE STUDY 62

Promoting sustainable agricultural systems increases resilience in the Southern Cone grasslands.

CASE STUDY 63

Conserving the High Andean wetlands supports birds and people.

CASE STUDY 64

Building resilient montane forest landscapes in Uganda improves livelihoods. 65

CASE STUDY 65

Connecting birds and people helps mobilise climate change action.

CASE STUDY 66

Empowering Burundi's Serukubeze community to take climate action.

CASE STUDY 67

Exchanging knowledge and lessons in East Africa helps communities cope with climate change.

CASE STUDY 68

59

60

60

There are still knowledge gaps, and uncertainties remain in the projected impact of climate change on nature and people. 67

FOREWORD

INTRODUCTION

KEY RECOMMENDATIONS

FOR POLICYMAKERS

REFERENCES



POPULATION TRENDS FOR WARM AND COOL-ADAPTED SPECIES IN EUROPE

Source Gregory et al. (2009) PLoS One 4: e4678.

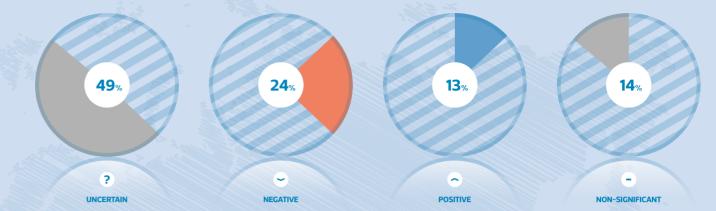




YEAR

SPECIES' RESPONSES TO RECENT CLIMATE CHANGE

Source Pacifici et al. in reviev



CASE STUDY 1

RECENT BIRD POPULATION TRENDS IN EUROPE SHOW A STRONG SIGNAL OF CLIMATE CHANGE

Warm-adapted species (those whose distributions are projected to expand under climate change) have increased in abundance in Europe over recent decades, while cool-adapted species (those whose distributions are projected to contract) have decreased in numbers. The ratio of trends for the two sets of species – the Climatic Impact Index – shows a strong signal of climate change on bird populations since about 1990, with increasing values showing the overall impact of climate change on birds is growing. Recent results for North America are similar.









COOL-ADAPTED SPECIES YELLOWHAMMER

CLIMATE CHANGE IS ALREADY AFFECTING SPECIES IN MANY, MOSTLY **NEGATIVE, WAYS**

Climate change is not just it is already impacting species. Climate change has been identified as an important driver of bird population trends across northern continents since the 1980s. A quarter of species studied in detail already show negative responses to recent climate change, while only one in eight responded positively.







CASE STUDY 2

MORE SPECIES HAVE RESPONDED **NEGATIVELY THAN POSITIVELY** TO RECENT CLIMATE CHANGE

A recent review of the scientific literature shows that 24% of the 570 bird species studied in detail around the world have been negatively affected by climate change to date, while only 13% have responded positively. For half of all species, the impact remains uncertain. Most negative impacts demonstrated to date have related to reductions in abundance and range size.

THE CLIMATIC IMPACT INDEX FOR COMMON EUROPEAN BREEDING BIRDS

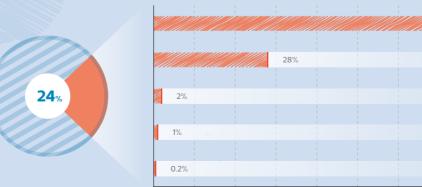
Source Gregory et al. (2009) PLoS One 4: e4678.

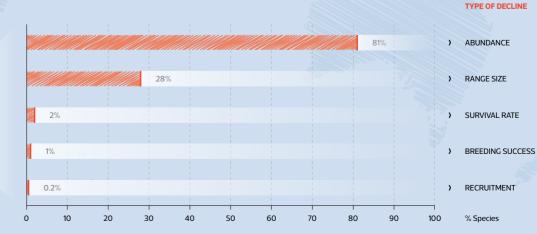




FREQUENCY OF DIFFERENT TYPES OF NEGATIVE IMPACTS ATTRIBUTED TO RECENT CLIMATE CHANGE

Source Pacifici et al in review





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GREY JAY Perisoreus canadensis HAS SHIFTED ITS RANGE NORTHWARDS BY AN AVERAGE

18.5 km
OF 18.5 km IN 26 YEARS, AND WARMER AUTUMNS HAVE BEEN LINKED TO REDUCED BREEDING
SUCCESS IN CANADA, LIKELY DUE TO INCREASED PERISHING OF HOARDED FOOD

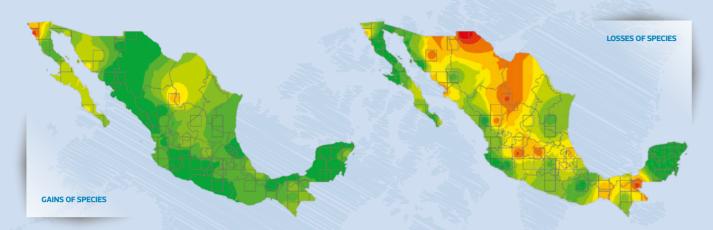
PHOTO ELAINE R. WILSON

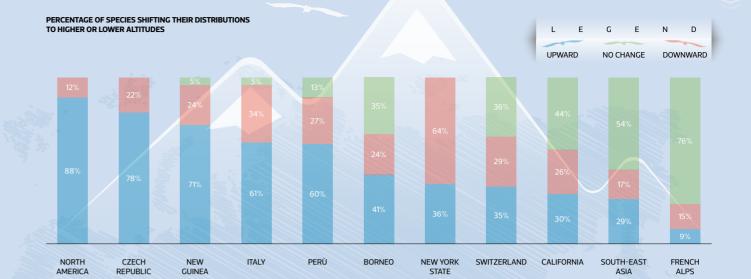


GAINS AND LOSSES SINCE 1950 OF BIRDS RESTRICTED TO MEXICO

SOUARES SHOW SAMPLED AREAS FROM WHICH PATTERNS WERE INTERPOLATED. GREEN INDICATES LOW VALUES. RED INDICATES HIGH VALUES.

Source Peterson *et al.* (2015) *Sci. Adv.* 1: e1400071.





CASE STUDY 3

TEMPERATURE CHANGES EXPLAIN THE DECLINES IN ENDEMIC BIRD **POPULATIONS IN MEXICO**

The gains and losses of endemic bird species from sampling points across Mexico in recent decades have been influenced mainly by temperature change. Substantially more endemic species have been lost from particular locations than gained.



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RECENT CLIMATE **CHANGE HAS DRIVEN POPULATION DECLINES** AND DISTRIBUTION **SHIFTS** Rising temperatures and other recent changes in climate have significantly impacted species' populations. Although warming has increased the abundance of some adaptable species in temperate regions, it has driven declines in a much larger number of species, and has resulted in distribution shifts to higher latitudes or altitudes. This has already resulted in significant changes in the composition of bird communities.







OCHRACEOUS BULBUL

DOWNWARD



RISING TEMPERATURES **ARE FORCING MONTANE SPECIES** TO MOVE TO HIGHER ALTITUDES

CASE STUDY 5

Many montane species are shifting their ranges upslope to track suitable climate, but there is considerable variation in responses, with some studies finding that a significant proportion of species have shown no change yet, or even shifted to lower elevations, likely owing to changes in rainfall patterns.

Source Archaux (2004) Ibis 146: 138-144: Peh (2007) Condor 109: 437–441; Zuckerberg et al. (2009) Glob. Change Biol. 15: 1866–1883; Popy et al. (2010) J. Biogeogr. 37: 57–67; Maggini et al. (2011) Ecol. Model. 222: 21-32; Forero-Medina et al. (2011) PLoS One 6: e28535; Reif & Flousek (2012) Oikos 121: 1053-1060: Harris et al. (2012) Raffles B. Zool. 25: 197-247: Auer & King (2014) Global Ecol. Biogeogr. 23: 867–875.

CASE STUDY 4

SPECIES ARE SHIFTING **THEIR RANGES POLEWARDS**

Long-term studies in Europe and North America show that many species are shifting their distributions northwards. Elsewhere, the picture is a little more complicated, with birds in Australia shifting their distributions in multiple directions.

Source Zuckerberg et al. (2009) Glob. Change Biol. 15: 1866–1883; Auer & King (2014) Glob. Ecol. Biogeogr. 23: 867–875; National Audubon Society (2014); Virkkala & Lehikoinen (2014) Glob. Change Biol. 20: 2995–3003; Gillings et al. (2015) Glob. Change Biol. 21: 2155-2168











40 species



MEAN NORTHWARD SHIFTS IN THE DISTRIBUTION
OF SPECIES IN EUROPE AND NORTH AMERICA

138

1.26

km/vear

Finland

breeding

94 species





122 species

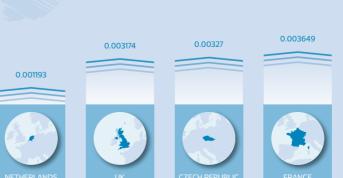
0.48 km/year

New York State 129 species

INCREASE IN COMMUNITY TEMPERATURE INDEX FOR BIRDS DURING 1990-2008

THE HEIGHT OF EACH ARROW IS PROPORTIONAL TO THE MAGNITUDE OF CHANGE

Source Devictor et al. (2012) Nature Climate Change 2: 121–124



CASE STUDY 6 0.012471

BIRD COMMUNITIES ARE BECOMING MORE DOMINATED **BY WARM-ADAPTED SPECIES**

The Community Temperature Index reflects the relative composition of warm and cool-adapted bird species in Europe. It shows that between 1990 and 2008, there was a shift of communities to warm-adapted species, owing to the increasing abundance and arrival of such species and decreasing abundance and local extinction of cool-adapted species. These shifts have happened slower than the changes in temperature across Europe during this period.



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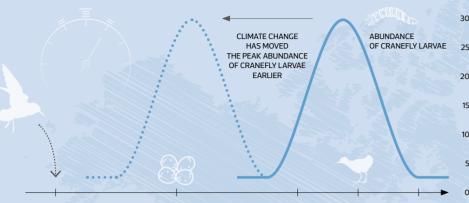


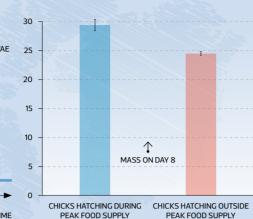
CLIMATE CHANGE HAS CAUSED MISMATCHES BETWEEN TIMING OF BREEDING AND PEAK FOOD AVAILABILITY BODY MASS FOR BAIRD'S SANDPIPER CHICKS HATCHING DURING OR OUTSIDE THE PERIOD OF PEAK FOOD SUPPLY

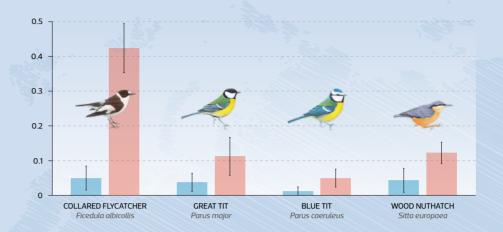
Source McKinnon et al. (2012) Can. J. Zool. 90: 961–971.

PREDATION RATES OF CAVITY-NESTING BIRDS Source Adamik & Kral (2008) J. Zool. 275: 209–215.

RV FDIRI F DORMICE









CASE STUDY 7

ARRIVE FROM MIGRATION

MISMATCHES BETWEEN THE TIMING OF BREEDING AND FOOD SUPPLY **ARE AFFECTING ARCTIC SHOREBIRDS**

EGGS LAID

Increasing temperatures in the high Arctic are bringing forward breeding times for some shorebirds such as Baird's Sandpiper Calidris bairdii, but not always in line with advances in the timing of peak abundance of the insects that sandpiper chicks feed on. Chicks raised outside the period of peak food abundance grew significantly more slowly, which may have subsequent effects for chick survival and recruitment. Similar results have been found for some populations of European Pied Flycatcher Ficedula hypoleuca in the Netherlands.



EGGS HATCH

CHICKS FEED





CRANFFLY LARVAF

TIPULIDAE



CLIMATE CHANGE IS DISRUPTING THE INTERACTIONS **BETWEEN SPECIES**

Species interact with predators, parasites, competitors and other species that they eat. Climate change is already disrupting these interactions through changes in the abundance of interacting species, the quality of food supply or timing of biological processes. Such effects have probably been more significant than the direct impacts of rising temperatures and other climatic shifts.











CASE STUDY 9

HIGHER TEMPERATURES HAVE **INCREASED PREDATION BY EDIBLE DORMICE ON WOODLAND BIRDS**

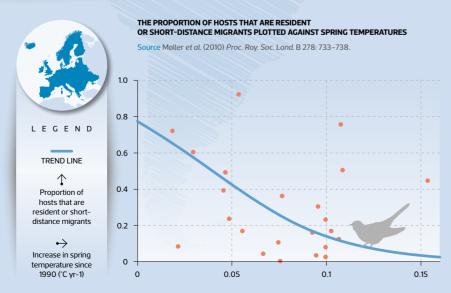
In the Czech Republic, higher temperatures have allowed populations of the Edible Dormouse Glis glis to increase, leading to more frequent predation on the nests of woodland birds such as Great Tit Parus major and Wood Nuthatch Sitta europaea, although this does not yet appear to have impacted population trends.

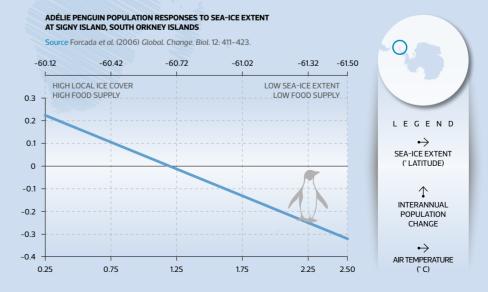
CASE STUDY 8

HOSTS OF BROOD-PARASITIC COMMON **CUCKOOS ARE BREEDING EARLIER THAN MIGRATORY CUCKOOS ARRIVE**

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As spring temperatures have increased since 1990, proportionately fewer nests of resident and short-distance migratory hosts are being parasitized by long-distance migratory Common Cuckoo Cuculus canorus in Europe, as these hosts are breeding earlier than the cuckoos are arriving. This may explain cuckoo declines in some countries (although overall trends have been stable since the late 1990s. at least in western/central Europe).





CASE STUDY 10

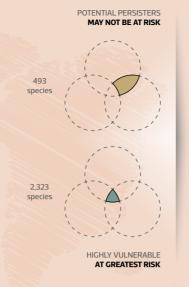
CLIMATE-DRIVEN REDUCTIONS IN KRILL NUMBERS HAVE CAUSED **ADÉLIE PENGUIN DECLINES**

The abundance of krill (Euphausiacea), which dominates the Southern Ocean foodweb, depends on sea-ice extent. Warming around the Antarctic Peninsula has reduced the survival of juvenile Adélie Penguins Pygoscelis adeliae as a result, while the contraction of sea-ice away from food-rich coastal upwellings has limited their access to food. Along with more spring blizzards causing breeding failure, climate change has caused significant population declines.

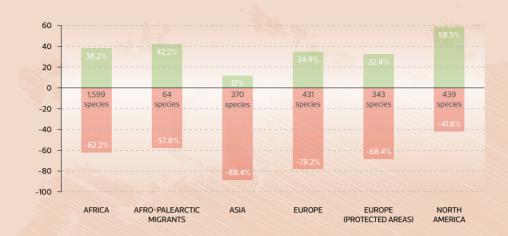


NUMBER OF SPECIES **VULNERABLE TO CLIMATE CHANGE** EXPOSED SENSITIVE ADAPTIVE

Source Foden et al. (2013) PLoS One 8: e65427



PERCENTAGE OF SPECIES PROJECTED TO UNDERGO RANGE EXPANSION OR EXPERIENCE MORE SUITABLE CLIMATE WITHIN THEIR DISTRIBUTIONS BY THE END OF THE 21ST CENTURY ('WINNERS') VERSUS RANGE CONTRACTION OR LESS SUITABLE CLIMATE ('LOSERS')





Source Huntley et al. (2008) PLoS One 3(1): e1439; Barbet-Massin et al. (2009) Biol. Lett. 5: 248–251; Hole et al. (2009) Ecol. Lett. 12: 420–431; Araujo et al. (2011) Ecol. Lett. 14: 484-492; Bagchi et al. (2013) Glob. Change Biol. 19: 1236-1248; Langham et al. (2015)

CASE STUDY 11

SOME SPECIES HAVE TRAITS THAT MAKE THEM PARTICULARLY SUSCEPTIBLE TO CLIMATE CHANGE

More than 2,300 bird species worldwide are highly vulnerable to climate change because they have a combination of high sensitivity to its impacts (e.g. through their dependence on other species), low ability to adapt (e.g. by dispersal) and a high exposure to changing climate.



1







MORE SPECIES ARE PROJECTED TO DECLINE UNDER CLIMATE CHANGE THAN ARE LIKELY TO BENEFIT

Although some species because their distributions and populations are expected to expand, there are likely to be many more species that lose more imperilled, while most of the species projected to be impacted (according to recent for conservation will grow substantially.





LOSERS

STARLING





climate change.

CASE STUDY 14

CASE STUDY 13

THERE ARE PROJECTED TO BE MORE LOSERS THAN WINNERS **UNDER CLIMATE CHANGE**

Results from studies across different regions show that, on average, there are projected to be more than twice as many species whose populations and distributions may decline under climate change than the number that are expected to increase. Generalist species are typically likely to increase in population and range, while specialist species are expected to decline. The magnitude of these declines is expected to increase with the severity of

CASE STUDY 12

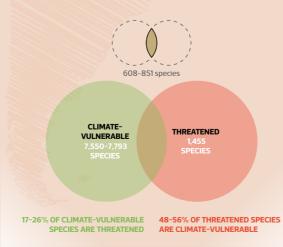
CLIMATE CHANGE WILL INCREASE THE **NUMBER OF SPECIES UNDER THREAT**

Globally, a quarter of 'highly climatically vulnerable' bird species (based on their biological characteristics) are listed as threatened on the IUCN Red List, while only 1% of climatically threatened or vulnerable bird species in North America have been identified as of concern on the Red List. This suggests that climate change will increase the number of threatened species and affect those that are already in trouble. The magnitude of these effects will be related to the degree of climate change.

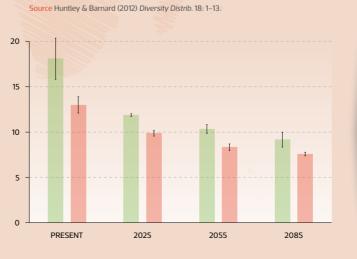


urce Foden et al. (2013)

RELATIONSHIP BETWEEN SPECIES AT RISK FROM CLIMATE CHANGE AND THOSE EVALUATED AS THREATENED BY BIRDLIFE ON THE IUCN RED LIST



PROJECTED SPECIES RICHNESS OF SOUTH AFRICAN BIRD COMMUNITIES AVERAGED ACROSS THREE CLIMATE MODELS FOR TWO BIOMES



LEGEND GRASSLAND FYNBOS MEAN SPECIES RICHNESS YFAR

BIRD SPECIES RICHNESS IN SOUTH AFRICA IS PROJECTED TO DECLINE

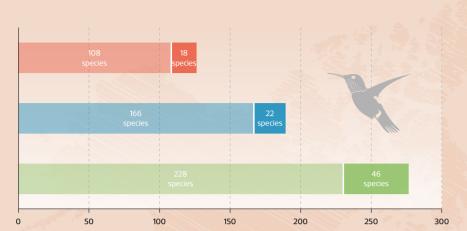
ACROSS DIFFERENT HABITATS

While some species of South African birds are projected to expand their distributions under climate change, more are projected to contract, leading to average reductions of 30-40% in the number of species in bird communities in grassland and fynbos by 2085. This is likely to influence the functioning of ecosystems, especially since important pollinators such as Malachite Sunbird Nectarinia famosa are projected to decline more than other species on average.



NUMBER OF NORTH AMERICAN SPECIES CLASSIFIED AS CLIMATE ENDANGERED. CLIMATE VULNERABLE AND CLIMATE STABLE

Source Langham et al. (2015) PLoS One 10: e0135350.



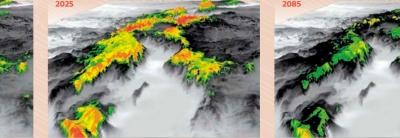
E G E N IN ONE SEASON **BOTH SUMMER AND WINTER** CLIMATE ENDANGERED Projected loss of >50% of current range, with no net increase in range extent CLIMATE VULNERABLE Projected loss of >50% of current range, with net increase in range extent CLIMATE STARLE Projected loss of <50% NUMBER OF SPECIES

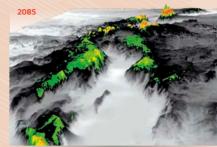
PROJECTED SPECIES RICHNESS OF 14 ENDEMIC SPECIES ACROSS TIME

Source Unpublished data from BirdLife International, Durham University, Wildlife Conservation Society, Makerere University, Nature Uganda, ACNR Rwanda, ABO Burundi, Albertine Rift Conservation Network and the RSPB.

WARMER COLOURS INDICATE HIGHER RICHNESS

DARKER GREV COLOLIRS REPRESENT HIGHER ELEVATION





CASE STUDY 15

HALF OF NORTH AMERICAN **SPECIES ARE THREATENED** BY CLIMATE-INDUCED RANGE LOSS

In North America, modelling by National Audubon (BirdLife in the USA) shows that 53% of species are projected to lose more than half of their current geographic range by the end of the 21st century. For 40% of these species, loss occurs without associated range expansion, while for the others, loss of current range is coupled with the potential to colonize new areas. Based on these results, one-fifth of species are classified as 'climate endangered', and another third of species are classified as 'climate threatened'.









MANY SPECIES WILL EXPERIENCE DISTRIBUTION SHIFTS AND POPULATION DECLINES

Results from studies across the world suggest that a high proportion of species populations may decline even faster. Many montane species will experience decreased population sizes as their ranges islands will be impacted by rising sea levels.









RED-COLLARED



CASE STUDY 17

SOME EAST AFRICAN SPECIES ARE PROJECTED TO LOSE ALL THEIR SUITABLE HABITAT BY 2085

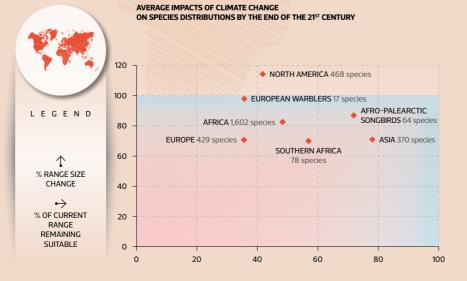
Bird communities in the Albertine Rift Valley of East Africa are likely to be forced upslope by an average of 350 m by 2085. Some areas in the valley are projected to support none of the endemic species by 2085, with at least one species - Red-collared Mountain-babbler Kupeornis rufocinctus - projected to lose all climatically suitable habitat in the region.

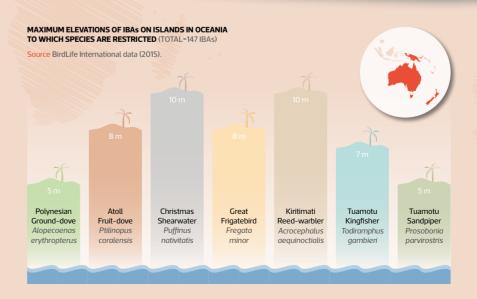
CASE STUDY 16

MOST SPECIES WILL EXPERIENCE **RANGE CONTRACTION AND SHIFTS**

Results from studies by BirdLife and others around the world show that, on average, species are projected to face 10-30% declines in their geographic range sizes, with 30-70% of their current distributions projected to become unsuitable by the end of the 21st century.

Source Huntley et al. (2008) PLoS One 3(1): e1439; Hole et al. (2009) Ecol. Lett. 12: 420–431; Barbet-Massin et al. (2009) Biol. Lett. 5: 248–251; Doswald et al. (2009) J. Biogeogr. 36: 1194– 1208; Huntley et al. (2012) Global Ecol. Biogeogr. 21: 668-681; Bagchi et al. (2013) Glob. Change Biol. 19: 1236–1248; Langham et al. (2015) PLoS One 10: e0135350.





CASE STUDY 18

SEA LEVEL RISE WILL CAUSE TROUBLE FOR BIRDS ON LOW-LYING **ISLANDS IN THE PACIFIC**

Species on low-lying islands are particularly vulnerable to sea level rise. In Oceania, seven species are entirely restricted to islands with a maximum elevation of < 10 m, including the Critically Endangered Polynesian Ground-dove Alopecoenas erythropterus. Sea level rise will also impact seabirds. For example, in Midway Atoll, Hawaii, a sea level rise of 2 m would flood 39-91% of Black-footed Albatross Phoebastria nigripes nests.



ALLEN'S HUMMINGBIRD Selasphorus sasin IS PROJECTED TO UNDERGO
A 90% DECREASE IN BREEDING RANGE BY 2080 OWING TO CLIMATE CHANGE,
WHILE ONLY 7% OF ITS RANGE IS PROJECTED TO REMAIN SUITABLE

PHOTO ALEXANDER VIDUETSKY/AUDUBON PHOTOGRAPHY AWARDS



MODELLED PROBABILITY OF EXTINCTION OF EUROPEAN SHAG COLONIES IN RELATION TO WEATHER THAT IS MORE EXTREME THAN THE CURRENT AVERAGE

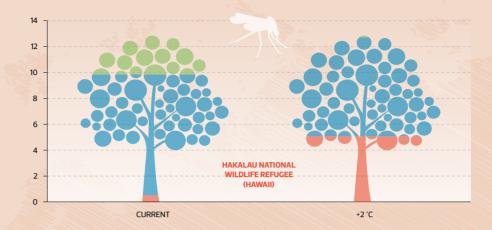
Source Frederiksen et al. (2008) J. Anim. Ecol. 77: 1020–1029.





AREA OF FOREST AT HIGH, MEDIUM OR LOW RISK FROM AVIAN MALARIA

Source Benning et al. (2002) Proc. Natl. Acad. Sci. USA. 99: 14246–14249.





CASE STUDY 19

EXTREME WEATHER WILL LEAD TO MORE FREQUENT MASS MORTALITY IN EUROPEAN SHAGS

Extreme weather events are projected to cause more frequent mass mortality for European Shags Phalacrocorax aristotelis, with increased rainfall and onshore wind causing mass mortality 'wrecks'. Population models show the potential negative impacts of increasingly variable weather, with an increased likelihood of population extinction.









CLIMATE CHANGE WILL ADD TO AND EXACERBATE EXISTING THREATS

in intensity and frequency. impacts on many species. Climate change will also increase the severity of existing threats, the frequency of fires, or by facilitating the spread of disease or invasive alien species













CASE STUDY 21

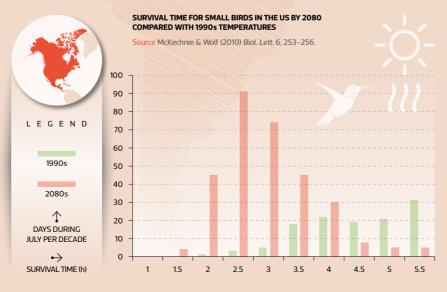
THE THREAT FROM AVIAN MALARIA **WILL INCREASE FOR HAWAIIAN BIRDS**

Climate change is likely to reduce the area of malaria-free habitat for endemic birds threatened by introduced diseases in Hawaii, as the projected lifting of the cloudbase shifts the malaria risk zone to higher altitudes.

CASE STUDY 20

CATASTROPHIC BIRD MORTALITY EVENTS WILL INCREASE DURING EXTREME HEAT WAVES

Severe heat waves, which occasionally kill large numbers of birds in hot desert environments, are predicted to increase in intensity, frequency and duration. Hotter temperatures will substantially increase water requirements, particularly for small birds, severely reducing survival times. This is projected to occur much more frequently by the 2080s, increasing the frequency of catastrophic mortality.



PROJECTED % DECLINE IN POPULATION SIZE AND HABITAT AREA BY 2050 FOR THREE INDONESIAN FOREST BIRD SPECIES Source Harris et al. (2014) Diversity Distrib 20: 773-785



CASE STUDY 22

SOUTH-EAST ASIAN FOREST BIRDS WILL DECLINE DUE TO CLIMATE **CHANGE AND DEFORESTATION**

Climate change and deforestation together create multiple problems for endemic South-East Asian forest birds such as White-eared Myza Myza sarasinorum. Projections suggest distributions will decline by 19-42% and population sizes by 19-62%. Lowland species will be hit hardest by deforestation, while climate change is the dominant threat for montane species.



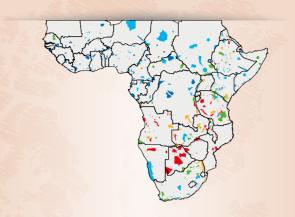
MANY IBAS ARE PROJECTED TO EXPERIENCE HIGH TURNOVER IN BIRD SPECIES OF CONSERVATION CONCERN

Turnover in the bird species occurring in IBAs in sub-Saharan Africa is projected to be high under future climatic scenarios. However, 88-92% of species of conservation concern are projected to have suitable climatic conditions remaining by 2085 in at least some sites where they currently occur. This demonstrates that existing IBAs will remain important for conservation under climate change.



PROJECTED TURNOVER OF SPECIES OF CONSERVATION CONCERN IN IBAs IN AFRICA

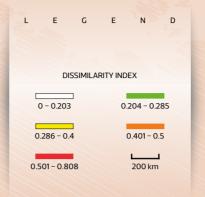
Source Hole et al. (2009) Ecol. Lett. 12: 420–431.



PROJECTED BIRD SPECIES TURNOVER IN CALIFORNIA BY 2070

COLOURS REPRESENT DISSIMILARITY BETWEEN CURRENT AND FUTURE AVIAN COMMUNITY COMPOSITION, BASED ON THE PROBABILITY OF OCCURRENCE FOR 60 FOCAL SPECIES. Source Stralberg et al. (2009) PLoS One 4: e6825.







CASE STUDY 24

THE DEGREE OF DISRUPTION TO BIRD **COMMUNITIES IN IBAS WILL INCREASE** THROUGH THE 21ST CENTURY

Bird community composition in two Asian IBA networks is also projected to change dramatically under future climatic scenarios, with an increase in species turnover from 19% in 2025 to 43% by 2085. Models suggest that 45% of species will have less suitable climate in these sites by 2085, highlighting the level of disruption projected to occur in communities.









PROJECTED TO OCCUR IN FEWER IBAs TIBETAN SNOWCOCK

BIRD COMMUNITIES WILL BE DISRUPTED IN PROTECTED AREAS AND IMPORTANT BIRD **AND BIODIVERSITY** AREAS The bird species these sites as climate changes, while other species may colonise as climate becomes suitable. Such turnover will be networks as a whole will provide suitable conditions for nearly all species of conservation interest, disruption of bird













CASE STUDY 25

BIRD COMMUNITIES IN CALIFORNIA WILL UNDERGO SUBSTANTIAL DISRUPTION UNDER CLIMATE CHANGE

Community disruption may lead to completely novel avian assemblages (i.e. combinations of bird species that do not occur together anywhere at present) across 10-57% of California's land area by 2070. Even in areas retaining species currently present, turnover rates are expected to be high, resulting in a range of new species interactions.

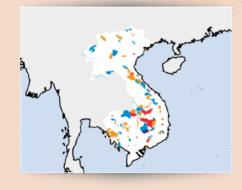
PROJECTED TURNOVER IN SPECIES OF CONSERVATION **CONCERN IN ASIAN IBAs BY 2085**

Source Banchi et al. (2013) Glob. Change Biol. 19: 1236–1248.

EASTERN HIMALAYA (163 IBAs)



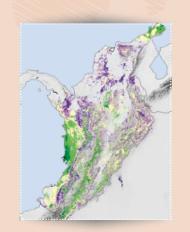






SIMILARITY BETWEEN CURRENT AND PROJECTED SPECIES RICHNESS FOR 2050 ACROSS WESTERN COLOMBIA

Source Velasquez-Tibata et al. (2013) Rea. Environ, Change 13: 235-248.





CASE STUDY 26

WIDESPREAD AND SUBSTANTIAL SHIFTS ARE PROJECTED FOR COLOMBIAN BIRD COMMUNITIES

Bird community structure is projected to change dramatically in Colombia, with consequences for species interactions and ecosystem function. Average species richness is expected to decline by up to 84% in some regions, with the similarity of current species richness and future richness projected to be as low as 30%. Such widespread and substantial shifts in bird communities will likely occur both within and beyond protected areas.



TOTAL POWER DISSIPATED ANNUALLY BY TROPICAL CYCLONES IN THE NORTH ATLANTIC

Source Emanuel (2005) Nature 436: 686–688.

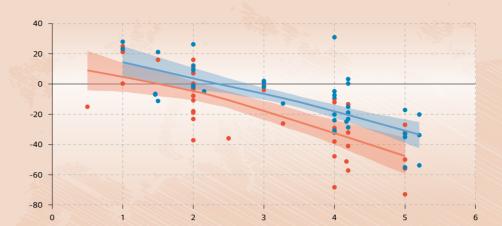


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SIMULATED CHANGE IN WHEAT YIELDS IN THE TROPICS IN RESPONSE TO TEMPERATURE INCREASE

Source Porter et al. (2014) Food security and food production systems. In: Fifth Assessment Report of the Intergovernmental Panel on Climate Change





CASE STUDY 27

EXTREME WEATHER EVENTS WILL INCREASE IN FREQUENCY AND INTENSITY

Climate change is expected to increase the frequency and intensity of heatwaves, fires, storms and flood events, with substantial impacts on people. By 2100, it is estimated that an additional 52 million people in 84 developing countries will be affected by coastal storm surges. Damaging typhoons are increasing in frequency and severity, causing considerable loss of life and economic damage. The risk of extreme summer heat events in Europe has already quadrupled, with serious implications: a heatwave in 2003, for example, resulted in 15,000 extra deaths.











CLIMATE CHANGE WILL HAVE PROFOUND CONSEQUENCES **FOR PEOPLE** Climate change threatens the essentials of life for people around the world: food, water, and people will suffer soonest and to the greatest extent.













CASE STUDY 29

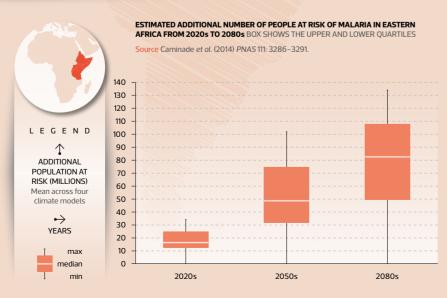
IMPACTS ON FOOD PRODUCTION MAY BE SUBSTANTIAL

The effects of climate change on food production are already evident in several regions of the world. In recent years, there have been several periods of rapid food and cereal price increases following climate extremes in key producing regions. By 2050, it is predicted that yields of most important crops will decline in developing countries due to climate change, exposing an additional 25 million children to malnutrition.

CASE STUDY 28

EXPOSURE TO INFECTIOUS DISEASE IS LIKELY TO INCREASE

In recent decades, higher temperatures have resulted in range expansions for key disease carriers, such as mosquitoes. The incidence of malaria, dengue and haemorrhagic fever is correlated with temperature, precipitation and humidity. Overall, improvements in public health are expected to lead to a decline in infectious diseases, but climate change will act as an impediment: by 2050, it is estimated that 200 million more people will be exposed to malaria as a result of climate change.





PROJECTED NET MIGRATION RATE FROM METROPOLITAN AREAS IN NORTH-EAST

BRAZIL UNDER CLIMATE CHANGE BARS SHOW ENSEMBLE MEANS FOR TWO SCENARIOS

LEGEND 2025-2030 2035-2040 2045-2050 NET MIGRATION RATE % METROPOLITAN AREAS

CASE STUDY 30

CLIMATE CHANGE IS EXPECTED TO DRIVE MASS MIGRATION OF PEOPLE

The impacts of climate change are expected to drive a significant increase in the scale of human migration and displacement. It is estimated that between 25 million and 1 billion people will move by the end of the century in response to extreme weather events, drought, sea level rise and other climate change impacts. In 2008 alone, 20 million people were displaced by extreme weather events, compared to 4.5 million internally displaced by conflict.



PROJECTED DIRECT AND INDIRECT IMPACTS OF CLIMATE CHANGE ON IBAS IN SOUTHERN AFRICA

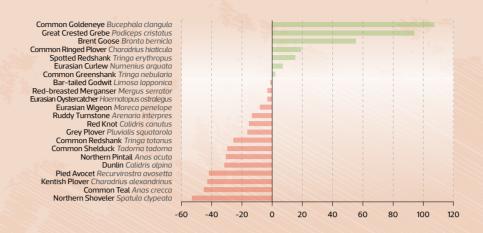
Source Segan et al. (2015) Divers. Distrib. 21: 1101–1111.

DIRECT IMPACT INDIRECT IMPACT COMBINED IMPACT



PERCENTAGE CHANGE IN WINTER WATERBIRD ABUNDANCE BEFORE AND AFTER CONSTRUCTION OF STORM SURGE BARRIERS

Source Schekkerman et al. (1994) Hydrobiol. 282/283: 509-524.





CASE STUDY 31

CONSIDERING THE IMPACT OF CLIMATE **CHANGE ON HUMAN COMMUNITIES** SIGNIFICANTLY ALTERS ASSESSMENTS OF THE VULNERABILITY OF IBAs

The set of IBAs projected to suffer the greatest direct impacts of climate change and highest rates of turnover of species for which they were identified to conserve do not entirely match the set of IBAs likely to be indirectly impacted by human responses to climate change. Setting priorities for adaptation interventions therefore needs to account for likely human responses.









RESPONSES TO CLIMATE CHANGE WILL LIKELY BE AT LEAST AS IMPORTANT **AS DIRECT IMPACTS ON NATURE**

THE EFFECTS OF HUMAN

People will be forced to such as through changes in where and how crops are grown, energy is produced and people live. For example, southern Africa could lose crop by 2030, requiring alternative staples to be grown. than the direct effects













CASE STUDY 33

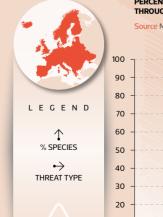
POORLY PLANNED RESPONSES TO COASTAL FLOODING HAVE **NEGATIVELY IMPACTED WATERBIRDS** IN THE NETHERLANDS

Habitat loss caused by the construction of storm surge barriers and dams in the Oosterschelde/Krammer-Volkerak delta region of the Netherlands has driven declines in waterbird populations. While some birds appear to have benefited, more than twice as many have undergone local population declines. The effects of climate change will lead to the construction of more such infrastructure projects, which if poorly planned could result in substantial wildlife impacts.

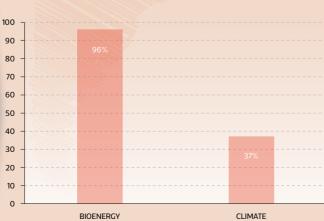
CASE STUDY 32

BIOENERGY EXPANSION WITHOUT CAREFUL PLANNING **WILL DRIVE BIODIVERSITY LOSS**

The direct effect of climate change on the range sizes of European birds is expected to have an influence of greater magnitude by 2050 than the effect of land-use change for biofuel production. However, bioenergy is predicted to have a negative impact on a larger proportion of species (96%) compared with climate change alone (37%).



PERCENTAGE OF EUROPEAN SPECIES PROJECTED TO BE IMPACTED INDIRECTLY THROUGH BIOENERGY EXPANSION OR DIRECTLY BY CLIMATE CHANGE BY 2050 Source Meller et al. (2015) Glob. Change Biol. Bioenergy 7: 741–751.



PERCENTAGE OF BIRD SPECIES FOUND IN NATURAL FORESTS, PALM OIL PLANTATIONS, OR BOTH HABITATS. FROM STUDIES IN THREE SOUTH-EAST ASIAN COUNTRIES

Source Danielsen et al. (2009) Conserv Riol, 23: 345–358 and sources therein



A File

LEGEND PALM OIL BOTH HABITATS

NATURAL FOREST % SPECIES

CONVERTING NATURAL HABITATS TO OIL PALM FOR BIOENERGY IS BAD FOR BIRDS AND CLIMATE CHANGE

CASE STUDY 34

Oil palm is one of the fastest expanding crops in equatorial regions, owing to its widespread use in food production and bioenergy. It is estimated that palm oil plantations take 75-93 years to compensate for the carbon lost through forest conversion, or nearly 700 years if peatland is convert-

ed. Avian species richness is vastly reduced in these plantations compared with forest, highlighting the negative biodiversity impacts when biofuels replace natural forests. COLINTRY





PROMOTING SMART, CLEAN ENERGY SOLUTIONS HELPS AVOID NEGATIVE IMPACTS

The BirdLife Partnership works at the local, national and international levels to promote ambitious responses. BirdLife supports renewable energy development and works to ensure it does not negatively affect species and ecosystems. For example, BirdLife has been working with the Convention on Migratory Species to adopt guidelines to help avoid any negative repercussions from renewable energy infrastructure on migratory species.



PINK-FOOTED GEESE Anser brachyrhynchus, GERMANY ® NICK UPTON/RSPB-IMAGES.COM



COMMON CRANE Grus grus, GERMANY © NICK UPTON/RSPB-IMAGES.COM



CASE STUDY 37

STRATEGICALLY DEPLOYING POWER LINES MINIMISES BIRD ELECTROCUTIONS

Scaling up renewable energy requires new infrastructure such as power lines. These are a major threat to birds, which can fly into them and get electrocuted. As part of the Renewables Grid Initiative, BirdLife International is helping prevent bird electrocutions, working with the industry to replace or insulate dangerous poles, strategically locate infrastructure, and develop and implement better practices to reduce bird collisions.

MINIMISING CLIMATE CHANGE IMPACTS REQUIRES
SMART MITIGATION EFFORTS INCLUDING CLEAN ENERGY SOLUTIONS
FOR PEOPLE AND NATURE



BEARDED VULTURE Gypaetus barbatus © C. V. ROOYEN



CASE STUDY 36

PROMOTING BIRD-FRIENDLY ENERGY INFRASTRUCTURE ON THE RED SEA FLYWAY BENEFITS MIGRATORY BIRDS

BirdLife International Partners are working across the Red Sea flyway – the migratory route for over 1.5 million soaring birds – to ensure that energy infrastructure is sustainable for wildlife. BirdLife's Sensitivity Map Tool is informing decisions on where to build energy infrastructure to minimise its impact on soaring birds, which are particularly sensitive to wind turbines, pylons and electricity cables.



CASE STUDY 38

PROMOTING ENVIRONMENTAL
SAFEGUARDS FOR BIOENERGY HELPS
AVOID DETRIMENTAL OUTCOMES

The EU's policies to tackle climate change have promoted the use of biofuels in transport. These biofuels, largely agricultural crops, contribute to direct and indirect clearing of natural habitats and, as a result, a perverse increase in carbon emissions. BirdLife Europe's persistent advocacy has contributed to the approval of new EU legislation in 2015 – the first of its kind in the world – that limits the share of foodbased biofuels.



RAPESEED FIELDS © JEAN-MARIE HULLOT/CC



RESTORING PEATLANDS IN BELARUS REDUCES CARBON EMISSIONS AND SAVES WATERBIRDS

Peatlands cover only 2-3% of the world's land surface, but contain carbon stocks equivalent to 100 years of current fossil fuel emissions. In Belarus, BirdLife Partners are restoring 51,000 hectares of degraded peatland, turning the land from a net source of carbon into a net sink and creating important habitats for threatened bird species.



DAKUDAUSKAJE PEATLAND, GRODNO REGION, WEST BELARUS © ANNETT THIELE



CASE STUDY 42

RESTORING FORESTS IN THE PHILIPPINES' SIERRA MADRE PROVIDES BENEFITS FOR PEOPLE AND NATURE

The Haribon Foundation (BirdLife in the Philippines) is working with local government, the environment ministry and indigenous people to protect and restore 40,000 hectares of forest in the Sierra Madre. This initiative reduces carbon emissions while protecting wildlife such as the Critically Endangered Philippine Eagle *Pithecophaga jefferyi* and safeguarding a water catchment for the national capital, Manila.



SEEDLING NURSERY, GOLA FOREST, SIERRA LEONE
© GUY SHORROCK/RSPB-IMAGES.COM



PHILIPPINE EAGLE Pithecophaga jefferyi © SHAUM/CC



CASE STUDY 43

IMPLEMENTING REDD+ IN SIERRA LEONE REDUCES EMISSIONS WHILE BENEFITTING BIRDS AND PEOPLE

The Conservation Society of Sierra Leone (BirdLife in Sierra Leone) is working with the RSPB (BirdLife in the UK) to reduce the pressures of logging and agriculture on the Gola Rainforest National Park, which supports over 330 bird species. This 'REDD+' initiative will conserve over 5 million tonnes of $\rm CO_2$ -equivalent in the first ten years, while providing livelihood support to 122 communities. Revenues from carbon credits will support national park management.

PROTECTING AND RESTORING CARBON-RICH ECOSYSTEMS COMBATS CLIMATE CHANGE AND BENEFITS PEOPLE AND NATURE



CASE STUDY 40

A NEW APPROACH TO FOREST CONSERVATION HAS BEEN DEVELOPED IN INDONESIA

Burung Indonesia (BirdLife in Indonesia) and the RSPB (BirdLife in the UK) are restoring 99,000 hectares of lowland Sumatran rainforest, protecting carbon stocks and habitat for species such as the Critically Endangered Sumatran Tiger *Panthera tigris sumatrae*. 'Ecological restoration concessions' have been recognised as a forest management tool by the Indonesian government, with 2.5 million hectares of forest now earmarked for restoration.



JERNANG TREE CULTIVATION © DESRI ERWIN



SAN RAFAEL FOREST © GUYRA PARAGUAY



CONSERVING FORESTS IN PARAGUAY BENEFITS CLIMATE, WILDLIFE

AND LOCAL COMMUNITIES

CASE STUDY 41

Guyra Paraguay (BirdLife in Paraguay) is combining carbon financing and payments for ecosystem services to cut emissions by more than 120,000 tonnes of CO₂-equivalent by 2030, as well as protecting 69,300 hectares of forest from agriculture in the San Rafael IBA. Communities are encouraged to practise sustainable farming, which enhances yields on cultivated land, thus increasing income and reducing the incentive for further forest clearance.



PRONATURA SUR'S MANGROVE AND CLIMATE CHANGE CORRIDOR INITIATIVE © JESUS GARCÍA RODRÍGUEZ/RICOH



CASE STUDY 44

RESTORING MANGROVES IN MEXICO ENHANCES CARBON SEQUESTRATION AND BENEFITS THE COMMUNITY

Mangroves are among the largest natural reservoirs of carbon in the tropics, but are highly threatened by habitat destruction and over-exploitation. Mangroves in the Chiapas-Oaxaca coastal region of Mexico are being restored by Pronatura (BirdLife in Mexico) and partners to ensure the effective storage of carbon, secure benefits for local communities, and improve the habitat for shorebirds such as Least Sandpiper *Calidris minutilla*.



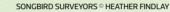


CONSERVATION PLANNING IS INCORPORATING CLIMATE CHANGE

Climate-smart conservation is a dynamic process to address explicitly climate impacts in conservation responses. Flexibility is key, with both management actions and conservation goals evolving with time. It is important to consider how species may move across landscapes and regions and plan for both current and future needs.

Source Adapted from Stein *et al.* (2014) *Climate-smart* conservation: putting adaptation *Principles into Practise*. National Wildlife Federation.







CASE STUDY 47

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MOBILISING CITIZEN SCIENTISTS IS AIDING CLIMATE PLANNING IN WASHINGTON, USA

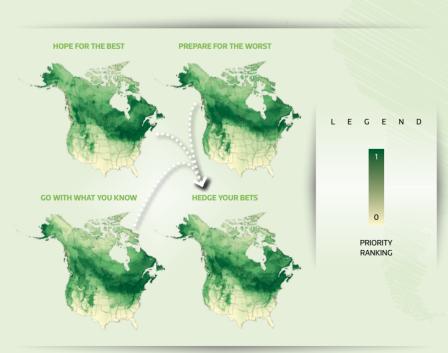
Citizen scientists in eastern Washington are monitoring sagebrush songbirds in a long term programme coordinated by the National Audubon Society (BirdLife in the USA). The program utilises data covering 1 million acres of habitat to inform large-scale conservation action and climate planning.

CONSERVATION IS BECOMING CLIMATE SMART

and dynamic in the future. While existing conservation goals usually remain valid, specific objectives are being redefined. Enhanced monitoring is essential to detect climate-induced changes in bird populations and to track the effectiveness of adaptation interventions.

SPATIAL PRIORITISATION APPROACHES FOR CONSERVING NORTH AMERICAN BIRDS, USING TREE SWALLOW TACHYCINETA BICOLOR AS AN EXAMPLE, BASED ON MODELLED CLIMATIC SUITABILITY AND ACCOUNTING FOR UNCERTAINTY

Source Schuetz et al. (2015) Ecol. Appl. doi: 10.1890/14–1903.1.







CASE STUDY 46

CLIMATE CHANGE IS BEING INCORPORATED INTO CONSERVATION SPATIAL PLANNING

A recent study by National Audubon Society (BirdLife in USA) developed three approaches to setting spatial priorities depending on assumptions about species' ability to track shifts in climate or adapt to changing conditions. It also developed a 'bet-hedging' prioritization drawing on all three to facilitate efficient conservation investment despite substantial uncertainty.



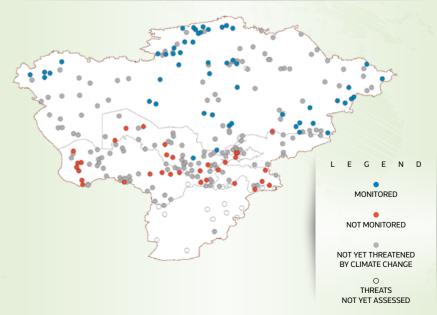
CASE STUDY 48

MONITORING IS EVEN MORE IMPORTANT UNDER CLIMATE CHANGE

Long-term monitoring will be necessary to assess if and when projected impacts on species are realised and to assess the effectiveness of adaptation interventions. Currently 61% of IBAs in Central Asia that are threatened with climate change are being monitored, and expansion to cover the remainder is a priority.

STATUS OF MONITORING IN CENTRAL ASIAN IBAS THREATENED BY CLIMATE CHANGE

Source BirdLife International data (2015).





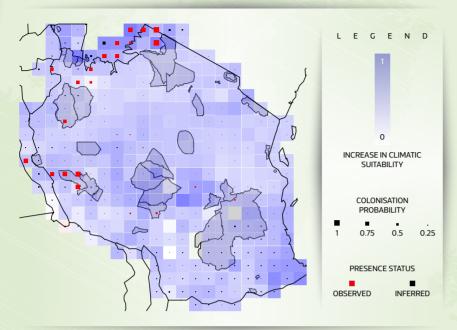


PROTECTED AREAS ARE HELPING SPECIES TO PERSIST WITHIN EXISTING RANGES AND TO COLONISE NEW AREAS

Under climate change, Tanzanian savannah birds are disproportionally colonising climatically suitable zones with a higher proportion of protected habitat. This suggests that current protected area networks are critical in helping species adapt to climate change. The same findings have been found in the UK, where protection also reduced the rate of extinction at species' trailing range margins.

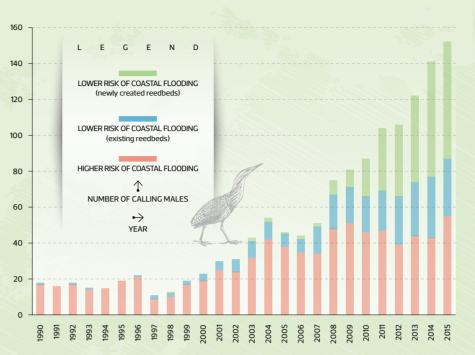
PROBABILITY OF COLONISATION OF FISCHER'S SPARROW-LARK Eremopterix leucopareia SHOWN ON TOP OF PROTECTED AREA BOUNDARIES AND DEGREE OF INCREASE IN CLIMATIC SUITABILITY

Source Beale et al. (2013) Ecol. Lett. 16: 1061–1068.



NUMBER OF CALLING MALE BITTERNS IN THE UK UNDER DIFFERENT LEVELS OF FLOOD RISK FROM RISING SEA LEVELS

Source Data provided by M. Ausden (RSPB).





CASE STUDY 51

CREATING NEW WETLAND HABITAT HELPS BITTERNS ADAPT IN THE UK

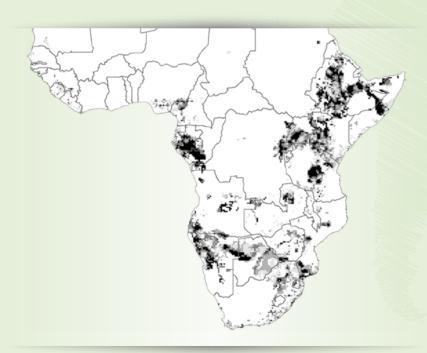
Core breeding sites for Eurasian Bittern *Botaurus stellaris* in the UK are situated along the Suffolk coast, but are at increasing threat from rising sea levels and more frequent storm surges. Losses of even a small proportion of birds in these core sites would substantially impact national trends. Efforts to restore existing reed beds and create new habitat at sites less susceptible to sea-water flooding have led to dramatic population increases, safeguarding the future of this iconic species in the UK.

UNBLOCKED

CONSERVING KEY SITES IS CRITICAL FOR ADAPTING TO A CHANGING CLIMATE

LOCATIONS OF HIGHEST IMPORTANCE UNDER CLIMATE CHANGE FOR IDENTIFYING POTENTIAL NEW IBAS IN AFRICA

Source Hole et al. (2011) Conserv. Biol. 25: 305–315.





CASE STUDY 50

IDENTIFYING NEW SITES INCREASES THE RESILIENCE OF THE IBA NETWORK

In sub-Saharan Africa, priority locations have been defined for identifying potential new IBAs to increase the robustness of the network under climate change. These take into account: the degree to which priority species are supported by existing IBAs; future range shifts; and remoteness of locations from existing IBAs.

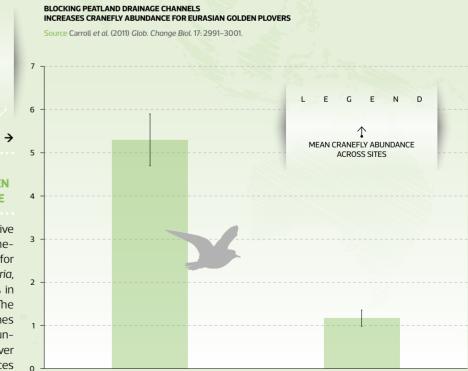
remains an urgent priority to ensure resilience under climate change, although the management of such sites is changing to accommodate shifting ecological communities. New IBAs are being identified, and habitat in key sites is being conserved, restored or created to provide suitable conditions for the future.

BLOCKED

MANAGING THE HYDROLOGY OF PEATLAND SITES COULD HELP GOLDEN PLOVERS ADAPT TO CLIMATE CHANGE

CASE STUDY 52

Peatlands in the UK uplands are sensitive to summer drought, which reduces cranefly (Tipulidae) abundance, a key prey for Eurasian Golden Plovers *Pluvialis apricaria*, which are projected to decline by 30% in the South Pennines by 2050-2080. The simple act of blocking drainage ditches increases soil moisture and cranefly abundance, with likely benefits for the plover population, and for ecosystem services including carbon storage and water quality.







ENHANCING HABITAT CORRIDORS ALLOWS SPECIES TO MOVE AMONG KEY SITES

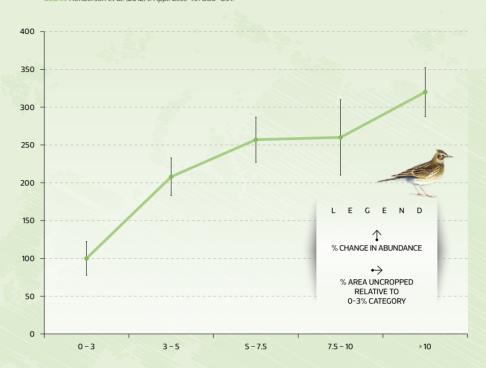
The benefit of habitat corridors varies among bird species and ecosystems, with habitat-generalists benefiting more from this approach than specialists. Networks of connected linear habitat, such as riparian forest corridors in the Brazilian Amazon, benefit woodland bird species if the corridors retain quality habitat. Studies for tropical forest songbirds suggest that corridors are most effective if at least half of the landscape remains forested.



AMAZON © NEIL PALMER/CIAT

CHANGE IN ABUNDANCE OF DECLINING FARMLAND BIRD SPECIES IN RELATION TO THE PERCENT AREA OF UNCROPPED LAND ON SITES ACROSS THE UK

Source Henderson et al. (2012) J. Appl. Ecol. 49: 883–891.





CASE STUDY 55

MANAGING THE MATRIX OF SUITABLE HABITAT BETWEEN KEY SITES WILL AID MOVEMENT OF SPECIES

Uncropped agricultural land has been shown to benefit declining farmland birds in the UK: farms containing only 3-5% of uncropped land support much lower densities than farms with more than 10% of uncropped land. Increased persistence of populations outside of protected areas will be important in facilitating climate-induced range expansion.

CONNECTING AND ENHANCING HEALTHY HABITATS
IN THE WIDER LANDSCAPE IS HELPING SPECIES TO ADAPT

With climate change forcing many species to shift their distributions, improving connectivity among key sites and policy responses to make the wider countryside more biodiversity-friendly is helping species to cope with climate change. However, targeted interventions will be needed for some species, such as captive breeding and potentially, assisted colonization.



A WILDLIFE BRIDGE IN THE NETHERLANDS © JOOP VAN HOUDT/RIJKSWATERSTAAT



CASE STUDY 54

CREATING STEPPING STONE HABITAT PATCHES MAY AID RANGE EXPANSION

Vogelbescherming Nederland (BirdLife in the Netherlands) is working with the Dutch government on a national strategy – the Dutch Ecological Network – to link wetlands and other habitats together across the country. This will facilitate the movement of species and increase ecological resilience, which will become essential as climate change shifts species ranges.



ASSISTING COLONISATION WILL HELP AFRICAN PENGUINS IMPACTED BY CLIMATE CHANGE

African Penguin *Spheniscus demersus* in South Africa occurs in two populations separated by 600 km. Climate-induced shifts in fish stocks are partly responsible for dramatic declines in numbers in western colonies. Plans are underway to create a new mainland colony between the two populations and increase the species' resilience to further impacts. This will involve protection from predators, nest boxes, deployment of decoys, and translocation of juveniles.

LOCATION OF CURRENT AFRICAN PENGUIN COLONIES IN SOUTH AFRICA, AND POTENTIAL SITES FOR CREATION OF NEW COLONIES THROUGH ASSISTED COLONISATION

Source C. Hagen (BirdLife South Africa).





CONSERVING MANGROVES IN THE NEOTROPICS PROVIDES A NATURAL SEA DEFENCE

In 2010, 13 BirdLife Partners formed the Neotropical Mangrove Alliance to conserve and restore mangroves in the Caribbean. Mangroves provide a natural protective shield against strong waves and extreme storms, which are becoming more severe under climate change. They are important carbon stores, and support fishes, molluscs and crabs used by birds and local communities.



MANGROVE NURSERY AT TELESCOPE, GRENADA © KADIR VAN LOHUIZEN/NOOR



CASE STUDY 59

CLIMATE RESILIENT ALTITUDINAL GRADIENTS (CRAGS) PROVIDE A FOCUS FOR ACTION IN EAST AFRICA

Intact habitats on altitudinal gradients will become increasingly important under climate change because they help control erosion, regulate water flow and allow species to move upslope. In the African Great Lakes region, BirdLife Partners are conserving the most vulnerable sites across a landscape with an altitudinal gradient of over 1,000 m. Planned interventions will enhance the resilience of local communities to climate change and benefit wildlife.



LAKE KIVU, WESTERN RWANDA © ADAM JONES/CC

ECOSYSTEM-BASED ADAPTATION DELIVERS BENEFITS FOR PEOPLE AND NATURE



MEDMERRY © PAUL BOWIE



CASE STUDY 58

REALIGNING COASTS HELPS PROTECT COMMUNITIES

Storm surges and sea level rise threaten coastal defences. RSPB (BirdLife in the UK) is partnering with government and engineers to move defences inland and create coastal wetlands as a buffer. At Medmerry, new wetland is reducing flood risk to 348 homes, while at Wallasea Island, 670 hectares of newly created wetlands is providing flood defence, benefits to fisheries and habitat for waterbirds.



CASE STUDY 60

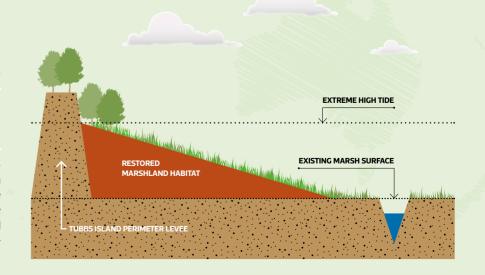
RESTORING TIDAL MARSHES IN SAN PABLO BAY, USA, **BENEFITS PEOPLE AND BIRDS**

Tidal marsh restoration by Audubon California (BirdLife in California) in the San Pablo Bay IBA is reducing storm surge risk for neighbouring landowners, while providing important habitat for threatened waterbirds such as the Black Rail Laterallus jamaicensis.



MARSH RESTORATION IN SAN PABLO BAY

Source Adapted from Sonoma Creek Marsh Enhancement Project Initial Study/Environmental Assessment (2014). United States, San Francisco Bay Regional Water Quality Control Board & US Fish & Wildlife Service.







ENHANCING THE RESILIENCE OF SAHEL HABITATS PROVIDES LONG-TERM BENEFITS

Unsustainable land management, combined with an increasingly inhospitable climate, is putting pressure on communities and migratory birds in the Sahel. BirdLife Partners are conserving and restoring wetland and dryland habitats across 13 IBAs and supporting communities to adopt more sustainable land-use practices that are building their resilience to climate change.



PLANTING SEEDLINGS, BURKINA FASO © MICHIEL VAN DEN BERGH/ASC



CENTRAL ANDEAN PUNA © JONATHAN STACEY



CASE STUDY 63

CONSERVING THE HIGH ANDEAN WETLANDS SUPPORTS BIRDS AND PEOPLE

The wetlands of the high Andes provide fresh water for more than 100 million people, support important wildlife, and are a significant carbon sink. Unregulated and unsustainable development threatens these habitats and their capacity to support people and wildlife. BirdLife Partners in Argentina, Bolivia and Ecuador work with local communities to ensure conservation and sustainable use of these wetlands.

NATURE-BASED SOLUTIONS LINK WELL-BEING, LIVELIHOODS AND THE NATURAL WORLD for the most vulnerable people. Poor communities tend to be seen as helpless victims of climate change But while they are often hit hardest, in many instances they are also the innovators and instigators of practical nature-based solutions that are accessible, cost-effective and locally appropriate.



BIRDLIFE PARTNERS IN SOUTH AMERICA ARE INTRODUCING SUSTAINABLE BEEF PRODUCTION TO THE PAMPAS ® A. PARERA



CASE STUDY 62

PROMOTING SUSTAINABLE
AGRICULTURAL SYSTEMS
INCREASES RESILIENCE IN THE
SOUTHERN CONE GRASSLANDS

In 2006, BirdLife Partners in Uruguay, Argentina, Brazil and Paraguay formed the Southern Cone Grasslands Alliance to promote sustainable cattle grazing practices. Working with cattle ranchers to promote more responsible production, the alliance is enhancing the integrity and resilience of the grasslands and ensuring ongoing carbon sequestration and storage.



CASE STUDY 64

BUILDING RESILIENT MONTANE FOREST LANDSCAPES IN UGANDA IMPROVES LIVELIHOODS

NatureUganda (BirdLife in Uganda) is helping communities at the Echuya Forest Reserve adapt to climate change while enhancing forest resilience. Activities include sustainable organic agriculture and agro-forestry to diversify community livelihoods, regulate water flow, and soil erosion, and reduce pressure on the forest. Adaptation plans and regulations have been developed to help to ensure that management of the Echuya landscape is climate-smart.



ECHUYA FOREST EDGE © CHRIS MAGIN



CONNECTING BIRDS AND PEOPLE HELPS MOBILISE CLIMATE CHANGE ACTION

The National Audubon Society (BirdLife in the USA) is mobilizing climate change action across North America by encouraging a network of volunteers ('climate ambassadors') to use their passion for birds to inspire others. It is through talking to friends, family and colleagues about the impacts of climate change on our environment that a growing number of individuals are creating a demand for solutions.



A CLIMATE AMBASSADOR FROM AUDUBON NORTH CAROLINA SHOWS OFF A WOOD THRUSH Hylocichla mustelina during a talk on Climate Change © Justin Cook



ADAPTATION KNOWLEDGE-SHARING AMONG KENYAN COMMUNITIES © EDWARD PERRY



CASE STUDY 67

EXCHANGING KNOWLEDGE AND LESSONS IN EAST AFRICA HELPS COMMUNITIES COPE WITH CLIMATE CHANGE

In Kenya, 18 communities from across the nation meet annually to exchange experiences and learn new strategies for coping with climate change at IBAs. Through collective learning and training, the network has developed a climate mitigation and adaptation strategy for addressing climate change that they are implementing across Kenya.

SOCIETY IS BEING MOBILISED TO TAKE CLIMATE ACTION



PLANNING ADAPTATION ACTIONS IN RUYIGI, BURUNDI © ALBERT SCHENK



CASE STUDY 66

EMPOWERING BURUNDI'S SERUKUBEZE COMMUNITY TO TAKE CLIMATE ACTION

The Association Burundaise for the protection of Nature (BirdLife in Burundi) works with the Serukubeze community to help them understand their vulnerability to climate change and identify adaptation actions. Through a participatory process the community is being empowered to engage with their local government and integrate ecosystem-based adaptation strategies into the municipality development plan. This will ensure that local development enhances the resilience of people and ecosystems.



CASE STUDY 68

THERE ARE STILL KNOWLEDGE GAPS, AND UNCERTAINTIES REMAIN IN THE PROJECTED IMPACT OF CLIMATE CHANGE ON NATURE AND PEOPLE

While we know that climate change is already affecting nature and people across the globe, and that the impacts will likely get worse, uncertainty remains surrounding the details of these projections. Plugging adaptation knowledge gaps is essential for scaling up effective adaptation responses worldwide



UNCERTAINTIES IN EMISSION TRAJECTORIES AND CLIMATE PROJECTIONS

POOR UNDERSTANDING OF THE IMPACTS OF EXTREME EVENTS

FEW PROJECTIONS FOR SPECIE
IN LATIN AMERICA, THE PACIFIC
AND FOR SEABIRDS

LITTLE INFORMATION ON DISPERSAL ABILITY OF BIRDS

FEW DATA ON IMPACTS ON ECOSYSTEM SERVICES AND IMPLICATIONS FOR PEOPLE

GAPS IN INFORMATION FOR INTEGRATIN
ADAPTATION INTO PLANNING
AND ACROSS SECTORS

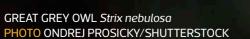
SOCIOECONOMIC DATA GAPS FOR EVALUATING IMPACTS AND EFFECTIVENES OF NATURE-BASED SOLUTIONS

KEY RECOMMENDATIONS FOR POLICYMAKERS

This synthesis shows that climate change is not simply a concern for the future: there is already considerable evidence of negative impacts from recent climate change. As the global average temperature continues to rise, climate change will threaten many species, disrupt ecological communities, and pose significant challenges to nature and people. However, we already know many of the solutions that are needed, and we are implementing these across the world. Policymakers have a critical role to play in scaling up these solutions, and must act now in order to safeguard the future of the earths' ecosystems upon which we all depend. Here we highlight the key policy responses required.

KEEP FOSSIL FUELS IN THE GROUND

- 1 Cut greenhouse gas emissions by reducing consumption, increasing energy efficiency, and switching from fossil fuels to renewable energy.
- **Reform fossil fuel subsidies and other perverse incentives** which undermine efforts to address global climate change and are an inefficient use of scarce resources.
- **Promote sustainable renewable energy deployment** by establishing robust environmental regulatory frameworks and applying strategic planning, sensitivity mapping and other safeguards to minimise negative impacts on nature and people.





HELP SPECIES ADAPT

- 4 Effectively manage protected areas, extending the network to cover Important Bird and Biodiversity Areas and other large areas of intact habitat, improving connectivity, and managing the wider landscape more sustainably.
- Tackle existing non-climate threats to populations to increase their resilience to climate change, addressing unsustainable agriculture, logging, fisheries and hunting, and tackling invasive alien species.
- 6 Implement targeted actions for those species requiring specific measures to help them adapt.
- **Establish effective monitoring** to detect climate change impacts and assess the effectiveness of adaptation solutions.

INVEST IN NATURE-BASED SOLUTIONS

- Scale-up investment in the conservation and restoration of natural ecosystems, which can provide an immediate, cost-effective and significant contribution to emission reductions while building the resilience of nature and people.
- **Develop and implement local and national adaptation plans** that integrate conservation, restoration and sustainable use of ecosystems to reduce disaster risk and help people adapt to climate change, as well as safeguards to avoid maladaptation.
- Catalyse and support multi-stakeholder collaboration between communities, civil society organisations, businesses and government, working across sectors to deliver solutions to the interlinked challenges of climate change and biodiversity loss.

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PHOTOS

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