Drought Resilience +10

High-level Meeting on National Drought Policy

Conveners Logos

Accelerating Adaptation: NbS for Drought (and Flood) Resilience

1 October 2024, 10:30-12:00

The Nature Conservancy

ACCELERATING ADAPTATION

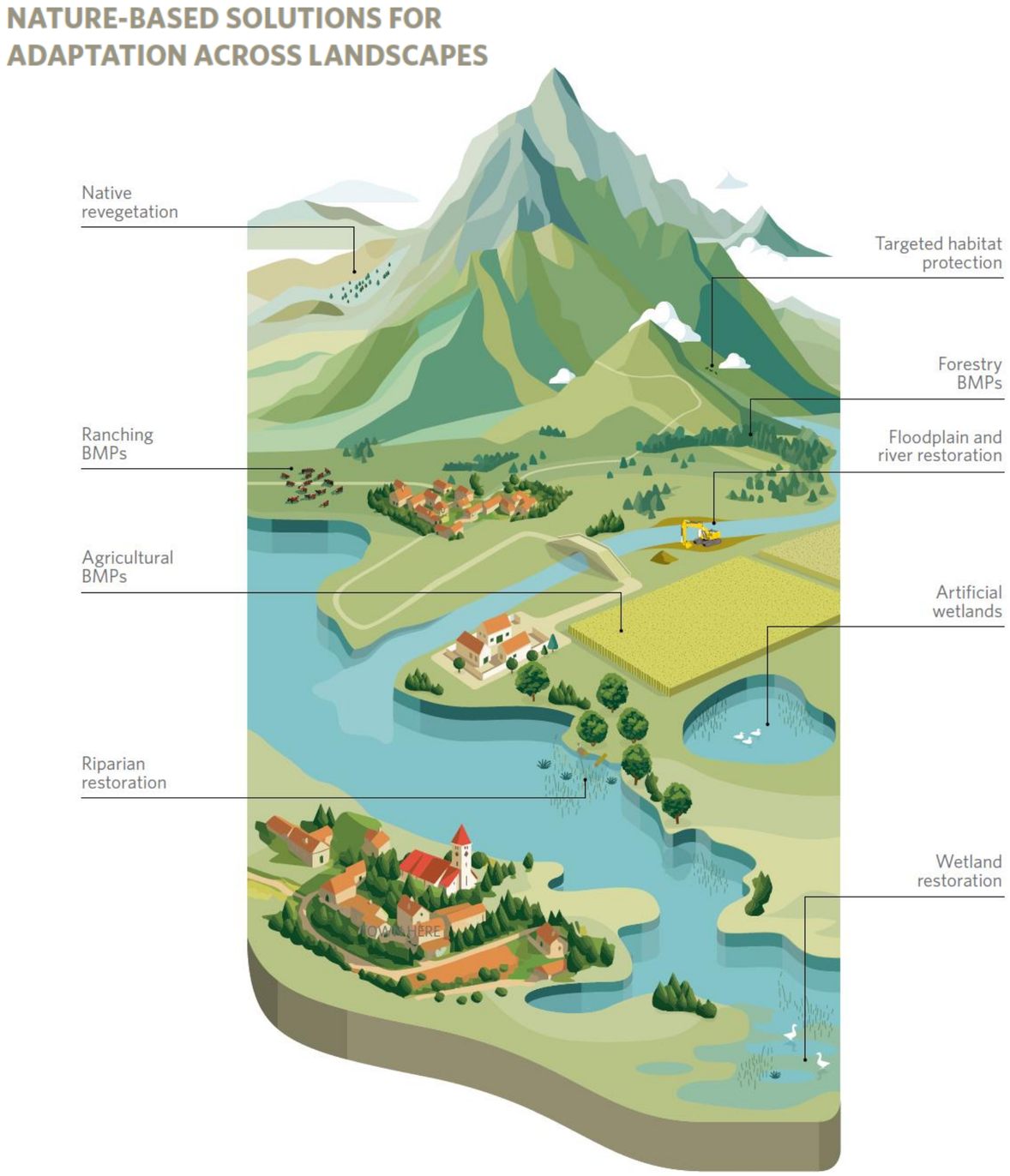
The promise and limitations of Nature-based Solutions in the race to adapt to increasing floods and droughts

Kari Vigerstol, Nathan Karres, Shiteng Kang,
Nancy Lilly, Marika Massey-Bierman

22 February 2024

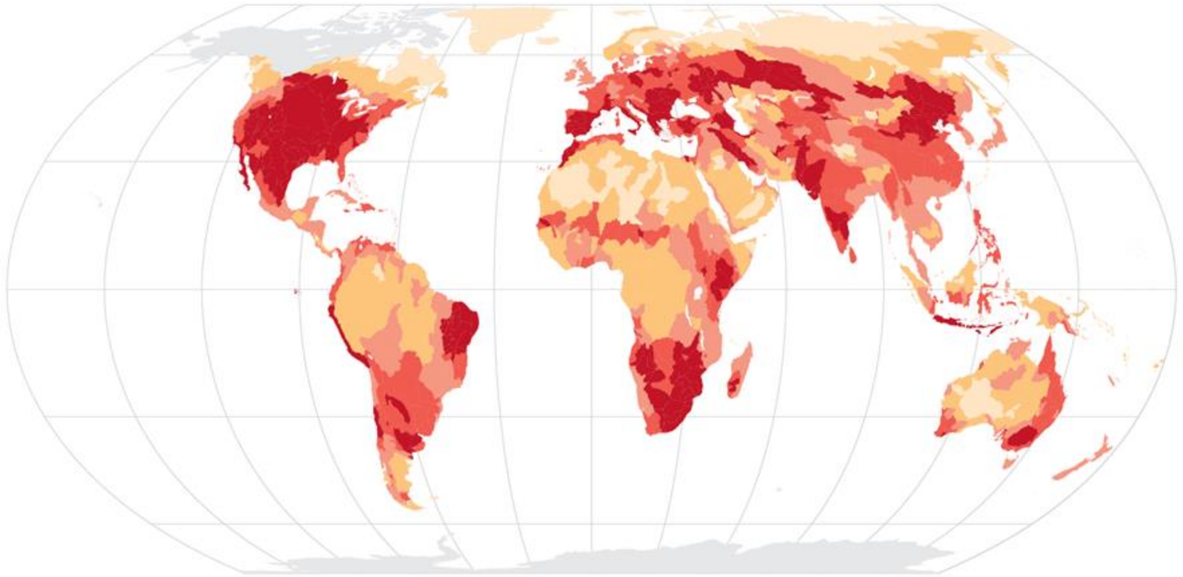
WHY THIS REPORT?

- Flood and drought are among the most damaging natural disasters on Earth, and climate change is increasing the impacts of floods and droughts.
- Nature-based Solutions can play a role in reducing these impacts—but this potential is not uniform.
- We describe the mechanisms that drive flood and drought risks to understand when and where NBS might have the greatest potential for adaptation.



CURRENT AGRICULTURAL DROUGHT HAZARD AND EXPOSURE

EXTENT OF DROUGHT: LOW HIGH

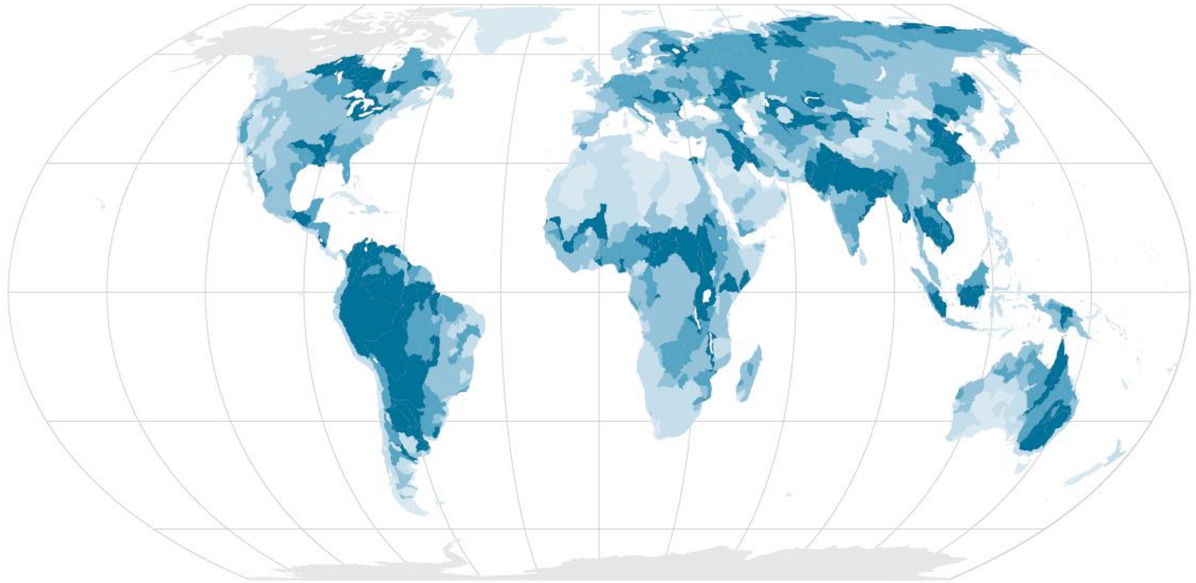


INCREASING DROUGHT HAZARD DUE TO CLIMATE CHANGE

A CHALLENGING PRESENT—AND MORE CHALLENGING FUTURE

CURRENT RIVER FLOOD HAZARD

EXTENT OF FLOODING: LOW HIGH



INCREASING RIVER FLOOD HAZARD DUE TO CLIMATE CHANGE

A CHALLENGING PRESENT—AND MORE CHALLENGING FUTURE

© IAN SHIVE

TYPOLOGIES OF NBS FOR FLOOD AND DROUGHT ADAPTATION

LIST OF NBS TYPOLOGIES

Protection

1 Targeted Habitat Restoration

Management

2 Agricultural Best Management Practices

3 Ranching Best Management Practices

4 Forestry Best Management Practices

5 Artificial Wetlands

Restoration

6 Native Revegetation

7 Wetland Restoration

8 Floodplain and River Restoration

9 Riparian Restoration

protection

1 Targeted Habitat Protection

Description

Protection and avoided conversion of existing and at-risk natural ecosystems such as forests, wetlands, and grasslands. They can be implemented as preventative measures to reduce risk of future adverse environmental impacts that may result from land use and water use changes.

The Iguaçu River in Parana, Brazil. One bank is dominated by agriculture and the other marks the protected forest of Iguaçu National Park. Protecting intact ecosystems like this one is the most effective form of NbS.

Risk Mitigation Potential

Hazard
- Flood: reduces and slows down runoff, reduces and delays peak flows
- Drought: retains infiltration and soil moisture, maintains low flow and groundwater recharge

Exposure
- Flood: reduces the probability of population and assets being present in flood-prone areas

Vulnerability
- Can generate income through diversified livelihood options and increase general adaptive capacity

Co-benefits

- Improved water quality
- Recreation + tourism
- Increased carbon storage

Synergies and Trade-offs

Each NbS can have a negative or positive effect on the opposite hazard.

Retained infiltration and soil moisture
- ⊕ More water captured/ delayed upstream results in reduced flood hazard
- ⊖ High antedecent soil moisture can increase flood hazard
- ⊕ Maintains low flow and enhances groundwater recharge

management

2 Agricultural Best Management Practices

Description

Agricultural practices that work with ecological and hydrological processes to provide multiple benefits beyond yield and income. They include soil management (e.g., reduced tillage, mulching, terracing), crop and vegetation management (e.g., cover crops, buffer strips, intercropping, agroforestry), and runoff management (e.g., ditches, ponds, constructed wetlands).

Risk Mitigation Potential

Hazard
- Flood: Enhances infiltration, reduces and slows down runoff, stores excess water, stabilizes soil
- Drought: enhances infiltration, increases soil moisture, slows down runoff, reduces evaporation

Exposure
- Flood: reduces the probability of floodwater reaching human settlements

Vulnerability
- Ensures food security, stabilizes agricultural production, and generates income for farmers "as soil is higher quality and more productive

Co-benefits

- Improved water quality
- Improved air quality

Synergies and Trade-offs

Each NbS can have a negative or positive effect on the opposite hazard.

increased infiltration and reduced runoff
- ⊕⊖ less water flows downstream
- ⊕ regular low flow
- ⊖ high antecedent soil moisture

agricultural expansion
- ⊕⊖ farming in floodplains and forests
- ⊕ more farms exposed to drought
- ⊖ water-efficient crops use less water

A shade-grown coffee agroforestry system in its fifth year in the Yaque del Norte watershed, Dominican Republic. TNC works with Fondo Agua Yaque del Norte, Plan Sierra and other partners to promote agroforestry in the country.

restoration

8 Floodplain and River Restoration

Description

Restore the floodplain retention capacity and ecosystem functionality by reconnecting the area to the river. This can include modifying the channel, removing legacy sediment, and creating oxbow lakes or ponds.

Risk Mitigation Potential

Hazard
- Flood: enhances infiltration, reduces and slows down runoff, reduces and delays peak flow, attenuates floodwater energy, stores excess water
- Drought: enhances infiltration, enhances water storage, recharges groundwater

Exposure
- Flood: reaching human settlements and/or population and assets being present in flood-prone areas

Vulnerability
- Generates income, reduces insurance costs for flood damage, and increases secure access to freshwater

Co-benefits

- Increased carbon storage
- Lower water temperature

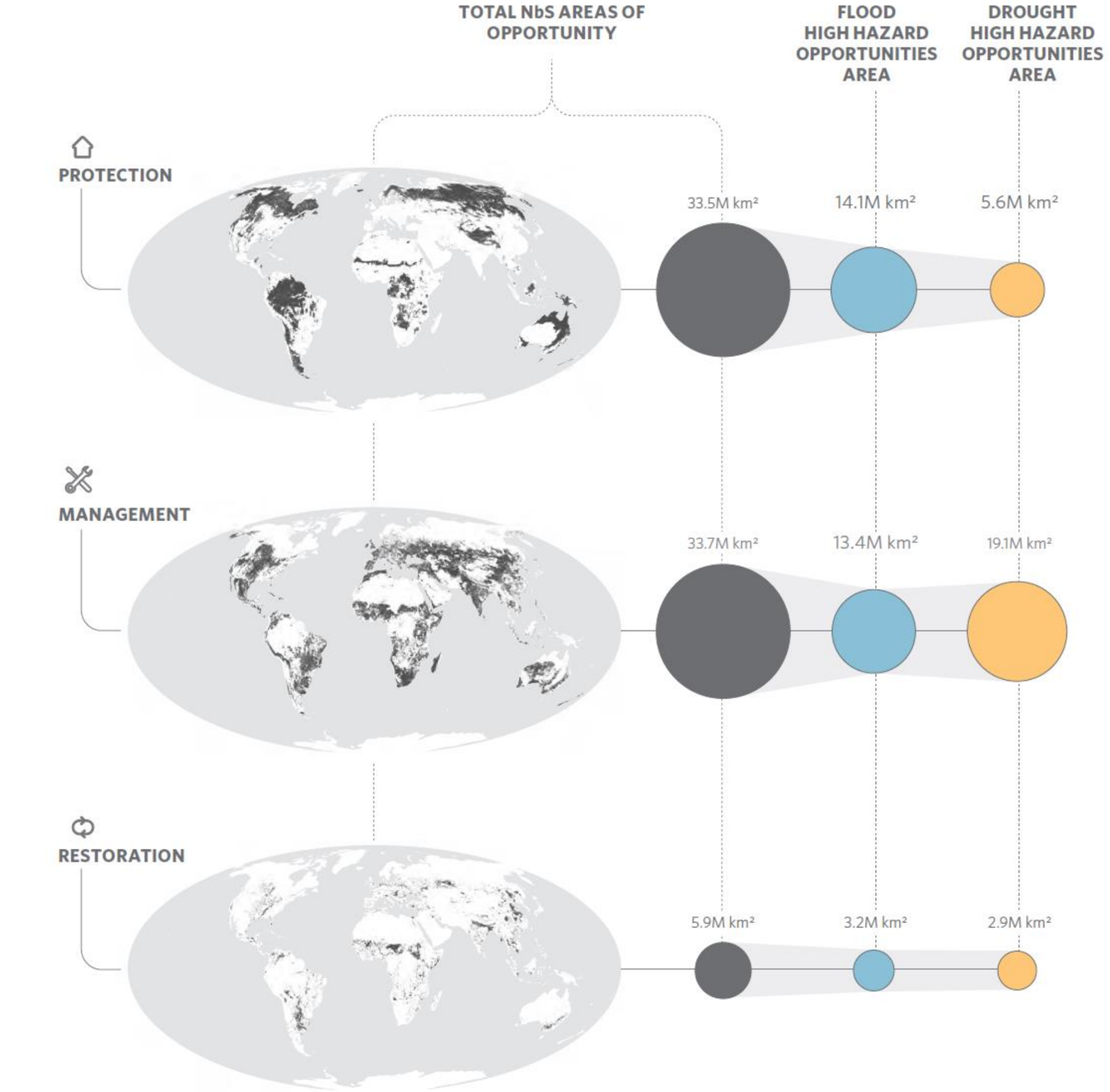
Synergies and Trade-offs

Each NbS can have a negative or positive effect on the opposite hazard.

increased infiltration and reduced runoff
- ⊕⊖ less water flows downstream
- ⊕ regular low flow
- ⊖ high antecedent soil moisture

increased vegetation
- ⊕⊖ increases evapotranspiration
- ⊕ increases water storage
- ⊖ less land for agriculture

The Nature Conservancy's Emiquon Preserve along the Illinois River. Emiquon is one of the largest floodplain restoration projects in the Midwest. This project allows the river and floodplain to connect again, restoring important habitat and protecting local farms from flooding.



ALIGNMENT OF POTENTIAL NBS AND CLIMATE HAZARDS

© DREW KELLY

SOUTH AFRICA

RESTORING NATURAL VEGETATION FOR ENHANCED WATER SUPPLY

The landscape around Cape Town, South Africa. © Roshni Lodhia

INTRODUCTION

Cape Town, the legislative capital of South Africa, is home to over 4.7 million people (Western Cape Government, 2021). A record-setting drought, lasting from 2015 to 2018, saw the city and its residents facing severe water shortages and approaching " day zero" conditions—when municipal water would have to shut down. Severe water restrictions and an increase in tariffs combined with drought-easing rains allowed Cape Town to narrowly avoid "day zero," but the threat still looms since demand continues to exceed supply. The realities of climate change in the form of decreasing rainfall and increasing temperatures, and population growth, however, make another water shortage crisis under current conditions not only possible, but likely (City of Cape Town, n.d.; Hill-Lewis, 2023).

Water security continues to be a priority for the city and its environs, particularly in light of climate change, as 95% of the city's water is shared with agriculture and nearby municipalities, and comes from a complex of six rainfed dams (OECD, 2021). While demand-side strategies provide a short-term solution, supply-side solutions are also needed in order to meet the region's future water needs. More typical supply-side strategies favor gray infrastructure like the construction of new dams, renovation of existing dams to expand reservoir capacity, water reuse and seawater desalination, and others. Given the heavy reliance on rainfall for supply, another option in this context involves a Nature-based Solution (NbS)—catchment management.

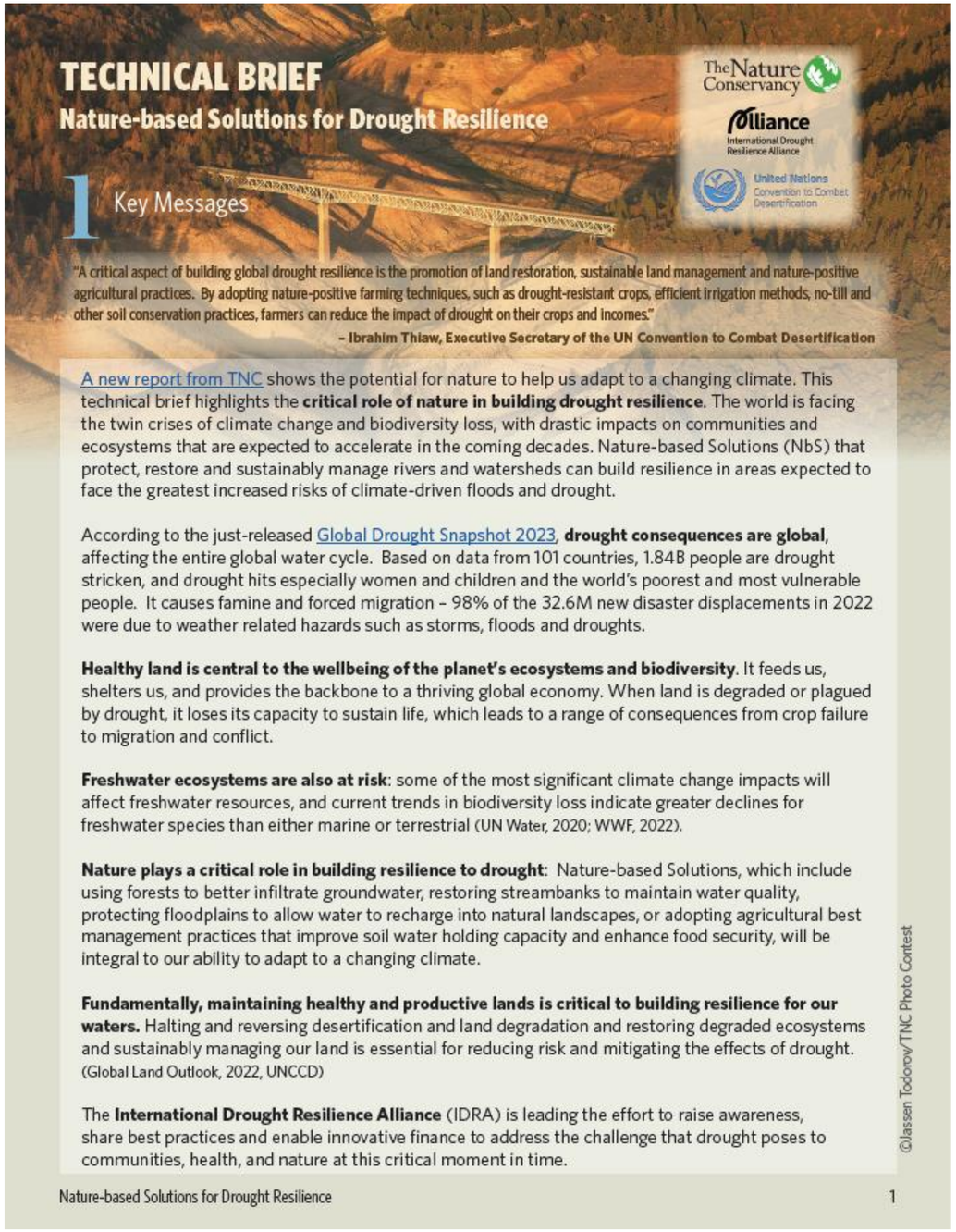
In South Africa, alien invasive plants (AIP), including pines, gums and wattles, are a major threat to water supply and water security. Alien invasive plants, through their excess uptake and evapotranspiration as compared with native flora, negatively impact over two-thirds of the Western Cape Water Supply System (WCWSS), which serves Cape Town and the surrounding areas. In addition to crowding out native fauna, AIPs increase fire intensity and alter habitat, soil ecology, biodiversity, river flow and aquifer recharge. Water consumption by AIPs is estimated to decrease water supply available to WCWSS by up to 55 billion liters per year, which would cover Cape Town's water needs for approximately two months of the year (or one-sixth of total annual water use). In addition to the substantial impact on water supply already created by AIPs, an additional concern is that the plants are spreading at a rate of 5–10% per year. If no actions were taken, estimated annual water loss across the study area would likely double within 30 years (South African Department of Forestry, Fisheries and the Environment, n.d.; The Nature Conservancy, 2018). This threat, on top of climate change impacts and population growth, puts the region at increasing risk for water shortages.

NBS APPROACHES

Ecological infrastructure is the "natural functioning ecosystem that generates and/or delivers valuable services to people, such as freshwater, climate regulation, soil formation and disaster risk reduction" (South African Department of Forestry, Fisheries and the Environment, 2022). Ecological infrastructure is also known to deliver co-benefits such as valuable services to the environment and wildlife. Restoration of ecological infrastructure, therefore, focuses on improving and/or rehabilitating natural ecosystems that have become degraded or destroyed as a result of anthropogenic activity. More specifically, this case study focuses on an effective approach that removes alien, invasive vegetation species in order to allow for native revegetation to repopulate an area.

PROJECT

In 2018, the Greater Cape Town Water Fund (GCTWF) was launched by The Nature Conservancy (TNC) and the City of Cape Town with support from a coalition of public agencies, private entities and non-governmental organizations. The primary function of the fund is to acquire and pool investments from multiple funders and downstream water users, and use that funding to coordinate and implement upstream restoration and/or conservation to improve water quality and/or quantity. In the case of the GCTWF, the primary activity funded will be removal and management of AIPs in seven priority sub-catchments.



TECHNICAL BRIEF

Nature-based Solutions for Drought Resilience

The Nature Conservancy

Alliance International Drought Resilience Alliance

United Nations Convention to Combat Desertification

1 Key Messages

"A critical aspect of building global drought resilience is the promotion of land restoration, sustainable land management and nature-positive agricultural practices. By adopting nature-positive farming techniques, such as drought-resistant crops, efficient irrigation methods, no-till and other soil conservation practices, farmers can reduce the impact of drought on their crops and incomes."

– Ibrahim Thiaw, Executive Secretary of the UN Convention to Combat Desertification

A new report from TNC shows the potential for nature to help us adapt to a changing climate. This technical brief highlights the **critical role of nature in building drought resilience**. The world is facing the twin crises of climate change and biodiversity loss, with drastic impacts on communities and ecosystems that are expected to accelerate in the coming decades. Nature-based Solutions (NbS) that protect, restore and sustainably manage rivers and watersheds can build resilience in areas expected to face the greatest increased risks of climate-driven floods and drought.

According to the just-released Global Drought Snapshot 2023, **drought consequences are global**, affecting the entire global water cycle. Based on data from 101 countries, 1.84B people are drought stricken, and drought hits especially women and children and the world's poorest and most vulnerable people. It causes famine and forced migration – 98% of the 32.6M new disaster displacements in 2022 were due to weather related hazards such as storms, floods and droughts.

Healthy land is central to the wellbeing of the planet's ecosystems and biodiversity. It feeds us, shelters us, and provides the backbone to a thriving global economy. When land is degraded or plagued by drought, it loses its capacity to sustain life, which leads to a range of consequences from crop failure to migration and conflict.

Freshwater ecosystems are also at risk: some of the most significant climate change impacts will affect freshwater resources, and current trends in biodiversity loss indicate greater declines for freshwater species than either marine or terrestrial (UN Water, 2020; WWF, 2022).

Nature plays a critical role in building resilience to drought: Nature-based Solutions, which include using forests to better infiltrate groundwater, restoring streambanks to maintain water quality, protecting floodplains to allow water to recharge into natural landscapes, or adopting agricultural best management practices that improve soil water holding capacity and enhance food security, will be integral to our ability to adapt to a changing climate.

Fundamentally, maintaining healthy and productive lands is critical to building resilience for our waters. Halting and reversing desertification and land degradation and restoring degraded ecosystems and sustainably managing our land is essential for reducing risk and mitigating the effects of drought. (Global Land Outlook, 2022, UNCCD)

The **International Drought Resilience Alliance** (IDRA) is leading the effort to raise awareness, share best practices and enable innovative finance to address the challenge that drought poses to communities, health, and nature at this critical moment in time.

©Jassen Todorov/TNC Photo Contest

Nature-based Solutions for Drought Resilience 1

Targeted NbS Products for UNCCD & IDRA

- **Technical Brief – UNFCCC COP 28**

https://www.unccd.int/resources/brief/nature-based-solutions-drought-resilience

- **Plan Follow-Up Report for UNCCD COP 16**

Drought Resilience +10

High-level Meeting on **National Drought Policy**

Thank you!