

## Key Insights into Droughts and Ecosystems Research October 1st, 2024

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Provisioning

### Nature's **Contributions to** People

In addition to nature's intrinsic value



#### Cultural

- Recreation
- Eco-tourism
- Religious
- Spiritual

- Timber
- Cross-laminated timber
- Pulp & paper
- Pellets for bio-energy
- Fibres for textile
- Fuelwood
- Fish and game
- Fruits, nuts, vegetables
- Medicinal plants

#### Supportive

• Primary production • Nutrient cycle • Water cycle Soil formation Biodiversity Evolution

#### Regulating

- Climate, e.g., carbon sequestration
- Flood control, e.g., mangrove forests
- Erosion prevention
- Pest and disease control

Definition: "An episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and/or human systems" (Crausbay et al. 2017)





Crausbay et al. 2017

### Ecosystem impacts

#### Drought risk





### Droughts can affect the balance of ecosystems

- When droughts impact a species, all the species that interact with it get affected as well. This can affect the structure and composition of a community, and even at the level of the ecosystem.
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Community

Species

Ecosystem

Drought



### Droughts can affect the balance of ecosystems

- Increasing severity of droughts  $\rightarrow$  Insufficient time for recovery  $\rightarrow$ tipping point  $\rightarrow$  regime shift.
- New state with less biodiversity and functions (less contributions), • more vulnerable to future droughts.



a) High diversity ecosystem primary production Net Time t Low diversity ecosystem c) primary production Net Time t

### Droughts affect carbon cycling

- The uptake, movement and release of carbon is part of a healthy ecosystem. ۲
- However, droughts can lead to vegetation stress, decreasing carbon uptake by plants; ۲
- And to soil desiccation.
- More carbon stays in the atmosphere, amplifying the impact of climate change. ۲





Source: Vahedifard et al. 2024

### Systems thinking

- Drivers of drought impacts on ecosystems go beyond meteorological changes
- Droughts can be seen as a continuum, rather than event, due to carry-over/legacy effects from previous drought impacts (Van Loon et al. 2024)





Credit: "Combate no Pantanal" Airton Pereira Sebastião Prevfogo/MS



Source: Rossi et al. 2023



# Thank you!