

The decline of amphibians is not only a loss of biodiversity but also a disruption of ecological functions, as amphibians play crucial roles in food webs and nutrient cycling. The ongoing crisis has prompted urgent calls for conservation efforts to mitigate these declines and preserve amphibian diversity. Conservation strategies must address the multifaceted threats facing amphibians, including habitat protection, disease management, and climate change adaptation (Pabijan et al., 2020). The global amphibian decline serves as a stark reminder of the need for comprehensive conservation strategies to protect vulnerable species and maintain ecological balance.

### 6.2 Climate change and habitat alterations affecting amphibian populations

Climate change is a significant driver of amphibian population declines, affecting their habitats and life cycles. Changes in temperature and precipitation patterns can alter amphibian habitats, impacting their survival, growth, and reproduction (Blaustein et al., 2010). For instance, extreme variations in precipitation, such as droughts and deluges, pose a severe threat to amphibians, whose reproduction is closely tied to water availability (Walls et al., 2013). These climatic changes can disrupt breeding cycles and alter community dynamics, leading to increased competition and predation pressures (Walls et al., 2013).

Moreover, climate change can force amphibians to adapt to new conditions, migrate to suitable habitats, or face extinction. Species inhabiting higher elevations are particularly vulnerable, as they may lose significant portions of their climatically suitable areas (Alves-Ferreira et al., 2022). The interaction of climate change with other stressors, such as UV-B radiation and contaminants, further complicates the survival of amphibian populations (Blaustein et al., 2010). Addressing these challenges requires integrated conservation efforts that consider the complex interactions between climate change and other environmental factors affecting amphibians.

### 6.3 The impact of disease on amphibian species

*Chytridiomycosis*, a disease caused by the fungal pathogen *Batrachochytrium dendrobatidis*, is one of the most significant threats to amphibian populations worldwide. This disease has been implicated in the decline and extinction of over 200 amphibian species, making it a critical factor in the global amphibian crisis (Wake and Vredenburg, 2008). The spread of chytridiomycosis is exacerbated by global warming, which may enhance the pathogen's virulence and distribution (Wake and Vredenburg, 2008). The disease affects amphibians by disrupting their skin function, leading to electrolyte imbalances and, ultimately, death.

The impact of chytridiomycosis highlights the need for disease management in amphibian conservation efforts. Strategies to combat this disease include monitoring and controlling its spread, developing disease-resistant amphibian populations, and implementing biosecurity measures in conservation programs (Wake and Vredenburg, 2008). Understanding the interactions between chytridiomycosis and other environmental stressors is crucial for developing effective conservation strategies to protect amphibian species from this devastating disease.

### 6.4 Conservation Efforts and Lessons Learned from Amphibian Declines

Conservation efforts for amphibians have focused on habitat protection, disease management, and the use of reproductive technologies to support population recovery. Conservation breeding programs have been established to maintain genetically diverse assurance colonies and provide individuals for population augmentation and reestablishment in the wild (Silla and Byrne, 2019). These programs utilize reproductive technologies, such as hormone therapies and artificial fertilization, to enhance the propagation and genetic management of threatened species (Figure 1) (Silla and Byrne, 2019).

Lessons learned from amphibian declines emphasize the importance of integrating evolutionary principles into conservation strategies. This includes considering genetic diversity, population connectivity, and adaptive potential in conservation planning (Pabijan et al., 2020). Additionally, addressing the multifaceted threats facing amphibians requires a holistic approach that combines habitat protection, disease management, and climate change adaptation. By learning from past declines, conservationists can develop more effective strategies to safeguard amphibian populations and preserve global biodiversity.