

Drought in the U.S. Caribbean: Impacts on Freshwater Ecosystems



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Healthy and functioning freshwater ecosystems are needed for successful conservation and management of native fish and invertebrate species, and the services they provide to communities across the U.S. Caribbean. Yet streams, rivers, and reservoirs are vulnerable to the effects of extreme weather, urbanization, energy development, and other environmental and human-caused disturbances. One major management concern is the impact of prolonged drought on freshwater ecosystems. Drought impacts streamflow, dissolved oxygen content, water quality, stream connectivity, habitat availability, and other characteristics necessary for sustaining fish and invertebrates. These changes can impact species interactions, abundance, life history events, and presence of native and non-native species.

The U.S. Virgin Islands (USVI) are particularly sensitive to drought, because almost all streams are ephemeral and typically only flow after rainfall. These intermittent channels, known locally as “ghuts”, run down the surface of steep slopes, rather than through the ground, and are important sources of freshwater. Natural springs are often located in ghuts, and can form pools that serve as habitat for wetland and migratory birds, freshwater shrimp and fish, and amphibians.

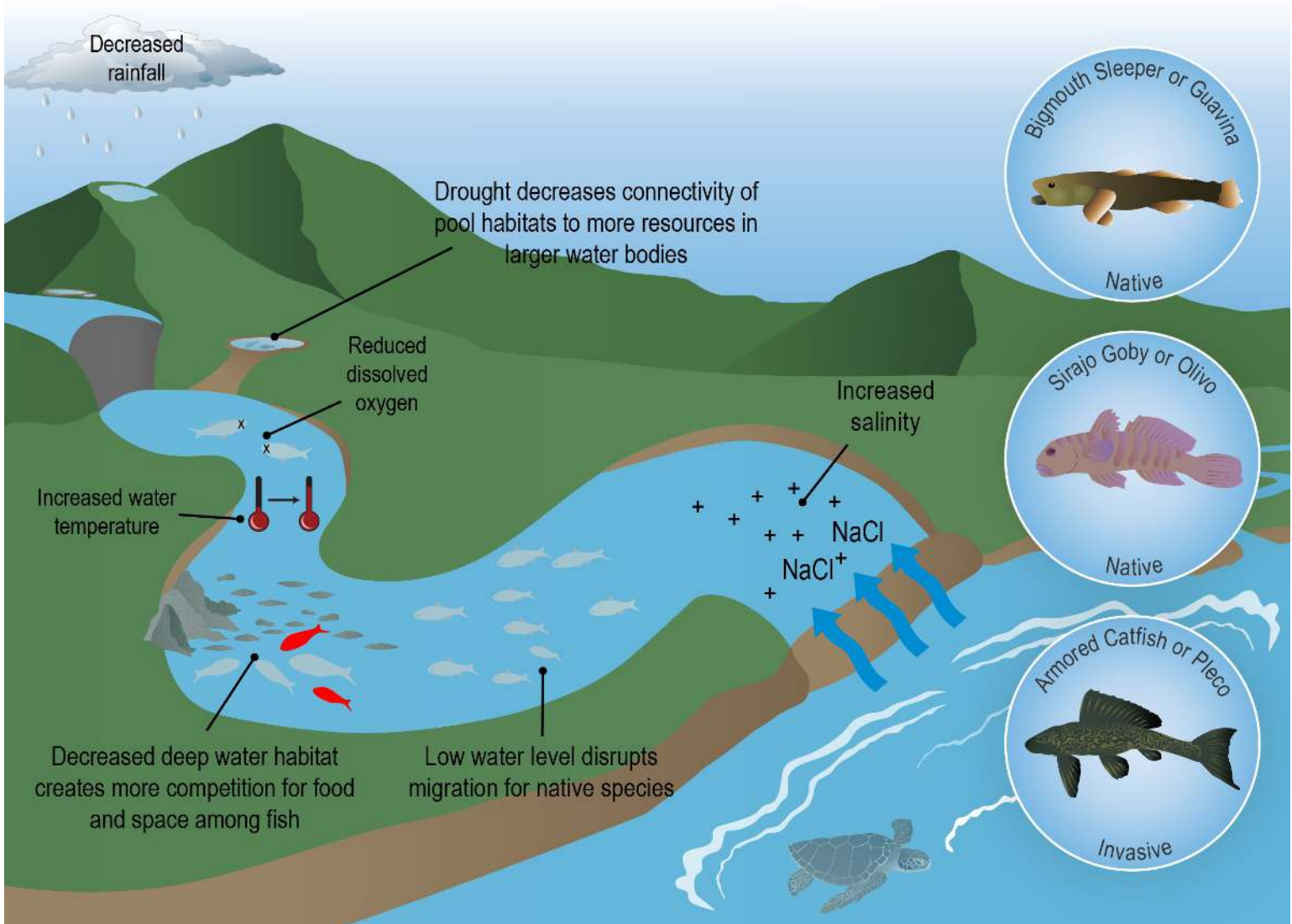
About this Series

This fact sheet is part of a series examining what we know about the impacts of drought on ecosystems and agriculture in the U.S. Caribbean. Explore the other fact sheets on:

- Coastal Estuary Ecosystems
- Tropical Forest Ecosystems
- Crops
- Livestock

View the complete series here:

usgs.gov/casc/IslandDrought



Short-Term Impacts

- **Altered Flows:** Drought can reduce stream flow, which can impact important pool habitat and dissolved oxygen concentrations, leading to changes in fish and invertebrate growth and survival.
- **Invasion of Introduced Species:** Reduced discharge and frequency of floods can facilitate the invasion of introduced fish species (such as the armored catfish or pleco), creating more competition for native fish.

Long-Term Impacts

- **Changes in Fish Assemblages:** Increases in non-native species, shifts in the presence of native fish and invertebrates, and permanent loss of endemic native species can occur.
- **Loss of Habitat:** Drought can lead to restrictions on upstream migrations of fish and invertebrates, impacting their ability to carry out important life events.

Spatial Impacts

Reductions in stream flow will impact freshwater ecosystems island-wide. However, the severity of drought can vary across an island. During the 2015 drought, the eastern half of Puerto Rico, which normally receives more rainfall than the western half, was under severe drought conditions, while the drier, western half was under moderate drought or abnormally dry conditions.

The 2015 drought resulted in a documented shift of native fish species to non-native species in an eastern Puerto Rican stream, likely due to a decrease in discharge and reduction of flood events. This suggests that freshwater ecosystems that experience a shift in flooding frequency and decreased discharge may be the hardest hit as droughts become more frequent and severe with climate change.

Cross-Sector Impacts

Drought impacts on freshwater ecosystems can affect water supply for human consumption, fish and invertebrate populations, and agricultural practices. Negative impacts on freshwater ecosystems, including reduction in water filtration capacity, quality, and frequency of flood events can occur and will alter important habitat for fish and invertebrate species. Changes in freshwater organisms assemblages can then reduce the beneficial services these ecosystems provide to the public. In addition, public recreational use of aquatic resources could be affected by drought events, with socioeconomic and cultural impacts.

Current Activities & Future Research Directions

Current Research Activities:

- Development of a long-term fisheries dataset from the Rio Piedras ecosystem in Puerto Rico (NC State University, University of Puerto Rico).
- Researching ecosystem integrity in riparian waterways and microclimate monitoring in the USVI (Water Resources Research Institute).

Key Research Needs:

- Long-term monitoring in Puerto Rico and the USVI to enable the identification of ecological changes following drought.
- Improved understanding of the mechanisms behind drought impacts on aquatic species interactions and life histories.

About Us

This fact sheet is a product of the 2018 U.S. Caribbean Drought Workshop, hosted by the USDA Caribbean Climate Hub in collaboration with the Climate Adaptation Science Center (CASC) network. View a more detailed description of drought impacts on freshwater ecosystems at usgs.gov/casc/IslandDrought

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