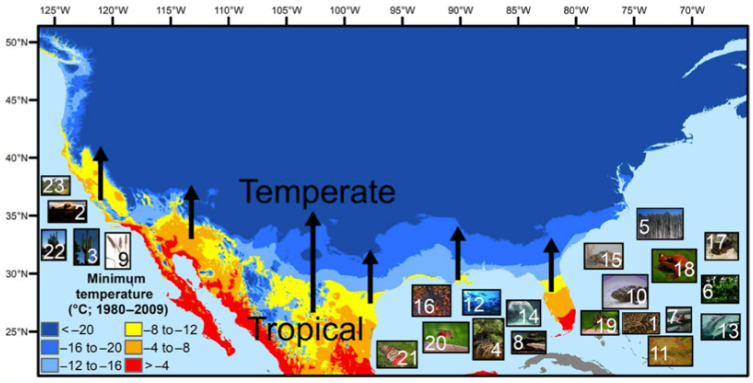
RESEARCH SUMMARY

TROPICALIZATION OF TEMPERATE ECOSYSTEMS IN NORTH AMERICA

Osland, MJ, Stevens PW, Lamont MM, et al. 2021. Tropicalization of temperate ecosystems in North America: The northward range expansion of tropical organisms in response to warming winter temperatures. *Global Change Biology 27*(13):3009-3034. DOI: 10.1111/gcb.15563

Keywords: climate change, extreme cold events, poleward migration, range expansion, tropicalization, warming

Tropicalization describes the transformation of temperate ecosystems as cold-loving species are lost and replaced by warm-loving species. In North America, decreases in extreme winter cold events are expected to allow many cold-sensitive tropical organisms to expand their ranges north, sometimes at the expense of temperate organisms. The review article by Osland et al., (2021) highlights the ecological role winter cold extremes have on maintaining transition zones that include tropical and temperate species (e.g., north-central Florida) and how the decrease of cold temperatures at this transition is giving tropical species an advantage (including many invaders).



1. Burmese python
4. Red mangrove
5. Melaleuca
6. Brazilian peppertree
7. Cuban treefrog
8. American crocodile
10. Goliath grouper
11. Sawfish
12. Cobia
13. Bull shark
14. Manatee
15. Loggerhead
16. Kemp's Ridley Sea turtle
17. Greenhouse frog
18. Coqui frog
19. *Aedes aegypti*

This figure shows the tropical/temperate ecological & climatic zones with more temperate zones in blue and the yellow to red showing the gradient towards tropical areas. Cold-sensitive tropical organisms are expected to move north, sometimes at the expense of cold-tolerant temperate organisms. The photos provide examples of tropical species predicted to move north. The species listed here are present in the Southeast. The figure and full list can be found in Osland et al. 2020.

- Research has shown that ecological transformations due to climate change are often driven by climate extremes and extreme climatic events.
- This review highlights the role of extreme cold temperatures in the distribution, abundance, and structure of species and ecosystems near tropical–temperate transition zones.
- Climate change-induced decreases in the frequency and intensity of extreme cold weather events are expected to facilitate the northward range expansion of many tropical species.

Management implications

- Species distribution modelling incorporating changes in extreme cold weather events can help prepare managers for future invasions facilitated by tropicalization.
- This information can assist prevention, EDRR, and highlights the need to regularly revisit management plans as species and communities change in numbers and composition requires flexibility in response.