Response to Follow-Up Questions on the Testimony of Dr. Molly Cross
Before the House Natural Resource Committee
Subcommittee on National Parks, Forests, and Public Lands
Hearing on: *"Building Back Better: Examining the Future of America's Public Lands"*
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Representative Sablan, Northern Mariana Islands, submitted the following question after the Hearing:

> *Dr. Cross, in my district, the Northern Mariana Islands, and throughout the Pacific, we rely heavily on our coral reefs to support our communities and the economy. Coral reefs provide critical habitat for many diverse species including the fish we eat, they serve as natural protection for our coasts, and support many tourism related activities. Yet, these resources are threatened by climate change. How can climate adaptation efforts help support communities like mine? Are there job opportunities through this work?*

Response:

Thank you for the opportunity to provide additional information of interest to you and your constituents on the Northern Mariana Islands.

Climate change is a significant threat to coral reefs – in the Northern Mariana Islands, throughout the Pacific, and across the globe. Climate change is very real and very scary – bleaching, acidification, loss of oxygen, sea level rise, and storms threaten the survival and resilience of coral reefs, against a backdrop of other local pressures.

However, there is hope. New science from scientists worldwide, including from the Wildlife Conservation Society, are showing that there are actionable options for climate adaptation in reef ecosystems.

First, there are expected to be critical areas of climate refuge for coral reefs, cool spots in the oceans where coral reefs have the best chance to survive next to deep channels, upwelling, or mixing currents – these are environmental conditions that can prevent severe bleaching. Global studies like the '50 Reefs' provide a blueprint for where these refuges occur[1,2]. A major recommendation is to increase efforts to reduce human impacts and engage people in protection of threatened coral reefs within climate refugia. This can **protect** reefs and jobs related to fishing, tourism, and other reef-dependent livelihoods[3]. The Northern Mariana Islands includes some of these refuges critical to the protection of global coral reef biodiversity and reef-dependent livelihoods [see Supplemental Table 6 in the Supplementary Information of Darling et al. 2019].

[1] Beyer, HL, et al. (2018). Risk-sensitive planning for conserving coral reefs under rapid climate change. *Conservation Letters* 11:e12587. https://doi.org/10.1111/conl.12587
[2] Hoegh-Guldberg et al. (2018). Securing a Long-term Future for Coral Reefs. *Trends in Ecology and Evolution* 33(12):936-944.
[3] Darling et al. (2019). Social–environmental drivers inform strategic management of coral reefs in the Anthropocene. *Nature Ecology & Evolution* 3:1341–1350.

But not all coral reefs will have these refuges from climate change. In climate-impacted areas, adaptation includes ensuring the conditions for coral reef **recovery** from bleaching[3]. For these areas, a similar recommendation is to reduce the human impacts and engage people in protection of threatened coral reefs. These recovery efforts can create new and protect existing jobs in coral reef restoration and ecotourism.

And finally, in some areas, the impacts of climate change are expected to erode the function and integrity of coral reefs. In these areas, strengthening the adaptive capacity of reef-dependent human communities is crucial[4]. This may include, for example, investments in equitable access to education, alternative livelihoods, and other investments to help people build new livelihoods and food security that is not dependent on coral reefs can help **transform** climate vulnerability into climate adaptation[4].

Below are a few brief descriptions of projects funded by the Wildlife Conservation Society's Climate Adaptation Fund that are taking place on Pacific islands or atolls, and which may address issues that are also relevant to the Northern Mariana Islands:

- In Guam, more extreme storms and heaver downpours are creating significant surface runoff and erosion, creating problems within uplands watersheds but also dumping sediment and pollutants into offshore coral reefs and sea turtle habitat. The Nature Conservancy and partners are taking a "ridge to reef" approach to adapting to larger rain events by building erosion control structures and planting native vegetation to stabilize soils in the upland watershed, which also benefits offshore ecosystems and species.
- The Palmyra Atoll is home to the only rainforest in the region, including 11 species of seabirds, a diverse land crab community, a thriving coral reef, and a significant overwintering site for migratory shorebirds. While seabirds prefer to nest in native trees, most of Palmyra's native tree species are threatened by climate-driven impacts such as shoreline erosion, saltwater intrusion into groundwater, changes in weather patterns, and increased storm activity. These effects are compounded by the species' competition with non-native coconut palms. The Nature Conservancy and partners are removing 99% of coconut palms and restoring native trees on all National Wildlife Refuge and TNC-owned land at Palmyra. Restoring these trees for seabirds will enhance the spread of guano and therefore the productivity of the land and reef. Re-establishing the seabird-derived nutrient pathway for the atoll will facilitate coral growth and could decrease the overall impact of sea level rise on the impacted terrestrial ecosystem.
- In Hawaii, Pacific Rim Conservation (an NGO) and the US Fish and Wildlife Service are rescuing seabirds from the low-lying Northern Hawaiian Islands that are becoming inundated by rising seas and storm surges, and moving the birds to newly-established habitat on higher ground in a National Wildlife Refuge on Oahu.

And here are a few projects funded by the Wildlife Conservation Society's Climate Adaptation Fund that are taking place on coastal areas in the lower 48 states that might offer some useful ideas for coping with sea level rise in the Northern Mariana Islands:

- In Maryland, the Blackwater National Wildlife Refuge is a hotspot of climate adaptation activity. Having completed an extensive and collaborative climate change planning exercise that assessed the consequences of future sea level rise scenarios and identified priority management responses, the USFWS and several NGO and agency partners (including The Conservation Fund and Audubon) are putting that adaptation plan into action. As rising seas and increasing storm surges inundate low lying salt marshes, managers are preparing land that is further inland and upslope to be the salt marshes of the future. By removing trees and non-native species, they are enabling the salt marshes to migrate inland as sea levels rise, so they can continue to provide habitat for birds and other wildlife, and provide protection to infrastructure further inland.

[4] Darling et al. (2019). Social–environmental drivers inform strategic management of coral reefs in the Anthropocene. *Nature Ecology & Evolution* 3:1341–1350.

- In Maryland, the National Wildlife Federation and partners are restoring eroding shoreline using a suite of cost-effective "living shoreline" techniques that will maintain ecological processes, reduce erosion, and restore lost marsh and shoreline habitats impacts by current and projected sea level rise and coastal flooding. With limited resources available to mitigate the impacts of climate change there is a growing emphasis on demonstrating cost-effective risk reduction strategies such as these.
- In Puerto Rico, record-breaking hurricanes and storms are causing coastal erosion and flooding. These disasters degrade sandy beach habitats and dunes that provide natural protection for nearby coastal wetlands, forests, grasslands, freshwater marshes, and human communities. Identifying sand dunes that were most resilience during these recent storms, this project will prioritize areas for restoration and dune re-establishment. Re-established dunes will be strategically located where they can best mitigate wave action to protect natural and human communities.

Please let me know if you have further questions about any of the information I have provided. Thank you for the opportunity to share this work and WCS' perspectives with the Subcommittee.