April 30, 2021

U.S. House of Representatives
Committee on Natural Resources
Subcommittee on Water, Oceans, and Wildlife
Washington, D.C. 20515

Dear Chairman Huffman and Committee Members,

Talofa lava. My name is Kelley Anderson Tagarino and I have the pleasure of serving as the University of Hawai'i Sea Grant extension agent based in American Samoa. I am providing testimony as a private citizen in support of support of H.R. 160, *Restoring Resilient Reefs Act of 2021* (Rep. Darren Soto, D-FL), to reauthorize the Coral Reef Conservation Act of 2000 and to establish the United States Coral Reef Task Force, and for other purposes.

I moved from Florida to American Samoa in 2009, where I have worked in a variety of capacities related to coral reefs with local agencies such as the American Samoa Government Department of Marine and Wildlife Resources for reef fish surveys, the National Marine Sanctuary of American Samoa assisting in education and outreach, and American Samoa Community College as their Marine Science Coordinator. My position is seconded to the American Samoa Community College, where I support both their Marine Science Associates of Science program and their Aquaculture extension program on the Land Grant side. I also serve as the American Samoa liaison for both the Pacific Islands Ocean Observing System liaison for the Water Resources Research Center. I believe my varied experiences, particularly in the extension field, have given me a broad perspective of both the intrinsic the value of our reefs, and their value to our community members.

I realize not everyone is very familiar with American Samoa, so allow me to share a brief overview with you: American Samoa is the only inhabited US Territory in the south Pacific and consists of five inhabited volcanic islands and two uninhabited coral reef atolls (see map in figure 1 below). Our population is approximately 55,000, of which over 90% resides on the main island of Tutuila. Tutuila, like our other inhabited islands, has a steep mountainous ridge that creates a concentration of human population and infrastructure along a narrow (about ¼ mile width) band of coastal land along the south side of the island. Although Tutuila is our largest island, it is only about 21 miles at its longest points east to west, and barely three miles north to south at its widest point. Thus, the narrow band of flat land is critical to protect – and our best protection from wave driven erosion is our coral reefs.

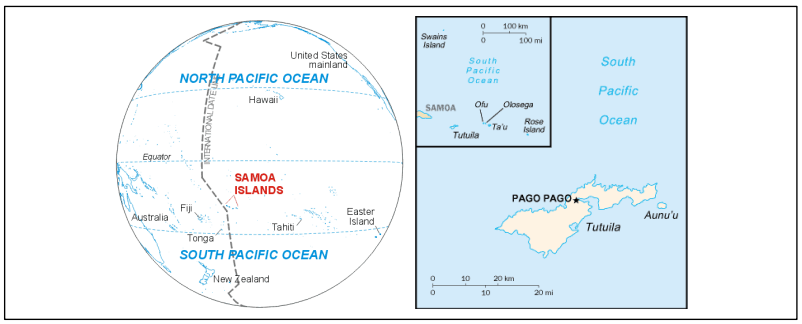

Figure 1. Location of American Samoa (above left) and a map of the islands of American Samoa (above right).

Like elsewhere around the world, American Samoa faces significant land loss to coastal erosion (see figure 2 below) exacerbated by sea level rise. However, American Samoa's islands are also sinking due to post-seismic subsidence caused by the 2009 earthquakes that generated a devastating tsunami in the Samoan archipelago. **While global sea level rise averages more than an inch per decade, Tutuila has lost about 7.6 inches in the decade from 2009-2019 from a combination of global sea level rise and local subsidence.** Impacts from this rapid loss are significant and multi-faceted, but one thing is clear – coral reefs are our best natural shoreline protection.

Figure 2. Faga'alu shoreline along Matafao Elementary circa 1967 (above left) and 2014 (above right).

A 2019 USGS report by Curt Storlazzi and others quantified the value to infrastructure that coral reefs provide and found that in American Samoa our reefs protect 580 people from flooding and $33 million in adverted property damage and economic activity. The same report found that with a one meter loss in reef height, the 100-year floodplain would increase across American Samoa by 1.24 square miles, imperiling an additional 1,000 people and $70 million in property and economic activity. These are significant numbers for such a small Territory. Again, the very narrow band of flat coastal area is highly vulnerable to coastal erosion as shown in figure 2 as well as below in figure 4 that shows the map from the aforementioned USGS report for Nu'a Se'etaga cove on the west side of the island. Note in figure 4 the one main road that connects the south side of Tutuila island would be completely flooded, along with several homes. American Samoa has shallow fringing reefs that grow right up to the water's surface (see figure 3 below), which serve as a natural wave break thus providing significant protection to the shoreline from wave driven erosion. **However, only healthy reefs can continue to grow and keep their height that enables this critical shoreline protection.**

Figure 3. Aerial image of Fatu ma Futi on Tutuila island – the white surf lines are where the crest of the fringing reef is located. The narrow strip of flat coastal land is also clear in this image. (Photo credit: Valentine Vaeoso, 2021)

Figure 4. USGS Map showing the simulated flooding for 100-year storm events with reefs (in blue) and without reefs (in red) in Nu'a Se'etaga, western Tutuila in American Samoa.

American Samoa's reefs are well known amongst reef scientists for three amazing reasons: one – they contain some of the most resilient coral reefs in any inhabited US jurisdiction, two – they contain the world's largest coral colonies (see figure 5), and three – they contain the world's oldest continuously monitored coral reef transect, making American Samoa the cradle of coral reef science. The value of this cannot be overstated. As we continue to lose our reefs to a combination of local and global stressors, the reefs that remain healthy and resilient gain value as potential "seed banks" for not just repopulating other reef areas, but potentially enhancing the resiliency of other reefs. As we have been reminded during the covid pandemic, viruses and other diseases do not operate in a vacuum nor respect political boundaries. This is even more true in the ocean, where currents carry larvae hundreds and thousands of miles. Thus, maintaining the remaining healthy reefs serves as a possible pathway towards future reef regrowth.

Figure 5. The large coral is a 500 year old Porites coral colony located in Ta'u. It is one of the oldest and largest corals ever recorded. Other giants are located nearby and the area is known as the Valley of the Giants. (Photo: XL Catlin Seaview Survey / The Ocean Agency). You can view a 3D image of this coral at: https://sanctuaries.noaa.gov/vr/american-samoa/big-momma/

While American Samoa's reefs remain relatively healthy, they nonetheless face numerous stressors and challenges. Like other reefs in crises around the world, the coral cover in American

Samoa's reefs has declined in some areas (see figure 6 below) in part due to bleaching events and a crown of thorns starfish outbreak in 2012-2016. American Samoa's marine agencies worked collaboratively to successfully eradicate the crown of thorns outbreak to background levels. **We were the only jurisdiction to have succeeded in crown of thorns removal based on presentations at the crown of thorns session at the world's largest coral reef conference in 2016. The removal of these coral-eating starfish was supported in part by Coral Reef Conservation funds, which provided logistical support for the in-water operations.** This serves as a concrete example of why allowing local management the autonomy to determine how to utilize these funds is critical to allowing rapid adaptation to emerging issues facing our reefs. In figure 7 below, you can see how healthy the reef in Fagatele Bay remained in 2012 despite prior bleaching events and a severe earlier crown of thorns starfish outbreak in the 1970's.

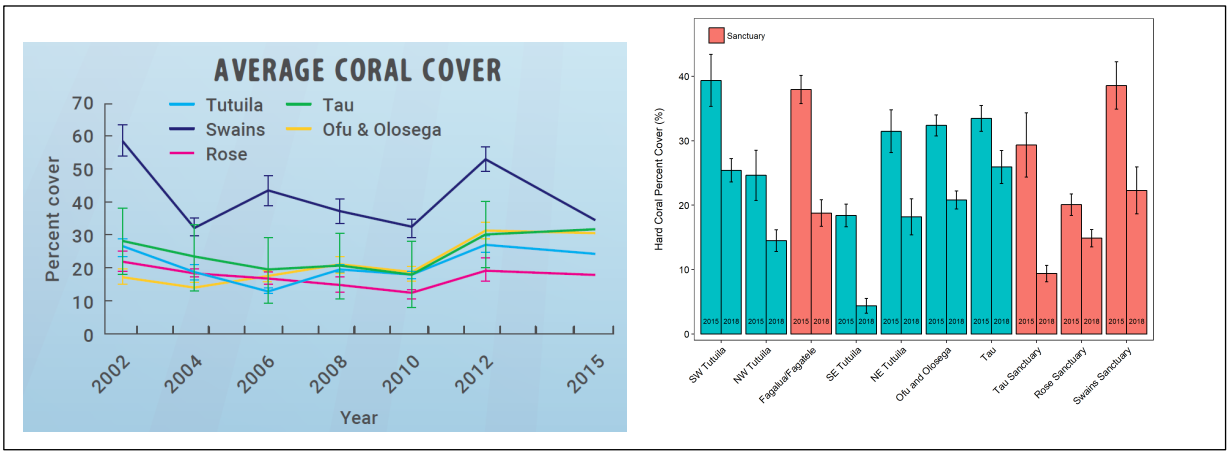

Figure 6. Above left - average coral cover from 2002-2015 (from NOAA CRCP. 2018. Coral reef condition: A status report for American Samoa. NOAA CRCP Silver Spring, MD. 8pp). Above right - average hard coral cover comparison from 2015 to 2018 around American Samoa (Vargas-Angel et al (2018) Coral Reef Ecosystem Monitoring Report for the National Marine Sanctuary of American Samoa. Pacific Islands Fisheries Science Center. Ecosystem Sciences Division. NOAA Technical Report).

Figure 7. Coral reef in Fagatele Bay, part of the National Marine Sanctuary of American Samoa.

Healthy reefs support healthy reef fish populations. Reef fish and other organisms were, and are today, central to Samoan culture. Not only are they culturally important, but food from the reef is relied upon by 72.5% of people in American Samoa (according to Arielle Levine's 2018 household survey). **57.8% of American Samoan's live at or below the poverty line** (according to the 2017 American Samoa Statistical Yearbook), **making the reliance on reef fish very high.** Fishers rely on the reef both for subsistence and contributions to family or village events (*fa'alavelave*) as well as income by selling their catch (see table 1 below for more details). As reefs decline in both coverage and health, their associated populations of fish and other food organisms such as crab, octopus, sea cucumber, and sea urchins also decline. The declining availability of food from the reef has significant negative impacts to culture, health, and community cohesiveness. The Samoan people have depended on reefs for their subsistence and livelihoods for over 3,000 years. Fishing and gleaning practices are woven into the culture, traditions passed down from generation to generation as village members stand side by side to gather the sea's bounty. Fishing still sustains families when ships don't come or money is short. Providing reef fish for traditional ceremonies and community leaders is a duty and a show of respect. American Samoa has relatively low fish biomass compared to other Pacific islands, as shown in figure 8 below. Funds from this Bill will allow managers to support healthy reefs and reef fish/organism populations that will in turn support American Samoa's fishing community (see figure 9 below for examples).

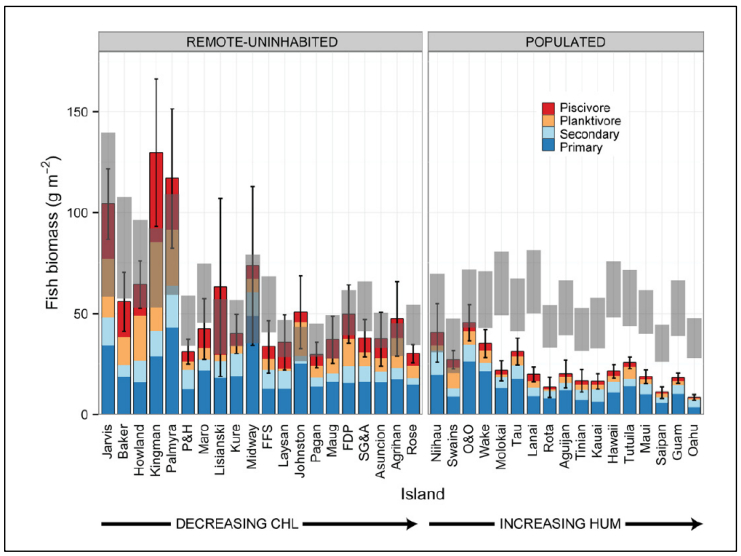

Figure 8. (At left) A comparison of observed fish biomass vs. predicted biological capacity (indicated by grey shaded bars) in an unfished state. Only Swains is within the predicted biological capacity for American Samoa. From Williams ID, Baum JK, Heenan A, Hanson KM, Nadon MO, Brainard RE (2015) Human, Oceanographic and Habitat Drivers of Central and Western Pacific Coral Reef Fish Assemblages. PLoS ONE 10(4): e0120516. doi:10.1371/journal.pone.0120516

Figure 9. Below left: A fishermen with a traditional basket weir on Ofu island. (Photo credit: A. Levine, 2007). Below right: The village of Fagasa participates in a communal fish drive for *atule* (Photo credit: E. Lilio)

Degree of Importance	Uses of Fish						
	For Food	To Buy	To Sell	For Recreation	For Cultural Use	For Aquarium Trade	To Maintain Healthy Ecosystem
Important	90	32	46	45	73	25	91
Somewhat Important	5	36	19	16	13	20	4
Neutral	2	2	5	4	3	6	1
Somewhat Unimportant	1	5	3	3	1	4	1
Unimportant	2	24	26	32	8	44	3
No Response	0	0	1	1	1	1	0

Table 1. Survey responses (in percent) on the degree of importance of fish for various uses in American Samoa. From Levine, A. and S. Allen. 2009. American Samoa as a fishing community. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-19, pg 24.

As previously mentioned, American Samoa is home to the world's oldest continuously monitored coral reef transect, which is located in the village of Aua. In 1917 Alfred Mayor from the Carnegie Institute conducted important studies of American Samoan corals. He established the oldest periodically resurveyed coral-reef transect in the world, which is now marked by US Coast and Geodetic Survey permanent markers at each end of the transect (see figure 10 below). Over the years, it has been learned from surveys of the Aua coral transect that after damages from events such as storms, crown-of-thorns (*alamea*), or pollution, reefs can recover quickly on solid surfaces such as large mound corals. But if an area of branching coral is killed, it becomes rubble and may not recover for decades.

Figure 10. Above left - 1917 photo showing the coral communities were diverse and included many branching corals when they were first surveyed by Alfred Mayor. Above right - In the 1950's the coral communities deteriorated when the tuna canneries were established in Pago Pago Harbor. However by 1992 the corals started recovering when a wastewater pipe was constructed from the canneries to the open ocean.

The lessons learned from the Aua coral reef transect monitoring are currently being used to conduct trials for coral restoration in Aua by the current American Samoa National Coral Reef

Management Fellow, who is housed in the American Samoa Governors Coral Reef Advisory Group (CRAG). CRAG is funded primarily by Coral Reef Conservation Program funds. The current American Samoa National Coral Reef Management Fellow happens to be a past student of mine, who was supported by CRAG funds when she took part in student internships related to coral reefs. In fact, two of CRAG's current staff are my past students, and both were supported by CRAG funded student internships. In addition, the current American Samoa National Coral Reef Management Fellow was also supported by a CRAG-funded scholarship when she matriculated from the American Samoa Community College to the University of Hawai'i at Hilo. Currently, CRAG provides funds to support American Samoa Community College Marine Science Program alumni who have matriculated to pursue their bachelor's degrees in relevant fields.

In addition, CRAG provides funds and staff time in support of the marine science field techniques program I coordinate at the American Samoa Community College. This field techniques program is called Quantitative Underwater Ecological Survey Techniques (QUEST) and teaches various techniques to monitor coral reefs. To date, QUEST has a proven track record of building capacity in fisheries science. Of the 53 past QUEST participants, 46 earned their QUEST certificate, and of those 46, 90% are either continuing their education in marine science or working in a relevant marine related-field. In addition, nine past QUEST participants have continued their education off island to earn their bachelor's degree in marine science and another 13 are currently enrolled in a bachelor's degree program. Four of the bachelor's recipients have returned to American Samoa and work in marine science related positions at the American Samoa Environmental Protection Agency (ASEPA), National Park of American Samoa (NPSA), and American Samoa Governor's Coral Reef Advisory Group (CRAG). In addition, of the QUEST agency staff participants: eight work in marine management positions at the Department of Marine and Wildlife Resources, one at CRAG, one at NOAA PIRO, one is a commercial diver with Crux Diving Services in American Samoa, and one is a marine technician in the Coast Guard and is actively trying to be stationed in American Samoa. Finally, one QUEST alumna is enrolled in an online master's degree program in marine science at Columbia Southern University, and three other alumni are actively applying to graduate programs. These are clear examples of local capacity being built with the support of Coral Reef Conservation Program funds.

Circling back to the National Coral Reef Management Fellowship program, I would be remiss if I didn't bring up the importance of this program to supporting and building local capacity in the coral reef jurisdictions. **The current National Coral Reef Management Fellow in American Samoa is only our second local Samoan NOAA Coral Reef Fellow in American Samoa**. Both the current Fellow and her predecessor were QUEST participants. I want to emphasize the importance of building local capacity, rather than a revolving door of off-island contractors. Having worked at the American Samoa Community College for over a decade, I can say it is very challenging to recruit students to science fields, but bringing them out into the field to snorkel is one of the best recruiting techniques there is. And such field trips require immense logistical and fiscal support, which both CRAG and the NOAA Coral Reef Fellows have consistently provided (see figure 11 below). I feel naming this program after the late, great Ruth Gates is a fitting tribute.

Figure 11. Current American Samoa NOAA Coral Reef Fellow leads a field trip to the meet with the Aua mayor and monitor the Aua transect for the American Samoa Community College Marine Science Program.

Given that CRAG is the main recipient of Coral Reef Conservation Program funds in American Samoa, allow me to explain a bit about it. CRAG member agencies and partners cooperate to manage coral reefs with the vision of thriving, valued, and conserved coral reef ecosystems in American Samoa. The group works toward this vision by providing guidance to territorial leaders and implementing strategies to reach goals that address various areas of coral reef ecosystem conservation. Foci range from education and outreach, policy and enforcement, to scientific research and monitoring.

Over the past 25 years, CRAG has:

- Established a **collaborative interagency team** that works collectively on implement American Samoa's coral reef conservation science and management goals
- Coordinate the **Territorial Coral Reef Monitoring Program**, which collects status and trends on American Samoa's Coral Reefs. Results from this program are used to advise management decisions
- Leading **village-based resilience planning**, with an interagency team to support effective on the ground management of natural resources.
- **Training the next generation of American Samoan Coral Reef Scientists and Managers** by hosting interns, fellows, student research, and providing mentorship for local young professionals and students.
- Expanding **Education and Outreach** through school and village presentations, but also through innovative methods such as mural projects, teacher training, curriculum development and more.
- Led the Territorials first Climate Change planning efforts, including coordinating the multi-sectoral **Climate Change Adaptation Framework of 2012**.
- Led the establishment of the American Samoa MPA Network, which has transformed into **Sustainable Reef Fisheries Management Planning.**
- Coordinated efforts in **USCRTF Watershed Priority Site Faga'alu** – From inception to being the first graduate of the program.
- Providing ongoing leadership in territorial planning efforts on **Coral Reef Restoration**
- Support American Samoa's Participation in the **US Coral Reef Task Force** and the US All Islands Coral Reef Committee to ensure local success, concerns and issues are showcased at the national level.

- Ongoing monitoring of the **Aua Transect,** the US's oldest coral reef monitoring site.
- Hosted hundreds of topical workshops and seminars and collaborated with Federal and University scientists to **advance scientific knowledge** as well as the territories ability to manage coral reefs.
- Been a participant and leader of **Le Tausagi,** an educational cooperative that exposes kids to ridge to reef environmental education outside the classroom.

Another aspect of this Bill that will greatly assist American Samoa is the funding and support for vessel groundings on reefs. As mentioned previously, corals protect the shoreline, which in turn protects communities. When a fishing vessel ran aground on the coast of Aunu'u island (which is part of the National Marine Sanctuary of American Samoa), it pummeled the coral, crushing it into a lifeless barren (see figure 12 below). Through the National Marine Sanctuary Act, the sanctuary worked with partners to remove the vessel as soon as possible, but the damage was done. And that damage increases the village's vulnerability to rising sea levels. When storm waves pound the shore, the boat's damage allows waves to push further inland. In 2019, storm waves threw rubble onto the shore, blocking the village's only road and cutting off electricity as waves swept through the power plant. This could be a glimpse of a future with less coral and rising seas.

Other grounded vessels outside of the sanctuary, have not been removed and continue to cause damage due to the lack of funding and technical assistance available to address vessel groundings and storm damage. Emergency assistance is desperately needed for all coral reef impacts, not just for reefs within the sanctuary system. Reefs are essential infrastructure for the islands and need to be recognized for that role.

Figure 12. F/V No.1 JiHyun grounded within the sanctuary's Aunu'u Multiple Use Zone in 2016 (top). The sanctuary moved quickly to remove it, but the vessel pulverized corals (bottom right), destroying an important living barrier (bottom left) against storm waves.

American Samoa's reefs have been surprisingly resilient in the face of repeated impacts from crown of thorns starfish, tropical cyclones, a devastating tsunami, vessel groundings, and now repeated coral bleaching (see figure 13 below). From giant corals in Ta'u to the super corals in

the Ofu pools and the astonishing recovery of Fagatele Bay, the reefs of American Samoa may hold the key to understanding resilience. Coral reef management agencies need support for mitigation measures and to continue long term monitoring efforts throughout the territory and to build capacity for research to inform adaptive management.

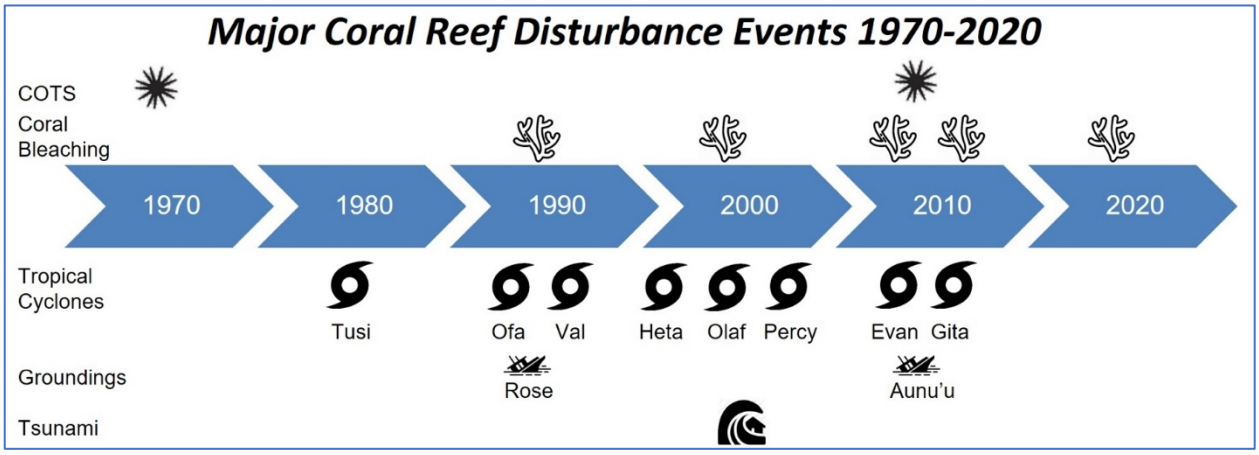

Figure 13. Coral reefs in American Samoa have been affected by crown of thorns starfish, coral bleaching, tropical cyclones, vessel groundings, and a tsunami, but are still resilient.

Like the village harvest of *akule* (scad), coral reef conservation requires partnership, coordination, and knowledge. Everyone needs to join in to ensure a successful outcome. This is true at all levels, from community-based village marine protected areas, to the American Samoa Coral Reef Advisory Group, to the US Coral Reef Task Force. Expanded partnership opportunities that include communities, businesses, and non-government organizations are necessary to conserve and restore coral reefs. Government agencies can't do it alone.

Education and outreach programs, volunteer opportunities, citizen science, internships, and fellowships all play an important role in building capacity to conserve and restore coral reefs. This has been observed first hand by the National Marine Sanctuary of American Samoa through their ocean literacy programs, as well as through CRAG's programs. An expanded investment in these programs will build a stronger foundation for future coral reef champions.

That's why support for mitigation efforts, continuation of existing education and outreach, capacity building, and expanded partnership opportunities are so important. Elders continue to pass traditional knowledge on to the youth of American Samoa, but the island is changing due to development and climate change. Tomorrow's leaders need to build on this traditional knowledge gained over millennia, combining it with modern science, and new partnerships to fuel solutions. Solutions that include expanded community roles in reef conservation, new partnerships and funding opportunities that include businesses and non-governmental organizations, and looking outside of traditional government management to solve these coral reef challenges.

Today, we see a shift in "western" science towards recognizing the depth and breadth of natural resource stewardship knowledge among indigenous populations. **Comprising less than 5% of**

the world's population, indigenous people protect 80% of global biodiversity. I believe this Bill allows federal agencies to support and empower local managers to maintain biodiversity, and it couldn't come at a more important time. We are barreling towards a climate crisis that will leave us with no reefs if we don't change our ways. Reefs are invaluable. Reefs are in crises. Every day missed is a day lost for helping our reefs. Now is the time to act.

"Coral acts as a shield or protection for the fish we eat. Without the coral, there are no fish. The little fish live there, eat there, grow up there. Protecting the coral, protects the fish. The coral also provides *maka lelei* and *maka malu* (seaweed) for us to eat."
- Toveine Neifi, lifelong fisherman

I sincerely appreciate your consideration of my testimony and am happy to answer any further questions you may have.

Sincerely,

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