ICRI Member's Report

United States of America

Reporting period December 2017 – November 2018

*NOTE: This is a consolidated report across US government agencies and US jurisdictions who wanted to provide input, this list is a high level summary and not intended to be exhaustive.

1. **Reporting on the ICRI Plan of Action 2016-2018.** *Your responses will help inform the Secretariat about members' contributions toward the previous Plan of Action.*

    a. **Please list any relevant examples from your organisation/country of investment/projects to protect and restore the natural infrastructure of reefs and mangroves.** (See Goal (1) 2 ICRI Recommendation for supporting investments in the natural infrastructure of reefs and mangroves to increase climate resilience).

NOAA:

NOAA's Coral Reef Conservation program supported the following studies:

- Capacity Building and Coral grounding Injuries in the Caribbean
- Acropora Nurseries in Puerto Rico and USVI
- Evaluation of ESA listed Acropora Spp. Status and Recovery Actions
- Seeding reefs with Diadema antillarum to enhance coral recovery in Puerto Rico
- Use of Restoration Genomics in Recovering ESA Species: Orbicella faveolata
- Characterization of relative genotypic disease resistance in ESA Acropora spp.
- Investigating Reproductive Failure in Populations of ESA Coral Acropora palamata
- Molecular mechanisms of heat tolerance in the threatened coral Orbicella faveolata from the Florida Keys
- Characterizing disease resistance to improve restoration and outoplanting success
- Testing strategies to increase thermal tolerance of restored corals in Florida
- Development of BMP guidance for coral restoration monitoring

NOAA staff served as subject matter experts for the Saving Coral Reefs concept, which was recently selected as the next XPRIZE Visioneering competition. Once launched, the project will challenge teams from around the world to achieve reef recovery at a scale that is more efficient and cost effective.

Department of the Interior U.S. Geological Survey:

Developed new, robust methodology integrating hydrodynamic, coastal engineering, geospatial, social, and economic models to accurately quantify the hazard risk reduction provided by coral reefs. By quantifying the role of coral reefs in coastal hazard risk reduction/coastal resilience, their protection and/or restoration can be funded as 'green' infrastructure using pre-disaster resilience funds and post-disaster recovery funding typically utilized for 'gray' infrastructure such as seawalls and breakwaters. (Storlazzi, C.D., Reguero, B., Lowe, E., Shope, J.B., Gibbs, A.E., Beck, M.W., and Nickel, B., 2017. "Rigorously valuing the role of coral reefs in coastal protection: An example from

Maui, Hawaii, U.S.A." Coastal Dynamics 2017, p. 665-674.)

U.S. National Science Foundation:

NSF invested $13,594,670 USD in coral reef related research and projects between December 2017 and November 2018. Funded awards include, but are not limited to, investigation of basic scientific research to better understand coral reef organisms and ecosystems, Grants for Rapid Research Response (RAPIDS) allowing for investigation of changes and impacts from Hurricanes Maria, Irma, and Harvey, and infrastructure support to rebuild the Virgin Islands Environmental Resource Station (VIERS) post hurricane.

American Samoa:

- The American Samoa Coral Reef Advisory Group [CRAG; AS Environmental Protection Agency, AS Department of Commerce (NOAA's Coastal Zone Management Program and its National Marine Sanctuaries), AS Community College, National Park of American Samoa, and the AS Department of Marine and Wildlife] supported many community-based marine debris clean-up activities, ridge-to-reef monitoring of stream and coastal water quality and coral reef ecosystem health at 34 watersheds around Tutuila, installation of 13 rain gardens, and numerous outreach activities to strengthen environmental stewardship.
- The Territory also completed a historic monitoring project. Scientists resurveyed coral reef monitoring sites around the main island of Tutuila, the Manu'a Islands, and Rose Atoll with the original surveyors throughout October and November 2018. Sites were last surveyed in 1996 and 2002 by Dr. Alison Green and in 2002 by Dr. Charles Birkeland. Dr. Douglas Fenner also joined the surveys in 2018.

b. **Has your organisation/country made any progress in the following areas to target anthropogenic pressures?** Please give detail below. Note: If no change since your last ICRI member report, please write 'no change'.

☐ **Encourage ban of plastic microbeads in cosmetic products.** (See Goal (3) 2 & See ICRI Recommendation to reduce plastic microbeads pollution in marine environment):

☐ **Improve regulation and enforcement to reduce direct anthropogenic damage due to dredging and physical alteration of reef structures.** (See Goal (3) 3 & ICRI Recommendation to reduce damage due to dredging and dumping on coral reefs):

US EPA:
EPA, R4, funded an assessment of baseline turbidity conditions at Pt Everglades utilizing satellite data completed in 2018, prior to the Pt. Everglades harbor deepening project.

☐ **Deployment of mooring devices limiting the mechanical destruction of coral reefs and seagrasses.** (See Goal (3) 4).

US Coast Guard:
In April, the US Coast Guard embarked on a two-year experiment to test several different types of environmentally friendly mooring systems. The USCG, using the U.S. Coast Guard cutter Joshua Appleby, a 175-foot Keeper Class coastal buoy tender,

deployed five buoy mooring systems near the coast of St. Petersburg, Florida. There, the buoys' impact on the ocean floor and ability to withstand the elements while staying securely moored will be evaluated. The results will determine if the moorings are fit to be adopted on a broader scale.

US EPA:

EPA, R4, through the Florida Keys National Marine Sanctuary Water Quality Protection Program supported the development of mooring buoy fields over haphazard anchoring practices destructive to the seagrass community. Comprehensive Mooring Field Plans for the cities of Marathon and Key West are now in place that provide permanently attached, engineered mooring systems to secure 400 resident and transient vessels. Local government is currently evaluating high traffic, unmanaged anchoring areas for future mooring field management.

c. **Did your organisation/country celebrate International Year of the Reef?** Please give details below. (See Goal (5) 1 & ICRI Recommendation designating 2018 as the third International Year of the Reef):

Guam:

Guam Year of the Reef 2018: Highly collaborative year-long effort conducted by partners from local and federal government agencies, academic institutions, NGOs, and the private sector. Activities included a proclamation signing and presentation of a legislative resolution, reef pledge campaign, educational events for World Oceans Day, an exhibit at the Guam Museum, and the 4th Guam Coral Reef Symposium. GYOR partners have conducted extensive public outreach through monthly newsletters, social media, and radio advertisements. GYOR won "best program/project of the year" at the Government of Guam MagPro Awards.

US Coral Reef Task Force -

The US Coral Reef Task Force celebrated the Year of the Reef in American Samoa during the 40th US Coral Reef Task Force meeting.

Department of State:

The Department of State hosted a diplomatic reception to celebrate the International Year of the Reef, featuring State's Senior Advisor Jon Harrison and NOAA's Administrator Tim Gallaudet and Force Blue, former Special Operators with a new mission: to protect and restore the world's coral reefs.

A number of U.S. Embassies worldwide celebrated IYOR by hosting activities and programs highlighting the importance and value of coral reef ecosystems.

For example, the U.S. Embassy in Manila organizes the Young Southeast Asian Leaders Initiative Sea and Earth Advocates Camp. This year, campers championed International Year of the Reef 2018 through 12 projects that raise awareness about the hazards marine plastics pose to coral reefs, fisheries, tourism, and human health, and reduce consumers and businesses to reduce plastic waste.

2. **Contribution to the ICRI Plan of Action 2018-2020 and upcoming ICRI general meetings.** *Your responses to the following questions will assist the Secretariat in assessing contributions towards the major themes of the draft ICRI Plan of Action 2018-2020.*

Theme 1 – Promote effective and adaptable solutions to improve the protection of coral reefs

a. **Which of the below topics do you consider to be the three top challenges that your organisation faces in managing coral reefs?** Please select from the options below:

- [X] Climate change impacts
- [ ] Inadequate planning, zoning and management
- [ ] Unsustainable resource extraction
- [ ] Tourism and recreation
- [ ] Shipping
- [X] Coastal development
- [ ] Dredging
- [ ] Illegal and destructive fishing
- [ ] Fish and coral trade
- [ ] Marine debris
- [X] Other. Please specify: Land-based sources of pollution

b. **Please list any examples of innovative management practices that your organisation/country is involved in, such as use of VMS, drones & ecological mooring devices.** Include their limits, conditions of implementation, financing and an assessment of their results and links for more information if possible.

NOAA:
NOAA's Coral Reef Conservation program supported the following studies:

- Support for a Caribbean Extension of the Coral Reef Early Warning Network
- Using UAVs to evaluate reef resilience and restoration sites in Kaneohe Bay

Guam:
The Guam Coral Reef Response Team has launched a crown of thorns sea star (COTS) mitigation effort, using ox bile injectors for culling. The program is based on the Guam COTS Outbreak Response Plan, finalized in December 2017. The Response Team has used this technique at five reef sites during 2018. The Response Team is an interagency group with representatives from three Government of Guam agencies, six US federal agencies, and the University of Guam.

USGS:
Unmanned aerial vehicles (UAVs, 'drones'), satellite psuedobathmetry

NASA:
The Neural Multi-Modal Observation and Training Network for Global Coral Reef Assessment (NeMO-Net) uses high resolution drone data coupled with other

NASA Earth Observations through an active learning software to assess coral reefs status from local to global scales – www.nemonet.info; www.nasa.gov/ames/las

c. **Please list any examples of innovative funding for management that your organisation/country is involved in.** Include their limits, conditions of implementation, financing and an assessment of their results and links for more information if possible.

USGS:
See #1a – trying to develop mechanisms to quantify the role of coral reefs in coastal hazard risk reduction/coastal resilience use pre-disaster resilience funds and post-disaster recovery funding to support coral reef protection and/or restoration.

d. **Please list any examples of leading practices, techniques and strategies for building reef resilience that your organisation/country is involved in.** Include their limits, conditions of implementation, financing and an assessment of their results and links for more information if possible.

NOAA:
NOAA's Coral Reef Conservation program supported the following studies:

- Testing strategies to increase thermal tolerance of restored corals in Florida Link: https://www.coris.noaa.gov/search/catalog/search/resource/details.page?uuid=%7BE57CDD39-78B7-4012-98FD-42EFC54536B1%7D

- Using Unmanned Aerial Vehicles (UAV s) to evaluate reef resilience and potential restoration sites in Kaneohe Bay Link: https://www.coris.noaa.gov/search/catalog/search/resource/details.page?uuid=%7BFF332F9F-4244-4189-BE9B-669B2471052A%7D

NOAA is also support a National Academy Study on "Interventions to Increase the Resilience of Coral Reefs" with a preliminary report to be released in late 2018. http://dels.nas.edu/Study-In-Progress/Interventions-Increase-Resilience/DELS-OSB-17-01

NOAA Resilience Grants:

The University of Miami received $521,920 to restore healthy staghorn coral thickets on nearshore reefs, increasing the resilience of coral reefs as fish habitat in a changing climate. The project will outplant 10,000 staghorn colonies, and 250 colonies each of elkhorn and other coral across Miami Beach and Key Biscayne.

The University of Puerto Rico received $200,000 to develop a model to help identify and prioritize coral restoration sites that not only contribute to the recovery of federally listed coral species, but also provide significant coastal shoreline protection benefits by reducing the impacts of waves. The project will quantify and model the wave energy attenuation effect of coral reef restoration at multiple sites within the Northeast Puerto Rico Habitat Focus Area. Having this tool will allow partners to select restoration sites that contribute to the recovery of federally listed corals and optimize wave attenuation, potentially reducing the risk of property loss and vulnerability of housing and hotel infrastructure along the shoreline from extreme storm events.

Guam:

Guam Reef Resilience Strategy: The GRRS, finalized in October 2018, updates Guam's coral reef management priorities in the context of building coral reef resilience to climate change, with an emphasis on shifting from reactive efforts to proactive, adaptive coral reef management interventions. Local managers and researchers attended the two-day "Climate-smart Design for Coral Reef Management Workshop" hosted in September to apply the CCAP Adaptation Design Tool to refine the management priorities in the GRRS.

e. **Please list any examples of leading practice reef restoration mechanisms that your organisation/country is involved in.** Include their limits, conditions of implementation, financing and an assessment of their results and links for more information if possible.

NOAA:

NOAA's Coral Reef Conservation program supported the following studies:

- Seeding reefs with Diadema antillarum to enhance coral recovery in Puerto Rico
- Use of Restoration Genomics in Recovering ESA Species: Orbicella faveolata
- Characterization of relative genotypic disease resistance in ESA Acropora spp.
- Investigating Reproductive Failure in Populations of ESA Coral Acropora palamata
- Molecular mechanisms of heat tolerance in the threatened coral Orbicella faveolata from the Florida Keys
- Characterizing disease resistance to improve restoration and outoplanting success
- Testing strategies to increase thermal tolerance of restored corals in Florida
- Development of BMP guidance for coral restoration monitoring

USGS:

See #1a – trying to develop mechanisms to quantify the role of coral reefs in coastal hazard risk reduction/coastal resilience use pre-disaster resilience funds and post-disaster recovery funding to support coral reef protection and/or restoration.

Theme 3 – Support communities reliant on coral reefs

f. Is sustainable tourism development a significant challenge for your organisation? If so please include detail below of the kinds of challenges faced and your strategies to deal with them.

Guam:

Guam's 2018-2020 National Coral Reef Management Fellow is focused on building relationships with the local tourism industry to reduce the impacts of recreational use and misuse on Guam's coral reef ecosystems. In 2018, the Fellow has focused on conducting outreach with hotels, providing training to managers and staff, and developing a guidebook for hotels on sustainable practices. In 2019, the Fellow will be leading a training program for marine tour operators.

g. **Is your organisation involved in activities to raise awareness and encourage action to support communities reliant on coral reefs?** Please include details below.

NOAA's Coral Reef Conservation program supported the following studies:

- Assessing socio-economic data and indicators to improve resource management in the US Pacific islands Link: https://www.coris.noaa.gov/search/catalog/search/resource/details.page?uuid=%7B54585885-7652-4E20-89FA-65406D517C1F%7D
- Integrating climate resiliency and adaptation into community marine spatial planning Link: https://www.coris.noaa.gov/search/catalog/search/resource/details.page?uuid=%7B38395EBD-C994-462D-B1D7-A1A75A1F7A7A%7D

Guam:
Friends of Reefs (FOR) Guam: FOR Guam is a community-based coral reef monitoring program that trains citizen scientists to assess the health of local reef sites, designed to instill a sense of ownership over coral reef resources. Over 1,200 Guam residents have participated in the program.

Eyes of the Reef Marianas (EOR): EOR is a community-based reporting system that trains local residents to identify and report coral reef impacts, including coral bleaching, coral diseases, and outbreaks of the crown of thorns sea star (COTS). EOR is an important component of Guam's early warning system; in 2018, EOR participants have submitted over 50 reports on COTS outbreaks, which informed mitigation efforts conducted by the Guam Coral Reef Response Team.

USGS:
Yes – we do numerous types of outreach, from websites to lectures to presentations on 'Earth Day', etc.

NASA:

- Human Impacts to Coastal Ecosystems in Puerto Rico (HICE-PR): carried a series of outreach/workshops with coral reef management stakeholders and farmers in Puerto Rico
- Coral Bleaching Assessment through Remote Sensing and Integrated Citizen Science (Coral BASICS)
- promoted reef conservation awareness by conducting a series of training workshops with local dive instructors in southwest, Puerto Rico
- NeMO-Net – has participated in numerous educational activities including Earth Day

American Samoa:
We have started a campaign to increase environmental stewardship (and overall environmental literacy) using traditional Samoan values and a traditional Samoan phrase, Lotonu'u. We want to increase people's ecological understanding as well as their ability and desire to make ecologically sound choices.

Theme 4 – Help to reduce anthropogenic threats to coral reefs, particularly those that occur at a global or regional scale

h. **What activities is your organisation involved in to elevate awareness of the global nature of the threat of climate change to coral reefs?** Please include details below

We provide unbiased, sound scientific information on historic trends, current processes and future impacts of climate change on coral reefs.

National Science Foundation:

NSF has contributed $499,828 USD to create a Coral Bleaching Research Coordination Network: Coral Bleaching RCN; https://www.bco-dmo.org/project/747042 . This network will coordinate three workshops to develop experimental design, sample archiving, and data synthesis protocols in addition to increasing the formation of interdisciplinary collaborative teams to study coral bleaching. The workshops will host researchers in various career stages and graduate students through an invitational and a competitive application process. Products and outcomes will be widely disseminated through a series of platforms including websites, cyber-seminar podcasts, international conferences sessions, and e-mail distribution.

NASA:

NASA funded airborne missions- CORAL https://coral.jpl.nasa.gov] and HyspIRI Hawaiian Coral https://hyspiri.jpl.nasa.gov/ for research supporting benthic community maps emphasizing reef status, human threats, and biodiversity. These airborne missions specific to coral reefs support studies of reef ecosystem health, reef extent, and response to climate variability (e.g., altered nutrient and water status).

i. **Has your organisation made any progress in dealing with destructive fishing and trade?** Please include details below.

j. **Has your organisation made any progress in dealing with marine debris?** Please include details below.

Guam:
The 34th Guam Legislature passed Public Law 34-110 in May 2018, banning the use of single-use plastic bags at all retail establishments on Guam. The ban goes into full effect in January 2021.

Department of State:
The Department of State issued five grants to combat land and sea based sources of marine debris totalling $1,000,000. The two year grants will work to build waste management capacity in Indonesia, Vietnam and Costa Rica; and reduce abandoned, lost and otherwise discarded fishing gear in the Caribbean and South America.

3. **Would you like to report on your activities during the ICRI GM?** Please give details below.

Y / N – Yes, NOAA would like to provide an update on the new strategic plan for the Coral Reef Conservation program and the National Academy Study update on "Interventions to Increase the Resilience of Coral Reefs"

4. **International events.** Please list any upcoming international events relevant to ICRI which someone from your organisation plans to attend in 2018-2019.

   X☐ICRI GM, Monaco, 5-7 Dec 2018

   X☐Conference of the Parties to the United Nations Framework Convention on Climate Change, 3-14 Dec 2018

   ☐Reef Futures 2018: A Coral Restoration and Intervention-Science Symposium, Florida, 10-14 Dec 2018

   ☐Global World Heritage Marine Managers meeting, Alaska, US, 26-31 May 2019

   Other:
   Ocean Optics XXIV, Dubrovnik, Croatia, October 7-12, 2018
   40th US Coral Reef Task Force meeting, American Samoa, Aug 14-16, 2018
   AGU Fall Meeting, Washington DC, Dec 10-14, 2018
   ASLO Aquatic Sciences meeting, San Juan, Puerto Rico, February 23 – March 2, 2019

5. **Publications.** Please list relevant publications and reports you have released during this reporting period.

Takesue, R.K., and Storlazzi, C.D., 2019. "Geochemical sourcing of runoff from a young volcanic watershed to an impacted coral reef in Pelekane Bay, Hawaii." Science of the Total Environment, v. 649, p. 353-363.

Buckley, M.L., Lowe, R.J., Hansen, J.E., van Dongeren, A.R., Storlazzi, C.D., 2018. "Mechanisms of wave-driven water level variability on reef-fringed coastlines." Journal of Geophysical Research–Oceans, v. 123, p. 3811-3831.

Pomeroy, A.W.M., Lowe, R.J., Ghisalberti, M., Winter, G., and Storlazzi, C.D., 2018. "Spatial variability of sediment transport processes over intra- and subtidal time-scales within a fringing coral reef" Journal of Geophysical Research-Earth Surface, v. 123, p. 1013-1034.

Prouty, N.G, Yates, K.K., Smiley, N., Gallagher, C., Cheriton, O.M., and Storlazzi, C.D., 2018. "Carbonate system parameters of an algal-dominated reef along West Maui" Biogeosciences, v. 15, p. 2467-2480.

Storlazzi, C.D., 2018. "Challenges of forecasting flooding on coral reef–lined coasts" Eos, 99, DOI: 10.1029/2018EO098517

Storlazzi, C.D., Cheriton, O.M., Messina, A.M., Biggs, T.W., 2018. "Meteorologic, oceanographic, and geomorphic controls on circulation and residence time in a fringing reef flat-lined embayment: Faga'alu, American Samoa" Coral Reefs, v. 37, p. 457-469.

Kuffner, I.B., and L.T. Toth, 2018. "A geological perspective on the degradation and conservation of western Atlantic coral reefs" Conservation Biology, v. 30(4), p. 706-715

Prouty, N.G, Cohen, A., Yates, K.K., Storlazzi, C.D., Swarzenski, P.W., and White, D., 2017.

"Vulnerability of coral reefs to eutrophication of reef seawater by land-based sources of pollution" Journal of Geophysical Research-Oceans, v. 122, p. 9319-9331.

Pearson, S.G., Storlazzi, C.D., van Dongeren, A.R., Tissier, M.F.S., Reniers, A.J.H.M., 2017. "A Bayesian-based system to assess wave-driven flooding hazards on coral reef-lined coasts" Journal of Geophysical Research-Oceans, v. 122, p. 10099-10117.

Pomeroy, A.W.M., Lowe, R.J., Ghisalberti, M., Storlazzi, C.D., Symonds, G., Roelvink, D., 2017. "Sediment transport in the presence of large reef bottom roughness" Journal of Geophysical Research-Oceans, v. 122, p. 1347-1368.

Storlazzi, C.D., van Ordmondt, M., Chen, Y-L., and Elias, E.P.L., 2017. "Modeling coral fine-scale larval dispersal and interisland connectivity to help designate mutually-supporting coral reef Marine Protected Areas: Insights from Maui Nui, Hawaii" Frontiers-Marine Science, 4:381 DOI: 10.3389/fmars.2017.00381

Storlazzi, C.D., Reguero, B., Lowe, E., Shope, J.B., Gibbs, A.E., Beck, M.W., and Nickel, B., 2017. "Rigorously valuing the role of coral reefs in coastal protection: An example from Maui, Hawaii, U.S.A." Coastal Dynamics 2017, p. 665-674.

Takesue, R.K., and Storlazzi, C.D., 2017. "Sources and fate of land-derived sediment and trace metals from small volcanic watersheds to a fringing coral reef: insights from geochemical tracers" Estuarine, Coastal, and Shelf Science, v. 188, p. 69-80.

Flannery, J.A., J.N. Richey, K. Thirumalai, R.Z. Poore, and K.L. DeLong, 2017, Multi-species coral Sr/Ca based sea-surface temperature reconstruction using Orbicella faveolata and Siderastrea siderea from the Florida Straits: Palaeogeography, Palaeoclimatology, Palaeoecology 466:100-109.

Kuffner, I.B., E. Bartels, A. Stathakopoulos, I.C. Enochs, G. Kolodziej, L.T. Toth, and D.P. Manzello, 2017, Plasticity in skeletal characteristics of nursery-raised staghorn coral, Acropora cervicornis: Coral Reefs, doi:10.1007/s00338-017-1560-2.

Kuffner, I.B., K.E. Roberts, J.A. Flannery, J.M. Morrison, and J.N. Richey, 2017, Fidelity of the Sr/Ca proxy in recording ocean temperature in the western Atlantic coral Siderastrea siderea: Geochemistry Geophysics Geosystems 18, doi:10.1002/2016GC006640

6. **ICRI Member Feedback.** What do you find most valuable about the ICRI member reports? If you have any ideas for improvement please list below:

7. **General Information.** (Note that this information will be posted on the ICRI website on your member page: http://www.icriforum.org/about-icri/members-networks.)

Member type (Country / Organisation):	
Focal Point 1:	
Name: Christine Dawson	
Title/Organisation: U.S. Department of State	
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Name: Jennifer Koss	
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Thank you very much for sharing your valuable experiences and information with ICRI.