

Virgin Islands NSF EPSCoR Evaluation Report- Year 2

May 2022

RII Track-1: Ridge to Reef Processes and Interdependent Drivers of Small Island Resilience

NSF EPSCoR Award OIA-1946412

Award Period: 1 July 2020 – 30 June 2025

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Introduction

Ridge to Reef (R2R) Processes and Interdependent Drivers of Small Island Resilience is an NSF EPSCoR RII Track-1 project among investigators from the University of the Virgin Islands (St. Thomas and St. Croix campuses). The project aims to address the impacts of changing environmental conditions on small island social-ecological systems.

The project started in July 2020 and is scheduled to end in June 2025. The evaluation team worked with the project leadership to develop an External Evaluation Plan to help guide evaluation activities. Survey instruments called the Undergraduate Student Survey and Graduate Student Survey were created and deployed in Spring 2022 to collect information from students associated with the project.

This report summarizes project data collected from three sources: ERCORE, TIG Evaluator Site Visit Interviews in January/February 2022, VI EPSCoR Office, and the Undergraduate/Graduate Student Surveys.

Research Productivity

Project participants reported various types of research outputs they produced in Year 2. Publications are summarized by publication year in Table 1, below:

Table 1. Publications

Year	Publications
2020	6
2021	18
2022	6

Importantly, the 2021-2022 publications appeared in high-impact journals (Table 2):

Table 2. Impact Factor

Journal	Frequency	Impact Factor
Animal Biotelemetry	2	2.364
Aquatic Botany	1	2.473
Aquatic Ecology	2	1.641
Communications Biology	1	5.489
Coral Reefs	1	3.88
Ecography	1	6.500
Ecosphere	1	3.171
Environmental Microbiology	1	5.491
Estuaries and Coasts	1	3.186
Frontiers in Marine Sciences	5	4.912

Journal	Frequency	Impact Factor
Harmful Algae	2	4.273
Journal of the Acoustical Society of America	1	1.819
Journal of Operational Oceanography	1	3.471
Marine Ecology Progress Series	7	2.824
Microbiology Resource Announcements	1	0.877
Molecular Ecology	1	6.185
Toxins	1	4.146

The project publications are increasingly collaborative. Figures 1 and 2 show the increase in Intra-VI-EPSCoR collaborative papers in 2020-2021 publications. In 2020, three publications involved collaborations among VI-EPSCoR participants. In 2021, this number increased to eleven.

Figure 1. 2020 Collaborative Publications

Intra VI-EPSCoR authorships: 2020

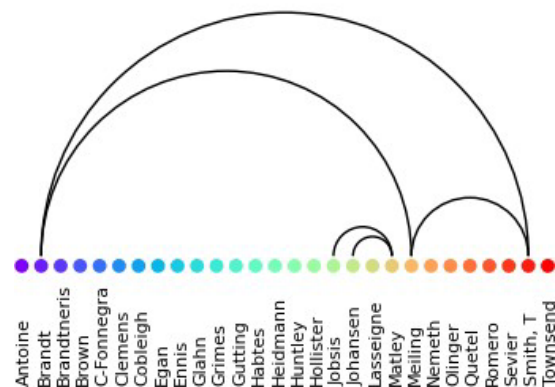
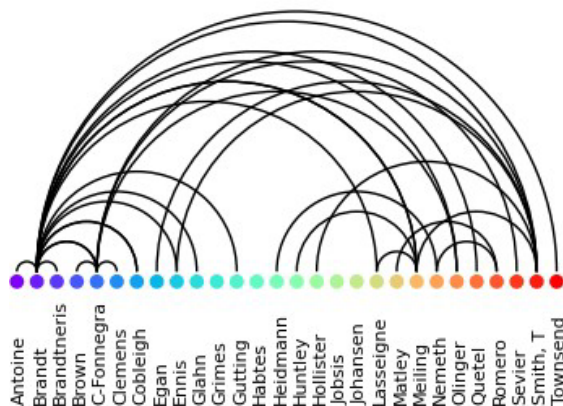


Figure 2. 2021 Collaborative Publications

Intra VI-EPSCoR authorships: 2021



The project reports submission of 22 non-EPSCoR-related research proposals during the reporting period, totaling a requested \$5,360,155.

Research Theme 1: Watershed Monitoring and Land Use (WL)

This Research Theme examines how human land-based activities impact the health and function of marine habitats of the USVI at the Salt River Bay, St. Croix and Fish Bay, St. John watersheds. The team will determine terrestrial-based inputs into the coastal and marine ecosystems by connecting land use practices in upland and nearshore habitats to downstream impacts including offshore habitats and reefs. There are three research goals:

- WL1 – Identify and characterize the sources of sediment flux in two watersheds in the USVI.
- WL2 – Characterize the impacts downstream by experimentally testing several conservation land use interventions.
- WL3 – Share communication, community education, and integration activities to educate and inform the public of the benefits of land use research.

This impact of this Research Theme will identify which land uses are majority contributors to problematic erosion and runoff into the marine ecosystems of the Virgin Islands.

In Year 2, the group reported **good progress** towards all three WL goals.

- WL1 – Continuing reporting obligations to the National Park Service have been fulfilled. Despite challenges with a lack of water sampling stemming from a lack of water flow observed during Year 2, all other objectives have seen progress since Year 1. Equipment for water sample processing has been purchased, tested, and is ready for use. Sediment traps in all environments have been installed and are being purged for samples on a regular basis. Initial data analysis and interpretation have resulted in submitting this work at conferences.
- WL2 – The three field studies are operating and collecting data. Despite minor setbacks, all three are on track to provide useful conclusions as related to hydrology and land use on schedule.
- WL3 – Presentations were made to teachers in the Project Based Learning program and regular contributions were made in photographs and text for the R2R newsletter. Both an undergraduate and graduate student were engaged in paid research activity. Research was presented at scientific conferences. Though planned, during Year 2, a SCI-100 student was not recruited for mentorship.

Assessment: The major risks for this Research Theme are the drought conditions for the Territory. The team was unable to recruit a SCI-100 student. The team did not present an action plan for recruiting this student.

Research Theme 2: Mangrove Function, Recovery & Restoration (M)

This Research Theme develops science-based opportunities for mangrove restoration by determining the current and historic distribution, loss and recover of mangrove species in the USVI territory. The goals are:

- M1 – The Mangrove Ecosystem Function & Recovery: Determine the current and historic distribution, loss, and recovery of the different mangrove species in the territory using a mix of archival maps and new technologies. This will identify stressors and other factors that influence their current distribution, health, and function in provisioning ecosystem services.
- M2 – Mangrove Restoration: Develop science-based opportunities for restoration by field testing restoration techniques and the factors that influence seedling success and resilience. These activities are coupled with citizen science programs.
- M3 – Work with our R2R communications, informal learning and education and workforce development (EWFD) teams to engage the local community including K-12 students, their teachers, and local citizenry.

The team has made **excellent progress** towards its year 2 goals.

- M1 – The team is compiling images and has been in communication with collaborators from the Smithsonian, Pennsylvania State University, and The Nature Conservancy on methods and approaches. Drone flights for high resolution imagery of mangroves across the territory have been delayed. However, in March 2022, FAA part 107 certification was successfully completed. The lab will participate in the acquisition of drone images in wetland habitats in May 2022 with The Nature Conservancy. Survey of 19 mangrove forests was completed. The first year of field data collection occurred in Year 2, therefore planned change analysis did not occur. Cores for all permitted sites have been collected but not yet analyzed.
- M2 – Construction of the land-based nursery is largely finished in its current location; it continues to expand and will be moved to the new Marine Science Center when that building is completed. The lab has successfully collected propagules of all three mangrove species (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*) from sites across the territory. All three mangrove species are now being grown at the land-based nursery. In Year 2, the lab began an on-going experiment to test the effects of container type on red mangrove growth and survival. Another experiment which will examine the effect

of plant clumping and substrate on red mangrove growth and survival at the nursery has begun. In March 2022, an application to UVI IRB was submitted to conduct community listening sessions to inform program design for the growth of the mangrove citizen science program. In Year 2, four UVI undergraduates volunteered at the nursery.

- M3 – The team contributed to website content and newsletter items for VI-EPSCoR. The lab participated in a virtual, live Science Saturday event hosted by the Virgin Islands Department of Planning & Natural Resources at the mangrove nursery and has hosted three student groups from UVI and beyond in mangrove nursery tours, sharing R2R research. The lab plans to further highlight mangrove research and restoration work with a table at the April 2022 Friends of the St. John National Park Earth Day Event. Stewart gave three guest lectures to UVI and University of Miami students, Grimes gave two guest lectures to UVI students and the Grimes lab together developed a new lab for MES 501 in Fall 2021 focused on mangrove restoration. The lab presented to teachers at the 2021 STEM Institute. The lab has also started drafting a mangrove nursery manual geared toward practitioners that is envisioned as a living document that will be shared online. The lab also launched its social media campaign, GRROE US Virgin Islands Mangroves, on Instagram at the end of March 2022. The Grimes lab held two Great Mangrove Cleanups in Year 2 (at the time of this report: 2021 St. John Great Mangrove Cleanup and the 2022 St. Thomas Great Mangrove Cleanup) with two more planned before July 1, 2022, on St. John and St. Croix. Two new, culturally relevant infographics were created and shared with the community on social media and press releases with the assistance of VI EPSCoR. Six MMES graduate students helped to advance R2R mangrove research and restoration goals in Year 2, assisting with nursery operations, field work, and mentoring undergraduate students. In Year 2, 7 UVI undergraduate students have engaged in R2R mangrove research, with another UVI undergraduate student joining the lab in June 2022.

Outputs: The Grimes lab actively shared R2R mangrove research in local, national, and international meetings, with 9 presentations in Year 2. In this reporting period, a total of 15 proposals were submitted with 5 successfully awarded (total of \$430,246, all as PI for Grimes), 9 pending, and 1 declined. Six of these proposals are directly related to expanding R2R mangrove research objectives; 4 were to NSF programs, including one led by Grimes to the NSF RII-BEC call (NSF 22-536) with Dr. Lawanda Cummings as Co-PI. Four peer-reviewed papers were published at the time of this report and two are in-review.

Assessment: This Research Theme has met its goals in the Strategic Plan.

Research Theme 3: Emerging Areas of Research (EA)

This Research Theme has three integrated projects centered around seagrass communities, the effects of *Sargassum* on beaches, and their connections to ridge-to-reef processes. The Emerging Areas will improve understanding of the physical variables that influence coastal and nearshore ecosystem function and resilience, including the role of seagrasses and impacts of the brown algae *Sargassum*. There are three integrated areas of focus with two research projects specific to Brewers Bay on the southwest coast of St. Thomas.

- EA1 – Determine the impacts of invasive seagrass that may alter movement, habitat, and food resources for invertebrates, fish, sea turtle species.
- EA2 – Quantify the role of seagrass type in short and long-term beach evolution.
- EA3 – Measure the spread of the invasive seagrass *Halophila stipulacea* in the territory and the mechanisms affecting its expansion.
- EA4 – Analyze the effects of *Sargassum* golden tides on Virgin Islands ecosystems.

The EA team made **excellent progress** towards its goals in Year 2.

- EA1 –A postdoctoral fellow has been hired, two MMES students engaged, and two undergraduate students engaged. The FPS array was installed, and data will be downloaded every six months. Benthic sampling of seagrass beds within the array has begun. Water samples are collected six times per year and processed. Two outreach events were held. In Year 2, 16 green turtles, 11 hawksbill turtles, and 9 giant hermit crabs were tagged with V16p or V9 acoustic tags. Non-acoustic tagging of giant hermit crabs was conducted on a nearly monthly basis.
- EA2 – A PhD student was hired through the University of South Alabama. An undergraduate student was recruited. Wave measurement and analysis field work has been delayed due to lack of graduate students. Permits received for field work on beaches in St. Croix and St. John for shoreline change analysis. Permits not received for seagrass bed analysis due to delay in getting student and field work. Field work has been delayed because of lack of graduate students. Work is now scheduled for Summer 2022. In Year 2, surveys were conducted of 20 different beaches in the USVI.
- EA3 – Due to COVID restrictions, diving recertification was not possible. Several delays due to lack of research space. A proposal was submitted but not funded. Graduate student Souza's project is well underway and projected to finish by Summer 2022. Graduate student Antoine is set to defend by the end of Summer

2022. No-choice laboratory experiments on relative palatability of *Halophila* vs native seagrass were completed. Various permits were submitted.

- EA4 – Supplies were obtained, and permits submitted. Previous UAB student has been replaced by another UAB student. Samples have been processed, shipped, and are ready to analyze in July 2022. Blogs are dependent on research conducted during travel to the VI. Due to COVID restrictions, this has not occurred. A NASA proposal was funded.

Outputs: 5 presentations, 3 grant submissions, NASA proposal funded.

Issues: Appropriate lab space lacking due to delays in the renovations of the Environmental Analysis Lab.

Assessment: Parts of this Research Theme have met goals; others are in the process of recovering from delays caused by COVID. The Seagrass and Beach team is ramping up operations. The Seagrass Ecology – Brewers Bay Array team has met all its goals with one exception – they did not capture and acoustically tag fishes in Brewers Bay (EA 1.2a) but will do this in summer 2022.

Research Theme 4: Fish Ecology

This Research Theme addresses the question, “How do environmental impacts and food quality affect reproduction in parrotfish?” The focus is on the relationship between habitat composition and sedimentation rates on herbivorous species composition, and the effect of these factors on feeding rates and reproduction of the yellowtail parrotfish (*Sparisoma rubripinne*), as well as how oceanographic variability influences reproductive output.

The Fish Ecology Research Theme has four research goals:

- FE1 – Advance understanding of how natural and anthropogenic stressors on coral reefs change herbivore assemblages.
- FE2 – Advance understanding of how benthic characteristics of impacted reefs affect feeding rates and reproduction (frequency of spawning, fecundity) of herbivorous parrotfishes.
- FE3 – Improve understanding of oceanographic and environmental variables that influence reproductive rates (frequency of spawning and fecundity) of coral reef fish that spawn in aggregations.
- FE4 – Share results of fish ecology research with stakeholders and provide opportunities for new partnerships.

The team has made **excellent progress** towards goals in Year 2.

- FE1 – Data analysis completed, and significant results obtained showing changes in parrotfish diversity, density, and biomass following disturbance. First draft of manuscript in progress.
- FE2 – Sediment from sediment cups collected monthly since October 2021. Sediment samples currently being analyzed by graduate students. Limestone times deployed September 2021 Benthic data collected monthly since October 2021 and currently being analyzed by graduate students. Feeding rates of 30 yellowtail parrotfish per site quantified (n=60 total) in October/November 2021 and data analyzed. Scarus species feeding rates still need to be completed. Fish collections completed and fish dissected for diet metabar coding analysis and gonads collected for fecundity analysis. Direct observations and counts of spawning adults at two sites completed multiple times monthly. First trial video/hydrophone deployment started April 2022.
- FE3 – Signature AWAK with echosounder installed at both fish spawning sites in January 2022. First data download in March 2022. A second trial deployment occurred, and data is being analyzed. Work on on-site plankton collection method development delayed due to departure of Sennai Habtes. Recruitment of a graduate student is underway.
- FE4 – Provided text and photos for blog post, website updates, and two newsletters. Kayla Budd promoted sediment awareness with a virtual demonstration at a Science Saturday event. R. Nemeth solicited the diving community to report on rainbow parrotfish sightings. Two undergraduate students completed directed independent research in Nemeth lab and 15 undergraduates engaged in field methods for fish ecology in Fall 2021. Seven graduate students worked on thesis research in fish ecology 14 graduate students engaged in field methods for research diving in Fall 2021. Nemeth lab submitted 7 abstracts to ICRS for 2021 but in-person presentations were postponed to July 2022 due to COVID. One presentation was conducted virtually at ICRS in July 2021.

Outputs: Four peer reviewed papers published in 2021. Two Citizen Science projects focused on sediment awareness using a smartphone App that allows users to report on sedimentation and erosion sites.

Assessment: Research Theme 4 has achieved all its goals; the team has leveraged R2R activities to apply for and receive external funding, in collaboration with DPNR.

Research Theme 5: Oceanography (OC)

This Research Theme is focused on understanding oceanographic variables affecting the spawning of yellowtail parrotfish and coral reef resilience, specifically the oceanographic conditions that drive connectivity patterns related to the increased

biodiversity at more resilient coral reefs, and the influence of oceanographic, environmental, and terrestrial inputs on the reproductive rates of a ubiquitous reef fish, the yellowtail parrotfish (*Sparisoma rubripinne*), between algal turf vs. macroalgal dominated nearshore reef sites. The Oceanography Research Theme has three research goals:

- OC1 – Quantify the influence of oceanographic and environmental variables on the variability in reproductive rates (frequency of spawning and fecundity) of *S. rubripinne*.
- OC2 – Determine larval dispersal pathways from point-source spawning aggregation sites of *S. rubripinne*. Insights into the linkage and distribution of larval and juvenile populations with the spawning sites of the parents is a powerful fisheries management tool that can help manage the species.
- OC3 – Share USVI Oceanography Research with Stakeholders & Provide Opportunities for New Partnerships.

In Year 2, the OC team has made **good progress** towards its goals.

- OC1 – Deployment of moored thermistor string with real-time data transmission at Grammanik Bank to measure and monitor full water column T-S structure and variability at this important mesophotic coral reef and fish spawning location. Signature AWAK with echosounder installed at both fish spawning sites in January 2022. First data download in March 2022. A second trial deployment occurred and data is being analyzed. Post-doc Kayla Blincow Isreal is starting to work with Ocean technician Vanessa McKague on learning acoustic Doppler wave and current logger (AWAC) data output. The team is in the testing phase of the echosounder data and working with Nortek engineers to refine the sensor calibrations to detect parrotfish egg densities at spawning sites. The team is also testing the ability of remote cameras to collect data on frequency of spawning rushes at two spawning sites. One graduate student and one undergraduate student were recruited. The team has collected yellowtail parrotfish females from four parrotfish feeding areas to examine fecundity.
- OC2 – The US Caribbean Coastal Ocean Model (USCCOM) finalized and published (Mukherjee et al. 2022. J. Opr. Oceanogr.), 330 m over the entire US Caribbean, data produced for years 2019 and 2020, manuscript in preparation on oceanographic dynamics from model. Model runs shared to collaborator Daniel Holstein who is incorporating into a connectivity modeling system, a proposal (Jobsis and Wilson) was submitted in March 2022 to the Office of Insular Affairs. The team is in process of collecting data on oceanographic variables and coral reef condition. The team will be able to estimate parrotfish reproductive output from fecundity and spawning visitation rates of females but other calibrating

reproductive output using AWAC data and plankton tows are uncertain at this time due to equipment calibration issues and Sennai Habtes departure. Given the lack of focused leadership in the oceanography program that would support vessel-based coastal and blue water research and the lack of a clear stream of funding to support the medium sized RV *Derektor* it was decided to sell the vessel. The proceeds and some of the funds in R2R earmarked to outfit the vessel would be used to purchase a smaller research vessel with a faster cruising speed.

- OC3 – Provided text and photos for blog post and newsletter. MMES advisee, Naomi Scott, was TA for SCI 100 for two years including Fall 2021 and Spring 2022. This role encompassed teaching labs to approximately 40 students per semester and helping to explain the service learning option to students. Made presentation at annual VI-EPSCoR conference and introduced concept of using various technologies (remote video camera, AWAC) to document reproductive output at yellowtail parrotfish spawning aggregation sites. Two undergraduate students recruited by Doug Wilson via lecturing in MSC 239 have participated in joint UVI-OCovi-Rutgers University ocean glider field activities. Recruitment of a graduate student to assist on plankton collection at Reef Bay study site is underway. Two UVI undergraduate students have applied to the Rutgers Summer 2022 Glider Camp. Dr. Mukherjee working with Dr. T. Smith to provide oceanographic data outputs for the Marine Resilience analysis with a workshop to be held in Year 3.

Outputs: Two presentations

Issues: Departure of Habtes to USVI Division of Fish and Wildlife. Habtes has a courtesy faculty appointment and will support OC beginning Summer 2022.

Assessment: This Research Theme has pivoted due to changes in leadership and departure of Habtes. This has caused some changes in terms of major equipment. The team submitted an MRI proposal. The team research activity and productivity remains high despite departure of Habtes. This is due to active management by R2R leadership and the resilience of the team.

Research Theme 6: Marine Disease and Restoration (MD MR)

This Research Theme will identify how the interactions of species diversity and environmental stressors affect disease susceptibility and coral restoration success. The team will specifically test for species interactions for coral outplantings. The eight goals for this Research Theme include those for Marine Disease (MD) and Marine Restoration (MR):

- MD1 – Determine how species biodiversity affects the spread and impact of coral disease.
- MD2 – Determine how local stressors (e.g., nutrients, turbidity) and global stressors (e.g., temperature stress) drive temporal and spatial distributions of disease.
- MD3 – Predict the spread and impact of multi-species coral disease.
- MD4 – Share Disease (and Restoration) Research with Stakeholders through participation in outreach and education activities.
- MR1 – Expand capacity for restoration ecology research in the US Virgin Islands.
- MR2 – Determine how diversity affects success of coral outplanting configurations.
- MR3 – Determine how gradients in water quality affect success of coral outplanting.
- MR4 – Share Restoration Research with Stakeholders through participation in outreach and education activities.

This research area addresses knowledge gaps in how species diversity and different water quality regimes affect the growth, health, and survival of coral outplants.

In Year 2, the MD MR team made **excellent/very good progress** towards meeting project goals:

- MD1 – Three papers were published addressing this goal. Multiple additional papers resulting from the analysis of the microbial communities, the histopathology, and the gene expression of the corals in this experiment are forthcoming.
- MD2 – Marine Disease and Restoration Theme lead M. Brandt received a grant in collaboration with Amy Apprill from Woods Hole Oceanographic Institution from the Water Resources Research Institute (WRRI). The grant is investigating water quality and disease patterns, though it is focused on elkhorn coral and white pox disease (not SCTLD). The WRRI grant supports MMES student Natasha Bestrom to sample diseased and healthy *Acropora palmata* colonies at sites where EPSCoR water quality sampling has been ongoing over this past year. Water quality sampling occurred at 11 sites around St. Thomas and St. John for 3 consecutive months in the fall (wet season) and again in the spring (dry season). This sampling consisted of collecting water samples for nutrient and fecal coliform analysis. Results are currently being analyzed.
- MD3 – Objectives in this area include developing a connectivity-based disease spread model with Dan Holstein's laboratory at Louisiana State University. Initial work on this has begun with his student experimenting with a pathogen dispersal model using the local ROMS model developed by VI-EPSCoR post-doc S.

Mukherjee. This work laid the foundation for a successful proposal to the NSF Ecology and Evolution of Infectious Disease program. The project is led by M. Brandt and was the highest ranked marine proposal and funded at \$2.5 million.

- MD4 – Theme lead M. Brandt maintains and contributes to the vicoraldisease.org website - the website that the territory uses to provide information on SCTLD in the U.S. Virgin Islands. Dr. Brandt and Marine Disease Specialist S. Meiling are also members of the Virgin Islands Coral Disease Advisory Committee (VI-CDAC). Dr. Brandt leads the Research subteam and is an Executive Team member of VI-CDAC. S. Meiling helps to lead the Research and Data Management subteams. M. Brandt, S. Meiling, and students presented information on disease in several venues, including the Gulf and Caribbean Fisheries Institute meeting, the U.S. Coral Reef Task Force SCTLD Surveillance in the Indo-Pacific Virtual Workshop, and the U.S. Caribbean Regional SCLTD Workshop.
- MR1 – In the fall of 2021, Dr. Robin Smith joined the research faculty as a Research Assistant Professor of Restoration Ecology. In addition, through the awarding of a contract from the National Park Service to M. Brandt, Coral Restoration Specialist, Bradley Arrington (an MMES alumnus) and Coral Aquarist Specialist, Rachel Ionata were hired to support coral restoration activities.
- MR2 – A multi-species outplanting experiment was deployed at Perseverance Bay in January 2022 to test the effect of diversity on coral outplanting success. The experiment will look at the growth and mortality of *Acropora cervicornis* when outplanted with and without two other coral species, one of which is a known alternative prey for a common *Acropora* spp. predator and the other is thought to be a possible sink for a known *Acropora* spp. disease pathogen.
- MR3 – Experiments are planned to start in year 3 and ongoing water quality sampling explained above will contribute to this goal.
- MR4 – New partnership with Lovango Resort and Beach Club through the VI Reef Response program. The work of VI Reef Response, and particularly the land-based nursery, provides excellent opportunities for training in research. Coral Restoration and Communications Specialist D. Mele collaborated with Dr. Michele Guannel to provide opportunities for undergraduate project-based learning. In addition, 6 graduate and 5 undergraduate interns were trained on coral restoration techniques over the last year. VI Reef Response also has a very active social media presence where student involvement is highlighted in research and M. Brandt's lab hosts the website vireefresponse.org which contains information on restoration operations. M. Brandt also presented a TEDx talk in April 2022.

Outputs: Nine manuscripts published in peer-reviewed journals. Presentations on disease and restoration were given at two local workshops, and one international conference. A \$2.5 million grant to study multi-species coral disease transmission was also awarded to Dr. Brandt by the NSF Ecology and Evolution of Infectious Disease Program.

Assessment: This Research Theme has met its goals. The team is research active and research productive.

Research Theme 7: Coral Reef Resilience (CR)

This Research Theme will determine the attributes that support resistance and recovery from disturbances. The team will determine the impact of multiple drivers (variation in biodiversity, magnitude and frequency of thermal and storm disturbances, resistance to coral disease, herbivory rates, and exposure to land-based run-off and water quality) for why some locations show resilience where others show precipitous declines in coral cover. CR Research will determine internal and external drivers underlying resistance and recovery of coral reefs to stress and disturbance in the northeastern Caribbean. The team will create a mechanistic understanding for management actions to improve coral reef condition and can be contrasted with other systems, such as the Indo-Pacific. Coral connectivity research will create an understanding of how connectivity networks shape biodiversity of coral reefs. The CR Research Theme has three goals:

- CR1 – Determine the internal and external drivers most critical to coral reef ecosystem resilience in the USVI and identify targets for restoration of resilience.
- CR2 – Understand the impact of regional larval connectivity patterns on biodiversity patterns.
- CR3 – Share Coral Reef Resilience Research with Stakeholders through participation in outreach and education activities.

In Year 2, the CR team has made **good progress** towards project goals.

- CR1 – Databases of internal and external drivers have been constructed for most variables. External driver databases have been constructed and QA/QC-ed for temperature regimes, wave regimes, water quality regimes. A manuscript is in revision for water quality regimes. A manuscript is in preparation on storm wave impacts on coral reefs using outputs from the Simulation of Waves Nearshore Model. External driver databases have not been completed for the current regimes at the long-term monitoring sites. However, the US Caribbean Regional Ocean Model (USCROMS) has been completed and published. Model runs have been completed for years 2019 and 2020 and these can be used to extract current regime data for the long-term monitoring sites. Internal driver databases have been constructed for coral species and attribute diversity, marine disease,

nuisance species, non-coral invertebrates, fish diversity, herbivory/herbivores, coral health, and coral interactions. Manuscripts and theses are being prepared from the synthesized data on herbivores and coral interactions. Internal driver databases have not been completed for connectivity matrices.

- CR2 – The connectivity model is under development by Dr. Daniel Holstein at Louisiana State University. Internal driver databases have not been completed for connectivity matrices as the connectivity model was waiting for finalization of the USCROMS and model runs. With that now completed the connectivity model is currently being created and the matrices should be forthcoming. Database of coral reef biodiversity at >1000 coral reef sites has been compiled from the National Coral Reef Monitoring Program, Deep Coral Reef Monitoring Program, and the Territorial Coral Reef Monitoring Program administered by UVI, DPNR, and NOAA. This database will be used with the finalized connectivity model to test hypotheses concerning the influence of larval connectivity on biodiversity patterns.
- CR3 – Provided material for VI EPSCoR promotions, website updates, and newsletter.

Outputs: Nine peer-reviewed publication, one publication in revision, and five manuscripts in preparation.

Assessment: This Research Theme has made progress on several goals. There are delays caused by COVID, but the team has provided a mechanism for addressing this and should complete Year 3 tasks on time.

Education & Workforce Development (WF)

This team trains local K-12 STEM teachers and junior faculty to be mentors and produce STEM education research to improve students' success and inclusion. The long-term goal is to transform STEM education in the USVI to be more grounded within the local environmental context. WF will require increased engagement from both stakeholders and the EWFD, and more encouraging of community action.

The Education and Workforce Development (WF) team has four goals:

- WF1 – WF is integrating resilience research themes from the VI-EPSCoR's current research areas into culturally relevant, place-based content for teachers to use in curricula development/planning as part of their professional development. To integrate resilience research themes (i.e. mangrove restoration, coral reef ecosystems, and land-sea interactions) into teacher professional development to improve K-12 student preparation.

- WF2 – Increase recruitment, retention, and persistence of URM undergraduates in STEM and resilience-related majors, minors, and certificate programs.
- WF3 – Support student/ faculty research infrastructure via support for pre and in-service STEM workforce, with the goal to increase STEM career interest, skills, and retention.

The EWD component has made **excellent progress** to completing the Year 2 goals.

- WF1 – The STEM Institute met with (VIDE) VI Department of Education and R2R researchers, and together coordinated a needs assessment for the 2021 Summer Institute. Due to COVID-19 limitations the 2021 summer session was virtual with a continued partnership with the Knowles Teacher Initiative. The STEM Institute was attended by 89 teachers from both STT and STX. In response to teachers' identified psychological needs, a partnership with a clinical psychologist in the Social Sciences (Hamilton) provided mental health support and training. The VI-ISERP Project Based Learning (PBL) certificate program recruited 3 R2R/UVI research faculty representing curricula expertise in mangrove restoration, coral reefs, and agriculture. Seven teachers were enrolled within the researcher-teacher partnerships. Due to increased responsibilities based on COVID-19 district requirements, the initial cohort experienced a 42% attrition rate. Remaining teacher-researcher pairings will begin curricula review during the STEM Institute. The director for STEM Institute facilitated 10 Teacher Talk Fridays with local teachers to address identified needs from COVID-19 in technology, teacher student wellness, and distance learning pedagogy. The Teacher Professional Development (PD) Team facilitated 6 pedagogy focused session for math, science, and art integration across the curricula and disseminated research results through 5 research conference presentations. The team received the Caribbean and African Studies in Education Sig Outstanding Research Paper Award at the American Education Research Association (AERA) Conference, on 22 April 2022. The team participated in training facilitated through NSF-CAISE in grant development and educational advocacy. The team participated in the NSF-CASL pre-conference training for NSF grant proposal development. VI-ISERP has submitted a grant in partnership with the Grimes lab for the NSF RII-BEC for bridge funding for graduating students in STEM career sites and another with the Emerging Caribbean Scientists NIH U-RISE to train faculty mentors. The VI-ISERP team has increased our partnership network with corporate businesses. In partnership with Microsoft and Subsume, VI-ISERP facilitated 4 computer science (CS) education events entitled, Teacher TechKnowledge, to promote CS teaching skills and integration across the curricula. With facilitation with Yolanda Payne of Georgia Tech, the team has launched partnerships with organizations such as Code.org, ARMS/Micro:bit,

Infosys, and established a Computer Science Teacher Association chapter for the USVI with support from UVI Computer Science department Chair, Marc Boumedine. This partner supported initiative is showcased in the Teacher PD submission to the NSF STEM for ALL video showcase on May 10-17th, 2022. Two master teachers have been hired for STT and STX to assist in local partnership development and a VI-ISERP newsletter template has been developed for distribution in July 2022 to the stakeholder network.

- WF2 – Resilience-themed experiential learning was employed in both UVI's required courses Science 100 and Social Science 100 during AY 2021-2022, increasing the number of student participants from 19 (2020-2021) to 33 (2021-2022). Existing and aspirational student learning outcomes were assessed in March 2022. Utilizing student feedback and analysis of projects during AY 2021-2022, updated learning outcomes will be identified during Summer 2022. One tool being utilized is the AAC&U VALUE rubric on critical thinking, to compare trademarks of this outcome across students who conducted experiential learning projects, versus students pursuing traditional research papers. Focus group questions were drafted in Summer 2021. Implementation has been delayed by the halt on in-person human subjects research. This restriction was just lifted at UVI in March 2022. During Spring 2022, the team are utilizing feedback surveys from SCI 100 and SSC 100 students to solicit information that will inform the finalization of focus group questions - this work and IRB updates (to include in-person focus groups) is slated for Summer 2022.
- WF3 – The VI-ISERP Mentoring and Research Infrastructure component have developed intra and inter intuitional supports for STEM students. The MRI team completed 2 faculty mentoring trainings with ECS and developed partnerships for faculty mentoring development for U-RISE proposal and the RII BEC proposal. Training of faculty (2 sessions) has been completed for IDP/compact use with undergraduate STEM students. The use of IDPs was done with ECS students during Summer 2022 with student training in goal setting and orientation. No end of year assessments were administered to students due to COVID-19 shifts in academic offerings and format. With respect to the undergraduate practicum, the COVID-19 shifts have limited local school's capacity to engage in novel partnerships and placement of students. VI-ISERP teachers and administrators will be approached during the STEM Institute for development of practicum sites for Fall 2022. The VI-ISERP team has launched a presence on social media (Facebook, LinkedIn, Twitter, Instagram, and Slack) to build virtual community during COVID-19. Platform analytics were analyzed and shared in the reverse site visit. The VI-ISERP Website is scheduled for launch on May 15th as a consistent space for center activities and resources. The VI-ISERP Educational Research Mini-Grants were launched with a call for proposals. A review

committee was formed with a R2R researcher, UVI faculty and team members. Mini-grant applications have been reviewed and awarded to 1 graduate student and 1 faculty member at UVI. VI-ISERP has facilitated a NASEM town hall meeting showcasing UVI initiatives entitled “University of the Virgin Islands Virtual Town Hall: Successes in STEM Education, Research, and Workforce Preparedness.” VI-EPSCoR contributed seven presentations with closing remarks from VI-EPSCoR Director, Dr. Kim Waddell, showcasing the impact of workforce development activities on UVI and the surrounding community. Two researchers (Dr. Guannel and Dr. Cummings) and 2 UVI undergraduate students have since been presenters for NASEM forums on STEM success.

Outputs: 18 research conference presentations, two videos for the STEM for ALL showcase, and two papers accepted to an edited volume.

Assessment: This Education and Workforce Development (WF) team has met or exceeded all project goals for Year 2. The team has a plan in place for addressing COVID-induced attrition.

Informal Learning (IL)

The goal of the Informal Learning (IL) Team is to advance the comprehensive and culturally responsive Education and Outreach plan that will expand to be more inclusive of URM groups within the Virgin Islands. The IL Team will increase the level of engagement with existing and new external partners as well as foster collaborations with other universities/research entities. The IL Team has six goals:

- IL1 – Increase and sustain the reach of the IL Team throughout the Territory.
- IL2 – Diversify the range of topics presented in informal education and outreach initiatives, drawing upon the research outputs and related activities from the R2R research teams.
- IL3 – Promote and guide K-12 underrepresented minority students into the geosciences and broader STEM pipeline as part of the larger R2R objective to build and enhance the local STEM workforce.
- IL4 – Become a recognized information and resource hub for STEM and environmental education, awareness, and sustainability for the Territory’s largely underserved communities.
- IL5 – Build new and improved-upon existing connections and lines of communication to better reach and understand target audiences.
- IL6 – Build self-sufficiency and innovation within the IL team and its efforts by pursuing funding that puts the IL team in a position to be more independent in building out and promoting its initiatives.

The IL team made **fair progress** towards its goals in Year 2, due mostly to COVID-induced delays.

- IL1 – A STX Community Engagement Specialist was hired and has participated in 4 outreach events. An IL training guide was created and is regularly updated to include all new partnerships/collaborations, resources, and personnel. IL has coordinated/participated in more than 10 outreach and/or citizen science initiatives across the Territory. IL has hired one graduate student to serve as an outreach assistant for the STT/STJ district. An outreach assistant has not yet been identified and hired for the STX district. Two volunteer groups have been recruited for outreach and/or citizen science events.
- IL2 – IL has collaborated with four R2R research leads to coordinate outreach and/or citizen initiatives. Creation of the planned outreach menu is still in progress (planned for Year 1 and to be recirculated in Year 2). IL has formed partnerships and/or community groups.
- IL3 – IL has conducted/participated in 12 STEM/environmental science-focused outreach activities that engaged k-12 students. A total of 755 k-12 students have been engaged. IL has provided funding support towards SCUBA certifications for 10 youth ocean explorer students, and 5 University Bound students. IL has also begun 1 STEM enrichment initiative geared towards public school STEM educators.
- IL4 – IL has worked with the communications specialist to disseminate R2R newsletters to partners and collaborators throughout the Territory. IL gave two presentations on the role of informal learning in sustaining the STEM Pipeline, and University Bound STEM enrichment. These presentations were for Rotary, and the National Academy of Science, Engineering and Medicine, respectively. IL's STT/STJ Community Engagement Specialist has remained a member of the national EPSCoR EOD Council.
- IL5 – IL has begun working on initiatives geared towards both the neurodiverse/differently-abled and non-English speakers. Surveys have not yet been created.
- IL6 – IL has engaged and received funding from 2 community and government funding sources. IL has purchased the tools necessary for, as well as made progress in, 3D printing, virtual reality and augmented reality. IL has also begun the creation of locally relevant outreach tools.

Outputs: Three conference presentations

Assessment: The Informal Learning team is ramping up from COVID-induced slowdowns. The team has demonstrated situational awareness in terms of integration of project elements and has put in place a mechanism for increasing engagement with R2R researchers.

Communication and Dissemination (CD)

The Communications Team develops and shares information and content that captures the research outputs and related activities emerging from the work and success of the R2R teams and affiliated students. The tools to do so include updates to the R2R website (viepscor.org), the production and dissemination of a biannual newsletter, updates on social media outlets including Instagram, Facebook and Twitter and YouTube. The CD team has three goals:

- CD1 – Inform stakeholders and community of R2R project research and educational goals and progress made toward achieving those goals.
- CD2 – Produce a biannual VI EPSCoR Newsletter for broad audiences.
- CD3 – Support R2R project team's promotional needs.

The CD team made **very good** progress towards Year 2 goals.

- CD1 – Updates to viepscor.org are ongoing. Researchers are encouraged at monthly meetings to use the website as a resource and contact Communications with updates. Social media content is generated weekly. Blog posts have been delayed due to other communications work. One blog post is planned by June 1, 2022. Informative videos for YouTube Channel are in development. Dan Mele has been hired (10 hours/week) to assist with photography and videography of R2R activities.
- CD2 – Winter 2022 newsletter issue completed and posted on the VI-EPSCoR website. Printed copies are available and are being distributed.
- CD3 – Promotional materials have been created as needed. Visual materials have been created as needed, such as branded slide templates and zoom backgrounds for virtual meetings and presentations have been designed and made available to team leaders. Promotional materials for the Storm Strong summer camp and mentorship opportunities have been designed. The Marine Debris Action Plan has been designed and published.

Assessment: The Communications team is meeting its goals from the Strategic Plan.

R2R Management (RM)

R2R has a thorough and responsive management structure overseen by Leadership and Management Teams, assisted by two panels of authorities and experts (External Advisory Board and Governing Committee). The Leadership and Management teams ensure that R2R meets the goals and objectives in the Strategic Plan.

R2R Management has three goals:

- RM1 – Meeting the data management needs of the R2R team.

- RM2 – R2R Project management, including project implementation, development and coordination of workshops, and preparation of the USVI Science and Technology Plan.
- RM3 – Collaboration with the external evaluator and NSF EPSCoR program teams to meet NSF’s expectation for R2R Project Evaluation and Assessment.

The RM team has made **very good** progress towards Year 2 goals. Deficiencies are caused by COVID including supply chain issues, delays, and shutdowns.

- RM1 – New Data Manager, Travis Hamlin has been hired. A Campus Cyberinfrastructure Proposal to supplement funding for network infrastructure upgrades has been submitted. UVI IT department is collaborating with Florida International University to configure network speed and capacity according to research needs. They are also developing specifications for campus network cabling and fiber Request for Proposals for contractors. Core network infrastructure upgrades were made (1 Gbps to 10 Gbps for research facilities). Improved research data server and storage topology. Configuring the current MS Azure environment to replicate with a newly proposed on-premises data server and storage solution.
- RM2 – Moved team meetings to monthly. A Governing Committee meeting was held April 21st and a second meeting is scheduled for September 2022. External Advisory Board meeting was held in July and the next meeting is scheduled for July 2022. The External Advisory Board is also kept up to date via email and researchers are encouraged to engage board members for advice and mentorship. Lastly, a Collaboration Agreement, which outlines how the team will work together on the project, was developed and is posted on the VI-EPSCoR website.
- RM3 – External evaluators attended R2R meetings as requested by PD/PA. A site visit was conducted in January/February 2022 where R2R faculty, students, staff, and select UVI administrators were interviewed or focus groups were held. Undergraduates and graduate students were surveyed. Proposals and awards were analyzed as part of the Year 2 Evaluation Report.

Assessment: The R2R project management is doing a good job in managing the project and ensuring the resources are made available for researchers, postdoctoral fellows, and student participants. Timely cyberinfrastructure buildouts and hiring to support IT have occurred.

R2R Participant Interviews

The external evaluation team met with R2R participants (administrators, faculty, postdoctoral fellows, graduate students, and undergraduate students). The majority of interviews were conducted in-person during the site visit to USVI in late January and early February 2022. The option of Zoom interviews/focus groups was also offered and several took place in that format. These conversations were framed by results from the surveys and were used to identify issues raised by R2R participants.

During these discussions, several common themes were identified:

Team Resilience

1. Despite the difficulties and barriers presented by COVID, the teams are performing and resilient. The majority of R2R participants remain engaged and enthusiastic about the work. For many of the research faculty, the RII Track-1 project provides a mechanism for performing high-quality research and building research capacity. For tenure-track teaching faculty R2R has allowed them the ability to engage beyond remote delivery of classes. Teams have been able to pivot from COVID-induced barriers. These impacts on the personal lives of team members have been harder than on the continental United States. For example, it is notable that the Territory public school district was remote for two full years and that intra island connectivity presented major hardships for personal lives. More than one faculty member expressed satisfaction with the project because it gave them important place-based work that allowed them to not think about COVID.
2. Despite the departure of Habtes and Cruz-Rivera, the teams are performing and resilient, and R2R leadership have been able to adapt in a way that allows the project to meet its short-term goals and has given the teams room to adjust to meet long-term goals. The courtesy appointments for both former UVI faculty members have allowed the teams to continue engagement in research, and other team members have stepped in to ensure that not only is research covered, but that mentoring of postdocs and students was covered.

Resilience of the participants is strong. Project leadership is doing a good job in managing the complications from COVID, administrative staff have found their footing as the project has gained momentum, and the teams recognize the need to continually hit milestones and ensure that students and postdocs continue to receive training and make progress in their education and workforce development efforts. There is an overall recognition of the importance of the project and the critical knowledge generation from R2R.

Institutional Support

R2R participants reported a lack of institutional support from UVI. This is a systemic condition that predates R2R and the pandemic and is representative of the need for R2R to be a mechanism for developing a stronger culture of research at UVI rather than just be used as a source of indirect funds. The need for support manifests at the project and institutional levels, as well as throughout the teams.

1. At the institutional level, there is a clear need for policies on return of F&A as a mechanism for promoting an environment of scholarly productivity by incentivizing University researchers. UVI is both an HBCU and a PUI. Currently UVI does not return F&A to faculty on any federal awards, and research faculty are appointed on annual contracts. However, members of the tenure-track faculty need this incentive to go after research grants, especially given their heavy teaching loads, which can be as high as 5 and 5. Members of the research faculty need similar returns of F&A – while they must cover their own costs with research grants, their soft money status means they need to be able to provide protection and bridge funding during potential gaps between awards. In addition, they need to be able to provide mechanisms for tapering as they near retirement or encounter illnesses.
2. At the institutional level, there is a clear need to provide a new mechanism for support of research faculty. Research faculty, who are reappointed annually, do not have mechanisms for longer-term security. There is no mechanism for hybrid positions whereby research faculty can count on salary support from the institution but still raise much of their compensation from outside sources. The current policies, coupled with the lack of return of F&A, do not match policies of UVI's peer and aspirants.
3. At the institutional level, UVI has not replaced the Marine Sciences Lab and the Environmental Analysis Lab since their destruction by hurricanes five years ago. Interviews with former R2R faculty (i.e., who have left UVI) indicated that the lack of lab space and office space contributed to their departure. Most of the project work has continued to be housed in makeshift space in trailers near renovations sites or in the Sports and Fitness Center. The lack of appropriate space and the absence of clear rules and space assignments has led to opportunistic behavior and internecine struggles between faculty and administrators. While UVI continues to build/renovate the needed facilities, the opening dates for these facilities has been pushed back repeatedly. Ultimately, priorities for these resources upon which R2R relies are set by the UVI administration and accountability for the lack of progress lies there.
4. At the institutional level, the accounting office is short staffed and according to faculty and staff, not timely in processing needed items. There appears to be a

lack of policy enforcement, as staff are sometimes told to do something one way and then following the same process again will result in rejection of the item. The lack of enforcement of policies and adherence of processes, hinders the accounting office and offices across UVI.

Building research capacity and a culture of research and scholarship on campus means creating opportunities for faculty to embrace research and scholarship. Many HBCUs with robust research programs (e.g., Howard University, North Carolina A&T) articulate specific F&A return policies with the understanding that transparency and open policies will support faculty as they navigate their instructional and research duties. The Council on Undergraduate Research (CUR) has established mechanisms for PUIs to enhance the culture of research on campus. This includes meeting faculty where they are and providing mechanisms that allow for some increased security. **These steps are all essential to building research capacity and ensuring that faculty are attracted to, and retained at, UVI.** Finally, having facilities in place that can showcase the important research being done is critical for bringing in current and future scholars. In February, the external evaluation team was told that the buildings would be open in May 2022, and then in fall 2022. The completion of the lab space will hopefully happen before calendar year 2023.

Need for Stronger Communication

The resilience of the team in dealing with COVID-induced delays, departure of key personnel, and lack of suitable lab space, has meant that the project has been able to meet most of its milestones for Year 2. This has come at the cost of increased hours and members of the team being stretched more thinly than originally planned. This is reflected in the need for more robust communication. Graduate students, pre-COVID, need significant on-boarding and mentoring, and these needs have increased given the distance created by COVID. Many R2R graduate students reported feeling connected to a mentor but being unable to see beyond their individual activities to the greater project goals.

Several postdocs reported the need for better communications with their mentors. Part of this was couched in terms of the remoteness from COVID but others articulated specific needs for more engagement with mentors. This was most notable from postdocs who joined the project in the past year. Since the site visit interviews, Dr. Waddell has initiated scheduled professional development meetings with the postdocs.

The issue of communication arises in other ways. Several students and one postdoc reported the need for increased communication so that mentors could better gauge the level of work required for graduate students and the resources available to them. Many staff members also expressed a desire for more communication regarding the bigger

picture of the project. They noted that they often do not know what others are doing in regard to the project and how it all fits together, feeling more siloed and less like a cohesive R2R team. Since R2R is at its core a capacity building program, it is imperative that this is remedied.

Student Survey Development Approach

The development of the Undergraduate and Graduate Survey instruments was informed by the project evaluation logic model, a review of project documents, and discussions with the project leadership.

The undergraduate and graduate student survey instruments had 10 questions/items each, which included a participant background section and questions regarding career aspirations, research interests, mentoring, R2R specific work/research, and a section on research competencies for graduate students.

The survey instrument was then converted into a web-based survey using the SurveyMonkey™ platform.

Undergraduate Student Survey

Based on the project team roster shared by the Project Administrator (PA), there are 9 undergraduate students directly involved in the R2R project. All undergraduate students received an invitation to participate in the survey. The Undergraduate Student Survey received 6 responses, which constitutes a response rate of 67%. The respondents had the option to skip questions that they did not wish to answer.

Table 3 summarizes the main characteristics of the survey participants, including institution, year in school, and demographics.

Table 3. Characteristics of Survey Participants

Participant Characteristics	Number (%)
Institution	
University of the Virgin Islands (St. Thomas)	6 (100%)
Year in School	
Senior	4 (67%)
Junior	2 (33%)
Gender	
Female	4 (67%)
Male	2 (33%)

Race	
African American or Black	5 (83%)
White	1 (17%)
Ethnicity	
Not Hispanic or Latino or Spanish Origin	6 (100%)

Survey Highlights

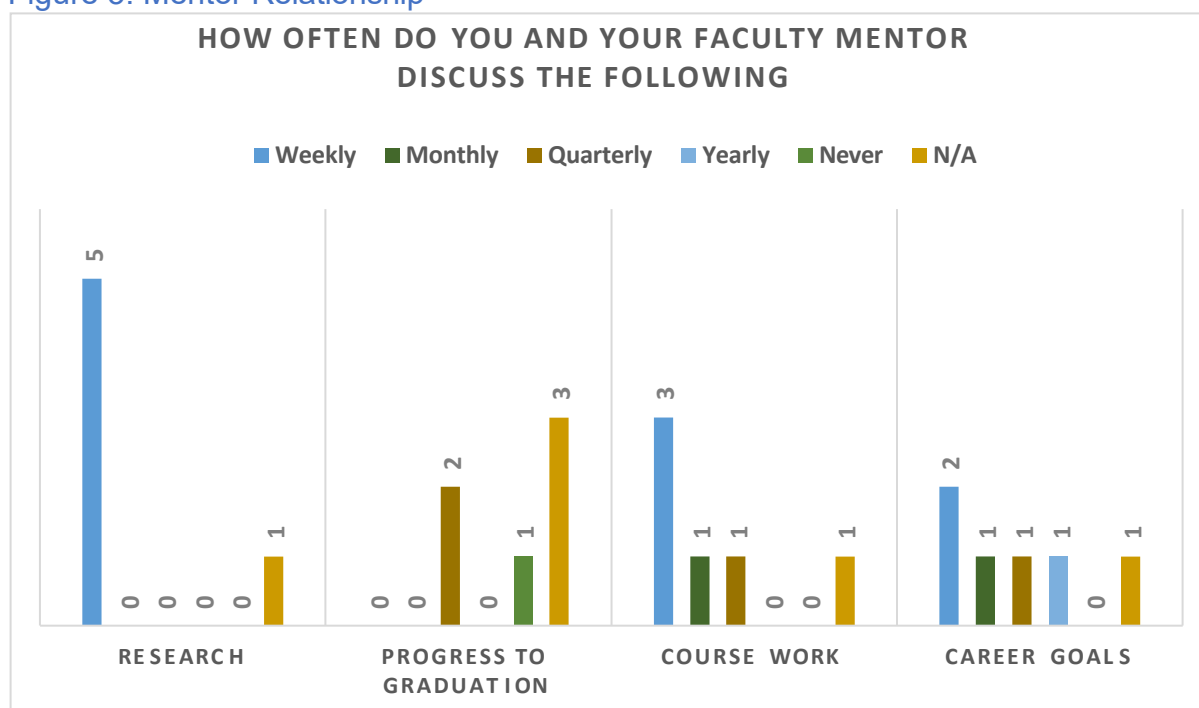
Five of six undergraduate students responded that their career goals or aspirations include plans to attend graduate school or work within themes related to R2R research. Of the respondents, 66% stated that their involvement in R2R affected what they want to do post-graduation, one student noted that “R2R solidified my love of research and drove me to pursue it at a graduate level.” Another student stated that “It has given me the skills and confidence necessary to pursue academic goals that I would have otherwise been scared to.”

When the undergraduate students were asked about what they expected to learn from their work with the R2R project, they noted items such as:

- How to have more confidence and accountability
- Learn how students and faculty are coping with the COVID-19 environment
- Absorb as much knowledge as possible about as many things as possible
- Learn how to become a researcher outside of a classroom setting

Approximately 83% of respondents stated that they discuss research with their faculty mentors each week, as shown in Figure 3. All undergraduate students rated their relationships with their faculty mentors in the two highest categories as either “effective” or “very effective.”

Figure 3. Mentor Relationship



Undergraduate survey participants were given the opportunity to provide comments or suggestions for ways in which the R2R project could further support undergraduate students. The following are some of the common responses:

- Create as many opportunities for students to get out there and learn, covering as many areas as possible
- Create more opportunities for undergraduate students to come together, meet, and talk amongst one another to share ideas and experiences
- Create workshops and have speakers present

Graduate Student Survey

Based on the project team roster shared by the Project Administrator (PA), there are 16 graduate students directly involved in the R2R project. All graduate students received an invitation to participate in the survey. The Graduate Student Survey received 14 responses, which constitutes a response rate of 88%. The respondents had the option to skip questions that they did not wish to answer.

Table 4 summarizes the main characteristics of the survey participants, including institution, year in school, and demographics.

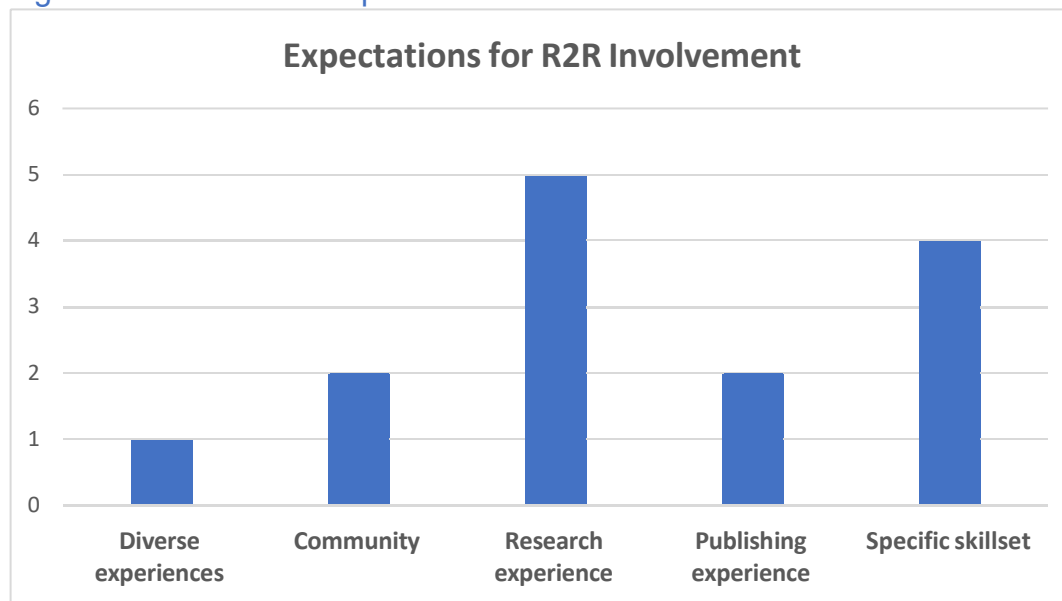
Table 4. Characteristics of Survey Participants

Participant Characteristics	Number (%)
Institution	
University of the Virgin Islands (St. Thomas)	13 (93%)
University of the Virgin Islands (St. Croix)	1 (7%)
Year in Graduate School	
First Year	7 (50%)
Second Year	5 (36%)
Third Year	2 (14%)
Gender	
Female	10 (71%)
Male	4 (29%)
Race	
African American or Black	2 (14%)
White	11 (79%)
Prefer to not answer	1 (7%)
Ethnicity	
Hispanic or Latino or Spanish Origin	4 (29%)
Not Hispanic or Latino or Spanish Origin	8 (57%)
Prefer to not answer	2 (14%)

R2R Involvement Expectations

Study participants were asked about what they anticipate getting out of their work with the R2R project in addition to a graduate degree. Results were summarized into five categories highlighted in Figure 4, below. Of the respondents, 93% had prior experience in research.

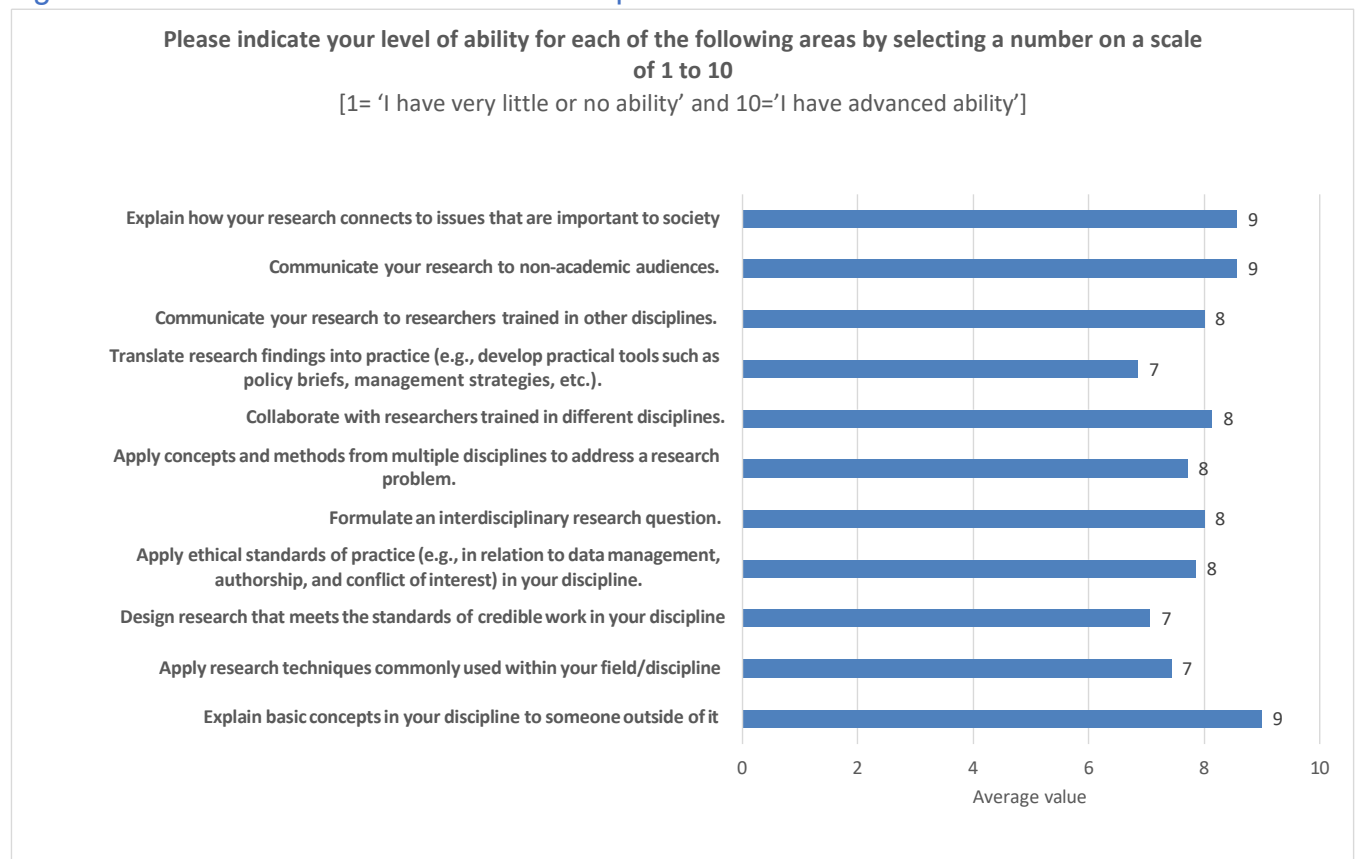
Figure 4. Involvement Expectations



Competencies

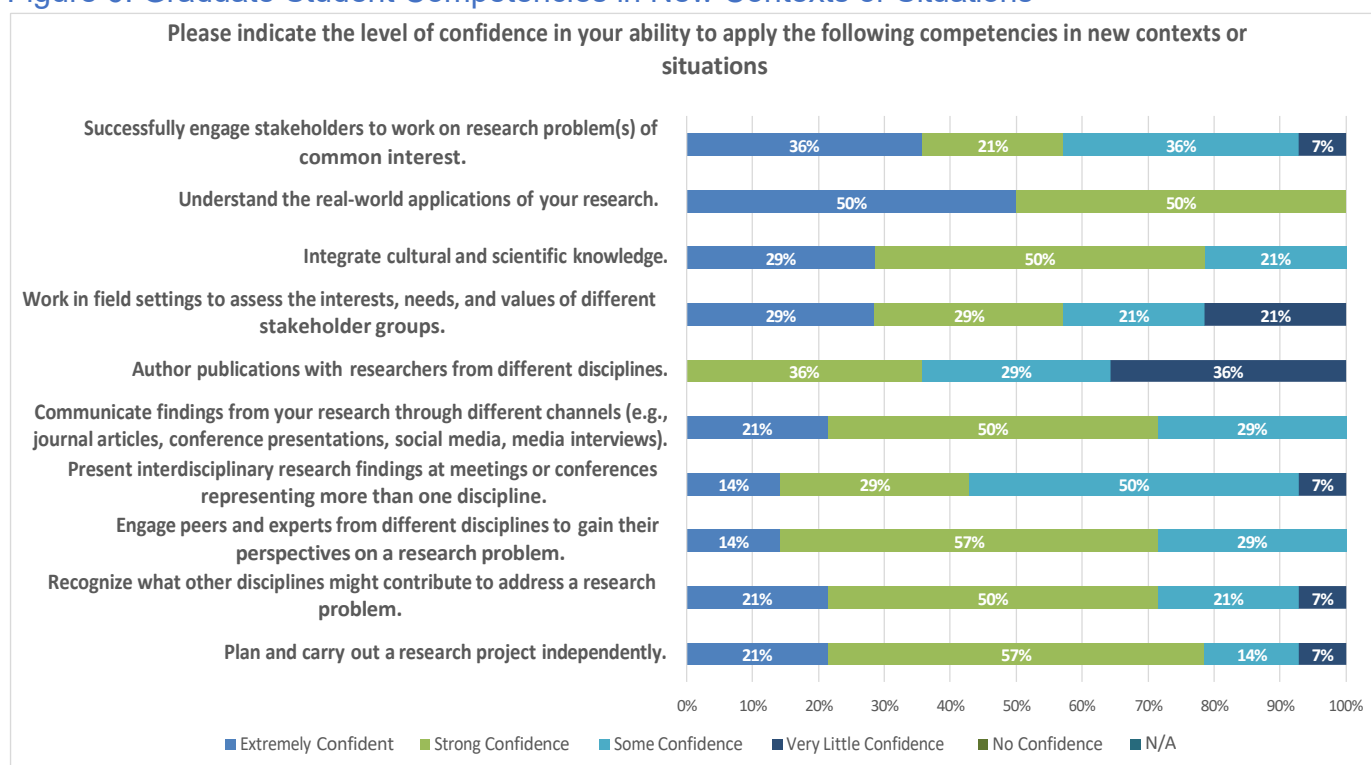
R2R graduate students were asked to self-rate their level of ability for several competencies related to research and applying learned skills. The average rating across the 11 areas was an 8 out of 10 as shown below in Figure 5. Therefore, R2R graduate students feel they have advanced ability across the competencies. The three competencies with the highest average (9) all related to communicating research to others.

Figure 5. Graduate Student Research Competencies



As shown in Figure 6 below, graduate student respondents also highly rated their confidence in their ability to apply competencies in new contexts or situations.

Figure 6. Graduate Student Competencies in New Contexts or Situations



Mentor/Mentee Relationship

When asked about the frequency of interaction with faculty on common subjects (Figure 7), 57% of graduate students reported discussing research with their faculty mentor each week and 36% each month. Of the respondents, 88% reported the relationship with their mentor was either “very effective” or “effective”, 6% neutral and 6% noted a “very ineffective” mentoring relationship, as shown in Figure 8.

Figure 7. Mentor Relationship

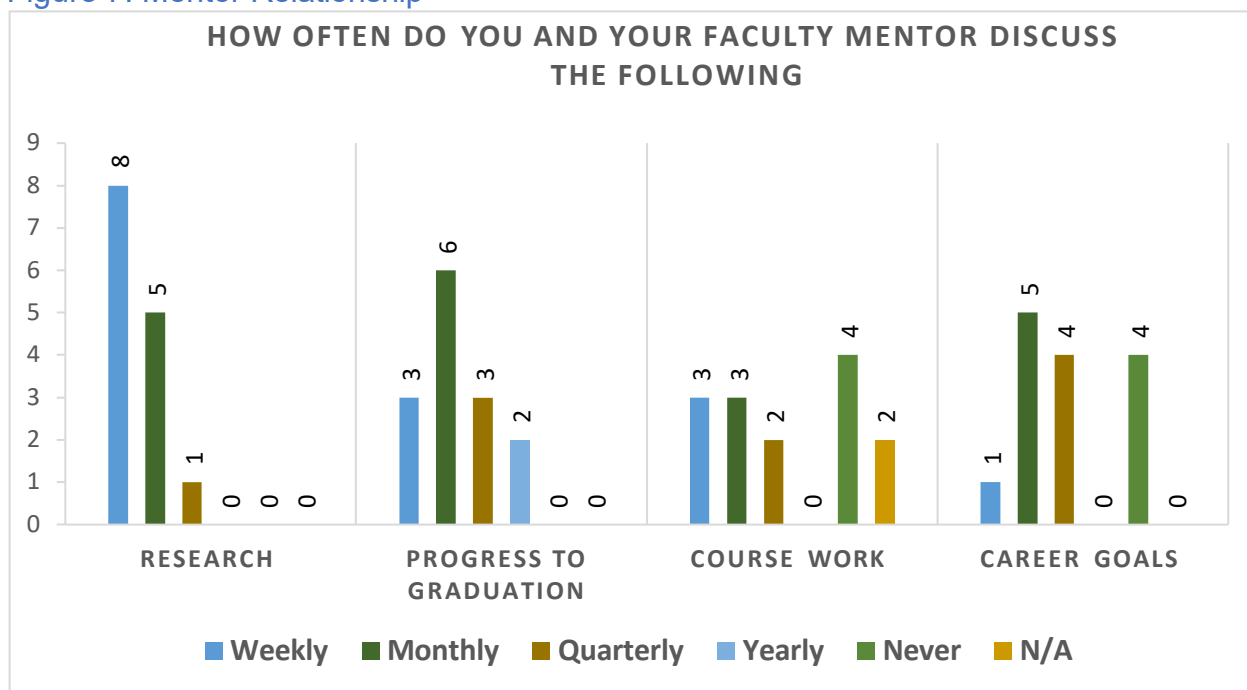
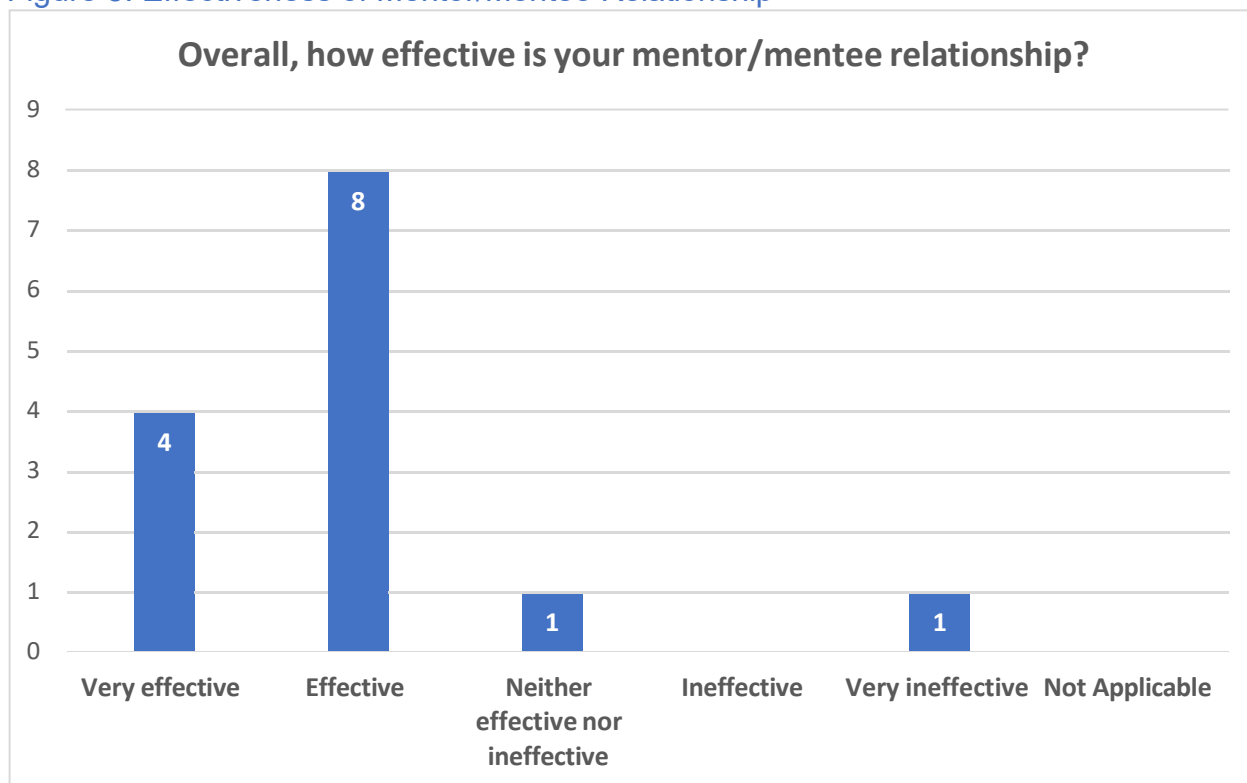


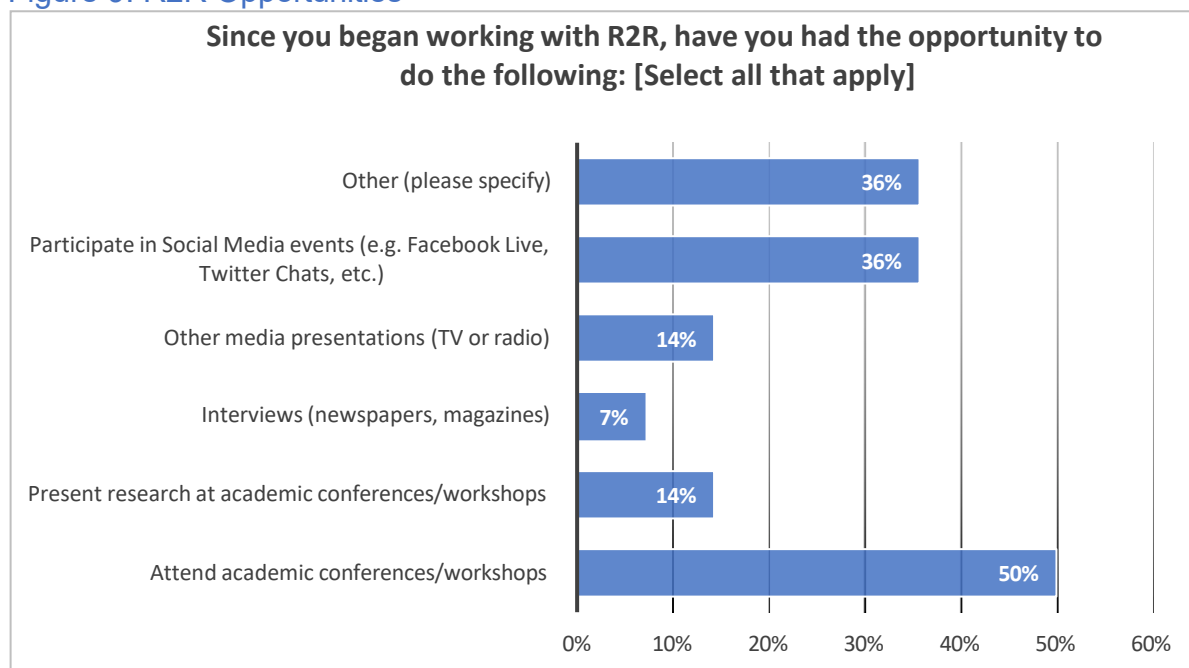
Figure 8. Effectiveness of Mentor/Mentee Relationship



R2R Opportunities

The COVID-19 pandemic has decreased the number and frequency of common opportunities extended to graduate students and that is reflected in Figure 9, below. Only 50% of graduate students reported having the opportunity to attend academic conferences and workshops and only 14% have had the opportunity to present research at conferences and workshops. In the “other” category, graduate students reported participating in community cleanups, community outreach, and fellowship opportunities.

Figure 9. R2R Opportunities



Graduate student survey participants were given the opportunity to provide comments or suggestions for ways in which the R2R project could further support graduate students. The following are some of the common responses:

- Workshops at UVI to present research at a smaller scale so conferences are not so intimidating
- R2R leadership should meet with students more often to discuss issues and resolutions. They should assess if the number of graduate students for each research theme is adequate for the volume of work generated by the teams.
- The lack of lab space due to renovations not being finished really effects the experience of graduate students
- Graduate students should be given the opportunity to see the larger picture of R2R as it feels very siloed at the graduate student level

Summary and Recommendations

This section summarizes the main outcomes from assessment of the progress achieved toward project goals in each of the R2R areas based on findings from the External Evaluation Site Visit Interviews and Focus Groups, ERCORE, Undergraduate Student Survey, Graduate Student Survey, and documents provided by R2R Management.

Overall R2R evaluation questions concentrate on three main themes: 1) project implementation and infrastructure; 2) research activities and outcomes; and 3) R2R impacts.

Project Implementation and Infrastructure

In Year 2, R2R participants have accomplished a great deal as evidenced by research outputs and by reaching most strategic plan goals and milestones this year. The project is well on its way to achieving the overall goals. Based on responses during the external evaluation site visit interviews and focus groups, participants would like to have more mechanisms to see the bigger picture of R2R which would further advance the success of the project. The project infrastructure has continued to develop and would be aided by more support from UVI.

Research Activities and Outcomes

Despite barriers caused by the COVID-19 pandemic and construction delays in rebuilding the Marine Science building and Environmental Analysis Laboratory, the R2R team has increased research productivity this year. Outputs include publications in high impact-factor journals, increased connections within VI-EPSCoR teams as evidenced by publications and presentations, and strengthening of ties beyond the Territory as the team members increase publications with investigators at other institutions.

R2R Impacts

While it is still too early in the project to form an assessment of the research, institutional, student, or education and workforce impacts, the majority of those areas are progressing well in achieving goals and milestones. This is due to the agility of the team and the management of R2R.

Recommendations

1. R2R should increase communications within the project so that participants at all levels can understand the value of their own contribution to the larger project goals. Part of this will occur naturally if COVID measures lift but the project should make strong efforts to engage across all levels to build momentum as R2R enters its mid-stage. The goal is for the project to finish strong and not be continuously recovering from COVID (and other) induced slowdowns.
2. R2R should position itself to be an agent of change and for building research capacity in the jurisdiction. To do this, the project needs to be a strong advocate for creating a culture of research at UVI – if VI-EPSCoR is unable to make even incremental changes at UVI, it is hard to imagine what will. The most critical of the issues identified by faculty is a policy for return of F&A to the project. This will not necessarily be a comfortable discussion, but it is a crucial conversation needed to attract the next generation of talent to UVI and to retain the current R2R participants.
3. The Informal Learning team would benefit from mentorship/leadership of more senior personnel that could guide, direct, and encourage staff. Further, a more direct partnership/collaboration with the Education and Workforce Development team would be beneficial.
4. R2R leadership should consider positioning itself to sunset Emerging Areas projects that are not making adequate progress. If such changes do not change project scope, their resources can be redirected to other R2R areas. These decisions would need to be informed by evaluations, advised by the EAB, and approved by NSF.