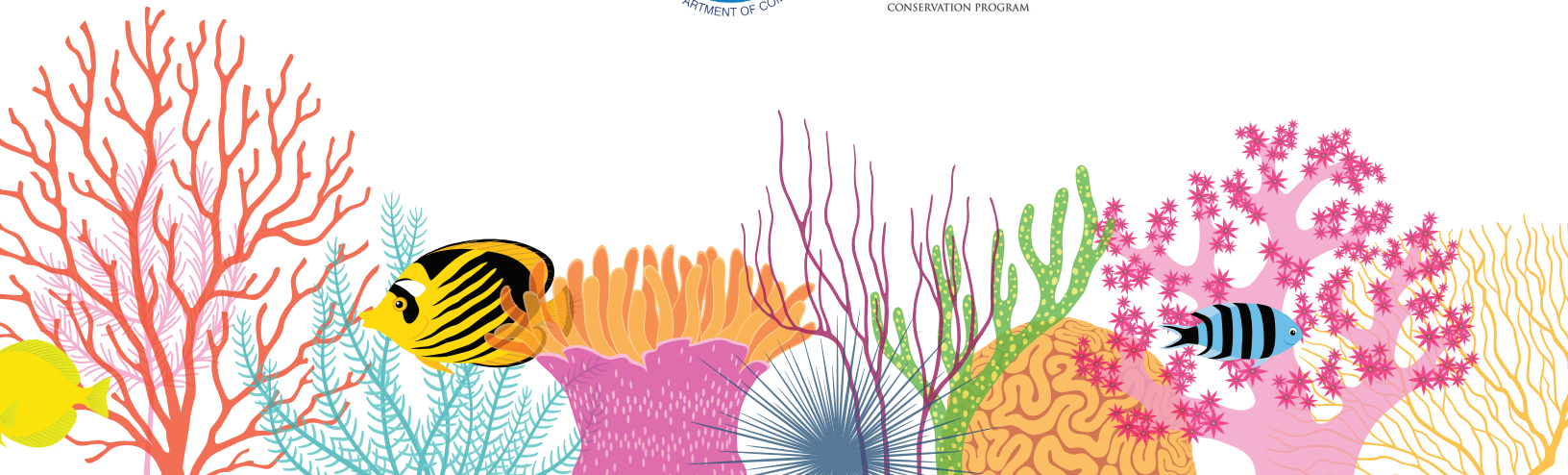
# Marine Outreach and Education U.S. Virgin Islands Style Initiative:

# Strategizing for Improved Outreach, Education and Communication Pertaining to USVI Marine and Fisheries Management and Conservation



# FINAL REPORT
# MARINE OUTREACH AND EDUCATION
# U.S. VIRGIN ISLANDS STYLE INITIATIVE: STRATEGIZING FOR IMPROVED OUTREACH, EDUCATION AND COMMUNICATION PERTAINING TO USVI MARINE AND FISHERIES MANAGEMENT AND CONSERVATION
# U.S. VIRGIN ISLANDS

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# EXECUTIVE SUMMARY

### *Strategizing for Improved Outreach, Education and Communication Pertaining to USVI Marine and Fisheries Management and Conservation*

### *U.S. Virgin Islands*

The National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program (CRCP) sponsored this report that provides a description of existing marine outreach and education programs in the U.S. Virgin Islands (USVI) as well as a series of action recommendations to improve communication efforts for future programs. The overall goal for this project was to provide insight on the current level of marine outreach and education in the USVI, providing resource managers, conservationists, and educators with a perspective on what is currently being done, what needs remain, and how those needs may be met. Ultimately, this project is meant to provide a foundation for future long-term community outreach, education, and engagement activities and is not specific to any one entity or individual interested in pursuing such activities in the USVI.

The primary inputs for this project have been related reports and studies, as well as the observations, experiences, and opinions offered by those people most closely associated with marine outreach and education in the USVI. This plan is a synthesis of these reports and studies and is part of the larger Marine Outreach and Education U.S. Virgin Islands Style (MOES-VI) effort.

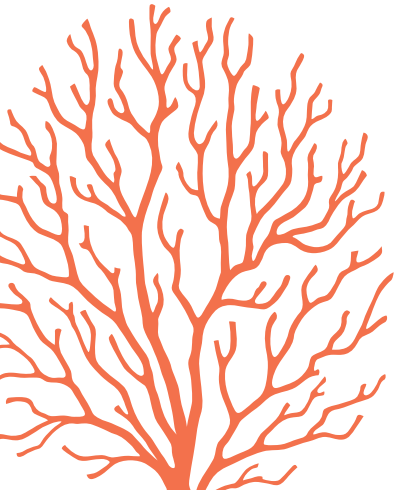
### *Marine Outreach and Education USVI Style Initiative Background*

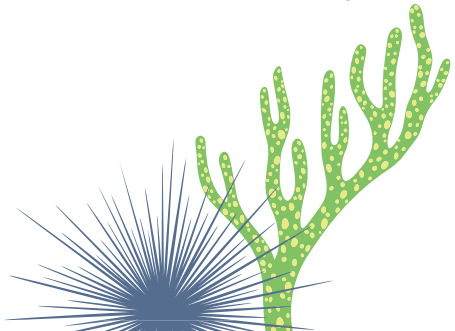
The MOES-VI effort is led by the NOAA CRCP. It has been established that commercial fishing, recreational marine use, land-based pollution, and climate change are the main stressors of coral reefs throughout the USVI and that increased community involvement in resource management is a key mechanism to reduce human-based stressors. While a substantial number of programs exist within the USVI focused on marine resource management and education, there is a perception that gaps exist and that governmental agencies and NGOs can make more progress in building relationships between resource managers and community members. It is hoped that an improved level of marine outreach and education will result in greater public support for necessary management actions and more active community-led conservation efforts. To address these priorities, and with funding from NOAA's CRCP, a series of projects was developed and these projects are being implemented under the brand of MOES-VI.

Current MOES-VI collaborators include the NOAA CRCP; NOAA Fisheries Southeast Regional Office; Caribbean Fishery Management Council; USVI Department of Planning and Natural Resources Divisions of Fish and Wildlife, Coastal Zone Management (including the St. Croix East End Marine Park and the St. Thomas East End Reserve), VI Council on the Arts, and Environmental Enforcement; USVI Department of Sports, Parks and Recreation; The Nature Conservancy; SeaGrant College Program, Puerto Rico; Earthbound Studios; Friends of the St. Croix East End Marine Park; Caribbean Restoration and Oceanographic Restoration and Education Foundation; VI Network of Environmental Educators; St. Croix Commercial Fishermen's Association; and St. Thomas Fishermen's Association.

### *Gathering the Data*

Project team members conducted individual interviews with key outreach and education leaders active in the USVI, asking them for their opinions and input on how their programs operate, who their programs involve, what major challenges they face, and how they could be more successful, among other questions. In addition to the interviews, 2 focus group meetings were held in the USVI, one each on St. Croix and St. Thomas, during April, 2014. Key stakeholders from local government agencies, educational institutions, and non-governmental organizations (NGOs), and others directly involved in marine outreach and education, were invited to participate in the focus groups. These key stakeholders were recommended to the project team for interviews and/or focus group participation via the project steering committee, which included representatives from local and regional NOAA offices familiar with USVI

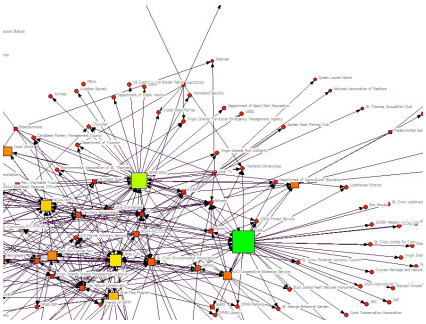




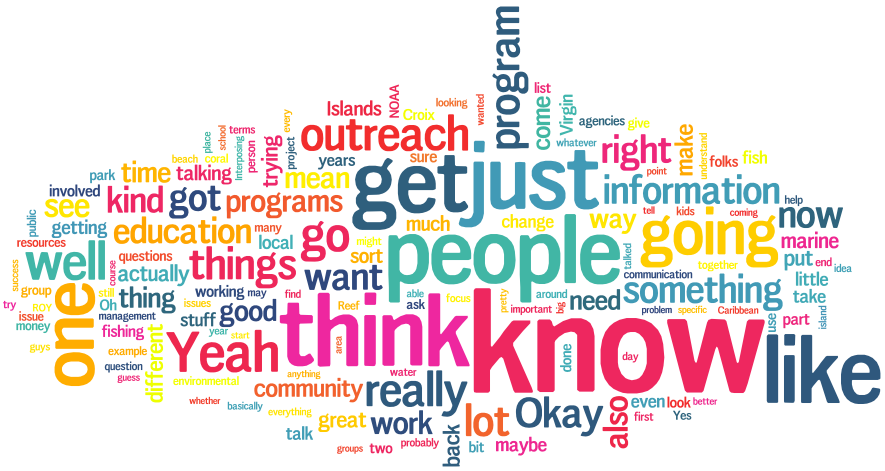
## *Gathering the Data*

education efforts. These steering committee representatives recommended employees of government agencies charged with marine resource conservation and protection, as well as academics, educators, members of the media, community organizers, and managers of NGOs focused on marine resources. Issues explored during the focus groups included those discussed during the individual interviews, as well as more detailed discussions focused on specific challenges faced and recommendations for programs associated with commercial fishing, recreational marine use, climate change, and land-based/marine pollution.

A number of different methodologies were employed during the interviews and focus groups to elicit information about existing marine outreach and education programs. These methods included multiple short surveys and a systematic review of transcripts from interviews and focus group meetings. The data from one survey, asking about which entities worked together, were turned into "sociograms," which are web-like representations of social networks, showing which government departments and organizations work together the most.



The word cloud on the right shows the words most commonly used when discussing marine outreach and education challenges and opportunities in the USVI based on interview and focus group transcripts.




## *Challenges and Existing Gaps*

A full description of challenges and existing gaps in marine outreach and education is presented in the report. Key challenges and gaps include:

- **Grant funding:** Typically, programs are funded through specific grants. A major challenge according to respondents was associated with long-term program planning since grant funding would run out or had no guarantee of renewal, even if program performance was high. Interviewees and focus group attendees both spoke of effective programs that lost their grant funding and eventually disappeared, with any gains achieved by the program essentially lost.

- **Staffing:** Interviewees and focus group attendees noted that many agencies and organizations were understaffed, with existing staff too overtaxed by technical and administrative duties to establish effective marine outreach and education programs in their "free time." People stated that this was particularly true for workers in the USVI, which is a large geographic region with complex natural resource issues. Additionally, participants noted that frequent leadership changes due to election cycles were another challenge to program consistency.

- **Interagency Co-ordination:** Communication was cited as a challenge, as were clarifying roles and responsibilities for each agency and securing the requisite amount of funding. Respondents stated that different agencies may have poorly coordinated parallel efforts, resulting in duplicative efforts or piecemeal management solutions that lack integration.

- **Digital Divide:** People stated regularly that websites, social media, or any sort of online presence was important and can only serve to help reach more people,

## *Challenges and Existing Gaps*

but they cannot be relied upon on their own to spread a communication message. Word-of-mouth was the most frequently cited method of communication. People regularly stated that the USVI was more unique in this respect since internet access and smartphone use is not as ubiquitous as on the mainland.

- **Non-local Flavor:** Some of the least successful programs, according to interviewees and focus group participants, are those with little-to-no local involvement. These types of programs are typically focused on issues considered unimportant to locals and education materials are designed in a manner that does not reflect local aesthetic values. Despite being professionally produced and designed, these types of materials accentuate the "otherness" of the message and serve to undercut its legitimacy among members of the general population.

- **Stakeholders and Trust:** Interviewees and focus group participants suggested that even outreach and education programs with little local involvement may find success in the USVI if they are delivered by an agency and/or individual trusted by the target audience or user group. In many ways, this trust can only be built over time and reciprocity is important. This is particularly true for fishermen and other user groups with highly developed knowledge of the marine environment who are unlikely to trust individuals they perceive as less knowledgeable

## *Action Recommendations*

The following action recommendations are based directly on statements gathered through the interviewee and/or focus group efforts and are generally categorized based on the themes uncovered through that process. In most cases, action recommendations were developed to respond to specific gaps or improve upon already-successful efforts being conducted in the USVI. They are presented and described in full in the final report.

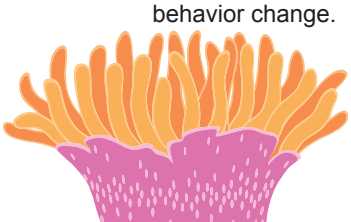
- **Establish a key node and capitalize on established centers of leadership:** A greater level of coordination is necessary to create more engaging and long-lasting outreach and education programs. It is preliminarily suggested here that the MOES-VI program could be used as a platform for integrating agency priorities for outreach and education efforts, as it is within NOAA CRCP, has strong connections to divisions within NOAA and other key agencies, and is already involved in successful outreach and education efforts in the USVI.

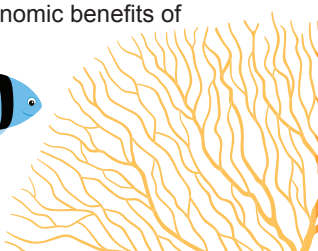
- **Work with law enforcement:** Law enforcement engages with all subsections of the population, including tourists, fishermen, students, property owners, businesses, and other members of the general public. It is recommended that the USCG and Department of Planning and Natural Resources-Division of Environmental Enforcement (DPNR-DEE) receive an environmental orientation and be provided materials by resource management partners and collaborate on the development of products on an ongoing basis for distribution to the general public.

- **Let the islands inform each other:** Despite their relative proximity, practices on St. Thomas, St. Croix, and St. John vary widely. Specifically, it is recommended that the St. Croix Environmental Association coordinate with the Environmental Association of St. Thomas, and other appropriate NGOs, to share best practices and help build their capacity.

- **Concentrate on recycling efforts:** While the Virgin Islands Waste Management Authority (VIWMA) is currently involved in promoting construction and remodeling recycling and reuse, it is recommended that recycling specialists from the VIWMA meet with other waste management entities in the Caribbean to determine the best way to facilitate aluminum, glass, and plastic recycling efforts in St. Croix; the Caribbean Challenge Initiative would be an ideal forum to establish lines of communication.

- **Broaden audiences:** This includes: (1) Make education materials available in places that members of the general public frequent; (2) Work with businesses to incorporate environmental awareness; (3) Focus on the economic benefits of behavior change.





## *Action Recommendations*

- **Form a USVI-wide message:** It is recommended that key entities in USVI marine outreach and education form a consistent message and attempt to prioritize outreach foci. It is also recommended that large campaigns share similar branding elements so that efforts sponsored by various agencies are experienced by the public as a cohesive whole, even if the individual events are funded by disparate grants and various agencies.

- **Make messages local and culturally relevant:** It is recommended that environmental educators work with local community members to identify environmental issues of particular relevance and prioritize programs responding to these issues. It is also recommended that local artists, photographers, musicians, writers, and designers be employed to develop materials and other content used in environmental outreach and education efforts such as brochures, posters, signs, and flyers.

As part of the Don't Stop Talking Fish event in 2014, a local fisherman shows visitors how nets are repaired.

- **Create programs that are discrete, experiential, and social, and result in immediate stewardship:** It is recommended that educators design programs to respond to these four key features to maximize stakeholder engagement.

- **Focus children's programs on needs:** It is recommended that programs focused on introducing children to swimming, teaching water and swimming safety, and snorkeling skills continue and become more permanently developed.

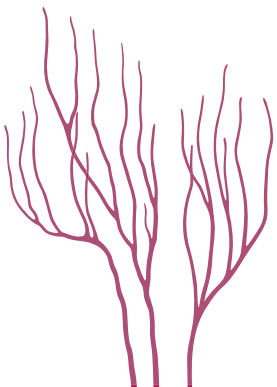
- **Engage the tourism industry:** It is recommended that entities involved in outreach and education work directly with cruise ship companies and provide outreach materials to program directors, concierges, and tour directors about key issues such as responsible recreational fishing, respecting wildlife, turtle nesting behavior, and coral maintenance.

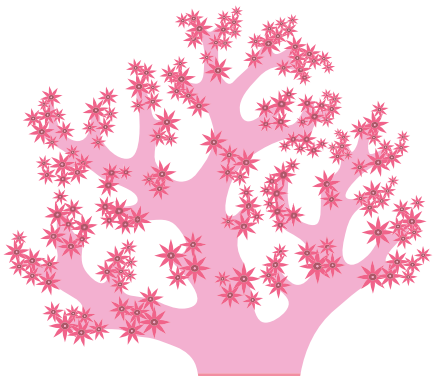
- **Engage territorial government effectively:** It is recommended that communications with politicians should focus on how issues affect (1) community public health; (2) cultural traditions; and (3) the economy of the USVI.

- **Invest in outreach:** It is recommended that the agency approving scientific research permits require a level of scientific outreach as part of the research plan, provide suggestions for communicating messages, and enforce this aspect as part of its overall QA/QC process of reviewing issued permits.

- **Incorporate stewardship into public events:** It is recommended that program developers keep this tension in mind when planning large-scale public events, taking the opportunity to think of strategies to keep the environmental message clearly at the heart of the event.

- **Use technology, but do not rely on technology:** For the foreseeable future, program developers should employ a range of media to draw attention to their efforts. This can include websites and social media, as well as radio commercials, print advertisements, press releases, and stories on the local television news and/or PBS station.





## 1.0 INTRODUCTION

This report provides a description of existing marine outreach and education programs in the U.S. Virgin Islands (USVI) as well as a series of action recommendations to improve communication efforts, summarizing the research conducted for the Strategizing for Improved Outreach, Education and Communication Pertaining to USVI Marine and Fisheries Management and Conservation Project, which is part of the larger Marine Outreach and Education U.S. Virgin Islands Style (MOES-VI) effort. The overall goal for this project was to identify and describe the current state of marine outreach and education in the USVI, identify gaps and challenges in current efforts, and provide recommendations and objectives to fill identified needs. The primary inputs for this project were related reports and studies, as well as the observations, experiences, and opinions offered by those people most closely associated with marine outreach and education in the USVI.

This report begins with an introduction of the program and a review of literature related to environmental outreach and education program design, challenges, and opportunities. The document then summarizes the results of input gathered during interviews and focus groups with key stakeholders in the USVI environmental outreach and education community. Finally, based on the results of the literature review and interview/focus group efforts, the document concludes with a description of existing gaps in outreach and education programs and a series of action recommendations that can be implemented to improve marine outreach and education programs throughout the USVI. It is hoped that this document will provide stakeholders, including decision makers, throughout the USVI with information about current outreach and education challenges, as well as ideas and recommendations to overcome these challenges and improve marine communication methods, outreach, and education on the islands of St. Croix, St. John, and St. Thomas.

### 1.1 Marine Outreach and Education USVI Style Initiative Background

The MOES-VI effort is led by the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP). It has been established that commercial fishing, recreational marine use, land-based pollution, and climate change are the main stressors of coral reefs throughout the USVI and that increased community involvement in resource management is a key mechanism to reduce human-based stressors. While a substantial number of programs exist within the USVI focused on marine resource management and education, there is a perception that gaps exist and that governmental agencies and non-governmental organizations (NGOs) can make more progress in building relationships between resource managers and

community members. It is hoped that an improved level of marine outreach and education will result in greater public support for necessary management actions and more active community-led conservation efforts. To address these priorities, and with funding from NOAA's CRCP, a series of projects was developed and these projects are being implemented under the brand of MOES-VI.

This MOES-VI project, *Strategizing for Improved Outreach, Education and Communication Pertaining to USVI Marine and Fisheries Management and Conservation*, is meant to provide insight on the current level of marine outreach and education in the USVI, providing resource managers, conservationists, and educators with a perspective on what is currently being done, what needs remain, and how those needs may be met. Ultimately, this project is meant to establish a foundation for future long-term community outreach, education, and engagement activities and is not specific to any one entity or individual interested in pursuing such activities in the USVI.

The MOES-VI effort also includes a handful of other projects, including the "Don't Stop Talking Fish" (DSTF) project, a cultural yet practical approach to improving community awareness, strengthening relationships, and encouraging compliance and buy-in from local community members, and the "Improving Fishing Community Awareness and Compliance" project, a training program for commercial fishers focused on fisheries management rules and regulations. These programs are meant to improve community relationships with regulators, improve community engagement in resource stewardship, and foster a sense of ownership with regard to marine resource management and conservation.

Current MOES-VI collaborators include the NOAA CRCP; NOAA Fisheries Southeast Regional Office; Caribbean Fishery Management Council (CFMC); USVI Department of Planning and Natural Resources (DPNR) Divisions of Fish and Wildlife (DFW), Coastal Zone Management (CZM [including the St. Croix East End Marine Park and the St. Thomas East End Reserve]), VI Council on the Arts, and Environmental Enforcement; USVI Department of Sports, Parks and Recreation; The Nature Conservancy; SeaGrant College Program, Puerto Rico; Earthbound Studios; Friends of the St. Croix East End Marine Park; Caribbean Restoration and Oceanographic Restoration and Education Foundation; VI Network of Environmental Educators (VINE); St. Croix Commercial Fishermen's Association; and St. Thomas Fishermen's Association.

## 2.0 LITERATURE REVIEW

Effective communication and education programs convey important ecological knowledge to a public that is both economically reliant on and culturally dependent on a healthy fishery and marine environment in order to increase their participation in fisheries management and environmentally sound behaviors. The purpose of this literature review is to summarize research findings and information on how environmental communications, outreach, and education programs are most effective in general and specific to the USVI.

Fisheries and environmental education journals and publications, previous applied research and study, and other print and online resources were reviewed. These included reports published by NOAA in the USVI, reports published by other federal agencies regarding outreach and education, and other literature in peer-reviewed journals on relevant topics related to outreach and education in the Caribbean and U.S. mainland. The project team believed that some information on this topic had already been produced during previous studies, while other trends in outreach and education may have been studied outside of a USVI context but could be easily applied. The literature established a series of domains of effective communication, education, and outreach programs. These domains are mode of communication, source of information, content of information, and the human dimension, or affective domain of the intended audiences. Resource managers and community supporters (i.e., fishing associations, academia, scientists, and NGOs) recognize the need for building USVI community capacity to participate in natural resources management and to play a more active role in community-led conservation as a way of reducing human-based stressors to coral reefs and fisheries resources. Indeed, after noting that the coral reefs surrounding the USVI are worth $200 million to the local economy, the 2012 USVI Capacity Assessment reported that “it is imperative to build an understanding among decision makers and the general public that the economic and cultural value of the USVI’s reefs is very high and that preserving reefs and coastal ocean health is utterly essential to the long term health and well-being of the USVI and its inhabitants” (Sustainametrix 2012). Therefore, the USVI is making awareness of marine and fisheries issues a top priority and expects to encourage the communities to take ownership of those resources.

### 2.1 Environmental Outreach and Education in a USVI Context

In researching issues applicable to the USVI, the project team included research from throughout the Caribbean. The islands that neighbor the USVI generally share a common history and face many of the same environmental challenges, including increased resource consumption due to the pressure of a growing population and specialized economies. As noted in the literature, an

increase in commercial development, pollution, and waste has led to a strain on coastal resources and marine ecosystems in many Caribbean Island states. In 1995, Oda W. Dijksterhuis of the University of Newcastle conducted a study of six Caribbean Island states—Jamaica, Barbados, Saint Vincent and the Grenadines, Trinidad and Tobago, Saint Lucia, and Dominica—to assess their environmental education programs. Historically, these islands were ruled by various European colonial governments. Once they gained their independence and these states became more directly involved in the world economy, a drastic increase occurred in the consumption of resources. Overconsumption, increased population, and a degradation of coastal resources led to environmental strain in these states.

To conduct her study, Dijksterhuis sent out a postal questionnaire to 60 organizations in the six Caribbean nations she selected. The questionnaire was used to assess the extent and nature of environmental education programs, evaluate their success, and assess the potential of further development of these programs (Dijksterhuis 1996). Her survey achieved a 41 percent response rate and she was able to analyze the returned surveys for general trends among the programs. Students at all levels (primary through tertiary education) received the most attention from the programs: 26 percent of survey respondents said they provided programs for this audience, 13 percent of survey respondents offered environmental education for community groups, and 8 percent conducted programs for youth clubs. Business and industry, tourists, fishermen, and farmers received environmental education from only 6 to 8 percent of survey respondents. Women were extremely underserved regarding education, even though they had a large role in the agricultural sector. These economic users of coastal resources had a huge, direct impact on the condition of the environment, and, it was suggested, should have received more attention in these environmental programs. Because they depend so heavily on these resources for their livelihoods, these economic users could benefit from increased environmental education, in combination with economic incentives and legislative tools, causing a paradigm shift. The topics covered by the programs varied, with ecosystem, ecology, resource exploitation, and species protection being the most widely covered; sociocultural issues were the least prevalent. It was found that only 11 percent of the topics were covered on a continual basis. To receive the greatest outcome of these programs, it was best to present the topics continually, as opposed to occasionally. The largest concern for the survey respondents was the lack of funding and, according to Dijksterhuis, “they indicated that increased levels of funding may need to be made available to improve both the quantity, and especially, the quality of environmental education.” Each organization had goals for their program, but over one-fifth did not know if they were meeting their goals (Dijksterhuis 1996). This reportedly created a problem when asking for funding for the programs.

From her study, Dijksterhuis concluded that, although some methods of measurement were already being used to determine the success of the programs, more quantitative assessments were needed. This would help the administrators determine the outcome of their programs and help them to gain long-term support from funding bodies. Dijksterhuis also found that many of the topics were being discussed repeatedly by many different organizations. The efficiency of these programs could be increased significantly by ending this duplication of material. This could be achieved by proper documentation and publication of each program, as well as an increased exchange of information through interagency communication; cooperation; and exchange of physical, printed materials. She found that creating an education network in which each organization had a specific role could be helpful in achieving this. Additionally, a top-down approach in which a foreign agency tried to impose its program on the local community would not be as effective. She concluded that an integrated approach should be taken, in which all members of the community at all levels were involved in the planning process. This would increase the transparency of the programs, interest in the programs, and make it more locally specific to help inspire participation and a change in behavior.

Lloyd Gardner in his report, *Protected Areas Management in the Caribbean: Core Themes for Education, Awareness, and Communication Programmes* (2009), looked at existing education, awareness, and communication programs for protected areas, challenges they faced, and changes that should be made to the programs. Gardner's report revolved around information from a literature review and a questionnaire-based survey. There were four responses to the survey, from the British Virgin Islands, Dutch Caribbean, Jamaica, and the USVI. Throughout the report, Gardner compared his findings from the survey with those from his own literature review.

The overarching themes for education, awareness, and communication programs that were present in all four countries were (1) building political and local support for protected areas; (2) importance of protected areas for biodiversity conservation; and (3) protected areas policy, legislation, and compliance by resource users and other stakeholders (Gardner 2009). Themes of education, awareness and communication programs analyzed in the literature review focused more on the economic and social benefit of protected areas.

Gardner found that many of the desired actions to improve the education, awareness, and communication programs were the same in the literature review and the survey results. Both sources supported the use of a broad media campaign, audio-visual materials, school and community programs, workshops, and community meetings. The results from the survey also showed that it was very important to work with organizations to secure a steady, reliable source of funding, as well as understand the importance of indigenous and local communities'

knowledge. However, it was pointed out that, at the time, the organizations only had access to in-house biologists and experts, and some outdated multi-media equipment, and would not be able to implement these actions without acquiring the additional resources needed to do so. Even with adequate resources, however, the planned actions only allowed for a one-way flow of information from the organization to the audience.

Gardner proposed the need for a shift in paradigm to a dual-purpose protected area, where the focus is on both environmental protection and community benefit. He stated that education, awareness, and communication programs needed to support all stages of development of a protected area, and should be encompassed in an overall public engagement strategy. By expanding the reach of these programs, they could now address financial support, activism, participation, and governance. This new strategy was aimed at increasing public involvement and reaching a wider audience to increase support for the protected areas. Gardner also advocated for using protected areas to support student learning, through curricula, use as learning laboratories, or for recreation. By increasing community involvement in the planning process and creating community benefits such as student education, the dialogue between the public and the protected area organizations would become a two-way street by which ideas could be shared and education, awareness, and communication programs could have a more substantial impact.

Many of these ideas for programs for protected areas also apply to marine outreach and education. Finances and available resources, as well as appropriate staffing, are a common concern among education programs. Additionally, the idea of having open communication between stakeholders, community members, and organizations is vital to the success of a program. By creating a goal of mutual benefit, especially when it comes to the use of marine resources for economic gain, it is much more likely that the general public will be invested in the program.

Taking ownership begins with awareness, and awareness begins with effective communication, outreach, and education from and between resource managers, scientists, resource users, decision makers, and the general public (EDAW 2009). In an examination of environmental education as an effective coastal management tool, Dijksterhuis (1996) writes that “education is indispensable in changing people’s attitudes so that they can have the capacity to assess and address their sustainable development concerns.” Individuals who understand how their actions impact the environment on which they depend are likely to make behavioral changes based on that information (Coyle 2005).

## 2.2 Key Principles of Outreach

Environmental information is shared in various ways, and effective environmental communication, outreach, and education generally keep several key principles in mind: (1) mode of communication or information exchange, (2) source of information, (3) content of information and the ability of receivers to understand it, and (4) the human dimension or affective domain of the intended receivers (OECD 1999; Palenchar and Heath 2002). In addition to these four domains, effective environmental communication remains a mutual dialogue in order to increase public involvement in conservation and management of natural resources (Brulle 2010; Ortiz 2013); therefore, information sharers both give and receive environmental messages. When a reciprocal dialogue is developed, trust and personal connections between the communicators and public are established so engagement and interactions increase (Ortiz et al. 2012).

Environmental communication, outreach, and education strategies use one or more of several modes to introduce concepts of conservation and preservation of natural resources. Options such as formal environmental education in the school curricula (Basile 2010; Ramsay, Hungerford, and Volk 1992); experiential learning activities like habitat explorations and wildlife encounters (D'Amato and Krasny 2011; Finger 2010; Zeppel 2008); radio, print, and television announcements (Hobert, Kwak, and Shah 2003; Steel et al. 2005); and online engagements like websites and social media sites (Moore and Huber 2001; Shirky 2011) have all been used to foster public participation in conservation and management. Other opportunities for dispersing natural resource conservation and management information include lecture demonstrations, large public awareness building events such as festivals, and involving existing community groups like churches and clubs (Hitzhusen 2006).

When determining how best to reach an intended audience, those who share environmental messages think critically about the actual and perceived source of information shared (EDAW 2009). Yale University's Center for Climate Change detailed in their Six Americas study what sources the respondents trusted for information about climate change. The most trusted sources were scientists and the federal NOAA and the National Park Service (NPS) though some bias may be present as the interviews were conducted within NPS sites. In some areas—like smaller Caribbean states—audiences will not trust large federal agencies or highly trained scientists due to colonialist attitudes, racial tensions, or perceived hegemony (Aikenhead 2003; Cobern and Loving 2000). A transparency in messaging, consistency, and an open, two-way dialogue between messenger and intended receivers will also build trust between the community, scientists, and managing agencies (Ortiz et al. 2012).

An effective environmental messenger is careful not to "[displace] any local knowledge that conflicts with it." Kawagley et al. (1998:134) argued that doing so "not only diminishes the legitimacy of knowledge derived through generations of naturalistic observation and insight, it simultaneously devalues those cultures which traditionally rely heavily on naturalistic observation and insight." In fact, environmental messengers agreed that "traditional ecological knowledge can be quite insightful and has much to offer," to resource managers, policy and decision makers, and the communicators of environmental messages (Snively and Corsiglia 2001).

In addition to the mode and source of environmental messages, the content of a message impacts how it is received. When sharing environmental information, the general public will have difficulty digesting extremely technical or complex information, huge amounts of data, scientific uncertainty, or conflicting or confusing information (Spyke 1999). Environmental messaging is most effective when it is directly relevant to the lives of the intended audience (An et al. 2008). If the audience is engaged by a message, they are able to internalize it and act on it. Without oversimplifying or overstating, environmental messages are most effective when they downplay technical jargon, avoid acronyms without definition, are as simple as possible, and the information is relevant to the audience (Spyke 1999; EDAW 2009).

The fourth domain established by the literature includes the perceptions and existing values of the audience—the affective domain or the human dimension. In an analysis of risk communication, Palenchar and Heath (2002) emphasized the importance of responding to community needs to successfully communicate messages. Mabogunje (2002) discussed how poverty significantly impacts an individual's environmental attitude. While multiple authors accentuate the opportunity to incentivize conservation (i.e., monetary values or tax savings), Coyle (2010:54) cautioned that environmental messengers should "attempt to develop an internal locus of control in learners" to increase the likelihood of environmental behaviors.

## 2.3 Human and Sociocultural Dimensions in Environmental Outreach and Education

Over the last 30 years, researchers have begun to explore the fact that ethnic minorities are underrepresented in environmental educational programs. Much of this research has taken place in the United States and has explored the involvement of historically underserved minority populations (e.g., African-Americans, Hispanics, etc.) in environmental education and outreach efforts. Historically, minorities have been believed to care less about environmental issues than whites, which may be a contributing factor to ethnocentrism seen in many environmental

education programs documented by researchers. Despite representing a majority of the population in the USVI, an underrepresentation of Afro-Caribbean participants in outreach programs could be detrimental to a marine outreach program and serve to alienate a large proportion of the island's population. Several studies have attempted to discover if there is a "concern gap" between minority populations and the white American population on environmental issues (with white American populations showing a higher level of concern and minority populations exhibiting less concern), as well as why that gap might exist.

The study performed by Newell and Green (1997) aimed to address the fact that many "studies that examined the relationship between race and environmental concern failed to account for other variables such as income and education." Overall, it is found that there was a higher number of minorities at lower socioeconomic levels, which was thought to potentially be the reason for the concern gaps noted in previous research on the topic. Previous studies did not control for these socioeconomic differences; the authors, in order to assess the socioeconomic effects on environmental concern across races, developed four hypotheses to test in their study (1997):

- H1: Environmental concern will not significantly increase as income increases;
- H2: Environmental concern will significantly increase as education increases;
- H3: At lower income levels, there will be significantly greater differences in environmental concern between black and white consumers than at higher income levels; and
- H4: At lower levels of education there will be significantly greater differences in environmental concern between black and white consumers than at higher levels of education.

These hypotheses were based on the majority findings at the time of their research. To conduct their research, Newell and Green created a questionnaire in which each item representing an aspect of an environmental issue was rated by the respondent on a seven-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree". Demographic data were also collected as a part of the survey for gender, age, education level, household income level, and residence. Over a span of 2 weeks, 233 interviews were conducted in a variety of public places in a large metropolitan city in the southeastern United States. Interviewers attempted to survey an equal number of African-American and white American subjects. The collected data were analyzed by MANOVAs and t-tests. The results of the study were that all four hypotheses were supported, with Hypotheses 3 and 4 more strongly supported than 1 and 2. The overall findings showed that

> "at higher levels of education and income, blacks and whites display similar attitudes toward the environment. However, at lower levels of education and income, significant differences do exist… these findings suggest that the label often attached to African-Americans of being apathetic toward environmental issues is largely unfounded…" (1997).

The authors charged policy makers at all levels of government with the "responsibility to provide equal access to information that will give all communities the leverage to enhance and protect their environment" (1997). Minority groups are generally found in lower-income, more polluted neighborhoods and may not be as well informed about the issues they face. By providing more information on environmental issues, members of minority groups can become more educated on the risks they face and express more concern about them to bring about change in their communities.

Mohai and Bryant argued that a difference exists between races in their concern for the environment, but that difference is not uniform across all environmental issues (1998). They examined three theoretical explanations as to why a concern gap may exist. The first explanation was based on Maslow's "Hierarchy of Needs Theory." In its simplest form, this explanation suggested that people cannot focus on "higher order" needs, such as the aesthetics of their environment, until their basic needs of survival were met (Mohai and Bryant 1998). From here, it was extrapolated that people of lower socioeconomic class must spend more time focusing on their needs of food, shelter, and security, and do not have the time or energy to worry about the cleanliness of their environment, as people in the upper middle class can. This was then translated to an issue of race, as it has been found that members of minority groups are disproportionately poor. These extrapolations led to the hypothesis that minorities would be less concerned with environmental issues.

The second explanation they explored was based on differences in culture between minorities and white Americans. This explanation was explored by Mohai and Bryant in detail for African-Americans, as they attributed the lack of concern to slavery when the outdoors may have been viewed as a prison, and racial discrimination when access to natural areas was restricted (1998). This explanation supported the historical view that African-Americans and minorities were less concerned with environmental issues than white Americans due to their lack of desire to be in nature, or their historically low use of natural resources for recreation.

Finally, the third explanation for the concern gap was identified as "environmental deprivation." This theory suggested that "direct experience with or exposure to pollution leads to greater concern about it" (Mohai and Bryant 1998). In conjunction with the findings of the environmental justice movement, the authors noted that "people of color communities are disproportionately burdened with environmental hazards," such as increased pollution or proximity to hazardous sites (Mohai and Bryant 1998). It can be inferred that minority groups and people of color would actually be more concerned with environmental issues than white Americans, who would not be exposed to these environmental hazards as often. There was, however, a counterargument to this environmental deprivation explanation, known as the "relative deprivation" argument. Proponents of this argument stated that when people are consistently exposed to an environmental hazard or pollution they become desensitized to it and their concern is lessened. At the time of their study, most evidence pointed to the "absolute" environmental deprivation explanation being correct. This explanation was in stark contrast with the previous two theoretical explanations.

Mohai and Bryant came up with a number of hypotheses for each theoretical explanation to see which one was the most likely cause of the concern gap between races. The researchers studied the metropolitan area of Detroit, Michigan, by conducting interviews of residents. The interviewees were asked questions (closed- and open-ended) on both local and national environmental issues, and demographic information was collected to determine neighborhood composition near hazardous sites. The study controlled for age, education, political liberalism, gender, and size of place of residence.

The findings of the study did not support the hierarchy of needs explanation, as none of the necessary criteria were met. Of all of the types of environmental issues examined, responses from African-Americans were not statistically different from those of white Americans. The cultural differences explanation was not upheld, as the findings showed that African-Americans expressed the same or a greater number of concerns for the environmental issues tested. The environmental deprivation explanation was upheld, however, as it was found that African-Americans were exposed to poorer environmental conditions than whites, and showed more concern for environmental issues, both local and in general, but with more emphasis placed on local/neighborhood issues. The study concluded that no significant difference existed in environmental concern between races, except that African-Americans expressed more concern for neighborhood environmental problems, most likely to the supported fact that African-Americans were disproportionately subjected to living in areas with poorer environmental quality.

Another study looked at the theoretical explanations of the concern gap, but focused solely on the hierarchy of need and the environmental deprivation explanations. In their initial literature review, Whittaker et al. (2005) found that evidence supporting either theory of racial concern gap was mixed among studies and largely inconclusive. It was on this basis that they began their research that spanned two decades and covered a variety of environmental topics. The researchers found that "virtually all of the existing research has ignored Hispanics entirely, focusing exclusively on African-Americans as the minority population of interest." They asked six questions in the poll taken in California: three related to general environmental concern, one regarding oil drilling, and two about toxic waste and pollution. The diversity of the California region allowed them to analyze responses from Hispanics, African-Americans, and non-Hispanic whites. Their study yielded two main conclusions with regard to race and environmental concern:

> "First, the presumption that non-Hispanic whites are more environmentally aware and concerned than either Latinos or African-Americans appears, at the very least, over-stated and out-dated, and perhaps, simply wrong… [and] Second, there appears to be considerable support for the environmental deprivation argument but only modest support for the hierarchy of needs approach" (Whittaker et al 2005).

The results of this survey showed no gap in concern for the environment between ethnic groups, and that groups of people exposed to environmental deterioration and pollution were more likely to show concern for the issue than those not exposed to it as regularly.

The irregularity of the results of research about the concern gap, especially the nearly complete reversal of historical findings compared to those of more recent studies then presented the question: should we be relying on this type of research to draw conclusions on this subject? Agyeman (2003) cited the findings of Dorceta E. Taylor, who stated that there are two types of "measurement errors" when it comes to measuring "black environmental concern… (a) the use of inappropriate indicator measures and (b) the sampling techniques… [in which researchers] often use 'preconceived, pre-coded categories' which may mean researcher and researched are talking about different things." Agyeman also pointed out that much of this type of research is ethnocentric, seen in the fact that "whiteness is unproblematized as an ethnic or cultural signifier; it is seen as 'normal' and its assumptions are seen as reasonable" (Agyeman 2003). He saw this as not only a problem in research methods, but in environmental programs as well. He went on to say that there were at least three types of culturally sensitive approaches to research on environmental concern and environmental education.

The first type that Agyeman discussed was "ethnic modeling in qualitative research," which was a method publicized by Stanfield in 1994. This method called for the creation of a new paradigm, one that was "grounded distinctly in the experiences of people of colour" (Stanfield 1994). Stanfield felt that "this would eliminate the dilemmas, contradictions, and distortions generated when researchers involved in work with people of colour operate on Eurocentric cognitive map criteria…" (1994). It was believed that this type of research would lead away from ethnocentric models and toward a more accurate assessment of environmental concern.

Next, "Culturing Environmental Education," a topic that Agyeman wrote about in the *Canadian Journal of Environmental Education*, discussed the importance of integrating the diversity of cultures into environmental education programs and research:

> "We must not just educate in a culturally appropriate way, rather we must educate in a culturally inherent way… [and we need] to make racial and cultural issues inherent in all such research, rather than focusing on them solely when they themselves are the research focus" (Agyeman 2003).

In this way, Agyeman argued we could end the ethnocentricity of our research and environmental education programs, to make them more culturally inclusive, and to "produce informed students, committed graduates, or empowered and enlightened environmental leaders" (Grass and Agyeman 2002).

Lastly, Agyeman explained the "community based participatory research" method in which, according to Shepard et al.:

> "scientists work in close collaboration with community partners involved in all phases of the research… [and] the research findings are communicated to the broader community… to effect needed changes in environmental and health policy… [and] to build capacity and resources in communities and ensure that government agencies and academic institutions are better able to understand and incorporate community concerns into their research agendas" (2002).

This allowed for increased transparency of the research, as well as increased community interest and stake in the project. It also reduced any misunderstanding of "preconceived, pre-coded categories" between the "researcher and researched" that may have otherwise altered study results. Agyeman ended his report with a call to "(re)frame environmental education along lines which recognize cultural diversity and all its implications" (2002).

Derek Hodson tackled the issue of creating a multicultural science education curriculum. Hodson believed that to achieve a truly multicultural education program three perspectives must be addressed: "their world (the immediate world of the child), our world (our particular society and environment as perceived by ourselves-both as scientists and nonscientists), or the world (in the sense that each child is encouraged and enabled to take account of multiple perspectives)" (Hodson 1993).

As of the 1990s, there was a shift in the emphasis of science education that was aimed at "(1) making science education more society oriented and (2) making science education more learner centered" (Hodson 1993). Hodson argued that, although this was the goal, many programs "still portray science as located within, and exclusively derived from, a western cultural context" (Hodson 1993) and thus do not meet the goal of being "society oriented." He also pointed out that being "learner centered" meant that all types of learners needed to be considered in the construction of science curricula, across all cultural boundaries. Research showed that when children learned, they based the information presented to them on their previous experiences and knowledge, in which case "cultural factors outside the school environment play an important role in the development of children's scientific concepts" (Hodson 1993). Unfortunately, many teachers of western science assumed that all children start off with the same background and understanding, which can present learning obstacles to students of minority ethnicities.

Language barriers to minority students include the lack of understanding of the language in which the material is presented (especially if English is their second language), the misunderstanding of science terminology, the presentation of the material, and required language-based learning material (Hodson 1993). Hodson offered solutions to these problems, such as assignments that do not require writing, such as making videos, taking photographs, or making models. He also suggested having the students work in collaborative groups to increase the understanding of the language. He cautioned teachers to be culturally conscious when presenting information to students in regard to body language or tone of voice, and to take different customs into account when working with students. For example, in some cultures, it is considered disrespectful to ask the teacher a question. Additionally, the use of dissection for learning purposes or preserving dead animals may be offensive to some cultures (Hodson 1993). Hodson also advocated for a more democratic system within the school and the classroom as it sends a message of "mutual tolerance, respect, and value for all" (1993).

Hodson cautioned teachers not to tokenize or stereotype minority cultures, however, as this can reinforce scientific racism. Materials for education programs should be developed to "show the contributions made by nonwestern scientists in the ancient and modern worlds," and local

cultural customs should be weaved into lessons to show their importance and value, as well as to present different ways to view science and the natural world (Hodson 1993).

A case study that exemplified creating an inclusive science education program was that of Roth and Lee (2003) at Henderson Creek in Oceanside, California. They analyzed a new way of defining "scientific literacy" through their observations and experiments by teaching three seventh-grade classes over a 3-year period. They argued that the needs of minority groups were not currently being met as science education programs continued to push students toward the laboratory and away from their real-life community (Roth and Lee 2003). They explained that "many students (especially women) who leave science are discouraged by the organizational structure of science including its competitive and individualistic nature and its claims to objectivity" (Roth and Lee 2003), and argued that there should be a change in its structure to be sensitive to all students' strengths and interests.

The researchers made the argument that, in the real world, a single person does not know how to do everything—that is, society is based on the division of labor. They provided examples such as specialized doctors or auto mechanics, and stated that science can be viewed the same way (Roth and Lee 2003). This could be seen in the way that students divided up responsibilities within their working groups. The authors developed the analogy of a rope to represent the entire community and how it is composed of threads, or individual human beings to support it. In this way, they proposed that scientific literacy is achieved not at the individual strand level, but at the level of the entire rope (2003).

During their study, the students became involved in the community project to study and rehabilitate the environmentally degraded Henderson Creek in partnership with the Henderson Creek Project environmental group. In the classes taught by the researchers:

> "students designed and conducted their own projects in and along Henderson Creek with the intent to report their findings at an open-house event organized each year by the HCP. Fundamentally, [the researchers] wanted to provide students with the opportunity to participate as active citizens in community-relevant affairs by contributing to the knowledge and representations available in and to the community" (Roth and Lee 2003).

Like the advice given by Hodson, Roth and Lee allowed the students to take on a variety of roles in their research groups and collect and present information in any way they chose. Some students conducted interviews, while others made videos, while still others used traditional

scientific methods. This project allowed the students to be directly involved in a real-life issue and learn outside of the classroom. This gave the students the knowledge of applications of science outside the classroom to stimulate life-long learning and community involvement. Minority students were also able to incorporate their own culture into their project design (Roth and Lee 2003).

Cole recognized the need for an environmental education program to not only be multicultural but multidisciplinary as well, in order to fully understand what it means to live well in a place (2007). She acknowledged that, currently, environmental education is seen more as an "add-on" to existing science curriculum, rather than its own subject. Through her own teaching experiences, Cole discovered that "although scientific methods produced rich and insightful data about human impacts on local ecology and biology, these methods did not address the more complex political and social realities of life in the valley," and that other methods would be needed to fully understand how impacts of race and class shape people and their environment (Cole 2007).

Cole discussed the environmental justice movement in which environmental issues were connected to civil rights issues, which stirred a greater following among the public, especially when "communities demonstrated that their racial and economic make-up was directly correlated with unequal exposure to environmental pollutants" (Cole 2007). Through this movement, issues relating to the environment were no longer exclusively about the natural world and concern transcended through all social classes. This movement presented the need to expand environmental education programs to include cultural and race issues and concerns.

Cole (2007) stated that if the ultimate goal of environmental education is the development of an "environmentally literate citizenry," and environmental literacy was defined as "a culturally specific body of knowledge that fosters particular ways of thinking and acting the world," then environmental educators needed to look critically at their biases and "at the ways primarily dominant, White, western tradition of scientific knowledge, inquiry methodologies, and decision-making behaviors (as 'environmentally literate citizens') shape environmental education methods and practices" (Cole 2007). Although science was perceived as being completely objective, it was shaped by cultural values and biases. Native and indigenous methods of science should be included in curriculum to present a more broad understanding of science and the way the world works.

Hill (2003) further explored the environmental justice movement and its influence on adult education. The goal of adult education in relation to environmental justice was to help rectify

situations in which ethnic minorities and people of lower socioeconomic class were disproportionately adversely affected by environmental hazards. This encompassed a wide variety of topics from urban sprawl, to pollution, agriculture, and labor issues (Hill 2003).

Hill acknowledged the need for local grassroots adult environmental education:

> "Significant change in society often comes from the bottom up rather than from the top down… Education for ecological democracy must begin with growth and empowerment of community-based associations that are the heart of civil society" (2003).

He also pointed out that these local groups "recognize that local people have valuable knowledge… [and] many activists challenge the scientific establishments (Merrifield 1989), especially when it rejects lay-expert opinion" (Hill 2003). This created a more culturally diverse knowledge base and exposed the fact that cultural politics plays a role in scientific knowledge. Hill concluded that social movements such as environmental justice and adult education help to bring about change and transformation in the world.

The power of education in relationship to public advocacy was also explored in a case study by Rogers (2013). Two marine resource reserves in Western Australia, Ningaloo and Ngari Capes, were examined to determine if there was a divergence between expert and public values of the reserves. Both public and expert opinion was relied upon when governments made decisions and the researcher wanted to determine if expert advice on a topic was reflective of public values. This study also evaluated whether public awareness on the issue created a difference of opinions. The parks were selected because one, Ningaloo, was well known and visited by the public, while the other, Ngari Capes, was not publically known to the same extent. Opinions on the park were gathered through a survey consisting of a set of questions about Ningaloo, a set on Ngari Capes, and a third on sociodemographic characteristics (Rogers 2013).

The results of the survey found that expert and public opinion converged for Ningaloo and diverged for Capes (Rogers 2013); this led to the conclusion that public awareness played a role in concern for environmental issues. This study supported the need for adult and school-aged environmental education.

Thus far, much of the literature has noted that environmental education programs are not fully inclusive of all cultures and races. "Limitations within the curricula may restrict the diversity of people involved in all levels of environmental education" (Lewis and James 1995). This is not

only an issue of what the curriculum focuses on, but of who is actually creating the curriculum. In 1991, at an environmental education curriculum workshop, "those who were creating an inclusive curriculum were almost all from White, middle-class, or upper-middle-class backgrounds" (Lewis and James 1995). As Hodson (1993) discussed in the creation of science curriculum, this could be a disadvantage to minority students and could be, although unintended, distancing for them. Lewis and James identified seven misconceptions that lead to the exclusiveness of environmental education programs with regard to race and culture, and offered a way for educators to evaluate their own programs.

The first misconception they identified was that "people of color aren't interested in environmental issues" (Lewis and James 1995). As evidence has suggested (above), this fact is unfounded and out-of-date. Lewis and James stated another misconception of environmental education programs was that there were "few people of color who can serve as role models in environmental education" (1995). They stated that history provides several examples of minority cultures contributing to science and environmental education; however, these examples were less widely known or celebrated compared to the contribution of white citizens. Hodson (1993) also saw this as a detriment to science education, and he, Lewis, and James all advocated for the inclusion of racial diversity when discussing the history of science and environmental issues. Lewis and James also found three misconceptions of environmental education related to the presentation of the subject: (1) the issues given the most attention are universally appealing to all students, (2) the needs of people of color are being met, and (3) presentation of environmental education programs is appealing to all audiences. These views were mirrored by Cole (2010) and Roth and Lee (2003), who pointed out the shortcomings of education developed for a homogenous student population. Lewis and James (2005) stated the learning barriers to students were created when information was not presented in a way that was usable for all learning styles. They also discussed how students could be successful in science and environmental programs when they were allowed to collect and present the information in a way that was appealing to them. Finally, the authors noted that, without including the diversity of science methods between cultures, the needs of minority groups and people of color cannot be fully satisfied. The final two misconceptions presented in the article were that people of color are not interested in pursuing a career in environmental education and that discussion of racial diversity and environmental education needed to be initiated and facilitated by environmental educators (Lewis and James 1995). The authors pointed out that people of color were interested in pursuing these types of careers, but they may not know what options are available to them, or may hold a different title. They also presented evidence that minorities have been involved with the development of environmental education, but their contributions needed to still be more widely recognized (Lewis and James 1995).

The authors called for "a unified, multidimensional agenda for environmental education that is more likely to meet the needs of all citizens," by recognizing "the diversity of environmental issues facing all of our students… [collecting] input from a variety of sources… [recognizing] the diversity that exists among all environmental educators… [and guarding] against tokenism" (Lewis and James 1995). They also noted that people of color needed to play an integral role in all steps of the planning process. By doing that, and by evaluating current programs for their cultural diversity, Lewis and James believe that we can move towards a multiracial environmental education program.

All of the authors discussed here presented valuable information on cultural diversity in environmental issues and education that can be transferred to developing a successful marine outreach and education program in the USVI. They disproved the notion that minority cultures are uninterested in environmental issues, which shows that programs should cater to the needs of all citizens and allow them to expand their knowledge base on how to protect and conserve marine systems. The authors also discussed the extreme importance of culturally inclusive programs. This would mean that the native traditions and ideas in the USVI should not only be discussed in the curriculum, but should be integrated in the planning process and used to present the information in a way that is culturally relevant to various stakeholders. Additionally, allowing the students to work on real-world projects can enhance learning and foster a life-long commitment to environmental issues. Finally, the research suggested the importance of educational programs making the public aware of the issues they face and inspiring a change in behavior to protect their local resources.

## 2.4 Conclusions

In summary, the literature is quite clear that sharing information and creating awareness are not the same as changing behaviors, participating in management, or adopting lifestyles. Despite much of the research cited occurring outside the USVI, the issues explored are relevant to USVI context. These issues include the mode by which information is transmitted, the source of the information, the content of environmental messages, and sociocultural issues. As Konrad Lorenz, Austrian zoologist once said, "Said is not heard. Heard is not understood. Understood is not accepted. Accepted is not yet done." To change the public's environmental behaviors and increase their participation in management decisions, both the National Environmental Education Foundation (NEEF) and the OECD stress that the public must feel ownership and an in-depth understanding of how their actions impact their environment. Finger 2010 highlighted that knowledge of the environment was unlikely to predict most environmental behavior, and a better predictor was a number of experiences in and with the natural environment.

Effective environmental messaging offers clear, concise techniques or behaviors that audience members can pursue. NEEF terms this "personal conduct knowledge" because, with it, "people willingly go a step farther to take personal action and make the connection between an environmental issue and their own individual conduct" (Coyle 2005). NEEF reminded environmental messengers that environmental literacy, defined as the level of understanding slightly deeper than simple environmental awareness, takes time and is not developed by attendance at a single program.

## 3.0 EXISTING MARINE OUTREACH AND EDUCATION PROGRAMS IN THE USVI

Project team members developed a matrix of existing marine and fisheries communication efforts to quantify relevant efforts currently underway in the USVI (see Appendix A). The team members initially contacted all members of the VINE listserv and requested information about historic, current, and future communication, education, and outreach efforts; key contacts; and resources. This request was followed with individual emails, phone calls, and personal visits by an investigator to schedule an appointment to discuss each voluntary respondent's programs.

At the appointed time, the investigator asked each respondent to list the communication, education, and outreach programs and resources they or their agency produced, implemented, or are planning. The investigator then asked the following open-ended questions and offered sample responses about each program or the media listed by the respondent:

- Marine or Fisheries Topics Covered
- Agency, Organization, or Individual Presenting
- Location(s)
- Method(s)
- Annual Participation
- Audience Makeup
- Estimated Effectiveness
- Reflective of Mission
- Challenges

Afterward, the investigator asked if the respondent could list other individuals to contact who were involved with other programs. Generally, several names came up in the discussion of each program. The investigator then made significant efforts to contact all named individuals and agencies through phone calls, emails, and personal visits. Finally, all data were aggregated into a draft matrix. The size and readability of the initial draft matrix were cumbersome so the

investigator developed and displayed representative categories/headings by which a dot could be added to represent inclusion. These categories/headings are defined in Appendix B.

One key finding is that an exceptional number of marine and fisheries communication, education, and outreach efforts occur in the USVI. A tabulation of recently past (within the last 3 years) and current activities suggested that over 100 distinct efforts were produced by over 70 different organizations, agencies, institutions, and individuals, with almost 180,000 contacts (residents and tourists) made with members of the public in aggregate. Fifty-four programs and resources did not report an annual number of individuals reached, and the numbers of contacts are likely much higher. However, as reported by matrix respondents, interviewees, and focus group participants, these 180,000 individuals were not distinct and many were believed to participate in multiple programs, some of which were no longer occurring.

For those programs with available data, a large proportion (53 of 102 programs, or 52.0 percent) covers the ecology of the marine environment (Figure 1). Following this in overall proportion are programs covering policy and decision making and sustainable marine use. The large proportion of marine ecology programs is likely due to the ubiquity of a basic ecology message that serves as a baseline for other programs, whether they are ultimately aimed at attempting to increase environmental behavior or simply build awareness about a key issue. Therefore, environmental educators typically work to develop a general marine ecology message as a foundation for their overall specific objective (e.g., safe snorkeling practices, fishing impacts, etc.).

The matrix shows that more complex topics are less frequently covered by existing activities. Climate change, water quality, and watersheds are highly complex and often difficult to teach in a short exchange with the general public, requiring more effort and resources on the part of educators. Simpler subjects, like some basic marine ecology and sustainable marine use, are easier for participants to receive in an outdoor experience or lecture; this may explain why there are more programs covering them or organizations whose outreach missions are oriented around these issues.

Of those programs for which there are data, experiential learning is, by far, the most frequently used technique to share information (Figure 1). This suggests a well-developed understanding of how to engage with the public by educators, since experiential learning is consistently stated by interviewees and focus group participants as being a key teaching tool. Responses also suggested that media resources like pamphlets, brochures, and websites were not used as frequently, likely due to development costs or concerns that they would not be as engaging as other methods. The three lowest reported methods were social media, public festival events, and internships or

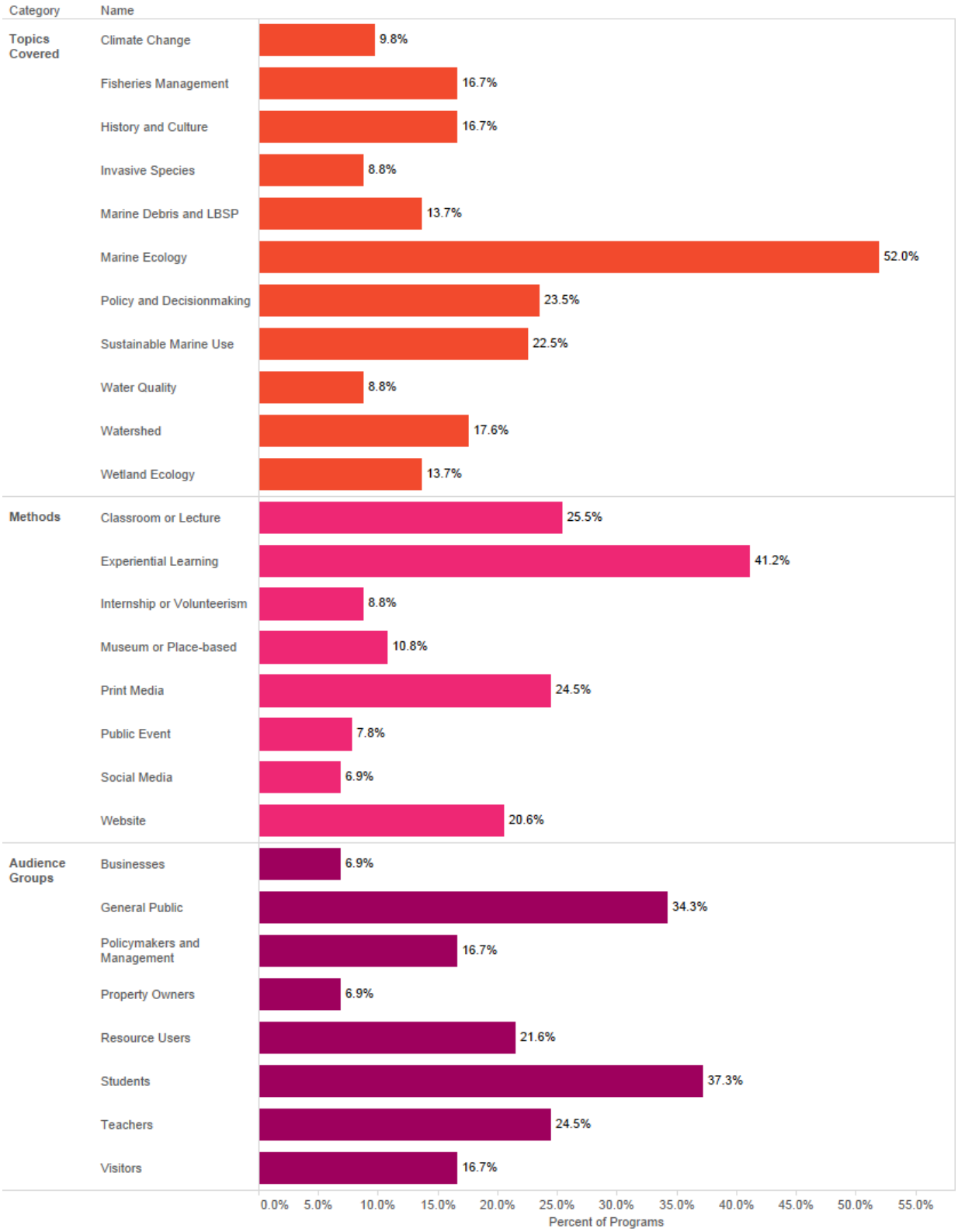



**Figure 1. Existing Outreach and Education Topics, Methods, and Audiences**

volunteerism, which each take considerably more time and resources to manage and implement than leading a hike or presenting a lecture, though this does not in any way underestimate the effectiveness of these outreach and education tools.

In terms of user groups or audience groups, students and members of the "general public" were the user groups most frequently identified for those programs for which data were collected (Figure 1). Students included elementary and secondary students, as well as college students. Programs oriented toward the general public were considered open and not particularly focused on any one group. Teachers, visitors/tourists, resource users, and policy makers were also key audiences with over a dozen programs oriented toward them. The least involved audiences included property owners and businesses, with seven programs apiece oriented toward them.

Overall, the matrix of existing activities shows that a great number of people are contacted by environmental program staff members annually. The messages typically cover marine ecology through experiential learning with students and the general public. Topics least covered include climate change and water quality. Businesses and property owners, which overlap somewhat with the general public, are infrequently targeted or reached. Programs seldom use social media, large public events, or internships or volunteers to share messages.

## 4.0 INTERVIEW AND FOCUS GROUP RESULTS

Project team members conducted individual interviews with key outreach and education leaders active in the USVI, asking them for their opinions and input on how their programs operate, who their programs involve, what major challenges they face, and how they could be more successful, among other questions. In addition to the interviews, two focus group meetings were held in the USVI, one each on St. Croix and St. Thomas, during April, 2014. Key stakeholders from local government agencies, educational institutions, and NGOs, and others directly involved in marine outreach and education, were invited to participate in the focus groups. These key stakeholders were recommended to the project team for interviews and/or focus group participation via the project steering committee, which included representatives from local and regional NOAA offices familiar with USVI education efforts. These steering committee representatives recommended employees of government agencies charged with marine resource conservation and protection, as well as academics, educators, members of the media, community organizers, and managers of NGOs focused on marine resources. Issues explored during the focus groups included those discussed during the individual interviews, as well as more detailed discussions focused on specific challenges faced and recommendations for programs associated with commercial fishing, recreational marine use, climate change, and land-based/marine pollution.

Information gathered during the interview phase has been combined with focus group responses, and major trends are presented here.

Throughout the process, interviewees and focus group participants were asked to provide their perspectives on the current outreach and education programs with which they were familiar, as well as the agencies/entities with whom they regularly worked, and the communication methods commonly used in their role as a manager and/or educator.

The descriptions of outreach activities presented below are framed by general order of the activity and its place in either the interview or focus group effort. Although all systematic qualitative data collection techniques were conducted with interviewees and focus group participants, they are described as part of the interview effort.

## 4.1 Outreach Activities and Methodology

### 4.1.1 Individual Interviews

Individual interviews were conducted via telephone or in person, depending on the location of the interviewee and the availability of project team members. Interviews typically lasted 45 to 60 minutes. A semi-structured, open-ended interview protocol was developed for the interviews (Bernard 2011:156–186; Spradley 1979). This protocol included a list of questions that project team members asked all interviewees, as well as general direction on how open-ended interviewing would be facilitated in the field. Project team members were able to explore individual issues brought up by interviewees and ask additional questions not formally included in the protocol if the topic was likely to result in additional information regarding existing outreach and education programs, challenges, recommendations, or solutions. Since interviewee answers were not constrained, it was not uncommon for interviewees to answer multiple questions after a single prompt. In those instances where the project team member believed that a protocol question had already been answered, the question was skipped to avoid respondent fatigue. Two sets of questions were developed for key stakeholders: one set of questions for stakeholders involved in planning, leading, and/or managing outreach and education programs; and one set of questions for stakeholders who identified themselves as participants in outreach and education programs. These populations were not mutually exclusive and some interviewees were asked both sets of questions depending on their role in the community. The following list of questions was used during the interview process:

- For all interviewees (question asked to establish their role in the community and marine education)
    - What do you do?
- For outreach and education planners, leaders, and/or managers
    - With what current communication, outreach, or education programs are you associated, and what is your role?
    - What do you consider to be a community, outreach, or education program?
    - What does the communication, outreach, or education program aim to achieve?
    - Who does your communication, outreach, or education program target? Who does your education program reach? Is there a difference between who you target and who you actually reach?
    - How does your communication, outreach, or education program work? What approach does it have?
    - How successful is your communication, outreach, or education program? What is your measurement of success?
    - What are the major challenges faced by your communication, outreach, or education program? In your opinion, why do they exist?
    - What are the major successes of your communication, outreach, or education program? In your opinion, how did you achieve these successes?
    - If you could change one aspect of your communication, outreach, or education program, what would it be? Why?
- For outreach and education participants and other "end users"
    - Can you recall any communication, outreach, or education programs? Do you participate in them? Why or why not?
    - How do you learn about new actions/events/efforts associated with your role in the community? How do other people in your same position learn about new actions/events/efforts? What technologies do you use?
    - Are there challenges to obtaining important information for your role as a [insert role depending on responses above]? If so, what are they?

Following these questions, a series of systematic qualitative data collection techniques were used to gather additional information on existing programs. While the individual interview questions focused more on the activities of the interviewee's own program, the other collection techniques were focused on relationships with other programs and agencies in the USVI.

#### 4.1.1.1 Successive Freelisting

Freelists are a systematic qualitative data collection tool used by social scientists to identify cultural domains, which are a set of items that are alike in some important way (Weller and Romney 1988:9–20). Typically, interviewees are asked to list as many items as they can think of in a reasonable amount of time about a specific topic. Interviewees can list as many or as few as they would like, but are encouraged to end their list when they start struggling to add more items. Lists from all interviewees are combined and the frequency of individual items is tallied, as well as their average rank in the lists in which they appear. Theoretically, those items mentioned the most frequently and most immediately are of the greatest salience in any given community and can form a foundation for broader study. Conversely, freelisting can suggest idiosyncratic items within a cultural domain that may be more difficult to study because they may be unfamiliar to a large proportion of community members.[1] Calculations of salience can suggest the level of community agreement within a cultural domain, with low salience suggesting a low level of agreement between community members and high salience suggesting a high level of agreement.

Successive freelists are created when interviewees are asked to make sub-lists for each of their initial freelist responses (Ryan et al. 2000). These sub-lists are typically focused on traits or features of the original freelist items. In contrast to measurements of rank and salience, the frequency of traits across each respondent is tallied and correspondence analyses can be performed to suggest the relationships between the original list of salient items. The relationships can be displayed visually through multi-dimensional scaling scatterplots. While freelisting identifies those items most important in a cultural domain, it does not provide any information as to their relationship to one another. Successive freelisting, however, does provide this information by synthesizing respondent viewpoints on key traits and quantifying the similarities between all items.

[1] Analysis of freelisting results can also suggest which respondent out of a group is most similar to the aggregate responses of the community as a whole. This can be useful when needing to identify key informants who may be most familiar with the cultural domain being studied. Since interviewees and focus group participants were recommended through a separate process, identification of key informants was not conducted through an analysis of freelist data.

For this project, each interview and focus group participant was asked to list "all of the education and outreach programs that you can easily remember." It was planned that the result would help to define the cultural domain and serve to bound the discussion of outreach and education programs to those salient to the group as a whole and, by extension, to other stakeholders engaged in outreach and education in the USVI. Following the completion of this list, each participant was asked to make successive freelists for each of the programs they originally listed. Each participant was asked to list the following for each program: topic/focus of the program, primary user group/audience, method(s) of outreach, and challenges to its continued success. Project team members and members of the steering committee believed that these traits were the most important to explore to provide a description of existing outreach and education programs in the USVI and suggest where overlaps and/or gaps existed in current efforts.

Because freelist results are not constrained by a list of pre-formulated responses, respondents provided a wide range of answers. In many cases, the responses varied in spelling or syntax but were clearly referencing the same agency or trait. For example, "Coral World" and "C-Dubs" both reference the same organization. Likewise, "money," "funding," and, "$$" were coded as the same trait ("funding") with regard to challenges faced by agencies and organizations. Project team members simplified responses based on their knowledge of programs in the USVI and their traits. This simplification and aggregation served to produce a more consistent dataset.

Unfortunately, completion and response rates for the successive freelists were not high among interviewees and focus group participants. While many respondents successfully completed the initial freelist inquiring about programs, not all respondents completed the four successive freelists. In some cases, only one program had associated subsequent lists. In other cases, respondents included no additional lists. This was likely due to time constraints on the part of the respondent. Project team members found that the lists associated with topic, audience, and methods of outreach paralleled closely the results of the literature review. Due to the paucity of data for these three sub-lists, the results of the literature review replaced respondent's answers. In those instances where the program listed in the primary freelist did not match the programs documented in the literature review, the topics/audiences/methods associated with marine outreach and education programs from the literature review associated with the agency were used as a proxy. Results from the fourth list regarding challenges were coded to reduce duplication in concepts and themes and were applied as respondents noted in their collective sub-lists despite some missing responses.

#### 4.1.1.2 Communication Methods Survey

One focus of this project was to understand the various communication methods used by agencies, NGOs, and key stakeholders to gather and communicate information about outreach and education programs throughout the USVI. As part of each interview and focus group, project team members facilitated a survey regarding the current use and preferred use of various communication methods (Bernard 2011:187–222; Weller and Romney 1988:66) (Appendix C). Specifically, this survey asked:

- How do you currently get information related to your role?
- How would you rather get information related to your role?

Respondents were asked to check the appropriate box for a wide range of traditional media, social media, websites, and technological applications. Project team members then tabulated answers by category.

#### 4.1.1.3 Social Networks

Documenting and measuring social networks is another systematic qualitative methodology employed by project team members for this project. Social networks document the relationships between a group of "actors" within a particular context (Borgatti et al. 2013; Knoke and Kuklinski 1982). Analyses can be used to determine the extent of a network, key individuals, and actors who—if removed—would affect the cohesion of the larger group, among other measurements. The analysis of social networks is predicated on the assumption that any social system involves a number of actors and that those actors influence one another's decisions; also, the analysis of social networks assumes that patterns exist in social relationships that can be quantified and measured. Participants are asked to identify others in the group with whom they have a specific relationship. For example, an analysis of Facebook could explore the relationship of "friends" while an analysis of a company may explore the relationships between supervisors and their staff, regardless of friendship ties. Each actor becomes a node and connections are made between nodes based on the various responses. Ideally, each node would be surveyed to list its relationships so that a complete understanding of the entire social network could be achieved. In practice, however, large networks are typically too complex and expansive to survey completely within project constraints.

For this project, each interviewee and focus group participant was asked to identify the agency, NGO, etc. for which they worked and to identify the agencies, NGOs, and companies (i.e.,

nodes) with whom they have relationships. Specifically, project team members planned to ask each interviewee and focus group participant the following questions:

- Who do you depend on for information related to your role in marine outreach and education?
- With which organizations, agencies, and/or companies do you (or your organization) work most closely as part of your role in marine outreach and education?
- What specific user groups do you (or your organization) target with your education, outreach, and communication efforts?

However, project team members found early in the interview process that the first two questions, in practice, received the same answers. Additionally, answers to the third question mirrored answers received during the successive freelisting exercise since most people would list their own program in their freelist. Thus, only the second question ("work closely") was carried forth for all interviewees and focus group participants.

In a manner similar to the successive freelisting exercise described above, project team members simplified responses from interviewees and focus group participants to be internally consistent. For example, "DPNR-DFW," "DFW," and, "Division of Fish and Wildlife," were coded as the same entity. A key choice made in the coding was that responses of "DPNR," or simply "Department of Planning and Natural Resources," were coded as "DPNR-CZM" assuming involvement with the division of Coastal Zone Management in marine outreach and education.

### 4.1.2 Focus Groups

As stated above, two focus groups were held as part of this project (Bernard 2011:156–186; Morgan 1997). One focus group occurred on St. Croix and involved those people headquartered in St. Croix as part of their USVI-wide duties and people most involved in St. Croix-based outreach and education programs. Likewise, the focus group in St. Thomas included those people headquartered in St. Thomas and St. John, as well as those people most involved with programs in St. Thomas and St. John. Focus groups were held in agency facilities currently engaged in outreach and education. Each focus group was meant to provide an opportunity for a wide range of marine education stakeholders to gather and provide input on existing programs, why some programs are successful or not, existing gaps in marine outreach and education, and suggestions for immediate steps that can be taken to improve outreach and education in the USVI. The agenda for both focus groups can be found in Appendix D.

Project team members facilitated the focus groups, establishing the ground rules and agenda for the meeting. In addition to the successive freelisting, social network, and communication survey, the focus group participants discussed which current programs were the most effective, which programs could be more effective, major challenges faced by marine outreach and education programs, successes achieved by past and current programs, and ideas to change marine outreach and education in the USVI. To focus the discussion on those programs most familiar to everyone and to survey the opinions of focus group participants, people were asked to participate in a "dot voting" exercise, described below.

After lunch, participants in each of the focus groups were split into two smaller groups to discuss specific topics related to marine outreach and education: one group discussed fishing and recreational activities, while the other group discussed climate change and pollution. While the discussion in each of these smaller groups was free-flowing and open-ended, some key questions were included in the agenda to guide the discussion. Specifically:

- Where do you see the future state of education, outreach, and communication in the USVI related to your topic?
- Challenges to existing or proposed education, outreach, and communication programs?
- Gaps of existing or proposed education, outreach, and communication programs?
- What are the untapped or underutilized resources?
    - What kinds of funding opportunities exist?
- Is general awareness lacking? How can awareness be improved?
- What are the most appropriate strategies for a communications framework? How should communications be conducted?
- What are initial action steps for addressing gaps?

#### 4.1.2.1 Dot Voting

One early activity during the focus groups was a review of the matrix of existing marine outreach and education programs developed for the literature review. The matrix identified nearly 100 programs active in the region, sponsoring agency/organization, topic, audience, and method of outreach/education. When available, the list also included the estimated number of participants. Focus group participants were then asked to vote for:

- Which programs are the most effective?
- Which programs do you want to be more effective?

Focus group participants were provided 10 dot stickers—five green and five red—to apply to a large printout of the matrix and vote in any manner they saw fit; dots could be applied all to the same program if the respondent felt passionately about it, dots could be distributed one at a time across five different programs, or dots could be applied in any combination (Bens 2012). Green dots were applied to programs deemed "most effective" and red dots were applied to programs that could be "more effective." Theoretically, these two groups are not mutually exclusive, as a highly successful program could still be perceived as having room for improvement. In practice, however, the two voting prompts were connoted as being opposites and individual focus group participants rarely voted for a program with both green and red dots. Project team members tabulated the dot votes and presented top vote-getters to the focus group.

The dot voting exercise served to focus the discussion on those programs that were the most successful and those programs that were valued by key stakeholders but needed additional help to be successful. Discussion regarding the most successful programs touched on how and why they have achieved this success, as well as discussed the possibilities of replicating this success in other programs. Discussion regarding programs that could be more effective touched on reasons for their low participation and/or success rates and ideas for improvement that could be applied not only to the program being discussed, but to all programs in the USVI with low participation or support.

## 4.2 Results

This section presents the results gathered through the various systematic qualitative data gathering techniques used as part of this project, as well as key themes heard throughout the interviews and focus groups regarding existing outreach and education programs, gaps in existing programs, opportunities, and recommendations to improve marine outreach and education throughout the USVI.

Results of the successive freelisting are presented first to provide a baseline description of the most salient marine outreach and education programs and how they are related to one another. Results of the focus group dot voting are presented next, providing additional insight on the various programs present in the USVI and the key stakeholder opinions surrounding them. The results of the social network analysis are presented third, including descriptions of network

centrality and cohesion. Next, the results of the communication methods survey are presented. Finally, major themes heard throughout the interviews and focus groups are presented.

### 4.2.1 Successive Freelisting

Responses from interviews and focus group participants regarding the marine outreach and education programs with which they are familiar are presented in Figure 2 and Table 1 (n=36). As stated above, freelist measurements include frequency (i.e., how many times it was mentioned), average rank (i.e., where in a given list it was mentioned), and salience, which is a function of the two measurements. In Figure 2, the size of the bar indicates salience (left y axis), while the red circles indicate its frequency (right y axis, by percentage). The shade of the bar and bar value both indicate average rank, with blue shades indicating a higher average rank. Table 1 is ranked by salience and is presented in three columns. This initial freelist was meant to capture and help define the domain for active programs in the USVI, with high salient values (near 1.00) suggesting wide consensus about any one item.

The salience rankings for this domain are low, with the highest ranked program, "Snorkel Clinics," receiving a value of 0.138 and being mentioned by only 16.7 percent of the respondents. It is clear from these results that the concept of a singular program is not well known among respondents, but the activities of individual agencies and/or organizations are known. In many ways, all actions of an agency or organization are recognized as an "activity," even if the agency or organization has many different concurrent marine outreach and education programs. Still, the rankings do show a variation between the highly ranked programs and the lowly ranked programs, suggesting that, while the domain may be somewhat ambiguous and fluid, there is at least a slight consensus with regard to which agencies or agency-sponsored programs are the most well-known and representative of marine outreach and education programs in the USVI.

For the purposes of subsequent correspondence analyses, only the top programs were carried forward. With no clear "break" in the data (where frequency and/or salience measurements drop noticeably and idiosyncratic responses become more common), a relatively arbitrary choice was made to carry forth those programs with salience values over 0.05. These programs are represented as emboldened text in Table 1.[2] As stated above, each program was assigned a range of traits based on the results of the literature review and the successive freelisting exercise completed by interviewees and focus group participants. Table 2 presents the traits, by category,

[2] One program, "CZM Outreach," was removed from additional analyses because its primary program, the East End Marine Park (EEMP), was already included in the analyses.

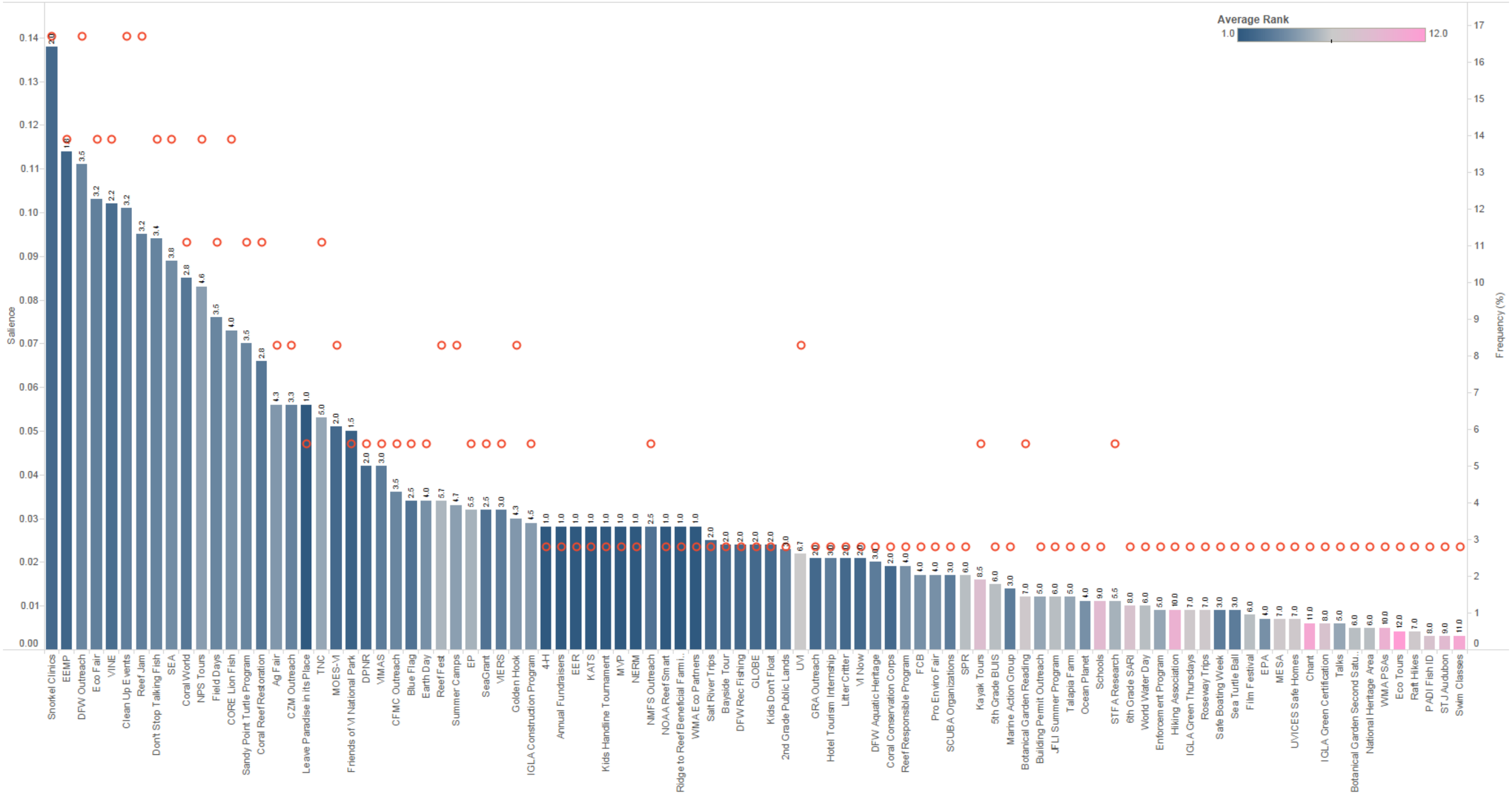



**Figure 2. Freelist Responses**

## Table 1
## Freelist Responses and Measurements

| Item | Frequency (%) | Average Rank | Salience | Item | Frequency (%) | Average Rank | Salience | Item | Frequency (%) | Average Rank | Salience |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Snorkel Clinics** | **16.7** | **2** | **0.138** | IGLA Construction Program | 5.6 | 4.5 | 0.029 | Marine Action Group | 2.8 | 3 | 0.014 |
| **EEMP** | **13.9** | **1.8** | **0.114** | KATS | 2.8 | 1 | 0.028 | Botanical Garden Reading | 5.6 | 7 | 0.012 |
| **DFW Outreach** | **16.7** | **3.5** | **0.111** | WMA Eco Partners | 2.8 | 1 | 0.028 | Talapia Farm | 2.8 | 5 | 0.012 |
| **Eco Fair** | **13.9** | **3.2** | **0.103** | NERM | 2.8 | 1 | 0.028 | Building Permit Outreach | 2.8 | 5 | 0.012 |
| **VINE** | **13.9** | **2.2** | **0.102** | Annual Fundraisers | 2.8 | 1 | 0.028 | JFLI Summer Program | 2.8 | 6 | 0.012 |
| **Clean Up Events** | **16.7** | **3.17** | **0.101** | NOAA Reef Smart | 2.8 | 1 | 0.028 | Ocean Planet | 2.8 | 4 | 0.011 |
| **Reef Jam** | **16.7** | **3.17** | **0.095** | EER | 2.8 | 1 | 0.028 | Schools | 2.8 | 9 | 0.011 |
| **Don't Stop Talking Fish** | **13.9** | **3.4** | **0.094** | MVP | 2.8 | 1 | 0.028 | STFA Research | 5.6 | 5.5 | 0.011 |
| **SEA** | **13.9** | **3.8** | **0.089** | 4-H | 2.8 | 1 | 0.028 | World Water Day | 2.8 | 6 | 0.01 |
| **Coral World** | **11.1** | **2.75** | **0.085** | Kids Handline Tournament | 2.8 | 1 | 0.028 | 6th Grade SARI | 2.8 | 8 | 0.01 |
| **NPS Tours** | **13.9** | **4.6** | **0.083** | NMFS Outreach | 5.6 | 2.5 | 0.028 | Roseway Trips | 2.8 | 7 | 0.009 |
| **Field Days** | **11.1** | **3.5** | **0.076** | Ridge to Reef Beneficial Farming | 2.8 | 1 | 0.028 | Sea Turtle Ball | 2.8 | 3 | 0.009 |
| **CORE Lionfish** | **13.9** | **4** | **0.073** | Salt River Trips | 2.8 | 2 | 0.025 | Safe Boating Week | 2.8 | 3 | 0.009 |
| **Sandy Point Turtle Program** | **11.1** | **3.5** | **0.07** | Kids Don't Float | 2.8 | 2 | 0.024 | IGLA Green Thursdays | 2.8 | 7 | 0.009 |
| **Coral Reef Restoration** | **11.1** | **2.75** | **0.066** | DFW Rec Fishing | 2.8 | 2 | 0.024 | Enforcement Program | 2.8 | 5 | 0.009 |
| **Ag Fair** | **8.3** | **4.33** | **0.056** | Bayside Tour | 2.8 | 2 | 0.024 | Hiking Association | 2.8 | 10 | 0.009 |
| **Leave Paradise in its Place** | **5.6** | **1** | **0.056** | GLOBE | 2.8 | 2 | 0.024 | Film Festival | 2.8 | 6 | 0.008 |
| **CZM Outreach** | **8.3** | **3.33** | **0.056** | 2nd Grade Public Lands | 2.8 | 3 | 0.023 | MESA | 2.8 | 7 | 0.007 |
| **TNC** | **11.1** | **5** | **0.053** | UVI | 8.3 | 6.67 | 0.022 | EPA | 2.8 | 4 | 0.007 |
| **MOES-VI** | **8.3** | **2** | **0.051** | GRA Outreach | 2.8 | 2 | 0.021 | UVICES Safe Homes | 2.8 | 7 | 0.007 |
| Friends of VI National Park | 5.6 | 1.5 | 0.05 | Litter Critter | 2.8 | 2 | 0.021 | IGLA Green Certification | 2.8 | 8 | 0.006 |
| DPNR | 5.6 | 2 | 0.042 | Hotel Tourism Internship | 2.8 | 3 | 0.021 | Talks | 2.8 | 5 | 0.006 |
| VIMAS | 5.6 | 3 | 0.042 | VI Now | 2.8 | 2 | 0.021 | Chant | 2.8 | 11 | 0.006 |
| CFMC Outreach | 5.6 | 3.5 | 0.036 | DFW Aquatic Heritage | 2.8 | 3 | 0.02 | WMA PSAs | 2.8 | 10 | 0.005 |
| Reef Fest | 8.3 | 5.67 | 0.034 | Coral Conservation Corps | 2.8 | 2 | 0.019 | National Heritage Area | 2.8 | 6 | 0.005 |
| Earth Day | 5.6 | 4 | 0.034 | Reef Responsible Program | 2.8 | 4 | 0.019 | Botanical Garden Second Saturday | 2.8 | 6 | 0.005 |
| Blue Flag | 5.6 | 2.5 | 0.034 | Pro Enviro Fair | 2.8 | 4 | 0.017 | Raft Hikes | 2.8 | 7 | 0.004 |
| Summer Camps | 8.3 | 4.67 | 0.033 | FCB | 2.8 | 4 | 0.017 | Eco Tours | 2.8 | 12 | 0.004 |
| VIERS | 5.6 | 3 | 0.032 | SCUBA Organizations | 2.8 | 3 | 0.017 | STJ Audubon | 2.8 | 9 | 0.003 |
| SeaGrant | 5.6 | 2.5 | 0.032 | SPR | 2.8 | 6 | 0.017 | Swim Classes | 2.8 | 11 | 0.003 |
| EP | 5.6 | 5.5 | 0.032 | Kayak Tours | 5.6 | 8.5 | 0.016 | PADI Fish ID | 2.8 | 8 | 0.003 |

## Table 2
## Categories and Codes Used for the Correspondence Analyses

| Topics | | Audiences | | Methods | | Challenges | |
|---|---|---|---|---|---|---|---|
| **Code** | **Value** | **Code** | **Value** | **Code** | **Value** | **Code** | **Value** |
| a | Climate Change | l | Businesses | t | Classroom or Lecture | bb | Behavior Change |
| b | Fisheries Management | m | General Public | u | Experiential Learning | cc | Diverse Audience |
| c | History and Culture | n | Policymakers and Management | v | Interships/ Volunteers | dd | Funding |
| d | Invasive Species | o | Property Owners | w | Museum or Place-based Experiences | ee | Key Person Engagement |
| e | Marine Debris and Land-Based Source Pollution | p | Resource Users | x | Print Media | ff | Lack of Awareness/Enforcement |
| f | Marine Ecology | q | Students | y | Public Event | gg | Lack of Space or Room |
| g | Policy and Decisionmaking | r | Teachers | z | Social Media | hh | Low Local Interest |
| h | Sustainable Marine Use | s | Visitors | aa | Website | ii | Message Unclear |
| i | Water Quality | | | | | jj | Narrow Audience |
| j | Watersheds | | | | | kk | Narrow Message |
| k | Wetland Ecology | | | | | ll | Politically Charged |
| | | | | | | mm | Spreading the Word |
| | | | | | | nn | Staff Issues |
| | | | | | | oo | Sustained Participation |
| | | | | | | pp | Transportation |
| | | | | | | qq | Weather |

used for the correspondence analysis. The codes for each category can be seen in subsequent figures detailing the results of the correspondence analyses.[3]

Figure 3 presents the results of the correspondence analysis for the 19 selected programs and all traits, presented in a multi-dimensional scaling scatterplot. For these types of graphical displays, the x/y coordinate of the point is irrelevant; meaning is found in each point's proximity to other points. Those programs that are more alike are closer together, while those programs less similar are farther apart. Mathematically, all similarities between the 19 programs can be presented in a space with 18 dimensions. In the two dimensions seen here, 19.8 percent of the various program relationships can be displayed (i.e., "percent displayed"). While this value is relatively low, a review of Figure 3 does reveal relationships between programs that correlate with information heard during the interview and focus group efforts. For example, the East End Marine Park (EEMP) and Snorkel Clinics are closely related; this makes intuitive sense because snorkel clinics are offered at the EEMP, among other places in the USVI. DSTF is closely related to MOES-VI, which makes sense since the DSTF program is actually a sub-program of the larger MOES-VI effort. Field Days, Sandy Point Turtle Program, CORE's Lionfish program, and NPS Tours are also closely related, likely due to their foci, method of outreach, and popularity. Reef Jam is unlike any other program, which was corroborated by interviewees and focus group participants who repeatedly mentioned that Reef Jam combined entertainment and a conservation message in a way dissimilar to other programs.

When viewed by specific traits, other similarities and differences in the 19 programs can be seen. Figure 4 presents a multi-dimension scatterplot for programs based on their topic of focus (percent displayed=31.0). When viewed as a whole, many of the programs in the USVI share common topics and there is substantial overlap between the various efforts. In many cases, programs focus on fisheries management, marine ecology, sustainability, etc. since these concepts are interconnected in the USVI context. The CORE Lionfish program was viewed by respondents as being relatively singular in topic, focusing on invasive species (code d), while respondents suggested that VINE was one of the few entities specifically focused on water quality (code i), in addition to topics shared by other programs. When VINE and the CORE Lionfish programs are excluded, the distribution of programs spreads out, showing different relationships (Figure 5, percent displayed=36.7). In this simplified display, those programs closely associated with NPS and U.S. Fish and Wildlife Service (USFWS [EEMP, Snorkel Clinics, Field Days, NPS Tours, and Sandy Point Turtle Program]) are clearly related. Leave Paradise in Its Place and DFW Outreach occupy the same spot, which is not unexpected since DPNR-DFW is a major partner in the Leave Paradise in Its Place program. Clean Up Events and

[3] One Challenge category, "jj – Narrow Audience" was not used for these 19 programs and is not seen in the correspondence analyses figures.

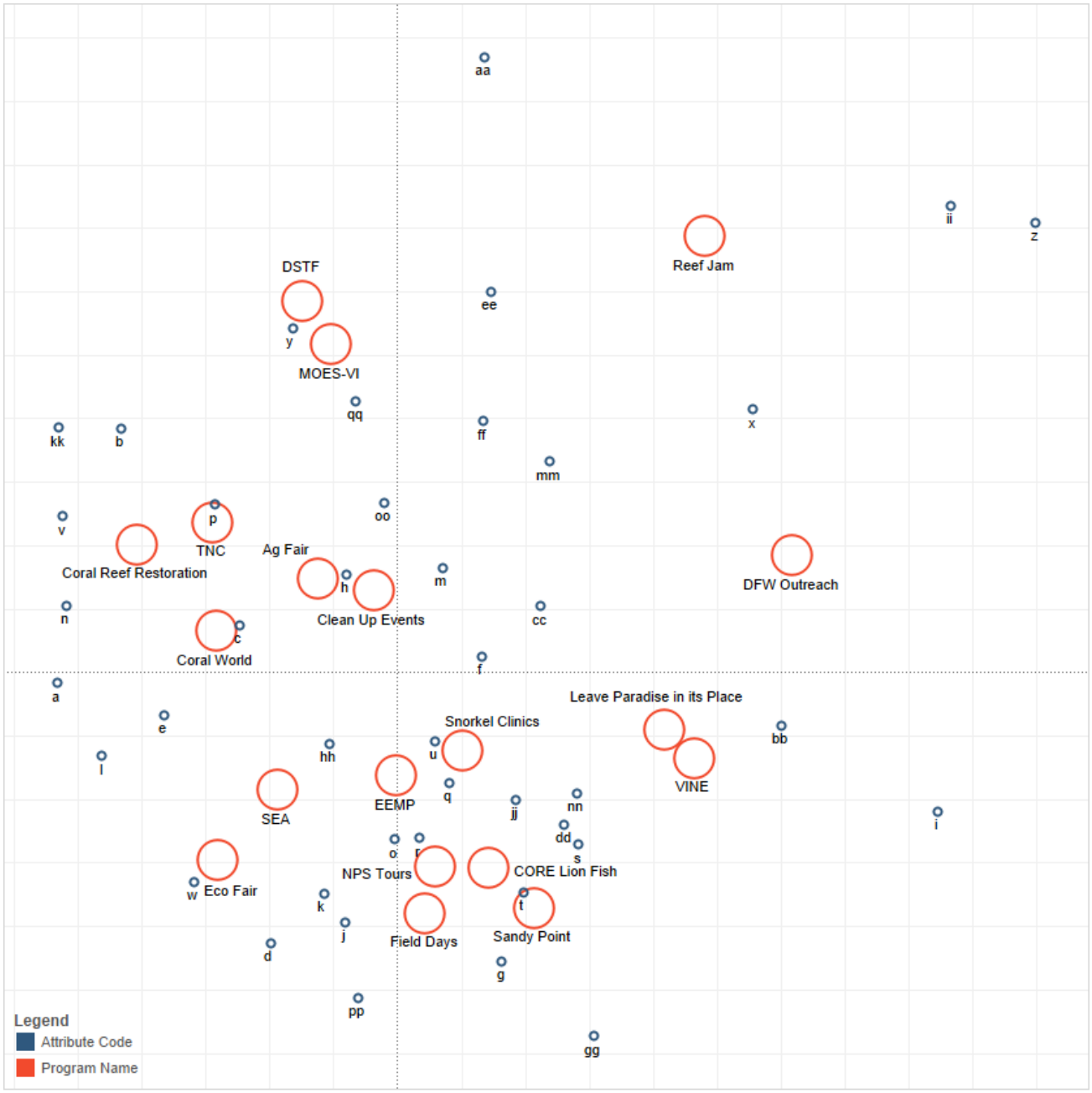



**Figure 3. Correspondence Analysis for All Programs and All Traits**


**Figure 4. Correspondence Analysis for All Programs, by Topic**

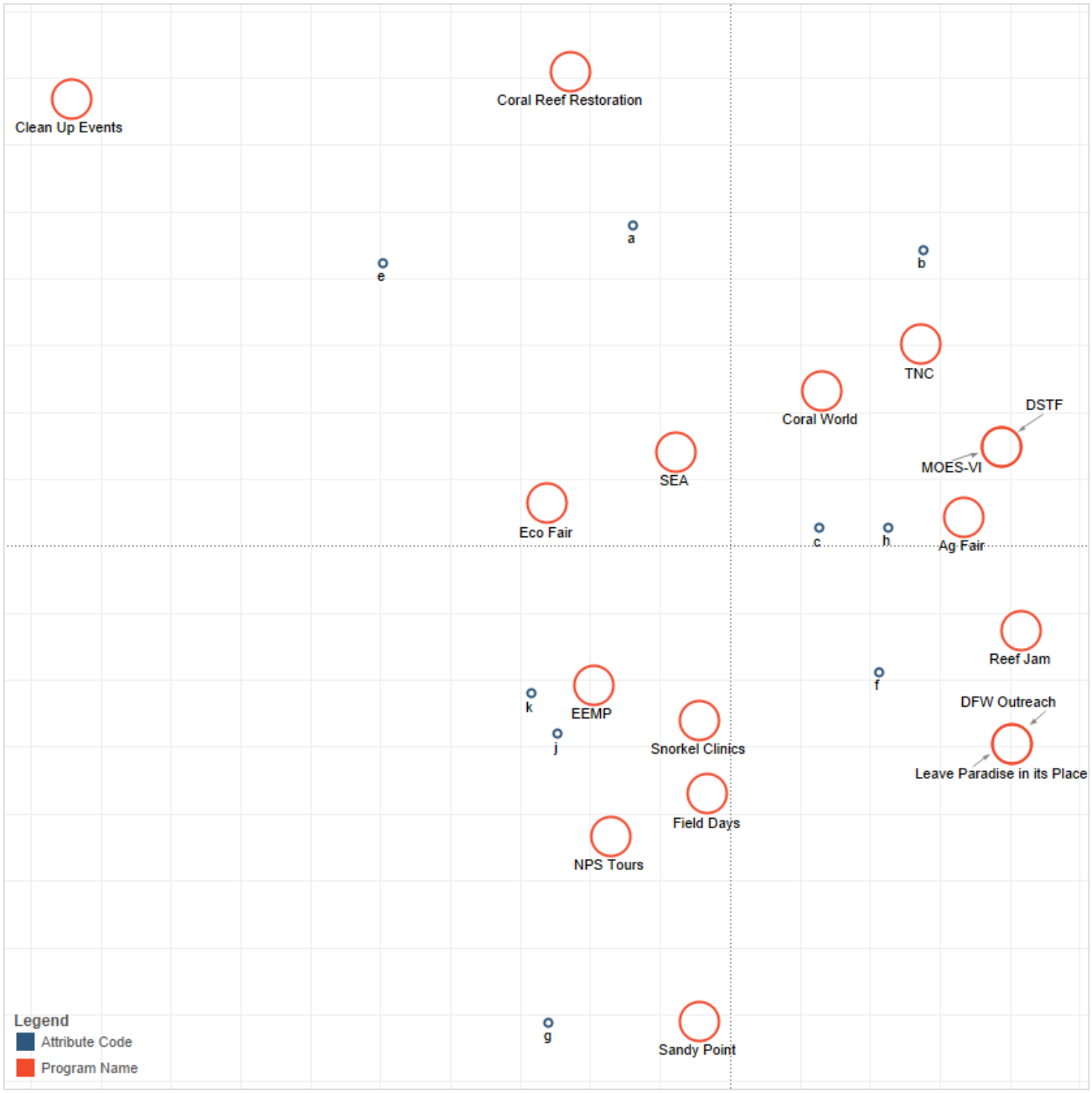



**Figure 5. Correspondence Analysis for Selected Programs, by Topic**

Coral Reef Restoration are somewhat distant from the other programs, likely due to their focus on marine debris and land-based source pollution (code e) and climate change (code a), respectively.

Figure 6 presents a multi-dimension scatterplot for programs based on their audience (percent displayed=38.8). The scatterplot shows a central collection of programs that include NPS Tours, the CORE Lionfish program, Clean Up Events, the EEMP, and the activities sponsored by the St. Croix Environmental Association (SEA). VINE's programs and the Leave Paradise in Its Place program are very similar in terms of audience, as both target visitors in addition to other audiences. At the top of the scatterplot is a handful of programs with the same focus in terms of audience, showing some overlap and suggesting an opportunity for coordination. These programs include the Ag Fair, DFW Outreach, Field Days, and Sandy Point Turtle Program. The General Public (code m) is a relatively common audience, as evidenced by its central location between multiple programs in the lower right quadrant.

Figure 7 presents a multi-dimensional scatterplot for programs based on the method through which they engage the public (percent displayed=41.0). Experiential learning (code u), which was noted during interviews and focus group efforts as being a key method in engaging the public, is near the center of a collection of programs near the top of the plot. These programs include those at the EEMP, Snorkel Clinics, programs at Coral World, programs organized by SEA, the Sandy Point Turtle Program, the CORE Lionfish Program, Field Days, and programs sponsored by VINE. Programs by DPNR-DFW and The Nature Conservancy (TNC) are somewhat separated from the main group due to their use of print and social media. Public events, including Clean Up Events, Coral Reef Restoration events, the Ag Fair, and MOES-VI (including DSTF) are centered on being Public Events (code y). The largest public event, Reef Jam, is again somewhat disconnected due to its strong print media and social media presence.

Figure 8 presents a multi-dimension scatterplot for programs based on their perceived challenges (percent displayed=23.0). There seem to be at least three main concentrations of programs based on general challenges. Those most affected by Staff Issues (code nn) and Funding (code dd) include the Eco Fair, Leave Paradise in Its Place, and the CORE Lionfish program. Those programs most affected by not engaging the core user group or audience (code ee) include the MOES-VI programs and the Ag Fair. Reef Jam is challenged by having an Unclear Message (code ii); this is reinforced by information captured in interviews mentioning that the conservation message of Reef Jam is sometimes lost in the party atmosphere. On the other side of the scatterplot, the NPS Tours, Sandy Point Turtle program, and Coral World programs are identified as having a Lack of Space or Room (code gg), but also Low Local Interest (code hh).


**Figure 6. Correspondence Analysis for All Programs, by Audience**

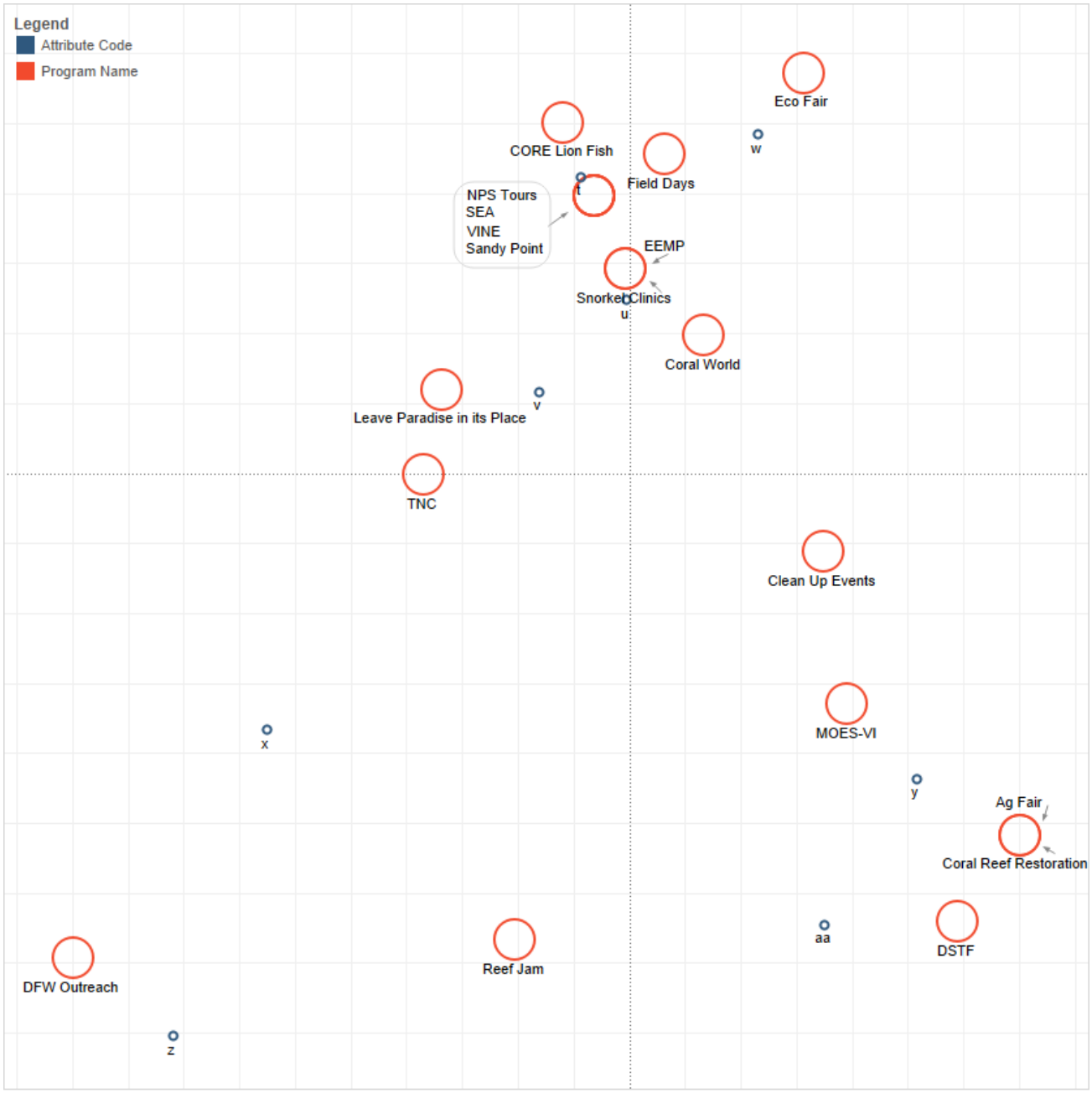



**Figure 7. Correspondence Analysis for All Programs, by Method**

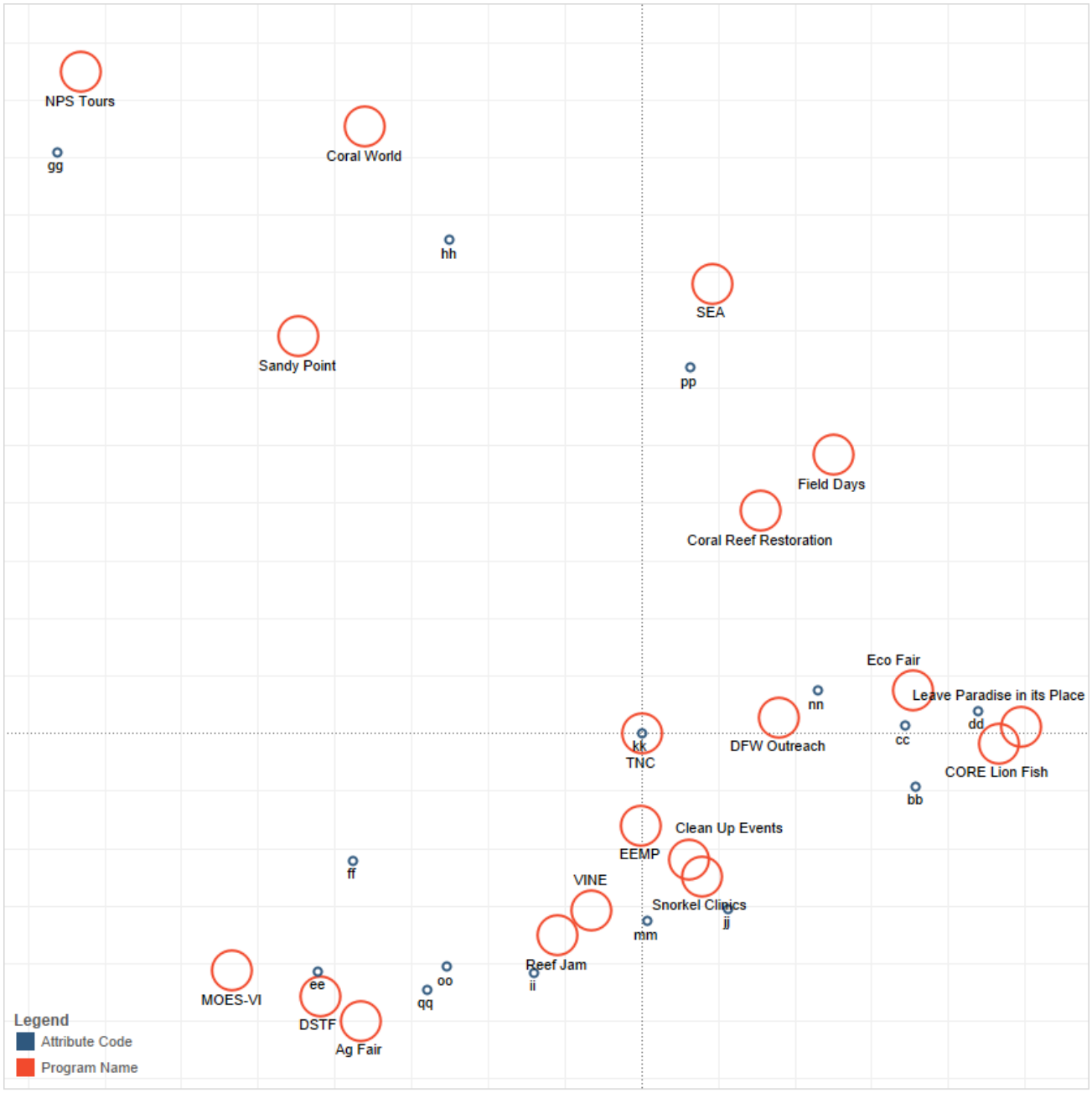



**Figure 8. Correspondence Analysis for All Programs, by Challenge**

Statistically, TNC programs were distant from the other 18 programs in one dimension not displayed here, suggesting that TNC has substantially different challenges than the rest of the agencies/organizations and their programs. Specifically, there is a perception that TNC's message is too narrow (code kk) and could be broadened. If displayed on a third dimension, the percent displayed would rise to 38.4.

As stated above, a substantial number of respondents did not provide sub-lists during the successive freelisting exercise. Figure 9 presents a multi-dimension scatterplot for programs based on their perceived challenges if non-responses are filtered out (percent displayed=24.2).[4] In this scatterplot, many of the programs are grouped together in the bottom, as many share the same issues related to creating lasting Behavior Change (code bb), Funding (code dd), and Staff Issues (including retention [code nn]). NPS Tours and Coral World programs are grouped together due to their reported Lack of Space (code gg) and Low Local Interest (code hh). SEA programs are challenged by Transportation issues (code pp).

### 4.2.2 Dot Voting

During the focus groups, attendees were asked to vote for which programs they thought were most effective and which programs could be more effective. Figure 10 presents the results of the dot voting activity, with the total value of each program (i.e., green dots minus red dots) in each column, with the size of the circle indicating the total number of votes (i.e., green dots plus red dots). The results of the focus groups are aggregated in the first column, while the results from St. Thomas and St. Croix are in the second and third columns, respectively. Those programs receiving no votes are not displayed.

The top programs in terms of perceived effectiveness were those associated with coastal and beach cleanups, followed by public events like the Eco Fair, the Safe Boating Workshop, and Reef Jam. Programs near the bottom, indicating a perception that they could be more effective, include the recycling program, activities at EEMP, and the Coral World turtle rehabilitation program. A substantial difference in opinion exists between the two locations, however. In terms of the programs with the highest perceived effectiveness, coastal cleanups had a net "green" vote in St. Thomas and a net "red" vote in St. Croix. The Leave Paradise in Its Place program had a similar distribution of votes between the two islands, while the NOAA in the Caribbean program was the opposite. CORE's Lionfish program received many votes between the two focus groups, with perceived effectiveness in St. Croix but substantial room for improvement in St. Thomas,

[4] Again, TNC programs can be thought of on their own third dimension and are separate from all other 18 programs, potentially raising the percent to 39.0.


**Figure 9. Correspondence Analysis for All Programs, by Challenge (simplified)**

resulting in a net value of zero between the two focus groups. Near the bottom of the list, focus group participants in St. Croix suggested that the EEMP could be more effective, while a focus group attendee in St. Thomas suggested that it was already effective. Aluminum can recycling was voted as "red" repeatedly in St. Croix and was a key topic of conversation in the St. Croix focus group but was not focused on in St. Thomas.

### 4.2.3 Social Networks

As discussed above, project team members asked interviewees and focus group participants to list all of the agencies, organizations, and other entities with whom they worked on a regular basis with regard to marine outreach and education. The results of these lists were aggregated and a social network was established. Figure 11 shows this web-like network for agencies and organizations within the USVI and beyond, with those entities interviewed shown as small squares and entities mentioned (but not spoken to) shown as small circles. Nodes are connected with lines, with arrowheads showing the relationship. Although too dense at this scale to truly explore visually, it is clear that a large number of agencies and organizations are involved in marine outreach and education (n=141). Some entities are mentioned only once and are distributed around the periphery, while other entities are mentioned multiple times by many actors and are concentrated in the center.

Mathematically, social networks can be analyzed to identify which actors may act as leaders or broker information within the network. These relationships can suggest which actors may control the access of information, resources, or knowledge. A primary measurement of this role is called "nodal degree centrality," which can be measured by metrics called "out-degree centrality" and "in-degree centrality." Out-degree centrality indicates how many nodes any singular node stated as having a relationship; it measures how many referrals went "out" from a node and can be considered in this context to be a measurement of prominence in the community and suggest a level of teamwork. In-degree centrality indicates how many nodes referred to any one node; it measures how many referrals came "in" to a node and can be considered a measurement of reliance on that particular actor. Table 3 presents these measurements in a normalized manner and in raw numbers (i.e., "Freeman" measurements in Table 3). The different metrics suggest that the mean out-degree and mean in-degree centralities are similar. However, there is a higher standard deviation for out-degree centrality, suggesting that it is more common within the community for an entity to reference more actors with whom they have a connection than it is for an entity to be referred to; more nodes have longer "out" lists than "in" lists. This suggests that a number of prominent nodes exist, but that fewer nodes are highly relied upon within the marine outreach and education community.


**Figure 10. Focus Group Dot Voting Results**

**Legend**

*Square* Interviewee

*Circle* Not Interviewed

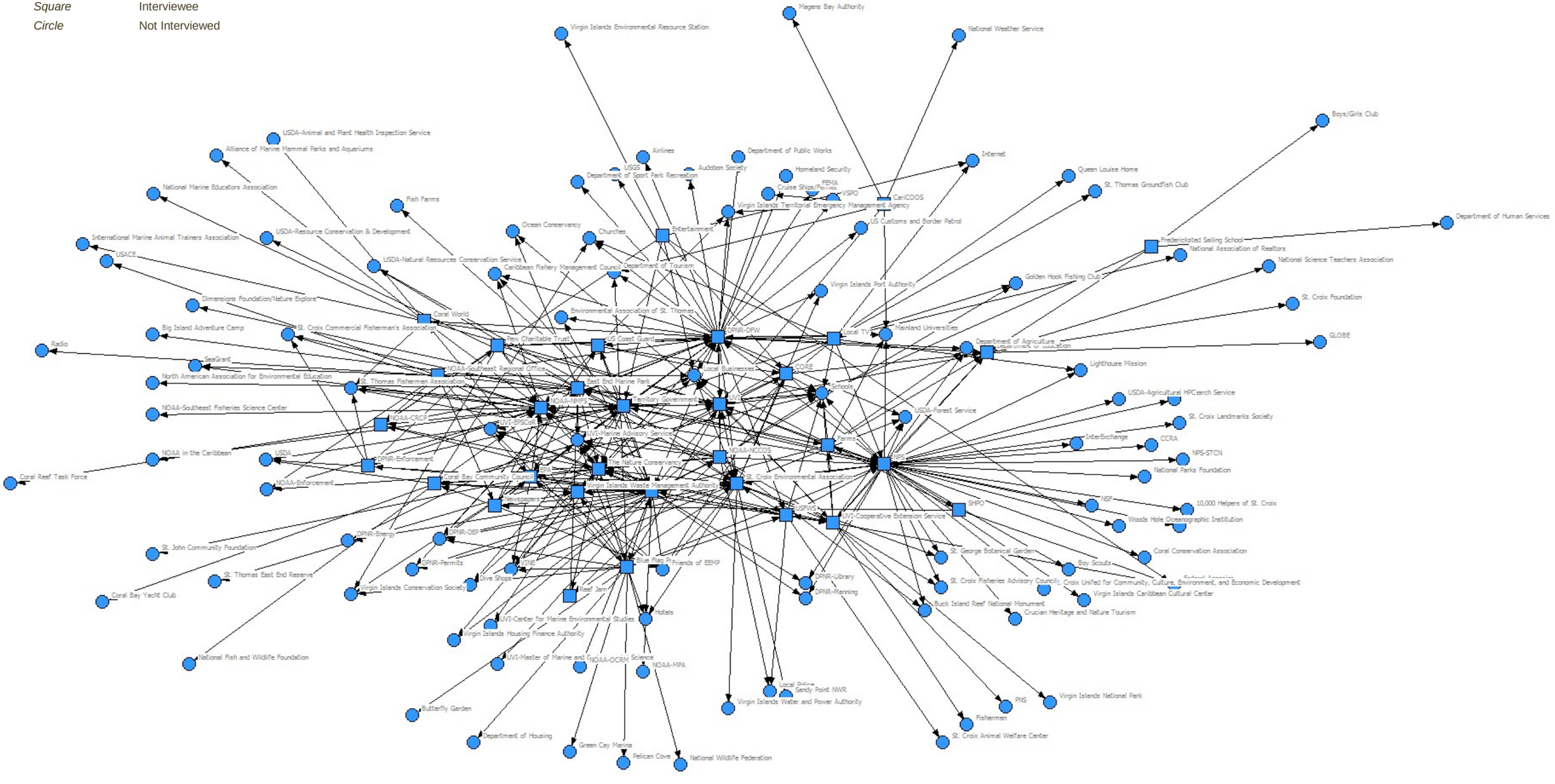



**Figure 11. USVI Outreach Network**

**Table 3**
**Nodal Degree Centrality**

| Nodal Degree Metrics (n=141) | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|
| Normalized Out-degree Centrality | 0.000 | 13.214 | 0.963 | 2.312 |
| Normalized In-degree Centrality | 0.000 | 6.429 | 0.963 | 1.136 |
| Freeman Out-degree | 0.000 | 37.00 | 2.695 | 6.474 |
| Freeman In-degree | 0.000 | 18.000 | 2.695 | 3.180 |

Other measurements for the network as a whole are presented in Table 4. These measurements are related to "centrality," and measure nodes based on a function of how prominent and interconnected a node may be within the network. These metrics suggest that approximately 12.4 percent of all nodes in the network (approximately 18 nodes) can be considered prominent and exhibit teamwork. However, only 5.5 percent of all nodes in the network (approximately eight nodes) can be considered highly reliant in terms of marine outreach and education programs. The undirected network degree value, 13.4 percent, suggests that the network is not highly centralized or hierarchical, meaning that the network is not controlled by one agency or entity. This is evident based on the distributed, web-like nature seen in the figures of the network.

Table 5 presents the most prominent nodes according to how many other entities interviewees stated they worked with (i.e., out-degree centrality). Table 6 presents the most prominent nodes based on how many times any individual entity was referred to by other entities (i.e., in-degree centrality). In terms of out-degree centrality, NPS and two divisions of DPNR are the most prominent, suggesting that these entities are the most involved within the USVI marine outreach and education community and are major partners in teamwork. Other major nodes include SEA, the Blue Flag program, and the territorial government (in its many forms). In a network where a handful of actors dominate teamwork, one would expect high out-degree centrality measures for the top-ranked actors, with a substantial drop in values for others on the list; this is not seen in this network, suggesting that while there are some major team members within the community, they are not omnipresent. In-degree centrality measurements show that the DPNR-CZM, National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA-NMFS), and the University of the Virgin Islands (UVI) are the most highly ranked in terms of reliance. Again, however, the values for the top nodes are not substantially higher than others on the list, suggesting that reliance is distributed throughout the network and is not seated in any one agency or organization.

## Table 4
## Degree Network Centrality

| Network Degree Metrics (n=141) | Proportion (%) |
|---|---|
| Network Out-degree Centrality | 12.428 |
| Network In-degree Centrality | 5.545 |
| Undirected Network Degree | 13.40 |

## Table 5
## Top 10 Nodes, by Out-degree Centrality

| Node | Normalized Out-degree Centrality | Rank |
|---|---|---|
| NPS | 13.214 | 1 |
| DPNR-DFW | 12.500 | 2 |
| DPNR-CZM | 9.286 | 3 |
| St. Croix Environmental Association | 7.500 | 4 |
| Blue Flag Program | 7.500 | 4 |
| Territory Government | 7.143 | 6 |
| NOAA-NCCOS | 6.786 | 7 |
| The Nature Conservancy | 5.714 | 8 |
| East End Marine Park | 5.714 | 8 |
| Local TV | 4.643 | 10 |
| UVI-Cooperative Extension Service | 4.643 | 10 |
| NOAA-NMFS | 4.643 | 10 |

## Table 6
## Top 10 Nodes, by In-degree Centrality

| Node | Normalized In-degree Centrality | Rank |
|---|---|---|
| DPNR-CZM | 6.429 | 1 |
| NOAA-NMFS | 5.357 | 2 |
| UVI | 5.357 | 2 |
| The Nature Conservancy | 5.000 | 4 |
| DPNR-DFW | 4.286 | 5 |
| St. Croix Environmental Association | 4.286 | 5 |
| Schools | 4.286 | 5 |
| NPS | 3.214 | 8 |
| EPA | 2.857 | 9 |
| Local Businesses | 2.857 | 9 |
| UVI-Marine Advisory Service | 2.857 | 9 |
| Virgin Islands Waste Management Authority | 2.500 | 10 |
| NOAA-CRCP | 2.500 | 10 |
| Territory Government | 2.500 | 10 |

Figure 12 displays the network by out-degree centrality, with size and color indicating the node's value; larger and greener nodes have higher values, while smaller and more red nodes have lower values. DPNR-DFW is the large green node near the center of the network, and NPS is the large green node on the right. Figure 13 displays the network by in-degree centrality, with size and color similarly indicating the node's value. The largest and greenest node near the bottom of the central concentration is the DPNR-CZM.

Measurements of "betweenness" can indicate which actors mediate or are "between" other actors within the network. In a network dominated by one individual, the normalized mean of betweenness would be 1.00; the same actor would be between all other actors and would serve as gatekeeper to all others, like an axel and spokes on a wheel. In this case (Table 7), the mean is 0.227, suggesting that the measurement of betweenness is relatively low and that few individual actors sit between others. The network centralization index measures how many entities are along most paths of the network, suggesting how many entities are the most involved in marine outreach and education. The index value is 4.39 percent, suggesting that approximately six of 141 actors are along most of the paths within the network. Again, these measurements suggest that the overall network is not controlled by any one agency, and that a large amount of teamwork and reliance exists between various agencies and organizations. Table 8 displays the top 10 nodes ranked by their individual normalized betweenness score. The top six ranking entities, which are those actors on most of the paths within the network, are DPNR-CZM, NPS, DPNR-DFW, UVI, NOAA-NMFS, and SEA.

Figure 14 displays the network by betweenness score, with size and color indicating the node's value; larger and greener nodes have higher values, while smaller and more red nodes have lower values. In Figure 14, the large green node at the bottom of the central concentration of nodes is DPNR-CZM, while the large green node on the right is NPS. NPS is connected to a large number of "pendant" nodes (i.e., actors with one connection, seen on the right side of the figure), meaning that these actors must come through NPS to connect to other nodes in the network—NPS is "between" them and the rest of the network—ultimately giving NPS a high betweenness score.

The structural relationships within the network can be measured in a number of different ways, including metrics related to the density of the network, the rates of reciprocity between nodes, the connectivity between nodes, and the network's potential for fragmentation if certain nodes are isolated. For this particular project, understanding the structural relationships of the network suggests how various agencies and organizations are tied within the network and how they may be affected if other agencies and organizations experience beneficial and/or adverse impacts. For example, if an NGO closes or goes bankrupt, understanding the structural relationships of the network can suggest how others in the network may be affected.

**Table 7**
**Betweenness and Centralization**

| Normalized Betweenness and Centralization Metrics (n=141) | | | | |
|---|---|---|---|---|
| **Minimum** | **Maximum** | **Mean** | **Standard Deviation** | **Network Centralization Index** |
| 0.000 | 4.582 | 0.227 | 0.726 | 4.39 |

**Table 8**
**Top 10 Nodes, by Betweenness**

| Node | Normalized Betweenness | Rank |
|---|---|---|
| DPNR-CZM | 4.582 | 1 |
| NPS | 4.029 | 2 |
| DPNR-DFW | 3.420 | 3 |
| UVI | 3.330 | 4 |
| NOAA-NMFS | 2.214 | 5 |
| St. Croix Environmental Association | 2.065 | 6 |
| The Nature Conservancy | 1.923 | 7 |
| Blue Flag Program | 1.376 | 8 |
| Territory Government | 1.121 | 9 |
| Department of Education | 1.095 | 10 |

One measurement of a network that can suggest its level of interconnectivity is called "density value." The overall density value of the network for this project is 0.019, meaning that the relationships (i.e., black lines between nodes) seen in the network are 1.9 percent of what would exist if all nodes were connected to all other nodes (i.e., 100 percent). A value of 1.9 percent is considered a relatively low value, suggesting low overall density, likely due to the large number of pendant nodes that were referenced only once by one actor. Since a pendant node is only connected to one other node and is not connected to the remaining 139 nodes, the overall density value of the network is decreased; each pendant node present further decreases the density value.

Another measurement of interconnectivity is related to reciprocal relationships, which are instances when two entities reference each other as working together. When this occurs, it can be inferred that there is a stronger bond between the two entities and that both rely on each other in some way. For this network, reciprocity values are relatively low (0.077), meaning that only 7.7 percent of ties between nodes were mutual.[5] Figure 15 shows the reciprocal relationships between nodes. Note that these relationships only occur between square nodes (see footnote 5);

[5] This measurement is somewhat misleading in this instance because the pendant nodes and other nodes indicated by a circle on the figures were never approached to list the agencies and organizations with whom they work. If they had, it is likely that the reciprocity values, and other measurements of interconnectivity, would be higher.

**Legend**

| | |
|---|---|
| *Square* | Interviewee |
| *Circle* | Not Interviewed |
| *Large and Green* | High Out-degree Centrality |
| *Small and Red* | Low Out-degree Centrality |

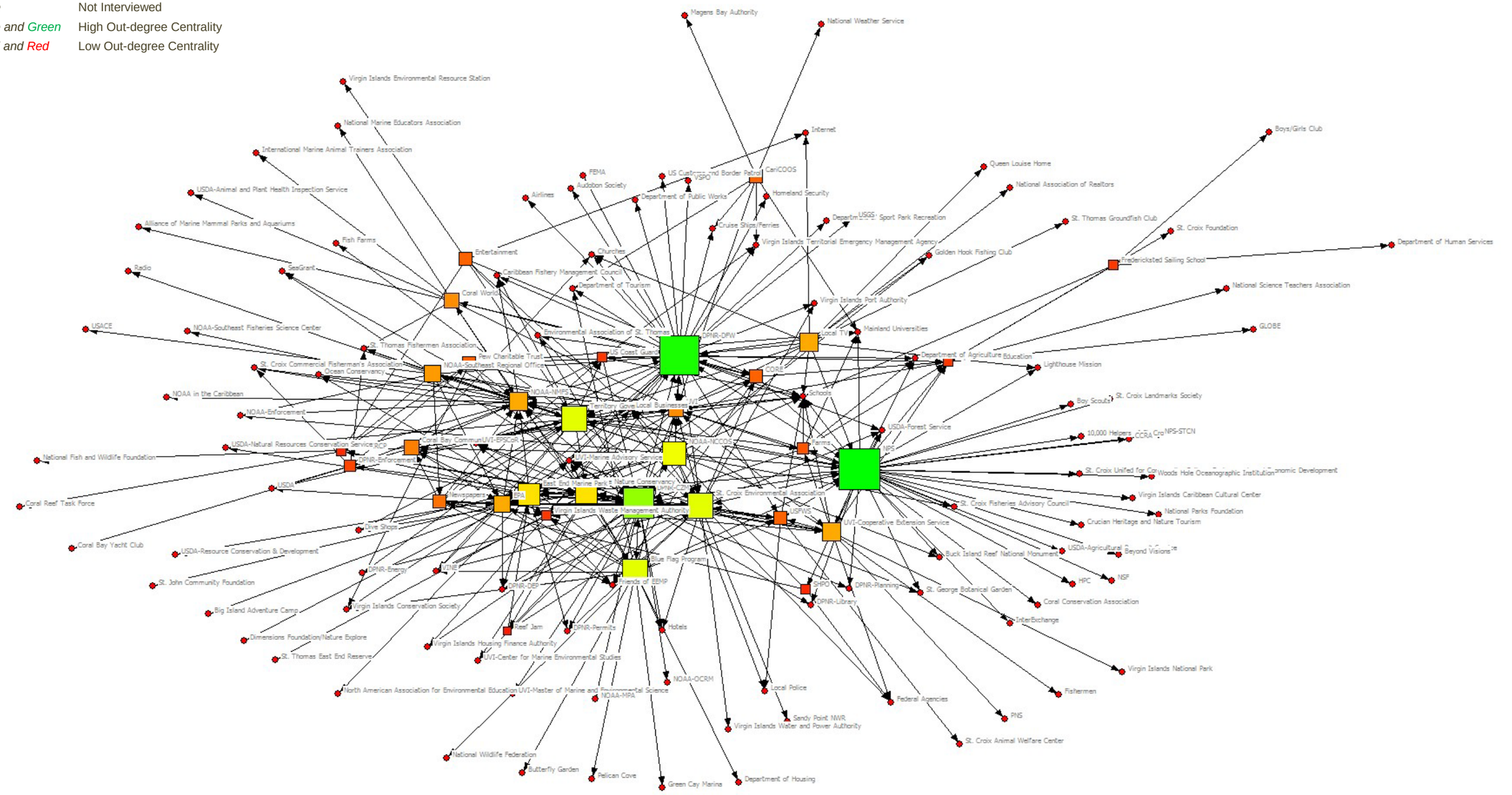



**Figure 12. USVI Outreach Network, by Out-degree Centrality**

**Legend**

| | |
|---|---|
| *Square* | Interviewee |
| *Circle* | Not Interviewed |
| *Large and Green* | High In-Degree Centrality |
| *Small and Red* | Low In-Degree Centrality |

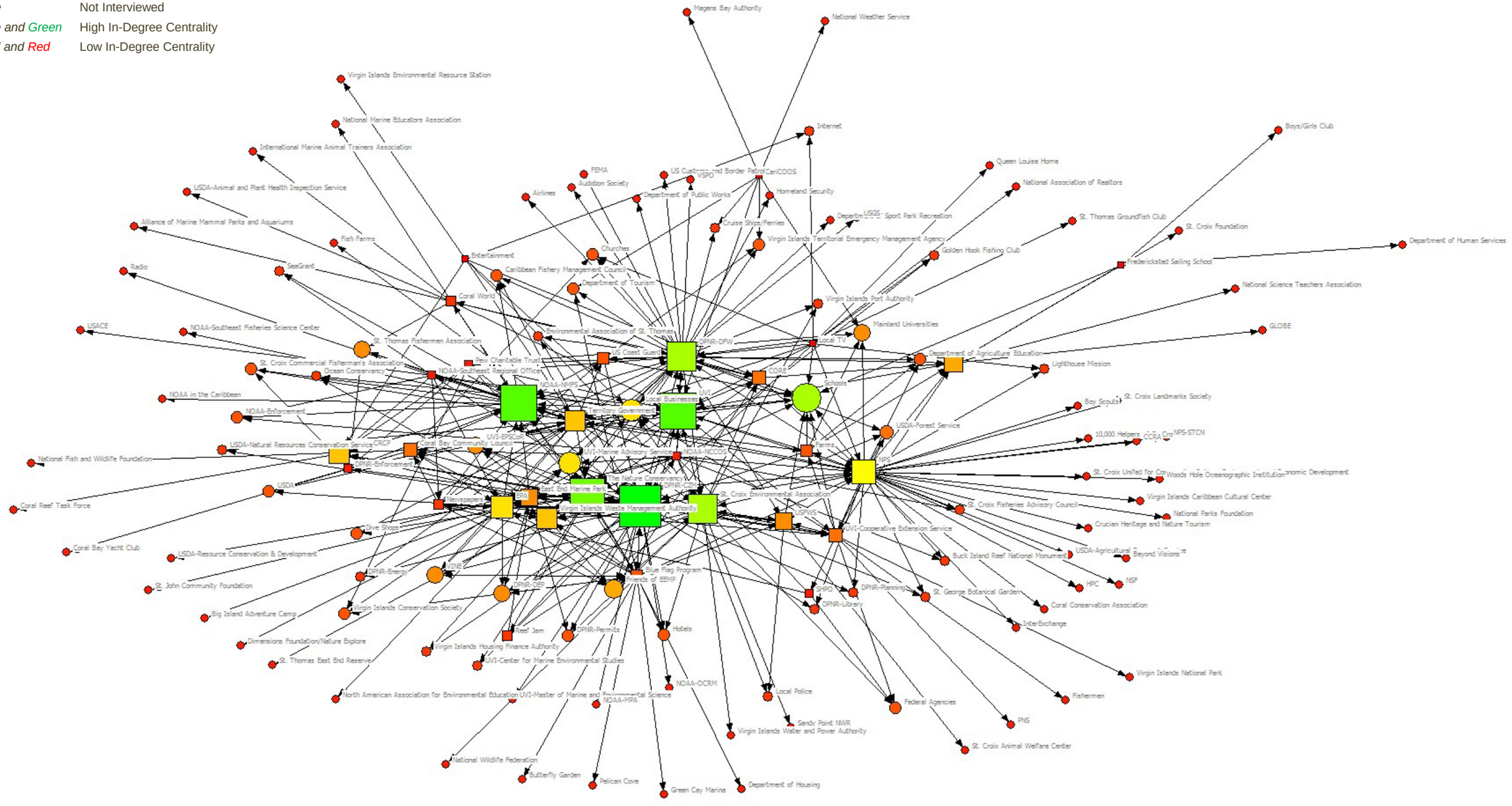



**Figure 13. USVI Outreach Network, by In-degree Centrality**

**Legend**

| | |
|---|---|
| *Square* | Interviewee |
| *Circle* | Not Interviewed |
| *Large and Green* | High Betweenness |
| *Small and Red* | Low Betweenness |

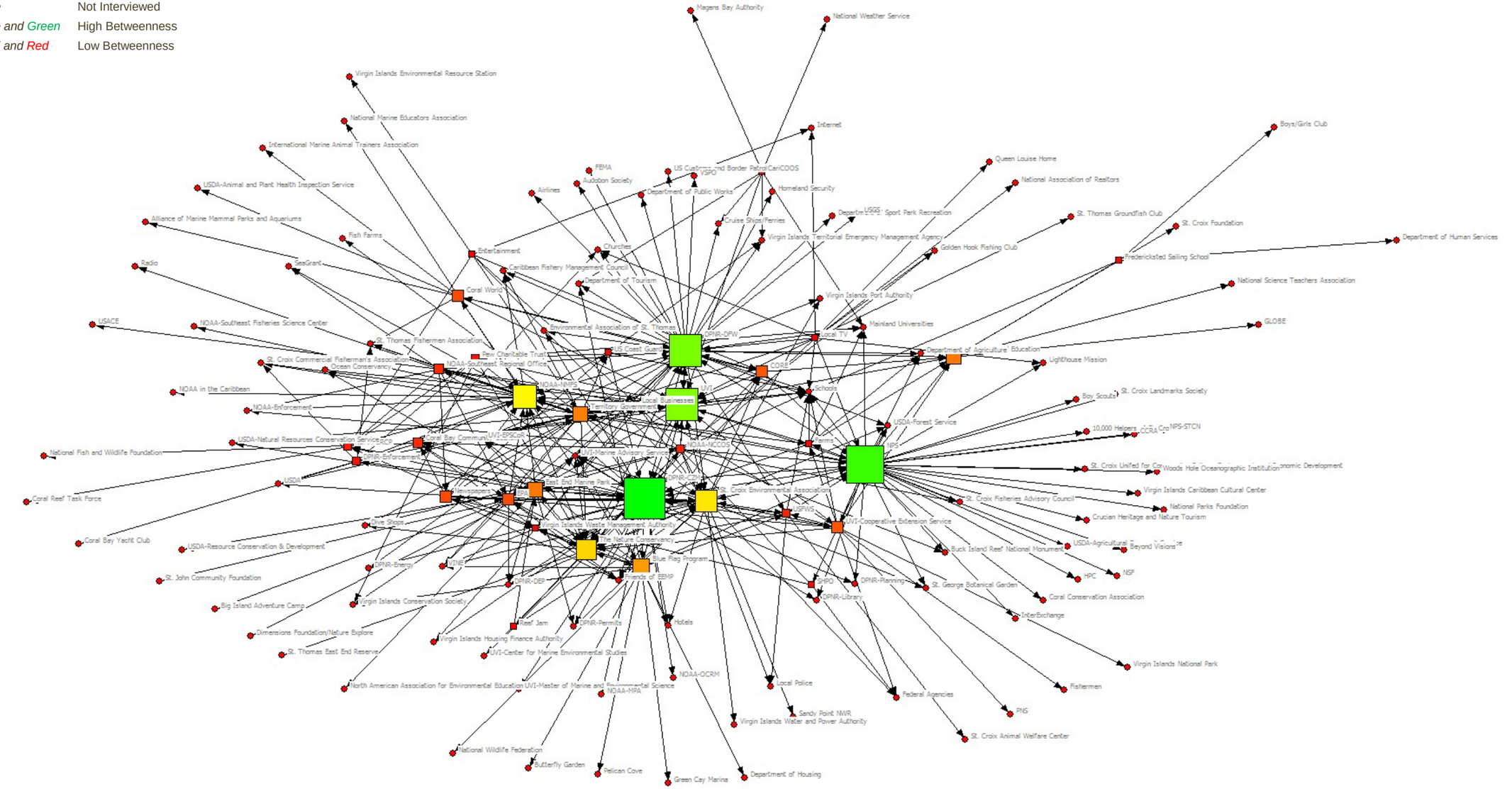



**Figure 14. USVI Outreach Network, by Betweenness Score**

**Legend**

| | |
|---|---|
| *Square* | Interviewee |
| *Circle* | Not Interviewed |
| *Red Line* | Reciprocal Relationship |

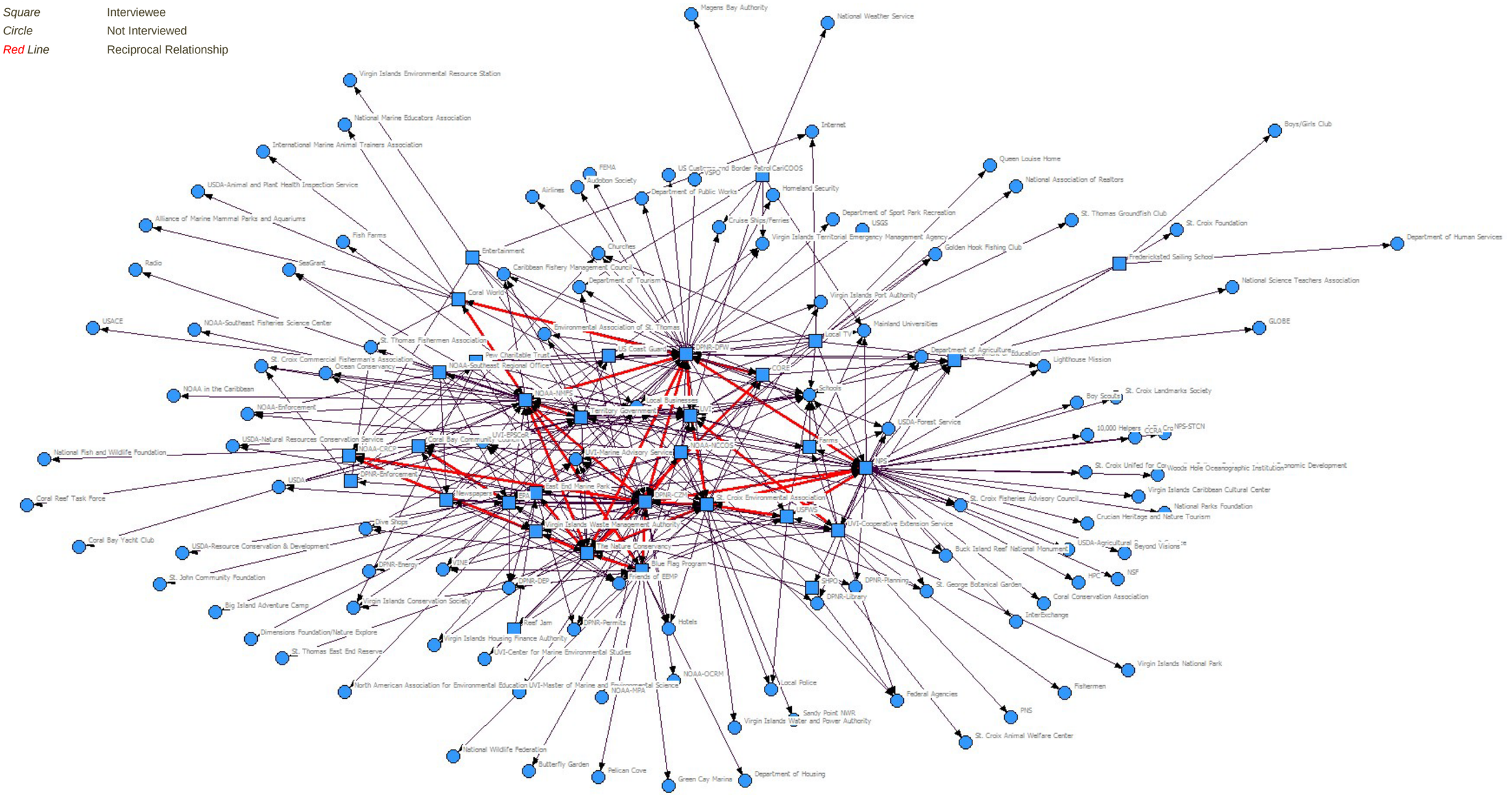



**Figure 15. USVI Outreach Network, with Reciprocal Relationships Highlighted**

however, the relationships identified by these reciprocal ties are reinforced by interview data and other results.

In terms of network cohesion, one quantification is the measurement of "geodesic paths," which is a measurement of how many different relationships need to be followed to get from any one node to any other node—like a game of hopscotch. In dense networks where many nodes are linked to many other nodes, geodesic path values are low; most nodes can be reached in one or two jumps. In less dense networks, or in networks with strict hierarchies, geodesic path values are high. Table 9 shows the number of paths needed to get from all of the nodes in the network to all of the other nodes. For example, 378 instances occur where nodes are directly connected to another node, and four instances occur where nodes are 6 degrees of separation away from another node. According to these data, approximately 87.6 percent of all nodes can be connected within three paths, suggesting neither an especially cohesive nor diffuse network.

**Table 9**
**Number of Geodesic Paths**

| Paths | Frequency | Proportion (%) |
|---|---|---|
| 1 | 378 | 9.6 |
| 2 | 1,473 | 37.2 |
| 3 | 1,615 | 40.8 |
| 4 | 431 | 10.9 |
| 5 | 54 | 1.4 |
| 6 | 4 | 0.1 |

Finally, a number of geodesic distance measures can be quantified that provide additional information about the level of cohesion in the network. As presented in Table 10, the average distance between nodes is 2.6, meaning that an entity can be connected to another entity in just under three jumps, on average. The compactness of the network is relatively low (0.090), meaning that many actors are isolated from the other nodes and must go through "bottlenecks" to reach other members of the network. The measurement of fragmentation reinforces this interpretation, suggesting a high likelihood that nodes could get isolated if certain entities drop out of the network. Figure 16 displays the network by fragmentation score, with size and color indicating the node's value: Larger and greener nodes have higher values and show those nodes that would result in high network fragmentation if removed, and smaller and redder nodes have lower values and would not result in network fragmentation if they left the network. The large node on the right is NPS, which is connected to a number of pendant nodes that would be isolated if NPS were removed. The other green/yellow node is DPNR-DFW, which also has a number of pendant nodes.

**Table 10**
**Geodesic Distance Measurements**

| | |
|---|---|
| Average Distance (among reachable pairs) | 2.576 |
| Distance-based Cohesion ("compactness") | 0.090 |
| Distance-weighted Fragmentation ("breadth") | 0.910 |

Figure 17 presents a display of the USVI marine outreach and education network with pendant nodes removed. Reciprocal relationships are displayed with red lines. Normalized betweenness values are displayed by color, with green representing high values and red representing low values. The size of the node represents normalized in-degree centrality, suggesting reliance. The large green square in the main concentration of relationships is DPNR-CZM, while other large, non-red nodes include UVI, DPNR-DFW, TNC, SEA, NOAA-NMFS, and NPS.

When all of the various measurements and quantifications are taken into consideration, a few general conclusions can be made regarding the structure, centrality, and interconnectivity of the USVI marine outreach and education network:

- The USVI marine outreach and education network is expansive, encompassing 141 entities across the three islands. Based on the centrality measurements, however, the different entities can be classified into two general categories: primary actors and secondary actors. Primary actors are those with high out-degree, in-degree, and betweenness scores. These include DPNR-CZM, NPS, DPNR-DFW, UVI, NOAA-NMFS, and SEA, as well as a few other entities with whom these agencies regularly work (e.g., TNC). Secondary actors include many of the pendant nodes listed by interviewees and other entities with relatively low centrality scores. Many of these secondary actors can be considered program participants or team members for small, one-off programs that occur throughout the year. This structure is likely attributable to the existing nature of marine outreach and education in the USVI, which includes singular activities headed by one agency that involve a wide range of participant stakeholders (resulting in high out-degree centrality measurements for some nodes), and more comprehensive efforts that involve a relatively small number of highly involved state and federal agencies (resulting in nodes with high in-degree and betweenness values). Density, cohesion, and reciprocity measurements indicate that the network is not controlled by any one entity or agency, which suggests that any primary actor can enact change and is not necessarily controlled by any other actor, although a relationship may exist between the two. These relationships may be formal or informal, although other

**Legend**

| | |
|---|---|
| *Square* | Interviewee |
| *Circle* | Not Interviewed |
| *Large and Green* | High Fragmentation |
| *Small and Red* | Low Fragmentation |

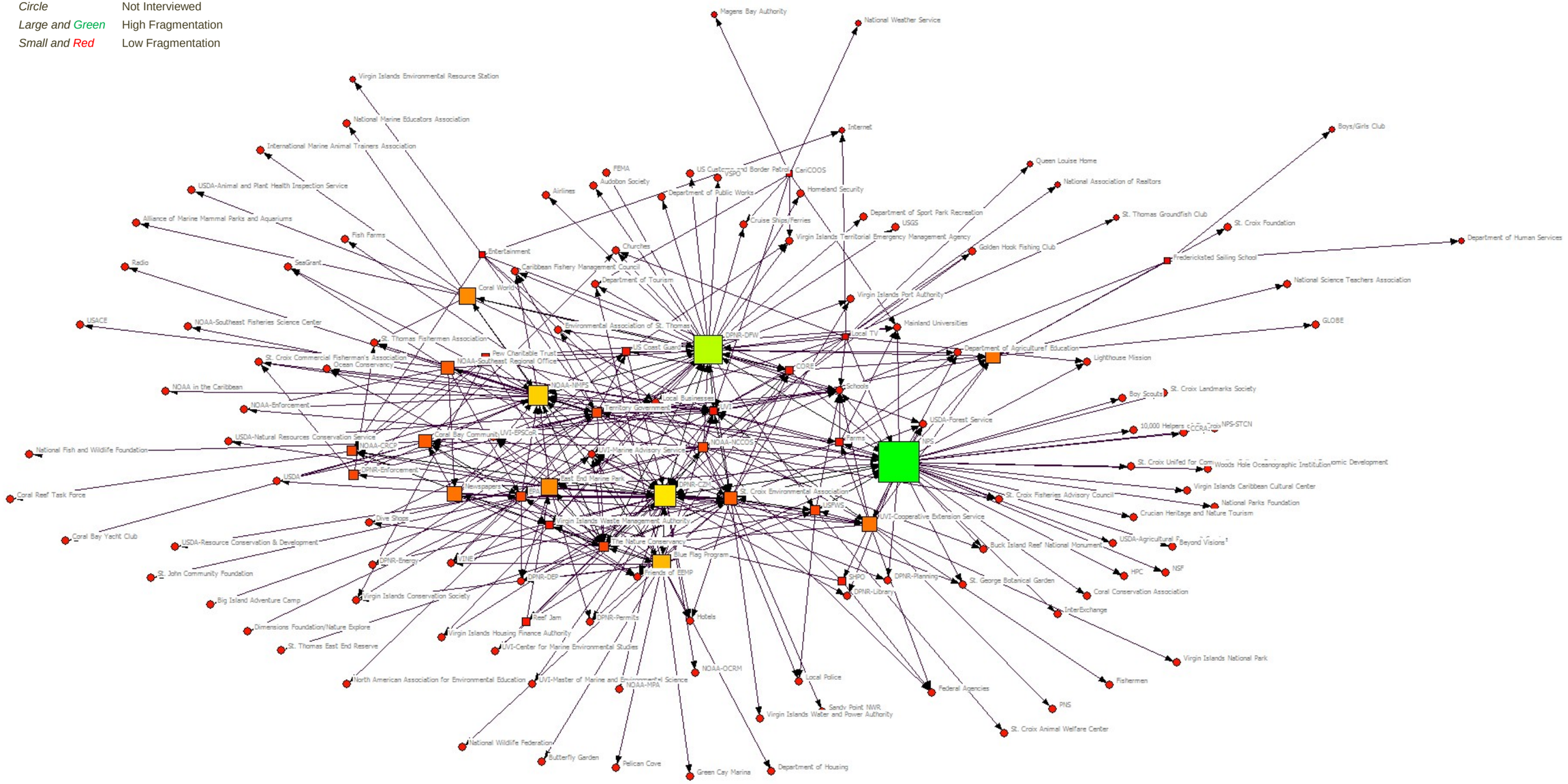



**Figure 16. USVI Outreach Network, by Fragmentation Score**

**Legend**

| | |
|---|---|
| *Square* | Interviewee |
| *Circle* | Not Interviewed |
| *Green Node* | High Betweenness |
| *Red Node* | Low Betweenness |
| *Red Line* | Reciprocal Relationship |
| *Large Node* | High In-Degree Centrality |
| *Small Node* | Low In-Degree Centrality |

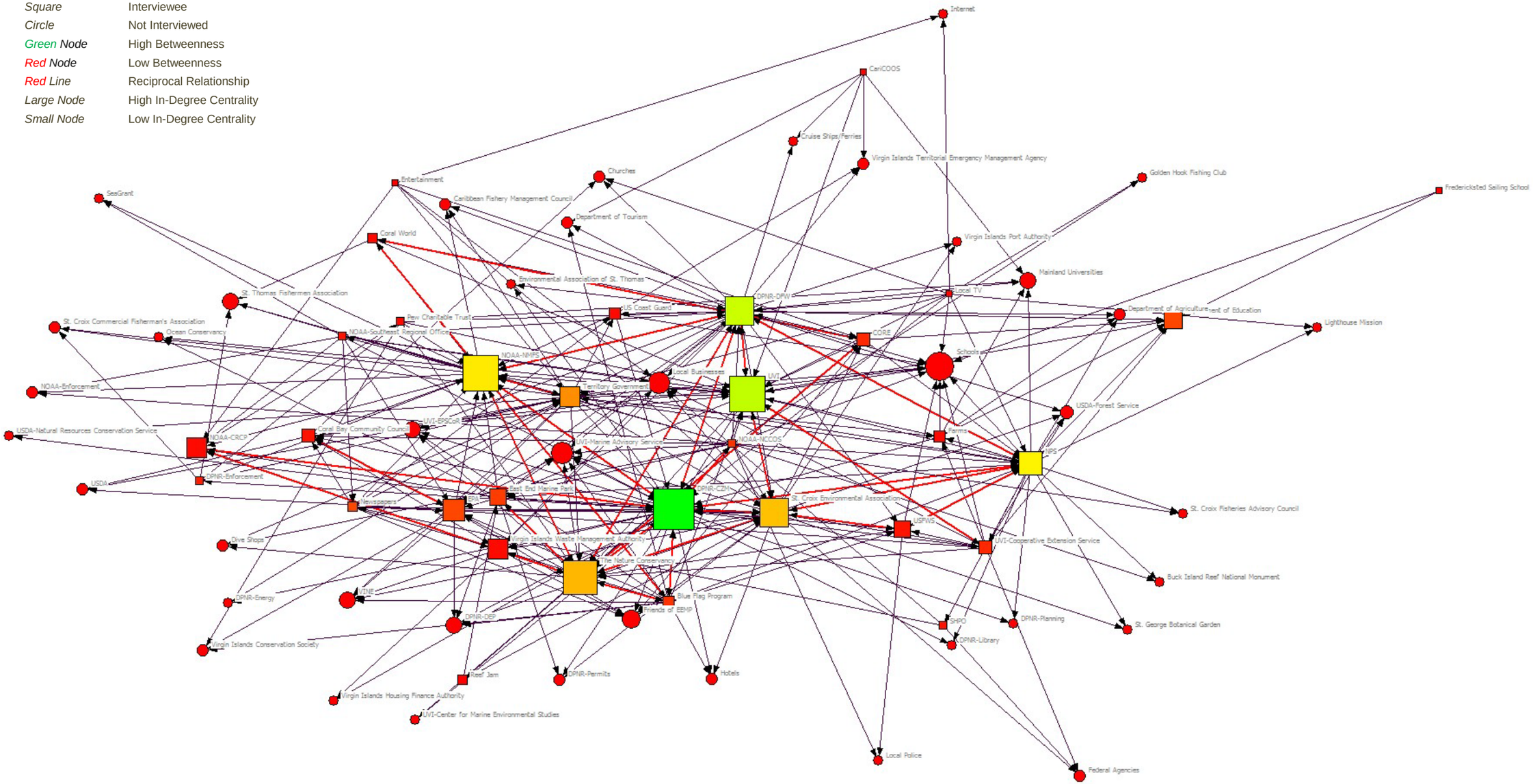



**Figure 17. USVI Outreach Network, Simplified**

results suggest that long-term relationships between entities can be organizationally challenging and that any relationship between primary actors may find success if focused on short-term efforts.

- Density, cohesion, and reciprocity measurements are not informative by themselves because many actors were not given the opportunity to provide a list of entities with whom they work. If circumstances had allowed, these entities would have likely provided lists that would have increased these network density measurements. However, many of the primary actors within the marine outreach and education network were involved in the project, and the density, cohesion, and reciprocity measurements all suggest that the primary actors are connected either formally or informally with one another by 1 to 3 degrees of separation. Based on the network analysis, it seems that the primary entities are only a few phone calls away. Some entities act as gatekeepers for smaller or more specialized entities, however, and would likely need to be involved in large marine outreach and education efforts that aim for a wide audience (e.g., DPNR-DFW, NPS).

- When pendant nodes are removed (Figure 17), the network changes slightly, highlighting the primary actors within the network. These actors are DPNR-CZM, DPNR-DFW, NOAA-NMFS, NPS, UVI, SEA, and TNC. Of primary importance are the two divisions of DPNR, as CZM is centrally involved as a team member within the network and DFW coordinates with many different stakeholder entities. Support by NMFS and NPS is essential for success in marine outreach and education, with NPS also reaching a wide range of different stakeholder groups that may provide support or be interested in participating in outreach and education events. Two primary NGOs, SEA and TNC, are the most involved in the network. Despite encompassing at least 141 entities, it is likely that a successful marine outreach and education program would need involvement from at least one or more of these six key entities in the USVI.

### 4.2.4 Communication Methods

Responses from interviewees and focus group participants regarding the methods of communication they use to get information (n=34), as well as the methods of communication they would rather use (n=30), are presented in Figure 18. The size and color of the bar represent the total number of responses for a given category.

In terms of what methods of communication are currently used, respondents' top choice was "Verbal/Word of Mouth," suggesting that most of the information gathered comes from interpersonal relationships with others in the outreach and education community. The second and third most common responses were "Telephone" and "Email," respectively, again suggesting

that most information is transmitted actively between key stakeholders within the marine outreach and education community. More passive means followed, including "Newsletters," "Newspaper," "Radio," and, "Facebook." Other responses were less numerous, including specific agency websites, television channels, and other social media. These responses suggest that marine educators tend to gather information from many different mechanisms to incorporate into their lessons and programs, including information they get from cable television and academic journals, and via government agencies.

When asked how people would rather receive information related to their role, answers were similar. In fact, some respondents had no suggestions as to how their communications could be improved or they simply stated "no change." "Email" was the top vote-getter for this question, followed by "Telephone" and "Verbal/Word of Mouth." Again, this suggests a preference for key stakeholders to remain actively connected with one another to receive information. The same four passive modes of information transmission selected as 4th through 7th in the first question occurred in the 4th through 7th spots in this question, although in a slightly different order. "Newspaper" and "Radio" moved slightly ahead of "Newsletters," while "Facebook" remained in 7th place. Specific television channels, agency websites, and other social media generally occupied the remainder of the list. These responses reinforce the idea that marine educators are comfortable gathering information from disparate sources to incorporate into their plans and programs, even if it were more convenient to get all relevant information in one place.

## 4.3 Major Themes

The following major themes emerged from the interview and focus group efforts. These issues were either raised multiple times across various interviews or were a common point of discussion during the focus groups. Interviews were audio recorded and draft transcripts of the interviews can be found in Appendix E. Draft transcripts of the focus groups can be found in Appendix F. Major themes can be generally classified as identifying a challenge or outlining a recommendation. Many of these same themes were explored in the context of coral reef management, specifically in *An Analysis of Issues Affecting the Management of Coral Reefs and the Associated Capacity Building Needs in the USVI* (Sustainametrix 2012), suggesting that the challenges and recommendations below are not necessarily unique to marine outreach and education, and are applicable to various contexts within the USVI.

### 4.3.1 Challenges

**Grant funding**: Individual interviewees and focus group participants both spoke about the challenges associated with funding marine outreach and education programs. Typically, these

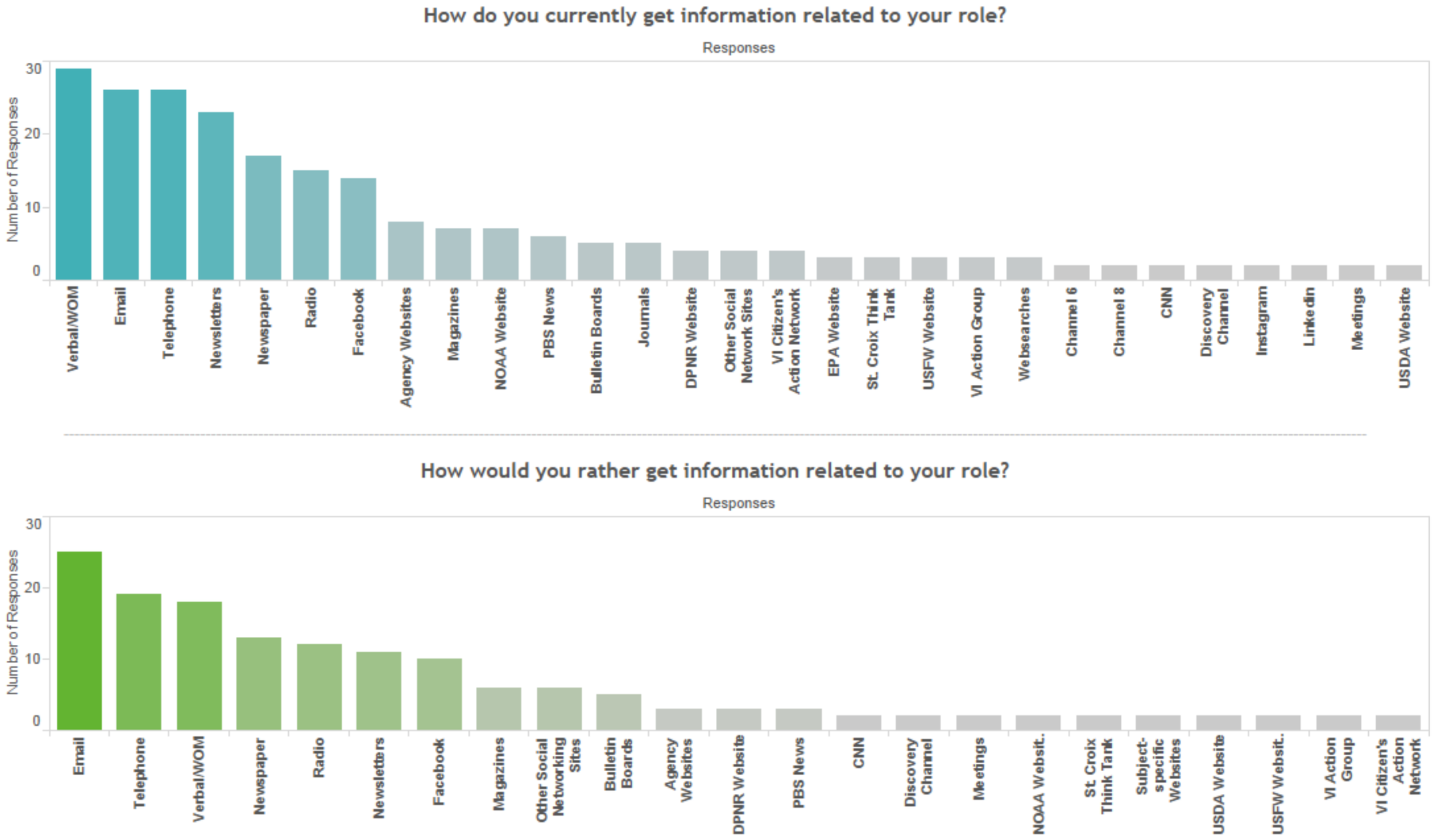



**Figure 18. Communication Methods Survey Results**

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programs are funded through specific grants. Challenges were mentioned with regard to identifying grant opportunities, as respondents noted that it took a substantial amount of effort to learn about opportunities, that large grants were rare, and that submissions were competitive (especially during the recent economic downturn). A greater challenge according to respondents, however, was associated with long-term program planning since grant funding would run out or had no guarantee of renewal, even if program performance was high. Interviewees and focus group attendees both spoke of effective programs that lost their grant funding and eventually disappeared, with any gains achieved by the program essentially lost. Smaller organizations reportedly experience a substantial degree of financial uncertainty when funded entirely by grants, which affects attracting and retaining key talent and employees. Finally, since grants are typically oriented toward a particular discrete issue, long-term coordinated efforts on marine issues are more challenging to organize.

**Staffing**: Respondents repeatedly stated that staffing issues were some of the largest challenges faced by both government agencies and NGOs. First, interviewees and focus group attendees noted that many agencies and organizations were understaffed, with existing staff too overtaxed by technical and administrative duties to establish effective marine outreach and education programs in their "free time." People stated that this was particularly true for workers in the USVI, which is a large geographic region with complex natural resource issues. It was noted that even tasks as seemingly simple as creating and designing a semi-frequent newsletter required extra time in collecting stories, copyediting, graphic design, and senior review and approval. Respondents stated that, within agencies, it is rare for a position to be singularly focused on outreach and that designing and/or organizing programs is typically outside one's job responsibilities.

Second, respondents stated that staffing turnover repeatedly threatens marine outreach and education programs. At the governmental level, administrative changes and political appointments of directorship positions occur frequently. The priorities of these new personnel are commonly aligned with party platforms or larger governing visions that often change, and formal commitment to any one program for outreach and education is rare. In those instances where someone does take the lead in organizing an education program, the program's success can be threatened by the departure of that person. Multiple instances were noted of programs ending or changing drastically due to the departure of one key person. Sometimes, the departure was due to grant funding ending (see **Grant funding** above), an employee finding more gainful employment somewhere else (typically on the mainland), or natural workplace attrition. Without the key champion of the program in place, the responsibility would fall to someone already charged with substantial technical and/or administrative duties or simply fall by the wayside.

This phenomenon is compounded when the key person involved in a program is a volunteer, who is reportedly more likely to leave a program for a paying position elsewhere or find greater incentives (financial or otherwise) to do something else.

Finally, respondents stated that it was difficult finding qualified people to fill open positions. This is particularly true with regard to hiring local residents with familial ties to the USVI who, ostensibly, would be less likely to pursue other positions on the mainland or elsewhere in the Caribbean. The term "brain drain" was stated in one focus group session to describe the gap between local educational opportunities and employment opportunities in the marine natural sciences. Respondents stated that promising local students do not typically pursue careers in the natural marine sciences; local students with analytical, scientific minds are more likely to pursue careers in medicine, engineering, law, or politics and not pursue careers in natural resource management or education. Those residents qualified for these positions are commonly "continentals" (individuals from the mainland) who are reportedly less invested in long-term employment in the USVI or are otherwise seen as outsiders with little understanding of the local issues or culture (regardless of how long they have lived on the islands). At the governmental level, respondents stated that some political appointees do not have the appropriate background or level of education to supervise or direct marine outreach and education programs.

**Interagency coordination**: Agency representatives and others stated that it is common for marine outreach and education programs to experience challenges due to a lack of interagency coordination. Communication was cited as a challenge, as were clarifying roles and responsibilities for each agency and securing the requisite amount of funding. Respondents stated that different agencies may have poorly coordinated parallel efforts, resulting in duplicative efforts or piecemeal management solutions that lack integration. One example noted by a focus group participant is that sea turtle management is handled by one agency when turtles are in the water (NMFS) and another agency when turtles are on land (USFWS), and DPNR also shares sea turtle management responsibilities at the local level. Since many education programs aim to be comprehensive, multiple agencies/departments can be involved in reviewing draft materials and/or implementing the educational events. Issues surrounding funding, oversight, and management can stymie otherwise effective programs by delaying events or following byzantine chains of command. Respondents noted that there was little point-to-point contact, and even good contact can be easily threatened with the departure of one key person.

**Climate change**: Climate change education has taken on substantial importance in much of the country, as droughts, wildfires, floods, hurricanes, and other natural disasters are commonly attributed to shifts in global climate patterns brought upon by growing levels of anthropogenic

greenhouse gases. Interviewees and focus group participants for this project, however, stated that climate change has proven too abstract for effective outreach and education programs since it is difficult to show progress or impacts at the individual level. People stated that the USVI, as a whole, feels less threatened by climate change than other areas and that economic pressures have already caused many residents to explore incorporating alternative energy in their homes (e.g., solar), reduce water use, and think critically about how much waste they generate. One focus group participant said, "We're ahead of the game." Finally, focus group participants stated that the concept of climate change has become politicized and that funding was more easily obtained for specific issues associated with a changing global climate and/or environmental sustainability, such as preventing/documenting coral bleaching or coastal trash cleanups.

**Land-based sources of pollution**: Focus group participants and interviewees regularly mentioned that coastal cleanup events were relatively successful venues through which conservation messages could be transmitted to the general public. However, there was a concern that other land-based sources of pollution less directly associated with the beaches or coastline were lacking general awareness. During both focus groups, participants discussed the role that corporations and developers play in generating land-based pollution, with some suggesting that the scale of the problem may not be solvable through outreach alone, and that tougher enforcement of existing regulations and permits may be needed. At the individual level, St. Croix focus group participants noted that the recycling program had ended and that recyclable materials were commonly found dumped in public open spaces inland or on beaches. Some people attributed this to a cultural shift in recent years that has decreased a sense of ownership among community members, and others noted that the proper disposal of refuse had become too onerous. In St. Thomas, focus group participants discussed a range of new initiatives focused on educating the public about pollution and litter, but admitted that funding and affecting lasting change in behavior are both major challenges.

**Commercial and recreational fishing**: Interviewees and focus group participants regularly stated that the primary challenge associated with commercial and recreational fishing is the depletion and/or irresponsible exploitation of the resource. For commercial fishers, focus group participants stated that basic commercial fishing information regarding seasons, closure areas, and gear limitations is not known by everyone. Participants suggested that loose enforcement of laws and regulations, as well as a generation gap between established commercial fishers and younger fishers, compounds this problem. With regard to recreational fishing, interviewees and focus group participants stated that tourists, as a whole, are not well educated about marine stewardship issues, and see recreational fishing excursions (on boat or from shore) as parties with few long-lasting negative ramifications for the environment. Tourists are also less likely to

participate in focused marine outreach or education events, and must be reached through more indirect means.

### 4.3.2 Recommendations

**Widen the audience:** One key recommendation provided by individual interviewees and focus group participants was to make any marine outreach and education message relevant to local community members or "other people" not typically captured in program efforts. A common feeling was expressed that many outreach and education programs, "preach to the choir," and that those people with the least amount of information about resource preservation and management were the people least likely to attend programs. These "other people" were generally characterized as adults in the community with multi-generational ties to the USVI and/or larger Caribbean region. Respondents noted that, in some cases, involving children can draw in parents and other adults by proximity; field trip chaperones receive the same message during events as the children do, or children bring their parents information and create change within the home. Recommendations to expand adult involvement included (1) place educational materials in places that people frequent, including banks, grocery stores, and the Department of Motor Vehicles; (2) incorporate marine education into people's jobs, focusing on how they can enhance sustainability through changes in their daily work practices; and (3) focus on the economic benefits of behavior change, either in a business context or in the home. The last point was mentioned by a number of focus group participants because there was a perception that most families, while concerned about the natural environment and resource preservation, make choices based on short-term economic concerns regardless of the larger, long-term environmental effects. One focus group member suggested that these economic concerns relate to problems associated with illegal dumping and land-based pollution, as it is cost- and time-prohibitive to "do the right thing" and dispose of materials per laws and regulations.

**Make messages local and culturally relevant:** Respondents recommended repeatedly that any marine outreach or education message should be "local." This includes tailoring the message to local community residents in tone and in format, incorporating local/native researchers, educators, writers, media creators, and managers. There is reportedly a perception that management and conservation messages are consistently delivered by "outsiders" and "continentals" with no established connection to the USVI, which is viewed by some local residents as a continuation of colonial rule—a chapter of the USVI history not viewed fondly by contemporary residents. This is especially evident when local interests and traditional ecological knowledge are marginalized or ignored. It is compounded by a clear racial difference between resource agency educators and managers (predominantly white) and multi-generational community residents (predominantly Afro-Caribbean).

It was repeatedly recommended that research projects and management regimes should be developed in a collaborative manner with local residents, reflecting local interests, perhaps through community-based participatory research frameworks or other methods. It was suggested that these approaches could build trust and involve key local community members, who would in turn attract a wider network of local residents historically underrepresented in outreach and education efforts. Interviewees and focus group participants recommended that materials be designed with the aesthetic of the USVI in mind, preferably by local writers, designers, and artists. While some focus group participants noted that current materials are well made (particularly those produced by federal agencies like NOAA-NMFS and NPS), they lack local flair that could be infused by involving local artists. Some debate occurred as to how prevalent Crucian and/or St. Thomian patois should be in written materials, with most people suggesting that it may help establish local credibility, if used sparingly.[6]

In terms of how much local influence is necessary to create a successful program, respondents generally stated that any local involvement is better than none. Respondents stated that many existing programs "preach to the choir" and regularly engage the same stakeholders; involving local talent and personnel would serve to broaden the appeal of any program and draw in new participants. Respondents said that involving local musical artists in events was successful in broadening an event's appeal. For print materials, respondents suggested that local photos and terms be used to give the impression that it was developed locally, as opposed to being developed outside the USVI (e.g., Washington, D.C.). While success could not be formally quantified by most respondents, many stated that those programs born from local interests and informed by local community members were the most successful, while those implemented via a top-down mechanism were not well received. Ultimately, however, respondents stated that the success of many marine outreach and education programs is based on a relationship of trust between the sponsoring agency/entity and the targeted participant group. This trust is built through a combination of time and direct involvement by locals in the design and implementation of outreach and education programs.

After noting that public outreach and education efforts are usually the responsibility of technical experts or administrators with little background in communications, interviewees and focus group participants suggested that training in public speaking or community-based social marketing may be worthwhile. It was suggested that outreach occur as a line item for any grant awarded, and that this be enforced so that the public may benefit from all research projects occurring on the islands.

[6] Recommended examples included bumper stickers, radio announcements, and "ironic signage" (meaning, signage that is more lighthearted, self-referential, or topical) that is posted in public areas and qualitatively different from more staid official government signs and placards.

**Create immediate stewardship:** One of the most effective collections of programs noted by the St. Croix-based focus group was the collection associated with lionfish education and invasive species eradication. By thinking critically about these programs, focus group attendees ultimately recommended that the most effective programs are ones that "make us feel good" by providing an immediately gratifying opportunity to become stewards of the environment. As suggested by respondents, people like seeing a noticeable change in the environment as a direct result of their actions, whether that is a clean beach, a new mangrove forest, or a bag of captured lionfish. It was noted that program participants can become fatigued if results are not seen in the short term or if little progress is demonstrated, and it was suggested that programs be designed to focus on short-term results from the outset. As stated above, this desire to see immediate progress is one reason why programs focused on climate change are not well received.

**Get kids in the water:** According to interviewees and focus group participants, some children (and many adults) in the USVI do not swim and are not directly familiar with the marine environment. Due to a host of historical, cultural, and economic reasons, this unfamiliarity is most common among Afro-Caribbean children with multi-generational ties to the USVI.[7] Educators noted, however, that snorkel clinics and other events held to introduce children to the marine world are highly effective and serve to spur wider interest in marine resource management and conservation. These activities may be enhanced by establishing "outdoor classrooms" where interacting with nature is the primary pedagogical tool. In many ways, these events serve as gateways for involvement in other outreach programs for children and their parents.

**Engage the tourism industry:** Interviewees and focus group participants suggested that the tourism industry could be more involved in environmental outreach and education. While some hotels and cruise ship operators include a sustainability message in their materials for guests, it was recommended that messages about responsible beach behavior, marine protected areas, littering, feeding wildlife, etc., could be presented more prominently at the airport, in taxis, on

[7] The reasons alluded to are too nuanced and complex to be fully explored here; however, many respondents noted that the history of slavery in the USVI played a major role. As stated in a recent Virgin Island Daily News article by John Klein, "[D]uring slavery swimming was viewed as another way of escape, so the slave traders and owners went to great lengths to make sure the skill was obliterated. … Many accounts found throughout written journals, ships logs and other documents point to slave traders bringing slaves in chains and shackles onto the decks of ships just after the crew had been chumming in known shark-infested waters. With the slaves watching on in horror, the crews would throw the sharks live animals, often chickens, in order to create an even bigger frenzy. These staged events to create fear drove home their point to the slaves that the future they faced trying to escape via water was worse than the future they faced once the ship landed. These records are appalling in every sense of the word, and they've partially trickled down into a cultural misperception that the waters are far more dangerous than reality" (January 15, 2014). For an additional perspective on the racially segregated nature of swimming behavior, the interested reader is encouraged to refer to Contested Waters: A Social History of Swimming Pools in America, by Jeff Wiltse.

charter vessels, and in hotels. It was also recommended that tourism service employees could incorporate resource management messages into their interactions with tourists, or that resource managers could coordinate with the USVI Department of Tourism to coordinate a consistent message.

**Respect the beach:** Reef Jam was noted by interviewees and focus group participants as a successful outreach and education program in terms of participation and attendance, but many people also stated that the conservation message was lost within the party atmosphere. Similarly, respondents noted that visitors and local residents alike were commonly careless at the beach, leaving litter or disturbing sensitive wildlife (like turtle nests). Concern was expressed that many beaches are not respected as "special" places, but merely as places to party and be carefree. It was recommended that future outreach efforts communicate beach environment preservation messages. Possible examples include increased signage and the availability of convenient trash bins.

**Establish a consistent message:** Interviewees and focus group participants recognized a large number of marine outreach and education programs were available within the region, but that few programs were coordinated with one another. While the broad sustainability messages were generally consistent across agencies and organizations, coordination between entities was less common unless it was a specific aspect of the grant or program. It was recommended that a consistent message adopted by many different agencies and organizations could serve to unify efforts and create a critical mass in terms of outreach that could involve a wide span of the population. It is possible that the MOES-VI effort may be a potential vehicle for this multi-agency coordination.

**Make programs discrete, experiential, and social:** In critically reviewing the programs that seem to be the most effective, interviewees and focus group attendees concluded that the best programs were focused on discrete issues that seemed within the capacity of the general public to help solve. Also, the best programs eschewed lectures and presentations in favor of experiential learning. Finally, the most successful programs were those that involved entertainment (e.g., Reef Jam), food, or a generally festive, social atmosphere. It was suggested that discrete programs are more likely to find funding (see **Grant funding** above), while programs focused on providing experiential learning opportunities tended to create more interest and bring about more lasting behavioral change. More festive events tend to bring in community members who are typically less involved in environmental education events, broadening the reach of programs that incorporate a more social aspect. A successful example is the Don't Stop Talking Fish Initiative, which had outreach events paired with a free concert that was highly attended in June 2014.

**How to do outreach:** In terms of access to technology, use of the internet, and ubiquity of smartphones, respondents repeatedly stated that the USVI is somewhat behind many communities on the mainland. Thus, while social media (e.g., Facebook, Twitter, YouTube, etc.) may have its place in marine outreach and education, it was recommended that successful programs continue to incorporate more traditional mechanisms for outreach. This includes advertisements and articles in the local newspaper, stories and shows on the local PBS station, signs on beaches and buoys, and posters at common gathering locations.[8] Specifically, people recommended advertisements and interviews on the local talk radio stations due to their wide reach and large, daily audience across all communities. As stated by focus group participants, talk radio is commonly playing in the background of various locations, including taxis, restaurants, offices, and stores. A particularly engaging radio spot can reportedly create word-of-mouth buzz in a manner dissimilar to other media.

## 4.4 Outreach Summary and Discussion

The documentation of existing marine outreach and education programs utilized many different methods, all focusing on slightly different aspects of those programs. Combined, the results are meant to suggest a more comprehensive picture of the existing efforts, challenges, gaps, and possible future opportunities. On the whole, access to key stakeholders and involvement were excellent, with many people directly engaged in natural resource management, outreach, education, and communication active in the project and providing their input. Information given during the interviews and focus groups provided a rich description of current issues and lessons learned.

The systematic qualitative data collection techniques employed were reasonably successful, even if the statistical significance of the results was not particularly high. For example, the results of the freelist exercise served to reasonably define a relevant domain with regard to marine outreach and education programs, but it was clear that the concept of "a program" was commonly conflated with the generalized actions of its sponsoring agency or organization. Statistically, this complicates the freelisting results; analytically, it suggests a conclusion that is reinforced by interview data regarding staffing, the vagaries of relying on grant funding, and the purposeful, singular focus of some organizations on key environmental issues. The results of the social network analysis were particularly insightful with regard to which agencies and organizations are most involved in outreach and education efforts. Clearly, the various divisions within DPNR are central and would likely be involved in many future efforts. Other organizations, such as TNC and SEA are also directly and/or indirectly involved in many efforts and may find success in

[8] These efforts may be combined with recommendations regarding the use of local patois, as stated above.

extending their respective reaches. Dot voting and survey results regarding methods of communication are far from statistically significant representations of the entire education community, but do provide a level of magnitude indication as to what people think about various programs and communication mechanisms, respectively. These results can be used to inform existing and future practices.

## 5.0 CURRENT PROGRAM AND COMMUNICATION GAPS

As discussed above, a large number of outreach and education programs exist within the USVI and there are few gaps in terms of topics; most environmental issues throughout the islands have a devoted outreach or education program associated with them. The gaps exist, however, in how well developed individual programs are and how fully they engage key user groups, which can be attributed to a range of underlying causes. Gaps also exist in the communication and cooperation between major educating agencies/groups and with stakeholders.

Table 11 presents a summary of key gaps by topic identified in the review of current programs and through the focus group and interview tasks.

**Table 11**
**Outreach and Education Gaps**

| Topic | Discussion |
|---|---|
| Communication Links | • **Formal vs. informal connections.** Based on interviews and the results of the social network analysis, it was clear that a number of connections exist between various agencies and other entities involved in outreach and education in the U.S. Virgin Islands (USVI). However, many people stated that these linkages were informal and not based on a formal cooperative agreement between entities. In some ways, these informal linkages are likely a product of a relatively circumscribed community of environmental program personnel in the USVI. Another reason for these informal linkages may be the lack of administrative support for formal linkages between entities and informal linkages have filled the void. According to interviewees and focus group participants, formal linkages are typically defined by grant opportunities and can expire when grant funding is exhausted.<br>• **VINE.** Interviewees and focus group participants regularly noted that Virgin Islands Network of Environmental Educators (VINE) was an important resource in terms of coordination and interagency communication; however, data from the social network analysis suggest that VINE is not considered a key partner in outreach and communication efforts. This is due partly to the nature of the organization, which can be considered a loose affiliation of environmental educators and listserv as opposed to a formal organization. Still, it is possible that VINE could take a more active role in coordinating efforts across agencies since it has a large membership but low utilization.<br>• **EAST and SEA.** The Environmental Association of St. Thomas (EAST) and St. Croix Environmental Association (SEA) seemingly occupy similar roles in their respective communities, organizing and sponsoring various environmental education and outreach |

| Topic | Discussion |
|---|---|
| | events. Interviewees consistently stated that SEA was a major player in the environmental education arena in St. Croix; social network analysis data reinforce their prevalence in the community. EAST, however, is seemingly less involved in St. Thomas and is prevalent in the social network by nearly all measures. Despite SEA's challenges with regard to funding, staffing, and user group involvement, they have instituted successful programs in St. Croix and the lack of a similar organization in St. Thomas is a gap.<br>• **UVI.** Based on the variety of metrics measured by the social network analysis, the University of the Virgin Islands (UVI) is heavily involved in the marine outreach and education community in the USVI. However, based on interviewee statements, the lack of full UVI support in St. Croix negatively affects coordination with the university. The university also serves as a major go-between for agencies and other user groups, with a trusted "brand" among visitors and locals, alike. There was also a perception from some interviewees that the university and its students could be more involved in projects throughout the USVI and incorporate public outreach and education into its curricula.<br>• **TNC.** The Nature Conservancy (TNC) is another primary organization in the USVI active in marine outreach and education. However, the social network analysis and correspondence analysis both suggest that TNC occupies a different space and has a much different focus than most organizations and entities within the USVI. TNC sponsors different programs and has a smaller out-degree centrality measurement compared to its in-degree centrality measurement, which suggests that more entities rely on TNC than it relies on other entities. Like UVI, TNC is well organized and has a large infrastructure in place to support grant writing and coordination activities.<br>• **Coral World.** For many visitors to St. Thomas, Coral World is a major communication and outreach organization, providing experiential learning activities with a wide variety of wildlife. However, Coral World reportedly struggles with engaging local community members and is arguably outside the core nucleus of agencies and organizations most involved in outreach and education in the USVI based on the social network analysis. Coral World has many of the same strengths as UVI and TNC, including a well-trained staff. It also has the added benefit of not being entirely dependent on grant funding, which could provide it more flexibility to become a local leader in marine outreach and education.<br>• **USCG and other enforcement agencies.** Many interviewees and focus group participants stated that environmental law enforcement is somewhat lax within the USVI. The reasons for this were not provided consistently; however, the overall result of decreased levels of enforcement was noted regularly as a degraded natural environment. Interview themes, freelisting results, and social network analysis results all suggest that the U.S. Coast Guard (USCG) and other enforcement agencies are not conceptualized as key partners in environmental education and outreach. When asked, however, focus group participants and interviewees would state that law enforcement personnel were often the front line of education with regard to environmental stewardship and safety for tourists and members of the general public. |
| Ineffective Outreach Strategies | • **Digital divide.** Focus group participants and interviewees regularly stated that social media, websites, and other online forms of outreach and education were not as well received as other methods. These statements are reinforced by the results of the small survey performed during the outreach task. People stated regularly that websites, social media, or any sort of online presence was important and can only serve to help reach more people, but these methods cannot be relied upon on their own to spread a communication message. People regularly stated that the USVI was more unique in this respect since internet access and smartphone use are not as ubiquitous as on the mainland. More classic forms of communication (e.g., newspaper, radio) were suggested as having more broad appeal. |

| Topic | Discussion |
|---|---|
| | • **Fests and jams.** Public events combined with a conservation message, like Reef Fest and Reef Jam, typically attract a large attendance and were consistently identified as successful events. However, interviewees stated that these events are not altogether effective in communicating the stewardship message to members of the general public, who are arguably more engaged in the festival atmosphere of the event. There is a concern that the pollution and beach damage done during an event runs counter to its environmental mission and perpetuates a belief among tourists and members of the general public that beaches and coastal zones are places for laid-back, carefree behavior and environmental awareness is not a concern.<br>• **Non-local flavor.** As discussed by interviewees and reinforced by the literature, a disconnect can develop between the environmental stewardship messages transmitted by educators and the intended audience. This can be exacerbated by socioeconomic, racial, and cultural tensions and/or historic contexts, as discussed in the Outreach Summary report. Some of the least successful programs, according to interviewees and focus group participants, are those with little-to-no local involvement. These types of programs are typically focused on issues considered unimportant by locals and education materials are designed in a manner that does not reflect local aesthetic values. Despite being professionally produced and designed, these types of materials accentuate the "otherness" of the message and serve to undercut its legitimacy among members of the general population.<br>• **Stakeholders and trust.** Interviewees and focus group participants suggested that even outreach and education programs with little local involvement may find success in the USVI if they are delivered by an agency and/or individual trusted by the target audience or user group. In many ways, this trust can only be built over time and reciprocity of information and resources is important. This is particularly true for fishermen and other user groups with highly developed knowledge of the marine environment who are unlikely to trust individuals they perceive as less knowledgeable. Staffing turnover issues can affect the trust placed in an agency, in turn affecting the efficacy of the agency's outreach and education program. |
| Disengaged Stakeholders/User Groups | • **Territorial government.** The survey of active programs and the results of the interview and focus group tasks all suggest that programs oriented toward territorial government and political decision makers are not as prevalent as other types of programs. Social network results suggest that they are key players in the community, and interviews suggest that territorial government decision makers are interested in local environmental issues, but the messages are not communicated to politicians and policy makers in a useful manner. Also, the constantly changing political climate of the territory requires repeated messaging from agencies and other entities about key issues, which can consume time and other resources.<br>• **Property owners.** Property owners were one of the user groups with the fewest number of programs oriented specifically to them. They are also minimally involved in the overall marine outreach and education community based on the results of the social network analysis. Interviewees and focus group participants stated that many of the island-wide environmental issues are communicated to property owners via programs oriented toward the general public. However, some programs associated with development, land use, and waste management are oriented specifically to property owners. These programs are reportedly lightly attended and/or have low participation rates. Reasons for these low rates of participation differ among interviewees but may include poor timing of events or an overall adversarial tone to the education programs since noncompliance can result in fines.<br>• **Businesses.** Businesses are the other user group with the fewest number of programs oriented specifically to them. Similar to property owners, programs oriented toward businesses include those associated with development, land use, and waste management. Restaurants are also involved in local sustainable fishing efforts. Despite some successes, |

| Topic | Discussion |
|---|---|
| | overall, the programs have low participation rates for many of the same reasons suggested with regard to property owners.<br>• **Volunteers.** Interviewees and focus group participants regularly stated that "quality volunteers" were difficult to find in the USVI, meaning volunteers who could provide a consistent number of hours a month, were able to be involved in long-term projects, and had needed skillsets. When quality volunteers are a part of a program, it is not uncommon for them to depart unexpectedly for a paying position elsewhere. Volunteers from the mainland United States usually have time limits on their residency (e.g., summer) and the cost of living in the USVI requires volunteers to have a side source of income, which can affect their availability to participate in any particular program.<br>• **Tourists.** Since tourism is a major driver of the USVI economy, a number of programs are oriented toward tourists specifically, and those programs oriented toward the general public are also developed with tourists in mind. Some programs have reportedly been very well received by tourists arriving by cruise ship or for longer, multi-day stays. Programs associated with tourist destinations (e.g., Coral World) or fun public events (e.g., Reef Jam) reportedly see adequate participation from visitors. However, some conservation, preservation, and stewardship messages are reportedly not well communicated to tourists. These messages include those associated with curbing litter, leaving shells and coral in their natural environments, and respecting sensitive marine life.<br>• **People "outside the choir.**" Interviewees and focus group participants regularly noted that they felt that their efforts were "preaching to the choir," and that they have historically had difficultly drawing in new people to their respective programs and activities. Many people did not have a clear reason as to why their program was not reaching a broader crowd, although some program coordinators stated that they sometimes overcame this challenge by engaging different audiences indirectly (e.g., parents chaperoning student programs) and making them take an active role in the experiential learning or outreach activity. |
| Less Popular Topics | • **Climate change.** The survey of existing programs revealed that climate change was not a popular topic of education in the USVI. Interviewees and focus group participants stated that the reason for this was twofold. First, the topic was considered too abstract and not tangible enough to inspire an engaging curriculum. Second, the topic had become politicized and programs directly addressing climate change only served to alienate potential participants.<br>• **Watersheds.** The survey of existing programs also revealed that programs concerned with watersheds were also not as prevalent in the USVI. Interviewees and focus group participants suggested that the reasons were somewhat similar to the reasons why climate change programs were fewer in number: the concept of watershed management is too large and abstract to communicate clearly and engagingly to a student and/or general audience. In both cases, program managers found that it was easier to orient a program on a singular issue associated with watershed management (e.g., pollution) as opposed to tackling the entire system.<br>• **Recycling.** The dot voting activity conducted during the focus groups revealed that recycling efforts in St. Croix were not present and, in terms of supporting wider environmental efforts on the island, desperately needed. Reportedly, economic forces on the island prevent a successful recycling program from operating. Focus group participants stated that the lack of a viable recycling program exacerbates an already-present waste dumping issue on the island, as well as tacitly reinforcing a more wasteful lifestyle for island youth. |

## 6.0 ACTION RECOMMENDATIONS

The following action recommendations are informed by the literature review, outreach effort, and gap analysis. Many of these action recommendations are based directly on statements gathered through the interviewee and/or focus group efforts and are generally categorized based on the themes uncovered through that process. In most cases, action recommendations were developed to respond to specific gaps or improve upon already-successful efforts being conducted in the USVI. At this point in the process, the recommendations are not constrained by specific budgets, grant opportunities, or staffing levels, although they are informed by historical trends in these areas.

- **Establish a key node and capitalize on established centers of leadership**. Interviewees and focus group participants suggest that a greater level of coordination is necessary to create more engaging and long-lasting outreach and education programs. Additionally, the literature suggests more coordination could serve to decrease inefficiencies inherent in multiple agencies and organizations covering identical topical work territories. Linkages between organizations exist, and many of the key agencies and organizations share reciprocal ties. These relationships should be formalized and a position of coordination —a key node—should be identified or created within an agency or organization. This should be a regular paid position and not dependent on grant funding (reducing the chance of staff turnover associated with volunteer and discrete grant-funded positions). The position should be considered an "Outreach Czar" who coordinates efforts and has relationships with the key entities in the USVI. The position should be housed within one of seven key agencies seen as centers of leadership within the USVI (as suggested by the social network analysis): DPNR-CZM, DPNR-DFW, NPS, NOAA-NMFS, UVI, SEA, or TNC. Whether the position is housed as part of local government (DPNR-CZM or -DFW), federal government (NPS or NOAA-NMFS), or outside government (UVI, SEA, or TNC) should be determined through consultation, as each agency or organization has certain strengths and weaknesses in terms of coordinating effort and promoting programs. It is preliminarily suggested here that the MOES-VI program could be used as a platform for integrating agency priorities for outreach and education efforts, as it is within NOAA-CRCP, has strong connections to divisions within NOAA and other key agencies, and is already involved in successful outreach and education efforts in the USVI. Alternatively, an outside organization like the Caribbean Landscape Conservation Collective, which has ties to many key agencies, is part of a larger nationwide network, but is relatively independent, may also act as a platform. Regardless, the entity housing the position is not nearly as important as the fact

that this position would link all seven of these key agencies and organizations and serve as a unifying force.

- **Work with law enforcement**. Law enforcement engages with all subsections of the population, including tourists, fishermen, students, property owners, businesses, and other members of the general public. However, law enforcement is not as engaged in promoting existing outreach and education programs as it may otherwise be. It is recommended that the U.S. Coast Guard and Department of Planning and Natural Resources-Division of Environmental Enforcement (DPNR-DEE) be provided materials by resource management partners and collaborate on the development of products on an ongoing basis for distribution to the general public. For example, information on sustainable fishing practices may be provided to tourists engaging in illegal sport fishing in combination with a warning or citation. However, prior to this effort, officers should be trained in customer service and all new recruits regardless of enforcement entity should receive an environmental orientation specific to the rules and regulations their entity enforces.

- **Let the islands inform each other**. Despite their relative proximity, practices on St. Thomas, St. Croix, and St. John vary widely. Specifically, it is recommended that SEA coordinate with the Environmental Association of St. Thomas (EAST) and other appropriate NGOs to share best practices and help build their capacity. This may result in SEA and EAST becoming more organizationally aligned or partnered and/or SEA engaging more in projects on St. Thomas.

- **Concentrate on recycling efforts**. While the Virgin Islands Waste Management Authority (VIWMA) is currently involved in promoting construction and remodeling recycling and reuse, it is recommended that recycling specialists from the (VIWMA meet with other waste management entities in the Caribbean to determine the best way to facilitate aluminum, glass, and plastic recycling efforts in the USVI; the Caribbean Challenge Initiative would be an ideal forum to establish lines of communication. It is also recommended that VIWMA promote throughout the entire USVI the existing St. Croix recycling guide via radio and printed advertisements.

- **Broaden audiences**. Interviewees and focus group participants provided some very specific recommendations with regard to broadening audiences for outreach and education programs. These included:

    - Make education materials available in places that members of the general public frequent. It is recommended that materials be placed where members of the general public have some "down time" so they can absorb an environmental

message. This can include banks, laundromats, movie theatres, airports, grocery stores, and the Department of Motor Vehicles.

- Work with businesses to incorporate environmental awareness. It is recommended that educators work with businesses to incorporate environmental education and sustainability messages into new worker training manuals. This is particularly relevant for industries that produce land-based source pollution or interface with commercial/sport fishing.

- Focus on the economic benefits of behavior change. When developing a new program, it is recommended that environmental educators make a point of showing the economic benefit of behavior change in addition to the classic stewardship/sustainability message. It is recommended that demonstrating a clear financial incentive for responsible environmental behavior will serve to draw in more members of the general public who feel that it is otherwise cost- and time-prohibitive.

- **Form a USVI-wide message**. It is recommended that key entities in USVI marine outreach and education form a consistent message and attempt to prioritize outreach foci. It is also recommended that large campaigns share similar branding elements so that efforts sponsored by various agencies are experienced by the public as a cohesive whole, even if the individual events are funded by disparate grants and various agencies. This branding can include the use of a consistent font, visual theme, tone, and/or charismatic spokes-character (e.g., Smokey Bear or Litter Critter).

- **Make messages local and culturally relevant**. Perhaps the most prevalent recommendation to come out of the interview and focus group tasks was to make messages feel more local and culturally relevant. It is recommended that environmental educators work with local community members to identify environmental issues of particular relevance and prioritize programs responding to these issues. It is also recommended that local artists, photographers, musicians, writers, and designers be employed to develop materials and other content used in environmental outreach and education efforts such as brochures, posters, signs, and flyers. It is recommended that some Crucian and/or St. Thomian patois be used sparingly on materials like bumper stickers, magnets, and posters to lend a more authentic, local flair to historically staid outreach messages. Finally, it is recommended that outreach and education specialists in the USVI pool resources and host/attend a workshop or attend a webinar on community-based social marketing. The current leader in the field is McKenzie-Mohr and Associates,

which is a consultancy that can provide in-house training and review of existing programs.

- **Create programs that are discrete, experiential, and social, and result in immediate stewardship**. In a review and discussion of programs that were the most engaging and successful, interviewees and focus group participants concluded that the best programs were (1) focused on discrete topics and did not tackle ecosystem-wide or worldwide phenomena (e.g., climate change); (2) provided participants to engage directly with nature and wildlife as part of the education or outreach program, achieving hands-on learning; (3) included a wide variety of participants and were social in nature; and (4) ended with measurable and immediate results in terms of preservation or stewardship. Two key examples provided by focus group participants included beach cleanup activities and lionfish "safaris," both of which are focused on discrete issues (beach pollution and invasive lionfish eradication), are experiential (collecting refuse and capturing lionfish), involve others (large groups and tours), and result in immediate results (a clean beach and removed lionfish). It is recommended that educators design programs to respond to these four key features to maximize stakeholder engagement.

- **Focus children's programs on needs**. Interviewees and focus group participants stated that children are a major focus of marine and environmental outreach and education. However, many children do not have strong swimming skills and are generally uncomfortable around water. This is particularly true for children of Afro-Caribbean descent.

    - It is recommended that programs focused on introducing children to swimming, teaching water and swimming safety, and snorkeling skills continue and become more permanently developed.

    - It is recommended that these activities and programs attempt to align themselves with local churches and Boy/Girl Scouts. Specific to scouting, it is recommended that existing swimming and snorkeling programs provide assistance to scouts in obtaining the Swimming Belt Loop (Cub Scouts), the Aquanaut badge (Webelos), swimming merit badge (Boy Scouts), and the 10 levels of water skills for the Girl Scout patch program.

    - It is recommended that swimming and snorkeling programs work with the Department of Education to understand how common core requirements and other student benchmarks can be incorporated into experiential learning programs so that all parties can benefit from student participation.

- **Engage the tourism industry**. Interviewees and focus group participants perceive that tourists are less concerned with environmental issues related to sustainability and stewardship than residents. Since many cruise ship-based tourists are in the USVI for only a few hours, a limited amount of time is available to communicate environmental messages. It is recommended that entities involved in outreach and education work directly with cruise ship companies and provide outreach materials to program directors, concierges, and tour directors about key issues such as responsible recreational fishing, respecting wildlife, turtle nesting behavior, and coral ecology and sustainability efforts. It is also recommended that outreach materials and signage be prominently displayed at major tourist destinations, including the airports, St. Thomas cruise ship terminal, Coral World, and other attractions. Finally, it is recommended that environmental educators work with the taxi industry to place signage and materials in taxis so that conservation messages are communicated frequently to visitors.

- **Engage territorial government effectively**. A key interview with a member of the territorial government provided a number of recommendations for environmental educators and program directors with regard to communicating issues to politicians. Generally, it is recommended that program directors "speak in D.C.'s language" when submitting material for territorial government consideration. Specifically, it is recommended that communications with politicians should focus on how issues affect (1) community public health; (2) cultural traditions; and (3) the economy of the USVI; environmental issues should be characterized through these lenses. It is recommended that brief reports be submitted to territorial government officials that have broad sponsorship or multiple signatories.

- **Invest in outreach**. A substantial amount of scientific environmental research is conducted in the USVI. In many cases, however, the research is completed by scientists who have very little direct public engagement. When research teams participate in outreach or provide details of their work, the public, interviewees, and focus group participants stated that the effort is commonly seen as an afterthought and is not presented in an especially engaging manner. It is recommended that the agency approving scientific research permits require a level of scientific outreach as part of the research plan, provide suggestions for communicating messages, and enforce this aspect as part of its overall quality assurance/quality control process of reviewing issued permits. For example, the North Pacific Research Board, which funds research on marine ecosystems in Alaska, requires each grant applicant to include outreach in its research plan prior to awarding a grant and requires a debrief of outreach efforts upon close-out of the grant.

- **Incorporate stewardship into public events**. Events like Reef Jam, Reef Fest, and Don't Stop Talking Fish combine an environmental and marine resource management message with a public event that includes music, food, and other activities. Interviewees and focus group participants stated that these events served to draw a larger proportion of attendees than classic environmental education events, but that there was a risk that the resource management message could get lost in the carnival atmosphere. It is recommended that program developers keep this in mind when planning large-scale public events, taking the opportunity to think of strategies to keep the environmental message clearly at the heart of the event. This can be done through media campaigns before and after the event, various exhibits and side-events, displays, activities (e.g., Don't Stop Talking Fish's lionfish derby and kids' angling tournament), recycling bins, and messages communicated by musical acts between or during sets.

- **Use technology, but do not rely on technology**. It is recommended that all outreach and education programs include an online and/or social media component. This should include a website, Facebook page, and/or Twitter/Instagram account. Large programs may want to explore the development of a devoted smartphone application. It is recommended that, despite these efforts, environmental outreach and education program developers should not rely solely on online and social media communications to spread their message. Technology is not as ubiquitous and pervasive in the USVI as it is in other places. For the foreseeable future, program developers should employ a range of other media to draw attention to their efforts. This can include radio commercials, print advertisements, press releases, and stories on the local television news and/or PBS station. It is specifically recommended that program directors should focus on radio advertisements and/or communicating their issue through talk radio programming to reach a wide, local audience.

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**APPENDICES A THROUGH F**

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