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IN AGRICULTURE AND NATURAL RESOURCES

Final Report

Composite Red Tide Vulnerability Index:

Focus Groups

Sponsored by the Florida Fish and Wildlife

Conservation Commission

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For More Information

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Ricky Telg, Ph.D. – Director & Professor, Department of Agricultural Education and Communication, University of Florida/IFAS Center for Public Issues Education



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Background

Red tide events are a recurring natural phenomenon along Florida’s coastline. While still not yet fully understood, the initiation, progress, termination, and ecosystem effects of red tide events have been observed and studied for decades (Burton et.al., 2020; Ahn et. al., 2006; Zhao et. al., 2016; Lee et. al., 2021; Gravines et.al., 2020; Brooks et.al., 2017). More recently, red tide events have been shown to influence human activity, resulting in significant impacts to human health (Fleming et.al., 2011; Stumpf et. al., 2022; Kirkpatrick et.al, 2004), tourism (Ferreira, et.al., 2022; Bechard, 2020(a); Bechard, 2020(b)), and other socioeconomic domains (Adams et.al., 2018; Moor et.al., 2022; Bechard, 2021; Hall-Scharf, et.al., 2018; Adams, et. al., 2002). The scope and severity of these impacts to human activity in a given region are not only dependent on the size, intensity, distance to, and duration of the red tide event itself, but also the demographics, economic structure, and relationship to other regions of the state and world (e.g., through visitation and trade) (U.S. National office for Harmful Algal Blooms, 2021; Ferreira et.al, 2022).

These findings are a first step towards a more complete understanding of the broad socioeconomic impacts from red tide events but still largely represent measurements of the impacts to specific human activities from individual red tide events and do not yet provide a framework for consistent, comparable measurements across years (U.S. National office for Harmful Algal Blooms, 2021; Florida Harmful Algal Bloom Task Force, 2021). There are critical needs to build upon this information towards consistent, comparable measurements across years and to quantify the vulnerability of coastal communities in Florida to the impacts of red tide events, which can both inform decision-making processes related to preparing for, mitigating, or preventing the negative impacts of red tide events. In this context, the term vulnerability refers to the degree to which a community is susceptible to and is unable to cope with the adverse effects of red tide on natural, social, and economic systems (Pollnac, et.al., 2015; Adger, 2006). This is especially important as continued population growth and coastal development increases the size of potentially affected human populations and the scope of the negative economic effects resulting from red tide events. In addition, climate change may affect the distribution of suitable living areas for *Karenia brevis* populations and nutrient enrichment related to human activity has been shown to be a driver of increased intensity and duration of red tide events in Florida, so the location, intensity, and duration of red tide events could change in the future.

From 2020-2023, researchers from University of Florida and Texas A&M, with funding from the Gulf of Mexico Coastal Ocean Observing System (GCOOS), collaborated to study knowledge and perceptions related to red tide in Southwest Florida, potential metrics for measuring community vulnerability to red tide events and socioeconomic impacts of a red tide event that occurred statewide in 2017-2019. The project team completed estimates of commercial fishing activity, recreational fishing activity, activity within peer-to-peer accommodations, visitation to affected regions by Floridians and non-Floridians, and residential property values.



Following the completion of this project, these researchers teamed up again, with funding from the Florida Fish and Wildlife Conservation Commission, to create a Composite Red Tide Vulnerability Index (CRTVI) to quantify the vulnerability of coastal communities in Southwest Florida to the impacts of red tide events. The CRTVI proposed can increase general awareness of an area's vulnerability to the impacts of red tide events and can be used as an objective criterion to help decision-makers both identify areas that are more vulnerable to impacts stemming from red tide events and design systems to better prepare for, respond to, and mitigate red tide event impacts in the future. As a composite index, the CRTVI will communicate the global vulnerability of distinct communities as well as provide insights on a community's vulnerability across the specific domains (tourism, fisheries, economic structure, health, environment). The composite nature of the CRTVI ensures that it will be useful to a wide range of potential audiences including local- and state-level policymakers, tourism development agencies, private industry, environmental agencies, and the general public.

The CRTVI research team has communicated with relevant stakeholder groups throughout the project period, not only to incorporate stakeholder insights and perspectives into the development of the CRTVI but to inform the design of outputs of the project and to ensure that results are communicated in a simple, accessible and creative manner.

A focus group protocol was developed (Appendix A) to collect stakeholder input during the indicator selection stage. The protocol utilized a non-probabilistic sampling approach and distribution relied on previously existing lists of stakeholders compiled by the PIs from previous red tide-related projects (GCOOS and WCIND economic projects, FWC-FWRI funded Red Tide Communication Project). Stakeholders encompassed members of the tourism and hospitality industries, and local small businesses (tourism); commercial and charter fisher folks (tourism and fisheries); public health officials and members of the Department of Health Harmful Algal Bloom (HAB) Health Committee (public health); and natural resource managers, city and county managers, and elected officials (coastal economies).

This focus group study specifically explored:

- Participants' experiences with potential outcomes of red tide events affecting tourism, fisheries, public health and coastal economies of Southwest Florida.
- Participants' perceptions, and knowledge related to potential metrics that could be used to assess the vulnerability of tourism, fisheries, public health, and economic impacts to red tide events.
- Participants' feedback regarding the weighting of metrics that could be used to assess the vulnerability of tourism, fisheries, public health, and economic impacts to red tide events.

Gaining an understanding of the participants' knowledge, perceptions, experiences, and concerns regarding potential outcomes and metrics to assess the vulnerability of coastal communities suffering impacts of red tide events can help to assess the socioeconomic impact on areas of Florida that were and could potentially be impacted by HAB events in the future.

Methods

Data for this report was collected through four focus groups held virtually in October 2023. Participants had to be Florida residents and at least 18 years of age. The focus group participants were a from convenience sample, recruited from the past GCOOS and FWC-FWRI-funded studies and from other existing stakeholder groups. Participants that were not part



of designated project advisory committee were offered a monetary incentive. During the focus group participants used Whiteboard in Zoom to create and post “notes” in appropriate categories during brainstorming activities. The moderator guide utilized in the focus groups was reviewed by a panel of experts consisting of faculty and specialists from the UF/IFAS Department of Agricultural Education and Communication (AEC), Department of Family, Youth, and Consumer Sciences, Department of Food, Resource, and Economics, and Florida Sea Grant. Member checking at the conclusion of each focus group was used to ensure credibility of the findings (Lincoln & Guba, 1985). The groups were analyzed using a constant comparison method to develop themes which have been identified in this report.

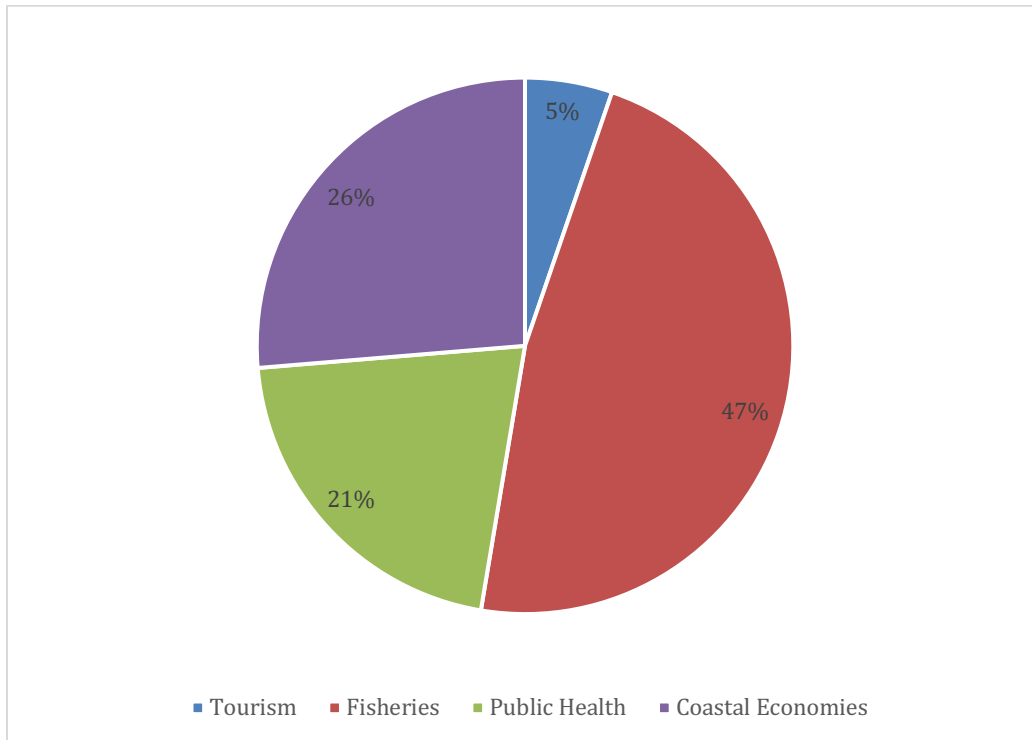
Description of Participants

We spoke with a total of 19 participants in this study, including two representatives from the organization that sponsored the study, Florida Fish and Wildlife Conservation Commission. Three of the focus groups consisted of participants considered to be experts from the fields of tourism, fisheries, public health and coastal economies, and one of the focus groups consisted of members of this project’s advisory committee.

Sector Representation

Participants were recruited as experts from the following sectors: tourism, fisheries, public health, and coastal economies of Southwest Florida. Forty-seven percent of participants were experts in fisheries, both commercial and recreational; 26% were experts in coastal economies of Southwest Florida; 21% of the participants were representatives from public health, and 5% of the participants were experts in tourism (Figure 1).

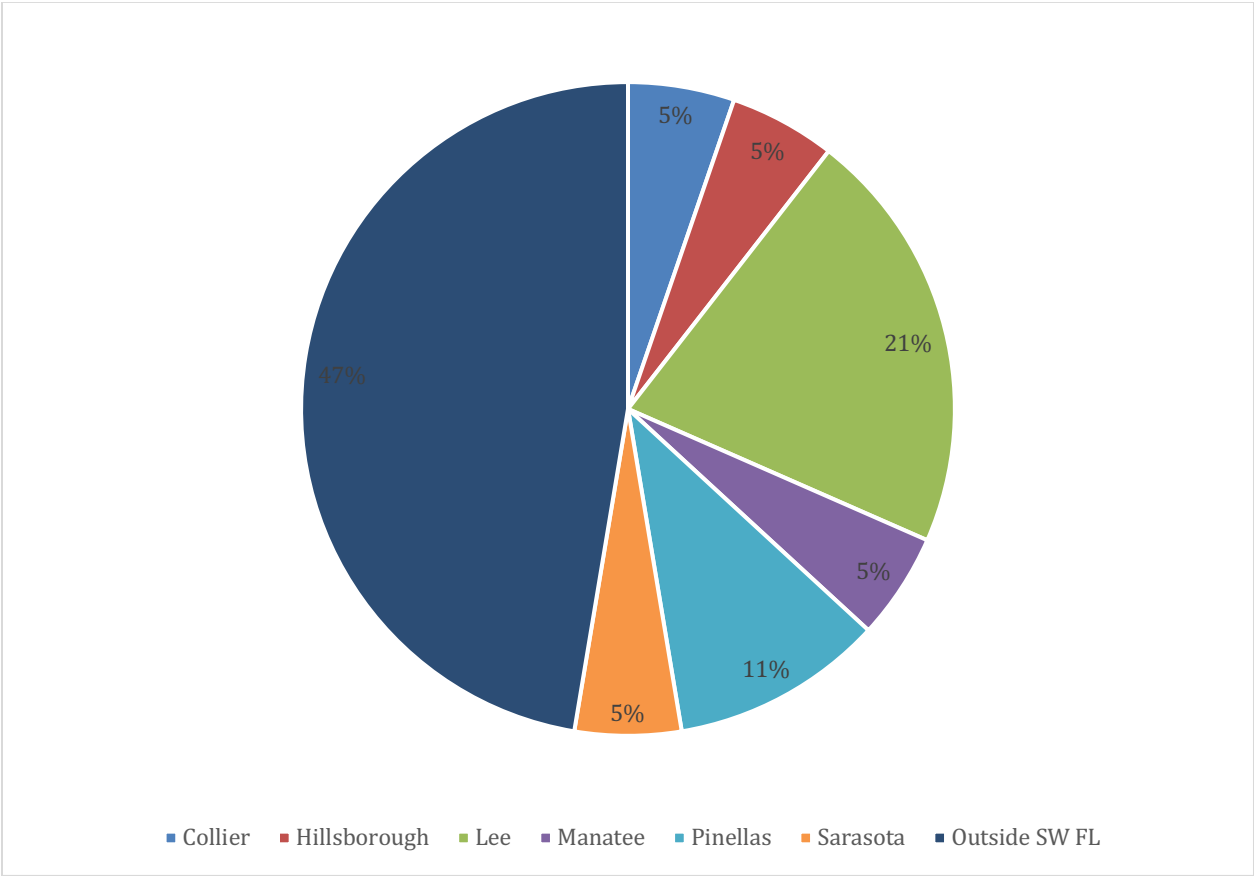
Figure 1. Sectors



Location of Participants

Participants were recruited from the Southwest Florida counties of Hillsborough, Pinellas, Manatee, Sarasota, Charlotte, Lee, and Collier. The counties of Collier, Hillsborough, Manatee, and Sarasota made up 5% of participants, respectively. Twenty-one percent of participants were from Lee County, and 11% were from Pinellas County. Experts from areas outside of Southwest Florida were also included in the focus groups, and they made up 47% of the participants (Figure 2).

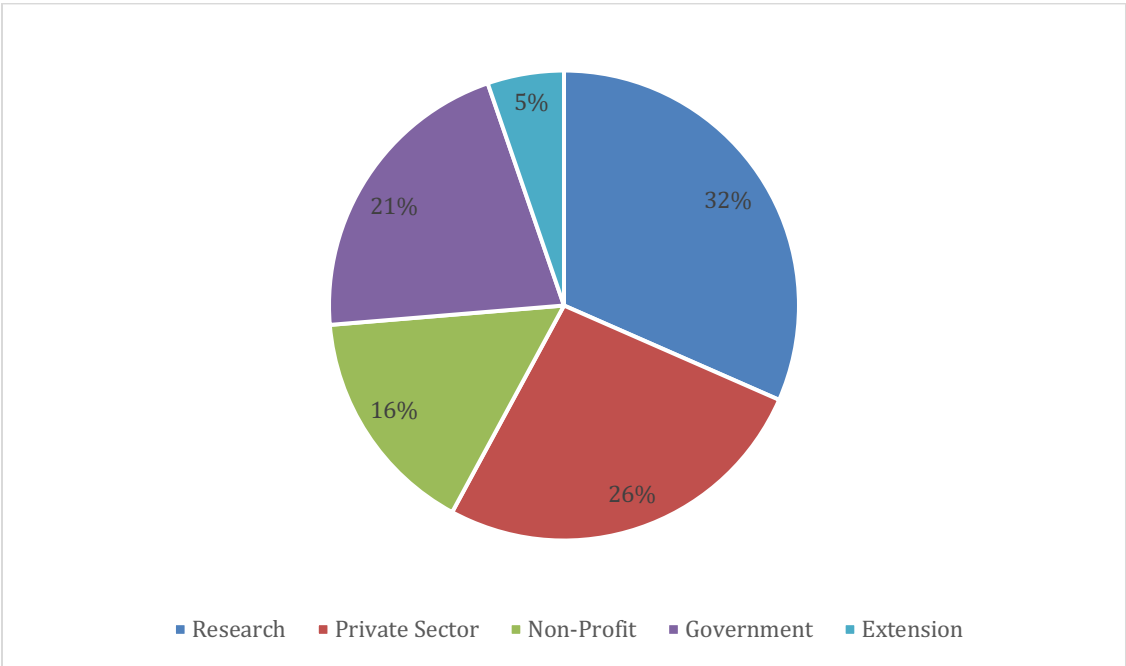
Figure 2. Location



Participants' Profession Type

Participants with research, private sector, non-profit sector, government and Extension backgrounds were recruited for this study. Thirty-two percent of the participants worked in research, including scientists from the DEP, NOAA, , and the Tampa Bay Estuary Program (TBEP). Twenty-six percent of participants worked in the private sector, including boat captains, real estate agents, and restaurant owners. Twenty-one percent of the participants worked in government, including representatives from Florida Poison Information Center, the St. Petersburg Innovation District, and the Florida Department of Health. The non-profit sector made up 16% of participants, including members of the Everglades Foundation, Captains for Clean Water and Solutions to Avoid Red Tide (START). Extension each made up 5% of participants (Figure 3).

Figure 3. Profession Type



Results

Participants provided feedback on potential outcomes caused by red tide events, and brainstormed metrics that could be used to quantify impacts to tourism, fisheries, public health and coastal economies caused by HAB's. The research team pre-populated the Whiteboard with several example metrics before the metrics brainstorming exercise.

Tourism

Participants said that tourists and event planners face real planning challenges from the uncertainty caused by red tide events. Visitors want to know the duration and location of red tide events, and whether they need to cancel their vacation or event due to red tide events. Participants said that visitors might not consider Southwest Florida for events and vacations because of the perception that the area is a hotspot for red tide events. One participant said, "You could just hear people being, 'I will never plan anything in this area again, because this could happen without any notice.' The frustration was palpable." Social media can influence the perceived magnitude of red tide events. Photos of fish kills and mammal strandings are shared widely during red tide events. One participant said that even though dead marine



animals might only be washing up in one area, social media can make it seem “like, there are dead dolphins everywhere. Like really horrifying.” Additionally, participants said the owners of seafood restaurants lose business during red tide events because of the perception that the seafood being served was unsafe to eat. One participant said, “I know there was a lot of pushbacks from restaurants stating, ‘If you advertise that there’s a red tide, we will lose our seafood business.’ Seafood in restaurants, it’s not like they’re going out to the beach and catching fish off the beach, right. That seafood is safe.” Finally, participants talked about how red tide events can have different effects on different counties depending on the type of attractions. Some counties have tourism attractions inland that people can visit; however, some counties are mainly visited for the beach.

The research team pre-populated the Whiteboard with the following example metrics related to tourism:

- Airbnbs per square mile
- Number of rented nights for maximum number of people per unit
- Share of tourism-related activities in employment

Participants listed the following metrics to measure the impact of red tide events on Southwest Florida tourism:

- Visitation data from tourism development councils
- Restaurant sales
- Seafood dealer and commercial fishing sales tax collections

Fisheries

Both commercial and recreational fishers face challenges due to red tide events. When red tide events occur, some fisheries are closed to all fishing, and open fisheries might require fishers to alter practices, such as traveling long distances to fish from non-red tide impacted areas. Recreational fishing tourists might catch fish but are wary to eat their catch for safety concerns. Safety concerns also affect shellfish aquaculture businesses, whose profits diminish because customers expecting locally caught or locally raised seafood avoid eating at seafood restaurants during red tide events. Red tide events have health effects for fish outside of fish kills- Low dissolved oxygen, increased nutrients, and red tide weakened immune systems, together with cold weather, can cold-kill affected fish. In addition, one participant said that red tide toxins cause problems with the neurological development of the larvae and younger fish, and that “we have the potential, during these blooms, to actually see a decrease in our hatching fish and in (fish) reproduction.” Red tide can also affect the size and growth rate of shellfish in aquaculture farms. Finally, fish kills leaving decomposing carcasses on the shore might result in higher nutrient loads in areas already affected by red tide events. Participants mentioned research investigating whether these nutrient loads could result in longer and recurring red tide events.

The research team pre-populated the Whiteboard with the following example metrics related to fisheries:

- Commercial fishing landings in pounds
- Number of recreational fishing trips by county of residence
- Total recreational fishing catch, number of recreational fishing trips by county of intercept
- Commercial fishing landings total estimated value in USD

Participants listed the following metrics to measure the impact of red tide events on Southwest Florida fisheries:

- Number of charters for hire



- Number of recreational day fishing passes
- Number of recreational fishing licenses and purchases by county
- Shellfish harvest closures

Public Health

Participants mentioned that red tide events can disproportionately affect the old and young and can affect residents with pre-existing health conditions like asthma and COPD. Health professionals said residents complained of flare-ups with their chronic conditions, including mouth sores and neurological issues, though some of these symptoms have not been scientifically linked to red tide events. One participant from the public health field reported that clients “weren’t able to leave the house for days because of the toxins.” Also, Florida’s aging population has more chronic health conditions than the general population, and because this demographic moves to Florida to retire, they have higher expectations about what their retirement should look like. According to one participant, red tide “really interferes with that for a lot of people in terms of retiring to Florida to have this healthy lifestyle and being outdoors and swimming every day.”

The research team pre-populated the Whiteboard with the following example metrics related to public health:

- COPD prevalence rate
- Asthma prevalence rate
- Hypertension prevalence rate
- Obesity prevalence rate
- Diabetes prevalence rate
- Population over 65
- Population under 5
- Population without health insurance

Participants listed the following metrics to measure the impact of red tide events on Southwest Florida public health:

- Over the counter medication sales
- Walk-in clinic admissions
- K-12 school absence rates
- Calls to hotlines (poison control, health departments)
- Percentage of year-round residents

Coastal Economies

Participants in multiple focus groups mentioned the cost burden of beach cleanups on coastal communities. There is no uniform statewide response for who is responsible for cleanup, and unless the governor declares a State of Emergency due to a red tide event, local cities and counties must budget to clean up the beaches after fish kills. Red tide can also affect the number of customers that businesses can attract. One participant said that red tide “affects us directly here in St. Petersburg because our entire downtown is waterfront, including our fancy new pier. It looks like a ghost town if we’re having a bloom.” Additionally, water quality has a monetary effect on real estate. The nature of Florida’s growing population means that there is a constant influx of residents who are new to the area and unfamiliar with red tide events, and many people move to Southwest Florida for retirement and have high expectations about their quality of



life. While full-time residents are familiar with red tide events and know what to expect as far as severity and duration, red tide events can affect the real estate decisions of people who live outside of Southwest Florida who are buying second homes in the area. One participant said, “In 2015... we actually did a study to show for every foot of water that was not clear, it affected real estate values in our county. It was a billion dollars lost of property values just to show... what water quality —red tide especially— did to our value of real estate. This was only from like seven data points. And they want it to be clear. People weren’t buying houses.” Red tide events can also influence entrepreneurs’ decisions to open new businesses in areas affected by red tide events, thus affecting commercial building sales as well as residential home sales.

The research team pre-populated the Whiteboard with the following example metrics related to coastal economies:

- Per-capita income
- Per-capita growth rate
- Gross regional product for marine-associated industries
- Population growth rate
- Location quotients for marine-associated establishments
- Location quotient for marine-associated employment
- Population density
- Residential density

Participants listed the following metrics to measure the impact of red tide events on Southwest Florida coastal economies:

- Sales tax
- Property values
- Real estate transaction data
- Cost of beach cleanups

Additional Findings

In addition to discussing potential outcomes to red tide events and metrics to measure the impacts of red tide events, focus group participants brought up specific needs related to red tide. First, there is a need for better centralized, accurate, and well-publicized information about red tide. One participant from the Florida Poison Information Center said that the poison control hotline would get information calls coming from all over the county because visitors didn’t know where else to get information pertaining to red tide. “People were asking, ‘I have a wedding six weeks out, will the red tide be gone by then?’... The doctors on the phones are like, ‘That’s not really my area of expertise.’” There is also a need for accurate, up-to-date information about the exact location and duration of red tide events. One participant said, “The biggest problem with red tide is everyone thinks it’s there forever, and so they just don’t come. They don’t realize.”

Another issue voiced by participants is the difficulty in balancing messaging about red tide with damaging the reputation of coastal communities. Some counties rely almost totally on tourism, and any public health press releases are highly scrutinized by tourism boards. One participant said, “It’s a very precarious position that I get put in as far as a public health messaging... any time I am tasked with putting out any type of signage or a press release, it is a pretty big ordeal, and tourism boards get involved as far as how I can word them, how long they’re out, or if I can put them out at all. It



can get interesting.” Participants said that visitors assume that red tide is affecting all beaches when it might only be affecting some communities. “And you gotta love the news... they’ve gotta keep talking about red tide, and it’s like, guys, stop. It’s been gone. We had a little bout of it two weeks ago, and it was on the news for a week straight.”

Finally, there is a need for clarification in messaging about how red tide affects health. Public health representatives reported that clients and patients were uncertain about which acute symptoms are caused by red tide, and how red tide affects chronic conditions. One participant said, “There’s still so much uncertainty about what disease these blooms cause, what the chronic issues are along with the acute issues—the long-term (health issues) versus what happens when people walk on the beach. I think there’s still a lot of people that worry about that.” Another participant reported, “We had people posting pictures on our Facebook page of the sores in their mouth, and really kind of surprising but deeply held beliefs.” There is also a need for more information about the differences between health effects of red tide and blue-green algae. One participant explained that there is misinformation that red tide can cause neurological issues, which is based on some speculative research on blue-green algae. This participant said, “People aren’t able to separate it out. When they hear algal bloom, they think of one set of symptoms.” Finally, participants reported that there is a need-to-know what health concerns residents and visitors have in order to provide better health information.

Conclusions

Red tide events affect many facets of life in Southwest Florida, including fisheries health, public health, tourism, and the economies. Following up past research that examined the knowledge and perceptions related to red tide in Southwest Florida, this series of focus groups provides researchers with insights to the potential outcomes of red tide events, as well as ways to measure the impacts of red tide events. Researchers will use these insights to rank the importance of these measures to develop an index to measure the vulnerability of coastal communities to red tide, providing leaders and decision-makers with criteria to make informed decisions about where and how to prioritize resources to better prepare for, respond to, and mitigate red tide event impacts on tourism, economic activity, fisheries and public health.

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Appendix

A. Focus Group Protocol

CRVTI Moderator Guide

Protocol Title: Understanding the Environmental, Social, and Economical Impacts of Harmful Algal Blooms in susceptible communities. Please read this consent document carefully before you decide to participate in this study.

Purpose of the research study: The purpose of this research is to obtain feedback and input on the development of a research tool that could be used to assess the vulnerability of coastal communities to Red Tide events.

What you will be asked to do in the study: This focus group will allow you to share your feedback, perceptions, and knowledge related to potential metrics that could be used to assess the vulnerability of tourism, fisheries, public health, and economic impacts to Red Tide events.

Time required: This session will take approximately 90 minutes.

Risks and Benefits: There are no anticipated risks or benefits to participating in the study.

Confidentiality: Your identity will be kept confidential to the extent provided by law. You will be assigned a code number. Your name will not be connected to any comments. The discussion will be audio and video recorded. An assistant moderator will take detailed notes. Only the researcher and research assistants will have access to the tapes, notes, and transcripts. They will be stored on a secure password-protected server. When the study is completed and the data have been analyzed, the audio and video tapes will be destroyed. Your name will not be used in any report. We encourage you to keep this discussion confidential. However, we cannot guarantee that all group members will do so.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at any time without consequence.

Whom to contact if you have questions about the study: For any general questions concerning this research study (IRB202300674), please contact Dr. Angela Lindsey at ablindsey@ufl.edu, or by phone at (352) 273-3552.

Whom to contact about your rights as a research participant in the study: If you have questions about subjects' rights or other concerns, you may contact UFIRB Office at (352) 392-0433.



Please let me know now if you do not wish to continue or if you have any questions at this time. Your continued participation in this focus group confirms your consent.

Before we begin today, we are going to use a tool that is available via ZOOM that is a virtual whiteboard. This is very easy to use, you simply “grab” a post-it note from the tool to the left, type on it, and then move it where you would like for it to go. For our next exercise, if you put it in the general area of the heading.

Great, let’s begin our discussion –

Let’s discuss outcomes of Red Tide events.

Please take a few minutes to describe the outcomes caused by Red Tide events? One post-it note per outcome – place under (or near) the heading

- In your work
- In your community

Please take a few minutes to describe the **POTENTIAL** outcomes caused by Red Tide events? One post-it note per outcome – place under (or near) the heading

- In your work
- In your community

Ask participants to do a “post-it” for each of the outcomes under each of the headings. Watch for folks ‘slowing down’

Are there additional outcomes that are not listed here that should be?

In thinking about these outcomes, we want to present to you the set of proposed metrics that have been developed to assess the vulnerability of coastal communities to Red Tide events and to some of the outcomes you have listed here today. Metrics are defined here as quantitative measurements designed to evaluate quality and/or amount of something that can be impacted.

Keep in mind that metrics should be - Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) Metrics – that meet these criteria in relation to Red Tide events

These metrics have been developed particularly for the tourism, fisheries, and public health sectors as well as economic structure. As we discuss these metrics, please think about your own work, experience, and knowledge to provide feedback if these metrics will capture the impacts that Red Tide events have had or have potential to have on these sectors. -

Team will present the proposed metrics to be used to assess vulnerability of the tourism, fisheries, public health sectors and economic structure to Red Tide events. Team will explain how metrics were developed and how they will be used to determine vulnerability.



Before we get into our questions regarding these metrics, are there any questions or points of clarification?

Our goal with developing metrics is to account for all these impacts (actual and potential) in assessing the vulnerability. With these outcomes we have discussed in mind, let's discuss the metrics.

Bring up metrics list BESIDE the outcomes slide

Overall, what are your thoughts on these metrics?

In thinking about the outcomes that were just developed, let's discuss if these metrics will capture the outcomes and potential outcomes we identified.

- Tell me the metrics you agree with?
 - Why?
- Tell me the metrics you disagree with?
 - Why?
- Describe changes to the metrics.
- Describe metrics that need to be added.
- Are there metrics that need to be combined?

Manipulate the metrics list as participants discuss.

In thinking about these metrics in your work –

Discuss if the metrics capture the impacts the Red Tide events can have on –

- Sustainability
- Different populations
- Current & future operations

Describe any impacts that you do not think are represented here?

With that in mind, are there metrics that may be dropped from the list and any best/favored metrics for the outcome?

We have before us a list of metrics –give us a thumbs up or a thumbs down or a so-so to indicate how you feel about the list.

For those that gave a thumbs down or a so-so, let's discuss why

- Outcomes & impacts not represented?
- Feasibility of the metrics?
- Too many?
- Other concerns?



Manipulate list again and ask participants by a show of hands do they agree with list. Once all agree proceed to final steps.

Are there any final questions or concerns before we wrap up our discussion today?

Thank you so much for your feedback and input today. If there are additional comments, questions, or suggestions you think of later, please feel free to reach out to one of us!

