I. Project Information*

Project Director	Amanda Moore
Project Title	Engaging Community Leaders in Tampa Bay through Storytelling and Personal Experiences of Climate Change
Project Location	The project will be implemented in Tampa Bay which encompasses greater Tampa, St. Petersburg and Clearwater, with a focus on the City of St. Petersburg. The World Bank named Tampa Bay one of the ten most at risk areas in the world. It is estimated that a Katrina-sized storm would have a $175 billion impact on the region. Tampa Bay has 700 miles of gorgeous shoreline, 4 million residents, and major development along miles and miles of coastal high hazard areas. This development exists, in part, because it's been a century since Tampa Bay has experienced a direct hit from a major storm. A 2017 Washington Post article pointed out that Tampa Bay is not prepared for sea-level rise and storm impacts and people should be worried. In addition to Tampa Bay's risks from climatic storms, the community is also facing increased risks from climate change-induced ocean warming and sea level changes. These climate risks are further magnifying and intensifying storms and other extreme events, accelerating water quality and water quantity issues in the region's cherished bay systems, causing toxic algae blooms and decreasing the resilience of already vulnerable communities. However, as work from Yale University on climate opinions has shown, even with increased localized climate impacts and the majority (72%) of Tampa Bay residents thinking global warming is happening, less than half (43%) think global warming will harm them personally (Howe et al., 2015)Though forty percent of St. Petersburg is in the Coastal High Hazard area, the city is still relatively early in its climate resilience planning and implementation efforts. In 2017, St. Petersburg published "Realizing Resilience" and followed it in 2019, with help from many collaborators, with its "Integrated Sustainability Action Plan" (ISAP). This plan defines the city's vision for resilience and sets targets and objectives for more resilient natural systems. The city is currently in the outreach and education phase of the plan, but they have noted there is a need

	to better understand the engagement methods that resonate with community leaders in the area before embarking fully. As a partner on this proposal, the City of St. Petersburg views this as a much needed next step based on the work already completed in the region. With the combined need for understanding the elevated risks Tampa Bay faces and ongoing synergistic opportunities with ongoing resilience planning, this project is launching in a shovel-ready target community. NWF has advocated for the resilience of natural systems across the Gulf of Mexico, including Florida's Gulf Coast, for over a decade. We've successfully supported projects to restore the health and resilience of Tampa Bay and served on the Technical Advisory Committee for the Tampa Bay Estuary Program since 2014. With several staff residing in and intimately familiar with St. Petersburg and Tampa Bay, we are poised to lead this project.
Project Summary	Tampa Bay is one of the areas in our nation most vulnerable to climate change. Referred to as an area with high risk and low readiness, the region has large populations, including communities with high social vulnerability, and extensive development in flood-prone areas. Currently, the region is in various planning stages for increasing climate resilience. In order to foster broad support for planning efforts and implementation, it's critical to grow awareness about the challenges faced and solutions at hand. Building from our experience across the Gulf Coast engaging with communities highly vulnerable to climate impacts, the National Wildlife Federation (NWF) will engage with community leaders in Tampa Bay to discern how storytelling and experiential learning resonates and grows awareness about climate risk and solutions.We will capture stories from community leaders across the Gulf to relay personal experiences with climate impacts, lessons learned, and solutions employed. The climate change impacts discussed will center on shared risks across Gulf communities. These stories will be compiled, along with Tampa Bay-specific information about climate risks, and presented in a short film to leaders with a facilitated discussion. Next, NWF will bring community leaders on follow-up boat tours to local restoration hotspots to see climate challenges and solutions firsthand. These events will use surveys to gauge changes in

	perspectives and understanding of risk. NWF deeply values equity, justice, and inclusion and will ensure those principles are at the forefront of our project, highlighting climate impacts and solutions in communities of color and low-income communities.

II. Progress Report Questions

1. Please revisit your proposal and review your goals and the outcomes you were seeking to achieve through this grant. How successful were you in meeting your goals? Please assess your success against the criteria you set in your proposal and use any combination of anecdotes, stories, graphs, charts, visuals as well as data to explain your success. Upload supporting files if you choose.*

The National Wildlife Federation team successfully met all goals and outcomes set for the grant, exceeding our own expectations on many aspects of the project.

Survey Findings: Our pre- and post- film screening surveys [1,2] were developed in partnership with the University of South Florida, specifically Dr. Rebecca Johns. Our survey team, made up of Dr. Johns and the NWF project staff, developed, administered, reviewed, and analyzed the survey results, which were included in the Final Report. The pre and post surveys were completed by 259 people. Likewise, we developed focus group questions for select participants in three boat tours (approx. 10 participants in each focus group) and provided an optional survey for boat tour participants not selected for focus groups (35 optional surveys completed). The focus groups were led by Dr. Johns immediately following each boat tour. Discussions were recorded by NWF staff and graduate students. Dr. Johns analyzed the focus group results and results were included in the Final Report. You can find the survey questions at the end of the Final Report.

Example of survey findings from our project summary document [see Image 1].

◊ a 240% increase in willingness to work with a group to advocate for nature-based infrastructure to absorb storm surge and sea-level rise;

◊ a 214% increase in willingness to work with a group to educate neighbors about the need for climate change policy solutions;

◊ a 149% increase in viewers willingness to attend meetings to learn about city and county resilience initiatives and how to become involved;

◊ a 35% increase in willingness to attend hurricane prep meetings;

◊ a significant increase in the participants sense of empowerment and capability to effect change to build resilience;

◊ a significant increase of knowledge in important issues such as temperature rise, storm surge, and the important of living shorelines;

◊ a shift away from reliance on state and federal government to be responsible for building resilience to climate change, and a shift toward reliance on self, community, local government, and the non-profit sector.

Example of boat tour findings:

◊ immersive learning fosters an understanding of climate challenges, while also fostering a generally positive, hopeful outlook if collective action is taken;

◊ recognition of the value of civic engagement, such as collective, community action and education and outreach to neighbors and community leaders;

◊ an emphasis of collective, community-scale action, rather than individual;
◊ recognition of systemic inequity as a major climate challenge.

Final Report: The Final Report, Engaging Community Leaders in Tampa Bay through Storytelling and Personal Experiences of Climate Change [3], detailed the project approach, reviewed and analyzed data collected, and discussed conclusions based on project outcomes. The research confirms visual media and storytelling as a powerful and impactful ways to engage audiences and conduct scientific learnings. It also revealed that experiential learning is both a successful outreach method for effectively communicating information about the natural environment and is likewise effective in inspiring and fostering a sense of individual agency toward building resilience. These results mirror our findings from years of NWF led field tours. Specifically, there has been strong anecdotal evidence suggesting that our engagement methods were effective in promoting action on coastal resilience. Our Community Engagement project has both confirmed our impact and also quantified it. The results are exciting and encouraging.

In an example of exceeding our goals for this project, the NWF team worked with Dr. Johns to submit two research manuscripts to peer-reviewed journals for publication. We are pleased to report that our paper on film and storytelling as tools for citizen engagement on climate change is now published in Environmental Communication (see attached). Our paper on experiential learning (boat tour research) is in review in the Journal of Outdoor and Environmental Education. These papers will add value to the scientific field in addition to its on-the-ground impacts.

Film and Boat Tour: In addition to the final report, we developed a four-page summary [4] for outreach, which you can find uploaded with the final report. Our team also developed handouts that convey a general overview of climate change, nature-based solutions, and Tampa Bay area risks. These were published in English and Spanish [5, 6].

Another example of exceeding expectations for the project is our short film [7, 8]. The 20-minute film went beyond our initial vision in terms of its quality, reach, and impact. We were lucky to partner with a filmmaker who works on Disney and National Geographic conservation films, in part due to our team's existing conservation network and in part due to the filmmaker's interest in the project and topic [images 2,3]. The film has been featured in five film festivals to date, from local festivals to esteemed national environmental film festivals (DC Environmental Film Festival and Jackson Wild). We are grateful to have the generous support of National Academies, which made the film possible. The film has been officially screened over 50 times [9]. The trailer has been played for thousands of people at large conferences and meetings throughout the state, including the Tampa Bay Beaches Chamber of Commerce annual dinner, the Florida Wildlife Corridor Summit, and Florida Fish and Wildlife Commission conservation conference, and many local government council and commission meetings [images 4, 5]. We also created a film screening toolkit [10] and facilitation guide [11].

The boat tours were created by the NWF team in partnership with local non-profits Tampa Bay Watch and Tampa Bay Estuary Program. Tampa Bay Watch provided the boat and captain for the tours as well as space for focus groups. Tampa Bay Estuary Program helped guide the tours along with NWF and Tampa Bay Watch [image 6]. NWF created visuals for the boat tour to be shown on screens as well as large maps and a tour guidebook [12] for each participant. Additionally, NWF exceeded project goals by adding two more boat tours specifically for elected officials. This was in response to input from the community leader boat tour participants, who thought elected officials would benefit from the experience. We had over three dozen elected officials from across the bay area spend their mornings with us learning about our project, coastal risks and solutions, and how they can help in their respective communities. See post-tour focus group example [image 7].

Materials Dissemination: We ensured broad accessibility to the project results, the film, and all project resources by creating a project webpage on www.nwf.org. The webpage provides context explaining the project, purpose, and how to get more information. The webpage hosts the facilitation guide for small group discussions post-screening, the boat tour field guide, the final report and summary, and handouts. NWF worked to disseminate the project materials by writing a blog and posting on our online platforms, presenting at conferences and large government meetings as well as directly to local government officials in the Tampa Bay area. We shared the webpage out to all film screening hosts and boat tour participants. https://www.nwf.org/Our-Work/Waters/Gulf-Restoration/Dear-Tampa [13].

Our team strategically waited until the final report was finished before publicly releasing the film in order to provide the context of why the film was made and share the insights gained from the research conducted using the film. The project was also highlighted through earned and paid traditional media, including press releases and media interviews [14, 15].

NWF anticipated the following potential outcomes:
Increased knowledge of local climate impacts: As detailed in the final report, our project findings confirmed both personal storytelling and experiential learning are powerful tools to increase awareness of climate challenges and solution as well as increase a sense of agency to further engage on climate resilience efforts. The film, boat tours, and project findings were shared widely, both online and in more targeted, direct ways to hundreds of community leaders and stakeholders. With more effective community engagement methods around the issue of climate impacts and risks, a measurable increase in community leader awareness and engagement on climate change issues in St. Petersburg and Tampa Bay is anticipated. The film (or its trailer) were shown in significant venues, including the Tampa Bay Beaches Chamber of Commerce annual dinner, the “Big-C” meeting of mayors for all barrier island communities in Tampa Bay, the Tampa Bay Regional Planning Council quarterly resilience webinar, several film festivals and state-wide or Gulf-wide conservation conferences and meetings. This reach is in the

thousands. The boat tours were attended by well over 100 key community stakeholders.

Scalability: Our anticipation that the project model and the products produced (film, field trip circuit) would be immediately relevant and available for the dozens of other municipalities in and around Tampa Bay was spot on. The film continues to be shown locally and the field trip circuit has been replicated for elected officials from Pasco to Hillsborough to Manatee Counties – and more. We have agreements with the City of Tampa, the City of Saint Petersburg, and the City of Sarasota to run more boat tours and other field tours, as well as continue screenings, in partnership with their resilience teams pending additional funding (multiple grant applications have been submitted or are being drafted).

Strengthened local capacity building efforts: We anticipated that the climate information provided through storytelling and experiential learning would enable and enhance community leaders' capacity to adapt and plan for future climate change. The project was well-received, and the partnership opportunities and interest from this work has been encouraging. The NWF team has met with and presented to [16] over a dozen NGO and local governments to discuss about how we can build from this project to help increase community engagement in local resilience efforts. One notable partnership is with the Tampa Bay Regional Planning Council led-effort to develop a coastal master plan for the bay area. Through connections built from this project, NWF has a lead role in developing the engagement strategy that complements the technical strategy. Funding is pending to implement the effort.

Optional File Upload

Supplemental - Links and Publication for NWF NASEM ICEM Report.pdf

Filename: Supplemental - Links and Publication for NWF NASEM ICEM Report.pdf **Size:** 2.7 MB

2. How has your work benefited your organization, professional field, community, or other stakeholders?*

Our community engagement efforts benefit organizations like the National Wildlife Federation and other entities working to engage stakeholders in climate resilience efforts because it provides data and tactics on how to effectively communicate this often-overwhelming topic of climate change. Instead of wondering exactly how much different community engagement methods impact audiences, this project provides a measure. It is a resource and a tool for professionals who want to raise awareness on climate issues and inspire action. The project benefitted the community and stakeholders through an enhanced understanding of climate change and its impacts as well as equipping them with solutions to mitigate the impacts. It also benefitted the scientific community through its contributions to the academic field, particularly to environmental research methods. The project has also helped shape frameworks for future resilience work in the region, including the development of the Coastal Master Plan, future experiential learning opportunities, and encouraging a deeper dialogue and connection with the broader Tampa Bay community and resilience efforts.

Finally, our project also benefitted NWF by introducing our team to the broader community. We have built many new partnerships and strengthened existing partnerships as a result of this project. The future holds many more possibilities to expand our efforts.

3. Are there any other successes related more broadly to this project that you would like to share with us?*

This community engagement project grew NWF's awareness of the reality that many people want to better understand climate change risks and solutions in the Tampa Bay area. Despite significant history in and ties to the Tampa Bay area, the NWF team was unsure of the public's receptivity to this project and messaging. Would the business community want to talk about vulnerability? Would community leaders want to focus on "what ifs" in a place that has been surprisingly undisturbed by major climate impacts? What we found, over and over, was a surprising level of interest. "What can we do?" "How can we help?" Audiences cheered after the film. Viewers cried watching the trailer. Indeed, this was the right project and the right time. It was well-received and is poised to enhance the way the Tampa Bay community engages on coastal climate risks and solutions. Our community engagement project opened the conversation for more direct engagement with local leaders across the bay area.

Additionally, this film itself was a success. The high-quality filmmaking and storytelling broadened our reach beyond the Tampa Bay area and inspired thousands of people. The film was screened at the Sunshine Film Festival, Eckerd College Environmental Film Festival, Dunedin International Film Festival, DC Environmental Film Festival, and Jackson Wild. In fact, the film was so well received that it was an "Impact Campaign" case study for Jackson Wild, and our film team was interviewed about how we made the film, what we learned, and why it's important. It can be viewed here: https://vimeo.com/866194916 [17]

4. What did you learn (positive or negative) as a result of this grant? What lessons would you share with other organizations or the field at large?*

As a result of the grant, our team learned that the Tampa Bay area – from community members to leaders - is ready to prioritize coastal resilience and nature-based solutions. We verified storytelling and experiential learning as effective community engagement methods when focusing on climate change. Our project benefited from ample funding and sufficient time, luxuries that many non-profit and community organizations often lack. This combination of resources and time significantly enhances the effectiveness and impact of a project.

In light of this, our team realized the necessity for more consistent, long-term financial support to continue our work in Tampa Bay. As the project concluded, it seemed as though we were just beginning to make significant headway and were encountering considerable interest from potential partners in extending the project's scope. Currently, our activities are on hold as we focus on raising funds for initiatives in Tampa, St. Petersburg, and Sarasota. We also learned that we need more time to build connections and meaningful partnerships with underserved and disadvantaged communities. Our project timeline was ambitious and aggressive and did not provide enough time to build trust in new communities.

Lessons that we can share with other organizations or the field at large include the importance of solid project partners who are all interested in the success of the project. Our project team went above and beyond (both external partners and the internal NWF team) to make the project a success. The entire endeavor, from the film's high quality to its submission to film festivals, the extensive time commitment by the participants and filmmaker for shooting, meticulous attention to report details and writing journal articles for publication, among many other aspects, required a significant effort from everyone involved. Additionally, we realized that when considering a media budget, investing in one $50,000 film could have a greater impact than producing ten films with a budget of $5,000 each. High-quality filmmaking has a greater impact and should be considered when non-profits are allocating often limited funding for video work.

Finally, we learned the importance of timelines when a lot of outreach and engagement is involved, especially in new communities and underserved communities. Building trust, new relationships, and actively listening for at least six months is essential before initiating any substantial programmatic partnerships. Ultimately, we found that direct, targeted relationship-focused engagement, despite requiring more time and resources, is more effective than broad, passive outreach, and it is crucial for movement-building on climate change issues.

5. How do you characterize your relationship with the GRP and what suggestions do you have for improvement?*

NWF is very appreciative on the GRPs support, guidance, responsiveness, and flexibility over the course of the grant period. We were very excited to see the GRP team at various events, including the DC Environmental Film Festival (thank you for coming!), State of the Coast in Louisiana, and the Gulf of Mexico Community of Practice, in which the GRP team connected NWF to the organizers and ensured we attended and presented our project. We are also looking forward to seeing the GRP team at the Gulf of Mexico Conference.

The NWF team knew some of the GRP grantees prior to the ICEM launch, but we have not learned much about their projects beyond the kick-off meeting. We were very excited to see the GRP team at various events, including the DC Environmental Film Festival (thank you for coming!), State of the Coast in Louisiana, and the Gulf of Mexico Community of Practice, in which the GRP team connected NWF to the organizers and ensured we attended and presented our project. We are also looking forward to seeing the GRP team at the Gulf of Mexico Conference.

In the early stages of the grant cycle, we had discussed a gathering of the GRP cohorts, which ultimately did not take place. However, it would have been a valuable opportunity to connect with and learn from other cohorts.

6. Please provide any other feedback or comments you have for the GRP.*

Thank you! This project was a wonderful experience for all involved. We had fun and carried out a meaningful and impactful project. We greatly appreciate the opportunity to explore and better understand effective community engagement techniques and the impact of our coastal climate messaging on community stakeholders. We are dedicated to continuing this work and are encouraged by the breadth of partner interest.

7. If applicable, please identify and describe the ways you or your organization leveraged GRP's grant (e.g., other funders, volunteers who worked on the program, in-kind donations etc.) Please specify the value and/or number/hours of volunteers if possible.

So far, NWF has drafted three grant proposals building off of this project. During the project period, we also received a private foundation donation in general support of our resilience efforts in the area. To date, we have received approximately $12,000 additional funds to support our resilience work in the area. We also submitted two manuscripts to peer-reviewed journals, one of which is being published and the other is in review.

National Wildlife Federation
Supplemental Document
For Final Report Grant # A-2026408270 2021 Innovative Community Engagement

[1] Pre-Screening Survey:
https://drive.google.com/file/d/1lm4bENgz_ymQXY48ToPTdm2CEoUCadwS/view?usp=drive_link

[2] Post-Screening Survey:
https://drive.google.com/file/d/15K67UQ5kbbiuq9YeNhoRJqji8d0LUwA6/view?usp=drive_link

[3] Final Report:
https://drive.google.com/file/d/1Niq0ggEQJARmpsQdNvqezOMauza9L9XG/view?usp=sharing

[4] Four-page Summary:
https://drive.google.com/file/d/1v4N0Qb98cJJDOmr1q9Lk1ghjRSexDpJm/view?usp=drive_link

[5] Handout (English): https://drive.google.com/file/d/1aH2Fx5eBFvyJMT2v-FrhzvFkoAk4-nrh/view?usp=drive_link

[6] Handout (Spanish):
https://drive.google.com/file/d/15HgGc0JpRjWOMyxAP_97fbyMr4NWF9Iu/view?usp=drive_link

[7] Film Trailer: https://www.youtube.com/watch?v=KRh3sw0P-98

[8] Full Film: https://vimeo.com/866194916

[9] Screening Locations:
https://earth.google.com/earth/d/1xxl7mqSA_z57l_V64nbAIN0EjMj4tOTL?ouid=101243422926847672146&usp=drive_link

[10] Screening Toolkit: https://drive.google.com/file/d/1PlWbd-lgMgXXpfZQktCUbesQ4cbRx80q/view?usp=drive_link

[11] Film Facilitation Guide: https://docs.google.com/document/d/1OGO-qv2utmVyw2VPCiLctRB1faoh38SIK0oEJhrocKk/edit?usp=drive_link

[12] Boat Tour Guide: https://drive.google.com/file/d/1GLz-wnRi2XxZsWz3ijBNLbV0o1g63KNv/view?usp=drive_link

[13] Webpage: https://www.nwf.org/Our-Work/Waters/Gulf-Restoration/Dear-Tampa

[14] Project Results Media Release: https://www.nwf.org/Home/Latest-News/Press-Releases/2023/10-10-23-Dear-Tampa-Bay-Project

[15] Funding Announcement Media Release:
https://docs.google.com/document/d/1ze3dPxPhlkIFLSfboyFjGgaDpmI9sYYNKD0a-O_BXqY/edit?usp=drive_link

[16] Project presentation:
https://docs.google.com/presentation/d/1ed0Mu_HmpNuDzLX2jqKtjInsuqvNe258kapV-m-c5ho/edit?usp=sharing

[17] Impact Campaign Case Study video: https://vimeo.com/866194916

[Image 1] Example of survey findings from our project summary document:

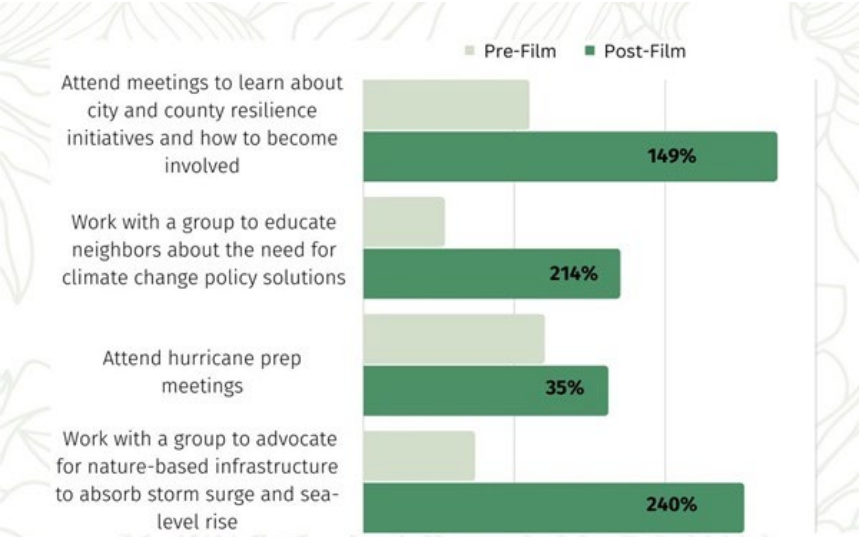


Fig. 1 Percent increase in willingness to participate in various climate change related activities after watching the film

[Image 2] Filmmaking in Grand Bayou, Louisiana:

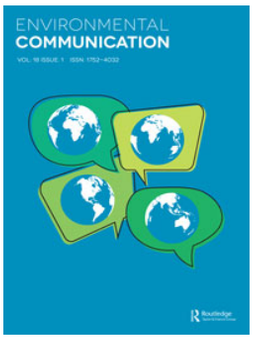
National Wildlife Federation
Supplemental Document
For Final Report Grant # A-2026408270 2021 Innovative Community Engagement

[Image 3] Filmmaking in Tampa Bay:

[Image 4,5] Screening film trailer at Tampa Bay Beaches Chamber of Commerce Annual Gala (top) and DC Environmental Film Festival (bottom)

[Image 6] One of 5 Boat Tours

[Image 7] Post-tour focus group led by Dr. Rebecca Johns



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Research Article

Dear Tampa Bay: Creating and Leveraging a Climate Resilience Documentary Film Using Story-Telling for Citizen Engagement

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ABSTRACT

Increasing the climate literacy of local leaders in the Tampa Bay region is critical if the area is to successfully face the rising challenges of the climate crisis. One of the most vulnerable areas in the world, the Tampa Bay region is often considered ill-prepared to cope with rising sea levels, threats of extreme rainfall, flooding and intense hurricanes, and the potentially deadly impact of recording breaking heat. This project produced a documentary film to increase awareness and understanding of the area's coastal climate related risks and solutions, and boost confidence and motivation to act among regional community members. We assess the impact of the film, which uses a storytelling format and strong visual messaging, on over 250 local community members' understanding of risk, knowledge of appropriate resilience strategies, and empowerment to act. Qualitative analysis of pre-film and post-film surveys reveals the strong impact of the storytelling portions of the film on fact retention, feelings of urgency and the willingness to work with others to promote local resilience.

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KEYWORDS
Climate resilience; ecoliteracy; storytelling; film; communication

Introduction

Tampa Bay is one of the most vulnerable areas to climate change impacts, particularly flooding, in the U.S (Hallegatte et al., 2013; Karen Clark & Company, 2015). An area with high risk and low readiness, the region has large populations, including communities with high social and economic vulnerabilities, and extensive development in flood-prone areas. Currently, the region is in various planning stages for increasing climate resilience. In order to foster broad support for planning efforts and implementation, increasing awareness about the challenges faced and potential solutions is critical. In this project, the reseach team in St. Petersburg engaged with community members in Tampa Bay to leverage storytelling as a communication pathway. This was achieved through the making of a documentary film which served to increase awareness about local climate risk and adaptation strategies.

The twenty-minute film, *Dear Tampa Bay*, captured stories from community leaders across the Gulf to relay personal experiences with climate impacts, lessons learned, and solutions employed. The film focused on risks shared by locations around the Gulf, and was narrated by individuals deeply embedded in, and committed to, their local communities. The narrative ends with a focus on the Tampa Bay area, with a call to action by local environmental leader, Maya Burke of the Tampa Bay Estuary Program. The completed film was shown to local leaders from a variety of organizations.

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Surveys were employed before and after the film screenings to capture the immediate impact on participants' understanding of local threats and approaches to resilience, their attitudes toward their own role in addressing climate issues, and their motivation to act.

The film screenings took place in the Tampa Bay region, which includes greater Tampa, St. Petersburg and Clearwater, with a specific focus on St. Petersburg. Tampa Bay is one of the ten most at risk areas in the world; the World Bank estimates that a Katrina-sized storm would have a $175 billion impact on the region (World Bank). Tampa Bay has 700 miles of highly valued shoreline, nearly 4 million residents, an important tourism industry, and major development along miles of coastal high hazard zones. The consensus among policy makers is that the region is ill-prepared for sea level rise and storm impacts (Washington Post, 2017). In addition to intensifying storms, a warming climate is driving extreme rain events, accelerating water quality and water quantity issues in the region's estuarine systems, causing toxic algae blooms. Despite increased localized climate impacts and the fact that the majority (72%) of Tampa Bay residents think global warming is happening, less than half (43%) think the climate crisis will harm them personally (Howe et al., 2021).

St. Petersburg faces multiple risks from the climate emergency, including sea level rise, storm surge, and other extreme weather events (Runkle et al., 2022; Tampa Bay Climate Science Advisory Panel, 2019). Between the period of 1947-2020, the relative sea level has been rising at the rate of 0.11 in./year and it is projected to increase another 2–8.5 feet by the end of the century depending on the global emission scenarios (NOAA Tidal Current Data). In addition to coastal erosion and inundation, sea level rise will exacerbate the high tide flooding from 2–3 flood days at present to 15–85 days by 2050 in St. Petersburg, which is already experiencing one of the highest official NOAA thresholds for high-tide flooding in the country (Sweet et al., 2018; Sweet et al., 2021). A projected increase in intensity of hurricanes, associated extreme precipitation and flooding due to sea level rise (e.g. Marsooli et al., 2019) also threatens the city's coastal, low-lying areas and vital coastal ecosystems. The expected inundation, flooding and erosion will likely lead to saltwater intrusion around the bay, causing contamination of coastal groundwater aquifers, posing compound impacts on the city's socio-economic and environmental assets. In July of 2023, St. Petersburg and the surrounding area experienced record-breaking temperatures, with the heat index topping 110 degrees (WTSP, 2023).

Given this level of climate-related risk, increasing awareness and empowering action to build resilience among local community leaders is critical. Scholars in environmental education have emphasized the need for innovative methods of communicating the dangers associated with the climate crisis, as well as potential solutions. Storytelling as a method of communication has been highly lauded (Muindi et al., 2020). Combining storytelling with visual media provides an innovative vehicle for raising awareness in the form of a short documentary film.

Storytelling as communication

This project developed an educational documentary film about the impact of the climate crisis on five communities on the Gulf of Mexico, as seen through the eyes of five community narrators. Storytelling as a science communication tool has received growing attention in recent years and is considered an effective vehicle for conveying facts, capturing the audience's emotional attention, promoting active listening and having a lasting impact on behavior (Huang & Grant, 2020; Bloomfield & Manktelow, 2021; Morris et al., 2019; Martinez-Conde & Macknik, 2017; Dahlstrom, 2014). Storytelling in science communication has rapidly become an important tool for conveying critical information about climate change (Muindi et al., 2020; Joubert et al., 2019; Harris, 2020; Carlin, 2010). Olson (2009) suggests that science educators "tell a concise, interesting and entertaining story" in order to engage the audience and convey critical information. Cooper and Nisbet (2016) found that storytelling could increase the audience's awareness of the risk of natural hazards

in particular. Males and Van Aelst (2021) document the impact of the documentary film, *The Blue Planet*, in charting the course in public debate about plastic pollution.

Stories are traditionally defined as narratives that involve characters, a setting, and a plot – or a series of events leading to a climax. Dahlstrom (2014) notes that "narratives typically describe a cause-and-effect relationship between events that take place over a particular time period that impact particular characters." Storytelling facilitates learning by techniques identified as narrative persuasion and transportation (Beamish, 2016). Films, in particular, are able to "transport" audiences to a particular setting and create the sense of being in a new place. Wright (2010) emphasizes that films are able to create a connection between viewers and a distant problem.

The science communication field recognizes that some variations on narrative format may still be considered stories. Research narratives and story plots have much in common (Martinez-Conde & Macknik, 2017). Both aim to present a series of related events to an audience and connect such events through causality. To make stories emotionally compelling, however, requires careful attention to the language communicators use. "We should not separate facts from emotion, à la Descartes, but tap into emotion to bolster scientific facts" (Martinez-Conde & Macknik, 2017), to persuade the audience to care about the issues. Avoiding third person, passive voice and general or vague actors is an important approach (Bloomfield & Manktelow, 2021).

Narrative persuasion results in an audience being swayed emotionally and morally by the story line (Jones & Peterson, 2017; de Graaf et al., 2012; Hoeken & Sinkeldam, 2014). Wong-Parodi and Feygina (2021) show that emotional responses are critical for engaging the public around climate change. Lockwood's work (2016) on the documentary *Cowspiracy* highlights the importance of affective imagery to communicate complex messages about the environment and evoke an emotional response in viewers.

Furthermore, personal stories rather than general, large-scale narratives, are most effective in connecting the audience emotionally to the subject (Gustafson et al., 2020; Lidskog et al., 2020). Scannell and Gifford (2013), confirmed that climate messages grounded in local places were more effective in engaging residents in conversations and planning around climate adaptation than global-scale messages. Degeling and Koolen (2022) found that framing issues locally could overcome demographic barriers to engagement with climate issues.

Storytelling is a longstanding practice among many cultures. Recently, environmental educators from within settler colonial culture have begun to pay attention to Indigenous ecological knowledge in environmental and science education (Nesterova, 2020; Kim et al., 2017) and the role of storytelling in indigenous knowledge of the land (Kinch, 2022) as a model to be valued and incorporated into mainstream Western environmental education. Indigenous knowledge and storytelling is part of this project, in particular the segment where Rosina Philippe is featured.

Films and videos are popular vehicles for science storytelling today (Walker & Boyer, 2018; Finkler & León-Anguiano, 2019; Kirby, 2003; Pearson et al., 2011; Whiteman, 2009), and the potential impact of online videos for science communication is widely recognized (Huang & Grant, 2020; León & Bourk, 2018; Erviti & Stengler, 2016). By 2018, 69% of Americans chose the Internet over television or newspapers to learn about scientific issues (National Science Board, 2018), with 75% of all web traffic involving video in 2017 (Cisco, 2018). Screen viewing is the primary modality for engaging with factual information for current generations; sixty-five percent of such viewing involves video (PRNewswire, 2023).

A visual communication strategy that is easy to understand, surprises the viewer while connecting to real and believable situations and information, encourages emotional connection to the issues and is structured as a story is most likely to be persuasive and have lasting impacts on the audience (Finkler & León-Anguiano, 2019; Lambert et al., 2003). Effective climate education should be engaging, personally relevant and meaningful for participants (Monroe et al., 2019). As Moser (2016) points out, climate communication has made great advances in the last several decades, but the connection between communication and action needs to be evaluated and strengthened.

Research questions

This project created and deployed an innovative educational tool for building climate literacy and inspiring active participation in community efforts to address the climate crisis in the Tampa Bay area. The project team developed and produced the film, *Dear Tampa Bay*, using a storytelling model, and assessed its efficacy in increasing climate literacy and enhancing viewers' confidence in their ability to collaborate with their communities to address climate change related challenges. Research questions include the following:

1. How effective is the storytelling model of the film, *Dear Tampa Bay*, in engaging viewers emotionally in the climate issues of the Gulf region?
2. How effective is the film in conveying factual information about the impacts of climate change on the Gulf region and increasing environmental literacy?
3. How effective is the film in increasing viewers' feelings of competency, responsibility, and empowerment?

Methods

This project was funded by the National Academies of Science, Engineering and Mediicine, and was led by the National Wildlife Federation's Gulf Progam officers in St. Petersburg with contributions from partners such as the Tampa Bay Watch, Galveston Bay Foundation, Grand Bayou Indian Village, and the Tampa Bay Estuary Program. Film production by filmmaker Katie Bryden of Wildpath, began in early 2022 and was completed by October of that year.

The film concept and selection of storytellers was led by the NWF project team. The team focused on storytellers across the Gulf who'd experienced significant impacts from climate change and were actively working to build local resilience. Prior to this project, National Wildlife Federation staff had professional connections to all the storytellers and had longstanding relationships with all but one of the storytellers. NWF worked with Wildpath to direct and produce the 20-minute film. The filmmaker worked from a storytelling lens, spending ample time getting to know each storyteller before filming and taking time to capture their daily routines and their local environment to introduce and connect the audience to the storyteller before hearing about the climate impacts and solutions.

The film script was reviewed multiple times at various stages of development by key stakeholders in local government, local non-profits, and other climate thought-leaders in the Tampa Bay area. Feedback was incorporated along the way. In Texas, Bob Stokes told the story of the Galveston Bay Foundation's efforts to address water quantity challenges and building marsh terraces to protect a nearby community. In Louisiana, the film highlighted two stories. Coastal erosion and sea level rise impacts on the Grand Bayou Village were relayed by Rosina Phillipe of the Atakapa-Ishak Chawasha Tribe, who also toured the living shoreline that now protects her ancestral grounds. In the Lower 9th Ward, Arthur Johnson and other community leaders remembered storm surge impacts from Hurricane Katrina and discussed their motivation to educate and empower the youth in the area to act by learning about and restoring their local environment. In Biloxi Mississippi, Dr. David Perkes, a community-based landscape architect with Mississippi State University, spoke about the

Table 1. Characters in the film, Dear Tampa Bay.

Name	Organization	Place
Maya Burke	Tampa Bay Estuary Program	St. Petersburg, FL
Bob Stokes	Galveston Bay Foundation	Galveston, TX
Arthur Johnson	Lower 9th Ward Center for Sustainable Development and Engagement	New Orleans, LA
Rosina Philippe	Grand Bayou Indian Village	Grand Bayou, LA
David Perkes	Gulf Coast Community Design Studio	Biloxi, MS

local experience with extreme rainfall and flooding and how the community restored an urban bayou to not only mitigate rainfall impacts, but also add habitat and recreational value to the area (Table 1).

The filmmaker wove the coastal climate story of Tampa Bay through the personal story of Tampa Bay-native and Assistant Director of the Tampa Bay Estuary Program, Maya Burke. Throughout the film, Maya narrates her own personal story like the other storytellers across the Gulf, but also narrates the informational and technical parts of the film that show viewers that although Tampa Bay hasn't had some of the extreme impacts faced by their neighbors, the area is facing serious climate impacts and is at high risk. The film ends with each storyteller giving their most powerful takeaways about climate change solutions and the importance of engagement. The team intentionally focused on supporting local nature-based solutions to coastal climate impacts.

In each case, the speaker conveys a heartfelt commitment to place, to the local residents and the living community. Narratives balance the devastating impact of environmental change with real-life initiatives currently underway, such as restoring seagrass habitats, protecting tidal marshes from urban expansion, re-engineering a channelized stream, and establishing oyster beds. Narration in the film happens in first person plural, increasing the connection between the audience and the speaker. For audiences in the Tampa Bay region, the culmination of the film's journey in their own region cements the connection with viewers. Compelling and astonishing visuals enhance the storytellers' narratives, with images that range from the pristine beauty of a marshland, the serenity of a kayak moving through mangroves to the devastation wrought by Hurricanes Ian and Katrina. Finally, images of community members working together to plant coastal wetland plants or build oyster beds emphasize the cooperative nature of resilience work and the importance of community relationships.

One short section of the film (from 3.16 min to 4.48 min) provides factual information in the voice of an omniscient narrator. In fact, this narration was done by Maya Burke, but this section of the film is not connected to her personally and presents as disconnected from the individual stories of the participants. The remainder of the film is clearly told by each storyteller in the first person.

Analyzing impact through surveys

Film screening recruitment targeted Tampa Bay coastal stakeholders including faith groups, academia/students, environmental, civic and business leaders, and local neighborhood associations. The research team's focus was on prioritizing diverse stakeholders who held regular gatherings, aiming to optimize the turnout for the screenings. Pinellas County, Florida boasts a high density of both public agencies and civic organizations. The research team consisted of individuals with a long history of working with environmental and social non-governmental organizations, local communities, and city, state and federal offices. Leveraging those partnerships, we targeted civically active residents of the county to participate in private screenings of the film. Invitations to participate were sent by email through key contacts and group lists. Follow-up phone calls were also made to ensure participation. Some screenings were held at regularly scheduled meetings of key organizations.

Screenings of the film began in November, and ran until the end of April, 2023. Our analysis of survey data gathered from participants at screenings of the film was completed by the end of July, 2023. Pre-film and post-film surveys were developed in concert with the filmmaker and the research team. Surveys were designed to measure attitudes and knowledge of climate impacts and solutions. Survey questions were primarily closed, ordinal category questions, with a few open-ended and multi-answer questions. Knowledge questions were true/false/unsure and were evaluated using percent analysis. A series of Likert scale statements covered participants' attitudes. Surveys were built and administered through Qualtrics. Hard copies of the surveys were also made available to those participants who felt more comfortable with this format and translation services were provided. To protect privacy and confidentiality, no personal identifying information was solicited. To facilitate

comparison between pre and post surveys at individual and group scales, however, each participant was assigned a unique ID code. This code had to be input into the survey at the point of consent.

The film was screened over 50 times in the Tampa Bay Area, with the majority of screenings taking place in St. Petersburg. The final count after data cleaning was 259 participants. The project was approved for human subjects research by the Internal Review Board at NASEM.

Survey data was collected in excel format, cleaned and analyzed. Analysis tracked impact on knowledge by calculating changes in the percentage of participants whose correct factual answers increased following the screening of the film, stayed the same, or declined. Additionally, attitude questions, which were measured using a Likert scale, were analyzed with both percent analysis and changes in median score on a sliding 1–5 scale to determine how the film shifted participants' attitudes toward specific issues. To better visualize large scale patterns, answers in strongly agree and agree were combined into one data point and compared to a similarly combined score for disagree and strongly disagree. In this way, it was easier to see if the film moved participants from one side of the Likert scale to the other. Median score analysis allowed for a finer scale view.

Demographics of participants

Over 50% of the survey respondents were in higher income brackets, with 27% making between $75 K and $125 K per year, and another 26% making over $125 K per year. Twenty-two percent of the sample made lower to middle income salaries, from $50 K to $74 K per year, and the remaining 24% made under $50 K per year. Sixty-seven percent of the sample was over the age of 35; most of these were over 61. Forty-three percent were in the less-than-35 group, with most of those respondents between 25 and 34. About 75% of the sample has achieved significant levels of higher education, including 34% with a master's or professional degree and 7% with a doctorate; an additional 34% have attained a four-year degree. About 60% of the sample identified as female, and seventy-five percent own their own homes.

The sample population was overwhelmingly white; less than 4% identified as Black, with a little under 10% identifying as Hispanic or Latinx, and 7% as Asian. Recruiting research participants from BIPOC communities, particularly the Black and Indigenous communities, requires a devotion of funds and time that were not possible for this project, hence the lower participation of members of these groups. Lack of participation from diverse residents is a weakness in the study that needs to be addressed in follow-up work. Given the demographic and socio-spatial configuration of St. Petersburg and Pinellas County, a focus on active neighborhood associations and other groups embedded in the Midtown area would be necessary for more diverse recruitment in the future.

The sample was clearly skewed towards higher socio-economic status individuals. Participants were drawn from the leaders of local civic organizations and other community members who are environmentally literate. The demographic and professional characteristics of the sample, which was chosen in concert with prominent public agencies and active civic organizations, may have impacted overall data patterns but given recent scholarship about the climate concerns of BIPOC communities (see Leiserowitz et al., 2018 for example), we cannot draw any conclusions about the impact on results. In the future, the film should be tested with a broader, more inclusive sample to allow identification of any differences in group response to the experience of viewing the film. Additionally, targeting residents of a variety of neighborhoods instead of civic leaders would be a potentially fruitful approach in the future.

Impact of the film on participants' knowledge

Table 2 summarizes differences in percentages of participants who answered correctly before and after the film on eight identical knowledge questions.

The data shows a high level of knowledge about climate impacts and solutions prior to the film viewing. For example, the rates of correct answers for the statements *Permanent inundation from*

Table 2. Rate of increase in correct answers to knowledge questions after film screening.

QUESTION	INCREASE
Permanent inundation from sea level rise threatens beaches, low-lying urban areas and fresh water supplies in the Tampa Bay area.	*+4.12*
Stormwater system design that uses nature-based features – such as a naturally meandering stream buffered by vegetation – can help protect residential areas from flooding.	*+10.05*
In the Tampa Bay area, the most expensive properties are at the water's edge, making them vulnerable to sea level rise.	*+7.82*
Average temperatures in the Tampa Bay area have risen about 1 degree since 1970	*+21.30*
Warming water from climate change leads to drier, smaller and less powerful hurricanes.	*−1.72*
Extreme rainfall can bring several inches of rain to an area in less than an hour.	*+2.3*
Oyster beds not only provide a natural barrier, breaking wave action and protecting inland areas, but also help filter the water and provide habitat for living things.	*+7.81*
Covering the land with hard surfaces is beneficial as it allows easy run off of excess water.	*+6.45*

sea level rise threatens beaches, low-lying urban areas and fresh water supplies in the Tampa Bay area was 95% prior to seeing the film; rising to 98% after the screening. Similarly, 97% of respondents responded to the statement *Extreme rainfall can bring several inches of rain to an area in less than an hour* correctly prior to the film; this rose to 99% after the film.

There was a steady increase of knowledge in most areas after the film, with improvement in correct answers to questions about temperature rise, the important of living shorelines and natural adaptations, and location of the most expensive properties, being particularly strong. For four of the eight statements, correct answers increased by over 7% following the film.

Analysis of impact of film viewing on environmental attitudes

Environmental attitudes were measured using a typical Likert scale and analyzed through percent analysis. The biggest shift in attitudes following the film was in the participants' confidence and motivation to effect change. The sample population was skewed toward individuals who already exhibited pro-environmental attitudes; nonetheless, the film clearly had a positive impact on participants' confidence in their ability to engage with their communities to build resilience.

Participants selected from a Likert scale from 1 to 5, strongly disagree to strongly agree, for each of 8 statements.

The statements that demonstrated the biggest shifts were *I feel confident that I know enough about climate risk and resilience in my area to help develop solutions*, and *I feel confident that I*

Table 3. Shifts in percent correct to attitudinal questions before and after film.

Statement	Pre-Film, % Agree	Post-Film, % Agree	% change
I feel confident that I can help my community prepare for climate change impacts and become resilient	53%	68%	+15%
I can help educate my neighbors about the risk from climate change in our area.	62%	74%	+12%
I feel confident that I know enough about climate risk and resilience in my area to help develop solutions	41%	59%	+18%
Before I can get more involved in addressing climate issues, I need to learn more about the type of risks we face in our area	61%	45%	−16%
There are personal steps I can take to improve my community's resilience to climate impacts	74%	87%	+13%
Working together with my community, we can be successful in developing solutions to climate risks,	76%	84%	+8%
I don't think my actions will have an impact on addressing climate risks in my area (disagree)	69%	77%	+8% (disagree)
I feel motivated to change my own behavior to address climate change risks in my area	84%	86%	+2%

can help my community prepare for climate change impacts and become resilient. For the statement, *Before I can get more involved in addressing climate issues, I need to learn more about the type of risks we face in our area,* agreement decreased by 16% following the film (Table 3).

Additionally, prior to watching the film**,** 62% of participants agreed with the statement, "I can help educate my neighbors about the risk from climate change in our area." Following the screening, the percentage of participants agreeing with the statement rose to 74%.

The percentage of participants agreeing with the statement, "There are personal steps I can take to improve my community's resilience to climate impacts," rose from 74% to 87% following the film viewing. Similarly, in response to "Working together with my community, we can be successful in developing solutions to climate risks," 76% of participants agreed with the statement prior to the film. This percentage rose to 84%, with most of the change occurring in the "strongly agree" category. This shift reflects the film's emphasis on collective action.

Overall, the sample population had a fairly high sense of their own empowerment and ability to work to effect change on climate resilience going into the film. This is consistent with the demographic characteristics of the sample. Nonetheless, the data indicates that viewing the film had a positive impact on participants' sense of their own competency and power, as well as their willingness to take various kinds of action, including talking to their neighbors, undertaking personal actions, and joining collective work.

Comparing the attitudinal data by age

The film had a slightly larger impact on the confidence and motivation of the younger sub-group. It is difficult to identify why this might be, except that the older participants may be at a stage in their lives where they may face barriers to greater engagement in the community.

As shown in Figure 1, the film boosted the motivation of the younger sub-group from 74% to 88% in agreement, while the motivation of the older participants declined slightly from 88% to 84% in agreement.

The level of confidence in their ability to help the community prepare was boosted by the film for both groups, agreement on three measures (Table 4). In regard to the belief that they can work together with others to develop solutions to climate risk, there was a strong impact on the younger group specifically (92% of the younger group agreed with the statement after the film, while 80% of the older group agreed.)

Educational attainment

Stratifying the attitudinal data by educational attainment revealed that the film's impact on participants' feelings of confidence in their ability to effect change were boosted more significantly for participants with less formal education than for those with four-year degrees or higher.

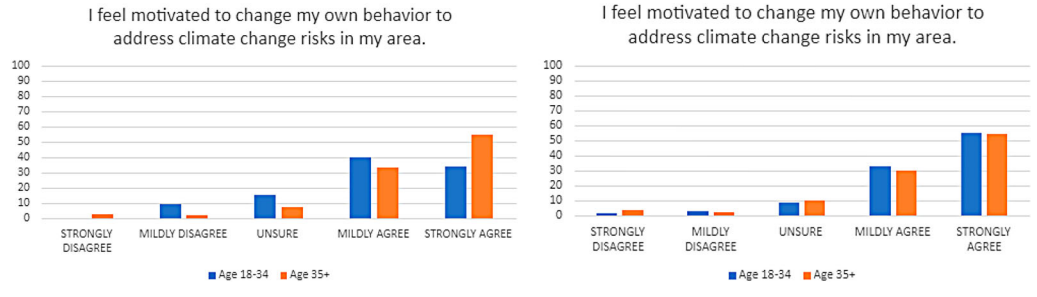

Figure 1. Comparison of pre-film and post-film survey responses on motivation to act.

Table 4. Competency and motivation change by age group, selected questions.

Survey Statement	Pre-Film Survey		Post-Film Survey	
	% Agree Age 18 - 34	% Agree Age 35+	% Agree Age 18 - 34	% Agree Age 35+
I feel motivated to change my own behavior … .	74%	88%	88%	84%
I feel confident I can help … .	55%	51%	70%	67%
Working together, my community can be successful …	78%	75%	92%	80%

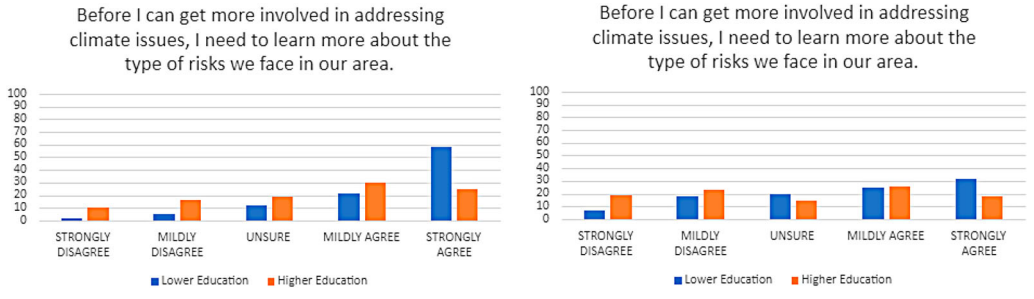

Figure 2. Pre-film and post-film survey responses on need to learn more.

The group with lower educational attainment started out strongly in agreement with the statement (79%) in Figure 2, indicating a need for more information; this percentage decreased following the film, to about 52%.

While the film increased confidence that viewers can help the community become resilient, the impact was greater for the group with lower educational attainment. Prior to the film, the participants with higher education attainment were in stronger agreement with the statement "I feel confident I know enough … ." – thus exhibiting higher levels of confidence about their knowledge level; however, following the film, the group with lower educational attainment shows a significant growth in confidence (from 43% to 63% in agreement) and now outranks the other group (63% in agreement compared to 57%) (Table 5).

Comparing attitudes by income, selected questions

Stratifying the data by income revealed that the impact of the film on the confidence of the participants to engage in solution-development was greater for the lower income group. The film boosted participants' confidence in their ability to help their communities, with the lower income group increasing the percentage in agreement from 58% to 73%, and the higher income group increasing the percentage in agreement from 47% to 64%.

Viewing the film increased the participants' confidence that they know enough about climate risk and resilience to help develop solutions for both groups, but the greater impact was on the

Table 5. Competency change by educational attainment, selected questions.

Survey Statement	Pre-Film Survey		Post-Film Survey	
	% Agree Lower Education	% Agree Higher Education	% Agree Lower Education	% Agree Higher Education
I feel confident I know enough …	43%	44%	63%	57%
I feel confident I can help … .	56%	51%	77%	65%
Working together, my community can be successful …	79%	34%	95%	80%

Table 6. Confidence change by income level.

Survey Statement	Pre-Film Survey		Post-Film Survey	
	% Agree Lower Income	% Agree Higher Income	% Agree Lower Income	% Agree Higher Income
I feel confident I know enough …	40%	42%	64%	55%
I feel confident I can help ….	58%	47%	73%	64%
Working together, my community can be successful …	75%	76%	88%	80%

lower income group, who moved from about 40% in agreement to 64% in agreement following the film (Table 6).

As a whole, the lower income group exhibits greater confidence in their ability to impact change. Reasons for this difference are likely complex and may be connected to correlation between age and income in the sample; hence, the wealthier participants are also likely to be older, and may feel that they have less ability to engage in solution-making at this stage of their lives. For example, 66% of the participants under the age of 35 made less than $75 K annually; compared to 65% of the over 35 group who made over $75 K annually.

Actions citizens are likely to take

This section analyzes responses to two similar questions on participants' current actions in regard to local resiliency (pre-film survey) and their predicted actions on local resiliency (post-film survey).

Prior to the film viewing, participants were asked what kinds of climate or environmental activities they currently participate in. The top three choices in this multi-answer question were "Choose candidates in elections that are committed to developing climate resilience policies," "Volunteer with an organization to build living shorelines such as oyster beds," and "Attend hurricane season prep sessions." The fourth most popular option was "Attend meetings to learn about city and county initiatives related to climate resilience," followed by "Work with a group to advocate for nature-based infrastructure", and "Work with a group to educate my neighbors" coming in sixth out of 6 possibilities (excluding "other,") (Table 8).

Following the film, participants were asked to pick from the same options in response to *In the future, I plan on participating in the following activities.* The top two choices remain the same as the pre-film answers, but "Attend meetings to learn about city and county initiatives" moved into third place, (Table 7), which signals a willingness to be involved in policy making decisions at the local scale. In the pre-film survey, 55 respondents chose this option; following the film, 137 respondents chose this option; thus, 82 people who did not previously attend local planning initiatives are willing to do so after viewing the film. Additionally, the number of people choosing the option "Work with a group to advocate for nature-based infrastructure," rose from 37 to 126, signaling that the message of the film, *emphasizing nature-based and living shoreline solutions*, was clearly heard. In a similar

Table 7. Actions participants are most likely to take.

	Pre-Film	Rank	Post-Film	Rank
Attend hurricane season prep meetings	60	3	81	6
Work with a group to advocate for nature-based infrastructure to absorb storm surge and sea-level rise	37	5	126	4
Attend meetings to learn about city and county initiatives related to climate resilience and how I can get involved	55	4	137	3
Work with a group to educate my neighbors about the need for climate change policy solutions	27	6	85	5
Volunteer with an organization to build living shorelines such as oyster beds	86	2	152	2
Choose candidates in elections that are committed to developing climate resilience policies	149	1	169	1

jump, the number of participants who chose "Volunteer with an organization to build living shorelines" rose from 86 to 152.

The consistently higher rates of responses in the post-survey indicate that while the participants are somewhat active already in a variety of environmental activities, their willingness to be involved in the future is a significant increase on their current activity. Thus, the film seems to have had a strong motivating impact on participants.

Greatest take-away

The post-film survey included two open-ended questions, the first of which stated, "Briefly tell us the most important take-away from this activity" to allow participants to share in their own words the issue they found to be most compelling after watching the film. Of the 259 respondents, 187 responded to this question.

Thematic coding of the comments revealed six dominant conceptual categories: fundamental *information* about climate impacts and solutions (52 responses) – of these, 23 specifically mentioned living or natural shorelines; the sense of *urgency* to act now in response to the climate crisis (32 responses); the importance of *community*/need to bring together diverse stakeholders to act as a community (23); the critical role of *living shorelines or natural solutions* in climate resilience (23 responses); the importance of hearing from *diverse* geographic or social communities (20 responses), and *optimism* (11 responses).

A sense of urgency was a prominent focus of the textual data. Phrases such as "If we do not change our behavior, the whole area is doomed," "We must do something now!" "It's important to act now," "There is no time left waiting," and "It's time for us to take action before it's too late" dominate the textual data.

Community was also emphasized through phrases such as "working together," "community involvement," "communities working together," and "community involvement required." The stories shared from diverse locations were also impactful, with participants noting, "learning about what works in other areas," "so cool to see different initiatives in different regions," and "diversity of experiences" as key take-aways.

Eleven responses expressed optimism about the resilience efforts highlighted in the film and the possibility of transferring these efforts to other places. Several respondents indicated a sense of expanded opportunities to become involved in local work. For example, "There are more actions I can take than I thought," "There are manageable steps everyone can take to help protect our community," and "Motivated to find out who, where, and how to get involved within the community." Several other people indicated a sense of urgency about their own involvement: "I need to do more to help," and "I need to be better educated and more involved."

Finally, there were several responses that expressed dismay and pessimism, such as "We are doomed," and "the end is coming." The film did emphasize the urgency of the climate crisis; combining messages of fear with positive messages of practical solutions supports the research findings of Diamond and Urbanski (2022) that messages leaning toward fear and danger do not necessarily alienate the audience and may, in fact, enhance their motivation to act. As Wong-Parodi and Feygina (2021) found, experiencing negative emotions can actually increase concern and motivation to act on climate issues. In the case of *Dear Tampa Bay*, the combination of urgency and demonstration of specific solutions sparked motivation in most viewers.

Element of the film with strongest impact

The last open-ended question in the survey asked respondents to "tell us which part of this activity had the strongest impact on you," and resulted in 164 responses.

Dominant themes identified in the comments include: the storytelling aspect of the film (24 responses); specifically, the Native American stories of the Lemon Tree Mound (10 responses of the 24); the impact of flooding and storm surge (18 total responses, with references specifically to images of New Orleans making up 7 of those remarks); the importance of living shorelines or natural solutions (14 responses); the diversity of perspectives provided (12 responses); images of general damage to ecosystems or urban environments (10 responses); the importance of community (10 responses); the involvement of youth in resilience solutions (5 responses); the emphasis on success, in general (4 responses) and finally, concern about wildlife (3 responses).

The storytelling format emerges as impactful, seen through phrases such as "Native American storytelling," "individual voices," "listening to everyone's point of view," "emphasis on stories," and just "storytelling." The appeal of the story of the Lemon Tree Mound in the Grand Bayou Indian Community, told by Rosina Phillippe, also stood out. Possible explanations for the powerful impact of Rosina's story include the emphasis on a people's deep love of, and connection to, place. Of all of the stories told, Rosina's strongly reflected ancestral, deep relationship with the land.

Viewers were also influenced by images of storm damage and long-term change to the environment. When remarks about flooding or images of the house floating down the street in New Orleans are combined with comments about images of general damage (Hurricane Ian, for example), the total comments indicating that images of damage were most impactful is 28, outweighing all other categories of response. "The floating house," "the height of the waters during floods," and "images of surge over existing structures" are examples of comments about the power of images of storm damage and flooding. The ability of visual imagery to evoke an emotional response in the audience is confirmed here (Smith & Joffe, 2009).

Notably, solutions were less frequently mentioned in open responses. Only 14 responses referenced specific solutions such as living shorelines. Hence, images and discussion of solutions were 50% less impactful than images of damages. The diversity of views and the role of community remained strong themes, mirroring the patterns in the first question.

Summary of the film's impact and discussion

The film had a clear impact on viewer's attitudes regarding their own competency and motivation to act in their local communities to build climate resilience. Further, the film increased knowledge about most issues.

There was a distinction between the rate of retention of information provided through by the individual storytellers compared to that provided by the omniscient narrator. Textual evidence from the surveys supports the effectiveness of the storytelling aspect of the film. The film opens with short statements from each of the individuals, then moves to focus briefly on Tampa Bay. Only one section of the film, about 1.5 min, is presented by an omniscient narrator; as noted above, the voice is that of Maya Burke, a resident of St. Petersburg, but she is not identified as the speaker. This section presents, rather quickly, important numerical information about rising temperatures, changing storms and the threat of inundation in the region. The film then continues with stories from each of the individuals about their unique place, circling back to Maya Burke, who then appears on camera, sharing her experiences of a changing climate in the Tampa Bay region.

The two knowledge questions for which the increase in correct answers was relatively small (+2.45% and + 4.1%) were covered by the narrator, rather than one of the storytellers. Additionally, the one question on which the rate of correct answers actually fell after the film was also covered only by the narrator. One deviation from this pattern, however, is the large jump in correct answers to the question about rising temperatures. Many participants answered this true/false question incorrectly before the film but answered correctly following the film (Table 8). This might be due to the fact that the film presents this rather ominous information in an animated chart. Additionally, the difference between the information in the question (a one-degree change in temperature) and the correct information (a 3.4 degree change in temperature) may have been startling

Table 8. Facts provided by narrator vs. storyteller.

Facts	Narrator	Storyteller	% Change in Correct Response
Permanent inundation from sea level rise threatens beaches, low-lying urban areas and fresh water supplies in the Tampa Bay area.	✓		*+4.12*
Stormwater system design that uses nature-based features – such as a naturally meandering stream buffered by vegetation – can help protect residential areas from flooding.		✓	*+10.05*
In the Tampa Bay area, the most expensive properties are at the water's edge, making them vulnerable to sea level rise.		✓	*+7.82*
Average temperatures in the Tampa Bay area have risen about 3.4 degrees since 1970	✓		*+21.30*
Warming water from climate change leads to wetter, more powerful hurricanes.	✓		*−1.72*
Extreme rainfall can bring several inches of rain to an area in less than an hour.	✓		*+2.3*
Oyster beds not only provide a natural barrier, breaking wave action and protecting inland areas, but also help filter the water and provide habitat for living things.		✓	*+7.81*
Covering the land with hard surfaces is problematic as it allows easy run off for excess water and prevents absorption.	✓		*+6.45*

to the audience, thus resulting in its retention. Overall, participants improved their scores at a stronger rate for most of the facts that emerged through storytelling, compared to a lower rate for all but one of the facts told by the narrator. The findings align with the broader literature on storytelling as an important tool for conveying critical information about climate change (Muindi et al., 2020; Joubert et al., 2019).

Participants who had lower levels of formal education benefitted more from the film than did those with higher education. Lower income participants appeared more confident in their abilities to work with the community and effect change following the film than did the group with higher income, though this might be a result of the age difference in the two groups, with lower income participants generally being in the younger categories. Younger participants also exhibited greater confidence in their role in change than did the older group. These findings support studies that revealed younger generation to be more worried about climate change (Swim et al., 2022), exhibit high levels of acceptance of anthropogenic climate change (Feldman, 2010), and an openness to change and a willingness to think deeply about issues linked to positive engagement with climate change (Sinatra et al., 2012).

The overall findings of this work suggest that the film could be highly impactful for the average community member, though this needs further investigation. Because the target sample population for the film was defined as "local leaders," many of the participants were affiliated with environmental NGOs or the local university's environmental or marine science programs. A broader sample of residents who were not already linked in some way to environmental issues might have produced more dramatic changes from the pre-film to post-film surveys, as suggested by the group data. Additionally, self-reporting of intentions to act should be taken with caution, and longitudinal studies that can track participants' activities and attitudes over time would strengthen these findings.

Conclusion

Overall, we confirm that visual media combined with elements of storytelling can be an effective vehicle for increasing knowledge about climate change and boosting viewers' feelings of competency and motivation. The storytelling format allows a personal connection to develop between the audience and the characters/narrators in the film. Additionally, when storytellers speak passionately about their own connection to the land, deep emotions resonate with the audience, increasing concern for the environment and motivation to act. The role of Indigenous stories, told by

Rosina Phillipe, was particularly impactful in this case, drawing attention to the potential of Indigenous knowledge and storytelling for environmental education (Kinch, 2022; Nesterova, 2020).

The results also suggest that combining messages that acknowledge potential devastation of the climate crisis while balancing them with clear examples of community-driven, tangible solutions, can foster a sense of hope and encourage the audience to act. The film sent a powerful message of urgency regarding the climate crisis. Rather than primarily feeling disheartened by this message, viewers were encouraged by the community resilience efforts displayed in the storytellers, confirming previous research (Diamond & Urbanski, 2022). The film can reach a wide audience in the region and will be disseminated through a variety of mechanisms as a free teaching tool for K-12, colleges, non-formal environmental educators, NGOs and government agencies to utilize. The information contained in the film is not likely to become outdated for some years, and can continue to impact residents' knowledge, confidence and motivation to act on the urgent challenges of climate resilience.

One barrier to utilizing a film such as *Dear Tampa Bay* as an educational tool is the expense involved in producing the documentary. Barriers presented by the cost of production may be ameliorated through partnerships between universities, public agencies and NGOs. Student and faculty filmmakers at local universities may be invited to assist with production of short, engaging environmental films such as this one. The global spread of social media has produced a wealth of amateur storytelling talent that might be leveraged for shorter, very focused local messaging similar to that of *Dear Tampa Bay* but at a smaller scale and duration. Additionally, filmmakers at all scales would benefit from reading the latest Impact Field Guide from the non-profit, Doc Society, which brings together current research and best practices in producing impactful films and provides tools for measuring a film's effect on the audience (Doc Society, 2023).

Creating locally embedded stories through visual media that can easily relay a factual and accessible account of a key environmental challenge and present practical solutions through the storytelling model is a strategy that environmental activists, scholars and planners should leverage to increase awareness and motive residents to act. No matter the place or specific challenge, storytelling has the capacity to convey meaning and spark an emotional response that can only assist in building momentum toward climate solutions.

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Declaration of competing interest

The authors report there are no competing interests to declare.

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