

**Leveraging Sea Grant's Climate and Weather
Expertise to Support Resilient Communities and
Economies:
A 10-Year Vision for Sea Grant Weather and
Climate Resilience**



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10-Year Vision Statement

Sea Grant will be a key partner in the Weather and Climate Enterprise, known for its role in helping coastal communities and residents build their resilience to weather and climate extremes by bridging the broader network of data and service providers with decision-makers. Its expertise in facilitating assessment of decision needs and providing capacity for planning, communications, disaster preparedness activities, disaster response, and resilience project implementation will be nationally recognized and will inform the development of best practices for weather and climate resilience.

Glossary of Acronyms and Terms

CIMMS/NSSL – Cooperative Institute for Mesoscale Meteorological Studies/National Severe Storms Lab

HACU – Hispanic Association of Colleges and Universities

HBCUs – Historically Black Colleges and Universities

FEMA – Federal Emergency Management Agency

SGCN – Sea Grant Climate Network

NOAA – National Oceanic and Atmospheric Administration

NSGO – National Sea Grant Office

RISA – NOAA Climate Program Office Regional Integrated Sciences and Assessments

WCE – Weather and Climate Enterprise

Adaptive management – the concept that adaptive actions should be assessed, planned, implemented, and evaluated, and readjustments made through an iterative cycle

Community – includes all decision-makers, such as elected officials, local agencies, and state, regional, and federal decision-makers; residents (year-round and part-time); business owners; property owners; local schools and universities; faith-based groups; and non-governmental organizations.

Introduction

Marine and Great Lakes coastal communities are vulnerable to the short-term and long-term impacts of weather, climate variability, and climate change. The short-term effects of temperature and precipitation extremes, winds, and storms include altered erosion patterns, rip currents, changing times and locations when commercial and recreational fishermen can fish, property damage, algal blooms, and floods affecting coastal infrastructure. On seasonal time scales, climate oscillations (such as the El Niño Southern Oscillation) influence winds and sea surface temperatures that alter storm patterns, influence coastal droughts, and may even influence upwelling that impacts ecosystems and species distributions.

In the long-term, climate change has the potential to force wholesale changes in human systems and natural environments. There is a critical need to draw on the available science to support proactive decision-making for coping with changes in temperature and precipitation extremes and long-term sea level rise. Coastal ecosystems, coastal economies, sustainable fisheries, and coastal workforce development are all at stake.

The American Meteorological Society broadly defines the Weather and Climate Enterprise (WCE) as the suite of public, private, academic, professional, and advisory organizations providing weather and climate data, and translating its use to inform adaptive actions that improve resilience to short-term weather events, mid-term climate variability impacts, and long-term climate change (after McPherson, Gail, & Friday, 2012). Sea Grant has been involved in weather and climate research, education, and extension for over 10 years. However, the Sea Grant network faces challenges in expanding its work and demonstrating the important role that it plays in the WCE. These challenges include lack of funding; lack of internal capacity; external barriers, challenges, and constraints when helping communities implement or scale up adaptation plans; and difficulty increasing the recognition of Sea Grant and the services that programs provide. **This document offers numerous opportunities for overcoming these challenges and aims to establish a national vision for Sea Grant's role in the WCE.**

The National Sea Grant College Program is a network of 33 programs that conduct research, outreach, and extension efforts to address the needs of coastal communities and ecosystems throughout the United States. The program is uniquely positioned to connect coastal communities and residents with scientific and practitioner groups working within the WCE, including federal and state agencies, NGOs, academic institutions, and private sector entities.

The Sea Grant network is comprised of policy specialists, communications specialists, educators, data analysts, engineers and scientists from an array of physical, natural, and social science disciplines working in locally specific contexts. These experts are attuned to the needs of the communities they serve and are adept at translating information in locally relevant and meaningful ways. By maintaining a multi-faceted view of pressing weather and climate issues, Sea Grant experts are able to bridge organizational divides to better coordinate efforts to improve adaptation and resilience. These skills and capacities are essential as many coastal communities are faced with the need to adapt and respond to changing weather and climate conditions.

Thanks in large part to groundwork done in the 2000s by Dale Baker, past associate director for New York Sea Grant, Sea Grant's first climate extension specialist reported for duty in 2007. Around the same time, many of Sea Grant's extension agents began including climate as part of their coastal hazards programs.

In 2009, the Sea Grant Extension Assembly chartered the Sea Grant Climate Network (SGCN). The goal for this network was to increase the effectiveness of Sea Grant climate programming and outreach nationwide by coordinating Sea Grant climate-related activities. The SGCN enabled participating programs to share talent and resources while facilitating partnerships with climate-related agencies and organizations within NOAA and the communities we serve.

The SGCN sponsored nationwide meetings in 2009 and 2013, and co-sponsored a meeting on adaptation and resilience with the Sea Grant Sustainable Coastal Communities Development and Legal Networks at the 2015 National Adaptation Forum. In its early days the SGCN hosted a site using the Ning platform for collaboration, but based on member feedback, shifted to hosting webinars and in-person meetings when possible. It currently maintains a listserv, hosted by North Carolina Sea Grant, with 81 members as of August 2018 – an indicator of the continued and growing importance of Sea Grant’s weather and climate extension programming nationwide, just a decade after the pilot program began.

The National Sea Grant Office (NSGO) supported ten teams to develop 10-year visions to meet needs in areas such as resilience to coastal floods and sea level rise, water resources, education, aquaculture communications, fisheries, and others. The issue of weather and climate stressors as cross-cutting drivers is relevant to many of these.

Elevating Sea Grant’s role in the WCE space – which includes many other, more central players – is essential, but also challenging. The WCE itself is evolving rapidly in response to an explosion of new information and data – and to a changing understanding of how that data can be applied to decision-making. Additionally, the WCE as a whole lacks capacity to ensure that the needs of diverse communities are served.

The Sea Grant WCE Vision document was developed based on input gathered from the national Sea Grant network via survey; feedback from key WCE partners through three synchronous workshops; and additional discussion and goal refinement among Sea Grant employees. The process occurred simultaneously with the development of other Sea Grant visions, including Community Response to Flooding, Water Resources, Citizen Science, as well as Diversity, Equity, and Inclusion. These complementary vision documents focus more on Sea Grant’s role in sector-specific resilience strategies or other broad capacity needs across the Sea Grant network. The Sea Grant WCE Vision represents a cross-cutting look at how information that informs community-level decisions is produced and disseminated in the WCE space, and defines goals and implementation steps that will elevate Sea Grant’s place in the WCE.

The overarching 10-year goal of the WCE Vision is as follows:

All coastal communities in the United States will become more resilient to weather and climate extremes, in part because of the role that Sea Grant programs play in connecting coastal communities with locally relevant and meaningful weather and climate information, and in facilitating planning, communications (associated with forecasting), disaster preparedness, disaster response, and/or resilience project implementation.

The first section of this document provides a brief overview of the Sea Grant network’s current efforts, capacity and challenges working in the WCE, and highlights niche roles that Sea Grant can fill in the greater WCE arena. The second section identifies goals, objectives, and activities designed to help Sea Grant fill these roles over the next 10 years in order to implement the vision.

The WCE Vision team developed four goals that are essential for the Sea Grant network to grow in the WCE arena. Goals 1 and 2 encompass internal Sea Grant capacities while goals 3 and 4 focus on goals for Sea Grant's external service to communities.

- Goal 1 (internal): Sea Grant is a trusted resource that guides and partners with communities to strengthen their capacity to address weather and climate risks.
- Goal 2 (internal): Sea Grant encourages and fosters an inclusive, innovative, and collaborative workforce and community of practice within the weather and climate enterprise.
- Goal 3 (external): Sea Grant works with coastal communities to increase their capacity for using weather and climate information to enhance their resilience, reduce risks, and take advantage of emergent opportunities associated with extreme weather and climate change.
- Goal 4 (external): Sea Grant helps coastal communities improve their capacity to use weather and climate information for making decisions that protect, restore, and promote the sustainable use of ecosystems and their services.

By following the implementation guidance described in this vision, the Sea Grant network can elevate its role in the WCE and strengthen its capacity to help marine and Great Lakes coastal communities build resilience to weather and climate extremes.

I. Assessing Sea Grant's Current Capacity in the WCE

Sea Grant programs throughout the network have expanded their weather and climate programs significantly over the last 10 years. The vision team conducted two activities during this vision's development process to assess internal and external capacity of Sea Grant's weather and climate programming. The first activity, conducted prior to the WCE Visioning workshop, was a program survey of current WCE capacities, activities, and challenges. The WCE Vision team recognized the need to conduct a gap analysis to identify how Sea Grant fits into the broader WCE. Recognizing that a full gap analysis was outside the scope of this visioning effort, the leadership team instead invited external partners from within the broader WCE to the three workshop locations. Workshop attendees also participated in a rapid network mapping exercise that helped the team develop broad goals, objectives, and implementation steps contained within this vision. The data produced by this exercise was rich, but it did not represent every Sea Grant program. Additionally, not every program represented the strength of connections to external WCE partners in the same way, meaning results were informative but not comprehensive. The WCE Vision team recommends that a more systematic effort to map the state of Sea Grant's place in the WCE is needed. This important implementation step should be conducted in parallel and in coordination with broader efforts by others within the WCE (including NOAA RISA programs and efforts led by a number of WCE-related professional societies) conducting similar assessments of the flow of information to meet decision-maker needs.

A. Results from the Pre-Workshop Survey and Takeaways Relevant to WCE Vision

Based on the programmatic survey, Sea Grant's current weather and climate activities are focused on approaches that are applicable to work in all communities (see Appendix B for methods and participating programs). For example, there tends to be strong participation in the weather and climate components of hazard planning, with fewer programs broadly engaged in other approaches like addressing weather and climate hazards and resilience in land use planning. Programs also tend to be engaged in long-term and lasting relationships with early adopting communities. Finally, programs are extremely interested in seeking both innovative approaches to partnerships as well as to obtaining additional support and funding.

Survey participants identified climate-related planning, risk communication, disaster preparedness, and education and outreach outside K-12 settings as the top four topics Sea Grant programs address in the WCE space. About half of the programs said they have a climate program coordinator or other similar position dedicated to performing this function. Engaging stakeholders in resilience work and having a good understanding of stakeholder needs was the most identified area of program capacity. Respondents also said their Sea Grant programs have locally relevant data, information, and/or maps of weather- and climate-related information available. Programs also ensure that they are providing social science and communications expertise during participation in collaborative groups and strategic partnerships on weather and climate.

Finally, programs reported having some funding available to work on weather and climate resilience. However, they still reported a lack of funding as one of the two most significant challenges to progress in WCE-related programming, suggesting that programs still need additional funding to fully meet current goals. Additionally, programs reported as a challenge that they still lack internal capacity, such as in-house expertise or dedicated weather and climate staff. Other frequently reported challenges included having a large geographic region and encountering barriers to collaborating, expanding partnerships, and receiving recognition of Sea Grant, or increasing awareness of Sea Grant services (Appendix B).

The vision team identified several important WCE topics that few programs indicated are being addressed in current programming. These included health and climate, business continuity during extreme weather events, and land conservation as a tool for improving resilience. Few programs reported having expertise and capacity in public health, weather and climate modeling, hydrology, climatology, engineering, and the economics of weather and climate resilience. Programs also said they rarely had the capacity to provide funding to communities for their work in weather and climate resilience. These topics indicate some areas of future growth for Sea Grant programming and capacity with the potential for high partnership interest within the broader WCE.

Finally, we asked survey respondents to identify three goals for their program related to weather and climate. The goals largely fell into four main categories: 1) community outcomes, 2) resource outcomes, 3) Sea Grant role in the broader WCE, and 4) resilience community of practice/workforce development. Key themes within goal statements are summarized in Table 1. The WCE Vision team used these analyses to provide draft goals and outcomes at the workshop for discussion and revision.

COMMUNITY OUTCOMES	RESOURCE OUTCOMES	SEA GRANT ROLE	RESILIENCE COP/WORKFORCE DEVELOPMENT
<ul style="list-style-type: none"> • Coastal communities are aware of and understand the risks and impacts of a changing climate • Communities adopt plans, policies, and/or regulations to improve their resilience • Communities are more resilient to a changing climate, reduce vulnerability to hazards, and build resilience in an equitable and inclusive way 	<ul style="list-style-type: none"> • Water resources are sustained and protected • Habitats, ecosystems, and the services they provide are monitored and restored • Balanced use, conservation, and management of habitats, species, and ecosystems 	<ul style="list-style-type: none"> • Develop and share best practices, innovation, information, technologies, tools, and strategies to advance resilience • Provide assistance to communities in building resilience and preparing for hazards • Ensure effective community engagement and education • Build partnerships and support local and regional efforts to enhance resilience • Include social science, economics, law, and policy in our weather and climate portfolio • Conduct research and assessments related to climate impacts and building resilience 	<ul style="list-style-type: none"> • Support a diverse, skilled, and innovative workforce in weather and climate resilience • Build resilience fellowship programs through partnerships with the private sector • Provide venues to share lessons learned among the resilience community of practice

Table 1: Synthesis of themes from goals provided by responding Sea Grant programs in pre-workshop survey. These themes were used to draft initial goals and objectives.

B. Results from External Partner Feedback at WCE Workshop

Because Sea Grant is a relatively new partner in the WCE, the team solicited feedback from strategic external partners about gaps in the enterprise and where Sea Grant can fit in. Workshop locations were chosen to ensure that we were getting feedback from known NOAA partners and potential partners outside NOAA, including the private sector. The list of partners is included in Appendix A. Input was solicited through small breakout group discussions as well as a rapid partner network mapping exercise.

Overall, the WCE Vision team heard from its external partners that current issues and challenges in the broader WCE primarily center on identifying where help is needed with decision-making under uncertainty. This is a task that requires a clear definition of resilience (given the number of ways the term is used in different fields), understanding the needs local decision-makers have, and the skills to connect decision-makers with scientific information relevant to those needs. The external partners recognize Sea Grant's current efforts, and noted that with additional coordination and expansion of effort, Sea Grant can play a critical connecting role in coastal regions. Current and potential future partners said Sea Grant is uniquely suited for helping identify coastal decision-making needs, and connecting people, organizations, and resources to those needs at various levels of government. One partner described this niche as a "kitchen table to federal agency" capacity. In general, attending partners said that as a boundary organization Sea Grant has a good recipe for filling these connective needs and suggested maintaining our current outreach and organizational approach. However, they noted that Sea Grant's efforts could focus on scaling innovations beyond single communities and developing support for such efforts more broadly and consistently within and across programs.

Sea Grant can fill an essential niche by assisting WCE partners with identifying needs and gaps among those partners. Sea Grant also can help create and amplify relationships between many of those WCE partners and local communities. Partners suggested that these connections need to be maintained and strengthened within NOAA (e.g. state Coastal Zone Management Programs, National Weather Service forecast offices, communities, and the broader WCE network), but also with other agencies (e.g. FEMA, state emergency management, aquariums and science centers, the insurance industry, and the emerging private sector components of WCE). To fill this niche, partners said, Sea Grant must continue to build and expand WCE-related coastal community resilience staff capacity at the national office and program levels.

C. Results from Partner Network Mapping Exercise

A rigorous analysis to determine capacity gaps in the WCE that could be filled by Sea Grant was outside the scope of what could be accomplished during this visioning activity. However, the WCE team recognized the need to better understand existing relationships between Sea Grant programs and external partners. Participants in each workshop site conducted a rapid-assessment network mapping exercise, with the goal of developing a shared understanding of existing and potential partners in the WCE and identifying gaps in the WCE's ability to meet coastal stakeholder resilience needs during the next 10 years.

To assess partnerships across the network, we analyzed the relationships participating Sea Grant programs identified with a subset of 21 specific partners, or partner categories (see Appendix C for complete methodology and results). We also examined the partnership maps created by participating external partners and characterized how close or distant they judged their relationships with Sea Grant programs to be. We note an overview of the following insights, which informed the development of vision goals, objectives, and implementation steps:

- 1) Sea Grant programs, local entities (communities and NGOs), and NOAA programs or offices were the most frequently listed partners.
- 2) Where other Sea Grant programs were mapped, the strength of those relationships varied.
- 3) The nature of “close” existing relationships suggests additional dimensions to the Sea Grant network. Academic partners, climate hubs (NOAA Regional Integrated Sciences and Assessments programs, USGS Climate Adaptation Science Centers, USDA Climate Hubs) and State CZMs formed a second tier of existing and “close” relationships.
- 4) Only one of the participating Sea Grant programs mapped at least one of each of these 21 partner categories as an existing relationship, except for “media,” which was not mapped by any participating Sea Grant program.
- 5) Desired new partnerships were not mapped as well as existing relationships due to constraints of the activity design. Three partner categories were identified as most desired: Real Estate/Insurance representatives, National Weather Service, and FEMA/Emergency Management Agencies.

A detailed list of insights and findings is in Appendix C.

II. Implementing the 10-Year Vision

This section describes the strategies, activities, and outcomes to achieve the goals identified by the WCE Visioning team and workshop participants. Workshop and visioning team discussions revealed the need for both internal and external goals. The activities related to achieving the internal goals capture the capacity-building needed within the Sea Grant network to achieve the external goals of empowering coastal communities to enhance their resilience and reduce their risk to weather and climate impacts.

The goals initially were identified through the pre-workshop survey disseminated to all 33 Sea Grant programs, refined by workshop participants, and then further refined by the visioning team after the workshops. Below is a summary of the strategies and activities and their prospective outcomes. The full logic models are in Appendix D.

Key to achieving the goals set forth in this vision will be commitment of staff time and resources from Sea Grant programs and the National Sea Grant Office (NSGO). Strong support at the director level from the state programs and from the NSGO will be necessary to help Sea Grant staff reserve appropriate time in their work plans and secure any extramural funding for conducting vision activities. The SGCN, as a community of practice, can serve as a resource for Sea Grant staff by providing opportunities for information-sharing and peer-to-peer learning. Although Sea Grant extension specialists and agents, through the SGCN and other extension networks, will be key players in vision implementation, the entire expertise of the Sea Grant network will be harnessed to achieve goals and objectives. This means Sea Grant research coordinators, communicators, educators, and funded researchers will be included in vision activities, when appropriate.

Important in many long-term cycles is that the concept of adaptive management applies not only to supporting communities in improving resilience to weather and climate hazards, but also to implementing this vision. Timing estimates labeled as “iterative” indicate that an activity progresses as a cycle composed of an assessment phase; an implementation phase; and then a phase of evaluation and adjustment based upon further evolution both within the WCE and the state of community response to weather and climate hazards. In most cases this iteration should continue throughout the 10-year vision timeframe.

Sea Grant, as a whole, is contributing positively to the WCE, and programs are doing good work. However, Sea Grant is still a minor player in the overall WCE. There are many opportunities to expand our reach and improve our connectivity outside of existing Sea Grant networks. Our goals and implementation plan listed below help advance our standing in this space.

Goal 1 (Internal): Sea Grant is a trusted resource that guides and partners with communities to strengthen their capacity to address weather and climate risks.

In order to become a trusted resource and professional cohort, the Sea Grant network first needs to understand the scope of its weather and climate resilience activities and impacts, and then conduct a gap analysis to compare Sea Grant’s current role within the WCE to Sea Grant’s desired role within the enterprise.

The primary objectives of this goal are to:

1. Synthesize the state of Sea Grant’s knowledge and understanding of on-the-ground weather and climate resilience planning and implementation, using data from PIER and other sources.
2. Develop a suite of best practices, information, technologies, and strategies to enhance the ability of Sea Grant and the WCE to advance community resilience to weather and climate hazards.
3. Improve the flow of weather and climate information between the WCE (including Sea Grant) and coastal communities.

The primary resources needed to accomplish these objectives include:

1. Funding to support staff time to complete the synthesis and identify synergies between the WCE 10-year vision and the 10-year Sea Grant visions for water resources, community response to flooding, citizen science, and diversity, equity, and inclusion.
2. Build capacity for stronger Sea Grant connections with RISA programs and other groups conducting gap and network analyses for the Sustained National Climate Assessment and emerging applied climate assessment practitioner networks to facilitate greater collaboration across the WCE (e.g., American Geophysical Union and others involved in the emerging Science to Action Network).

Timing	Major Activities	Implementer Level	Funding Source Level
Years 1-2	Reinvigorate the SGCN to support sustained communication with other Sea Grant vision teams and communities of practice on data collection and dissemination.	Programs with support from SGA and NSGO	Programs, with support from NSGO

Years 1-2	Connect, as appropriate, with other Sea Grant vision teams and communities of practice for their input on overall best practices for resilient decision-making.	Programs with support from NGSO as appropriate	NSGO (in a coordinating role, with support from programs through staff time)
Years 1-2	Build on the pre-workshop survey and conduct a formal gap analysis.	Programs with support of NSGO as appropriate to collaborate with synergistic efforts elsewhere in WCE	NSGO, with support from programs
Years 2-4	Sea Grant hosts a retreat to assess the needs of local decision-makers in communicating the risks associated with the impacts of hazards such as sea level rise to residents and businesses (retreat would include participation from Sea Grant experts and partners in the WCE).	Programs with support from NGSO as appropriate	NSGO, with support from programs and external funding sources as needed
Years 2-5	Expand and formalize the initial network analysis that originated in the WCE Vision workshops.	Programs with support of NSGO as appropriate to collaborate with synergistic efforts elsewhere in WCE	NSGO, with support from programs
Years 3 – 10 (iterative)	Develop, deploy, and adapt a communication and engagement strategy that maximizes the two-way flow of decision-relevant information between scientists and decision-makers to fill gaps identified in the gap analysis, including how to develop relationships with the rapidly growing private weather and climate industry.	Programs with support from NGSO and other communities of practice as appropriate	Programs, with support from SGA and NSGO

Major Outcomes from Goal 1:

- The Sea Grant network fully understands its role within the WCE and broadens its network of close WCE partners beyond NOAA and its line offices.
- Sea Grant is viewed as a trusted cohort of professionals that connects coastal communities with WCE partners to enable decision-making that incorporates timely and relevant weather and climate information.

- Sea Grant is nationally recognized in coastal and Great Lakes states for helping communities link weather and climate information to decision-making and improve their ability to implement best practices that enhance resilience.

Goal 2 (Internal): Sea Grant encourages and fosters an inclusive, innovative, and collaborative workforce and community of practice within the weather and climate enterprise.

In order to have the capacity to respond to the needs of everyone in coastal communities, an organization's workforce should reflect the communities it serves. This is as true for the WCE as it is for Sea Grant. In this context, the principles of diversity, equity, and inclusion are defined as core values consistent with the language in the Sea Grant DEI Vision. We acknowledge that effective participation and collaboration means ensuring weather and climate information is integrated across academic degree programs in colleges and universities (e.g., the social sciences, law, economics). Such participation and collaboration, in turn, fosters multidisciplinary partnerships within the WCE to help communities incorporate weather and climate information in local plans and policies.

The primary objectives of this goal are to:

1. Implement programs and practices that support a more diverse, skilled, and innovative work force in weather and climate resilience.
2. To enhance the capacity of a more diverse practitioner community to use weather and climate information for improving resilience.

The primary resources needed to accomplish these objectives include:

1. Invested staff time from state Sea Grant programs and the NSGO to secure the partnerships and funding to conduct the activities under this goal.
2. New platforms for networking and information-sharing that support partnerships with non-traditional or diverse practitioner communities (e.g., rural economic development associations, community colleges, tribal colleges, HBCUs, HACUs), and professional societies that focus on the application of science to policy (e.g., American Meteorological Society).
3. Additional funding for new initiatives, including partnerships and student weather and climate resilience fellowships.

Timing	Major Activities	Implementer Level	Funding Source Level
Years 1-2	Partner with the Diversity, Equity, and Inclusion community of practice.	Programs with support from NGSO as appropriate	Programs, (staff time)
Years 1-10 (iterative)	Build a collaborative network of partners within the WCE and Sea Grant that can provide a platform for trainings and information-sharing on how to be more inclusive and collaborative in empowering communities to enhance their resilience.	Programs and WCE partners	Programs and WCE partners, with external funding sources as needed

Years 2-3	Develop and provide trainings to Sea Grant program workforce on inclusive communication and engagement strategies when working with the public.	Programs and DEI partners (potentially University offices or NGOs)	Programs, with support from NSGO and external funding sources as needed
Years 2-4	Identify gaps and needs in the development of an inclusive, innovative, and collaborative WCE workforce.	Programs and WCE partners	Programs, with support from NSGO and external funding sources as needed
Years 3-5	Build resilience fellowship programs through partnerships with universities (including tribal colleges and HBCUs), community colleges, and the private sector to train students across disciplines and foster an inclusive WCE workforce.	Programs and NSGO	Programs, with support from NSGO and external funding sources as needed
Years 3-10 (iterative)	Develop trainings and seminars for traditional workforce audiences, such as food safety and aquaculture, which incorporate weather and climate information.	Programs and WCE partners	Programs and WCE partners, with external funding sources as needed

Major Outcomes:

- Sea Grant strengthens or establishes new partnerships with HBCUs, HACU, tribal colleges, community colleges, and other institutions with a more diverse base of practitioners.
- Workforce development programs fully integrate weather and climate information into existing classes, trainings, and workshops.

Goal 3 (External): Sea Grant works with coastal communities to increase their capacity for using weather and climate information to enhance their resilience, reduce risks, and take advantage of emergent opportunities associated with extreme weather and climate change.

There is a high volume of weather and climate information and related decision-support tools available from both public sector and private sector sources. However, enhancing coastal communities' understanding of these resources and how to use them to meet their local planning and policy needs is imperative.

Sea Grant, as a boundary organization, has a strong track record of helping communities use research-based science and other information to solve problems. Therefore, Sea Grant is a natural fit to connect decision-makers with weather and climate tools and resources and with WCE partners that could provide communities with related services, such as down-scaling weather and climate models to fit local risks.

Most importantly, there are numerous barriers, challenges, and other factors external to the actions of Sea Grant that constrain the application of weather and climate information at all levels of government. This goal is not intended to hold Sea Grant responsible for these external factors. However, this goal does recognize that Sea Grant's research, extension, and education staff are in an ideal position to identify such factors and generate possible strategies that would help communities overcome these external barriers, challenges, and constraints to make progress toward resilience.

The primary objectives of this goal are to:

1. Improve coastal communities' awareness and knowledge of climate and weather information resources and decision-support tools.
2. Assist coastal communities in expanding their capabilities to incorporate weather and climate information and mitigation and adaptation strategies into local plans and policies
3. Develop, enhance, and apply new and existing decision-making protocols and practices that coastal communities may use to increase resilience to weather and climate risks.

The primary resources needed to accomplish these objectives include:

1. Staff time, in particular program-level education and extension staff, for both educational knowledge assessment and programming and technical assistance.
2. Financial resources, including funding of core research funded projects and other research proposal calls in addition to grants to staff.
3. Staff time and financial resources for communications products related to vulnerabilities and decision support for weather and climate resilience.
4. Extramural grants and contracts, in collaboration with WCE partners.

Timing	Major Activities	Implementer Level	Funding Source Level
Years 1-4	Sea Grant partners with communities to conduct assessments to identify their baseline knowledge of weather and climate risks and then hosts or co-hosts workshops in those communities to address knowledge gaps and identify information needs.	Programs, WCE partners, and communities	Programs, with external funding sources as needed
Years 1-10 (iterative)	Sea Grant works with local decision-makers and local staff to produce diverse outreach products that educate communities on weather and climate risks.	Programs, WCE partners, and communities	Programs, with external funding sources as needed
Years 2-10 (iterative)	Sea Grant works with communities to identify strategies to engage with residents, property owners, business owners, and other decision-makers to identify priority actions to include in local plans and policies.	Programs, WCE partners, and communities	Programs and WCE partners, with external funding sources as needed
Years 2-7 (iterative)	Sea Grant research and extension staff work with WCE partners to identify external barriers,	Programs, WCE	Programs and WCE

	challenges, and other constraining factors to community-level applications of weather and climate information in planning and policy.	partners, and communities	partners, with external funding sources as needed
Years 2-10 (iterative)	Sea Grant and WCE partners help communities co-produce research that fills identified gaps in weather and climate information and data needs and addresses implementation challenges.	Programs, WCE partners, and communities	Programs and WCE partners, with external funding sources as needed
Years 4-10 (iterative)	Sea Grant assists partner communities to help them mainstream weather and climate risks into local plans and policies.	Programs and communities	Programs and communities, with external funding sources as needed

Major Outcomes:

- Communities have increased baseline knowledge of weather and climate risks and can apply what they have learned in planning efforts to enhance their resilience.
- Communities have an inventory of weather and climate information resources and decision-support tools, with the capacity to update their inventory when needed.
- Communities have increased access to and understanding of weather and climate information resources and can use them in communicating risk to residents, property owners, business owners, and other decision-makers.
- To the extent possible given external barriers, challenges, and constraints, communities include adaptive management strategies in local plans and policies and fund and implement those strategies through their local budgets and grants.

Goal 4 (External): Sea Grant helps coastal communities improve their capacity to use weather and climate information for making decisions that protect, restore, and promote the sustainable use of ecosystems and their services.

Communities don't want resilience to apply only to structures and built infrastructure. They also want their surrounding natural environment to be resilient to weather and climate risks. Establishing management priorities and monitoring strategies are ways in which communities can enhance resilience of their natural resources. Resource management and protection through nature-based solutions (e.g., living shorelines) can benefit communities in two main ways: (1) they can help communities adapt to risks such as flooding and sea level rise; and (2) they can provide communities, particularly ones that rely on tourism, with economic benefits.

Sea Grant, as a boundary organization with place-based extension staff in communities, is well-positioned to provide information on ecosystem management and protection strategies and to assist communities with integrating weather and climate information into these strategies. Key Sea Grant partners in this effort include the Community Response to Flooding, Water Resources, and Citizen Science vision teams and their related communities of practice.

The primary objectives of this goal are to:

1. Improve the resilience of land and water resources in coastal communities to weather and climate events.
2. Ensure that management and monitoring strategies for coastal habitats, ecosystems, and their services take into account weather and climate risks.
3. Empower coastal communities to improve their capacities to incorporate weather and climate risks into the use, management, and conservation of their habitats and ecosystems.

The primary resources needed to accomplish these objectives include:

1. Staff time, in particular program-level research and extension staff, for both original research on ecosystem vulnerabilities to weather and climate hazards and on ecosystem adaptation opportunities, and for designing programming and technical assistance.
2. Financial resources, including funding of core research projects and other research proposal calls in addition to grants to staff.
3. Both staff time and financial resources to produce communications materials on ecosystem-based strategies for reducing weather and climate vulnerability and on adaptation needs in response to changing species distributions.
4. Extramural grants and contracts, in collaboration with WCE partners.

Timing	Major Activities	Implementer Level	Funding Source Level
Years 1-3	Sea Grant, in partnership with other groups in the WCE, provides information and trainings in coastal communities on resource protection, restoration, and monitoring approaches and best practices.	Programs and WCE partners	Programs and WCE partners, with external funding sources as needed
Years 2-6 (iterative)	Sea Grant and WCE partners help communities identify research and data needs regarding coastal resource management and conservation and identify land and water resource vulnerability to weather and climate events.	Programs, WCE partners, and communities	Programs and WCE partners, with external funding sources as needed
Years 3-7 (iterative)	Sea Grant and WCE partners help communities co-produce research on coastal resource management and restoration that fills data needs to address local land and water resource vulnerability.	Programs, WCE partners, and communities	Programs, WCE partners, and communities, with external funding sources as needed
Years 4-8 (iterative)	Sea Grant helps communities integrate weather and climate information into resource management and restoration strategies.	Programs, WCE partners, and communities	Programs and communities, with external

			funding sources as needed
Years 5-10 (iterative)	Sea Grant helps communities incorporate restoration and monitoring strategies, including citizen science, into local plans and policies.	Programs and communities	Programs and communities

Major Outcomes:

- Communities receive trainings on habitat management and restoration approaches and best practices, including trainings on how to incorporate citizen science in monitoring efforts.
- Communities have the resources they need to address land and water resource vulnerabilities and can identify partners within the WCE to help them meet their needs.
- Communities have the capacity to identify priority areas for restoration and then design and implement projects that include monitoring as a key element.
- Communities include policies on water resource management and restoration measures in local plans to support broader community efforts to mitigate and adapt to weather and climate risks.

References

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<https://www.ametsoc.org/cwwce/index.cfm/reports-and-studies/general-reports-and-studies/state-of-the-weather-and-climate-enterprise-in-2012/>

Appendix A: Acknowledgements

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Appendix B: Methodology for Current Sea Grant Weather and Climate Efforts Survey

The objective of the program survey was to gather baseline information about Sea Grant programs' capacities, goals, challenges, and needs related to our role in the weather and climate enterprise. This would ensure that the majority of contact time in the workshop focused on our relationships with external partners and on developing goals and objectives for the vision document. New Hampshire Sea Grant took a leadership role in developing and deploying the survey using Qualtrics, and received 26 responses, including from the National Sea Grant Law Center and CIMMS/National Severe Storms Laboratory (Appendix A). Based on these results, the WCE Vision leadership team drafted initial goals and objectives to which workshop attendees responded. The programs who responded to the survey were:

1. California
2. Cooperative Institute for Mesoscale Meteorological Studies/National Severe Storms Lab
3. Connecticut
4. Florida
5. Georgia
6. Hawaii
7. Lake Champlain
8. Louisiana
9. Maryland
10. Minnesota
11. Mississippi-Alabama
12. National Sea Grant Law Center
13. New Hampshire
14. New Jersey
15. New York
16. North Carolina
17. Pennsylvania
18. Puerto Rico
19. Rhode Island
20. South Carolina
21. Texas
22. University of Southern California
23. Virginia
24. Washington
25. Wisconsin
26. Woods Hole

Of particular interest were programmatic responses to the challenges to progress in current WCE-related research and programming. The two most frequently mentioned challenges were the lack of funding and a lack of internal capacity, such as in-house expertise or dedicated weather and climate staff. The major themes in challenges to programs' work in the WCE were:

- **Lack of funding**
- **Lack of internal capacity** (in-house expertise, dedicated climate/weather staff)
- Large geographic region
- Lack of collaboration, expanding partnerships

- Recognition of Sea Grant and awareness of Sea Grant services
- Implementation
- Scaling up/expanding work
- Uncertainty of projections
- Lack of data (economic/environmental)
- Political will/politics, lack of national leadership/direction
- Communication challenges (esp. states with widespread political barriers to use of climate science)
- Response issues (e.g., pace of response, Sea Grant role)
- Diversity and inclusion
- Complacency, other issues are all-consuming
- Lack of training/capacity-building for stakeholders
- Disagreement among stakeholders
- Community buy-in

Appendix C: Methodology for Partner Network Mapping Exercise

Each of the network maps developed during visioning workshops was visually analyzed with four questions in mind:

- 1) Was it created by SG staff, or an external partner?
- 2) Who are mapped as partners?
- 3) Are the relationships to those partners classified as existing or desired?
- 4) Are those relationships identified as being close, medium or distant?

To assess those partnerships across the network we analyzed identified relationships to a subset of 21 specific partners, or partner categories. The complete table is located here: <https://drive.google.com/open?id=1ecTe3brlpL3B2k1j7s7KLI8Zmhune4rQeFr2lcZhSYo>.

Additionally, we also characterized the nature of the relationship mapped by external partners to a Sea Grant program. This represents data from the participating Sea Grant programs and partners is not a full network analysis. However, we note the following insights, which informed the development of vision goals, objectives, and implementation steps:

- 1) Sea Grant programs (14 of 18 maps), local entities (11 of 18 maps), and NOAA programs or offices (10 of 18) were the most frequently listed partners. We did not distinguish between different NOAA programs or offices, though Office for Coastal Management and the National Estuarine Research Reserve system were most frequently listed.
- 2) Where other Sea Grant programs were mapped, the strength of those relationships varied, with only 5 of 18 programs mapping other Sea Grant programs as close partners, 5 of 18 mapping them as medium partners, and 8 of 18 as distant partners.
- 3) Desired relationships were not mapped as well as existing relationships due to constraints of the activity design. Three partner categories were identified most desired (3 of 18): Real Estate/Insurance representatives, National Weather Service, and FEMA/Emergency Management Agencies. There was discussion about the rapidly expanding private sector for both weather and climate services (for example, Surfline, the climate services businesses housed at The Collider, or new multimillion dollar big data firms such as Jupiter Intel). However, these private industries did not appear strongly in network maps, perhaps because only one external private sector partner attended who represented the insurance industry and not a private weather and climate data or service provider. Whether and how to develop a path to interface with this network of private industry providers is an open question for not only Sea Grant, but our WCE partners more broadly.
- 4) Only one of the participating Sea Grant programs mapped at least one of each of these 21 partner categories as an existing relationship, except for “media”, which was not mapped by any participating Sea Grant program.
- 5) The nature of “close” existing relationships suggests additional dimensions to the Sea Grant network. The three partners identified above (other Sea Grant programs, local entities and NOAA) also were the three top-most “close relationships”, but other partners were close behind. Notably academic partners, climate hubs (NOAA Regional Integrated Sciences and Assessments programs, USGS Climate Adaptation Science

Centers, USDA Climate Hubs) and State CZMs formed a second tier of existing and “close” relationships.

- 6) Eight of 18 Sea Grant programs mapped NGOs (which makes them equivalent to academic partners and climate hubs in terms of the number of existing relationships identified), but only one Sea Grant program identified that relationship as “close”.
- 7) Of the 13 external partners that created network maps, 11 identified a Sea Grant program as an “existing” partner, but of those, only five were identified as “close.” Most Sea Grant programs were identified as either medium or distant (6 total). Interestingly, for the two partners that identified a desired partnership with a Sea Grant program, both suggested a desired relationship that was medium or distant, not close.

Appendix D: Pathway to Implementing WCE 10-Year Vision (Logic Models)

Goal 1: Sea Grant is a trusted resource that guides and partners with communities to strengthen their capacity to address weather and climate risks.

<i>Objectives</i>	<i>Inputs/ Resources</i>	<i>Sea Grant Activities</i>	<i>Outputs</i>	<i>Short-term Outcomes (2-4 years)</i>	<i>Mid-term Outcomes (4-7 years)</i>	<i>Long-term Outcomes (7-10 years)</i>
Sea Grant synthesizes its knowledge and understanding of weather and climate hazards to develop a suite of best practices, information, technologies, and strategies to enhance community resilience	<p>Sea Grant pursues external funding to support staff time for rigorous analysis of best practices for using weather and climate information to support resilience to all weather and climate hazards across SG programs</p> <p>Synthesis of lessons learned and synergies between WCE Vision and the Water Resources, Community Response to Flooding, Citizen Science, and Diversity, Equity, and Inclusion</p>	<p>Cross-connect with Water Resources, Community Response to Coastal Flooding, and Citizen Science visions to distill overall best practices for resilient decision-making</p> <p>Reinvigorate networks within Sea Grant (SGCN, Communications, Education, Legal, etc.) to support communication, data collection, and dissemination</p> <p>Work with the NSGO to identify and summarize relevant PIER data</p>	<p>Sea Grant Academy provides continued professional development to new Sea Grant professionals</p> <p>Peer-reviewed journal articles, technical articles in practitioner journals, and publications through venues such as the NOAA Climate Toolkit</p> <p>Training program designed and delivered to SG fellowship awardees, including Knauss</p>	<p>Outcome 1: Sea Grant has a shared understanding of effective use of weather and climate information for improving resilience in coastal communities (includes end-to-end roles of social science, economics, and policy as opportunities and constraints on the use of weather and climate information)</p>	<p>Outcome 2: Sea Grant works within internal and external communities of practice to share best practices, build skills needed to work with other professionals in the WCE and with communities</p>	<p>Outcome 4: Sea Grant is nationally recognized as a close partner by coastal and Great Lakes communities for its expertise in linking information on weather and climate extremes with decision-making</p> <p>Outcome 5: Sea Grant is recognized for helping improve the implementation of best practices for coastal resilience to weather and climate hazards</p>

	visions	in Sea Grant's work in weather and climate resilience				
Improve the flow of weather and climate information between the broader WCE enterprise partners and Sea Grant's coastal communities and stakeholders	<p>Sea Grant Climate Network</p> <p>National Sea Grant Office</p> <p>Connections with RISA and other WCE groups also involved in conducting gaps/network analyses for the Sustained National Climate Assessment</p>	<p>Build on pilot survey from visioning effort to conduct more formal gaps analysis</p> <p>Build on existing input from visioning effort to expand and formalize network analysis</p> <p>Develop a communications and engagement strategy that maximizes flow of decision-relevant information between scientists and decision-makers to fill identified gaps</p> <p>Host a retreat (to include Sea Grant experts and partners in the WCE) to assess the needs of local decision-makers in communicating the risks associated</p>	<p>Connections with other emerging networks (e.g., Science to Action Network emerging from National Climate Assessment efforts)</p> <p>Gaps analysis that is available to Sea Grant specialists to drive research, extension, and communications program development</p>	Sea Grant understands its role within the WCE enterprise and broadens its network of close WCE enterprise partners beyond NOAA-related entities	Outcome 3: Sea Grant is considered a trusted professional cohort for its bridging role in helping to help coastal communities with linking information with decision-making by academia, public sector, and the private sector partners in the WCE	Outcome 6: Communities that are building resilience and preparing for hazards receive assistance and are coproducing information for improved resilience

		with the impacts of hazards such as sea level rise to residents and businesses and evaluate best practices in co-production of research in communities				
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Goal 2: Sea Grant encourages and fosters an inclusive, innovative, and collaborative workforce and community of practice within the weather and climate enterprise.

Objectives	Inputs/ Resources	Sea Grant Activities	Outputs	Short-term Outcomes (2-4 years)	Mid-term Outcomes (4-7 years)	Long-term Outcomes (7-10 years)
Support a diverse, skilled, and innovative workforce in weather and climate resilience	Staff time Financial resources Extramural grants and contracts Sea Grant DEI community of practice Partnerships with professional societies making synergistic efforts (e.g., American Meteorological	Implement DEI best practices in workforce development re: weather and climate Identify and work to address gaps and needs in workforce development re: climate/weather Build resilience fellowship programs through partnerships with	Training modules and seminars for traditional workforce audiences (e.g., food safety, aquaculture) which incorporate appropriate weather and climate information	Outcome 1: Sea Grant partners with programs at host universities and diverse practitioner institutions to discuss how to include weather and climate information in across academic degree programs	Outcome 4: Weather and climate information is included across academic degrees and fields	Outcome 9: Weather and climate information are integrated throughout academic and skill-building degrees

	Society)	the private sector				
Enhance the capacity of a more diverse practitioner community to use weather and climate information for improving resilience	<p>Staff time</p> <p>Financial resources</p> <p>Extramural grants and contracts</p> <p>Sea Grant DEI community of practice</p> <p>Diverse practitioner communities (e.g., rural economic development associations), institutions (e.g., HBCUs, HACUs, and tribal colleges) and others</p>	<p>Pursue and fund partnerships with more diverse practitioner communities</p> <p>Amplify the development and promotion of resilience building programs through partnerships with practitioner networks and the private sector</p>	<p>Collaborative network of partners provides platform for sharing knowledge on working with diverse communities</p> <p>New pilot programs developed in conjunction with members of diverse coastal communities to meet needs</p> <p>New training efforts developed and deployed (e.g., train the trainers) on inclusive communication and engagement strategies when working with the public, in partnership with diverse practitioner communities</p>	<p>Outcome 2: New partnerships established or strengthened with HBCUs, HACUs, tribal colleges, community colleges, and other diverse practitioner institutions</p> <p>Outcome 3: In partnership with diverse practitioner institutions, initiate needs assessments and/or Strategic Doing efforts, as appropriate, to scope needs for capacity building</p>	<p>Outcome 6: New pilot capacity building efforts initiated to build resilience in diverse coastal communities as a direct result of partnerships with practitioner networks with the support of Sea Grant</p> <p>Outcome 7: Networking efforts become established partnerships that yield competitive efforts for external funding from government agencies and foundations</p> <p>Outcome 8: Entrepreneurship programs around weather and climate are diverse and inclusive, and meet the needs of all coastal communities for weather and climate decision support</p>	<p>Outcome 10: Best practices are distilled from capacity building efforts and included in activities to meet Goal 1 (above), thereby diversifying the practice of improving coastal weather and climate resilience</p> <p>Outcome 12: Enduring collaborations diversify the WCE and improve the inclusivity of the WCE as a whole</p>

Goal 3: Sea Grant works with coastal communities to increase their capacity for using weather and climate information to enhance their resilience, reduce risks, and take advantage of emergent opportunities associated with extreme weather and climate change.

Objectives	Inputs/Resources	Sea Grant Activities	Outputs	Short-term Outcomes (2-4 years)	Mid-term Outcomes (5-7 years)	Long-term Outcomes (7-10 years)
Objective 1: Coastal communities have greater awareness and knowledge of climate and weather information resources and decision-support tools	Staff time and financial resources Extramural grants and contracts	Sea Grant conducts individual assessments in partner communities of their baseline knowledge of local weather and climate risks Sea Grant hosts workshops to address knowledge gaps and to share local knowledge Sea Grant works with local decision-makers and local staff to produce diverse outreach products that educate communities on weather and climate risks	Individualized baseline assessments of weather and climate resilience knowledge in Sea Grant partner communities Community-relevant information is provided to residents and businesses	Outcome 1: Partner communities have increased understanding of their weather and climate risks and can identify additional trainings needed to increase knowledge Outcome 2: Sea Grant hosts/co-hosts workshops and trainings in partner communities to increase baseline knowledge of weather and climate risks and offer continuing education credit when feasible	Outcome 5: Workshop attendees understand and can apply knowledge they have learned	Outcome 9: Communities have an inventory of weather and climate information resources and decision-support tools and have capacity to update inventory when needed Outcome 10: Due to increased access to resources, communities have the ability to use of weather and climate information and resources in planning efforts

<p>Objective 2: Sea Grant assists coastal communities in expanding their capabilities to incorporate weather and climate information and mitigation and adaptation strategies into local plans and policies</p>	<p>Staff time and financial resources</p> <p>Extramural grants and contracts</p>	<p>Sea Grant assists communities with identifying gaps in local plans and policies</p> <p>Sea Grant works with communities to identify information needs to address gaps in local plans and policies</p> <p>Sea Grant research and extension staff work with WCE partners to identify external barriers, challenges, and other constraining factors to community-level applications of weather and climate information in planning and policy</p> <p>Sea Grant works with communities to identify potential partners in the WCE to address those information needs</p> <p>Sea Grant and WCE partners</p>	<p>Communities understand information gaps that are needed to inform local plans and policies</p> <p>Communities know who their potential partners are in the WCE to help them fill information gaps</p> <p>Communities and their partners, including Sea Grant, create down-scaled weather and climate models tailored to local weather and climate risks</p> <p>Communities work with Sea Grant to identify strategies to engage residents, property owners, business owners, and other decision-makers to identify priority actions to include in local plans and policies</p>	<p>Outcome 3: Sea Grant helps communities mainstream weather and climate risks into their plans and policies</p>	<p>Outcome 6: Communities actively participate in assessing and measuring progress (e.g., Community Rating System, Resilience Star)</p>	<p>Outcome 11: Communities incorporate risk communication into planning efforts, which includes targeted communication with vulnerable populations</p> <p>Outcome 12: Communities adopt local policies that reduce their weather and climate risks</p> <p>Outcome 13: Communities fund and implement adaptive management strategies through local budget and grants</p>
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		iteratively co-produce research with communities to fill identified research and data needs				
Objective 3: Sea Grant develops, enhances, and applies new and existing decision-making protocols and practices that coastal communities may use to increase resilience to weather and climate risks.	Staff time and financial resources Extramural grants and contracts	Sea Grant conducts baseline inventory of decision-making protocols and practices that can help communities mitigate and adapt to weather and climate risks Sea Grant helps communities identify gaps in decision-making protocols and practices Sea Grant helps communities develop new protocols and practices and provides assistance with public engagement in these discussions through iterative co-production	Communities identify goals of adopting protocols and practices Communities receive input from residents, property owners, business owners, and other decision-makers	Outcome 4: Sea Grant helps communities develop decision-making protocols and practices	Outcome 7: Communities pilot new protocols and practices Outcome 8: Sea Grant maintains communication with these communities to help them measure success, identify lessons learned, and share lessons through peer-to-peer learning	Outcome 14: Communities have adopted or improved their protocols and practices Outcome 15: Sea Grant publishes lessons learned (e.g., peer-reviewed publications, outreach products) Outcome 16: Sea Grant extension staff transfers knowledge across the Sea Grant Network and to partners in the WCE

Goal 4: Sea Grant helps coastal communities improve their capacity to use weather and climate information for making decisions that protect, restore, and promote the sustainable use of ecosystems and their services.

Objectives	Inputs/ Resources	Sea Grant Activities	Outputs	Short-term Outcomes (2-4 years)	Mid-term Outcomes (4-7 years)	Long-term Outcomes (7-10 years)
Objective 1: Land and water resources in coastal communities are more resilient to weather and climate events	Staff time and financial resources Extramural grants and contracts Sea Grant Water Resources, Community Response to Flooding, and Citizen Science communities of practice	Sea Grant provides information on resource protection and restoration approaches and best practices, including alternatives to shoreline hardening	Communities identify land and water resource vulnerability to weather and climate risks Communities incorporate restoration in day-to-day efforts to mitigation efforts (e.g., living shorelines)	Outcome 1: Sea Grant works with communities to identify land and water resource vulnerability to weather and climate risks	Outcome 6: Sea Grant works with community to identify research and data needs to address resource vulnerabilities and identified potential partners within the WCE to help meet those needs	Outcome 10: Communities incorporate restoration in day-to-day efforts to mitigation efforts (e.g., living shorelines)
Objective 2: Management and monitoring strategies for coastal habitats, ecosystems, and their services take into account weather and climate risks	Staff time and financial resources Extramural grants and contracts Sea Grant Water Resources, Community Response to Flooding, and Citizen Science communities of practice	Sea Grant provides information and training on restoration and monitoring approaches Post-trainings, Sea Grant helps communities identify research and data needs regarding resource protection and restoration	Sea Grant works with communities increase capacity to gather monitoring data	Outcome 2: Communities receive trainings on restoration approaches and best practices	Outcome 7: Communities identify priority areas for restoration Outcome 8: Communities design projects, in which monitoring plays a key role	Outcome 11: Communities implement and monitor restoration projects Outcome 12: Communities incorporate citizen science in habitat and ecosystem monitoring

		Sea Grant and WCE partners iteratively co-produce research with communities to fill identified research and data needs				
Objective 3: Sea Grant empowers coastal communities to improve capacity to incorporate weather and climate risks into the use, management, and conservation of their habitats and ecosystems	Staff time and financial resources Extramural grants and contracts Sea Grant Water Resources, Community Response to Flooding, and Citizen Science communities of practice	Sea Grant works with communities to co-produce research that identifies restoration and monitoring strategies to will meet local needs Sea Grant helps communities integrate weather and climate information into resource management and restoration policies Sea Grant identifies funding mechanisms, or assists with legislation to develop funding options (e.g., improvement districts)	Communities have the ability to streamline weather and climate information into local policies on resource management, use, and conservation	Outcome 3: Communities have capacity to pursue coastal management alternatives that consider future conditions Outcome 5: Communities evaluate and pursue alternatives that consider ecosystem impacts (positive and negative)	Outcome 9: Sea Grant's involvement in local projects or policies that involve protection and restoration measures have been implemented and serve as successful examples	Outcome 13: Coastal communities implement policies that promote protection and restoration measures that can mitigate potential impacts from weather and climate events. Outcome 14: Local plans and policies regarding land and water resources take into account changes in weather and climate patterns