Submitted August 31, 2018

CITIZEN SCIENCE

Community-based science initiatives

National Sea Grant
Visioning Document

Submitted August 31, 2018

NOAA Sea Grant Citizen Science Network Vision

Sea Grant Citizen Science is used widely as a place-based research, outreach and education strategy providing inclusive, and equitable opportunities for diverse participants and partners to advance science and inform decision-making. The Sea Grant Network coordinates CS initiatives nation-wide; provides professional development training for CS practitioners; shares best practices for implementing place-based CS efforts; and becomes a vital collaborator and resource in the CS field.

Disclaimer: *It is important to note that while "citizen science" is the more common, widely understood term, the use of "citizen" can be perceived as exclusionary. In this document, we use "citizen science" to refer to all members of coastal communities and not to imply citizenship of any particular country. The Visioning Team recognizes the less commonly used but emerging term "community science" as better representing the intention of community-based science programs. In the future we recommend Sea Grant consider shifting terminology.*

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Executive Summary
August 31, 2018

Sea Grant is well positioned to contribute to the rapidly growing field of community science (CS) at a national level. Our presence in U.S. communities coast-to-coast, our non-advocacy stance and our expertise in extension, research, education and communications are well suited to a leadership role in place-based CS. Although not a top priority area for all Sea Grant programs, CS is referenced broadly in strategic plans across the network focus areas and included in approximately two-thirds of state strategic plans. In the 2018 - 2021 National SG Strategic plan, CS is specifically referenced in Healthy Coastal Ecosystems, although the visioning team suggests it be evaluated as a cross-cutting theme in the future.

> *"Citizen science, while cost effective, is not free."*
> *-Environmental Protection Agency*

Currently, Sea Grant has at least 83 CS programs in 25 states addressing an impressive array of topics from phenology in New England to subsistence hunt monitoring in Alaska. The most common goals of these programs are citizen engagement, research, resource management and education. Several SG CS programs, such as beach profile monitoring in Maine, New Hampshire and California, currently have strong partnerships. Many other well-established programs exist that could provide useful regional models. Overall, there is little exchange of information between SG CS programs or awareness of SG CS activities in other states.

Citizen science challenges were identified by the CS visioning team with expert input from NOAA, National Water Quality Monitoring Council, Alliance for Aquatic Resource Monitoring (ALLARM), the USA Volunteer Water Monitoring Network and the California Academy of Sciences and Citizen Science Association. Specific obstacles include:

- the collection of large volumes of data, occasionally with uncertain quality;
- lack of unidentified users;
- duplicative efforts;
- the inability to sustain programs long-term;
- high staff turnover
- and lack of diversity in partners and participants.

SG Network assets, such as strong linkages with university researchers, technical expertise, cross-network communication platforms, excellence in science outreach and strong community linkages can be targeted to address these challenges.

A vision with two distinct focus areas is proposed for SG CS: an internal focus and an external focus. The process for realizing this vision is detailed in two logic models featured later in the document. Support will be needed at the national, state and program/practitioner level to achieve the vision. The CS team agreed upon a message first voiced by the Environmental Protection Agency that "citizen science, while cost effective, is not free".


Mississippi-Alabama Sea Grant

Background

Community science (CS) is a rapidly growing field. In recent years, technological advancements made it easier for volunteers to collect and upload data, federal legislation has increased support for programs and CS is increasingly recognized by researchers as a reliable means of data collection. This rapid growth has led to a subsequent rise in efforts to study the field. For instance, CS has been described as existing along a spectrum (Figure 1). At the contributory end, volunteers are primarily data collectors. As public involvement increases, the project moves to collaborative and ultimately toward co-created with volunteers as equal partners at every stage of the project. Further distinctions are made between place-based projects (research conducted in a place volunteers know and care about) and projects directed by managers in remote locations. The purpose of CS data is similarly varied, but in recent years the majority of programs focus on responding to direct management needs.

The field of CS has seen many successes and the movement is quickly organizing and developing ways to share advances. There is a Citizen Science Association and its peer-reviewed journal, *Citizen Science: Theory and Practice*. Additionally, many local, regional and national communities of practice exist. Place-based research has emerged as a strength of CS, motivating volunteers to participate with engagement serving to catalyze stewardship and management outcomes. Furthermore, CS has been shown to enhance civic engagement, often drawing together diverse stakeholders to build a community focused on management of common resources. Finally, CS is a demonstrated, cost-effective way to enhance research capacity; it can serve as a tool for formal or informal education and it can be an effective method of public outreach.

Despite many successes, the field's rapid growth has resulted in some challenges. Technological advances make it easier to contribute to large-scale and distantly located projects, but result in an inability to directly communicate with the volunteer base. A variety of different data storage options exist, but it is difficult or impossible to share data between platforms. And some CS programs collect extensive datasets with no identified end user. A further challenge lies in the proliferation of programs. CS projects compete for limited funding and volunteers' limited time and attention, making it a challenge to attract volunteers to urgently needed CS programs. Maintaining engagement of trained volunteers can be an issue. While CS programs are a highly efficient use of funding, there is an inaccurate perception that they are free.

Finally, CS practitioners report difficulties reaching broader audiences, limiting diversity. This can result in concerns over a lack of equitable and inclusive opportunities, addressing the needs of underserved communities and developing programs within impacted communities. Issues

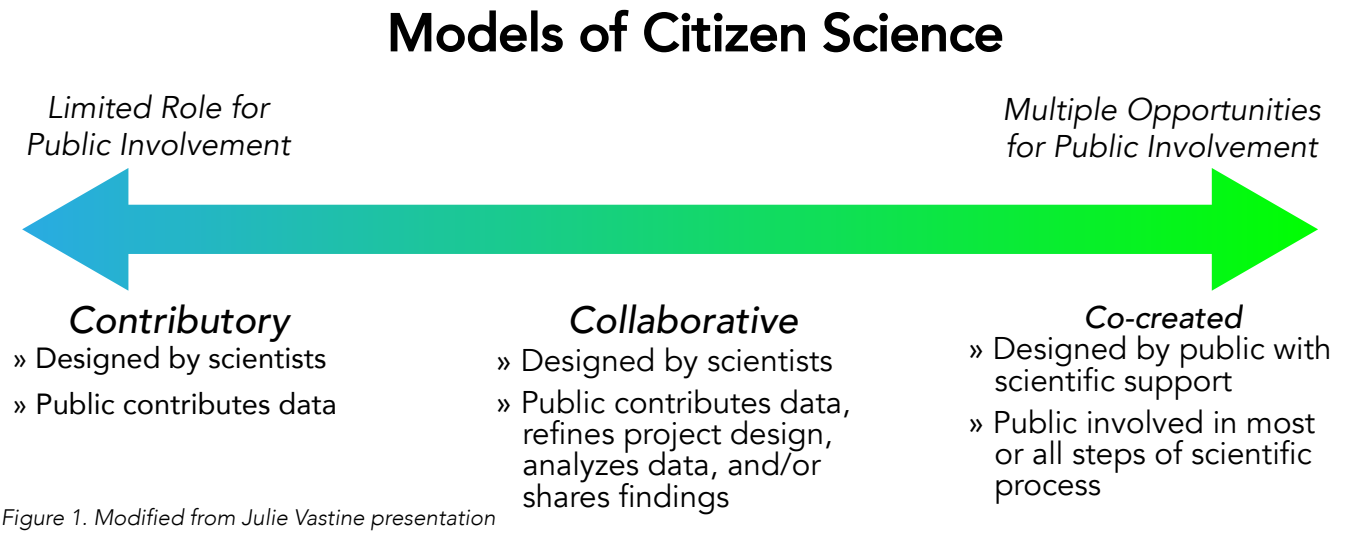


Figure 1. Modified from Julie Vastine presentation

surrounding diversity in CS reveal an opportunity to bridge gaps between environmental, social and economic issues toward creating programs that are relevant to stakeholders. These challenges can make the prospect of sustaining valuable, existing programs extremely difficult.

The next several years likely will see the expansion of citizen science research addressing the above challenges. Even now, there are data-driven best practices: successful citizen science programs set clear goals for project design and data use; bring all relevant partners together in early stages of the project; have a well-developed protocol for volunteer training and coordination; review data for quality control; maintain strong metadata for all volunteer-collected data; and evaluate programming regularly and adapt as needed to make progress towards the program's stated outcomes. Furthermore, citizen science programs that work with a wide range of partners, including not only environmental but also civic organizations, tend to be most successful at achieving outcomes in the community. In many cases, citizen science programs can reduce competition between programs by leveraging existing resources rather than producing redundant programming.

A Niche for Sea Grant

The collaborative, non-advocacy, research-based approach of the National Sea Grant program uniquely positions us to play an important role in supporting CS. Engaging volunteers in the collection of scientific data aligns well with the Sea Grant approach of supporting coastal and Great Lakes communities through research, extension and education. As such, Sea Grant can provide important contributions to the national/international CS movement, and in turn, can benefit from the role CS can play in strengthening Sea Grant programming.

Sea Grant has the potential to fill an important niche as experts in community-based initiatives, an identified need of the CS movement. Our work is grounded in responding to stakeholder needs to address local issues. Unsurprisingly,


Lake Champlain Sea Grant

current CS programming within Sea Grant is comprised of largely place-based, locally focused programming. Our origins within NOAA and our base in university settings provides us connections to the academic community while working with diverse stakeholders such as government agencies, non-profit organizations, schools and communities. These partnerships afford us the opportunity to learn from communities who can best identify the most pressing and relevant research and management questions that we can deliver to the research community. Furthermore, these partnerships allow us to sustain programs and maintain community connections beyond the timeline of a grant funded project, an opportunity many other entities do not have.

Sea Grant personnel are viewed by our stakeholders and partners as non-biased professionals. Our reputation as "honest brokers" of science-based information positions us well as trusted conveners of CS programs. Our experience in connecting scientific information to the people who can use it is a critical aspect of effective CS programming. Our science communication expertise and national platform creates important opportunities for communicating the stories and outcomes that result from these efforts. The potential exists for Sea Grant to not only play a role as conveners of CS programs, but also as technical service providers, such as developing or validating methods for stakeholders.

The ability of Sea Grant to respond to emerging

issues is a hallmark of the program. This nimbleness combined with our strong partnerships creates the potential for us to support communities to employ CS as a tool in response to emergent issues. For Sea Grant to effectively engage communities in CS as a response to urgent information needs, we will need to plan and build the structure to support this work. Our ability to be flexible and adaptive in response to emerging issues would be an important contribution to the larger CS movement.

Sea Grant CS programs benefit from the broad geographic scope and connectedness of the national Sea Grant network. Sea Grant CS practitioners can learn from one another, particularly with regard to best management practices across programs. We can take advantage of existing programs, platforms and databases where they exist; replication of effort is a challenge faced by the CS community at large and we are well poised to create synergies. Furthermore, the broad geographic distribution of Sea Grant programs facilitates unique opportunities to address large-scale questions such as environmental climate-related challenges.

CS in Strategic Plans - National Level

Every four years, the National Sea Grant College Program reevaluates and adapts its strategic plan to direct Sea Grant efforts to produce high quality science and inform management of coastal resources in ways that balance human use with environmental health. The process identifies core values and focus areas that drive efforts to address the priorities established by coastal communities. Likewise, Programs in the Sea Grant network develop their own four- year strategic plans, influenced by the National plan. The 2018-2022 National Strategic plan included language about CS:

Focus Area: Healthy Coastal Ecosystems

- Goal: Land, water and living resources are managed by applying sound science, tools and services to sustain ecosystems.
  - Action: Support a sound science- and management-driven framework that integrates observations, monitoring, local and knowledge, research and modeling to provide a scientific basis for informed decision-making.
    - Desired Outcome: Citizen science initiatives are utilized and contribute to improving our knowledge with respect to coastal communities, economies and ecosystems.

Submitted August 31, 2018

Sea Grant CS Hot Spots

Land of Plenty

Thanks to its two Sea Grant programs California currently has the most programs of any single state, with 14 different offerings.

Enduring Impact

Maine's beach profile monitoring program began in 1999, making it one of the longest running volunteer-driven shoreline monitoring programs in the country.

Small, But Mighty

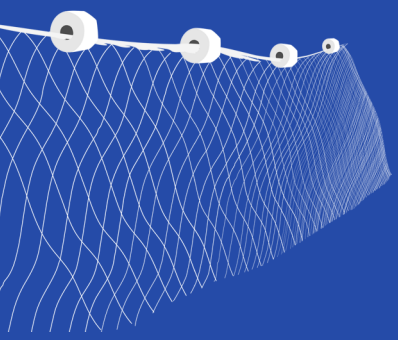
With only 15 miles of coastline, New Hampshire is currently running 11 different citizen science programs.

CS in Strategic Plans - Program Level

To explore the level to which programs incorporated CS language into their own strategic plans, program plans were reviewed for CS terminology. Approximately 2/3 of the plans contained direct references to CS under Healthy Coastal Ecosystems, with about 1/5 identifying CS as an approach to increasing Sea Grant's impact on Environmental Literacy and Workforce Management, some in conjunction with Healthy Coastal Ecosystems. A couple of programs identified CS as a strategy for supporting Sustainable Fisheries and Aquaculture, while king tide monitoring was mentioned related to Resilient Communities and Economies but not explicitly identified as CS. While the approach above was far from exhaustive, it showed that CS is identified by many names and is broadly used across the Sea Grant Network.

Sea Grant staff from eight geographically diverse programs further explored the use of CS in strategic plans, identifying additional themes, details and staff perspectives on the role of strategic plans in clarifying and supporting CS as a tool to expand Sea Grant capacity to impact focus areas. The group concluded that CS-related work is referenced widely in most plans but generally not as an intentional programmatic focus. Including a reference to CS in the recent 2018-2022 National Sea Grant Strategic Plan may influence the more intentional use in Network Plans. Such influence can be similarly used to further clarify and promote CS. Because of the broad applicability of CS concepts, the National Strategic Plan could include a section that addresses the language, definitions, benefits and applications of CS.

CS Compatibility with Strategic Initiatives

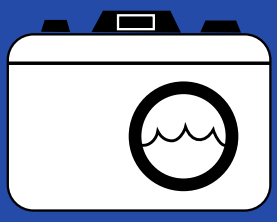


Sustainable Fisheries

Since 2013, the New Hampshire Coastal Research Volunteers have assisted NH Fish & Game in expanding the number of monitoring sites for the commercially important American Eel.

Resilient Communities

Hurricane Rita devastated southwestern Louisiana, but local Sea Grant agents facilitated a citizen science clean-up initiative where volunteers mapped debris for subsequent removal.

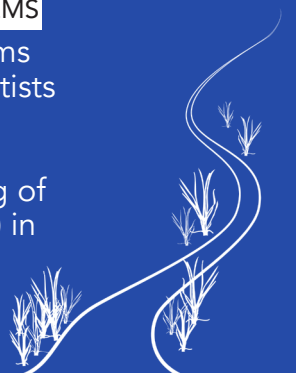


Environmental Literacy

Sea Grant programs have recruited and engaged the public to observe and document extreme high-water level events to better understand impacts from sea level rise and other hazards.

Healthy Coastal Ecosystems

Numerous Sea Grant programs have teamed up citizen scientists with trained water quality professionals to develop community-based monitoring of Harmful Algal Blooms (HABs) in local water bodies.



A Plan to Move Forward - One Vision with Two Focus Areas

The Community Science (CS) visioning group identified the need for two, distinct visioning focuses. The first is an internal vision that focuses on the assets and needs of the members of the Sea Grant network itself. The second is an external vision that is focused on the assets and needs of stakeholders, audiences and clients that the Sea Grant network serves.

CS Vision - Internal Focus

Goal: Sea Grant networks CS initiatives nation-wide; provide professional development training for CS practitioners; share best practices for implementing place-based CS efforts; and become a vital collaborator and resource in the CS field on the national stage and beyond.

PLANNING TO ACHIEVE THE INTERNAL FOCUS

Inputs

Mentorship and training also will be needed for SGCS professionals to ensure that quality data is collected from CS, to engage and work with researchers to use CS best practices, to develop inclusive and equitable approaches for working with diverse groups and to explore the role of diverse knowledge in CS. As a network excelling in place-based programs, Sea Grant's existing relationships within communities will be drawn on and expanded as well as the potential role for Sea Grant to provide assistance and expertise to other organizations in place-based CS.

Broadening Participation

With broad support and participation in CS programming across the Sea Grant Network, we anticipate positioning ourselves to achieve a leadership role on the CS national level. As CS visioning team members learned from our national level guests from NOAA Citizen Science, Dickinson College's Alliance for Aquatic Resource Monitoring, The National Water Quality Monitoring Council, The Citizen Science Association and California Academy of Sciences, the national stage presents many opportunities for diverse partnerships. As such, it will be important for SG to clarify our niche to collaborate most effectively with these and other partners. As a boundary organization between academia/research and communities, SG is uniquely positioned to provide linkages to researchers, data users and community scientists. Identifying a common data sharing mechanism will facilitate further engagement within the network.

OUTCOMES

Awareness, Knowledge, Skills
Short-Term

» Sea Grant professionals are aware of existing SGCS initiatives, their objectives and their outcomes.

» Sea Grant professionals who are leading CS initiatives have increased knowledge and skills to develop successful CS program characteristics and funding mechanisms; ensure scientific credibility and data quality; engage and support researchers willing to implement CS; evaluate programs and position CS as a SG cross-cutting issue.

» Sea Grant professionals have access to professional development opportunities to learn how to create inclusive and equitable programs that effectively engage diverse participants and partners, in particular, individuals from underserved and underrepresented communities.

» Sea Grant colleagues and partners are aware of and can identify opportunities to address emerging topics through CS.

» Sea Grant colleagues include administrators, extension, educators, communicators and researchers.

» Partners include:
- National-level NOAA - NMFS, NOS, NWS, NOAA Office of Education
- National-level Outside NOAA- National Water Quality Monitoring Council, Citizen Science Association, etc.

Actions
Mid-Term

» Sea Grant programs across the nation actively integrate CS into initiatives.

» National-level partners at NOAA, NOAA Office of Education, NMFS, NOS, NWQMC, and CSA partner or call on SG to share our expertise in CS.

» CS program gaps are strategically addressed on emerging topics/issues of concern.

» CS programs that are meeting priority needs are provided with continuing support.

» CS programs use a common platform for data compilation and collaboration among shared projects.

» CS programs align with successful program characteristics, ensure scientific credibility and data quality, are routinely evaluated, represent varied levels of participant and partner engagement (collaborative, co-created or collegial), and are implemented when possible across the SG Network to address research and management needs.

» Sea Grant professionals are aware of best practices to create inclusive and equitable programs and use them intermittently to engage diverse participants and partners, in particular, individuals from underserved and underrepresented communities.

Conditions
Long-Term

» Sea Grant's place-based CS programs are inclusive and equitable, exemplify successful characteristics, ensure diverse participation, scientific credibility and data applied to decision making.

» CS programs are sustained over the long-term as necessary, and result in meaningful benefits to the society, environment and economy.

» CS programs and participants feel empowered to act in relation to the project in which they are engaged and feel a sense of community.

» Sea Grant is regarded as a trusted partner in place-based CS across nation and beyond.

» CS data and contributions in research studies are recognized in peer-reviewed publications.

» Sea Grant researchers advocate for the integration of CS into their projects where well-suited.

» Sea Grant professionals consistently use best practices to create inclusive and equitable programs that effectively engage diverse participants and partners, in particular, individuals from underserved and underrepresented communities.

CS Vision - External Focus

Goal: Sea Grant CS is used widely as a place-based research, outreach and education strategy providing inclusive and equitable opportunities for diverse participants and partners to advance science and inform decision-making on the national stage and beyond.

PLANNING TO ACHIEVE THE EXTERNAL FOCUS

Inputs

For Sea Grant to achieve the external CS focus, support will be needed at multiple levels. CS team members will need the commitment of the National Sea Grant Office to establish and sustain a Sea Grant CS Network and a willingness to implement its initiatives. At the state level, time will be needed for SGCS team members to dedicate to Network activities as an element of our annual work plans. At the individual level, SGCS practitioners will need to build skills, knowledge and capacity toward developing, sustaining and/or expanding diverse, place-based CS programs that lead to a more sustainable future.

Engaging Diverse Audiences

Sea Grant's CS initiatives better serve diverse participants and partners by acknowledging and incorporating distinct cultural, historical and geographic perspectives; interests; priorities; experiences; knowledge and skills. Thus, to broaden participation in CS initiatives, SG professionals should seek out perspectives from diverse community members and partners to uncover their CS needs and motivations.

The external vision seeks to identify and address barriers to engaging diverse individuals in CS, in particular, constraints that limit participation of individuals from underserved and under-represented communities. We are committed to relationship building to find common ground with new participants and partners by providing inclusive, equitable and adaptive programs that meet the needs of more groups and communities.

OUTCOMES

Awareness, Knowledge, Skills
Short-Term

» CS participants have increased knowledge of the social, environmental and economic context of their contributions to SGCS initiatives.

» Diverse participants and partners (including individuals from underserved and underrepresented communities) are aware of and understand the relevance of SG CS initiatives.

» CS participants have increased knowledge on sharing data and engaging in local decision-making processes.

» CS participants have skills to use scientific methods to understand the world around them, to effectively conduct their monitoring activities and to contribute quality-assured data.

» CS participants have a greater opportunity and role in developing projects and participating in analysis and presentation in partnership with scientists.

» Researchers have increased awareness of strategies and support for employing CS and the value of including diverse types of knowledge and experience in their projects.

» Resource managers have increased awareness of the value of CS data in informing management decisions.

» CS participants, partners, resource managers, local decision-makers, researchers and industry have increased awareness of the value of more inclusive and equitable recruitment for broadening participation in CS programs.

» CS participants, program partners, resource managers, local decision-makers, researchers, and industry have increased awareness of CS as a tool to create new knowledge and inform decisions.

Actions
Mid-Term

» Diverse participants and partners, in particular, individuals from underserved and underrepresented communities, participate intermittently in SG CS initiatives.

» CS participants use the scientific method to understand the world around them; effectively conduct their monitoring activities following protocols; contribute quality-assured data; undertake stewardship actions to address the social, environmental, economic context of their monitoring and engage in local decision-making processes.

» Researchers integrate CS diverse types of knowledge and experience in their projects and recognize the CS contributions in presentations and publications.

» Resource managers and decision makers seek and apply CS data to inform management.

Conditions
Long-Term

» Sea Grant CS efforts are inclusive and equitable, and participants and program partners reflect the diversity of the regions in which they exist.

» Diverse perspectives and knowledge are represented, valued and integrated in SGCS projects.

» Data generated through SGCS inform research and are applied in local, state, federal and tribal-level decision making.

» Stewardship actions taken by SGCS participants and program partners address the social, environmental and economic issues related to monitoring activities.

» Researchers seek CS engagement in developing, implementing, analyzing and presenting findings.

Activities of a CS Network

Implementing the Internal Focus

- Establish a SGCS Network or Community of Practice with regular modes for communication and collaboration.
  - » Next Step: Participants in CS Visioning develop a proposal to present to NSGO and SGA.

- Compile complete inventory of existing SGCS projects and their place-based outcomes.
  - » Next Step: Updated SGCS program inventory is included in appendix. CS Network members are in the process of building a corresponding inventory of related success stories and outcomes.

- Compile CS success stories and communicate these.
  - » Next Step: Success stories are currently being collected from CS Network members. CS Network member and Louisiana Sea Grant Communicator Dani Dilullo will provide direction on approaches for communicating these.

- Coordinate CS Network activities with those of related SG Networks (TEK, DEI, Education)
  - » Next Step: Sea Grant vision plans are shared among all vision teams. Vision team leads each present a Sea Grant webinar to share results and begin to identify linkages.

- Share CS Network vision and progress at Sea Grant Week 2018. Explore CS as a cross-cutting theme in Sea Grant.
  - » Next Step: CS Network members develop a framework for this session. A discussion of CS as a cross-cutting theme could be considered as an element of this Sea Grant Week session.

- Foster partnerships with national-level partners at NOAA, NOS, NWQMC and CSA.
  - » Next Step: A subset of CS Network members will present a webinar to NWQMC in August; Members have agreed to submit an abstract for a SGCS workshop and opportunities for professional development at Citizen Science Association 2019 Conference, Raleigh, NC March 13-17, 2019.

- Identify and strategically address CS program gaps on emerging topics/issues of concern, while providing needed support for existing programs.
  - » Next Step: Use the inventory of existing programs as a starting point for identifying program gaps and for opportunities to share existing programs and resources across the Sea Grant Network.


California Sea Grant


New Hampshire Sea Grant

- Align SGCS programs with established characteristics of successful programs: clear goals; clear participant and partner roles; program design and sustainability plan that includes funding; support from researchers and decision makers; common SG study design process; Informed equipment selection; quality assurance program plan (QAPP), data review, metadata; coordination, training; data application; program evaluation.
  - » Next Steps: Share resources describing characteristics of successful programs with CS Network members. Share quality assurance program plans among SGCS programs.

- SGCS practitioners work in collaboration with the Sea Grant Diversity, Equity and Inclusion Community of Practice to develop and co-lead trainings on creating inclusive and equitable programs that effectively engage diverse participants and partners, in particular, individuals from underserved and underrepresented communities

- Train SGCS practitioners in Best Practices for: scientific credibility and data quality in CS, funding mechanism and sustaining CS program in the long-term.
  - » Next Step: Identify experts from inside and outside Sea Grant as potential resources for this training.

- Educate SGCS practitioners in CS program models (contributory, collaborative, co-created, collegial) to understand anticipated outcomes and align programs appropriately, with the goal of moving toward increased levels of participant engagement.
  - » Next Step: Identify experts from inside and outside Sea Grant as potential resources for this training.

- As feasible, adapt existing CS programs for implementation elsewhere in SG network.
  - » Next Step: Use the inventory of existing programs as a starting point for identifying opportunities to share existing programs and resources across the Sea Grant Network.

- Develop a SG network-wide CS platform for data compilation and collaboration among shared projects.
  - » Next Step: Inventory platforms currently used by existing CS programs for adaptability. Identify commonalities for CS Network platform needs. If necessary, survey other existing, available fee-for-service, or open source platforms.

- SGCS programs should undergo internal evaluation and adapt as necessary.
  - » Next Step: As needed, train CS Network members in program evaluation methods. NOAA's Program Design and Evaluation training is a potential resource.

Activities of a CS Network

Implementing the External Focus

- Provide CS program materials in formats available and accessible to diverse audiences (language, ADA, etc)
  - » Next Step: Sea Grant CS Network members work with Sea Grant Communicators Network to identify opportunities for sharing resources and expertise to make CS program materials accessible, inclusive and equitable across the Sea Grant Network.

- Sea Grant CS practitioners engage diverse cohorts of citizen scientists in place-based CS research programs.
  - » Next Step: SGCS members work regionally to identify CS needs and opportunities.
  - » Subsequent Steps: Work through regional partnerships to build relationships and trust with local stakeholders in the identified areas. These stakeholders will include those traditionally underserved and underrepresented in decision-making and stakeholders with diverse types of knowledge and experience.

- Work with these local stakeholders to identify local priorities, assets, and needs that could be connected to CS programs; identify research support for data application; clarify participant and partner roles and engage decision makers; establish or support existing CS programs appropriate to meet needs; and evaluate and adapt CS programs as necessary.
  - » Next Step: CS Network members develop skills in working with diverse groups through mentorship and training with resource people inside and outside Sea Grant.

- Researchers who express interest in seeking Sea Grant funding are provided an orientation to CS and assistance in incorporating CS following funding if appropriate.
  - » Next Step: CS Network works with Sea Grant research coordinators to develop best practices for incorporating CS into Sea Grant funded research.

Next Steps for Sea Grant: Identify cross-focus relevance of CS

As noted previously, Network Programs have already applied CS to the four Sea Grant focus areas. As such, CS should be considered a cross-cutting approach for Sea Grant to address strategic plan priorities. To clarify the cross-cutting nature of CS to the Sea Grant Network as a whole, the CS Network identified the need for:

- A table of the types of CS applications for Sea Grant programs to help define the breadth of Sea Grant activities that are considered CS.
- A framework for considering long-term planning of CS as impactful and cost-effective, yet not free.
- Our current understanding of CS volunteers' motivations for participating could be shared in this context.
- The strategic planning process can also be used to encourage collaborative writing within and between Sea Grant Programs to improve consistency of terminology and technique and to encourage innovation.


Louisiana Sea Grant

Provide definitions and common language

Applying names and definitions to the variety of activities where non-scientists contribute meaningful data to scientific pursuits has proven challenging and continues to be debated in CS circles. Sea Grant Program staff expressed a variety of stakeholder sensitivities to terminology. Currently the dominant descriptor, "citizen" science can convey limitation to some stakeholders where community members are not citizens.

- Alternatives used in the Sea Grant network include "community" science, used in at least two Program strategic plans, and "community engaged research".
- "Collaborative" science is used in California to better suit relationships with and contributions by commercial fisheries. Fisheries were identified as a likely underrepresented and possibly underutilized CS technique. Data collection by commercial fisheries professionals who have received training in specific protocols can be considered contributors to CS.
- The importance of using terminology that is readily relatable to most stakeholders, as well as clarifying the definitions of these term, was also identified as an important consideration.

State understanding and support of CS inputs and outputs

CS is a highly cost effective, but not cost free, approach for extension, research, education and communications. It is important for Sea Grant programs to explicitly acknowledge the support needed for CS activities and the relative return on investment.

- Dedicated staff within programs was identified as a highly effective approach. How those positions are established and supported can be identified in the strategic planning process.
- Strategic plans can also provide guidance on how citizen science efforts are accounted for in Sea Grant metrics and how success is measured when metrics don't fit well.

Review of CS Visioning Process

Recognizing that the field of CS involves players at all levels of government, NGOs and academia, experts in CS on the national stage were invited to collaborate in the development of Sea Grant's vision. The following four guests represented organizations and agencies outside Sea Grant: Laura Oremland (Acting NOAA Citizen Science Coordinator); Kris Stepenuck (Citizen Science Association board chair, USA Volunteer Monitoring Network board member); Julie Vastine (Dickinson College's Alliance for Aquatic Resource Monitoring, National Water Quality Monitoring Council, chair of volunteer monitoring work group, Citizen Science Association board member) and Alison Young (California Academy of Sciences, Citizen Science Association board member). All guests provided critical context to this national-level discussion. With these experts, we launched the visioning with a discussion of CS-The Big Picture, where we identified the current trends, challenges and role for Sea Grant.

Current trends and emerging issues (from *Background)* include:

- Place-based CS that builds community and fosters stewardship, especially in impacted communities
- The range of engagement that exists in CS models (contributory, collaborative, co-created)
- The characteristics of successful CS programs
- The need to maintain data quality for application in management, as well as for research the need to track and promote the outcomes of CS

Challenges (from *Background)* include:

- A dramatic increase in the number of CS programs which can lead to competition for funding, duplication of effort and generation of high volumes of data without designated data users
- Existing data gaps
- Sustaining programs
- Numerous apps and platforms that don't link with each other and don't garner many users
- Lack of recognition that CS is not free
- Lack of diversity in CS participants and partners

Role for Sea Grant (from *the Niche for Sea Grant*):

- Expertise in place-based CS
- Established relationships with communities and partners to help identify research needs
- Support to CS through extension, research, education and communications
- Shared programming
- Connecting with management decisions
- Research to understand outcomes in natural resource management decisions
- Uniquely positioned to sustain programs in the long-term

Before integrating our team's ideas into our own vision for CS in Sea Grant, we also felt it was valuable to reflect on how CS was captured in our current National and State-level strategic plans in the session, CS and Our Strategic Plans (detailed in *CS in Strategic Plans*). In advance of the visioning workshop, team members were asked to review their program's strategic plan and to identify references to CS. These were then shared in regional breakout groups who translated the themes in how CS was incorporated into strategic planning across the network.

<u>CS and Our Strategic Plans</u>

- SG needs common language for this work
- CS work is referenced widely in most plans but generally not as an intentional program focus
- There is no Network-wide effort to align current CS programs with the models of CS
- There is potential for CS to be described as a cross-cutting issue
- How CS is referenced is likely to depend on how the plan was drafted in each program. Collaborative strategic plan writing enables the plan to reflect the perspectives of many

Conclusion

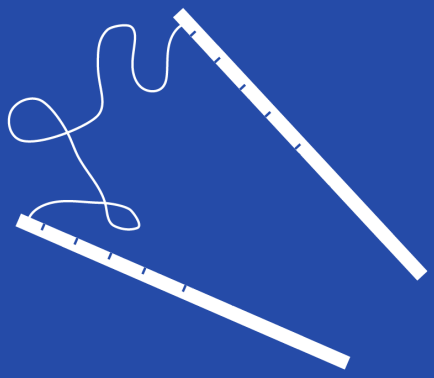
Sea Grant can play a leadership role in the rapidly expanding CS movement. By networking our collaborative, research-based state programs, which are integrated in communities coast-to-coast, we can engage diverse stakeholders to answer large scale, pressing research questions, respond to emergencies, inform coastal management and policy and partner with other efforts on the national stage. The many existing place-based SGCS programs can benefit from a network supported by SG staff and a platform for information exchange. This will allow programs to maximize resources and learn from other programs. A highly visible, unified presence will leverage the work of existing SGCS efforts, support nationwide expansion, highlight Sea Grant's unique niche in place-based science and benefit the field of CS.

Submitted August 31, 2018

Snapshot: Current CS in Sea Grant

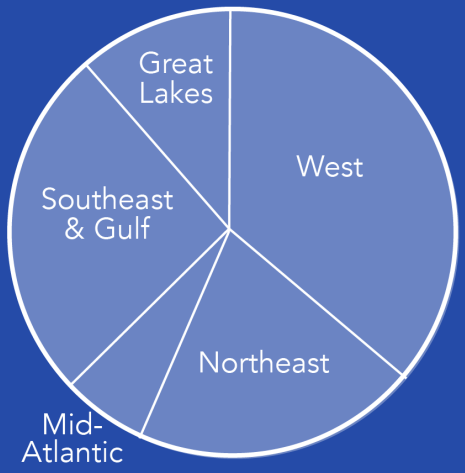
86 Number of identified citizen science programs in the Sea Grant network. California, New Hampshire and Alaska lead the pack with 14, 11 and 10 programs, respectively.

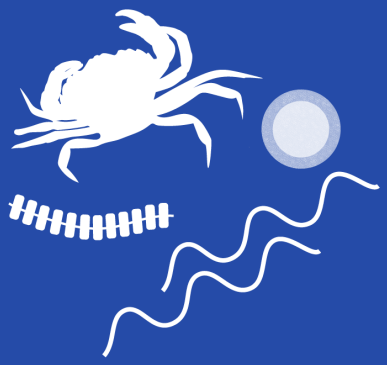
New Hampshire has a CS model worth replicating within the Sea Grant network. They have a dedicated Outreach Coordinator for their Coastal Research Volunteers program which facilitates eleven different initiatives.



Maine is an important leader of CS in the Sea Grant Network, developing a model beach profile monitoring program that has been adopted by the Sea Grant Programs in California and New Hampshire.

SGCS programs are happening in all regions, with the most occuring in the West. The Northeast and the South/Gulf also have robust CS programming. The Mid-Atlantic and the Great Lakes regions have the fewest programs but are smaller regions overall.





The Sea Grant network covers a wide variety of topics with its CS programs Common themes include shoreline monitoring, microplastics, king tides, HABs and green crabs. Several of these topics have potential to be addressed by the entire Sea Grant network.

Submitted August 31, 2018

CS Network Visioning Members

Name	Sea Grant Program	Position	Email
Network Vision Workshop Leads			
Kristen Grant	Maine	Marine Extension Associate	kngrant@maine.edu
Monique Myers	California	Coastal Specialist	moniquemyers@gmail.com
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Jeff Adams	Washington	Marine Ecologist	jaws@uw.edu
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Other Agency Participants			
Laura Oremland	NOAA	CS Coordinator	laura.oremland@noaa.gov
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Alison Young	California Academy of Sciences	CS Manager	ayoung@calacademy.org

Appendix A. Current Programs

As an initial effort to elucidate Sea Grant's involvement in citizen science, Sea Grant programs across the national Sea Grant network were asked to provide information about the type and number of 'citizen science' programs they lead. The data provided should not be regarded as a thorough or exhaustive examination but as a rough overview of the number and type of programs currently operating. No definition of the words 'citizen science' or 'program' were provided to SG programs when data were solicited so inconsistent interpretation of these terms are a source of inaccuracy. Also, the relatively short time frame of data collection did not allow for input from every program.

Figure 1 CS programs are happening in all regions of the country, with the most occurring in the West. The North-east and the South/Gulf also have robust citizen science programming. The Mid-Atlantic and the Great Lakes regions have the fewest programs but are smaller regions overall. Total Program numbers and a summary of all current programs can be found in the supporting documents section of the appendix.

By state, California has the most citizen science programs overall, followed closely by New Hampshire and Alaska. State program breakdowns are shown in Figure 2.

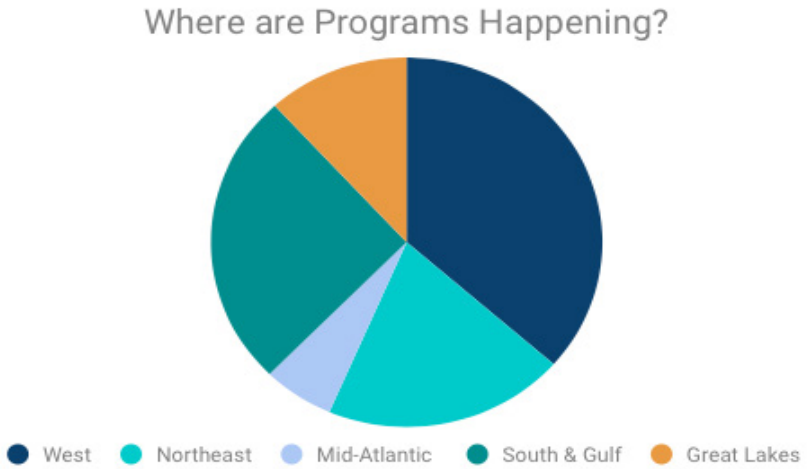

Figure 1. CS programs by region

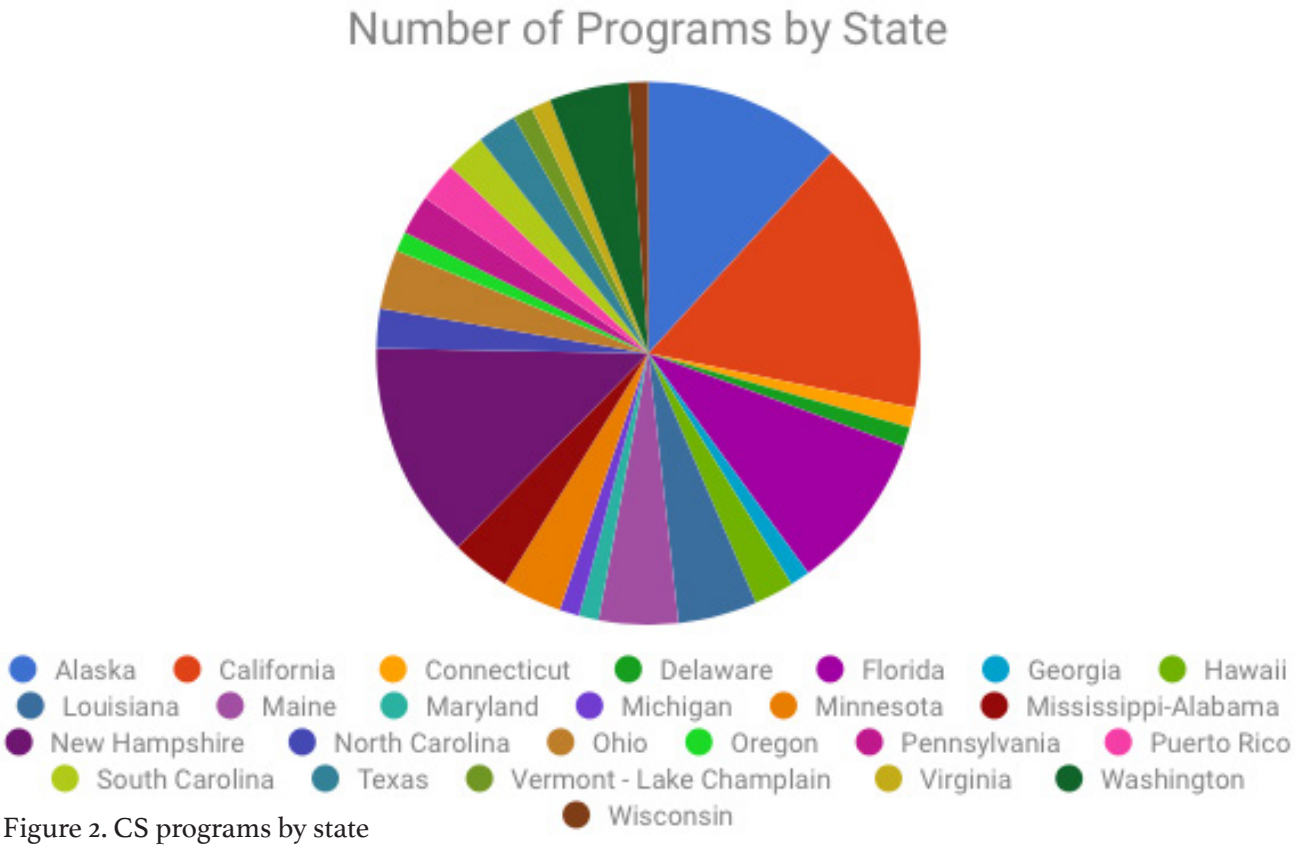

Figure 2. CS programs by state

In the western region, all states are participating in citizen science with 14 programs in California and 10 programs in Alaska. Both are large states and the number of programs reflects the large amount of coastline in each state. Washington Sea Grant is running four high quality programs.

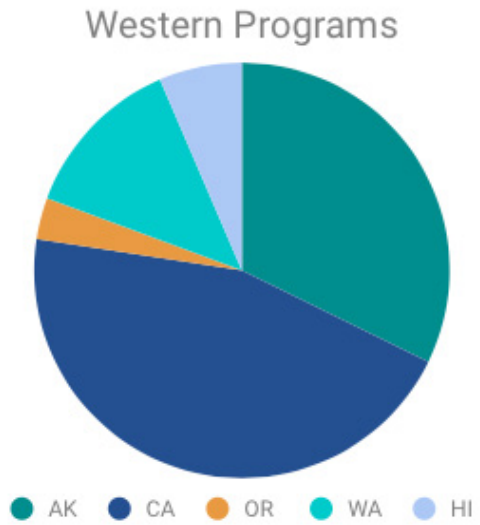

Figure 3. Western CS programs

In the Northeast, three out of seven SG programs have active citizen science programs. Maine and New Hampshire collaborate on two programs. Connecticut and New Hampshire both have horseshoe crabs programs. Vermont and New Hampshire have stream monitoring programs.

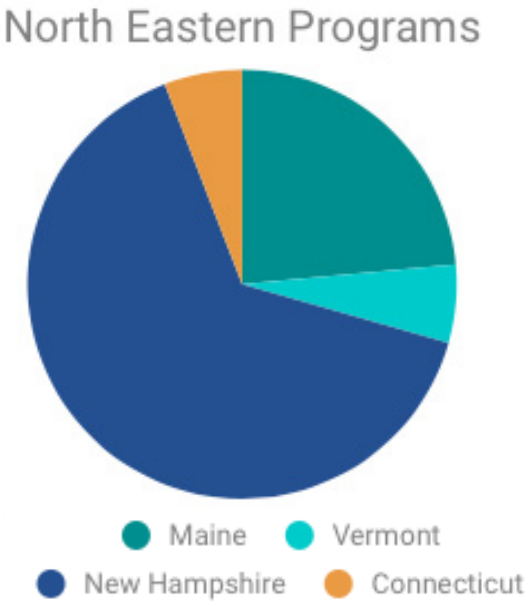

Figure 4. Northeastern CS programs

In the Mid-Atlantic four out of five states have CS programs. Carolina has two CS programs focusing on invasive species fisheries management. The other three state's programs are related to water quality. Maryland's program is focused on wetland restoration and conservation and
Virginia's program is focused on oyster growth in relation to water quality.

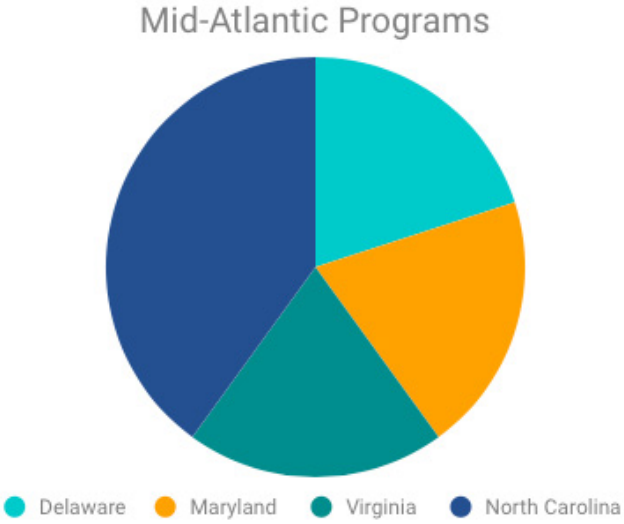

Figure 5. Mid-Atlantic CS programs

In the Southern and Gulf region, Florida
has 8 CS programs. Marine debris is a prominent issue with six programs in

Florida, Mississippi/Alabama, South Carolina and Louisiana focus on this issue. Mississippi/Alabama Sea Grant also is a leader on this issue leading three programs focused on marine debris with well established protocols and a dedicated staff person.

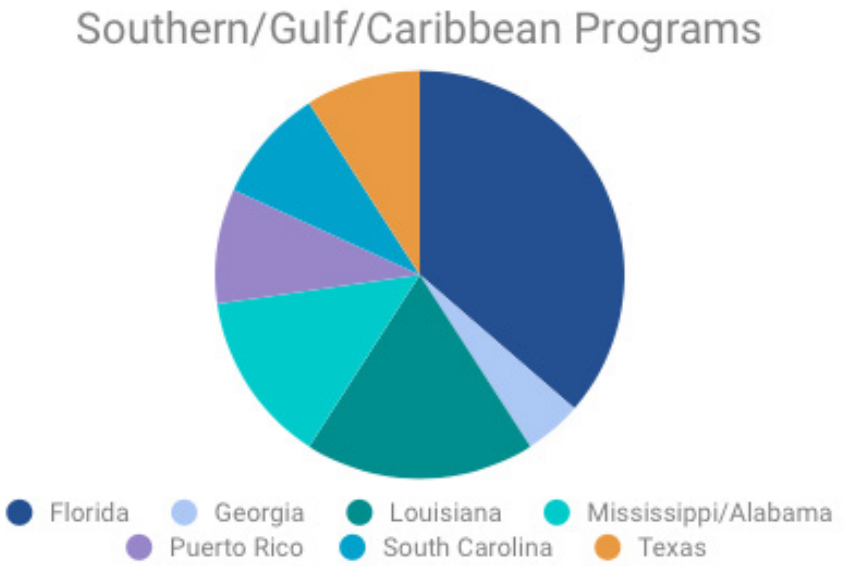

Figure 6. Gulf South and Caribbean CS programs

Finally, in the Great Lakes region, five out of six SG programs have CS programs. Minnesota and Ohio each have three citizen science programs. Both Wisconsin and Michigan have developed mapping tools to engage people in collecting data.

Figure 7. Great Lakes CS programs

Programmatic Goals

SG CS programs have a variety of goals with citizen engagement, as the most common goals. Resource management and research are frequent the top priority for many programs. We requested each program select their two main goals so these figures are a reflection of the primary goals of a project, not necessarily the only goals they are meeting.

Figure 8. Program Goals

Program Audience

These programs reach a number of different audiences although adult community members are by far the most common. Resource managers are the second most common and K-12 students come in third. For this category again, all programs were asked to select their two main audiences from the list provided. They may reach more audiences than the two they selected as their primary audiences so this reflects who the primary audiences are not necessarily the complete reach of all programs.

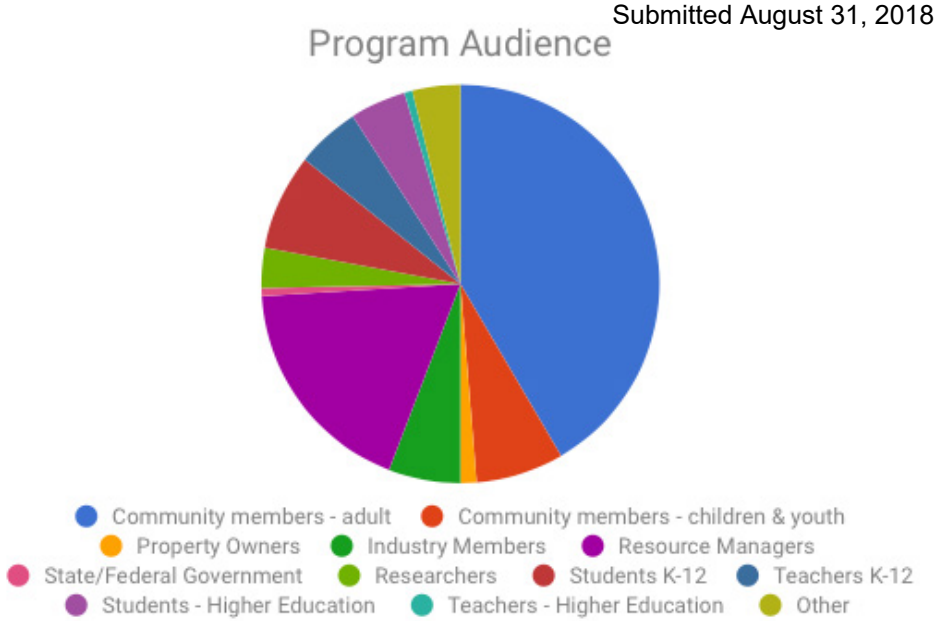

Figure 9. Program Audience

Program Categories

We grouped all programs into five categories: Geological/Physical, Biological, Chemical, Ecosystem and Citizen Science Capacity Building. Biological programs were the most common.

- It should be noted that there is some overlap in categories/topics. For example, water quality can be looked at through a chemical or biological lens causing certain types monitoring to end up in the Chemical category while others have been sorted into the Biological category.
- Oysters are another example of overlap - two states (NH and FL) have oyster restoration programs categorized as Biological. VA's oyster focused program is categorized in Ecosystem as it focused on how oyster growth responds to changes in water quality.

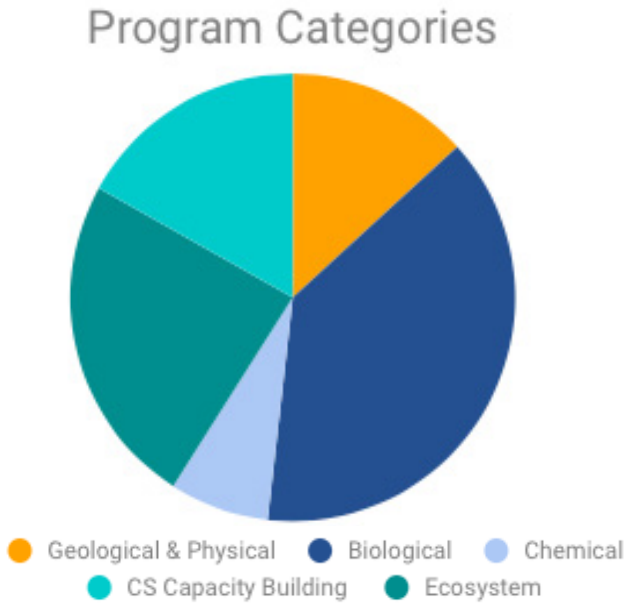

Figure 10. Program Categories

We further divided each large category into smaller sub groups. The Geological/Physical category was broken down into Shoreline monitoring, Beach Restoration and King Tide/Storm Surge monitoring. Shoreline monitoring was the most common making up over half of this category, followed by King Tide programs.

- Maine Sea Grant developed the shoreline monitoring protocol that is being used in both New Hampshire and California.
- All King Tide programs are similar

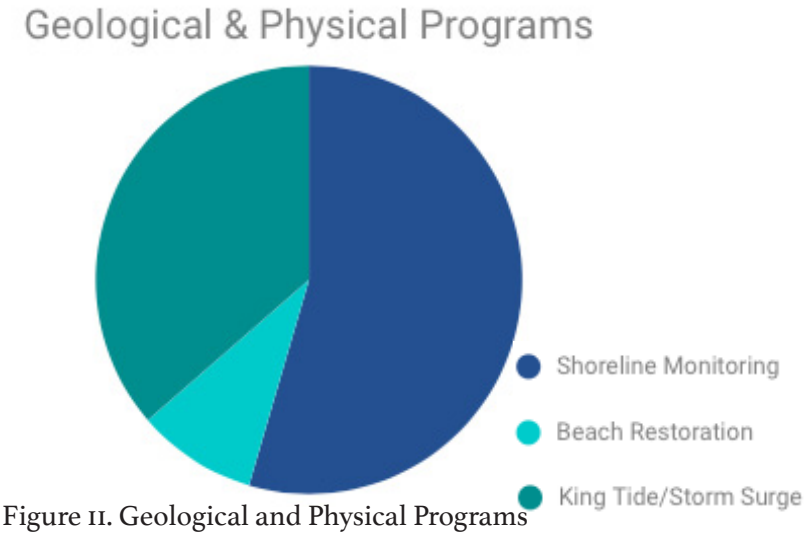

Figure 11. Geological and Physical Programs

In the Biological category, aquatic animals was the most common sub group.

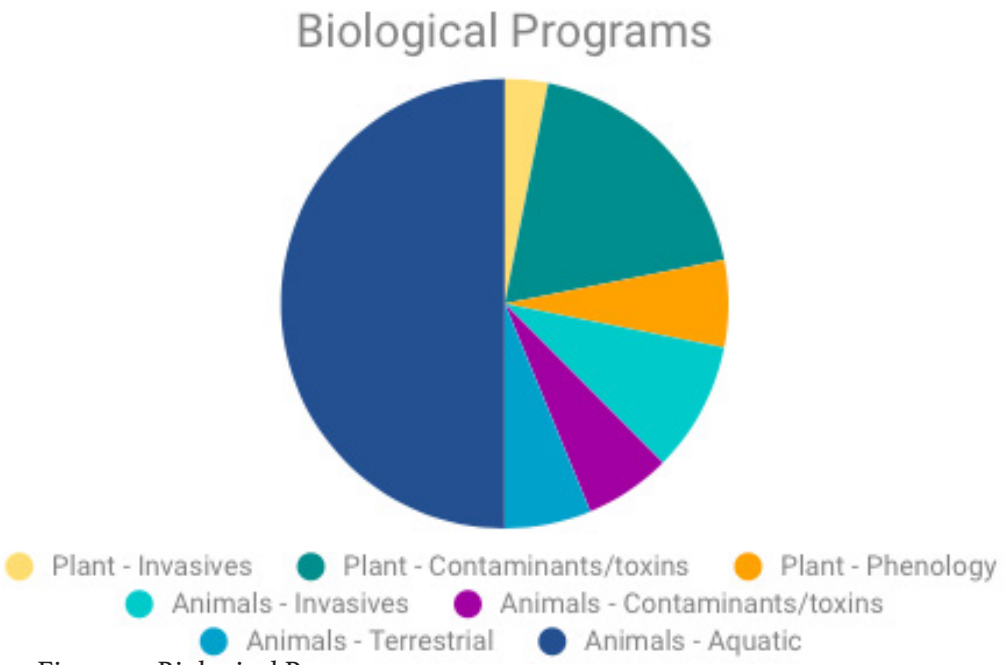

Figure 12. Biological Programs

- Many of the biological programs were focused on water quality through a biological lense. Harmful Algal Bloom programs occur in 6 states including AK, TX, CA, WA & MN. Water quality is measured using mussels in both NH and AK.
- Invasive green crab monitoring is another common biological program, performed in WA, AK and NH, but currently without coordination among programs.
- Three east coast states (NH, CT, and FL) have horseshoe crabs programs.
- Collection of fisheries management information is a large component of Louisiana's citizen science programs. Most other southern states also are heavily involved in this type of citizen science.

Water quality monitoring was the most common type of 'chemical' program.

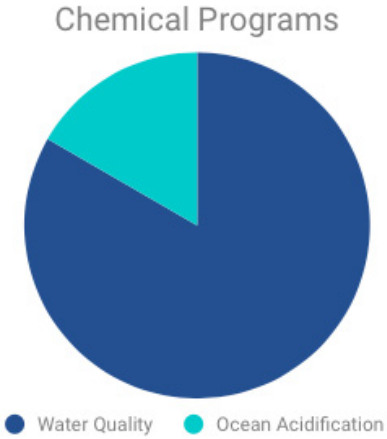

Figure 13. Chemical Programs

In the Ecological category, most programs address Ecosystem Impacts. These projects mainly focus on marine pollution, specifically microplastics. Microplastics programs in Florida, Mississippi/Alabama, and New Hampshire may translate well to other parts of the Sea Grant network. Most programs in the ecosystem change category are concerned with ecosystem changes related to climate change. Some collect baseline data, others focus on adaptation (e.g. restoration). (King Tide programs also address climate change impacts.)

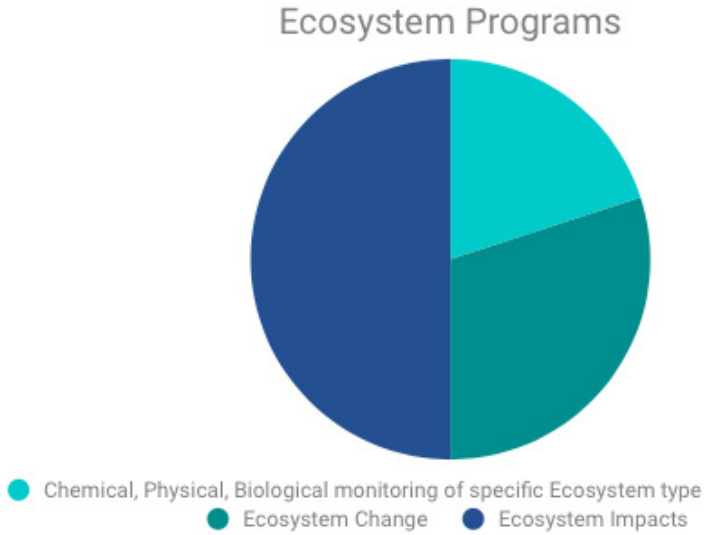

Figure 14. Ecological Programs

Half of the CS Capacity Building programs were focused on education. The majority of the educational programs aim to better acquaint citizens with their local environments. Two of these programs do so with Master Naturalist programs, providing in depth training while another two are bio blitzes (citizens collect biodiversity data during a single day). Two other educational programs work with the commercial fishing industry.

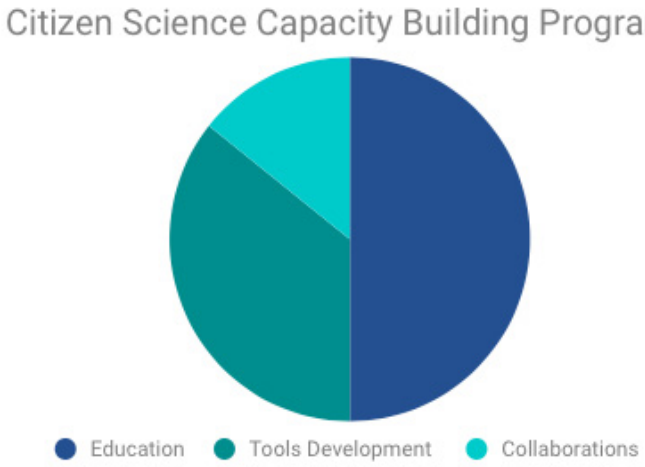

Figure 15. CS Capacity Building Programs

To conduct CS programs, Sea Grant works with a wide variety of partners. The most common are NGOs and universities followed by State and Federal government agencies. Partners also vary on state by state basis. Alaska for example partners with native tribes far more than any other state and New Hampshire is most involved with K-12 schools.

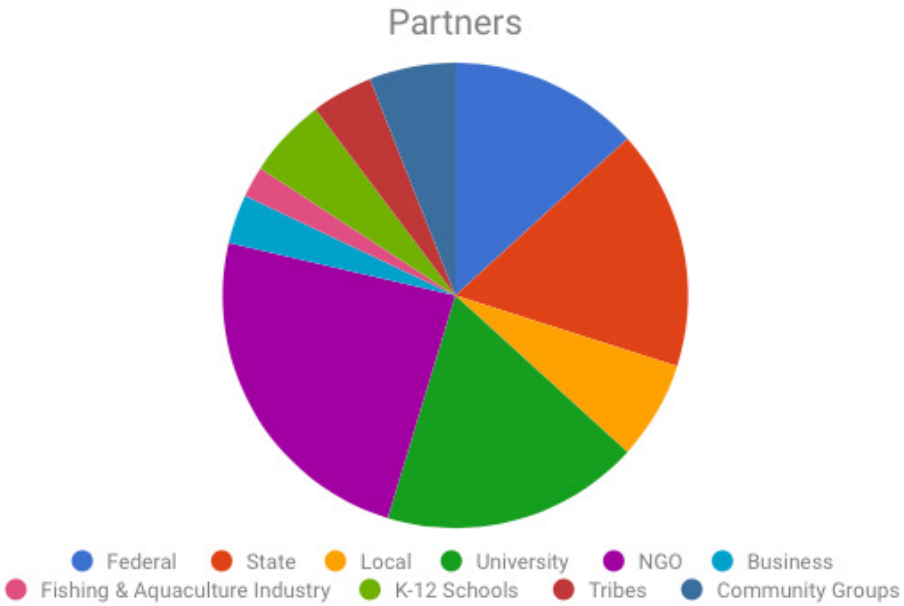

Figure 16. SGCS Partners

Future Programs

- The Sea Grant network covers a wide variety of topics with its citizen science programs
- Common themes include: shoreline monitoring, microplastics, King Tides, HABs and Green Crabs.
- These topics, especially shoreline monitoring, King Tides and Microplastics, have potential to be addressed by the entire Sea Grant network.
- Topics with simple and transferrable protocols and/or already being addressed in multiple states are ideal for consideration by Sea Grant at a national level.
- Programs easily translatable to a new location have potential to create synergy between SG programs and help build the larger Sea Grant CS network.

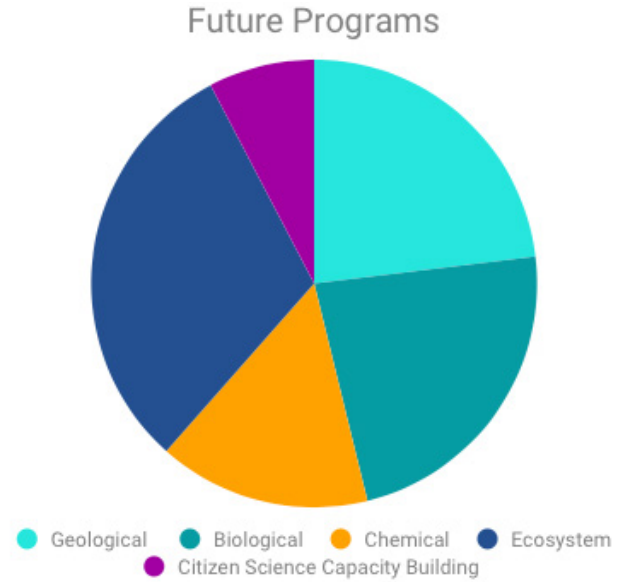

Figure 17. Future Programs

Appendix B. Citizen Science Programs by the Numbers

In a pre-workshop survey CS visioning participants were asked to indicate citizen science programs they may be interested in starting in the future. Ecosystem programs were most commonly listed. There was interest in micro-plastics monitoring and in programs that would monitor the impacts of climate change.

Location	Number of Programs
West	31
Northeast	17
Mid-Atlantic	5
South & Gulf	22
Great Lakes	10

Number of Programs by State:

Alaska	10	New Hampshire	11
California	14	New Jersey	0
Connecticut	1	New York	-
Delaware	1	North Carolina	2
Florida	8	Ohio	3
Georgia	1	Oregon	1
Guam	0	Pennsylvania	2
Hawaii	2	Puerto Rico	2
Illinois - Indiana	0	Rhode Island	0
Louisiana	4	South Carolina	2
Maine	4	Texas	2
Maryland	1	Vermont - Lake Champlain	1
Massachusetts	0	Virginia	1
Michigan	1	Washington	4
Minnesota	3	Wisconsin	1
Mississippi-Alabama	3		

Western Programs:

Alaska	10
California	14
Oregon	1
Washington	4
Hawaii	2
Guam	0

Mid-Atlantic Programs:

New Jersey	0
Delaware	1
Maryland	1
Virginia	1
North Carolina	2

North Eastern Programs:

Maine	4
Vermont	1
New Hampshire	11
Massachusetts	0
Rhode Island	0
Connecticut	1
New York	0

Southern/Gulf/Caribbean Programs:

Florida	8
Georgia	1
Louisiana	4
Mississippi/Alabama	3
Puerto Rico	2
South Carolina	2
Texas	2

Great Lakes Programs:

Illinois-Indiana	0
Michigan	1
Minnesota	3
Ohio	3
Pennsylvania	2
Wisconsin	1

Program Goals:

Research	33
Education	15
Citizen Engagement	49
Resource Management	30
Public Policy Development	0
Community Resilience & Adaptation	7
Community Capacity Building	5
Other	9

Program Audiences:

Community members - adult	64	Local Government	0	Teachers K-12	8
Community members - children/youth	11	State/Federal Govt.	1	Students - Higher Ed	7
Property Owners	2	Researchers	5	Teachers - Higher Ed	1
Industry Members	9	Students K-12	12	Other	6
Resource Managers	28				

Program Categories:

Geological & Physical	11
Biological	32
Chemical	6
Ecosystem	20
CS Capacity Building	14

Geological & Physical:

Shoreline Monitoring	6
Beach Restoration	1
King Tide/Storm Surge	4

Biological:

Plant - Invasives	1
Plant - Contaminants/toxins	6
Plant - Phenology	2
Animals - Invasives	3
Animals - Contaminants/toxins	2
Animals - Terrestrial	2
Animals - Aquatic	16

Chemical Programs:

Water Quality	5
Ocean Acidification	1

Ecosystem Programs:

Chemical, Physical, Biological monitoring of specific Ecosystem	4
Ecosystem Change	6
Ecosystem Impacts	10

CS Capacity Building Programs:

Education	7
Tools Development	5
Collaborations	2

Program Partners:

Federal	31
State	39
Local	16
University	42
NGO	56
Business	8
Fishing & Aquaculture Industry	5
K-12 Schools	13
Tribes	10
Community Groups	14

Future Programs:

Geological	3
Biological	3
Chemical	2
Ecosystem	4
Citizen Science Capacity Building	1

GEOLOGICAL & PHYSICAL - SHORELINE MONITORING

1. **CoAST SB, California Sea Grant, Monique Myers - Coastal Specialist (moniquemyers@gmail.com)**
   Mission Statement: To engage citizen scientists in collection of beach profile monitoring data for management and scientific purposes. Through participation in CoAST SB, participants learn about sandy beach geomorphology, ecology and sea level rise impacts.

   Program Description: Sandy beach profile monitoring modeled after the Maine SG program. Volunteers measure beach profiles monthly at ~26 sites in Santa Barbara and Ventura Counties

   Program Website: https://caseagrant.ucsd.edu/project/coast-sb-community-alliance-for-surveying-the-topography-of-sandy-beaches

   Program Goal: Resource management, education

   Program Audience: community members-adult and youth, students K-12/higher ed

   Program Partners: USGS and UCSB Research, Experience and Education Facility (REEF)

2. **New Hampshire Volunteer Beach Profile Monitoring Program, New Hampshire Sea Grant, Alyson Eberhardt and Caitlin Mandeville - Coastal Ecosystems Specialist, (Alyson.Eberhardt@unh.edu)**
   Program Description: Forces like storms, ocean currents, and changes in sea level work together to add and remove sand from the beach. Beach profiling is a simple way to track these changes over time. By measuring the contour, or profile, of a beach at regular monthly intervals, we can start to observe long-term patterns of sand erosion and accretion. The New Hampshire beach profiling program consists of volunteer teams that measure the profile of a site once per month as well as after major storms. We currently have thirteen sites being monitored. NH beach profiling is a project of the NH Sea Grant Coastal Research Volunteers program.

   Program Website: https://seagrant.unh.edu/beach-profiling-0

   Program Goal: Community Resilience and Adaptation; Citizen Engagement

   Program Audience: Community members - adult; Resource managers

   Program Partners: NH Department of Environmental Services Coastal Program; NH Geological Survey; University of New Hampshire Center for Coastal and Ocean Mapping

3. **Sand Watch, Puerto Rico Sea Grant, Rene Esteves - Extension Leader (rene.esteves@upr.edu)**
   Program Description: In collaboration with UNESCO, stakeholders are taught to survey and measure different aspects of their local beach geomorphology and water quality parameters.

   Program Website: https://seagrantpr.org/guardarenas/

   Program Partners: Caribbean Regional Association, UNESCO, CIEL, University of Puerto Rico

4. **Shoreline Monitoring Toolbox, Washington Sea Grant, Kate Litle - Assistant Director for Programs (kalitle@uw.edu)**
   Program Description: A website to provide information to various CS and local groups on shoreline monitoring protocols, provide guidance on what type of monitoring might be relevant in different conditions, and provide info about relative skill level and cost requirements of various monitoring protocols.

   Program Website: wsg.washington.edu/toolbox

   Program Goal: Research, resource management

   Program Audience: community members - adult, other: volunteer groups

   Program Partners: Puget Sound Ecosystem Monitoring Program, Puget Sound Partnership & EPA

5. **Southern Maine Beach Profile Monitoring Program, Maine Sea Grant, Kristen Grant - Marine Extension Associate (kngrant@maine.edu)**

   Mission Statement: The mission of the Southern Maine Volunteer Beach Profile Monitoring Program is to provide opportunities for collaboration among local volunteers, participating municipalities, regulatory agencies, and scientists to provide data for beach management decision making.

   Program Description: Started in 1999, monitoring by over 100 community volunteers and students on ~12 sandy beach systems in southern Maine on a monthly basis, on the lowest tides. The program was initiated as a 2 year Sea Grant research project and Maine Sea Grant led the evolution of the research project to a long-term monitoring program. The data are used by Maine Geological Survey to produce the biannual State-of-Maine's Beaches Report and guide beach management decision making such as permitting by the Maine Department of Environmental Protection, post-dredge monitoring by Army Corps of Engineers, calculating sand budgets in regional embayments, etc. The program is primarily funded through the municipal budgets of the Cities and Towns where beaches are monitored.

   Program Website: http://www.seagrant.umaine.edu/extension/beach-profile-monitoring/home

   Program Goal: Engagement and Collaboration; Beach Management

   Program Audience: Community members, Property Owners, Students/Teachers K-12

   Program Partners: Municipalities, ME Geologic Survey, Wells National Estuarine Research Reserve, University of Maine.UM Cooperative Extension, ME Coastal Program, ME Dept of Environmental Protection

6. **Stakes for Stakeholders: Community Based Erosion Monitoring , Alaska Sea Grant, Gabriel Dunham, Marilyn Sigman, Marine Advisory Agent, Marine Education Specialist (gabe.dunham@alaska.edu, msigman@alaska.edu)**

   Program Mission Statement: To build an understanding of long-term shoreline change in areas with rates of rapid coastal erosion.

   Program Description: Alaska Sea Grant–funded researchers and partners created a system for residents to monitor local erosion, installed equipment and trained residents in five Bristol Bay communities. They also leveraged funds to bring additional experts to rural communities. https://seagrant.uaf.edu/research/projects/summary.php?id=1041 Site selection and monitoring protocols for three community-based shoreline monitoring systems—stake sites, stake and time-lapse camera sites, and emery rod cross-shore profile sites—have been developed into a tool in the Climate,gov toolkit and monitoring protocols suitable for use by local residents. https://toolkit.climate.gov/tool/stakes-stakeholders-community-based-erosion-monitoring. Alaska Sea Grant-funded researchers will expand the program to Utqiagvik with K-12 education and community outreach support by ASG.

   Program Goal: citizen engagement, community resilience and adaptation

   Program Audience: Community members - adult, K-12 teachers and students

   Program Partners: Bristol Bay Native Association, North Slope Borough Department of Risk Management and Emergency Preparedness, Alaska Department of Natural Resources/Division of Geological and Geophysical Surveys, multiple other local and tribal organizations as research partners

BEACH RESTORATION

1. **Dune Restoration & Research, New Hampshire Sea Grant, Alyson Eberhardt - Coastal Ecosystems Specialist (Alyson.Eberhardt@unh.edu)**

   Program Description: The Coastal Research Volunteers work with UNH's Coastal Habitat Restoration Team to restore and maintain healthy dunes in New Hampshire and Massachusetts by engaging volunteers in restoration work. Alongside the Restoration Team, volunteers plant native grasses, install sand fencing, post educational signage, and actively survey the dunes to document sand gains and losses. Volunteers are also active participants in research on dune resilience and restoration methods.

   Program Website: https://seagrant.unh.edu/dune-restoration-and-research

Program Goal: Community Resilience and Adaptation; Citizen Engagement

Program Audience: Community members - adult; Students K-12

Program Partners: University of New Hampshire researchers (2); Town of Seabrook; Town of Hampton; Seabrook-Hamptons Estuary Alliance; local schools (~10)

KING TIDES/STORM SURGE

1. **CA King Tides, California Sea Grant, Lisa Schiavinato - Director of Extension (lschiavinato@ucsd.edu)**
   Program Description: Provides citizen science opportunities to document sea level rise in coastal communities

   Program Website: http://california.kingtides.net

   Program Partners: USGS, Scripps Institute of Oceanography, SCCOOS, The Bay Foundation, Aquarium of the Pacific, Cabrillo Marine Aquarium, Tijuana River National Estuarine Research Reserve and Heal the Bay

2. **Hawaii and Pacific Islands King Tides Citizen Science Project, Hawai'i Sea Grant, Maya Walton - Program Leader (waltonm@hawaii.edu)**
   Program Description: Hawai'i Sea Grant is engaging citizen scientists to document today's high water level events, i.e., King Tides, to better understand tomorrow's impacts from sea-level rise and other coastal high water events. Photographic data are entered into a free,publicly available data set and are informing research, policy, and decision making across the state and Pacific region. Almost 200 Citizen Scientists have contributed 2,400 photo records to a publicly accessible online database. These data serve as a critical resource for researchers, policy makers, and community members to better understand the potential impacts of sea-level rise and other coastal hazards.

   Program Website: http://ccsr.seagrant.soest.hawaii.edu/king-tides

   Program Partners: International King Tide Project

3. **Urban Tides Initiative, USC Sea Grant, Nick Sadrpour and Linda Chilton (sadrpour@usc.edu and lchilton@usc.edu)**
   Program Description: Urban Tides Initiative: we recruit, train and engage the public in helping to asses extreme high tides, especially in areas needing additional clarity for USGS modelers and city planners.

   Program Website: http://dornsife.usc.edu/uscseagrant/urban-tides-initiative/

   Program Goal: research, citizen engagement

   Program Audience: community members- adult, community members- children & youth

   Program Partners: USGS, Scripps Institute of Oceanography, SCCOOS, The Bay Foundation, Aquarium of the Pacific, Cabrillo Marine Aquarium, Tijuana River National Estuarine Research Reserve and Heal the Bay

4. **Witness King Tides, Washington Sea Grant, Kate Litle - Assistant Director for Programs (kalitle@uw.edu)**
   Program Description: currently an opportunistic collection of king tide photo submissions, but working with various local groups to incorporate more "citizen science" components such as more systematic documentation of storm surge, etc.

   Program Website: http://washington.kingtides.net

   Program Goal: Citizen engagement, community resilience and adaptation

   Program Audience: Community members- adult

   Program Partners: State of Washington Department of Ecology

BIOLOGICAL - PLANT - INVASIVES

1. **North Carolina Sea Grant, Gloria Putnam - Coastal Resources & Communities Specialist (gfputnam@ncsu.edu)**
   Program Description: Monitoring of aquatic plants and in specific an invasive (Hydrilla verticillata)

   Program Website: https://ncseagrant.ncsu.edu/hydrilla/hydrilla-learn-more/

   Program Goal: Research, Citizen engagement

   Program Audience: Community members

   Program Partners: Chowan Edenton Environmental Group, Chowan County Soil and Water, NC State University

BIOLOGICAL - CONTAMINANTS AND TOXINS

1. **Alaska Harmful Algal Bloom Network, Alaska Sea Grant, Gary Freitag, Julie Matweyou, Melissa Good, Gay Sheffield, Gay Sheffield - Alaska Sea Grant MAP agents (gary.Freitag@alaska.edu; Julie.matweyou@alaska.edu; Melissa.good@alaska.edu; gay.sheffield@alaska.edu)**
   Program Mission Statement: The Alaska Harmful Algal Bloom Network (AHAB) was formed in 2017 to provide a statewide approach to HAB awareness, research, monitoring, and response in Alaska.

   Program Description: AHAB coordinates a diverse group of coastal stakeholders to address human and wildlife health risks from toxic algal blooms
   Kodiak PSP monitoring: The community-based monitoring program is designed to contribute to responsive, reduced-cost testing of shellfish harvested for recreation and subsistence purposes and safe shellfish harvesting. It has a strong educational component that engages high school and college students in Kodiak communities in the monitoring.

   Program Website: http://www.aoos.org/alaska-hab-network/

   Program Goal: Other (please specify): Coordinated, reduced-cost monitoring, reduction of public health risks from marine toxins

   Program Audience: Community members – adults and K-12 teachers and students , resource managers

   Program Partners: Multiple network partners. Unalaska PSP monitoring: Aleutian Pribilof Islands Association; Kodiak PSP monitoring: Kodiak Community College, Kodiak Island communities and K12 schools

2. **Cyanobacteria Monitoring Collaborative, Minnesota Sea Grant, Marte Kitson - Extension Educator (mkitson@d.umn.edu)**
   Program Description: We work with citizen scientists, trained water professionals, and the general public to find and study cyanobacteria in water bodies.

   Program Website: https://cyanos.org/

   Program Goal: Education and Citizen Engagement

   Program Audience: Community Members - adult and Resource Managers

   Program Partners: EPA

3. **Marine Biotoxin Monitoring, California Sea Grant, Carrie Culver - Aquatic Resources Specialist (carolynn.culver@lifesci.ucsb.edu)**
   Program Description: Train citizens in collecting water and shellfish samples for biotoxin analysis done by the state department of public health. Some citizens trained in phytoplankton analysis to help with monitoring efforts.

   Program Website: https://caseagrant.ucsd.edu/project/developing-a-collaborative-volunteer-network-for-expanding-biotoxin-monitoring-in-california

   Program Goal: Other - to inform public health advisories

Program Audience: Community members - adult and Industry members

Program Partners: California Dept. of Public Health and California Dept. of Fish and Wildlife

4. **Red Tide Rangers, Texas Sea Grant, Cindie Powell - Assistant Director and Communications Leader (cpowell@tamu.edu)**

   Program Description: The Red Tide Rangers, a dedicated volunteer group formed and trained by Texas Sea Grant, monitor Texas coastal waters for the presence of harmful algal blooms (HABs), such as the red tide caused by the dinoflagellate Karenia brevis.

   Program Website: http://texasseagrant.org/assets/uploads/resources/SafeSustainableSeafood-Red-TideRangers.pdf

   Program Goal: Resource Management, citizen engagement

   Program Audience: State/Federal government, community members - adult

   Program Partners: Texas A&M, NOAA

5. **SoundToxins, Washington Sea Grant, Kate Litle - Assistant Director for Programs (kalitle@uw.edu)**

   Program Description: a volunteer based HABs monitoring program in Puget Sound (partnership with NOAA Northwest Fisheries Science Center)

   Program Website: https://www.soundtoxins.org

   Program Goal: Other - early warning system, Research

   Program Audience: Community members - adult, industry members

   Program Partners: NOAA Northwest Fisheries Science Center, Washington state shellfish and finfish growers, environmental learning centers, native tribes and Puget Sound volunteers

6. **Southern California HABWatch, USC Sea Grant, Nick Sadrpour and Linda Chilton (sadrpour@usc.edu and lchilton@usc.edu)**

   Program Description: we train and support partner institutions who collect and analyze plankton samples and post results current results are used by CA Dept. of Health for early detection of Harmful Algal Blooms.

   Program Website: http://dornsife.usc.edu/uscseagrant/habwatch/

   Program Goal: resource management; stewardship; education

   Program Audience: students and educators; aquaria staff and volunteers; community members

   Program Partners: Wrigley Center for Environmental Studies, Santa Barbara Natural History Museum, Channel Islands National Park, National Marine Sanctuary, Santa Monica Pier Aquarium, Los Angeles Conservation Corps SEA Lab, Cabrillo Marine Aquarium, Los Angeles Maritime Institute, Aquarium of the Pacific, Back Bay Science Center, Port of Los Angeles High School, Ocean Institute, and COSEE West

BIOLOGICAL - PHENOLOGY

1. **Signs of the Seasons (SOS), Maine Sea Grant, Esperanza Stancioff and Beth Bisson - Marine Extension (esp@maine.edu, beth.bisson@maine.edu)**

   Program Description: A New England Phenology Program—2010—present. Signs of the Seasons has coequal objectives of 1) filling the critical need for phenology data to better understand the biological effects of climate change, and 2) empowering citizens to become part of the response, and ultimately, solutions to climate change through the program, by increasing their climate literacy, engaging in participatory research, and sharing their knowledge and experiences with others. SOS has 22 indicator species including the intertidal rockweed, Ascophyllum nodosum, has trained over 700 hundred volunteers providing data to researchers and resource managers.

Program Website: https://extension.umaine.edu/signs-of-the-seasons/

Program Partners: USA National Phenology Network, Acadia National Park, Schoodic Education and Research Center, US Fish and Wildlife Service, Maine Maritime Academy, Maine Audubon, Coastal Maine Botanical Gardens, and climate scientists and educators at the University of Maine.

2. **Signs of the Seasons Rockweed Phenology, New Hampshire Sea Grant, Alyson Eberhardt - Coastal Ecosystems Specialist Coordinator (Alyson.Eberhardt@unh.edu)**

   Program Description: Signs of the Seasons is a program of Maine Sea Grant with whom the NH Sea Grant Coastal Research Volunteer program partners. Volunteer rockweed monitors collect biweekly data on the reproductive phase of rockweed (Ascophyllum nodosum) at one coastal location throughout the late spring and early summer. Data are analyzed by a researcher at Maine Maritime Academy.

   Program Website: https://seagrant.unh.edu/rockweed-phenology

   Program Goal: Research; Citizen Engagement

   Program Audience: Community members - adult

   Program Partners: Maine Sea Grant; Maine Maritime Academy

BIOLOGICAL - ANIMAL - AQUATIC

1. **Alaska Marine Mammal Stranding Network, Alaska Sea Grant, Gary Freitag, Melissa Good, Gay Sheffield & Sunny Rice - Alaska Sea Grant MAP agents (gary.Freitag@alaska.edu; Melissa.good@alaska.edu; gay.sheffield@alaska.edu; sunny.rice@alaska.edu)**

   Program Description: The Alaska Stranding Network is a group of dedicated volunteers and organizations that help support rescue, stranding and rehabilitation efforts statewide.

   Program Website: http://www.alaskasealife.org/stranding_network
   Program Goal: Research. Other: Improve the rescue, care and treatment of stranded marine mammals and reduce public health risks.

   Program Audience: Community members - adult, resource managers

   Program Partners: Alaska SeaLife Center, Alaska Department of Fish and Game, National Marine Fisheries Service, NOAA, the North Slope Borough, U.S. Coast Guard, U.S. Fish and Wildlife Service, UAF, UAS, and representatives from Alaska Native communities and oil companies.

2. **Coastal Observation and Seabird Survey Team (COASST), Alaska Sea Grant, Gary Freitag, Melissa Good - Alaska Sea Grant MAP agents (gary.Freitag@alaska.edu; Melissa.good@alaska.edu)**

   Program Description: COASST is a rigorous citizen science project that trains coastal residents in their communities. Post-training, participants pledge to conduct monthly surveys on a beach that has special meaning to them. At present, three basic types of data are collected: beachcast birds, marine debris, and evidence of human use of the beach environment.

   Program Website: https://depts.washington.edu/coasst/

   Program Goal: Research, citizen engagement

   Program Audience: Community members - adult, resource managers

   Program Partners: University of Washington

3. **Cooperative Research Blue Crab Discards, Louisiana Sea Grant, Julie Lively - Fisheries Specialist (janderson@agcenter.lsu.edu)**

   Program Description: Working with blue crab fishermen to collect research to better understand the discard rate and reason of blue crabs from the commercial industry.

   Program Goal: Research, resource management

   Program Audience: Industry Members

Program Partners: Blue Crab Commercial Fishery, Louisiana Sea Grant

4. **Cooperative Research Plate Frozen Shrimp, Louisiana Sea Grant, Julie Lively - Fisheries Specialist (janderson@agcenter.lsu.edu)**
   Program Description: Working with shrimp fishermen to collect research for developing best management practices for a premium product

   Program Goal: Research, resource management

   Program Audience: Industry Members

   Program Partners: Shrimp Commercial Fishery, Louisiana Sea Grant

5. **Cooperative Research Soft Shell Crabs, Louisiana Sea Grant, Julie Lively - Fisheries Specialist (janderson@agcenter.lsu.edu)**
   Program Description: Working with soft shell crab shedders to collect research to better understand a blue crab virus CsRV1

   Program Goal: Research, Resource Management

   Program Audience: Industry Members

   Program Partners: Louisiana Sea Grant, LSU AgCenter, NOAA SK Program Funded, Virginia Institute of Marine Science, and University of Maryland Center for Environmental Science

6. **Diamondback terrapin monitoring, Florida Sea Grant, Maia McGuire - Extension Agent (mpmcg@ufl.edu)**
   Program Description: Diamondback terrapins are a flagship species for coastal salt marshes. In the attempt to assess the health of the Pensacola Bay system, Florida Sea Grant seeks volunteers to help monitor selected beaches in the bay area for the presence of these animals.

   Program Goal: Resource management & citizen engagement

   Program Audience: Resource managers, community members

7. **Eel Monitoring, New Hampshire Sea Grant, Alyson Eberhardt - Coastal Ecosystems Specialist(Alyson.Eberhardt@unh.edu)**
   Program Description: The American Eel is also a commercially important species, so there is a strong federal and state effort to monitor their population status. Since 2013, the Coastal Research Volunteers have assisted NH Fish and Game in expanding the number of sites at which they monitor eel migration. Coastal Research Volunteers conduct daily monitoring at an eel migration site on the Oyster River. American Eel monitoring is a project of the NH Sea Grant Coastal Research Volunteers program.

   Program Website: https://seagrant.unh.edu/eelmonitoring

   Program Goal: Resource Management; Citizen Engagement

   Program Audience: Community members - adult; Resource managers

   Program Partners: NH Fish and Game

8. **Florida Horseshoe Crab Watch, Florida Sea Grant, Maia McGuire - Extension Agent (mpmcg@ufl.edu)**
   Program Description: Florida Horseshoe Crab Watch (FHCW) is a standardized citizen science program, started in Cedar Key by the University of Florida (Dept. of Biology, UF IFAS Nature Coast Biological Station, and Florida Sea Grant) and FWC's Fish and Wildlife Research Institute (FWRI) in 2016. FHCW takes advantage of beach nesting behavior to collect valuable information about breeding horseshoe crabs. Volunteers walk a known section of beach at predetermined times and count the number of horseshoe crab mating groups observed. A subset of the crabs are collected, tagged with a small, numbered disc, and released back to the wild. Reports of tagged horseshoe crabs help track crab movements, reappearances on beaches, and population numbers.

Program Website: https://ncbs.ifas.ufl.edu/extension/florida-horseshoe-crab-watch/

Program Goal: Resource management & citizen engagement

Program Audience: Resource managers, community members

Program Partners: University of Florida, Florida Sea Grant, Nature Coast Biological Station, USFWS, National Wildlife Refuge System, and Florida Fish and Wildlife Conservation Commission

9. **Great Goliath Grouper Count, Florida Sea Grant, Angela Collins - Extension Agent (abcollins@ufl.edu)**
   Program Description: This is a fisheries CS Program that relies on volunteer divers to collect fisheries data on goliath grouper.

   Program Website: https://www.flseagrant.org/news/2016/06/great-goliath-grouper-county-provides-fisheries-managers-stock-assessment-data/

   Program Goal: Resource management, research

   Program Audience: Resource managers, community members - adult

   Program Partners: Citizen volunteers, charter captains, county government staff and scientists from the Florida Fish and Wildlife Conservation Commission

10. **Lake Erie Watersnake Recovery Program, Ohio Sea Grant, Tory A. Gabriel - Extension Program Leader & Fisheries Educator (gabriel.78@osu.edu)**
    Program Description: Delisting of the Lake Erie watersnake resulted from intensive monitoring which demonstrated that the Population Persistence criterion of the Lake Erie watersnake recovery plan had been met. Monitoring was heavily dependent on efforts of volunteers participating in intensive population censuses each spring and less intensive efforts throughout the active season.

    Program Goal: Resource management & citizen engagement

    Program Audience: Resource managers, community members

    Program Partners: Professional affiliations of volunteers included 20 colleges & universities, 5 state agencies, 5 zoos, 3 regional herpetological societies, 3 regional nature centers and forest preserves, and 2 federal agencies.

11. **Marine mammal subsistence hunt monitoring program, Alaska Sea Grant, Gay Sheffield - Marine Advisory Agent (gay.sheffield@alaska.edu)**
    Program Description: Collection of biological samples and observations during subsistence hunts of bowhead whales, seals, and walruses, including animals with lesions or other signs of disease. Data is used to set IWC whale hunt quotas and as the basis for other harvest regulations. Harvest of diseased animals triggers health alerts.

    Program Goal: Research, resource management

    Program Audience: Resource managers, Other: Community members – adult subsistence hunters and others dependent on subsistence harvests for food security, resource managers

    Program Partners: ASG, North Slope Borough Wildlife Department, other tribal governments and organizations, LEO Network

12. **Oyster Restoration, Florida Sea Grant, Maia McGuire - Extension Agent (mpmcg@ufl.edu)**
    Program Description: Florida Sea Grant is responding by partnering with St. Lucie County and the Florida Oceanographic Society to create a volunteer-based program of reef restoration that has, since its creation in 2006, resulted in over 2 miles of new oyster reef in the Indian River Lagoon.

    Program Website: https://www.flseagrant.org/news/2013/09/indian-river-oyster/

Program Goal: Resource management & citizen engagement

Program Audience: Resource managers, community members

Program Partners: St. Lucie County and the Florida Oceanographic Society

13. **Oyster Restoration, New Hampshire Sea Grant, Alyson Eberhardt Coastal Ecosystems Specialist (Alyson.Eberhardt@unh.edu)**

    Program Description: The Nature Conservancy and University of New Hampshire partner on a long-term oyster reef restoration effort in New Hampshire's Great Bay. The NH Sea Grant Coastal Research Volunteers assist with some restoration tasks, including the preparation of shells and oyster spat for reef restoration.

    Program Website: https://seagrant.unh.edu/oyster_restoration

    Program Goal: Resource Management; Citizen Engagement

    Program Audience: Community members - adult; Resource Managers

    Program Partners: The Nature Conservancy; University of New Hampshire researchers

14. **Project Limulus, Connecticut Sea Grant, Syma Ebbin - Research Coordinator (syma.ebbin@uconn.edu)**

    Program Description: A Study Examining the Ecology of the Long Island Sound Horseshoe Crab (Limulus polyphemus) population. A Community-Based Research Program Providing Opportunities for All People to Become Active Contributors to On-Going Scientific Research. A Data-Gathering Network to Potentially Direct Conservation Programs for the Horseshoe Crab. A Data-Gathering Network to Potentially Direct Conservation Programs for the Horseshoe Crab. An Educational Tool to Increase Public Awareness of Limulus and its connection to the Long Island Sound Ecosystem and Human Health. Part of the International Union for the Conservation of Nature (IUCN) Horseshoe Crab Species Specialist Group.

    Program Website: http://www.sacredheart.edu/academics/collegeofartssciences/academicdepartments/biology/projectlimulus/

    Program Goal: Research & Citizen Engagement

    Program Audience: Community Members & Researchers

    Program Partners: USFWS, IUCN Horseshoe Crab Species Specialist Group

15. **South Atlantic Fishery Management Council Citizen Science Program, North Carolina, Georgia and Florida Sea Grant, Scott Baker - Fisheries Specialist (bakers@uncw.edu)**

    Program Mission Statement: Improve fisheries management through collaborative science
    Program Description: For many years the South Atlantic Fishery Management Council (Council) has grappled with the challenge of ensuring adequate and timely science to support management despite limited resources, a multitude of species to manage, and a complex and highly diverse ecosystem. Discussions of data shortcomings and the resulting scientific uncertainties often lead to offers from fishermen to provide their vessels as research platforms, collect samples and record their own observations to help increase scientific knowledge and 'fill the gaps'. The Council recognizes the desire of constituents to get involved and the need to have a well-designed program and accompanying sampling protocols to ensure that information collected through such efforts is useful. To meet this growing need, the Council intends to develop a comprehensive Fishery Citizen Science Program.
    Program Website: http://safmc.net/citizen-science-initiative/
    Program Goal: Citizen engagement and research

    Program Audience: Resource managers, community members - adult

    Program Partners: State and federal fishery management agencies; industry; academia, NGOs (Nature Conservancy, Pew Oceans, etc.).

16. **Spawning Horseshoe Crab Surveys, New Hampshire Sea Grant, Alyson Eberhardt - Coastal Ecosystems Specialist(Alyson.Eberhardt@unh.edu)**

    Program Description: The NH Sea Grant Coastal Research Volunteer program works with UNH researchers to conduct surveys for spawning horseshoe crabs using methods that are consistent with State agency surveys.

    Program Website: https://seagrant.unh.edu/spawning-horseshoe-crab-surveys

    Program Goal: Research; Citizen Engagement

    Program Audience: Community members - adult

    Program Partners: University of New Hampshire researcher (1)

BIOLOGICAL - TERRESTRIAL

1. **Monarch Monitoring, Ohio Sea Grant, Ohio Sea Grant, Tory A. Gabriel - Extension Program Leader & Fisheries Educator (gabriel.78@osu.edu)**

    Program Description: Since 2012, Ohio Sea Grant/Stone Lab has partnered with the Lake Erie Nature and Wildlife Center in a Monarch monitoring and education program reaching more than 3000 people annually. With the help of citizen scientists, approximately 1500 animals have been tagged on several island properties, 8 of which have been recovered in Mexico.

    Program Goal: Resource management & citizen engagement

    Program Audience: Resource managers, community members

    Program Partners: Lake Erie Nature and Wildlife Center

2. **Pennsylvania Amphibian and Reptile Survey, Pennsylvania Sea Grant, Sean D. Rafferty - Research Director & Associate Director (sdr138@psu.edu)**

    Program Description: The Pennsylvania Amphibian and Reptile Survey (PARS) is an important state-sponsored atlas project launched in 2013. PARS will determine the distribution and status of all amphibians and reptiles throughout Pennsylvania, building upon previous atlas efforts and combining modern technology with an army of citizen scientists

    Program Website: https://paherpsurvey.org

    Program Goal: Research & citizen engagement

    Program Audience: Resource managers, community members

    Program Partners: PA Fish & Boat Commission (PFBC) and the Mid-Atlantic Center for Herpetology and Conservation (MACHAC), funded by the PFBC (via the US Fish & Wildlife Service's State Wildlife Grants Program), the PA Department of Conservation and Natural Resources (Wildlife Resources Conservation Program), and MACHAC.

BIOLOGICAL - ANIMAL - INVASIVES

1. **Crab Team, Washington Sea Grant, Kate Litle - Assistant Director for Programs (kalitle@uw.edu)**

    Program Description: A volunteer-based early detection and monitoring program for European green crab in the Washington Salish Sea

    Program Website: http://wsg.washington.edu/crabteam/

    Program Goal: Resource management; research

    Program Audience: Community members - adult, Other - partner organizations (tribes, NERR, USFWS, etc.)

Program Partners: Washington Department of Fish and Wildlife

2. **Marine Invasive Monitoring, Alaska Sea Grant, Gary Freitag, Melissa Good - Alaska Sea Grant MAP agents (gary.Freitag@alaska.edu; Melissa.good@alaska.edu)**

   Program Description: Green crab surveys (Ketchikan). Surveys to detect a range expansion into Alaska waters. PlateWatch, https://platewatch.nisbase.org/, Monitoring for non-native tunicates and other invasive species along the West Coast, with a primary focus on Alaska (Ketchikan, Kodiak, Unalaska), Baseline subtidal/intertidal surveys (Ketchikan)

   Program Website: https://platewatch.nisbase.org/

   Program Goal: Research & citizen engagement

   Program Audience: Community members - adult, K-12 teachers and students; resource managers

   Program Partners: PlateWatch: Smithsonian Environmental Research Center (SERC). Green crab monitoring: Alaska Department of Fish and Game, NMFS, Gastineau Guiding, Juneau; Southern Southeast Regional Aquaculture Association

3. **New Hampshire Green Crab Project, New Hampshire Sea Grant, Gabriela Bradt, Commercial Fisheries Specialist (gabriela.bradt@unh.edu)**

   Program Description: Volunteers are needed to search the coast for green crabs (Carcinas maenas) to contribute to a study evaluating the potential for a commercial fishery to help control this nonnative species. Green crabs are edible, but because they are smaller than other popular crabs, they are not commonly harvested for food. To this end, NH Sea Grant is researching when green crabs molt to explore the feasibility of a soft-shell crab market (similar to blue crabs). The NH Green Crab Project coordinates volunteer engagement in green crab surveys, trapping, and lab research, and also works with the Coastal Research Volunteers on community green crab surveys.

   Program Website: https://seagrant.unh.edu/green-crab-surveys

   Program Goal: Research; Community Capacity Building

   Program Audience: Community members - adult; Community - children & youth; Industry Members

   Program Partners: Green Crab R&D Project; Manomet

CONTAMINANTS AND TOXINS

1. **Gulfwatch, New Hampshire Sea Grant, Alyson Eberhardt - Coastal Ecosystems Specialist(alyson.Eberhardt@unh.edu)**

   Program Description: Gulfwatch is a program of the Gulf of Maine Council on the Marine Environment. The program's goal is to measure chemical contamination throughout the Gulf of Maine. The blue mussel (Mytilus edulis) is used as an indicator species to detect contamination levels. Because blue mussels are long-lived and sedentary, their body concentrations of contaminants reflect local environmental conditions over time. In New Hampshire, Coastal Research Volunteer members work with NH Sea Grant's Steve Jones to help with the collection of mussels, which are then processed and analyzed for contaminants.

   Program Website: https://seagrant.unh.edu/gulfwatch-blue-mussel-collection

   Program Goal: Research; Citizen Engagement

   Program Audience: Community members - adult;

   Program Partners: Gulf of Maine Council on the Marine Environment

2. **Mussel Watch, Alaska Sea Grant, Gary Freitag - ASG MAP agent (gary.Freitag@alaska.edu)**

   Program Mission Statement: To monitor the concentration of contaminants in bivalves (mussels and oysters) and sediments in the coastal waters of the U.S.

   Program Description: NOAA's Mussel Watch is the longest continuous contaminant

monitoring program in U.S. coastal waters. The project has analyzed contaminant trends at 300 sites since 1986. Half the sites are sampled one year; the other half are sampled the next

Program Website: **https://celebrating200years.noaa.gov/datasets/mussel/welcome.html#mon**

Program Goal: Other (please specify): Monitoring contaminants

Program Audience: Resource Managers

Program Partners: NOAA

CHEMICAL - WATER QUALITY

1. **Citizen Monitoring Program, Delaware Sea Grant, Dr. Ed Whereat - Program Coordinator (whereat@udel.edu)**
   Program Description: To collect verifiable water quality data to support public policy decisions and to increase public participation and support for the management and protection of the Delaware's waterways

   Program Website: https://www.citizen-monitoring.udel.edu/

   Program Goal: Research & citizen engagement

   Program Audience: community members - adult, resource managers

   Program Partners: Delaware Inland Bays National Estuary Program (aka Center for the Inland Bays)
   Delaware Department of Natural Resources and Environmental Control
   Delaware Environmental Observing System (University of Delaware)

2. **FLOW, Ohio Sea Grant, Ohio Sea Grant, Tory A. Gabriel - Extension Program Leader & Fisheries Educator (gabriel.78@osu.edu)**
   Program Description: These stewards are dedicated to a sustained hands-on effort to quantify the health of our stream waters through the monitoring and reporting of chemical and macroinvertebrate indicators in several of its tributaries.

   Program Website: https://www.olentangywatershed.org/?p=641

   Program Goal: Resource management, citizen engagement

   Program Audience: Resource Managers and community members

   Program Partners: Ohio Water Resources Center & The Sierra Club

3. **Maine Healthy Beaches Program (MHB), Maine Sea Grant, Meagan Simms - Marine Extension (meagan.sims@maine.edu)**
   Program Description: 2002—present. MHB was established as part of the Beaches Act to ensure that Maine's salt-water beaches remain safe and clean. The program brings together volunteers and staff from 29 coastal communities to conduct routine monitoring, assessment and public notification of water quality conditions for 60 beach management areas spanning Kittery to Mount Desert Island.

   Program Website: http://www.mainehealthybeaches.org/index.html

   Program Goal: Resource Management

   Program Audience: Community members - adult

   Program Partners: University of Maine Cooperative Extension, Maine Department of Environmental Protection, and local municipalities.

4. **Water Watch, Florida Sea Grant, Maia McGuire - Extension Agent (mpmcg@ufl.edu)**
   Program Description: Coastal water quality monitoring--each measures slightly different parameters, but they are all using that name

Program Website: https://www.flseagrant.org/news/2016/03/florida-sea-grant-agents-train-south-florida-residents-monitor-water-quality-local-waters/

Program Goal: Resource management, citizen engagement

Program Audience: Resource Managers and community members

5. **Watershed Alliance, Lake Champlain, Kris Stepenuk Extension Program Leader (kris.stepenuck@uvm.edu)**
   Program Description: A K-12 educational program, that began in 2002. Students engage in stream monitoring (mostly), and some conduct lake monitoring. There are chemical, physical and biological components to both programs. There is also a new effort to have students dissect fish stomachs from bycatch from another research project to look for microplastics. In the stream monitoring program, the parameters are transparency, temperature, phosphate, dissolved oxygen, macroinvertebrates, sometimes E. coli, habitat, stream velocity, stream cross sectional area (I don't think they do the calculation to determine flow though).

   Program Website: https://www.uvm.edu/watershed/welcome

   Program Goal: Education, Stewardship

   Program Audience: Students K-12, Teachers K-12, Students - Higher education

   Program Partners: Rubenstein School of Environment and Natural Resources

CHEMICAL - OCEAN ACIDIFICATION

1. **Ocean and Coastal Acidification (OCA), Maine Sea Grant and University of Maine Cooperative Extension, Esperanza Stancioff, Climate Change Educator, (esp@maine.edu)**
   Program Description: Project in the Northeast—2017—present. The objectives of this project are (1) to develop the first replicable citizen science monitoring program in accordance with recently developed EPA guidance document, for monitoring ocean and coastal acidification, and (2) to provide in-person technical trainings and educational materials through an initial series of three regional workshops, and (3) to support the successful use of citizen science participation in research and management by building on the Northeast Coastal Acidification Network's extensive stakeholder network.

   Program Website: http://necan.org/

   Program Partners: Island Institute and Friends of Casco Bay

ECOSYSTEM- CHEMICAL, PHYSICAL, BIOLOGICAL MONITORING OF A SPECIFIC ECOSYSTEM TYPE

1. **Florida Monitoring Programs, Florida Sea Grant, Maia McGuire - Extension Agent (mpmcg@ufl.edu)**
   Program Description: Florida Sea Grant monitors salt marshes, sea grass, lionfish, scallops, artificial reefs, and native and invasive plants.

   Program Goal: Resource Management, Citizen Engagement

   Program Audience: Resource managers, community members

2. **LIMPETS - Long Term Monitoring Program and Experiential Training for Students, USC Sea Grant, Linda Chilton - Education Program Manager (lchilton@usc.edu)**
   Program Description: Intertidal monitoring

   Program Website: http://limpets.org/

   Program Goal: community engagement: citizen science; research; education
   Program Audience: teachers and students; youth; community members;

   Program Partners: Ch. Islands National Marine Sanctuaries, NOAA and the Pacific Grove Museum; Greater Farallones Association, Wrigley Institute for Environmental Studies; MARINE; Earthwatch

3. **Stream Health, New Hampshire Sea Grant, Alyson Eberhardt - Coastal Ecosystems Specialist(Alyson.Eberhardt@unh.edu)**

   Program Description: The NH Sea Grant Coastal Research Volunteers program collects data on water quality, benthic macroinvertebrate communities (insects, worms, and crustaceans), fish species, and riparian vegetation to assess stream health, and participates in riparian restoration work.

   Program Website: https://seagrant.unh.edu/stream-health-surveys

   Program Goal: Resource Management; Citizen Engagement

   Program Audience: Community members - adult; Resource managers; Industry members

   Program Partners: Sagamore-Hampton Golf Club; The Nature Conservancy

4. **Tres Palmas Marine Reserve Monitoring, Puerto Rico Sea Grant, Rene Esteves - Extension Leader (rene.esteves@upr.edu)**

   Program Description: One of our extension projects for the past several years has been with Amigos de Tres Palmas, a citizen group in charge of co-management of a marine reserve PR Sea Grant helped create in 2004 in the town of Rincon. As part of our guidance and coordination efforts in 2017 we funded workshops and field training of UPR Marine Science Graduate Program Students on NOAA's Coral Reef Conservation Program (CRCP) National Coral Reef Monitoring Program (NCRMP) methodologies. The trained students then served as volunteer for a Citizen Science Monitoring Project done within MPA boundaries to supplement NCRMPs dataset and provide a baseline data for its Co-management strategies.

   Program Goal: Resource Management, Citizen Engagement

   Program Audience: Students - Higher education, community members - adult

   Program Partners: Amigos de Tres Palmas, University of Puerto Rico

ECOSYSTEM CHANGE

1. **Bering Watch, Alaska Sea Grant, Melissa Good - MAP Agent (melissa.good@alaska.edu)**

   Program Description: BeringWatch is a valuable standardized, but customizable, tool for recording and communicating significant environmental and ecological events in order to empower remote communities dealing with the effects of climate change. Our approach enables communities to implement rigorous monitoring programs and utilize our well-refined environmental database with a internet-based access system. Two broad categories of environmental data are collected and stored: wide ranging descriptive data through the Citizen Sentinel program and more focused, detailed observations on specific, or focal, species by researchers.

   Program Website: https://www.beringwatch.net/

   Program Goal: citizen engagement, Other: To facilitate communication of relevant ecological and biological information among community and government stakeholders.

   Program Audience: community members – adults, resource managers

   Program Partners: Aleut Community of St. Paul Island Tribal Government, The Agdaagux Tribe of King Cove, St. George Island Institute, The St. George Traditional Council, the Aleut Marine Mammal Commission

2. **Building Climate Resilience of Urban Waters, Ecosystems, and Communities, California Sea Grant, Theresa Talley - Coastal Specialist (tstalley@ucsd.edu)**

   Program Description: Climate change preparation should include water quality improvement and conservation measures, particularly in urban ecosystems. The project site, Manzanita Canyon, is located in the heart of a "disadvantaged" community where action is needed to increase resiliency of both the urban community and the ecosystem. This project integrates urban native greening, invasive plant and trash removal, and the engagement of the community and local decision makers in order to sustainably improve water quality, and the climate resilience of urban ecosystems and an underserved community.

Program Website: https://caseagrant.ucsd.edu/project/education-making-waves

Program Partners: Ocean Discovery Institute, San Diego Canyonlands and the California Coastal Conservancy

3. **Citizen science in global change ecology in the Chesapeake Bay, Virginia Sea Grant, Dr. Emily Rivest - Assistant Professor, VIMS Biological Sciences (ebrivest@vims.edu)**

   Program Mission Statement: Investigation of water quality and oyster performance (growth) to determine how oyster performance correlates with environmental conditions.

   Program Description: VIMS Assistant Professor Emily Rivest and her graduate students work with regional high schools to develop data collection programs that integrate Chesapeake Bay water quality (specifically carbonate chemistry) and oyster ecology data that will drive student led research. The scientists are working with two teachers and their students in Tidewater, VA to field-test a citizen science protocol for collecting paired data that describes water quality and oyster performance. The compiled dataset addresses the larger question: how does oyster performance correlate with environmental conditions? Each high school has three sites along the Chesapeake Bay or its tributaries where measurements of water quality and oyster growth measurements are collected on a weekly or monthly basis. Students collect data via deployed temperature loggers, handheld devices, and preserved water samples for chemical analysis. Juvenile oysters have been deployed, and students measure their growth using calipers and photography. The data will be analyzed for a correlation between oyster growth and water quality and to compare the two methods for measuring oyster size.

   Program Goal: research, citizen engagement

   Program Audience: K-12 students (high school students)

   Program Partners: Virginia Institute of Marine Science (VIMS) Biological Sciences, VIMS Marine Advisory Services, Virginia Sea Grant, Chesapeake Bay Governor's School – Glenns, and Oyster Reef Keepers of Virginia. Funded by Dominion Energy Charitable Foundation.

4. **From Seeds to Shoreline, South Carolina Sea Grant, EV Bell - Marine Education Specialist (ev.bell@scseagrant.org)**

   Program Description: From Seeds to Shoreline® (S2S) is South Carolina's only salt marsh restoration program designed for students! By getting your school involved in cultivating and transplanting young seedlings of salt marsh grass, your students will not only learn about the importance of this critical coastal ecosystem, but they will be helping restore areas of salt marsh. There's no better way to learn, serve our local communities, and have fun in the process!

   Program Website: http://www.scseagrant.org/Content/?cid=921

   Program Goal: Resource Management, Education

   Program Audience: K-12 Students and Teachers

   Program Partners: S.C. Sea Grant Consortium, S.C. Department of Natural Resources, Clemson University Extension

5. **Local Environmental Observer (LEO) Program, Alaska Sea Grant, All ASG MAP Agents**

   Program Mission Statement: LEO Network members share unusual environmental events that help us understand our changing world.

   Program Description: LEO is a network of local observers and topic experts who share knowledge about unusual animal, environment, and weather events. With LEO, you can connect with others in your community, share observations, raise awareness, and find answers about significant environmental events. You can also engage with topic experts in many different organizations and become part of a broader observer community.

   Program Website: https://www.leonetwork.org

Program Goal: community resilience and adaptation, Other (please specify): “early warning” system to detect significant environmental changes that threaten food security

Program Audience: Community members - adult, community members (emphasis on tribal members), resource managers

Program Partners: Alaska Native Tribal Health Consortium (program lead), multiple other tribal, local, state, and federal government partners

6. **Picture Posts, New Hampshire Sea Grant, Alyson Eberhardt- Coastal Ecosystems Specialist (Alyson.Eberhardt@unh.edu)**

   Program Description: The NH Sea Grant Coastal Research Volunteer program is working with local salt marsh natural areas to install Picture Posts, which are fixed points that volunteers visit regularly to take pictures. Photographs taken at these fixed locations build up a long-term record of changes over time. Our Picture Posts in Hampton Falls and Seabrook are part of a nationwide network of Picture Posts, with volunteers all over the country contributing photo data. CRV is partnering with science literacy researchers at UNH and local middle schools to develop and evaluate lesson plans that allow middle school students to analyze Picture Post data.

   Program Website: https://seagrant.unh.edu/picture-post-monitoring

   Program Goal: Education; Resource Management

   Program Audience: Students K-12; Community members - adult

   Program Partners: Picture Post program; University of New Hampshire Leitzel Center for Mathematics, Science, and Engineering Education; local schools (4)

ECOSYSTEM IMPACTS

1. **Beach Sweep/River Sweep, South Carolina Sea Grant, Susan Ferris Hill - Director of Communications (susan.ferris.hill@scseagrant.org)**

   Program Description: Clear environmentally sensitive areas of debris, collect data on debris collected, develop a sense of community pride and recruit and retain environmental stewards

   Program Website: http://www.scseagrant.org/Content/?cid=49 and https://www.facebook.com/BeachSweepRiverSweep/

   Program Goal: Citizen engagement and education

   Program Audience: Community members youth & adult

   Program Partners: Organizing partners: S.C. Sea Grant Consortium and S.C. Department of Natural Resources; part of the Ocean Conservancy’s International Coastal Cleanup

2. **Crab Trap Cleanup Citizen Science, Louisiana Sea Grant, Julie Lively - Fisheries Specialist (janderson@agcenter.lsu.edu)**

   Program Description: Using citizen scientists to help collect ghost fishing data during derelict crab trap cleanups. Publication resulting: **https://www.sciencedirect.com/science/article/pii/S0025326X13007352**

   Program Website: http://www.laseagrant.org/crabtraps/

   Program Goal: Research, resource management

   Program Audience: Community members-adult

   Program Partners: Louisiana Department of Wildlife and Fisheries and Louisiana Sea Grant

3. **EPA Marine Debris Program, Mississippi-Alabama Sea Grant, Amanda Sartain - Extension Program As-**

sistant/Marine Debris Specialist (amanda.sartain@msstate.edu)

Program Description: Engaging the fishing community to remove marine debris and quantify impacts.

4. **Citizen science marine debris monitoring and outreach, Mississippi-Alabama Sea Grant, Eric Sparks - Coastal Ecology Specialist (eric.sparks@msstate.edu)**

   Program Description: Marine debris sampling, specifically microplastics

   Program Goal: Education and Citizen Engagement

   Program Audience: Researchers and community members

5. **Florida Microplastics Awareness Project, Florida Sea Grant, Maia McGuire - Extension Agent IV (mp-mcg@ufl.edu)**

   Program Description: citizen scientists collect and analyze water samples from around the state for the presence of microplastics (also tied to an outreach component to have people reduce plastic waste)

   Program Website: www.plasticaware.org

   Program Goal: Education, Citizen engagement

   Program Audience: Community members - adult; community members - children & youth

   Program Partners: Adventure Scientists , MS/AL Sea Grant, GA Sea Grant

6. **Microplastics, New Hampshire Sea Grant, Gabriela Bradt, Commercial Fisheries Specialist (gabriela.bradt@unh.edu)**

   Program Description: Volunteers assess the quantity and type of microplastics debris collected at beach sites.

   Program Website: https://seagrant.unh.edu/marine-debris

   Program Goal: Resource Management; Citizen Engagement

   Program Audience: Community members - adult;

   Program Partners: Blue Ocean Society

7. **Mississippi Coastal Cleanup, Mississippi-Alabama Sea Grant, Amanda Sartain - Extension Program Assistant/Marine Debris Specialist (amanda.sartain@msstate.edu)**

   Program Description: Citizen science marine debris monitoring and outreach

   Program Goal: Education and Citizen Engagement

   Program Audience: Community members – adults and children & youth

8. **MPA watch, UCS Sea Grant, Linda Chilton - Education Program Manager (lchilton@usc.edu)**

   Program Description: MPA Watch trains volunteers to observe and collect unbiased data on coastal and marine resource use. Volunteers will be trained to collect valuable data on ocean users and their activities, such as surfing, kayaking, fishing, boating, running, etc. Specifically, the MPA Watch volunteers will observe and record both consumptive and non-consumptive offshore and onshore activities in and around MPAs, which will improve our understanding of how people are using these new MPAs. Data are meant to inform the management, enforcement and science of California's marine protected areas and allow us to see how human uses are changing as a result of MPA implementation. By involving local communities in this important work, MPA Watch programs inspire and empower stewardship, and educate citizens about California's ocean ecosystems.
   Program Website: http://www.mpawatch.org/

   Program Goal: Research; community engagement; resource management; education

   Program Audience: students and teachers youth and higher education; community members

Program Partners: California Department of Fish and Wildlife; CA MPA collaborative; Wrigley Institute for Env. Studies: Heal the Bay; LA Coastkeeper

9. **Nā Kilo ʻĀina, Hawaii Sea Grant, Pelika Andrade**
   Program Description: A community based marine ecosystem monitoring program

   Program Website: http://www.nakiloaina.com/

   Program Partners: University of Hawaiʻi at Mānoa Ethnobotany Program, Kaʻūpūlehu Dryland Forest Restoration and Education Project, University of Hawaiʻi Sea Grant, University of Hawaiʻi at Hilo, Conservation International, The Nature Conservancy, SAND Camp, Kaʻūpūlehu community, and Kamehameha Schools. Technical support from the Joseph F. Rock Herbarium. Funding is from the Pacific Islands Climate Change Cooperative.

10. **Pennsylvania Lake Erie International Coastal Cleanup, Pennsylvania Sea Grant, Sean D. Rafferty - Research Director & Associate Director (sdr138@psu.edu)**
    Program Description: Help organize the Pennsylvania Lake Erie International Coastal Cleanup by recruiting volunteers and leading some of those volunteers at various sites along Lake Erie and its tributaries. PASG also manages thewww.nie.goerie.com/coastalcleanup website and publishes newspaper articles that advertise the results of past cleanups and information about participating in the current cleanup. PASG also coordinates school neighborhood cleanups for K-12 students. Data collected at the local event are combined with the school cleanups and shared with the Ocean Conservancy to be added to the worldwide total. Staff Lead: Anna McCartney

    Program Website: https://seagrant.psu.edu/topics/clean-marina-initiative-coastal-cleanups/projects/pennsylvania-lake-erie-international

    Program Goal: Research and citizen engagement

    Program Audience: Community members youth & adult

    Program Partners: Ocean Conservancy

CITIZEN SCIENCE CAPACITY BUILDING - EDUCATION

1. **BioBlitz, Alaska Sea Grant, Gary Freitag, Melissa Good - Alaska Sea Grant MAP agents (gary.Freitag@alaska.edu; Melissa.good@alaska.edu)**
   Program Description: A Bioblitz is a race against time to find and count as many species as possible in a given area in a 24-hour time period. Bioblitzes are a blend of science, celebration, education and community, where biologists, naturalists and citizens team up to discover any living thing they can find. (Ketchikan, Unalaska)

   Program Website: https://www.nationalgeographic.org/projects/bioblitz/

   Program Goal: citizen engagement Other: surveying biodiversity

   Program Audience: Community members – adults, K-12 teachers and student

   Program Partners: Alaska Department of Fish and Game, federal agencies (NOAA Fisheries, USFS, USFWS), National Geographic, SERC

2. **Commercial Fishing Apprenticeship Program, California Sea Grant, Theresa Talley - Coastal Specialist (tstalley@ucsd.edu)**
   Program Description: We are developing an apprenticeship to help educate young people about the opportunities in commercial fishing, while educating about the regulations, skills and co-management approach necessary to keep commercial fishing economically, ecologically and socially sustainable.

   Program Website: https://caseagrant.ucsd.edu/project/education-making-waves/commercial-fishing-apprenticeship-program

Program Partners: San Diego and Santa Barbara Commercial Fisherman, UCSB, UC Extension, Santa Barbara City College, Alaska Longline Fishermen's Association and the California Department of Apprenticeship Standards

3. **Fishermen Led Injury Prevention Program, Oregon Sea Grant, Kaety Jacobson - Marine Fisheries Extension Faculty (Kaety.Jacobson@oregonstate.edu>)**

   Program Description: Understand and prevent non-fatal injuries in the West Coast commercial Dungeness Crab fishery.

   Program Website: http://extension.oregonstate.edu/lincoln/sites/default/files/flipp_twopager_apr16.pdf

   Program Goal: Research & Education

   Program Audience: Commercial Fishing Industry

   Program Partners: 6 community researchers that are members of the fishing industry that we trained to collect data, Newport Fishermen's Wives, and many individual vessels and fishermen.

4. **LA Coastal Naturalist Training, USC Sea Grant, Linda Chilton (lchilton@usc.edu)**

   Program Description: This training course brings together traditional and scientific knowledge about coastal regions to be used to foster effective interpretive programs.

   Program Website: http://dornsife.usc.edu/uscseagrant/la-coastal-ca-naturalist/

   Program Goal: community engagement; research; education

   Program Audience: community members; high education students; resource managers; interpreters/ naturalists

   Program Partners: University of California ANR, UC Cooperative Extension ; LA Conservation Corps Sea Lab; CA Naturalist Program; Wishtoyo Foundation; Catalina Island Conservancy; Cabrillo Marine Aquarium; City of LA Park Rangers; Grunion Greeters Program; CAL Academy iNaturalist Program; CA Science Center; Natural History Museum of LA County

5. **Texas Master Naturalist Program, Texas Sea Grant, Cindie Powell - Assistant Director and Communications Leader (cpowell@tamu.edu)**

   Program Mission Statement: To develop a corps of well-informed volunteers to provide education, outreach, and service dedicated to the beneficial management of natural resources and natural areas within their communities for the State of Texas.

   Program Description: Partnership between Texas Parks and Wildlife Department and Texas A&M AgriLife Extension, and we're involved via the county agents who are dual AgriLife/Sea Grant folks. They do restoration work and naturalist education.

   Program Website: https://txmn.org/

   Program Goal: Resource Management, Education

   Program Audience: Community Members - adults, resource managers

   Program Partners: Texas Parks and Wildlife Department and Texas A&M AgriLife Extension

6. **Twin Ports City Nature Challenge, Minnesota Sea Grant, Marte Kitson - Extension Educator (mkitson@d.umn.edu)**

   Program Website: https://www.inaturalist.org/projects/city-nature-challenge-2018-twin-ports
   Program Goal: Citizen engagement

   Program Audience: Community members, Researchers

Program Partners: The Lake Superior Regional Citizen Science Collaborative

7. **Watershed Stewards Academy, Maryland Sea Grant, Amanda Rockler - Watershed Restoration Specialist (arockler@umd.edu)**

   Program Mission Statement: WSA's mission is to develop, coordinate and support a widespread, successful network of volunteer community leaders in Maryland to serve as Master Watershed Stewards ("Stewards") in the protection, restoration, and conservation of watersheds. Through sharing resources and fostering partnerships, the WSA works with a Consortium of Support Professionals to assist Stewards and their communities to reduce the negative impacts of stormwater runoff into the Chesapeake Bay.

   Program Description: Master Watershed Stewards work with communities to:
   Assess Watersheds—help communities identify pollution sources.
   Educate Communities—help neighbors understand their area's most pressing water quality problems.
   Reduce Pollutants—work with communities to target pollution sources such as pet waste, fertilizer, pesticides, and illicit discharges.
   Take Action—help communities to reduce polluted runoff by engaging them in installation of Best Management Practices.
   Measure Success—track and demonstrate measurable impacts.
   Continue Efforts— continue education beyond the program and ensure practices are maintained.

   Program Website: https://extension.umd.edu/watershed/watershed-stewards-academy

   Program Goal: Education, citizen engagement

   Program Audience: Community members - adult, property owners

   Program Partners: Hosted by University of Maryland Sea Grant Extension in Harford County, Cecil County, Howard County, and St. Mary's County. The National Capital Region WSA is supported by UMD Sea Grant Extension but hosted by the Anacostia Watershed Society. Harford County government, Harford Community College, Cecil County government, Howard County government, St. Mary's County government, Anne Arundel Watershed Stewards Academy, Anacostia Watershed Society, Chesapeake Bay Trust.

CAPACITY BUILDING - TOOLS DEVELOPMENT

1. **Aquatic Invasive Species Citizen Monitoring, California Sea Grant, Carrie Culver - Aquatic Resources Specialist (carolynn.culver@lifesci.ucsb.edu)**

   Program Description: Develop web-based tools for mapping sightings of marine and freshwater AIS.

   Program Website: **https://caseagrant.ucsd.edu/project/aquatic-invasive-species-eradication-control**

   Program Goal: Citizen engagement, resource management

   Program Audience: Community members - adult, Industry members

   Program Partners: University of California ANR, UC Cooperative Extension

2. **Developing a Citizen Science Program Model to Engage Underrepresented Minority Groups, California Sea Grant, Theresa Talley - Coastal Specialist (tstalley@ucsd.edu)**

   Program Description: While interest in citizen science as an avenue for increasing scientific engagement and literacy has been increasing, understanding how to effectively engage underrepresented minorities (URMs) in these projects remains a challenge. Based on the research literature on strategies for engaging URMs in STEM activities and the project team's extensive experience working with URMs, the project team developed a citizen science model tailored to URMs that included the following elements: 1) science that is relevant to participants' daily lives, 2) removal of barriers to participation, such as transportation, faced by URMs, 3) hands-on, authentic science, 4) work alongside a scientist, 5) opportunities for repeated and ongoing participation, 6) leaders who are reflective of the community, 7) experiences that are guided as opposed to self-guided. To develop the model, we conducted a citizen science project entitled: City to Sea Science: Testing the sources and pathways of trash through our wa-

tershed to improve the health of our communities. The goal was to collaboratively develop scientifically-based management recommendations that will reduce urban trash in coastal waterways. Specifically, we (i) classified and determined the spatial and temporal distributions of plastics trash, and (ii) tested the pathways of common plastics items. We also worked with the San Diego Bay Debris Work Group and community volunteers to help assess the status of the trash problem in all habitats associated with San Diego Bay, from upstream to bay bottom.

Program Website: https://caseagrant.ucsd.edu/project/education-making-waves

Program Partners: Ocean Discovery Institute, Ruzic Consulting, SCCWRP, AMEC Consulting, San Diego Bay Debris Working Group, and the City Heights community

3. **Great Lakes FieldScope, Michigan Sea Grant**
   Program Description: This web-based mapping and graphing collaboration tool is designed to engage students, volunteers and citizens in Great Lakes science. FieldScope is part of a nationwide initiative to share, analyze and interpret data.

   Program Website: http://www.miseagrant.umich.edu/education/great-lakes-fieldscope/

   Program Goal: Research & citizen engagement

   Program Audience: Community Members - adults & youth

4. **WhaleMapp, USC Sea Grant, Linda Chilton - Education Program Manager (lchilton@usc.edu)**
   Program Description: Monitoring of marine mammals

   Program Website: http://www.whalemapp.org/

   Program Goal: Research; community engagement;

   Program Audience: community members - adult and youth; researchers

   Program Partners: Wrigley Institute for Environmental Studies; Earth Watch; Dr. Leilani Steele - University of Redlands; American Cetacean Society

5. **Wisconsin Geotools, Wisconsin Sea Grant, David Hart - Assistant Director for Extension (dhart@aqua.wisc.edu)**
   Program Description: As part of a research project funded by Wisconsin Sea Grant, we worked with Esri to develop the Wisconsin Geotools (http://maps.aqua.wisc.edu/geotools). They are paired mobile-and web-based applications that allow citizens to create and map natural and cultural observations of meaningful places in their community.

   Program Website: http://maps.aqua.wisc.edu/geotools/

   Program Goal: Citizen engangement, Community Capacity Building

   Program Audience: Community members - adult, resource managers

   Program Partners: Esri, Nelson Institute for Environmental Studies and the Environmental Resources Center

COLLABORATIONS

1. **Superior CitSci - Lake Superior Regional Citizen Science Collaborative, Minnesota Sea Grant, Marte Kitson - Extension Educator (mkitson@d.umn.edu)**
   Program Description: LSRCSC seeks to identify citizen science efforts and opportunities in the Western Lake Superior Region in order to create an opportunity for communication and collaboration among researchers, educators and volunteers who want to engage in citizen science in our region.

Program Website: https://superiorcitsci.org/

Program Goal: Citizen Engagement and Community Capacity Building

Program Audience: Community Members and Researchers

Program Partners: Minnesota Pollution Control Agency, MN Department of Natural Resources, City of Superior and Large Lakes Observatory

2. **Surfrider Smartfin, USC Sea Grant, Nick Sadrpour (sadrpour@usc.edu)**
   Program Description: Utilizing surfers as instruments of collecting oceanographic data.

   Program Website: http://www.surfrider.org/programs/smartfin

   Program Goal: citizen engagement, resource management

   Program Audience: community members- adult, community members - children & youth

   Program Partners: Surfrider Foundation, Future Fins, Los Bird Project