Potential of Citizen Science for Data Needs in Support of Ecosystem-Based Science

Ecosystem Science and Management Working Group

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Main points covered in the report

- CS has potential to contribute to data collection and monitoring needs in coastal ecosystem science, particularly when data are needed over broad spatio-temporal scales and/or require significant human power to collect
- NOAA has supported a number of programs already, many of which have provided data that are useful to mainstream science
- To be useful for scientific analysis, data must be of high quality. Several studies have provided “best practices” for CS program development and sustainability.
- Significant time and resources are needed to develop and maintain successful programs

NOAA's Mission: Science, Service and Stewardship

1. To understand and predict changes in climate, weather, oceans and coasts;

2. To share that knowledge and information with others; and

3. To conserve and manage coastal and marine ecosystems and resources.

Citizen Science can provide data that contributes to knowledge (#1), impart training and knowledge to the public about what NOAA does (#2), and promote local stewardship (#3).

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Search NOA

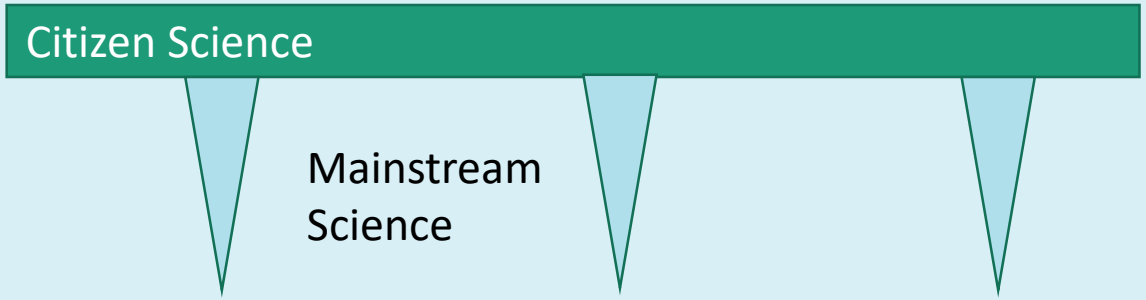
Citizen science and crowdsourcing

NOAA has a rich tradition of supporting citizen science.

Citizen science is defined as *a form of open collaboration where members of the public participate in the scientific process to address real-world problems in ways that include identifying research questions, collecting and analyzing data, interpreting results, making new discoveries, developing technologies and applications, and solving complex problems.* NOAA has a rich tradition of supporting citizen science. This tradition is being carried on through a portfolio of projects fostered and supported across the Agency.

https://www.noaa.gov/office-education/citizen-science-crowdsourcing

Impact and Value



- Cost Effective Data Collection
  - Volunteers can cover large areas, sample at regular intervals, check instruments, enter data
  - Well-designed and compatible local programs can be linked to expand scope of knowledge
    - Biological, physical, social sciences

- Community Engagement
  - Establish relationship between scientists and the public
  - "Actionable science" to the public = locally relevant, accessible
  - Observe patterns and changes, work together to understand "why"

COASST volunteers
https://depts.washington.edu/coasst/

What are some potential applications of CS to augment NOAA's Ecosystem Management data needs?

- Baseline information/monitoring
  - Physical, biological, social data
- Response to events
- "Groundtruthing"
- Documentation of instrument readings or remote sensing data

Clam Garden Network
@marcohatch

“Best Practices” – many resources, each project tailored to science and community needs

- Scope the problem, engage local community
- Design with volunteer capabilities and interest in mind
- Build a community around the project, training programs
- Data management – quality review, database maintenance
- Regular feedback is critical to sustain engagement

https://www.citizenscience.gov/toolkit/howto/#

Should we be using CS primarily as a tool for scientific data collection or as an outreach tool?

Two programs compared

LiMPETS (Longterm Monitoring Program and Experimental Training for Students)

- Designed to provide data collection experience for students
- Promotes investigation, inquiry while teaching kids about the ocean and conservation
- Aim is to provide publically accessible, scientifically useful data
- Data are highly variable in quality and quantity, but program focuses on easily identified species

http://limpets.org/rocky-intertidal-monitoring/

Two programs compared

Coastal Observation and Seabird Survey Team (COASST)

- Designed to provide data for mainstream science
- Focus is on issue that matters to local residents (program volunteers)
- Intensive training, data QA/QC
- Program sustained through regular feedback to volunteers

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

Findings and Recommendations

- CS is likely an underutilized tool for environmental data collection and monitoring in coastal systems, and well-designed programs have potential to contribute cost-effective information that can be used in scientific investigation

- Further review of existing programs that already have valuable data for ecosystem monitoring is warranted, and additional support, standardization of data storage and sharing, and enhancement of data collection protocols or trainings in those programs may improve their utility.

Findings and Recommendations

- Citizen science doesn’t just happen – it requires intention, consideration of community and participant needs, interests and abilities, and careful planning to ensure data quality and control.

- Commitment of resources and expertise from NOAA Regional and Science Centers can improve the quality and integration of data generated by citizen science and contribute to participatory research that enhances public awareness of science and its value to coastal communities.

How can NOAA enhance existing programs?

- Design and Development.
  - Continued work on best practices
  - Integration of citizen science with mainstream science
- IT support.
  - Data storage, management, and tools for QA/QC
  - Development of mobile applications
  - Web-based interfaces for program communication, training, reporting and dissemination of results.
- GIS support and data visualization.
  - Maps, simple data reporting tools – ways for public and scientists to visualize data collected
- Communication tools and public engagement training for scientists to "report back" to communities, sustain engagement.

Expand citizen science at NOAA from outreach/education to a recognized, supported component of research