

# NOAA Education Partnerships 2013 Portfolio Review Final Report

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## INTRODUCTION

This Partnerships Working Group (PWG) study responds to recommendations from the National Research Council's (NRC) NOAA's Education Program: Review and Critique (2010) for NOAA to better understand how NOAA Education partnerships are formed, fostered, sustained, and evaluated. The NRC report noted that while partnerships were mentioned as a means of achieving NOAA Education strategic goals and objectives, "there is limited evidence that current evaluations conducted by NOAA account for the influence of partnerships in achieving outcomes and impacts. In addition, most evaluations do not attempt to observe the underlying partnership or explore this as a factor in assessment" (p. 124). The goal of this study is to provide information and recommendations for the NOAA Education Council (Council) and NOAA Education community to use in making strategic decisions regarding NOAA Education partnerships.

The PWG was formed to conduct a Partnerships Portfolio Review (PPR). The PWG was charged with reviewing and evaluating a portfolio of NOAA Education partnerships. To carry out this charge, the PWG reviewed existing documents, revised and implemented a survey, and developed case studies. From this analysis, the group identified important elements of successful partnerships that can be used to evaluate existing partnerships and inform the development of future partnerships. The lessons learned from this review inform a set of actionable recommendations for the Council to consider.

### **Context and Rationale**

Partnerships are an important strategy in advancing NOAA Education goals and objectives. The importance of partnerships is reflected in both the NRC report (2010) and the NOAA Education Implementation Plan (2010).

Limited education resources and the inherently global nature of NOAA's mission make strategic partnerships necessary in order for the agency to accomplish its ambitious goals. (NRC 2010, p. 3)

In the partnership and collaboration section, NOAA states that it is the leading science and service agency in ocean and atmospheric science, and thus it has the responsibility to increase its role as a coordinator and collaborator in these areas of science education. The America COMPETES Act is cited as a mandate to serve as a "catalyst" to strengthen oceanic and atmospheric science. The strategic plan points to a broad array of potential partners, including other agencies, businesses, organizations, professional societies, education associations, and school systems. All partnerships will be developed in the interest of the agency using its resources to "advance the environmental literacy and scientific knowledge of our Nation and the global community." Partnerships will be critical if NOAA is to reach the ambitious goals identified in the strategic plan, because the agency does not have the resources to achieve its goals on its own. (NRC 2010, p.60)

Innovation in content delivery is also empowered by participation in strategic partnerships and organizational networks with formal and informal institutions that share NOAA's educational goals. Fostering these relationships allows the agency to leverage its resources to connect with the public through local and regional informal science venues; without such partnerships, these connections would otherwise be cost prohibitive. (NOAA Education Implementation Plan, 2010)

The NRC publication also recognized a lack of direction regarding partnerships: “Although the importance of partnerships is stressed in the [NOAA Education Strategic] plan, there is no specific guidance about how or with whom to partner” (NRC, 2010, p.5). Accordingly, the NRC publication includes a recommendation that NOAA should “evaluate where it leads, collaborates, follows or declines to participate in partnerships with others” (NRC, 2010, p.137).

Evaluation of such partnerships can also help inform the revisions of the NOAA Education Strategic Plan and Implementation Plan. To further investigate NOAA Education partnerships, the PWG was established.

### **Background**

In 2010, the Council organized a set of working groups to implement the NOAA Education Strategic Plan. Two of the working groups were the Finding Innovative Ways to Connect NOAA to the Public working group (Connects) and the Pre-Kindergarten through Early Career (PK-20) working group.

The Connects working group’s tasks focused on informal education and included a survey of all NOAA Education informal partnerships. The PK-20 working group’s tasks focused on formal education and was in need of a partnership survey. The Council advised the two working groups to develop and disseminate the survey together to meet the following objectives:

- Determine the types of partnerships NOAA Education programs participated in;
- Identify overlaps and gaps based on NOAA Education strategic plan needs; and
- Determine which partnerships demonstrate the best return.

In 2012, the Council approved the PWG, which focused on completing an evaluation of the NOAA Education partnership portfolio. The PWG leads were Frank Niepold and Kate Thompson. Dr. Diana Payne of Connecticut Sea Grant served as the Evaluation Lead, working in direct collaboration with Dr. John Baek. PWG members included: Julie Bursek, Ron Gird, Maria Murray, Seaberry Nachbar, Frank Niepold, Rochelle Plutchak, Shannon Ricles, and Sarah Schoedinger. The PWG was tasked with:

- Completing and disseminating the partnerships survey to better understand the nature of existing NOAA Education partnerships;
- Conducting an evaluation study to identify and better understand the nature of successful partnerships;
- Developing a set of actionable recommendations to present to the Council; and
- Sharing findings with the Council.

## **METHODS**

The PWG conducted the evaluation study from January 2013 to February 2014. The evaluation approach was a participatory process, focusing on the involvement of staff from multiple programs in the evaluation of NOAA Education partnerships with the support of professional evaluators. This approach is called a portfolio review.

### **Study Design**

#### **Portfolio Review**

A portfolio review is an internal evaluation, conducted by a team of agency staff, of a focal area of an agency's portfolio of efforts in relation to goals or outcomes (Yee, 2012). Several steps encompass a portfolio review: determining study scope, developing logic models, developing research questions, conducting a data inventory, collecting and analyzing data, selecting evaluative criteria, developing actionable recommendations, and drafting a final report. All steps of the PPR process were conducted by PWG members with support from evaluation leads.

#### **Scope**

The scope of an evaluation study defines the subject matter assessed, including a program or aspect of a program and the time periods and locations that will be included (GAO, 2012). The study was inclusive of active and inactive external partnerships undertaken by NOAA Education professionals from programs serving on the Council.

The scope was informed by a similar study conducted by the Smithsonian Institution Office of Policy and Analysis (2012) examining the portfolio of partnerships across all Smithsonian units. The study conducted a "baseline inventory of unit active partnerships with external organizations" (p. 7) via an online partnership survey instrument. The report summary included a recommendation to develop of case studies, in part to "discover what partnerships are successful and why, whether they can be expanded, and whether they can provide some variant of lessons learned." (p. 35)

The portfolio of NOAA Education partnerships may number in the hundreds, and the PWG did not have the three years it took Smithsonian to conduct an exhaustive and comprehensive study of its many partnerships. To focus the study, the PWG decided on a subset of the portfolio deemed high-return partnerships (see p.8). PWG members identified the need to highlight the unique mechanisms and value of NOAA Education partnerships in the current budget climate.

Additionally, the PWG identified the outcomes of the study and how study results might be implemented. The deliverables of the PPR included the following:

1. A sampling of NOAA Education high-return partnerships, including leveraged dollars, gaps, and overlap;
2. A model of how to initiate and manage effective, high-return partnerships; and
3. A final report to communicate the NOAA Education partnership portfolio to leadership and stakeholders.

The PWG intended the results of the PPR to inform potential future working group activities, including:

1. Develop a partnerships performance measure;
2. Develop a training manual;
3. Inform strategic planning;
4. Provide feedback on progress toward the NRC recommendations; and
5. Develop a standardized partnership survey instrument.

### Research Questions

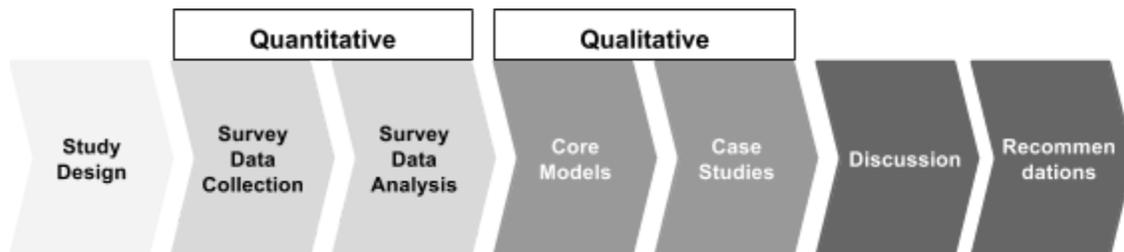
The research questions of an evaluation study are constructed so that the issues and concerns of a program's stakeholders about program performance can be articulated and focus the evaluation to help ensure that its findings are useful (GAO, 2012). In addition to recommendations made by the NRC, the following questions were developed by the PWG leads and evaluation leads at an initial meeting in 2013 and reviewed by the PWG members:

1. How can NOAA partners help complete our mission?
2. In what ways does NOAA maximize its Education partnerships?
3. What commonalities are shared by NOAA Education high-return partnerships?
4. What tools and strategies are needed to foster an effective NOAA Education partnership portfolio?

### Evaluation Design

Based on the research questions, the PWG leads and evaluation leads outlined the following sequential, mixed-methods design to help answer the research questions (Figure 1). The results of the quantitative component (e.g., survey) would provide a broad view of the portfolio. The qualitative component (e.g., case studies) would examine partnerships by analyzing mechanisms and outcomes related to success.

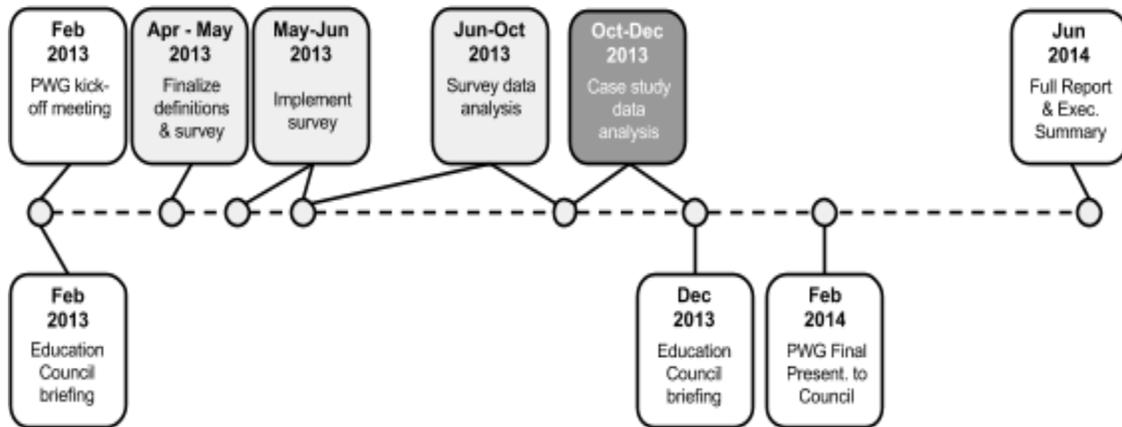
Figure 1. NOAA Education Partnerships Portfolio Review evaluation design.



## Timeline

The PWG leads and Evaluation leads met to discuss initial goals and drafted a timeline. The final timeline (Figure 2) deviated from the original plan due to unforeseen delays (i.e., October 2013 government shutdown).

Figure 2. NOAA Education Partnerships Portfolio Review Timeline.



## Data Collection & Analysis

Two types of evaluation activities were conducted to help understand the nature of NOAA Education high-return partnerships: an online survey and case study examples resulting from the survey data.

### Survey Design

Based on previous work of the PK-20 WG and Connects WG, the PWG reviewed an existing NOAA Education Partnership draft survey and then defined the partnerships and assessment criteria. Note that not all criteria need to be met in assessing and/or selecting a partner. The PWG gathered and reviewed the following sources of evidence:

- MOU/MOA of existing NOAA Education partnerships;
- NOAA Education Partnership draft survey;
- Geographic database of NOAA Education programs and facilities;
- NRC Report: NOAA's Education Program: Review and Critique (2010);
- NOAA Education Strategic Plan 2009-2029 (2009);
- NOAA Education Implementation Plan (2010);
- Rhode Island Sea Grant Partnership Principles; and
- Smithsonian Institution partnerships report (2012).

The PWG established the following definitions and criteria for the survey.

- Partnership - An agreement between two or more organizations, created to achieve or assist in reaching a common goal. Partnerships may involve one organization utilizing another's unique abilities, equipment or services, or it may be a "sharing" of resources (e.g., money, time, knowledge, equipment) to accomplish shared objectives between the participating partners.

- High-return Partnership - Benefits to NOAA and partners outweigh the investment and involvement for all parties involved.

Criteria for assessing a partnership:

- The partner shares similar values and qualities to those of NOAA. Our corporate values are Science, Stewardship and Service. Our agency is successful, welcoming, trusted, innovative, reliable, customer-focused, and collaborative;
- The partnership creates stories or case studies that will be relevant, interesting and intriguing for NOAA stakeholders directly as a result of operating unit(s) involvement;
- The partnership provides opportunities for NOAA involvement by either our staff or our constituents;
- The partnership provides a high return to NOAA's local communities where NOAA offices/labs/sanctuaries and reserves are located (high return means benefits to NOAA and partners outweigh the investment and involvement for all parties involved);
- The partnership provides a high return to NOAA staff and our constituents (high return means benefits to NOAA and partners outweigh the investment and involvement for all parties involved);
- The partnership provides a high return to International/National/regional/local initiatives (high return means benefits to NOAA and partners outweigh the investment and involvement for all parties involved);
- The partner organization has broad connections with communities of influence that would further our mission and goals;
- The partnership includes opportunities for NOAA (e.g., conservation, stewardship, science, awareness, safety and preparedness);
- The partnership is designed to make a lasting contribution to NOAA communities; and
- The partner is helping us address our education strategic goal/objectives.

Criteria for selecting a partner:

- Partner has established relationships that will help provide a different level of policy access to those networks for NOAA Education officials;
- Partner has established relationships that will help provide a different level of science content knowledge (technical expertise) to those networks for NOAA Education officials;
- Partner has established relationships that will help NOAA provide a different level of access to new or refined approaches for audiences, constituents, stakeholders;
- Partner can contribute to NOAA'S workforce development goals; and
- Partner is selected through competition.

### **Survey Administration**

The NOAA Education Partnership Survey (Appendix A) was distributed to members of the Council and their education networks in late spring/early summer 2013 with a close date of July 1, 2013. A total of 67 partnerships were identified in the survey responses. It is important to note that this was not a comprehensive survey, and some programs did not

respond to the survey at all. Each Council member could provide up to five examples of high-return partnerships.

### **Survey Data Analysis**

Fourteen analysis questions were developed by evaluation leads to help guide working group members in analyzing the survey data. The questions were developed based on the Partnership Survey items, survey responses and evaluation questions. The answers provided a broader understanding of who NOAA Education partners with, the strategies for partnering, and the resulting outcomes of the partnership. The 14 questions were:

1. With whom does NOAA Education partner?
2. What types of institutions are represented in NOAA Education partnerships?
3. How does NOAA Education formalize partnerships?
4. What is the current status of NOAA Education partnerships?
5. How long have NOAA Education partnerships been in place?
6. Where are NOAA Education partners?
7. How much funding has NOAA contributed to the partnership?
8. How much staff time has NOAA contributed to the partnership?
9. Does the partner share NOAA Education goals and objectives?
10. Does the partner align with NOAA Education output measures?
11. Does the partnership allow NOAA to reach new audiences?
12. Does the partnership provide access to expertise, facilities and technology NOAA does not have?
13. Does the partnership allow NOAA to provide unique expertise and/or opportunities?
14. Could the outputs and activities be achieved in the absence of the partnership?

PWG members volunteered to investigate one or two questions each and were the primary analyzers of the data with support from the evaluators. PWG members shared and reviewed results with the evaluation leads. Most of the analysis involved qualitative coding by identifying natural categories in the survey responses. Results are presented in percentages to provide an understanding of part-whole relationships and an overall understanding of the portfolio of high-return partnerships.

### **Case Studies**

According to the U.S. Government Accountability Office (GAO, 2012), “If the objective of the case study is to describe aspects of an issue, provide context, or illustrate findings developed from a more broadly applied survey, then selecting a non-generalizable sample of cases may be appropriate” (p.34). The PWG leads and Evaluation leads selected the case study as an appropriate methodology to better understand the nature of NOAA Education high-return partnerships. Case studies “can be used to document and analyze the outcomes of interventions...[including] programs sponsored by federal agencies” (Yin, 2012, p. xix), and are useful when considering an initiative that takes place in a “real-world setting” (Yin, 2012), to illustrate findings, or present an in-depth analysis (GAO, 1990). Because each of these aspects was important in the analyses, the PWG reviewed the NOAA Education Partnership Survey dataset to determine which of the reported partnerships might best illustrate high-return.

The PWG identified case studies that represented broad categories of partners identified in the survey data and to which working group members could easily access data. The PWG

had limited time and needed to rely on the working group to document partnership case studies (i.e., convenience sampling). With examples of case study partnerships selected, three broad categories were identified as core models based on the type of partner: 1) informal education institutions; 2) nonprofit organizations; and 3) partnerships with a local focus.

Once examples were suggested and discussed for each core model, PWG members volunteered to write up a case study. PWG members utilized data collected in the survey and their own records and documents of the partnerships, and consulted with partners to gather additional information. Authors were provided with a template to guide writing up the case study to ensure that necessary information was included.

### **Logic Model**

Logic modeling is an evaluation technique encouraging careful consideration of the relationships between program activities and results (Knowlton & Phillips, 2009). Program logic models in diagram format are visual depictions of how an organization does its work. “At a minimum, a program logic model should outline the program’s inputs, activities or processes, outputs, and both short-term and long-term outcomes—that is, the ultimate social, environmental, or other benefits envisioned” (GAO, 2012, pp.10-11). The PWG developed the logic model, fully described in the Discussion section of this report. The logic model describes how NOAA Education partnerships lead to the outcomes of increased reach, efficiency and effectiveness.

### **Final Presentation and Report**

The Evaluation leads reviewed data analyses and case study drafts to begin development of the final report structure. Reviews of the final report and the development of actionable recommendations were conducted by the PWG in January 2014, with a presentation to the Council in February 2014. The draft was updated and revised based on comments made at the presentation, with final delivery of the report to the Council in July 2014.

# RESULTS

## Survey Data

A total of 14 Analysis Questions were answered based on the survey data. The questions were developed by the evaluation leads based on the original NOAA Education Partnership Survey items, survey responses and research questions.

The answers provide a broader understanding of whom NOAA Education partners with, the strategies for partnering, and the resulting outcomes of the partnership. Because the response to the survey was incomplete, readers should not generalize to the whole universe of partnerships that exist within the NOAA Education community. Additionally, because respondents were able to indicate multiple answers or chose not to answer questions, the number of answers (n) differs between questions.

### Analysis Question 1: With whom does NOAA Education partner?

A total of 67 NOAA Education partnerships were identified in the survey. The partners are presented in Table 1. Some partner organizations were listed multiple times because they were partners in different partnerships.

Table 1. NOAA Education Partners.

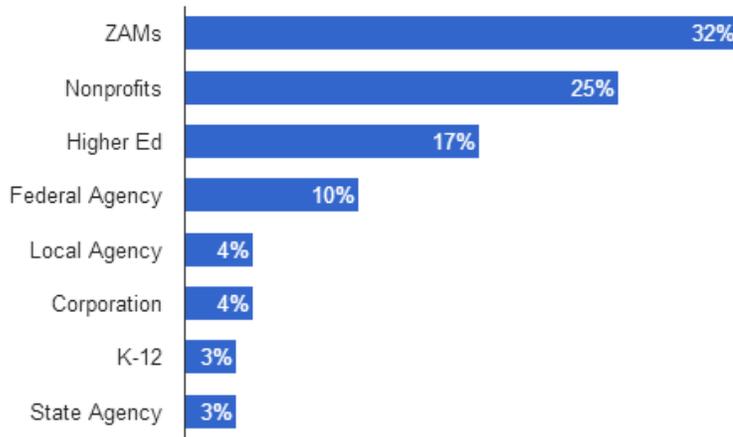
Ala Kaina Foundation	National Marine Sanctuary Foundation
American Meteorological Society (AMS)	National Park Service, Great Lakes Research and Education Center
Annapolis Maritime Museum	National Science Teachers Association
Ao"ao O Na Loko I'a O Maui Fishpond Association	Navarre Beach Marine Science Station (NBMSS)
Aquarium at Moody Gardens	New England Aquarium
Aquarium of Niagara, Buffalo Museum of Science	Oakland Museum of California (OMCA)
Awaiaulu	Ocean Discovery Institute
Bishop Museum	Oregon Coast Aquarium (OCA)
California Academy of Sciences (CAS)	Pacific Tsunami Museum
Channel Islands National Park (CINP)	Pennsylvania Sea Grant
City and County of Honolulu	PLAN!T NOW (P!N)
City College of the City University of New York	Randall Museum
Coral Reef Alliance	Science on a Sphere (SOS)
Council of State Science Supervisors	Seacoast Science Center
Exploratorium	Seattle Aquarium
Farallones Marine Sanctuary Association	Smithsonian Institution, National Museum of Natural History
Feiro Marine Life Center	South Carolina Aquarium
Florida A&M University	Texas A&M University - Galveston
Florida Department of Environmental Protection, Office of Environmental Education (FL DEP OEE)	The Mariners' Museum
Galveston Island Nature Tourism Council	The Weather Channel
Georgia Aquarium	Turtle Bay Resort
Georgia Southern Museum	Tybee Island Marine Science Center
Great Lakes Aquarium	U.S. Forest Service
Gulf of Mexico Foundation	UAF School of Fisheries and Ocean Sciences
Howard University	University of Georgia Marine Extension Service
Huron-Clinton Metropolitan Authority	University of Maine Cooperative Extension
Johns Hopkins Center for a Livable Future	University of Maryland Eastern Shore
MADE CLEAR (Maryland and Delaware Climate Change Education Assessment and Research)	University of Rhode Island
National Association of Black Scuba Divers	USFWS Kilauea Point National Wildlife Refuge
National Earth Science Teachers Association	Waikiki Aquarium
National Environmental Education Foundation	Western Pacific Coral Reef Institute (WPCRI)
	Whaler's Village/Oceanology

**Analysis Question 2: What types of institutions are represented in NOAA Education partnerships?**

NOAA partners with a wide variety of organizations. The resulting number in this question is greater than the number of partnerships represented in the survey data because in some cases the partnership is among NOAA and several different types of organizations.

Of the 67 NOAA education partnerships described in the survey, at least one partnership (the Science on a Sphere® Collaborative Network) comprises several different types of institutions and organizations, so percentages in this question are calculated based on 71 institutions. Zoos, aquariums and museums (ZAMs) make up the largest portion (32%, n=23) of institution types, with nonprofit professional and nongovernmental organizations representing 25% (n=18), and colleges and universities representing 17% (n=12) of all partnering institution types reported (Figure 3).

Figure 3. Type of Partner Institutions.



**Analysis Question 3: How does NOAA Education formalize partnerships?**

Most NOAA Education partnerships are formalized at some point in during their existence, although multiple mechanisms may be used throughout the life of the partnership. Respondents were given the option of grants, cooperative agreements, memoranda of agreement (MOA)/memoranda of understanding (MOU), contracts. Thus the number of responses is greater than the 67 partnerships represented in the survey.

Of the 83 mechanisms identified in the survey, greater than 50% (n=46) are funded through a grant or cooperative agreement at some point during the tenure of the partnership (Figure 4). Almost a quarter (24%; n=20) have been articulated through MOA's or MOU's. These instruments may co-occur with grants and cooperative agreements, but not exclusively so. Only three (15%) of the MOA's reported involved a partnership with a local, state or federal agency. Almost 20% (n=16) of the surveyed partnerships have no formal mechanism articulating the partnership. In these cases, the support is provided in-kind.

Figure 4. Type of Partnership Mechanisms.

**Analysis Question 4: What is the current status of NOAA Education partnerships?**

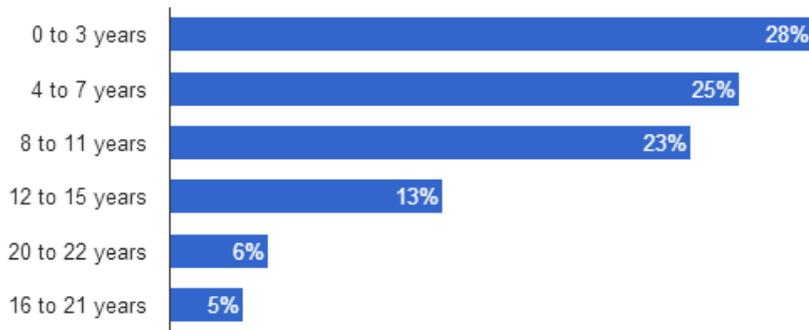
To describe the level of activity and operation of the partnership, respondents could select from following four options: 1) active and fully operational (76% to 100%), 2) partially operating (51% to 75%), 3) minimally operating (1 to 50%), 4) not active (0%). A total of 59 responses were received for this item, which did not require a response. As depicted in Figure 5, 85% (n=50) of NOAA Education partnerships identified in the survey are active and fully operational, while 10% (n=6) of NOAA partnerships are partially operating. Two respondents (3%) selected minimally operating, and only one respondent (2%) indicated that the partnership is not active.

Figure 5. Current Status of the Partnership.

**Analysis Question 5: How long have NOAA Education partnerships been in place?**

Respondents were asked to provide the year the partnership began. A total of 64 responses were received for this question, which did not require a response. More than three-fourths of the partnerships were new or at mid-point (compared to all responses received), having been in place for 11 years or less. Most NOAA Education partnerships identified in the survey began within the last three years (2009-2012; n=18, 28%), although the four-to-seven (n=16, 25%) and eight-to-eleven (n=15; 23%) year ranges also rated high (Figure 6). Some respondents indicated that partnerships were in place for many years, but became formal partnerships through an MOU/MOA within the last seven years.

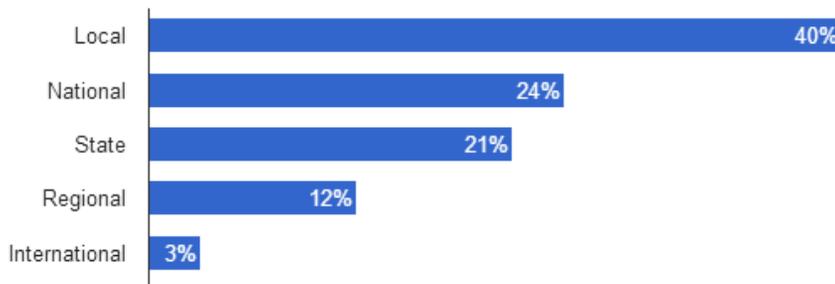
Figure 6. Length of the Partnership.



### Analysis Question 6: Where are NOAA Education partners?

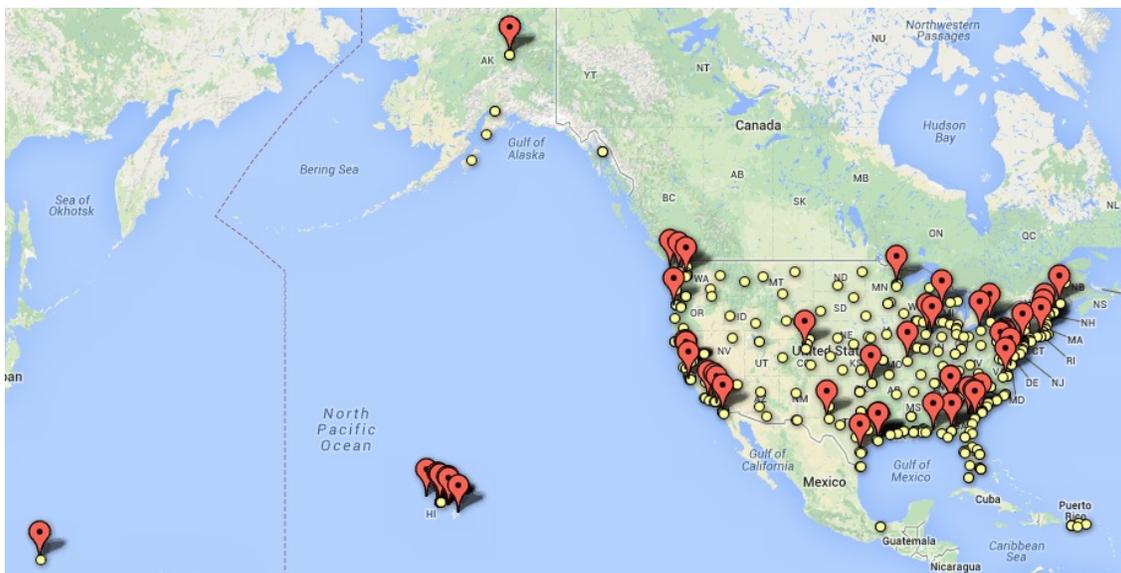
Based on 67 partnership descriptions, five categories were created to group the responses based on the geographic focus of the partnership: local, state, regional, national, and international. Local is defined as an area smaller than a large portion of a state. The definition for state covers most or all of a state. Regional encompasses at least two states in the same geographic area. National includes many if not all states, geographically spread across the country. International indicates at least two countries. As depicted in Figure 7, local was the largest percentage (40%, n=27) of partnerships represented in survey. The next largest group was national (24%, n=16), followed by state (21%, n=14) and regional (12%, n=8). Only two (3%) partnerships were reported as international: PLAN !T NOW and the Science On a Sphere® Users Collaborative Network.

Figure 7. Geographic Focus of the Partnership.



Respondents were asked to provide the city, state and zip code of the partner. In Figure 8, red pins represent partner locations as specified in the 2013 NOAA Education Partnerships survey. Yellow dots represent locations of NOAA offices, labs, sanctuaries, and reserves.

Figure 8. NOAA and Partner Locations.

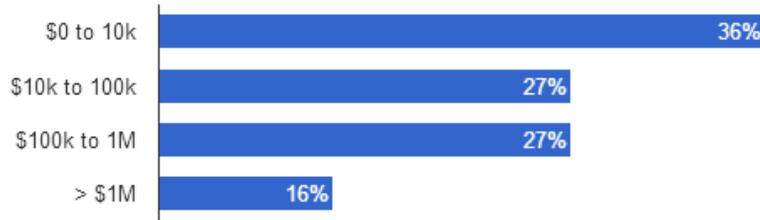


Note: Image provided courtesy of Ronald Tardiff.

**Analysis Question 7: How much funding has NOAA contributed to the partnership?**

Survey respondents were asked to provide the total contribution in US dollars, which included the monetary value of staff time, other in-kind contributions, and cash. Based on these data, an estimate of how much NOAA provided in funding in one year to the partners was \$17,021,262. NOAA partners with a variety of organizations, with levels of funding that can vary from zero dollars to over one million dollars. For the majority of partnerships, NOAA provided less than 10 thousand dollars of funding (36%, n=23), as shown in Figure 9. The majority of funding to partners has been via multi-year grants with universities (60%, n=4) and non-profit organizations (30%, n=3).

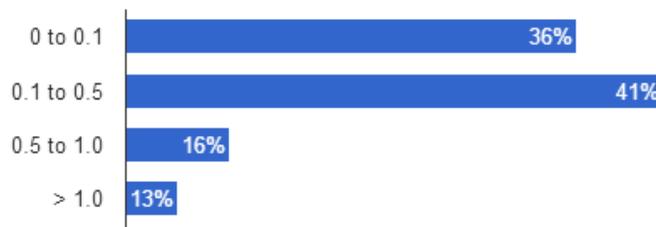
Figure 9. NOAA Funding Contributed to the Partnership.



**Analysis Question 8: How much staff time has NOAA contributed to the partnership?**

Based on the 64 responses to this survey question, which did not require a response, FTE estimates were made based on verbal descriptions or when multiyear estimates were provided. NOAA contributed a total of 23 full-time equivalents (FTEs) to Education partnerships. The partnerships that have historically received the most FTE support have been university and non-profit partnerships which match almost directly with NOAA funding support. Figure 10 depicts the breakdown across range of staff time contributions. The majority (77%, n=49) of partnerships are maintained with less than 0.5 FTE, as shown in Figure 10.

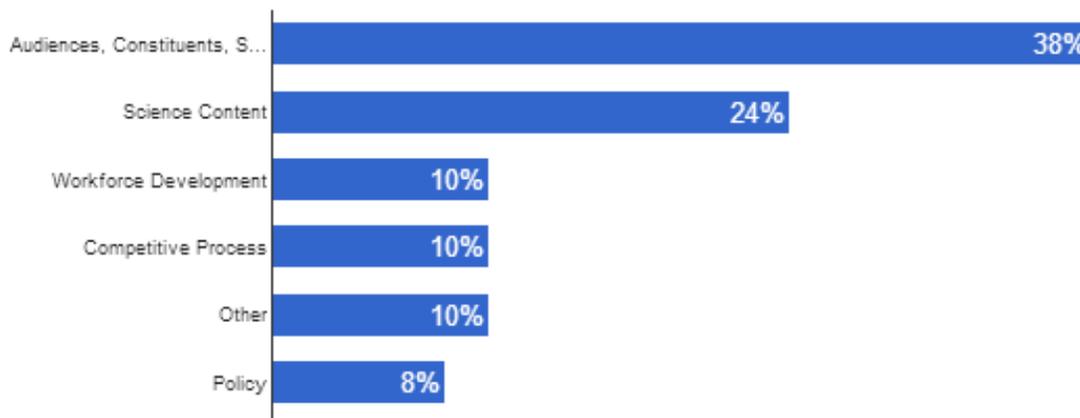
Figure 10. NOAA FTE Contributed to the Partnership.



**Analysis Question 9: Does the partner share NOAA Education goals and objectives?**

In terms of criteria for selecting a partner, each respondent was able to indicate multiple selections based on NOAA Education goals and objectives (n=116). As represented in Figure 11, 38% (n=44) of the partnerships were established to help provide increased access to new or refined approaches for audiences, constituents and, stakeholders. Additional responses included providing increased level of science content knowledge or technical expertise (24%, n=28), contributing to NOAA’s workforce development goals (10%, n=12), selecting the partner through a competitive process (10%, n=12), and helping provide a different level of policy access (8%, n=9). Some respondents (10%, n=12) elaborated by selecting other.

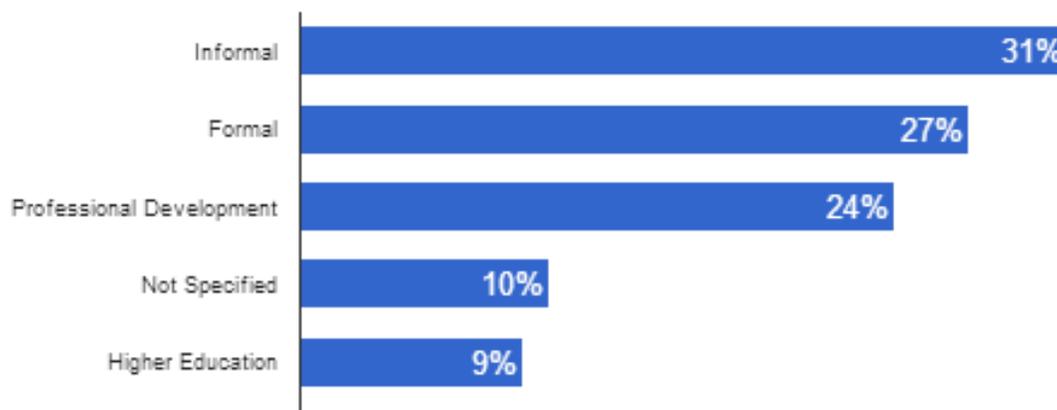
Figure 11. Criteria for Selecting Partners.



**Analysis Question 10: Does the partner align with NOAA Education output measures?**

In assessing the partnership in terms of alignment with NOAA educational output measures, each respondent was able to indicate multiple measures (n=131). For example, a partnership might include both formal education and professional development program activities. As illustrated in Figure 12, 31% (n=41) indicated the partnership aligned with informal education programs, 27% (n=36) with formal education programs, 24% (n=32) with professional development programs, and 9% (n=12) with higher education programs, while 8% (n=10) were not specified.

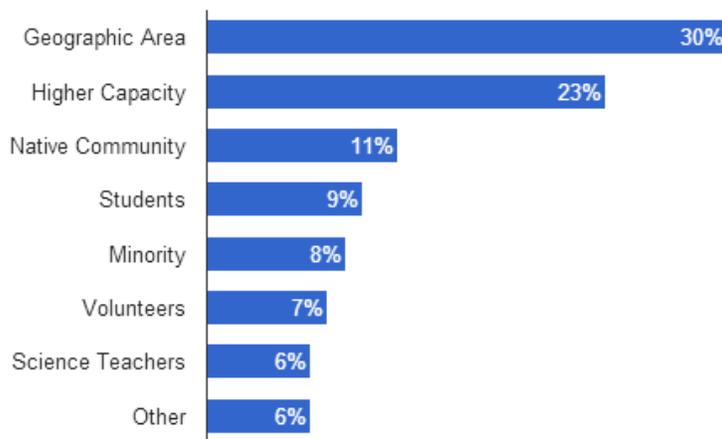
Figure 12. Alignment with NOAA Education Output Measures.



**Analysis Question 11: Does the partnership allow NOAA to reach new audiences?**

To answer these questions, the survey responses were reviewed and synthesized into eight categorical bins. Sixty-nine descriptions of new audiences reached were identified. Overall, new audiences were reached by 97% (n=67) of the partnerships reported. Of these new audiences, the largest group indicated was visitors to an institution in a new geographic area (30%, n= 20), followed by visitors to a new institution with access to a higher capacity (23%, n=16) as shown in Figure 13. Other audiences indicated included access to a traditional or native community (11%, n=8), access to students due to higher capacity (9%, n=6), minority students and underserved populations (8%, n=5), access to new volunteers (7%, n=4), and science teachers (6%, n=3) and “other” (6%, n=3). The category “other” included graduate and undergraduate students, general public, docents, and families.

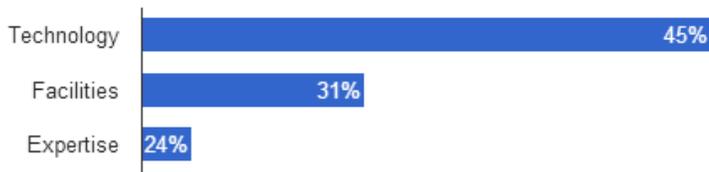
Figure 13. Reaching New Audiences.



**Analysis Question 12: Does the partnership provide access to expertise, facilities and technology NOAA does not have?**

Many partners indicated providing more than one type of contribution, thus the higher number of total contributions identified (n=84). Contributions were grouped as technology (45%, n=38), facilities (31%, n=26) and expertise (24%, n=20), as depicted in Figure 14.

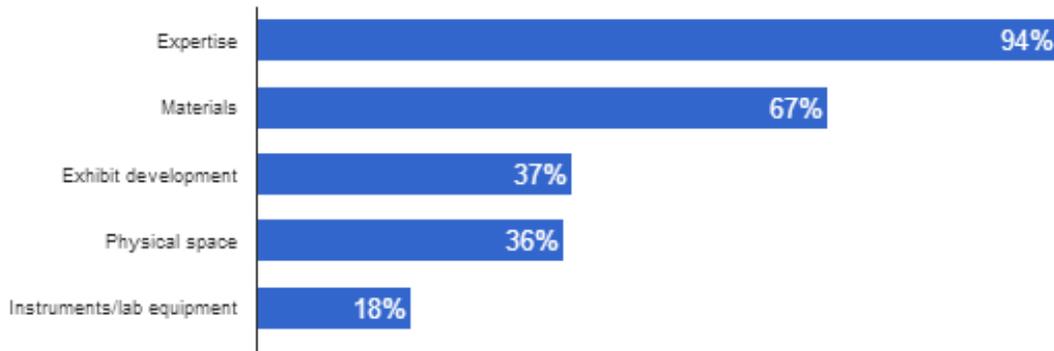
Figure 14. Partner Contribution to the Partnership.



**Analysis Question 13: Does the partnership allow NOAA to provide unique expertise and/or opportunities?**

Survey results indicate that NOAA provides technical and knowledge transfer. Of the 67 responses depicted in Figure 15, 94% (n=63) indicated that NOAA provided expertise, either scientific or educational. The NOAA materials category was identified by 67% (n=45), and ranges from handouts at special events at partnership institutions to curriculum collections. Physical space (e.g., facilities, exhibit space, real estate) was identified by 36% (n=24). Other resources identified by respondents include exhibit development (37%, n=25) and instruments and lab equipment (18%, n=12). Some open-ended responses mentioned opportunities for students to work alongside NOAA scientists.

Figure 15. NOAA Expertise/Opportunities Contributed to the Partnership.



### Analysis Question 14: Could the outputs and activities be achieved in the absence of the partnership?

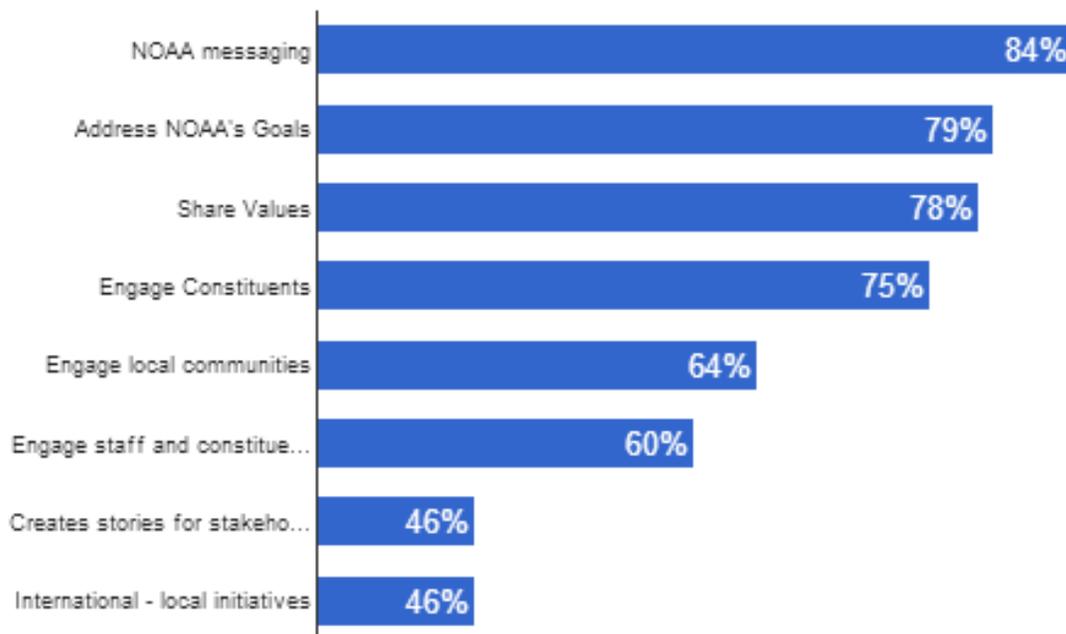
When considering NOAA Education partnerships, the PWG also contemplated what the partnership added in value and tried to consider what benefits were caused from the partnership or may not have happened in the absence of the partnership. This, however, was difficult to ascertain given the scope of the study.

Qualitative data provided the direct response this question. Specific comments evoked by this question included:

- We could not deliver the programs on which we collaborate without this partnership.
- We have one part-time education staff person and cannot achieve our desired outcomes without significant partnerships.

Quantitatively, respondents were requested to assess the partnership based on criteria to indicate outputs and activities the partnership provides. Of the 67 responses shown in Figure 16, opportunities for NOAA messaging rated highest (84%, n=56). Partnerships provided opportunities for NOAA involvement by either staff or constituents (75%, n=50), provided a high return to NOAA's local communities where NOAA offices, labs, sanctuaries and reserves are located (64%, n=43), and provided opportunities for NOAA involvement by either staff or constituents (60%, n=40). Many respondents indicated the partnership created stories or case studies that will be relevant, interesting and intriguing (46%, n=31), and provides a high return to international, national, regional, and local initiatives (46%, n=31).

Figure 16. Partnership Assessment Criteria.



## Core Models

PWG members recommended potential case studies, reviewed the options, and selected several examples. The PWG then identified thematic core models for the case studies, based on the type of partner: 1) informal education institutions, 2) non-profit institutions, and 3) partnerships with a focus on local issues.

The PWG selected partnerships with informal education institutions (i.e., zoos, aquariums and museums) and with non-profit/non-governmental organizations (i.e., policy or professional organizations), as these were most often reported in the NOAA Education Partnerships Survey (32% and 25% respectively). Partnerships with a local focus were selected to highlight the reach of NOAA. As noted by the NRC (2010), “[i]ndividual offices have separate mandates and often have local components with local control.” (p. 143).

Core models serve as cross-case synthesis and were recommended by the Evaluation Co-Leads, as the analysis of case studies can occur across multiple cases to synthesize findings from individual cases and identify patterns (Yin, 2012). The three core models are described below, with specific examples provided in the following section.

### **Core Model 1: Partnerships with Informal Education Institutions**

NOAA Education programs have numerous partnerships with informal education institutions (e.g., zoos, aquariums, museums). Respondents to the NOAA Education Partnerships survey indicated 32% of partnerships reported were of this type. Partnerships with informal education institutions help NOAA: 1) increase access and reach to broader audiences and diverse populations; 2) better distribute NOAA science, data, technology and issues important to NOAA (e.g., via exhibits, websites); and 3) facilitate broader impacts of NOAA science and scientists. A key component of successful high-return partnerships with informal education institutions is communication between specific points of contact for each partner. The contacts are committed to sustaining the partnership, and may or may not have been integral to the formation of the partnership. The mutual points of contact can also facilitate opportunistic collaborations to capitalize on the capabilities each partner brings to the relationship. Examples of NOAA Education high-return partnerships with informal education institutions are noted below and more fully described in the following section.

- Case Study 1A: NOAA and the Exploratorium
- Case Study 1B: NOAA Office of National Marine Sanctuaries (ONMS) and the Oakland Museum of California (OMCA)
- Case Study 1C: NOAA and Science on a Sphere® (SOS)

### **Core Model 2: Partnerships with Nonprofit Institutions**

Partnerships with nonprofit institutions were indicated in 25% of the responses to the NOAA Education Partnerships survey. NOAA Education partnerships with nonprofit organizations are generally more targeted than partnerships with informal education institutions in terms of audience (e.g., inservice teachers, children) and content (e.g., atmospheric and ocean science; surviving severe weather events). For NOAA Education, such specific endeavors have resulted in 1) long-term involvement of partners and participants; 2) a product that has been leverageable for additional support (funding and/or in kind) from other federal agencies and partners; and 3) involvement of highly recognized celebrities in the support and promotion of projects. Key components to success

include meaningful evaluation and support from program leadership. Two exemplary case studies are noted below.

- Case Study 2A: NOAA and the American Meteorological Society (AMS)
- Case Study 2B: National Weather Service (NWS) and PLAN!T NOW

### **Core Model 3: Partnerships with a Focus on Local Issues**

Given the geographic and content diversity (e.g., ocean, coast, Great Lakes, atmosphere, weather) of NOAA Education programs as well as the individual education mandates within specific programs, forging partnerships with a focus on local issues is a unique strength of NOAA. Partnerships with a local focus highlight the reach of NOAA, and survey respondents indicated that 61% of the partnerships take place at the local or state level (40% local, 21% state). Such partnerships allow NOAA to: 1) capitalize on interest in local issues directly connected to agency mission and goals; 2) encourage local and often sustainable collaboration among scientists, educators, volunteers and others on common community issues; and 3) leverage local and/or regional funding and resources (e.g., volunteers). Key components for success include established personal relationships - the “people factor” - between key individuals knowledgeable about the local issues and the leveraging of in-kind support of resources. The following two case studies demonstrate the capacity and effectiveness of partnerships focused on local issues.

- Case Study 3A: EPA Great Lakes National Program Office (GLNPO) and the Center for Great Lakes Literacy (CGLL)
- Case Study 3B: Channel Islands National Marine Sanctuary (CINMS) and Channel Islands National Park (CINP)

## Case Study 1A: NOAA and the Exploratorium

A partnership initiated in 2009 between NOAA and the Exploratorium connects NOAA scientists and science content with an informal education institution serving hundreds of thousands of people annually via its physical space and online presence.

### Background

Located in San Francisco, California and founded in 1969, the Exploratorium is an exceptional hands-on public science center consisting of approximately 600 physical exhibits offering experiential learning experiences difficult to obtain through any other medium. The Exploratorium has also expanded its reach beyond its own doors by sharing exhibits with other museums globally and through a strong web presence. Its staff and programs are leaders in the field of exhibit design and best practices training, and have had a significant impact on the worldwide museum and science center community.

According to 2012 self-reported statistics, the Exploratorium's reach includes the following:

- 570 thousand people visited the Exploratorium (55% adults; 45% children);
- 52% of the visitors were from the Bay Area, 24% from the rest of California, 14% from other states, and 10% from outside U.S.;
- 115,000 students and chaperones;
- 36% of visitors received free or discounted admission;
- 44 thousand attended on "Free Wednesdays";
- 180 million visited Exploratorium exhibits at other science centers and locations worldwide;
- 13 million people visited [www.exploratorium.edu](http://www.exploratorium.edu) and viewed the 50 thousand pages of original content;
- 75 live webcasts, podcasts, and videos are produced; and
- New over-the-water location on San Francisco Bay may bring in an estimated 1 million ticketed visitors per year.

In 2009, NOAA and the Exploratorium signed a 5-year MOU, which described a multi-faceted and in-depth collaboration between the two institutions. As the Exploratorium moved to a new location on San Francisco Bay, an expansion into environmental science content was also planned. Both NOAA and the Exploratorium were well positioned to undertake the challenge of creating a citizenry engaged in current environmental issues.

The partnership covers a broad range of activities, including the co-development of exhibits, education and public programs, ship docking, media-rich websites, staff exchanges, and learning research programs focused on critical issues important to NOAA. The goal is to promote public engagement to help society better understand NOAA science, global environmental change and the ways in which individuals can create a healthier, sustainable future for the planet.

The collaboration leverages each partner's strengths in translating accurate, up-to-date science content and understanding of complex systems into learning opportunities for the public. The effort also benefits the fields of informal science education (ISE) and scientific research by exploring new methods of engaging audiences regarding critical and dynamic environmental sciences.

While some of the partnership work was supported by NOAA Environmental Literacy Grants (ELG) program, particularly the Scientist-in-Residence Program, the majority of the work and support for the partnership came from in-kind contributions authorized by the formal MOU. The MOU was flexible and allowed for experimentation and engagement between NOAA and the Exploratorium. The MOU engaged all aspects of NOAA in the partnership.

The Exploratorium works on a regular basis with Carrie McDougall, NOAA Office of Education (OED), Rochelle Plutchak (OAR), and Maria Murray (OED). There is a standing call every two weeks with counterparts at the Exploratorium, Mary Miller and Kate O'Donnell. This group does most of the planning and high-level work, but the partnership is designed so that this group does not become a bottleneck.

The partnership is governed by an eight-member Vision Council that consists of four members each from NOAA and the Exploratorium. One member from each is rotational, based on the projects underway at the time. The Vision Council meets biannually. Traditionally, the summer meeting has been at a NOAA location and paired with a site visit, while the winter meeting has been in San Francisco concurrent with the American Geophysical Union meeting in December. This capitalizes on opportunities to involve scientists in conversations with the Exploratorium.

The Exploratorium has visited and had in-depth conversations with offices across NOAA, including, but not limited to, OAR labs, NMFS science centers, NOS National Marine Sanctuaries, NWS local forecast offices and CPC, and NESDIS NCDC and NSOF. Many strong relationships have been built as a result of these interactions, and the Exploratorium feels that they can reach out to their contacts directly when needed.

## **Results**

Numerous activities have resulted from the partnership between NOAA and the Exploratorium:

- Scientists-in-Residence - The Scientist-in-Residence grant, awarded through the OED-managed Environmental Literacy Grants program, enabled four groups of NOAA scientists to participate in week- and month-long residences on the Exploratorium floor. Working with Exploratorium “Youth Explainers”, NOAA scientists strengthened their skills in communicating their research to the public, and shared NOAA scientific expertise for use in Exploratorium exhibit mediation and development.
- Scientific instruments - The Exploratorium’s new waterfront location offers an opportunity to engage the public in environmental science as well as collect data that can be shared with both the public and the larger science community. The Exploratorium equipped the pier with sensors to gather data on the water, atmosphere, weather, and biological communities of the San Francisco Bay, including a NOAA buoy to measure aspects of ocean acidification. Recently, the Exploratorium added an HF Radar installation, which reports to CENCOOS. The Exploratorium is also now an institutional member of CENCOOS with representation on the governing board, and will become a data collection site for the PORTS network.
- Exhibit development - NOAA scientists are intensively involved in the conception, development and completion of new Exploratorium exhibits.

- Ship docking - The Exploratorium's location on the pier offers a prime location for NOAA (and other) research vessels to tie up during routine operations. Several successful NOAA ship dockings have occurred since the new location opened in 2013. Activities around the research vessel visits can include ship tours for media and the public, public programming in the Exploratorium featuring the scientists from the vessel, trainings for Exploratorium and NOAA staff, or sample processing in the Exploratorium lab. Even when schedules cannot accommodate extra activities, the prominence of the ship at the Exploratorium is excellent exposure for NOAA.
- Opportunistic collaborations - The Transit of Venus provided an opportunity for the Exploratorium to use a NOAA facility to broadcast the Transit. The event raised awareness of the Mauna Loa Observatory. The live webcast and multiple videos remain on the Exploratorium website.

For the Exploratorium, specific benefits as a result of the partnership include:

- Access to NOAA scientists, ships, equipment and laboratories;
- Access to observational and modeling data;
- Incorporating cutting-edge research and real-time data into exhibits on the museum floor; and
- Allowing audiences to experience the results of research as well as the evidence, methods and processes scientists undertake to explore the natural world.

For NOAA, specific benefits as a result of the partnership include:

- Accelerating fulfillment of NOAA's mandate under the America COMPETES Act;
- Engaging with a recognized leader in informal science education in a public research and development laboratory;
- Reaching multiple audiences (e.g., school children, families, young adults, educators, policy-makers, web browsers, and life-long learners) via rapid prototyping and testing of new ideas;
- Discovering and applying new models for NOAA to engage the public;
- Increasing the capacity for NOAA scientists to communicate research, models and forecasts to the public; and
- Providing NOAA greater visibility throughout the museum and science center community.

### **Lessons Learned**

The cultural differences between institutions were not fully appreciated or understood at the start of the partnership, which had the potential to create tension in some situations. For example, an exhibit that may be generally unnoticed may be considered by the Exploratorium staff as a nice surprise for those who are paying attention to the world around them. From a NOAA standpoint, this was not be considered a success or a good use of resources.

A lesson learned quickly was to prioritize ideas and projects, as the breadth of the partnership provided many potential areas for collaboration. Initial prioritization included ensuring that major NOAA focus areas (e.g., climate, weather, oceans) were covered by projects available to a variety of audiences.

### **Current Status of Partnership**

The partnership between NOAA and the Exploratorium has created meaningful relationships among several contacts at each institution, ensuring in-kind collaborations will likely continue in the future. Benefits to both NOAA and the Exploratorium have elevated the status of each partner in a variety of ways:

- Lasting capacity for both NOAA and the Exploratorium in delivering and interpreting ocean and atmospheric science for the public;
- Capability at the Exploratorium to promote and highlight the work of NOAA in a very positive context;
- The Exploratorium is now capable of contributing original data to ocean and atmospheric observing networks and has developed new partnerships with other scientific organizations;
- Contributions to the informal science education (ISE) and science fields;
- NOAA has an improved reputation in informal science education;
- The Exploratorium has a good reputation in the science arena;
- Positive media and public perception of NOAA's work;
- Broad engagement in both NOAA and the Exploratorium; and
- Even if no additional effort were put into the partnership, there would be lasting benefits to NOAA, the Exploratorium, and the public.

Budget constraints present a challenge in continuing travel-based activities including site visits, which have been crucial in forming the relationships and direct lines of communication between the Exploratorium and NOAA staff and scientists. This may impact how the partnership expands to include more components of NOAA in the future, and may also result in further exploration into building a robust remote component into the partnership.

### **Conclusion**

The Exploratorium has established relationships and networks that help provide a different level of policy access for NOAA Education officials. The partnership has established relationships that provide a different level of access to new or refined approaches for audiences, constituents or stakeholders. The partnership is strongly supported by connections between people in both organizations committed to sustaining the partnership.

## **Case Study 1B: NOAA Office of National Marine Sanctuaries (ONMS) and the Oakland Museum of California (OMCA)**

A partnership that began in 2005 with an informal conversation broadens NOAA reach to diverse populations.

### **Background**

The Oakland Museum of California (OMCA) brings together collections of art, history and natural science under one roof to tell stories of California and its people. Opened in 1969, OMCA is a leading cultural institution of the Bay Area and a resource for the research and understanding of California's dynamic cultural and environmental heritage. The museum is a community resource for Oakland and East Bay residents, offering community events, lectures, docent program, school programs, teacher workshops, and off site explorations in California.

OMCA serves primarily East Bay families (80% of total visitorship), paid admission, museum members, and school groups. This museum is becoming more of a tourist destination. The annual visitation in 2012 was 150 thousand with a goal to increase it to 250 thousand.

- The breakdown of ethnic diversity in the Oakland area is White (31%), Black/African American (36%), Asian (15%), Hispanic/Latino (22%), and American Indian, Native Hawaiian/Pacific Islander and other races (14%) according to the 2000 Census.
- About 40% of participating students are from the Oakland Unified School District (OUSD), which includes a diverse student population of over 54 thousand children. The ethnic breakdown for OUSD is 47% African American, 29% Latino, 18% Asian/Pacific Islander, 6% Anglo/European American, and 1% American Indian/Alaskan Native. Nearly 55% of these children come from low-income families and qualify for free or reduced price lunches. More than 35% are recent immigrants who speak English as a second language.

The partnership with OMCA evolved from a conversation in 2005 with an interpretation specialist, who mentioned that a major renovation was planned in the near future and OMCA sought to include more ocean content. This became part of the 5-year exhibit plan, which was adopted by the museum's site management. A proposal of 500 thousand dollars was submitted to NOAA Office of National Marine Sanctuaries (ONMS) for Procurement and Construction Funds (PAC). Funds were transferred through a Broad Area Announcement Grant. In 2007, ONMS awarded funds to the OMCA to build exhibits that focus on Cordell Bank in the OCMA Natural Sciences Gallery.

Through that grant, Jenny Stock of NOAA Cordell Bank National Marine Sanctuary (CBNMS) collaborated with OMCA to produce a new permanent exhibit gallery about CBNMS, other California sanctuaries, and ocean science and conservation. The goals for the exhibits were to:

1. improve public understanding of the importance of California's marine and coastal resources;
2. increase awareness of environmental issues along our coastline and stewardship opportunities;

3. provide a venue for students and public to access current marine research outcomes; and
4. implement innovative interpretive approaches to presenting current marine science related research and how to become active stewards.

## **Results**

NOAA has contributed 500 thousand dollars of funding and 25 to 30 thousand dollars of staff time spent on the partnership, funding mechanism, and exhibit development. The return on this investment includes exhibit space, ongoing education programming, outreach and becoming a hub for learning about National Marine Sanctuaries in California. Most importantly, there is a place for people to learn about Cordell Bank, which is 20 miles offshore and inaccessible to most people. OCMA provides a built-in audience for NOAA to communicate with and influence.

- OCMA audiences - The partnership broadened the NOAA community by reaching a new population in the East Bay. The Natural Sciences Guild, a membership base at the museum that attend natural science lectures and field trips, is considering a multi-day field trip about Cordell Bank NMS in 2014.
- Cordell Bank Gallery - The Natural Sciences Gallery reopened in 2013 and includes seven places: Oakland, Mount Shasta, Tehachapi Mountains, Coachella Valley, Sutter Buttes, Yosemite, and Cordell Bank. The Cordell Bank gallery is a 3 thousand square foot gallery of exhibits showcasing the major marine habitats and communities located within the Cordell Bank NMS. It also includes exhibits on the iconic marine and coastal communities located within all four California National Marine Sanctuaries.
- Education and public programs - In 2012, OMCA initiated a school program focused on Cordell Bank that continues today (as of 2014). This program was funded on their own, without additional funding from NOAA. Jenny Stock had a small role in consulting about the content of this program.

## **Current Status of the Partnership**

This is a currently active partnership (as of 2013). Although all parties would like to continue to work together, this is a fragile time right now in the partnership. Now that the exhibits in the gallery are open and the original MOA has expired, the partners will determine how to work together through programs, community events, and more. There is potential for STEM collaborations, teacher professional development, student programs, after school programs, public programs and further community engagement. In addition, the continued partnership is an opportunity to address following activities:

- Plan ways to obtain the numbers, evaluation, and impact results. The new draft MOA includes such language. Funds were transferred through a Broad Area Announcement Grant, but a better arrangement would have been a cooperative agreement.
- Align the partnership with NOAA's current educational output measures, including formal education programs, informal education programs, and professional development programs.

## **Conclusion**

The OMCA has established relationships that helped provide different levels of a) policy access to those networks for NOAA Education officials, b) science content knowledge, c)

access to new or refined approaches for audiences, constituents or stakeholders in addition to helping contribute to NOAA's workforce development goals. The partnership is strongly supported by connections between people in both organizations committed to sustaining the partnership, although a lack of funding makes this a fragile time for the partnership.

## **Case Study 1C: NOAA and the Science on a Sphere® (SOS) Users Collaborative Network**

A partnership with more than 100 institutions provides effective and efficient communication of NOAA-related science and messaging to the public that reaches over 35 million visitors annually across the globe. A list of the SOS institutions is presented in Table 2 at the end of this case study.

### **Background**

The Science on a Sphere® (SOS) is an animated 68-inch diameter globe designed to show dynamic images and data of the atmosphere, ocean, or surface of a planet or moon. Current global processes are visualized and displayed on the SOS, making this tool a flexible and visually stunning exhibit of real Earth systems science data. Museums, zoos, aquariums, and science centers throughout the world are creating exhibits featuring SOS.

The goal of SOS is to engage audiences with relevant research results and data visualizations about Earth to foster a greater appreciation for the interconnectedness of the planet, how it is changing, and how people will need to react to and plan for the change. NOAA's partnership with the informal science education institutions displaying SOS has helped to advance NOAA's informal science education objectives. They include the following:

1. partner with informal science education centers to integrate ocean, coastal, Great Lakes, weather, and climate science content into their programs through multiple platforms and emerging technologies; and
2. establish and collaborate with networks of informal science education institutions to develop effective practices for science content delivery.

In 2006, OED formed the SOS Users Collaborative Network (SOS Network) to keep the groups involved in the SOS education program working together and focused on the objectives. The SOS Network consists of institutions that have or will have SOS installed as part of a public exhibit, or are currently working with institutions to support the application of the technology. Currently, there are more than 100 member institutions in this international network.

OED supports collaboration among SOS Network members through regular workshops and meetings and through funding opportunities. The institutions involved in the SOS Network discuss the SOS system and software, creation of content, related exhibits, new methods for delivering content via SOS, and many other issues relevant to this effort. OED has involved the SOS Network in a major initiative to assess the education impact of SOS exhibits. By working together, the SOS Network members are advancing their collective ability to teach science with SOS.

The goals of the partnership are to:

- Build capacity of SOS Network institutions to engage audiences with recent and complex Earth system science research results through use of SOS;
- Provide a mechanism for member institutions to share lessons learned about how to use SOS as an effective Earth system science education platform and collaborate with one another;
- Build capacity of docents and presenters to interpret complex data visualizations and discuss Earth system science with public audiences;

- Provide guidelines for creating easily understood, scientifically accurate content; and
- Evaluate the effectiveness of SOS as a learning tool.

The SOS Network is largely maintained through the voluntary participation of SOS sites. SOS Network members share and collaborate freely with minimal interference from NOAA. Services provided by various offices in NOAA and the sharing among Network members are largely in-kind. However, OED has funded SOS exhibit development, content development, and professional development through its competitive Environmental Literacy Grants (ELG) program. ELG also strongly encourages projects to leverage NOAA assets like SOS. To date these grants have totaled over 10 million dollars. The professional development workshops are funded through the National Marine Sanctuaries Foundation.

OED manages the SOS Network. Carrie McDougall is the senior program manager and leads the effort for OED with assistance from Maria Murray and formerly John McLaughlin. Carrie McDougall and John McLaughlin also work on the Environmental Literacy Grants program and coordinate funding opportunities with the needs of the community. OED works very closely with the SOS Technology Team at NOAA ESRL to coordinate activities and participate in bi-weekly team calls. OED also frequently exchanges ideas with other NOAA SOS partners at the Pacific Services Center, the Environmental Visualization Lab, and Climate Program Office.

### **Results**

The Network provides effective and efficient communication of NOAA-related science and messaging to the public at science centers and other institutions that reach over 35 million visitors annually across the globe - a reach that is only possible through this partnership. The partnership is tailored to address NOAA's mission and education goals based on NOAA Education Strategic Plan (2009).

SOS is installed at over 100 institutions worldwide. These institutions include museums, science centers, visitor centers, zoos, aquariums, major federal labs, universities, and a few K-12 schools. Within the United States, there are 62 SOS sites across 28 states. Internationally, there are 42 SOS sites across 15 countries.

In addition to the institutions that exhibit SOS, the SOS Network includes institutions that are government agencies, video production studios, research labs, and informal science education specialists. These institutions generally serve the SOS Network to support content development for display on SOS. A few groups have been involved in evaluating the effectiveness of SOS and SOS presentations for education and engagement.

Activities of the partnership include:

- Collaborative meetings - OED has convened the SOS Network for 5 face-to-face workshops every 18 months and for 5 smaller meetings annually at the Association for Science-Technology Centers conference. These meetings include professional development opportunities and other ways to increase the effectiveness of education practices using SOS. Between meetings, SOS Network members collaborate online by sharing products, resources, evaluations and best practices.
- Technical support - The SOS Tech Team at NOAA ESRL distributes, installs, and provides training for SOS systems year-round. This team is also responsible for providing technical support to all SOS facilities.

- Grants - OED has provided over \$10 million in grants for SOS-related education projects. In the early years of the partnership, OED developed focused funding opportunities to grow and develop the Network in its nascent stages. Funding has been for SOS system installation, exhibit development, content creation, educator professional development, public programs, and evaluation. At times, NASA and NSF have supported SOS efforts through grants.
- Dataset and content creation - Collectively, SOS Network members have contributed over 400 datasets and content pieces to the dataset catalog. NOAA has developed a large portion of these datasets. Network members work together with scientists to create stories related to various Earth system science topics. Data are visualized in ways that are compelling and comprehensible to the public.

### **Evaluation**

The OED and the Institute for Learning Innovation (ILI) conducted a cross-site summative evaluation of SOS impacts involving sixteen SOS sites (Haley Goldman, Kessler, & Danter, 2010). Key results from the evaluation, include:

- Most participants (71%) reported learning something new and provided specific examples as depicted in Figure 17. Learning outcomes did not vary by age, ethnicity, or social groups);
- Those who had seen SOS before were just as likely to report they learned something new as those who had not;
- Most respondents (82%) stated that the spherical display changed their understanding of the information;
- SOS supports understanding complex processes and phenomena; and
- Visitors who saw a facilitated presentation were significantly more likely to report they learned something new (87%) than those who viewed an unfacilitated program (66%).

Figure 17. Categories of Specific Things Visitors Learned. SOS Summative Evaluation.

## **Return on Partnership**

NOAA's role:

- The SOS Tech Team provides SOS software updates, SOS equipment, installation, and technical support;
- NOAA scientists and educators provide content knowledge for exhibit and content development;
- NOAA produces data and data visualizations;
- NOAA catalogs all content (data visualizations, scripts, etc.);
- NOAA staff plans and executes Network workshops/meetings;
- NOAA staff facilitates collaboration and communication across Network; and
- NOAA offers funding opportunities open to the SOS Network.

The SOS Network's role:

- Network members directly interact and share assets, science, and information related to NOAA work to more effectively and efficiently communicate with public;
- Network members contribute to NOAA dataset catalog;
- Network members conduct evaluations on the effectiveness of SOS (a NOAA product) as an educational tool;
- Network members act as trusted providers of scientific information and provide audience-appropriate data presentation and context; and
- Network members provide exhibit space and credit signage for NOAA's Science On a Sphere®.

Both NOAA and Network members produce and share video content and supporting materials (e.g., scripts, activities).

## **Lessons Learned**

Voluntary participation in a networked partnership is critical. While some partners take leadership roles, not all SOS institutions are active partners. Institutions and individuals can broker their own involvement based on their priorities and availability. Less active partners still can gain through their loose affiliation by using contributed content and tips.

A broad network of institutions that are disparate geographically and in their individual missions can be highly collaborative if their common goal is a very focused one. While the specific functioning and needs of each institution are different, the convener of the network (OED) needs to be able to synthesize these needs and hear the signal above the noise to determine common goals and initiatives.

Regular, though infrequent, face-to-face meetings have been an important activity for those who are able to participate. Participants report valuing the forum for networking, collaborating, sharing ideas, and refocusing their thoughts and plans on the central topic of the partnership (SOS).

With so many institutions in a networked partnership, it has been impossible to tie too much of the partnership to specific individuals. As time goes on, the institution's commitment to the partnership may remain even though personnel at these institutions change. Flexibility is needed to engage new people.

In order to keep advancing the work of the partnership, it may be beneficial to engage complementary disciplines and expertise outside the network. Some examples of experts that have helped the SOS Network include: artists, interpreters, evaluators, movie producers, scientists, social scientists, policy makers, and industry.

### **Current Status of the Partnership**

This partnership is active and fully operational. To maintain the SOS Network and plan regular Network workshops, the partnership requires effort from people at all of above mentioned NOAA offices, which totals to over 1 FTE.

The SOS Network was developed to build capacity of informal science education centers to utilize Earth system science data effectively in their education efforts. The Network continues to grow through new SOS installations and an expanding list of organizations supporting SOS work. Both the hardware and software technology is continually updated in response to the needs of the SOS Network members. The SOS Network likely will continue to operate as long as SOS is supported as an educational tool by the SOS Tech Team and the museum community.

While OED has made significant investments in the Network, the financial contributions that are made help sustain the face-to-face focused collaborative meetings that Network members continue to value. The voluntary and collaborative nature of the Network does not necessitate financial contributions. If OED's involvement were to cease tomorrow, SOS Network members would continue to collaborate. The in-kind management work that OED provides does help the Network address cross-institutional needs and priorities in a more unified and synergistic way.

### **Conclusion**

SOS is a high-return NOAA partnership with institutions (as opposed to individuals), requiring different methods of fostering relationships.

Table 2: SOS Network Sites.

<p>Governor Tauese P.F. Sunia Ocean Center          Instituto Oceanografico da Universidade de Sao Paulo          Museum of Natural History          TELUS World of Science          Techmania Science Center          Visual Climate Center          Heureka, The Finnish Science Centre          Cite de L'Espace          Cite des Sciences et de L'Industrie          Museo delle Scienze          Discovery Center          Climate Institute - Puebla, Mexico          Climate Institute - Cuernavaca, Mexico          Climate Institute - Chilpancingo, Mexico          Climate Institute - Atlacomulco, Mexico          Climate Institute - Metepec, Mexico          Climate Institute - Casa de la Tierra, Veracruz, Mexico          Climate Institute - Planetario de Morelia, Morelia, Mexico          Climate Institute - Acapulco, Mexico          Climate Institute - Texcoco, Mexico          Climate Institute - Valle de Bravo, Mexico          Climate Institute - Villahermosa, Mexico          Climate Institute - Oaxaca, Mexico          Climate Institute - Ciudad Victoria, Mexico          Climate Institute at the Natural History Museum          Beijing Huaxinchuanzi Technology Co., Ltd.          China Beijiko Meteorological Museum          China Maritime Museum          China Science and Technology Museum          China Weather Channel, Huafeng Group          Dongguan Meteorology and Astronomy Museum          Fuzhou Science and Technology Museum          Daegu National Science Museum          Gwacheon National Science Museum          Gwangju National Science Museum          KIGAM Geological Museum          National Youth Space Center          Science Centre          Our Planet Centre          Central Weather Bureau          National Museum of Marine Science and Technology          National Museum of Natural Science          Science Museum          Alaska State Museum          Aldo Leopold Nature Center          Aquarium of the Pacific          Bay Education Center          Bishop Museum          Boonshoft Museum of Discovery          Clark Planetarium          Climate Corporation</p>	<p>Cyberinfrastructure Building at Indiana University          Danville Science Center          Denver Museum of Nature &amp; Science          Detroit Zoological Society          Discovery Science Center          E.O. Wilson Biophilia Center          Fiske Planetarium and Science Center of Colorado University          Galaxy E3 Elementary          Grand Canyon Visitor Center          Great Lakes Maritime Heritage Center          Great Valley Museum          Harsco Science Center          Houston Museum of Natural Science at Sugarland          Imagination Station Science Museum          Imiloa, Astronomy Center of Hawaii          Infinity Science Center          International Museum of Art &amp; Science          James Madison University          Lawrence Hall of Science          Maryland Science Center          McWane Science Center          Microsoft Visitor Center          Museum of Science and Industry          NASA Ames Exploration Center          NASA Goddard Space Flight Center Visitor Center          NASA Wallops Flight Facility Visitor Center          Nauticus - The National Maritime Center          NOAA Earth System Research Laboratory          NOAA Headquarters          NOAA Inouye Regional Center          NOAA National Severe Storms Laboratory          NOAA Ted Stevens Marine Research Institute (NMFS)          North Carolina Aquarium          Nurture Nature Center          Ocean Explorium          Oregon Museum of Science and Industry          Orlando Science Center          Pacific Science Center          Point Reyes National Seashore          Science Central          Science City at Union Station          Science Museum of Minnesota          Science Museum of Virginia          Smithsonian National Museum of Natural History          Smithsonian's National Zoo          South Florida Science Center and Aquarium          Space Foundation Visitors Center          St. Charles High School          St. Paul's School          Tech Museum of Innovation          US Astronaut Hall of Fame          Wild Center          Wildlife Experience</p>
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## Case Study 2A: NOAA and the American Meteorological Society (AMS)

A partnership between NOAA and the American Meteorological Society (AMS) develops and implements courses for pre- and in-service K-12 teachers with strong content in atmospheric and ocean sciences. It has reached an estimated 140 thousand teachers and 4.9 million students directly or indirectly since the inception of the program in 1990.

### Background

The AMS is a non-profit professional and scientific organization representing those in atmospheric, oceanic, hydrologic, and related sciences. Like most professional organizations, AMS publishes peer-reviewed publications, holds various meetings and conferences for its members and other professionals involved in scientific research, forecasting and related work. AMS offers numerous educational programs for K-12 audiences, focusing primarily on in-service teachers, and postsecondary audiences. It creates introductory college-level weather, ocean, and climate courses offered by higher education institutions, with a special focus on smaller liberal arts colleges, community colleges, and minority-serving institutions. All educational initiatives include a component directed toward increasing participation of underrepresented minorities in science and science teaching.

The AMS Education Program was established in 1990. This same year marked the beginning of Project Atmosphere and the close working partnership between AMS and NOAA. With a NSF grant and the in-kind support of NOAA, a two-week summer precollege teacher workshop on weather topics was conducted at the NWS Training Center (NWSTC) in Kansas City. The NWSTC summer workshop had already been in existence since 1984, run by the State University of New York [SUNY] Brockport with NWS in-kind support. It became the first major initiative of Project Atmosphere. In 1994, again with primary support via grant from NSF and in-kind support from the U.S. Navy and NOAA, the Maury Project: Exploring the Physical Foundations of Oceanography Program was started at the U.S. Naval Academy. These two summer programs have been held annually since then and provided the initial training of master teachers who were instrumental in the implementation and continued offering of the AMS suite of DataStreme courses.

With the reduction over time of support from NSF, NOAA began providing direct funding in support of both summer training programs. This funding came from different line offices, beginning with annual ad hoc grants from NESDIS, NWS, NMFS, NOS, and OAR. In 2001, the AMS/NOAA Cooperative Program for Earth System Education was proposed in order to draw together the various NOAA and AMS Education Program cooperative components. The working relationship between AMS and the NOAA Office of Education (OEd) was formalized with a Memorandum of Agreement (MOA) on 13 September 2004 and signed by John J. Kelly, Jr., Deputy Under Secretary, NOAA/DOC. The MOA states that

“... the Parties will support a cooperative program of projects and activities in ocean, coastal, atmospheric, hydrologic, and Earth system science education, aimed at preparing citizens in our society to understand and act on information related to our planet’s dynamic air and water systems and how they affect every aspect of our lives.” The MOA formalized the de facto working relationship that has existed between NOAA and AMS for many years.

The DataStreme programs have been developed and continue to be conducted with technical assistance and various kinds of support from all NOAA line offices and hundreds of NOAA personnel. The first DataStreme course, DataStreme Atmosphere, was implemented in 1996 via Local Implementation Team (LIT) leaders, who were trained at Project Atmosphere summer workshops. NOAA provided in-kind support for DataStreme Atmosphere, particularly in the annual summer training of LIT leaders. Each LIT is composed of at least one master precollege teacher and most include a professional meteorologist, hydrologist, oceanographer or environmental scientist. NWS field offices have hosted many of these meetings. In 2002, NOAA began providing direct financial support for this partnership via a grant. In 2004, the National Weather Service's National Center for Environmental Prediction became the primary provider of over 175 real-time meteorological products delivered via the course webpage, including customized maps, charts, imagery, and text.

This partnership has evolved from in-kind support of teacher professional development programs through the direct involvement of NOAA personnel and facilities to financial support in the form of grants and cooperative agreements. NOAA's early awards to AMS were non-competitive, but since 2005 OED has provided a competitive award vehicle for one-NOAA financial support. The DataStreme Ocean course started in 2005 with a 3-year award from NOAA's Environmental Literacy Grant Program. Development and subsequent implementation of DataStreme Ocean and Atmosphere courses has been almost entirely supported by NOAA both through in-kind and annual financial support. In 2007 an institutional award to AMS was established competitively and then renewed in 2012 for another five years. The evaluation criteria of the funding announcement that established the initial institutional award stressed the importance of the involvement of NOAA personnel and other NOAA assets as well as the use of partnerships to leverage NOAA's investment. Since 2007, six NOAA offices (NESDIS, NWS, NMFS, NOS, OAR and OED) have contributed equally to program support, with award administration through OED.

## **Results**

Conservatively over 14 thousand educators, primarily in K-12, have completed the DataStreme Atmosphere and Ocean courses. Teachers have been asked to report on the number of other teachers they train on the course materials and the number of students reached by themselves or these secondary recipients. To date, an estimated 140 thousand teachers and 4.9 million students have benefited directly or indirectly from these courses.

Since 2002, NOAA has provided almost \$7 million in direct financial support to AMS to support its K-12 teacher professional development and leadership training programs.

The in-kind contribution of 275 NOAA professionals involved in supporting DataStreme Atmosphere and DataStreme Ocean courses is estimated to range from 96 to 120 hours per year per person for an average of 5 years since 1996. The time estimate is based on the average volunteer time for one NOAA LIT member assuming a contribution of 4 to 5 hours per week in each 12-week semester. NOAA personnel have also provided time and expertise in the review of AMS's course materials, but this contribution has not been quantified. Nevertheless, assuming \$150K for the annual cost per federal FTE (a standard estimate), NOAA's minimum in-kind contribution has been \$9.52M – 11.90M since 1996.

The in-kind contribution is likely much greater because the estimate does not include the review of course materials and support provided at NOAA locations for LIT meetings, as well as the summer institutes that train the master educators who in turn become LIT members. Additionally, this figure does not include the in-kind cost of NCEP's production of real-time data visualizations and explanatory text.

A conservative per-teacher cost estimate ranges from \$1,158 to \$1,325. NOAA's real and in-kind investment has enabled the integration of NOAA data, data products, and educational resources into these teachers' classrooms and beyond, thus introducing 4.9 million students in the US to NOAA-related sciences and NOAA products.

Further, NOAA's investment in these courses has been matched almost dollar-for-dollar by AMS. Through SUNY-Brockport, AMS has been able to offer tuition waivers for their course credits. This offer of three free course credits is a huge incentive for educators to complete the semester-long courses. AMS's cumulative in-kind contribution in tuition waivers for DataStreme Atmosphere and Ocean course participants is \$20.2 million, with an average participant cost of \$1,373.

### **Lessons Learned**

One of the reasons for AMS's continued success in sustaining this partnership over such a long time is their continual cultivation of supporters among NOAA leadership as well as those individuals providing in-kind support "on the ground." The deep and long-lasting connections with individuals at NOAA have enabled AMS to sustain some financial support even while overall funding has gone down. AMS continues to focus on long-term involvement of the teachers who have taken their courses and local implementation team members who have helped them implement their programs. Additionally, AMS has leveraged the funding provided by various federal agencies across its suite of programs that they offer in support of K-12 and higher education. This has been a strong selling point with NOAA leadership.

### **Current Status of the Partnership**

AMS has been a driving force behind this partnership and AMS educational staff members have actively cultivated numerous connections throughout the agency. Consequently, the biggest challenge in recent years has been sustaining a budget from across all line offices during the strained financial situation facing the agency's budget, especially for its education programs. An additional challenge from OED's perspective has been managing the process for obtaining funds from across the line offices while continuing to encourage AMS to conduct a more robust evaluation of their courses' impacts despite recent budget cuts.

NOAA personnel and NOAA data products, educational resources and other assets will continue to be a key piece of the DataStreme courses. The question is whether AMS will be able to shift the burden of financial support to other sources outside of NOAA. The institutional award established in 2007 was intended to show NOAA's long-term commitment to the program with the expectation that over time the dependence on NOAA funding to sustain the routine operations of the DataStreme courses would decline. AMS is currently developing revenue streams from the sale of their course materials, as textbooks and more recently e-books, from multiple programs to sustain these operations.

**Conclusion**

The NOAA partnership with the American Meteorological Society (AMS) meets the criteria of a high-return partnership, in that the benefits to NOAA and partners outweigh the investment and involvement for all parties involved. The partnership provides benefits national, regional, local initiatives as described in this case study. Partnership success has been contingent on connections among people in both agencies.

## Case Study 2B: National Weather Service (NWS) and PLAN!T NOW

A partnership between the National Weather Service (NWS) and PLAN!T NOW with the NOAA Office of Education, National Weather Service Outreach Program, and the American Meteorological Society-Education Office to produce the Young Meteorologist Program.

### Background

PLAN!T NOW (P!N) is an international disaster preparedness nonprofit organization whose public awareness campaigns help individuals and communities in the United States and worldwide understand the best strategies for surviving natural and human-made hazards. P!N's hallmark public education initiative, the Young Meteorologist Program is a free online computer game that educates and empowers children in grades K-8 about severe-weather science, weather confidence and safety.

Founded in 2005 after Hurricane Ivan devastated Grenada, P!N assists communities at risk of being impacted by disasters including hurricanes, flooding, lightning, tornadoes, winter storms, earthquakes, fires and other natural and man-made disasters. It provides relief in the form of scholarships to meteorology students and students affected by severe weather events. P!N has advocated empowering people for severe weather events with eye-catching, engaging information. The program portfolio includes public awareness campaigns that help individuals and communities understand the best strategies for surviving natural and human-made hazards. P!N works with public, government, nonprofit and private partners from fields as diverse as disaster relief, insurance, social work, disaster studies and meteorology to disseminate important information to help those at risk of disasters prepare their families and communities.

The NWS was introduced to the PLAN!T NOW (P!N) organization by the AMS. After requesting NOAA General Counsel guidance, it was determined both organizations (P!N and NWS) had similar education goals and both organizations would benefit from a partnership. An MOU was signed by both organizations and NWS appointed the Outreach Program Manager as the science advisor to P!N.

Unique for the National Weather Service, it has granted non-exclusive, royalty-free, worldwide rights to P!N to use all versions of its Owlle Skywarn trademark and severe weather slogans, "Turn Around Don't Drown." to produce the Young Meteorologist Program (YMP) and in all promotional activities related to the YMP. YMP is a digital evolution of the National Weather Service's famed Owlle Skywarn publication, which has educated children about the dangers of severe weather since the 1970s. A goal of the partnership is to associate Owlle with severe weather preparedness in the same way the US Forest Service and their Smokey Bear is associated with forest fire prevention. The YMP team consists of science teachers and educators, meteorologists, software developers, marketing professionals and celebrities from the entertainment industry.

YMP takes children in third through eighth grades on a "Severe Weather Preparedness Adventure" where they encounter lightning, hurricanes, tornadoes, floods, and winter storms. The YMP centerpiece is an interactive online game featuring a 21st-century Owlle Skywarn, a quirky owl and junior data collector for the weather center who helps kids prepare for real life severe weather and natural hazards. In addition, through the program website, young meteorologists will be presented with opportunities to put their new knowledge to work through hands-on activities and community service projects.

YMP offers a safe, non-threatening learning environment to show children how to prepare to protect themselves, help their families, and their communities when a real storm or other forms of severe weather comes to their city or town. The YMP stands out from other preparedness programs because it is aimed at children as the gateway into families to take action, i.e. creating a family disaster supply kit. Resources that educators, parents, and meteorologists can use to guide their newly appointed Young Meteorologists are available.

## **Results**

NWS's long term goal is to significantly reduce the NWS Owlle publication costs and thus save the federal government annual printing costs. Annual printing cost savings to the federal government range from 15 thousand to 20 thousand dollars annually. Since Owlle's inception in 1974, NWS estimates it has printed over 1.5 million copies of the Owlle publication, 30 to 40 thousand copies annually. NWS expects the YMP to be even more popular since it will be available for free on the Internet.

YMP went online September 2012. P!N has installed Google Analytics to collect data on visits to the YMP website. For example, preliminary metrics collected during the period of July 2011 to February 2013 there were a little less than 11 thousand visits to the YMP web site. NWS and P!N are working on methods to provide routine metrics. This is still a work in progress.

Initial testing, including classrooms, has shown YMP is popular with all family members including children, parents and grandparents for a "family" bonding session. Players who complete the game earn a Young Meteorologist Certificate.

Data was collected from the NWS field office staff using YMP in local community outreach events, such as school visits, and from AMS Atmospheric Education Resource Agents who used the YMP material in their classrooms. NWS and P!N continue to promote the YMP activity at conferences and celebrity events. NWS takes the lead in promoting YMP in science and education conferences.

P!N has provided the following:

- YMP game software;
- YMP high quality graphics for YMP banners and exhibits;
- YMP bookmarks for NOAA/NWS education and outreach events; and
- P!N Owlle costume, available to NOAA/NWS for outreach events nationwide.

NOAA has contributed approximately 1 FTE in staff time. NOAA has also provided materials (e.g., curriculum, activity kits, literacy guides, outreach materials), expertise (e.g., scientific, educational), datasets and data visualizations. The P!N/YMP activity is integrated into NOAA and NWS exhibits at conferences and workshops. NOAA/NWS Scientific content (e.g., publications-imagery) are provided and integrated into the P!N/YMP web site, which is accessed by teachers, students, educators and the public.

NWS has provided the following:

- Accurate and current science: hurricanes, tornadoes, winter storms, lightning, floods;
- Safety and preparedness content from Red Cross and FEMA;

- Marketing and promotional opportunities within the “Weather Enterprise” community;
- New P!N Team members (National Weather Association-Midland Radio);
- Promotion of the YMP on the NWS Weather Forecast Offices home page; and
- YMP Facebook and Twitter presence.

P!N's professional experience in marketing and promotion allows NOAA and NWS messages to reach large, broad audiences. High visibility media entertainers such as Kenny Chesney, Michael Douglas and Morgan Freeman and P!N celebrity boosters provide opportunities for NOAA and NWS to promote severe weather safety to markets and organizations not usually linked with government agencies. For example, the 2012 Celebrity Golf tournament had NWS weather safety messages (e.g., “When Thunder Roars, Go Indoors”) posted at every hole during the tournament.

P!N is constantly seeking events outside the "weather enterprise community" to expand the reach of NOAA Education and NWS Outreach. P!N promotes the NWS Weather Ready Nation Campaign and its messages at venues outside of the "weather enterprise" such as the Federal Government's Public Service Recognition Week-DC.

### **Lessons Learned**

Frequent, honest communication between all members of the partnership (including scientists and administrators) is critical. Face-to-face meetings are critical. Modern technologies (e.g., emails, webinars) are not a substitutes for face-to-face meetings.

The composition of the team is important, each having open minds and being respectful of different opinions. Strong, dynamic team leadership which can reach consensus is a must.

Making sure the partnership stays relevant throughout the years is important. During the course of the partnership, budgets change, new capabilities emerge, and surprises pop up along the way. The team must be nimble and respectful of other team members. There could also be an element of growth into new unexpected areas which the partnership did not originally anticipate.

### **Current Status of the Partnership**

The partnership began in 2010, and is active and fully operational. Strategic planning continues between both organizations on how to promote the NWS Weather Ready Campaign nationwide using high visibility venues such as music concerts, sporting events and TV talk shows. This is still a work in progress, looking to involve more organizations within the weather enterprise, such as Midland Radio Corporation (NOAA Weather Radio manufacturer) and The Weather Channel.

### **Conclusion**

The partnership between NWS and P!N allows the NWS to reach out to communities, organizations outside of the weather enterprise community. This is consistent with the recent National Academy of Public Administration's report: "Assuring the Capacity of the NWS". The report for the NWS "...considerable engagement and close collaboration with public and private sector partners. The NAPA report further states the NWS will need the support and cooperation of its partners to achieve its vision of a "Weather Ready Nation."

### **Case Study 3A: EPA Great Lakes National Program Office (GLNPO) and the Center for Great Lakes Literacy (CGLL)**

A partnership between the EPA Great Lakes National Program Office (EPA GLNPO) and the Center for Great Lakes Literacy (CGLL) ensures continued support for Great Lakes literacy collaborative efforts.

#### **Background**

The Great Lakes Literacy effort had its origins in the Ocean Literacy movement, where hundreds of scientists and educators contributed time and expertise to develop a concise framework for conveying the most important ocean science principles and interconnected concepts that all citizens should know. Educators in Centers for Ocean Sciences Education Excellence (COSEE) Great Lakes gratefully acknowledge the groundbreaking work of those who contributed to Ocean Literacy.

While the Ocean Literacy principles and concepts provided useful guidance for teaching about the marine environment, educators using ocean literacy principles in the Great Lakes found themselves stretching to say “ocean” when teaching on a lake. After aquatic educators in Ohio identified a need for a place-based environmental literacy framework for Lake Erie, the Lake Erie Literacy Principles (LELP), based on the Ocean Literacy framework, were developed to guide a unified strategic plan for Lake Erie education and outreach. Concurrent with the development of the LELP, COSEE California, a guiding force in the Ocean Literacy movement, recognized the need to expand the utility of the Ocean Literacy Principles for the Great Lakes region. With the support of COSEE California, COSEE Great Lakes education leaders in the Great Lakes Sea Grant Network examined the Ocean Literacy Principles and LELP and drafted a baseline set of principles for Great Lakes literacy in October 2009. The draft was reviewed and edited by more than 80 scientists and educators throughout the eight Great Lakes states. Ohio Sea Grant educators synthesized and organized feedback, ultimately compiling Great Lakes Literacy Principles and Fundamental Concepts for Great Lakes Learning.

For the development of Great Lakes Literacy Principles, the concepts of Ocean Literacy were followed as closely as possible, acknowledging the leadership role of the Ocean Literacy community and wider public input to the project. Additionally, the Earth Systems background of Ohio educators, beginning with Lake Erie principles, contributed to a need to say more about connections of humans with the lakes than was encompassed in Great Lakes Literacy Principle #6: The Great Lakes and humans in their watersheds are inextricably interconnected. From the Lake Erie document, then, Great Lakes Literacy adopted Great Lakes Literacy Principle #8: The Great Lakes are socially, economically and environmentally significant to the region, the nation and the planet. This addition allows for greater inclusion of the environmental history of the lakes and their role in the development of the region’s history, economy, and regional identity.

With the elimination of NSF funding for COSEE, COSEE Great Lakes’ successful programs and resources were reinvigorated in 2012 as the new Center for Great Lakes Literacy (CGLL). NOAA Sea Grant educators from across the Great Lakes basin (New York, Pennsylvania, Ohio, Michigan, Illinois, Indiana, Wisconsin, and Minnesota) who were previously part of COSEE Great Lakes, cultivated a rich collaborative relationship with EPA’s Great Lakes National Program Office (GLNPO) in Chicago. CGLL strives to develop a Great Lakes-literate public capable of effectively contributing to the environmental,

economic and social sustainability of the Great Lakes. The group fosters informed and responsible decisions that advance basin-wide stewardship by providing hands-on experiences, educational resources and networking opportunities. These activities promote Great Lakes literacy among an engaged community of educators, scientists and citizens. The center is primarily funded by the Great Lakes Restoration Initiative (GLRI) money administered via EPA GLNPO.

### **Results**

EPA GLNPO provides access to the R/V Lake Guardian for five years. Focusing on a different lake each year, fifteen teachers spend one week aboard the vessel participating in the annual Great Lakes Shipboard Science program. The contribution of technical logistics, staff time and scientific expertise is essential in maintaining this highly successful and unique professional development opportunity. EPA GLNPO also partners with Sea Grant on the Limno-Loan program, where past participants in CGLL events can request use of one of four HydroLab multiparameter sondes for assessing water quality for use in their own educational setting. While Sea Grant coordinates the overall program, EPA GLNPO has purchased and maintains the equipment, as well as provides technical support.

NOAA's Great Lakes Sea Grant educators provide support for workshops, including participant selection, trip agenda, NOAA curricula, NOAA scientists to work with teachers, land-based facilities for professional development, knowledge and expertise of Great Lakes environmental issues, and educational resources to share with participants. NOAA Sea Grant educators also conduct "Teachable Moments," which are one to two day workshops, and sponsor opportunities for stewardship, citizen science and outreach events (e.g., Great Lakes Awareness Day). Staff time, website development, communications and publication development is also provided as in-kind support. Specifically, Ohio Sea Grant conducts a week-long course on Great Lakes Education, held at Stone Laboratory on Lake Erie, and provided facilities, equipment, staff, materials and relevant curricula. Ohio Sea Grant provided 2 thousand dollars for instructor salary for a Great Lakes Education course, while GLRI funding from EPA provided 5 thousand dollars in participant support. NOAA Sea Grant staff time in maintaining the CGLL partnership is approximately less than 0.2 FTE across the basin and is often combined with other program efforts.

Highlighted effects of this support includes:

- Allowing for the continuation of the Great Lakes Shipboard Science workshop for educators aboard the R/V Lake Guardian;
- Enhancing place-based learning opportunities (including shipboard science and citizen science programs, as well as environmental stewardship events), in eight states throughout the Great Lakes region;
- Funding Great Lakes Awareness Days (GLADs) and Teachable Moment workshops in regional states;
- Supplying technical equipment for place-based learning opportunities about water quality;
- Providing classroom teachers the opportunity to attend and present at the International Association for Great Lakes Research (IAGLR) Conference;
- Providing travel and tuition support for participants in The Ohio State University's (OSU) Great Lakes Education Workshop; and

- Aiding in the revitalization of the COSEE Great Lakes website as it transitions into cgl.org (a hub for regional NOAA/Sea Grant professional development opportunities).

### **Lessons Learned**

Coordinating Great Lakes educational efforts among 5 lakes, 7 Sea Grant offices and eight states, along more than 10 thousand miles of shoreline and throughout 247 thousand square kilometers of watershed, and for more than a quarter of the U.S. population takes teamwork. CGLL is a true team of educators and the concept of captains and crew is unknown to the group.

*Lesson 1: Establish a few key programs that will be standard throughout the group, but allow partners to branch out with their own specialties.*

The EPA GLNPO-CGLL partnership is built upon the successful events and best management practices that originated with COSEE Great Lakes, as well as the individual strengths of the seven Sea Grant state programs in the Great Lakes network. This collaborative model maintains the key programs for which COSEE Great Lakes was known for (e.g., Shipboard Science on the R/V Lake Guardian, Teachable Moments, land-based watershed workshops, and IAGLR's Educator Day), while allowing individual states to broaden their education and outreach efforts in their areas of expertise. For instance, one state may have the equipment and facilities to host professional development for pre- and inservice educators, while another state may focus on citizen science or stewardship projects for K-12 students, and a third state may prefer to enhance Great Lakes literacy via webinars and social media. All members of the partnership share a vision to develop a Great Lakes-literate public capable of effectively contributing to the environmental, economic and social sustainability of the Great Lakes. However, supporting each state program's unique strategies and established successful projects to achieve this goal allows CGLL – and thus NOAA – to expand its community of practice to a larger network of Great Lakes educators, scientists, and citizen science groups who will become committed to stewardship of our greatest freshwater resource.

*Lesson 2: Emphasize evaluation.*

Frequent reporting requirements are present at all levels (state, regional, national). Formative and summative evaluation not only provides constructive feedback for programs, but also serves as a framework for needs assessments or justification for future funding opportunities. Clearly identifying areas of need or gaps in aquatic education initiatives allows CGLL to develop competitive proposals for additional financial support and broaden their scope of impact.

Logic models assist in clearly identifying measurable outcomes for projects. Furthermore, CGLL is developing a system of common metrics to ensure objectives are achieved, including core questions for use in all CGLL programming and a bank of elective questions specifically designed for different types of activities (e.g., stewardship projects, teacher professional development workshops, or ) and various audiences. Investment in online survey software to streamline data analysis and house a question bank saves time and allows members of the partnership to efficiently share vetted survey questions and formats.

Moreover, CGLL focuses on following up with participants for an extended period after programming to collect data on the achievement of long-term outcomes. Ohio Sea Grant is

facilitating an extended longitudinal survey examining the impacts of the Great Lakes Shipboard Science workshop on educators and their students since its inception in 2006. These strategies ensure a richer understanding of the effects of NOAA's regional efforts to increase Great Lakes literacy.

### *Lesson 3: Communicate regularly*

An initial strategic planning meeting hosted by EPA GLNPO set the course for regular and consistent communication among the group. Although CGLL spans a large geographic area, members use their attendance at regional and national events (e.g., Great Lakes Place-based Education Conference, Great Lakes Sea Grant Network Meeting, or National Marine Educators Association Annual Conference) as opportunities to convene, reflect on CGLL events and plan future endeavors.

CGLL also recognizes the strengths of individual Sea Grant programs and supports those programs in completing specific tasks that sustain the group as a whole. Illinois-Indiana Sea Grant recently developed a poster presentation introducing CGLL and made it available for all members to use. Frequent conversations (via phone or email) between partners update everyone on progress and happenings, as well as encourage accountability and continued completion of tasks.

### **Conclusion**

The partnership between the EPA Great Lakes National Program Office and the Center for Great Lakes Literacy catalyzes established relationships that integrate Great Lakes science and technical expertise with effective educational pedagogy. EPA GLNPO administers the GLRI funding that supports the CGLL collaborative effort. It helps NOAA provide a more expansive level of access to new or refined approaches for audiences, constituents and stakeholders to protect, maintain and restore Great Lakes ecosystems.

The partnership is strongly supported by connections between people in both organizations committed to sustaining the collaborative efforts. Furthermore, it allows Great Lakes Sea Grant Educators to achieve all six outcomes under NOAA's educational goal of advancing environmental literacy.

The development of a locally sustained partnership following the conclusion of grant funding is continued and sustained by rich, collaborative relationships among several regional groups focused on the same goals.

### **Case Study 3B: Channel Islands National Marine Sanctuary (CINMS) and Channel Islands National Park (CINP)**

A partnership between Channel Islands National Marine Sanctuary and Channel Islands National Park created a cooperative educational program to the benefit of all partners involved.

#### **Background**

Channel Islands National Park (CINP) is a special terrestrial and marine protected area of national and global significance, administered by the National Park Service. The park consists of 250 thousand acres of land and ocean environment encompassing the Anacapa, Santa Cruz, Santa Rosa and San Miguel Islands. CINP monitors and protects threatened and endangered species, restores ecosystems and preserves those natural and cultural resources for current and future generations. 300 thousand visitors to park visitor center, 30 thousand people to the islands and an additional 60 thousand to park and sanctuary waters through various commercial and recreational boating activities.

In 2000, Channel Islands National Marine Sanctuary (CINMS) established a MOU with whale watch and marine excursion vessel operators who operate out of Santa Barbara Harbor, Ventura Harbor, and Channel Islands Harbor. The MOU created a cooperative educational program between CINMS and the vessel operators. CINMS trains and schedules specially trained volunteers to represent the sanctuary and educate passengers on board vessel operators, at local outreach events, and to serve as citizen scientists collecting opportunistic marine mammal sighting data.

In 2002, an MOU between the CINMS and CINP was established to merge the programs to include joint training, funding and scheduling of volunteers. The program name was changed to the Channel Islands Naturalist Corps. Volunteers represent both agencies on board CINP concessionaire vessels as well as non-concessionaire marine excursion vessels operating in the Santa Barbara Channel and CINMS and CINP waters. The partnership enables CINMS and CINP to have more efficient use of community volunteers and allows each agency to expand its educational services while also providing additional opportunities.

Channel Islands Naturalist Corps (CINC) are a group of specially trained volunteer ocean stewards dedicated to educating passengers on board vessels visiting the Channel Islands National Marine Sanctuary and National Park. Members provide education about the unique marine life found in sanctuary and Park waters to thousands of local residents, tourists, and school children annually. CINC volunteers also participate in numerous local outreach events and collect valuable research on marine mammals and other important sanctuary and Park resources. Volunteers accepted into the program are specially trained in a 5-week training class. Topics include sanctuary and park resource protection programs, interpretation techniques, and an overview of the physical, biological, and cultural aspects of the Santa Barbara Channel and the Channel Islands.

#### **Results**

- Engagement - 137 volunteers actively participate in the program annually. The program has a high level of retention and represents community members with varied backgrounds from scientists to teachers and students to the retired. They donate approximately 34,000 hours;

- Reach - Volunteers reach over 400,000 people annually through participation in over 35 outreach events in Ventura and Santa Barbara and Los Angeles counties and as naturalists aboard 8 whale watch vessels in 3 main harbors;
- Budget - All undertakings by CINMS and CINP are subject to the availability of appropriated funds. CINMS annual volunteer program budget, not including staff salaries, is 10 thousand dollars. A percentage of the CINP volunteer fund is provided each year to the program. This amount varies depending on the needs each year of additional Park volunteer programs. In addition, CINP will provide in-kind staff services and CINP visitor center auditorium facility for training classes and meetings.
- Supervision - Personnel facilitate and coordinate whale watch calendar with all non-concessionaire and CINP concessionaire non-landing trips. NPS coordinates directly with CINP concessionaires to coordinate CINC "Island Hike Naturalist" staffing on both day and overnight landing trips to the islands;
- Scheduling - CINMS and CINP coordinate staffing at community events. Efforts will be made to have both agency booths next to each other at events in order to share volunteer staff and to demonstrate the agency partnership;
- Liability - CINC volunteers work under an interagency position description and sign both agencies' volunteer agreements and liability forms. Liability for non-landing trips is covered by CINMS. Liability for all landing trips, where volunteers go ashore to lead a hike, is covered by CINP. Vessel operators purchase and maintain comprehensive general liability insurance and such insurance policies shall be assumed by, credited to the account of, and undertaken at vessel operators' sole risk; and
- Recognition - CINMS has a volunteer tracking database and recognizes volunteers for efforts at an annual volunteer recognition dinner. CINP helps with this event and provides "Volunteer Recognition" day trips to the islands throughout the year. Program also has national prestige and has received the US Department of Commerce's Take Pride in America national award for the best Federal volunteer program in 2011. A CINC volunteer received the 2012-13 National Marine Sanctuary Foundation Volunteer of the Year award.

### **Lessons Learned**

It is important to diversify funding streams (appropriated and through foundations) to maintain a fully operational volunteer program like the Channel Islands Naturalist Corps. The return on investment with a volunteer program like this is remarkable, 135 volunteers donate approximately 34 thousand hours and reach over 400 thousand people annually. However with declining federal budgets, it is becoming necessary to seek outside funding and sponsorship sources to maintain all the vital functions of the program (i.e. uniforms, recognition dinner, training, staffing).

### **Current Status of the Partnership**

CINMS is still obligating program funds toward CINC supplies and recognition budget; however, both agencies struggle to provide adequate staffing to maintain such a large volunteer program.

**Conclusion**

The partnership enables CINMS and CINP to have more efficient use of community volunteers and allow each agency to expand its educational services while also providing additional opportunities for volunteers.

## DISCUSSION

Evaluation activities were conducted to clarify the definition of NOAA Education high-return partnerships, identify partnership activities, and identify case studies to understand the mechanisms that operate within a high-return partnership.

### Research Questions

This section of the report summarizes the findings based on the research questions and data collected.

#### **Research Question 1: How can NOAA partners help meet our mission?**

Partners can help complete the NOAA mission by extending the reach of programs, and by increasing program efficiency and effectiveness. These outcomes cannot be achieved by NOAA alone, and therefore partners are critical in meeting NOAA's mission. Each outcome is discussed below, supported by results from survey data and case study analyses. The logic model (Figure 18) illustrates how partners and partnerships support the NOAA mission.

Figure 18. NOAA Education Partnerships Logic Model.

#### *Reach*

NOAA cannot hope to engage the entire Nation in terms of education and outreach. Partnerships expand NOAA's reach, leveraging partners' own relationships with audiences. Understanding the audience of the partner and the kind of relationship they have with them is an important part of partnership formation. The NOAA Education Partnership Survey data and selected case studies illustrate NOAA's expanded reach to audiences on very large scale. For example:

- Respondents indicated that new audiences were reached by 97% of partnerships [Analysis Question 11];
- In 2012, the Exploratorium [Case Study 1A] reached 570 thousand visitors living in or visiting the San Francisco area ;

- The Science on a Sphere® [Case Study 1C] has more than 100 installations worldwide;
- The AMS partnership [Case Study 2A] has reached more than 140 thousand K-12 teachers and 4.9 million students directly or indirectly since the inception of the program in 1990; and
- Volunteers reach more than 400 thousand people annually through the CINMS and CINP partnership [Case Study 3B].

Simply reaching more people is not enough, partner institutions should also share the NOAA Education mission and goals. Results from the NOAA Education Partnership Survey and resulting case studies indicate how partners share the NOAA mission:

- Respondents indicated that they include opportunities for NOAA messaging (84%), help NOAA address education strategic goals and objectives (79%), and share similar values and qualities (78%) [Analysis Question 14]; and
- The EPA GLNPO and CGLL [Case Study 3A] partnership allows Great Lakes Sea Grant Educators to achieve all six outcomes under NOAA's educational goal of advancing environmental literacy.

A heretofore unacknowledged benefit is that an education partnership can move beyond education to extend NOAA's operational reach, at least in the case of Exploratorium [Case Study Example 1A]. This partner has now become part of the observing system and is a port where NOAA ships can dock. This partnership contributes to the NOAA mission on education, operations and science arms of the agency.

Reach can also be considered geographically. NOAA's mission covers the entire United States, U.S. territories, its oceans and coasts, and the mission differs in each region. Using maps such as Figure 8, NOAA can assess gaps in partnerships to reach all regions, for example a state in a region is not represented by a partner. Leveraging regional investments and partnering with other groups that share regional missions allows NOAA to reach people in the region focused on that region's issues. For example:

- Respondents indicated that the majority (73%) of NOAA education partnerships occur on a regional or smaller scale. Specifically, 40% were reported as local, 21% as state and 12% as regional [Analysis Question 6];
- Respondents indicated that partnerships take place in local communities where NOAA offices, labs, sanctuaries, and reserves are located (64%) [Analysis Question 14] as shown in Figure 8;
- The CINMS and CINP partnership [Case Study 3B] focuses on educating people of all ages about the park and sanctuary's special terrestrial and marine protected area of national and global significance through a partnership with vessel operators and the training a cadre of volunteers.

### *Efficiency*

NOAA must make the most its resources, funding, and staff. NOAA Education cannot expect additional resources in order to reach and educate the Nation in our mission. Partnerships increase efficiency of allocated resources. By combining forces with partners that may also be resource-limited, NOAA and its partners can work together on a shared mission. The characteristics of NOAA and the partner must be complementary and symbiotic. Authority

and organizational characteristics can be critical to success when they complement each other. For example:

- The Science on a Sphere® [Case Study 1C] partnership, with more than 100 collaborating institutions worldwide, provides effective and efficient communication of NOAA-related science and messaging to the public, reaching more than 35 million visitors annually; and
- Great Lakes partners [Case Study 3A] share and contribute resources to run programs collaboratively.

#### *Effectiveness*

NOAA is not an expert in everything and cannot expect to hire and bring experts for everything it needs to accomplish. Partnerships improve program effectiveness by leveraging a partner's expertise. The core business of a partner might be to develop interactive science exhibits. This will never be the core business of a federal agency, yet NOAA can partner with others and bring its expertise in science content, which is NOAA's core business. Leveraging the strengths of each partner should result in a more effective program, experience or engagement with the target audience than if each partner were to go it alone.

#### **Research Question 2: How does NOAA maximize NOAA Education partnerships?**

Maximizing partnerships can occur in a variety of ways, by providing funding and staff time, leveraging resources, increasing reach or maximizing personal relationships (i.e., the "people factor"). Not all partnerships bring in funding, but many partnerships provide reach beyond what could be accomplished in the absence of the partnership. A clear and significant finding of this study is the important role that human and social capital plays in maximizing NOAA Education high-return partnerships. This is echoed by the NRC (2010) report which noted that "people are NOAA's most valuable assets" (p. 149). Another key finding of this study is the importance of the maturity of the partnership. While not necessarily merely measurable in years, a mature NOAA Education high-return partnership provides significant returns, often with minimal but necessary maintenance.

#### *Funding and staff time*

NOAA must understand its contributions in terms of funding and staff time regarding high-return partnerships. The NOAA Education Partnership survey asked respondents to estimate NOAA's contribution in the form of money invested, the staff time in the form of FTE, and what NOAA and the partner contributed in the form of resources.

- Not all partnerships require a great deal of funding or staff time [Analysis Question 7 and 8].

Although beyond the scope of this study, the PWG wondered if the monetized outcomes or benefits of the partnership was greater than the monetized inputs or costs. Measurement of monetary partnership contributions can be achieved through a cost-benefit analysis. NOAA Education is now well positioned to conduct such an analysis and monetize the contributions and outcomes of a partnership. The work will be extensive, and require a sense of the type of outcomes to be monetized. Only a few NOAA Education partnerships will have sufficient information required for a cost-benefit analysis.

### *Leveraging Resources, Increasing Reach, and Maximizing Personal Relationships*

Results from the NOAA Education Partnership Survey and resulting case studies provide examples of the contributions and outcomes as a result of partnerships. For example:

- Respondents indicated that new audiences were reached by 97% of partnerships [Analysis Question 11];
- Local and in-kind funding and resources are leveraged in the Great Lakes [Case Study 3A: EPA GLNPO and CGLL] to facilitate the Great Lakes Literacy effort, which is strongly supported by connections between people committed to sustaining the collaborative efforts;
- Local resources and expertise are leveraged [Case Study 3B: CINP];
- Personal relationships are leveraged as well as dollars [Case Study 1A: Exploratorium; Case Study 1B: OMCA; Case Study 1C: SOS; Case Study 3A: EPA GLNPO and CGLL];
- NOAA offices are able to expand upon a partnership to involve broader participation, including the science arm of the agency [Case Study 1A: Exploratorium; Case Study 2A: AMS];
- Partners leverage NOAA funding and support into additional investments from other funders [Case Study 2A: AMS; Case Study 3B: CINP]; and
- Benefits as an indirect result of partnership (e.g., sustained capacity, investment in infrastructure, permanent exhibit leads to programming) [Case Study 1A: Exploratorium; Case Study 1B: OMCA].

Another consideration of how NOAA maximizes Education partnerships is to examine non-monetary quantitative data in terms of touchpoints. For example:

- The number of parts of NOAA involved in the partnership;
- The number of parts of the partner organization involved in the partnership;
- The number of activities completed as a result of the partnership; and
- The number of resources (or assets) shared between the partners beyond normal duties (e.g. buoy data, NOAA equipment, scientific expertise)

### *Level of Maturity of the Partnership:*

Partnerships may reach a level of maturity where relatively modest in-kind contributions by NOAA are needed to sustain the partnership [Case Study Example 1A: Exploratorium; Case Study Example 2A: AMS]. At this stage, significant returns often result. However, the majority (76%) of NOAA Education partnerships reported in this study have been in place for eleven years or less [Analysis Question 4]. While the maturity of a partnership cannot be calculated simply by the number of years in existence, partnerships that end “too early” may not reach the high-return stage. It is in NOAA’s best interest to facilitate and nurture the most promising partnerships to attain a high level of maturity to fully realize its potential and maximize the benefits to all parties involved.

### **Research Question 3: What qualities are shared by NOAA Education high-return partnerships?**

In an effort to focus the quality and number of partnerships reported in the NOAA Education Partnership Survey, respondents were asked to select their “top 5” high-return partnerships. High-return was defined by the PWG as “benefits to NOAA and partners outweigh the investment and involvement for all parties involved.” The PWG assumed all partnerships reported were indeed high-return, and cross-case study analysis revealed

several aspects as common and integral components of a NOAA Education high-return partnership.

Several characteristics are common among NOAA Education high-return partnerships. The case studies illustrate many of these characteristics, and commonalities were further categorized into performance or organizational aspects.

Performance aspects, or how the partnership is formed, staffed, and extended, indicative of a high-return partnership include:

- Partners leverage NOAA dollars to secure funding and in-kind support from other sources [Case Study 1C: SOS; Case Study 3A: EPA GLNPO and CGLL];
- Staff time invested by partners is equal to or greater than NOAA staff time [Case Study 1C: SOS];
- Partnership as networks a large number of multiple partners [Case Study 1C: SOS; Case Study 3A: EPA GLNPO and CGLL];
- Partnership opens the doors to new partners [Case Study 1B: OMCA; Case Study 1C: SOS; Case Study 2A: AMS; Case Study 2B: P!N; Case Study 3A: EPA GLNPO and CGLL];
- NOAA resources are used in new and different ways [Case Study 1A: Exploratorium; Case Study 1C: SOS; Case Study 2B: P!N]; and
- Opportunities are capitalized on as they arise [Case Study 2B: P!N; Case Study 3A: EPA GLNPO and CGLL; Case Study 3B: CINP].

Organizational aspects, or how the partners work together and manage the partnership, indicative of a high-return partnership include:

- Successfully forging gaps between different organizations (i.e., NOAA and partner) [Case Study 1A: Exploratorium];
- Partner learns about NOAA and the capabilities of the agency [Case Study 1A: Exploratorium; Case Study 1C: SOS; Case Study 2A: AMS];
- Partner successfully navigates NOAA bureaucracy and increases connectivity to different parts of NOAA [Case Study 1A: Exploratorium; Case Study 2A: AMS]; and
- Communication occurs through primary representatives from each partner [Case Study 1A: Exploratorium; Case Study 1C: SOS; Case Study 1B: OMCA; Case Study 2A: AMS].

#### **Research Question 4: What tools and strategies are needed for an effective NOAA Education partnership portfolio?**

A variety of tools and strategies are necessary for an effective partnership portfolio. An NRC report on learning in informal settings (2009) outlined effective partnership strategies, including “identifying shared goals; designing experiences around issues of local relevance; supporting participants’ patterns of participation (e.g., family structure, modes of discourse); and designing experiences that satisfy the values and norms and reflect the practices of all partners” (p.301). While specified for informal environments, this study found the strategies applicable across NOAA high-return Education partnerships. Additional NOAA Education partnership-specific strategies were also identified based on this study, including:

NOAA Education partnerships are most effective when there is:

- Regular, ongoing communication between NOAA and the partner(s);
- An emphasis on meaningful evaluation;
- Support from both NOAA and partner leadership; and
- A cultivation of critical personal relationships.

When forming a new or transitioning an existing NOAA Education partnership, the following should be reviewed:

- Partnership definition and criteria;
- Partnership mechanisms for both formation and dissolution; and
- Programming goals and resources.

The following are essential for an effective NOAA Education partnership portfolio:

- Involving NOAA General Counsel when providing resources or support beyond normal duties;
- Determining whether a MOU or MOA is the best to use and knowing that mechanisms can change over time; and
- Establishing a point of contact in each NOAA line office to facilitate partnership formation.

### **Response to NRC Recommendations**

Part of the context and rationale of this study was to address the recommendations from the National Research Council's (NRC) NOAA's Education Program: Review and Critique (2010) to better understand how NOAA Education partnerships are formed, fostered, sustained, and evaluated. As the report notes, "[p]artnerships will be critical if NOAA is to reach the ambitious goals identified in the strategic plan, because the agency does not have the resources to achieve its goals on its own" (p.60). Accordingly, a stated goal of this report was to provide information and recommendations to the NOAA Education Council and NOAA Education community to use in making strategic decisions regarding NOAA Education partnerships.

The NRC report covered an array of topics regarding NOAA Education. A subset of recommendations relevant to partnerships were selected from the report subtopics of NOAA's role in education, education goals and outcomes, and education evaluation practices. The pertinent recommendations are outlined below, along with a response based on information collected and analyzed for this study.

#### **NRC Recommendation I.1**

*NOAA should fulfill its role in education through the use of...partnerships with local and state education infrastructure, academic institutions, government agencies, business and industry, and private-sector and nonprofit organizations; and the agency's global science and international partnerships.*

The results of this study indicate that NOAA Education staff have been and continue to forge partnerships with a variety of local, state, regional and national institutions and agencies. Sixty-seven partnerships were identified in this study, some spanning greater than 20 years.

As noted in the NRC report (2010), “the resources [NOAA] manages provide vast and important education opportunities, and management of of these environments provides the agency with connections to the surrounding communities and organizations” (Conclusion I.4, p.135). Indeed, the NRC report further articulates “NOAA’s ability to make good use of its education resources and assets to engage a substantial number of education activities is impressive. Most partnerships with educational organizations, other agencies, and institutions with complementary STEM expertise have enhanced the reach and impact of NOAA’s education efforts. These partnerships have often yielded additional expertise, educational tools, mechanisms for dissemination, and matching funds” (p. 148). Nearly every case study outlined in this study provided specific examples of such partnerships. The additional data from this study can support implementation of this recommendation, as NOAA Education now has a road map to foster and facilitate efficient and effective education partnerships across line offices and on multiple scales (i.e., local, state, regional, federal and international).

**NRC Recommendation I.3:**

*Within the constraints of NOAA’s mandates in education, the agency should continually evaluate where it leads, collaborates, follows or declines to participate in partnerships with others. These decisions should be guided by consideration of the agency’s role, assets, resources, and priorities in education and the strengths and missions of other agencies, institutions, and organizations engaged in education.*

As candidly recognized by the NRC Committee, “the Education Council does not have budgetary or institutional control over the education efforts of NOAA line and program offices”, and several have individual education mandates within their legislation, often with “local components with local control” (p.143).

Because there is no common data collection and the NOAA Education partnership portfolio is not under one authority, it is difficult to shape the portfolio as recommended. This study is the first attempt to examining the NOAA Education Partnership portfolio. The working group’s recommendations in this study are based on how the NOAA Education community operates, and therefore include providing training and guidance as needed and to individuals.

NOAA Education can focus on assuring that partnerships have clear, mutually agreed upon goals, make wise use of NOAA resources, and provide a reach that NOAA would not have in the absence of the partnership. Additionally, the NRC Committee (2010) concluded that “NOAA can play a supporting role in state and local education” and should “focus on productive partnerships to support local and state education systems while promoting NOAA’s education and stewardship mission.” Furthermore, the report notes “education efforts are more likely to be productive if they align with national and local education needs” and “make better use of assets and programs that already exist” (Conclusion I.7, p. 136). Data from this study support these conclusions, and that NOAA Education has case studies as examples from which to draw to further implement this recommendation on a larger scale.

**NRC Recommendation II.2**

*To reach NOAA’s environmental literacy goal, the Education Council should develop its implementation plan and future revisions of the education strategic plan to... articulate how*

*NOAA education programs will draw on the scientific, engineering, research, and other expertise accessible within the agency as well as in the broader community.*

A component of this recommendation focuses on partnerships internal to NOAA and was considered beyond the scope of this study. However, data from NOAA Education Partnership Survey and case studies included in this report would provide an excellent foundation upon which to further explore these important contributions as related to the broader community (i.e., Analysis Question 13 and several case studies).

**NRC Recommendation IV.1**

*The Education Council should continue to improve the evaluation expertise of its education program managers, contract with external evaluators for summative evaluation, and require the incorporation of the most appropriate and rigorous evaluation strategies during program development to guide design, continual improvement, and delivery of its education programs.*

While not directly related to the scope of this study, improving the evaluation expertise of members of the PWG was a goal for the Evaluation leads. In developing the collaborative effort between program staff and evaluators to collect data regarding NOAA Education partnerships, members of the PWG were tasked with developing research question(s), logic model, scope of the study, data inventory, data collection and analysis, and actionable recommendations for the NOAA Education Council. While this was a small step toward improving evaluation expertise among program staff, the experience provided a foundation for developing an understanding of the complexities and intricacies involved in the evaluation process. The Evaluation leads believe this will assist members of the PWG in understanding what is required to better evaluate, design, improve and deliver NOAA Education programs.

**NRC Recommendation IV.4**

*Education programs should evaluate internal collaboration among line offices and between education and operational and scientific staff, as well as the quality of external partnerships with other agencies, institutions, organizations, and the broader STEM communities.*

As stated previously, partnerships internal to NOAA were considered beyond the scope of the Portfolio Review study. In terms of examining the quality of external partnerships, the PWG directly addressed this component of the recommendation. Accordingly, a recommendation of the PWG will be included to address this via annual completion of the NOAA Education Partnership Survey by NOAA educators.

## RECOMMENDATIONS

Actionable recommendations are the most important part of the Portfolio Review process and drove the inquiry of this study from the start. The recommendations developed by the PWG are intended to be actionable by the NOAA Education Council. Education Council should take on the following tasks:

**PWG Recommendation 1. Develop a guidance manual for establishing new partnerships or transitioning existing ones.**

The audience for this guidance manual would be NOAA educators both in the field and at the headquarters level. The guidance would provide checklists of items that should be addressed, as well as procedural instructions for those tasks that need to be completed step-by-step. The manual would provide general guidance regarding key questions that should be considered. Use the partnership definition and criteria as a starting point and this report for case studies for the manual.

**PWG Recommendation 2. Disseminate the guidance manual and a collection of MOUs as resources for partnership development.**

The working group should consider how such information and guidance would best support NOAA educators seeking partnerships. Making the resources available on a website will be important part of the dissemination strategy.

**PWG Recommendation 3. Provide training for NOAA educators in forming new partnerships and transitioning existing partnerships.**

Although providing a one-time webinar will likely be ineffective, just-in-time and context-appropriate support at the right time would make this guidance most effective. Additionally, general education of all NOAA Educators would make them aware of when they should seek this information.

**PWG Recommendation 4. Conduct a cost-benefit analysis of partnerships.**

As noted in the Discussion section, conducting a cost-benefit analysis will more definitively answer questions about how partnerships are maximized.

**PWG Recommendation 5. Conduct a gap analysis based on the existing dataset of NOAA Education partnerships.**

The authors of this report recognize that there are gaps in the data collected, as not all of the NOAA Education community reported partnership data into the survey. In the future, a review comparing the survey results with the entire NOAA Education community could identify gaps. Questions and figures used in this study could serve as a guide to this analysis. For example, identifying geographic gaps by comparing partners locations with NOAA locations as shown in Figure 17.

The Education Council's Monitoring and Evaluation Working Group should take on the following tasks:

**PWG Recommendation 6. Develop partnership performance measures, track the total number of partnerships, goals, money, leverage and who is involved.**

The M&E Working Group should consider taking on the task of monitoring partnerships on an annual basis. Measures would be developed for Council member to report into on an

annual basis. This would include the total number of partnerships, partnership goals, the level of funding and personnel involved.

**PWG Recommendation 7. Review and revise the NOAA Education Partnership Survey.**

If the M&E Working Group takes on the task of monitoring partnerships annually, the NOAA Education Partnership Survey can be adapted as the primary data collection instrument. Additionally, if a gap analysis is conducted and data is collected regarding partnerships not previously reported, the Survey can be improved to better collect data to align with the analysis. Working groups can propose changes to Survey to better assess the return on partnership.

**PWG Recommendation 8. Explore the role that partnerships contribute to existing performance measures.**

As displayed in the results of Analysis Question 9, partners share the NOAA mission and performance measures in terms of reaching similar audiences, educators, K-12 students and postsecondary students. The M&E Working Group should consider collecting the contribution of partners in helping NOAA meet our mission and how partners contribute to our common performance measures to demonstrate a collective impact. Communication between NOAA and partners will help determine the documentation process so both entities receive proper credit for their efforts.

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# APPENDICES

## Appendix A: NOAA Education Partnership Survey

### High-Return Education Partnerships

The new Partnerships Working Group of the Education Council is completing the work of the former Pre-Kindergarten through Early Career Working Group (PK-20+ Working Group) and Finding Innovative Ways to Connect NOAA to the Public (Connects). We are requesting information from NOAA Program and Line Offices regarding intra-agency; interagency; and external (non-profit, university, corporate) partnerships. The request is in direct response to the recent (2010) National Research Council (NRC's) recommendation for NOAA Education to establish and coordinate partnerships with organizations whose purposes are to conduct or support science education. It is also important as part of NOAA's Education Strategic Plan 2009-2029, Outcome 1.5, NOAA works cooperatively to maximize the impact of federal investment in ocean, coastal, Great Lakes, weather, and climate education.

For purposes of this survey, we are requesting that you report up to 5 important partnerships that your programs/projects have through grants, cooperative agreements, contracts, or that use in-kind mechanisms (MOU/MOA) and have significant benefits to NOAA and advance NOAA's Education Strategic Plan.

Once collected, the survey will provide a snapshot of NOAA's reach to stakeholders and will help to focus future efforts in areas that are lacking.

If you have questions, please do not hesitate to contact the Partnerships Working Group: Kate Thompson or Frank Niepold at [kate.thompson@noaa.gov](mailto:kate.thompson@noaa.gov) or [frank.niepold@noaa.gov](mailto:frank.niepold@noaa.gov). Thank you for your cooperation. We look forward to your participation in this survey.

#### Education Council Administrative Unit: \*

Instruction: From the drop down menu, select the program or office for which you are reporting.

OED - EPP	▼
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#### Name other NOAA partners (optional)

#### Definition: Partnership

A partnership is an agreement between two or more organizations, created to achieve or assist in reaching a common goal. Partnerships may involve one organization utilizing another's unique abilities, equipment or services, or it may be a "sharing" of resources (money, time, knowledge, equipment, etc.) to accomplish shared objectives between the participating partners. (3/27/13)

#### Name of Partner \*

Instruction: In the text box, report the name of the informal education institution that hosted a NOAA exhibit or docent training program in FY12. See above for more detailed instructions on what counts.

**Partnership Description \***

Describe the partnership, and type(s) of activities.

**When did the Partnership begin?**

Calendar Year (e.g. 2007)

**Location of Partner**

City, State and/or Zip

**Type of Institution of Partner \***

- K-12 Institution
- College/University
- Federal Agency
- State Agency
- Local Agency
- Corporation
- Zoos, Aquariums and Museums
- Science Research Institutions
- Non-Profit/NGOs (policy, professional orgs)
- Other: \_\_\_\_\_

**Partnership Mechanism \***

- Grant
- Cooperative Agreement
- MOU/MOA
- Donations to the Department
- Statutory Partnership
- None
- Other: \_\_\_\_\_

**Current Program Status**

- Active and fully operational (76% to 100%)
- Partially operating (51% to 75%)
- Minimally operating (1 to 50%)
- Not active (0%)
- Other: \_\_\_\_\_

**How much funding has NOAA contributed to the partnership? \***

Total contribution in US dollars (includes monetary value of staff time, other in-kind contributions, cash). Excludes funding for non-educational activities. Range of dollars or descriptions of funding if cannot calculate.

**What is the staff time for NOAA (in FTE) of maintaining this partnership?**

## **Partnership Assessment**

This section is meant to provide insight into the processes surrounding the rationale and methodology for selecting partners, sustaining partnerships, and terminating partnerships.

### **Partnership alignment with NOAA's current educational output measures**

- Formal education programs
- Informal education programs
- Professional development programs
- Higher education programs

### **What NOAA provides in Technical and Knowledge Transfer**

in-kind contributions

- Instruments/ lab equipment
- Materials (curriculum, activity kits, literacy guides, outreach materials)
- Expertise (scientific, educational)
- Real estate (for interpretive signs)
- Facilities (places for programs)
- Exhibit space
- Datasets and Data visualizations
- Exhibit development
- Other: \_\_\_\_\_

**Please, elaborate on the above criteria that you selected for what NOAA provides.**

### **What the Partner Provides in Technical and Knowledge Transfer**

in-kind contributions

- Instruments/ lab equipment
- Materials (curriculum, activity kits, literacy guides, outreach materials)
- Expertise (scientific, educational)
- Real estate (for interpretive signs)
- Facilities (places for programs)
- Exhibit space
- Datasets and Data visualizations
- Exhibit development
- Other: \_\_\_\_\_

**Please, elaborate on the above criteria that you selected for what the Partner provides.**

**What were the SELECTION criteria for selecting the partner?**

Select all that apply.

- Partner has established relationships that will help provide a different level of POLICY access to those networks for NOAA Education officials
- Partner has established relationships that will help provide a different level of SCIENCE CONTENT KNOWLEDGE (technical expertise) to those networks for NOAA Education officials
- Partner has established relationships that will help NOAA provide a different level of access to new or refined approaches for AUDIENCES/CONSTITUENTS/STAKEHOLDERS
- Partner can contribute to NOAA's WORKFORCE DEVELOPMENT goals (AAAS Fellows, Einstein Fellows, Presidential Management Fellows, Minority Serving Institutions, etc.)
- Partner is selected through competition
- Other: \_\_\_\_\_

**What mechanisms were used in determining if the partner met the SELECTION criteria?**

Select all that apply.

- Conduct competition to select the partner (or Apply series of criteria or a rubric to choose the partner)
- Conduct background research on proposed partner (to ensure partner stability, suitability)
- Host one or more meetings with proposed partner prior to entering into formal agreements
- Conduct an onsite partner visit to observe, examine, and analyze organizational structure and program efficacy
- Consider asking other NOAA offices to join with your Line Office in the proposed partnership
- Inquire of potential partner if there have been (or are) other existing (or past) NOAA partnerships
- Adapt existing MOA or MOU to fit this partnership
- Other: \_\_\_\_\_

**Please, assess your partnership based on the following criteria.**

Select all that apply

- The partner shares similar values and qualities to those of NOAA. Our corporate values are Science, Stewardship and Service. Our agency is successful, welcoming, trusted, innovative, reliable, customer-focused, and collaborative.
- The partnership creates stories or case-studies that will be relevant, interesting and intriguing for NOAA stakeholders directly as a result of operating unit(s) involvement.
- The partnership provides opportunities for NOAA involvement by either our staff or our constituents.
- The partnership provides a high return to NOAA's local communities where NOAA offices/labs/sanctuaries and reserves are located (high return means benefits to NOAA and partners outweigh the investment and involvement for all parties involved).
- The partnership provides a high return to NOAA staff and our constituents (high return means benefits to NOAA and partners outweigh the investment and involvement for all parties involved).
- The partnership provides a high return to International/National/regional/local initiatives (high return means benefits to NOAA and partners outweigh the investment and involvement for all parties involved).
- The partner organization has broad connections with communities of influence that would further our mission and goals.
- The partnership includes opportunities for NOAA messaging (ex. conservation, stewardship, science, awareness, safety and preparedness).
- The partnership is designed to make a lasting contribution to NOAA communities.
- The partner is helping us address our education strategic goal/objectives.
- Other: \_\_\_\_\_

**Please, elaborate on the ASSESSMENT criteria that you selected above.**

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## **Final Page**

Instructions: Before clicking SUBMIT, review your reported data by clicking on the BACK button to review the your submission on the previous pages.

**OPTIONAL: Provide information about how data was collected, assumptions that were used, or other remarks about the data submitted.**

This data is used to understand the context of what was reported.

## Appendix B. List of Acronyms

AERA	Atmospheric Education Resource Agents
AMS	American Meteorological Society
ASTC	Association for Science and Technology Centers
B-WET	Bay Watershed Education and Training
CENCOOS	Central and Northern California Ocean Observing System
CGLL	Center for Great Lakes Literacy
CINMS	Channel Islands National Marine Sanctuary
CINP	Channel Islands National Park
COSEE	Centers for Ocean Sciences Education Excellence
CPC	Climate Prediction Center
CPESE	Cooperative Program for Earth System Education
CPO	Climate Program Office
DOC	Department of Commerce
ELG	Environmental Literacy Grant
EPA	Environmental Protection Agency
ESRL	Earth System Research Laboratory
FEMA	Federal Emergency Management Agency
FTE	Full Time Equivalent
GAO	Government Accountability Office
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
IAGLR	International Association for Great Lakes Research
ILI	Institute for Learning Innovation
ISE	Informal Science Education
LELP	Lake Erie Environmental Literacy Principles
LIT	Local implementation Team
M&E WG	Monitoring & Evaluation Working Group
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAPA	National Academy of Public Administration
NASA	National Aeronautics and Space Administration
NCDC	National Climatic Data Center
NCEP	National Centers for Environmental Prediction
NESDIS	National Environmental Satellite, Data, and Information Service
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPS	National Parks Service
NRC	National Research Council
NSF	National Science Foundation
NSOF	NOAA Satellite Operations Facility
NWS	National Weather Service
OAR	Office of Oceanic and Atmospheric Research
OED/OEd	Office of Education
OMCA	Oakland Museum of California
ONMS	Office of National Marine Sanctuaries

OPM	Office of Personnel Management	
P!N	PLAN !T NOW	
PK-20	WG	Pre-Kindergarten through Early Career Working Group
PORTS	Physical Oceanographic Real-Time Systems	
PPR	Partnerships Portfolio Review	
PWG	Partnerships Working Group	
SG	Sea Grant	
SOS	Science on a Sphere®	
STEM	Science, Technology, Engineering and Mathematics	
USFWS	US Fish and Wildlife Service	
WG	Working Group	
WRN	Weather Ready Nation	
YMP	Young Meteorologist Program	
ZAM	Zoos, Aquariums and Museums	