FY24-26 OAP Strategic Prospectus

Feb 8, 2023

SEC 1.0 FY24-26 OAP OVERVIEW

NOAA's Ocean Acidification Program (OAP) funds scientific research and monitoring on 3-year cycles in an effort to ensure continuity of intramural projects and allow sufficient time to evaluate progress towards achieving science outcomes. This approach provides an opportunity to review the investment portfolio for potential new priority areas and make adjustments to ensure science outputs meet emerging requirements and achieve strategic outcomes. As directed by the Federal Ocean Acidification Research and Monitoring Act (FOARAM) reauthorization through the CHIPS and Science Act of 2022, OAP supports NOAA Ocean and Atmospheric Research's (OAR) mission to conduct research to improve the predictive understanding of the Earth's systems, delivering mission-relevant science outcomes in close partnership with NOAA line offices. The OAP is also committed to the NOAA FY22-26 Strategic Plan and specifically contributes to priority 1, to build a climate ready nation, and priority 3, to advance the New Blue Economy. The proposed science investments detailed here will further an understanding of the environmental changes and potential species impacts caused by ocean acidification (OA) in conjunction with other climate related stressors and use this information to help prepare coastal communities and ocean industries for those changes. The proposed investment areas presented here are responsive to the NOAA Ocean, Coastal, and Great Lakes Acidification Research Plan: 2020-2029 (henceforth termed NOAA OA Research Plan) that reflect input from NOAA OAR leadership, the OAP Executive Oversight Committee, the NOAA Ocean Acidification Working Group, NOAA researchers and program managers, the OA science community, and interested/affected parties. This NOAA OA Research Plan partitions activities across three broad, intersecting domains of vulnerability. They are environmental change, biological sensitivity, and human dimensions. Figure 1 denotes how the Interagency Working Group on Ocean Acidification (IWG-OA) strategic research plan themes, which indicate priorities for the Federal government in addressing ocean and coastal acidification, map

across the vulnerability domains.

Figure 1. IWG-OA Strategic Research Plan Themes are defined as ***1.0 Research to Understand Responses to Ocean Acidification, 2.0 Monitoring of Ocean Chemistry and Biological Impacts, 3.0 Improving Models of the Effects of Ocean Acidification on Ecosystems and Society, 4.0 Technology Development and Standardization of Methods, 5.0 Assessment of Socioeconomic Impacts and Development of Strategies to Conserve Marine Organisms and Ecosystems, 6.0 Education, Outreach, and Engagement Strategy on Ocean Acidification, 7.0 Data Management, Integration, and Synthesis****.** *Assessing the vulnerability of the U.S. Blue Economy to ocean acidification demands a transdisciplinary approach that simultaneously combines an understanding of how conditions are changing (Environment, IWG-OA Themes 2, 3, 4, 7), how living marine resources respond to the changes (Sensitivity, IWG-OA Themes 1, 2, 3, 4, 7), and how such impacts affect dependent human communities (Human Dimensions, IWG-OA Themes 3, 4, 5, 6, 7).*

1.1 Federal Ocean Acidification Research And Monitoring (FOARAM) Reauthorization 2022

The Federal Ocean Acidification Research and Monitoring Act of 2009 was recently reauthorized through the CHIPS and Science Act of 2022 (see section 10641-10649). In the reauthorization, a number of updates were introduced to FOARAM; many of these updates involved the Interagency Working Group on Ocean Acidification, including the requirement to establish an advisory board. New language was also introduced that

directs the NOAA OAP to do the following:

- As a part of the ocean and coastal acidification monitoring program, leverage the Integrated Ocean Observing System (IOOS) and the ocean observing assets of other Federal, State, and Indigenous agencies as appropriate.
- Prioritize the location of monitoring instruments, assets, and projects to maximize the efficiency of resources and agency and department missions.
- Optimize understanding of socioeconomic impacts and ecosystem health.
- Provide technical assistance to socioeconomically vulnerable States, local governments, Indigenous governments, communities, and industries impacted by ocean and coastal acidification to support their development of mitigation strategies.
- Conduct research that improves understanding of the impacts of ocean and coastal acidification and how multiple environmental stressors may contribute to and exacerbate impacts on living resources and coastal ecosystems.
- Conduct research to support the development of adaptation and mitigation strategies to address the socioeconomic impacts of ocean and coastal acidification on coastal communities.
- In coordination with the IWG-OA, support the long-term stewardship of, and access to, data relating to ocean and coastal acidification by providing the data on a publicly accessible data archive system. To the extent possible, this should include data from federally funded research, from Federal, State, or local governments, academic scientists, citizen scientists, industry organizations, Tribes, and from existing global or national data assets currently maintained by federal agencies. All data should adhere to data and metadata standards to support FAIR data principles (Findable, Accessible, Interoperable, and Reusable).

1.2 NOAA OA Research Plan Near-term Priority Science Areas

Presented below are some of the primary national research goals identified as short term priorities. These represent key science gaps identified in the NOAA OA Research Plan and the IWG-OA Vulnerability Report:

- ***Environmental Change***
    - Sustain, improve, and adopt cost-effective and robust analytical systems, sensors, and uncrewed technologies to observe the water column and benthic environment and to serve as key operational elements of the NOAA OA Observing Network (NOA-ON)
    - Support ocean acidification synthesis activities to ensure environmental data are transitioned to useful products to inform modelers and other audiences
    - Improve the use of satellite and other remote sensing tools and applications to observe and characterize the open ocean, coastal, and estuarine environments
    - Foster observing and modeling data products that best inform human dimension needs particularly those identified in the regional

vulnerability assessments.

- ***Biological Sensitivity***
    - Foster new research to study emerging and unanticipated ecosystem changes in response to OA and multi-stressor interactions
    - Advance CO_2 sensitivity experiments to understand the underlying physiological mechanisms and to explore the potential for acclimation and adaptation as a means to extrapolate from the responses of individuals (from a species) to long-term ecosystem-scale impacts in the context of a changing ocean
    - Identify and adopt appropriate field measures to track ecosystem response
    - Foster biological research that best informs human dimension needs, particularly those identified in the regional vulnerability assessments
- ***Human Dimensions***
    - Identify and build relationships with vulnerable communities, interested/affected parties, and non-academic partners to identify needs and to understand how OA fits within their environmental and societal concerns
    - Assess, evaluate, and model socio-economic impacts of OA and explore adaptive strategies, assess intervention actions, inform policy-making, and empower communities
    - Encourage OA research in partnership with interested/affected parties and non-academic partners via a two-way dialogue by supporting networks that engage in OA communication and outreach to ensure research is responsive to priority actions at the local level
    - Monitor trends in community awareness and perceptions of OA impacts and participation in stewardship activities across diverse interested/affected groups and non-academic partners
    - Provide technical assistance to socioeconomically vulnerable States, local governments, Indigenous governments, communities, and industries impacted by ocean and coastal acidification to support their development of mitigation strategies

PROGRAM RESEARCH INVESTMENTS

Research investments are partitioned between *directed*, *intramural competitive* and *open competitive* activities. Pending available appropriated resources, the OAP FY24-26 proposed investment portfolio across each of these avenues is previewed in Figures 2 and 3 and further detailed in the subsequent sections. Please note that intramural and open competition topics are subject to change pending emerging needs on the science front and/or opportunities to leverage with partners.

DIRECTED ACTIVITIES. Sustained Investments represent the core OAP-funded intramural research and monitoring efforts that are primarily funded through three-year Sustained Investment Workplans and are often funded over multiple 3-year cycles. Broadly, these sustained projects and other directed priorities comprise the activities detailed in SEC 2.0.

INTRAMURAL COMPETITIVE ACTIVITIES. These comprise a NOAA-only competitive suite of funding opportunities that will be advanced by the OAP periodically throughout the 3-year science cycle should funding permit. This will include an internal broad call for proposals executed in parallel with the directed call for workplans, as well as a limited number of targeted opportunities as described in SEC 3.0. Unless otherwise specified at the time of the call, only intramural investigators will be afforded an opportunity to apply for these limited resources (e.g. PI must be assigned an active @noaa.gov email address).

ROUTINE PRODUCT DELIVERY. In the FY 24-26 cycle, OAP has carved out a new category for investments that provide routine delivery of an OA product specifically for a target audience. These products may be public facing and are provided to the target audience on a specific timeframe as defined in coordination with the user community. Products are provided in a format that is tailored for and in consultation with the intended user community. Projects will conduct outreach on the use of the product, monitor statistics on access/downloads, and/or provide periodic user community surveys. The types of projects under this category can include forecasts, indicators, data/information portals, etc. These efforts are sustained through 3-year Workplans provided as part of a Request for Workplans.

OPEN COMPETITIVE ACTIVITIES. OAP, or partner-led, Notice of Funding Opportunities (NOFOs) announced to the public to advance NOAA's mission in accordance with the NOAA OA Research Plan. Topics currently engaged and/or being considered for the FY24-26 science cycle are briefly reviewed in SEC 4.0.

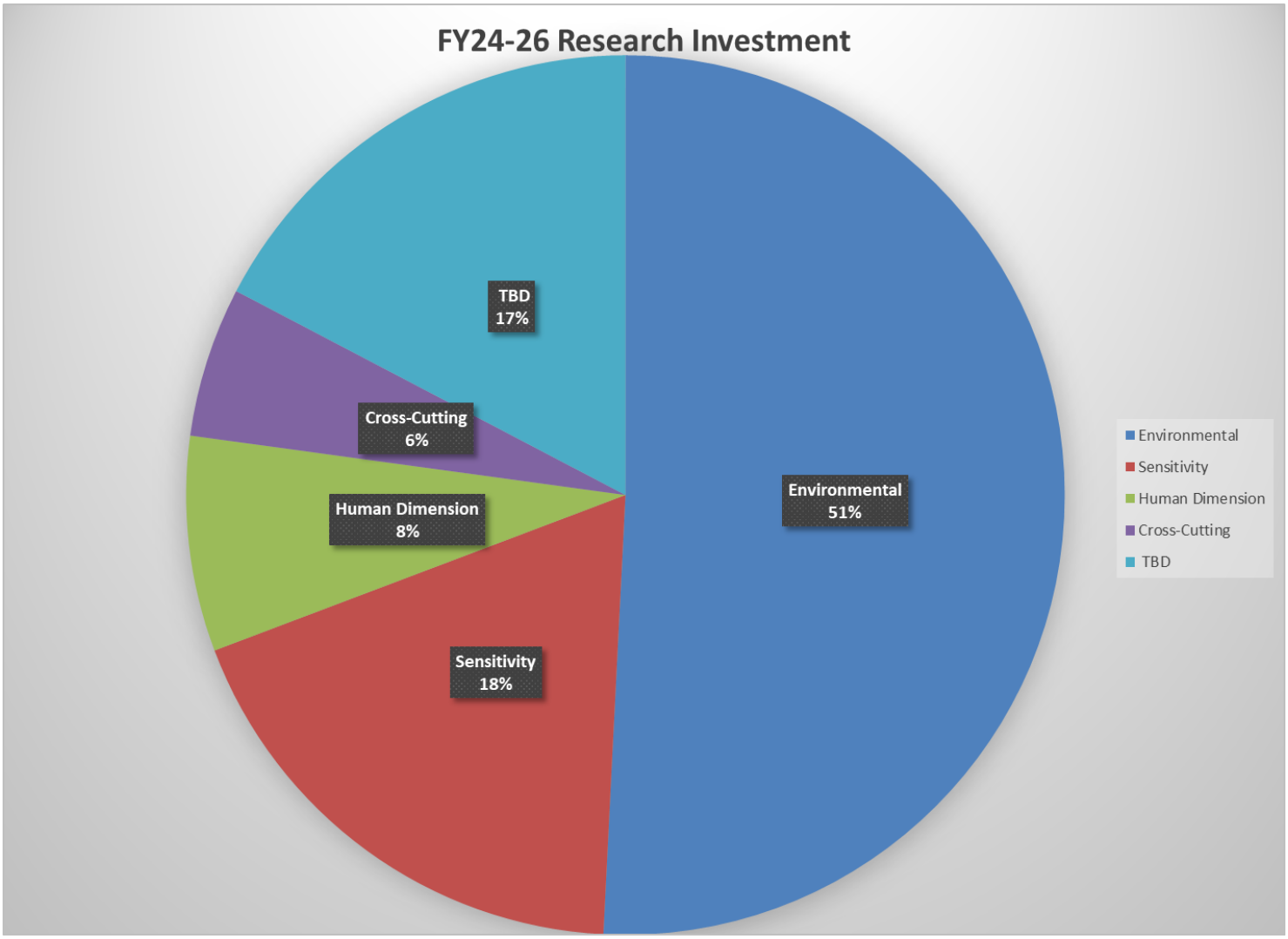

Figure 2. FY24-26 OAP planned research investment by thematic areas.

SEC 2.0 FY24-26 OAP DIRECTED ACTIVITIES

OAP directed activities comprise a suite of investment areas that have been determined over past funding cycles, program designated, and/or long-term sustained efforts carried out by either the program office itself, or by the various labs and centers engaged in on-going intramural research and monitoring across the agency and through cooperative agreements (e.g. IOOS, NOAA Cooperative Institutes). Directed activities will comprise the priorities outlined in each thematic area below. OAP will asses the directed activities and intramural competitive activities (SEC 3.0) from the previous funding cycle to determine projects that fill the priorities outlined below and in the NOAA OA Research Plan, the FOARAM Reauthorization 2022, NOAA FY22-26 Strategic Plan, and IWG-OA strategic planning priorities as well as anticipated

budgetary opportunities/constraints and FMC interest to determine directed funding in the FY24-26 cycle.

2.1 Environmental Change

OBSERVING

OAP supports continuation of the existing NOAA Ocean Acidification Observing Network (NOA-ON) fixed mooring network but with the expectation of achieving subsurface capability during this next cycle.

Jointly led out of NOAA PMEL and AOML laboratories, the OAP will prioritize supporting the maintenance, servicing, and data stewardship of the existing fleet of surface coastal underway OA systems targeting waters within the U.S. coastal large marine ecosystems.

Efforts to maintain existing ship-of-opportunity surveys (e.g. ECOMON OA and other NMFS surveys) are also encouraged. Autonomous and remotely piloted assets may be considered as an alternative means of expanding coverage if they demonstrate suitable technology readiness and cost effectiveness.

OAP will continue to provide science support for at least one synoptic coastal OA ship survey per year to cover the nation's coastal large marine ecosystems (LMEs) and, as feasible and resources allow, the coastal LMEs of partnering nations of the North American GOA-ON Hub. During the FY24-26 science cycle, these cruises will target the U.S West Coast (FY24), Gulf of Mexico (FY25), and U.S. East Coast (FY26) prioritized within the U.S. coastal LMEs. FY27 will prioritize coverage of a full-scale OA research cruise in Alaska. Core requirements of these surveys are to acquire a full water column characterization of GOA-ON Goal 1 Level 1 measurement requirements[1] (starting on page 11) including carbon-system constraint, oxygen, temperature, salinity, and pressure (water depth), as well as nutrients and chlorophyll. Limited, relevant, community-vetted biological observations will again be in the core suite of measurements in this cycle. The OA Cruise Science Priority Guidance for the FY24-26 cruises is available here[2]. Any measures beyond the level 1 core variables in the OA Cruise Science Priority Guidance will be contingent on available funding and need to be competitively assessed via the competitive extramural open-call (SEC 4.0). In cases where NOAA labs are unable to lead a cruise, OAP will open a competitive intramural call for chief scientist and core measurement sampling (SEC 3.1).

MODELING

[1] http://www.goa-on.org/documents/general/GOA-ON_2nd_edition_final.pdf

[2] https://oceanacidification.noaa.gov/sites/oap-redesign/Documents/Funding%20Opps/OA%20Cruise%20Science%20Priority%20Guidance.pdf?ver=2023-05-04-100350-237

Regional biogeochemical forecast modeling efforts will continue to be supported by OAP for this science cycle where success has been suitably demonstrated towards meeting user requirements detailed in the NOAA OA Research Plan. Modeling efforts should maximize the utilization of observing datasets and coordinate with the observational teams to ensure observations are tailored to improve model performance.

OAP will continue its support of OA research and monitoring efforts in support of the Coral Reef Conservation Program (CRCP) National Coral Reef Monitoring Program (NCRMP) led by AOML (Atlantic) and the PIFSC (Pacific). This project monitors changes to coral reef carbonate chemistry over time at U.S.-affiliated coral reef sites. These measurements in conjunction with ecological metrics measured as part of the broader NCRMP, inform data synthesis, assimilation, and distribution as part of the regular juristically reporting.

2.2 Biological/Ecological Sensitivity

OAP will continue to support experimental work at the Fisheries Science Centers and NOAA laboratories focused on ecologically or commercially important marine species with likely sensitivity to OA with priority emphasis on economically significant calcareous species (crabs, mollusks, corals), commercially important fish species that NOAA manages, and species that are key trophic links for fisheries and protected species. Particular emphasis should be placed on characterizing physiological and energetic costs or acclimation capacity associated with OA under multi-stressor conditions to develop improved population and ecosystem models that better inform bioeconomic modeling and assessments of Blue Economy vulnerability. OAP would also prioritize research that moves beyond single species response and explores more ecologically relevant experimental designs that look to better resolve community response and improve our understanding of ecosystem impacts.

2.3 Human Dimensions

OAP will continue to support socioeconomic forecasting using experimentally informed bioeconomic modeling efforts that are being carried out at NMFS centers. OAP will also sustain its investments towards the Coastal Acidification Networks (CANs), Education and Outreach, provide support to ongoing initiatives within the GOA-ON Regional Hubs and investment in the IWG-OA's OA Information Exchange. To the extent possible, providing "technical assistance" to vulnerable communities in the development of OA mitigation plans is a priority per FOARAM reauthorization.

2.4 Cross Cutting (e.g. Data Management)

OAP continues its support of the NCEI ocean acidification data management to ensure all data collected from OAP investments are properly archived and made easily accessible for use towards improved assessments of marine ecosystem vulnerability, and better forecasting capabilities, in accordance with the NOAA Plan for Public Access

to Research Results (PARR) and the White House Executive Order on making data open and machine-readable. This includes dedicated support for data acquisition, quality assurance, and management of rich metadata, application of controlled vocabularies, long-term archival and stable data citation, as well as online data-discovery and access services. Maintenance of existing data synthesis and retrieval efforts are encouraged.

SEC 3.0 FY24-26 OAP INTRAMURAL COMPETITIVE ACTIVITIES

3.1 INTRAMURAL OPEN CALL FOR PROPOSALS

An intramural open call for letters of intent will be released agency-wide to pursue additional projects either to augment existing sustained activities or to propose new research endeavors responsive to the NOAA OA Research Plan. Potential open calls that are currently under considerations for the FY24-26 science cycle may include (among others):

SYNTHESIS AND PRODUCT DEVELOPMENT - This funding cycle OAP will be pursuing opportunities for data synthesis products, including three multi-year post-doc fellowships each targeting one of the three trifecta elements (environment, sensitivity, and human dimension). OAP anticipates the products of these post-doc fellowships to inform multiple congressional reporting requirements.

If funds permit, OAP may provide additional funding opportunities to conduct targeted data synthesis activities or advance product development responsive to explicitly identified user needs that integrate OA information obtained through NOAA OA investments.

INFRASTRUCTURE INVESTMENT - Periodically, OAP may solicit short proposals for Infrastructure Investments in support of Sustained OAP activities. This is limited to directed intramural calls that focus on shoring-up existing infrastructure related to OAP supported experimental or observational capabilities.

CRUISE SCIENCE LEADS AND CORE REQUIREMENTS - If deemed needed (SEC 2.1), OAP will solicit for scientific lead(s) to support the logistics for and core measurements of coastal synoptic cruises.

SEC 4.0 FY24-26 ROUTINE PRODUCT DELIVERY

In the FY 24-26 cycle, OAP has carved out a new category for investments that provide routine delivery of an OA product specifically for a target audience. This new category

of investments will support the continuation of existing products or products ready for routine delivery in the FY24-26 cycle. These products may be public facing and are provided to the target audience on a specific timeframe as defined by the user community. Products are provided in a format that is tailored for and in consultation with the intended user community. Projects will conduct outreach on the use of the product, monitor statistics on access/downloads, and/or provide periodic user community surveys. The types of projects under this category can include forecasts, indicators, data portals, or other informational products. These efforts will be proposed through 3-year Workplans provided as part of a Request for Workplans. Examples could include seasonal outlooks of OA conditions, forecasts, or the Ocean Acidification Information Exchange, etc. While these types of projects have been funded historically, the FY24-26 cycle will be the first in which they are categorized separately. The OAP will use this initial launch of the new category to develop a plan for if developing a more robust arm for routine product delivery in the future is needed and how to go about developing such an arm.

SEC 5.0 FY24-26 OPEN COMPETITIVE ACTIVITIES

The OAP competitive portfolio includes multi-year competitive grants awarded to successful proposals responsive to targeted Notice of Funding Opportunities (NOFOs) developed by or in partnership with the OAP. Wherever appropriate, the OAP will seek out funding partners, ideally partners with grant making capacity, personnel and funds to leverage. These have or will include NOS/NCCOS, NOS/IOOS, OAR/Sea Grant, OAR/GOMO plus potentially others such as programs within the Climate Program Office, Coral Reef Conservation Program, and elsewhere across the agency. Investigators from NOAA laboratories and science centers as well as academic institutions, industry and NGOs will be eligible to compete for funding, and external participants will be encouraged to collaborate with NOAA PIs and, as appropriate, make substantial use of OAP sustained investments. We are also currently exploring options to provide technical assistance to socioeconomically vulnerable States, local governments, Indigenous governments, communities, and industries impacted by ocean and coastal acidification to support their development of mitigation strategies through the open competitive activities.

SEC 6.0 FY24-26 OAP POLICIES

OAP Intramural Policies is committed to ensuring fair and equitable policies that foster transparency, optimize cost efficiencies, ensure a mutual vested interest between the program and executing offices, promote NOAA's culture of scientific excellence and integrity (NAO 202-735D), and adhere to NOAA's Plan for Public Access to Research Results (PARR). The following policies will be in effect for the FY24-26 period and remain in effect until explicitly modified or retracted by the OAP.

6.1 Commitment to Diversity, Equity, Inclusion, and Accessibility

At OAP, we recognize that our work benefits from the diverse perspectives of our staff, interested/affected parties, and the public we serve. We strive to create an equitable and inclusive work environment free from discrimination and harassment so that all community members are able to contribute and thrive. We have the responsibility of supporting work that will better prepare society to respond to ocean change, and we acknowledge that our goals can only be fully realized by encouraging interdisciplinary, equitable representation in that work. We are committed to the long-term, sustained effort it will take to fulfill this mission.

6.2 Scientific Integrity Policy

It is the policy of OAP to maintain a culture of scientific integrity. Production of data collections and research results should be objective and not influenced by financial interests or affiliations. Scientific or technological findings should not be suppressed or altered. OAP funded efforts are expected to adhere to high standards of ethical conduct. In addition, any data synthesis effort using data collected by an OAP funded effort is encouraged to suitably acknowledge the data collection researcher(s) in their synthesis product.

6.3 Intellectual Property Policy

OAP intellectual property policy requires that any PIs developing manuscripts or other relevant products with OAP funds ensure that all project co-investigators (as designated at time of proposal submission) are aware of the product being developed and be given the opportunity to serve as co-authors. As such, all project co-investigators on OAP funded projects must be notified by the lead author prior to the submission of any manuscript or other products.

We expect that users of data generated as a result of OAP funded projects will: a) Acknowledge the contribution of data providers and investigators in the form of invitation to co-authorship, reference to relevant scientific articles by data providers or by naming data providers in the acknowledgements. We recognize that co-authorship is only justified in cases involving intellectual contribution to the key findings of a publication and that provision of data on its own does not necessarily merit co-authorship but acknowledgment is warranted; and b) Include in the acknowledgements the use of NOAA OAP funded data, the associate DOI, and where appropriate the project identifier.

6.4 Data Management Policy

All OAP funded PIs agree to comply with the White House Executive Order – Making Open and Machine Readable the New Default for Government Information (2013) and NOAA Plan for Increasing Public Access to Research Results (2015) and adhere to the following:

1. All data generated from NOAA OAP funded projects shall be sent to the National Centers for Environmental Information (NCEI) under the Ocean Carbon and

Acidification Data System (OCADS), unless a pre-approved alternative has been provided by the program office: https://www.ncei.noaa.gov/products/ocean-carbon-acidification-data-system.

2. Investigators are required to fill out the NCEI rich OA metadata form to document the data in detail using the newly developed Scientific Data Information System (SDIS): https://data.pmel.noaa.gov/sdig/oap/Dashboard/OAPUploadDashboard.html.
3. The deadline to have your data published at NCEI is two years after the end date of the project, or immediately following publication of a peer reviewed paper using these data whichever is sooner (it's recommended that you share your data with NCEI as soon as the paper is accepted).
4. Data must be PUBLISHED and ACCESSIBLE before the above deadline. It normally takes up to one month to publish a dataset at NCEI, but when multiple datasets are submitted around the deadline, long delays can occur. For that reason, we recommend that you submit your data to NCEI early to avoid delays.
5. It is required to work with NCEI staff and answer any questions they may have in a timely manner to get your dataset published.
6. While NCEI is charged with assisting data submission, it is the PI's responsibility to meet the above data management requirements.
7. Past data management performance will be used for consideration of future OAP funding opportunities.