

**Semi-annual Program Performance Report for NA16NOS0120027**  
**FY 2016-20 Implementation and Development of a Regional Coastal Ocean Observing**  
**System: Alaska Ocean Observing System**  
**For reporting period June 1, 2017 – November 30, 2017**  
*Prepared by Molly McCammon, Project PI on December 22, 2017*

## **1.0 PROGRESS AND ACCOMPLISHMENTS**

### **1.1 Regional Governance & Management Subsystem**

#### *1.1.1 Support ongoing board and committee activities.*

- The AOOS Board's Executive Committee met in July to accept additional funding and tasks from the national IOOS Program Office as part of the Year 2 cooperative agreement. The fall board meeting was delayed until January 2018 to address recommendations from the November external review of the AOOS Data System.

#### *1.1.2 Provide ongoing fiscal and administrative oversight for program.*

- Executive Director Molly McCammon conducted annual evaluations for Operations Director, Carol Janzen and Alaska Ocean Acidification Network Director, Darcy Dugan.
- Staff worked with fellow suite occupants Alaska Sea Grant and the North Pacific Research Board to evaluate the office lease, search for new space, and finally renegotiate the existing lease at a substantial cost savings.
- Staff submitted and received approval on a de-scoped budget and work plan for the current cooperative agreement year two funds. Staff finalized no cost extensions for subawards for this cooperative agreement and agreements for new subawards.
- AOOS continues to seek additional external funding, and in this reporting period, provided match for a University of Alaska proposal to the Murdock Charitable Trust for an ecosystem observatory in the northern Gulf of Alaska; partnered with UAF on a successful \$369,604 proposal to the Bureau of Ocean Energy Management for a central Beaufort Sea Waves and Hydrodynamic Modeling Study; and partnered with AECOM's submission to NOAA for a Pro-Tech contract for NOAA's Ocean Services Domain. Awards were received from the US Arctic Research Commission for \$20K to support OA work and \$30K to expand the HAB network in the Arctic. A \$2K award was received from the NOAA OAP to further development of the OA network.
- McCammon and Janzen convened a team of six data management experts in November to conduct an external review of the AOOS data system.

#### *1.1.3 Support national and international partnerships and collaborations.*

- McCammon and AOOS Data Manager, Rob Bochenek participated in an effort initiated by the US Arctic Observation Network office to help coordinate the various US Automated Information System database efforts.
- McCammon attended a joint meeting with Alaska Senator Dan Sullivan, Nancy Wallace, director of NOAA's marine debris program, Peter Murphy, head of Alaska's program, and Chris Pallister, head of Gulf Keeper in August to discuss marine debris issues.
- McCammon continued to participate in the Cook Inlet Regional Citizens Advisory Council as the Municipality of Anchorage's representative and chair of its Environmental Monitoring Committee.
- McCammon was invited by Canada's National Sciences and Engineering Research Council to serve on an expert panel in Ottawa in August reviewing the Oceans Network Canada Innovation Center's renewal application as an Innovation Center of Excellence.

- AOOS hosted a luncheon for Craig McClean, NOAA’s Deputy Assistant Administrator for Research, to meet with AOOS PIs, partners and board members.
- McCammon attended a Consortium for Ocean Leadership industry forum and fall trustee meeting in October. McCammon serves on the COL board.
- McCammon attended the bi-annual US-Canada Northern Oil & Gas Research Forum in Anchorage in October to highlight recent research results and address regional priorities.
- While in Washington for various meetings, McCammon met with numerous NOAA program directors, as well as NOAA Administrator nominee Barry Myers and Department of Commerce Policy Director Earl Comstock.
- McCammon participated in numerous meetings with the IOOS program office and the IOOS Association (IA). These included monthly meetings with other Regional Association directors, the IA Executive Committee and the IA Finance Committee, as well as the fall IOOS meeting in Seattle, WA, a July meeting with the IA’s Honorary Directors, and Washington D.C. Hill events. McCammon is also working with the IA to develop a series of op-eds to be published across the country highlighting the value of ocean observations to the economy and national security.
- AOOS planned an Animal Telemetry Network (ATN) workshop with the ATN coordinator Bill Woodward to be held in December with over 50 participants both in person and online.

#### *1.1.4 Support Alaska and regional partnerships and collaborations.*

- Staff met with the NOAA Arctic Environmental Response Management Application team as part of their quarterly meetings to share the latest in their activities and discuss future data sharing and collaborations.
- McCammon joined UAF College of Fish and Ocean Sciences Dean Brad Moran at a brainstorming session on developing an “Ocean Cluster” in Alaska based on a model developed in Iceland to enhance collaborations among industry, academia and non-profits involved in the marine sector. Both McCammon and Moran participated in a Blue Economy panel at the Ocean Sciences conference in Alaska in September.
- McCammon met in July with a small group of NOAA staff and partners organized by Regional Team Lead Doug Demaster and Coordinator Amy Holman to brainstorm future NOAA collaboration (across line offices) priorities.
- AOOS Director of Administration and Outreach, Holly Kent, attended the annual partnership and steering committee meetings for Shorezone in November.
- Janzen attended the *Exxon Valdez* Oil Spill Trustee Council PI meetings in November.
- Janzen presented at the Arctic Domain Awareness Center’s Annual Meeting in November.
- McCammon participated in a panel on Arctic Marine Transportation at the “Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations” symposium in July in Washington D.C., sponsored by the US Arctic Research Commission and US National Ice Center.
- McCammon participated in a visioning meeting in November regarding the future of the Department of Interior’s four Landscape Conservation Cooperatives in Alaska.
- McCammon participated in the November meeting of the Alaska Sea Grant Advisory Committee in Anchorage.
- McCammon met in July with other members of a follow-up team to discuss how to move forward with the recommendations developed from four coastal resiliency workshops held in western Alaska in the past year.

#### *1.1.5 Finalize certification application*

- The official certification document was signed by AOOS and the IOOS program office at a joint ceremony at the MTS 2017 Oceans conference in Anchorage on September 18.

## **1.2 Outreach, Stakeholder Engagement & Education Subsystem**

### *1.2.1 Support website, Facebook and printed publications as key AOOS communication tools.*

- Kent continued to add content to the AOOS website and Facebook page, including news, featured stories, and descriptions of new data tools.
- Staff produced monthly updates and started a monthly proposal update for board members.
- Staff circulated a quarterly e-newsletter in July to a list-serve of over 500 recipients and produced a hard copy fall newsletter.
- Staff produced a handout for the National Weather Service outlining AOOS water level and coastal hazards projects.

### *1.2.2 Support ongoing stakeholder interactions.*

- AOOS hosted an informational booth at the MTS Oceans'17 conference in Anchorage in September
- AOOS shared a booth with the U.S. Arctic Research Commission at the Alaska Federation of Natives meeting in October.

### *1.2.3 Support stakeholder working groups including ocean acidification network, integrated water level observation network, Alaska Pacific Anomalies Working Group, and long-term observing system coordination and integration.*

#### Alaska Ocean Acidification Network

- AOOS staff Darcy Dugan, the network director, reached out to new organizations and businesses to expand the network to over 35 partner entities. The network has worked particularly closely with United Fishermen of Alaska.
- The network launched a Facebook page, completed a communications plan in October, and coordinated the publishing of a one-page document outlining the impacts of ocean acidification on Alaska fish and shellfish.
- Dugan interviewed researchers monthly for stories and produced a monthly e-news distributed to a list serve of over 1,000 people.
- The network began hosting a "Fishing Fellow" through the Alaska Marine Conservation Council's new fellowship program in October. Dugan supervises the fellow, Clayton Hamilton, who is helping with outreach to fishermen.
- Dugan organized and facilitated five topic-specific working groups currently working to implement the network's mission.
- Dugan gave presentations at the MTS Oceans'17 conference, the Alaska Tribal Environmental Managers conference, the University of Alaska Bookstore, and helped coordinate presentations or roundtables in Petersburg, Juneau, and Cordova.
- Dugan had over 50 conversations with fishermen and fishing industry representatives at an OA Network booth at the Pacific Marine Expo in Seattle in November, and helped organize a panel on ocean acidification and salmon.
- Dugan worked with the U.S. Arctic Research commission to develop a plan for expanding community-based sampling to two Arctic communities.
- Dugan join NOAA OAP's "Information exchange steering committee" to provide input into a new collaborative platform.
- Dugan continued to coordinate with other regional OA networks during periodic "CAN" calls or individual communication, sharing information and discussing group questions.

#### Alaska Harmful Algal Bloom Network

- Dugan serves as co-chair of the Alaska Harmful Algal Bloom Network (AHAB).
- Dugan helped facilitate the transfer of a new real-time data portal to the AHAB homepage, which became live in November.

- Dugan organized and participated in two AHAB steering committee meetings, as well as the AHAB communications working group.
- Dugan worked with the U.S. Arctic Research Commission to develop ideas for expanding HABS monitoring in the Arctic.

#### Integrated Water Levels Observing Working Group

- McCammon and Janzen continue to work with partners to implement pilot projects for alternative water level observation technologies and produced a 2017 status report on these efforts.

#### *1.2.4 Support partnerships with marine education and outreach programs.*

- Kent participated on the organizing committee for the 2018 Communicating Ocean Sciences Workshop (COSW) featuring scientist/photographer Chris Linder in conjunction with AMSS. This committee is also organizing a one-day science communication workshop led by the American Geophysical Union's Sharing Sciences group.
- Staff supported the Shorezone project as a partner.
- Kent maintained a web page with resources for educators on AOOS.org.
- Staff provided support to Alaska Sea Grant's marine education programs.

#### *1.2.5 Support Alaska Marine Policy Forum*

- AOOS partnered with Alaska Sea Grant to host sessions of the Alaska Marine Policy Forum (AMPF) in July and September 2017.

#### *1.2.6 Continue AOOS short film contest.*

- AOOS held the fourth annual Short Film Contest with 13 entries.

#### *1.2.7 Continue to co-sponsor the Alaska Marine Science Symposium.*

- AOOS staff participated on the steering committee for the event.
- AOOS staff coordinated workshops and keynote addresses for symposium week.

#### *1.2.8 Participate in IOOS Outreach Committee*

- Kent attended monthly meetings of the committee and responded to various requests for materials from the IOOS office for inclusion into IOOS publications and website.
- Kent updated the IOOS Education and Outreach Inventory.

### **1.3 Observing Subsystem**

#### *1.3.1 Marine Operations*

##### 1.3.1.1 Sustain weather observations in the GOA.

- **Subaward to Prince William Sound Science Center to service 8 SnoTel stations in Prince William Sound and Cook Inlet; Original completion date: September 2017.**

Status: Complete – September 2017.

##### 1.3.1.2 Increase access to weather observations using AIS.

- **Subaward to the Marine Exchange of Alaska to install and maintain joint weather/AIS stations in at least two new remote locations; Original completion date: June 2018.**

Status: On Track. Midway Island and Gull Island have been chosen as the remote location sites to be installed. Permitting for sites is underway.

##### 1.3.1.3 Support sea ice radar in Barrow

- **Subaward to University of Alaska Fairbanks (UAF), Geophysical Institute.**
  - Repair the UAF coastal sea ice radar system in Utqiagvik. Original Completion Date: October 2017.  
Status: Complete. – System returned to operation in November 2017.
  - Finalize plan for transitioning data processing and management tasks to Axiom/AOOS. Original Completion Date: August 2018.  
Status: On Track.

1.3.1.4 Sustain critical wave buoys for navigation safety.

- **Operate and maintain Cook Inlet buoy; Original completion date: May 2018.**  
Status: On Track. The buoy was recovered and replaced in December 2016 and has been operational through November 2017.
- **Operate and maintain Norton Sound Buoy; Original completion date: May 2018.**  
Status: Completed. The buoy has been shipped back to Seward. Due to the expense and uncertainties of deployment and retrieval with operating in the Arctic, this asset will possibly be relocated, and a more robust and easy to install/maintain system installed in the Norton Sound region with AOOS partners.

1.3.1.5 Map surface currents with high frequency radars (HFRs).

- **Subaward to University of Alaska Fairbanks to support operation and maintenance of three HFR sites on the Chukchi and Beaufort Seas as part of a consortium; Amended Completion Date: May 2018.**  
Status: On Track. All field sites are being maintained with real-time data delivered to the AOOS data portal.

**1.3.2 Coastal Hazards & Inundation**

1.3.2.6 Increase water level observations in western & northern Alaska

- **Subaward to the Alaska Department of Natural Resources.**
  - Install two rapid response water level sensors during the 2017 fall storm season at Hooper Bay and Nunam Iqua, Alaska; Original Completion Date: November 2017.  
Status: Complete – November 2017.
  - Complete flood communication mapping for at least 10 communities on the west coast of Alaska; Original Completion Date: December 2018.  
Status: On Track. Tidal datum conversion tool was not successful and not all communities have sufficient data for maps. Maps will be created for four communities with the necessary baseline information.
  - Complete maintenance of current operational water level sensors that have experienced gaps in data or are no longer transmitting; Original Completion Date: May 2019.  
Status: On Track. Two sensors replaced.
  - Assist the Alaska-based weather forecasting offices of the NWS with storm forecasting and post-storm cataloging of storm conditions. Original Completion Date: May 2018.  
Status: On Track. Storm impact guidance was provided to NWS for 6 storm events. Storm data are being archived and cataloged and community based observations of maximum water levels have been ingested and transmitted.
  - Establish collaboratively developed content for online information regarding the Water Level Network of Alaska; Original Completion Date: May 2018  
Status: On Track. The Alaska Water Level Watch Facebook page was launched

with three feature stories.

- **Subaward to UNAVCO to install one GPS telemetered water level station in St. Michael; Original Completion Date: May 2018.**

Status: On Track. Completed the onsite assessment at St Michael, verified viable station communications and logistics. Permitting delayed installation until spring.

- **Subaward to ASTRA LLC to install and maintain GPS water level station in Seward; Original Completion Date: October 2017.**

Status: On Track. Two GPS systems were deployed and have been operational since spring. One system will be re-deployed to a Homer site and determination made about future operations.

- **Subaward to UAF to complete installation of rapid deployment inundation platforms in three rural communities; Original Completion Date: July 2017.**

Status: Complete – September 2017.

#### 1.3.2.7 Increase wave observations for forecasting and planning

- Planning is underway to deploy CDIP wave buoy for Port of Nome in summer 2018.

#### 1.3.2.8 Initiate statewide geospatial mapping coordination

- Funding was acquired for a short-term AOOS position to develop a statewide coastal mapping strategy and implementation plan with support from NOAA and the state of Alaska. A position description was created and advertised.

### 1.3.3 *Ecosystems, Fisheries & Climate Trends*

#### 1.3.3.1 Sustain ship-based sampling along the Seward Line.

- **Subaward to University of Alaska Fairbanks to support two sampling cruises along the Seward Line; Original Completion Date: May 2018.**

Status: On Track. The fall cruise was completed in September 2017.

#### 1.3.3.2 Support ecosystem moorings in Alaska's Large Marine Ecosystems.

- **Subaward to University of Alaska Fairbanks to begin the incremental build-out of a moored Gulf of Alaska Ecosystem Observatory (GEO) by providing funding for equipment purchases.**

○ Notification about Murdock funding; Original Completion Date: November 2017.  
Status: Complete – November 2017.

○ Complete design of real-time surface buoy and data transmitting features; Original Completion Date: May 2018.

Status: On Track. Mooring design has begun. Once complete, equipment purchases will begin and project website will be developed.

○ Assemble first mooring for deployment; Original Completion Date: May 2018.  
Status: On Track.

- Continue support to UAF for Chukchi Sea Ecosystem Mooring.

○ 2017 mooring turnaround was successful using ship of opportunity. All data was successfully recovered, except that sediment trap did not collect samples properly.

#### 1.3.3.3 Pilot use of gliders to monitor ocean conditions and marine mammals

- **Subawards to Woods Hole Oceanographic Institute, University of Alaska Fairbanks and University of Washington to conduct a simultaneous marine mammal and oceanographic survey of the Chukchi Sea using a Slocum autonomous underwater glider during the summer of 2017.**

○ Deploy glider in southern Chukchi Sea using a ship of opportunity; Original Completion Date: July 2017.

Status: Complete – July 2017.

○ At sea data collection and maintenance of website with real-time acoustic

detections and oceanographic data; Original Completion Date: October 2017.  
Status: Complete – October 2017.

- Glider recovery and download of acoustic and oceanographic data; Original Completion Date: October 2017.  
Status: Complete – August 2017. The glider mission was ended prematurely due to Iridium communication issues.
- Data QA/QC'd and delivered to Axiom; Original Completion Date: June 2018.  
Status: On Track.

#### 1.3.3.4 Host regional ATN workshop

AOOS to host a regional ATN workshop and build on data tools previously developed; Original Completion Date: December 2017.

Status: On Track. Planning for workshop to be held December 5-6.

#### 1.3.3.5 Regional Sentinel Observations

- **Subaward to Prince William Sound Science Center to support partnership to operate and maintain acoustic arrays across major PWS entrances and maintain conductivity sensor; Original Completion Date: May 2018.**

Status: On Track. Conductivity sensor cleaned in July and replaced in October. Data downloaded from many of the OTN arrays in September with the rest to be downloaded in February 2018. Nine additional receivers retrieved and refurbished to be deployed in February, expanding coverage in Prince William Sound.

- **Funding set aside to NOAA/UAF's Kasitsna Bay Laboratory and other partners to collect oceanographic data along repeated transects in Kachemak Bay and lower Cook Inlet.**

- Conduct monthly CTD surveys at mid-Kachemak Bay transect; Original Completion Date: November 2017.  
Status: Complete – Monthly mid-Kachemak Bay oceanographic surveys were completed on 28 June, 24 July, 24 August, 22 September, 17 October and 7 November 2017.
- Conduct three seasonal surveys at outer Kachemak Bay transect (spring, summer, fall); Original Completion Date: November 2017.  
Status: Complete. Seasonal outer Kachemak Bay oceanographic surveys were completed on 25 July and 17 October 2017.
- Conduct two seasonal oceanographic surveys on an along-Kachemak Bay transect (spring, summer). Original Completion Date: November 2017.  
Status: Complete, with four additional surveys. Along-Kachemak Bay oceanographic surveys were completed on 28 June, 24/26 July, 24 August, 22 September, 20 October, and 2-7 November.
- Deliver quality assured/quality controlled oceanographic data to AOOS data contractor Axiom. Original Completion Date: November 2017 (for data through May 2017).  
Status: Complete (early). Quality assured/quality controlled oceanographic data from the Kachemak Bay CTD surveys through 11 November 2017 have been provided to Axiom via the AOOS Research Workspace.
- Present oceanographic and nutrient monitoring results at one or more science conferences annually (Alaska Marine Science Symposium or other); Original Completion Date: November 2017.  
Status: Complete. Kachemak Bay oceanographic sampling results were presented at one science conferences/meeting during the reporting period in November 2017.

- Participate in one or more science outreach events, using graphic products developed from Kachemak Bay oceanography data (e.g., Kachemak Bay NERRS Discovery Labs); Original Completion Date: November 2017.  
Status: Complete. Kachemak Bay oceanographic survey data were presented in Homer, Alaska in August 2017.

### 1.3.4 *Water Quality*

1.3.4.1 Sustain Ocean acidification (OA) monitoring including moorings, sampling along the Seward Line, Burkolators and an instrumented ferry.

- **Subaward to University of Alaska Fairbanks to continue a ten-year time-series in the Gulf of Alaska along the Seward Line as well as support the deployment of OA moorings adjacent to the oceanographic sampling line.**

- Support OA Sampling along Seward Line; Original Completion Date: September 2017.

Status: Complete - OA sampling on the Fall 2017 Seward Line cruise was completed in September 2017.

- Support equipment maintenance and turnaround for OA surface mooring sites; Original Completion Date: Fall 2017.

Status: Complete - The M2 surface mooring in the Bering Sea was recovered in October 2017.

- **Subaward to Hakai Institute to instrument an Alaska state ferry that routinely transits the Gulf of Alaska to collect various OA parameters.**

- Testing of CO2 instrumentation aboard Ferry M/V Columbia; Original Completion Date: June 2016.

Status: Complete – October 2017.

- **Subaward to Alutiiq Pride Shellfish Hatchery to maintain continuous ocean acidification monitoring using a permanently installed Burke-o-Lator; Original Completion Date: June 2018.**

Status: On Track. Installed Burke-o-Lator has been continuously monitoring seawater during this project period.

1.3.4.2 Support Alaska OA Network

- **AOOS received funding from the national OA Program to support the Alaska OA Network. Original Completion Date: May 2018.**

Status: On Track.

## 1.4 Data Management & Communications Subsystem, subaward to Axiom Data Sciences

### 1.4.1 *Provide Core Data Management Support*

1.4.1.1 Provide technical support for AOOS cyber infrastructure.

- Throughout this performance period project, Axiom ensured that the AOOS Data System was healthy, secure and monitored; provided technical support to system problems; and mapped out future upgrade strategies.
- A prototype version of new sensor and model system is actively being developed to monitor and display current status. This system will make adding new sensor datasets and maintaining existing sensor datasets much less cumbersome.

Status: On Track.

1.4.1.2 Continue development of AOOS Data Portal.

- Released a v2.3 beta version of a next generation AOOS Data Portal from the AOOS home page in a test environment. The updated data portal gives users access to new features as well as a revamped design.

Status: Delayed 6 months, but now On Track.

1.4.1.3 Implement QARTOD QA/QC checks for AOOS real time data feeds.



- Redesigned the back-end systems handling sensor data (still in progress). The next-generation system will facilitate management of multiple overlapping time-series generations (e.g. raw data, provider QCed data, revised data) and include support for QARTOD checks.

Status: On Track.

#### 1.4.2 *Provide DMAC support to the AOOS program*

##### 1.4.2.1 Provide overall DMAC project management and oversight.

- Participated in regular, bi-monthly meetings with AOOS to discuss and communicate progress on project tasks. Maintained a Trello project management board to track progress.
- Participated in the planning and presentation of the 5-year AOOS data management system review on November 28-30 to the AOOS Review Committee, composed of federal and university partners.

Status: Ongoing.

##### 1.4.2.2 Participate in regional, state, national and international DMAC activities

- Attended or presented at the following meetings related to AOOS DMAC activities: AIFC, Alaska LCC, UAF-GINA, OA Network, ICER, AK DNR, Audubon, CIRCAC, and others.
- Hosted a half-day workshop entitled *Data Management in the Ocean Sciences: Technologies, Tools, and Approaches Learned from a Decade Managing Data* which featured the AOOS data system at the Marine Technology Society and the IEEE Oceanic Engineering Society's OCEANS17 conference.

Status: Ongoing.

##### 1.4.2.3 Implement recommended and standard data management procedures for AOOS data assets.

- Provided formal data management support for AOOS-funded projects, including marine mammal gliders, AK DNR coastal profiles, Chukchi Sea ecosystem mooring, and the Seward Line. Support included ingesting, formatting, and serving data and metadata through the AOOS Workspace and related data portals.
- Develop detailed AOOS policies and procedures for both internal and external data management processes. Developed a data management primer for AOOS-funded researchers on how to use the AOOS Workspace to meet project data sharing deliverables.

Status: Ongoing and On Track.

##### 1.4.2.4 User Engagement, Data Requests, and User Support (feedback, response and actions plus fielding requests for data).

- Conducted quarterly portal feedback synthesis with AOOS staff to identify, respond to, and develop a strategy to modify and improve AOOS tools to meet end user needs.
- Served a user feedback survey on the AOOS data portal to solicit feedback from end users.
- Created AOOS data portal user exercises in preparation for use and feedback from the AOOS Review Committee and the AOOS data system review.

Status: Ongoing and On Track.

#### 1.4.3 *Develop and maintain special data products*

##### 1.4.3.1 Support existing products.

- Worked with Alaska Division of Geological & Geophysical Surveys Coastal Hazards Program to create an updated Alaska Water Level Watch site. Ingested and served observation, real-time, tidal datum, and published resource information.
- Migrated all data layers from the regional AOOS data portals to the Ocean Data Explorer.

- Worked with Audubon Alaska to access the updated Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas data and maps. In process of updating and enhancing the map layers and narratives within the Ocean Data Explorer.

Status: Ongoing and On Track.

#### 1.4.3.2 Ingest new data.

- Progress towards ingesting or resolving datasets in the AOOS data portals:
  - Port Heiden and Point Lay water level stations
  - GISSt model maintenance
  - ASTRA GPS Reflectometry
  - Chukchi Ice Detection buoy
  - AK DOT webcams

Status: Ongoing and On track.

#### 1.4.3.3 Develop new data products

- Cultivated the v2.4 beta version of the AOOS Data Portal. A test release of this version is expected in December 2017. Enhancements include:
  - vertical charts, interpolation, and 4D charting for glider data;
  - spatial and temporal data parsing;
  - integration of model data to charting and custom data views.
- Developed and documented a test ERDDAP API instance for external users and systems to programmatically interact with real-time AOOS data served through in the HPC cache. This API emulates the SOS style requests/response services in addition to several higher-level methods which allow users access summary analytics and advanced packaging of data for downloading.
- Developed and released an Alaska HAB map that aims to reduce health risks to humans from HABs by providing access to up-to-date results for phytoplankton and shellfish biotoxin monitoring across Southeast and Southcentral AK regions.
- Created an US Arctic Observing Network website construct in collaboration with NOAA partner to forth the ‘Mobilizing Arctic Observing in Support of Societal Needs’ effort.

Status: Ongoing and On track.

#### 1.4.4 *Provide Data Management services for integrated research programs using other funding:*

- MARES Research Program: Received and began processing for mooring datasets.
- Central Beaufort Sea Wave, Sediment and Hydrodynamic Study (BOEM): Attended the project kick-off webinar in November 2017. Developed a plan to acquire and work with PIs to curate data in early 2018.
- NSB Data Management Project: Continuation of data coordination with individual PIs to compile and curate historical data and generate metadata.
- AIERP Research Program: Attended and presented data management updates and live demonstrations at the annual PI meeting, October 2017. In process of acquiring data from 2017 field season and coordinating with PIs to complete data submission and metadata documentation.
- EVOS (Gulfwatch and Herring Programs): Attended and presented data management updates and live demonstrations at the annual PI meeting, Nov 2017. Finalized DataONE archive datasets from 2017. Initiated the next five year cycle, including developing project-level data management plans.
- UAF LTER: Attended the project kick-off meeting in October 2017 to present the data management strategy. Developed a draft data inventory and management plans for all projects.
- NPRB Special Project: Continued support for the annual research data submission cycle and updating of the administrative reporting tool. Piloted the visualization of GOAIERP

EDM and particle trajectory models.

Status: On Track with these projects, using other funding.

#### 1.4.5 *Support national IOOS Program data management activities*

##### 1.4.5.1 *Continue enhancements to the Environmental Sensor Map*

- Develop Next Generation National Sensor Map deployed with technical documentation; Original Completion Date: April 2018.  
Status: On Track.
- Determine best suite of data servers for Environmental Sensor Map; Original Completion Date: May 2018.  
Status: On Track.
- Develop release plan and test environments to accompany deployment of data servers; Original Completion date: May 2018.

Status: On Track.

##### 1.4.5.2 *Support ATN DAC*

- **Expose SECOORA OTN Node supporting FACT group and/or the AOOS Arctic telemetry network data through ATN DAC; Original Completion Date: May 2018.**  
Status: Ahead of schedule.
- **Deploy ATN Asset Inventory Data Visualization System to IOOS Website; Original Completion Date: June 2018.**  
Status: On Track.

##### 1.4.5.3 *Support NOS OCS AIS, Marine Traffic Information Interactive Web Tool*

- **Develop and refine web page tool for public access to AIS Vessel Traffic Data Products; Original Completion Date: June 2018.**  
Status: On Track.

##### 1.4.5.4 *Create and curate vessel heatmaps from AIS ship location data for NESDIS BEDI*

- **Develop spatio-temporal vessel heatmaps served via existing AOOS/IOOS resources; Original Completion Date: April 2018.**  
Status: On Track. Data has been processed and vessel traffic summaries and heatmaps developed.
- **Curate and archive final datasets in NOAA Data Catalog and a federal data repository; Original Completion Date: May 2018.**  
Status: On Track.

##### 1.4.5.5 *Support Marine Biodiversity Observing Network (MBON) portal*

- **Enhance MBON Portal based on user feedback; Original Completion Date: July 2018.**  
Status: On Track. Enhanced portal draft released and publicized.
- **Refine functionality of existing MBON Portal and increase availability of data; Original Completion Date: May 2018.**  
Status: On Track. Actively developing next generation version of portal to integrate biological vector data layers with other data.
- **Determine most efficient process and data formats for future submissions of data to portal; Original Completion Date: February 2018.**  
Status: On Track. Webinar delivered in October 2017 to demonstrate and receive feedback on prototype version of next generation portal.

##### 1.4.5.6 *Support further development of the USGS data portals*

- **Deploy maintenance and software developments to existing CMGP photography and video portal and CMGP oceanographic model and data portal. Original Completion Date: June 2018.**  
Status: Ongoing. On Track. Provided high performance data hosting and other technical support, added new data layers, and enhanced software.

#### 1.4.5.7 *Support Marine Mammal Stranding Network*

- **Visualize marine mammal stranding data in all regional IOOS Association portals.**  
Original Completion Date: June 2018.  
Status: On Track. Developed prototype interactive data map. Worked with Gulf of Mexico partners to implement web-based data sharing tool.

### 1.5 Modeling, Analysis & Product Development Subsystem

#### 1.5.1 *Support existing models & data products including Historical Sea Ice Atlas, Research Assets Map and Yukon-Kuskokwim Chinook Run Timing Forecast*

- **Subaward to University of Alaska International Arctic Research Center to update Historical Sea Ice Atlas twice a year; Original Completion Date: March 2017.**  
Status: Delayed – First annual update completed September 2016; second update scheduled for March 2017 is delayed due to late release of data from National Snow and Ice Data Center. Data for the first six months (January-June) of 2017 were added in October, 2017. These data will be part of the updated atlas that will be delivered to AOOS in May 2018.  
Status: On Track.
- **Subaward to Axiom Data Science to support 2017 Yukon-Kuskokwim Chinook Run Timing Forecast; Original Completion Date: May 2017.**  
Status: Complete – May 2017. No action this reporting period.
- **Subaward to Axiom Data Science to support Research Assets Map; Original Completion Date: Ongoing.**  
Status: Ongoing.

#### 1.5.2 *Continue to assess support for ROMS forecasts for PWS and GOA*

The PWS ROMS Model was funded by PWSSC through May 2017 for completion of a circulation study of Valdez Arm. With that project now complete, we no longer support this model and are still assessing the role of AOOS in various modeling activities.

#### 1.5.3 *Continue support for Model Explorer and increase capabilities*

- **Support Model Explorer; Original Completion Date: Ongoing.**  
Status: On Track.

#### 1.5.4 *Continue to explore support for Alaska Modeling Testbed*

- **Explore support for Alaska Modeling Testbed; Original Completion Date: Ongoing.**  
Status: On Track. We will be meeting with the Alaska National Weather Service office in first quarter 2018 to discuss how best to collaborate with their new Arctic Modeling Testbed and their new Alaska Environmental Services and Integration Center.

### 1.6 Additional Activities and Successes Related to Mission

- Continued financial support for Alaska Harmful Algal Bloom Network is being sought.
- Future support for the Shorezone program is also being pursued

### 2.0 Scope of Work

- The Norton Sound Buoy has been shipped back to Seward for maintenance as we investigate a longer-term plan for its deployment.
- Only one of the four HF radars on the North Slope was actually removed this summer due to a lack of long-term funding.
- We do not expect any other changes to the project Scope of Work at this time.

### 3.0 Personnel and Organizational Structure

There have been no changes in AOOS personnel or organizational structure.

#### **4.0 Budget Analysis**

All financial reports are up to date and have been submitted on time. There are no risks to the project that need identifying. There was no equipment purchased during this period.

HFR Operations and Maintenance Expenditures - AOS 2017

Operator/Principal Investigator	Field Engineer/Techician Salary including fringe benefits & overhead*	O&M Oversight (PI or O&M manager) salary including fringe benefits & overhead*	Travel*	Supply and equipment expenses, fees: computer equipment, air conditioners, generators, enclosures, antenna whips, test/calibration/repair tools, cables, services, electrical power, rentals, data communications/networking	# of radars	# of FTE	# of students (FTE)
University of Alaska/Seth Danielson	\$78,588	\$10,645	\$15,000	\$68,500	3	0.375	0
	*state indirect cost rate(s) = 50.5%	*state indirect cost rate(s) = 50.5%	*state indirect cost rate(s) = 50.5%				
				Note: Shell Oil paid for \$8500 of this used towards communications			

\*state indirect cost rate(s)

95% O&M covered by IOOS

5% O&M covered by Shell Oil

**2017 Template for reporting HF radar expenditures - AOOS**

Staff Member	(% FTE or #person-months)
Principal Investigator: Seth Danielson	1 person/0.5 months/year
Technicians/Engineers: Rachel Potter, Hank Statscewich	2 people/2 months each/year = 4 months/year total technician time
Students: Used intermittently for field work, costs are absorbed into the above technician salary	

<p>Total # of Radars Supported: 3</p> <p>2017 Funding Sources: AOOS/IOOS and Shell Oil</p>
<p>Names, locations (lat,lon), locations (city, state), Transmit Freq, Operating Institution for each radar:</p> <p>SIMP - 71.0586°N, 154.75056°W - Cape Simpson, AK - 4.66 MHz - University of Alaska Fairbanks (UAF)</p> <p>PBRW - 71.3784°N, 156.4801°W - Point Barrow, AK - 4.55 MHz - University of Alaska Fairbanks (UAF)</p> <p>WAIN - 70.6434°N, 160.0271°W - Wainwright, AK - 4.80 MHz - University of Alaska Fairbanks (UAF)</p> <p>2017: ICYC was decommissioned due to lack of funding. Previous support was 100% from Shell Oil. ICYC - 70.2850°N, 161.9289°W - Icy Cape, AK - 4.66 MHz - University of Alaska Fairbanks (UAF)</p>

## DMAC Reporting for December 2017 IOOS Annual Report

Data Management, Products, and Services Section:

DMAC is the framework for RA ingestion, management, and publication of digital data sets. These data sets can be generated by observing system assets, numerical models, or through any other process that results in a value added product. The specific requirements for DMAC participation are described at <https://ioos.noaa.gov/data/contribute-data/>.

Each section contains specific requirements that, when implemented, provide the standards based foundation for DMAC capabilities. Progress and challenges toward addressing each requirement should be described following the section headings on the web site above.

### 1. Open Data Sharing

IOOS, being a part of the Global Earth Observing System of Systems (GEOSS), ascribes to the [GEOSS data sharing principles](#):

<b>GEOSS Data Sharing Principles:</b>
---------------------------------------

- There will be **full and open exchange** of data, metadata and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation;
- All shared data, metadata and products will be made available with minimum time delay and at minimum cost;
- All shared data, metadata and products being free of charge or no more than cost of reproduction will be encouraged for research and education.

### 2. Data management planning and coordination

Data management is an increasingly important aspect of IOOS activities. Data management plans and the coordination of activities between Regions and the IOOS Program Office ensure that data are maintained in easily accessible formats that are archived for long-term storage.

### 3. Provision of data to the Global Telecommunication System (GTS)

U.S. IOOS is committed to ensuring that all relevant U.S. coastal ocean observations will be contributed in near real time to the global GTS network.



- All real-time stations must be assigned a WMO ID.
- All real-time observations must be submitted to the WMO GTS

#### 4. [Data access services](#)

All IOOS Data Providers must serve all data and products through these DMAC recommended services.

- All data and products must be made available via data access services, and [registered in the IOOS Catalog](#)
- For gridded data you must use OPeNDAP and WMS
- For in-situ observations (including point, profile, trajectory, timeseries, or other sampling types) you must use SOS and optionally OPeNDAP
- For tabular data ERDDAP/TableDAP should be used

#### 5. [Catalog registration](#)

The IOOS Catalog is the master inventory of IOOS DMAC datasets and data access services. All DMAC [data access services](#) shall be registered in the IOOS Catalog.

#### 6. [Common data formats](#)

U.S. IOOS® data providers are expected to offer data in one or more approved U.S. IOOS® formats .

#### 7. [Metadata standards](#)

All IOOS data providers are expected to ensure relevant metadata is produced, accessible and compliant with IOOS conventions, and to participate as appropriate in the development of such conventions. Descriptive information about datasets, sensors, platforms, models, analysis methods, quality-control procedures is essential for the long-term usability and reuse of information.

- [ISO 19115-2 XML Metadata](#): Metadata: Part 2: Extensions for Imagery and Gridded Data
- [CS-W](#): Catalog Service-Web
- [IOOS Metadata Profile for NetCDF](#)
- [NetCDF-CF](#): Climate and Forecast conventions for NetCDF
- [ACDD](#): Attribute Conventions for Data Discovery

#### 8. [Storage and archiving](#)

Data providers are expected to provide for storage of data, metadata and other supporting documentation and algorithm descriptions, to establish data recovery mechanisms, and to perform off-site storage of backups until the data and metadata are submitted to NCEI for archiving.

#### 9. [Ontologies, vocabularies, common identifiers](#)

IOOS is presently developing and adopting shared vocabularies for terminology such as names of observed properties, units of measure, coordinate reference systems, animal species, etc.

### 10. Consideration for Long-term Operations

The IOOS observing, data management, and modeling capacities being developed will, ideally, persist as the overall enterprise matures. In data management plans, IOOS partners should include a discussion of potential plans for maintaining such persistence as part of normal IOOS operations (e.g., by automating as many activities as possible, implementing operational procedures).

Requirements	AOOS Procedure	Progress	Challenges
<p><b>Open Data Sharing</b></p>	<p>The AOOS Data System provides data resources in a one stop data portal, free to the public, with data assets originating from federal and state agencies, local municipalities, academic institutions, research organizations, private companies, non-profit organizations, and community observers.</p>	<p>Status: All data currently served by the AOOS data portal(s) carries with it the permission to view and access, and carries no privacy or ethical restrictions. Data access is defined here as being permitted to download data through an AOOS data portal.</p> <p>Real-time and near real-time data are served as soon as the data become available.</p> <p>Data assets that come from AOOS funded programs without real-time capability are currently received within 2 years after data recovery, or by the end of the awarded project period (the lesser of both).</p> <p>NEW 2017:</p>	<p>The AOOS Research Workspace became active in August 2017, and will facilitate and streamline necessary long-term data submittal activities and will improve compliant metadata generation for sustained assets. As PIs become more familiar with submitting data to the Workspace and the capabilities within, data submissions should become easier to implement for new projects.</p>

		<p>Sustained AOOS funded assets are now set up to be submitted annually through the established AOOS Research Workspace. The AOOS Research Workspace streamlines data submittal, ingestion, and compliant metadata generation. It became operational to AOOS PIs in August 2017, and is just underway.</p> <p>The Research Workspace became a DataONE Member Node, which will streamline data sharing to long-term repositories like NCEI (who is also becoming a DataONE Member Node).</p>	
<p><b>Data management planning and coordination</b></p>	<p>The Alaska Ocean Observing System Data Assembly Center and Data Management Subsystem Plan (referred to as the Data Plan) provides the approach to the necessary implementation, describing how data are ingested, managed and distributed from the source to public dissemination.</p> <p>The primary processes involved with data management and flow include data ingestion, standards and format, metadata and discovery, quality control, stewardship and preservation, access and dissemination, archival and security.</p> <p>All non-federal AOOS data assets (referred to as Data Streams) are fully documented for data management in individual Data Stream Plans. These Data Stream Plans are maintained as an</p>	<p>NEW 2017:</p> <p>AOOS officially became RICE certified by NOAA in summer 2017. As part of this process, an AOOS data plan was completed (September 2016) and will be updated routinely (minimum 5 years) as needed to meet new requirements from the IOOS DMAC.</p> <p>The AOOS Data Plan and all related certification documentation are available at the link below.</p> <p><a href="http://www.aos.org/data-management-advisory-committee/">http://www.aos.org/data-management-advisory-committee/</a></p>	<p>None at this time.</p>

	<p>Appendix G to the larger AOOS Data Plan New non-federal additions to the regional observational data asset inventory will have a Data Stream plan developed prior to serving of data.</p> <p>In 2017, AOOS and AXIOM developed a guidance document - Data Policies and Procedures – to inform the AOOS/Axiom Data Science (the AOOS data management team) roles and responsibilities. This document also provides a guide/pathway for AOOS funded PIs regarding data submission protocols and procedures.</p>	<p>A Data Policies and Procedures document was prepared in the summer of 2017 to guide AOOS Principal Investigators on data and metadata submittal expectations, and is now included in new Statements of Work on all AOOS funded projects.</p> <p>AOOS completed an external Data System Review Nov. 27-30, which included but was not limited to evaluation of AOOS data portals and functionality, system usability, documentation of operations, business models, and strengths and weaknesses. A report is being prepared to go over recommendations for planning the next 10-years of AOOS Data System operations.</p>	
<p><b>Provision of Data to GTS</b></p>	<p>A primary goal of the AOOS Data Plan is to deliver real-time, delayed-mode and historical data for in-situ and remotely-sensed physical, chemical and biological observations. The AOOS data inventories (Appendices B, C, and E of the Data Plan) list the multiple types of data, including real-time data and near real-time data (as well as historical and citizen science data) served by AOOS.</p> <p>AOOS defines real-time data consistent manner with IOOS RICE Guidelines:</p> <ol style="list-style-type: none"> <li>1. <i>Real-time data</i> are ingested, served, and displayed by the AOOS Data System at the</li> </ol>	<p>Most real-time data assets served by AOOS are federally operated and are already meeting required data management standards.</p> <p>AOOS owned assets include two real-time reporting wave buoys. The Lower Cook Inlet wave buoy data are received, processed and served through the CDIP program (WMO # 46108).</p> <p>A second Ice Freeze-Up Detection buoy, funded by the NWS, was</p>	<p>Some real-time assets are privately owned and are not currently reporting through the GTS. AOOS staff are working towards making these assets available to the GTS, which requires finding the resource contact person/company on the deployed assets, and also getting the metadata information required for reporting data according to</p>

	<p>same frequency the data are collected (and sometimes reported) by the originator with little to no delay. Examples of real-time assets include weather stations, oceanographic buoys, and webcams.</p> <p>2. <i>Near real-time data</i> are ingested by the AOOS Data System at the same frequency that the data are made available; however, there is some delay (hours to days) between data collection and when the data provider makes it available. Examples of near real-time assets include satellite images and derived satellite products.</p>	<p>deployed in the Chukchi Sea in August 2017. Unlike the first OTT funded prototype, this 2<sup>nd</sup> buoy was reporting data to the GTS for most of its real-time reporting life. The data from the 2<sup>nd</sup> ice detection buoy was on the GTS under WMO ID 4801730 through mid-November 2017, after which the surface float broke free due to ice, and the subsurface instruments stopped reporting data. Data were being used by NOAA NWS ice forecast modelers to demonstrate the buoy utility in forecasting capacity.</p> <p>The King Island Wave Buoy, when deployed, is served through directly through the AOOS web data portal (WMO NDBC WMO Station 48114). Data are shared in the AOOS portals with descriptive narratives describing the data and linking back to the NDBC website where FGDC-compliant metadata are available.</p> <p>UPDATE: This asset is currently not deployed and there are no plans to return it to active duty at this time.</p> <p>Other assets served by AOOS that are not federally sourced fall outside this provision. There is a limit to the age of data that can be pushed to the GTS (about 6 hours or so). WMO IDs are</p>	<p>RICE certification requirements. Real-time data sources that cannot be certified will be blocked from the real-time sensor map until remedied. Once remedied, AOOS will work on gaining a WMO for the real-time observation (if relevant, most of our stations are land-based, and do not qualify for WMO status.</p>
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		not assigned to delayed-mode only moorings because of the GTS limit.	
<p><b>Data Access Services</b></p> <ul style="list-style-type: none"> <li>All data and products must be made available via data access services, and registered in the IOOS Catalog</li> <li>For gridded data you must use OPeNDAP and WMS</li> <li>For in-situ observations (including point, profile, trajectory, timeseries, or other sampling types) you must use SOS and optionally OPeNDAP</li> <li>For tabular data ERDDAP/Table DAP should be used</li> </ul>	<p>All data and products are registered in the IOOS Catalog.</p> <p>AOOS offers six access points:</p> <ol style="list-style-type: none"> <li><i>Thematic Realtime Environmental Distributed Data Services (THREDDS)</i> AOOS provides THREDDS access points for raster (gridded) data stored in NetCDF format.</li> <li><i>Open-source Project for a Network Data Access Protocol (OPeNDAP)</i> - AOOS provides OPeNDAP access points for raster (gridded) and time-series data.</li> <li>Web Map Service (WMS) - AOOS provides WMS access points for point, vector, and polygon information, as well raster (gridded) data.</li> <li>Web Feature Service (WFS) - AOOS provides WFS access points for point, vector, and polygon information, as well as time-series and raster (gridded) data.</li> <li>Environmental Research Division's Data Access Program (ERDDAP) - AOOS primarily uses this service to facilitate device-level downloads (e.g., tabular data).</li> <li>File Downloads - AOOS often provides data as downloadable files. These files are mostly served in the standard shared data file formats above, or in the case of project-specific data, in their native file formats.</li> </ol>	<p>Any data served by the AOOS portal carries with it the permission to view and access, and carries no privacy or ethical restrictions. Data access is defined here as being permitted to download data through an AOOS data portal.</p> <p>The IOOS Data Catalog is being updated at the time of this report. AOOS Data Managers are involved and aware of updated catalog.</p>	None at this time
<b>IOOS Catalogue</b>	All data and products are registered in the IOOS	Compliant and up to date.	None at this time

<b>Registrations</b>	Catalog.		
<b>Common Data Formats</b>	<p>AOOS provides nearly all data in four open, standardized forms:</p> <ol style="list-style-type: none"> <li>1. <i>Network Common Data Form (NetCDF)</i> - a self-describing, machine-independent data format that AOOS uses primarily for raster (gridded) data. Some data stored as unstructured grids use this format as well.</li> <li>2. <i>Comma Separated Values (CSV)</i> - a human-readable ASCII format that is nearly universally accepted by spreadsheet and programming languages. AOOS uses CSV formats to allow users to download (1) time-series extractions from raster data, and (2) GIS vector and polygon information (e.g., boundaries).</li> <li>3. <i>Shapefile</i> - an open geographic information system format for point, vector, and polygon data. AOOS allows users to download shapefiles of static GIS layers such as boundaries, biologic distributions, etc.</li> <li>4. <i>Portable Network Graphics (PNG)</i> - PNG is a lossless, image format provided as an alternative to shapefiles in the AOOS catalog. PNGs are limited in use as they are pre-projected, pre-scaled, and pre-sized images of data layers. However, AOOS provides PNG files as example WMS requests, which are useful to users who cannot access GIS services and who do not understand how to manipulate WMS requests.</li> </ol>		

<p><b>Metadata standards</b></p> <ul style="list-style-type: none"> <li>• <a href="#">ISO 19115-2 XML Metadata: Metadata: Part 2: Extensions for Imagery and Gridded Data</a></li> <li>• <a href="#">CS-W: Catalog Service-Web</a></li> <li>• <a href="#">IOOS Metadata Profile for NetCDF</a></li> <li>• <a href="#">NetCDF-CF: Climate and Forecast conventions for NetCDF</a></li> <li>• <a href="#">ACDD: Attribute Conventions for Data Discovery</a></li> </ul>	<p>AOOS requires standards-compliant metadata for project-level data (AOOS or IOOS-funded projects). Though AOOS does not require specific metadata standards for ingesting other types of data, most modern data submittals are accompanied by standard ISO/FGDC metadata records.</p> <p>Details and availability of metadata are discussed in individual AOOS Regional Data Stream Plans.</p>	<p>The AOOS web-based data management application, named the Research Workspace (‘Workspace’), is now being used to assemble, store, and share data by researchers or AOOS partners. There are approximately 500 users have uploaded over 20 terabytes of data spread across nearly 1 million files using this system.</p> <p>The Workspace provides users with an intuitive, web-based interface that allows scientists to create <i>projects</i> to represent particular scientific studies or focuses of research within a larger effort. Standard, discovery-level ISO 19115-2 and 19115-10 compliant metadata can be generated for both projects and individual datasets.</p> <p>Many historical datasets come with informal metadata documentation that is variable in terms of completion and detail required by modern standards. Some data sets are only accompanied with narrative information. In these cases, AOOS works to make the source information easily accessible to the end-user by providing links to source data or data providers, and by making all available metadata information that came with the data</p>	<p>AOOS is currently working on data discovery that will adequately provide sourced metadata in the data catalog in addition to the links already leading to metadata.</p> <p>Current and future data ingestion efforts make use of a metadata editor in the AOOS Workspace to streamline this process and ensure standards-compliant metadata are uploaded with the data.</p> <p>Historical data sets may continue to provide occasional difficulties in terms of metadata generation. AOOS will continue to do the best possible to make these valuable data resources available with as much documentation as possible.</p>
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		available in the data catalogue.	
<p><b>Storage and Archiving</b></p>	<p>AOOS <u>stores</u> ingested data in a secure, professionally managed external facility and currently has total storage space for over 1.8 petabytes of data. Those resources are geo-replicated between Portland, Oregon and Providence, Rhode Island. Local data storage in Anchorage is limited to temporary files only that are checked in to the main servers on a sub-daily basis.</p> <p>AOOS <u>stores</u> all aggregated data indefinitely beyond the life of each individual project. Real-time sensor feeds will become historical sensor feeds one-month after collection. The only assets that are not kept indefinitely in storage are webcam images.</p> <p>As a federally funded program, AOOS is required to submit data it generates to a national archive center. AOOS is working with the National Centers for Environmental Information (NCEI) to assist with the <u>archival</u> of appropriate data types accepted by NCEI.</p>	<p>AOOS serves many datasets that already have archival mechanisms in place, including CDIP wave buoy data, real-time sensor streams from federal sources (e.g., NSF Circum-Arctic Lakes Observing Network, NOAA CO-OPS, NOAA NDBC, NOAA PMEL, USGS NWIS, etc.), and marine mammal telemetry data from the BOEM-funded MARES program.</p> <p>The AOOS Data System became a DataONE Tier 3 Generic Member Node (GMN) and is attached to an updated version of the Research Workspace launched in 2017. This Tier 3 Member Node will serve as the primary archive for AOOS-managed data assets that NCEI does not accept.</p>	<p>NCEI does not accept all AOOS data assets served. Regardless, AOOS continues to make future interest in these data accessible to NCEI and with the required formats to meet NCEI archival requirements.</p> <p>AOOS will continue to work with NCEI to identify the relevant data streams of interest for long-term archival within NCEI and will make those data available.</p>

	<p>The bulk of the data assets managed by AOOS are non-real-time, nonfederal assets, sometimes from small data originators (e.g., weather reported by a ski resort), and often from distinct research projects or large, integrated ecological research programs. These data may not fall under the purview of the NCEI. Accordingly, AOOS plans to <u>archive</u> these data in the DataONE network.</p>		
<p><b>Ontologies, vocabulary, and identifiers</b></p>	<p>The AOOS data system is divided into four logical tiers. <i>Tier 3 (Asset Catalogue)</i> includes an Asset Catalogue, which provides (1) ontological metadata and (2) connections to externally-hosted data via web services. The ontological metadata in the catalogue describes the characteristics including geographic locations, spatial and temporal resolution, units, source location and CF parameter, taxonomy, date of last update, etc. of each data resource. Storing the metadata outside of the files themselves is critical to providing a responsive, up-to-date public-facing catalog. It also allows AOOS to optimize data discovery tools such as advanced searching by parameter or geographic location and build tools such as on-the-fly unit conversions for gridded datasets. External web services in <i>Tier 3</i> provide the catalogue access to external (web-based) sources of information. This is commonly used to display data and basemaps from reliable data providers so data do not have to be stored and maintained by AOOS. CF Standards are provided in Appendix I of the AOOS Data Plan. <a href="http://www.aos.org/data-management-advisory-">http://www.aos.org/data-management-advisory-</a></p>	<p>Data processed through the AOOS data portals have been transformed to adhere to the following CF (Climate and Forecast) conventions. These conventions are designed to promote the processing and sharing of files created with the NetCDF API. The CF conventions are increasingly gaining acceptance and have been adopted by a number of projects and groups as a primary standard. The conventions define metadata that provide a definitive description of what the data in each variable represent, and the spatial and temporal properties of the data.</p> <p>CF Standards are provided in Appendix I of the recently revised AOOS Data Plan, available at: <a href="http://www.aos.org/data-management-advisory-">http://www.aos.org/data-management-advisory-</a></p>	<p>None at this time</p>

<p><b>Consideration for long-term operations</b> Potential plans for maintaining persistence of IOOS observing assets (e.g., automating as many activities as possible; implementing operational procedures).</p>	<p><a href="#">committee/</a></p> <p>The AOOS Data System hosts several integrated data management tools to ease data access, storage, and sharing by its users including the Research Workspace and its metadata editor, and the AOOS Ocean Data Explorer, the statewide data portals.</p> <p>The AOOS web-based data management application, named the Research Workspace (‘Workspace’), is used to assemble, store, and share data by researchers or AOOS partners.</p> <p>The Workspace includes an integrated metadata editor to support the documentation of data and facilitate its accuracy and reuse. Content collected in the Research Workspace metadata editor uses fields from the ISO 19115 suite of standards for geospatial metadata, which is the FGDC endorsed successor to the CSDGM, extended to describe taxonomic classification for biological datasets. Standard, discovery-level ISO 19115-2 compliant metadata can be generated for both projects and individual datasets.</p>	<p>The AOOS Data Plan was completed in September 2016 and will be updated routinely as needed to meet new requirements from the IOOS DMAC.</p> <p>Standard Operations Protocols for the one AOOS owned asset (Lower Cook Inlet Wave Buoy) is in preparation because it is a long-term commitment for the AOOS region. This asset already has an assigned WMO number for the GTS provision.</p> <p>AOOS currently applies three standard and automated QC procedures to real-time and historical observation data before it is stored in the AOOS Data System. These tests include the following:</p> <ol style="list-style-type: none"> <li>1. <i>Syntax Test</i>: If no data can be extracted, the test fails, and no data are accessed, served or stored for that record.</li> <li>2. <i>Gross Range Test</i>: Values outside of the prescribed parameter ranges are rejected and replaced with missing value flags in data storage connected to access points and the graphic displays.</li> <li>3. <i>Time-Gap Check</i>: If no data are received from an existing observational station for four</li> </ol>	<p>AOOS’s data management contractor, Axiom Data Science, has made significant progress redesigning the back end AOOS data system to implement and support QARTOD checks for real-time data.</p> <p>Implementing QARTOD takes resources, which were not factored into any of the regional budgets. The current trend is to continue to increase QARTOD manual generation without a clear understanding of how the current QARTOD implementations are coming along and how well they are performing. In 2016, we suggested that IOOS assess the current implementation of QARTOD for the existing manuals to ensure that these manuals are providing the correct level of guidance for implementing appropriate</p>
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		<p>hours, the icon on the map changes from a scaled color to a small grey-shade dot.</p> <p>AOOS QC syntax and gross range tests meet Quality Assurance of Real-Time Oceanographic Data (QARTOD) protocol requirements for IOOS data. AOOS will continue to implement the necessary QARTOD tests where required.</p> <p>The AOOS Data Management Team is working on automating the submission of AOOS-owned data assets and AOOS-managed non-federal real-time assets to the NCEI. NCEI will advise AOOS exactly what data assets they will accept and will supply information on the data submission forms and all necessary procedures moving forward.</p>	<p>QC at the regional level <u>prior</u> to continued development of more complicated parameter manuals.</p> <p>NCEI does not have an interest in receiving all of the AOOS data. This needs to be at least acknowledged by IOOS. AOOS has found an alternative in DataONE, which is not a federal archive, but provides some long-term data access alternative.</p> <p>Lack of adequate O&amp;M support may put long-term assets at risk of being removed indefinitely. AOOS region has seen one HFR removed, and no longer supports the King Island Wave Buoy in the Bering Strait due to costs and O&amp;M.</p> <p>Not all of the AOOS regional assets maybe capable of sending data to the GTS. If this cannot be</p>
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			<p>met, does it really serve our region to disable access to these data? PACIOOS had similar issues, and finally stopped showing data in such cases under pressure from IOOS during certification. If the region does it's best to get data available to the GTS, but is unsuccessful, then what?</p>
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HFR Operations and Maintenance Expenditures - AOS 2017

Operator/Principal Investigator	Field Engineer/Techician Salary including fringe benefits & overhead*	O&M Oversight (PI or O&M manager) salary including fringe benefits & overhead*	Travel*	Supply and equipment expenses, fees: computer equipment, air conditioners, generators, enclosures, antenna whips, test/calibration/repair tools, cables, services, electrical power, rentals, data communications/networking	# of radars	# of FTE	# of students (FTE)
University of Alaska/Seth Danielson	\$78,588	\$10,645	\$15,000	\$68,500	3	0.375	0
	*state indirect cost rate(s) = 50.5%	*state indirect cost rate(s) = 50.5%	*state indirect cost rate(s) = 50.5%				
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