

Semi-annual Program Performance Report for NA16NOS0120027
FY 2016-20 Implementation and Development of Regional Coastal Ocean
Observing System: Alaska Ocean Observing System
For reporting period June 1, 2016 – November 30, 2016
Prepared by Molly McCammon, Project PI on December 23, 2016

1.0 Progress and Accomplishments

1.1 Regional Governance & Management Subsystem

1.1.1 Support ongoing board and committee activities.

- The AOOS Board met October 25 to approve new board members, elect officers and begin a strategic planning effort. New board members are Theresa Peterson as North Pacific Fishery Management Council representative and the Indigenous Peoples Commission on Marine Mammals with Mike Miller as their representative. Officers are now Ed Fogels (Alaska Department of Natural Resources), Chair; Katrina Hoffman (Prince William Sound Science Center), vice-chair; Cheryl Rosa (US Arctic Research Commission), secretary; and Jim Kendall (BOEM), treasurer.
- The AOOS DMAC met on October 19 for programmatic updates.

1.1.2 Provide ongoing fiscal and administrative oversight for program.

- Staff worked with fiscal sponsor, Alaska SeaLife Center (ASLC) to develop new guidelines for budget reporting.
- McCammon renewed AOOS' fiscal sponsor agreement with ASLC for one year (October 1, 2016 – September 30, 2017).
- Staff developed no cost extensions for subawards from prior cooperative agreement.
- Staff developed new subawards for this cooperative agreement.
- Staff reorganized organizational documentation to meet certification standards.
- AOOS continues to seek additional external funding, and in this reporting period, received 2 new awards: a \$530K award for the next two years from the National Academy of Science's Gulf Research Program to synthesize ship tracking data, oil spill model results and subsistence use data into a tool to aid in research and planning for coastal communities of the Beaufort Sea and a \$218,000 award one-year from the Exxon Valdez Oil Spill Trustee Council for Data Management services of the Gulf Watch Alaska and Herring Research and Monitoring programs. This program, just concluding its first five years, is anticipated to extend at least another 5 years, and potentially a total of 20 years.

1.1.3 Support national and international partnerships and collaborations.

- AOOS Operations Director, Carol Janzen, Janzen attended the Oceans 16 MTS/IEEE/GEOS conference in Monterey California in September and presented a submitted paper on Arctic observing technologies. She is co-leading the technical program planning committee for Oceans 17 conference which will be held in Anchorage, Alaska September 18-22, 2017.
- McCammon attended a meeting of the Consortium for Ocean Leadership in October.
- McCammon served as a member of an external review committee of the Sustained Arctic Observing Network.
- McCammon participated in numerous meetings with the IOOS program office and the IOOS Association. These included monthly meetings with other RA directors, with the IOOS Association Executive Committee (McCammon is IA treasurer) and the IA Finance

Committee. AOOS hosted the annual IOOS Association fall meeting in Anchorage with directors of the 11 RAs and staff from the IOOS program office from September 25-30.

- Janzen participated in meetings of the IOOS HFR working group and the IOOS mooring strategy working group.
- AOOS hosted a climate science briefing for the Council on Foreign Relations Arctic Strategy Task Force in August.
- AOOS co-hosted a public event, “One Arctic: Pacific to Atlantic Connections”, with NERACOOS in conjunction with the Arctic Council’s meeting in Portland, ME in October.

1.1.4 Support Alaska and regional partnerships and collaborations.

- Kent attended the 2-day annual meeting of Shorezone partners in October.
- Janzen attended the Gulf Watch Alaska annual PI meeting in October.
- McCammon participated in the Alaska Sea Grant Advisory Committee meeting in November and the Alaska Center for Climate Assessment and Policy steering committee meeting in September.

1.1.5 Finalize certification application (Year 1 completion date.)

- Certification application submitted October 6.

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 website and Facebook page, including news, featured stories, and explanations for new data tools.
- Staff produced monthly updates.
- Staff circulated quarterly e-newsletter in November to a list-serve of over 500 recipients and produced a hard copy summer newsletter.
- Kent organized and completed the 2016 AOOS film contest.

1.2.2 Support ongoing stakeholder interactions.

- Kent participated on the steering committee for and attended the Aleutian Life Forum in August. McCammon served on planning committee for December Coastal Resiliency workshop to be held in December.
- AOOS staff served on planning committee with Alaska Sea Grant for a two-day workshop on Harmful Algal Blooms to be held in December.
- AOOS Executive Director, Molly McCammon, participated in a 2-day workshop on Climate Change Adaptation and Resiliency sponsored by the Alaska Institute of Justice and the Alaska Native Science Commission in September.

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.

- AOOS Program Manager, Darcy Dugan, launched the Alaska Ocean Acidification Network (AOAN) and website on July 28. The AOAN hosted the 2-day State of the Science workshop Nov 30 – Dec 1 with over 250 people attending online and in person ranging from the general public to the science community and including some of the top researchers in the field.
- AOOS worked with the Alaska Department of Natural Resources (ADNR) to produce the final meeting summary and guidance document detailing the results of the 2015 workshop on priority gaps in water level observations. A team made up of AOOS, ADNR and NOAA are overseeing expenditures from the National Weather Service funds to implement pilot water level observation activities.
- Janzen organized regular ad hoc teleconferences with the Alaska Pacific Anomalies working group and maintained and contributed to the Alaska Blob Tracker blog.
- Janzen participates in the Alaska Climate Change Executive Roundtable’s Long-term Monitoring Committee. She and McCammon met with UAF PIs regarding plans for long-term observations and an update to the AOOS buildout plan.

1.2.4 Support partnerships with marine education and outreach programs.

- Participate annually on the organizing committee for the Communicating Ocean Sciences Workshop in conjunction with the Alaska Marine Science Symposium.
- Supported the Shorezone project as a partner.
- Delivered a presentation on using the Ocean Data Explorer in the classroom to the Chugach School District.
- Maintained a web page with resources for educators on AOOS.org.
- 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 on July 20, September 21 and November 16, 2016.

1.2.6 Continue AOOS short film contest.

- Solicited entries for the third annual AOOS short Film Contest.
- Coordinated judging of films and announced 2016 winners.
- Now working to share films through ocean-focused events.

1.2.7 Continue to co-sponsor Alaska Marine Science Symposium.

- Participated on the steering committee for the event.
- Coordinated workshops and keynote addresses associated with the symposium.
- Participated on the steering committee and developed a session for the Communicating Sciences workshop on the first day of the symposium.

1.2.8 Participate in IOOS Outreach Committee

- Responded to various requests for materials from the IOOS outreach program for inclusion into IOOS publications and website.
- Updated the IOOS Education and Outreach Inventory.

1.2.9 Other related activities

- AOOS hosted

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: May 2017.
Status: On Track – Award in place; stations were serviced in September 2016.

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: May 2017.
Status: On Track – Award in place. Stations sites were surveyed in fall 2016 in preparation for spring installation in Nome and Ketchikan.

1.3.1.3 Sustain critical wave buoys for navigation safety.

- Operate and maintain Cook Inlet buoy; completion date: Ongoing.
Status: On Track – buoy began experiencing battery issues in November. Janzen worked with Kris Holderied (NOAA Kasitsna Bay Lab), Angie Doroff (Kachemak Bay NERR) and the Data Information Program (CDIP) program staff in September-November 2016 to plan recovery and redeployment of the buoy, including obtaining a replacement buoy from CDIP and arranging vessel charter support services.
- Operate and maintain Norton Sound Buoy; Completion Date: Ongoing.
Status: Delayed – the buoy was not deployed in the summer of 2016 due to maintenance problems and lack of plan for retrieval; now working to resolve issues.

1.3.1.4 Map surface currents with high frequency radars (HFRs)

- Subaward to University of Alaska Fairbanks to support operation and maintenance of four

HFR sites on the Chukchi and Beaufort Seas as part of a consortium; Original Completion Date: May 2017.

Status: On Track using prior year funds. New award not yet in place.

1.3.2 Coastal Hazards & Inundation

1.3.2.1 Increase water level observations in western & northern Alaska

- Subaward to the Alaska Department of Natural Resources to install sensors at village and coastal sites most vulnerable to inundation, flooding and erosion; Original Completion Date: May 2017.

Status: Delayed. Still completing prior year's commitments. New award not yet in place.

1.3.3 Ecosystems, Fisheries & Climate Trends

a. Sustained Observation Network

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 2017.

Status: On Track – Award in place. Fall cruise took place.

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

- Subaward to University of Alaska Fairbanks to support addition of sensors to the Chukchi Mooring and purchase equipment for an additional mooring in another LME; Original Completion Date: May 2017.

Status: On Track – Award in place. The 2015 mooring was recovered and the 2016 mooring deployed in August 2016. Orders were placed for new equipment in November 2016 to complete the Chukchi Mooring.

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 support the pilot implementation of a real-time marine mammal detection system deployed on a glider operating in the Chukchi Sea; Original Completion date: May 2017.

Status: On Track – Award in place. This project will start in February of 2017.

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: ?

Status: Discussions underway with IOOS ATN Coordinator Bill Woodward about location and scope of workshop.

b. Regional Sentinel Observations

1.3.3.5 Support sentinel monitoring in Prince William Sound including ocean tracking network and weather stations.

- Subaward to Prince William Sound Science Center to service 8 SnoTel stations in Prince William Sound, support partnership to operate and maintain acoustic arrays across major PWS entrances and maintain conductivity sensor; Original Completion Date: May 2017.

Status: Activities for first part of year completed using other funds. Acoustic array maintenance delayed. Unable to be retrieved. New subaward not yet in place.

1.3.3.6 Support sentinel monitoring in Cook Inlet including repeat transects in the inlet and in Kachemak Bay.

- 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; Original Completion Date: May 2017.
- Status: On Track. Monthly mid-Kachemak Bay oceanographic surveys were completed for reporting period, conducted on 16 June, 27 July, 6 September, 23 September, 13 October and 10 November. Seasonal outer Kachemak Bay oceanographic surveys were completed for the reporting period, conducted on 27 July and 13 October 2016. Seasonal along-Kachemak Bay

oceanographic surveys were completed for the reporting period, conducted on 16 June and 27 July 2016. QA/QCd data through 23 September 2016 has been provided to AOOS.

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 maintain OA sampling along the Seward Line in the northern Gulf of Alaska during May and September and help support two moorings (Bering Sea and Gulf of Alaska) equipped with a surface and bottom sensor packages to measure various OA parameters; Original Completion Date: May 2017.
Status: On Track – Award in place and Bering Sea mooring serviced.
- Subawards to Tula Foundation and the University of Washington to instrument an Alaska state ferry that routinely transits the Gulf of Alaska to collect various OA parameters; Original Completion Date: summer 2016.
Status: Delayed until spring 2017 – Awards not yet in place.
- Installation of a Burkolator in Ketchikan was accomplished with other funds.

1.3.4.2 Support Alaska OA Network

- AOOS received funding from the national OA Program to host the Alaska OA Network website, list serve, and experts network and to convene a statewide State of the Science workshop and regional workshops. Original Completion Date: December 2016 for State of the Science Workshop; May 2017 for other activities.
Status: State of the Science workshop Complete – Over 250 people in person and via webinar attended the two-day workshop held on November 30 and December 2016. The event brought together an audience of OA scientists, resource managers, fishermen, and the general public to discuss the latest monitoring, research, impacts to species, and ideas for community engagement.

1.4 Data Management & Communications Subsystem

Subaward to Axiom Data Science.

1.4.1 Provide technical support to AOOS Data Assembly Center cyber infrastructure

- Ensure that the AOOS data system is healthy, secure and monitored and respond to system problems and map out future upgrade and expansion strategies.
- Support, cultivate and expand both the hardware and software, which enables the AOOS data management system to function.
- Extend capabilities of existing AOOS cyber infrastructure by exploring and implementing new software server technology, optimizing physical hardware configurations and deploying additional server resources to power applications and functionality as agreed to by AOOS.
Milestone: Design next generation Data Center; Original Completion Date November 2016
Status: Complete October of 2016
Milestone: Next Generation Data Center operational April 2017
Status: On track – ahead of schedule

1.4.2 Maintain and enhance the Ocean Data Explorer including the Arctic, Gulf of Alaska and Bering Sea portals.

- Integrate new technologies and functionalities, including further implementation of AOOS lite and “my aOOS” type functions.
- Extend the virtual sensor to produce histograms to convey distribution of hypothetical measurements across values.
- Extend virtual sensor to provide depth profiles so that users can visualize data through the water column.
- Enable complex GIS datasets (ones with large numbers of feature types) to provide intelligent information for users during roll over events. This will be extremely useful for habitat classification data sets and other complex datasets.

- Apply hexagonal binning techniques to densely packed data sets such as Shorezone to convey regional trends for habitat types and other features.
- Extend the capabilities of the Model Explorer to perform model-to-model and model-to-observation comparisons.
- Develop new and extend existing search indexes to support more advanced querying by space, time, taxonomy and parameter.

Milestone: Transition all Portals to Next Generation User Interface Original Completion Date June 2017

Status: On track

1.4.3 Implement QARTOC QA/QC checks for AOOS real time data feeds.

- Working with the broader IOOS community, Axiom will implement protocols for applying QARTOD checks to real-time data feeds.

Milestone: Work with the IOOS Community to Develop Python Library for QARTOD, June 2017

Status: Effort started, on track.

1.4.4 Provide technical support for existing data products (including the Real-time Sensor Map, Research Assets Map, Model Explorer, Sea Ice Atlas and Cook Inlet Response Tool).

- Ongoing

1.4.5 Develop new data products

- Continue development of AIS Vessel tracking tool, climatologies and glider visualizations

Milestone: Deploy Cruise and Glider 4D Visualization System, February 2017

Status: On track.

Milestone: Expose Climatology Tool for Sensors, April 2017

Status: Effort started, on track.

1.4.6 Maintain and provide access to existing and new data sets.

- Work with AOOS staff to identify high priority data sets for ingestion
- Provide technical support for existing data sets.

1.4.7 Provide overall DMAC project management and oversight.

- Support the AOOS Data Management Advisory Committee and participating in committee meetings.
- Submit written reports to the AOOS Executive Director according to a time schedule dictated by the NOAA grant, but normally twice a year, and based on a template provided by the Executive Director. These reports will include reporting on the “status of the system” as of the reporting dates.
- Provide short project highlights for newsletters and monthly updates when requested.
- Work with the AOOS Executive Director to develop appropriate performance metrics for assessing usage and value of the data system and products.
- Work with AOOS staff with input from the AOOS Board and advisory committees to develop an annual work plan that will include specific milestones and deliverables.
- Assist AOOS in becoming an IOOS certified Regional Association, especially in developing the materials and capabilities to meet the data management requirements of certification.

Milestone: Hold Fall AOOS DMAC Meeting, September 2016

Status: Complete

1.4.8 Collaborate with other state, regional, national and international data management programs

- Work with other RAs and the IOOS Program office to develop collaborative products
- Participate on behalf of AOOS in groups such as the AK Interagency Data Integration Working Group, as well as national IOOS and IOOS Association data management committees and working groups.

- Participate in statewide and national conferences to promote AOOS data services and products as requested by AOOS staff.

1.4.9 Support national IOOS Program data management activities

1.4.9.1 AOOS will augment and maintain the i52n SOS server and supporting software packages.

- Defining high level feature roadmaps
- Release planning and management
- Enhancements and bug fixes
- Improved user documentation
- Establishment of test environments and test datasets
- Investigate ODIP collaboration opportunities
- IOOS SOS 2.0 Template Development

Milestone: 52 North Software Stack upgraded to SOS 2.0 template, Original Completion Date May 1, 2017

Status: Progress is being made on this milestone and the project team expects to deliver on time.

Deliverable: SOS 2.0 52 North Software Stack Original Completion Date June 1, 2017

Status: Progress is being made on this milestone and the project team expects to deliver on time.

1.4.9.2 Continue enhancements to the Environmental Sensor Map and its integration with the IOOS Catalog

- Define high level roadmap
- Release planning and management
- Enhancements, bug tracking and fixing
- Improved documentation

Deliverable: Advanced National Sensor Map deployed Original Completion Date Feb 1 2017.

Status: Progress is being made on this milestone and the project team expects to deliver on time. Next generation tools for sensor streams are maturing.

Milestone: Improved environmental sensor map with API access, Original Completion Date April 1, 2017

Status: Progress is being made on this milestone and the project team expects to deliver on time.

1.4.9.3 Develop tools for users producing animal telemetry data sets which streamline the data management process and accelerate integration into relevant data assembly centers (ATN DAC)

- Develop detailed project plan and timeline including roles and responsibilities
- Organize meetings to discuss details on how to improve workspace to enable ATN data sharing
- Integrate Workspace with ATN data sharing tools with ATN DAC front end interface
- Propagate and package information for use by IOOS community

Milestone Explore OTN node Integration Original Completion Date June 2016

Status: Complete June 2016 - Working with OTN group in Halifax, Axiom engineers implemented a standalone OTN node.

1.4.9.4 Develop a scalable methodology for storing and querying the national AIS data set assembled by the NOAA Office of Coast Survey with the following functionality

- Interact with data in ArcGIS
- Filter data both spatially and temporally
- Build tracklines using user-defined parameters (distance and time)
- Maintain transit id, MMSI, IMO and other vessel characteristics
- Output subsets based on time/distance, vessel type

- Define resolution, output coordinate system
- Calculate density per cell based on total number of vessels, total number of unique vessels (based on MMSI/IMO), and total number of unique vessels with user-defined cap (number of vessels within an individual cell may be set to not exceed a customizable number)
- Clean data to separate time at anchor vs time in transit
- Be run on a large (national) scale
- General null values for grid cells where there is no vessel traffic (between shoreline and extents of US EEZ)
- Generate raster output
- Calculate difference between charted depth and reported vessel draft possibly using authoritative list of vessel characteristics associated with MMSI numbers
- Calculate number of unique vessels within given grid cell navigating within 1 m of charted depth

Milestone: AIS analytical system Original Completion Date May 1 2017

Status: Ahead of schedule, milestone is planned to be met by January 2017 meeting all above requirements.

Deliverable: AIS Analysis tool Original Completion Date May 1 2017

Status: Progress is being made on this milestone and the project team expects to deliver on time.

1.4.9.5 Improve tools for preserving High Frequency Radar (HFR) output and allowing for reprocessing HFR data

- Engage with HFR working group to develop instruction manual for HFR operators for use of Research Workspace

Milestone: Isolate Candidate HFR Sites to Participate in the Pilot Original Completion Date June 2016

Status: Complete June 2016

Deliverable: Research Workspace for HFR data Original Completion Date May 2017

Status: On track.

1.4.9.6 Support and enhance USGS Coastal and Marine Geology Program portals

Milestone: Deploy Next Generation Charting and Data Integration Portal Original Completion Date May, 2017

Status: On track for completion

Milestone: Develop Deployment Pathway to USGS Cloud Hosting Services Original Completion Date May 2017

Status: On track for completion. Phase one to USGS cloud staging area will be complete by Feb 1, 2016.

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: September 2016 and March 2017. Status: On-track. Milestone met in September. Support for Y-K Chinook Run Timing Forecast included in Axiom contract. Future support for Research Assets Map is being assessed.
- Subaward to Axiom Data Science to support research assets map and YK forecast
Milestone: Support 2017 Yukon-Kuskokwim Chinook Run Timing Forecast, May 2017
Status: On track.
Milestone: Support 2017 Field Season Arctic Assets Maps, May 2017
Status: On track.

1.5.2 Continue development of AIS Vessel Tracking Tool

- Subaward to Axiom. Status: on track

1.5.3 Continue to assess support for ROMS forecasts for PWS and GOA

- ROMS model removed from AOOS portal in order to assess stakeholder usage and interest. Primary interest appears to be from PWS Science Center, but only for a limited time. Funds for the modeling contract have been transferred to the PWSSC subaward through June 2017.

1.5.4 Continue support for Model Explorer and increase capabilities

- Exploring options within available funds

1.5.5 Continue to explore support for Alaska Modeling Testbed

- Discussing options with new National Weather Service Arctic testbed.

1.6 Additional Activities and Successes Related to Mission

- Exploring development of an Alaska Harmful Algal Bloom Network.

2.0 Scope of Work

- We do not expect any substantive 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. The grant manager for AOOS at the Alaska SeaLife Center was vacant for several months. A new person just started full-time in December.

4.0 Budget Analysis

All financial reports are up to date. Expenditures have been somewhat lower as there is a lag period between agreement start date and actual start dates.

II. Performance Progress Report Addendums

1.0 Special Report: Education and Outreach Inventory

The AOOS Education and Outreach Inventory has been updated online.

2.0 Special Report: Data Management, Products, and Services

IOOS Requirements	AOOS Procedure	AOOS Progress	AOOS Challenges
<p>Open Data Sharing</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>All data currently served by the AOOS data portal(s) carry permission to view and access with no privacy or ethical restrictions. Access also permits user to download data.</p> <p>Real-time and near real-time data are served as soon as the data become available to AOOS. Sustained non-real-time AOOS funded assets submit data on an agreed upon basis or at least annually.</p> <p>The AOOS Data System is now using a data submittal tool (Research Workspace) for these and other project assets, streamlining data submittal, ingestion, and compliant metadata generation.</p>	<p>Establishing Research Workspace capability with all AOOS funded project leads and organizations takes time. However, the Research Workspace tool will facilitate and streamline necessary long-term data submittal activities and will improve compliant metadata generation for all submitted data served by AOOS.</p>
<p>Data management planning and coordination</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 data management implementation, describing how data ingestion, standards and format, metadata and discovery, quality control, stewardship and preservation, access and dissemination, archival and security are handled.</p> <p>All non-federal AOOS data assets (referred to as Data Streams) are further documented in individual Data Stream Plans. These Data Stream Plans are maintained as an Appendix (G) to the Data Plan.</p> <p>http://www.aos.org/data-management-advisory-committee/</p>	<p>A revised AOOS Data Plan was completed in September 2016 and the plan is to routinely update as needed (minimum 5 years) to meet new requirements from the IOOS DMAC.</p> <p>This plan is currently going under review as part of the AOOS RICE certification process. The AOOS Data Plan is available at the link to the left, except for Appendices G (Data Stream Plans), which are currently undergoing revision as part of the certification process.</p> <p>Any new non-federal additions to the regional observational data asset inventory will have a Data Stream plan developed prior to going forward with serving of the data.</p>	<p>None at this time.</p>
<p>Provision of Data to GTS</p>	<p>A primary goal of AOOS 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 – see link above) 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 with IOOS RICE Guidelines: <i>Real-time data</i> are ingested, served, and displayed by the AOOS Data System at the same frequency the data are collected (and sometimes reported) by the originator with little to no delay.</p> <p><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.</p> <p>Assets operated by AOOS that return real-time or near real-time data send data through the GTS if they meet GTS requirements.</p>	<p>Most real-time data assets served by AOOS are federally operated and are already meeting required data management standards and GTS provision.</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>The King Island Wave Buoy, when deployed, serves data directly through the AOOS web data portal and simultaneously sends data to NDBC (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>Other AOOS data assets 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). Furthermore, WMO IDs are not assigned to delayed-mode moorings or weather stations because of the GTS limit.</p>	<p>Some real-time assets are privately owned and are not currently reporting through the GTS. It is not totally clear what assets are required to meet the GTS provision, and we could use some guidance on this.</p>

<p>Data Access Services</p> <p>1. All data registered in the IOOS Catalog</p> <p>2. For gridded data – OPeNDAP, WMS</p> <p>3. For in-situ observations (including point, profile, trajectory, timeseries, or other sampling types) SOS and optionally OPeNDAP</p> <p>4. For tabular data ERDDAP/TableDAP should be used</p>	<p>All AOOS data and products are registered in the IOOS Catalog.</p> <p>AOOS offers six access points:</p> <ol style="list-style-type: none"> 1. <i>Thematic Realtime Environmental Distributed Data Services (THREDDS)</i> for raster (gridded) data stored in NetCDF format. 2. <i>Open-source Project for a Network Data Access Protocol (OPeNDAP)</i> for raster (gridded) and time-series data. 3. <i>Web Map Service (WMS)</i> for point, vector, and polygon information, as well raster (gridded) data. 4. <i>Web Feature Service (WFS)</i> for point, vector, and polygon information, as well as time-series and raster (gridded) data. 5. <i>Environmental Research Division's Data Access Program (ERDDAP)</i> to facilitate device-level downloads (e.g., tabular data). 6. <i>File Downloads</i> for files served in the standard shared data file formats above, or in the case of project-specific data, in their native file formats. 	<p>The updated IOOS Data Catalog has just been released.</p> <p>AOOS Data Managers are involved and aware of the updated IOOS catalog.</p> <p>AOOS data access services are compliant and up to date.</p>	<p>None at this time</p>
<p>IOOS Catalogue Registrations</p>	<p>All AOOS data and products are registered in the IOOS Catalog.</p>	<p>Compliant and up to date.</p>	<p>None at this time</p>
<p>Common Data Formats</p>	<p>AOOS provides nearly all data in four open, standardized forms:</p> <ol style="list-style-type: none"> 1. <i>Network Common Data Form (NetCDF)</i> for raster (gridded) data. Some data stored as unstructured grids use this format as well. 2. <i>Comma Separated Values (CSV)</i> to allow users to download time-series extractions from raster data, and GIS vector and polygon information (e.g., boundaries). 3. <i>Shapefile</i> to download shapefiles of static GIS layers such as boundaries, biologic distributions, etc. 4. <i>Portable Network Graphics (PNG)</i> are limited in use as they are pre-projected, pre-scaled, and pre-sized images of data layers. 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. 	<p>Compliant and up to date</p>	<p>None at this time</p>
<p>Metadata standards</p> <ul style="list-style-type: none"> • ISO 19115-2 XML Metadata • CS-W • IOOS Metadata Profile for NetCDF • NetCDF-CF • ACDD 	<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>AOOS is using a data submittal tool, the Research Workspace (“Workspace”) to help with the proper generation of metadata for all data it serves. Standard, discovery-level ISO 19115-2 compliant metadata can be generated for both projects and individual datasets from all types of data providers.</p> <p>Details and availability of metadata are discussed in individual AOOS Regional Data Stream Plans.</p>	<p>Many historical datasets came/come with informal metadata documentation that is variable in terms of completion and detail required by modern standards. Some only contain narrative information. 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 available in the data catalogue.</p> <p>The AOOS web-based data management tool, referred to as the Research Workspace (‘Workspace’), is now being used to assemble, generate metadata, store, and share data by researchers or AOOS partners. Users have uploaded over 18 terabytes of data spread across more than 800,000 files using this system.</p>	<p>Historical data sets may continue to provide 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, working with data providers to ensure more robust metadata for future data ingestion.</p>

<p>Storage and Archiving</p>	<p>AOOS <u>stores</u> ingested data in a secure, professionally managed external facility, has total storage space for over 1.8 petabytes of data, and keeps data and services highly available between Portland, Oregon and replicated in the Amazon web services cloud. Local data storage in Anchorage is limited to temporary files only that are checked into the main servers sub-daily. AOOS <u>stores</u> all aggregated data indefinitely beyond the life of each individual project. 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. The bulk of the data assets managed by AOOS are non-real-time, nonfederal assets, sometimes from small data originators, 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>AOOS serves many datasets that already have national archival mechanisms in place (see Data Plan). AOOS's current submissions for long-term archive at NCEI are limited to historical data from a single buoy (King Island Wave Buoy).</p> <p>The AOOS Data Management Team is standing up a DataONE Tier 3 Generic Member Node (GMN) attached to an updated version of the Research Workspace that will serve as the primary archive for AOOS-managed data assets that NCEI does not accept. The local deployment of the DataONE GMN has been installed in a virtual machine on AOOS cyberinfrastructure resources.</p> <p>AOOS is working with NCEI on automating the submission of AOOS-owned data assets and AOOS-managed non-federal real-time assets that NCEI will accept now or possibly in the future to the NCEI archive.</p>	<p>NCEI does not have interest nor has been willing to accept all AOOS data assets. Regardless, AOOS continues to make these data accessible to NCEI 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>Ontologies, vocabulary, and identifiers</p>	<p>The AOOS data system includes an Asset Catalogue, which provides ontological metadata and 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. CF Standards are provided in Appendix I of the AOOS Data Plan. http://www.aos.org/data-management-advisory-committee/</p>	<p>Compliant and up to date.</p> <p>Data submitted through the AOOS data portals have been transformed to adhere to CF (Climate and Forecast) conventions, 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.</p>	<p>None at this time</p>
<p>Consideration for long-term operations Potential plans for maintaining persistence of IOOS observing assets (e.g., automating as many activities as possible; implementing operational procedures).</p>	<p>The AOOS Data System hosts several integrated data management tools to ease data access, storage, and sharing by its users including the data submittal tool, the Research Workspace with its metadata editor, and the AOOS Ocean Data Explorer, the statewide data portal.</p> <p>The Research Workspace ('Workspace') is used to assemble, store, and share data by researchers or AOOS partners, and 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 using this tool. These tools facilitate and streamline necessary long-term data submittal activities while improving compliant metadata generation for all submitted data served by AOOS.</p> <p>The AOOS Ocean Data Explorer, the statewide data portal, is a tool used for discovery of scientific and management information (real-time data, model outputs, satellite observations and GIS data sets) of Alaska and its surround waters.</p>	<p>The revised AOOS Data Plan was completed in September 2016, and is currently under review.</p> <p>Since its release in April 2012, the Research Workspace user-base has grown to more than 500 individuals from a number of large-scale scientific research programs.</p> <p>The AOOS Data Team at Axiom, developed a tool that allows users to search the ~625,000 taxonomic entities of the Integrated Taxonomic Information System (ITIS) in order to rapidly add species information to metadata.</p> <p>AOOS currently applies three standard and automated QC procedures to real-time and historical observation data before they are stored in the AOOS Data System to meet Quality Assurance of Real-Time Oceanographic Data (QARTOD) protocol requirements for IOOS data.</p> <p>The AOOS Data Team is working on automating the submission of AOOS-owned data assets and AOOS-managed non-federal real-time assets to the NCEI.</p>	<p>NCEI does not have an interest in receiving all of the AOOS data; however, IOOS DMAC personnel insist all data served must be submitted to NCEI. This point of confusion needs to be resolved.</p> <p>AOOS will continue to automate and document necessary QARTOD tests for qualified real-time AOOS Data Streams.</p>

3.0 Special Report: Observing Assets

3.1 RA Observing Asset Inventory

2021 ACES AWARD SUPPORTIVE ASSISTANCE

Table with columns: Station ID, Station Name, Station Location, Station Description, Station Status, Station Longitude, Station Latitude, Station Elevation, Station Type, Instrument Type, Instrument Year, Time Period Start, Time Period End, Platform Maintainer, Platform Operator, Operator Lead, Operator Subor, Variable Name, Variable Units, Abbreviation/Code. Rows include sections for AOPS SUPPORTED WAVE BUOYS, LONG-TERM GULF OF ALASKA MOORING GAKI, CHUKCHI SEA ECOSYSTEM MOORING, SENSITIVE BASIN MOORING, OCEAN ACQUISITION MOORINGS IN ALASKA, WEATHER ON AIS AND AIDS TO NAVIGATION SUPPORT, MARINE EXCHANGE OF ALASKA, and various island moorings (Alaska, Hawaiian Islands, Phoenix Islands, Johnston Atoll).

3.2 High Frequency Radar Annual Expenditures

	Expendables:	Software:	Hardware:	Communications:	Facilities:	Labor:	Testing & Calibration:	Data Mgmt & Data Archive:	Transportation:	Travel to Working Groups & Conferences
	Replenishment of supplies (THIS MAY NOT BE NECESSARY-JH)	Costs for applications and mission software, commercial off-the-shelf software, communications software and the cost of software modifications, improvements and maintenance	Investment in durable mission hardware (sensors, platforms, information and communications technology); and modifications and maintenance to systems and mission hardware; includes engineering and off-site repairs, and unit-level replacement of persistent components	Costs associated with leased circuits, internet service, mobile phone service & telemetry required to collect data and deliver data from radar sites to regional or national servers	Costs associated with facilities and facilities infrastructure. Includes, leases and cost of utilities (power and fuel, but excluding communications costs), maintenance and repair for shelters, antenna bases, and HVAC equipment, security fencing or other security-related expenses, lightning protection, and grounds and access maintenance fees including rent.	Sum of salary, fringe benefits & their indirect costs for all field labor.	Labor and transportation costs (surface transport and days-at-sea) to test and calibrate antennas; excludes facilities, software and hardware needed for test and calibration	Cost of managing and processing radial velocity data to the point of delivery to national or regional servers, including data quality analysis and control; meta-data management and maintenance; and allocated cost of long-term data archive	Transportation costs to conduct to maintain and repair/replace radar site equipment; excludes test and calibration transport costs.	Transportation, lodging & associated travel expenses
Cost	\$10,000	\$0	\$20,000	\$5,500	\$3,000	\$55,000		\$6,000	\$25,000	\$2,500
			The above cost is mostly for annual replacement of components of our remote power systems (e.g. batteries, wind turbines). SeaSonde repair costs are often done in house and absorbed into expendables (<\$5k) and labor.				Included in transportation, cannot be separated after the fact, and is often performed during a multi purpose trip.			
Cost + Indirect	\$15,000	\$0		\$8,250	\$4,500	\$82,500		\$9,000	\$37,500	\$3,750
					Remote power costs are not listed here, but rather in expendables, cannot be separated after the fact					
	***Costs for Categories not offered above = \$60,000 (\$90,000 with indirect)									
	These costs for services: air freight, site access (4-wheeler, snow machine, boat rentals), honoraria, etc.									

3.3 High Frequency Radar Annual Assets & Staffing

Template for reporting HF radar expenditures

Staff Member	(% FTE or #person-months)
Principal Investigator: Thomas Weingartner	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	

Total # of Radars Supported: 4
<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</p> <p>PBRW - 71.3784°N, 156.4801°W - Point Barrow, AK - 4.55 MHz - University of Alaska Fairbanks</p> <p>WAIN - 70.6434°N, 160.0271°W - Wainwright, AK - 4.80 MHz - University of Alaska Fairbanks</p> <p>ICYC - 70.2850°N, 161.9289°W - Icy Cape, AK - 4.66 MHz - University of Alaska Fairbanks</p>

3.4 Glider Days Inventory

Glider Operator	Glider Data Manager	Responses to IOOS RA Glider Use Questions			
		1) How many glider-days of data were collected annually in 2016 by glider operators in your RA? (Note: Glider-day = 1 glider in the water collecting data for 1 day).	2) Of the glider-days reported, how many were completed outside of the EEZ?	3) Of the glider-days reported, how many were supported by IOOS PO? Consider only operations and maintenance, not capital costs.	4) What missions were completed? If possible also include how many glider days/mission. (It's ok if one glider was conducting multiple missions at once. You can count the glider days toward each mission for this purpose.)
UAF: Peter Winsor, Brita Irving, Hank Statscewich WHOI: Mark Baumgartner	Brita Irving, Mark Baumgartner	86 using the AOOS purchased glider	0	0	1 mission: hydrographic mapping and whale acoustics
UAF: AK Ocean Acidification Research Center/NOAA PMEL	Jessica Cross, Jeremy Mathis	282 days	0	0	4 missions. 2 with saildrones for 104 days each; 2 with wave gliders for 89 days each. Ocean acidification research and monitoring