National Leadership Grants - Museum

Sample Application MG-257527-OMS-25
Project Category: Collections Stewardship and Access
Project Type: Research

Alaska SeaLife Center

Amount awarded by IMLS:	$499,345
Amount of cost share:	$0

The Alaska SeaLife Center will work with collaborators to investigate the effectiveness of different methods to detect, diagnose, vaccinate, and treat aspergillosis, an environmental fungus causing respiratory disease in birds under human care. The team will study how best to monitor and mitigate this pathogen across many species to determine which methods work best for seabirds and waterfowl while providing meaningful comparative data, shared via publications and presentations, to help any aviary decide what works best for them. Ultimately, the goal is to minimize the morbidity and mortality of birds under professional care across the country.

Attached are the following components excerpted from the original application.

- Narrative
- Schedule of Completion
- Digital Products Plan

When preparing an application for the next deadline, be sure to follow the instructions in the current Notice of Funding Opportunity for the grant program and project category to which you are applying.

Aspergillosis Monitoring And Prevention in Seabirds (Asper MAPS)
Project Justification

Goal and Objective

The Seward Association for the Advancement of Marine Science (dba Alaska SeaLife Center or ASLC) seeks $499,000 in IMLS National Leadership Grants for Museums (NLG-M) funding to advance research on disease mitigation that poses an imminent threat to the birds at our facility and other similar institutions. The project, Aspergillosis Monitoring And Prevention in Seabirds (Asper MAPS), is aligned with the IMLS NLG funding opportunity NLG-M Program Goal 3: Advance the museum field's ability to identify new solutions that address high-priority and widespread collections care or conservation issues, Objective 3.2 Support research focusing on any broadly relevant aspect of the management, conservation, and preservation of collections.

The Problem

Aspergillus fungus poses a significant threat to avian health in managed populations. A retrospective analysis of mortalities in one zoological institution found aspergillosis as the primary cause in 41.8% of 91 tufted puffin deaths over 35 years.[1] Other studies showed a 48.5% mortality rate at a rehabilitation center [2] and a 66% mortality rate of eider ducks raised from confiscated eggs.[3] Oiled wildlife are especially vulnerable due to immune compromise from oil exposure[4,5] and the warm, humid facilities in the facilities where they are housed and cleaned- factors which promote the growth of *Aspergillus*[6,7] and lead to a high rate of aspergillosis in oiled birds.[8–10] Although this disease significantly impacts commercial, zoological, and private bird collections, it remains poorly understood and challenging to detect, diagnose, and treat.[11–13]

Standard diagnostic methods for aspergillosis, such as culturing samples for contamination or infection, often require weeks to yield results and are prone to false negatives.[14] Antibody detection lacks sufficient sensitivity and specificity,[13] while fungal antigen detection is not consistently reliable.[15] Auxiliary tests like protein electrophoresis and inflammatory parameters are non-specific and contribute only to presumptive diagnoses, which are often only confirmed through histopathological examination and at necropsy.[12] Experimental vaccines exist but have had challenges,[11,16,17] some early attempts even caused death,[18] and antifungal treatment carries risks due to low safety margins and the extended treatment durations required for exposure (weeks) or active infection (months).[16] Group medication strategies, like mixing drugs in food, may not account for individual foraging behaviors, further complicating treatment. Additionally, the common practice of applying standard dosages across species without confirming effective drug levels may foster drug resistance, a serious concern given aspergillosis can also affect humans.[11] Drug choice and delivery thus require careful consideration.

At our facility, we care for 137 birds across 11 species in three isolated habitats. While aspergillosis cases have been rare in the past two decades, last year, we saw a marked increase, leading us to treat most of our birds prophylactically due to exposure risks. Alaska's summer of 2023 was unusually moist, and rising temperatures, likely due in part to climate change,[19–21] more conducive to *Aspergillus* growth. Warmer, wetter conditions in the subarctic region, which previously suppressed this pathogen, now threaten both our managed birds and their wild counterparts.

These changes have prompted a need to incorporate monitoring and mitigation strategies for aspergillosis in our preventive medicine program. In response to the increase in cases, we reached out to colleagues who generously shared protocols, though they admitted to a lack of scientific validation of the efficacy of current strategies. Their shared management plans varied,

underscoring a need for standardized best practices. Many expressed interest in collaborating on research to assess and refine protocols.

As a cold-water research facility, ASLC is well-positioned to lead this study. The emergence of aspergillosis as a new threat in our collection offers a unique opportunity to rigorously test and compare management approaches, contributing valuable insights for facilities facing similar challenges.

Primary Audience

Our project primarily targets the seabirds and waterfowl in our collection that are affected by *Aspergillus*. To enhance the statistical power of our data, we will focus on testing eiders, puffins, and common murres, which are our most numerous species. Specifically, we currently house 70 eiders (spectacled, Steller's, and king), 22 puffins (horned and tufted), and 31 common murres. These species are held in both public and private collections across North America, including at partner institutions like Monterey Bay Aquarium, Point Defiance Zoo and Aquarium, Dry Creek Waterfowl, and Pinola Aviary. The puffins and murres are exclusively housed within AZA institutions, with up to 15 institutions caring for each species. These species are managed by AZA's Shorebird Taxonomic Advisory Group (TAG), which provides husbandry guidance, breeding recommendations, and transfer plans. AZA's Waterfowl TAG oversees the eiders, though they are housed by fewer AZA institutions.

Eiders, prized for their engaging behavior and contribution to conservation messaging on Arctic climate change, are also found in private collections. However, the risk of aspergillosis has deterred many facilities, both AZA and private, from expanding their eider populations. Dry Creek Waterfowl, a longtime collaborator and private facility, identified aspergillosis as a serious threat to their collection and led initial efforts to develop an aspergillosis vaccine. While we will prioritize testing samples from these key species to support statistically significant results, any facility with avian species is welcome to participate in our working group and contribute environmental samples for testing.

Ultimate Beneficiaries

The knowledge gained from this project will benefit all aviaries and bird rehabilitation facilities, as aspergillosis affects all bird species. Seabirds, waterfowl, and Arctic species, with potentially lower natural immunity due to minimal exposure in the wild, are expected to benefit most. Facilities that rehabilitate birds—such as members of the National Wildlife Rehabilitators Association (NWRA), which includes over 1,500 members caring for more than 60,000 birds annually—will greatly benefit from enhanced monitoring and mitigation protocols, as their often-immunocompromised patients are particularly vulnerable. Finally, we will share our findings with facility guests and through community-based science cafés, aiming to enhance public understanding of threats to animal health.

Distinctive Elements of the Project and Benefit to the Field

This project builds on previous efforts by individual facilities to monitor and mitigate *Aspergillus* infection, advancing these efforts by exploring new testing methods. We will apply molecular techniques to accelerate pathogen identification and assess the safety and efficacy of the Aspergillus vaccine currently used only by select facilities. This study will enable us to compile best practices across a range of species and institutions, contributing valuable insights to avian health management and advancing the field of avian medicine.

Project Work Plan

Specific Activities & Sequence

Establishing the Peer Advisory Board: The first few months will be spent getting organized, finalizing documentation, and planning for the first wave of testing. A core working group of peer advisors will be established, including representatives from partner facilities providing case information and samples, as well as experts from reference laboratories conducting analyses. Given limited resources, facilities involved in testing will be prioritized based on factors such as bird population size, species diversity, and current aspergillosis management approaches at each facility. However, all facilities are welcome to join the group to participate in data sharing, review, and dissemination of results. In this initial phase, we will establish sample and data-sharing agreements and complete any required Institutional Animal Care and Use (IACUC) applications. We will also confirm testing options, costs, and any available bulk or research discounts with reference labs.

General Schedule: *Aspergillus* infections are most common from April through October, which is when most sampling and testing will occur. During these months, warm, humid conditions prevail, even for indoor aviaries, where cycles are often simulated to mirror natural seasons. Also, at that time of year, birds are engaged in nesting, rearing chicks, and molting—which elevate stress, decrease immune response, and increase susceptibility to infection. During fall and winter, we will coordinate with collaborators to review findings from the previous season, refine priorities, and prepare for the next spring and summer "*Aspergillus* season," when sampling and testing will peak.

Setting Priorities and Scheduling Sampling and Testing: The Peer Advisory Board will hold planning meetings to finalize priorities for testing across the four mitigation areas: Environmental Testing, Diagnostic Testing, Vaccine Effectiveness, and Drug Level Testing (described in detail below). During these meetings, facilities will review their inventory of archival samples and historical test data, allowing us to address preliminary questions and streamline the setup for the first sampling season. This phase will establish a detailed sampling and testing strategy, specifying the types and quantities of samples each facility will contribute and the timing of their submissions.

Environmental Testing: Historically, detecting *Aspergillus* fungus has relied on culturing environmental samples such as swabs, static plates capturing airborne spores, or air-sampling device plates, which are then sent to labs for analysis.[22] However, this culture method is time-intensive, often taking up to a month for results. Molecular techniques now offer faster detection, identifying genes within a few days.[23–26] We plan to conduct side-by-side testing of culture and molecular methods to evaluate their comparative effectiveness and speed in detecting *Aspergillus* in environmental samples.

Diagnostic Testing of Birds: Historically, definitively diagnosing aspergillosis required the culture of a swab or tissue from a patient, which as described above, takes time. Adjunct tests looking for antibodies and fungus are available,[12,13,15] but levels do not correlate well with disease. Newer tests on different immune responses are available but have not been studied for correlation with aspergillosis. We aim to do side-by-side comparative testing of microbiological culture and molecular techniques of animal samples to determine if both can detect the presence of *Aspergillus*. Additionally, we aim to test a broad suite of physiological parameters and biomarkers[12] to determine which correlates best with disease.

Vaccine Effectiveness: Autogenous vaccines, also known as customized vaccines, have been used to combat unique variants of bacterial and viral infections.[27] A few aviaries have used this technique to create vaccines from locally sourced *Aspergillus* strains, which is important as *Aspergillus* sub-varieties differ widely in key characteristics. Due to these differences, broad-spectrum vaccines are ineffective, but the efficacy of these customized vaccines remains largely unstudied, particularly across diverse bird species. We aim to measure changes in diagnostic and physiological markers following vaccination to evaluate effectiveness. In addition, historical and new case data will be analyzed to compare disease incidence in vaccinated vs. unvaccinated groups.

Drug level testing: While ideally administered individually, oral antifungal treatments for birds often require labor-intensive hand-feeding, which may elevate stress and thus lower immunity, increasing disease risk. Alternative methods like "top dressing" (adding drugs to food), gelatin-drug cubes, or medicated feed enable flock-based delivery, though their efficacy in achieving therapeutic blood levels is unknown. We will assess whether these drug delivery methods maintain effective systemic drug levels.[28,28]

After the first year of sampling and testing, we will review the results and overall project execution, adjusting our approach as necessary for the second sampling season.

Data Synthesis, Analysis, and Reporting: Data analysis will commence as soon as robust datasets become available. Preliminary findings will be presented at relevant conferences to inform the field. In the project's final phase, the Peer Advisory Board will analyze data from both sampling seasons, prepare publications, and produce a summary report with recommendations for best practices in aspergillosis monitoring and mitigation.

Risk management and mitigation

Ironically, a key risk to this project is the potential absence of significant *Aspergillus* impacts due to variable conditions. Environmental factors could shift such that *Aspergillus* does not proliferate to levels that cause disease or remain below detectable thresholds, limiting our ability to evaluate environmental testing methods and diagnostic comparisons effectively. However, this risk is minimized by partnering with multiple facilities across varied climates. If a facility has not provided sufficient sample numbers by the midpoint of the testing period, we will reallocate sample collection to another facility to ensure data robustness.

Another challenge involves using diagnostic tests originally designed for one species but applied across multiple avian species in this study. Tests may yield different results or prove ineffective when used with samples from non-target species. To address this, we will coordinate closely with diagnostic laboratories to assess the suitability of tests for various species and conduct additional validation steps if necessary.

Finally, the project's ambitious scope, with multiple investigative areas and collaborating institutions, poses a risk to overall coordination. To mitigate this, we will hold regularly scheduled virtual meetings approximately every two months to review progress, set priorities, and address any logistical or procedural challenges that may arise, ensuring consistent alignment across all partner.

Management Plan

The Alaska SeaLife Center (ASLC) will lead this collaborative effort, coordinating with partner facilities and laboratories.

Carrie Goertz, MS, DVM, will be the Project Director and Principal Investigator, responsible for programmatic oversight and all grant reporting. Her duties will include organizing and leading regular collaborator meetings, ensuring sample and data-sharing agreements are in place, setting and tracking deadlines, and other administrative tasks. Dr. Goertz brings extensive experience managing multi-center grants, including a previous grant from the Association of Zoos and Aquariums (AZA) on *Streptococcus bovis* in northern sea otters. Like the project proposed here investigating aspergillosis, the *Strep bovis* project involved coordinating sample collection across multiple facilities, establishing agreements, providing sampling guidance and supplies, and compiling data anonymously. Dr. Goertz will also mentor Dr. Emmanuelle Furst in grant management as part of this project.

Emmanuelle Furst, DVM, MS-OH, will act as an Assistant Director and Co-Investigator. She will be the clinical lead for ASLC cases, handling the collection and testing of samples from ASLC birds. Dr. Furst will supervise technicians assisting in these tasks and will travel as needed to collaborate with other facilities. Over the project's duration, Dr. Furst's grant management responsibilities will gradually increase, providing hands-on experience under Dr. Goertz's mentorship.

Kristen Pelo will serve as the second Assistant Director and Co-Investigator, working closely with Dr. Furst to ensure sample collection from aviary birds is minimally disruptive. As a member of the AZA's Avian Taxon Advisory Groups, she is well-positioned to identify appropriate partner facilities based on species profiles and to disseminate findings across aviary networks. Her connections will also help expand the reach of this project within the avian conservation community.

ASLC's team of veterinary and laboratory technicians will assist with sample collection, processing, shipping, and data entry. These technicians are trained and certified in handling and shipping biological specimens and have significant experience performing similar tasks while supporting ASLC's veterinary care program.

Confirmed collaborators include the Monterey Bay Aquarium, Point Defiance Zoo and Aquarium, Pinola Aviary, and Dry Creek Waterfowl Sanctuary (see Letters of Support). We will seek additional comparison sites during the project's initial phase. Key representatives from these facilities will form a Peer Advisory Board, composed of veterinary and aviary management professionals experienced in aspergillosis mitigation. The board will validate project priorities and assist in refining sampling and testing plans. Meetings will primarily be virtual, supplemented by in-person discussions at the annual AZA meeting.

We will procure competitive quotes for laboratory and manufacturing services from reputable laboratories to meet our testing and vaccine needs. Partner laboratories likely include:

- The University of Miami Avian & Wildlife Laboratory
- The University of Georgia-Athens Veterinary Diagnostic Laboratory

- North Carolina State University College of Veterinary Medicine Clinical Pharmacology Laboratory
- Cornell University Duck Research Laboratory

The ASLC uses Microsoft Dynamics SL for its financial accounting and grant management. This grant's business point of contact is Carrie Brown, Director of Finance (grants-contracts@alaskasealife.org).

Required resources

This project will span two sampling "seasons" to achieve statistically meaningful conclusions, allowing for robust sample collection and testing. Additional time will be necessary for data processing, analysis, and report and publication preparation. Additional key resources include:

- Personnel: Staff from multiple institutions with expertise in seabird and waterfowl will manage and implement sample collection, handling, and submission.
- Birds: Biological samples from seabirds and waterfowl across partner facilities are essential for comprehensive testing.
- Laboratories: Accredited reference laboratories will analyze the collected samples, providing the necessary expertise for both microbiological culture and molecular testing.

Progress tracking

Regular, bi-monthly meetings will facilitate prioritizing, task scheduling, and ongoing review of project progress. To monitor sample submission and testing outcomes in real-time, we will maintain a shared online document accessible to all collaborators. This will allow for dynamic reallocation of sampling quotas between institutions as needed to ensure sufficient case numbers. After the two sampling seasons, these meetings will transition to focus on report compilation and publication drafting progress.

Research Aims

We propose specific hypotheses for each focus area to evaluate methodologies and outcomes related to *Aspergillus* detection, diagnosis, prevention, and treatment in avian populations.

Environmental Testing Objective: To compare the efficacy and efficiency of microbiological culture and molecular techniques in detecting *Aspergillus* within environmental samples. Specific hypotheses include:

- Molecular analysis will detect *Aspergillus* as reliably as fungal culture, supporting its utility as an effective detection tool.
- Molecular analysis will provide faster detection of *Aspergillus* than fungal culture, allowing for more timely mitigation efforts.

Diagnostic Testing Objectives: To evaluate both microbiological culture and molecular techniques for *Aspergillus* detection in clinical samples and to assess a range of physiological parameters for correlation with active infection. Specific hypotheses include:

- Molecular analysis will detect *Aspergillus* as reliably as fungal culture, indicating it as a viable diagnostic tool.
- Molecular analysis will provide faster detection of *Aspergillus* than fungal culture, thus enhancing the responsiveness of mitigation measures.
- Specific physiological and biochemical markers—including serum protein electrophoresis (SPE) ratios, haptoglobin, serum amyloid A (SAA), *Aspergillus* antibody titers, galactomannan, gliotoxin, and white blood cell (WBC) counts—will deviate from

baseline in birds with confirmed *Aspergillus* infection, helping to identify a suite of markers that most accurately indicate active infection

Vaccine Effectiveness Objective: To assess the safety and effectiveness of the vaccine by evaluating the impact of vaccination on physiological markers associated with the immune system and determine infection rates between vaccinated and nonvaccinated groups. Specific hypotheses include:

- Physiological parameters will remain within normal ranges post-vaccination, demonstrating vaccine safety.
- *Aspergillus* antibody titers will increase following vaccination, consistent with appropriate immune response and vaccine efficacy.
- The incidence of infection will be lower among vaccinated birds than unvaccinated controls, indicating vaccine efficacy in reducing disease rates.

Drug Level Testing Objective: To assess the systemic bioavailability of antifungal drugs delivered through various non-invasive, flock-based methods. The hypothesis being tested is:

- Antifungal agents administered via feed will achieve therapeutic systemic concentrations, validating the utility of alternative drug delivery methods.

Relevance to Current Practices

Current diagnostic practices for *Aspergillus* infections are limited by lengthy processing times—often several weeks—and a high incidence of false negatives. These delays force clinicians to choose between initiating treatment on a presumptive basis, risking adverse effects due to the narrow therapeutic index of antifungal drugs, or postponing intervention until diagnostic confirmation or clinical deterioration. Utilizing advanced molecular techniques and identifying additional disease-specific biomarkers would improve both diagnostic speed and accuracy, supporting earlier and more effective treatment.

For drug delivery, individualized treatment remains the gold standard. However, in birds that do not hand-feed, twice-daily restraint and force-feeding is often required. This method is highly stressful and can undermine immune response, particularly when sustained over long periods. Furthermore, individualized treatment is impractical in larger aviaries or flock settings. Facilities frequently adapt by incorporating antifungal drugs into food, though few of these delivery methods have been tested for their ability to achieve therapeutic drug levels, risking the development of drug resistance or suboptimal therapy. Validating the efficacy of these flock-based delivery systems would provide a viable alternative to direct administration, allowing earlier intervention in outbreak situations and potentially mitigating disease progression in affected populations.

Data Description

Data collection will focus on diagnostic and physiological metrics derived from blood and other biological samples, which will likely include the following:

- *Aspergillus* Presence and Concentration: Detected via fungal culture and molecular analysis to assess both presence and relative load.
- Complete Blood Count (CBC): Including red (RBC) and white blood cell (WBC) metrics to assess overall hematologic health.
- Biochemistry Profile: Measures electrolytes, trace elements, enzymes, proteins, and other indicators of organ function.
- Aspergillosis-Specific Markers: Assesses antibodies and antigens linked to aspergillosis, including galactomannan and gliotoxin levels.

- General Immune Indicators: Including serum protein electrophoresis (SPE), haptoglobins, serum amyloid A (SAA), and other acute-phase inflammatory markers.
- Antifungal Drug Concentrations: Blood levels of antifungal medications to assess therapeutic range.

In addition to these laboratory parameters, we will collect detailed case-specific data, such as diagnostic findings, treatment protocols, and outcomes.

Data Collection, Analysis, and Use

Biological samples will be obtained from individual animals and sent to reference laboratories for analysis, which may include but are not limited to the following:

- The University of Miami Avian & Wildlife Laboratory (for blood analyses)
- The University of Georgia-Athens Veterinary Diagnostic Laboratory (for fungal culture)[22]
- North Carolina State University College of Veterinary Medicine Clinical Pharmacology Laboratory (for drug-level analyses)[28,29]

Test results will be provided to the originating facilities for immediate use in animal care and stored securely in the Zoological Information Management System (ZIMS), which anonymizes data yet allows long-term data retention and controlled data sharing across institutions for animal case management and research.[30,31] Additionally, the Alaska SeaLife Center (ASLC) will anonymize and pool data to enhance statistical robustness for project-wide analyses. Results will be maintained in data management platforms suited to the statistical evaluation of each dataset.

- *Aspergillus* Identification (Environmental and Animal Samples): Given the limitations of fungal culture (e.g., high false-negative rates), we will evaluate the sensitivity (but not specificity) of molecular techniques relative to culture. Using a one-sided exact binomial test, we will test the null hypothesis that molecular methods are less sensitive than fungal culture. We also anticipate faster detection times with molecular techniques. For time-to-result analysis, we will use a one-sided Wilcoxon signed-rank test to compare median turnaround times with an additional Generalized Linear Model (GLM) using a Negative Binomial link function to estimate overall time savings.
- Physiological Parameters (Patient Health and Vaccine Evaluation): To determine correlations between physiological metrics and aspergillosis status, we will apply the Student's t-test when sample sizes exceed 30. The Student's t-test will also identify significant parameter changes for post-vaccination assessments. Alternative approaches, such as Welch’s t-test or Mann-Whitney U, may be employed if sample sizes are limited or variance assumptions are unmet.
- Drug Level Analysis: A one-sample, one-sided t-test will be used to assess whether average antifungal drug levels in blood samples meet or exceed therapeutic thresholds.

Research Oversight

This project has received approval from ASLC’s Institutional Animal Care and Use Committee (IACUC), an ethical review board focused on animal welfare, analogous to an Institutional Review Board. Prior to their animals' participation, IACUCs at collaborating institutions may also review the project to ensure compliance with their standards.

Reporting and Dissemination Plans

We plan to produce at least four peer-reviewed publications based on findings from each key focus area, targeting journals such as *Zoo Biology* and the *Journal of Zoo and Wildlife Medicine.* A comprehensive summary report of findings and recommendations will be distributed to the AZA Taxon Advisory Groups and the American Association of Zoo Veterinarians (AAZV) for further

dissemination. Presentations will be scheduled throughout and following the project at professional conferences, including AZA's Annual Conference, the International Wild Waterfowl Association, and other relevant veterinary, zoo, and aquarium forums. Conference presentations will be complemented by presentations with ASLC's guests and community-based science cafés for the general public, aimed at increasing awareness of threats to animal health.

Project Results

Intended Results

This project aims to evaluate and refine methods for detecting, diagnosing, vaccinating, and treating aspergillosis in avian species, with the goal of developing evidence-based recommendations for best practices. This knowledge will allow us to optimize aspergillosis management protocols based on species-specific needs, logistical constraints, and local environmental conditions. By implementing these improved methods, we anticipate enhancing the health and longevity of our birds. Findings will be broadly shared with other institutions, including AZA's 237 accredited zoos and aquariums, the National Wildlife Rehabilitators Association's network of over 1,500 rehabilitators, and other facilities and private avian care organizations.

Anticipated Changes

Data generated from this project will inform and enhance ASIC's, and other aviaries' health protocols, which will be adapted as new findings emerge. The project's multi-institutional nature will promote communication among avian care providers and allow all participating facilities to remain informed of the latest advances in aspergillosis prevention and management.

Products

Key deliverables include presentations, scientific publications, and a comprehensive report outlining best practices for aspergillosis management. This report will be shared with AZA Taxon Advisory Groups, AAZV, and other professional networks, ensuring that findings and recommended protocols reach a broad audience in the avian care community.

Sustained benefits

To maintain and build upon project outcomes, we will conduct annual reviews of our aspergillosis detection, diagnosis, and treatment protocols at the close of each sampling season. These reviews will assess the effectiveness of the protocols, comparing current outcomes with historical data and incorporating any advancements in diagnostic or treatment methods. We will also stay engaged with professional industry groups and conferences to continuously share our findings and incorporate emerging tools and techniques in avian health management. Through this sustained approach, we aim to keep our protocols responsive to new developments that are beneficial to a wide array of avian care facilities. Finally, the scientific publications, a summary report of best practices, and the data saved in ZIMS would remain accessible for future researchers and avian health managers.

Schedule of Completion

	2025				2026							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Finalize collaborator agreements	x	x										
Coordination meetings- mostly virtual	x	x	x		x	x	x		x		x	
• Informal, in-person meeting at AZA	x											
• Kick off meeting		x										
• Discuss and Establish priorities for 2025			x		x							
• Confirm diagnostic labs & costs						x						
• Set testing calendar for each participant							x					
• Check-in, updates									x		x	
Treating, sampling, and testing						x	x	x	x	x	x	x
• Vaccinations at ASLC						x	x	x				
• Nesting and molting at ASLC								x	x	x	x	x

	2026				2027							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Nesting season at ASLC	x	x										
Coordination meetings- mostly virtual	x		x		x	x	x		x		x	
• Informal, in-person meeting at AZA	x											
• Review data from 2025 season			x									
• Establish priorities for 2026					x							
• Confirm diagnostic labs & costs						x						
• Set testing calendar for each participant							x					
• Check-in, updates									x		x	
Treating, sampling, and testing						x	x	x	x	x	x	x
• Vaccinations at ASLC						x	x	x				
• Nesting and molting at ASLC								x	x	x	x	x

	2027				2028		
	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Review sendouts from 2026	x						
Last batch of samples sent for analysis		x					
Last batch of results			x				
Coordination meetings	x		x		x	x	x
• Informal, in-person meeting at AZA	x						
• Assign sections to writers			x				
• Check in on writing progress					x		
• Section leas							
Draft project report						x	
Finalize project report							x

Aspergillosis Monitoring And Prevention in Seabirds (Asper MAPS)
Digital Products Plan

For the purposes detailed in the Project Description, Alaska SeaLife Center (ASLC) and its collaborators will collect the following types of data during the project in accordance with the following protocols.

I. Types of data and data ownership.

Type	Source and parameters	N	Owner
Bio-sample and Case information	Submission records in digitized forms, information to be transferred onto a spreadsheet and may include but not be limited to the following parameters: ● Date of acquisition ● Place of acquisition ● Animal information (ID, species, sex, age) ● Type of sample (for example environment swab, air sample, animal swab, serum, etc)	~100	Submitting organization and ASLC
Bio-sampleSubmission tracker	Basic information of samples submitted to reference laboratories ● Date sent ● Submitting facility ● Destination laboratory ● General sample description ● Date complete test results received	~200	ASLC and the working group established for this project
Test results	Laboratory reports in digitized forms, information to be transferred onto a spreadsheet for further statistical analysis. Additionally, when possible results will also be entered into the Zoological Information Management Systems (ZIMS), a leading digital resource that enables longterm storage, sharing of data on animals, and pooling of data about species held in multiple institutions. ● Date of test ● Laboratory information ● Result ● Interpretation	~100	Submitting organization, ASLC, and the working group
Summary findings	Summary statistical analysis of test results (without identifying facility association) stored in a spreadsheet ● Summary statistics (average, standard deviation) ● Time based statistics (frequency, incidence)	NA	ASLC and the working group established for this project

II. Availability

Results will be shared through manuscripts in peer-reviewed journals, presentations at professional conferences, and other publications. All identifying details will be removed before dissemination to protect proprietary and confidential information related to specific facilities and individual animal health.

Quantitative data, stripped of any facility or animal identifiers, will be accessible as read-only Google documents. Identifiable information—such as names, ID numbers, addresses, or any unique markers—will be excluded to ensure anonymity. Data availability will be announced on our website, where any limitations or caveats will be clearly noted.

In addition to raw data, we will provide data collection protocols, analysis coding, and data aggregation methods to support transparency and reproducibility. Data will be accessible within three years following the submission of the final research report or peer-reviewed publication.

Finally, results will be entered into the Zoological Information Management Systems (ZIMS) or a similar platform. ZIMS, managed by Species360, supports a global network of over 1,300 zoos, aquariums, and wildlife institutions across more than 100 countries, facilitating collaborative data-sharing for animal care and conservation initiatives.

III. Access

All working group members for this project will have full access to data generated during the study. Intellectual property rights will be preserved for three years after the grant concludes, after which data may be shared upon request. Any use, reuse, redistribution, or derivative work from the project must credit the project, affiliated organizations, and the supporting IMLS grant. Data entered into ZIMS will also be accessible to qualifying users, with non-members able to access it via subscription or research requests.

IV. Sustainability.

Animal and research data will be stored, archived, and backed up following ASLC's data management protocols. Data will be anonymized before archiving to protect proprietary and confidential information by removing identifiers of specific institutions or individual animals.

Electronic files, including raw data and analysis, will be stored in a secure, password-protected cloud location. ASLC will retain these files as long as they hold value for the field or meet animal health regulatory requirements, with a minimum retention of three years after the grant period.

The project team will seek publication opportunities for broader archival and dissemination. Additionally, we will engage with relevant professional organizations, including the AZA taxon advisory groups for dissemination with their membership. ZIMS will act as the primary data repository, ensuring long-term accessibility to historical and current records. Species360, which manages ZIMS, has maintained comprehensive archival continuity since 1974.