



Museums for America

Sample Application MA-30-15-0491-15
Project Category: Collections Stewardship
Funding Level: \$ \$25,001-\$150,000

American Museum of Natural History

Amount awarded by IMLS:	\$149,934
Amount of cost share:	\$152,984

Attached are the following components excerpted from the original application.

- Abstract
- Narrative
- Schedule of Completion

Please note that the instructions for preparing narratives for FY2016 applications differ from those that guided the preparation of FY2014 and FY2015 applications. Most obviously, the names of the three narrative sections and the order in which they appear have changed. Be sure to use the narrative instructions in the FY2016 Notice of Funding Opportunity for the grant program and project category to which you are applying.

The American Museum of Natural History (AMNH) is home to one of the largest invertebrate paleontology collections in the world, estimated at 5.2 million specimen lots. The collection has been assembled over the past 140 years through fieldwork, purchase, and donation. In 2013, the Museum was the beneficiary of one of the largest acquisitions in its recent history when, upon his retirement from Ohio University, Dr. Royal Mapes donated 540,000 marine fossils to the Division of Paleontology. AMNH requests \$149,934 over three years to conduct urgent rehousing, conservation, cataloging, and databasing of the Mapes Collection in order to incorporate it into its permanent scientific collections. The proposed work to ensure the collection's proper stewardship and accessibility is a top priority for AMNH; key goals in its five-year Strategic Plan include continued collections acquisition, improved collections stewardship, exploration of existing collections, and increased collections access through new technologies, including online databases. AMNH has already allocated the project significant capital and in-kind resources, including shipping, space, high-quality storage cabinets, infrastructure improvements, and staff support.

The Mapes Collection is of high scientific value and fills an important chronological gap in the current Invertebrate Paleontology holdings; it also contains hundreds of type specimens as well as exquisitely preserved and unique individual specimens of important taxa. AMNH is one of the few institutions with the capacity to accept such a collection in its entirety, and Museum scientists have already identified many valuable research opportunities. However, its full potential cannot be realized in its current state: it is largely uncatalogued, the specimens are housed in sub-optimal materials, scientific data is not directly linked to the specimens, and many specimens need immediate conservation to prevent deterioration. AMNH seeks IMLS support to help meet these urgent needs and to preserve this important collection and its associated data into the future.

The proposed project consists of three components over three years: (1) rehousing the specimens in conservation-grade storage materials, (2) conservation of specimens affected or threatened by pyrite disease (the presence of the mineral pyrite in a fossil can cause the specimen to fracture when the mineral oxidizes), and (3) cataloging and databasing the entire collection and incorporating it into the AMNH's online KE EMU collections database. The workplan, time budgets, and assessment tools have been developed based on extensive experience on previous NSF and similar grant projects focused on the conservation and curation of large quantities of specimens.

The proposed rehousing and conservation will result in the protection of the physical specimens; cataloging and databasing will ensure that essential tools are in place for effective collection management—retrieving specimens, monitoring the collection for risks, and maintaining an accurate inventory. The project team will consist of AMNH scientists with deep expertise in invertebrate paleontology and collections specialists with a demonstrated record of success completing prior collections projects on time and within budget. Led by PI Ruth O'Leary (Director of Collections, Archives and Preparation, Division of Paleontology), the team will train and supervise interns and volunteers to assist with the day-to-day tasks. Dr. Mapes will provide important consulting.

The proposed improvements to the Mapes Collection will facilitate efficient management of the collection and will enhance its usability and accessibility. Adding specimen data to AMNH's KE EMU data management system will increase access to researchers and will also ensure its sustained integration into AMNH's permanent scientific collections. In addition, the Mapes Collection will provide a valuable resource for special exhibitions and education programs for students, teachers, and the general public.

Regular project monitoring and evaluation through monthly (weekly in the summer) and quarterly assessment meetings, supported with thorough record keeping and progress tracking in Excel files, will ensure that targets are hit and goals are met. Results will be disseminated widely both through AMNH's website, interns' blogs, staff presentations and posters at professional meetings, and notes published in relevant journals.

1. PROJECT JUSTIFICATION

Statement of need and project proposal: The American Museum of Natural History (AMNH) requests \$149,934 over three years to conduct time-sensitive curation, organizing, and databasing of its newly acquired Royal Mapes Collection of marine fossils and to incorporate it into its permanent scientific collections, where it will significantly deepen its renowned natural history holdings and advance research and related activities that are central to the Museum's science and education mission. This new donation from Earth Science Professor Royal Mapes upon his retirement from Ohio University of approximately 540,000 specimens—one of the largest and most significant specimen donations in the Museum's history—is a spectacular addition to its existing paleontology collections, which include one of the world's largest fossil invertebrate collections. The proposed work to ensure proper stewardship and accessibility of this unparalleled collection is a top strategic priority for AMNH.

The Mapes Collection's scientific value is extremely high, providing rich opportunities for furthering the Museum's cutting-edge research in evolution, systematics, and paleobiology. But to fully realize the collection's value and potential, AMNH must address urgent collection management and conservation needs. The collection arrived at AMNH in non-archival cardboard trays, uncatalogued, and with some specimens at risk of pyrite disease (which if left untreated, can severely degrade specimens). It requires immediate rehousing in archival-quality boxes, cataloging and databasing, and targeted prevention of further pyrite disease deterioration. In addition, until incorporated into the AMNH management system, only rough estimates of its contents can be made. The location of any particular specimen lot within the collection is imprecisely known, making organization, management, and study difficult to oversee and track. Time is of the essence: as Dr. Mapes is willing to provide identification and contextual data that are essential to this project, it is imperative to begin as soon as possible in order to utilize his assistance and availability.

Beneficiaries of the project: For more than 140 years, the Museum's collections have grown steadily to more than 33 million specimens and artifacts through donations and expeditionary fieldwork by AMNH curators and their students. Exceptional among the Museum holdings are paleontology collections of approximately 5.2 million fossil invertebrates and 500,000 specimens of fossil vertebrates, all which serve a wide user base of researchers and students, as well as engaging K–12 students and the general public via Museum exhibitions and educational programs.

With more than 540,000 exquisitely preserved and unique Upper Paleozoic marine fossils, the Mapes Collection includes invertebrates such as nautiloids, ammonoids, crinoids, sponges, brachiopods, trilobites, bivalves, gastropods, as well as vertebrates such as exquisitely preserved fish skulls and rare shark skulls. In addition to Arkansas, Kansas, Oklahoma, and Texas material, the collection also includes fossils from distant locations, including Morocco, Russia, Japan, England, Ireland, and Vietnam. All specimens were collected over 45 years by Royal and Gene Mapes and their students at Ohio University.

The collection fills an important chronological gap in the Museum's existing holdings, and helps to maintain the AMNH in the top ranks of natural history museums worldwide—while strong in Devonian fossils from New York State and in Mesozoic fossils from the Northern Great Plains and Atlantic and Gulf Coastal Plains of the U.S., the holdings lacked fossil cephalopods from the Upper Paleozoic of the U.S. Mid-Continent. The largest component of the Mapes Collection is cephalopods (ammonoids and nautiloids) from the Carboniferous (358 to 299 million years ago) of the mid-continental U.S. There is also considerable material from the Devonian (419 to 358 million years ago) of Morocco as well as important individual specimens, including a unique shark-like organism showing primitive gill structures and the earliest known preservation of ammonite nacre (mother-of-pearl).

Importantly, the collection contains approximately 700 type specimens—i.e., specimens that form the basis for new species designations, and as such, are essential, irreplaceable references for all future specimen identifications or amendments to current species descriptions. Any museum that takes on the responsibility of housing type specimens is therefore obligated to preserve and make these specimens available for study by qualified researchers inside and outside the Museum. Also of high importance to AMNH is protecting against the loss of “orphaned collections,” which can be dispersed or discarded when the researchers who built the collections retire and their institutions can no longer allocate resources towards housing and collection management. Maintaining this important collection in one institution ensures its maximum scientific value and its accessibility to the research community.

The nature of the Mapes Collection lends itself to use in many different research projects. For example, the Carboniferous was a period of diversification of nektonic (swimming) organisms, fundamentally changing marine ecosystems. Because the collection is focused on certain areas during this time period, sampling is at high enough spatial and temporal resolution to support paleobiogeographic and biodiversification studies of the long-term evolution of marine faunas and ecosystems. In addition, many taxa are represented by multiple specimens collected from the same locality, providing the sampling required for studies of morphological diversity and changes in variation through time.

Museum scientists working with Ohio University collaborators over the years have already described two new fish species, and studies of the systematics and evolution of cephalopods have resulted in numerous publications. Organizing the Mapes acquisition into the Museum’s permanent research collections, as proposed here, will spur continued research, at AMNH and by scientists and students worldwide, allowing for further study of marine biodiversity throughout Earth history while furthering the study of the shape and structure of animals over time (phenomics).

Many of the specimens will provide rich material for Museum exhibitions, education offerings, and public programs about the evidence of the history of life on Earth. The project will also benefit the 18 summer undergraduate and graduate interns working on the collection, who in addition to gaining work experience, will receive valuable exposure to different research and museum careers, enhanced by specially designed tours and orientations by collection managers across the institution. Finally, through the vital help of volunteers, the project benefits museum-community ties through engaging the community first-hand in the essential and sustaining work of a natural history museum.

Performance goals and intended results: The project goals are (1) to fully incorporate the Mapes Collection into the Museum’s collections management system and make it available for scientific research by rehousing, labeling, and cataloging each specimen lot; and (2) to provide long-term preservation of specimens sensitive to deterioration. Based on prior experience on NSF collections projects,¹ we believe these goals are achievable in the proposed three-year project period.

Relation to AMNH Mission and Strategic Plan: As it advances Museum collections-based research and education, the proposed project ties directly to the AMNH mission of “to discover, interpret, and disseminate—through scientific research and education—knowledge about human cultures, the natural world, and the universe.” It is a direct response to priorities of the Museum’s five-year Strategic Plan 2011–2015. Key goals in Science are: continued collections acquisition and furthering of Museum research leadership, improved

¹ These include *Microfossil curation project* (NSF grant #1203394), *Rehousing Fossil Mammal type specimens* and *Perissodactyla collection* (NSF grant #0545155); see page 4 (Implementation) and Supplementary Document 4 (Job Descriptions) for more details.

collections stewardship, exploration of existing collections, and increased collections access through new technologies, including online databases. This project, concerning one of the most significant Museum acquisitions in recent history, clearly aligns with these strategic goals.

The paleontology curators responsible for invertebrate collections unanimously supported the importance of the Mapes Collection, and finding the resources to ship, rehouse, curate, and preserve it quickly rose to the top of the Museum's collections' priorities. Prioritizing the Mapes acquisition over many competing needs, the Museum allocated significant funds to transport it from Ohio to New York, to purchase high quality cabinetry, and to allocate major space to house it. Additionally, the institution and the Division of Paleontology funded an upgrade of the electrical service to the Mapes Collection room and wired the space for Internet connectivity to aid in cataloging and databasing.

2. PROJECT WORK PLAN

The project comprises the following three essential areas of work:

Rehousing: The collection arrived at the Museum in December 2013 on 16 shipping pallets weighing 15,000 pounds, packed in non-archival cardboard boxes, many in poor condition and aging badly, without specimen tags or catalog numbers, and with some specimens showing evidence of pyrite disease. It was moved into specially purchased 30 triple door cabinets, with 912 drawers in total (21,835 specimen lots in total, with an average of 24 specimen lots per drawer). The project team will replace all the current cardboard trays with archival, pH-neutral trays, lined with Ethafoam to cushion and support specimens when needed. Each drawer will be also lined with Ethafoam to provide cushioning and prevent trays from moving when drawers are pulled out. They will also flag specimens with signs of pyrite disease.

Conservation: Specimens collected from parts of Oklahoma and Texas, which are Pennsylvanian in stratigraphic age are susceptible to pyrite disease. Already, 200 lots have been identified as targets of pyrite deterioration (*Supporting Documents 1, Images of pyrite disease*). Pyrite is a common mineral found in sedimentary rock and when incorporated into fossils, can cause damage when the mineral oxidizes. Oxidation of pyrite results in an expansion in volume of the specimen and can cause the fossil to fracture.² In order to prevent further deterioration, we plan a course of intervention that has been developed and successfully implemented in AMNH geological collections by Chief Registrar and Director of Conservation Lisa Elkin (*Supporting Documents 2, Rehousing specimens and artifacts using oxygen absorbing material*). The protocol involves re-housing the vulnerable specimens in anoxic packages that create a dry, oxygen-free storage environment, thereby reducing relative humidity and oxygen levels to prevent pyrite decay. Since first implemented in the geological collections ten years ago, the anoxic environmental conditions have prevented further decay. A humidity strip is included in the anoxic package for routine monitoring of the storage conditions, and we plan annual monitoring to review specimen conditions.

Cataloging and databasing: Only a small fraction of the Mapes Collection has AMNH catalog numbers, making management very challenging and the need for cataloging critical. Currently the primary link between the specimen and its associated data is locality codes created by Dr. Mapes when the collection was housed at Ohio University; these codes require Dr. Mapes' interpretation to "translate" into locality and stratigraphic data, and date of collection, and are not easily interpreted without Dr. Mapes' direct input. Labeling of specimens and digital cataloging are essential to realizing its scientific and educational potential by providing a means to search, browse, and organize its components. Following assignment of AMNH catalog numbers to all specimen lots, the locality code Dr. Mapes assigned to the lots will be matched to his notebooks and all data will be

² See <http://preparation.paleo.amnh.org/56/pyrite-disease>.

entered into a database, from which labels will be printed and housed with the specimens. This will allow collection managers and researchers to work with the physical collection and have relevant data on hand with the specimens as well as to search the collection electronically and remotely via the online database. Taxonomic identifications by Dr. Mapes and AMNH Curators Drs. Neil Landman and Melanie Hopkins, according to their research specialties, will also be included on labels.

Each specimen lot, its associated data, and its storage location will then be integrated into the KE EMu database management system used by most departments in the Museum. KE EMu is an object-oriented, relational database defined by discipline specific schemas, and is specifically designed for Museum collections management at all steps. Access improvements through using this database include the ability to accession specimens through the centralized Registrar's Office, to integrate specimen data with loan data, and to publish the data online. In addition, because the storage locations will now be precisely known, specimens treated for pyrite deterioration can be efficiently and effectively monitored to guard against future decay.

Implementation:

The Museum brings a highly experienced and expert team to this project. Principal Investigator Ruth O'Leary (Director of Collections, Archives, and Preparation, Division of Paleontology) has worked in collections management for 14 years and is currently responsible for the management of all aspects of collection care in the Division of Paleontology. She worked on or managed two prior NSF-funded collections grants, one in which 35,000 bat skins and skeletons were rehoused, re-curated, and database records updated; and another in which 2,000 fossil mammal type specimens were rehoused and more than 75,000 Perissodactyl specimens were rehoused and their locality and descriptive data updated. Currently, O'Leary is Co-PI on an NSF project to rehouse and rehabilitate 7,000 microfossil lots. Additionally 1,000 type specimens are being imaged and 50 type specimens are being CT-scanned in this project—a technique that is being pioneered to great acclaim.

O'Leary will be responsible for overall project management and oversight, reporting directly to the Division Chair, Dr. Mark Norell. Specifically, she will plan and schedule all project tasks, recruit, and hire summer interns, train, and manage all AMNH staff working on the project, manage the budget, co-ordinate the visits of Dr. Mapes, track all data, quantify progress and activities on the grant, schedule and run progress meetings, and write all progress reports requested by the IMLS.

Neil Landman (Curator-in-Charge, Department of Invertebrate Paleontology) and Melanie Hopkins (Assistant Curator, Department of Invertebrate Paleontology) will have specific responsibilities for the labor-intensive task of providing taxonomic identifications for the specimens in the collection. Landman has been a Museum curator for 32 years and Curator-in-Charge for 24 years during which time he has focused on ammonite research, especially Late Cretaceous forms of the U.S. Western Interior and has been a PI or Co-PI on numerous research and collections improvement grants. Hopkins joined the AMNH in January 2014. The Mapes acquisition is particularly timely since her research is in trilobite paleobiology and she has five years of experience as a curator for the paleontology teaching collections at the University of Chicago where she was a graduate student.

Bushra Hussaini, Senior Scientific Assistant, has 17 years of experience at AMNH, where she has been responsible for most of the routine management aspects in the Invertebrate Paleontology collections. Under the supervision of O'Leary, Hussaini will implement day-to-day activities and tasks on the project, order and track supplies, assist in the evaluation of intern applicants, and will be principally responsible for the training and supervision of volunteers and interns. She will meet with O'Leary frequently to quantify progress and discuss planning and strategy.

Royal Mapes will act as a consultant, making semi-annual visits, and otherwise being available from North Carolina, in order to make taxonomic identifications and answer questions (*Supporting Documents 3, Letters of support*).

Lisa Elkin, Chief Registrar and Director of Conservation, is an experienced PI on several prior successful IMLS collections grants and currently a National Museums Leadership conservation research project. She will consult closely with O'Leary and staff on specimen conservation and on pyrite disease treatment.

Divisional volunteers and summer interns will implement hands-on tasks, including rehousing, conservation, cataloging, and databasing. Interns will be enrolled in an undergraduate or graduate degree course, or about to apply to a graduate course, in invertebrate paleontology, life sciences, museum studies, or related fields (*Supporting Documents 4, Job Descriptions*). Volunteers' and interns' work will be supervised and proofed by Hussaini and O'Leary.

Sequence of activities:

- Start up, December 1, 2015–June 30, 2016: The initial six to seven months will include workspace organization, ordering of supplies, training of volunteers, and publication research for type specimens. (This part of the cataloging procedure is time-consuming and has to be done before physical cataloging).
- Rehousing, July–August, 2016–2018: Rehousing will be broken down into several passes. Six interns hired for eight weeks each July and August will carry out the rehousing tasks, to be completed by August 2018. One team of interns will cut Ethafoam liners and line each drawer, followed by a second team who will change out the cardboard trays for archival trays and flag trays that need to be lined with Ethafoam. A subsequent pass will involve lining those flagged trays with Ethafoam. 338 drawers will be lined in total (574 drawers have already been lined using museum staff and resources). During each of these passes, interns will flag specimens when they observe pyrite decay or any other signs of deterioration.
- Cataloging and databasing, July 2016–November 2018: The first step will be to create a database for the locality codes and map them to the locality and stratigraphic data hand written in Dr. Mapes' field notes, with his consultative assistance. AMNH catalog numbers will be assigned to specimens and the locality data linked to the catalog number in the database. Taxonomic identifications will be added to the database and then specimen labels can be printed from the database and housed with the specimen. Drawer and cabinet labels will also be printed to aid in the search and retrieval of specimens. Cataloging and databasing will be carried out by summer interns, volunteers, and project staff. Landman, Hopkins, and Mapes will provide taxonomic identifications. These tasks will be worked on year round, and completed by November 2018.
- Conservation and preventative treatment, July–August 2018: In this final stage, specimens affected by or susceptible to pyrite disease flagged during rehousing will be treated. Since the treatment includes sealing specimens in a transparent plastic envelope, this task must take place once all the rehousing and cataloging has been completed. The plastic envelope is heat-sealed and can be easily opened and re-sealed when the specimen is removed for study. Conservation work will be carried out by interns in Summer 2018.

Based on project staff experience on prior collection improvement and collections projects with similar specimens, the following time budgets have been estimated for each key task (see *Schedule of Completion* for details and time budgets for each task).

- Cut an Ethafoam liner for a drawer and line drawer: 8 minutes per drawer
- Change out old trays for new ones, flag trays that require Ethafoam lining, log drawer location, flag trays that contain specimens affected by pyrite disease and log drawer location for above, log volume of trays used each day: 1 hour per drawer
- Cataloging and databasing: 10 minutes per specimen lot

- Proofing cataloging, printing labels: 5 minutes per specimen lot
- Cut Ethafoam liner for tray and line the tray: 3 minutes per tray
- Conservation: 15 minutes per specimen lot

Project resources: Prior projects have been carried out successfully with interns, and the bulk of the IMLS request will go toward intern salaries. IMLS funds will also support travel and accommodation for Dr. Mapes' visits and staff travel for dissemination at conferences. Other items include rehousing, conservation, and cataloging supplies and equipment.

Institutional Resources: As mentioned, AMNH has already provided substantive support, including: physical space in the Division; \$127,000 for the physical transfer from Ohio to New York and purchase of 30 high quality triple door cabinets with seals that mitigate fluctuations in temperature and humidity and prevent access for pests, and easy glide drawers that lessen the risk of damage when specimens are removed; upgrading of the electrical supply and installation of local and wireless Internet access to the space where the Mapes Collection is housed, ensuring access to Museum servers and databasing software for cataloging; and initial supplies of Ethafoam, leaving only 338 drawers remaining to be lined.

On the Museums for America grant, AMNH will provide an approximate 1:1 cost share in the form of AMNH staff salary costs and fringe benefits. In total, O'Leary will contribute 10 percent, Hussaini 25 percent, and Landman and Hopkins five percent effort each throughout the project. Dr. Mapes will volunteer his time as a consultant. In addition, AMNH will also waive indirect, or F&A, costs, and contribute training and consultation by the Chief Registrar and Director of Conservation. Landman and Hopkins' travel costs to conferences will also be paid through AMNH funds.

Evaluation, progress assessment and tracking: Project progress and success will be measured in terms of reaching the goal of rehousing, conserving, cataloging, and databasing 100 percent of the Mapes Collection. Our first tool for doing so will be Excel tracking files that have been developed to quantify progress on prior paleontology collection improvement projects; they will allow measurement of how much work is being done, how long tasks are taking to complete, and to adjust scheduling and allotment of effort accordingly. They will also provide accurate, up-to-date data for reports. See *Supporting Documents 5* for a sample evaluation tracking sheet.

The targets and goals for rehousing, conservation, cataloging and databasing will be broken down into component steps; progress and supply use will be recorded for each. Based on time budgets, we will set targets for each period we track.

Evaluations will take place both on a monthly (weekly in the summer) and quarterly basis. Record keeping of weekly progress in Excel files, coupled with quarterly evaluation meetings, will allow us to objectively evaluate if goals are being met according to schedule, and if not, to make corrections and re-distribute resources as needed:

- Weekly/Monthly: During summer intern periods when activity is high, and otherwise monthly, we will quantify task progress and supply use, log it into Excel files, and meet weekly to discuss scheduling and any delays or road bumps that affect progress (e.g., supplies being used at a faster rate than assumed). Regular reviews will allow us to react swiftly if we need to reassign volunteers or interns to work on certain tasks. These evaluations will focus on the specific tasks being worked on at the time.

- Quarterly: Throughout the year, we will also plan quarterly evaluations to reflect on the progress as a whole in terms of the overall three-year project period and plan ahead for the forthcoming months.

Evaluation will be at no additional cost beyond the resources already budgeted. The goals and targets of the project are clear-cut, concrete, and easily quantifiable at any interval.

Dissemination of project results: Dissemination will be active and diversified: (1) A section of the Divisional website that is dedicated to the Mapes Collection (<http://www.amnh.org/our-research/paleontology/collections/fossil-invertebrates/royal-mapes-collection>) will be expanded and used to update other collection management professionals, researchers, educators, and the public on the progress of the project; (2) Student interns will blog about their project contributions, which has been done in previous Divisional projects and has proven to be a successful way to communicate the importance of and passion for the work being done (see <http://ipmicrofossils.blogspot.com>); (3) Project results and descriptions will be presented at professional meetings (e.g., Geological Society of America, Society for the Preservation of Natural History Collections); (4) For researchers in academia, we will provide notification of the availability of the collection and its associated data via notes published in journals (e.g., the Journal of Paleontology) and paleontological websites such as Paleonet (http://www.nhm.ac.uk/hosted_sites/paleonet/Index.html).

3. PROJECT RESULTS

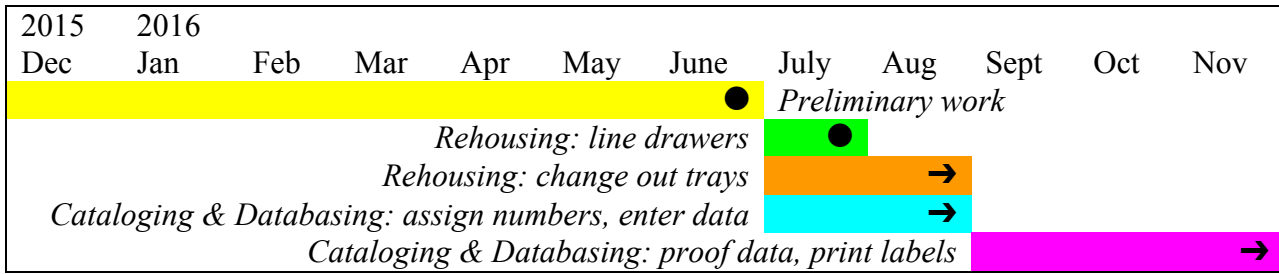
The proposed work will result in a vast improvement in the physical storage and preservation of the entire Mapes Collection, the maintenance of associated specimen data, and the ongoing and future management and curation of the collection including routine activities such as inventory, climate and pest monitoring, and monitoring for other threats such as pyrite disease.

The primary tangible products will be the records generated within KE EMu, the Museum's searchable relational database by which all specimen lots will be identified by a unique catalog number and each one linked with their collection locality data, taxonomic and stratigraphic information, and storage location. In addition, dissemination efforts will result in webpages, blogs, conference presentations, and published notifications, all designed to improve public awareness of the project and its results.

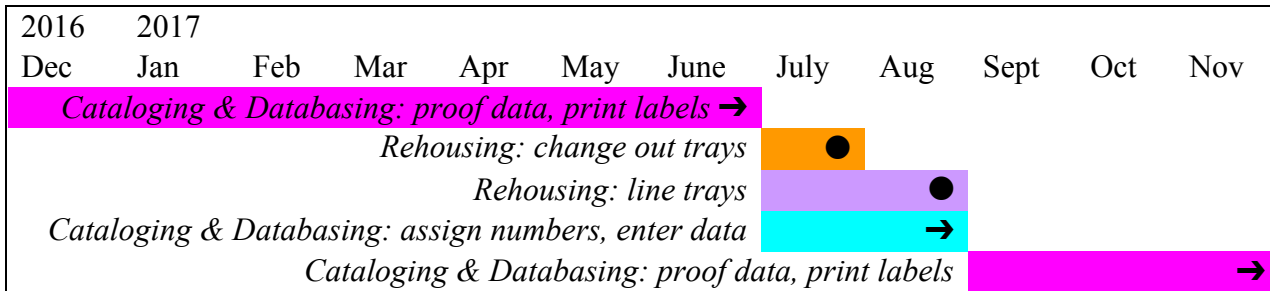
Performance indicators, targets, and comparison of targets to results will be facilitated by the frequent, scheduled evaluations of progress as described above in the *Project Work Plan*. The goals of the project are to fully integrate the Mapes Collection into the Divisional management system and to provide for the long-term preservation of the specimens vulnerable to pyrite disease. Our comprehensive project work plan allows for all associated tasks of the project to be completed within the proposed three-year time frame.

Because the project will result in the incorporation of the Mapes Collection into the Museum's collection management system, including the KE EMu database, the collection will be automatically subject to the routine and ongoing collections care already established at the Museum. In this way, the successful project completion ensures that when the grant ends, its benefits are self-sustaining and enduring.

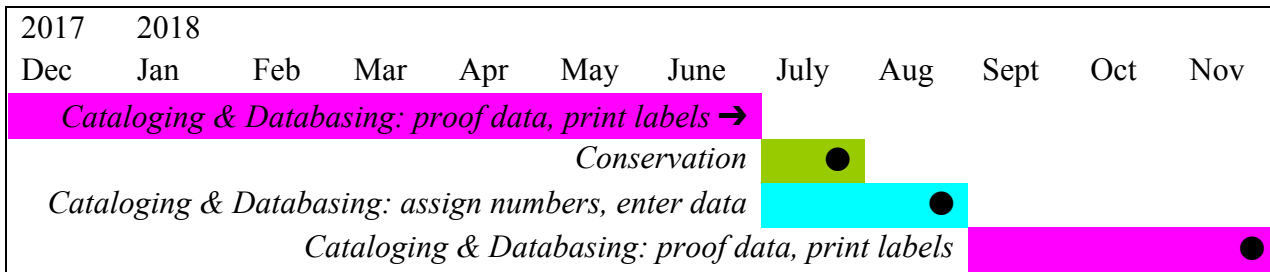
Year 1: December 2015–November 2016



Year 2: December 2016–November 2017



Year 3: December 2017–November 2018



Legend

→ : task continues in following months/year

● : task completed

Notes:

Schedule has been calculated for all project tasks based on prior collection improvement projects carried out on similar specimens in the Division, or in the case of the conservation work, based on similar work carried out in other AMNH departments. See proposal *Narrative* for timing calculations and *Budget Justification* for staff and intern time commitments.

Year 1: December 2015–November 2016

1. Preliminary work

- Ordering supplies, training volunteers, publication research, commencement of database to translate locality codes using Dr. Mapes field notes, recruiting summer interns

2. Rehousing

- Line 338 drawers with Ethafoam
- Change out trays (in 912 drawers)

3. Cataloging and Databasing (21,835 specimen lots)

- Complete database to translate locality codes using Dr. Mapes field notes, assign catalog numbers to specimens, enter locality and stratigraphic data in Excel and link to catalog number, enter taxonomic data once determined by curators
- Proof data, upload to database, print specimen and other labels

Year 2: December 2016–November 2017

1. Cataloging and Databasing (21,835 specimen lots)

- Proof data, upload to database, print specimen and other labels

2. Rehousing

- Change out trays (in 912 drawers)
- Line (~7,205 or ~1 in 3) trays with Ethafoam

3. Cataloging and Databasing (21,835 specimen lots)

- Assign catalog numbers to specimens, enter locality and stratigraphic data in Excel and link to catalog number, enter taxonomic data once determined by curators
- Proof data, upload to database, print specimen and other labels

Year 3: December 2017–November 2018

1. Cataloging and Databasing (21,835 specimen lots)

- Proof data, upload to database, print specimen and other labels

2. Conservation to treat pyrite disease (~200 specimen lots)

- Set up work stations
- Place affected specimens in plastic bag with Ageless chemical, humidity strip and heat seal the bag. Log the storage location of the bag for future monitoring.

3. Cataloging and Databasing (21,835 specimen lots)

- Assign catalog numbers to specimens, enter locality and stratigraphic data in Excel and link to catalog number, enter taxonomic data once determined by curators
- Proof data, upload to database, print specimen and other labels