Dusting Off the Data

Curating and Rehabilitating Archaeological Legacy and Orphaned Collections

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Most museums and repositories that have existed for any period of time are now facing systemic issues related to the lack of storage space for archaeological collections and the staff to adequately provide access to these resources. These are not new problems. As early as 1977, scholars were raising concerns about the growing scope of collections in museums within the United States as a result of an increasing corpus of federal and state legislation (Ford 1977; Lindsay and Williams-Dean 1980; Lindsay et al. 1980; Marquardt 1977). In 1980, Lindsay et al. noted that:

the vast number of archaeological remains that are housed as collections, along with their respective documentation, represent a significant part of our national heritage.… However, the quantity of material in these collections has been increasing dramatically, placing severe burden on repositories and bringing into question our capabilities to curate these collections adequately [1980:2].

The issues have come to be referred to collectively as the "Curation Crisis," and while some modest changes have occurred, many of the key problems are still as evident today as when they were first identified. Since that time, the problem has been compounded. On a daily basis, museums and repositories are confronted with the challenge of preserving and ensuring access to collections, a task that has come to require constant evaluation, rehabilitation, and maintenance as new techniques and technology become available to properly curate collections and

ABSTRACT

Archaeological projects that are described as orphaned or legacy collections are generally older materials that do not meet modern "best practice" curation standards and require considerable resources to be preserved for future research. Rehabilitation and curation of these projects allows for better inventory control of the artifacts, and accompanying documentation ensures that cultural heritage is preserved and plays an important part in the repatriation process. Procedures and methods for rehousing archaeological legacy collections are outlined. Using the 1984–1987 Arizona Archaeological and Historical Society (AAHS) volunteer excavations at Redtail Village (AZ AA:12:149 [ASM]) as a case study, we propose a process for rehabilitating legacy collections and offer solutions for preserving important archaeological resources for future research.

Proyectos arqueológicos huérfanos o también llamados proyectos de colecciones heredadas, generalmente están formados por materiales antiguos que no cumplen con los "mejores" estándares modernos de restauración. Dichas colecciones requieren considerables recursos para ser preservados para generaciones futuras. La rehabilitación y curación de estos proyectos permite obtener un mejor control de los artefactos inventariados, así como una mejor documentación que aseguraran la preservación del patrimonio cultural, a la vez, este procedimiento juega un papel importante en el proceso de repatriación. A continuación se describirán los procedimientos y métodos usados para el realojamiento de colecciones de proyectos de legado arqueológicos. Usando como caso de estudio, las excavaciones de las temporadas 1984–1987 del voluntariado de la Sociedad Histórica de Arqueólogos de Arizona (AAHS) en Redtail Village (AZ AA:12:149 [ASM]), proponemos un proceso para la rehabilitación de proyectos heredados, así como ofrecer soluciones para la conservación de importantes colecciones arqueológicas para futuras investigaciones.

associated provenience data. This article focuses on the challenging process of preserving and rehabilitating an orphaned or legacy collection (defined below) and making this type of project accessible to the public.

An archaeological collection, defined as material remains (i.e., artifacts, objects, specimens, and other excavated physical evidence) that are "excavated or removed during a survey, excavation or other study of a prehistoric or historic resource, and associated records that are prepared or assembled in connection with the survey, excavation or other study" (E-CFR 2015a), can range in size from one box to thousands. A repository provides curatorial services for these collections, managing and preserving according to professional museum and archival practices (E-CFR 2015a). Management of these collections includes inventorying, accessioning, labeling and cataloging, evaluating and documenting, and storing and maintaining a collection under appropriate environmental conditions and physically secure controls. It is also necessary to periodically inspect a collection and to take actions necessary (e.g., cleaning, stabilization, and conservation) to preserve it and provide access to it. Much of the discussion related to the curation crisis has focused on the issues of addressing the management of collections, maintaining storage space, and the inadequacy of staffing and funding resources, in direct response to an ever increasing volume of artifacts and related materials that are being generated by excavations resulting from legal mandates and academic projects on a worldwide basis (Bawaya 2010; Cantwell et al. 1981; Ford 1977, 1980; Green 2015; Kersel 2015; Kletter 2015; Marquardt 1977; Marquardt et al. 1982). Solutions, usually couched as "partial" solutions, have discussed culling older or redundant material (Bawaya 2007; Jamieson 2015; Kersel 2015; Silberman 2015), long-term multi-year loans (sometimes referred to as leasing), or possibly a return to *partage* agreements in which excavators and land administrators split excavated collections at the end of the field season (Green 2015; Jamieson 2015; Kersel 2015). Alternatively, it has been suggested that there should be more in-field analysis such that fewer collections can be made (Gonzalez et al. 2006; Lightfoot 2008), or at least careful determination on a case-by-case basis as to whether in-field analysis is sufficient for site management purposes (e.g., Heilen and Altschul 2013). These approaches have advocates but raise a variety of legal and ethical concerns (see Kersel 2015).

Preexisting orphaned collections represent one subset of these curatorial challenges. Orphaned collections are composed of excavated archaeological material that lost curatorial support or was abandoned prior to transfer to a qualified curatorial facility. In many cases, orphaned collections were systematically collected by academic professionals, cultural resource management (CRM) companies, or avocational groups that lacked access to curation facilities. In the case of academic professionals, the principal participants may have retired, relocated, been laid off, or died. In the CRM context, these collections may become orphaned when project budgets were inadequate to cover full analysis, publication, preparation, and transfer of the collections to a qualified repository (E-CFR 2015a; Voss 2012; Voss and Kane 2012). Legacy collections are recovered from archaeological excavations under similar circumstances as orphaned collections, and both contain artifacts that are housed and documented in a way that is not in keeping with modern curation standards and therefore cannot easily meet research

demands. The main difference between the two is that ownership or title to legacy collections is clearly demonstrated.

One of the main concerns regarding archaeological curation is the cost of ensuring that the artifacts and their associated documentation are cared for and remain accessible in perpetuity. In the early years of academic, state, and federally funded excavations, costs associated with artifact curation were rarely addressed (Marquardt et al. 1982); grant budgets solely focused on field costs, and final storage arrangements were not considered. While this situation is now largely addressed by federal and state statutes that require curatorial agreements to be in place prior to issuance of excavation permits (E-CFR 2015b), collections generated by privately funded excavations may lose curation funding due to bankruptcy and economic difficulties of the landowners and the CRM companies that excavated the collections. These orphaned collections are at risk because the ability of museums and repositories to recover the expenses associated with the transfer of these collections is limited, at best. These costs must be absorbed into the institution's budget and ultimately result in higher fees to the remaining clients (Lyons and Vokes 2010). While the situation may appear bleak, one positive note is that when collections arrive on the doorstep without support, they are often accompanied with field documentation, and in some cases with analysis reports and draft manuscripts, which means that their research potential may still be high, if properly curated and integrated into the institution's permanent holdings.

This paper focuses on the process of integrating orphaned and legacy collections into an institution's holdings to enhance research potential and to disseminate the available information to interested parties. The difficulties of working with old data when rehabilitating orphaned and legacy collections has been discussed in recent scholarship (Collins et al. 2010; Crisis and Opportunity 2015; Pozza 2014; Yellow Jacket Project 2005; Voss 2012; Voss and Kane 2012), but is not well understood by the archaeological community at large and needs further discussion. The severe burden on curation facilities, first acknowledged more than 35 years ago, is greater than merely ensuring that there is a shelf for a collection of artifacts; beyond the managing and conserving of the artifacts, it is the preservation of provenience data associated with each artifact that desperately needs to be addressed and is the focus of this paper.

BALANCING STEWARDSHIP AND RESEARCH

In the United States, archaeological projects that require a permit for surveying, testing, monitoring, and data recovery (i.e., excavation) of archaeological resources are also obligated to obtain a curation agreement stipulating that all recovered materials and documentation, including field notes and photos, will be stored and curated at a public facility that meets federal and state requirements (Lindsay et al. 1980). Archaeological repositories act as stewards of these projects, taking on the responsibility of not only maintaining shelf-space for these collections, but also making them available to researchers by maintaining the integrity of the material. These agreements provide curation of the complete collection; the repository will also maintain records of subsequent analysis, publication, exhibit, conservation treat-

ment, etc. that further document the collection (E-CFR 2015b; Griset et al. 2004). As a result, huge amounts of data exist in archaeological repositories. The preservation of the artifacts and the accompanying data is a complex process that requires balancing the preservation of the internal logic that governed the procedures through which artifacts were collected by excavators and the integration of these materials into an existing collection structure established by the repository using best-practice principles of museum curation (e.g., E-CFR 2015a; Griset et al. 2004; Idaho Museum of Natural History 2015; Mississippi Department of Archives and History 2015; Museum of Indian Arts and Culture Laboratory of Anthropology 2002; National Park Service 2015; Smithsonian Institution Archives 2012).

The Arizona State Museum (ASM) has been housing archaeological collections for over 100 years and is one of the nation's largest and most active non-federal archaeological repositories. ASM houses excavated materials from Arizona's state and private lands and serves as a steward of collections on behalf of federal agencies and tribal governments. Prior to 1984, the majority of the collections were generated in-house by the activity of the ASM's staff or the faculty of the University of Arizona's (then) Department of Anthropology. At that time, there were no formal guidelines for long-term curation, and the collections associated with these early projects reflect old standards that are not in compliance with modern concerns regarding in-perpetuity storage. Our goal is to detail the intensive process of curating legacy collections so that practicing field archaeologists, students, the public, funding agencies, tribal governments, and other interested parties will understand the necessity of proper documentation at the time of excavation and the amount of time and resources that should be budgeted to properly curate such collections. We also provide an approach for rehabilitating older collections that takes into account the complexity of such projects.

Legacy collections are unique windows into past excavation strategies and, at times, outdated curation standards. These projects can offer substantive data sets that can be incorporated into modern research with new analytical techniques. However, many challenges stand in the way of integrating data from these projects into current research, exhibition, outreach, and public education. These include, but are not limited to, lack of site reports, incomplete and unorganized field notes, out-of-date and/or incomplete inventories of all bags housed within the project boxes, incomplete information on field bags, deteriorating housing for artifacts and field notes, and site nomenclature (specific terminology utilized during excavation such as abbreviations and codes that require a manual or decoding list to understand) that was not defined, consistently applied, or indexed (e.g., bags without unique identifiers, crucial for creation of a digital database). Each legacy collection has its own unique combination of challenges that repository staff must consider in order to meet best-practice standards of modern archaeological curation facilities. The volume of material and growth potential (Lyons and Vokes 2010), along with a lack of financial resources, means that while the need for treatment is recognized, the ability to rehouse legacy collections (to stabilize and replace materials housing artifacts and documents) is limited.

Another important issue is that legacy collections were typically excavated prior to the implementation of the Native American Graves Protection and Repatriation Act (NAGPRA), enacted in 1990, which means that accurate inventories of these collections and a firm grasp of excavation processes are crucial to identifying materials that are eligible for repatriation. The repatriation process under NAGPRA requires institutions that have received federal funds to provide descendant communities with an inventory of human remains, funerary objects, sacred objects, and objects of cultural patrimony, which then can be claimed for reburial or other disposition. Similar to federal laws protecting human remains and objects of cultural heritage, Arizona state law protects human remains and associated funerary objects in unmarked graves and abandoned cemeteries that exceed 50 years in age on state, county, city, and municipal lands (Arizona Revised Statute §41-844) and private lands (Arizona Revised Statute §41-865). Under these regulations, an authorized repository identifies human remains and funerary objects within its collections and, through consultation with descendant communities, determines the appropriate disposition. To be in compliance with both sets of laws requires that accurate and detailed inventories are kept for each collection in the repository's holdings. In the case of a legacy or orphaned project, rehousing a collection is an opportunity to establish these inventories and evaluate whether or not each artifact is an associated funerary object, sacred object, or object of cultural patrimony. It is also essential to ensure efficient, accurate, and more manageable turn-around times for repatriation projects.

REHOUSING A PROJECT: THE PROCEDURE

Rehousing a legacy collection is a unique process: each collection contains differing levels of documentation, unique terminology, and unforeseen challenges. The ASM repository maintains 31,000 boxes of material and keeps a database that documents the condition and needs of each collection, which can be employed to select projects for rehousing. In this section, we detail the rehousing process, from removing artifacts from acidic bags and boxes, organizing, and archivally storing the associated documentation to creating a digital inventory (i.e., database) of all catalogued and bulk artifact bags. Aspects of this process mirror the approaches taken by researchers who want to incorporate legacy data into modern research projects. Our process is intended to preserve as much data as possible and to ensure that the complex of material and associated information is preserved for the future. ASM recently rehoused a legacy collection from Redtail Village (AZ AA:12:149 [ASM]), and this will serve as a case study that illustrates some of the challenges and the steps taken to bring the collection up to modern curation standards.

Step 1: Inspect the Archive, Catalog, and Bulk Collection

It is absolutely essential to begin by assessing the condition and organization of the archive and the bulk collection boxes and bags and to analyze the project field notes and associated records to determine the types of documents and field forms utilized by the excavators. This helps establish the documents that will be helpful in analyzing information written on field bags and within the field notes themselves. If available, a complete set of field notes, including a field manual and a final report, are

FIGURE 1. The box shown in photos (a) and (b) is typical of the condition we find legacy projects. In (a), there is water damage on the box, and it is inadequately labeled; the attached note is our assessment of the contents of this particular box. In (b), the bags within each box are disintegrating, not well organized and inconsistently labeled. In (c), the completed rehousing process is visible for this Redtail Village box, with a new box label that is ready to put on the shelf and (d) newly generated, accurate box inventory and bags organized by project, site, material, and intrasite provenience. Photos by the authors.

the best forms of documentation. While performing an initial inspection of the bulk collection boxes, it is useful to check to make sure that the boxes are numbered and that the contents essentially match the information expressed on the exterior (Figures 1a and 1b). For budgeting purposes, it is also useful to assess the number of boxes containing each material class and to estimate the bag sizes needed for rehousing. It is also important to determine the integrity and condition of the bags containing the bulk collection materials, which are often paper bags that are disintegrating due to age and their inherent acidity. The containers, usually cardboard boxes, also need to be assessed for their stability and condition. It is important to determine what information is consistently recorded on the field bags and to identify which information may be missing that would inhibit the complete compilation of an inventory of bags in an electronic database, if one does not already exist.

Step 2: Prepare to Rehouse the Bulk Collection

When available, a complete, well-organized set of field notes is a key document to verify information, decipher illegible handwriting, unlock cryptic codes, and identify possible mistakes that were recorded on field bags during excavation or in transferring the information to field logs and analytical records. All notes are organized in a way that is logical for the project, reflective of the way that the site was excavated and the materials were originally organized. These should be stored in acid-free archival folders. Digital scans of the field notes should be created and saved as PDF/A files (a subset file type intended for archiving) for use during the rehousing, to ensure that the records are available for future researchers.

The master field bag list, termed the Field Number (FN) or Registry List by the ASM repository crew, is usually the best docu-
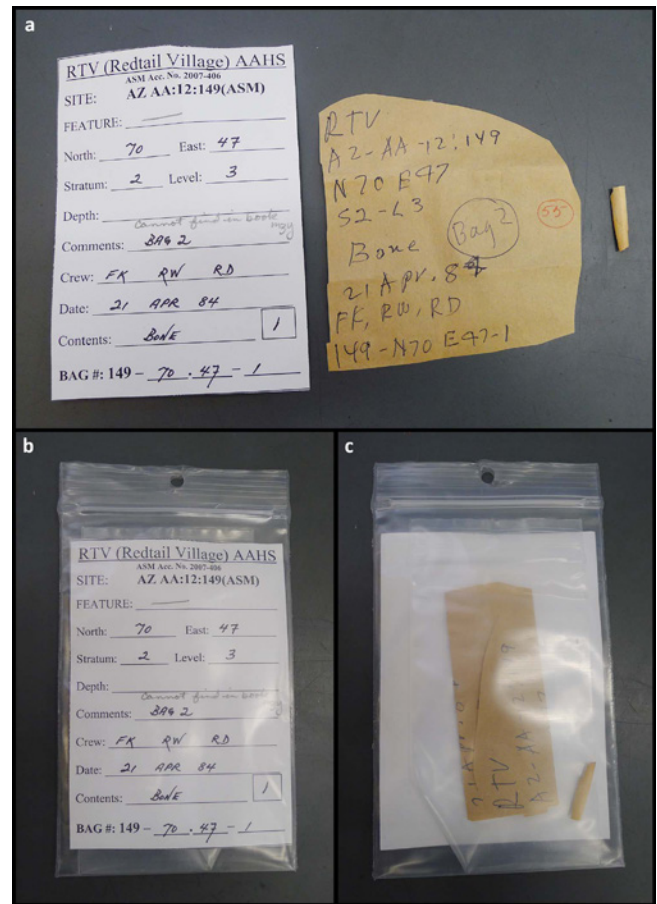
FIGURE 2. Two University of Arizona students, Aazar Hadad (left) and Erika Heacock (right), working on a rehousing project. Aazar is copying and interpreting information from an old bag to a new "worksheet" tag. Erika is getting ready to work on a new bag. Photo by the authors.

FIGURE 3. Illustration of a typical rehoused bag's contents. In (a), the original bag tag was cut away from the field bag and the information transferred over to the new, archival "worksheet" tag. The contents (in this case faunal bone) are ready to transfer to the new acid free archival bag. The clearly readable front (b) and back (c) of the completely rehoused artifact bag, complete with the original field tag, are placed in an archival bag (visible in c) and are ready for recording in the project's digital database. Photos by the authors.

ment to settle most debates regarding the information recorded on field bags. The FN list also helps clarify the details of site excavation that may not be available in a final report, such as the rough dates when units and features were excavated, which excavators were working in an area on specific dates, or basic terminology used during excavation for individual units. The staff acquaint themselves with this type of information as much as possible in preparation for the next step, creating a "worksheet" tag (visible in Figure 3a) that we print out on acid-free cardstock and that will serve as a new tag, which, when filled out, will contain relevant provenience information for each bag when the artifacts are transferred from their original paper to new archival plastic bags and boxes. In situations when a FN list is not available and there is little supporting documentation from an excavation, it will be necessary to simply record data from the old bags on the new worksheet tag and input the bag record into the database (discussed in Step 4), thereby creating a FN list. When this strategy is used, it will be doubly important to cross-check information on the bags and address inherent problems, such as possible double-numbering of bags (multiple bags with the same FN number), as discussed in Step 5.

Step 3: Rehouse the Collection

If the ASM curators have determined that the bags will degrade if left as they are, then it is necessary to transfer the artifacts to an archival, acid-free plastic bag and accurately record the infor-

mation written on the bag to a new worksheet bag tag (Figures 2 and 3). The ASM staff generally uses this procedure:

(1) The contents of the bag are checked, ensuring that the material class and object type matches the information written on the exterior of the bag. If a bag contains multiple material classes, artifacts are separated accordingly, and a new tag is created for each bag. A photocopy of the original tag is placed with items removed from the master bag, preserving the original provenience information.

If rehousing animal bone, or if there is an indication that the bag might contain human remains, these bags are separated and thoroughly checked by a bioarchaeologist or expert in identifying human bone. When human

bone is present, associated artifacts are flagged as possible funerary objects. The human bone is inventoried and secured apart from the rest of the project in preparation for future repatriation.

(2) Information is carefully copied from the original field bag to the new worksheet tag. The rehousing crew (a mixture of ASM staff, students, and volunteers) is asked to use the FN list and other necessary field notes (such as feature forms, daily logs, etc.) to check for accuracy and fill in information that may not have been recorded on the bag at the time of excavation. Old tags are cut from the original bags and kept for future reference by placing them into a separate polyethylene plastic bag that is inserted into the rehoused artifact bags (visible in Figure 3c), so as not to contaminate the new acid-free tag and artifacts. This process is sometimes complicated by the fact that legacy collections sometimes reused bags from previous projects, simply crossing out old information, which can lead to considerable confusion if the new data were not clearly segregated.

(3) Each new bag tag will contain the following information: Accession Number, Site Identification Number, Field Number (or equivalent system), Contents, Unit, Stratum, Level, Feature, Coordinates, Excavator, Date Excavated, and any additional information that may be unique to the project (Figure 3a).

(4) Artifacts are then transferred from the original paper bag to the new, appropriately sized plastic polyethylene bags (Figures 3b and 3c). Following guidelines outlined in the 36 CFR Part 79 rules (E-CFR 2015b), the new bags are at least 4 mm thick; larger bags are 6 mm thick. Each new plastic bag contains the new bag tag, as well as the old tag housed in a smaller plastic bag. We strongly recommend retaining the original field tags with the newly rehoused bags for database creation; illegible handwriting is easily misinterpreted and corrections may need to be made to the new tags.

(5) The bags are then sorted into a logical grouping, which at ASM typically means sorting artifacts first by site, then by material class (e.g., ceramics, lithics, ground stone, faunal bone, etc.), and finally by intrasite provenience (e.g., feature, excavation unit).

(6) All bags are placed into archival polypropylene boxes; each box receives a unique identifying number. Each box label (Figure 1c) clearly identifies the project name, site number, site name, box number, accession number, sub-collection (e.g., bulk material, catalogued specimens, photographic material), and material (e.g., chipped stone, ceramics, faunal remains, shell). When the box is full, a box inventory is created by using ASM's electronic database.

Step 4: Create a Digital Database

Any database created within the ASM repository utilizes the guidelines set out by the ASM Collections Division best-practice guidelines for museum curation (Griset et al. 2004). Even though these guidelines are intended to be as accommodating as possible to a wide range of archaeological terminology and excavation strategies, merging legacy data with the master database used at ASM can be challenging. It is important to begin the process by determining how the information recorded by the excavators will be mapped on to the standardized fields of the database. After a random sample of rehoused bags has been entered into the database, ideally about 100–200 bag records for a collection containing 50–75 boxes, the entry process should be reviewed and modification of the data mapping may be necessary. In order to maintain consistency in a large rehousing project, it is advisable to review data mapping periodically. This approach is advocated because, over the course of all stages of rehousing, insights about terminology, abbreviations, excavation procedures, and the site itself are gained and often require earlier work to be corrected. If the project being rehoused is well understood to begin with and all involved parties are confident that there are no internal issues with overlapping bag numbering and provenience designations, it may be possible to develop an automated data integration framework, as described by Kulasekaran et al. (2014), simultaneously entering data into the database representing the legacy collection and linked to the repository's master database.

Step 5: Validate the Database

One of the first things we do when validating is to look for duplicate FN numbers in the "FN/Bag No." field. If and when they are present, we determine whether this was due to bags being split apart because multiple material classes were included in the same bag, but not noted on the new bag tag and in the database. Duplicate FN numbers are a problem when the provenience information within each bag is different. If this occurs, it is an indicator that either an error was made in data entry, the person who created the new bag tag made an error in interpreting the information on the original bag, or the excavators made a mistake by assigning the same number to two artifact bags from different parts of the excavation. In these cases, a new number needs to be assigned to one of the bags, with the error noted in a remarks field. Regardless, when there are inconsistencies within the database, we return to the boxes, pull the bags, and make the appropriate changes to the FN lists, field bags, and database. This is a crucial step in the process that ensures that the new record of excavated objects is an accurate reflection of all materials, ensuring better integration for future research. All comments recorded on the original bags should be included on the new tags and incorporated into the new database, under the "comments" field if there is not another appropriate place. There have been times during the rehousing process when we doubted the need to do this but found every time that this cautious approach is justified, especially during the database validation phase. The ultimate goal of rehousing is to retain the data accompanying a collection, preserve the materials in an archival manner, and thereby allow and encourage the integration of data from a legacy collection into modern archaeological research. The database created during a rehousing effort will allow for efficient searching of the components of the collection, making access easy and incorporation of these data into future research projects possible.

FIGURE 4. Photo (a) illustrates shelves in the Arizona State Museum (ASM) repository that contain boxes waiting to be rehoused. Legacy and new projects submitted by Cultural Resource Management firms and academic research projects that reflect ASM's current "best practices" for curation are shown in photo (b). Photos by the authors.

Step 6: Finalize Bag Locations, Print Final Inventories, and Store Rehoused Artifact Boxes and Archive

After all inconsistencies are accounted for within the database, and artifacts are in their final box location, three copies of final box inventories are printed. As shown in Figure 1(d), one copy will be placed in the box itself, another will be placed in the document archive, and the third copy will be placed in the master project folder, called the Accession (i.e., master project registration) folder in the ASM system, which holds all essential management information (e.g., Repository Agreement, Project Registration Form, storage location summary sheet, inventories of bulk and catalog collections). Once this step is complete, the boxes can be housed on a shelf (Figure 4) and the locations recorded in the ASM's master database of all box locations. Finally, the project database is mapped on to and merged with ASM's master database of all artifact bags.

Step 7: Metadata

Metadata, or a summary document detailing any changes made during the rehousing and documenting the overall strategy behind the effort, should be included in the project archive. This precaution will make sure that future curators and researchers know how to use the database created for the project and how to locate artifact bags among the research collection boxes. Further, it is likely that, over the course of the rehousing project, minor mistakes (e.g., incorrect depths recorded on bag) and systematic errors (e.g., multiple bags with the same FN number, multiple excavated loci with the same provenience designation) made by the original project will be discovered and will need to be corrected during the rehousing process. Logistical problems in the creation of the database, primarily the need for unique identifying numbers for each set of artifacts from a specific context, may lead to changes that future researchers will need to understand when utilizing the collection. When appropriate, comments regarding changes should be included with the bag record in the database.

CASE STUDY: REHOUSING THE 1984–1987 REDTAIL VILLAGE EXCAVATIONS

In 2010, the decision to rehouse the bulk collections from the Redtail site was prompted by a research request for access to the material, availability of some of the original excavators, and resources available to fund the rehousing.
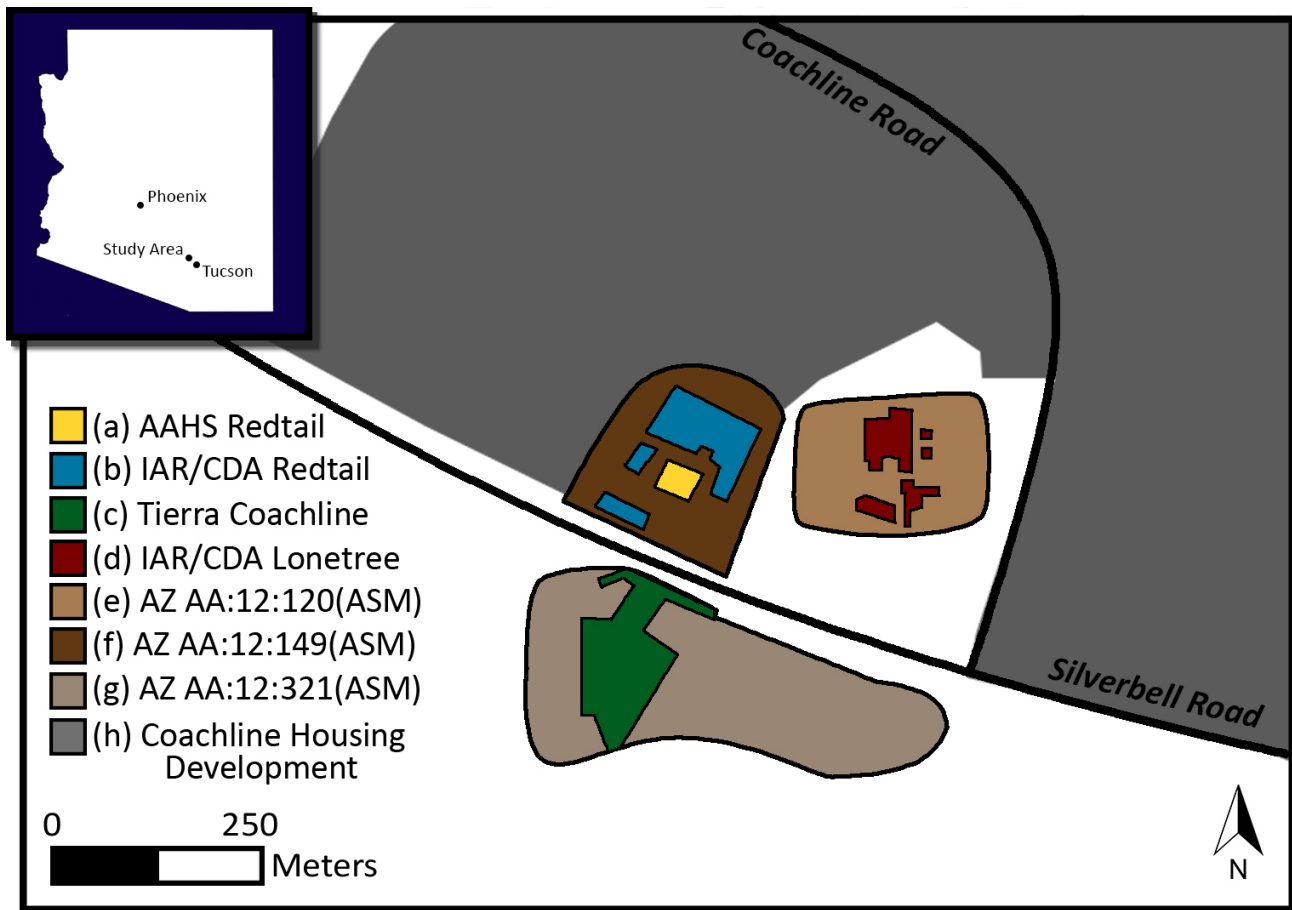
FIGURE 5. Map showing location of excavation projects (a through d) and recorded site boundaries (e through g) associated with the Redtail Community. The Coachline Housing Development is illustrated in grey (h). The (a) Arizona Archaeological and Historical Society (AAHS) excavations of Redtail Village are located in the center of site AZ AA:12:149(ASM) and the later (b) Institute of American Research (IAR) excavations. Later research in the surrounding sites, the (d) IAR excavations at Lonetree and (c) Tierra's Coachline excavations have broadened what is known of the Redtail Community. When the sites and all excavation projects are viewed in a single map, it is clear why the materials from (a) AAHS Redtail excavations would be of interest to the archaeological community. Please see Bernard-Shaw et al. (1989), Bernard-Shaw et al. (1990), Jones (2015), Thiel and Elson (2011) for detailed maps illustrating locations of excavation trenches and features. Map generated by the authors.

The Relationship between the Arizona State Museum and Arizona Archaeological and Historical Society

Redtail Village was excavated in 1984–1987 by the AAHS. From its inception, AAHS has been intimately tied to ASM. For example, Byron Cummings, the first director of the ASM and the first department head of Archaeology at the University of Arizona (UA), was a founding member of AAHS in 1916 (Hartmann and Urban 1991:330). ASM staff members have served on the AAHS board and participated in its activities by giving lectures and directing the excavation of archaeological sites using AAHS volunteers. The ASM and AAHS share a unique relationship, which is important to understand when considering the history of AAHS excavations at Redtail, the subsequent excavations by licensed CRM firms, and the eventual rehousing of the materials from the initial Redtail excavation.

Background of Excavations at Redtail Village (AZ AA:12:149[ASM]): Highlights of Major Excavations

Redtail Village (also known as Peppertree Ranch and sometimes abbreviated RTV) is a Hohokam site located in the northwest Tucson Basin, in southeast Arizona (Figure 5). Its excavation has been the focus of two major projects. Archaeological field work on this site commenced with volunteer excavations (Figure 6) by AAHS in conjunction with the Continuing Education Department of the University of Arizona. The excavation focused on the center of the site and was directed by William Hohmann, then the president of AAHS. Approximately 300 m^3 of subsurface cultural remains were excavated (Bernard-Shaw et al. 1989), including four pithouses, several secondary cremations, one primary cremation, and many other auxiliary features. The recovery of rare objects like ceramic figurines and large quanti-

FIGURE 6. Two photos of the volunteers excavating at Redtail Village in March 1986. Due to lack of a photo log, the precise excavation locations shown are unknown. Photos courtesy of the Arizona State Museum.

ties of worked and unworked turquoise from the graves and other features sets Redtail apart from other sites in the Tucson Basin. Subsequent excavation was undertaken by the Institute for American Research, which conducted a CRM phased site evaluation and data recovery that was in response to a proposed development (Bernard-Shaw et al. 1989). This testing and data recovery, conducted in 1987, identified a total of 58 features, including numerous pithouses, mortuary features, extramural pits, trash middens, and a possible canal in the area surrounding the 1984–1987 AAHS project area.

Additional CRM excavations were also undertaken at the Lonetree site (AZ AA:12:120 [ASM]), which lies immediately east of Redtail (Bernard-Shaw et al. 1990; see Figure 5). Later excavations at the Coachline site, immediately south of Redtail, were completed by Desert Archaeology, Inc. (Thiel and Elson 2011), and Tierra Right of Way (Jones 2015). All of these reports generally conclude that the individual study areas, currently designated as different "sites," are more likely loci of a larger site complex, referred to as the Redtail Village community (Bernard-Shaw et al. 1989; Jones 2015; Thiel and Elson 2011). As Figure 5

shows, the AAHS excavations constitute the center of the site. Unfortunately, the materials from this early phase remained largely unavailable, which made a firm understanding of the relationship of the site loci difficult.

Subsequent Research and Interest in Redtail Village

The Redtail collections contain enormous research potential and are of great interest to those who study the early Hohokam occupations of the Tucson Basin. Request for access to the AAHS Redtail archaeological collections is common, including current studies of turquoise sourcing and manufacture from the site itself (Thibodeau 2012; Thibodeau et al. 2010) and for future comparison with other archaeological sites in Arizona (Hedquist et al. 2010; Thibodeau et al. 2015).

Additionally, subsequent projects by Desert Archaeology, Inc., and Tierra Right of Way at the Redtail community Coachline locus identified multiple burial locations and cremations that offer an unprecedented view of the occupation of the Tucson basin late Pioneer (A.D. 450–750) and Colonial (A.D. 750–950) phases. This includes information on settlement structure, funerary practices, and regional exchange systems in the Tucson Basin. One mortuary deposit, dubbed the "Artisan's burial" (Thiel and Elson 2011), yielded the "largest quantity of artifacts ever recovered by archaeologists from a Hohokam cremation" (Lindeman and Thiel 2007:7; also see Thiel and Elson 2011). This individual's grave contained a large quantity of diverse high-status objects.

The Redtail bulk research collection generated by the AAHS excavations recovered a large quantity of turquoise. Sourcing studies of this material have the potential to provide a better understanding of the role of Redtail households in regional exchange networks. The AAHS excavations occurred before the adoption of NAGPRA, so excavated materials from cremations and inhumations at the site were mixed among the bulk collection. Thus, in addition to immediate research concerns, the ASM repository anticipated a request for repatriation of funerary objects from this site. Now, five years after the rehousing was completed, this repatriation is currently underway.

Rehousing Redtail Village

The rehousing of the Redtail Village archaeological project provides a practical application of the approaches described earlier. As stated previously, each project has its unique challenges, and Redtail was definitely no exception. We will not belabor points we have already made; rather, we will describe the issues we faced in the implementation of the process. This case study illustrates how one might approach the various challenges associated with rehousing a legacy or orphaned archaeological collection.

At the initiation of the rehousing project, meetings were held between repository staff and AAHS officers. A volunteer program was developed wherein AAHS members participated in the rehousing effort. Some of these individuals had worked on the original excavation, which proved helpful. The volunteers were split into two crews, 13 people total, who worked alongside repository staff two days per week, four hours a day, for

a year and a half (an estimated 3,000 volunteer and 1,000 staff hours), during which time they successfully rehoused the project and created a digital inventory of all excavated materials and accompanying documentation.

For the first eight months of the Redtail rehousing effort, a Xerox copy of the FN lists and the information on the artifact bags were the only documentation that accompanied the 100 boxes of artifacts curated by the ASM repository. Inspecting the archive, an important component of Step 1, was not possible until eight months later, when the rest of the field notes were transferred to the ASM by the original director at the request of AAHS and the ASM museum staff. In the absence of a complete set of field notes, our first move was to assemble our copy of the FN list into a three-ring binder, essentially creating a "book" we could flip through as needed, in search of information for each bag of artifacts. Upon inspection of the FN list, we determined that excavations by AAHS at Redtail Village occurred in three phases. This was a crucial piece of information because each season had a unique way of numbering field bags that was not always consistent or completely recorded on each bag. The goal was for each bag to have the maximum amount of available information recorded on our new field tags (as shown in Figure 3), so locating the log entry for each bag in the original FN lists in order to fill in information gaps was important. There were basic problems, however, with completing this simple task. The excavators maintained a variety of FN lists for each season of excavation. Our understanding of the original bag numbering system is shown in Table 1 and briefly explained below. The excavators used a general protocol (frequently not fully expressed on the bags) that artifacts from non-feature areas were assigned the FN code 149-N___.E___-FN# (149 is the Redtail site number-North Coordinate.East Coordinate-FN sequence number). Artifacts excavated from a feature were assigned the code 149-###.###-FN# (149-Feature.Subfeature-FN sequence number). Their protocol was effective only if the entire string of numbers was recorded on all bags and there was no confusion amongst the volunteer excavators when recording this number on the bags (i.e., they did it correctly). Since knowledge of whether or not an artifact was recovered from a feature was crucial for assigning the appropriate FN code, the ASM rehousers needed to be able to locate the FN number among all the FN lists in which the artifact bag could potentially be listed, when information was not completely recorded on a bag, or there was conflicting information. After working with the bags, we came up with some ways to trouble-shoot (described below) which year the artifact bags may have been excavated if the data was not recorded and to determine whether or not it was recovered from a feature.

Season 1 (1983–1984)

The majority of the artifacts from the first season of excavation were recorded on a continuous list of FN numbers, labelled as a list of artifacts excavated from features 10-11, 16-17; it became apparent that not all artifacts recorded from this list were indeed recovered from these features but were likely from the "vicinity." Furthermore, after much research, before and after we eventually received the excavators' complete set of field notes, we determined that it was impossible in most cases to distinguish between the feature 10-11, 16-17 (they all shared the same coordinates and depths; too much overlap in dates excavated).

TABLE 1. Our reconstruction of the original Arizona Archaeological and Historical Society (AAHS) excavations of Redtail Village bag numbering system, by excavation season.

Excavation Year	Excavation Type	Description of Field Number system
1983-1984	Feature & Non-Feature	Continuous list which you can find in the list tabbed 10-11, 16-17. They typically only provided coordinates and an FN#, which we recorded in the following way: 149-N__.E__-FN#. Periodically, we came across a bag that was labeled within the feature and they had labeled that bag in this way: 149-000.000-FN# (149-Feature.Subfeature-FN#). We typically labeled these bags with the coordinate system.
	Non-Feature	A section of the FN book, titled "By Grid Designation," labeled with the range of coordinates N62-64-69-70-78. Bags from this list were recorded as 149-N__.E__-FN#
1984-1985	Feature	Lists by grid designation but grouped by the feature number 149-000.000-FN# (149-Feature.Subfeature-FN#) and started their FN lists at 1 each time they changed coordinates (resulting in double/triple/etc. numbering of bags).
	Non-Feature	Lists by grid designation but grouped by the feature number 149-N__.E__-FN# and started their FN lists at 1 each time they changed coordinates (resulting in double/triple/etc. numbering of bags).
1985-1987	Feature	Continuous list (both Feature and Non-feature) starting with FN1000. Field bags from Non-feature contexts are labeled 149-N__.E__-FN#Field bags from Feature contexts are labeled 149-000.000-FN# (149-Feature.Subfeature-FN#).

We decided that unless it was clearly stated on the field bag that the artifact was from a feature, or the FN number was listed on the paperwork for the feature, we had to assume it was from non-feature excavation.

Season 2 (1984)

All excavation paperwork in the second stage of excavation, FN lists included, were organized by grid designation, starting at FN 1 each time they excavated at new coordinates. This season of excavation was more straightforward in the sense that there was a separate list for each coordinate pair from a non-feature context and a separate list for each coordinate pair within a feature, again starting at FN 1. As you can easily imagine, however, this meant that the FN number itself was not going to be useful as a unique identifier for each bag; we had at least 50 bags all labeled as "FN 1." Our primary strategy to locate a record for a bag with missing information was to identify whether or not a bag was (or was likely to be) excavated from a feature. If a feature was not identified within the FN number itself, or marked elsewhere, it was probably not going to be located in a feature FN list. Another clue within the project documentation was to consider the stratigraphic level (strat) reported on the field bag. Stats ranging from 1 to 9 indicated overburden, or non-feature levels; 10 and above were designated as cultural layers and were generally found in the FN sheets created for feature excavations. If a bag was missing coordinates, or another piece of crucial information, but a date was recorded on the artifact bag, it was possible to search lists focusing on this variable. In cases where multiple lists were created for a single coordinate, a new FN number was created by the authors on whichever list would cause the least confusion.

Season 3 (1985–1987)

The FN list for this phase of excavation included a continuous list, regardless of context, starting from FN 1000. Any artifact bag that had a FN number of 1000 or above was located within this list, without too much confusion. In the absence of a database, there were problems with this system as well. The first main problem was that some FN number sequences were out of order in relation to the larger list due to the fact that the person filling out the paperwork "reserved" FN numbers and then put that list on its own page. The second major issue with this list was that it was difficult to look for all bags associated with a single feature by looking only at this list, which, in the absence of a FN number, made it challenging to locate the record of an artifact bag when logic dictated that it must be on this list. The creation of the database made it possible to locate non-sequential FN numbers associated with a feature.

Creating a Single List of all Excavated Artifacts

Our primary concern was to create a unique number for each bag to ensure that the newly created database developed during the rehousing would be a useful tool for locating the bag within the research collection boxes. To do this, we adapted the systems utilized during excavation to a new protocol, illustrated in Table 2. Since the original boxes containing artifacts were fairly well organized by material class and provenience, we were able to create the database as the curation-approved boxes were filled. Once the rehousing and database were completed, we started the process of cleaning up the database and looking for problems. There were cases, and this was not apparent until the database was complete, that multiple bags among differ-

TABLE 2. This table illustrates the AAHS Redtail Village Field Number nomenclature adopted during the rehousing, intended to eliminate the situation in which there would be multiple bags with the same identifying number.

Feature Clarification: Rehousing Protocol for recording bag numbers	
If FN is below 1000 write	149-N__.E__-FN#
If FN is 1000 or above write	149-023.000-FN# (Feature 23 is used as an example) (149-Feature.Subfeature-FN#)
If the bag is not in a feature always use coordinates	149-N__.E__-FN#

TABLE 3. Illustration of the problem we encountered during AAHS Redtail Village database validation: Coordinates that were excavated multiple times; the same Field Numbers were assigned to each these bags.

Grid Coordinates	Conflict Date 1	Conflict Date 2	Conflict Date 3
N67 E39	27 October, 1984 (Non-feature)	12 November 1984 (Feature 4)	
N74 E46; N75 E46	24 March 1984 (Non-feature)	12 November 1984 (Feature 23)	14 April 1984 (Feature 23)
N73 E48	6 October 1984 (Feature 23)	3 November 1984 (Feature 23)	
N70 E49; N71 E49	17 November 1984 (Feature 23)	1 December 1984 (Feature 23)	9 February 1985 (Feature 23)

ent lists in both the Feature and Non-feature lists had duplicate coordinates, even though the original FN lists with the intended coordinate pairs did not conflict (Table 3). In this situation, our solution was to assign a new FN number in the list that would cause the least confusion. Full explanations were written out on the bag tags, within the FN lists, and the decision accounting for the change was recorded within the database. The database itself became a master concordance between information originally recorded on the bag and the adaptive system.

One of the tenets of rehousing at ASM is that every attempt is made to preserve the internal logic of an archaeological project, primarily because all field notes and data recorded on bags will be most usable if they are associated with their original excavated context. Every effort was made to hold to that ideal over the course of the year-and-a-half of rehousing, as well as during database construction and clean-up effort. Now that rehousing is complete, the Redtail collection is being analyzed by volunteers from AAHS. Soon, new information from these excavations and analyses will be published and available to the public.

TAKE-AWAYS AND PARTING THOUGHTS

Curational standards change as technology improves, and there will always be a need to update collections, which will incur monetary costs and revisiting collections that have previously been rehoused and updated. As illustrated in the Redtail example, the needs of each project are unique and, at times, require creative solutions. Looking to the future of the management of legacy collections, we now offer some additional aspects of the collections management process to consider, prompted by our experiences with multiple projects.

The Cost of Rehousing

There are significant costs to consider in the supplies required to physically transfer artifacts and accompanying information from old bags and boxes to new tags, bags, and boxes. The estimated costs of archival quality materials (E-CFR 2015a) used during the AAHS Redtail rehousing project are listed in Table 4. The total cost, $1,527.50, is calculated on the most common bag sizes used in rehousing. It is important to keep in mind that larger bags used for rehousing large artifacts and large reconstructable vessels (RVs), for example, are more expensive and, depending on the assessment of required bag sizes needed, as mentioned in Step 1 of the rehousing procedure, will affect the cost of project.

In any rehousing endeavor, volunteers are an invaluable resource and in most cases it is not possible to work with a legacy or orphaned project greater than 100 boxes in a timely manner without these dedicated individuals. An additional and considerable cost to consider when planning a rehousing project is allocating repository staff who are knowledgeable about the rehousing procedures, are capable of leading volunteers, and have the time to meet the commitments of these projects.

Another of Archaeology's Dirty Little Secrets

In a famous commentary in *Archaeology* magazine, Fagan discussed one of the dirty secrets of archaeology: many excavations have not been "published in full" (1995:14). A direct result of this practice is inadequately documented artifacts and collections in a museum's storeroom, leading to the orphaned (Voss 2012; Voss and Kane 2012) and legacy collections described in this article. There is an inherent "dirty little secrets" aspect of the rehousing process. There will undoubtedly be old arguments, politics, and hurt feelings that will re-surface when a project is closely examined. We have found that people are

TABLE 4. Table 4: Estimated costs of archival quality materials (E-CFR 2015a) used during the AAHS Redtail rehousing project are listed in the table. Larger bags used for rehousing large reconstructable vessels (RVs) or bulk ceramic sherd bags, for example, are more expensive. Costs are calculated on the most common bag sizes used in rehousing. This calculation does not include staff and volunteer time. We estimate a total of 3,000 volunteer and 1,000 staff hours to complete this project in all stages..

Material used for rehousing	Cost per item ($)	Quantity	Total ($)
4 x 6in (10.16 x 15.24cm) 4mm plastic bag Typical size used to rehouse artifacts and original field tag	.075	5,200	390
3 x5in (7.6 x 12.7cm) 4mm plastic bag Houses original field tag	.04	5,200	208
1cubic foot box	8.45	110	929.50
	Total Cost of Materials to Rehouse Redtail:		1,527.50

sensitive about someone coming behind them and merging a "legacy" project with modern "best practices" required for storage in a museum repository, and perhaps more importantly, integration with subsequent research. The process of reconstructing the procedures, nomenclatures, excavation practices, and subsequent correction of errors can, at times, be viewed as a "critique" of the excavators' work. Our approach to rehousing is simple. Mistakes happen in the field. Incorrect depths, stratums, feature numbers are recorded on bags. Excavation and documentation strategies that seem like a great idea at the time do not always work out. Directors of past archaeological excavations, now considered legacy collections, did not have to consider issues surrounding the creation of a database. However, it has now become necessary to integrate the information of the past with current technology.

Improving Excavation Documentation and Curation

In a broad discussion, Kintigh and colleagues (2015) describe the "impediments to synthesis" in archaeology as a lack of digital data, citing data preservation, discovery, access, integration, and complexity as a crucial inhibition to systematically addressing the "Grand Challenges" of archaeological investigation (Kintigh et al. 2014). As illustrated in this article, preserving old data by creating databases of orphaned and legacy collections and caring for the artifacts themselves is a complex process that must be addressed before many collections can be integrated into forward-thinking technological resources, such as the Digital Archaeological Record (tDAR). Generating databases to inventory and curate legacy collections in preparation for integration into larger datasets is a time-consuming impediment that must be considered and funded if, as a discipline, we do not want an incalculable resource to be lost due to deteriorating bags and boxes. As Kintigh et al. (2015) say, a cultural change in how we think about the data we generate and the future of these data will ultimately help the discipline as a whole.

We further argue that more can be learned from legacy data than just facts and additions to data tables. Archaeology as a discipline can learn how to improve excavation strategies, documentation, and initial housing of excavated materials by understanding mistakes made in past excavations. Adopting this attitude will improve collections management, ensuring that data generated now is more likely to be relevant for the future and minimizing the costs of upgrading current collections to

new curation standards in the future. Aside from the lessons that can be learned from projects such as Redtail, we want all archaeologists who plan to deposit materials in a repository or similar facility to minimally make sure all codes, shorthand, and terms are defined, which can be achieved by simply including a field manual in the project's documentation.

Archaeological repositories also have some work to do: at a minimum, they must digitize inventories of their non-sensitive collections and make them accessible, preferably online. Better inventories of collections mean that it is more likely that old data will be incorporated into modern research, justifying the need to curate and devote space to archaeological research collections and the need for funding to maintain the integrity of these collections. This is just one way that museums, repositories, and curation facilities themselves can do their part to keep themselves relevant to research that seeks to conduct syntheses of large databanks.

Finally, repository staff and project archaeologists should strive for better communication early in a project's development to ensure a reasonable and accurate curation budget before they step foot into the field. This simple step will safeguard a seamless transfer of material and data from the field and analysis stages to long-term curation, minimizing additional management and updates to legacy collections.

CONCLUSION

The rehousing process preserves the cultural heritage of already excavated sites and enables the incorporation of these previously unavailable data into multi-disciplinary studies. It also mitigates the loss of information and data for future researchers. Rehousing is an essential step in the repatriation of legacy collections. Each project is unique and requires creative solutions. We believe that it is our ethical duty to preserve these collections for many publics: researchers, those that claim affiliation with the inhabitants of the archaeological sites, and those interested in learning about the past.

It also bears repeating that working on legacy collections is instructive as to what not to do when excavating and documenting an archaeological site. As you can see from our experiences with Redtail Village, problems compound quickly if there is not a unified approach that is consistent across the length of the

project. Finally, we should anticipate that the projects of today will be the legacy collections of tomorrow. We have to recognize that it is of paramount importance that people fully document the recording procedures, nomenclatures, and excavation strategies every time and anticipate the long-term curatorial needs of the excavated materials. This is a crucial way in which the responsibility of curating cultural heritage is shared by everyone, ensuring these materials are around and available for all interested parties in the future.

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Data Availability Statement

All collections referenced herein are curated in perpetuity at the Arizona State Museum's archaeological repository. All inquiries regarding access to these collections can be addressed to the Curator of the Archaeological Repository or the Head of the Collections Division. Contact information is available at http://www.statemuseum.arizona.edu/about/staffdir/

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