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## A DATABASE TOOL FOR COLLECTIONS RISK EVALUATION AND PLANNING

**Keywords:** risk assessment, risk management, preventive conservation

### ABSTRACT

The American Museum of Natural History has developed a tool for managing risk assessment data – the Scientific Collections Risk Evaluation (SCoRE) database. SCoRE provides a platform for organization and analysis of extremely large sets of risk data in a number of different ways and allows the flexibility needed to generate reports according to various audiences and demands. Users can analyze data according to location, risk type, or administrative unit as well as being able to document current procedures, practices and events. Originally built in Microsoft Access and most recently upgraded to MySQL, SCoRE enables facility management and collection preservation planning efforts to become united and clearly focused on issues of highest priority.

### RÉSUMÉ

L'American Museum of Natural History a mis au point un outil de gestion de données d'évaluation des risques : la base de données Scientific Collections Risk Evaluation (SCoRE). SCoRE offre une plateforme dédiée à l'organisation et l'analyse de vastes ensembles de données relatives aux risques, selon plusieurs modalités. Sa souplesse d'utilisation permet de générer des rapports en fonction des usagers et des critères retenus. Les usagers peuvent analyser des données selon le lieu, le type de risque ou l'unité administrative ; ils peuvent aussi documenter les procédures, les pratiques et les événements en cours. Conçu à l'origine sous Microsoft Access et migré dernièrement sous MySQL, SCoRE permet de combiner les efforts des secteurs de la gestion des immeubles et de la planification de la préservation des collections et de cibler sur les questions prioritaires.

### INTRODUCTION

The American Museum of Natural History (AMNH) has developed a tool for organizing and analyzing risk assessment data. The Scientific Collections Risk Evaluation (SCoRE) database can be utilized by a wide range of collection-holding institutions and was built to facilitate application of the Cultural Property Risk Analysis Model (CPRAM) (Waller 2003). Assessing risks to collections in a historically and physically complex institution requires and produces large quantities of diverse data. This challenged the AMNH risk management team to develop a means for organizing the data and presenting the results effectively to a variety of audiences. The SCoRE database, originally built in Microsoft Access and most recently upgraded to MySQL, provides this platform.

### HISTORICAL BACKGROUND

Since its founding in 1869, the AMNH has been steadfastly committed to its joint mission of scientific research and public education. The Museum's collections, global in scope and numbering more than 32 million items, support this dual mission. In addition to the wear and tear of time and exposure on collections, events such as September 11, 2001, the Northeast Blackout of 2003, and Hurricane Katrina have emphasized the threats to museum collections and underscored the importance of a comprehensive approach to risk management. In recent years, the American Association of Museums' Accreditation Commission has released expectations regarding collections stewardship, stating that "accreditable museums must have appropriate measures to protect against potential risk and loss, and specifically demonstrate that risks to collections are accurately identified and assessed and that resources are appropriately allocated to have the greatest effect on reducing risk to facilities and collections" (American Association of Museums 2007). Thus, to protect and preserve these collections for current and future generations, the AMNH began a formal risk assessment of its collections.

### COLLECTIONS RISK ASSESSMENT AT THE AMNH

The AMNH is a complex facility with more than 1.6 million square feet of actively used space spread out over an 18-acre campus among 26 interconnected buildings. Collections are housed in 13 buildings and

## RESUMEN

El Museo Americano de Historia Natural ha desarrollado una herramienta para la evaluación de datos relacionados con la gestión de riesgos, la base de datos *Scientific Collections Risk Evaluation* (SCoRE, o Evaluación Científica de los Riesgos de las Colecciones). SCoRE es una plataforma que permite organizar y analizar de muchas formas distintas bloques inmensos de datos relacionados con los riesgos, además de proporcionar la flexibilidad necesaria para generar informes en función de distintas audiencias y demandas. Los usuarios pueden analizar los datos en función de la ubicación, el tipo de riesgo o la unidad administrativa, así como documentar procedimientos, prácticas y eventos actuales. SCoRE, que fue originalmente desarrollada dentro de Microsoft Access y recientemente se ha migrado a MySQL, permite que la gestión de las instalaciones y los esfuerzos de planificación de la conservación de las colecciones se unifiquen y se centren de manera clara en los asuntos más prioritarios.

displayed in 46 permanent exhibit halls; construction dates range from the late 1800s to the early 2000s. The Museum's collections cover virtually every discipline in natural history (Figure 1). They include some of the world's most renowned specimens, objects and records such as archives of renowned curators, scientists, naturalists and artists (e.g. Margaret Meade, Henry Fairfield Osborne, Theodore Roosevelt and Carl Akeley), iconic exhibits and halls (e.g. flagship bird and mammal dioramas, nearly 100 totem poles in the Hall of NW Coast Indians, the largest meteorite on museum display and the world's most perfect star sapphire) and collections of comprehensive taxonomic coverage (ex. the Ornithology collections contain the most comprehensive taxonomic coverage of any collection in the world, including 100 percent of the families, 99.5 percent of the genera, and 97.8 percent of the species of living birds).

Though conservation surveys of the AMNH collections have been undertaken over the years, there has never been an attempt to quantify the needs of the collections throughout the entire institution and prioritize accordingly. Therefore, in 2004 the Museum began a multi-stage collections risk management process encompassing the millions of accessioned and/or catalogued specimens and artifacts stored on- and off-site, the approximately 25,000 objects on display as well as the library and archive materials that support these collections. The assessment model is based on the CPRAM developed by the CMN and adapted to accommodate AMNH's specific needs. It examines all the risks arising from the nature of the collections and the facilities in which they are held, studied and exhibited. The model produces information beyond the scope of more traditional conservation surveys by quantifying specific risks. This allows comparison of risks across widely varying collections, rooms, and buildings.

The results from the AMNH assessment allow for the development of effective risk management strategies and provide a solid foundation for long-term planning and resource allocation. Some examples of the types of outcomes one can expect include:

- reports that prioritize collection needs in a rational, unbiased, relational manner allowing the institution to compare risks of different frequencies and different types across widely varying collections
- strategies for mitigating the risks as viewed from an institutional perspective. This allows an institution to develop cost-effective plans and to allocate resources efficiently. Strategies can be presented as both short-range and long-range plans.
- A baseline of collection risks that can be used to compare progress made in collection preservation and management and the impact this progress has on risk levels.

## THE CHALLENGE - DATA

Both the strength and the challenge of this approach is the enormous amount of data that is collected concerning the collections, how they are used,



**Figure 1**  
Photo-collage illustrating the diversity of the AMNH collections (courtesy of Justine Cooper)

their primary storage and the building envelope. Such data is required in order to quantify variables in the risk assessment equation.

### Buildings and infrastructure

Data concerning the physical infrastructure of collection areas and buildings, the cabinetry contained within a specific area as well as the history of the collections spaces is recorded in advance of risk evaluations (Table 1). Approximately 186 collections storage areas, 46 exhibit halls and associated areas containing library/archive collections museum wide were surveyed to collect this information. The storage areas range in size from 200 square feet to 2000 square feet and in age from five to 125 years. Collecting this information up front saves time and effort in subsequent evaluation processes.

**Table 1**

*Buildings and Infrastructure Data Collection:* the information listed is collected for each individual collection storage room

Location	Building/floor/room
Environment	Climate Control (system type, RH/temp, variance) Window Units Radiators Window Type (Single pane, skylight, double hung)
Plumbing	Identification of pipes Location of exposed pipes
Fire Suppression	Sprinklers (type, location) Extinguisher (type, location) Standpipe/Fire-hose (location) Detection (smoke, heat)
Security	Type (monitored, key/bolt, card access) Locked cabinets P/A system
Electrical	Conduits, panels, IT
Integrated Pest Management	Raised cabinets Sealed floors Door sweeps
Risk History	Leaks (pipes, windows, roof) Damp Fire Pests HVAC system failure Sprinkler failure

### Collection unit identification and description

Each AMNH ‘collection unit’ requires an individualized collection unit description, dated and complete with photo-documentation to be referenced for unit specific information throughout the risk assessment (a collection unit is defined first by administrative authority and then by material type, i.e., Vertebrate Zoology, Mammalogy, Osteology). Each collection unit is described in terms of the nature of the material, the total number of objects, how the specific materials are used and tracked, where they are stored, the quality of cabinetry and storage materials, etc. Often this requires precise breakdowns of numbers, as even one collection unit could be stored in up

to five different locations. Additionally, the collection unit descriptions act to capture historic knowledge of staff, many of whom have been working with the collections for up to 20 years and subsequently stand as records of oral history. To give a sense of scope, the AMNH collections risk assessment identified 328 collection units museum-wide (a distinct material type can be divided into more than one collection unit due to its location as well as its place within the administrative structure, but each collection object is only counted as belonging to one collection unit) (Table 2).

**Table 2**

*AMNH Collection Units:* individual collections units have been merged within more general groupings with total numbers of units along the right column

AMNH Collection Groups	Units in group
Archaeological Anthropology, Bone/Ivory/Shell	3
Archaeological Anthropology, Inorganic (ceramic, metal, stone)	8
Archaeological Anthropology, Organic (cellulose, textile, protein, wood)	7
Earth & Planetary Sciences, Gems & Minerals	13
Earth & Planetary Sciences, Meteorites	7
Earth & Planetary Sciences, Petrology	5
Ethnographic, Composite	9
Ethnographic, Inorganic	10
Ethnographic, Organic	10
Ethnographic, Totems	3
Exhibition, Diorama Paintings	14
Frozen Tissue, Cryo preservation	1
Frozen Tissue, Freezer	3
Invertebrate Paleontology, Macro fossil	6
Invertebrate Paleontology, Micro fossil	1
Invertebrate Zoology, Amber	1
Invertebrate Zoology, Dry	19
Invertebrate Zoology, Fluids	6
Invertebrate Zoology, Nests	1
Invertebrate Zoology, Slides	1
Library/Archives, Unbound sheets	25
Library/Archives, Photographic Collections	36
Library/Archives, Books & bound volumes	24
Library/Archives, Moving Image & Recorded Sound collections	6
Physical Anthropology, Osteology	2
Physical Anthropology, Protein	1
Vertebrate Paleontology, Fossil (amphibian, reptile, bird, fish, mammal)	14
Vertebrate Paleontology, Mounts	4
Vertebrate Paleontology, Subfossil	2
Vertebrate Zoology, Eggs/Nests	5
Vertebrate Zoology, Fluids	5
Vertebrate Zoology, Horn, baleen & ivory	4
Vertebrate Zoology, Mounts (taxidermy and skeletal)	25
Vertebrate Zoology, Osteology	20
Vertebrate Zoology, Skins & Hides	26
Vertebrate Zoology, Slides	1
<b>Total</b>	<b>328</b>

### Risk identification – specific risks

The AMNH risk assessment, like the CMN model, follows a comprehensive categorization framework using the concept of “agents of deterioration” (Michalski 1990). Ten agents are considered: Physical Forces, Fire, Water,

Criminals, Pests, Light and Radiation, Contaminants, Incorrect Temperature, Incorrect Relative Humidity, and Dissociation. The ten agents are further divided into three generic risk types: Type 1 – rare and catastrophic events (potentially high impact with low frequency; e.g., tsunami); Type 2 – intermediate events which are severe in effect but sporadic in occurrence (e.g., plumbing leaks); and Type 3 – constant and gradual processes (e.g., wear from handling). Finally, each generic risk is comprised of a series of specific risks each of which addresses a particular risk cause and effect combination. Just fewer than one hundred specific risks applicable to AMNH collections were defined in the process.

### Risk analysis

Once sufficient background data has been collected, the process of risk quantification begins. This involves determining an overall magnitude of risk for each specific risk as it applies to a collection unit. The following equation was used to accomplish this:  $MR = FS \times LV \times P \times E$ . All variables are simple ratios with values between 0 and 1 inclusive. They are:

- Magnitude of Risk (MR) – represents the fraction of the total collection unit value expected to be lost over the next century
- Fraction Susceptible (FS) – the part of a collection unit considered vulnerable to a loss in value from exposure to a specific risk
- Loss in Value (LV) – the maximum possible reduction in utility, for known or anticipated uses, of the Fraction Susceptible
- Probability (P) – the likelihood of an event within a century (P = 1 for a type 2 or 3 risk and between 0 and 1 for a type 1 risk)
- Extent (E) – the spread of a risk in terms of numbers of objects affected and/or the degree to which Loss in Value is realized.

With 328 collection units and nearly 100 risks to the collections, data storage and analysis is a complex process; there are nearly 32,800 total risks requiring assessment (note: there are procedures in place to make initial determinations concerning whether a risk to a collection unit is considered not applicable or trivial; this reduces the total number of assessments significantly). At the end of the project, the team will have collected more than 131,000 quantitative data elements relating to collection risk, detailing where specimens are located, what level of security/pest control/fire detection these specimens are housed in, how susceptible these specimens are to specific risks, and which specimens require special attention. This information has been instrumental in crafting grant applications and in allowing senior management to incorporate mitigation strategies into the annual, cyclical capital planning process.

### THE CHALLENGE - ANALYSIS

Not only is the organization of such extensive data complicated, but also the complexities concerning analysis and reporting compound this challenge.

Various audiences want to evaluate the data differently. Facilities professionals need to analyze data according to the buildings the collections are stored in, collection managers may evaluate according to collection or material type, and museum administrators may want to view risk profiles overall, by specific division/department or by other criteria, such as insurable versus non insurable risks.

### **Collection/material analysis**

Often, analyzing data concerning a specific collection or material type is most critical. At the AMNH it was found that housing like collections together allows for planning mitigation strategies concerning collection specific risks across the board. An example is the fluid preserved collections. These are stored in 70 percent alcohol, which imposes very specific requirements concerning fire detection/suppression, construction, ventilation, and temperature. The specifications appropriate for these collections differ from those for most other material types. Evaluating the risks to only and all fluid collections allows the museum administration to analyze the impact of moving all these collections to a purpose build facility compared to leaving them in place.

### **Administrative unit analysis**

An individual division or department will often set goals and procedures specific to their needs and will independently seek extramural funds for collections improvements. Generating risk profiles specific to a division/department presents an understanding of their individual needs. Providing the capability to set those priorities within the context of a larger institutional profile illustrates an understanding of strategic planning and sensitivity to institutional goals.

### **Location specific analysis**

Location specific information is fundamental in understanding the vulnerability of collections to infrastructure-related risks; specifically risks concerning security, integrated pest management, environmental parameters, fire suppression/detection, etc. Audiences such as building managers, engineers and construction professionals, may be more interested in evaluating the overall risk to a particular building; in this case, analyzing the building's risk profile is critical. In some cases, these audiences will want a clearer understanding of non-risk related but location driven information such as collection distribution. All of this analysis requires data to be organized by location as well as by collection type.

For an institution of the magnitude of AMNH, a capability for data collection, organization, and presentation greater than the spreadsheet applications previously used for the CPRAM was required.

## THE SOLUTION - A DATABASE TOOL

With more than 328 collections units, nearly 100 risks per collection unit, and close to 131,000 points of data, the storage, mining and analysis needs for this project extended beyond those immediately available in off-the-shelf, non-customized products. Also, to minimize the risk of data entry error, a customized piece of software was created to store and utilize data in an efficient manner. Thus, integral to the AMNH risk-assessment process has been the development of the Scientific Collections Risk Evaluation (SCoRE) software.

This software allows users to view data by collection unit, building, floor, specific risk, etc., making data organization more efficient and searchable. It also generates reports needed to prioritize collection needs and can be used as an aid to determine how to most effectively allocate museum funds. The database is under progressive amendment to be even more user friendly and efficient to both scientific and operations staff. It was originally designed in Microsoft Access, but quickly outgrew this software. It was converted to a quicker, more accessible and more stable user platform that links in with the Museum's overall IT infrastructure.

All summary data can be presented by material type, department/division or more comprehensive museum-wide reports in various formats including risk matrices and bar charts. Examples of the types of reports generated include:

- *Collection unit descriptions*: each collection unit is described using written and photographic methods in order to document information concerning storage environment, previous treatment and preparation, supporting data, labeling and sampling procedures, use, tracking, etc. These reports are particularly useful to conservation, collections management and curatorial staff as stand-alone records documenting how collections are stored and used at a particular point in time.
- *Collections distribution*: the specimens and artifacts constituting the AMNH collections are distributed throughout 26 buildings on site and one building off site, all with varying conditions concerning storage and environment. The Collections Distribution charts (presented as either a table or as a floor plan) allow one to visualize exactly where specimens are stored (specific building and floor number). These charts can present overall, museum-wide data or be broken down to look at specimens constituting individual collection units, departments or divisions (Figure 2 and 3).
- *Collections size*: accessible in both table and bar chart format, this report allows one to understand the size of a collection unit in the context of its department, division and the Museum as a whole (Figure 4). Such a report can help to determine emphasis one may place on mitigation strategies for specific collection units.

**Assessment Year: 2007**

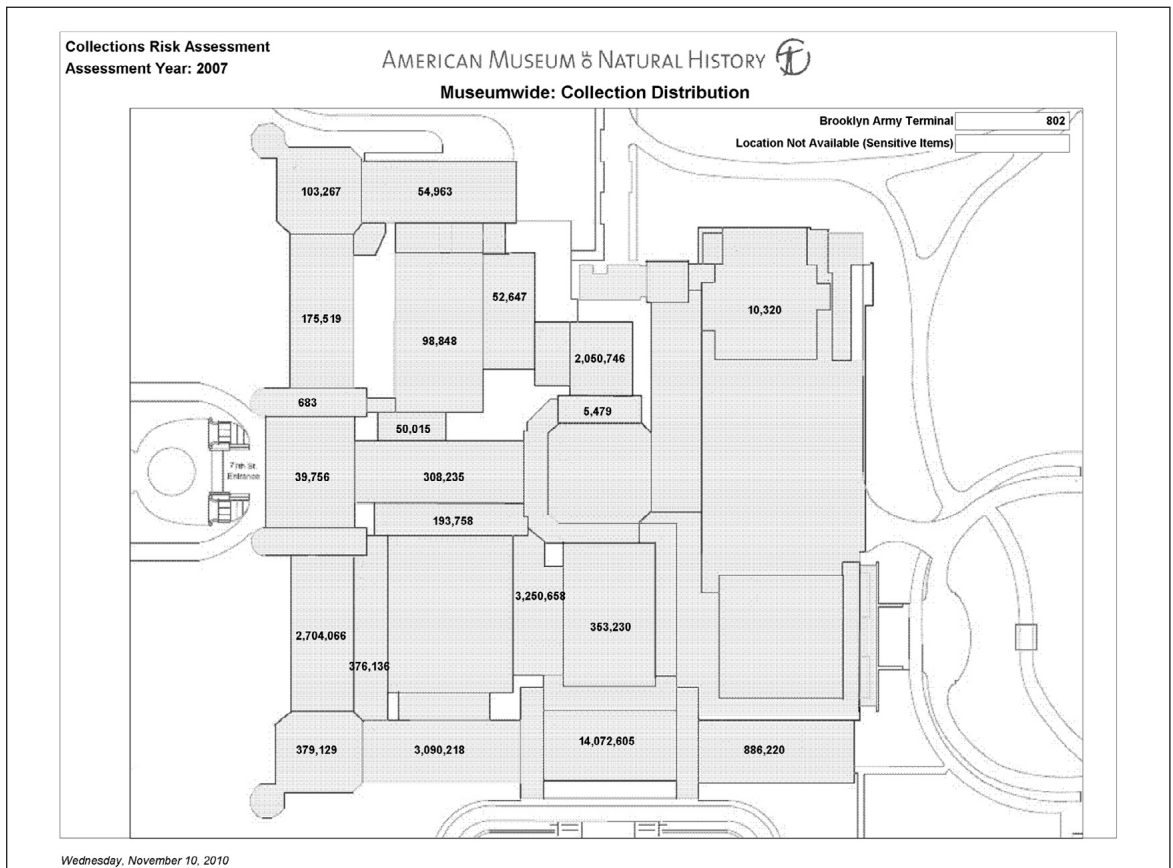
AMERICAN MUSEUM OF NATURAL HISTORY  
COLLECTIONS RISK ASSESSMENT  
COLLECTION DISTRIBUTION  
Museumwide Report

Section	LL	1st Fl.	1 Mezz	2nd Fl.	2 Mezz	3rd Fl.	3 Mezz	4th Fl.	4 Mezz	5th Fl.	5 Mezz	6th Fl.	6 Mezz	7th Fl.	8th Fl.	9th Fl.	10th Fl.	N/A	Total
9	0	0	0	0	0	0	0	0	0	1,108,291	0	1,981,927	0	0	0	0	0	0	3,090,218
1A	17,573	0	176,185	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	193,758
2	0	0	0	0	0	0	0	0	0	39,348	0	408	0	0	0	0	0	0	39,756
2A	0	0	0	0	0	0	0	0	0	579	0	104	0	0	0	0	0	0	683
3	51,928	0	0	0	0	0	0	0	0	2,652,138	0	0	0	0	0	0	0	0	2,704,066
3A	6	8,350	0	56,824	0	22	0	54,852	0	189,574	0	24,080	0	42,628	0	0	0	0	376,136
4	0	0	0	0	0	0	0	96,485	22,282	54,006	2,746	0	0	0	0	0	0	0	175,519
5	0	0	0	0	0	0	0	0	0	372,078	0	7,051	0	0	0	0	0	0	379,129
6	0	0	0	0	0	31,415	0	17,333	0	42,720	11,799	0	0	0	0	0	0	0	103,267
1	0	0	0	757	0	0	0	0	0	302,695	0	4,783	0	0	0	0	0	0	308,235
8	0	0	0	0	0	0	0	12,243	0	42,720	0	0	0	0	0	0	0	0	54,963
BAT	0	0	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	0	802
11	48,830	50,018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98,848
11A	0	50,015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50,015
11B	0	52,647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52,647
12	0	0	0	0	0	0	0	0	1,066	14,071,539	0	0	0	0	0	0	0	0	14,072,605
13	0	0	0	0	0	0	0	0	0	353,230	0	0	0	0	0	0	0	0	353,230
16	172,106	898,300	980,000	0	0	340	0	0	0	0	0	0	0	0	0	0	0	0	2,050,746
17	0	10,320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,320
19	194,503	0	0	0	0	298,058	0	78,216	140,029	89,581	0	85,833	0	0	0	0	0	0	886,220
20	1,846	0	0	0	0	187,288	0	0	0	50,700	0	2,989,115	0	21,709	0	0	0	0	3,250,658
7A	0	0	0	0	0	0	5,479	0	0	0	0	0	0	0	0	0	0	0	5,479
Total	486,792	1,069,650	1,156,185	57,581	0	517,123	5,479	258,929	163,377	19,369,199	14,545	5,093,301	0	65,139	0	0	0	0	28,257,300

Wednesday, November 10, 2010

**Figure 2**


The *Collection Distribution Chart* presents a subset of the museum collections by floor/building allowing the reader to scan the chart to determine their relative distribution



**Figure 3**

The *Collection Distribution Floor Plan* is an example of an easily generated visual that might be used for presentations to senior administration




AMERICAN MUSEUM OF NATURAL HISTORY 		
COLLECTIONS RISK ASSESSMENT		
Assessment Year: 2007		
Museumwide Report		
<b>Ambrose Monell Cryo Collection</b>		
R - Ambrose Monell Cryo Collection	48,830	100.0%
<b>Total Items in Division</b>	<b>48,830</b>	
<b>Anthropology</b>		
R - Archaeology	340,004	94.2%
R - Physical Anthropology	21,000	5.8%
<b>Total Items in Division</b>	<b>361,004</b>	
<b>Invertebrate Zoology</b>		
R - Hexapoda	16,610,524	86.4%
R - Malacology	1,153,515	6.0%
R - Spiders	1,101,396	5.7%
R - RINMS	246,987	1.3%
R - Non-Spider Arachnids	91,791	0.5%
R - Amber	8,734	0.0%
R - Wasp Nests	2,132	0.0%
<b>Total Items in Division</b>	<b>19,216,059</b>	
<b>Paleontology</b>		
R - Fossil Invertebrates	4,303,000	90.0%
R - Fossil Vertebrates	476,243	10.0%
<b>Total Items in Division</b>	<b>4,779,243</b>	
<b>Physical Sciences</b>		
R - Earth and Planetary Science	119,025	100.0%
<b>Total Items in Division</b>	<b>119,025</b>	
<b>Vertebrate Zoology</b>		
R - Ichthyology	2,050,406	54.9%
R - Ornithology	898,611	24.1%
R - Mammalogy	421,958	11.3%
R - Herpetology	364,230	9.8%
<b>Total Items in Division</b>	<b>3,735,205</b>	
<b>Total Items Museumwide</b>	<b>28,258,366</b>	

Tuesday, November 09, 2010

**Figure 4**

The report, *Collections Sizes – Museum wide*, presents a subset of the collection numbers and breaks them down according to department and division as well as percent breakdown of total collections by division

- *Location specific reports*: security, cabinetry, integrated pest management and HVAC information is stored by location providing summary data concerning the physical conditions of the collections storage and the percentage of collections stored under the given parameters.
- *Risk estimation Logic*: these documents outline the detailed documentation of the logic used when determining values for the variables that determine the magnitude of risk – fraction susceptible, loss in value, probability, and extent. It cannot be emphasized enough how critical it is that this data is documented and archived carefully.
- *Risk profiles and matrices*: final risk data can be presented in a number of formats (bar charts, pie charts or simple chart form). These charts allow the viewer to compare the relative magnitude of risks impacting individual collection units, departments, divisions or museum-wide. The '*Risk Matrices*' provide the actual magnitude of risk values (either numerically or using a letter grade) for each generic risk as it applies to a specific collection unit, department or division (Figure 5) (due to issues

**Assessment Year: 2007**  
**AMERICAN MUSEUM OF NATURAL HISTORY**   
**COLLECTIONS RISK ASSESSMENT**  
**Museumwide Risk Matrix**

*General risks that are not included here are Fire 1, Fire 2*

CU (Specimens)	CO1	CO2	CO3	CR1	CR2	CR3	D1	D2	D3	F1	F2	LR3	P2	PF1	PF2	PF3	RH2	RH3	T2	W2	W3	Total **	
<b>Division 1</b>																							
Division Total *	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048
<b>Division 2</b>																							
Division Total *	0.000	0.000	0.009	0.000	0.001	0.001	0.000	0.048	0.002	0.000	0.000	0.000	0.001	0.000	0.013	0.012	0.003	0.033	0.000	0.015	0.000	0.128	
<b>Division 3</b>																							
Division Total *	0.000	0.000	0.002	0.000	0.041	0.001	0.000	0.051	0.003	0.000	0.000	0.000	0.000	0.011	0.017	0.000	0.001	0.009	0.003	0.000	0.000	0.131	
<b>Division 4</b>																							
Division Total *	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.044	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.028	0.000	0.074	
<b>Division 5</b>																							
Division Total *	0.000	0.000	0.007	0.000	0.002	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.001	0.001	0.013	0.000	0.000	0.000	0.052	
<b>Division 6</b>																							
Division Total *	0.000	0.000	0.003	0.000	0.031	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.001	0.001	0.027	0.004	0.000	0.002	0.001	0.004	0.000	0.078	
<b>Museum Total *</b>	0.000	0.000	0.002	0.000	0.032	0.001	0.000	0.043	0.002	0.000	0.000	0.000	0.000	0.007	0.015	0.001	0.001	0.007	0.002	0.006	0.000	0.114	

\* The total for each risk is calculated by using a weighted average (i.e. multiplying the risk for each collection unit by the percent of items in that collection unit relative to the total items in the department).  
 \*\* The total for each collection unit is calculated using the Venn Intersection formula.

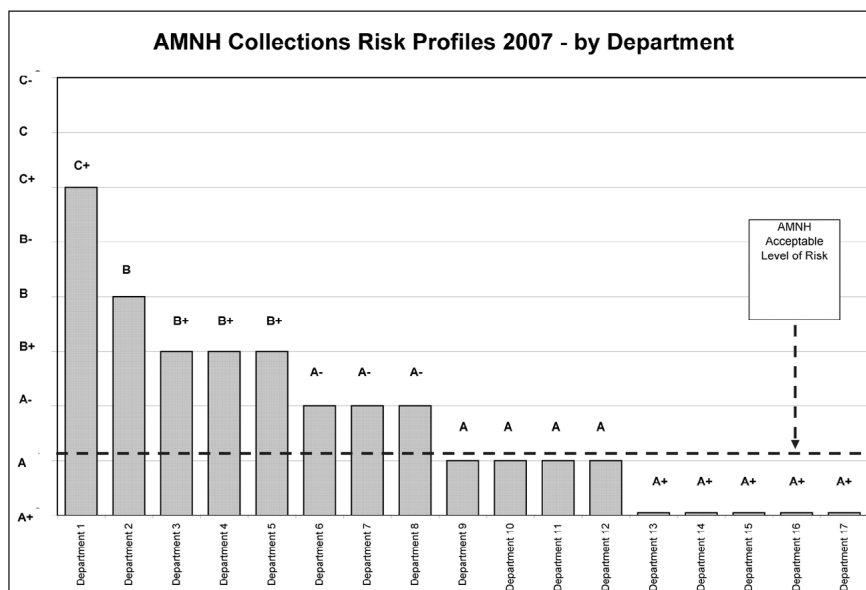
**KEY**

CO1 Contaminants 1	D2 Dissociation 2	PF2 Physical Forces 2
CO2 Contaminants 2	D3 Dissociation 3	PF3 Physical Forces 3
CO3 Contaminants 3	F1 Fire 1	RH2 Incorrect Relative Humidity 2
CR1 Criminals 1	F2 Fire 2	RH3 Incorrect Relative Humidity 3
CR2 Criminals 2	LR3 Light and Radiation 3	T2 Incorrect Temperature 2
CR3 Criminals 3	P2 Pests 2	W2 Water 2
D1 Dissociation 1	PF1 Physical Forces 1	W3 Water 3

Wednesday, November 10, 2010

**Figure 5**  
 Museum-Wide Risk Matrix: this chart presents risk to collections by division

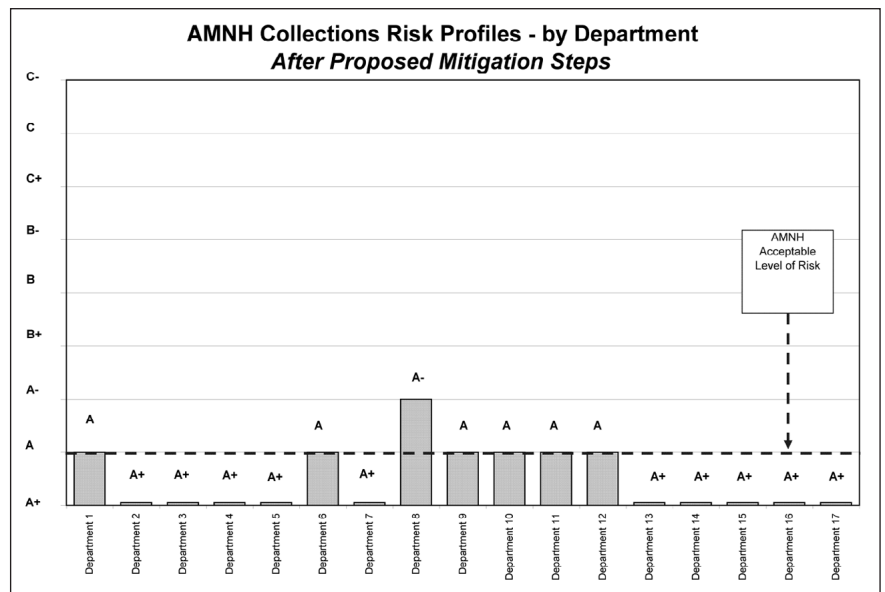
of sensitivity, letter grades are presented). These provide easy access to the values for detailed analysis and comparison; scanning reveals areas of high risk and subsequent drilling down to underlying data reveals the specific risks that contribute to high collection unit risk. The ‘Risk Profiles’ present the data in a more visual format allowing for easy comparison of magnitude of risk values; these reports tend to be more useful for presentations (Figure 6). The AMNH has operationally defined



**Figure 6**  
 Risk Profile, before mitigation: the bar chart presents the risk exposure to collections, by department, before any proposed mitigation efforts

an ‘A’ grade (or the equivalent numeric range) to represent acceptable risk. This is the baseline goal for planning mitigation strategies.

- *Before and after reports*: the database also permits generation of before and after profiles and matrices. An especially useful tool for senior administrators and planners is to be able to present resulting changes in a risk profile subsequent to mitigation efforts and resources allocation (Figure 7). The bar chart presents a theoretical profile after strategies such as re-housing and staff increases are initiated.



**Figure 7**

*Risk Profile – after mitigation*: the bar chart presents risk exposure after theoretical mitigation efforts

- *Catering to the audience*: with some basic knowledge of Access, administrators can develop a wide range of customized reports catered to their specific needs.

The database allows efficient use of data, but nonetheless the analysis is only as good as the data. Different individuals interpret data in very different ways. As a result, one of the key features is the ability to export processed data into Excel for further analysis. This has allowed the risk assessment team to generate customized charts and graphs depending upon the audience – collections staff, facilities/operations staff or museum administration.

## FUTURE DEVELOPMENTS

Due to the expansive nature of the AMNH data, the Microsoft Access platform quickly reached its capacity and a newer data platform was needed to increase speed, usability, and flexibility in the data structure. Subsequently, the database has been updated using MySQL as a web application. The new application was re-developed in a manner that allows AMNH to make available a distribution-friendly version. User documentation explaining all functionality has been created and is targeted toward the novice web application user.

## CONCLUSION

Clear direction from senior management has been instrumental in developing and driving forward the AMNH risk management strategy. This is evidenced by the fact that the Museum added risk assessment to its overall collections management policy (June 2008) thus emphasizing the need for proactive risk mitigation strategies and tactics instead of a combination of historical inertia and reactive decisions. The risk evaluations provide baseline information at a point in time describing the condition of the collections and their preservation needs.

SCoRE allows for organization and analysis of risk data in a number of different ways and provides the flexibility needed to generate reports according to various audiences and demands. The risk assessor can identify challenges at a higher level and quickly and easily drill down to more specific areas to determine most effective mitigation strategies. Thanks to the development of SCoRE and application of CPRAM, facility management and collection preservation planning efforts have become united and clearly focused on issues of demonstrable highest priority.

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