IMAGE ARCHIVAL AND ACCESS: CRITICAL SUPPORT FOR THE MISSION

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ABSTRACT: *Every organization has images of incidents they've been involved with, including 35 mm slides, photographs, negatives, digital camera files, graphics from this presentation or that, PowerPoint files, etc. What does an organization do with these after the fact? Is there a central repository? Who takes care of them? How do I find them again? These are very valid questions whether an organization has been involved in incidents for one year or twenty-five years. NOAA's Office of Response and Restoration (NOAA OR&R) has been taking pictures of incidents since December 1976 at the ARGO MERCHANT oil spill in Buzzards Bay, Massachusetts. Since that time, roughly 20,000 pictures have been taken. Before 1995, there was very little organization and even sketchier access to the images. Today, more than 14,000 are available as digital files and can be searched through the use of an image database. The process of getting from very little access to near full access has been daunting at times but is well worth the effort.*

Discussion

Thousands of slide images represent the on-site observations of a myriad of responders that have worked for NOAA OR&R in its spill response history. Some incidents NOAA has been involved with include, Argo Merchant, Amoco Cadiz, Ixtoc I, Mega Borg, American Trader, New Carissa, Ethel H, Alvenus, Morris J. Berman, Presidente Rivera, Ashland oil spill, Exxon Valdez, Julie N, Bouchard B155, Kure, Kuroshima, Stuyvesant, Cape Mohican, San Jorge, Jessica, Erika, Blue Magpie, and many more (Table 1). Pictures are taken, slides are mounted, digital cameras are unloaded, talks are given, papers are written. The next spill happens and many of these images are forgotten. The slides are put away on a shelf, in a cabinet, in a desk drawer, in a box, or in a slide carousel. Then, someone comes along and borrows this slide or that. Some will be returned, but most will never come back. Important bits and pieces of these events will be lost forever. Creating an image database will ensure the these images will never truly be lost.

Processed color photographic materials require special storage and handling (Kodak, 1997). We recommend to keep these materials in an environment with a temperature of 0° F (-18° C) and a relative humidity between 30 and 35 percent. It is important to use appropriate envelopes and/or sleeves to avoid damaging the images. Black and white materials do not have stringent temperature requirements, but the relative humidity should be between 25 and 60 percent for best results. Special storage envelopes, or metal storage containers, are recommended as well for long-term storage. Conservation, museum, or archival grade products should also be used. Further, photographic files should be stored on the main or upper floor and never in a damp basement or a hot attic. It is important to avoid areas of high relative humidity or great temperature shifts at all costs, as well as avoid all sources of heat and water for the storage area. The room should be free from dust, dirt and contaminating fumes. If the room has been painted with oil-based paint, allow it to air for at least four weeks before using it to store prints and negatives. Use containers intended for long-term storage of photographic materials, and store the containers at least 6 inches (15 cm) above the floor. It is further recommended that these materials be stored in a fireproof storage vault that incorporates all these temperature, humidity, dust and dirt controls. This may also be accomplished with a fire cabinet or safe for a smaller collection.

Photographic materials not stored under these conditions are subject to deterioration of image quality, and in more extreme cases the image can be damaged irreparably. Our organization does not possess the resources, space, or environment to provide this level of care to all our negatives and/or slide images. How would the images be accessed if an organization did possess this type of storage facility? What alternatives could be utilized to achieve preservation of our images while still being able to reproduce them at a quality as close to the original as possible? These are tough questions to ask, but necessary to fulfill than the requirements for lossless storage.

NOAA identified the need to have a system for managing their extensive resources from decades of spill response. A project was proposed to research available solutions, test each solution, and make recommendations on the best course of action. The following are the requirements for the system that was developed:

1. Be able to archive historical slides and/or negatives at a quality level acceptable for any future print or other use.
2. Be able to store these archived images on a medium that has minimum degradation and a shelf life far superior to that of the original images.
3. Be able to archive any of a multitude of digital formats from near past, present, and future incidents with a minimum of effort.
4. Be able to reproduce archived images as a slide and/or print image at a quality acceptable/comparable to the original.

5. Be able to access these archived images through a user-friendly interface and provide public access to them.

Requirements help establish a fair and equitable system for testing products and choosing those that best meet the needs of the project. Review of our requirements made clear we would need: a) an archival process, b) image quality, c) a storage medium, and d) a database product.

We investigated available processes for archiving large numbers of slide images and/or negatives. Various commercial and individual processes can be utilized to scan images to a digital format: a) PhotoCD scans, b) drum scans, c) flatbed scans, and d) slide scans. Each has its advantages, disadvantages, and associated costs. The costs can be extremely variable depending on availability in a particular area, personnel costs, and other variables, ranging range from PhotoCD at the low end of the spectrum to drum scans at the high end. The costs associated with both flatbed scans and slide scans depend heavily on computer and personnel resources available and their cost to the organization. There is also the potential for a large variability in image quality in this process (Table 2).

Table 1. Incident names, locations, and number of images cataloged (partial list).

Incident Name	Incident Date	Incident Location	No. of Images
Alvenus	7/30/1984	Cameron, LA	42
American Trader	2/7/1990	Hamilton Beach, CA	42
Amoco Cadiz	3/16/1978	Brittany, France	71
Argo Merchant	12/22/1976	Buzzards Bay, MA	1007
Ashland oil spill	1/2/1988	West Elizabeth, PA	103
Blue Magpie	11/19/1983	Yaquina Bay, OR	75
Bouchard B155	8/10/1993	Tampa Bay, FL	226
Cape Mohican	10/28/1996	San Francisco, CA	224
Erika	12/12/1999	Brittany, France	210
Ethel H	2/4/1977	Hudson River, NY	56
Exxon Valdez	3/24/1989	Prince William Sound, AK	963+
Ixtoc I	6/3/1979	Bay of Campeche, MX	89
Jessica	1/16/2001	Galapagos Islands	100
Kure	11/5/1997	Humboldt Bay, CA	96
Kuroshima	11/26/1997	Dutch Harbor, AK	375
Mega Borg	6/9/1990	Offshore Galveston, TX	21
Morris J. Berman	1/7/1994	San Juan, PR	56
New Carissa	2/4/1999	Coos Bay, OR	795
Presidente Rivera	6/24/1989	Marcus Hook, PA	91
San Jorge	2/8/1997	Punta del Este, Uruguay	416
Stuyvesant	9/6/1999	Humboldt Bay, CA	96
Westchester	11/28/2000	Empire, LA	87

Table 2. Digital formats, resolutions, and costs.

Product	Resolution(s)	File Format(s)	Images	Cost
PhotoCD	2048 x 3072 1024 x 1536 512 x 768 256 x 384 128 x 192	ImagePac (PCD) (Can be opened using Adobe Photoshop© or a like product.)	≈100	$.80/each
Pro PhotoCD	4096 x 6144 2048 x 3072 1024 x 1536 512 x 768 256 x 384 128 x 192	ImagePac (PCD) (Can be opened using Adobe Photoshop© or a like product.)	≈24	$10.00/each
PictureCD	1024 x 1536	JPG	Roll of film	$8.95/roll
Drum Scans	Varies	Varies	Varies	$10.00/each
Flatbed Scans	Varies	Varies	Varies	Varies
Slide Scans	Varies	Varies	Varies	Varies
Digital Camera	Varies	Varies	Varies	Varies

Image quality can vary greatly depending on the original image, the process utilized to capture the image, and the resolution at which the image is captured. It is very desirable to identify a process with the best available quality and the least amount of variability. Flatbed and/or slide scans were the most variable.

The storage mediums we assessed were compact disc (CD), internal storage (hard drives), and removable storage. While internal storage is the least expensive per megabyte (MB) stored, CD was found to be the most durable and reliable. A solution that incorporates both of these would be the optimum choice.

Database products vary greatly in features, programming options, price, availability, and the ability to provide Internet access to them. We tested most of the available off-the-shelf database products but found their image handling capabilities to be less than inspiring. We also tested many different image database products. We put them through rigorous tests to try their limits, breaking many of them repeatedly. We identified one that handled all of our tests and didn't break. The cost of the product was minimal, especially in comparison to its competitors.

A process was determined for gathering, archiving, cataloging, and accessing the test images. A proposal was written to fund the project for the first year, and was accepted and funded. An image database of over 6,000 images was produced in the first year and the project was a rousing success. A follow-on proposal for three additional years was also accepted and funded. More images were gathered, archived, and cataloged, and at the end of the fourth year over 14,000 images had been preserved. Extensive work was done developing Internet access to the images, refining the keywords used to access the images, and improving the descriptions of the images. Internet users can access images and get either a Joint Photographic Experts Group (JPEG) version at a medium resolution (768 x 512 pixels at 72 dots per inch (DPI)) or the original image at the original resolution, be it a Kodak PhotoCD (PCD), JPEG, Tagged Image File Format (TIFF), PowerPoint (PPT), etc.

Our solution incorporates a web server running the plug-in for the photo database, two large (73 Gigabytes (GB)) data drives, and a file organization scheme that separates images into logical folders where both a medium resolution and a high resolution (as high as the original) version of the image are kept. Presentations are kept in only their original format. We have preserved over 18,000 images to date and have provided access to most of them. Our images have been used in presentations, books, magazines, and scientific papers all over the world.

Conclusions

NOAA OR&R developed a solution that is both reasonable and cost-effective. The best solution to meet our requirements is to archive past and present slides using Kodak PhotoCD technology. A service bureau picks up the images, scans them to PhotoCD using a specialized workstation, and returns the originals along with the accompanying CD(s) a few days later. The cost to us is $.80 per image. We take the CD, copy the images to a folder on a data drive with a name corresponding to the original PhotoCD number assigned randomly by the workstation. We run a program to do a batch conversion of all the images to make a medium resolution (768 x 512 pixels) JPEG image for use in the web interface and perfect for use in PowerPoint© presentations. Digital images are archived to CD and put in folders according to the incident they are associated with. The images are cataloged using the Portfolio© image database and descriptions and keywords are added. Users, and the general public, can access the databases through an Internet interface. We are in testing on an upgrade to our system that includes a server-based image database engine accessible from individual workstations and over the Internet. Our existing system has saved our personnel countless hours of time and has increased our ability to produce professional presentations exponentially. Most of all, we are preserving the history of our organization and saved images that likely would have been lost forever. Present and future generations can now understand, utilize, and enjoy the images that document our history.

Biography

John Kaperick is a Technical Information Specialist for the Office of Response and Restoration of NOAA. He is in charge of all photo database work for his office, as well as the organization's Response Reference Center and its document distribution facility. Mr. Kaperick is a 12-year NOAA employee.

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