



The Iowa Flood of 2008: Putting the Disaster Response Plan to the Test

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Abstract:

In the summer of 2008, the rivers in eastern Iowa rose to historic levels, prompting a major evacuation and shutdown of the University of Iowa campus and resulting in nearly \$750 million in damage, particularly to the buildings that housed the fine and performing arts. The art library reopened in late 2011, and the music library will be in temporary quarters for several more years. Though the main library received only minor flooding in the basement, the building was closed for several weeks even while campus reopened and classes resumed.

The library's data center, located in the main library, needed to be relocated during the evacuation. Fortunately, the library's disaster response plan was updated just four months earlier and ready to be put to the test. This paper presentation will discuss which elements of the plan were most helpful as well as lessons learned. Two important gaps in the plan were the need to identify a communications point person who could be isolated from operational responsibilities and the need to adapt to members of the disaster response team needing to leave in the middle of implementation. In particular, as the waters rose, staff members who lived on the west side of the river had to go home before the last bridge closed, and we had never anticipated choosing disaster response team personnel based on whether or not they had to cross a bridge to get home. The paper will conclude with a status update on moving to hosted servers and decommissioning the library's data center.

The Iowa Flood of 2008: Putting the Disaster Response Plan to the Test

Paul Soderdahl, University of Iowa Libraries

On 13 July 2008, the University of Iowa's main library was one of many campus buildings evacuated due to unprecedented flooding along the Iowa River. Damage exceeded \$1 billion, equal to the combined damage of all eight New Orleans colleges and universities from Hurricane Katrina. Many campus buildings were destroyed and reconstruction will continue for years to come.

The library's data center, located in the main library, needed to be vacated during the evacuation. Fortunately, the library's disaster response plan was updated just four months earlier and was ready to be put to the test. This paper will highlight which elements of the plan were most helpful as well as lessons learned.

The Flood

The University of Iowa, located in Iowa City in the upper Midwest of the U.S., is bisected by the Iowa River. The medical campus, home to one of the largest hospitals owned by a public university, is situated on a bluff on the west side of the river, along with sports facilities and the law school. Most academic buildings, including the main library, fall on the flatter east side. The fine and performing arts campus sits at the north end of campus on the low-lying west bank where the river bends to create a peninsula.

Iowa City is downstream from the Coralville Dam, a reservoir built by the U.S. Army Corps of Engineers in the 1950s to control flooding on the Mississippi River, 135 km away. The lake formed by the reservoir reaches 100 square km before it hits capacity and water overtakes the emergency spillway. Capacity was reached for the first time in the summer of 1993 in what was called a 100-year flood. The number reflects the probability in any given year that water will reach a certain level. The 100-year flood plain map shows the area with a 1% chance of flooding in any given year. Just days before the water topped the emergency spillway in 1993, many experts still predicted the reservoir would not reach capacity because the top of the lake holds such a large percentage of the total volume of water given the shape of the basin.

Fifteen years later, in the spring of 2008, the reservoir once again began to approach capacity. The dam's average midsummer outflow (which is measured in cubic feet per second, or cfs) is 1,730 cfs. On Wednesday, 4 June 2008, engineers increased the outflow from an already high 10,000 cfs to 12,000 cfs, and they projected that the gates would soon be opened to their maximum 20,000 cfs, creating flood conditions in Iowa City and the surrounding area. Recalling the 1993 flood, engineers took more aggressive action to drain the reservoir so that the water would not reach 1993 levels.

On Monday, 9 June, campus officials decided to evacuate the low-lying arts campus. Library staff and essential resources (e.g., reserves) were moved from the art and music libraries on the west bank to the presumed safety of the main library on the higher elevation east side. Since both libraries were on upper floors of their respective buildings, there was little risk of damage to the collections, but any resources left behind could become inaccessible.

Library management began to assess the risk to the main library, but the likelihood of evacuation was very low. Engineers soon projected that the emergency spillway would be breached for a second time, resulting in an outflow of 25,000 cfs. This rate would cause flooding at the same level as 1993, still not putting the main library building at risk. Library information technology (IT) staff started to consider a

variety of scenarios. Other library employees responded to the call for volunteers to report to posts elsewhere on campus to sandbag areas considered to be at risk.

On Tuesday, 10 June, archivists made the decision to get materials off the floor in the basement storage area of the main library “just in case.” On Wednesday, 11 June, the evacuation of the arts campus was complete, and art and music library staff were settling into their temporary quarters in the main library.

Early in the morning of Thursday, 12 June, university officials announced that important materials in 12 more buildings, including the main library, should be moved to higher ground. In mid-morning, library administrators and archivists issued the call to clear the bottom shelf as well as the floor, and by mid-afternoon additional shelves were added to the list. At the end of the day, campus officials indicated their intent to evacuate the main library in two days.

The situation deteriorated quickly, however, after another night of severe weather. On Friday, 13 June, teams of volunteers – including students and staff, townspeople, members of the local Amish community, and prisoners on release programs – descended upon the main library to sandbag the perimeter and create book brigades in every stairwell efficiently moving materials to upper floors.

The building would be locked at the end of the day with no one able to predict when it might reopen. One of the benefits of being downstream from the reservoir is that flooding is usually mitigated. On the other hand, when flooding does occur it can persist for days or weeks. In 1993, once the emergency spillway became breached, water poured over the spillway for four weeks.

Another wrinkle was added when a railroad bridge over the nearby Cedar River collapsed, suddenly damming the Cedar River and flooding Cedar Rapids’ entire downtown district and surrounding neighborhoods. Back on the Iowa River, the north campus bridge was at some risk, with water already up to the roadway. If that bridge were to fail – a real possibility – pieces could float downstream and get caught by the next few bridges, damming the Iowa River right in the center of campus. In the end, all bridges on campus withstood the flood. The total outflow from the reservoir, however, reached a record 57,000 cfs at the time of the evacuation.

During the following week, 16-20 June, campus was closed to all but essential personnel. Classes resumed on Monday, 23 June, but the main library and two dozen other buildings remained shuttered. The main library was certified for occupancy on Monday, 7 July, and reopened to the public on Wednesday, 9 July. Recovery continued for many months. The art and music buildings, however, suffered severe damage, and the libraries would remain displaced for years. The art library finally returned to its renovated building in January 2012. The music library continues to be housed in the main library until a new music school is built.

The Disaster Response Plan

The first “complete” Library IT Disaster Response (DR) plan was finalized on 12 February 2008, just four months before the flood. Not surprisingly, the plan was a long time coming.

In late 2004, the university published its Enterprise IT Disaster Plan, which called on campus departments to develop their own plans. The enterprise plan stated that “each unit must produce and maintain a Disaster Recovery Plan in order to be prepared to continue doing business in the event of a severe disruption or disaster. The focus of the plan is on actions needed to restore services and

necessary operations in the event of a loss of critical functions.” In early 2005, a library task force was charged to develop a plan addressing the following:

- Establish the criteria and severity of a disruption based on the impact it will have on the Libraries’ critical IT functions.
- Determine what the critical IT functions and systems are and the associated timeframes for recovery.
- Determine the resources needed to support the critical IT functions and systems, and define the requirements for a recovery site.
- Identify the people, skills, resources, and supplies necessary to assist in the recovery process.
- Identify the Libraries’ vital institutional data, which must be stored offsite to support resumption of business operation.
- Document the appropriate procedures and information required for recovery.
- Provide for periodic review and updating of the plan to keep it current.
- Provide for testing of the documented procedures to ensure that they are complete and accurate.

As a first step, the task force decided to develop a business impact analysis form where each library department would list each of its business functions (process books, create finding aids, staff reference desk, etc.). For each business function, department managers were instructed to identify any requisite technology, any dependencies, the priority both to the library at large and to the specific unit, and who would feel an impact if IT were unavailable. Intending to be comprehensive, the form was such a burden to complete that compliance was low. By July, the project stalled out and was tabled indefinitely.

Over the next year, several new campus IT policies were developed and/or significantly revised, including a new enterprise backup and recovery policy and an institutional data access policy. In addition, the university’s internal audit department released findings and recommendations across all university business operations, with 13 recommendations for IT. After months of wrestling with overlapping compliance requirements, a new library IT compliance task force was charged in August 2006 to perform a self-audit of library compliance with new recommendations and policies. The task force decided that four documents needed to be developed:

1. Safe Computing Policy and Practice
2. University IT Policies and Impact on Library Staff
3. Library Data Retention Schedule
4. Library IT Disaster Recovery Plan

Progress was slow but steady. The first two documents were drafted relatively quickly, but the data retention schedule and the DR plan took considerably longer. The DR plan was finally completed on 12 February 2008 and contained language on sending and receiving emergency communications, naming a disaster response team, implementing IT services at a remote location, and communicating with library staff and external constituencies.

Prior attempts to identify the criticality of services had always stalled because units resisted labeling any functions as non-essential. As a consequence, none of the underlying services were deemed non-essential. This was avoided in the 2008 plan. Levels of criticality were defined as:

- Critical to university operations
- Critical to library operations
- Essential
- Necessary, Desirable, or Non-Essential

By clustering “necessary, desirable, or non-essential,” there was little squabbling over fine distinctions that would typically be unimportant in any real-life emergency. In addition, services considered necessary, desirable, or non-essential were not even inventoried. This strategy made it easier to complete the plan and resulted in a plan that would not be outdated the moment it was published. Other volatile details (vendor contacts, hardware and software inventories, etc.) were incorporated by reference to minimize the likelihood of someone relying on a plan with incorrect information.

The plan was posted for comments in March 2008 and declared final in April. In an unlikely turn of events, the plan was put to the test in June.

The Relocation

On 12 June 2008, the day before the evacuation, it became clear that the library was headed toward a disaster event. The plan was invoked and the response team was identified. In its first communication to library administration, the team stated that “our expected worst-case scenario from a library IT perspective is this: Main Library building is without utilities for an extended period of time, but the campus as a whole remains operational.” The reasoning was that if the overall situation on campus became truly catastrophic, problems will be so widespread that other infrastructural contingency plans would take precedent, giving the library DR team time to reassess the situation. If, however, the campus remained operational but the main library was offline, the responsibility would fall chiefly on the library DR team.

In order to prepare for this projected worst-case scenario, services deemed “critical to university operations” were copied from the virtual environment to two physical servers. Those two servers were then transported to the College of Engineering’s data center where they could be brought online if the situation deteriorated. Arrangements were made with campus network engineers for an emergency VPN that could route the library’s IP subnet to the engineering building so that vendors’ IP-based authentication would be preserved. Preparations were substantially completed by the end of Thursday, 12 June, and a cutover could take place when needed. By the end of the day, university officials announced that the main library building would indeed need to be evacuated.

On Friday, 13 June, the team quickly developed plans to restore services “critical to library operations” including access to networked drives, intranet, and desktop computers. In the event that the library would need to operate for weeks or months at a remote location, plans were made to relocate the entire data center, moving two complete racks out of the building to higher ground. The library’s server room was itself not in danger of flooding, barring an unimaginable catastrophe. If the water reached the building, however, power and networking would be unpredictable. The best alternative for restoring all services at a new location was to relocate existing equipment. With the emergency servers in place, continuity of service for the most critical systems serving end users was well in hand.

The team decided that there was enough time before vacating the building to power down the production servers gracefully and move all server equipment to a temporary home at the College of Engineering. The racks could not be transported fully populated due to the weight of all the hard drives and backup power supplies.

Under close supervision, one team of volunteers – mostly programmers at central IT Services, or ITS – helped dismantle the racks and carefully transport the drives, battery supplies, and half-empty racks to the engineering building. At the same time, another team of volunteers (mostly IT support staff who oversee campus student computing labs) helped move 150 desktop computers and monitors to a storage area inside ITS. As luck would have it, a new fleet of computers had just arrived and were still in original boxes, so several dozen computers were easy to transport. Fortunately, most staff members had followed the best practices document keeping all essential work-related files on network storage.

To the outside world, library servers appeared offline for several hours because network engineers had stripped the building switches when underground utility tunnels were breached. The services identified as “critical to university operations” were fully operational by the end of the day on Friday, 13 June. The services identified as “critical to library operations” were available less than 24 hours later.

The following week, while campus was closed to all non-essential personnel, library IT personnel continued to get systems in place so that nearly all library operations could resume when campus reopened. By the end of that week, several more servers were back online. Temporary offices were set up, with administration, finance, and human resources in the business library; circulation and reserve in the engineering library, interlibrary loan and technical services in the health sciences library, and media services in the physics library. Digital library and IT staff were set up for telecommuting, and public services staff (from the main library as well as art and music libraries) either worked from home or used a bank of public workstations repurposed for staff use only.

The message sent to all staff prior to campus reopening read as follows:

TO: All Library Staff

DATE: Saturday, 21 June 2008, 16:36:47

GENERAL COMMENTS

1. The word of the day is “fluid.” As in, “The situation is fluid, and any information in this message might have changed by the time you read it.” Or, “If it weren’t for all this fluid, we would not have had to evacuate Art, Music, and Main.” I’ll send out updates as they occur. The situation seems to change at least daily.

2. The information here applies to the generic situation. If you’ve been given specific instructions from your supervisor, follow those instead.

3. In any situation like this, it is difficult to determine how much effort to put into the infrastructure for temporary quarters. We would use different strategies if the relocation is for days vs. weeks vs. months. Still today, we have very little solid information on the expected duration of the Main Library relocation. From a technology perspective, we’re equipped to become fully operational if the relocation is prolonged, but until we know whether it will be long- or short-term, we will be focusing on core functionality first. Just like the physical environment, you should be prepared that the technology will be less than ideal.

LINKS AND OTHER INFORMATION: See the intranet page for Flood-Related Information for Library Staff at <http://intranet.lib.uiowa.edu/flood>.

PHONES

FORWARDING CALLS. You may forward your phone to anywhere, on or off campus. If you’re at your phone, dial *7 then the number you’re forwarding to (including 9-xxx-xxxx if forwarding to a cell or off-campus phone). If your phone is in an evacuated building, contact Wendy ___ by phone or e-mail, and tell her the original number and the number to which the calls should be redirected. NOTE: Because our phone numbers (esp. departmental office numbers, but also individual phone numbers) are listed in so many places, I recommend FORWARDING your calls rather than trying to disseminate ever-changing information about temporary numbers.

CHECKING VOICE MAIL FROM ANOTHER PHONE. The instructions for getting into your voicemail are slightly different

when checking in from another campus phone or from a phone off campus. See:

http://www.its.uiowa.edu/tns/voice/user_guides/vm_user_guide.htm#mai

VOICE MAIL & CALL FORWARDING. If you have your calls forwarded, please read this CAREFULLY because it is not intuitive. If a phone is being forwarded OFF CAMPUS, you are leaving the campus telephone system, so voice mail is handled by the new number. (For example, if my desk phone is forwarded to my cell phone, then voicemail will go to my Verizon mailbox.) If a phone is being forwarded to another CAMPUS phone, then any voicemail is deposited into the original mailbox. (For example, if my desk phone is forwarded to my temporary office at a branch library, then I need to continue to check my desk phone's voicemail regularly, even though I don't have an indicator light to remind me.)

WEB-BASED ONLY ACCESS

WEB-BASED E-MAIL AND CALENDAR. Use <http://email.uiowa.edu>. (Colloquially referred to as OWA ["oh-wah"] for "Outlook Web Access.") You might want to check the option for "private computer" on login to change the default timeout due to inactivity from 15 minutes to 24 hours. (See: <http://cs.its.uiowa.edu/exchange/faqmisc.shtml#timeout>.)

WEB-BASED DEPARTMENTAL E-MAIL. Login to your web-based individual e-mail account as described above. Click the little down arrow in the upper right hand corner next to your name to "Open Other Mailbox." (See: <http://cs.its.uiowa.edu/exchange/faqmisc.shtml#deptacct2007>.)

VIEWING ANOTHER CALENDAR IN WEB MAIL. Go to <https://email.uiowa.edu/owa/firstname-lastname@uiowa.edu/?cmd=contents&f=calendar>, substituting *firstname-lastname* with the individual's UI e-mail address. (See: <http://cs.its.uiowa.edu/exchange/faqmisc.shtml#viewcal2007>.)

WEB-BASED H: DRIVE. Use <http://myfiles.uiowa.edu>. Most users will want to choose MyFiles Basic. MyFiles Premium provides a more elegant interface, including drag-and-drop, but it can be a bit tricky to get started (Mac vs. Windows; public workstation vs. personal computer). Feel free to try it, but LIT staff will be stretched too thin to provide support for MyFiles Premium at this time.

WEB-BASED ACCESS TO L:\LIBRARYDATA. Use <http://myfiles.uiowa.edu/shared/library/librarydata/>. This provides read-only access, but it is fast and convenient. Technically, you can also get to L:\LIBRARYDATA through MyFiles Premium, but LIT staff is not able to provide support at this time. NOTE: Anyone who logs in to a campus computer using Hawk ID will have normal access to H:\ and L:\librarydata. Off-campus computers and computers not tied to Hawk ID will need to use web-based access only.

STAFF WORKSTATIONS

STAFF WORKING AT HARDIN OR A BRANCH LIBRARY. We have an adequate number of computers at each location to accommodate staff who have been relocated. At least initially, we will likely not have adequate IT resources to accommodate each staff member having a dedicated workstation. With some staff working at home and others staggering work hours, we expect to have an adequate number of shared computers to accommodate anyone who needs one. Also, staff should be prepared to have web-based only access at this time. Depending on the duration of the relocation, we can improve this situation as time permits.

STAFF WORKING AT HOME. Our ability to provide technical support for staff working at home is very limited. For general off-campus tech support, you may contact the ITS Help Desk by phone, 384-4357 (4-HELP), or by e-mail, its-helpdesk@uiowa.edu. For library-specific questions, you may contact the LIT Help Desk by phone, 384-4778 (4-ISST), or by e-mail, lib-it-help@list.uiowa.edu. Note, however, that support for individuals off campus will likely be less than ideal, since so much attention needs to be directed to reinstating core services first.

USING REMOTE DESKTOP TO ACCESS MY COMPUTER IN MAIN. This is not an option at this time. Main Library has no network connectivity at this time, so desktop machines in Main Library are not accessible even though power is available.

LIBRARY WEB SITE

EDITING YOUR WEB PAGES. For the most part, the library web servers, including www.lib.uiowa.edu and intranet.lib.uiowa.edu are read-only. If you have an urgent change (e.g., flood-related update), please contact Linda ___ by email. Otherwise, please queue up your changes and wait until we are back on the primary servers.

SERVERS/SERVICES

ONLINE SERVICES CRITICAL TO THE UNIVERSITY. According to our disaster response plan, these four services should be restored first. All four were fully operational by the end of the day Friday, June 13.

- infohawk.uiowa.edu (Aleph) [*unaffected because no Aleph hardware in Libraries' machine room*]
- infolink.lib.uiowa.edu (SFX)
- proxy.lib.uiowa.edu
- purl.lib.uiowa.edu

ONLINE SERVICES CRITICAL TO LIBRARIES OPERATIONS. These four are to be restored second. All were available within 24 hours of shutdown.

- E-mail access (Outlook) [*unaffected because no hardware in Libraries' machine room*]
- intranet.lib.uiowa.edu
- H:
- L:\librarydata

OTHER SERVICES. As of today, these services are currently operational:

- digital.lib.uiowa.edu (CONTENTdm)
- sdr.lib.uiowa.edu
- www.lib.uiowa.edu
- blog.lib.uiowa.edu (Library News)
- wiki.lib.uiowa.edu
- verde.lib.uiowa.edu
- mylibrary.uiowa.edu (MetaLib)

OUTAGES. These are not yet fully restored:

- illiad.lib.uiowa.edu (ILLiad) [see note below]
- smartsearch.uiowa.edu (Primo) [see note below]
- webstats.lib.uiowa.edu
- test.lib.uiowa.edu
- powerclock [possibly available now]
- morrisedition.lib.uiowa.edu
- LOCKSS
- libres.lib.uiowa.edu
- etd.lib.uiowa.edu
- cd-server.lib.uiowa.edu and all cd's hosted on library servers
- bailiwick.lib.uiowa.edu
- inpress.lib.uiowa.edu
- isearch.lib.uiowa.edu (Google search of intranet)

ILLIAD (INTERLIBRARY LOAN) UNAVAILABLE. ILLiad requires additional server hardware and significant setup in order to move to the temporary server room. If we will be out of Main Library for an extended duration, ILLiad obviously becomes critical since the physical collections in Art, Music, and Main are inaccessible. If we will be able to move into Main Library sooner than later, spending the time to get ILLiad fully operational in the temporary room would slow down any move back into Main Library and then require another substantial downtime to bring ILLiad back into the main server room. We will reassess the situation on Tuesday, June 24. In the meantime, departments should be prepared to handle interlibrary loan emergencies manually.

PRIMO (SMARTSEARCH) UNAVAILABLE. Primo requires substantial additional hardware. The servers are stored outside of Main Library, so if we are out for an extended duration, we can bring Primo online. However, because of the hardware requirements, Primo would be too much of a strain on the space, cooling, and electrical in the temporary server room. I expect that we will keep Primo down for as long as campus utilities are strained and not direct staff effort at this time to try to find an alternate location to bring Primo online temporarily.

If you have any questions, please do not hesitate to contact me.

As mentioned above, we've created an intranet page for this and other information. See **LINKS AND OTHER INFORMATION**: See the intranet page for Flood-Related Information for Library Staff at

<http://intranet.lib.uiowa.edu/flood>. If you have additional information to add to the intranet page, please contact Kelly ___ or Linda ___.

Thanks.

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Overall, the evacuation went smoothly, and the library continued to serve campus from remote locations for a month. The only equipment failure was a USB dongle left attached to a server and damaged as the rack was moved through the server room door.

Lessons learned

As a result of this exercise, several lessons were learned to improve the library's disaster readiness.

Lesson #1: Plans may be worthless, but planning is indispensable.

The plan was helpful in defining priorities and setting expectations. The lack of specificity in the plan was not only not problematic but kept the document relevant in an unanticipated situation. Former U.S. President Dwight D. Eisenhower once stated:

I tell this story to illustrate the truth of the statement I heard long ago in the Army: Plans are worthless, but planning is everything. There is a very great distinction because when you are planning for an emergency you must start with this one thing: the very definition of "emergency" is that it is unexpected, therefore it is not going to happen the way you are planning.

So, the first thing you do is to take all the plans off the top shelf and throw them out the window and start once more. But if you haven't been planning you can't start to work intelligently at least.

That is the reason it is so important to plan, to keep yourselves steeped in the character of the problem that you may one day be called upon to solve – or to help to solve.¹

By not trying to identify every service and not worrying about subtle distinctions between necessary or desirable, the written plan stayed focused on broad concepts, trusting that the implementation team would work out the specifics based on the situation at hand. Too much detail makes a plan less applicable in unanticipated circumstances.

¹ From a speech to the National Defense Executive Reserve Conference in Washington, D.C. (November 14, 1957) ; in Public Papers of the Presidents of the United States, Dwight D. Eisenhower, 1957, National Archives and Records Service, Government Printing Office, p. 818.

Lesson #2: In any given disaster, probabilities don't matter.

A Galton board, sometimes referred to as a “bean machine,” nicely illustrates the central limit theorem where any large number of trials will trend toward a normal distribution curve. But the tool also illustrates that it is not possible to predict the outcome for any single trial. There is a temptation to spend more time planning the “most likely” scenarios. Any given disaster, however, is a single experiment. As the disaster unfolds (or as the ball drops down the Galton board), it is easy to account for all possible next moves, but there is neither time to plan for every possible outcome nor benefit in guessing the most likely outcomes based on a “typical” situation. No disaster is typical.

Lesson #3: Designate a non-essential team member as the communications point person.

The DR plan appropriately described how official communications would be delivered and received, naming several authorities (administrator, manager, team leader) as sources for official information. During a crisis situation, however, there is a need to identify personnel who can serve in a dispatch role – individuals who will not be pulled away from dispatch because they have special expertise or authority. This was especially noticeable trying to coordinate with external units who were also busy dealing with the disaster. For example, library IT needed a place to stow 150 desktop computers and monitors. A potential location was identified near ITS. However, key personnel in ITS were unavailable and there was no reliable way to “leave a message.” A non-IT person to serve as an inside contact within ITS would have been invaluable.

Lesson #4: Identify a volunteer coordinator.

When drafting the DR plan, no one considered how to handle volunteer offers for help, yet during the evacuation volunteers kept pouring in. Some had no special IT skills and could get redirected to other efforts such as sandbagging or book brigade, but dealing with these individuals took time away from dealing directly with implementing the DR plan. Other volunteers were IT professionals who wanted their IT skills to be put to good use. There was a humorous miscommunication when a call for volunteers to handle fragile hard drives was relayed as a request to deal with sensitive data. Dealing with the many unexpected volunteers was, at times, overwhelming.

Lesson #5: Essential is a relative concept.

The notion of identifying “essential personnel” was first introduced in pandemic planning and carried over to other critical incidents. Upper-level administrators and health and safety experts were deemed essential, but IT support staff were not. Even among IT staff, the notion of who was essential varied as the crisis unfolded. At times, desktop support or web editing staff suddenly became essential.

Similarly, despite a good effort to predetermine essential services, circumstances on the ground can change what becomes essential. While drafting the DR plan, interlibrary loan was seen as very important but was not a top priority. With no access to the physical collections in main library or the art and music libraries, however, the relative importance of interlibrary loan suddenly increased.

Lesson #6: Prepare for personnel changes among the disaster response team.

Core team members were selected based on skills and availability, but the catastrophe introduced new unexpected variables. No one had imagined, for example, that it would become important to consider which disaster team members lived on the east side of the river, a factor that came into play once the last remaining bridge in Iowa City was threatened to close. Several library staff members commute to Cedar Rapids, normally a 40 km drive, but road closures made the detour into a 400 km trip.

Lesson #7: Look for easy opportunities to repurpose resources.

While end users in other campus units were instructed to pack up their desktop computers, the library IT staff relocated dozens of computers that had just arrived and were still in boxes. This allowed library non-IT staff to attend to other critical matters such as relocating special collections materials. In a debriefing after the event, staff noted that another solution would have been to repurpose student checkout laptops and issue them to library staff on their way out the door. The DR plan should explicitly grant authority to one or more members of the DR team to make last-minute administrative decisions that might contradict standing policy.

Documenting the Disaster

Since the library is also charged with preserving the institution's history, documenting the disaster became a priority as soon as systems were operational. Digital library staff began capturing media coverage and established a repository for photos. Arrangements were made with StoryCorps, and library staff reached out to community members and campus leaders to capture their flood stories.

During the recovery, university administrators asked campus units to identify ways that their individual unit's expertise and services could be used to benefit the institution. In response to this call, digital library staff were tapped to collect, organize, and store thousands of photos taken primarily for insurance purposes. This outreach effort was well received by facilities management and has spawned other collaborative efforts, blurring the traditional boundary between institutional archives and records management.

Long-Term Impact: Moving to the Cloud

In subsequent years, this real-life disaster became a factor in considering a general move to hosted platforms. Significant resources had been invested to construct the library's server room, purchase equipment, and maintain and administer systems. The flood was a reminder, however, that the library's server room is not an institutional priority. The sandbag wall on campus that reached the highest elevation was the one surrounding the university's data center. Hundreds of volunteers came to the library to save the print collection, but few were inspired to ask about digital resources.

During the flood, the library's servers were relocated to the College of Engineering's data center, a superb environment with a fully redundant electrical system. Yet even there they needed to be shut down briefly when the chilled water system failed. On the flipside, the Computer Science department's equally endowed data center is equipped with a fully redundant cooling system but suffered from lack of generator power. In the years since the flood, several services, including interlibrary loan, were migrated to vendor-hosted platforms – with mixed reviews. Remaining on-premise systems have nearly all been relocated permanently to Engineering or to ITS.

Building a new state-of-the-art enterprise-wide data center became a high institutional priority after the flood. The new facility will come online in 2012. In the same timeframe, the last remaining library systems will be moved out of the building and the library's server room will be powered down once and for all. These cloud-based solutions create new dependencies and will radically alter the next DR plan. New strategies will be required to respond to a disaster event when the underlying servers are no longer under local control.

Biographical statement:

Paul Soderdahl joined The University of Iowa Libraries in 1995, first as team leader then head of the Information Arcade. In 2000, he became coordinator for information systems and technology and in 2006 was named Director, Library Information Technology. Mr. Soderdahl holds a B.A. in mathematics and a B.M. in music from Northwestern University, and he earned an M.S. in technology-based music instruction from the University of Illinois at Urbana-Champaign in 1991. His M.A. in library and information science is from The University of Iowa.