SILVER JACKETS

http://mrcc.isws.illinois.edu/1913Flood/

The Great Flood of 1913

100 Years Later

"The people of the Miami Valley learned through the flood to do effective team work and to share their resources in furthering common interests." A sentiment made by the Miami Conservancy District in 1917 and shared by the modern day Silver Jackets.

In late March of 1913 rain fell in such an excess over the Ohio Valley that no river in Ohio and most of Indiana remained in it's banks. Bridges, road, railways, dams, and property were washed away. In its wake an at least 600 people had drowned, a quarter million people were left homeless, and damages were estimated in the hundreds of millions making it at that time the largest natural disaster the United States had witnessed.

A few years before the Great Floods of March 1913, Andrew Carnegie was quoted as prediction "the Ohio Valley will become the workshop of the world; the present commerce of the river is so immense." Around the time of the Great Flood the Ohio Valley population was an estimated 21,700,000 people, or one quarter of the nation's total population. Also during this time the region was the largest producer of the nation's coal, iron, and natural. The amount of manufacturing being produced and shipped in and out of the Ohio Valley was unprecedented.

On Easter Sunday of 1913 the beginning of a series of storms moved out of the Rockies and into the Ohio Valley. This began the onset of four straight days of rain and historic flooding. For the first time a natural disaster in one part of the country had an instant effect across the entire nation. The damage to roads, railways, telephone and electrical lines paralyzed commerce in and out of the region. As a result, there was national outcry for state and federal governments to reevaluate their role in flood control. Some local communities couldn't wait for state and federal help. In southwest Ohio, people of the Miami Valley began the technical and political process to prevent future flooding.

This and future floods continued to expand the nations interest and investments into flood control. Today those in emergency response realize the how critical flood awareness and preparedness can be in reducing our threat to life and property in the face of future floods.

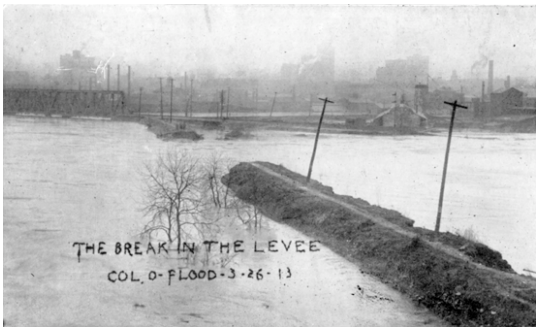
Paddlers in downtown Youngstown on March 26, 1913 (above) and a failed railway track between Wooster and Millbrook Ohio (below). Photos from "Pennsylvania Lines West of Pittsburgh: A History of the Flood of March, 1913" by Charles W. Garrett

The Great Ohio Valley Floods

The torrential rains from March 23-27th over the Ohio Valley produced a flood of rare magnitude and destructive force. The Ohio Valley was no stranger to flooding with floods occurring on a nearly regular basis, especially in spring. However this event was unprecedented in it's duration and the severity of the damage in its wake. Levees and dams failed under the immense pressure of so much water.

Prior to the Great Flood many towns in the Ohio Valley had some form of flood protection such as levees or floodwalls. These proved severely insufficient with floodwaters of the magnitude observed that March. Hundreds of flood protection measures failed, surprising residents who believed they were safe. The devastation was too much for most local communities to handle.

With limited warnings available from upstream, there was often little time to prepare. When alerted to potential flooding, communities would often try sandbagging. If that failed, evacuation was the last recourse.



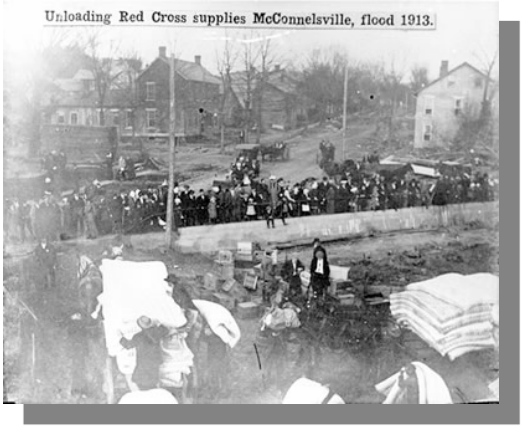
Levee failures at Columbus (above) and Dayton (below) Ohio March 25, 1913. Photos Courtesy from Ohio Historical Society.

Most information regarding flooding came from monitoring river staff gauges and reports from upstream. The heavy rains in March 1913 made it clear flooding was immanent, to what severity was anyone's guess. The Weather Bureau of 1913 was able to send word to some of the hardest hit communities about the flood threat, but with downed telephone lines from previous severe storms most communication was limited.

The Columbus fire department helped save many stranded people. NOAA photo library.

At the state level the capitals of Ohio and Indiana were underwater which slowed rescue and recovery efforts to the rest of the state. Telephone and power lines were down, limiting the ability to relay accurate information or for pleas of help to reach potential rescuers. Trains were halted or marooned, and bridges and roads were washed out in multi-states limiting the movement of resources. To avoid looters and chaos martial law was issued in several towns. Despite the immense challenges at the time, there are thousands of accounts of neighbors helping neighbors, and towns helping towns. Heroic stories were reported by the hundreds. However many citizens perished in attempts to cross swift waters during rescue attempts.

Silver Jackets…Remember the Flood of 1913



Postcard depicting the Red Cross arrival in McConnelsville after the flood. Courtesy www.brisray.com

In the immediate aftermath of the Great Flood the main concern facing communities was organizing relief work. After a few days the relief work was passed onto the American Red Cross. State Legislatures passed emergency acts authorizing the Mayor of any city or town affected by the floods to appoint a committee to assess the extent of repairs needed to recover. For flood victims charitable relief was raised, but for those who lost their homes there was little recourse. Many lived in shelters for months or with neighbors.

The Conservation Act and Organization of the Miami Conservancy District

Citizens of the Miami Valley took active steps to turn their focus from tragedy to the prevention of future floods. On April 20th the numerous committees in the Miami Valley combined into one entity called the Citizens Relief Committee. The group soon passed a resolution stating the committee's intent to "apply the maximum of human knowledge and scientific skill with the necessary measure of financial resources to prevent the recurrence of a similar calamity."

In this resolution the committee requested a voluntary gift from the people of Dayton on the order of $2,000,000 to accomplish its mission. May 25th and 26th were designated as "Dayton Days" which was able to raise the $2,000,000 necessary to ensure that a flood of this might never occurred again. The committee hired the Morgan Engineering Company from Tennessee to oversee the project. With aid from Army Corps of Engineers former chief General Chittenden and seven other consulting engineers, Morgan devised a plan to protect the valley from a storm 40% greater than that of the 1913 flood. This highly involved plan, first of its kind in the country, would solve this problem by building five dry dams, miles of levee and making improvements to the river channel.

Despite all the plans being discussed in Dayton at this time there was no law in Ohio allowing for the implementation of these cross-jurisdictional flood control systems. Arthur Morgan, the chief engineer in Dayton, collected existing laws and those used in Europe in similar flood control programs to draft a law allowing the formation of a Conservation District. The law and submitted it to the Ohio House, which was finally voted on in January 1914. The Conservation Act became official in February1914.

The Miami and Upper Scioto Conservancy Districts were established a year after the Ohio Conservancy Act was official due to a legal battle that was eventually upheld by the US Supreme Court. Similar legislation soon followed in Indiana and western states, and eventually to the entire nation. The Muskingum Conservancy District, covering one fifth of Ohio's runoff, was soon to become the most extensive district in the state. By 1938 the district boasted 14 flood control dams and retention ponds to prevent flooding and store water for times of drought. "The Muskingum Conservancy District is probably the greatest example up to now in all civilization of man's understanding of how to develop his natural environment to his greatest good."[1]

1 "Ohio-A History", by Walter Havighurst, New York, 1976, page 192.

Silver Jackets…Remember the Flood of 1913

Image a depiction of humanity seeking help from science to prevent such a disaster as the floods of 1913. Source: Tragic story of America's Greatest Disaster: Tornado, flood, and Fire in Ohio… By Marshall Everett

What did the 1913 flood teach us about sustainable floodplain management?

Rarely is there one solution to a community's flood problems; rather a combination of strategies are needed to reduce risk. Some of these strategies include:

- Prevention Measures (building, zoning, storm water management, floodplain regulations)
- Property Protection Measures (acquisition, elevation, relocation, flood insurance)
- Natural Resource Protection (wetland protection, erosion/sediment control)
- Advanced Flood Warnings
- Emergency Services (warning programs, disaster response)
- Structural Projects (dams, levees, channel modifications),
- and Public Information (outreach, technical, and education).

SILVER JACKETS-BUILDING THE TOTAL FLOOD WARNING AND MITIGATION SYSTEM

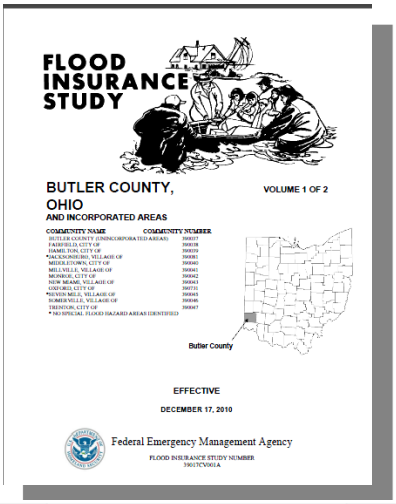
The starting points for developing the total flood system must be an understanding of the nature and needs of those being warned, and a recognition that the sole purpose of the system is to help people to cope effectively with flooding by maximizing their safety and minimizing their property losses. There are many elements to the total flood warning system involving many different expertise and agencies. Ensuring that these agencies can and will work effectively together is a vital part of ensuring the whole system succeeds when needed.

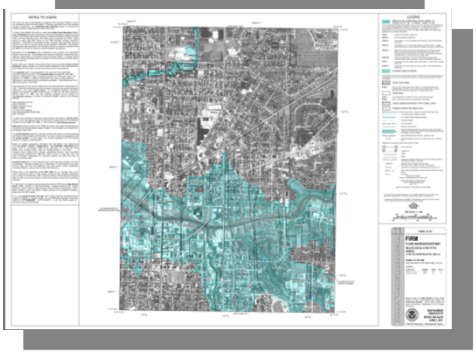
One role the Silver Jackets play in the flood system is be alert to changes in relevant technological innovations that become available, knowing when there is a critical need for flood protection, or when additional resources are available for their respective constituents.

Ultimately it is our collective role to involve the communities. The floods of 1913 proved that no community, in a designated flood zone or not, was vulnerable to flooding. All agencies in the Silver Jackets fundamentally believe that people need to be prepared for floods, and this requires a willingness to develop public awareness initiatives. Information is also made available through multiple agency websites and local libraries and community centers. However, it is up to the receptiveness of the individual communities which drives the ability of Silver Jackets team members to educate citizens on flood risk and preparedness.

2013-100 Years of Flood Services

Flood Awareness Today





Flooding is a coast to coast threat to the United States and its territories in all months of the year. In March The National Weather Service promotes National Flood Safety Awareness Week which is intended to highlight some of the many ways floods can occur, the hazards associated with floods, and what you can do to save life and property.

FEMA's Flood Insurance Survey (FIS) is a presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community.

The USGS uses the long period streamgage network to assist FEMA in promoting flood frequencies such as a 100 and 500 year flood event. This information can help community planners with building in flood plains. The information is also vital for the National Flood Insurance Program.

These are just a few means the public and decision makers have in evaluating their flood risk prior to an event.

How do we prepare for floods?

Flood control and mitigation prior to flood seasons can greatly reduce or prevent the impacts of flooding. Some significant changes that can be done included:

- constructing levees, flood bypasses, channel improvements, detention basins and flood mitigation dams,
- instituting land use controls (such as zoning and the removal of existing buildings) and building restrictions (such as establishing minimum floor levels and raising buildings) in relation to development on flood-prone land,
- developing local flood warning systems,
- developing response and recovery capabilities,
- evaluate your communities risk, FEMA Flood Maps and Flood Insurance Studies,
- and encouraging flood awareness in the community and the means by which people can manage it.

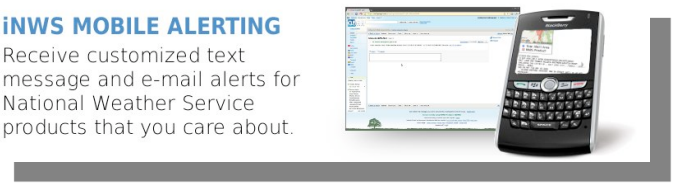
While these measures rarely remove the flood risk entirely, they can reduce the impact of floodwaters in ways that enable communities to cope better when flooding occurs. State and local officials prepare for floods through flood emergency planning, conducting exercises, and educating communities on their personal flood risk. Such steps as preparing flood emergency checklists can go a long way in minimizing the risk of lost time, property, or even life when flooding occurs.

2013-100 Years of Flood Services

How do we communicate and warn about floods?

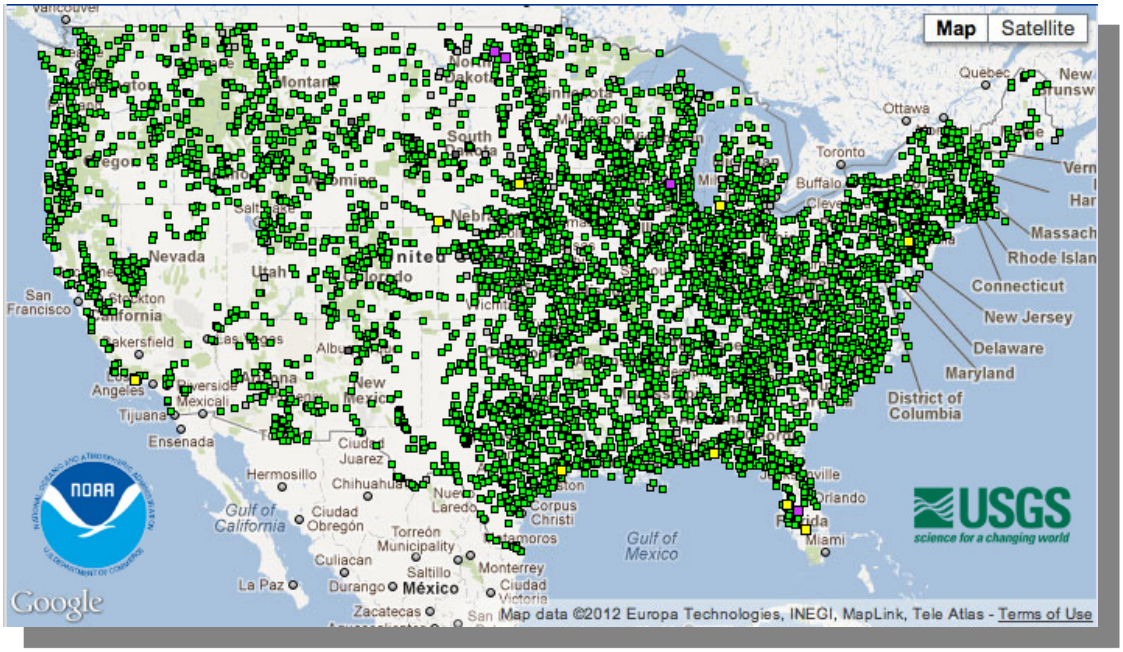
The United States has an array of natural disasters, but the far most costly to life and property is flooding. The earliest river warnings in the flood of 1913 came from the Weather Bureau by means of telephone and telegram. This was problematic as many telephone lines were down from recent storms.

But in more recent times warnings have become more sophisticated as science and technology have improved the predictability of floods and flood severity, timing and rate of rise. The forms of communicating these warnings and forecasts are available through NOAA Weather Radio, mobile device updates, and the Advanced Hydrologic Prediction Service (AHPS) webpage.



Warning alerts through mobile devices are becoming more and more popular. Above are two sources of mobile alerts, on the left is the National Weather Service's interactive alerting (iNWS) and to the right is the USGS WaterAlert sytem. Both require activation by the user.

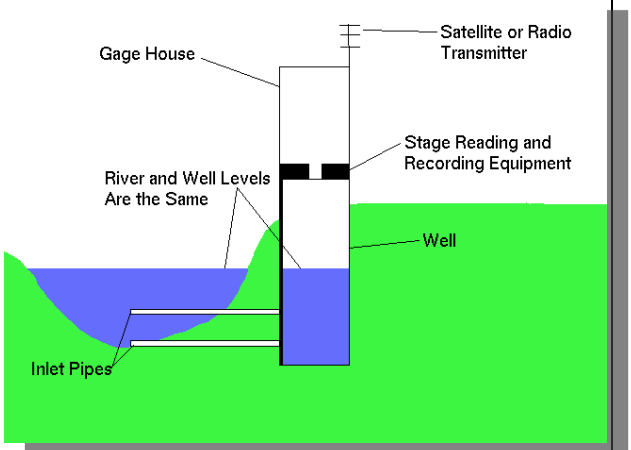
Below is the Advanced Hydrologic Prediction Services (AHPS) front page map depicting river gage sites across the United States. The National Weather Service provides warning services for a number of these gages in times of flood. For more information visit www.weather.gov/water.

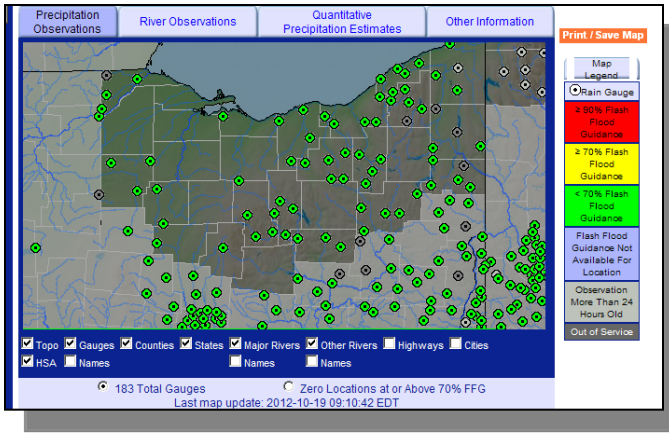


Silver Jackets…Remember the Flood of 1913

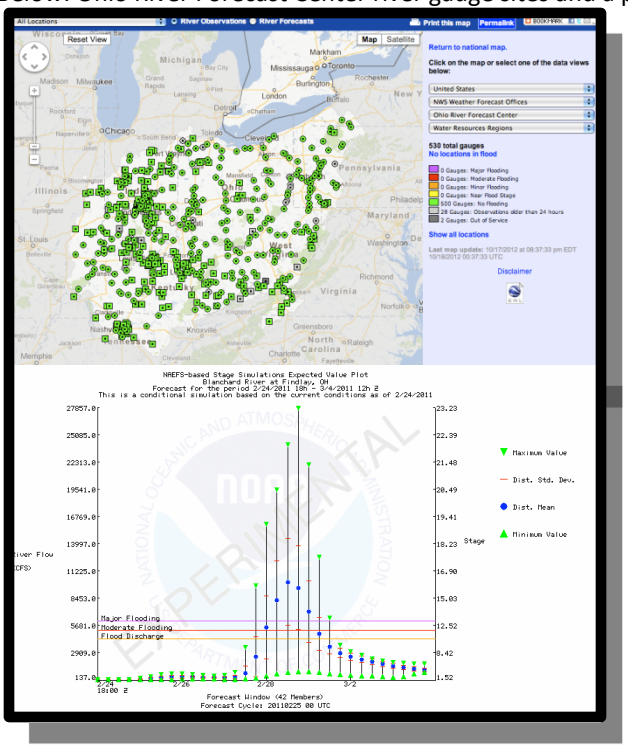
Networks of rain and river gauges have been deployed across the U.S. to provide accurate observations to the users and warning forecasters. With the passage of time many of the manual gauges were telemetered to allow the transfer of data by telephone or satellite..

The National Weather Service's goal has been to provide accurate flood warnings with enough time for the public to protect their property, or in the case of flash flooding move out of the way of danger.





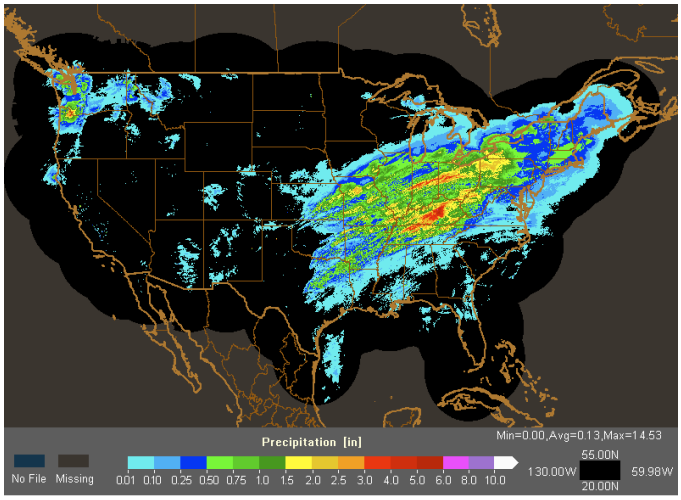
Above left: 15 minute reporting rain gauges in northern Ohio (http://afws.erh.noaa.gov/afws/). Above Right: Depiction of a river gauge with picture of the Ohio River at McAlpine Lock and Dam below it.
Below: Ohio River Forecast Center river gauge sites and a plot depicting flood risk at a site in northern Ohio.



The National Weather Service has 13 River Forecast Centers that are responsible for flood forecasts for over 4,000 river locations, or gauge sites, across the U.S. The River Forecast Centers use computer models to process ground conditions such as snow depth, soil moisture, streamflows and combines this with future rainfall and runoff to produce a predicted river level. A number of USGS, U.S. Army Corps of Engineer, NWS, and privately owned river gauge have established flood stages. The NWS will issue flood warnings for these river forecast points when it is predicted that the river will rise above flood stage.

Silver Jackets…Remember the Flood of 1913

Radar is the most utilized tool in the forecasters war chest for determining where and how intense the rainfall is over a given area. Between 2011 and 2013 the NWS went through a radar upgrade, the first since the Doppler Radar installation in the 1990s, with the installation of Dual Polarimetric Radar. This latest technology increases the forecasters ability to determine the amount and type of precipitation, a tool most useful for flood forecasting.



Above: National graphic depicting the network of Doppler Radar hourly rainfall estimates from the National Weather Service.

Local flood warning systems are also becoming more common as a means of detecting flash floods. Over 600 local flood warning systems are established over the U.S. which are composed of a network of rain gauges, river gauges, and an alert system for local officials and/or the National Weather Service. The Integrated Flood Observing and warning System and Ohio STORMS gauge networks are located in the Ohio River Valley. The networks integrate various county and statewide systems that have communication networks for transmission of near real-time rainfall.

Flood Warnings

Flood Watch Flood watches inform the public of hydrometeorological conditions which may cause flooding when the flooding is neither certain nor imminent. Flood watches may cover states, counties, rivers, portions of states, portions of counties, or portions of rivers (e.g., one or more forecast points).

Flash Flood Warning Flash flood warnings are issued when flooding is imminent. This product will be reserved for those short-term events which require immediate action to protect lives and property, such as dangerous small stream flooding or urban flooding, and dam or levee failures.

Flood Warning Flood warnings are issued for any high flow, overflow, or inundation not covered by flash flood warning products. There are two general types of flood warnings - areal flood warnings and river flood warnings issued for specific forecast points. Flood warnings for forecast points usually include information on the impacts of expected flooding at locations upstream and/or downstream from covered forecast point(s) on a river or stream. Areal flood warnings are issued for areas along rivers and streams not associated with a forecast point, or for counties or portions of counties (with the areas covered described in the same way as for flash flood warnings).

Urban and/or Small Stream Advisories Flood statements issued to provide information on elevated river/ stream flows or ponding of water in urban or other areas, when such events warrant notification of the public in a product less urgent than a warning.

How do we respond to floods?

Once flood forecasts and warnings have been sent and the potential flood consequences identified, it is necessary for emergency planners and responders to coordinate with supporting agencies for an accurate flow of information. Before the floods start many actions can be done to prepare the community such as:

- Starting emergency operation centers
- moving people and property out of flood zones,
- sandbagging,
- starting pumping stations, and
- the rerouting of traffic away from flood prone roads

During the floods actions include:

- conducting search and rescue operations,
- and evacuating persons and providing for their immediate welfare,

Flood rescue is performed by specialized, trained and equipped emergency service personnel. The scale of most rescue operations are usually small in scale and involve only a few individuals. However, when flooding affects high population centers and many people have failed to evacuate or have become trapped by floodwaters, the demand for flood rescue can be high. These events require coordination of large-scale flood rescue operations.

How do we recover from floods?

The Department of Homeland Security along with many other federal agencies have developed the National Disaster Recovery Framework as a guide for effective recovery after a flood. The National Disaster Recovery Framework has six recovery support functions that are led by designated federal coordinating agencies. The Recovery Support Functions (RSFs) purpose is to support local governments by facilitating problem solving, improving access to resources and fostering coordination among state and federal agencies, nongovernmental partners and stakeholders. The Recovery Support Functions and designated federal coordinating agencies are:

- **Community Planning and Capacity Building:** Federal Emergency Management Agency
- **Economic:** U.S. Department of Commerce
- **Health and Social Services:** U.S. Department of Health and Human Services
- **Housing:** U.S. Department of Housing and Urban Development
- **Infrastructure Systems:** U.S. Army Corps of Engineers
- **Natural and Cultural Resources:** U.S. Department of Interior

The National Disaster Recovery Framework offers a flexible structure enabling recovery officials to operate in a collaborative manner. Not only does it consider disaster prevention, protection, mitigation, response, and recovery; it also:

- defines core recovery principles;
- outlines various roles and responsibilities for recovery coordinators and other stakeholders;
- offers a coordinating structure for planning across the disaster lifecycle; and
- establishes an overall process "by which communities can capitalize on opportunities to rebuild stronger, smarter, and safer."

Silver Jackets…Remember the Flood of 1913

Summary

The earliest flood control systems in the Ohio Valley were those implemented by private or local interests. Recovery from flood disasters was the primary role of the American Red Cross and other charitable organizations,. Due to the staggering extent of damage the Great Flood left in its wake, it led to an era of flood awareness. New local, state, and federal agencies worked to develop programs that would help prevent or limit the impacts from this type of flood in the future.

After the flood of 1913 local citizens and those from the federal government began to push for more comprehensive flood prevention. Though there is no way of preventing the rain from coming, there are many means of limiting the extent of the damage. However many of these methods come with large price tags, too significant for many smaller communities to afford.

The Miami Conservancy District, followed soon by several more so inspired Conservancy Districts across Ohio and Indiana, completed an unprecedented flood control system to protect their citizens from future floods. The Federal government saw that each dollar spent on flood protection saved future flood relief dollars. Shortly after the 1913 flood the federal government became interested in funding flood control projects. The legislation lagged in Washington however other significant floods, most notably the Mississippi Flood of 1917, drove the policies through. As a result, more state and federal agencies across the country became invested in the mission to protect life and property against floods.

In the one hundred years since the Great Flood of 1913 there have been great strides in reducing the threat to life and property from floods. Some of these strategies include:

- Prevention measures (building, zoning, storm water management, floodplain regulations)
- Property protection measures (acquisition, elevation, relocation, flood insurance)
- Natural resource protection (wetland protection, erosion/sediment control)
- Emergency services (warning programs, disaster response)
- Structural projects (dams, levees, channel modifications)
- Public information (outreach, technical assistance, education)
- Flood Warnings and alerts

It has been learned time and time again that it is through a combination of these efforts that the loss of life and property can be greatly reduced in future floods. The authority to implement these strategies is spread across various government agencies, the private sector, non-profits, academia, etc. The collaboration of many of these agencies into the Silver Jackets teams will help reduce impact from future floods. Arthur Morgan of the Miami Conservancy District knew that there is more than one solution to a community's flood problems. In order to know where you are going, you must know where you have been. Understanding and learning from past floods will help this country continue to improve our abilities to protect life and property the next time the waters rise.

Sarah Jamison
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And Ohio and Pennsylvania Silver Jackets Member