All Natural Hazard Mitigation Plan

Clermont County, Ohio

BOARD OF COUNTY COMMISSIONERS
CLERMONT COUNTY, OHIO

MARY C. WALKER ROBERT L. PROUD R. SCOTT CROSWELL III

Building a Disaster Resistant Community
PROJECT IMPACT

Fuller Messbarger Scott & May
EMSM ENGINEERS

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Acknowledgement

We would like to thank Beth Nevel and Deborah Britton of the Clermont Department of Public Safety for their integral part in facilitating the Clermont County's All Natural Hazards Mitigation Plan. Their help and foresight were key in completing the plan for the County's current and future natural hazards mitigation efforts.

1.0. Forward

In recent years, Clermont County has suffered damage to both private and public infrastructure from floods and other natural hazards. Clermont County is committed to providing for the welfare of its residents. Above all, the County strives to alleviate suffering and protect the lives and property of its citizens by addressing mitigation, preparedness, response, and recovery for natural hazards.

One of the ways that the Clermont County felt it could make an impact and strive to become more disaster resistant was to create an **All Natural Hazards Mitigation Plan**. An **All Natural Hazards Mitigation Plan** addresses natural disasters that could affect a local community, whether it is flooding, tornados, subsidence, winter storms or some other disaster. By developing a mitigation plan, the County is able to determine its areas of risk, assess the magnitude of the risk, and develop strategies and priorities for reducing risk. Disaster mitigation planning is a comprehensive "future-oriented" process that determines how a community will deal with its problems while protecting the natural and beneficial aspects of the area.

In an effort to continue to meet the mission of protecting lives, property, economic viability and quality of life for the people of Clermont County, the County's Department of Public Safety has supported the effort to create an **All Natural Hazards Mitigation Plan** for multiple jurisdictions and their residents. A list of the jurisdictions seeking credit for this plan is listed in the table to the right and documentation of their participation can be found in section 3.1.

Jurisdiction	
Batavia Twp.	Village of Amelia
Clermont County	Village of Batavia
Franklin Twp.	Village of Bethel
Goshen Twp.	Village of Chilo
Jackson Twp.	Village of Felicity
Loveland, City of	Village of Moscow
Miami Twp.	Village of Neville
Ohio Twp.	Village of Newtonsville
Pierce Twp.	Village of Williamsburg
Stonelick Twp.	Washington Twp.
Tate Twp.	Wayne Twp.
Union Twp.	Williamsburg Twp.

The **All Natural Hazards Mitigation Plan** will allow Clermont County to:

- Locate their areas of risk and assess the cost and magnitude of the risk;
- Develop strategies and priorities, and identify projects for reducing risk;
- Guide the community and lessen conflicts between agencies; and
- Provide eligibility for future mitigation program funds.

1.1. Clermont County Hazards

Clermont County is susceptible to several natural hazards. Flooding, severe storms, tornadoes and earthquakes have all left their mark on the County. Of these natural hazard risks, severe storms and flooding are the most frequent hazards. The main source of flooding is the Ohio River, but the Little Miami River has also caused past floods. *Please note: Detailed descriptions of other hazards are addressed later in the text.*

View of the Little Miami River

Flood damage has been the result of unusual rainfall events and constricted waterways. Due to this devastating combination, several residents have suffered repetitive losses in a short time frame. There were Presidential Disaster Declarations for Clermont County in 1996 and 1997, due to flooding. Severe storms have also recently taken their toll on the County. The winter storms of 2002-2003 strained the County's resources and on February 16th and 17th of 2003 ice storms caused property damage and a level 3 emergency was declared.

2.0. Clermont County, Ohio Community Information

Clermont County is located in southwestern Ohio, bounded to the south by the Ohio River, to the north by Warren and Clinton Counties, to the east by Brown County, and to the west by Hamilton County and Cincinnati. It encompasses approximately 452 square miles. The County is comprised of two cities, eleven villages, and fourteen townships. The county has grown from 15,820 people in 1820, 36,713 in 1880, and 42,182 in 1950 to about 178,000 in 2000.

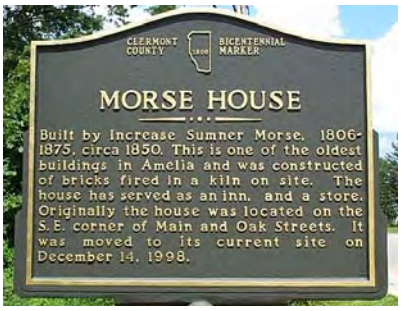
Clermont County Community Map

2.1. Clermont County History

From heroics to war stories to debates over what's in the name, Clermont County has a rich and fascinating history. Since its founding over two centuries ago, the county has retained nearly the same shape and size. Others - neighboring Hamilton County, for instance - have changed drastically.

Clermont County was established by proclamation on December 9, 1800, before Ohio itself became a state; Clermont County celebrated its bicentennial as the world entered the next millennium. Clermont was the eighth of ten counties in the area that eventually would become Ohio. General Arthur St. Clair formed the counties from the southeast tip of the Northwest Territory. The county was named for a French word that described the area in the late 1700s and early 1800s - "clear mountains and hills." The county was named in honor of our French allies who helped defeat the British at the Battle of Yorktown in 1781.

Clermont County was originally composed of five large townships, but they have since been divided into a total of 14 townships; a brief summary of these subdivisions can be reviewed in the table below. The original county seat was in Williamsburg (originally spelled Williamsburgh), where it remained until 1823. It then moved to New Richmond, along the Ohio River, for one year. Batavia became the third and final county seat of government on February 24, 1824. Early settlements included Denhamstown, incorporated as Bethel in 1851. Jesse Grant, father of Ulysses S. Grant, was Bethel's first mayor. Other early settlements included: Withamsville (then called Witham's settlement), Miami Township, Hageman's Mills (later Milford), Stonelick Township, Chilo, Goshen Township, Felicity, Moscow, Point Isabel and Amelia. All communities date to the early decades of the 19th century.



Clermont County Townships

The *Clermont County Community Map* on page 4 shows the location of each township. A brief description of each township is summarized in the table below.

Clermont County Township Information Summary

Township Name	Origin of Name	Date Established	Establishment Notes
Batavia Township	Named for the Village of Batavia, which was named for Batavia, N. Y.	September of 1815	Formed from parts of original townships, Williamsburg and Ohio.
Franklin Township	Named after Benjamin Franklin.	May of 1818	Formed from Washington and Lewis (now part of Brown County) Townships.
Goshen Township	Named after Goshen, N. Y.	March of 1819	Formed from Miami Township.
Jackson Township	Named after President Andrew Jackson.	June of 1834	Formed from Wayne, Stonelick, and Williamsburg Townships.
Miami Township	Named after the Little Miami River and the tribe of Indians who once controlled the area.	February of 1801	Miami was one of the county's original townships.
Monroe Township	Named after President James Monroe.	June of 1825	Formed from Ohio and Washington Townships.
Ohio Township	Named after the state.	February of 1801	It is one of the county's original townships.
Pierce Township	Named after President Franklin Pierce.	December of 1852	Formed from Ohio Township.
Stonelick Township	Named for the creek that passes through it.	March of 1812	Formed from Miami and Williamsburg Townships.
Tate Township	Probably named for the Tate family, who settled from Tates Creek, Kentucky.	June of 1805	Formed from Ohio and Williamsburg Townships.
Union Township	Probably named after the union of the states that formed the United States.	December of 1811	Formed from Ohio Township.
Washington Township	Named after the first President of the United States, George Washington.	February of 1801	It is one of the county's original townships.
Wayne Township	Named after General "Mad" Anthony Wayne.	March of 1819	Formed from Stonelick Township.
Williamsburg Township	Named for the Village of Williamsburg.	February of 1801	It is one of the county's original townships.

Newspapers

Clermont County is served by several newspapers, including:

- Cincinnati Enquirer,
- Community Journal,
- Clermont Sun,
- Bethel Journal, and
- Milford Miami Advertiser.

2.2. Clermont County Utilities

A list of several utilities that serve Clermont County is shown below:

Utility	Phone Number
Telephone	
Cincinnati Bell Telephone	565-2210
AT&T	(800) 222-0300
Belgacom North America	936-5281
I-Link Access IR	791-0020
NPS Inc.	722-4999
R&B Phone Installation and Repair	752-2787
Gas and Electric	
Cinergy/CG&E	421-9500
Ferrellgas	575-1400
Grubb Oil Co.	947-8841
Lykins Oil Co.	724-3117
Rich Energy Inc.	271-1460
Clermont Electric Supply Co.	248-0900
Electronic Testing Consultants	831-8758
Ohio Valley Electric Corp.	553-4246
Cinergy/Cinti Gas & Electric Co.	421-9500
Water	
Clermont County Sewer and Water	732-7970
Tate-Monroe Water Association Inc.	734-2236
Waste	
Rumke	851-0122
CSI	771-4200

2.3. Census Information

According to 2000 census information, Clermont County has 177,977 residents. Clermont County has had an 18.6 percent increase in its population from 1990 to 2000.

The County has 69,226 housing units with a homeownership rate of 74.7 percent. The median value of the housing units was reported to be $122,900 in 2000. The median household income was reported to be $49,386 in 1999. In 1999 Clermont County had 7.1 percent of its population below the poverty line.

The Ohio Department of Development has made a PDF Document available on their website that provides more specific information for Clermont County.
http://www.odod.state.oh.us/osr/profiles/pdf/clermont.pdf

Clermont County is home to a wide range of businesses including agriculture, industrial, commercial, and retail establishments. In 1999 the county reported 3,232 non-farm establishments employing 45,735 persons. The local governments in Clermont County employ 5,079 full time equivalent people. In 1999 there were $1.5 billion in manufacturer's shipments and $1.7 billion in retail sales.

2.4. Clermont County Authority to Adopt Plan

Clermont County is required under Chapters 5915 and 3750 of the Ohio Revised Code to develop emergency plans with the approval of the Governor and all departments of state government. In order for the Clermont County's **All Natural Hazard Mitigation Plan** to be enforceable and compliant with the Disaster Mitigation Act, the Clermont County Board of County Commissioners will adopt this plan upon approval from the Ohio Emergency Management Agency and the Federal Emergency Management Agency's acceptance.

2.5. Clermont County Emergency Operations Plan

In an effort to plan for emergencies that may arise the future, Clermont County has developed an Emergency Operations Plan (EOP). The EOP was commissioned by the Clermont Department of Public Safety and promulgated by the Board of County Commissioners. The EOP was recently revised in September of 1997 and October of 2002. The purpose of the EOP is to predetermine actions to be taken to prevent avoidable disasters and to quickly respond and recover from emergencies that occur. The EOP identifies several hazards, both natural and non-natural, that may affect Clermont County.

Clermont County Emergency Operations Center

The EOP also discusses several important aspects of emergency prevention and recovery, including:

- **Direction and Control** of the Clermont County Emergency Operations Center,
- **Communications** procedures and capabilities in the event of an emergency,
- **Notification and Warning** for the general public in the event of an emergency,
- **Emergency Public Information** releases through county representatives to protect the community,

- **Law Enforcement** coordination and tasks during an emergency,
- **Fire and Rescue** presenting Clermont County's firefighting and rescue capabilities during and emergency,
- **Engineering, Utilities, and Public Works** responsibilities during an emergency,
- **Public Health** services during emergency situations,
- **Medical** provisions including lifesaving, transport, evacuation, treatment of the injured, disposition of the dead, and crisis mental health services during a disaster,
- **Evacuation** of the Clermont County population in the event of a hazard,
- **Shelter and Mass Care** of any of the population affected by a hazard,
- **Damage Assessment** procedures to be followed in the event of a hazard or disaster,
- **Radiological Protection** outlining the organization, personnel, equipment, and procedures required to protect the populous from radiological hazards,
- **Resource Management** for mitigation and preparedness to respond to emergencies, and
- **Hazardous Material** emergency response and preparedness in the County.

The Clermont County **All Natural Mitigation Plan** will utilize the EOP, specifically Annex L, for damage assessment. A damage assessment done properly is critical in the application process to potentially bring mitigation dollars to Clermont County after a natural disaster. Mitigation activities associated with damage assessment include, but are not limited to establishing a damage assessment program, designating a damage assessment coordinator, and developing a damage assessment training program. Clermont County has been proactive in their damage assessment program by implementing an ongoing training program for local officials. The last training session was held in November of 2003.

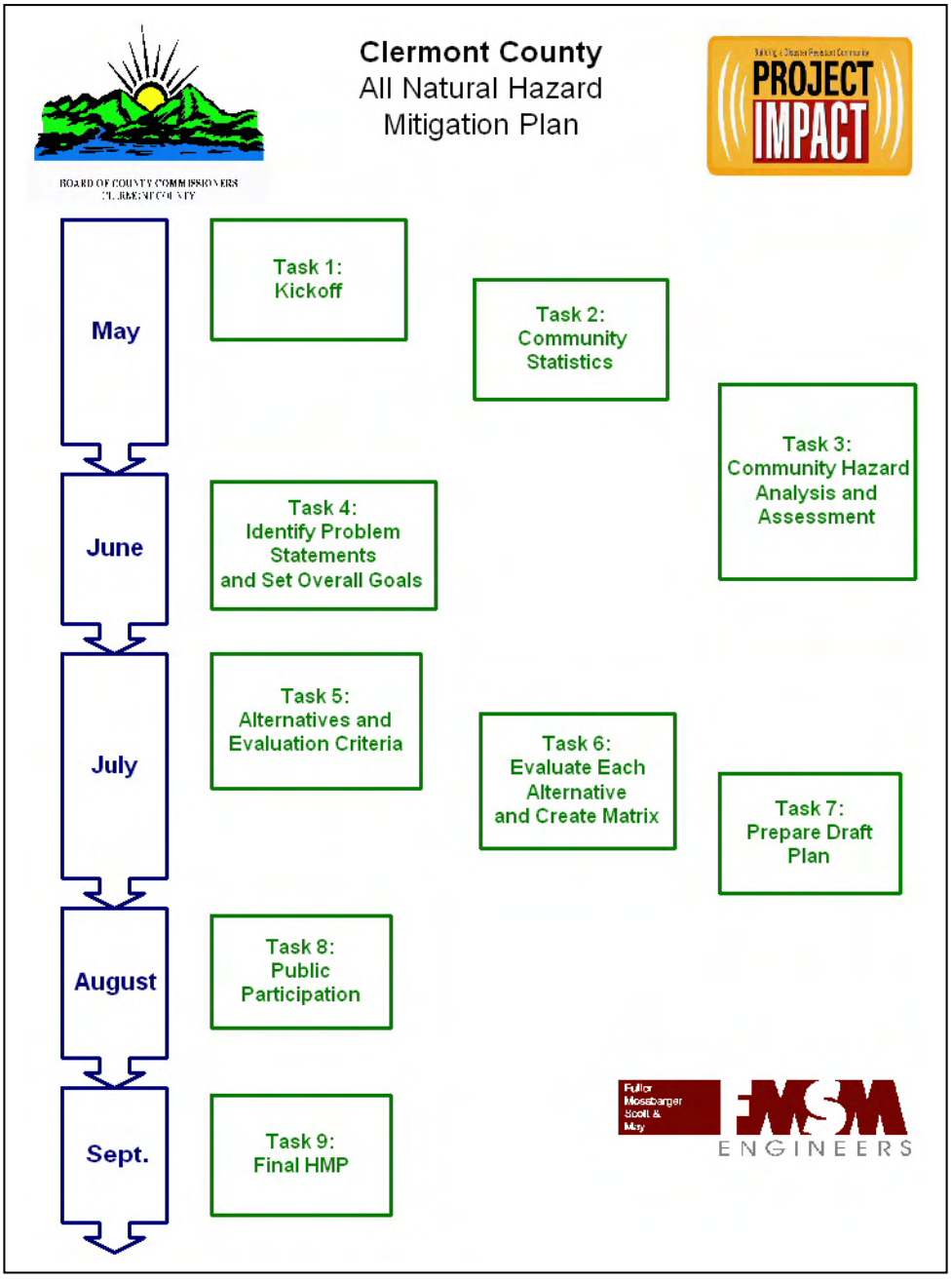
2.6. Community Planning and Development

Clermont County's Comprehensive Plan was written in 1978 and recently updated and supplemented with the Vision 32 Plan as an appendix. The Vision 32 Plan was written in response to the County's recent rapid growth along the State Route 32 corridor. The planning effort sought to balance the preservation of the unique character of Clermont County and its rural heritage while allowing opportunities for new jobs and industry, commercial, public facility, and residential development.

3.0. All Natural Hazards Mitigation Planning Process

Clermont County is very serious about hazard planning. Their Emergency Operations Plan is a good example of the County's commitment to provide mitigation, preparedness, response, and recovery actions that assure public welfare. Above all, Clermont County strives to protect the lives and property of its citizens. The **All Natural Hazards Mitigation Planning Process** is another important way for Clermont County to protect its residents.

Mitigation Planning Process Schedule



This **All Natural Hazards Mitigation Plan** utilizes the planning process recommended by FEMA and ODNR. FEMA's Community Rating System (CRS) Program Manual suggests that the following outline be utilized in preparing an **All Natural Hazards Mitigation Plan**:

A. Organize to prepare the plan,
B. Involve the public,
C. Coordinate with other agencies,
D. Assess the hazard(s),
E. Assess the problem(s),
F. Set goals,
G. Review possible activities,
H. Draft an action plan,
I. Adopt the plan, and
J. Implement, evaluate and revise the plan.

Clermont County Administration Building

As stated above, the approach undertaken in the creation of the **All Natural Hazards Mitigation Plan** for Clermont County can be described as both comprehensive and collaborative. The comprehensive approach includes following the interim final rule guidelines enacted under the Disaster Mitigation Act of 2000 and the Federal Emergency Management Agency (FEMA) suggested guidelines for the creation of an **All Natural Hazards Mitigation Plan**. Any additional items that Clermont County chose to address as part of the comprehensive analysis of their community were addressed as well. The Ohio Emergency Management Agency and the Ohio Department of Natural Resources were consulted during the preparation of this plan. All attempts were made to meet the suggested guidelines of the Ohio Natural Hazard Mitigation Planning Guidebook.

The collaborative portion of creating the Plan included working with the different agencies within Clermont County. The County could not have a comprehensive plan without the coordination and cooperation with several agencies in Clermont County. Information was collected from agencies such as the Clermont County Emergency Management Agency, Clermont County Water & Sewer, Clermont County Engineer's Office, Office of Environmental Quality, Clermont County Building Officials, Clermont County Planning Commission and other agencies that are involved in planning efforts for Clermont County.

3.1. Core Group

The process to create an **All Natural Hazards Mitigation Plan** started with the formation of a "Core Group" of decision makers and implementers. This group was created at the beginning of the process to lead the planning efforts. The Core Group was made up of County, Township, Village, and City elected official and administrators, special interest groups, and concerned citizens. A list of Core Group members that attended at least one meeting can be seen below. Obtaining support from the whole community required a comprehensive approach to preparing the Mitigation Plan. Identifying those persons, community leaders, and government agencies with the knowledge and authority to help a community organize a plan was key to the planning effort. A core group of leaders was necessary in order to give this task validity. Communities not able to attend Core Group meetings were involved in the process by completing surveys.

Jurisdiction/ Agency	Name	Title
Clermont County	Paul Braasch	OEQ
Clermont County	Debbie Britton	Administrative Support Technician
Jackson Township	William Christie	FD Lt.
Pierce Township	Dave Coyle	Twp Administrator
Village of New Richmond	Terry Durrette	Mayor
Village of Moscow	Dan Freeman	Village Administrator
Goshen Township	Sandy Graham	Clerk
Village of Batavia	Robert Handra	Mayor
Village of Batavia	Larry Evans	Trustee
Village of Batavia	Kathy Turner	Trustee
Ohio Township	Rick Hinson	Trustee
Milford, City of	Sarah Imhulse	Assistant to the City Manager
FMSM Engineers	Jim Latchaw	Project Manager
Fischer Homes	John Lateulere	Resident
Village of Neville	Betty Lucas	Mayor
FMSM Engineers	Kari Ann Mackenbach	Environmental Planner
Miami Township	Mary Makley Wolff	Trustee
Village of Owensville	John Mathews	Mayor
Clermont County	Beth Nevel	Director of DPSS
Clermont County	Curt Paddock	Planning
Clermont County	Bobbi Padgett	OPI
Loveland Symmes Fire	Captain Steve Pegran	Fire Department
Clermont County	Kelly Perry	GIS
Village of Newtonsville	Don Pringle	Mayor
Village of Felicity	Jim Shafer	Public Works
Village of Amelia	Kerry Schultze	Zoning
FMSM Engineers	Scott Peyton	Project Engineer
Village of Bethel	Sgt. Mark Planck	Police Department
Clermont County	Ray Sebastian	Building
Village of Chilo	Shana Stevenson	Mayor
Village of Williamsburg	Lynn Tetley	Village Administrator
Clermont County	Joe Uecker	Engineer
Clermont County	Tom Yeager	Water & Sewer

3.2. Public Notification Process and Involvement

It was important to Clermont County to have active public participation in the mitigation planning process and mitigation efforts. The formal public notification process as defined in the Federal Code took place prior to approval and/or adoption of the plan. The public was notified that the process to produce the **All Natural Hazard Mitigation Plan** was underway and that they would have an opportunity to review the draft for a thirty-day period prior to submittal to the Ohio Emergency Management Agency and the Federal Emergency Management Agency. The Clermont County Office of Public Information issued a press release during the week of April 18th, 2003. The press release can be seen below and at the following website:

http://www.co.clermont.oh.us/default.php?section=news&topic=default&article=nr0403ema&prior=no

Press Release

April 22, 2003

Making Clermont County Disaster Resistant

Batavia, Ohio. The Clermont County Emergency Management Agency invites Clermont County citizens to take part in a core group putting together a hazard mitigation plan designed to make this area disaster resistant. A meeting has been scheduled for Thursday, May 1, 2003, at 4:30 p.m., in the Clermont County Engineer's conference room, 2381 Clermont Center Drive in Batavia.

The Federal Disaster Mitigation Act of 2000 requires that local communities to develop All Natural Hazard Mitigation Plans (HMP) with specific goals for mitigating natural disasters such as flooding, tornadoes, or earthquakes. The Clermont County EMA has received a federal grant from the Federal Emergency Management Agency to prepare such a plan for the entire county. All local governments in Clermont County must have a federally approved HMP to qualify for future pre or post disaster mitigation funding.

The agenda for the May 1 meeting will include an overview of the All Hazard Mitigation Planning process and a discussion of a prioritized list of potential hazards.

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For additional information, contact the Clermont County Office of Public Safety Services at (513) 732-7661.

Beth Nevel, the Director of Public Safety Services gave an interview to 700 WLW radio that was aired on April 30th and May 1st, 2003. Notification letters were also sent to adjacent communities. (Please see Appendix 5 - Notification to Adjacent Communities.)

3.3. Meetings

There were four Core Group meetings during the planning process.

Determination of Hazards – Meeting 1

The kick-off meeting outlined the process for creating the All Hazards Mitigation Plan for Clermont County. Overall goals of the Plan were discussed and the initial hazard assessment was presented. The core group ranked six natural hazards based on information in the initial hazard assessment. The hazards ranking list from highest concern to lowest concern was **severe storms**, **flooding**, **tornadoes**, **landslides**, **droughts** and **earthquakes**. By the end of the first meeting, Core Group members had exchanged contact information, organized and scheduled the remaining additional meetings, discussed the general plan process, and reviewed the timeline of the project.

Determination of Problem Statements and Overall Goals – Meeting 2

The second meeting focused on the development of problem statements and setting overall goals for the hazards selected at the first meeting. Each Core Group member received documents (via e-mail, mail, or fax) to prepare for discussion during the second meeting. Along with the development of problem statements, the core group agreed on overall goals for each hazard. The goals were general guidelines that explain what the community wanted to achieve in the future.

Below are the **problem statements** that were created for each of the natural hazards as well as a list of some non-natural hazards that concerned the Core group in Clermont County.

Severe Storms
The Core Group has prioritized this hazard as their highest rated concern. Severe storms occur throughout the year in Clermont County, and historically have had a drastic impact on the community.
There is a lack of citizen awareness and outreach through public service announcements (PSA's) and other education in Clermont County as they relate to severe storms.
Clermont County residents are accustomed to dealing with severe storms, which creates some apathy as it relates to the seriousness of an event.
There are frequent power outages in above ground utilities and from the spurred system (versus a grid system) that exists in Clermont County.
There is a lack of design regulations to account for catastrophic storms (i.e. 500-year storm).
Much of the existing infrastructure in Clermont County is undersized. (Most culverts are designed for the 25-year storm.)
There are numerous ditch maintenance issues including residents not maintaining ditches and residents piping ditches.
There is inadequate supply inventory and preparation to deal with some storm events (i.e. salt).
Emergency response resources are strained when a severe storm event occurs in Clermont County, which causes problems in response time and communications between emergency response entities.
There is a lack of communication between communities and operations planning for severe storm recovery.
There is often confusion about the severity of the storms, so there is a need to develop several condition levels for severe storm events.
There is a lack of evaluation of salt alternatives.
There is a lack of lightning detection equipment in Clermont County.
Overall Goal: *To save lives, reduce potential damage, and to increase awareness of the hazards of severe storms.*

Flooding (Including 100-year flood zone, non-flood zone, and flash flooding)
The Core Group decided to prioritize the natural hazard of flooding as their second highest rated concern. Flooding occurs throughout the year in Clermont County and has had drastic affects on several communities in the county.
Flash Flooding
There is generally a lack of awareness and educational campaigns as it relates to non-flood zone, 100-year flood zone, and flash flooding in the County, and there are currently no initiatives to educate residents of these occurrences.
There is an inadequate storm sewer system in some parts of Clermont County.
There is little or no effort to make the general public aware of high hazard areas through an educational program.
Youth play in high flood hazard areas. There needs to be further education focused on youth and the general public about the potential for danger.
There is a lack of high water signage in areas that often are affected by flooding.
Basement flooding is a problem throughout the County during flooding and storm events.
Residents often drive through standing floodwaters.
Debris cleaning after a flood event continues to be a problem throughout the county.
Storm water is often rerouted by street resurfacing which impedes the storm sewer and drainage ditches.
Illegal filling of storm water ditches and channelization occurs throughout the County.
Non-flood Zone Flooding
There is increased development throughout the county leading to increased amounts of runoff and limited NFIP maps in those areas.
There is a need to update NFIP maps throughout the County.
Flooding repeatedly damages existing structures in 100-year floodplain.
There are some dam operation issues on the East Fork due to limited communication with the Corps leading to erosion and siltation (flooding may also be exacerbated by reservoir releases). *(see picture below)*
100-year Flood Zone Flooding
Clermont County lacks a countywide, inter-operable flood warning system.
Some critical facilities are located in the 100-year floodplain, which, in the event of a flood, may not be able to function in their needed capacity (i.e. well fields and waste water plants).
Solid waste is stored in the floodplain, which can lead to contamination.
Overall Goal: *To save lives, reduce flood damage to property, and to increase education (awareness) in the community.*

East Fork Lake Spillway

Tornadoes
The Core Group has prioritized the natural hazard of tornadoes as their third highest concern. Tornadoes occur sporadically throughout the County, which has limited capacity to handle the damages caused by this hazard.
There is a lack of an all inclusive and inter-operable warning system throughout Clermont County.
There is a lack of public education and outreach to the general public concerning tornadoes and the use of weather radios.
There is a lack of designated tornado shelters in Clermont County.
The Ohio Department of Health does not require tornado shelters or permanent structures near mobile home communities.
Overall Goal: *To save lives, reduce potential damage, and to increase awareness of the hazards of tornadoes.*

Landslides
The Core Group has prioritized the natural hazard of landslides as their fourth highest concern. Landslides happen often in Clermont County and are exacerbated by other natural hazards, such as flash floods and severe storms.
Roadways and other infrastructure are in high hazard areas incurring high cost and disrupting traffic (some are repetitive loss items). Infrastructure is often fixed with a short-term solution because of time and cost; this practice can lead to repeated landslide events in some locations.
Removal of vegetation and cutting hillsides for homes, businesses, and roads is leading to erosion that exacerbates landslide problems.
There are few educational awareness activities showing how landslides are particularly associated with other hazards. (i.e. flood events can trigger a landslide)
There is a lack of building buffer zones and countywide regulations for developing and building in high hazard areas.
Regulations for building roadways and other infrastructure in landslide areas are not always followed by federal and state agencies.
There is a lack of care taken in development techniques in landslide areas.
Overall Goal: *To save lives, increase education on appropriate building, and to develop adequate controls regulating communities and private landowners from building in high hazard areas.*

Droughts
The Core Group has decided to prioritize the natural hazard of droughts and wildfires as their fifth highest concern. Droughts can happen in Clermont County, and the potential for crop damage and property damage from fires can be high.
No public education programs on droughts or wildfires exist in Clermont County.
Urban/residential and natural areas interface in many areas of Clermont County increasing the potential for wildfires to cause property damage.
Site layout of neighborhoods and homes is poor; a fire/buffer zone should surround the home.
Dry hydrant systems may be inadequate to deal with wildfires.
Sensitive population outreach should be focused on during extreme hot and cold periods in Clermont County.
Droughts can lead to infrastructure (pipes) and basement damage.
Overall Goal: *To save lives, increase awareness of how droughts can increase the risk of wild fires, and to be better prepared to deal with this hazard event.*

Earthquakes
The Core Group has decided to prioritize the natural hazard of earthquakes as their sixth highest concern. Earthquakes rarely happen in Clermont County, but the potential for damages from earthquakes in great.
There are little or no public awareness campaigns occurring in the County as they relate to the seriousness of earthquakes and how an earthquake could affect the community as a whole.
Overall Goal: *To save lives, reduce potential damage, and to increase awareness.*

Other Non-Natural Hazards
The Core Group wishes to discuss the following non-natural hazards in the mitigation plan:
Riots
Fire / Arson
West Nile Virus
SARS
Hazardous materials spills
Nuclear waste spills
Hazardous waste landfill

Determination of Alternatives and Evaluation Criteria – Meeting 3 and 4

These two meetings were focused on drafting possible mitigation alternatives for each problem discussed during the second meeting. One of the alternatives considered for all of the hazards is the "No Action" option. The core group identified alternatives by considering several strategies and measures to implement that particular alternative.

Below are the **mitigation alternatives** that were developed by the Core Group.

Severe Storms
No Action.
Coordinate countywide PSA's that deliver the same message on the public access channel to heighten awareness on severe storms. Possibly direct message to school age children.
Expand weather radio distribution program and focus an outreach program on school age children.
Change the system from a spurred to a grid system or bury existing utilities. Streamline service from CG&E and Cinergy by establishing countywide service level agreements.
Modify existing regulations to convey larger flood events. (Refer to design regulations problem statement)
Modify existing regulations to convey larger flood events. (Refer to undersized infrastructure problem statement)
Use educational outreach (PSA's) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create a "hotspot" database.
Develop a memorandum of understanding (MOU) between jurisdictions to share resources and for cities, villages, and townships to stockpile salt for their use during severe storms. Make available resource lists for all communities. Evaluate storms of record and plan for them accordingly.
Update the storm mode policy and operating conditions. Examine the need for an additional flooding emergency line to determine emergencies and to gather information.
Develop an MOU between communities to plan for severe storm recovery.
Endorse the existing Alert/Notification Levels (1-3), including Level 1-Potential Emergency Condition, 2-Limited Emergency Condition, and 3-Full Emergency Condition. Expand the existing three level operating conditions to a five level "all hazard" alert notification system.
Although some alternatives may be cost prohibitive, they should be evaluated in greater detail.
Seek funding to develop countywide lightning detection system in Clermont County parks.

Flooding (Including 100-year flood zone, non-flood zone, and flash flooding)
Flash Flooding
Widen distribution of video for school age children and develop one for adults. (Refer to educational campaign problem statement)
Establish storm water master plan and storm water utility.
Widen distribution of video for school age children and develop one for adults. (Refer to general public awareness problem statement)
Widen distribution of video for school age children and develop one for adults. Seek funding to build water facilities in parks (include water safety). (Refer to youth in high hazard area problem statement)
Evaluate locations for signage at repeated high water locations.
Use education and outreach to alleviate some flooding problems. Expand existing sump pump program.
Issue tickets and fines for vehicles in flood hazard areas. Expand depth of water gauge program. Increase Education.
Evaluate and expand the countywide debris management and post disaster clean up plan.
Resurfacing projects may need to pass through storm water review before approval.
Use educational outreach (PSA's) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create a "hotspot" database.
Non-flood Zone Flooding
Seek funding for NFIP map updates. Update regulations as they relate to runoff amounts. (Refer to development problem statement)
Seek funding for NFIP map updates. (Refer to NFIP map update problem statement)
Target repetitive loss structures for buyouts and other mitigation alternatives.
Develop an MOU with the Corps of Engineers.
100-year Flood Zone Flooding
Seek funding to install a countywide, inter-operable flood warning system; evaluate the types of systems and the needs of Clermont County.
Create maps of critical facilities in the floodplain. Evaluate the need to relocate the structures.
Evaluate the need for establishing new floodplain regulations to address this issue.

Tornadoes
Seek funding for a countywide inter-operable warning system.
Create innovative PSA's on the use of weather radios and seek funding to place weather radios in all critical facilities.
Develop PSA's to reaffirm existing tornado shelter locations. Seek funding to install multiuse shelters in parks. Work with mobile home parks to install tornado shelters.
Evaluate the potential for the State Board of Health to change the requirements for shelters within mobile home parks.

Landslides
Roadways and other infrastructure are in high hazard areas incurring high cost and disrupting traffic (some are repetitive loss items). Infrastructure is often fixed with a short-term solution because of time and cost; this practice can lead to repeated landslide events in some locations.
Seek long term and innovative long-term solutions to landslide problems.
Work with the Planning Department to develop standards and regulations for development in landslide prone areas.
Develop innovative PSA's targeted at school age children and those affected by landslides. Develop a flyer for people who wish to build in landslide prone areas.
Work with the Planning Commission to create a landslide potential overlay zone.
Work with the Engineer's office to create an MOU with other agencies.
Work with the Planning Department to develop standards and regulations for development in landslide prone areas.

Droughts
Coordinate with the Fire Service Alliance for outreach concerning droughts and wildfires.
Develop a map showing the urban and natural area interface.
Work with the Planning Commission to create a buffer zone regulation to prevent the spread of wildfires.
Seek funding to identify locations for dry hydrants and to install dry hydrants. Develop a PSA to define the use of dry hydrants (work with SWCD).
Develop a critical facilities map.
Develop a PSA concerning watering foundations.

Earthquakes
Develop a PSA concerning the effects of earthquakes in Clermont County; target school age children.

In addition to identifying mitigation alternatives, the Core Group also chose **evaluation criteria** to be used when assessing each item. The evaluation criteria are listed below.

Evaluation Criteria
Cost Effective
Technically Feasible
Environmentally Sound
Socially Equitable
Meets Local Regulations
Activities reduce risk
Socially Acceptable
Funding Available

3.4. Matrix Development

Once the alternatives were created for each hazard, the Core Group established evaluation criteria, shown above, to rank each of the alternatives. The evaluation criteria and the alternatives developed by the Core Group were then placed in a matrix designed to aid in rating the alternatives. Utilizing a matrix allowed the community to systematically review all alternatives, identifying which mitigation method(s) are appropriate based on the specified criteria. The combined results of all the Core Group members were tabulated and the matrix comparison was complete. Each of the activities was given an averaged number based on all the Core Group scores. This will help Clermont County focus their mitigation strategies on the highest rating activities. Completed matrices can be seen in Section 4.

3.5. Public Review

After the draft plan is completed, the Core Group, and the public, will be provided with an official 30-day public review period following a public meeting.

Public input is necessary in order to gage the opinion of the community and build support for the Plan. Draft copies of the Plan will be made available at the public meeting, along with a set agenda to keep the discussion on course. There will be several large-scale maps available for public review of the potential hazards in their community. Public comment will be documented and incorporated into an added section within the **All Natural Hazards Mitigation Plan**.

3.6. Final Plan Adoption

Once all comments have been reviewed and added to the draft Plan, the preparation of the final Plan will begin. Implementation of the plan is crucial. The Core Group must strategize effectively to put the plan into action. Clermont County must follow through to translate the goals and objectives developed during the planning process into action steps. It is recommended that a monitoring program be included in the Plan. For each hazard several mitigation alternatives were developed. Several local officials voted on which alternative they felt was best. The top three alternatives were selected for each hazard except for flooding (6) and earthquakes (1).

4.0. State of Natural Disasters and Hazard Assessment for Clermont County

4.1. Initial Hazard Determination for Clermont County

In order to properly evaluate the natural hazards that affect Clermont County, a three-step process was utilized. This three step process was completed in order to “narrow-down” the hazards that the Clermont County should prepare for, and potentially mitigate, in the future.

Step 1 - FMSM Engineers researched FEMA‘s database to determine which hazards FEMA had documented as possible natural hazards, including future threats, for the State of Ohio. Several hazards that are listed on FEMA’s website include flooding, severe storms, tornadoes and winter storms.

Step 2 - FMSM Engineers contacted the National Climatic Data Center (NCDC), that allows reviews of historic hazard information down to the County level. The NCDC website presents each hazard and the historic information associated with it for each County, offering several hazard search results including: droughts, dust storm, flooding, fog, hail, hurricanes, lightning, tornadoes, wild/forest fires, ocean/lake surf, precipitation, snow and ice, temperature extremes, thunderstorms and high winds. Of those results, dust storms, severe fog, hurricanes, wild/forest fires, ocean/lake surf and severe precipitation have either never been documented in Clermont County, or have not occurred since 1950. This left droughts, flooding, hail, lightning, tornadoes, snow and ice, temperature extremes, thunderstorms and high winds to further assess. Note that earthquakes are not part of the NCDC database. The information pertaining to earthquake susceptibility was attained from United States Geological Survey (USGS), the Ohio Department of Natural Resources (ODNR), and the Ohio Emergency Management Agency (OEMA).

Initial Hazard Assessment	No. of Events	Cost in Millions
Floods (1950-2003)	**60**	**24.425**
Flash Floods	21	3.012
100-Year / Non Floodzone Floods	39	21.413
Tornadoes (1950-2003)	12	5.66
Severe Storms (1950-2003)	**177**	**22.457**
Winter Storms	17	16.041
T-Storms / High Winds / Lightning	122	3.378
Ice	5	0.4
Hail	33	2.638
Landslides (ODOT District 8)	15 per year	
Earthquakes (1804, 1859, and 1864)	3 epicenters	
Droughts, Excessive Heat, and Extreme Cold (1950-2003)	6	1.402

Step 3 - In addition to the NCDC data, FMSM reviewed the Ohio Hazard Analysis and Risk Assessment, a document created in 1998 by OEMA for local and state emergency preparedness officials. The Ohio Hazard Analysis and Risk Assessment looks at both natural and non-natural (technological) hazards.

The data obtained from the above sources were provided to the Core Group for their review and initial assessment. The Core Group made the decision to explore six hazards, based on all the above information. The Core Group rated severe storms as their highest rated concern, flooding second, tornadoes third, landslides fourth, droughts fifth, and earthquakes sixth.

4.2. Severe Weather History in Clermont County

Clermont County, like most communities in Ohio, is susceptible to severe weather. Clermont County's history of severe weather is quite lengthy. The severe weather category is a "catch all" for hazards that do not meet other specific criteria, but may be associated with tornado and flood hazards. Severe thunderstorms, winter storms, high wind, ice storms, hail, and lightning are all examples of hazards included in the severe weather category.

Thunderstorms and winter storms both fit into the severe weather category. One of the biggest problems associated with severe weather is lack of public education and

awareness. Severe storms can cause damage and are often the precursor for much more severe hazards that may follow. One example is that tornadoes are sometimes directly linked with thunderstorms. Please refer to Appendix 1 for an accounting of severe weather events that have affected Clermont County.

Severe Thunderstorms

A severe thunderstorm **watch** is issued by the National Weather Service when the weather conditions are such that damaging winds of 58 mph or more, or hail three-fourths of an inch in diameter or greater, is likely to develop. Citizens should locate to a safe place in the home and tell family members to watch the sky and listen to the radio or television for more information. A severe thunderstorm **warning** is issued when a severe thunderstorm has been sighted or indicated by weather radar. At this point, danger is imminent; citizens should move to a safe place, turn on a battery-operated radio or television, and wait for the "all clear" by the authorities.

Tornadoes and flash flooding are sometimes spawned by thunderstorms. When a "severe thunderstorm warning" is issued, citizens should take the same actions as if it were a "tornado warning" or a "flash flood warning." When thunderstorms bring heavy rains (which can cause flash flooding), strong winds, hail, lightning, and tornadoes, people should get inside a sturdy building and listen to a battery-operated radio for weather information.

Lightning is also a major threat during thunderstorms. In the United States, 75 to 100 Americans are hit and killed each year by lightning. The myth that lightning never strikes twice in the same place needs to be replaced by the fact that lightning can strike several times in the same place in the course of just one discharge.

Winter Storms

Winter storms are common to Clermont County, however blizzards are not as common. Ohio has had only a handful of blizzards over the past 100 years. For the most part, these storms bring communities to a standstill due to heavy and blowing snow and extremely cold temperatures.

The main problems associated with winter storms are power outages, cold temperatures, and heavy snowfalls. Cold temperatures and snowfall pose problems for local motorists and rescue workers, mainly because automobiles will not run properly or end up in crashes. The leading cause of death during winter storms is associated with motor vehicle crashes. Preparing vehicles for the winter season, and knowing how to react if stranded or lost on the road are vital to safe winter driving. Fire crews have difficulties in winter storms because their equipment can freeze in the colder temperatures or the hydrants may be buried in snow. During a winter storm, individuals may end up stranded in their homes until road crews clear the roadways for safe travel. However, for those who have to venture out for work, food or emergency purposes, conditions can be treacherous.

Wind Chill

The lack of concern citizens may have for extremely cold temperatures during Ohio winters can also lead to deaths. Wind chill can dramatically affect the temperature outside, causing frostbite in a matter of minutes. Wind Chill is a calculation of how cold it feels outside when the effects of temperature and wind speed are combined. A strong wind combined with a temperature of just below freezing can have the same effect as a still air temperature 35^{o}F colder.

Winter Storm Watches and Warnings

A winter storm **watch** indicates that severe winter weather may affect your area. A winter storm **warning** indicates that severe winter weather conditions are definitely on the way. A **blizzard** warning signifies that large amounts of falling or blowing snow and sustained winds of at least 35 mph are expected for several hours.

Ice storms caused damage to Clermont County in 2003

Clermont County Severe Weather Mitigation Efforts

Currently, there are limited severe weather mitigation efforts underway; these efforts have had some effect on reducing the impact severe storms have on Clermont County, but there is a need for additional efforts. As part of the completion of the **All Natural Hazards Mitigation Plan**, the Core Group has chosen severe storms as the number one hazard concern because of the frequency of the events, and has chosen to address this hazard with specific action items. Please see the Matrix Results in the paragraphs to follow.

Current Development Trends

Since severe storms are a non-site specific hazard, current development trends have no affect other than the increased population that would be susceptible to severe storms in Clermont County.

Mitigation Strategy

Clermont County Department of Public Safety will lead mitigation efforts through a concentrated involvement to educate residents about the severe storms and other hazards in the County.

Hazard Assessment and Vulnerability Analyses

Because severe storms are random in nature, the Core Group has chosen to look at historic events to determine Clermont County's susceptibility to severe storms. According to the National Climatic Data Center (NCDC), there have been 177 severe storms in Clermont County reported since 1950, with total losses of around $22.5 million. (Please see Appendix 2.) The totals from the past three years give an idea of the costs of severe storms within Clermont County. In 1999, the cost associated with severe storms was $538,000. According to NCDC records for Clermont County, the amount of damage by severe storms decreased in 2000 from $256,000 to $87,000 in 2001. Though the number of events is increasing in Clermont County, the cost associated with the storms is not. This could be the direct result of mitigation efforts. By taking residents out of harms way, even the smallest difference can have a significant effect.

Due to the non-site specific nature of the hazard, the best way to deal with preparing for the future events is to consider historical occurrences. This information was obtained from the NCDC website and is shown in Appendix 2.

Matrix Results for Severe Storms

The matrix results, on the following page, show the rating for all the Core Group members for the severe storm hazard. The three highest rated activities for severe storm hazards are listed below.

Highest Rated Mitigation Alternatives for Severe Storms
Develop a memorandum of understanding between communities to plan for severe storm recovery.
Endorse the existing Alert/Notification Levels (1-3), including Level 1-Potential Emergency Condition, 2-Limited Emergency Condition, and 3-Full Emergency Condition. Expand the existing three level operating conditions to a five level "all hazard" alert notification system.
Use educational outreach (PSAs) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create "hotspot" database.

Matrix Results for Severe Storms

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Severe Storms									
No Action.	13	15	10	11	11	8	7	13	**88**
There is a lack of citizen awareness and outreach through public service announcements (PSAs) and other education in Clermont County. Coordinate countywide PSAs that deliver the same message on the public access channel to heighten awareness on severe storms.	26	28	23	28	27	27	29	15	**203**
Clermont County residents are accustomed to dealing with severe storms, which creates some apathy as it relates to the seriousness of an event. Expand weather radio distribution program and focus an outreach program on school age children.	18	26	25	27	27	26	25	14	**188**
Clermont County is plagued with frequent power outages in above ground utilities and from the spurred system. Change the system from a spurred system to a grid system or bury existing utilities. Streamline service fromCinergy/CG&E by establishing a countywide service level agreement.	15	24	26	27	26	27	26	13	**184**
There is a lack of design regulations to account for catastrophic storms (i.e. 500-year storm). Modify existing regulations to convey larger flood events.	19	24	27	26	19	24	21	14	**174**
Much of the existing infrastructure in Clermont County is undersized. Most culverts are designed for the 25-year storm. Modify existing regulations to convey larger flood events.	22	25	25	27	23	28	25	13	**188**
There are numerous ditch maintenance issues in Clermont County including residents not maintaining ditches and residents piping ditches. Use educational outreach (PSAs) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create "hotspot" database.	24	28	27	26	27	27	26	20	**205**
Communities do not have adequate preparation and supply inventories in place to deal with some severe storm events (i.e. salt). Develop a memorandum of understanding (MOU) between jurisdictions to share resources and for cities, villages and townships.	25	26	26	23	26	26	24	22	**198**
Emergency response resources are strained when a severe storm event occurs in Clermont County, causing problems in response time and communications between emergency response entities. Update the storm-mode policy and operating conditions.	24	26	24	27	25	25	25	19	**195**
Communication between communities and operations planning for severe storm recovery are both lacking in Clermont County. Develop a memorandum of understanding between communities to plan for severe storm recovery.	27	27	26	26	25	27	27	24	**209**
Confusion often exists about the severity of storms; there is a need to develop several condition levels for severe storm events. Endorse the existing operating conditions (1-3).	24	27	29	27	26	24	26	25	**208**
There is a lack of evaluation of salt alternatives. Alternatives should be evaluated in greater detail, even though some may be cost prohibitive.	18	24	23	25	20	22	24	19	**175**
Lightning detection equipment is lacking in Clermont County. Seek funding to develop a countywide lightning detection system in county parks.	20	21	25	24	22	20	23	9	**164**

4.3. History of Flooding in Clermont County

The history of flooding in Clermont County is extensive. The National Climatic Data Center (NCDC) has comprehensive information available back to 1993. Flooding is the number two disaster in terms frequency of events and the number one disaster in terms of dollars associated with each event.

There were 51 flood events documented between 1993 and 2002. (See Appendix 2 - Flooding History in Clermont County.) A detailed description of two significant recent events follows and the 100-year floodplain can be seen below. The summer of 2003 has been one of the wettest on record for many counties across the state. During the last year, Ohio has suffered four federally declared disasters. Currently, federal individual assistance for 20 federally declared counties for severe storm damage totals more than $32.7 million and counting. Small Business Administration low-interest loans to individuals and businesses totals more than $15.4 million.

Recent Significant River Flooding Events

January 1996 – The combination of snow cover, warm temperatures, and rainfall produced widespread tributary flooding in the Ohio River basin starting on the 17th. Most of the tributaries were back within their banks by the 21st, but points along the Ohio River were still in flood stage at that time. Some of the tributaries that experienced significant flooding were the Scioto, Great Miami, and Blanchard rivers, as well as Ohio Brush Creek.

Source-enquirer.com
Clermont County Sheriff's Deputy Jeff Sellars patrols New Richmond flooded streets in a boat (Michael Snyder photo)

March 1997 – Heavy rainfall occurred across Southern Ohio and Northern Kentucky on the 1st and 2nd of March, with areas along the Ohio River receiving up to 12 inches of rainfall. The river rose rapidly, reaching a crest of 59.8 feet in Portsmouth at 10:00 PM on the 4th, where the flood stage is 50.0 feet. About 30 miles east of Cincinnati at the Meldahl Dam, where the flood stage is 51.0 feet, the river crested at 61.3 feet at 7:00 PM on the 6th. In Cincinnati, the river crested at 64.7 feet at 11:00 PM on the 5th. Many towns were flooded from Portsmouth to Cincinnati and thousands of people were evacuated from their homes for several days.

Flash Flooding

Flash flooding in Clermont County is a nuisance compared to the Ohio River flooding. The Core Group's main concern about flash flooding is the lack of awareness the public has about the hazard. People driving in high water and children playing in hazard areas are examples of problems associated with flash flooding.

Infrastructure and Critical Facilities

There are currently several “grand fathered” critical facilities located within the 100-year floodplain. Below is a table showing the facilities, one nursing home, one sheriff station, and several ems and fire stations. For additional detail, please see image below for a Critical Facilities Map.

Critical Facilities in Floodplain

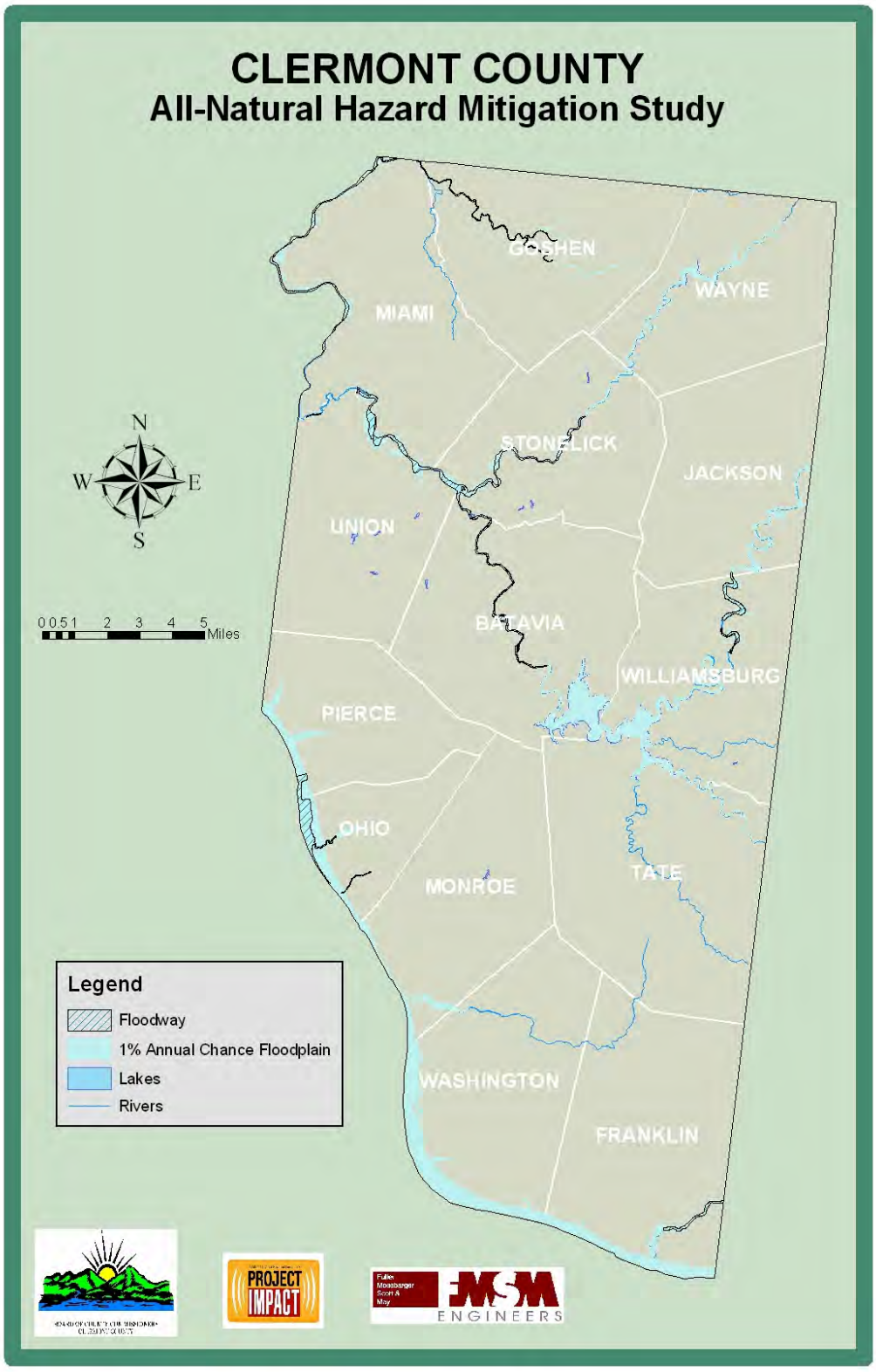
NAME	ADDRESS	CITY	STATE	ZIP	Property Value Estimate
Dobbins Nursing Home	400 Main St.	New Richmond	OH	45157	$ 273,870
New Richmond Police Station	102 Willow St.	New Richmond	OH	45157	$ 474,640
New Richmond Fire Dept.	104 Market St.	New Richmond	OH	45157	$ 158,330
Washington Twp. Fire Dept. 3	410 Market St.	Neville	OH	45156	$ 390,400
Clermont County Sheriff Moscow	79 Elizabeth St.	Moscow	OH	45153	$ 81,150
Wayne Twp. Fire & Rescue 2	6514 SR 133	Blanchester	OH	45107	$ 206,660
Washington Twp. EMS	410 Market St.	Neville	OH	45156	$ 390,400
New Richmond EMS	300 Hamilton St.	New Richmond	OH	45157	$ 116,680

Repetitive Loss Properties

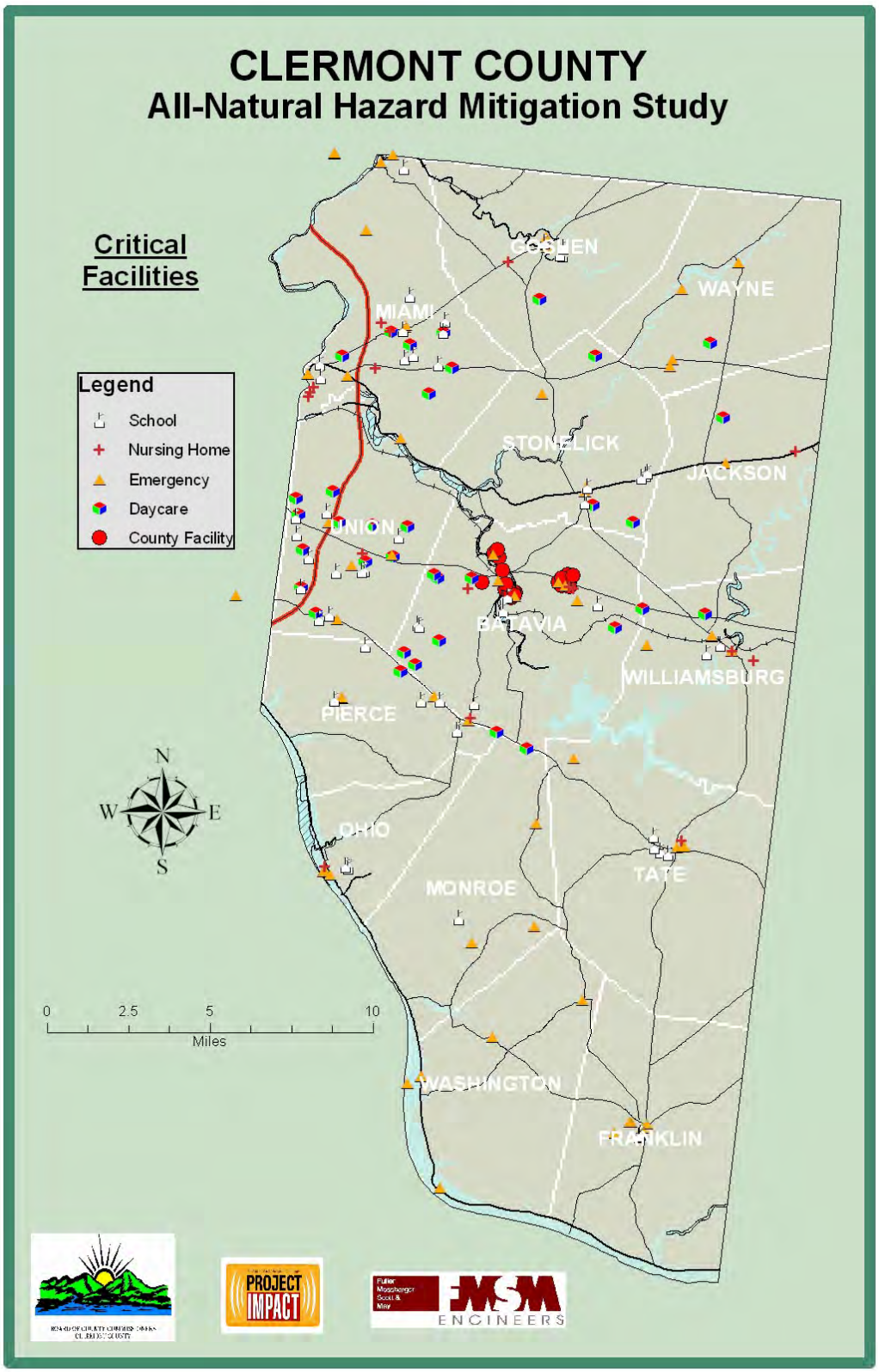
Clermont County has several repetitive loss properties located within its boundaries. Repetitive loss mitigation will be addressed using data from the 1997 HMGP. Clermont County submitted a request for a time extension of the HMGP as a result of the 1997 floods for 49 repetitive loss properties; at the time of the submittal six (6) properties were already being mitigated. Twenty-two (22) of the residents were removed from consideration by OEMA because they did not respond to OEMA by the July 31, 2001 deadline. Of the 27 remaining properties, OEMA accepted the time extension for 23 properties in Clermont County, including the 6 already being mitigated, and prioritized a number of structures. The four (4) properties excluded from the analysis would not have benefited from the time extension because their benefit cost ratio was below 0.95. OEMA performed a benefit-cost analysis on the 27 remaining properties that are shown at the top of the chart below. OEMA removed eight properties with ratios between 0.26 and 0.59. OEMA feels that the remaining 19 properties listed at the bottom of the table below should be given priority and mitigated first. Repetitive loss properties have been developed into mitigation actions and prioritized; the properties will be mitigated when funding is available. Please see the maps below for greater detail of several at risk and repetitive loss properties.

PRIORITY	LOCATION	BENEFITS	COSTS	RATIO	COST
12	Third Street				$ 6,000
20	Third Street				$ 4,804
23	Elizabeth				$ 6,004
12	Broadway				$ 87,000
30	Second Street				$ 46,705
21	Palestine	$ 81,168	$ 38,495	2.11	$ 38,495
22	Fourth Street	$ 40,043	$ 21,500	1.85	$ 21,500
13	Palestine	$ 86,625	$ 52,160	1.68	$ 52,160
6	Second Street	$ 66,280	$ 52,500	1.26	$ 52,500
4	Elizabeth	$ 52,124	$ 41,900	1.24	$ 41,900
20	US 52	$ 29,895	$ 24,500	1.22	$ 24,500
9	Water Street	$ 108,099	$ 123,364	0.88	$ 123,364
18	Fourth	$ 34,466	$ 44,000	0.78	$ 44,000
18	Broadway	$ 47,953	$ 69,500	0.69	$ 69,500
48	Clervill	$ 16,452	$ 24,500	0.67	$ 24,500
26	Second Street	$ 31,099	$ 47,400	0.66	$ 47,400
25	Third	$ 28,375	$ 44,400	0.64	$ 44,400
15	Second Street	$ 73,405	$ 116,500	0.63	$ 116,500
39	Washington	$ 17,921	$ 29,150	0.61	$ 29,150
36	Broadway	$ 33,784	$ 57,600	0.59	$ 57,600
26	Green	$ 23,676	$ 44,450	0.53	$ 44,405
29	Third	$ 23,540	$ 47,850	0.49	$ 47,850
36	Water Street	$ 41,776	$ 84,800	0.49	$ 84,800
33	Second	$ 28,626	$ 59,300	0.48	$ 59,300
30	Fourth	$ 28,480	$ 71,650	0.4	$ 71,650
37	Fourth	$ 20,359	$ 57,600	0.35	$ 57,600
34	Washington	$ 28,632	$ 108,200	0.26	$ 108,200
Totals		**$ 942,778**	**$ 1,261,319**	**0.69**	**$ 1,411,787**
	Broadway				$ 87,000
	Third Street				$ 6,000
	Third Street				$ 4,804
	Elizabeth				$ 6,004
	Second Street				$ 46,705
	Palestine	$ 81,168	$ 38,495	2.11	$ 38,495
	Fourth Street	$ 40,043	$ 21,500	1.86	$ 21,500
	Palestine	$ 86,625	$ 52,160	1.66	$ 52,160
	Second Street	$ 66,280	$ 52,500	1.26	$ 52,500
	Elizabeth	$ 52,124	$ 41,900	1.24	$ 41,900
	US 52	$ 29,895	$ 24,500	1.22	$ 24,500
	Water Street	$ 108,099	$ 123,364	0.88	$ 123,364
	Fourth	$ 34,466	$ 44,000	0.78	$ 44,000
	Broadway	$ 47,953	$ 69,500	0.69	$ 69,500
	Clervill	$ 16,452	$ 24,500	0.67	$ 24,500
	Second Street	$ 31,099	$ 47,400	0.66	$ 47,400
	Third	$ 28,375	$ 44,400	0.64	$ 44,400
	Second Street	$ 73,405	$ 116,500	0.63	$ 116,500
	Washington	$ 17,921	$ 29,150	0.61	$ 29,150
Totals		**$ 713,905**	**$ 729,869**	**0.78**	**$ 880,382**

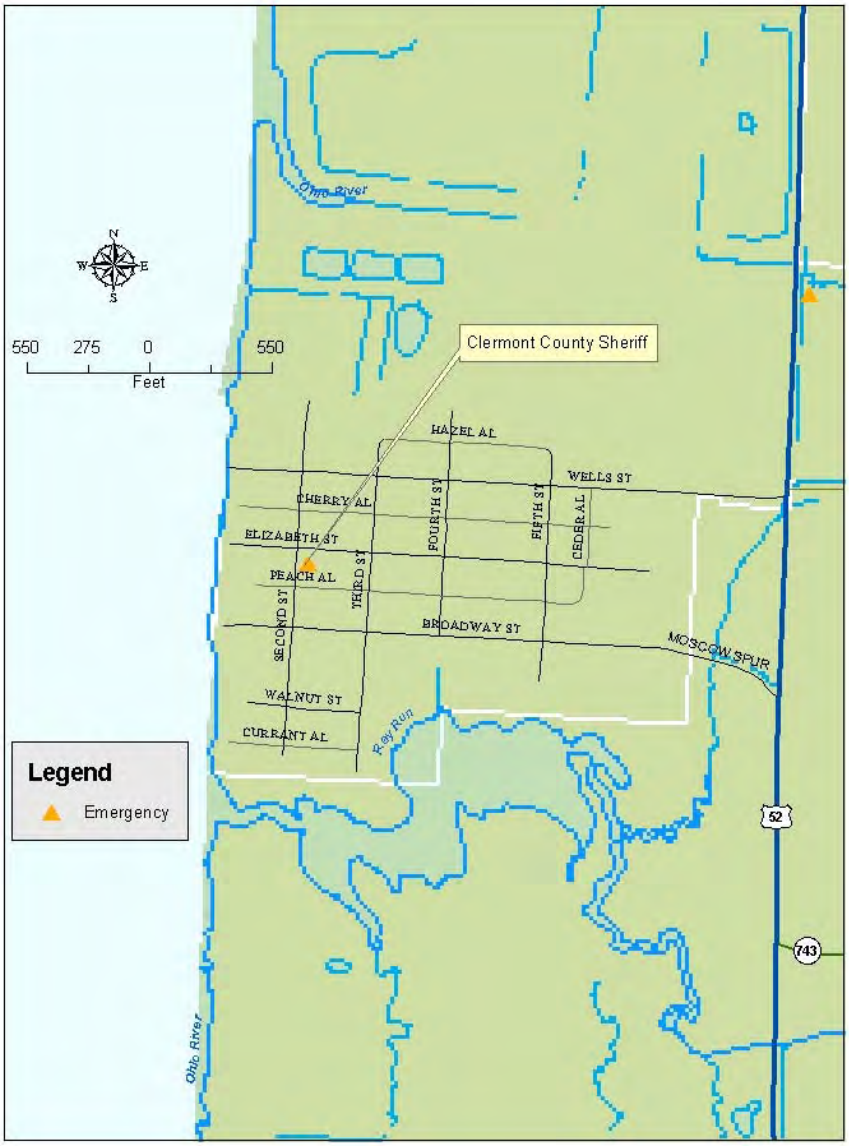
Clermont County 100-Year Floodplain and Floodway



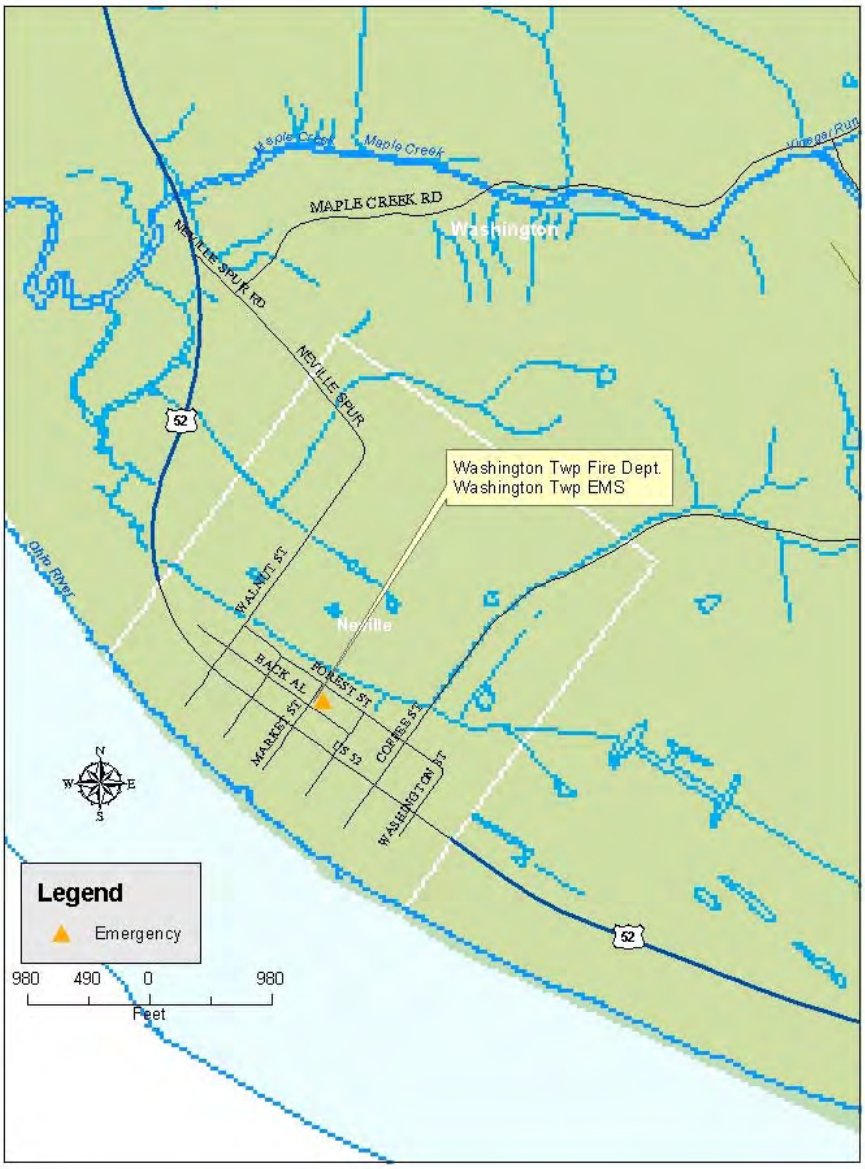
Clermont County Critical Facilities



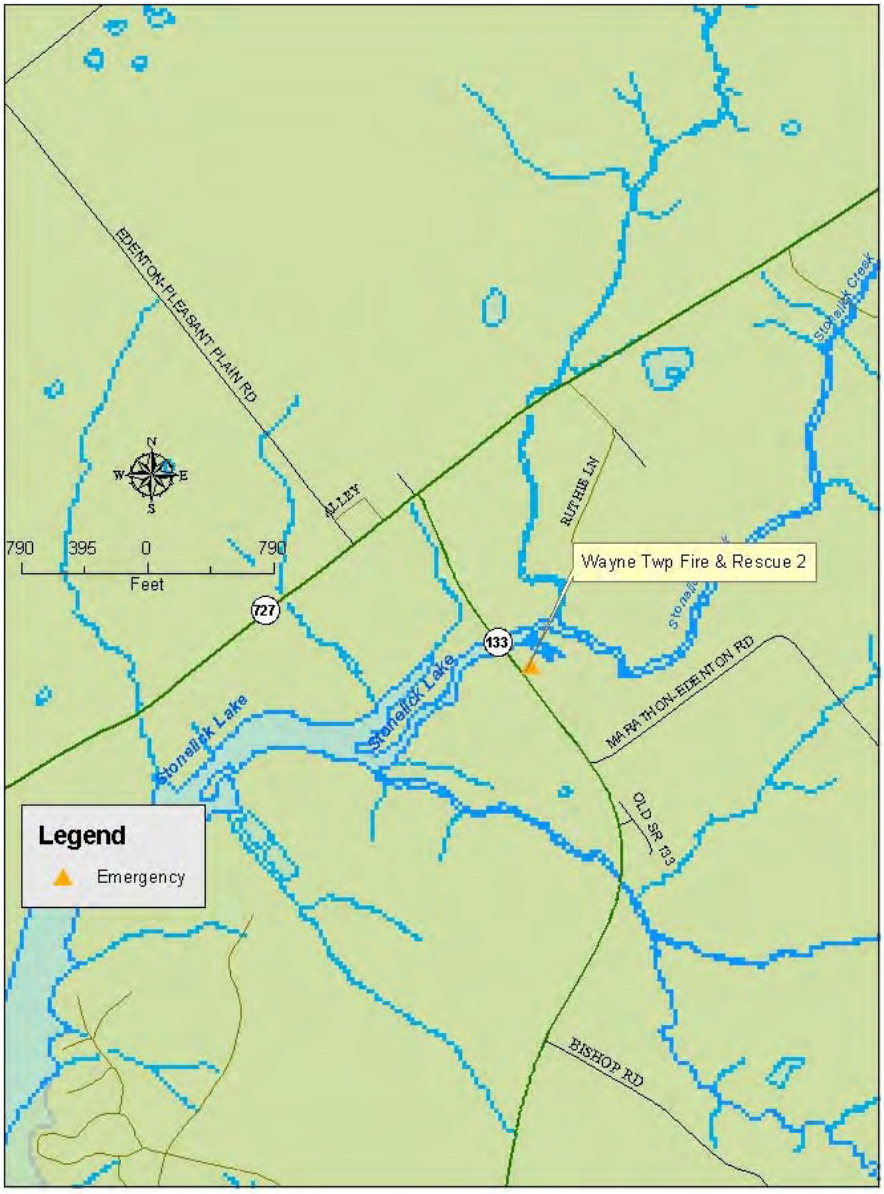
Village of Moscow County Sheriff



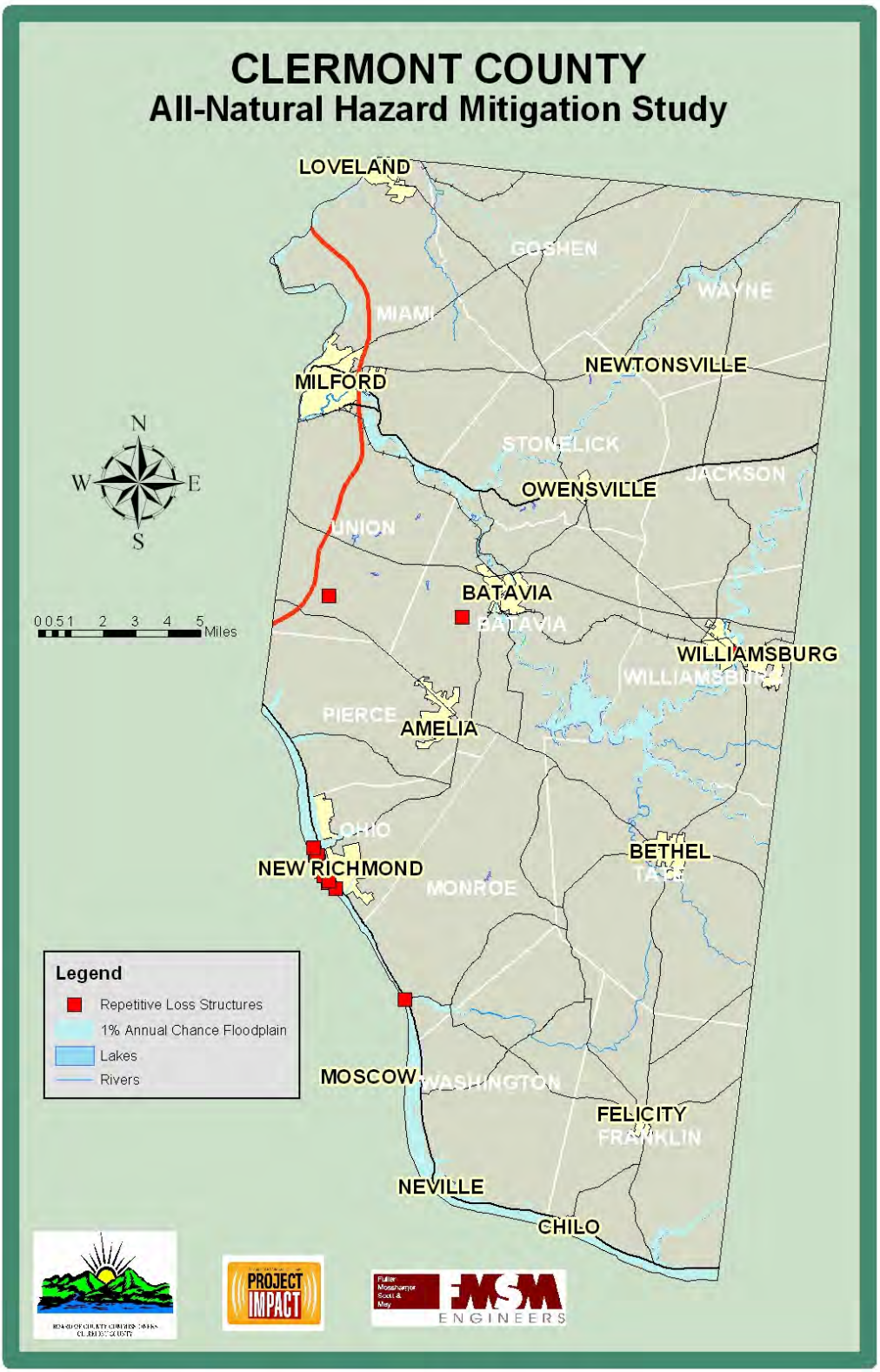
Washington Township Fire and EMS



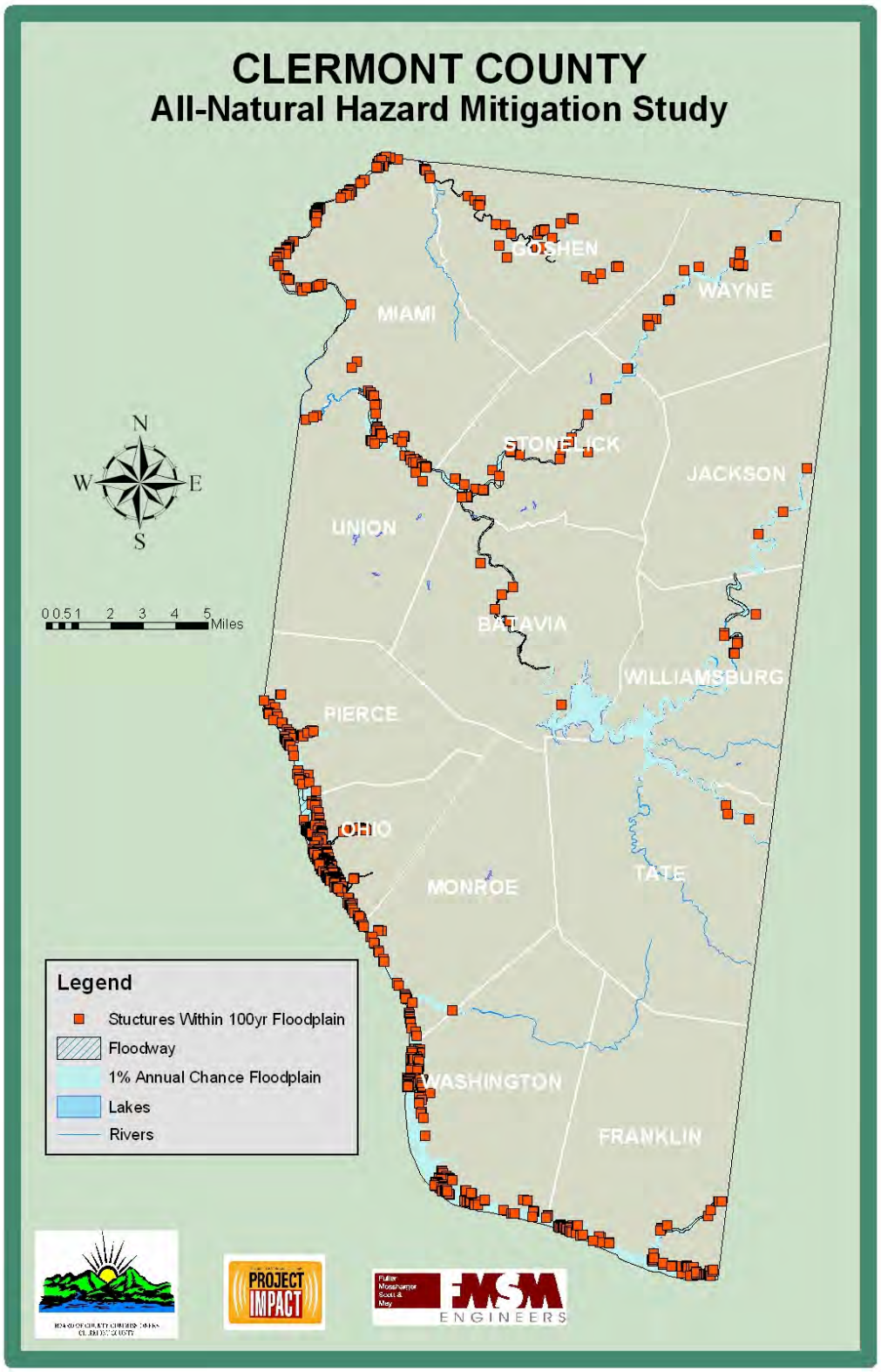
Wayne Township Fire and Rescue



Clermont County Repetitive Loss Structures



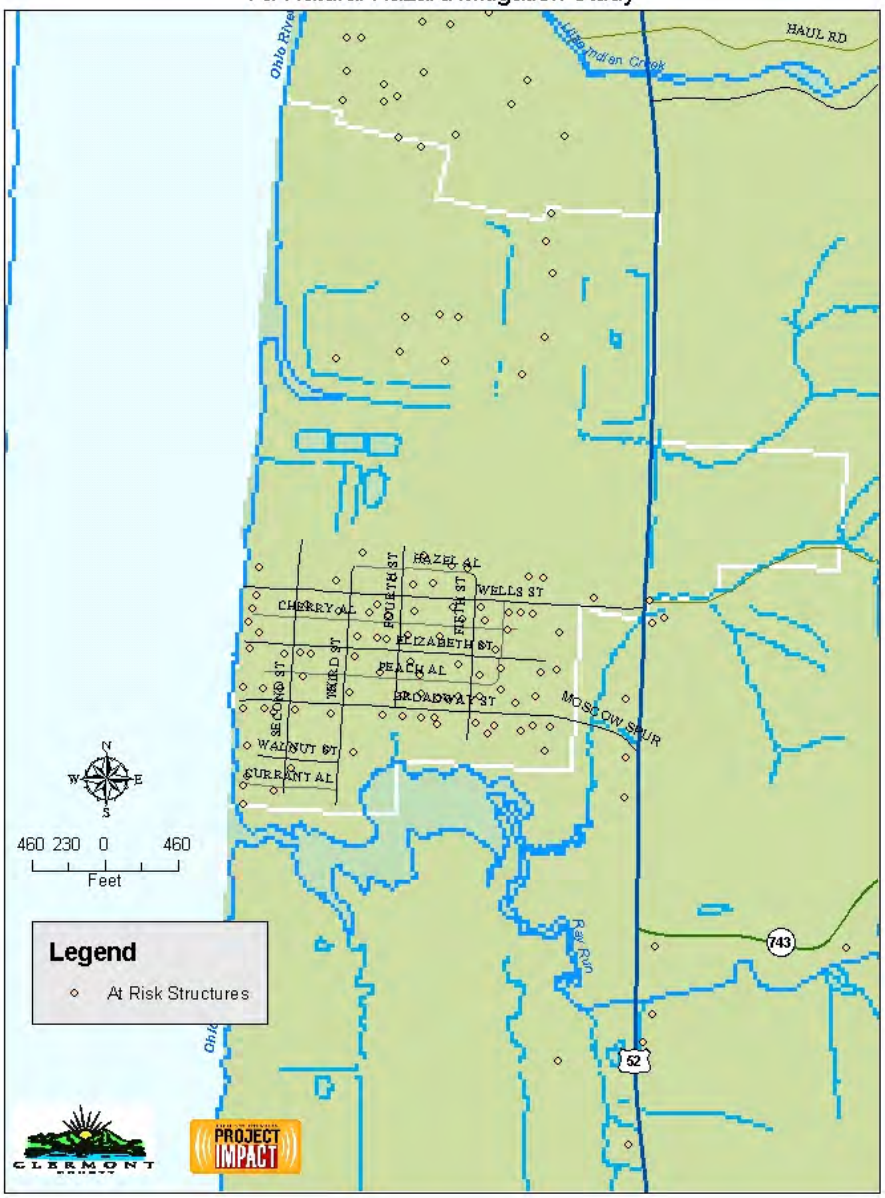
Clermont County Structures in the 100-Year Floodplain



Clermont County Structures in the 100-Year Floodplain
Village of Chilo
CLERMONT COUNTY
All-Natural Hazard Mitigation Study

Clermont County Structures in the 100-Year Floodplain
City of Loveland
CLERMONT COUNTY
All-Natural Hazard Mitigation Study

Clermont County Structures in the 100-Year Floodplain
Village of Moscow
CLERMONT COUNTY
All-Natural Hazard Mitigation Study



Clermont County Structures in the 100-Year Floodplain
Village of Neville
CLERMONT COUNTY
All-Natural Hazard Mitigation Study

Clermont County Flood Mitigation Efforts

The County received Hazard Mitigation Grant Program (HMGP) funding to mitigate several structures affected by the March of 1997 floods. The programs offered voluntary acquisition and elevation of structures based on flood levels. Following the completion of each individual acquisition, the structures were removed and the land preserved as green space.

Mitigated Structures

Mitigation Strategy

Clermont County's mitigation strategy involves working with the NFIP and continuing efforts towards reducing damages to structures in flood hazard areas. In addition to these efforts, Clermont County is actively involved with keeping their community informed of the true threat of flooding.

Current Development Trends

Clermont County is growing but not in areas of the floodplain. The County is seeing significant development throughout the County and in the State Route 32 corridor, but development pressures will not affect the high-hazard areas because of the existing regulations and standards.

Hazard Assessment and Vulnerability Analyses

Thomas Jefferson called the Ohio "the most beautiful river in the world." Since 1878, the Ohio River has been straightened, dredged and dammed in a continual effort to make the river navigable. Industrial and residential build-up along the river has been subjected to many disastrous floods. Because the Ohio River Basin lies in the direct path of many storms and is located primarily in narrow valleys, drainage has been a major problem, causing extreme damage to developed areas. The construction of tributary reservoirs to impound excessive runoff and the building of floodwalls for the protection of downstream communities was authorized by Congress in 1938.

As long as the Ohio and Little Miami Rivers flow, Clermont County will flood. Residents respect the river's presence, and understand that the constant threat of flooding demands that they remain organized and ready.

There are a total of 1,387 at risk structures in Clermont County. A breakdown of the locations of these structures can be seen in the table below. A more detailed analysis of these at risk structures may be completed later by the Clermont County Department of Development.

At Risk Structures

Communities	Total # At-Risk Structures	Residential At-Risk Structures	Commercial or Industrial At-Risk Structures	Misc. Structures (i.e., farm buildings)
Clermont County (unincorporated)	550	217	82	251
Amelia	0	0	0	0
Batavia	4	1	2	1
Bethel	0	0	0	0
Chilo	51	28	0	23
Felicity	0	0	0	0
Loveland	38	22	10	6
Milford	2	0	2	0
Moscow	124	69	7	48
Neville	64	20	1	43
New Richmond	548	140	74	334
Newtonsville	0	0	0	0
Owensville	0	0	0	0
Williamsburg	6	1	1	4
Total	**1,387**	**498**	**179**	**710**

(Data obtained from the Clermont County GIS Department)

From this at risk structures list, an estimate of the total dollars lost during a flood event can be made. The median values of residential properties were obtained from US Census data (2000). The value for industrial and commercial properties was obtained from the Ohio Department of Taxation (2002). These property values were converted to 2003 values by taking inflation into account. Values for each individual community were not available. Miscellaneous structures, seen in the table above, were not used in this analysis.

Potential Dollars Lost

Communities	Total # At-Risk Structures	Residential At-Risk Structures	Commercial or Industrial At-Risk Structures		Median Value of Housing Units		Average Value of Commercial or Industrial Units	Potential Residential Dollars Lost	Potential Commercial or Industrial Dollars Lost
Clermont County (unincorporated)	550	217	82	$122,900	$131,503	$170,300	$173,706	$28,536,151	$14,243,892
Amelia	0	0	0	$111,300	$119,091	$170,300	$173,706	$0	$0
Batavia	4	1	2	$101,300	$108,391	$170,300	$173,706	$108,391	$347,412
Bethel	0	0	0	$86,200	$92,234	$170,300	$173,706	$0	$0
Chilo	51	28	0	$63,300	$67,731	$170,300	$173,706	$1,896,468	$0
Felicity	0	0	0	$66,200	$70,834	$170,300	$173,706	$0	$0
Loveland	38	22	10	$134,000	$143,380	$170,300	$173,706	$3,154,360	$1,737,060
Milford	2	0	2	$117,100	$125,297	$170,300	$173,706	$0	$347,412
Moscow	124	69	7	$79,700	$85,279	$170,300	$173,706	$5,884,251	$1,215,942
Neville	64	20	1	$74,200	$79,394	$170,300	$173,706	$1,587,880	$173,706
New Richmond	548	140	74	$109,000	$116,630	$170,300	$173,706	$16,328,200	$12,854,244
Newtonsville	0	0	0	$91,000	$97,370	$170,300	$173,706	$0	$0
Owensville	0	0	0	$91,300	$97,691	$170,300	$173,706	$0	$0
Williamsburg	6	1	1	$85,800	$91,806	$170,300	$173,706	$91,806	$173,706
Total	**1387**	**498**	**179**		**$1,426,631**		**$2,431,884**	**$57,587,507**	**$31,093,374**

Miscellaneous structures were not used in this analysis
Data from Ohio Department of Taxation and Clermont County GIS Department

If a flood encompassed the entire county, the damage to residential, commercial, and industrial properties could total **$88.7 million** dollars.

($57.6 million in residential dollars lost + $31.1 million in commercial and industrial dollars lost = $88.7 million)

Matrix Results for Flooding

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Flash Flooding									
No Action.	14	14	9	10	6	7	7	14	**81**
There is generally a lack of awareness and educational campaigns as it relates to non-flood zone, 100-year flood zone and flash flooding in the County, and there are currently no initiatives to educate residents of these occurrences. Widen distribution of video for school age chilren and develop one for adults.	25	30	27	28	27	27	29	20	**213**
Some areas of Clermont County do not have adequate storm sewer systems. Establish a storm water master plan and storm water utility.	27	29	27	30	26	28	27	15	**209**
There is little to no effort to make the general public aware of high hazard areas through an educational program. Widen distribution of video for school age children and develop one for adults.	25	29	27	29	25	28	29	17	**209**
Youth play in high flood hazard areas. Further education focused on youth and the general public about the potential for danger is necessary. Widen distribution of video for school age children and develop one for adults. Seek funding to build water facilities in parks (include water safety).	26	30	28	28	27	25	29	16	**209**
Areas often affected by flooding lack high water signage. Evaluate locations for signage at repeated high water locations.	24	29	27	29	27	25	28	19	**208**
Basement flooding is a problem throughout the County during flood and storm events. Use education and outreach to alleviate some flooding problems. Expand existing sump pump program.	21	24	24	25	23	22	25	13	**177**
Residents often drive through standing floodwaters. Issue tickets and fines for vehicles in flood hazard areas. Expand depth of water gauge program. Increase education.	21	23	27	22	25	25	21	19	**183**
Debris cleaning after a flood event continues to be a problem throughout the county. Evaluate and expand the countywide debris management and post disaster cleanup plan.	26	25	28	25	23	21	26	18	**192**
Storm water is often rerouted by street resurfacing which impedes the storm sewer and drainage ditches. Resurfacing projects may need to pass through storm water review before approval.	18	23	24	22	18	19	22	15	**161**
Illegal filling of storm water ditches and channelization occurs throughout the County. Use educational outreach (PSAs) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create a "hotspot" database.	26	29	28	29	29	27	27	17	**212**

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Non-Flood Zone Flooding									
No Action.	14	14	9	10	8	6	6	16	**83**
Increased development throughout the County is leading to increased amounts of runoff. There are limited NFIP maps for those areas of increased development. Seek funding for NFIP map updates. Update regulations as they relate to runoff amounts.	22	24	24	24	22	22	23	17	**178**
NFIP maps throughout the County are in need of updates. Seek funding for NFIP map updates.	24	25	26	25	24	24	24	20	**192**
Existing structures in the 100-year floodplain are repeatedly damaged by flooding. Target repetitive loss structures for buyouts and other mitigation alternatives.	16	21	23	18	19	20	17	11	**145**
There are some dam operation issues on the East Fork due to limited communication with the Corps leading to erosion and siltation (flooding may also be exacerbated by reservoir releases). Develop a memorandum of understanding with the Corps of Engineers.	22	23	24	23	24	24	23	15	**178**
100-Year Flood Zone Flooding									
No Action.	11	13	7	8	8	6	6	14	**73**
Clermont County lacks a countywide, inter-operable flood warning system. Seek funding to install a countywide, inter-operable flood warning system; evaluate the types of systems and the needs of Clermont County.	15	21	23	23	21	18	22	12	**155**
Some critical facilities are located in the 100-year floodplain, which, in the event of a flood, may not be able to function in their needed capacity (i.e. well fields and waste water plants). Create maps of critical facilities in the floodplain. Evaluate the need to relocate the structures.	19	20	21	21	21	22	21	14	**159**
Waste is stored in the floodplain, which can lead to contamination. Evaluate the need for establishing new floodplain regulations to address this issue.	20	22	25	23	24	24	21	13	**172**

The above matrix results show the rating for all the Core Group members. Each member filled out an individual matrix, and then the results for each hazard were averaged. The hazard of flooding had the most activities associated with it. The six top rated activities have been highlighted below, however the other activities are equally important and should be re-evaluated during the monitoring process of the All Natural Hazards Mitigation Plan for Clermont County.

The six highest rated activities for Flooding hazards are listed below.

Highest Rated Mitigation Alternatives for Flooding
Widen distribution of video for school age children and develop one for adults. (all flooding)
Establish a storm water master plan and storm water utility.
Widen distribution of video for school age children and develop one for adults. (high hazard areas)
Widen distribution of video for school age children and develop one for adults. (youth in high hazard areas) Seek funding to build water facilities in parks (include water safety).
Evaluate locations for signage at repeated high water locations.
Use educational outreach (PSAs) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create a "hotspot" database.

4.4. Tornado History in Clermont County

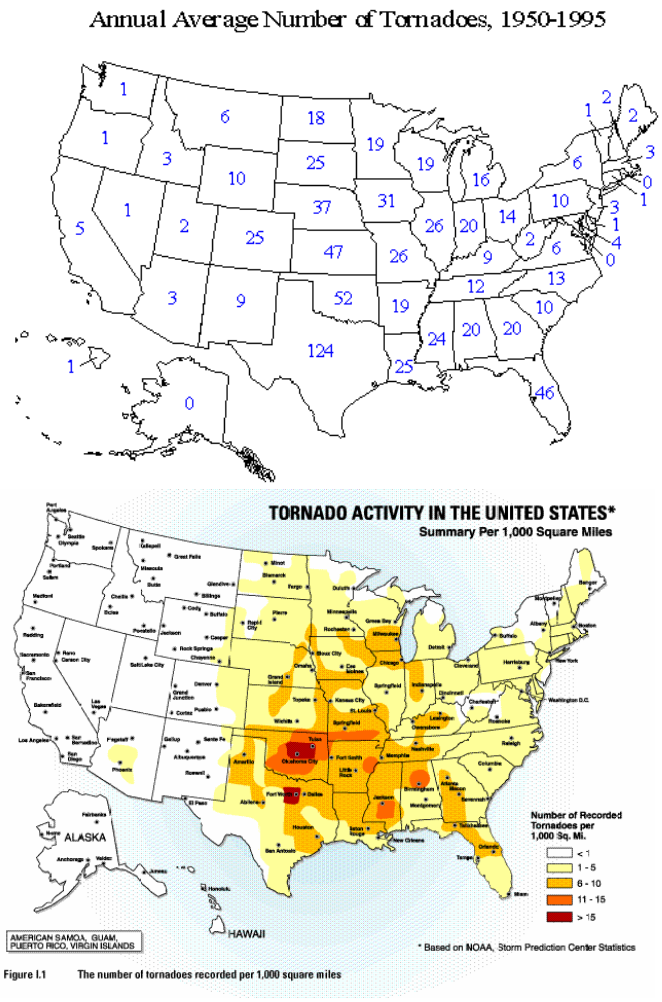
What is a Tornado?

Tornadoes are produced from the energy released during a thunderstorm, but account for only a tiny fraction of the overall energy generated by a thunderstorm. What makes them particularly dangerous is that the energy is concentrated in such a small area, perhaps only a hundred yards in diameter. Not all tornadoes are the same, of course, and science does not yet completely understand how a portion of a thunderstorm's energy becomes focused into something as small as a tornado.

Tornadoes occur whenever and wherever conditions are right, but they are most common in the central plains of North America, east of the Rocky Mountains and west of the Appalachian Mountains. They occur primarily during the spring and summer – the tornado season comes early in the south and later in the north according to the seasonal changes in relation to latitude – usually during the late afternoon and early evening. They have been known to occur in every state in the United States and every continent on Earth, any day of the year, and at any hour.

The damaging strong winds generated from tornadoes can reach 300 mph in the most violent tornadoes, causing automobiles to become airborne, ripping ordinary homes to shreds, and turning broken glass and other debris into lethal missiles. The biggest threat to living creatures (including humans) during tornadoes is flying debris and the risk of being tossed about in the wind. Contrary to previous belief, it is not true that the pressure in a tornado contributes to damage by making buildings "explode."

Today, the development of Doppler radar has made it possible, under certain circumstances, to detect tornado winds with radar. However, spotters remain an important part of the detection system for tornadoes because not all tornadoes occur in situations where the radar can "see" them. Ordinary citizen volunteers make up what is called the SKYWARN (*www.skywarn.org*) network of storm spotters, who work with their local communities to watch out for approaching tornadoes to ensure that appropriate action is taken during tornado events. Spotter information is relayed to the National Weather Service, who operates the Doppler radars and issues warnings (usually relayed to the public by radio and TV) for communities ahead of the storms. They utilize all the information they can obtain from weather maps, modern weather radars, storm spotters, monitoring power line breaks, and so on.



Based on NOAA Storm Prediction Center Statistics

Although the process by which tornadoes form is not completely understood, scientific research has revealed that tornadoes usually form under certain types of atmospheric conditions. Those conditions can be predicted, but it is not yet possible to predict in advance exactly when and where they will develop, how strong they will be, or precisely what path they will follow. There are some "surprises" every year, when tornadoes form in situations that do not look like the right conditions in advance, but these are becoming less frequent. Once a tornado is formed and has been detected, warnings can be issued based on the path of the storm producing the tornado, but even these cannot be perfectly precise regarding who will, or will not, be struck.

The table below shows that although the State of Ohio may not have the most tornadoes, those that do hit Ohio are significant in damage and in all the indication factors of a large-scale tornado.

State Rankings for Tornado Statistics

Rank	Total Number of Tornadoes	Deaths per 10,000 sq. miles	Number of Killer Tornadoes	Total Tornado Path Length per 10,000 sq. miles	Killer Tornadoes as a % of all Tornadoes	Annual Tornadoes per 10,000 sq. miles
1	Texas	Massachusetts	Texas	Mississippi	Tennessee	Florida
2	Oklahoma	Mississippi	Oklahoma	Alabama	Kentucky	Oklahoma
3	Florida	Indiana	Arkansas	Oklahoma	Arkansas	Indiana
4	Kansas	Alabama	Alabama	Iowa	**Ohio**	Iowa
5	Nebraska	**Ohio**	Mississippi	Illinois	Alabama	Kansas
6	Iowa	Michigan	Illinois	Louisiana	Mississippi	Delaware
7	Missouri	Arkansas	Missouri	Kansas	North Carolina	Louisiana
8	Illinois	Illinois	Indiana	Indiana	Michigan	Mississippi
9	S Dakota	Oklahoma	Louisiana	Nebraska	New York	Nebraska
10	Louisiana	Kentucky	Tennessee	Wisconsin	Massachusetts	Texas

Tornadoes are considered the most violent atmospheric phenomenon on the face of the earth, having winds estimated at 300 mph in F5 tornadoes. Although the number of tornadoes in Ohio does not rank high compared to other states in the United States, the State does average around 14 tornadoes a year. Ohio's peak tornado season runs from April through July, with most tornadoes occurring between 2-10 p.m. Even though June has been the month with the most tornado occurrences, many of the State's major tornado outbreaks have taken place in April and May. However, history has shown that tornadoes can occur during any month of the year and at any time of the day or night. Many of these tornadoes are weak (F0 or F1 on the Fujita Scale), but Ohio has been struck by some of the most destructive (F5) tornadoes ever, including the April 3, 1974 tornado which devastated Xenia, killing over 30 people and destroying 2,000 buildings.

FUJITA SCALE FOR TORNADOES

F-0 Weak
Wind: 40-72 miles per hour (mph)
Light Damage: Some chimneys damaged, twigs and branches broken off trees, shallow-rooted trees pushed over, signboards damages, some windows broken

F-1 Weak
Wind: 73-112 mph
Moderate Damage: Surface of roofs peeled off, mobile homes pushed off foundations or overturned, outbuildings demolished, moving autos pushed off the roads, trees snapped or broken; beginning of hurricane speed winds

F-2 Strong
Wind: 113-157 mph
Considerable Damage: Roofs torn off frame houses, mobile homes demolished, frame houses with weak foundations lifted and moved, large trees snapped or uprooted, light-object missiles generated

F-3 Strong
Wind: 158-206 mph
Severe Damage: Roofs and some walls torn off well-constructed houses; trains overturned; most trees uprooted, heavy cars lifted off the ground and thrown, weak pavement blown off the roads

F-4 Violent
Wind: 207-260 mph
Devastating Damage: Well-constructed houses leveled, structures with weak foundations blown off foundation, cars thrown and disintegrated, trees in forest uprooted and carried some distance away

F-5 Violent
Wind: 261-318 mph
Incredible Damage: Strong frame houses lifted off foundations and carried considerable distance to disintegrate, automobile-sized missiles fly through the air in excess of 300 feet, trees debarked, incredible phenomena will occur.

The scale shown below is called the Fujita Scale, and is the mechanism used to determine the potential type of tornado that may have affected a particular community. It is based on velocity of wind and the type of damage the tornado caused.

Clermont County, which lies near the far southwest corner of Ohio, is within the area referred to as the Ohio Valley Tornado Alley. Because of the geography and prevailing weather patterns in the spring and summer, storm systems produce tornadoes across the Ohio Valley a few times each year. Records since 1950 suggest that Clermont County can expect a direct hit by a tornado every 6 years, on the average. There are records of tornadoes striking the Cincinnati area dating back to the early 1800's, but not nearly as frequently as during the past 50 years.

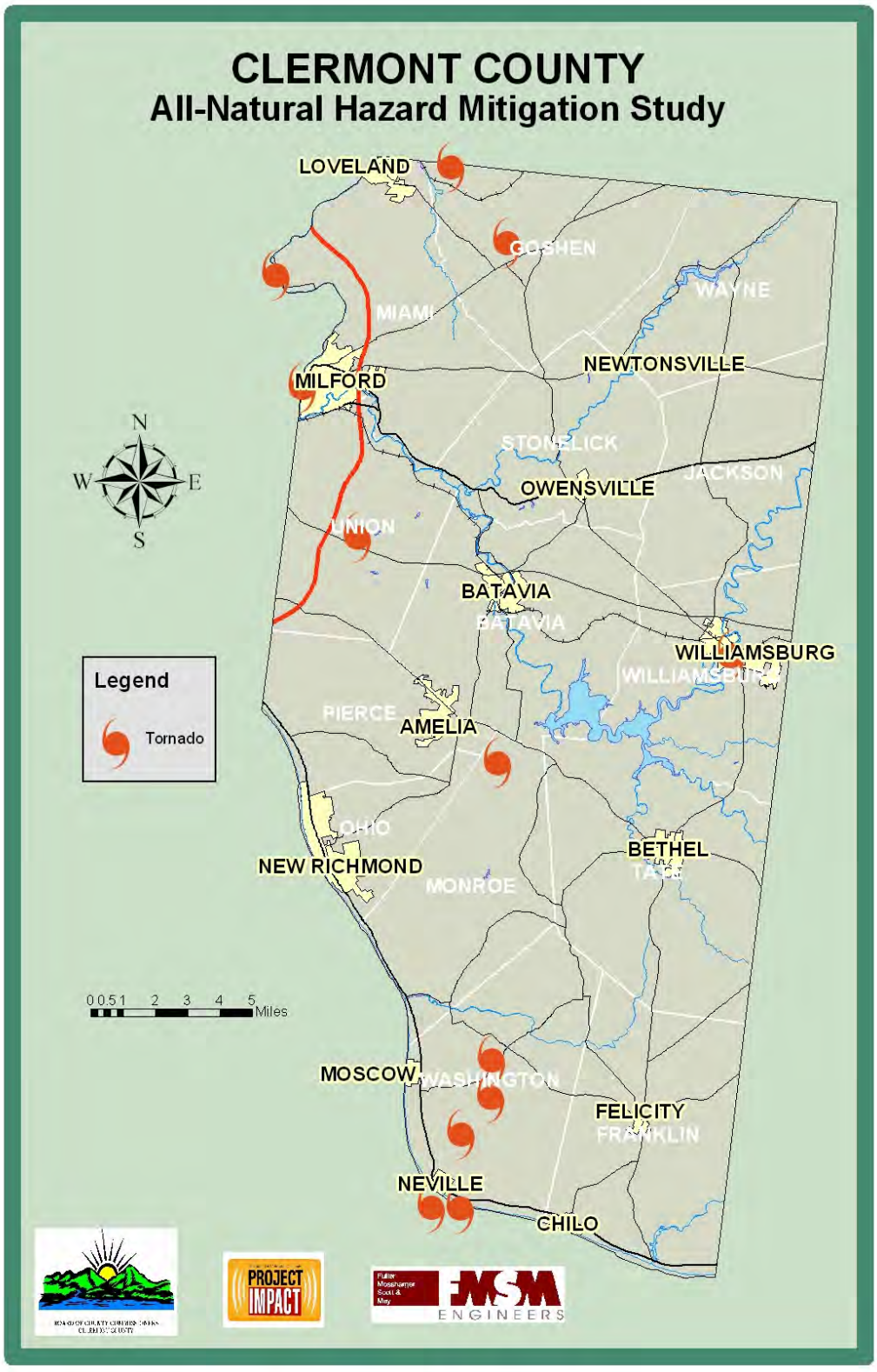
Tornado Map

Tornadoes are relatively common in the Southwest quadrant of the State of Ohio. This map shows that tornadoes, as a non-site specific hazard, are a random occurrence best mitigated by planning ahead. Clermont County is best served by having well informed officials who instruct their residents about tornado dangers, in turn.

Tornadoes in Clermont County

Location or County	Date	Time	Mag	Dth	Inj	PrD
1 Clermont	4/15/1953	17:00	F1	0	0	25K
2 Clermont	4/23/1968	12:56	F4	1	29	2.5M
3 Clermont	8/9/1969	17:20	F3	0	7	250K
4 Clermont	6/24/1976	17:15	F0	0	0	250K
5 Clermont	6/12/1978	12:10	F0	0	0	25K
6 Clermont	6/12/1978	12:50	F1	0	0	25K
7 Clermont	4/8/1980	14:50	F1	0	2	250K
8 Clermont	6/2/1990	23:50	F2	0	0	250K
9 Neville	8/5/1995	13:20	F1	0	0	30K
10 Neville	5/8/1996	17:46	F0	0	0	30K
11 Moscow	7/2/1997	19:30	F3	0	0	2.0M
12 Loveland	8/24/1999	14:28	F0	0	0	25K
			TOTALS:	**1**	**38**	**5.660M**

Clermont County Tornado Map



Clermont County Tornado Mitigation Efforts

At this time, other than awareness campaigns during Tornado season, a few sirens, and a weather radio system at select facilities, Clermont County does not have any formalized efforts underway towards mitigation and tornado preparedness. However, the Core Group has looked closely at tornado mitigation techniques and focused closely on several activities as listed below under the Tornado Matrix Results section.

Current Development Trends

Since tornadoes are a non-site specific hazard, current development trends have no affect other than the increased population that would be susceptible to a tornado event within the County's boundaries.

Mitigation Strategy

Clermont County EMA will lead mitigation efforts to further research the possibility of establishing public safe zones in areas with no tornado protection, including public parks and mobile home neighborhoods. Clermont County will also work to establish warning systems throughout the county.

Hazard Assessment and Vulnerability Analyses

Based on the knowledge that tornadoes are a random event that can cause large amounts of damage, the Core Group has decided to deem tornadoes the third highest hazard in the county. Considering the unpredictability of tornadoes, it was decided to evaluate past events to analyze the potential damage on the community and prepare as much as possible, with the realization that tornadoes are usually accompanied by other hazards. When tornadoes hit a community, they are typically coupled by other natural events such as high winds, thunderstorms, lighting and possibly flash floods.

According to the 2000 Census, Clermont County's average housing cost is approximately $122,900. There are 69,226 housing units in Clermont County. If 0.1% of the housing stock was totally devastated by a tornado event, the vulnerability analysis numbers compute the potential loss of over $8,500,000 dollars in damages.

Matrix Results for Tornadoes

The matrix results show the rating for all the Core Group members for the tornado hazard.

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Tornadoes									
No Action.	14	14	8	10	10	9	6	14	**85**
There is a lack of an all inclusive and inter-operable warning system throughout Clermont County. Seek funding for a countywide iner-operable warning system.	25	25	26	26	26	28	26	14	**196**
Public education and outreach to the general public concerning tornadoes and the use of weather radios is lacking in Clermont County. Create innovative PSAs on the use of weather radios and seek funding to place weather radios in all critical facilities.	24	28	25	26	25	28	26	17	**199**
There is a lack of designated tornado shelters in Clermont County. Develop PSAs to reaffirm existing tornado shelter locations. Seek funding to install multiuse shelters in parks. Work with mobile home parks to install tornado shelters.	23	25	25	27	25	26	27	14	**192**
The Ohio Department of Health does not require tornado shelters or permanent structures near mobile home communities. Evaluate the poential for the State Board of Health to change the requirements.	16	16	17	20	16	20	20	12	**137**

The three highest rated activities for Tornado hazards are listed below.

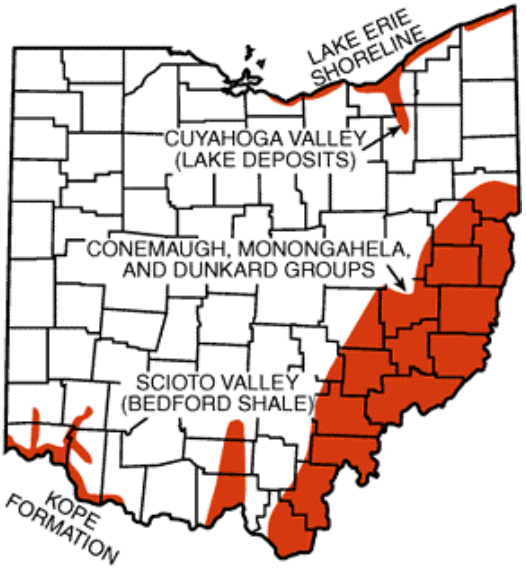
Highest Rated Mitigation Alternatives for Tornadoes
Create innovative PSAs on the use of weather radios and seek funding to place weather radios in all critical facilities.
Seek funding for a countywide inter-operable warning system.
Seek funding to install multiuse shelters in parks. Work with mobile home parks to install tornado shelters.

4.5. Landslide History in Clermont County

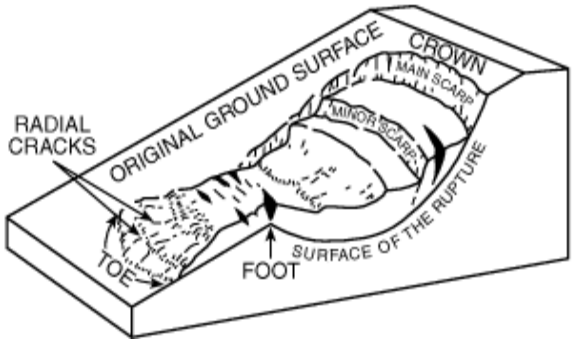
A landslide can be a wide range of ground or soil movements (creeps, rock falls, deep failure of slopes, slumps and shallow debris flows) that can happen in an instant or over several weeks, months, or even years. Landslides occur all over the United States and present a significant problem in several Ohio regions. A map of landslide prone areas in Ohio can be seen below.

The most common types of landslide events in Clermont County are rotational slumps, earth flows, and rock falls. Rotational slumps are the largest movements of earth in Ohio. They are characterized by a large mass of weakened rock or sediment moving along a curved slip plane. An example of a typical slump is depicted below.

An earth flow involves a smaller mass, and is more common. Earth flows entail jumbled masses of rock or sediment, usually unconsolidated glacial sediment, moving down a slope, forming odd topographical features. Rockfalls are described as blocks of bedrock becoming detached and tumbling down cliffs or steep slopes.



Landslide Prone Areas in Ohio



Rotational Slump

There are several indicators for landslide prone areas including tilted or bending trees, displaced fences, poles, or walls, a concentration of stones at the toe of a slope, irregularly shaped mounds or ridges, step-like ground and water seeps. There are two elements that come together to cause a landslide – the existing geologic conditions, combined with a trigger set the landslide in motion. According to the Ohio Department of Natural Resources, the Cincinnati area has one of the highest per capita costs related to landslide damages in the United States. Clermont County needs to understand landslide potentials and establish mitigating actions to prevent them.

Geologic Conditions of Clermont County

The geology of Clermont County and greater Cincinnati was formed primarily by three separate glacial events. Each time a glacier advanced, it left a clear and identifiable mark behind including large deposits of sand, silt, clay and other unconsolidated glacial sediment. This type of sediment is prone to instability that can lead to landslide events. Glaciers are also largely

responsible for the unique cliffs and slopes that are prevalent throughout Clermont County, and these features may contribute to impending landslides. Landslides can be primarily attributed to the mix of sediment and colluvial matter that overlays the bedrock in Kope Formations, as shown in the landslide figure at the top of this page.

Another cause for earth movements in Clermont County is the disintegration and failure of shale beds, caused by any number of reasons. These conditions combine to create a unique and starkly beautiful landscape. Unfortunately, these areas are susceptible to landslide hazards unless mitigation actions are taken.

Triggers and Catalysts of Landslide Events

There are several sets of circumstances or individual events that can lead to a landslide, most of which are directly caused by alterations made to the terrain by humans. One trigger that can cause a landslide is an activity vibration. A vibration can be anything from human induced blasting, to construction, or even heavy traffic. Slope modification is another reason landslides occur. Over-steepening a slope, adding weight to the top of a slope, removing part of the toe of a slope and constructing an embankment or fill on a slope are all possible causes for landslides.

Vegetation that exists on slopes is important in adding stability to loose soil and rocks and absorbing excess water on the slope. If removed, the slope may weaken and fail, resulting in a landslide.

Naturally recurring phenomenon might cause landslides. Vibrations resulting from earthquakes can cause landslides, although no landslide instances involving earthquakes has ever been documented in Ohio, the possibility remains.

Large amounts of water or snowmelt can saturate the slope to the point of failure. The saturated slope could develop into a debris flow or a mudflow. Uncontrolled runoff can lead to erosion, which can add to slope instability. Though some of these catalysts cannot be foreseen, many landslides can be prevented.

Preventive Measures and Precautions

Many landslide hazards can be preempted by good geologic investigations and engineering practices, and effective enforcement of land-use management regulations. Avoiding the triggers of landslides and being aware of landslide indicators are the simplest ways to avert landslide hazards. Preventing unnecessary alterations of the slope, steering clear of vibrations and leaving vegetation on slopes are all practical and common sense ways to avert landslides. Regulating building in questionable areas is another practical way to avoid a landslide catastrophe.

This landslide on Benton Road happened after some flooding in the area in 2001.

Measures that are more assertive can also be considered. Excavating some of the upper slope or placing fill on the toe of the slope may indeed prevent a landslide. Improving drainage on a slope can remove stress caused by excess moisture, thereby reducing the potential for landslides. Restraining the slope by the use of cribbing, piling or retaining walls may also prevent landslides or minimize damage if one does occur. These mitigation measures should be weighed with geologic, hydraulic and economic attributes before choosing the most suitable avenue of prevention.

Landslide Map Summary

A map of landslide prone areas in Clermont County can be found on the following page. The yellow areas on this map indicate areas where landslide prone soils exist. The varying shades of green indicate slopes percentages.

Clermont County Landslide Mitigation Efforts

There are currently only limited landslide mitigation activities underway in Clermont County. The County Engineer has been tracking the number of landslide cases in the County and has been working with the townships on a hillside overlay zone for any development in high hazard landslide areas. For the most part, the county takes a reactive approach to solving landslide problems by fixing landslides as they happen. Typically, the Engineer's office repairs 2 landslides per year.

Recent Landslide Events

The following is a list of some recent slides that have been repaired in Clermont County:

- Felicity Cedron Slide: length 300': repair cost $125,900. Repair was using drilled shafts into bedrock.
- Nine Mile Slide: length 400': repair cost $168,200. Repair was drilled shafts and "t-wall"
- Benton Road Slide: length 300': repair cost $240,600. Repair was drilled shafts into bedrock
- Clermontville Laurel Slide: length 400': repair cost $459,000. Repair using drilled shafts into bedrock (uphill and downhill side)

Hazard Assessment and Vulnerability Analyses

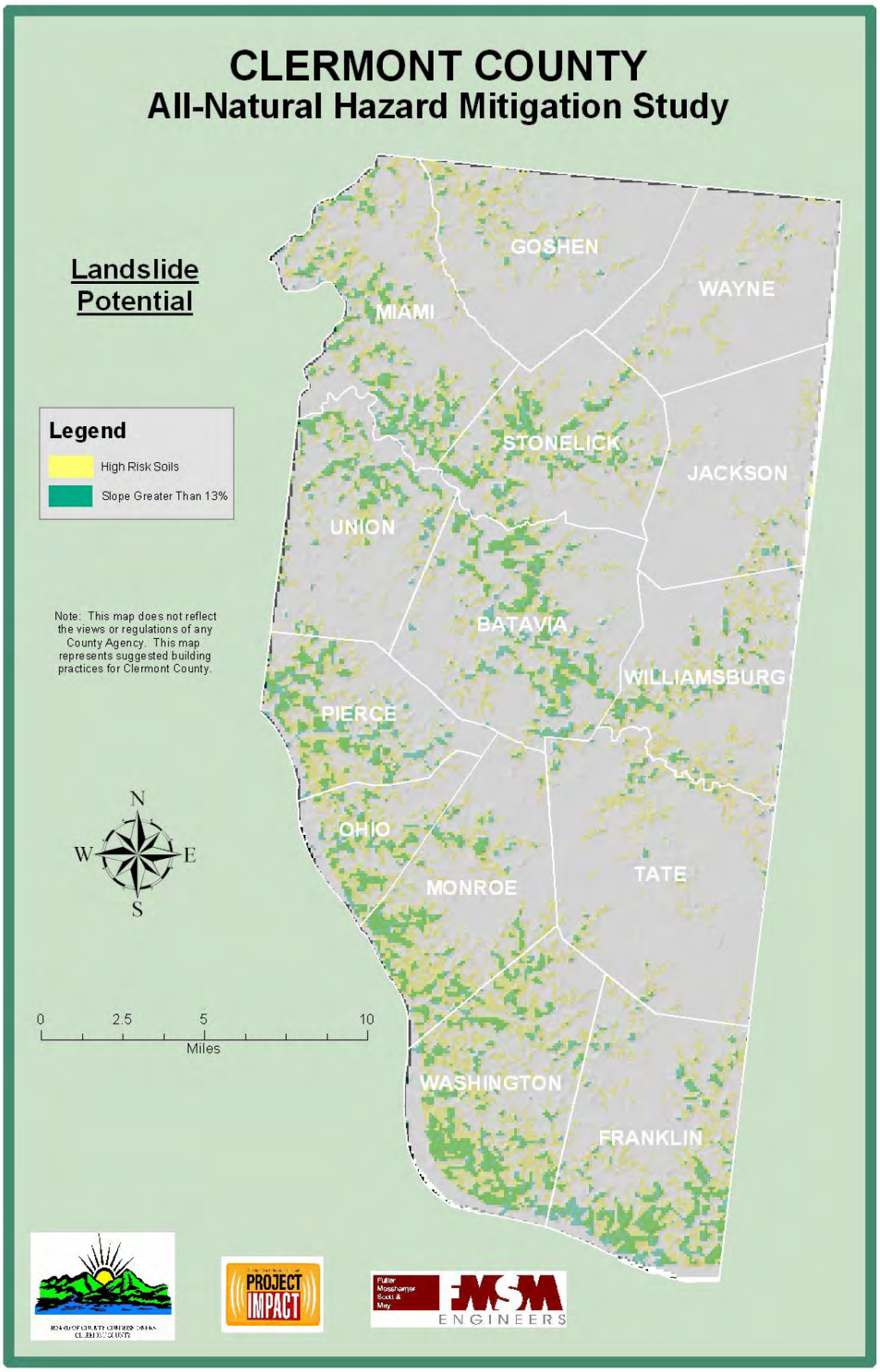
Because of the steep slopes, soil types, and growth in the County the threat of landslides continues to increase. As vegetation is removed from steep slopes or these slopes are surcharged by development, the threat of landslides or slumps increases proportionally. Continued denuding of these vulnerable areas will significantly increase the risk of landslides.

The County Engineer's office and the Ohio Department of Transportation fix landslides every year that affect Clermont's infrastructure. Combined, they repair an average of 5 slides per year at an average cost of $250,000 each resulting in a rough yearly infrastructure repair cost estimate of $1,250,000. When some of the Core Group's recommended activities are implemented, the number and severity of landslides in Clermont County could be reduced.

Clermont County does not currently keep a detailed database of costs incurred from related landslide damages to residential properties. Clermont County will compile this data for a more

detailed Hazard Assessment and Vulnerability Analysis to be performed when the plan is updated in five years.

Clermont County Landslide Map



Matrix Results for Landslides

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Landslides									
No Action.	14	16	9	9	6	6	6	12	**78**
Roadways and other infrastructure located in high hazard areas are incurring high cost and disrupting traffic (some are repetitive loss items). Infrastructure is often fixed with a short-term solution because of time and cost; this practice can lead to repeated landslide events in some locations.	26	24	28	26	27	29	27	17	**204**
Removal of vegetation and cutting hillsides for homes, businesses and roads is leading to erosion that exacerbates landslide problems. Work with the Planning Department to develop standards and regulations for development in landslide prone areas.	27	27	28	27	26	28	24	22	**209**
There are few educational awareness activities showing how landslides are particularly associated with other hazards (i.e. flood events can trigger a landslide). Develop innovative PSAs targeted at school age children in those areas affected by landslides. Develop a flyer for people who wish to build in landslide prone areas.	21	28	26	26	26	23	27	15	**192**
Building buffer zones and countywide regulations for developing and building in high hazard areas are lacking. Work with the Planning Commission to create a potential landslide overlay zone.	24	26	25	26	23	27	26	22	**199**
Regulations for building roadways and other infrastructure in landslide areas are not always followed by federal and state agencies. Work with the Engineer's office to create a memorandum of understanding with other agencies.	25	28	26	27	26	28	27	22	**209**
There is a lack of care taken in development techniques in landslide areas. Work with the Planning Department to develop standards and regulations for development in landslide prone areas.	28	29	28	28	25	28	24	20	**210**

The matrix results above indicate the opinion of the Core Croup members. The top three activities are highlighted below, however the other activities may be just as important and should be re-evaluated during the monitoring process for the All Natural Hazard Mitigation Plan for Clermont County.

Highest Rated Mitigation Alternatives for Landslides
Work with the Planning Department to develop standards and regulations for development in landslide prone areas. (vegetation and hill cutting)
Work with the Planning Department to develop standards and regulations for development in landslide prone areas. (federal and state agencies)
Work with the Engineer's office to create a memorandum of understanding with other agencies.

4.6 Clermont County Drought History

Defining Drought

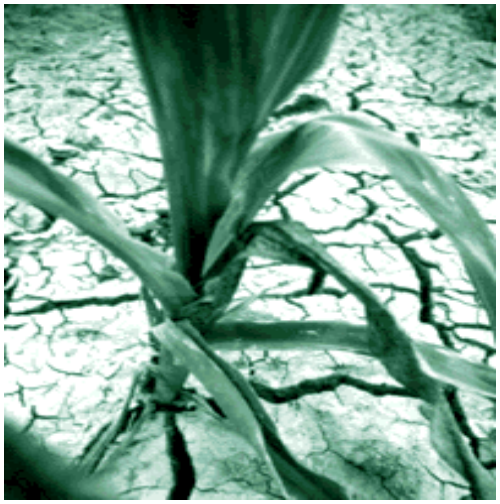
Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Defining drought is therefore difficult; it depends on differences in regions, needs, and disciplinary perspectives. In the most general sense, drought is a period of unusually dry weather sufficiently prolonged for the lack of precipitation to cause serious hydrologic imbalance in the affected area producing below average water content in streams, reservoirs, ground-water aquifers, lakes and soils. Whatever the definition, it is clear that drought cannot be viewed solely as a physical phenomenon. The affects of drought are many including:

- lowering of water levels in lakes or reservoirs that supply water to local communities,
- low stream flows, which in some cases means streams actually dry up completely, dramatically affecting the fish and biotic populations,
- insufficient moisture for crops resulting in reduced yields,
- lack of moisture to sustain vegetation, and
- grass fires and wildfires which can spread to developed areas.

In the National Water Summary dated 1988-1989, the USGS stated that:

> "The drought of 1930 – 1936 was the most severe recorded in Ohio. Precipitation totals for 1930 and 1934 were the smallest since the earliest statewide records in 1883. Since 1930 droughts in Ohio have occurred about every 10 years, with an apparent random variation in duration and severity. A short but severe drought occurred in 1988."

Most generally droughts are gauged by comparing the current situation to the historical average, often based on a 30-year period of record. The threshold identified as the beginning of a drought (e.g., 75% of average precipitation over a specified time period) is usually established somewhat arbitrarily, rather than on the basis of its precise relationship to specific impacts.



Agricultural drought occurs when soil moisture no longer meets the needs of crops

Disciplinary Perspectives on Drought

Drought in a *Meteorological* sense is a measure of departure of precipitation from normal. Due to climatic differences what is considered a drought in one location may not be a drought in another location.

Agricultural drought refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.

Hydrological drought occurs when surface and subsurface water supplies are below normal.

Socioeconomic drought refers to the situation that occurs when physical water shortage begins to affect people. Wildfires, property (and crop) damage, and extreme heat can all be classified as socioeconomic effects. Socioeconomic impacts of droughts were the type that is of most

concern to the Core Group. The overall goal agreed upon by the group was to save lives, increase awareness of how droughts can increase the risk of wild fires, and to be better prepared to deal with this hazard event.

Recent Droughts in Clermont County

Clermont County has experienced droughts most recently in 1999 and 2002. The Clermont County Soil and Water Conservation District applied for drought emergency funding in each year with the United States Department of Agriculture (USDA) Farm Service Agency. Precipitation and weather data were included in the application from the Weather Bureau and the US Army Corps of Engineers sites in Chilo, Wilmington, and East Fork Park. Other information in the application included percent of crop yield lost, hay lost, pasture lost, and other crop data.

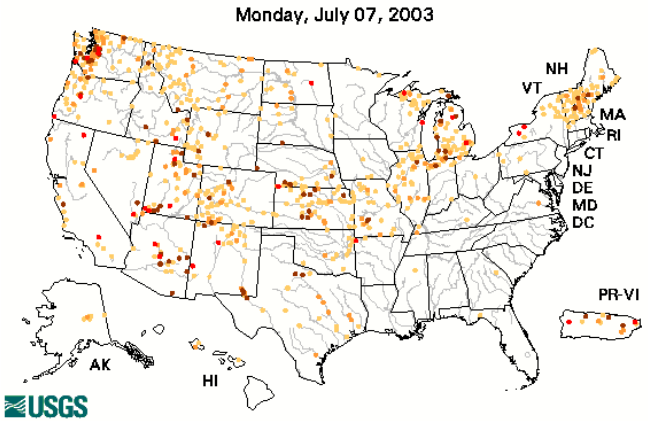
Clermont County Mitigation Efforts

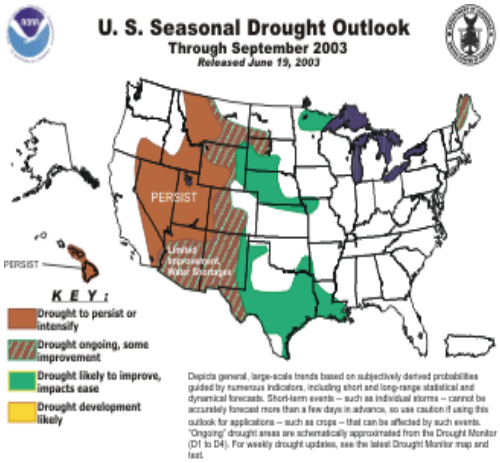
As is the case in most of Ohio, Clermont County takes a reactive approach to solving most drought problems rather than a proactive one. When droughts hit Clermont County emergency funding is sought to aid the agricultural community. In cases of excessive heat Clermont County takes a more proactive approach in protecting sensitive populations.

Monitoring Drought

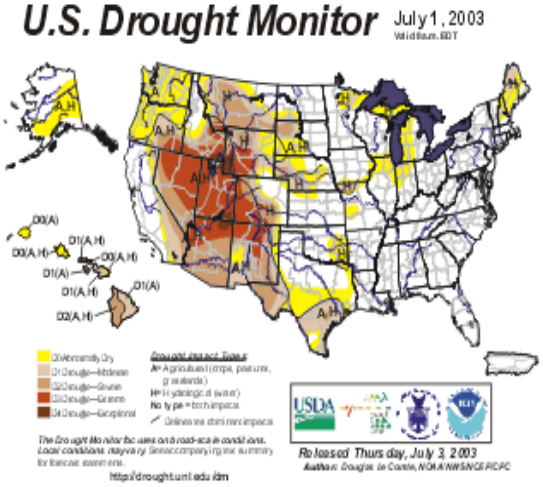
There are several resources for monitoring drought levels in Ohio. The USGS website "Water Watch" shows a current water resources conditions map of below normal 7-day average stream flow compared to historical stream flow for the week of the year. The National Climatic Data Center (NCDC) and the National Oceanic and Atmospheric Administration (NOAA) web sites also have numerous informative documents and datasets to monitor and, to a degree, predict droughts.

USGS "Water Watch" Map





NOAA Weekly drought monitor and latest seasonal outlook



NCDC Drought Monitor

Palmer Drought Severity Index

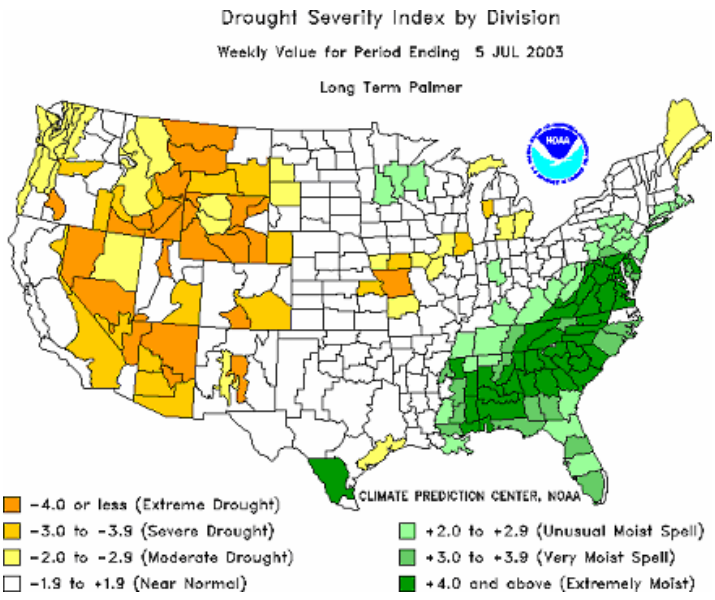
The Palmer Drought Severity Index (PDSI) is used by many Federal agencies and States to evaluate the current impact of limited rainfall. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil. The numerical index varies from 4.0, which is extremely wet to – 4.0, which indicates extreme drought conditions. The following table defines the range of PDSI values. The data is typically plotted on a map in varying shades to reflect the variation of the severity of the conditions. The PSDI in Clermont County at the end of July 2003 was 2.39, rated as moderately wet.

The January, 1994 Ohio Drought Response Plan utilizes the PDSI to activate the State Drought Response System, these include:

Phase I – Normal conditions, monitor and assess conditions and report monthly to the Ohio EMA.

Phase II – PDSI reaches – 1.0 to – 2.0, a "Drought Alert" is issued and the Drought Assessment Committee is activated by the Governor.

Phase III - PDSI reaches – 2.0 to – 4.0, water conservation measures are increased in affected areas.



Low Flows in Area Streams

Most of the smaller tributary streams are primarily supplied by groundwater during the dry summer months. Typically during the winter and spring months, rainfall and snowmelt are stored in rock, gravel, or soil aquifers, which then seep into the streams providing a source of water to maintain low flows. During sustained drought conditions, when these sources are not recharged with precipitation or are emptied by recharging the streams, flows may slow to a trickle or disappear completely for extended periods of time. The fish and biologic community in these streams are either lost completely or move to a larger downstream waterway with more summer flow. Little can be done to sustain these streams short of constructing substantial reservoirs to store spring runoff and then recharge the streams during summer months, a difficult and costly solution.

Crop and Vegetation Moisture

From a financial standpoint, one of the most serious impacts of sustained drought conditions is the affect on farming. Most agricultural activities rely on periodic rainfall during the growing season to sustain the crops. Too much rainfall in the spring delays planting and many times washes out newly planted crops. Too little rainfall during the remainder of the growing season produces small yields or completely burns out and destroys plants. Some farming operations have the capability of irrigating their fields from wells or pumping water from adjoining streams using irrigation equipment. The same drought conditions that are impacting the crops may also significantly reduce the stream flow or groundwater recharge. One of the objectives of the State Drought Response Plan is to establish priorities for the use of threatened or multi-use water sources. Under severe drought conditions, the State must establish the most important uses from available water supplies and allocate water accordingly. Agricultural use may be competing with urban water supply, recreation or environmental needs.

Grass and Wildfires

Palmer Classifications	
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.9 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

Typically, one of the first tangible signs that a drought is occurring are grass and wildfires. As soil moisture decreases most grasses dry out and are susceptible to a carelessly thrown cigarette or spark, which can ignite them, often resulting in substantial fires.

Wildfires are a hazard that is generally thought of as primarily affecting large forested areas in rural areas. However, they do present a real hazard in Clermont County where large forested parks or reserves adjoin urban development. As drought conditions occur, the trees and vegetation in these areas dry out and are susceptible to any number of ignition sources. The interface between these forested areas and urban development could become a potential hazard.

Hazard Assessment and Vulnerability Analyses

The County's vulnerability to droughts has increased over the years due to increased water consumption and population growth. Unlike most hazards, the threat of a drought tends to be

dismissed because of the relative long period it takes to have damaging effects. Clermont County is fairly vulnerable to drought because the county has a significant agricultural base and there is also urban/wildlife interface throughout the county. Please refer to the Matrix Results for the Core Group plans in regard to mitigating the effects of droughts in Clermont County.

Matrix Results for Droughts

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Droughts									
No Action.	19	19	13	13	12	10	10	17	**113**
No public education programs on droughts or wildfires exist in Clermont County. Coordinate with the Fire Service Alliance for outreach concerning droughts and wildfires.	21	24	22	23	22	21	23	17	**173**
Urban/residential and natural areas interface in many areas of Clermont County, increasing the potential for wildfires to cause property damage. Develop a map showing the urban and natural area interface.	19	21	23	22	21	16	22	12	**156**
The current site layout of neighborhoods and homes is poor; a fire/buffer zone should surround the home. Work with the Planning Commission to create a buffer zone regulation to prevent the spread of wildfires.	17	20	23	20	19	20	18	13	**150**
Dry hydrant systems may be inadequate to deal with wildfires. Seek funding to identify locations and installation of dry hydrants. Develop a PSA to define the use of dry hydrants (work with SWCD).	19	25	23	20	23	22	20	14	**166**
During extreme hot and cold periods in Clermont County, sensitive population outreach should become a main focus. Develop a map of sensitive populations.	19	21	23	22	22	21	23	19	**170**
Droughts can lead to infrastructure (pipes) and basement damage. Develop a PSA concerning watering foundations.	17	20	19	18	18	18	19	14	**143**

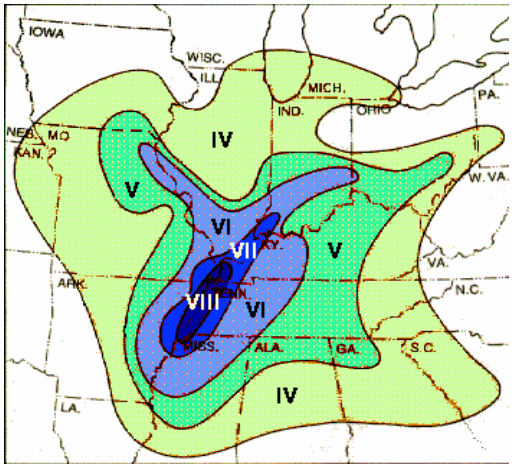
The matrix above shows the results for the drought hazard in Clermont, which only had a small number of associated activities. The three highest rated activities are highlighted below.

Highest Rated Mitigation Alternatives for Droughts
Coordinate with the Fire Service Alliance for outreach concerning droughts and wildfires.
Develop a map of sensitive populations.
Develop a PSA to define the use of dry hydrants (work with SWCD).

4.7. Earthquake History in Clermont County, Ohio

It is surprising to many Ohioans that the State has experienced more than 120 earthquakes since 1776, and that 14 of these events have caused minor to moderate damage. The largest historic earthquake in Ohio was centered in Shelby County in 1937. This event, estimated to have had a magnitude of 5.5 on the Richter scale, caused considerable damage in Anna and several other western Ohio communities, where at least 40 earthquakes have been felt since 1875. Northeastern Ohio, east of Cleveland, is the second most active area of the state. At least 20 earthquakes are recorded in the area since 1836, including a 5.0 magnitude event in 1986 that caused moderate damage. A broad area of Southern Ohio has experienced more than 30 earthquakes.

Clermont County could be impacted by two separate geologic faults that could potentially cause earthquakes. In general, earthquakes with epicenters in Ohio occur along pre-existing zones of weakness in Precambrian rocks. The Cincinnati Arch is one such pre-existing zone and last contributed to an earthquake felt in Clermont County in 1875. This event caused damage in western Ohio, and affected a total area estimated at over 40,000 square miles. Walls were cracked and chimneys were toppled in Sidney and Urbana. The shock was felt sharply at Jeffersonville, Indiana. The affected area also included parts of Illinois, Indiana, Kentucky and Missouri. The Cincinnati Arch is not considered to be as big a hazard as the New Madrid Fault. Although the New Madrid Fault Line is outside the boundary of the State of Ohio, it still presents a risk. There has not been an earthquake of any significance since 1811 and 1812 but this event was felt strongly throughout Ohio and knocked down chimneys in Cincinnati. There have never been measurable earthquakes in and around Clermont County.



New Madrid Fault Line
Map provided by NOAA

Clermont County Risk Zone

According to Candice Sherry, Ohio Earthquake Program Manager, Clermont County is in a high-risk zone in relation to the proximity to the New Madrid Fault line. The geological make-up of the area, glacier till, is considered unconsolidated material and furthers the risk. These deposits tend to be unstable when exposed to vibrations that occur during earthquakes. Historic information indicates the risk of an earthquake in this area is minute; however, damage ramifications of an earthquake in areas of unconsolidated material would be great should one occur.

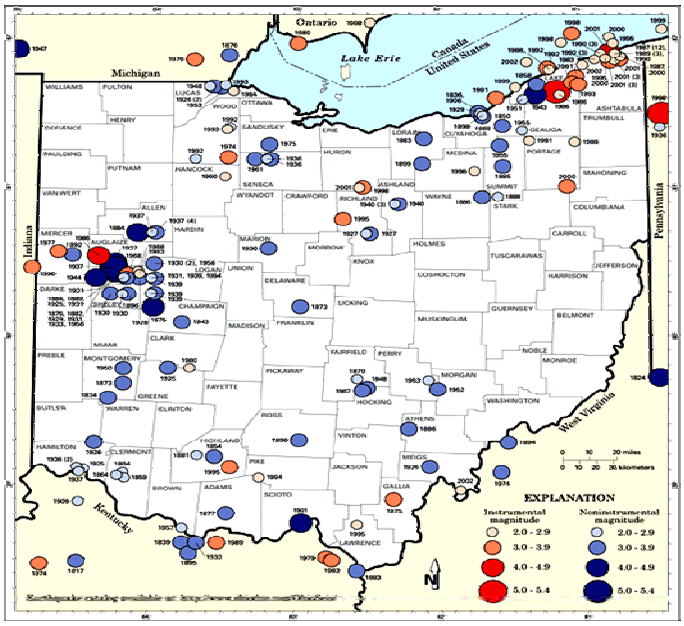
Monitoring of Earthquakes

The Ohio Department of Natural Resources (ODNR) Division of Geological Survey has established a 22 station cooperative network of seismograph stations throughout the State in order to continuously record earthquake activity. The network, which went on line in January 1999, ended a five-year gap during which there was only one operating station in Ohio. The state was dependent on seismographs in Kentucky and Michigan to record Ohio earthquakes.

The 22 stations of the new seismograph network, which is called OhioSeis, are distributed across the state, but are concentrated in the most seismically active areas or in areas that

provide optimal conditions for detecting and locating very small earthquakes that are below the threshold of human notice. These small micro earthquakes are important because they occur more frequently and help to identify the location of faults that may periodically produce larger, potentially damaging earthquakes.

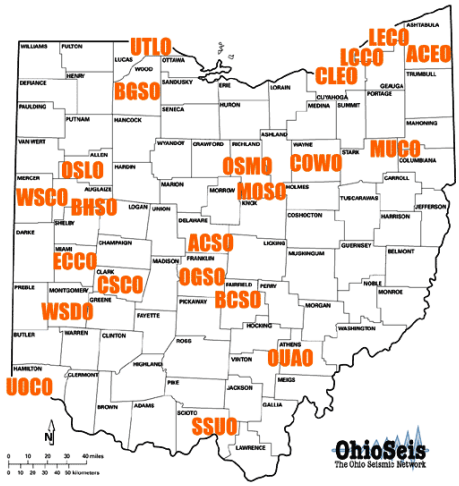
The OhioSeis seismograph stations are located at colleges, universities and other institutions, employing new technology that not only makes them very accurate, but also relatively inexpensive and easy to operate and maintain. In contrast to the old technology, in which a pen made a line on a paper drum, the new system is entirely digital and uses a computer to continuously record and display data. Two other innovations have made the system unique. An inexpensive Global Positioning System (GPS) receiver is used to keep very precise time on the continuously recorded seismogram, and each station's computer is connected to the Internet for rapid data transfer.



Epicenters of past earthquakes in Ohio.

Each OhioSeis station is a cooperative effort. Seismometers, the instrument that detects Earth's movements, and other seismic components were purchased by the Division of Geological Survey with funds provided by the Federal Emergency Management Agency (FEMA) through the Ohio Emergency Management Agency, as part of the National Earthquake Hazards Reduction Program. The computers and Internet connection were purchased and provided by the cooperating institutions.

The Division of Geological Survey is coordinating the seismic network and has established the Ohio Earthquake Information Center at the Horace R. Collins Laboratory at Alum Creek State Park, north of Columbus. This facility functions as a repository and laboratory for rock core and well cuttings, but has a specially constructed room for earthquake recording. The seismograph system allows for very rapid location of the epicenter and calculation of the magnitude of any earthquake in the State. The earthquake records, or seismograms, from at least three seismograph stations are needed to determine earthquake locations (epicenters). These records can be downloaded from the Internet at any station on the network, and location and magnitude can be determined. This system allows small earthquakes to be detected, ones that may not have been detected by distant, out-of-date seismograph stations.



OhioSeis Monitoring Stations

The OhioSeis network provides a completely new dimension of understanding about the pulse of the earth beneath Ohio. Although the new seismograph network will not predict earthquakes or provide an alert prior to an event, it will provide insight into earthquake risk in the State so that intelligent decisions about building and facility design and construction, insurance coverage and other planning decisions can be made by individuals, business and industry, and governmental agencies.

The closest monitoring stations to Clermont County are located at the University of Cincinnati and at Wright State University near Dayton. These locations are:

Station UOCO
Location:
University of Cincinnati
Department of Geology
500 Geology/Physics Bldg.
Cincinnati, OH 45221-0013

Lat: 39.140° North
Long: 84.522° West
Elev: 226 m

Contact Person:
Dr. Attila Kilinc
attila.kilinc@uc.edu

Station WSDO
Location:
Wright State University
Dept. Geological Sciences
Brehm Lab
Dayton, OH 45435

Lat: 39.783° North
Long: 84.063° West
Elev: 289 m

Contact Person:
Dr. Ernest C. Hauser
ernest.hauser@wright.edu

Clermont County Earthquake Mitigation Efforts

There are currently no earthquake mitigation efforts underway, nor have there been any in the past. The Core Group has decided to take several steps as it relates to earthquake preparedness for the County.

Current Development Trends

Since earthquakes are a non-site specific hazard, current development trends have no affect other than the potential increased population that would be susceptible to earthquakes within Clermont County. Historically, the County has a very low probability of earthquakes.

Mitigation Strategy

The overlying theme for all hazard mitigation efforts that concern Clermont County is innovative public service announcements and education.

Hazard Assessment and Vulnerability Analyses

Since there has not been a damaging earthquake in Ohio since 1875, the Core Group felt the best approach to analyzing vulnerability to an earthquake would be by looking at other communities and how they deal with earthquakes and preparedness.

Matrix Results for Earthquakes

Clermont County All Natural Hazard Mitigation Plan	Cost Effective	Technically Feasible	Environmentally Sound	Socially Equitable	Meets Local Regulations	Activities Reduce Risk	Socially Acceptable	Funding Available	Total
Earthquakes									
No Action.	19	19	13	14	13	10	11	17	**116**
There are little to no public awareness campaigns occurring in the County as they relate to the seriousness of earthquakes and how an earthquake could affect the community as a whole. Develop a PSA concerning the effects of earthquakes in Clermont County; target school age children.	20	23	22	24	19	21	23	16	**168**

The matrix above shows the results for the hazard of earthquakes, which only had a small number of associated activities. The top ranked activity has been highlighted below.

Highest Rated Mitigation Alternative for Earthquakes
Develop a PSA concerning the effects of earthquakes in Clermont County; target school age children.

5.0. Highest Rated Activities and Action Plan

Each of the highest rated activities for Clermont County, described in the previous sections, were organized into an action plan. The action plan included the activity rating, an implementation schedule, the funding source, cost estimates, and the entities responsible for the implementation of each action item. The plan can be seen below. Because FEMA has asked that each community participating in this plan identify at least one action item that their community is interested in undertaking, the County EMA will meet with each jurisdiction after the Plan has been approved and an additional listing of the highest rated action items for each participating community will be put into an additional Appendix.

Model Implementation Schedule	Hazard Prioritization	Activity Rating	Implementation Schedule (Year)	Funding	Cost Estimate	Responsible Entity
Severe Storms						
Use educational outreach (PSAs) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create "hotspot" database.	1	205	January-05	Assessment and Code Fees for the SWCD - TBD	TBD	Building Dept, Storm Water Conservation District (SWCD) & Engineers Office
Develop a memorandum of understanding between communities to plan for severe storm recovery.	1	209	March-05	TBD	TBD	Prosecutor, EMA Director & SWCD
Develop several condition levels for severe storm events. Endorse the existing operating conditions (1-5).	1	208	March-05	County Staff Hours Only	$2,000.00	DPSS / EMA
Flooding						
Widen distribution of video for school age children and develop one for adults. (all flooding)	2	213	March-05	Unidentified Grants	$1000.00 Est	DPSS / EMA
Establish a storm water master plan and storm water utility.	2	209	January-05	Fee Assessment	TBD	Building Dept, SWCD, Engineers Office & DPSS
Widen distribution of video for school age children and develop one for adults. (high hazard areas)	2	209	March-05	Unidentified Grants	$1000.00 Est	DPSS / EMA
Widen distribution of video for school age children and develop one for adults. (youth in high hazard areas) Seek funding to build water facilities in parks (include water safety).	2	209	March-05	Unidentified Grants	TBD	Building Dept, SWCD & DPSS / EMA
Evaluate locations for signage at repeated high water locations.	2	208	TBD	TBD	TBD	GIS & DPSS
Use educational outreach (PSAs) to teach residents the importance of ditch maintenance and piping. Coordinate outreach with SWCD. Create a "hotspot" database.	2	212	June-05	Unidentified Grants	$5,000.00	CAD, GIS, SWCD & Office of Public Information
Tornadoes						
Create innovative PSAs on the use of weather radios and seek funding to place weather radios in all critical facilities.	3	196	June-07	Unidentified Grants	$10,000.00	DPSS / EMA
Seek funding for a countywide inter-operable warning system.	3	199	June-09	TBD	In excess of $1,000,000	Office of Technology, Communications & Security
Seek funding to install multiuse shelters in parks. Work with mobile home parks to install tornado shelters.	3	192	Ongoing	Community Development Block Grant	TBD	State, County & Township Parks

Model Implementation Schedule	Hazard Prioritization	Activity Rating	Implementation Schedule (Year)	Funding	Cost Estimate	Responsible Entity
Landslides						
Work with the Planning Department to develop standards and regulations for development in landslide prone areas. (vegetation and hill cutting)	4	209	January-09	TBD	TBD	SWCD
Work with the Planning Department to develop standards and regulations for development in landslide prone areas. (federal and state agencies)	4	209	January-09	TBD	TBD	SWCD
Work with the Engineer's office to create a memorandum of understanding with other agencies.	4	210	January-08	TBD	TBD	DPSS / EMA & SWCD
Drought						
Coordinate with the Fire Service Alliance for outreach concerning droughts and wildfires.	5	173	June-06	TBD	TBD	DPSS / EMA & Fire Chief's Alliance
Develop a map of sensitive populations.	5	170	June-07	TBD	TBD	OSU Extension Office & GIS
Develop a PSA to define the use of dry hydrants (work with SWCD).	5	166	June-07	Unidentified Grants	$10,000.00	Local Fire Departments & OSU Extension Office of Soil & Water Conservation
Earthquake						
Develop a PSA concerning the effects of earthquakes in Clermont County; target school age children.	6	168	June-06	Unidentified Grants	Minimum of $5,000.00	Office of Public Information & DPSS / EMA

6.0. Plan Maintenance

The Clermont County Department of Public Safety / Emergency Management Agency, in conjunction with the Core Group, will review, and if necessary update, the **Countywide All Natural Hazard Mitigation Plan** on a yearly basis. The plan will be updated and resubmitted on a 5-year cycle. When a mitigation activity is conducted, the Plan will be utilized at that time and may be updated after the mitigation activity takes place. Major updates will be sent to the Ohio Emergency Management Agency and the Federal Emergency Management Agency Region V to ensure that the newly updated plans still meet the required Disaster Mitigation Plan standards.

The Clermont County **All Natural Hazards Mitigation Plan** will be evaluated on a yearly basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. Clermont County will also review the goals and action items to determine their relevance to changing situations in the County to ensure that they are addressing current and expected conditions. The County will also review the risk assessment portion of the Mitigation Plan to determine if this information should be updated or modified, given any new available data.

The Clermont County **All-Natural Hazard Mitigation Plan** will be incorporated into other existing planning documents, specifically the Emergency Operations Plan, and capital improvement plans where appropriate. The Clermont County Department of Planning and

Development will refer to the Plan wherever feasible within the existing documents that support mitigation and growth within the County. Each individual community will be responsible for integrating the Plan with any existing comprehensive plans or ordinances in that community. In addition, each community will be responsible for implementing their highest rated mitigation alternatives. A listing of each community's highest rated activity will be listed in an Appendix after the Plan has been approved.

The Core Group will be consulted to determine how the public will be involved in the maintenance of the plan. Information regarding plan updates may be provided on the County's web site, and press releases may also be issued to inform the public of the ongoing plan maintenance. The Core Group will also consider holding an annual public meeting to address the Plan and its continued maintenance.