

Part V: Mitigation

Definition of Mitigation

Mitigation is defined by FEMA as "...sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects." It describes the ongoing effort at the Federal, State, local, and individual levels to lessen the impact of disasters upon families, homes, communities, and economy.

Mitigation includes not only avoiding the development of vulnerable sections of the community, but also making existing development in hazard-prone areas safer. For example, a flood buyout is a step that can be taken to reduce vulnerability in identified hazard prone areas.

Growth can also be steered to less risky areas, through nonstructural measures such as avoiding construction in the most flood-prone areas. Keeping buildings and people out of harm's way is the essence of mitigation. Incorporating mitigation into decisions related to the community's growth can result in a safer, more resilient community, and one that is more attractive to new families and businesses.

Missouri is subject to many types of natural hazards: floods, tornadoes, winter storms, landslides, earthquakes, droughts, winter storms and occasionally, wildfires. Technological hazards such as chemical explosions, manmade explosions, hazardous material or HAZMAT spills, and terrorism, all of which can have significant economic and social impacts, are also possible. Some, such as floods and HAZMAT spills, can occur at many times of the year and almost anywhere in the state. Their occurrence in some places in Missouri is inevitable. However, due to time and funding limitations, this planning initiative focuses on natural hazards only.

Categories of Mitigation

Mitigation measures may be grouped into six categories, including:

- Prevention
- Property protection
- Natural resource protection
- Emergency services
- Structural projects
- Public information

Prevention Measures

Prevention measures are intended to keep a hazard risk from getting worse. They ensure that future development does not increase hazard losses. Communities can achieve

significant progress toward hazard resilience through prevention measures. This is particularly true in areas that have not been developed or where capital investment has not been substantial. Using prevention measures, future development can be guided away from hazards, while maintaining other community goals such as economic development and improving the quality of life. Some examples of prevention measures are:

- Planning and zoning
- Open space preservation
- Land development regulations
- Storm water management
- Erosion and sediment control regulations
- Engineered foundation standards

Property Protection Measures

Property protection measures are used to modify buildings subject to hazard risk, or their surroundings, rather than to prevent the hazard from occurring. A community may find these to be inexpensive measures because often they are implemented or cost-shared with property owners. These measures directly protect people and property at risk. Protecting a building does not have to affect the building's appearance and is therefore a popular measure for historic and cultural sites. Some examples of property protection measures are:

- Acquisition – public procurement and management of lands that are vulnerable to damage from hazards
- Relocation – permanent evacuation of hazard-prone areas through movement of existing hazard-prone development and population to safer areas
- Rebuilding – modifying structures to reduce damage by future hazard events
- Floodproofing – protecting a flood-prone building using one or more of several different methods
- Elevation of existing buildings above the flood height
- Installation of saferooms for protection against tornadoes and severe storms
- Installation of backup power generators in the event of power outages due to severe weather conditions

Natural Resource Protection Measures

Natural resource protection measures are intended to reduce the intensity of hazard effects as well as to improve the quality of the environment and wildlife habitats. Parks, recreation, conservation agencies or organizations usually implement these activities. Examples of natural resource protection include:

- Erosion and sediment control
- Wetlands protection

- Open space easements
- Acquisition of environmentally beneficial lands
- Hillside conservation
- Stream bank restoration
- Riparian zone protection
- Urban forestry and horticulture programs
- Watershed protection programs

Emergency Services Measures

Emergency services measures protect people before and after a hazard event. Most counties and many cities have emergency management offices to coordinate warning, response, and recovery during a disaster. Emergency services include:

- Warning
- Critical facilities protection
- Health and safety maintenance
- Distribution of weather alert radios to homes and businesses
- Emergency response and recovery support
- Community storm shelters
- Disaster relief centers
- Emergency housing shelters

Structural Mitigation Measures

Structural measures directly protect people and property at risk. They are called “structural” because they involve construction of man-made structures to control hazards. Structural projects for flood control may include:

- Storm sewers
- Drainage channel modifications
- Diversions
- Levees, floodwalls and seawalls

Public Information Mitigation Measures

Public information activities inform and remind people about hazardous areas or hazardous conditions and the measures necessary to avoid potential damage and injury. Public information activities for mitigation are directed toward property owners, potential property owners, business owners and visitors. Examples of public information activities to achieve mitigation are:

- Providing hazard maps and other hazard information on a request basis
- Outreach programs that provide hazard and mitigation information to people when they have not asked for it

Disseminating information to the public might be accomplished through:

- Print media
- Radio/TV spots and interviews
- Videotape
- Mass mailings
- Notices to residents and property owners in a specific, hazard-prone area
- Displays in widely used facilities such as public buildings and retail businesses
- Property owners handbook
- Presentations at meetings of neighborhood groups
- Real estate disclosure
- Information in the public library or a library developed specifically for mitigation information
- Technical assistance programs
- School age and adult education locations

How Mitigation Differs from Preparedness, Response, and Recovery

Emergency management is divided into four phases, with each phase involving different types of organization, preparation, and activities. These four phases include: preparedness, response, recovery, and mitigation.

Preparedness focuses on building emergency response and management capabilities before a disaster occurs in order to respond to and recover when a disaster event occurs. Preparedness activities include programs for training emergency response personnel, exercising plans, and conducting public outreach programs. Preparedness also includes activities such as developing and maintaining warning systems, maintaining communications networks, and establishing procedures for mobilizing response personnel.

Response refers to the actions taken immediately before, during and after a disaster event to save lives, minimize property damage and aid in the recovery process. Response activities typically involve public warning, evacuation and sheltering, search and rescue, emergency medical care, and securing property. Other types of response activities depend on the type of disaster and may include activities such as supplying emergency water and power, removing debris from roads, attending to the needs of people with disabilities or special health concerns, closing roads, or fire fighting.

Recovery involves short term post disaster activities to restore vital services and longer term activities to return the community to normal or pre-disaster status. The first step of recovery is assessment of damages to determine needs and priorities. Typical recovery activities include debris removal, coordinating volunteers and donations of goods, delivering disaster aid to individuals and families, restoring vital community services, and repairing and reconstructing buildings and public infrastructure. Recovery can take

from a few days to years, depending on the magnitude of the disaster and the resources available to address the community's needs.

Mitigation is the cornerstone of emergency management. Mitigation differs from preparedness, response and recovery in that it is an ongoing effort focused on activities and policies that will reduce or eliminate the community's vulnerability to damage from future hazard events. Mitigation measures generally are those that can be put in place before a disaster occurs and builds resilience.

Mitigation Plan Benefits

Planning provides many benefits to a community. The planning process enables communities to identify strengths, weaknesses, opportunities, and threats which may affect quality of life and the desired direction of the community. Planning further enables communities to establish goals and a framework for actions that can be undertaken to preserve, protect, and enhance the resources that contribute to quality of life and long-term economic prosperity. The hazard mitigation planning process likewise offers opportunities and benefits to communities to safeguard its natural and built environment, protect public and private sector investments in the community, and reinforce economic viability and community livability. Hazard mitigation planning can:

- Reduce injury, death and property losses
- Identify specific problems and appropriate solutions
- Achieve multiple objectives in a sustainable manner
- Reduce future risks
- Prioritize post-disaster projects
- Enhance funding opportunities through federal, state, and local programs
- Promote public participation and ownership of solutions

Goals, Objectives and Mitigation Actions

Development Process

The development of the goals, objectives and actions for the *Christian County Multi-Jurisdictional Natural Hazards Mitigation Plan* update began with a review of the previous set of goals, objectives and action statements from the original 2005 *Christian County Natural Hazards Mitigation Plan*. This was undertaken at a countywide workshop-style meeting that was advertised to engage community representatives and the public on March 11, 2010. To begin the process, a consensus was reached regarding the deferment or continuation of the three broad goals and objective statements from the previous plan as they still remained relevant and adequate to structure and categorize the more specific actions. Meeting participants were provided with a "menu" of sample actions developed by the Emergency Management Director as well as actions pulled from plans of surrounding jurisdictions to consider for inclusion based on the needs and preferences of those in attendance. The meeting participants then addressed the specific needs of Christian County and suggested actions or strategies to address each of the

natural hazards that could affect local jurisdictions within county. At this point, each action from the previous plan was evaluated and agreement was reached as to whether remove, revise, continue or insert a better alternative from the actions menu.

Actions Eliminated

Ultimately, six actions from the previous plan were deleted from the updated set of action statements. These actions are listed below in Table 5-1 and were removed either because an acceptable benchmark had been reached, a lack of political support existed, or cost or a clearer alternative was identified.

Table 5-1: Actions Removed from the Christian County Natural Hazard Mitigation Plan		
Objective	Action	Reason for Removal
1.1	Encourage citizens to retrofit their homes and become more energy efficient	Governmental incentives in place, lacked a clear nexus to mitigation
1.2	Install additional radio controlled storm warning sirens in areas of population concentration	Not cost effective
1.3	Designate “safe places” in public buildings	Clearer alternative identified
1.3	Retrofit or add shelters to existing essential facilities that offer inadequate protection	Not cost effective
1.3	Install storm shelters to existing mobile home parks	Lack of political support, legally questionable
2.2	Develop ordinances that require buffers, stringent erosion control enforcement and prohibition of enclosing creeks	Ordinances in place are satisfactory
3.2	Encourage mitigation activities consistent with promoting sustainable ecological management and community stability	Too broad, planning committee decided this was not an actionable item

Many actions were left unchanged (i.e. deferred) because there was no finite benchmark and it was determined that there was favorable benefit for continuing efforts towards them. Some actions were simply reworded and revised to add clarity and specificity to what was to be accomplished. Finally, new actions were identified to meet the needs and values of jurisdictions and the people of Christian County. Progress made towards deferred actions is summarized in Table 5-2.

Objective	Action	Progress Made
1.1	Continue to develop and provide education/training programs on hazard mitigation and reducing risk for citizens, public agencies, property owners and businesses.	Information and training activities implemented through Citizen Corps, CERT and VIPS as well as Planning and Zoning Depts.
1.2	Maintain programs enabling the distribution of low-cost NOAA all-hazard radios for continuous operation in homes, businesses and all facilities for public accommodation.	The school districts all use NOAA radios and other facilities have been provided with radios. Radios available at low cost through Wal-Mart and Project Community Alert sales program.
1.2	Add warnings and markers at all low water crossings in the county.	Many have been installed. Additional installation at all others remains a priority of the road depts.
1.2	Develop safe rooms in areas of population concentration.	Safe rooms installed in Ozark and OTC. Nixa and Clever schools have initiated development.
2.1	Purchase emergency generators for critical water and sewer system facilities.	Generators purchased in Nixa and Clever.
2.1	Install culverts to eliminate water flow restrictions.	Culverts have been installed throughout the County. Progress is ongoing where feasible. All have been mapped.
2.2	Encourage the adoption of the most current edition of a model building code to better address structural and architectural issues related to high wind events.	Christian County adopted new building codes with wind resistance requirements as have Ozark, Nixa and Fremont Hills.
3.1	Encourage collaborative planning and compatible regulatory controls between the county and incorporated communities to promote infrastructure development practices that reduce the potential for flooding and property damage.	Christian County maintains intergovernmental agreements with counties throughout Region D as well as Fremont Hills, Billings and Saddlebrook. Urban service areas established in Nixa and Ozark.
1.4	Communities that are members of the NFIP will maintain requirements for continued NFIP participation and work to reduce repetitive flood losses.	All jurisdictions have joined and maintain participation in NFIP except Billings and Sparta
2.1	Encourage development of acquisition and management strategies to preserve open space for flood mitigation and water quality in the floodplain.	Christian County and Ozark have participated in flood buyouts. The City of Ozark has adopted open space dedication measures.
2.2	Enhance data and mapping for floodplain information and flood-prone areas outside of designated floodplains.	Emergency Management Director in process of mapping and classifying low water crossings and frequently flooded areas outside the floodplain.
3.2	Upgrade low water crossings	Several have been completed and others are scheduled for this year and beyond

The revised set of action statements was then distributed to the Plan Review and Advisory Committee for comment over the interim period until the next scheduled meeting. All actions are identified as continuing, revised or new in five year action matrix in Table 5-6.

STAPLEE Cost-Benefit Review and Prioritization

A second countywide workshop-style meeting that was advertised to engage community representatives and the public was held on March 30, 2010. The purpose of this meeting was to apply a prioritization method to the updated actions that was clear and logical and emphasized evaluating actions in terms of costs and benefits. A quantitative method for prioritizing mitigation actions from *How-To Guide (FEMA 386-5): Using Benefit-Cost Review in Mitigation Planning* using the STAPLEE criteria and simple scores was agreed upon by the plan review and advisory committee well in advance of this meeting. The definition of each letter in the STAPLEE acronym, derived from *How-To Guide (FEMA 386-3): Developing the Mitigation Plan*, was distributed to meeting attendees and discussed prior to the scoring process. These definitions are presented in Table 5-3.

Abbreviation	Criteria	Definition of the Criteria
S	Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T	Technical	Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
A	Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding
P	Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.
L	Legal	It is crucial that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E	Economical	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective and possible to fund.
E	Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

The meeting attendees were supplied a score sheet that listed all of the revised actions. The format of the score sheet allowed the attendees to consider whether each of the actions represented an overall cost or benefit in terms of each of the STAPLEE criteria. The attendees applied a rating scale from 2 to -2 depending on their perceived degree of the cost of the action or its benefit. A truncated version of the score sheet with a definition of the rating scale is presented in Table 5-4.

Table 5-4: Prioritization Using STAPLEE and Simple Scores						
Actions	Identify water drainage obstructions and make improvements to lessen flooding potential.		Add warnings and markers at all low water crossings in the county.		Make the location of best identified available refuge areas (these do not comply with FEMA Publication 361 for Safe Rooms) available to the public	
Criteria	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social						
Technical						
Administrative						
Political						
Legal						
Economic						
Environmental						
Sub-total of cost/benefit						
Total Score						
Priority						

Definition of rating scale:

2 =Very beneficial, 1 =Favorable, 0 =None/Not applicable, -1 =Not Favorable, -2 =Impractical

After this meeting the total scores for each action for all individual score sheets were compiled and standardized relative to the maximum and minimum values assigned by that individual. This method would produce a ranking of all actions relative to one another and convert all score sheets to a common scale. The standardized values were then summed and divided by the number of individuals that weighed the cost and benefits of that particular action creating an average priority score for all actions relative to every other action. The average priority scores for all actions were collapsed into three classes of high, medium and low.

The quantified STAPLEE priority ranks were then subjected to a qualitative common sense review at the final plan review and advisory committee meeting advertised as open to the public on April 27, 2010. At this meeting attendees were presented with the list of actions according to their priority rank in conjunction with the hazard identification and

analysis by jurisdiction and asked once again to consider the STAPLEE criteria and weigh the cost and benefit of the actions presented. Some ranks were then elevated to either high or medium based on the hazard addressed and a reevaluation of the costs and benefits. A few actions were lowered.

This method for prioritizing and reviewing the revised actions sought to place a strong emphasis on evaluating their costs and benefits in relation to one another. Consideration was given to using one of the review tools described in *How-To Guide (FEMA 386-5): Using Benefit-Cost Review in Mitigation Planning* in conjunction with the prioritization method. However, it was determined that conducting a review would require information and time that were not available. The STAPLEE and simple scores method was selected because of its clear emphasis on a cost-benefit review and strength in establishing a baseline for a more qualitative review. A complete list of the revised actions with STAPLEE score and information as to whether it is intended to address existing or new structures is presented in Table 5-5.

Table 5-5: Goals, Objectives and Actions		
Action	STAPLEE Score	Type of Structure Addressed
Goal 1: Protect the lives and livelihoods of all citizens.		
<i>Objective 1.1: Promote education, outreach, research and development programs to improve public awareness of natural hazards and hazard mitigation alternatives than can reduce vulnerabilities.</i>		
Encourage the newspapers to publish information on hazards and ways to reduce vulnerabilities.	69.4 High	N/A
Continue to develop and provide education/training programs on hazard mitigation and reducing risk for citizens, public agencies, property owners and businesses.	65.6 High	Existing
Promote and maintain citizen preparedness activities; such as, Citizen Corps, CERT, VIPS, Neighborhood Watch, Fire Corps, Amateur Radio, etc.	71.5 High	N/A
Develop information programs on flood hazards and encourage citizens to consider flood risk in decision-making on future development.	56.3 Medium	New
Continue to provide public education programs in the schools on natural hazards.	57.3 Medium	N/A
Develop “tips” brochures for property owners to identify potential signs of sinkhole formation like closed depressions developing on their property and promote appropriate mitigation measures.	48.6 Low	Existing
Develop and disseminate information relating to wildfire hazard areas to educate builders and homeowners about mitigation activities and to help guide emergency response services.	69.6 High	New & Existing

Table 5-5: Goals, Objectives and Actions		
Action	STAPLEE Score	Type of Structure Addressed
<i>Objective 1.2: Provide adequate warning and communications systems to alert the public to severe weather events.</i>		
Expand and improve the County's Emergency Communications Network by keeping the reverse 911 database and maps up to date and implementing and maintaining alert messaging technologies, such as; IRIS or others as they become available to alert civil employees and the public of natural hazard events.	68.8 High	N/A
Add warnings and markers at all low water crossings in the county.	46.5 Low	Existing
Maintain programs enabling the distribution of low-cost NOAA all-hazard radios for continuous operation in homes, businesses and all facilities for public accommodation.	38.0 Low	N/A
Install river height and weather gauges for warning and tracking	59.5 Medium	N/A
<i>Objective 1.3: Provide for safe refuge during weather extremes.</i>		
Create and update tornado/severe storm plans and identify refuge areas (these do not comply with FEMA Publication 361 Safe Rooms) in essential facilities and other establishments serving the public.	50.5 Low	Existing
Incorporate safe rooms in the construction of new essential facilities.	43.7 Low	New
Develop safe rooms in areas of population concentration.	53.9 Medium	New
Require all new mobile home park developments to provide for an approved safe room in the development. Encourage community organizations to develop a program to distribute fans and other donations to vulnerable populations during weather extremes.	55.7 Medium	New
Goal 2: Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.		
<i>Objective 2.1: Apply engineered structural modifications to natural systems and public infrastructure to reduce the potentially damaging impacts of hazards, where feasible, cost effective, and environmentally suitable.</i>		
Ensure that wastewater treatment plants will function during flood events.	57.7 Medium	New & Existing

Table 5-5: Goals, Objectives and Actions		
Action	STAPLEE Score	Type of Structure Addressed
Purchase emergency generators for critical water and sewer system facilities.	66.8 High	N/A
Promote and encourage existing facilities that house vulnerable populations to install transfer switches to their electrical systems to provide for the use of generators during power outages.	54.3 Medium	Existing
Improve low water crossings and bridges.	59.5 Medium	Existing
Identify water drainage obstructions and make improvements to lessen flooding potential.	48.5 Low	N/A
Install culverts to eliminate water flow restrictions.	53.3 Medium	N/A
<i>Objective 2.2: Ensure that future development in the county is as “hazard proof” as possible.</i>		
Encourage electrical utilities to use underground construction methods where possible.	62.3 High	New
Ensure that new dams are constructed in compliance with the national dam safety hazard reduction initiative.	36.4 Low	New
Require new facilities that house vulnerable populations be constructed with transfer switches in their electrical systems to provide for generators during power outages.	61.8 High	New
Promote the use of fire-resistant construction materials and building practices.	60.6 Medium	New
Encourage property owners to take measures to reduce flooding of homes and businesses.	65.4 High	Existing
Encourage the adoption of building codes in incorporated areas that currently do not have such regulations.	58 Medium	New
Encourage the adoption of the most current edition of a model building code to better address structural and architectural issues related to high wind events.	48.2 Low	New
Goal 3: Ensure and enhance continued operation of government and emergency functions in a disaster.		
<i>Objective 3.1: Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.</i>		
Identify, review and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts.	58.0 Medium	N/A
Encourage all agencies to adopt and sign mutual aid agreements.	81.4 High	N/A

Table 5-5: Goals, Objectives and Actions		
Action	STAPLEE Score	Type of Structure Addressed
Increase communication, coordination, and collaboration between wildland urban interface property owners, firefighters and officials to address risk, existing mitigation measures, and federal assistance programs.	42.7 Low	Existing
Develop public and private partnerships to implement mitigation actions.	52.9 Low	N/A
Encourage collaborative planning and compatible regulatory controls between the county and incorporated communities to promote infrastructure development practices that reduce the potential for flooding and property damage.	73.0 High	New
<i>Objective 3.2: Design, enhance, or amend policies that will work to limit the adverse impacts of natural hazard events.</i>		
Integrate the goals and actions from the Natural Hazard Mitigation Plan into existing regulatory documents and programs where appropriate.	65.5 High	N/A
The NFIP communities of Christian County, Clever, Fremont Hills, Highlandville, Nixa and Ozark will enforce floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SPFAs).	68.8 High	New & Existing
Communities that do not participate will be encouraged to apply for participation in the NFIP and adopt and enforce floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SPFAs).	57.4 Medium	New & Existing
Encourage the adoption of measures to control runoff from developing areas outside the floodplain where ordinances have not been enacted.	64.3 High	N/A
Recommend revisions to requirements for development within the floodplain, where appropriate via zoning ordinances, subdivision regulations, etc.	42.0 Low	N/A
Encourage development of acquisition and management strategies to preserve open space for flood mitigation and water quality in the floodplain.	53.9 Medium	Existing
Adopt and amend comprehensive floodplain management regulations that jurisdictions determine are necessary for planning and appropriate to protect public health and safety.	48.6 Low	N/A
Implement burn restrictions during time of weather conditions conducive to wildfire spread.	57.5 Medium	N/A

Table 5-5: Goals, Objectives and Actions		
Action	STAPLEE Score	Type of Structure Addressed
<i>Objective 3.3: Improve the efficiency, timing, and effectiveness of response and recovery efforts for natural hazard disasters.</i>		
Strengthen emergency services preparedness and response by linking emergency services with hazard mitigation programs and enhancing public education.	46.0 Low	N/A
Review and update as necessary emergency procedures in the event of any type of manmade or natural hazard.	53.0 Low	N/A
Enhance strategies for debris management from winter storms, such as; designating post-disaster debris disposal sites.	53.2 Low	N/A
Improve the CRS rating for the county.	36.0 Low	N/A
Retain the County's Storm Ready status with the National Weather Service.	62.0 High	N/A
<i>Objective 3.4: Increase capabilities to mitigate the effects of a natural hazard in the county.</i>		
Enhance data and mapping for floodplain information and flood-prone areas outside of designated floodplains.	53.5 Medium	N/A
Continue development of Geographic Information Systems (GIS) and mapping to further identify and assess vulnerabilities to hazards.	67.2 High	N/A
Identify condition of dams whose failure could be reasonably expected to endanger human life, the maximum area that could be flooded if the dam failed, and public facilities that would be affected by the flooding.	64.4 High	Existing
Continue to inventory alternative firefighting water sources and encourage the development of additional services.	53.3 Low	N/A
Identify and pursue funding opportunities to develop and implement local and county mitigation activities.	60.2 Medium	N/A

Mitigation Program/Strategy Development

The development and implementation of the goals, objectives and mitigation actions involves the county, individual communities, emergency management and services, and other public and private sector organizations and entities. A mitigation planning committee comprised of members of these groups and other stakeholders will be established to plan for and implement the activities and projects necessary to accomplish the goals and objectives identified during the planning process.

To help maintain a focus on the greater goal of the overall community well-being and to help ensure implementation, underlying operating principles such as those listed below should be utilized. These principles will improve fiscal and operational efficiency as well. Recommended actions should be implemented according to the following principles:

- Promote and encourage collaboration between disparate agencies and departments to create a synergism that results in benefits that would not be possible through a single agency
- Employ sustainable principles and techniques in the implementation of each objective to attain maximum benefits
- Incorporate mitigation objectives into existing and future plans, regulations, programs and projects
- Create and implement a prioritization process that includes monetary, environmental, and sociological considerations
- Determine cost-effectiveness of mitigation programs on a case-by-case basis, depending upon the scope of damages, the estimated savings in future hazard events, the type of mitigation project, and the probable hazard to human life in future events. For example, FEMA-funded mitigation projects must meet the benefit/cost analysis criteria required by FEMA

It is recommended that the *Christian County Multi-Jurisdictional Natural Hazards Mitigation Plan* be implemented by the County Commission, through the Emergency Management Director and its delegates, and the incorporated communities and school districts participating in the plan. The implementation process will include coordination among county departments, coordination with other relevant agencies or districts throughout the county, and the municipalities. The Emergency Management Director should set up a system to monitor progress and evaluate the effectiveness of implemented actions with revisions as needed. Every five years, the county and municipalities should review the plan and include any needed updates. The updated plan must be submitted for SEMA/FEMA approval. In addition, the plan shall be reviewed for any necessary updates following any major disasters that occur within the county.

With the exception of normal responsibilities of local government agents, this is a voluntary participation that in no way states nor implies the acceptance of any liability for the success or failure of the program, activities, events or projects undertaken to complete the program or any portions thereof.

Local government acceptance and approval through government resolution of the details of this mitigation program document in no way obligates the local government to actually carry out its provisions. Each individual action contained in this document that incurs a cost and/or liability must still be approved by separate governmental actions

commensurate with the normal governmental proceedings for approving such actions, in accordance with local ordinances, laws and regulations.

Analysis and Prioritization of Mitigation Actions

The mitigation actions outlined in the *Christian County Multi-Jurisdictional Natural Hazards Mitigation Plan* promote and/or support the development of local hazard mitigation plans, projects and activities. Examples include programs to increase public awareness of hazards and ways to reduce risks, encouraging local building codes, adoption or amendment of zoning, subdivision and storm water regulations to reduce or eliminate the potential for damages to future development, enhancing advanced warning systems, and increasing emergency preparedness and response capabilities.

The following Five-Year Action Matrix (see Table 5-6) provides an analysis and prioritization of the goals, objectives and mitigation actions contained in this plan. The matrix also places each action into one of the six categories of mitigation, identifies the hazards addressed by the mitigation action, the potential sources of funding, the lead agency for implementation, and a method of assessing implementation or accomplishments.

Because certain hazards can impact incorporated areas more than the county as a whole, the matrix indicates the incorporated communities or other public institutions that could be affected or which may be responsible for a mitigation action. The codes used in the matrix for each incorporated area are shown below.

- CC = Christian County
- CL = Clever
- FH = Fremont Hills
- HI = Highlandville
- NX = Nixa
- OZ = Ozark
- SP = Sparta
- OTC = OTC-Richwood Valley Campus
- BLPS = Billings R-IV School District
- CHPS = Chadwick R-I School District
- CLPS = Clever R-V School District
- NXPS = Nixa R-II School District
- OZPS = Ozark R-VI School District
- SPS = Spokane R-VII School District
- AG = All Governments
- AS = All School Districts

Table 5-6: Christian County Five-Year Action Matrix																	
Community	Action	Type of Strategy	New, Revision, Ongoing	Priority Rank and Estimated Target Date	Probable Lead Organizer	Potential Funding Sources	Evaluation	Natural Hazards									
								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
Goal 1: Protect the lives and livelihoods of all citizens.																	
Objective 1.1: Promote education, outreach, research and development programs to improve public awareness of natural hazards and hazard mitigation alternatives than can reduce vulnerabilities.																	
AG	Encourage the newspapers to publish information on hazards and ways to reduce vulnerabilities.	Public Information	Ongoing	High 2010 & continuing	County EMA Cities	Internal funds	Information published seasonally	x	x	x	x	x	x	x	x	x	x
AG AS	Continue to develop and provide education/training programs on hazard mitigation and reducing risk for citizens, public agencies, property owners and businesses.	Public Information	Revised	High Annual	County EMA Cities School Districts	Govt. Programs, Internal funds	Educational programs reviewed and updated and presented.	x	x	x	x	x	x	x	x	x	x
AG	Promote and maintain citizen preparedness activities; such as, Citizen Corps, CERT, VIPS, Neighborhood Watch, Fire Corps, Amateur Radio, etc.	Public Information, Emergency Services	New	High 2010 & continuing	County EMA Cities	Govt. Programs, Internal funds	Activities promoted and supported. Training programs maintained.	x	x	x	x	x	x	x	x	x	

Table 5-6: Christian County Five-Year Action Matrix																	
Community	Action	Type of Strategy	New, Revision, Ongoing	Priority Rank and Estimated Target Date	Probable Lead Organizer	Potential Funding Sources	Evaluation	Natural Hazards									
								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Develop information programs on flood hazards and encourage citizens to consider flood risk in decision-making on future development.	Public Information, Property Protection Measures	Ongoing	Medium 2012-2013	County EMA Cities	Internal funds	Information distributed annually				x						
AS	Continue to provide public education programs in the schools on natural hazards.	Public Information	Revised	Medium continuing	School Districts	Internal funds	Quarterly program in the schools updated and maintained	x	x	x	x	x	x	x	x	x	x
AG	Develop “tips” brochures for property owners to identify potential signs of sinkhole formation like closed depressions developing on their property and promote appropriate mitigation measures.	Public Information, Natural Resource Protection Measures	New	Medium 2012-2013	County EMA Cities	Internal funds	Tips brochures developed and distributed.										x

Table 5-6: Christian County Five-Year Action Matrix																	
								Natural Hazards									
Community	Action	Type of Strategy	New, Revision, Ongoing	Priority Rank and Estimated Target Date	Probable Lead Organizer	Potential Funding Sources	Evaluation	Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
CC HI	Develop and disseminate information relating to wildfire hazard areas to educate builders and homeowners about mitigation activities and to help guide emergency response services.	Public Information, Emergency Services, Prevention Measures	Revised	Medium 2012 & Continuing	County EMA Fire Districts City of Highlandville	Internal funds	Information to developers and homeowners in wildfire hazard areas distributed									x	
Objective 1.2: Provide adequate warning systems.																	
AG AS	Expand and improve the County's Emergency Communications Network by keeping the reverse 911 database and maps up to date and implementing and maintaining alert messaging technologies, such as; IRIS or others as they become available to alert civil employees and the public of natural hazard events.	Emergency Services	New	High 2010 & Continuing	County EMA, Cities, School Districts	Govt. Programs, Internal funds	Reverse 911 database and maps updated. Messaging alert technologies researched, identified and evaluated for implementation	x	x	x	x			x	x	x	

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Community	Action	Type of Strategy	New, Revision, Ongoing	Priority Rank and Estimated Target Date	Probable Lead Organizer	Potential Funding Sources	Evaluation	Natural Hazards									
								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
CC OZ NX	Add warning markers at all low water crossings in the county.	Emergency Services	Revised,	Low Continuing 2010 - 2015	County Commission, Road Districts, Ozark & Nixa Public Works	Internal funds	Low water markers installed at all low water crossings			x							
AG AS OTC	Maintain programs enabling the distribution of low-cost NOAA all-hazard radios for continuous operation in homes, businesses and all facilities for public accommodation.	Emergency Services	Revised	High 2010 & Continuing	County EMA Cities School Districts Colleges	Private funds, Internal funds	NOAA weather radios located in all public facilities; programs promoting purchase of radios maintained	x		x	x	x	x	x	x	x	x
CC	Install river height and weather gauges for warning and tracking	Emergency Services	New	Medium 2012-2015	County EMA	Govt. programs Internal funds	River height and weather gauges installed.			x							
Objective1.3: Provide for safe shelter during weather extremes.																	
AG AS OTC	Create and update tornado/severe storm plans and identify refuge areas (these do not comply with FEMA Publication 361 Safe Rooms) in essential facilities and other establishments serving the public.	Public Information, Emergency Services	Revised	High 2011-2013	County EMA Cities	Internal funds	"Safe Refuge Area" list established	x	x								

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Community	Action	Type of Strategy	New, Revision, Ongoing	Priority Rank and Estimated Target Date	Probable Lead Organizer	Potential Funding Sources	Evaluation	Natural Hazards									
								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
CLPS NXPS	Incorporate safe rooms in the construction of new essential facilities.	Emergency Services, Property Protection Measures	Ongoing	High 2011	Clever R-V & Nixa R-II School Districts	Gov't Programs, Internal funds	Safe rooms installed in Nixa & Clever new school facilities	x				x			x		
AG BLPS CHPS OZPS SKPS	Develop safe rooms in areas of population concentration.	Emergency Services, Property Protection Measures	Ongoing	Medium & Continuing 2011-2015	County EMA Cities School Districts	Govt. programs Internal funds	Number of safe rooms increased in areas of population concentration	x				x			x		
AG	Require all new mobile home park developments to provide for an approved safe room in the development.	Emergency Services, Prevention Measures, Property Protection Measures	Ongoing	Medium 2012 & continuing	County Cities	Govt. programs Internal funds	Incorporated into local govt. policies	x				x			x		
AG	Encourage community organizations to develop a program to distribute fans and other donations to vulnerable populations during weather extremes.	Emergency Services	Ongoing	Medium 2010 & Continuing	Public Service Orgs.	Private funding	Programs developed and annual report on persons served					x			x		

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
Goal 2: Reduce the impact of natural disasters on properties, infrastructure, and the local economy.																	
Objective 2.1: Apply engineered structural modifications to natural systems and public infrastructure to reduce the potentially damaging impacts of hazards, where feasible, cost effective, and environmentally suitable.																	
AG	Ensure that wastewater treatment plants will function during flood events.	Property Protection, Structural Projects	Ongoing	Medium 2007 & continuing	Cities	Govt. programs Internal funds Private funds	Wastewater treatment plants upgraded where necessary			x							
CC FH SP HL	Purchase emergency generators for critical water and sewer system facilities.	Property Protection	Ongoing	High 2011-2012	County EMA Cities	Govt. Programs Internal Funds	Backup generators installed	x	x	x	x		x	x			
CC OZ NX	Promote and encourage existing facilities that house vulnerable populations to install transfer switches to their electrical systems to provide for the use of generators during power outages	Property Protection, Emergency Services	New	Medium 2012-2013	Private Residential Care and Skilled Nursing Facilities	Private funds	Transfer switches installed to provide for generator use	x	x		x		x	x			
CC NX OZ	Improve low water crossings and bridges.	Natural Resource Protection, Structural Measures	Ongoing	Medium 2010 & continuing	County Commission, Road Districts	Govt. programs Internal funds	Low water crossings and bridges improved			x							

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Identify water drainage obstructions and make improvements to lessen flooding potential.	Natural Resource Protection, Prevention Measures	Ongoing	Low 2010 & Continuing	County Cities	Govt. programs Internal funds	Drainage obstructions removed				x						
A	Install culverts to eliminate water flow restrictions.	Natural Resource Protection	Ongoing	Low 2010 & continuing	County Cities	Internal funds Private funds	Culverts installed Flood reports				x						
Objective 2.2: Ensure that future development in the county is as “hazard proof” as possible.																	
AG	Encourage electrical utilities to use underground construction methods where possible.	Prevention Measures, Emergency Services	Ongoing	High 2010 & continuing	Utility Companies	Private funds	Underground utilities installed in new developments	x	x			x					
CC	Ensure that new dams are constructed in compliance with the national dam safety hazard reduction initiative.	Prevention Measures, Structural Mitigation Measures	Ongoing	Low 2010 & continuing	Zoning Administrator	Private funds	Amendments to land development codes									x	
AG	Require new facilities that house vulnerable populations be constructed with transfer switches in their electrical systems to provide for generators during power outages.	Property Protection, Emergency Services, Prevention Measures	New	High 2011-2012	County Cities	Internal funds Private funds	Added to building regulations	x	x			x		x	x		

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Promote use of fire-resistant construction materials and building practices.	Public Information, Property Protection	Revised	Medium 2010 & continuing	County/City Zoning Administrator	Internal funds Private funds	Added to building regulations										x
AG	Encourage property owners to take measures to reduce flooding of homes and businesses.	Property Protection	New	High 2010 & continuing	County EMA Cities	Internal funds Private funds	Flood damage reports			x							
SP	Encourage the adoption of building codes in incorporated areas that currently do not have such regulations.	Prevention Measures	Ongoing	High 2011-2012	Cities	Internal funds	Building codes adopted	x	x		x			x		x	
CL SP HI	Encourage the adoption of the most current edition of a model building code to better address structural and architectural issues related to high wind events.	Prevention Measures	Revised	Medium 2012-2013	County Cities	Internal funds	Building codes adopted and or amended	x									

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
Goal 3: Ensure and enhance continued operation of government and emergency functions in a disaster.																	
Objective 3.1: Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.																	
AG AS OTC	Identify, review and implement mechanisms to foster collaboration among jurisdictions, agencies, and special districts.	Emergency Services, Prevention Measures	Ongoing	Medium 2010 & Ongoing	County EMA Cities School Districts Fire Districts Road Districts	Internal funds	Increase in agreements	x	x	x	x	x	x	x	x	x	x
AG	Encourage all agencies to adopt and sign mutual aid agreements	Natural Resource Protection, Emergency Services	New	High 2011	County Cities	Internal funds	Increase in partnerships	x	x	x	x	x	x	x	x	x	x
CC NX OZ HI	Increase communication, coordination, and collaboration between wildland urban interface property owners, firefighters and officials to address risk, existing mitigation measures, and federal assistance programs.	Prevention Measures, Natural Resource Protection	Ongoing	Low 2013-2014	County EMA Cities Fire Depts.	Internal funds	Education program attendance, Information distributed to development community									x	
AG	Develop public and private partnerships to implement mitigation actions.	Property Protection, Natural Resource Protection	Ongoing	Low & Ongoing 2010-2015	County EMA Cities	Internal funds Private funds	Partnerships increased	x	x	x	x	x	x	x	x	x	x

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Encourage collaborative planning and compatible regulatory controls between the county and incorporated communities to promote infrastructure development practices that reduce the potential for flooding and property damage.	Prevention, Property Protection, Natural Resource Protection	Ongoing	High 2010 & Continuing	County/City Zoning Administrator	Internal funds	Increase in cooperative agreements and development practices incorporated into zoning and/or building codes			x							
Objective 3.2: Design, enhance, or amend policies that will work to limit the adverse impacts of natural hazard events.																	
AG AS OTC	Integrate the goals and actions from the Natural Hazard Mitigation Action Plan into existing regulatory documents and programs where appropriate.	Prevention Measures	Ongoing	High 2011 & continuing	County Cities School Districts OTC	Internal funds	Existing plans, regulations and policies amended or updated to include mitigation	x	x	x	x	x	x	x	x	x	x

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
CC CL HI FH NX OZ	The NFIP communities of Christian County, Clever, Fremont Hills, Highlandville, Nixa and Ozark will enforce floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SPFAs).	Prevention, Property Protection	Revised	High 2010 & continuing	County Cities	Internal funds	NFIP conformance maintained; reports on repetitive flood losses			x							
SP	Communities that do not participate will be encouraged to apply for participation in the NFIP and enforce floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SPFAs).	Prevention, Property Protection, Natural Resource Protection	New	Medium 2013-2014	County Cities	Internal funds	NFIP participation applied for and maintained; floodplain identification and mapping, reports on repetitive flood losses			x							

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Encourage the adoption of measures to control runoff from developing areas outside the floodplain where ordinances have not been enacted.	Prevention, Structural Mitigation	Revised	High 2011-2013	City/County Zoning Administrator	Internal funds	Zoning and subdivision regulations amended or adopted			x							
AG	Recommend revisions to requirements for development within the floodplain, where appropriate via zoning ordinances, subdivision regulations, etc.	Natural Resource Protection, Prevention, Property Protection	Ongoing	Medium 2012-2013	County Floodplain Manager; City/County Zoning Administrator	Internal funds	Zoning and subdivision regulations amended or adopted			x							
AG	Encourage development of acquisition and management strategies to preserve open space for flood mitigation and water quality in the floodplain.	Property Protection, Natural Resource Protection	Ongoing	Low 2014-2015	County Cities	Govt. Programs Internal funds	Programs established			x							

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Adopt and amend comprehensive floodplain management regulations that the jurisdiction determines are necessary for planning and appropriate to protect public health and safety.	Prevention	Ongoing	Low 2014-2015	County Floodplain Manager Cities	Internal funds	Evacuation plans developed and floodplain management ordinances amended as needed			x							
AG	Implement burn restrictions during time of weather conditions conducive to wildfire spread.	Prevention	Revised	Medium 2012-2013	County Cities Fire Protection Districts	Internal funds	Policies established or updated									x	
Objective 3.3: Improve the efficiency, timing, and effectiveness of response and recovery efforts for natural hazard disasters.																	
AG	Strengthen emergency services preparedness and response by linking emergency services with hazard mitigation programs and enhancing public education.	Public Information, Emergency Services	Ongoing	Low 2010 & Continuing	County EMA Cities	Internal funds	Emergency services reviewed and linked where appropriate	x	x	x	x	x	x	x	x	x	x
AG	Review and update as necessary emergency procedures in the event of any type of manmade or natural hazard.	Emergency Services	Revised	High 2011	County EMA Cities	Internal funds	Procedures reviewed and updated	x	x	x	x	x	x	x	x	x	x

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes
AG	Enhance strategies for debris management from winter storms, such as; designating post-disaster debris disposal sites.	Emergency Services	Revised	High 2011	County EMA Cities	Internal funds	Severe weather debris removal plans established	x	x	x	x						
AG	Improve the CRS rating for county.	Property Protection	Ongoing	Low 2010-2015	County Cities	Internal Funds	CRS status improved			x							
CC	Retain the County's Storm Ready Status with the National Weather Service.	Emergency Services	New	High 2010 & Continuing	County EMA	Internal funds	Storm Ready Status Retained	x	x		x						
Objective 3.4: Increase capabilities to mitigate the effects of a natural hazard in the county.																	
AG	Enhance data and mapping for floodplain information and flood-prone areas outside of designated floodplains.	Natural Resource Protection, Public Information, Prevention Measures	Ongoing	Medium 2012-2013	County EMA County Floodplain Manager Cities	Govt. programs Internal funds	Flood reports and warning coverage maps			x							
AG	Continue development of Geographic Information Systems (GIS) and mapping for the county to further identify and assess vulnerabilities to hazards.	Emergency Services	Revised	High 2010 & Continuing	County Cities	Internal funds	GIS capability increased and used in decision making on development proposals	x		x	x			x	x	x	x

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								Tornado	Severe T-storm	Flood	Winter	Drought	Heat Wave	Earthquake	Dam Failure	Wildfire	Sinkholes	
CC	Identify condition of dams whose failure could be reasonably expected to endanger human life, the maximum area that could be flooded if the dam failed, and public facilities that would be affected by flooding.	Emergency Services	Ongoing	Medium 2012-2013	County EMA	Internal funds	Assessments completed									x		
CC	Continue to inventory alternative firefighting water sources and encourage the development of additional services.	Emergency Services	Ongoing	Medium 2011 & Continuing	County EMA	Internal funds	Updated firefighting plans include alternative water resources		x			x			x	x		x
AG AS OTC	Identify and pursue funding opportunities to develop and implement mitigation strategies.	All	Ongoing	Medium 2010 & Continuing	County EMA Cities Schools Colleges	Federal and State funds, Internal funds, Private sources	Funding options assessed, annual review of funds requests and funding awards received	x	x	x	x	x	x	x	x	x	x	x