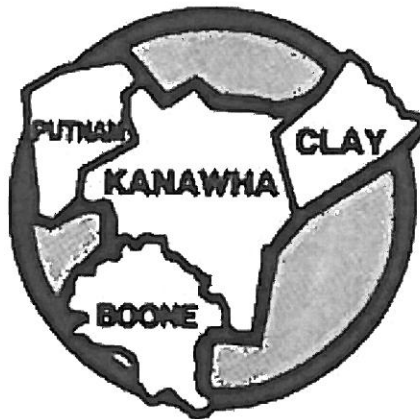


B-C-K-P Regional Intergovernmental Council

All Hazards Mitigation Plan



B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

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Introduction and Background Information:

This plan was developed in accordance with Part 201.6 of Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000. Under the current guidelines of the Hazard Mitigation Grant Program and the pre Disaster Mitigation Program administered by the Federal Emergency Management Agency, the B-C-K-P Regional Intergovernmental Council is required to create a Regional Hazard Mitigation Plan. By combining the 4 county mitigation plans developed by Boone County, Clay County, Kanawha County and Putnam County, the B-C-K-P Regional Intergovernmental Council will be able to qualify for grant funding.

The purpose of a Hazard Mitigation Plan for the B-C-K-P Regional Intergovernmental Council is to identify ways to reduce the effects of natural hazards on the land, environment and citizens, and determine actions to be taken to reduce the risk of people and property to all disasters. Possible projects and suggestions from the individual county plans will also be included.

Several resources were used during the development of the plan, including the US Department of Homeland Security's Federal Emergency Management Agency (FEMA) Mitigation Planning How-To series, each county's own Hazard Mitigation Plan, the governing regulations in the Code of Federal Regulations (CFR), and documents provided by the WV Division of Homeland Security and Emergency Management, West Virginia Department of Natural Resources, National Oceanic and Atmospheric Administration, and the National Climactic Data Center.

B-C-K-P Regional Intergovernmental Council

The B-C-K-P Regional Intergovernmental Council (hereafter referred to as RIC in this document) was formed in 1968 and comprised of locally elected municipal and county officials in Boone, Clay, Kanawha and Putnam counties. The initial goal of RIC was to address regional issues and promote intergovernmental cooperation. In 1971 the West Virginia Legislature enacted the West Virginia Regional Planning and Development Act. This divided the state into eleven regions, each serving as a development district for its respective counties. The goal of the act is to effectively utilize and organize the State's resources and to maximize the opportunities for local communities and public service agencies to secure Federal assistance for economic development, water and sewer systems, and other public projects. Currently RIC is structured as a locally oriented public corporation. It is directed by elected municipal and county officials from within its jurisdiction, as well as non-elected appointees from a cross-section of the region's social and economic institutions. RIC's policy board consists of 45 members, including one commissioner from each of the four counties, the mayor of each of the 25 municipalities, fourteen citizen representatives, and two minority representatives. (RIC 2009 Annual Report)

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

RIC is comprised of Boone, Clay, Kanawha and Putnam counties, each with their own different characteristics. Boone and Clay are rural counties with little urban development and many coal operations. Kanawha and Putnam hold most of the development and therefore the majority of population and employment from the region.

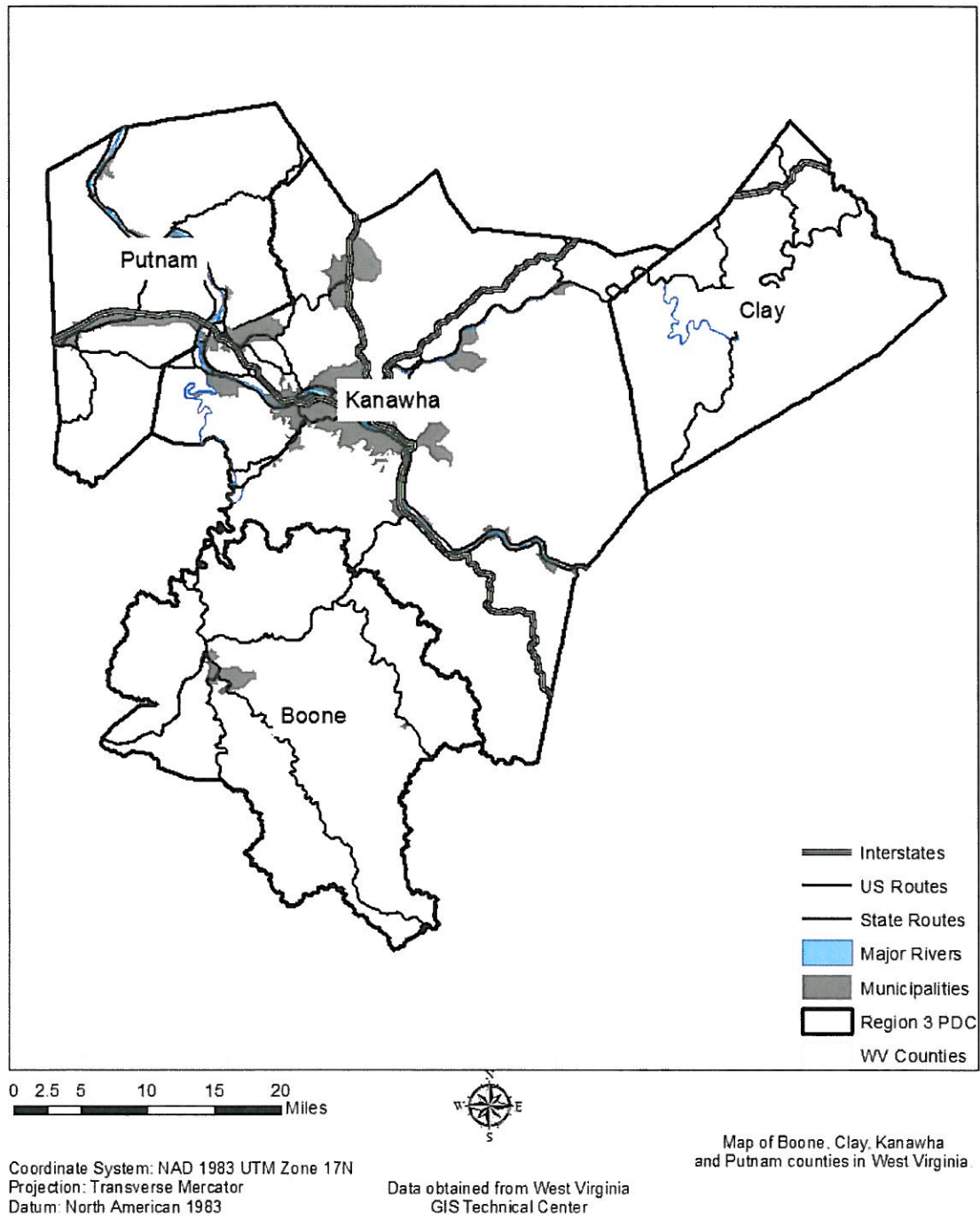
Part of RIC's four county area falls in the Kanawha River Valley with the Appalachian Mountains nearby. The Kanawha River flows through Kanawha and Putnam counties. The Elk River flows through Clay County and joins the Kanawha River in Charleston. The Big Coal River flows through Boone County and joins the Kanawha River in St. Albans. This waterway system combined with the Appalachian Mountains creates an area of deep valleys and steep slopes. The valleys and mountain slopes do increase the risk of flooding, dam failure and other minor hazards related to flooding. However, the mountains protect the area from tornadoes and other extremely high winds. The distance from the ocean greatly lessens the risk of damage by hurricane. Also RIC does not lie on any fault lines, so major earthquakes are not likely.

Three interstate highways meet in Charleston. I-64 travels east and west. I-77 travels directly north and south, while I-79 starts in Charleston and follows a north east direction. Several U.S. Highways and state highways are utilized by travelers in Region 3; U.S. 35, U.S. 60, U.S. 119, WV 34 and WV 25.

The following table describes the population, population density and precipitation amounts in RIC's four county area.

	Population	Households	Area	Pop. Density	Rainfall	Snowfall	Avg Temp	Elevation
Boone	25,535.0	10,291.0	503.0	50.8	46.3	20.6	54.0	820.0
Clay	10,330.0	4,020.0	344.0	30.0	45.3	25.6	54.0	805.0
Kanawha	200,073.0	86,226.0	911.0	219.6	42.9	20.8	56.0	692.0
Putnam	51,589.0	20,028.0	350.0	147.4	40.5	13.9	55.0	591.0
RIC	287,527.0	120,565.0	2,108.0	136.4	43.8	20.2	54.8	727.0

Region 3 Planning and Development Council



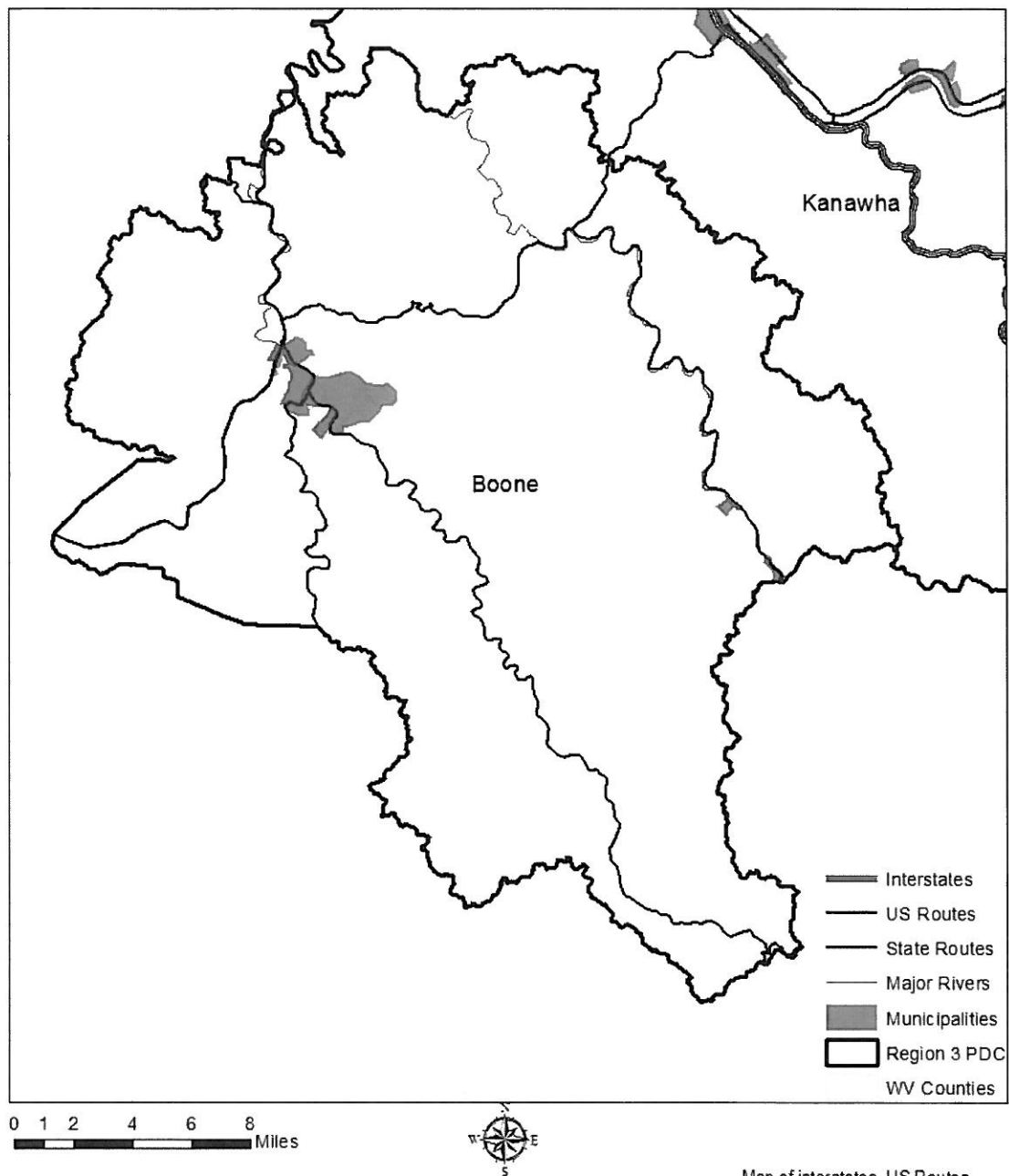
Boone County

Boone County is a rural county in southern West Virginia about 15 miles south of Charleston, the state capital. It has four municipalities; Madison, the county seat, and the Towns of Danville, Whitesville and Sylvester. As the population grew along the waterways so did a lot of the counties infrastructure. Most of the counties roads and utilities follow along the same path, increasing exposure to natural hazards.

The 2000 Census lists Boone County as having a total population of 25,535. Boone County's temperature is varied but has an average of 54 degrees Fahrenheit with four distinct season changes. The average elevation is 820 feet above sea level. Boone County has a total area of 503 square miles.

Boone County's economy relies strongly on coal production. Coal mining has been the main stay of the area for over 100 years. Most of the largest employers in the county are coal producers or transporters. Over 90% of the land area in the county is woodland. The timber industry has been growing in the county for the past several years bringing along with it those businesses that service i.e. trucking and sawmills. Tourism is another industry that has grown in this area due to hunting, fishing, the addition of the Hatfield and McCoy Trail system and the creation of the National Coal Miners memorial.

Boone County



Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

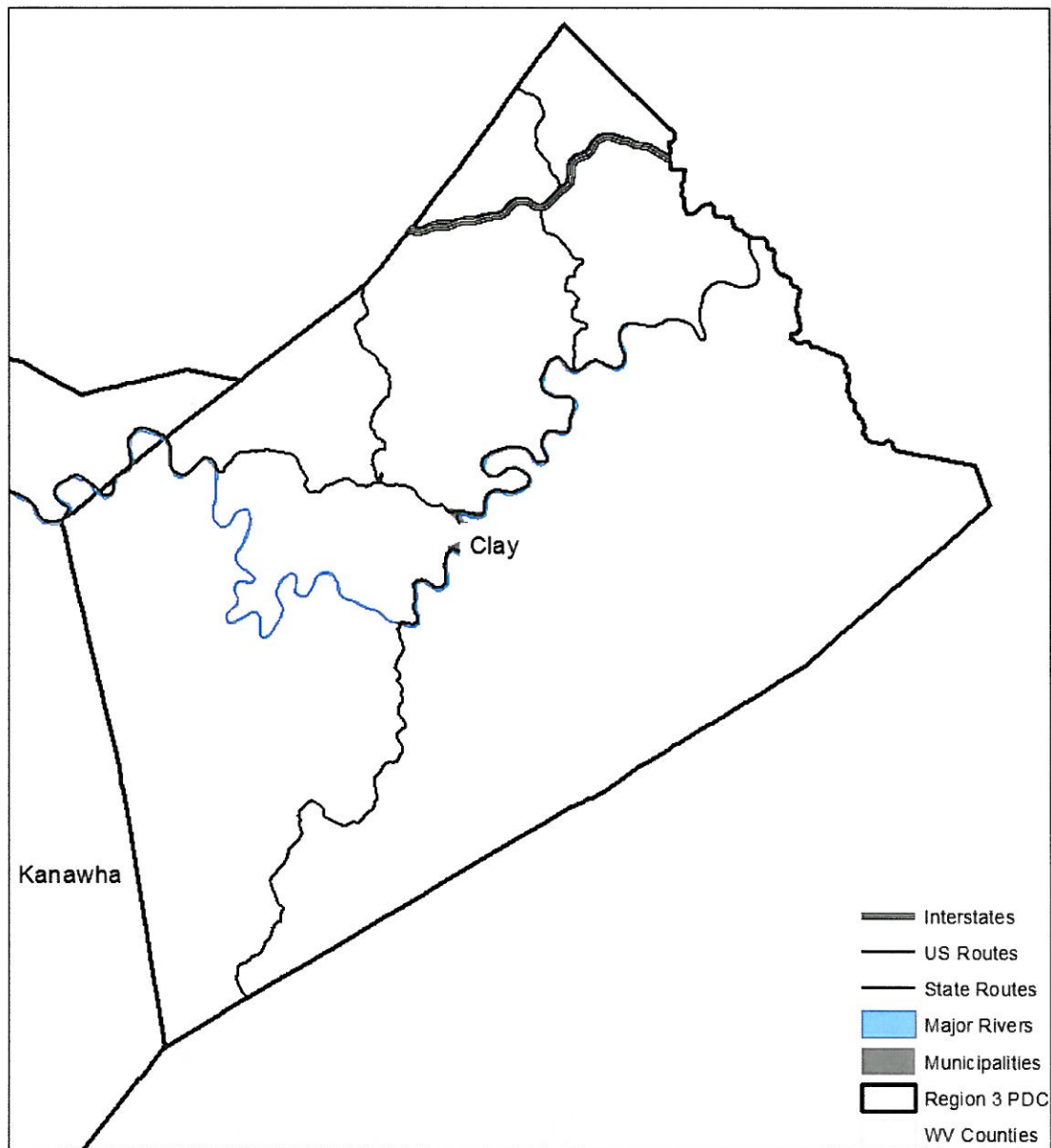
Map of interstates, US Routes,
State Routes, major rivers and
municipalities in Boone County

Clay County

Clay County is located in the South-central part of West Virginia. Clay County's temperature is varied but has an average of 54 degrees Fahrenheit with four distinct season changes. The average elevation is 805 feet above sea level. Clay County has a total area of 344 square miles.

Population is 10,330 according to the 2000 census. Clay County's only municipality is the Town of Clay located in the central part of the county. Leading industries are lumber, coal and natural gas.

Clay County



00.51 2 3 4
Miles



Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

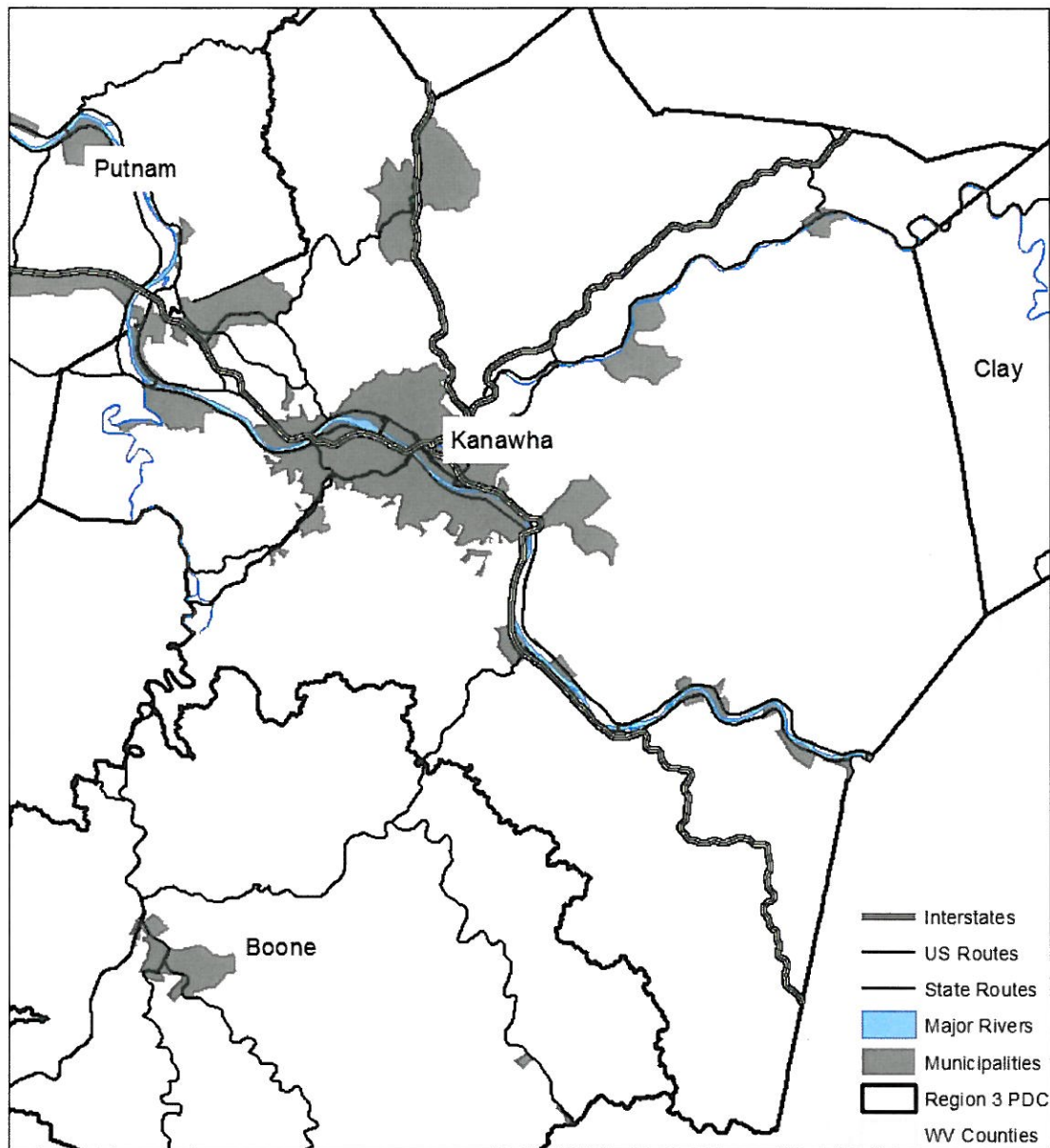
Map of interstates, US Routes,
State Routes, major rivers and
municipalities in Clay County

Kanawha County

Kanawha County is located in south-western West Virginia. Kanawha County's temperature is varied but has an average of 55 degrees Fahrenheit with four distinct season changes. The average elevation is 692 feet above sea level. Kanawha County has a total area of 911 square miles. Kanawha County contains 14 municipalities: Belle, Cedar Grover, Charleston, Chesapeake, Clendenin, Dunbar, East Bank, Glasgow, Handley, Marmet, Nitro, Pratt, St. Albans, and South Charleston.

According to the 2000 Census, Kanawha County's population is 200,073. The population density is 222 people per square mile with an average household size of 2.28. There are five locations of industrial and business development in the Charleston-Kanawha County area. These locations provide room for various companies who seek to expand their market in West Virginia and surrounding states. Peerless Industrial Park, Fork of Coal Industrial Park, South Charleston Technology Park, NorthGate Business Park and Washington Heights Business Park are all located within easy access to various transportation methods.

Kanawha County



0 1.252.5 5 7.5 10
Miles



Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

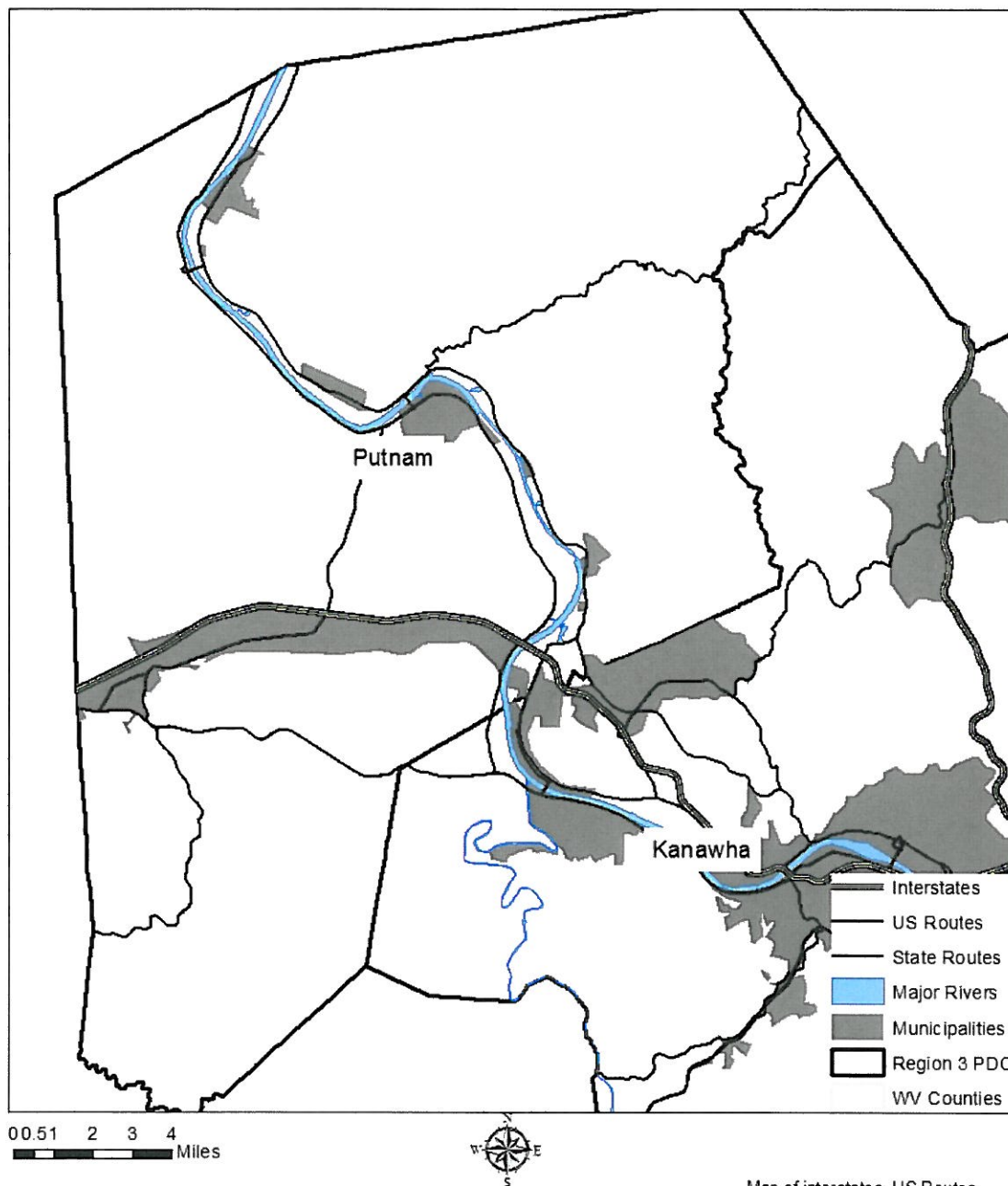
Map of interstates, US Routes,
State Routes, major rivers and
municipalities in Kanawha County

Putnam County

Putnam County is located in the Central Western section of the state. Putnam County's temperature is varied but has an average of 55 degrees Fahrenheit with four distinct season changes. The average elevation is 591 feet above sea level. Putnam County has a total area of 350 square miles.

The total population of Putnam County is 51,589 from the 2000 Census. There are seven incorporated municipalities within the county; Bancroft, Buffalo, Eleanor, Hurricane, Nitro, Poca and Winfield. Putnam County has several industrial parks and many retail shopping centers. Because of Putnam County's close proximity to Charleston and Huntington, many people travel to those large cities for employment.

Putnam County



Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

Map of interstates, US Routes,
State Routes, major rivers and
municipalities in Putnam County

Documentation of Planning Process

In August 2009 FEMA conducted a Planning and Project Management Workshop for the Regional Planning and Development Councils in West Virginia. This workshop detailed the Hazard Mitigation planning process, FEMA grant programs and how to generate projects for mitigation.

Following the FEMA sponsored workshop work began to combine Boone, Clay, Kanawha, and Putnam Counties plans into a Regional Hazard Mitigation Plan. From individual plans to now, all jurisdictions still participate. Because this was originally thought of as simply a combination of each county's plan a formal steering committee was not formed.

Each individual county plan was thoroughly examined for hazards, risks, goals, and projects. Each section of each county's Hazard Mitigation Plan (Boone County Multi-Jurisdictional Hazard Mitigation Plan, Clay County Hazard Mitigation Plan, Kanawha County Multi-Jurisdictional Hazard Mitigation Plan, and Putnam County All-Hazards Mitigation Plan) was reviewed, analyzed and revised as part of this regionalization effort.

When questions regarding a specific element in a county plan arose the appropriate representative was contacted. A risk assessment was performed on all hazards represented in the individual county plans. Hazard profiles were created based upon the risk relative to the entire area. The recently updated West Virginia State Hazard Mitigation Plan was consulted for a complete list of hazards. An inventory of assets and loss estimation were performed by gleaning information from the county plans, Geographic Information Systems (GIS) data, NCDC Data, and HAZUS reports.

A mitigation strategy was developed by combining each county's goals, objectives, and projects. Goals were summarized for a uniform regional perspective, but each county's specific goals, objectives and projects are listed in Appendix D.

Eventually a Draft B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan was formed. The next task was to involve each municipality and county representative and encourage response. An initial e-mail was sent to all members of the RIC directing them to view the draft plan online or in office and return an attached questionnaire. We also encouraged them to participate in an online survey. Public Announcements were published in the four county areas and draft plans were available online and in the RIC office in South Charleston. Kara Greathouse addressed the RIC members at a quarterly meeting on Thursday May 13th 2010, and has had the sole responsibility of combining the four county hazard mitigation plans into one regional plan. This communication and involvement effort resulted in 3 returned comments, two in the form of the questionnaire and one online survey response. All documentation and responses can be found in Appendix A. Members of the public and especially the RIC board, who we feel are comprised of our primary stakeholders, have been contacted multiple times and asked for input. There has been a lack of response, but it is not unexpected for this area. There has been no effort to include neighboring communities as

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

it is assumed they are participating in the regionalization of their Hazard Mitigation Plan. The entire state of West Virginia is under going this process at the same time. Other agencies, businesses etc. have had the same opportunity as the general public to participate in this plan update. As this is the first Hazard Mitigation Plan for Region 3 it is likely more effort will be placed upon this in future updates.

Responses were considered and incorporated into the plan and a Final B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan was completed and distributed to FEMA for initial approval. Pending FEMA approval each municipality and county will receive a digital or hard copy for adoption. Adoption Documentation is provided in Appendix B.

Risk Assessment

Risk Assessment is the process of measuring the potential loss of life, personal injury, and economic and property damage resulting from natural or man-made hazards. The result of this assessment helps to identify and understand the risks involved. This information also serves as the foundation for the development of the mitigation plan and strategies to help reduce risks from future hazard events.

The purpose of this risk assessment is to identify the hazards that have caused or possess the potential to cause hazardous situations and the loss of property and life in Boone, Clay, Kanawha and Putnam Counties. The information in this assessment will allow us to identify the events that are most likely to occur and have the greatest.

Hazard Identification:

Several methods of research were utilized to identify the hazards to which Region 3 is susceptible. Several related plans and historical data were used to compile a list of potential hazards and their risk.

Boone County Multi-Jurisdictional Hazard Mitigation Plan, Boone County Commission, 2005

Clay County Hazard Mitigation Plan, Clay County Commission, 2003

Kanawha County Multi-Jurisdictional Hazard Mitigation Plan, Kanawha County Commission, 2009

Putnam County All-Hazards Mitigation Plan, Putnam County Commission, 2008

Kanawha County All Hazards Mitigation Manual, Kanawha County Commission, 2003.

The following chart lists the hazards previously analyzed in individual county plans. The chart ranks each hazard based upon ranking from individual plans and the state plan. RIC's individual vulnerability was considered and each hazard will be further researched and analyzed in this document.

Hazard	Priority	Reason
Dam Failure	med/high	There are 57 dams in Boone, Clay, Kanawha, and Putnam counties, several dams are coal related, at capacity or near capacity. – USACE

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

Drought	med/low	There have been three periods of Severe or Extreme Drought throughout the entire state of West Virginia.
Earthquake	low	The USGS rates RIC as having a 8% Peak Ground Acceleration in 2008.
Extreme Heat	low	Temperatures in RIC rarely exceed 100 degrees Fahrenheit and periods of over 100 degree weather do not last long. Extreme heat will be further discussed under the Drought Hazard Profile.
Flooding	high	All counties in RIC have experienced flooding to varying degrees and contain development within the 100 year flood plains.
Hazardous Material	med/low	West Virginia has experienced 21 Hazardous Material Incidents in 2009 and 3 have been classified as serious incidents. Out of 21 incidents 19 occurred on the highway system.
Hurricane	low	RIC is at least 400 miles from the Atlantic Ocean, coastal events are unlikely to effect this area. Hurricanes cause severe storms in this area, please see 'Severe Storms.'
Land Subsidence, Karst Topography, Expansive Soils, Landslides, or Mudslides	medium	USGS classifies most of West Virginia and all of RIC as being at a high risk for land slides owing to the steep mountainous slopes. However there have been very few landslides reported in RIC. If a landslide were to occur it would be in the more remote or uninhabited areas of Region 3. It is important to note that there is no Karst Topography in any of RIC's four counties, this greatly lowers the risk of land subsidence or landslides.
Nuclear Accident	low	This hazard was profiled and analyzed in the West Virginia State Hazard Mitigation Plan, but was not ranked. Based upon the analysis in the state plan and the closest nuclear reactor being over 200 miles away a nuclear accident is unlikely to affect the RIC counties.
Severe Storms (thunderstorms, Lightning, and hailstorms)	med/high	Most flooding occurs after severe storms or heavy rain events; while these events do not always cause major damage the after effects often cause major damage.
Tornadoes/High Winds	med/low	Because of the terrain and topography of RIC, tornadoes are unlikely; however there have been 6 reported tornadoes in the area in the past 50 years. High Winds are likely to occur with severe storms or winter storms and cause minor damage.
Wildfire	med	RIC includes forested areas so wildfire is likely to occur, but the history of wildfires in the region is very small.
Winter Storms	high	RIC occasionally experiences periods of heavy snow, ice storms, extreme cold temperatures or other blizzard conditions. There have been disasters declared in the past

		due to winter storms so the risk in Boone, Clay, Kanawha, and Putnam counties is high. See also, 'severe storms.'
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The following table lists all the hazards analyzed in this plan and their corresponding definition.

Hazard	Definition
Dam Failure	A dam is defined as a barrier constructed across a waterway for the purpose of storage, control or diversion of water. Dams provide water for drinking, navigation, agricultural irrigation, hydroelectric power, recreational opportunities, waste impoundment and, perhaps most importantly in West Virginia, flood protection.
Drought	Drought is a prolonged period of dry weather that causes serious problems to crops or water supply. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area.
Earthquake	An earthquake is a sudden rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface
Flooding	FEMA defines flooding as the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands.
Landslides / Land Subsidence	A landslide is characterized by the downward and outward movement of slope forming materials reacting under the force of gravity. The term landslide includes mudflows, mudslides, debris flows, rock falls, rockslides, debris avalanches, debris slides, and earth flows. Landslides are mostly caused by extreme rainfall, excavation, construction or new development, underground mining, Karst topography, rock fall, extraction of natural gases, or seasonal effects. Land subsidence is vertical earth movement resulting from increased stresses in the soil mass, or loss of shallow soil support. Subsidence can be described as rapid, caused by undermining or failure of the underlying strata, or slow, caused by consolidation.
Severe Storms	Severe storms can encompass many different types of storms; severe thunderstorms, lightning, winter storms, wind storms and hail storms. Severe storms typically

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

	involve heavy or long periods of rain, snow and/or hail.
Tornadoes	A tornado appears as a rotating, funnel-shaped cloud that extends from a storm cloud to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be as large as one mile wide and 50 miles long.
Wildfire	A wildfire is an uncontrolled fire that occurs in a forested area. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, and its ability to change direction unexpectedly and to jump gaps, such as roads, rivers and fire breaks. A non-wilderness structural fire occurs in an urban area and primarily accrues structural damage. Urban fires are instances where uncontrolled burning occurs in residential and commercial development areas.

Profile of Priority Hazards:

Dam Failure

A dam is defined as a barrier constructed across a waterway for the purpose of storage, control or diversion of water. Dams provide water for drinking, navigation, agricultural irrigation, hydroelectric power, recreational opportunities, waste impoundment and, perhaps most importantly in West Virginia, flood protection.

A dam failure is the collapse, breach or other failure resulting in downstream flooding. Dams can pose a risk to communities if not designed, constructed, operated, and maintained properly. In the event of a catastrophic dam failure, the energy the water released from even a small dam is capable of causing extensive property damage, injury and potential loss of life. This is especially true in West Virginia where many communities lie in steep, narrow valleys. A dam failure is a rare occurrence, but can cause great damages and loss of human life.

Dams regulated by the state and federal authorities are classified by their potential impacts on downstream life and property. Class 1 (High Hazard) dams are located where a failure may cause loss of life or major damage to buildings and lifelines such as highways, roads, and bridges. Class 2 (Significant hazard) dams are located where a failure may cause minor damage to structures downstream, and is unlikely to result in loss of life. Classes 3 and 4 represent dams with lower or no potential for downstream damage. The WVDEP currently regulates 310 Class 1 and 2 dams in West Virginia.

Dam owners in West Virginia include the National Resources Conservation Service (47 %), other federal government bodies (7%), the state (12 %), local government (10%), private individuals or corporations (15 percent), and unknown owners (9%). The landowners generally do not operate the dams. The approximately 150 NRCS flood control dams (of Dam Safety Act jurisdictional size) are operated and maintained by a sponsor agency such as a soil conservation district, county, or WVDNR. These sponsor agencies are organized under an umbrella agency to represent their interests in the legislature and help develop monitoring and emergency action plans. The umbrella agency is the West Virginia Conservation Agency (WVCA). (Long, 2007)

There are 57 dams in RIC's four county area ranked as a significant or high hazard and owned by state and federal entities; fourteen are categorized as a significant hazard while 43 are considered a high hazard. The table below breaks down the total number of dams by county and hazard.

	Significant Hazard	High Hazard	Total Dams
Boone	0	15	15
Clay	2	2	4

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

Kanawha	7	17	24
Putnam	5	9	14
Region 3	14	43	57

Dams with a significant hazard potential would result in no loss of human life, but cause economic loss, environmental damage or disruption of lifeline facilities if a failure occurred. Significant hazard potential dams are often located in mostly rural or agricultural areas. Dams with a high hazard potential would result in the loss of one or more human lives. The dam owner may choose to produce an Emergency Action Plan (EAP) to reduce the potential for property damage and loss of life if the dam were to fail. RIC has 57 dams total and only eight dams have an Emergency Action Plan.

The WVDEP DWWM Dam Safety Program has regulatory jurisdiction over dams in the State of West Virginia, and performs inspections of dams as necessary to enforce the provisions of the West Virginia Dam Control and Safety Act. The following table describes recorded dam incidents within the past 100 years.

Date	Dam	Location	Deaths	Damages	Cause	Description
August 9, 1916	Unnamed	Between Acme & Kayford, WV (Kanawha County)	60-75 from flood (unknown if related to failure)		Inflow flood	
August 9, 1916	Unnamed	Jarrolds Valley, Boone Co, WV	60-75 from flood (unknown if related to failure)		Inflow flood	
August 9, 1916	Unnamed	Cabin Creek Valley, WV (Kanawha County)	60-75 from flood (unknown if related to failure)	>\$600,000	Inflow flood	Extensive damage; especially to rail, telephone, and coal company

History of Dam Failure

There are no comprehensive databases of historical dam failure in West Virginia. Most failures occur due to lack of maintenance of facilities in combination with major precipitations events, such as hurricanes and thunderstorms. There have been no significant incidents of dam failures at coal combustion waste impoundments.

Boone County, in the past, has experienced breakthroughs, seepage or failures of coal slurry impoundments. Coal slurry impoundments are considered a higher risk due to the

close proximity of people and structures. According to the West Virginia Division of Culture and History, Buffalo Creek hollow was flooded in February of 1972 due to negligent strip mining and heavy rain. After the surge of coal slurry 118 were dead and 4000 were left homeless. This disaster led to stricter regulations regarding mining dam construction and future maintenance. Since then there have been no dam failures. However, there have been several breakthroughs, where slurry from an impoundment enters the nearby streams and rivers through the mine. This causes great environmental damage but so far no losses of life. Coal slurry impoundment failures will cause damages similar to a 100 year flood.

The Bluestone Dam spans the New River at Hinton, WV forming Bluestone Lake. Bluestone Dam was constructed as part of the Kanawha River Basin flood control system primarily to reduce major flood damages along the New, Kanawha, Ohio, and Mississippi Rivers. Bluestone Dam was completed for operational purposes in January 1949. As of January 2009 Bluestone Dam has prevented over 2.1 billion dollars worth of flood damage from occurring. Bluestone Dam has the largest drainage area, 4,565 square miles, of any dam in West Virginia. Recently concerns have been expressed about the possible failure of the Bluestone Dam. A stabilization project began in 1998, and is projected to be completed by 2017. At the end of the project the Bluestone Dam will have over 500 additional anchors installed to ensure the stability of the structure. The anchors will be drilled through the dam into the bedrock to keep the dam from sliding. After the project is completed the Dam will be able to withstand a 5,000 year flood event.

Vulnerability and Impact Assessment:

Predicting the probability of a dam failure requires a detailed, site-specific engineering analysis for each dam in question. Failure may result from hydrologic and hydraulic design limitations, or from geotechnical or operational factors. The data and time necessary to perform a probabilistic failure analysis for each dam in West Virginia is beyond the scope of this plan. Vulnerability to dam failure is dependent on dam operations planning and the nature of downstream development. Depending on the elevation and storage volume of the impoundment, the impact of dam failure may include loss of human life, economic losses such as property damage and infrastructure disruption, and environmental impacts such as destruction of habitat. Evaluation of vulnerability and impact is highly dependent on site-specific conditions.

Risk Assessment

Dams of greatest concern for failure are those included on a list of deficient dams maintained by the WVDEP DWWDM Dam Safety Program. A deficient dam is defined as a structure that exhibits one or more design or maintenance problems that may adversely affect the performance of the dam during a major storm, or over time, that represents a potential for loss of life or property. However, the degree of hazard within this definition can vary greatly. The dams in West Virginia are rated based on a variety of factors, including the storm capacity of the dam, spillway condition, safety, embankment

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

condition, reservoir volume, height, downstream population, proximity to population, highway traffic, and posted speed. The scores for each of these variables are added to determine the priority rank order for deficient dams. The following table provides a list of deficient dams with a priority ranking. There are 38 deficient dams in West Virginia, two are in Putnam County and one is in Kanawha County. (WVDEP DWWM, 2004).

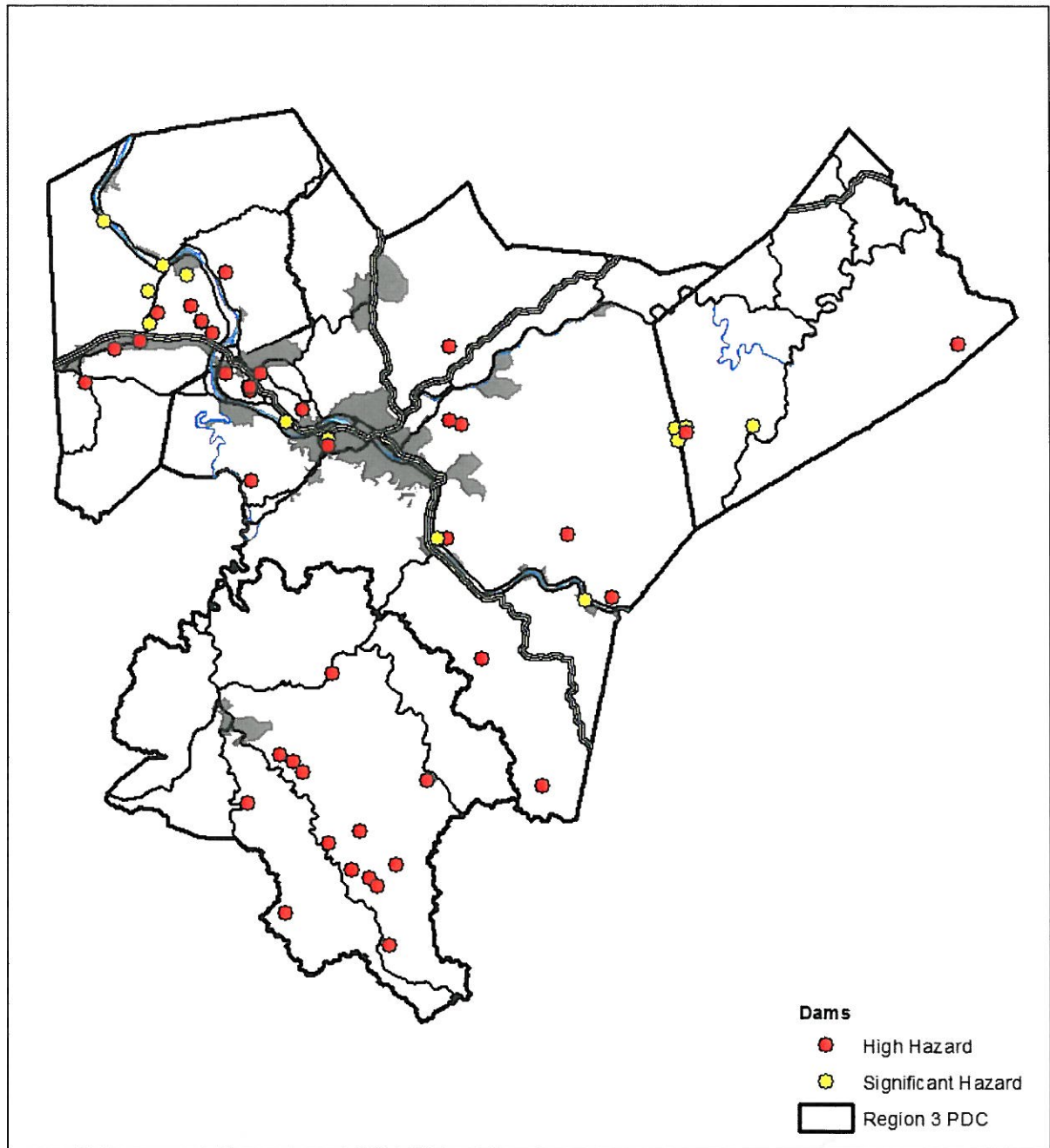
Deficient Dams in Boone, Clay, Kanawha and Putnam Counties

Priority Rank	Name of Dam	ID	Downstream Town/County
3	Lake Washington Dam	07906	Hurricane/Putnam
18	Hurricane WS Dam	07909	Winfield/Putnam
23	Poffenbarger # 1 Dam	03904	Cross Lanes/Kanawha

Source: WVDEP DWWM, 2004

The following map shows the location of all known dams in the RIC four county area and their classification. Refer to the third paragraph under the Dam Failure hazard profile for the classification definitions.

Dam Location and Hazard Ranking



0 2.5 5 10 15 20 Miles

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983



19

There are 57 dams in RIC's four county area ranked as a significant or high hazard and owned by state and federal entities; fourteen are categorized as a significant hazard while 43 are considered a high hazard. Data obtained from West Virginia GIS Technical Center

Drought

Drought is a prolonged period of dry weather that causes serious problems to crops or water supply. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area.

Droughts are predictable by careful monitoring of meteorological and hydrological variables. Meteorologists study precipitation patterns, soil moisture and stream flow using various indices to show deficits in precipitation over periods of time.

There are four methods to define the severity of drought: meteorological, hydrological, agricultural, and socioeconomic. Meteorological drought refers to a reduction in the normal rainfall for a given geographic area. This needs to be area-specific, as the average rainfall can vary greatly in different areas. Hydrological drought is based on the amount of surface and groundwater relative to normal levels. Agricultural drought deals with the amount of moisture in soils available for plants. The last, socioeconomic drought, measures the impact that any or all of the first three have on people and businesses. Perhaps the simplest and most consistent measure is meteorological drought. An existing index called the Palmer Drought Severity Index measures a departure from the normal rainfall in a given area.

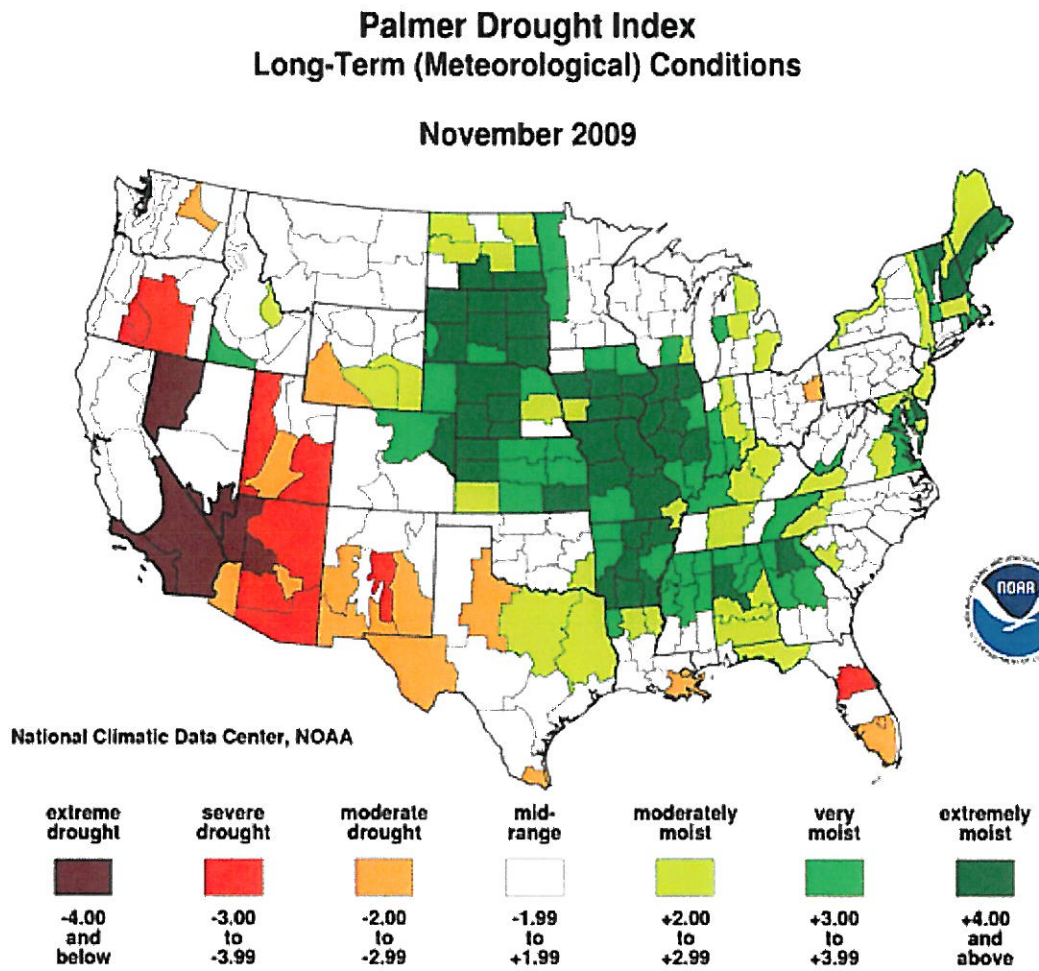
Palmer Drought Severity Index

Severity	Index Value
Extreme Drought	-4 or less
Severe Drought	-4 to -3
Moderate Drought	-3 to -2
Mild Drought	-2 to -1
Incipient Dry Spell	-1 to -0.5

Current drought conditions in West Virginia and the nation are tracked by the U.S. Drought Monitor, a partnership between the University of Nebraska-Lincoln, as well as various federal and state agencies and other experts. Graphical and text summaries of current and projected drought conditions are updated on a weekly basis and are available through: <http://www.drought.unl.edu/dm/monitor.html>.

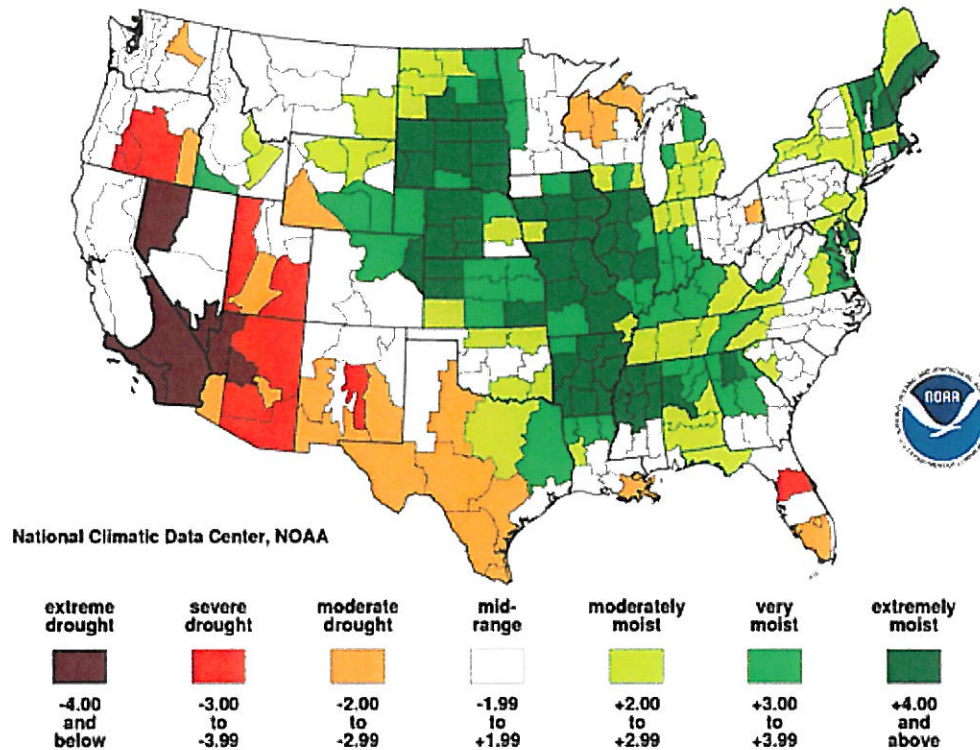
The Palmer Index is most effective in determining long term drought, and uses temperature and rainfall information in a formula to determine dryness. Palmer Drought Severity Index measures the duration and intensity of a drought. Below are two maps showing the Palmer Drought Index for meteorological and hydrological conditions in November 2009. An animated copy of this map can be found on the National Oceanic and Atmospheric Administration's (NOAA) website. The animated version shows the geographical pattern of the long term moisture conditions for the entire year of 2009. RIC is shown in white on both maps; this indicates a normal pattern of moisture for November

2009. If the animated maps are viewed, RIC is depicted as having a normal pattern of moisture throughout 2009.



Palmer Hydrological Drought Index Long-Term (Hydrological) Conditions

November 2009



History of Droughts

There have been 43 recorded droughts in Region 3 since 1995. Boone County has reported 10 droughts, Clay County has reported 9 droughts, Kanawha County has reported 12 droughts, and Putnam County has reported 12 droughts. No crop damages were reported, but it is likely that each county suffered from crop loss due to drought. Most damages that incur costs from droughts are damages to crops and wildfire prevention. Deaths directly caused by a drought are rare. It is difficult to calculate the amount of crop loss that occurred during a drought; therefore it will not be included in the risk assessment.

Impact and Vulnerability Assessment

Short-term droughts can impact agricultural productivity, while longer term droughts are more likely to impact not only agriculture, but also water supply. Jurisdictions that have invested in water supply and distribution infrastructure are generally less vulnerable to drought.

Short and long-term drought may lead to an increase in the incidence of wildfires which might in turn lead to increased potential for landslides or mudflows once rain does fall.

Risk Assessment

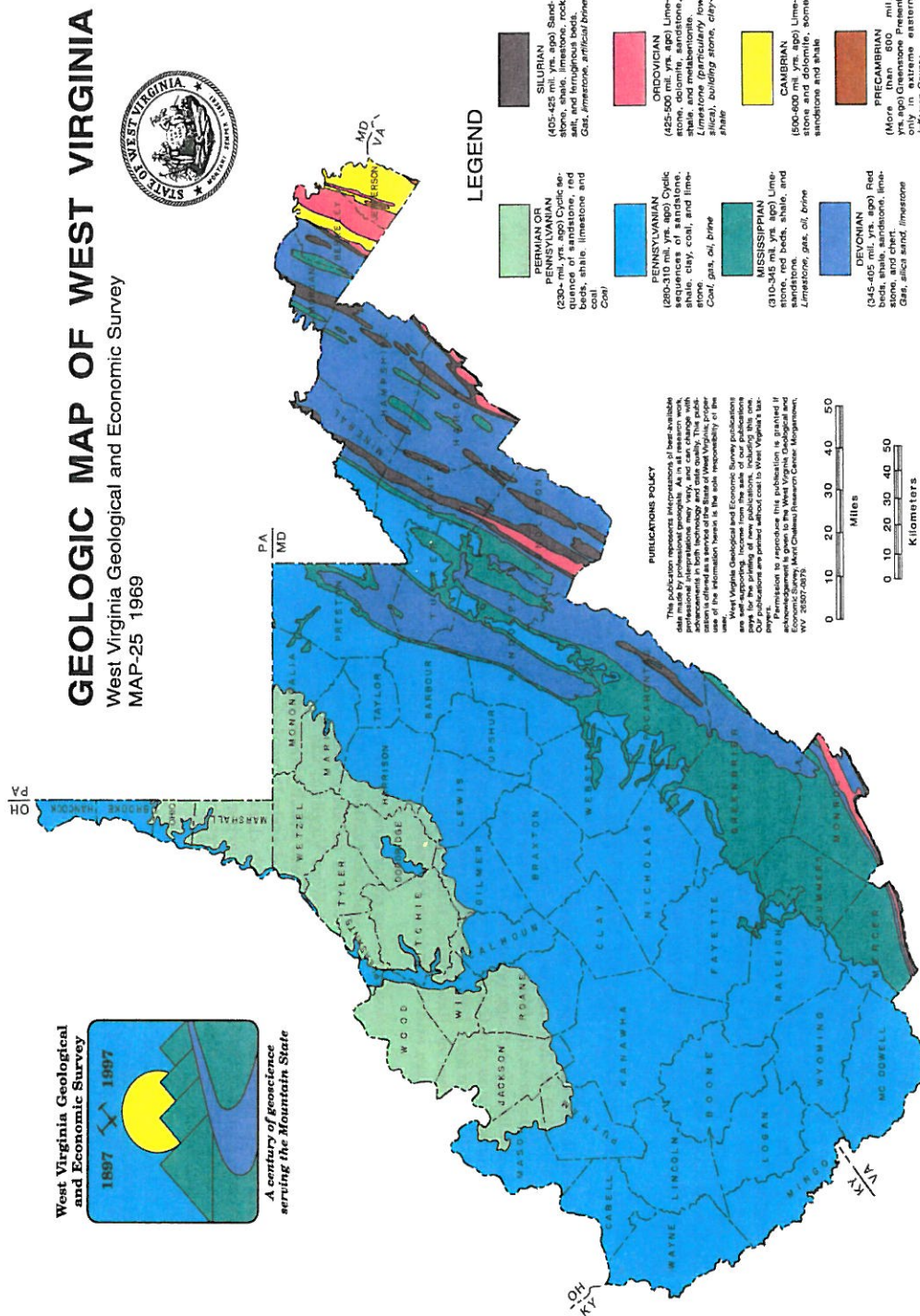
Risk from drought has not been formally quantified, due to the difficulty in assessing its frequency and a lack of data detailing its impact. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area. Throughout 2009 RIC has had a normal pattern of moisture. Drought is likely to occur in the future, damage costs are low and each county is equally vulnerable. Crops and livestock would be damaged most by a drought.

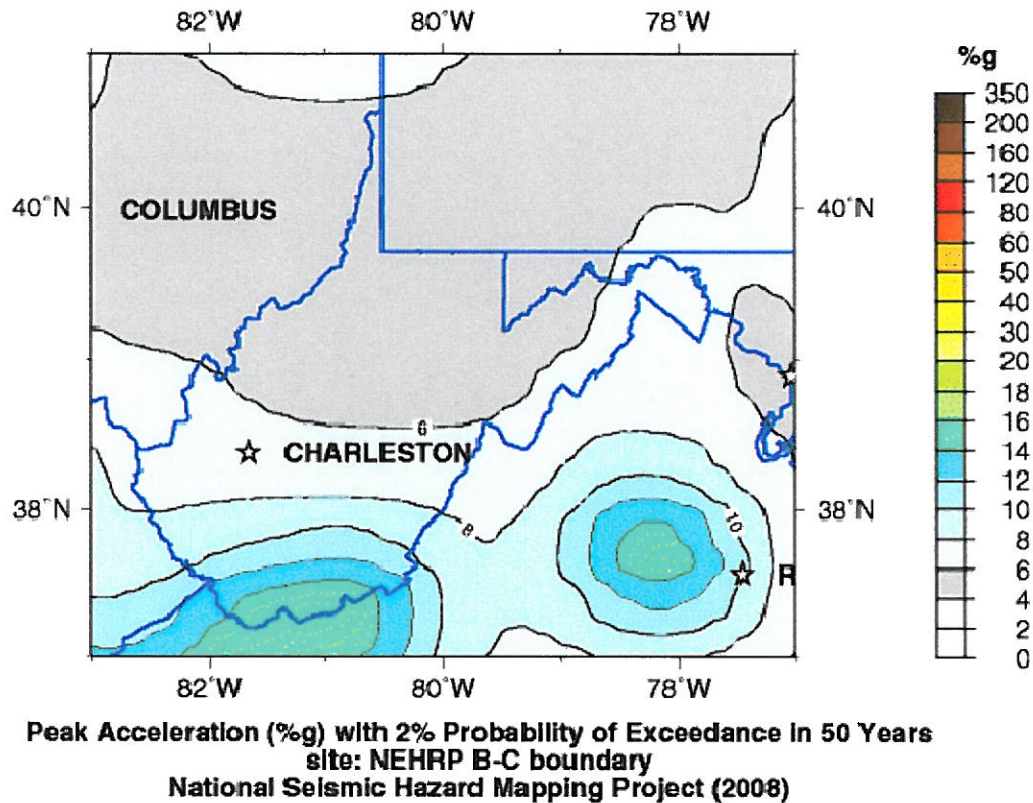
From the limited data regarding previous drought events that is available through NCDC Storm Events, it is apparent that drought has taken a considerable toll on the crops in the past. No deaths, injuries or property damage (other than crops) appear in the NCDC dataset.

Earthquake

An earthquake is a sudden rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. Most earthquakes east of the Rockies occur when two slides of a fault slip past each other, or a new slip is created on an existing fault. Small faults exist more frequently than big faults and therefore more small earthquakes than big. The size of an earthquake is measured by magnitude and intensity. Most earthquakes in West Virginia are too small to be felt or cause damage. Very few earthquakes have occurred in West Virginia. Occasionally earthquakes will cause tremors in areas of West Virginia, but little damage results.

The West Virginia Geological and Economic Survey provided a Geologic Map of West Virginia. By looking at West Virginia's geologic map you can see no visible fault lines, they are usually designated by black lines on geologic maps. However, there may be faults that are buried beneath the soil; this is common in states east of the Rocky Mountains.





History of Earthquakes

To date, there have been no Federal Declared Disasters or NCDC recorded events for earthquakes in the RIC four county area. An active earthquake region in Giles County, Virginia has recorded many earthquakes over the years. Occasionally tremors will be felt in West Virginia, sometimes in Boone, Clay, Kanawha, or Putnam counties. Damage is usually limited to cracked plaster, items fallen off shelves or broken windows. West Virginia in general has a moderate risk of seismic activity; however the potential damage from this seismic activity is relatively low compared to states with more dense populations and more tall buildings.

From 1887 through 1974, only a handful of earthquakes were detected in and around the state. The strongest earthquake experienced by West Virginia occurred on November 19, 1969. More significant damage was sustained during the Giles County, Virginia earthquakes of 1897 and 1959. During these two events, residents reported damage to chimneys.

Vulnerability, Impact and Risk Assessment

Most earthquakes in West Virginia are too small to be felt or cause damage. Very few earthquakes have occurred in West Virginia. Occasionally earthquakes will cause tremors in areas of West Virginia, but little damage results. The southern portion of Kanawha

County and all of Boone County are more vulnerable to earthquakes than the rest of the study area.

The United States Geologic Survey designed the above Seismic Hazard Map. Most of Region 3 is located in a 6 – 8% peak acceleration area. The probability of an earthquake occurring within the next 50 years is high, but the damage we would be likely to see is negligible. Since fault lines are unknown throughout all of West Virginia, the same general risk for the entire RIC area will be assumed.

Annualized loss was computed, in HAZUS, by multiplying losses from eight potential ground motions by their respective annual frequencies of occurrence, and then summing the values. The following table shows the HAZUS results for the probabilistic annualized loss run by county. Kanawha County has the highest annualized loss due to earthquake.

Boone	\$153,024
Clay	\$75,806
Kanawha	\$722,629
Putnam	\$254,898
RIC Total	\$1,206,357

Flooding:

FEMA defines flooding as the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. Flooding can be separated into several types: riverine flooding including over flow from a river channel, flash floods, alluvial fan floods, and ice-jam floods; riverine flooding including dam-break floods; local drainage or high groundwater levels; fluctuating lake levels; coastal flooding, including storm surges and tsunamis; debris flows; and subsidence.

Flooding is the most common environmental hazard in Region 3 due to the topography and location of development and water systems in the region. Flooding generally occurs during a flash flood, a large amount of precipitation in a short period of time, or a general flood, a prolonged period of precipitation.

Flash floods occur within a few minutes or a few hours from large amounts of rainfall over a water way. Flash floods characteristically involve fast moving water that can destroy bridges, homes, roadways, landscaping and even cause mudslides or landslides.

General flooding occurs over a longer period of time combining rainfall and runoff volumes from slopes adjacent to streams and rivers. General flooding usually occurs within the floodplain, low lying areas next to rivers, streams or creeks. Floodplains are divided into different zones based upon the different levels of flooding experienced in a

certain amount of time. A 100 year flood will most likely cover the 100-year zone of the land next to the water body, and will have a one percent chance of occurring during a year. A 500-year flood is more damaging, but will be less likely to occur, a 0.2 percent chance in a year. Floodplain maps delineating the floodplain zones are developed by the National Flood Insurance Program. These easy to decipher maps enable viewers to see if a structure falls within a floodplain and therefore justify participation in the National Flood Insurance Program. The National Flood Insurance Program made floodplain maps from certain counties available in a GIS format. Clay, Kanawha and Putnam counties are all available, Boone County will soon be able to view digital formats of their floodplain maps.

History of Flooding

Boone County

Boone County has experienced 22 floods between May 1996 and 2009. These flood events incurred \$42.942 million in property damages and resulted in 5 deaths. The two most notable floods in this time period occurred in Whitesville. In July 2001 a flash flood incurred three million dollars in property damage. In April 2007 a general flood caused \$750,000 in property damage.

Clay County

Clay County has experienced 17 floods between May 1996 and 2009. These flood events incurred \$37.07 million in property damages and resulted in 4 deaths. In June 1998, the most notable flood occurred in the Bomont area, property damage was in excess of \$150,000. Disaster assistance was also received in May 2001 from flooding in Nebo, property damage was estimated at \$20,000.

Kanawha County

Kanawha County has experienced 41 floods between May 1996 and 2009. These flood events incurred \$67.387 million in property damages and resulted in 1 injury and 11 deaths. In June 1998 a costly flood occurred in Sissonville resulting in five million dollars of property damage. In June 2003 another notable flood occurred in the Pocatalico area (close to Sissonville) resulting in seven million dollars in property damage.

Putnam County

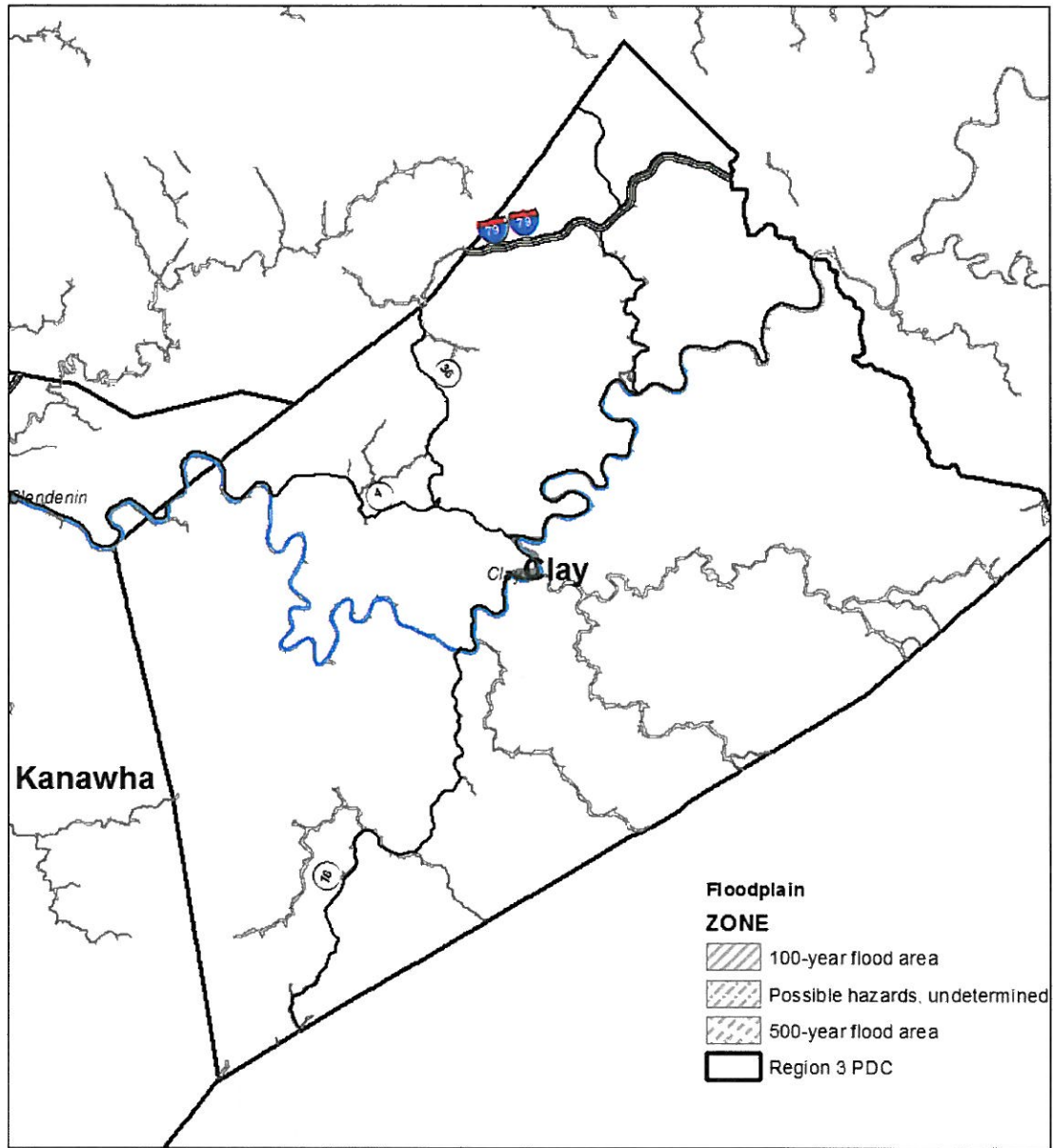
Putnam County has experienced 29 floods between May 1996 and 2009. These flood events incurred \$37.175 million in property damages and resulted in 1 injury and 5 deaths. The southern portion of Putnam County is more prone to flooding than then northern half.

	Deaths	Injuries	Property Damage
Boone	5	0	42.942M
Clay	4	0	37.07M
Kanawha	11	1	67.387M
Putnam	5	1	37.175M
Region 3	25	2	184.574M

Vulnerability and Impact Assessment:

Flooding is likely to occur in the future and more likely to occur in the floodplain. Flooding is frequent in all four counties and creates a large mess. Mud, mildew and poor drinking water are just a few things to combat after flood waters recede. A map below shows the floodplain for Clay, Kanawha, and Putnam counties and municipalities. Land area located in the 100 year flood plain has a 1% annual chance of flooding. Land area located in the 500 year flood plain has a 0.2% annual chance of flooding. Data in the map below is taken from the FEMA Flood Insurance Rate Maps (FIRMs) and has not been completed for Boone County.

Floodplain



00 51 2 3 4
Miles

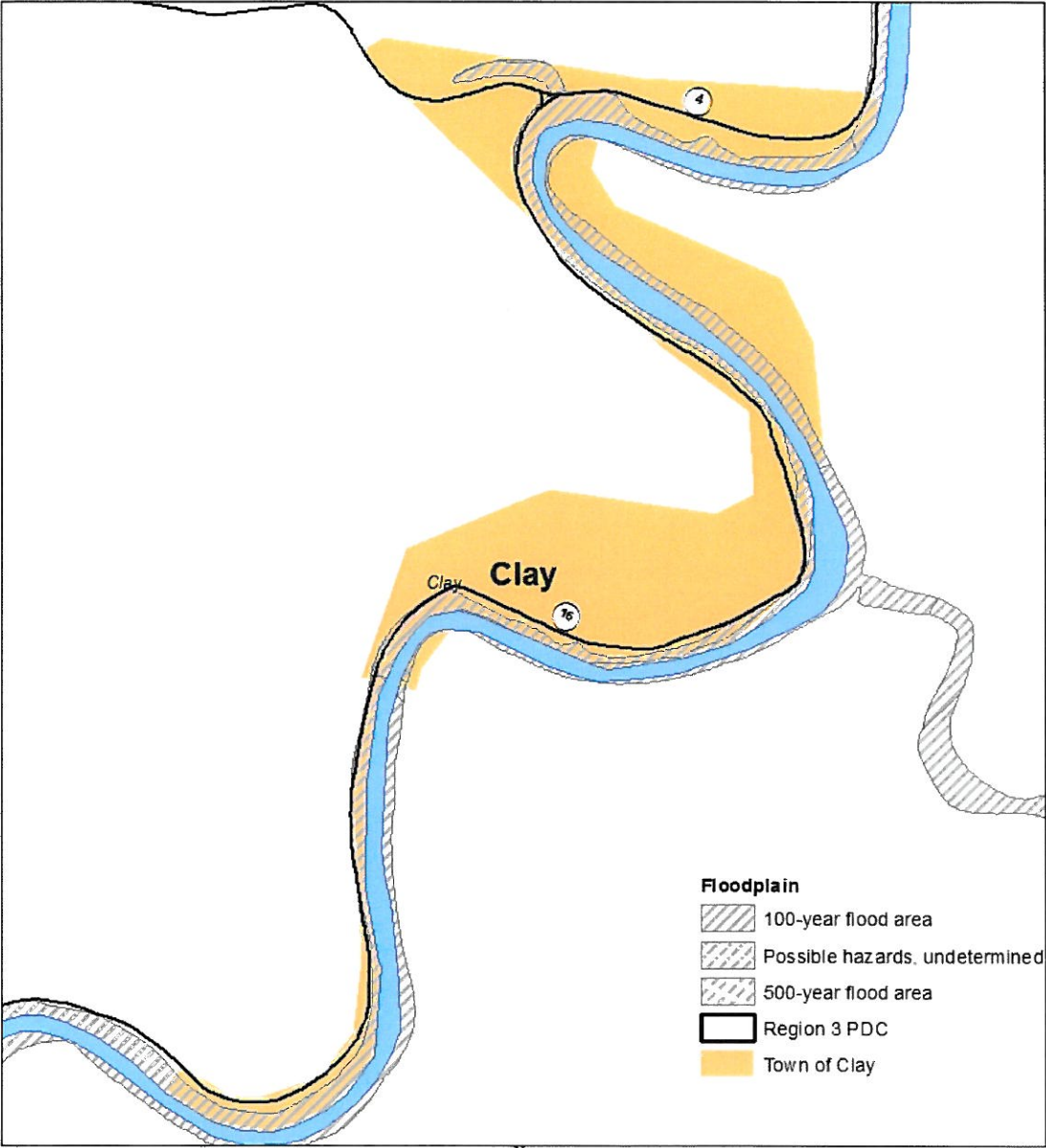


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
Clay County, West Virginia
Refer to the legend for specific
flood event information.

Floodplain



0.0 0.1 0.2 0.3 0.4
Miles

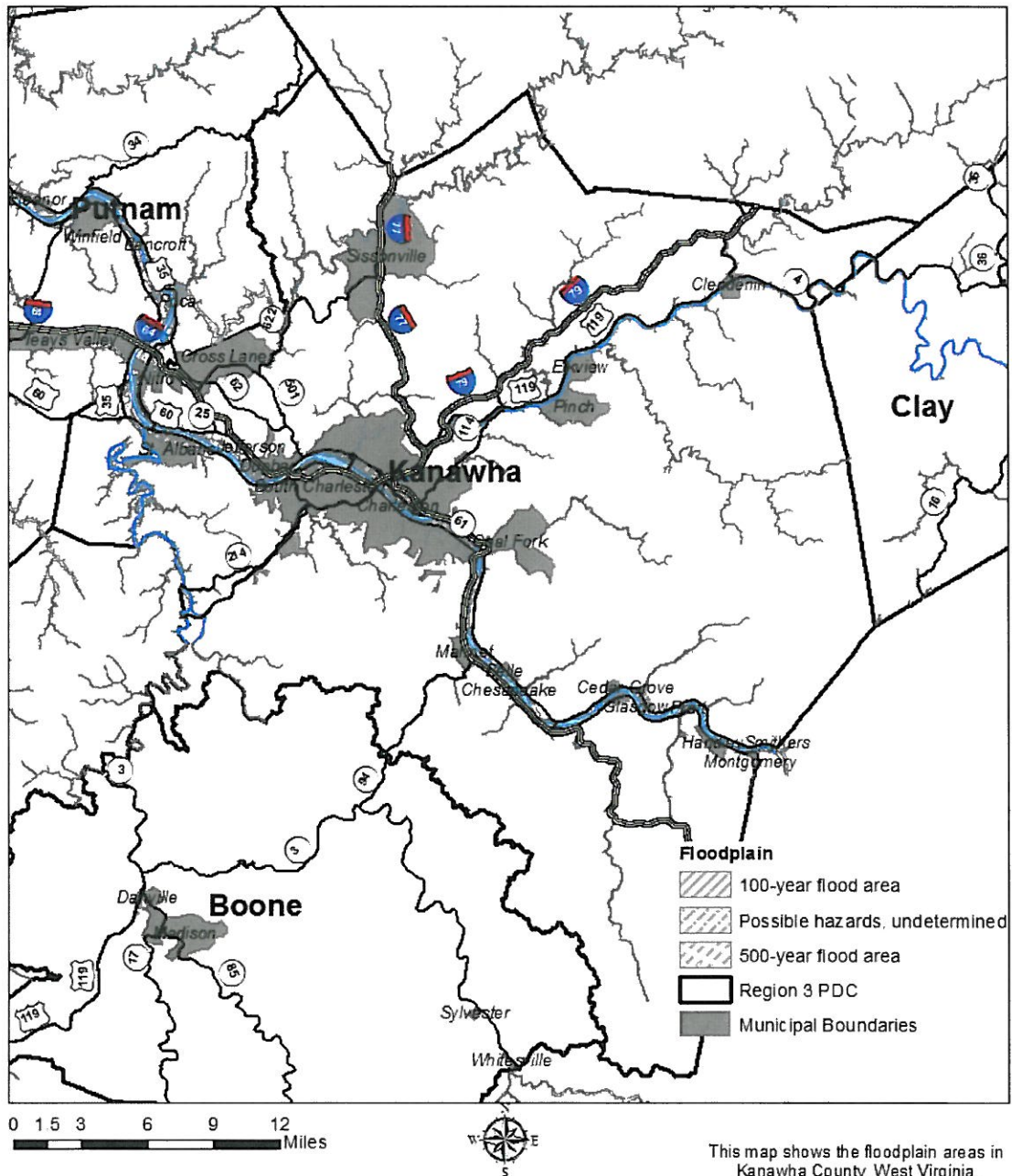


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

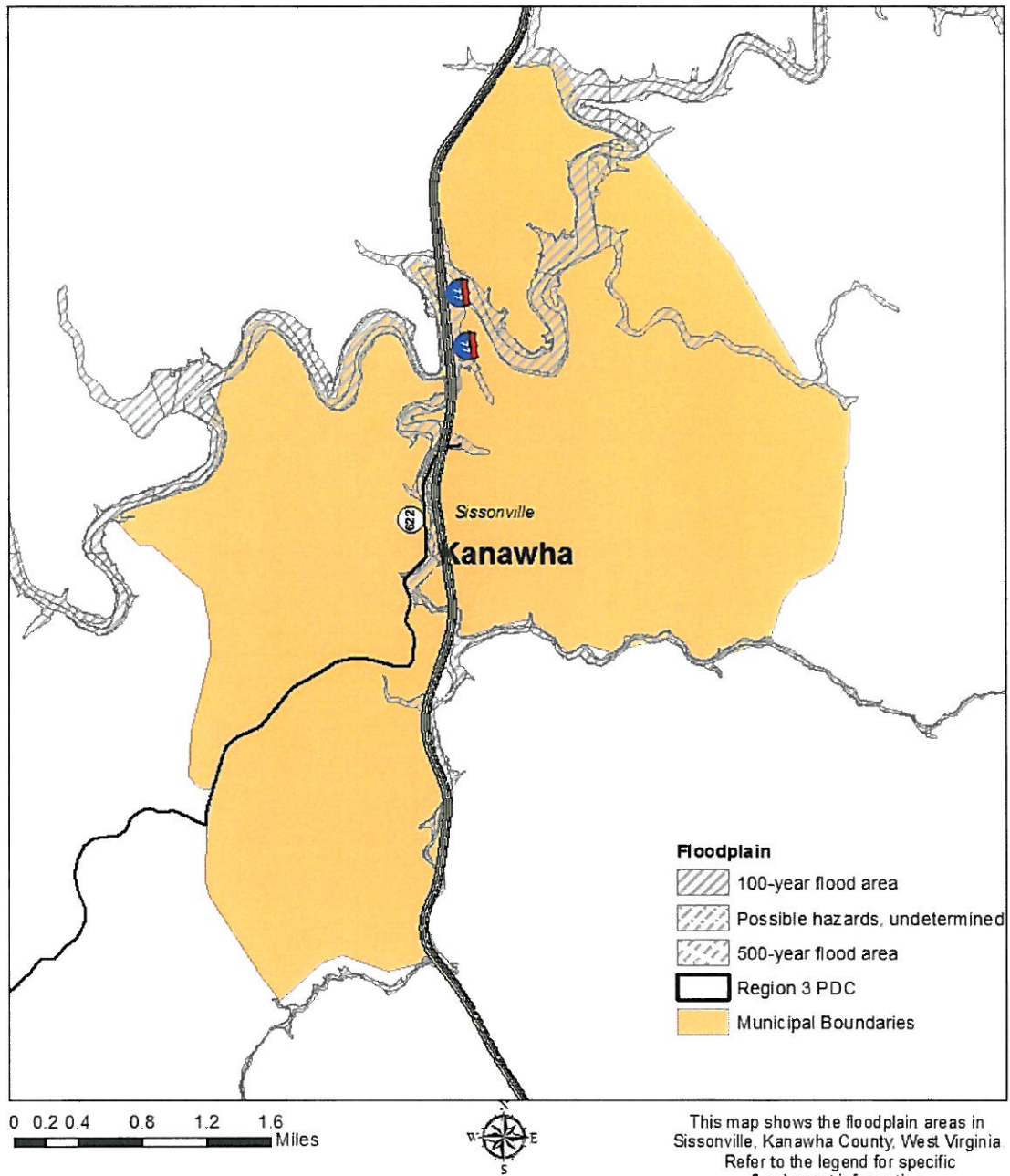
Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
The Town of Clay, Clay County, West Virginia.
Refer to the legend for specific
flood event information.

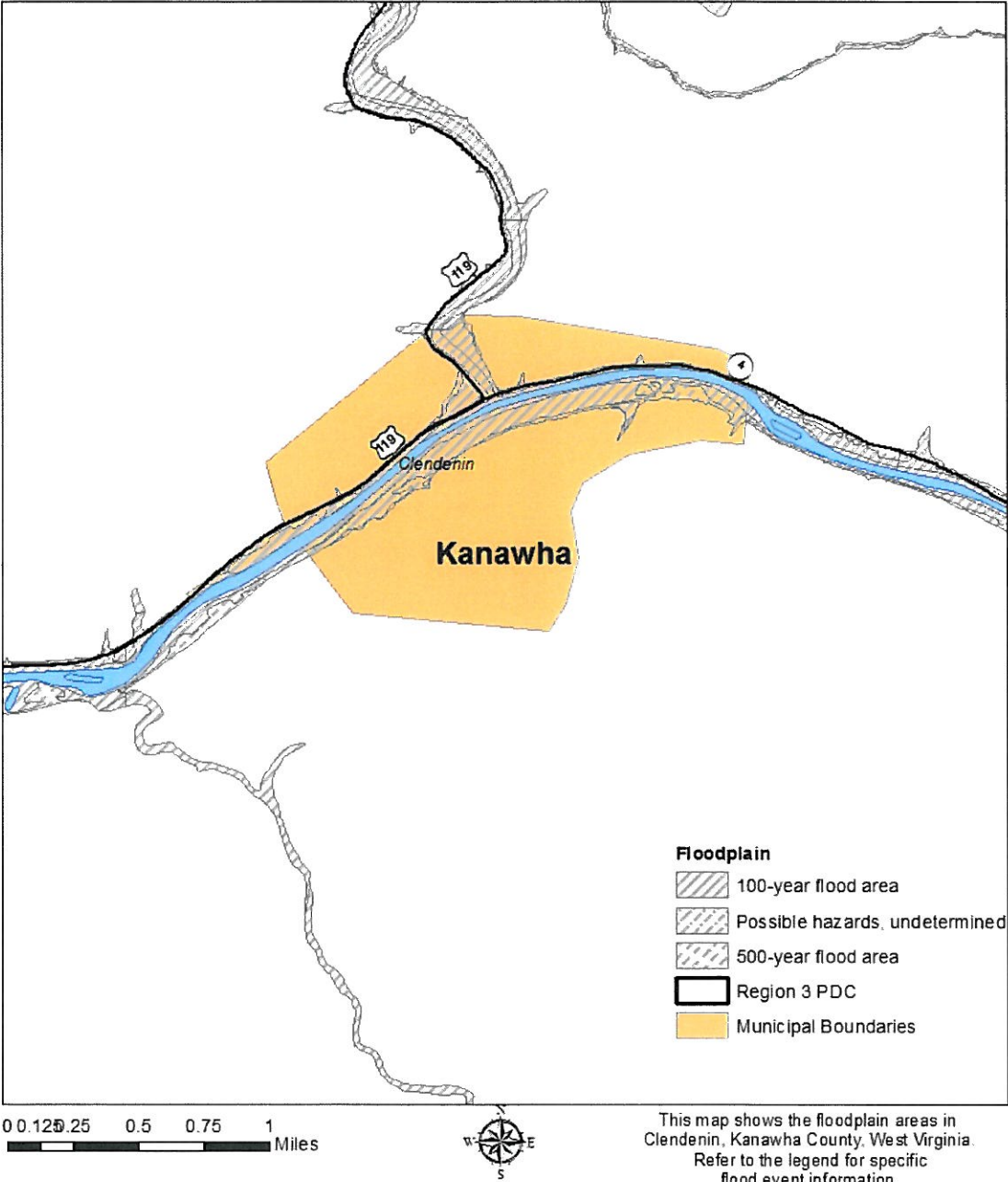
Floodplain



Floodplain



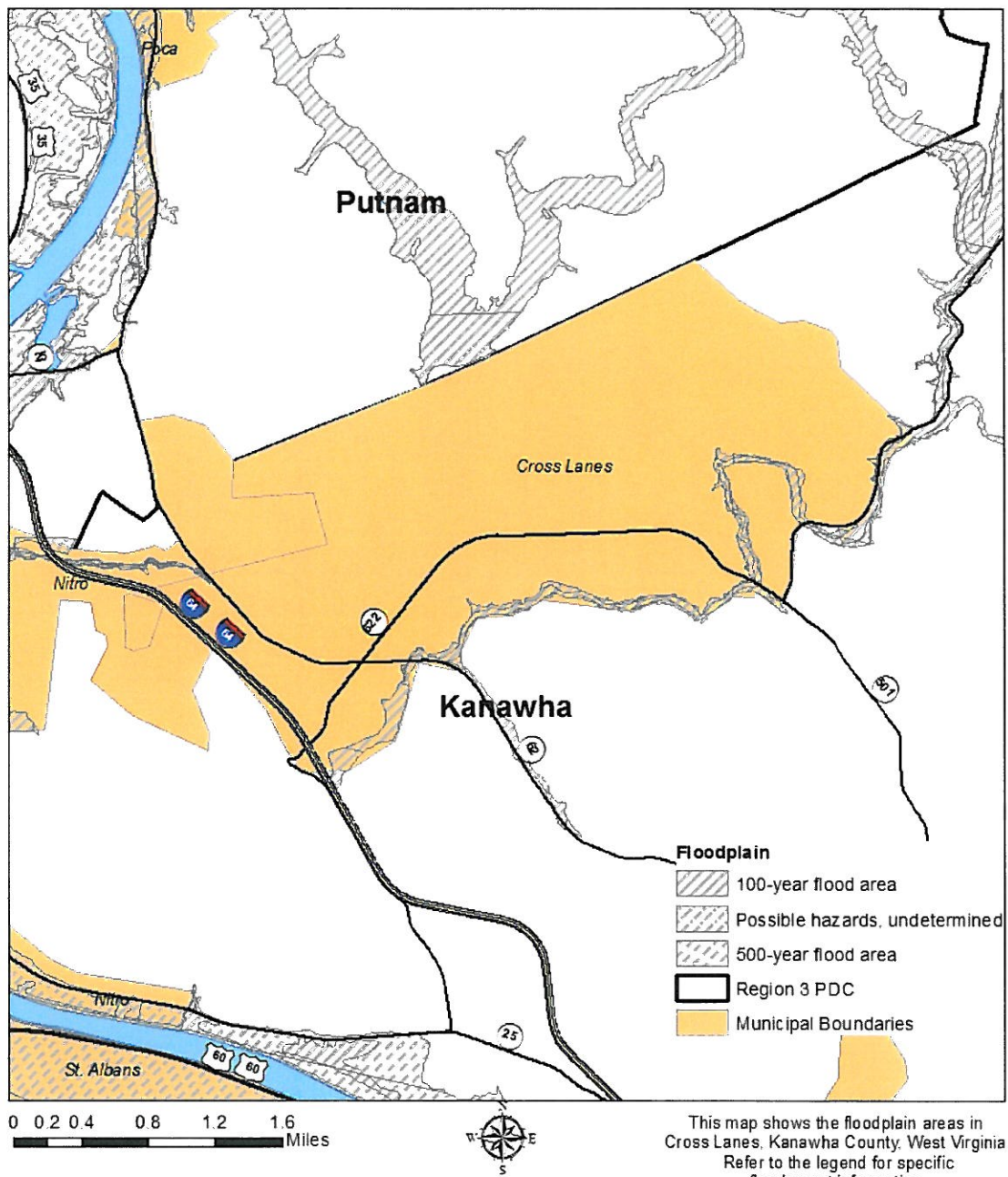
Floodplain



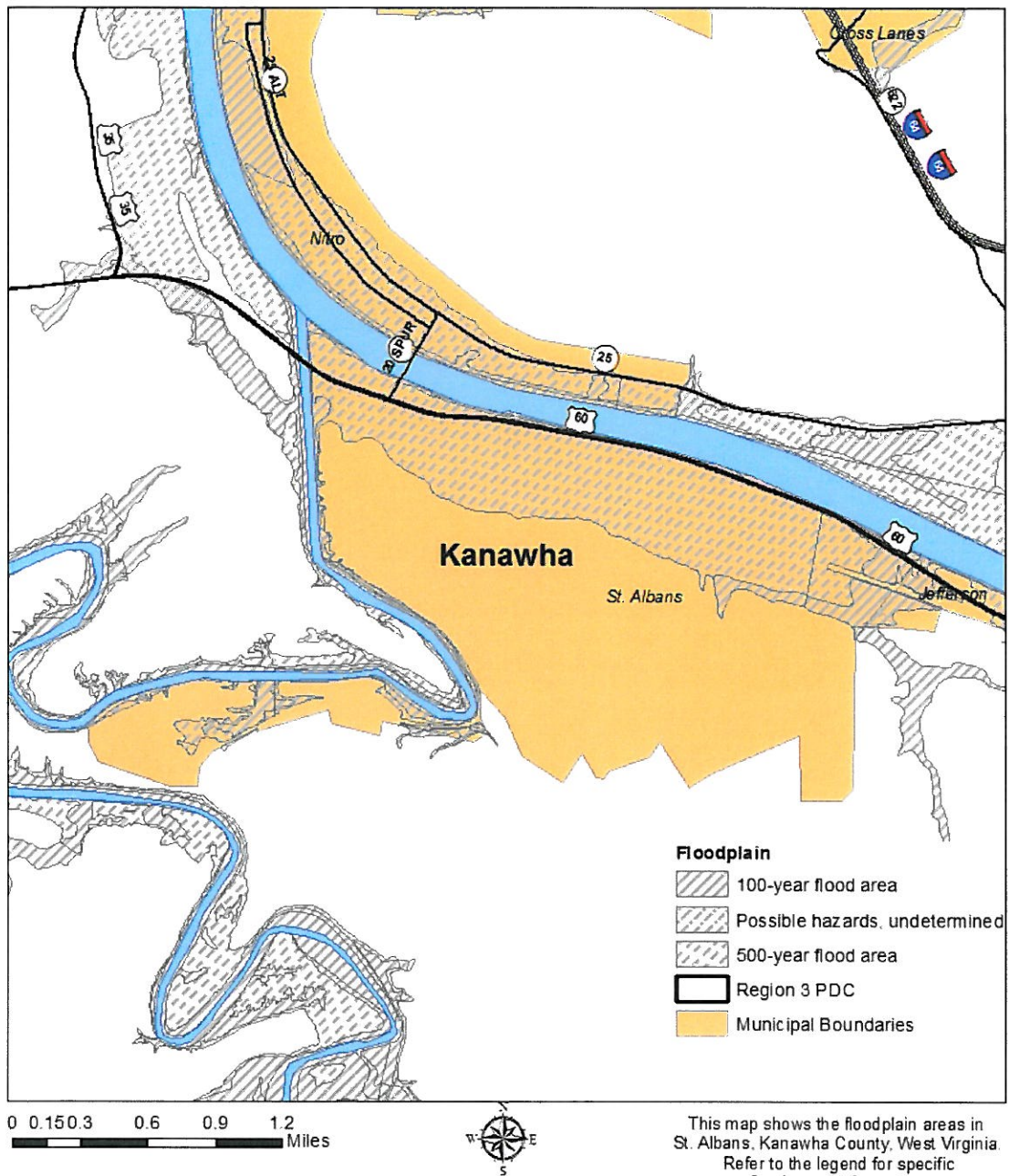
Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

Floodplain



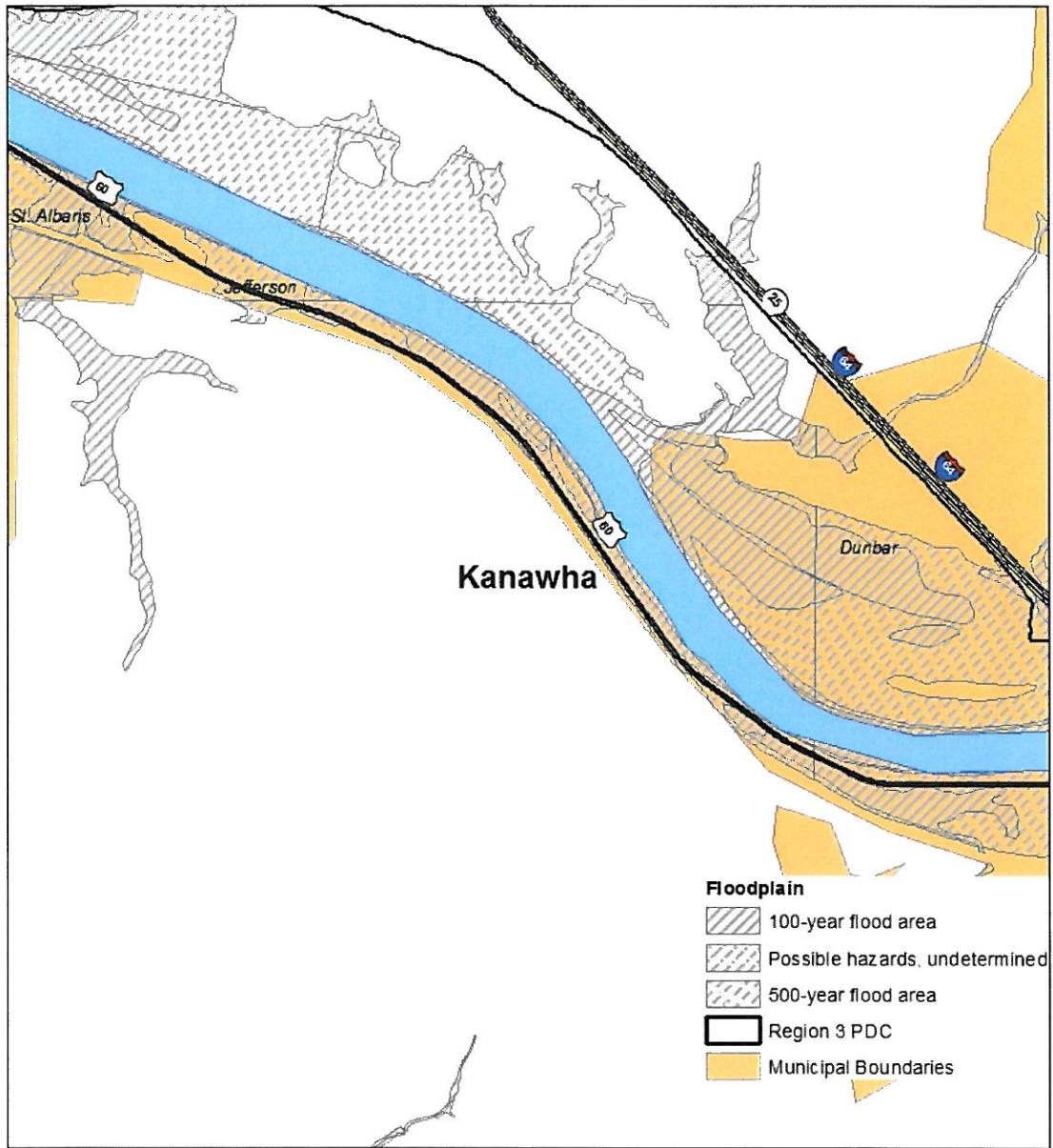
Floodplain



Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

Floodplain



0 0.1 0.2 0.4 0.6 0.8
Miles

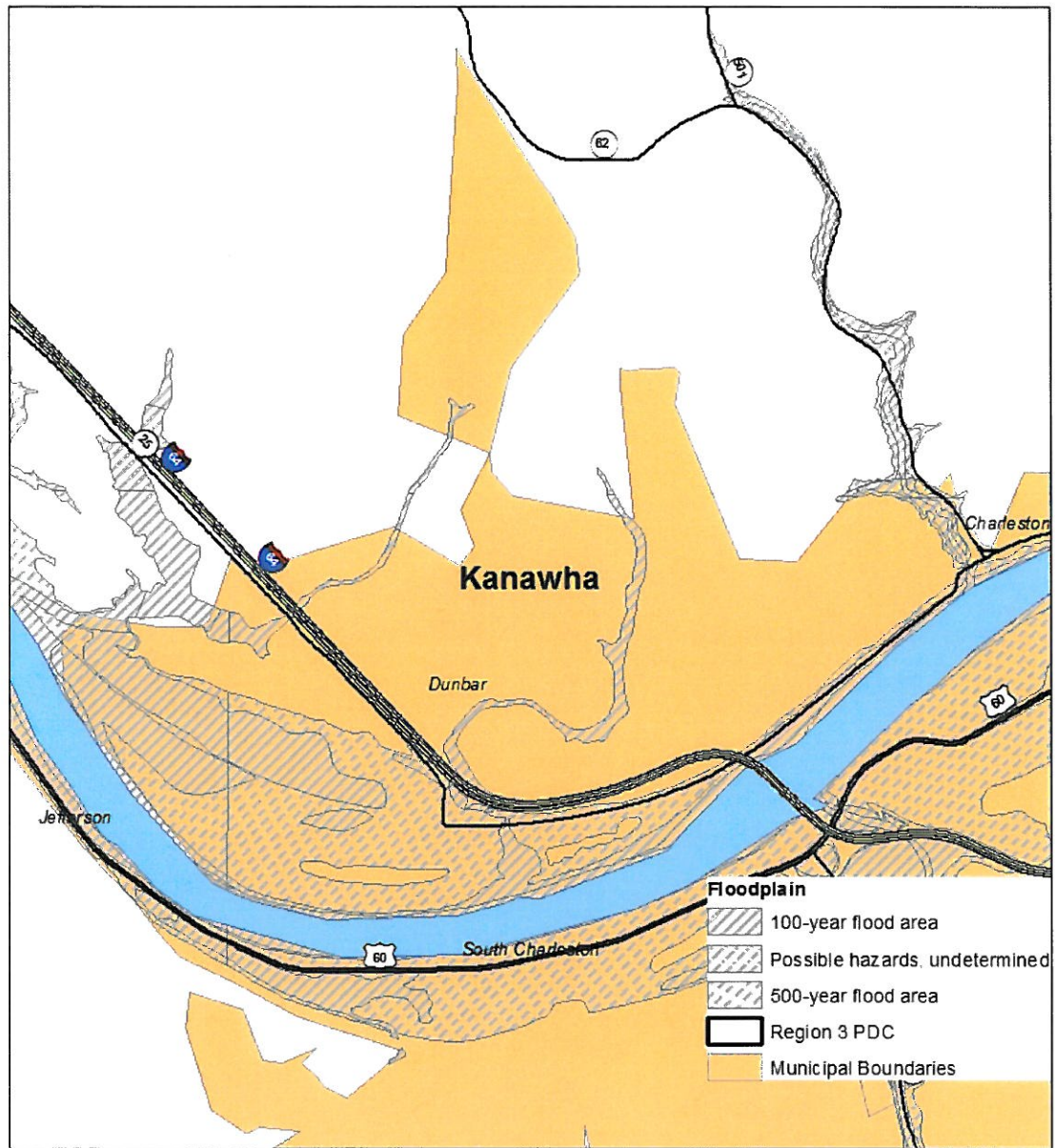


This map shows the floodplain areas in
Jefferson and Institute, Kanawha County, West Virginia.
Refer to the legend for specific
flood event information.

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

Floodplain



0 0.1 0.2 0.4 0.6 0.8 Miles

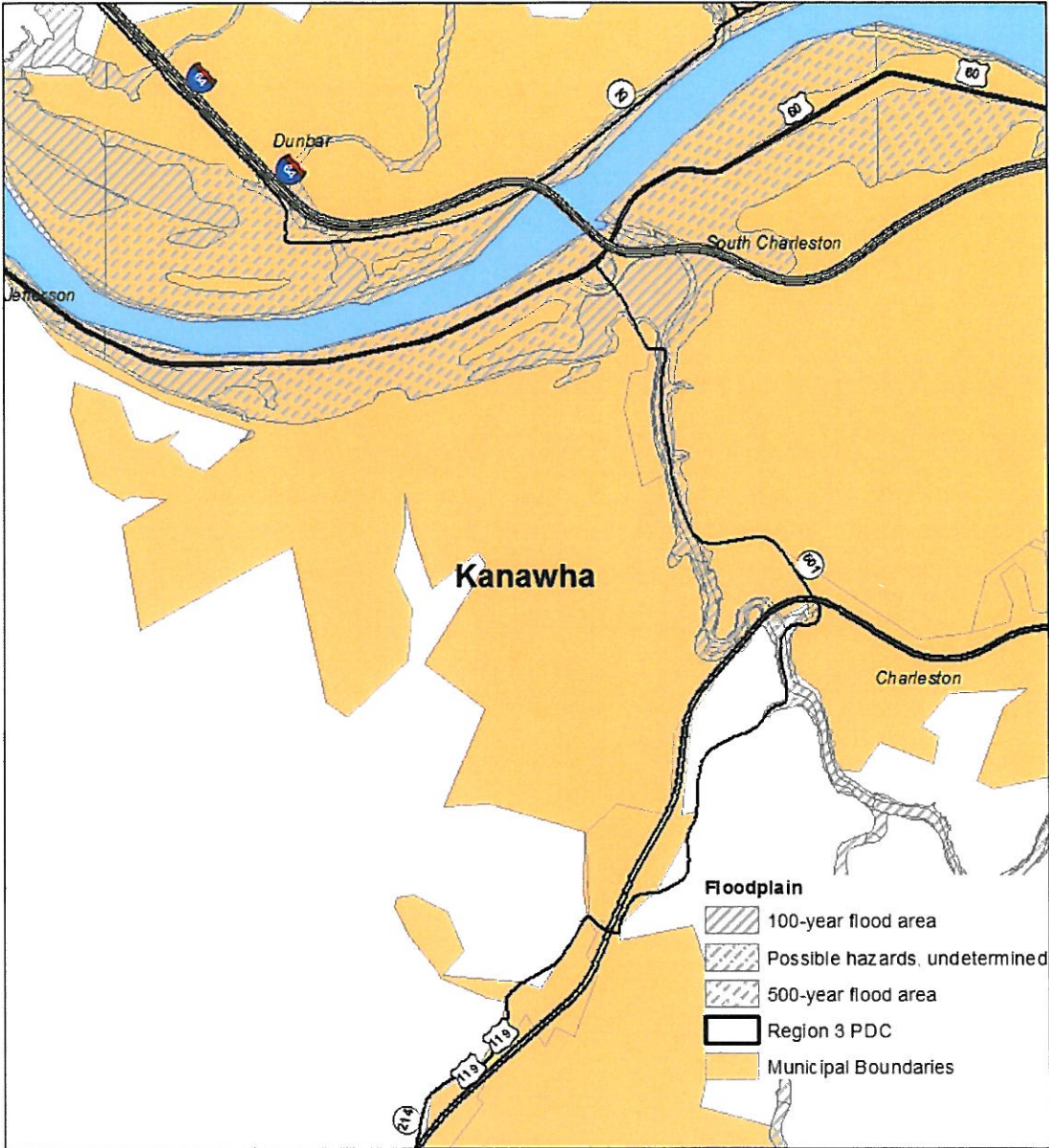


This map shows the floodplain areas in Dunbar, Kanawha County, West Virginia. Refer to the legend for specific flood event information.

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

Floodplain



0 0.125 0.25 0.5 0.75 1 Miles

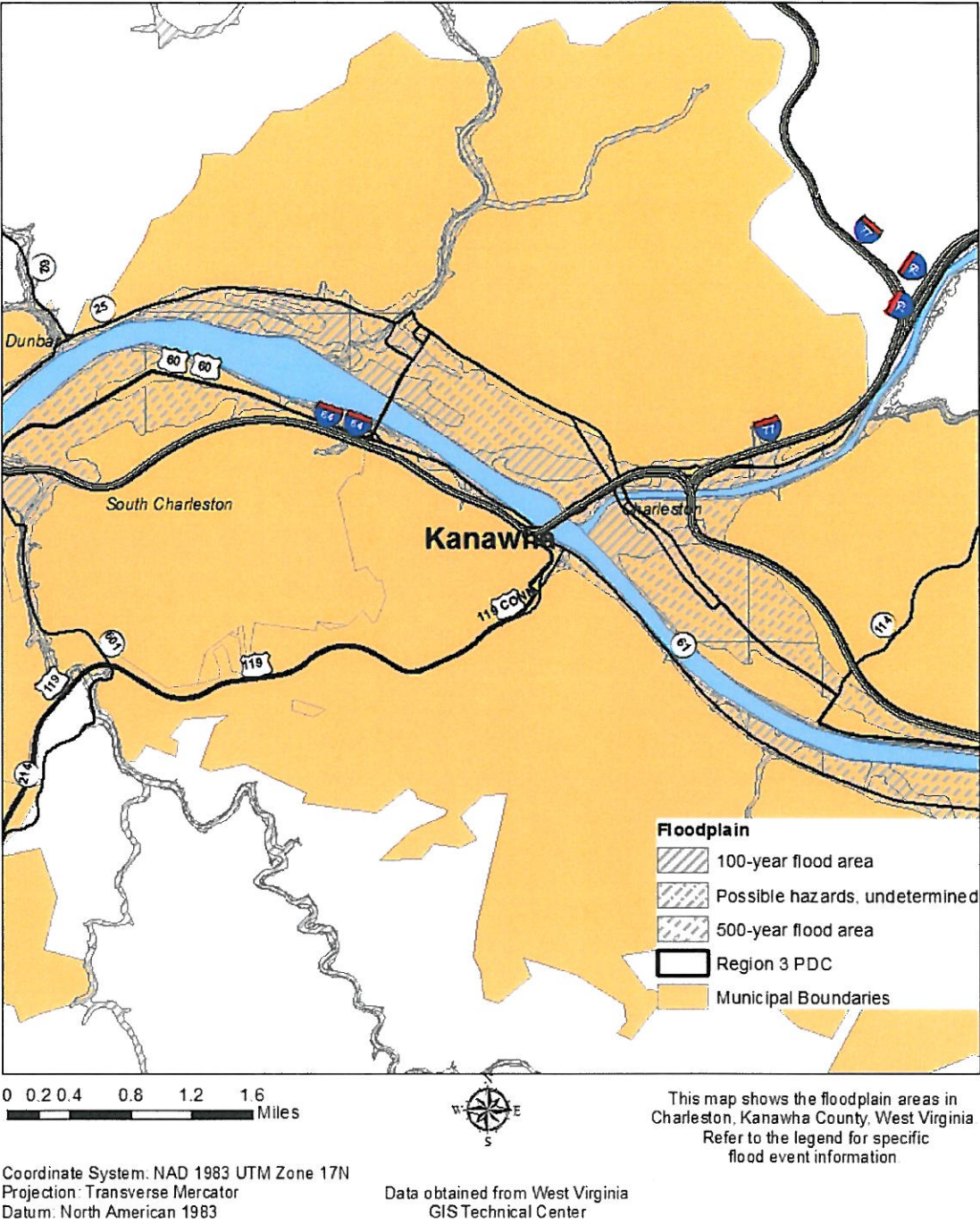


This map shows the floodplain areas in South Charleston, Kanawha County, West Virginia. Refer to the legend for specific flood event information.

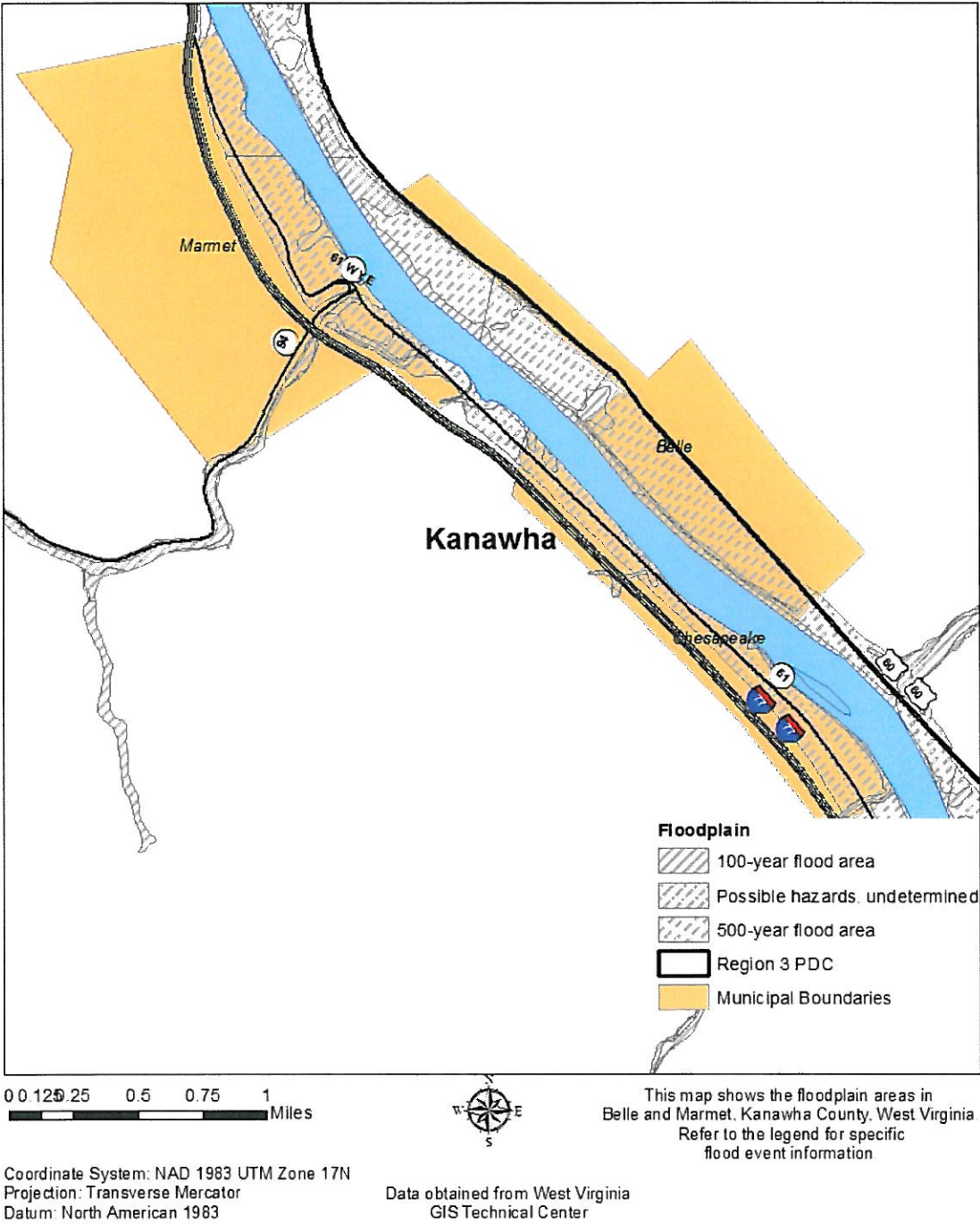
Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

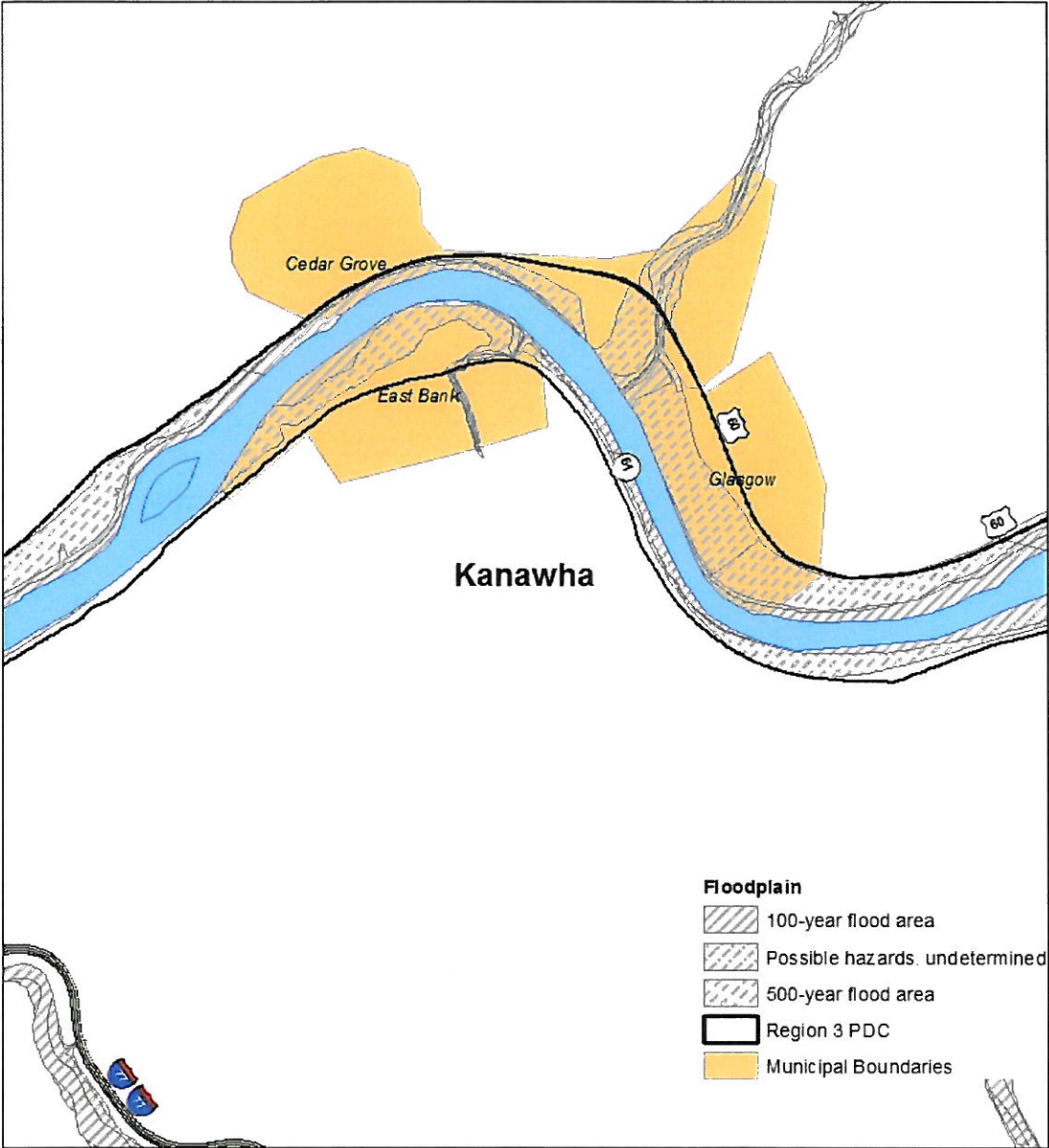
Floodplain



Floodplain



Floodplain



0 0.125 0.25 0.5 0.75 1 Miles

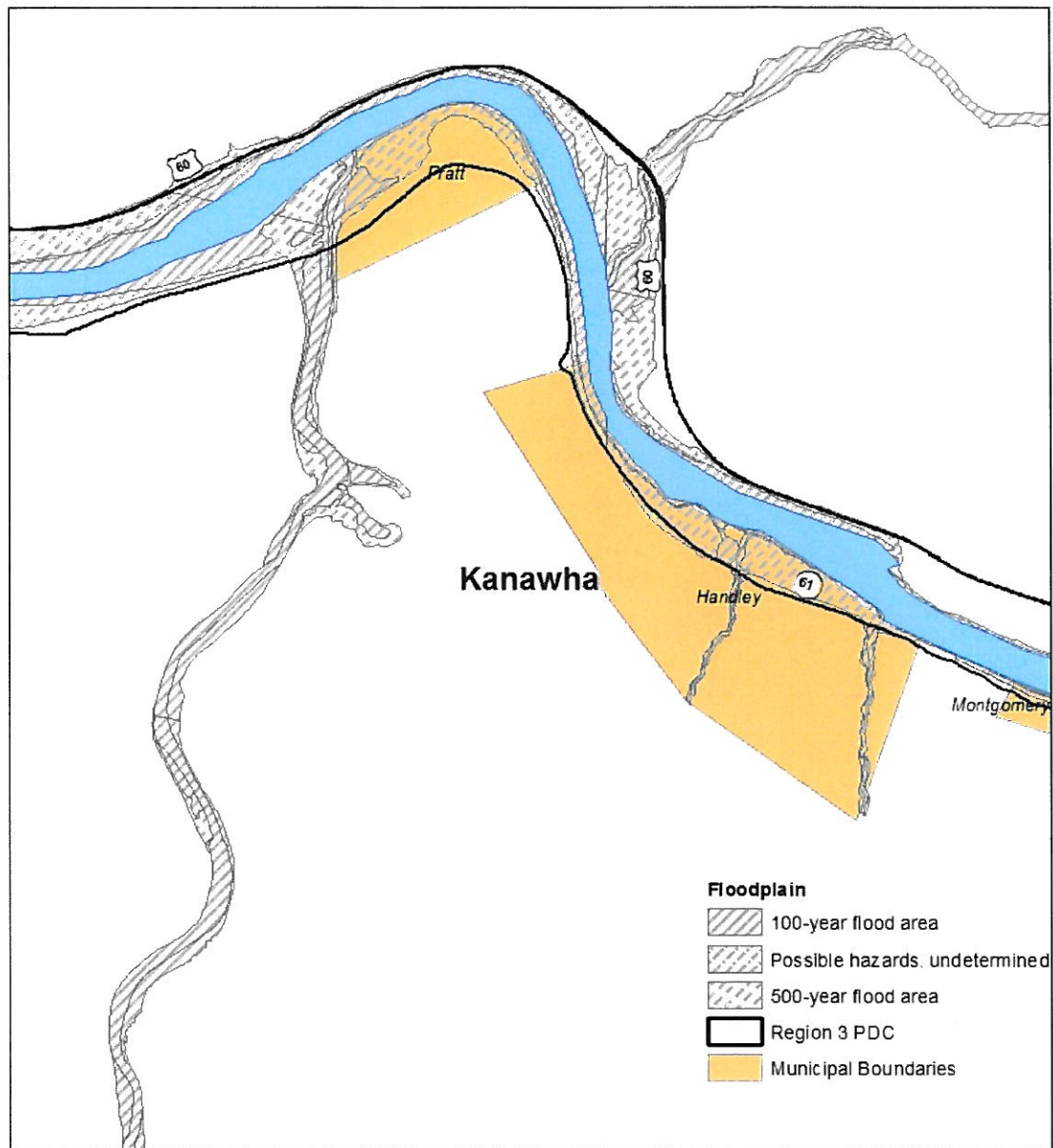


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in Cedar Grove, East Bank, and Glasgow, Kanawha County, West Virginia. Refer to the legend for specific flood event information.

Floodplain



0 0.125 0.25 0.5 0.75 1 Miles

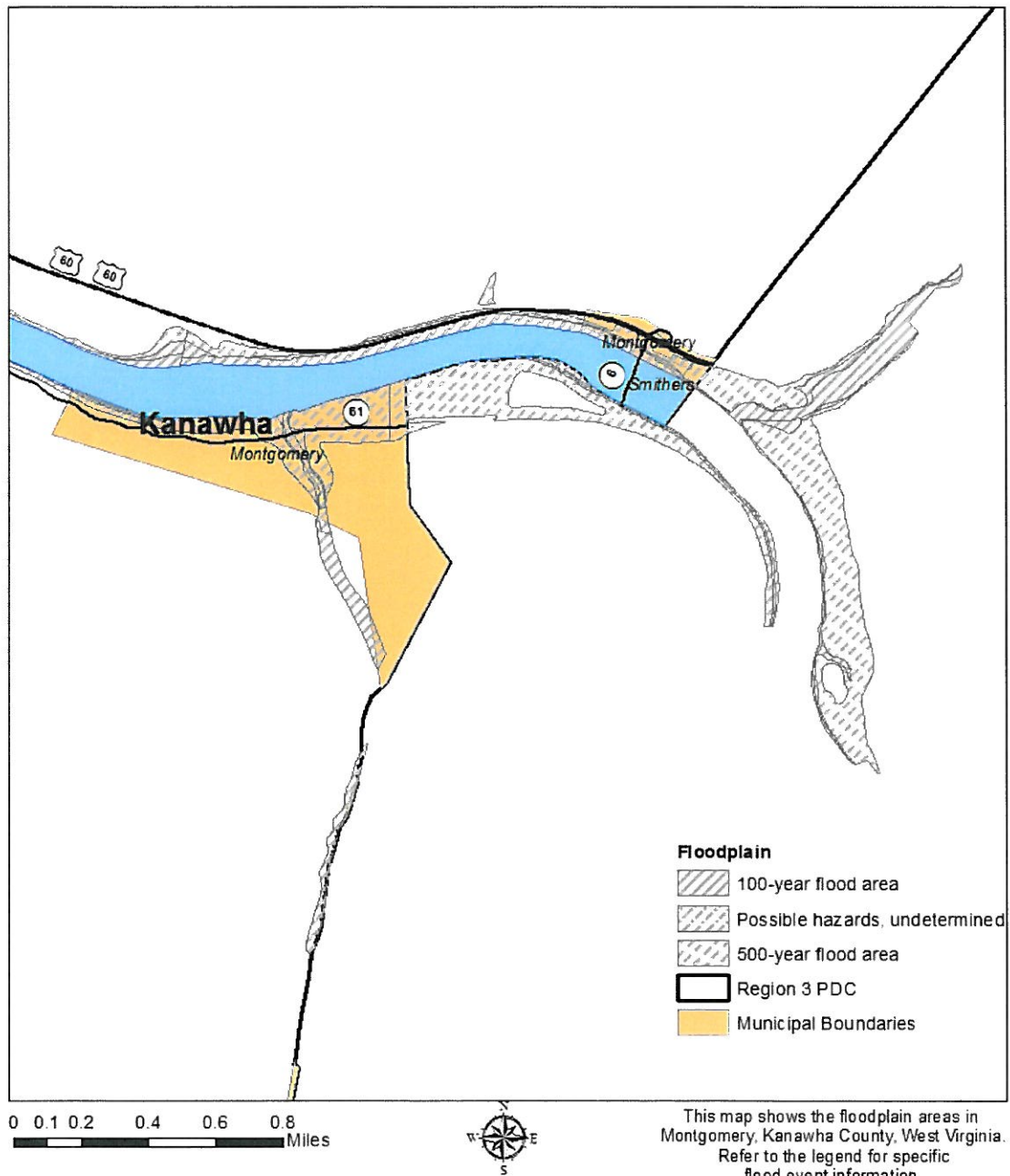


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

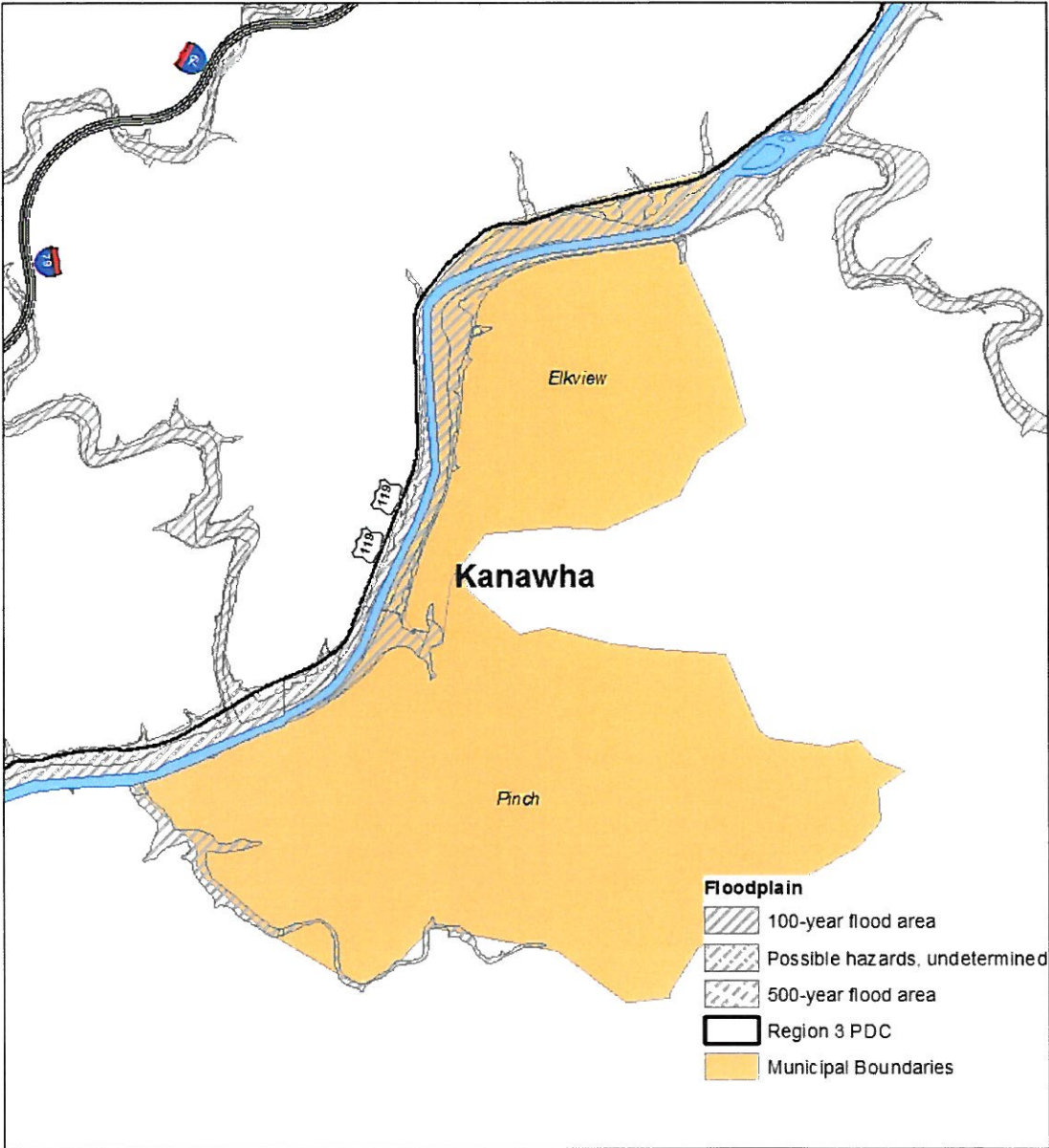
Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
Pratt and Handley,
Kanawha County, West Virginia.
Refer to the legend for specific
flood event information.

Floodplain



Floodplain



0 0.150.3 0.6 0.9 1.2
Miles

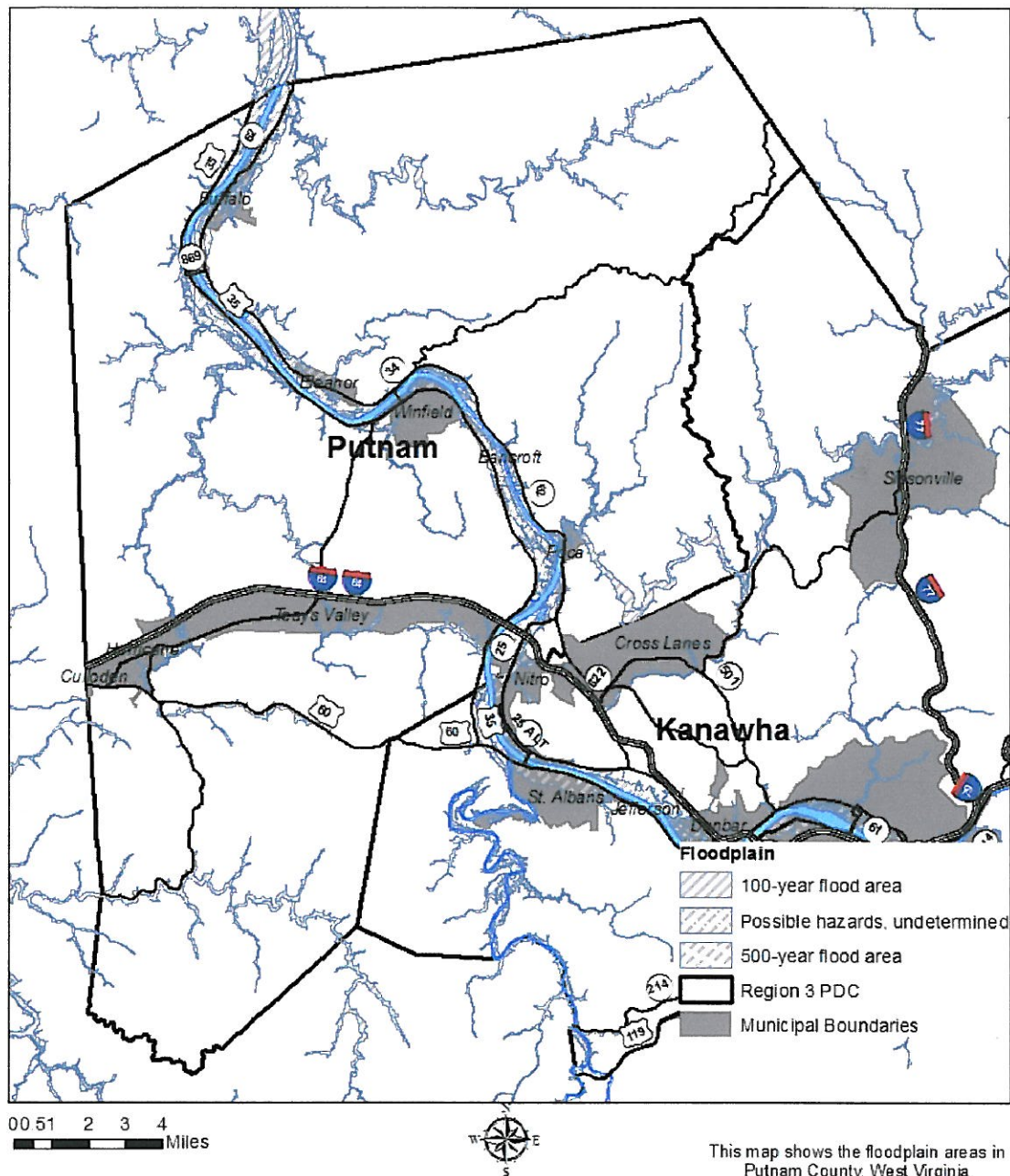


This map shows the floodplain areas in
Elkview and Pinch, Kanawha County, West Virginia.
Refer to the legend for specific
flood event information.

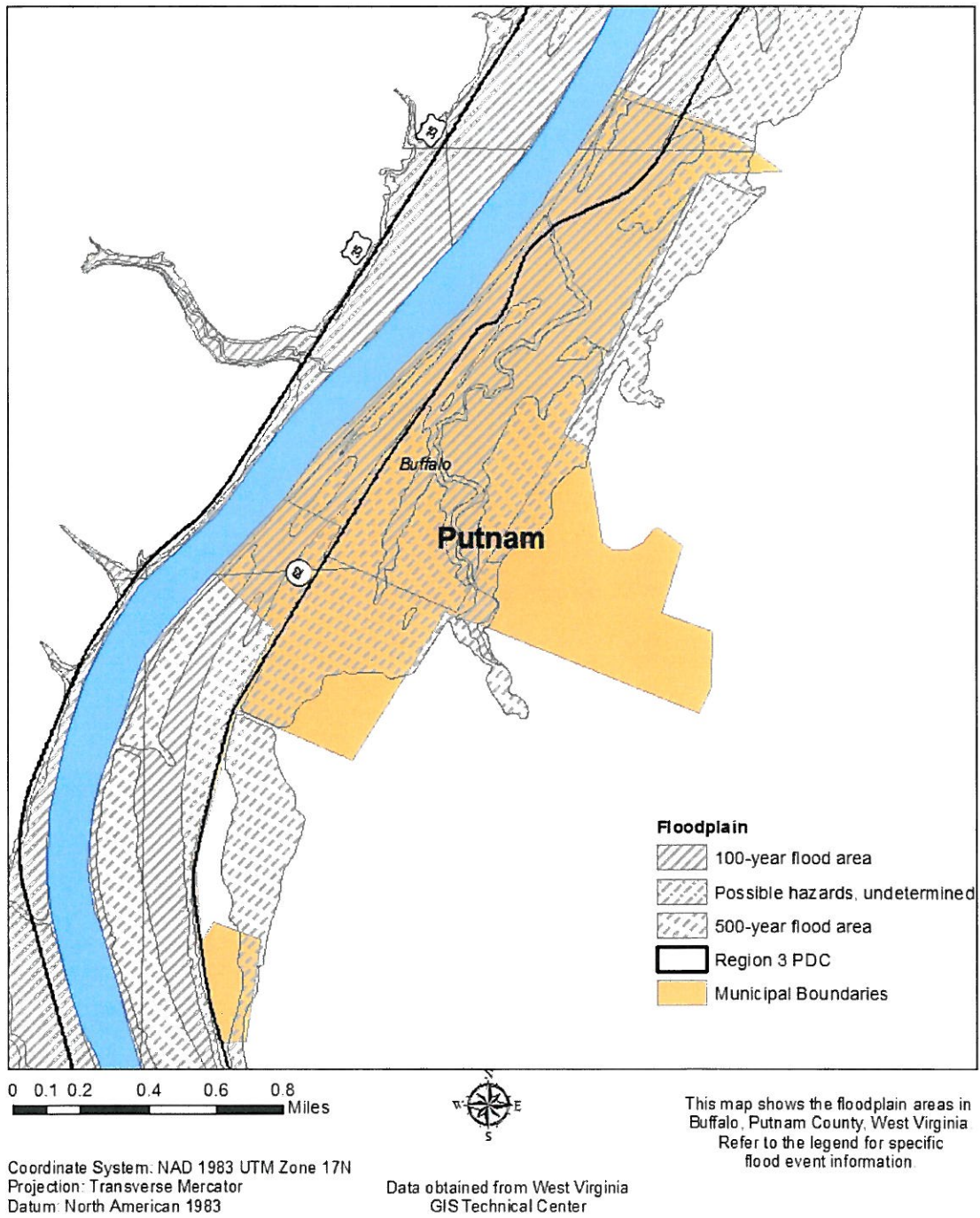
Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

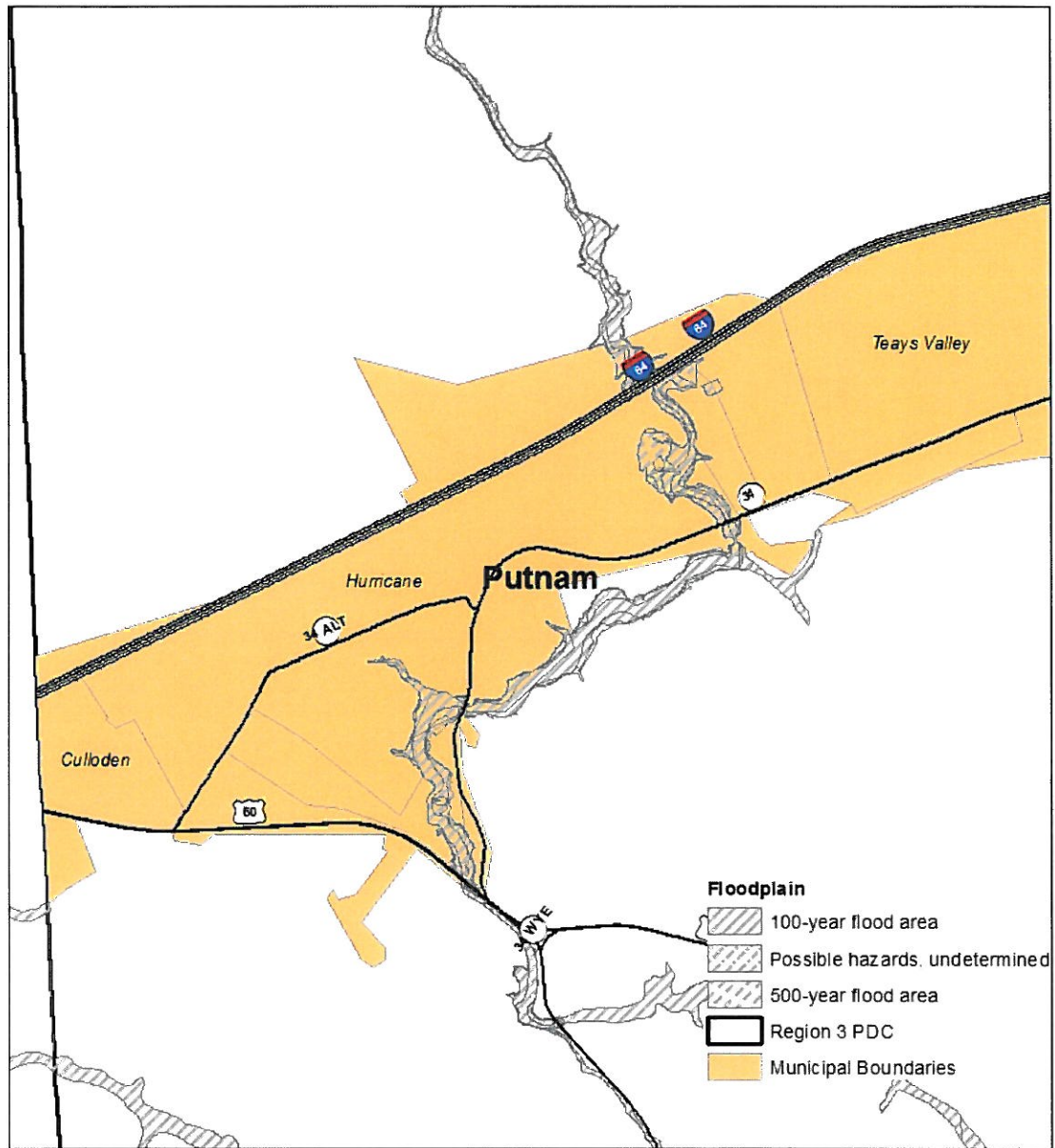
Floodplain



Floodplain



Floodplain



0 0.15 0.3 0.6 0.9 1.2 Miles

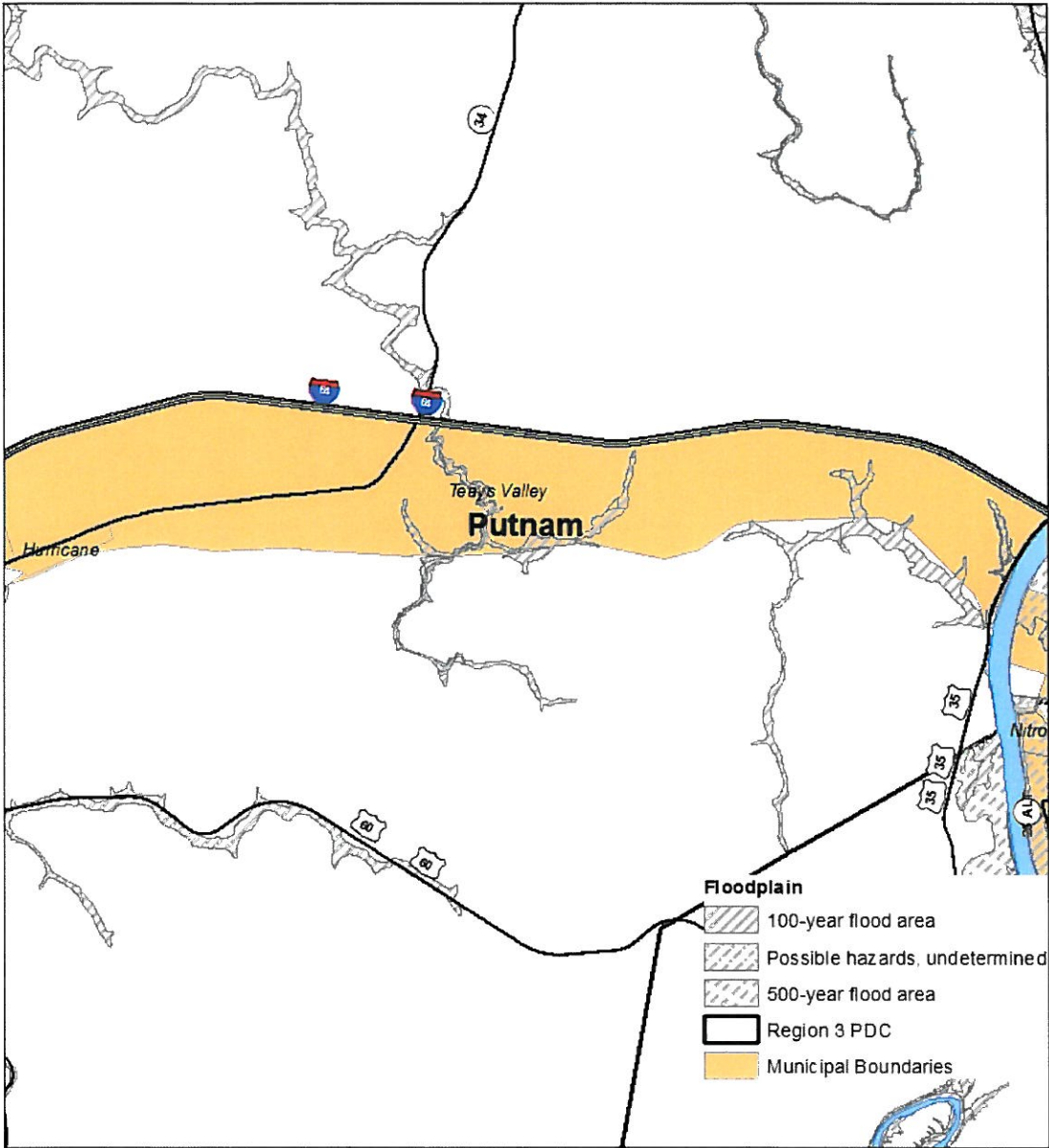


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
Hurricane and Culloden, Putnam County, West Virginia.
Refer to the legend for specific
flood event information

Floodplain



0 0.25 0.5 1 1.5 2 Miles

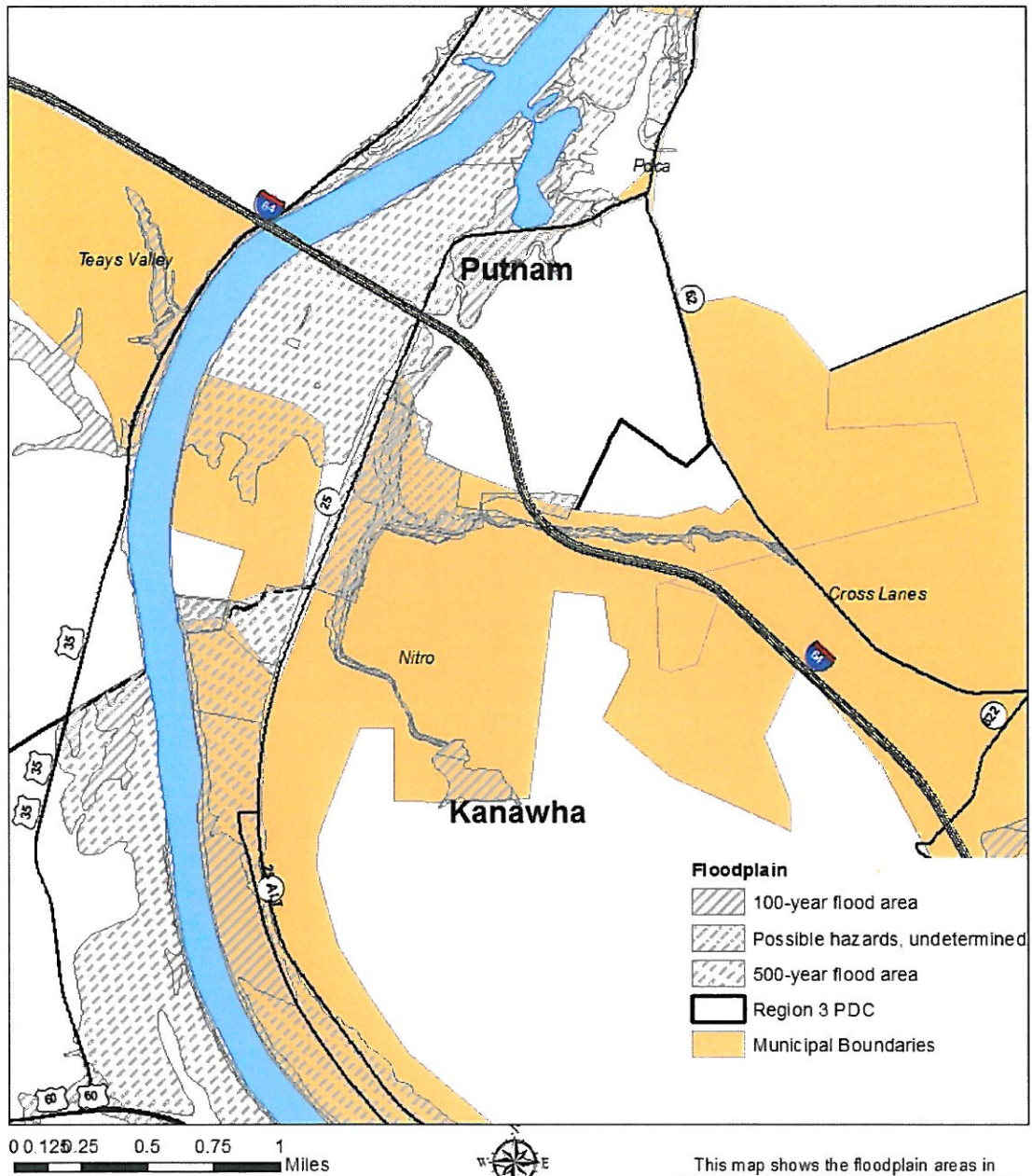


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

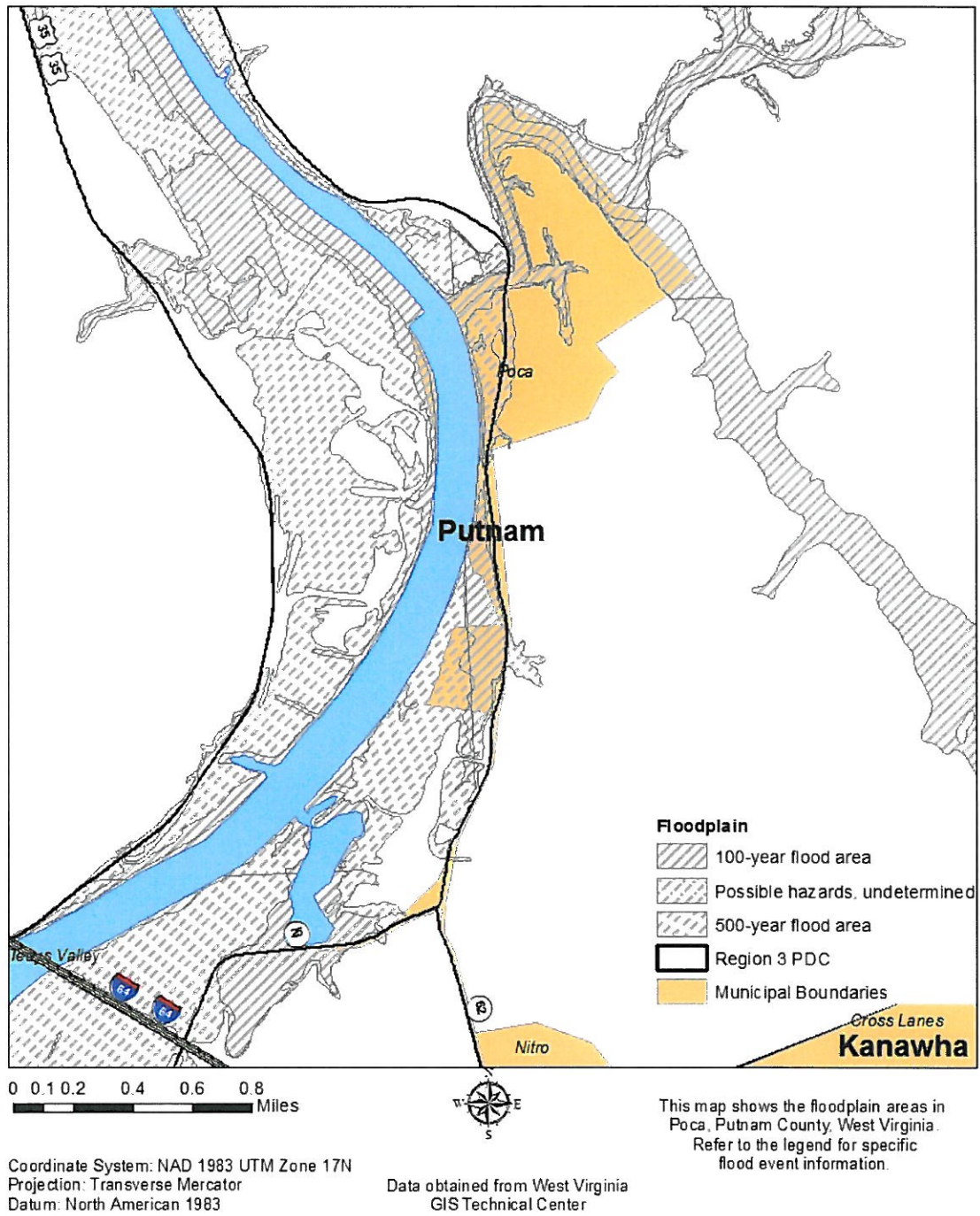
Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
Teays Valley, Putnam County, West Virginia.
Refer to the legend for specific
flood event information.

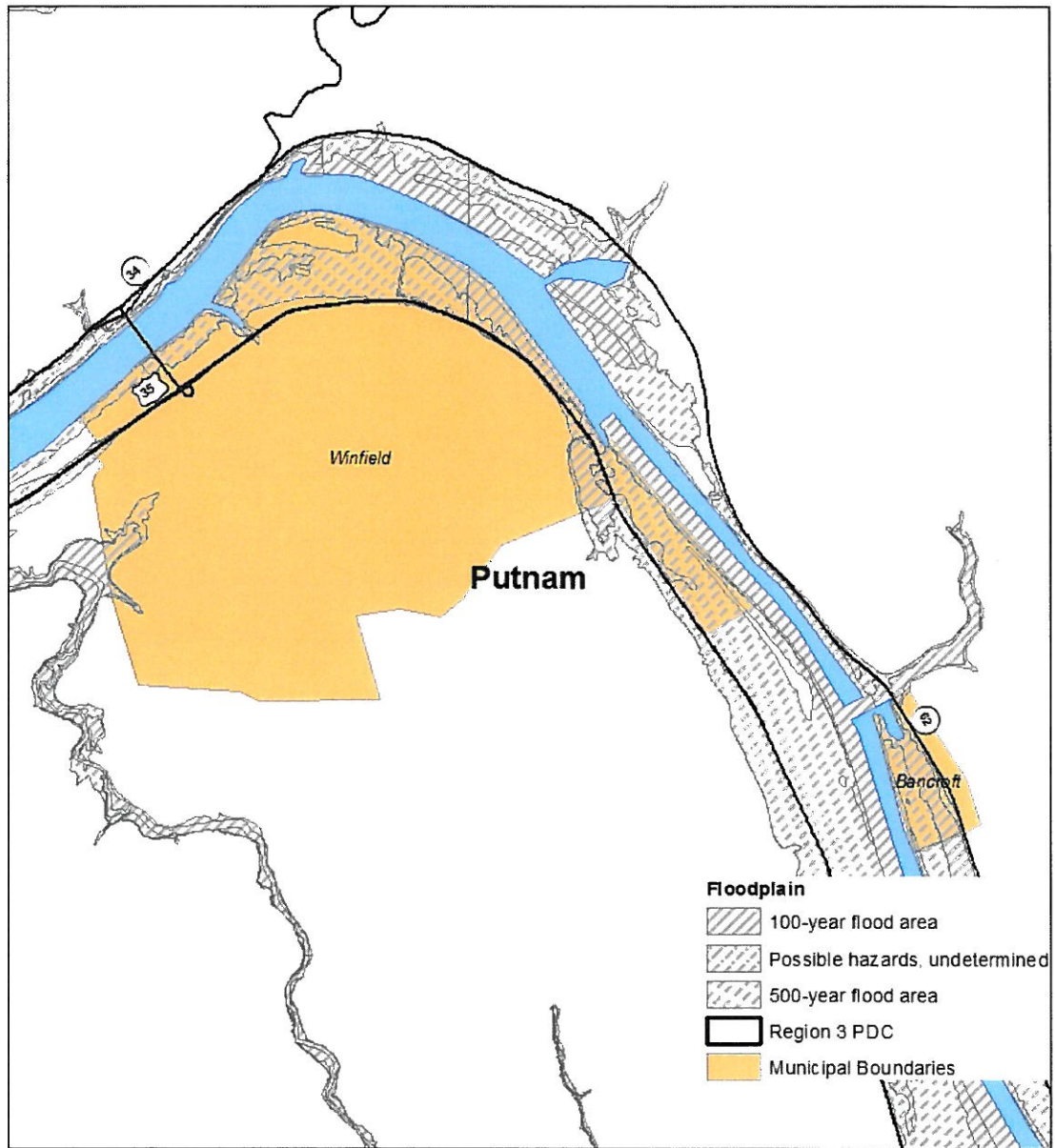
Floodplain



Floodplain



Floodplain



0.0 0.125 0.25 0.5 0.75 1 Miles

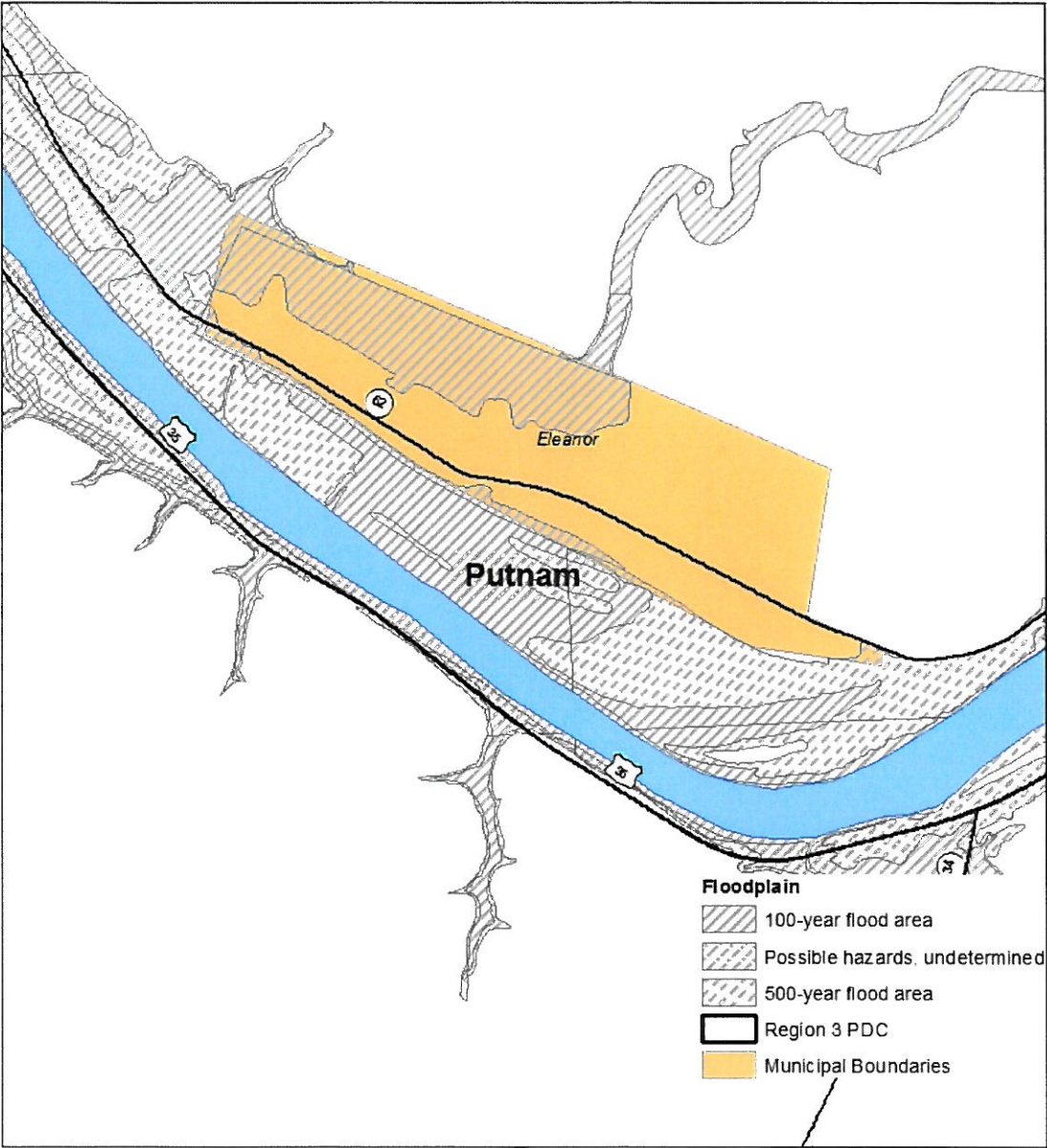


Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
Bancroft and Winfield, Putnam County, West Virginia.
Refer to the legend for specific
flood event information.

Floodplain



0 0.1 0.2 0.4 0.6 0.8 Miles

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

W E
S N

Data obtained from West Virginia
GIS Technical Center

This map shows the floodplain areas in
Eleanor, Putnam County, West Virginia
Refer to the legend for specific
flood event information

Risk Assessment

Flooding in West Virginia is quite common, as a general rule future development within a floodplain without proper precaution should be discouraged. A critical facility should not be located in a floodplain if at all possible. If a critical facility must be located in a floodplain it should be provided a higher level of protection so that it can continue to function and provide services after the flood. Typical critical facilities include hospitals, fire stations, police stations, and similar facilities. Critical functions should also be broadened to consider things like storage of critical records in flood-prone basements. Communities should develop emergency plans to continue to provide these services during the flood.

Repetitive Loss

Properties that have incurred two losses within 10 years of at least \$1,000 paid under the National Flood Insurance Program are defined as Repetitive Loss Properties. Severe Repetitive Loss properties are residential properties that have made four or more claims resulting in \$5,000 or more in losses. Kanawha County has seven severe repetitive loss properties, and Boone County has two. Participation in the Severe Repetitive Loss Program requires flood insurance, and can provide assistance in acquisition, elevation or mitigation of the Severe Repetitive Loss properties. More information can be found in the section titled Participation in the National Flood Insurance Program.

Landslides/mudslides/Land Subsidence

A landslide is characterized by the downward and outward movement of slope forming materials reacting under the force of gravity. The term landslide includes mudflows, mudslides, debris flows, rock falls, rockslides, debris avalanches, debris slides, and earth flows. The type of movement and type of material in motion generally classifies the landslides. Types of movement include: rotational, translational, block, falls, topples, debris flows, debris avalanche, earth flow, creep and lateral spreads. The types of materials in motion generally consist of fractured or weathered bedrock and loose or unconsolidated soils. A combination of two or more of the principle flow types is referred to as a complex movement.

Land subsidence is changes in the surface elevation from underground changes of the soil structure. Landslides are mostly caused by extreme rainfall, excavation, construction or new development, underground mining, Karst topography, rock fall, extraction of natural gases, or seasonal effects. Land subsidence is vertical earth movement resulting from increased stresses in the soil mass, or loss of shallow soil support. Subsidence can be described as rapid, caused by undermining or failure of the underlying strata, or slow, caused by consolidation. Rapid subsidence, generally referred to as sinkholes, result from small subsurface voids enlarging over time until the thickness of soil/rock at the roof is

insufficient to support the applied loads, including its own weight. Rapid subsidence frequently occurs in areas of abandoned mines, and karst areas underlain by carbonate rocks (limestone and dolomite). Karst is a landscape with topographic depressions caused by the dissolution of carbonate rocks (limestone and dolomite) by moving groundwater. Karst topography develops throughout the United States, but is not widely found in Boone, Clay, Kanawha or Putnam Counties.

History of Landslides

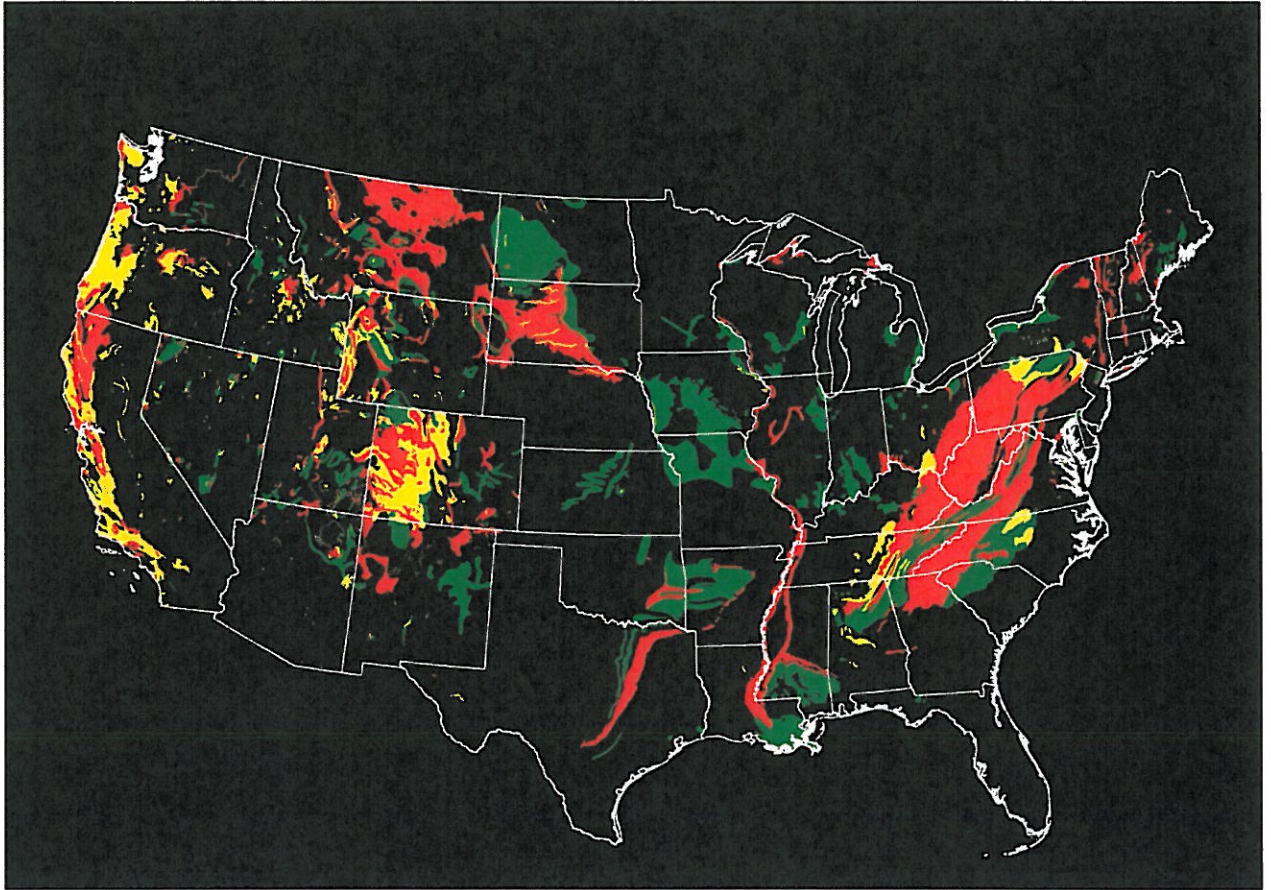
As the map below shows, West Virginia is at a very high risk for landslides. While the risk is high, it is very hard to predict when and where a landslide could occur. Most landslides in RIC have occurred around abandoned mine lands. These areas are prone to landslides because the underground soil structure has been greatly altered. However, these areas are often in uninhabited areas, so very low damage costs are incurred. Kanawha and Putnam counties would be at risk of landslides with a cause of excavation due to new development or construction. No historic record of landslides in West Virginia was found so it is unknown how many or what circumstances landslides have caused in Boone, Clay, Kanawha and Putnam Counties.

Vulnerability and Impact Assessment

Landslides occur in all 50 states and U.S. territories, and cause \$3.5 billion in damages and between 25 and 50 fatalities each year (2005, USGS). Expansion of urban and recreational developments into hillside areas leads to more people that are threatened by landslides each year. Landslides commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods, and are sometimes more damaging than the initial natural disaster. The probability of subsidence cannot be expressed in terms of a specific return period as easily as it can for other hazards.

Risk Assessment

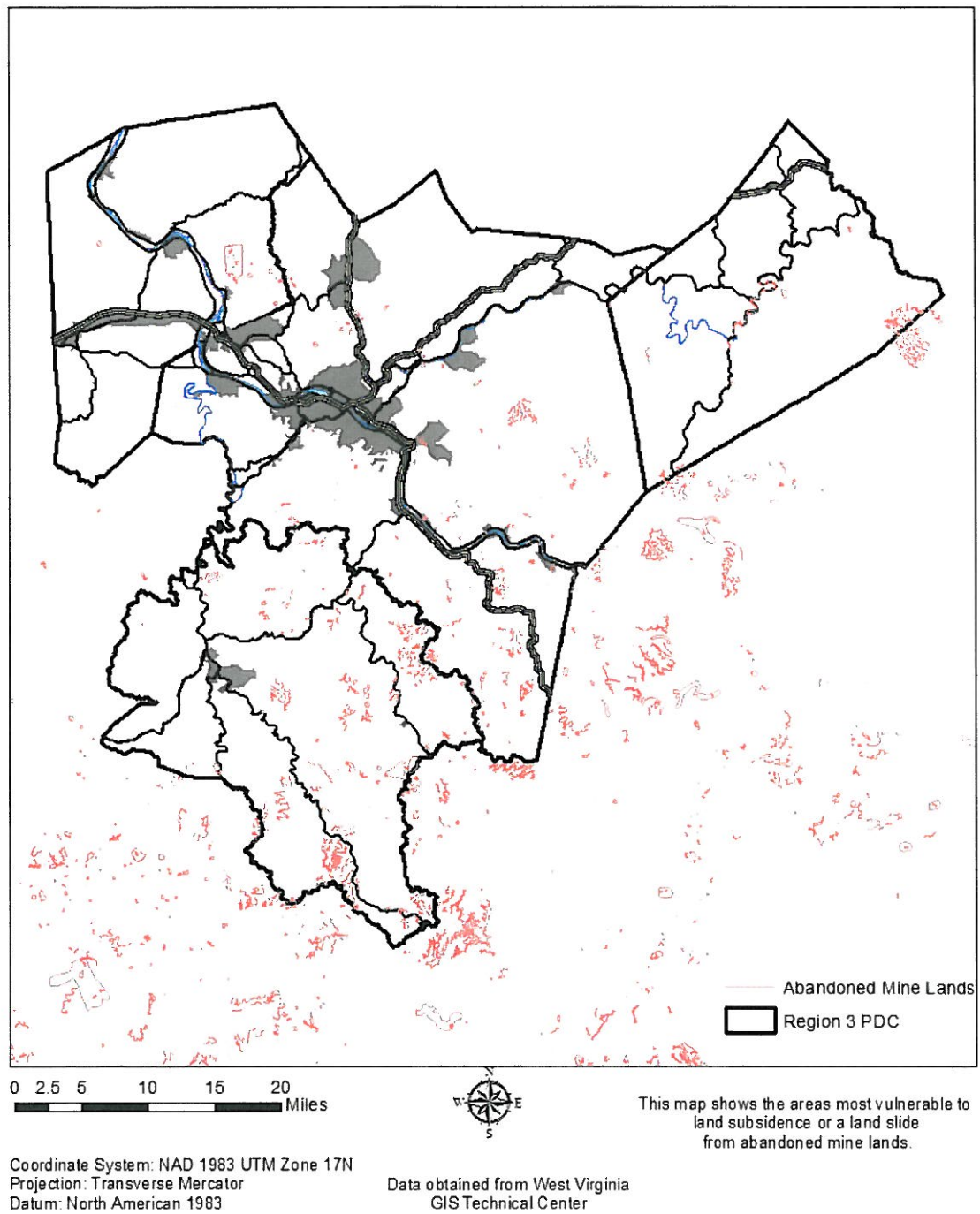
West Virginia is at a high risk for landslides. While the risk is high, it is very hard to predict when and where a landslide could occur. Most landslides in RIC have occurred around abandoned mine lands, however, these areas are often in uninhabited areas, so very low damage costs are incurred. Kanawha and Putnam counties would be at risk of landslides with a cause of excavation due to new development or construction.



Landslide potential of the conterminous United States: Red areas have very high potential, yellow areas have high potential, and green areas have moderate potential. Landslides can and do occur in the black areas, but the potential is low. Map not to scale. Sources: the National Atlas and the USGS

The map below will show abandoned mine lands in Boone, Clay, Kanawha and Putnam counties. These areas are at a higher risk of a landslide than the rest of the county area.

Abandoned Mine Lands in the RIC



Severe Storms

Severe storms can encompass many different types of storms; severe thunderstorms, lightning, winter storms, wind storms and hail storms. While severe storms occur frequently they rarely cause costly damages. Region 3 is at high risk throughout the year to various types of severe storms.

A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm or cold front, or a sea or lake-breeze. All thunderstorms contain lightning. Damage from severe thunderstorms often occurs when a single thunderstorm affects one location for an extended time. Thunderstorms can contribute to an onslaught of other hazards, such as flooding, strong straight-line winds, tornadoes, hail, and lightning, as well as the possibility of lightning initiated fires.

Downburst winds, typically associated with thunderstorms, are 'straight-line' winds that are distinguishable from tornado activity by pattern of destruction and debris. Depending on the size, intensity, and location of these events, the destruction to property may be devastating. Downburst winds generally fall into two categories; microburst, an area less than 2.5 miles in diameter, macroburst, an area at least 2.5 miles in diameter.

Thunderstorms and wind storms are declared when winds reach 58 miles per hour. Severe wind gusts cause damage to power lines and trees; tree limbs or even whole trees fall down and damage power lines or block roadways. Loss of power causes a loss of business and additional work to repair the failed utilities. Also, blocked roadways will cause additional work to repair and clean up any debris or fallen limbs. Since 2000 Region 3 has incurred \$1.2 million in damages due to high winds.

Hailstorms cause damage to crops, structure, transportation systems and personal property. Hailstorms are more common in elevated areas like the mountainous areas of Region 3. Hail rarely causes enough damage to close a business or keep employees from reporting to work. Since 2000 Region 3 has reported many storms with hail ranging from 0.75 inches to 2.5 inches.

Winter storms may pose the most risk to human life due to the freezing temperatures, dangerous driving conditions and utility failures. Winter storms can include blizzards, heavy snowstorms and ice storms. A blizzard is classified by having 35 mile per hour winds and heavy snowfall. Heavy snowstorms are declared when four inches or more snow falls in a twelve hour period. An ice storm involves rain and below freezing temperatures. All three types of winter storms can cause utility failures, road closures and falling trees and tree limbs. February 16th, 2003 marked a winter storm that encompassed all of Region 3 and several other West Virginia Counties and cost \$1.9 million in damages. This was the largest and most costly winter storm during our study period of 2000 to November 2009.

History of Severe Storms

It has already been noted that Boone, Clay, Kanawha and Putnam counties have experienced 362 wind events over the past 60 years. The following table will provide some insight into different severe storm related events that have occurred within the past 60 years. Data provided by NCDC.

Severe Storm Event	Boone	Clay	Kanawha	Putnam	RIC
Hail	40	24	112	48	224
High Winds	2	2	4	5	13
Lightning	1	0	4	1	6
Snow and Ice	23	28	28	22	101
Strong Winds	0	0	3	1	4
Thunderstorm Winds	51	35	174	85	345

Impact and Vulnerability Assessment

Due to the somewhat unpredictable nature of damaging wind and thunderstorms, it is difficult to determine future probability of the hazard. Modeling of future occurrence is difficult and not practical for purposes of this plan. Instead, an examination of past events was performed using NCDC data that dates to 1950.

From historic data, the RIC four county area has experienced 362 wind events in almost 60 years. At the highest occurrence county level, Kanawha County has experienced approximately 3 events annually. On the opposite end of the spectrum, there have been fewer than 0.6 events annually in Clay County. It is worth noting that the differences in the number of reported events may be significantly related to population and population density. Regardless, based on this analysis, it is clear that wind is a significant hazard.

The impact of wind can be measured in financial terms as well as fatalities and injuries. An examination of NCDC data shows that wind contributed to the deaths of at least 7 individuals and injuries sustained by more. Wind vulnerability is based in large part on building construction and standards. Other factors, such as location, condition and maintenance of trees also plays a significant role in determining vulnerability.

Risk Assessment

Risk, as defined as probability multiplied by impact, cannot be fully estimated for damaging winds due to the lack of intensity-damage models for this hazard. Instead, financial impacts of damaging winds can be developed based on NCDC Storm Events data.

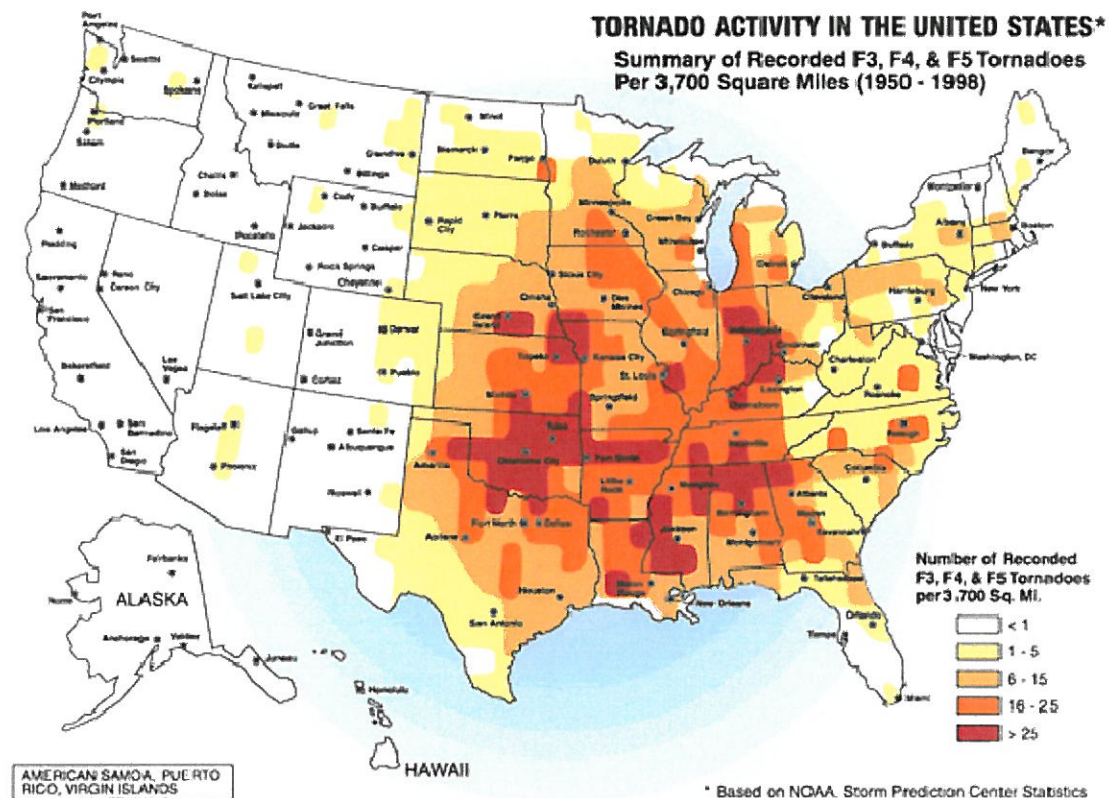
Tornadoes

A tornado appears as a rotating, funnel-shaped cloud that extends from a storm cloud to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be as large as one mile wide and 50 miles long. Every state is at some risk from this hazard, however, tornadoes are found more frequently east of the Rocky Mountains during the spring and summer months. In an average year, 800 tornadoes are reported nationwide, resulting in 80 deaths and over 1,500 injuries. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more.

History of Tornadoes

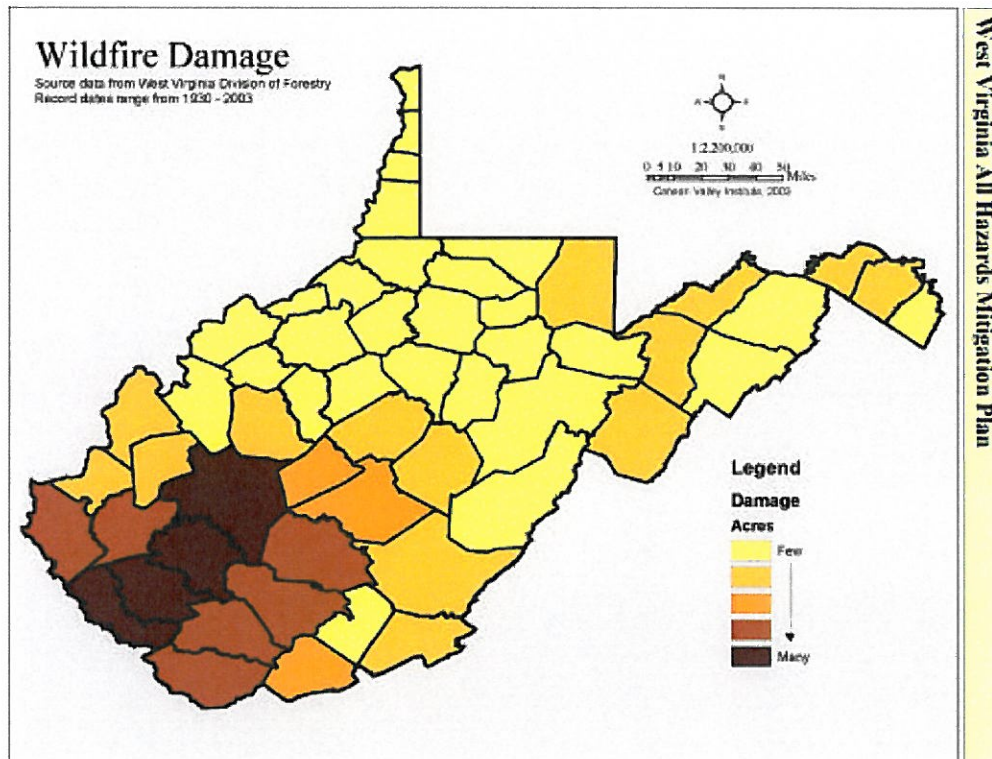
RIC has experienced only 12 tornadoes since 1950. Boone and Clay counties have not seen any tornadoes, while Kanawha and Putnam counties have seen 7 and 5, respectively. Within the past 10 years, Region 3 has only recorded 3 tornadoes. In all the recorded tornadoes no deaths were reported and damage has been relatively minimal.

The map below, from NOAA, depicts West Virginia as having 5 or less tornadoes rating an F3, F4 or F5.



Wildfire

A wildfire is an uncontrolled fire that occurs in a forested area. A non-wilderness structural fire occurs in an urban area and primarily accrues structural damage. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, and its ability to change direction unexpectedly and to jump gaps, such as roads, rivers and fire breaks. Urban fires are instances where uncontrolled burning occurs in residential and commercial development areas.



The above map from The WVU Extension Service Disaster and Emergency Management Resources shows Boone and Kanawha counties as having high damage from wildfires reported by acreage. Wildfires cause high costs including loss of timber, homes and structures and fire suppression costs. It is important to note non-wilderness fires include fires with the following causes; unknown, incendiary, suspicious, misuse of heat or material, mechanical failure, construction deficiency, operational deficiency natural condition and animal/rekindle. In 1995 Kanawha County reported 914 non-wilderness fires, the highest in the entire state of West Virginia.

History of Wildfires

Two of the largest wildfires in West Virginia in recent years occurred in 2001. That year saw the occurrence of two federally declared fire disaster complexes, the Trough-Smokehole Wildfire Complex in the southern portion of the state, and the Southwest West Virginia Wildfire Complex in the eastern part of the state. The Trough-Smokehole

Complex was centered in Grant and Hardy counties, and the Southwest West Virginia Complex affected Boone, Cabell, Kanawha, Lincoln, Logan, McDowell, Mercer, Mingo, Raleigh, Wayne, and Wyoming counties. These large wildfires burned for four and three weeks, respectively, and were responsible for more than \$105 million in damages. Fire suppression costs for these fires exceeded \$500,000 statewide. As a result of these two fires, West Virginia received more than \$1.8 million in federal grant assistance from the National Fire Plan Program

Impact & Vulnerability

Vulnerability to wildfire is influenced by a variety of factors, such as land cover conditions, weather, and the effectiveness of land management techniques. Individual buildings in urban areas may be more or less vulnerable to damage from wildfire based on factors such as the clear distance around the structure, and the structure's construction materials.

The primary impacts of most wildfires are timber loss and environmental damage, although the threat to nearby buildings is always present. In the wake of a wildfire, secondary impacts may also include landslides and mudslides caused by the loss of groundcover which played a key role in stabilizing soil.

The economic history of West Virginia's forests makes it particularly vulnerable to wildfires. The state's forests were extensively logged from 1890-1920. Shay engines were used to move logs off the mountain. These often sent sparks into dry, residual woody debris, igniting forest fires which burned through the state untended for years. Other factors contributing to wildfires across the state include intense forest recreation (e.g., camping, hiking, etc.), deteriorating and neglected buildings, areas prone to lightning strikes (e.g., high ridges, mountains), drought, windy conditions, lack of adequate fire prevention and/or suppression apparatus, increased arson activity, presence of non-indigenous flora, and lack of proper supervision during debris burning in rural areas.

Human activities such as intentional setting of fires, debris burning and other miscellaneous activities are the leading cause of wildfire incidents and acres burned during years 1987 through spring 2010. As suburban residential development continues to expand, it is reasonable to expect an increase in human/wildland interactions, resulting in more wildfires.

Risk Assessment

The occurrence of wildfires depends largely on the amount of fuel, wind direction and speed, weather conditions, and the effectiveness of fire prevention measures. Further, the steep terrain and the aspect of the slopes were major contributors to the fires becoming large in the Trough-Smokehole Wildfire Complex and the Southwest West Virginia Wildfire Complex.

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Boone and Clay counties have more widespread areas of forest and are therefore more vulnerable to a wildfire. Kanawha County has experienced many urban fires and is the most vulnerable to this type of hazard owing to the more dense population and development.

Vulnerability Assessment

Identifying Structures

Critical Facilities are public or private facilities providing essential products and services to the general public. They are necessary to preserve the welfare and quality of life in the county, and function as public safety, emergency response, or disaster recovery centers. Critical facilities are vital to the continued delivery of key government services and may significantly affect the public's ability to recover from an emergency. The following list of critical facilities in each county is pulled directly from each county's mitigation plan and has only been adjusted when necessary.

Boone County Critical Facilities

Bias Branch Community Center	community center
City of Sylvester Hall - Sylvester Community Center	community center
Danville Community Center	community center
Foster Community Center	community center
J.M. Protan Community Center	community center
Racine Community Center	community center
Salamy Building	community center
Van Community Center	community center
Wharton Barrett Community Center	community center
Boone County 911 Center	emergency center
Boone County Ambulance Authority	emergency center
Boone County Ambulance Authority - Station 20	emergency center
Boone County Sheriff Department	emergency center
Boone County Sheriff Department - Racine Office	emergency center
Danville Police Department	emergency center
Danville Volunteer Fire Department	emergency center
Spruce River Volunteer Fire Department	emergency center
Town of Whitesville - City Hall	emergency center
Van Volunteer Fire Department	emergency center
Wharton Barrett Volunteer Fire Department	emergency center
Whitesville Volunteer Fire Department	emergency center
WV State Police-Madison Dept.	emergency center
Boone County Health Department	medical center
Boone Nursing and Rehab Center	medical center
Medic Station 20	medical center
Medic Station 60	medical center
Raleigh Boone Medical Center	medical center
Shawneed Hills Mental Health Inc.	medical center
Wharton Medical Center	medical center
Ashford Rumble Grade School	school
Boone Career and Technical Center	school
Boone County Schools - Truck Driving academy	school
Brookview Elementary	school
Jeffrey Spencer Grade School	school

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Kindergarten Academy	school
Nellis Grade School	school
Ramage Grade School	school
Sherman Elementary School	school
Sherman High School and Junior High School	school
Southern WV Community and Tech College	school
Sylvester Elementary School	school
Van Elementary School	school
Van Junior - Senior High School	school
Wharton Elementary School	school
Whitesville Elementary School	school
Madison Elementary School	school
Madison Middle School	school
Christian Faith Academy	school

Clay County Critical Facilities

Clay Primary Care Clinic	medical center
Big Otter Clinic	medical center
Clay County Ambulance Service	emergency center
Clay County Court House	community center
Clay City Hall	community center
Clay Fire Department	emergency center
Big Otter Fire Department	emergency center
Lizemore Fire Department	emergency center
Clay Public Service District	emergency center
Prociuous Public Service District	emergency center
Clay High School	school
Clay Junior High School	school
Clay Elementary School	school
Ivydale Elementary	school
Lizemore Elementary	school
Valley Fork Elementary	school
Clay Head Start	school
H.E. White Elementary School	school
Clay Christian Academy	school

Kanawha County Critical Facilities

Charleston City Hall	Community Center
Kanawha County Board of Education	Community Center
Kanawha County Courthouse	Community Center
Kanawha County SD	Community Center
130th AW Fire Department	Emergency Center
Belle Police Department	Emergency Center
Cabin Creek Volunteer Fire Department	Emergency Center
cedar Grove Police Department	Emergency Center

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Cedar Grove Volunteer Fire Department	Emergency Center
Charleston Fire Department - Station 1	Emergency Center
Charleston Fire Department - Station 2	Emergency Center
Charleston Fire Department - Station 3	Emergency Center
Charleston Fire Department - Station 4	Emergency Center
Charleston Fire Department - Station 5	Emergency Center
Charleston Fire Department - Station 6	Emergency Center
Charleston Fire Department - Station 7	Emergency Center
Charleston Fire Department - Station 8	Emergency Center
Charleston Fire Department - Station 9	Emergency Center
Charleston Fire Department Repair Shop	Emergency Center
Charleston Fire Department Training Office	Emergency Center
Charleston Police Department	Emergency Center
Chesapeake Police Department	Emergency Center
Chesapeake Volunteer Fire Department	Emergency Center
Clendenin Police Department	Emergency Center
Clendenin Volunteer Fire Department	Emergency Center
Davis Creek/Ruthdale Volunteer Fire Dept.	Emergency Center
Dunbar Fire Department	Emergency Center
Dunbar Police Department	Emergency Center
East Bank Police Department	Emergency Center
East Bank Volunteer Fire Department	Emergency Center
Frame Volunteer Fire Department	Emergency Center
Glasgow Police Department	Emergency Center
Glasgow Volunteer Fire Department	Emergency Center
Handley Police Department	Emergency Center
Handley Volunteer Fire Department	Emergency Center
Institute Volunteer Fire Department	Emergency Center
Jefferson Volunteer Fire Department	Emergency Center
Kanawha County Ambulance Authority	Emergency Center
Lakewood Volunteery Fire Department	Emergency Center
Loudendale Volunteer Fire Departmetn	Emergency Center
Malden Volunteer Fire Department	Emergency Center
Marmet Police Department	Emergency Center
Montgomery Police Department	Emergency Center
Nitro Fire Department	Emergency Center
Nitro Police Department	Emergency Center
Pinch Volunteer Fire Department	Emergency Center
Pratt Police Department	Emergency Center
Pratt Volunteer Fire Department	Emergency Center
Rand Volunteer Fire Department	Emergency Center
Sissonville Volunteer Fire Department	Emergency Center
Smithers Police Department	Emergency Center
South Charleston Fire Department	Emergency Center
South Charleston Police Department	Emergency Center
St. Albans Fire Department	Emergency Center
St. Albans Police Department	Emergency Center

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Tornado Volunteer Fire Department	Emergency Center
Tyler Mountain Volunteer Fire Department	Emergency Center
West Side Volunteer Fire Department	Emergency Center
Arthur B. Hodges Center	Medical Center
Beverly Health and Rehab	Medical Center
Cedar Ridge Nursing and Rehab	Medical Center
Charleston Area Medical center	Medical Center
Greenvview Residential Board and Care	Medical Center
Herbert J. Thomas Memorial Hospital	Medical Center
Kanawha County Hospice Care	Medical Center
Marmet Health Care Center	Medical Center
St. Francis Hospital	Medical Center
Thomas Memorial Hospital	Medical Center
Valley Health Village	Medical Center
A Caring Heart and Home	Nursing Home
Americare Dunbar	Nursing Home
Ann's Elder Care	Nursing Home
Belle's Residential Board and Care	Nursing Home
Capital City Nursing Home	Nursing Home
Cross Lanes residential Board Home	Nursing Home
Hilltop Home for the Elderly	Nursing Home
K&T Board and Care	Nursing Home
Riverside Nursing Home	Nursing Home
Ruby's Residential Board and Care	Nursing Home
Smith's Elderly Care Home	Nursing Home
Tender Heart Home Care	Nursing Home
Vineyards Care Homes	Nursing Home
Alban Elementary	School
Alum Creek Elementary	School
Andrew Jackson Middle	School
Andrews Heights Elementary	School
Anne Bailey Elementary	School
Belle Elementary	School
Ben Franklin Voc. School	School
Bible Baptist Christian School	School
Bible Center School	School
Bonham Elementary	School
Bridge Elementary	School
Bridgeview Elementary	School
Capital High	School
Carver Career Center	School
Cedar Grove Elementary	School
Cedar Grove Middle	School
Central Elementary	School
Chamberlain Elementary	School
Chandler Elementary	School
Charleston Catholic High	School
Chesapeake Elementary	School

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Christian Family Academy	School
Clendenin Elementary	School
Conquerors Christian School	School
Cross Lanes Christian School	School
Cross Lanes Elementary	School
Dunbar Intermediate Center	School
Dunbar Middle	School
Dunbar Primary Center	School
DuPont Middle	School
East Bank Middle	School
Elizabeth Memorial Pre-school	School
Elk Center Community Education	School
Elk Elementary	School
Elk Valley Christian School	School
Elkview Middle	School
Fairhaven Christian School	School
Flinn Elementary	School
Freedom Christian Academy	School
Garnet Career Center	School
Garnet High	School
George C. Weimer Elementary	School
George Washington High	School
Glenwood Elementary	School
Grandview Elementary	School
Hayes Middle	School
Herbert Hoover High	School
Holz Elementary	School
Horace Mann Middle	School
J.E. Robins Elementary	School
John Adams Middle	School
Joshua Scott Boarding school	School
Kanawha City Elementary	School
Kenna Elementary	School
Kiddie Academy Child Care	School
Kingsway Christian Academy	School
Lakewood Elementary	School
Living Faith Christian Academy	School
Malden Elementary	School
Marmet Elementary	School
Mary Ingles Elementary	School
McKinley Middle	School
Midland Trail Elementary	School
Montrose Elementary	School
Mountaineer Montessori	School
Nitro Elementary	School
Nitro High School	School
Overbrook Elementary	School
Piedmont	School

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Pinch Elementary	School
Point Harmony Elementary	School
Pratt Elementary	School
Richmond Elementary	School
Riverside High	School
Ruffner Elementary	School
Ruthlawn Elementary	School
Sacred Heart Elementary	School
Seventh Day Adventist	School
Sharon Dawes Elementary	School
Shoals Elementary	School
Sissonville Elementary	School
Sissonville High	School
Sissonville Middle	School
South Charleston High	School
South Charleston Middle	School
St. Agnes	School
St. Albans High	School
Stonewall Jackson Middle	School
Twin City Christian Academy	School
Tyler Middle	School
Universal School	School
Upper Kanawah Valley Christian School	School
Washington Booker T. High	School
Watts Elementary	School
Weberwood Elementary	School

Putnam County Critical Facilities

Buffalo Town Hall	Community Center
Putnam County Development Auth.	Community Center
Putnam County Courthouse	Community Center
Winfield Town Hall	Community Center
Putnam General Hospital	Hospital
Sun Bridge Care and Rehab for Putnam	Nursing Home
Teays Valley Center	Nursing Home
Buffalo Elementary	School
Buffalo High	School
Calvary Baptist Academy	School
Confidence Elementary	School
Conner Street Elementary	School
Eastbrook Elementary	School
George Washington Elementary	School
George Washington Middle	School
Hometown Elementary	School
Hurricane High	School
Hurricane Middle	School
Hurricane Town Elementary	School
Lakeside Elementary	School

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Lighthouse Baptist Academy	School
Poca Elementary	School
Poca High	School
Poca Middle	School
Putnam Career Technical Center	School
Rock Branch Elementary	School
Scott Teas Elementary	School
Teays Valley Christian	School
Truth and Liberty	School
West Teays Elementary	School
Winfield Elementary	School
Winfield High	School
Winfield Middle	School

Critical features are visually displayed in maps located in Appendix D. The maps in Appendix D display the critical facilities in Boone, Clay, Kanawha and Putnam counties and their relation to the region's major transportation system. The maps also identify critical facilities located in the 100 year floodplain; this notation will be in the bottom right hand corner of each map.

Estimating Losses

Estimating the losses that may arise from a hazard event both educates local officials as to how to prioritize mitigation projects and speeds up the recovery process. Those community assets at risk of sustaining significant hazard-related losses will likely be higher priorities to protect with mitigation projects.

The following figures are loss estimates obtained from Michael Baker Engineering. FEMA provided software, HAZUS-MH3, to estimate losses in the case of a flood, hurricane winds, or earthquake. The figures below represent losses from a one hundred year flood event because this is the most likely hazard in all counties. This report was compiled in October 2009 and uses 2006 dollars. Michael Baker Engineering also ran 10 year, 25 year and 50 year flood scenarios. The full reports from all four scenarios are included in Appendix C

Boone County Loss Estimate

HAZUS estimates 12,618 buildings in Boone County with a total replacement value of \$1.5 million.

Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Total
Residential	1,229,902	82.8%
Commercial	109,945	7.4%
Industrial	27,544	1.9%
Agricultural	725	0.0%
Religion	36,856	2.5%
Government	17,157	1.2%
Education	62,850	4.2%
Total	1,484,979	100.00%

HAZUS estimates the number of households expected to be displaced and the number of people that will require the use of a temporary public shelter. The HAZUS Flood Model estimates 1,639 households will be displaced and 2,923 people will seek temporary shelter. Approximately 11.44% of the population will utilize public shelters. HAZUS estimates 1,057 structures will be moderately damaged by a 100 year flood; this is roughly 16% of the structures in Boone County. Approximately 470 structures will be completely damaged. The total economic loss for a one hundred year flood is approximately \$221.97 million.

Clay County Loss Estimate

HAZUS estimates 5,251 buildings in Clay County with a total replacement value of \$563 million.

Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Total
Residential	499,396	88.7%

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Commercial	33,984	6.0%
Industrial	9,851	1.7%
Agricultural	258	0.0%
Religion	9,800	1.7%
Government	2,936	0.5%
Education	7,095	1.3%
Total	563,320	100.00%

The HAZUS Flood Model estimates 174 households will be displaced and 201 people will seek temporary shelter. Approximately 1.94% of the population will utilize public shelters. HAZUS estimates 139 structures will be moderately damaged by a 100 year flood; this is roughly 7% of the structures in Clay County. Approximately 71 structures will be completely damaged. The total economic loss for a one hundred year flood is approximately \$30.27 million.

Kanawha County Loss Estimate

HAZUS estimates 97,488 buildings in Kanawha County with a total replacement value of \$19,233 million.

Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Total
Residential	14,584,707	75.8%
Commercial	3,159,944	16.4%
Industrial	431,537	2.2%
Agricultural	41,218	0.2%
Religion	468,696	2.4%
Government	354,908	1.8%
Education	192,282	1.0%
Total	19,233,292	100.00%

The HAZUS Flood Model estimates 4,460 households will be displaced and 8,553 people will seek temporary shelter. Approximately 4.27% of the population will utilize public shelters. HAZUS estimates 2,409 structures will be moderately damaged by a 100 year flood; this is roughly 24% of the structures in Kanawha County. Approximately 661 structures will be completely damaged. The total economic loss for a one hundred year flood is approximately \$836.21 million.

Putnam County Loss Estimate

HAZUS estimates 24,438 buildings in Putnam County with a total replacement value of \$4,577 million.

Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Total
Residential	3,499,206	76.5%
Commercial	695,525	15.2%

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Industrial	157,839	3.4%
Agricultural	15,709	0.3%
Religion	94,629	2.1%
Government	60,244	1.3%
Education	53,645	1.2%
Total	4,576,799	100.00%

The HAZUS Flood Model estimates 529 households will be displaced and 1,248 people will seek temporary shelter. Approximately 2.46% of the population will utilize public shelters. HAZUS estimates 472 structures will be moderately damaged by a 100 year flood; this is roughly 6% of the structures in Putnam County. Approximately 228 structures will be completely damaged. The total economic loss for a one hundred year flood is approximately \$105.17 million.

In 2007 the state of West Virginia completed a Hazard Mitigation Plan that included loss estimate tables for each county. Below are the loss estimates for state facilities, private property and transportation infrastructure in RIC's four county area.

Loss Estimate

State Facilities

Counties	Structures	Critical Structures	Square Feet	Total Value
Boone	32	17	117,264	\$19,320,115
Clay	16	11	43,923	\$1,570,175
Kanawha	564	242	6,888,018	\$708,871,924
Putnam	33	17	276,124	\$6,119,272

Private Property

Counties	Total Value
Boone	\$447,055,633
Clay	\$163,866,833
Kanawha	\$7,774,988,117
Putnam	\$2,256,267,683

Transportation Infrastructure

Counties	Highway Miles	Other Road Miles	Total Road Miles	Railroad Miles
Boone	0	892	892	107
Clay	9	837	845	27
Kanawha	84	3,070	3,155	168
Putnam	14	1,063	1,076	42

Analyze Development Trends

Southern West Virginia relies strongly on coal production. Boone and Kanawha Counties contain several coal related employers. Especially in Boone County, the largest employers in the county are coal producers or transporters. Over 90% of the land area in the county is woodland. The timber industry has been growing in the county for the past several years bringing along with it those businesses that service i.e. trucking and sawmills. Many grants have been secured to develop water and sewer lines throughout the county.

The Town of Clay is working on a \$5.1 million water treatment project. They have received funding from many different sources including; WV Infrastructure and Jobs Development, USDA/Rural Development and the U.S. Army Corps of Engineers. Leading industries in Clay County are lumber, coal and natural gas.

There are five locations of industrial and business development in the Charleston-Kanawha County area. These locations provide room for various companies who seek to expand their market in West Virginia and surrounding states. Peerless Industrial Park, Fork of Coal Industrial Park, South Charleston Technology Park, NorthGate Business Park and Washington Heights Business Park are all located within easy access to various transportation methods. Water and Sewer development continues around Kanawha County. Charleston is experiencing growth in the technical and medical fields. Several new jobs and businesses have opened in these fields.

Putnam County has several industrial parks and many retail shopping centers. Putnam County is a largely residential area serving Charleston and Huntington commuters. Putnam County has seen an increase in employment in their Industrial Parks.

Multi-Jurisdictional Risk and Vulnerability Assessment

Region 3 Planning and Development Council is comprised of four counties, Boone, Clay, Kanawha and Putnam. Region 3 includes the Town of Danville, the City of Madison, the Town of Sylvester, the Town of Whitesville, the Town of Clay, the Town of Belle, the Town of Cedar Grove, the City of Charleston, the City of Chesapeake, the Town of Clendenin, the City of Dunbar, the Town of East Bank, the Town of Glasgow, the Town of Handley, the City of Marmet, the City of Nitro, the Town of Pratt, the City of St. Albans, the City of South Charleston, the Town of Bancroft, the Town of Buffalo, the Town of Eleanor, the City of Hurricane, the City of Nitro, the Town of Poca and the Town of Winfield and wide areas of unincorporated areas and Census Designated Places.

Flooding is by far the most damaging and most frequently occurring hazard in Region 3. More disasters have been declared for floods than any other hazard. The entire RIC area is at risk to flooding, but the 4.25% of the land area in the 100-year floodplain is at a higher risk to flooding. The population density of the floodplain is unknown therefore the direct risk to human life is unknown. In general the rest of Region 3 is equally at risk for each other hazard. Region 3, in terms of *natural* hazard risk, is relatively homogenous. If non-natural hazards were considered the city centers of Charleston and South Charleston and business centers throughout the I-64 corridor, mentioned above, would be more at risk than the low-populated unincorporated rural areas.

The following table compares the individual municipality risk assessment against the overall Region 3 risk assessment.

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Multi-Jurisdictional Risk Assessment										
			Dam Failure	Drought	Earthquake	Flooding	Landslides	Severe Storms	Tornadoes	Wildfire
		Municipality								
Regional Intergovernmental Council	Boone County	Danville	=	=	=	=	=	=	=	=
		Madison	=	=	=	=	=	=	=	=
		Sylvester	=	=	=	=	=	=	=	=
		Whitesville	=	=	=	=	=	=	=	=
	Clay County		=	=	=	<	=	=	=	<
		Clay								
	Kanawha County	Belle	=	=	=	>	=	=	=	=
		Cedar Grove	=	=	=	=	=	=	=	=
		Charleston	=	=	=	=	<	=	=	=
		Chesapeake	=	=	=	=	=	=	=	=
		Clendenin	=	=	=	=	=	=	=	=
		Dubar	=	=	=	>	=	=	=	=
		East Bank	=	=	=	=	=	=	=	=
		Glasgow	=	=	=	=	=	=	=	=
		Handley	=	=	=	=	=	=	=	=
		Marmet	=	=	=	>	=	=	=	=
		Pratt	=	=	=	=	=	=	=	=
		St. Albans	=	=	=	>	<	=	=	=
		South Charleston	=	=	=	=	<	=	=	=
	Putnam County	Bancroft	=	=	=	=	<	=	=	<
		Buffalo	=	=	=	>	<	=	=	<
		Eleanor	=	=	=	=	<	=	=	<
		Hurricane	=	=	=	=	<	=	=	<
		Nitro	=	=	=	=	<	=	=	<
		Poca	=	=	=	=	<	=	=	<
		Winfield	=	=	=	=	<	=	=	<
		= At equal risk								
		< At less risk								
		> At greater risk								

Mitigation Strategy

Mitigation Goals

The mitigation goals listed below were compiled from the varied All-Hazard Mitigation Plans from each county in RIC. Specific objectives, strategies and projects pertaining to each goal may be found in the individual county plan.

1. Increase public awareness, understanding, support and demand for hazard mitigation activities and future strategies or projects.
2. Improve upon the protection of the citizens of Boone, Clay, Kanawha and Putnam counties from all natural and man made hazards.
3. Reduce the current and future risks from hazards in Boone, Clay, Kanawha and Putnam counties.
4. Reduce the potential impact of natural and man made disasters on Boone, Clay, Kanawha and Putnam counties' historic structures and landmarks
5. Develop better hazard data for Boone, Clay, Kanawha and Putnam counties.
6. Reduce the negative effects of drought in Boone, Clay, Kanawha and Putnam counties.
7. Decrease losses due to land subsidence and landslides.
8. Reduce the negative effects of an earthquake in Boone, Clay, Kanawha and Putnam counties.
9. Protect the citizens of Boone, Clay, Kanawha and Putnam counties from an epidemic.
10. Protect the general public in Boone, Clay, Kanawha and Putnam counties from hazardous material incidents.
11. Minimize the impact of flooding and flash flooding on the people and property in Boone, Clay, Kanawha, and Putnam counties.
12. Lessen the effects of Tornadoes and high winds.
13. Reduce the effects and occurrences of wildfire.
14. Protect Boone, Clay, Kanawha and Putnam counties from a catastrophic release or failure of a dam or coal waste slurry impoundment.

Mitigation Actions and Implementation

When considering strategies and projects it is important to remember the six general categories for mitigation. Each strategy or project should fall into one or more category. Prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects make up the six general mitigation categories. Prevention includes taking measures such as planning and zoning, open space preservation, and creating and enforcing development codes, storm water management, fire fuel reduction, soil erosion, and sediment control. Property protection could involve acquisition, relocation, storm shutters, rebuilding, barriers, floodproofing, and insurance. Public education and awareness involves outreach projects, real estate disclosure, hazard information centers, technical assistance, and school and adult education programs. Natural resource protection includes erosion and sediment control, stream corridor protection, vegetative management, and wetlands preservation. Emergency services should consist of hazard threat recognition, hazard warning systems, emergency response, protection of critical facilities, and health and safety maintenance. Structural projects could include any of the following; dams, levees, seawalls, bulkheads, revetments, high flow diversions, spillways, buttresses, debris basins, retaining walls, channel modifications, storm sewers, and retrofitted buildings and elevated roadways (seismic protection).

RIC recognizes all the efforts put forth by the individual county planning teams to compile projects for their county. We support their decisions in priority ranking and as usual offer assistance and guidance when necessary. RIC was not a part of the original compilation of their individual project lists and has never been part of the actual project implementation. RIC will continue to take this stance and act as facilitator as requested. Listed below are the individual county strategies which mold very well with RICs Hazard Mitigation goals.

Boone County provided strategies that correspond with specific goals and objectives in their County Mitigation Plan. All the municipalities of Boone County have agreed and approved these mitigation actions and strategies for their jurisdiction. Boone County Hazard Mitigation Planning Team hopes to implement measures that are available, affordable and that take advantage of programs already in existence.

Mitigation Actions and Strategies of Boone County

1. Continue to participate in the National Flood Insurance Program.
 - Responsibility: Boone County Commission
 - Funding: Boone County Commission
 - Time Frame: Ongoing
2. Continue to enforce current floodplain regulations
 - Responsibility: Boone County Commission
 - Funding: Boone County Commission
 - Time Frame: Ongoing
3. Relocate or acquire and remove floodway structures

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- Responsibility: Boone County Commission, Boone County OES
 - Funding: FEMA Hazard Mitigation Grants
 - Time Frame: As money becomes available
 - Possible Locations: Roundbottom Circle, Seng Creek Road on Big Coal River.
4. Work with the Board of Education to place pagers in each school that can be activated from the Emergency Operations Center to provide early warning to all schools.
 - Responsibility: Boone County OES, Boone County Board of Education
 - Funding: Boone County BOE, Boone County Commission
 - Time Frame: One year
 - Location: All public schools
 5. Local Government, industry and the private sector will work to make available a low cost emergency alert radio that can be placed in all homes and businesses that can be activated from the Emergency Operations Center during emergencies.
 - Responsibility: Boone County Commission, Boone County OES, National Weather Service
 - Funding: Boone County Commission, Public
 - Time Frame: Two years
 - Location: All homes and businesses in Boone County
 6. Seek funding through state and federal resources to relocate the County Emergency Operations Center to a more secure location.
 - Responsibility: Boone County Commission, Boone County OES
 - Funding: Boone County Commission, Federal Homeland Security Grants, Federal DOJ Grants
 - Time Frame: Unknown
 - Location: Unknown
 7. Seek funding through state and federal resources to erect additional communications towers to improve radio coverage, and add to the back-up capabilities of the Emergency Operations Center.
 - Responsibility: Boone County Commission, Boone County OES, Boone County E-911
 - Funding: Boone County Commission, FEMA EMPG Grants
 - Time Frame: 2 Years
 - Location: Unknown
 8. Seek funding through state and federal resources to purchase equipment and locate communications towers to improve interoperability to other counties and state agencies.
 - Responsibility: Boone County Commission, Boone County OES, Boone County E-911
 - Funding: Boone County Commission, FEMA EMPG Grants
 - Time Frame: 3 years
 - Location: Unknown
 9. Communicate to industry and private property owners the need to open private roads that lead to higher ground in an emergency to shorten evacuation routes.

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- Responsibility: Boone County OES, Local Fire Departments
 - Funding: Private
 - Time Frame: Unknown
 - Location: Various locations throughout Boone County
10. Place signs marking such routes
 - Responsibility: Boone County E-911
 - Funding: Boone County Commission
 - Time Frame: Unknown
 - Locations: Various locations throughout Boone County
 11. Map routes and make maps available to public.
 - Responsibility: Boone County E-911
 - Funding: Boone County Commission
 - Time Frame: Unknown
 - Locations: Various locations throughout Boone County
 12. Hold evacuation drills to familiarize the public with proper procedures.
 - Responsibility: Boone County OES, Local Fire Departments
 - Funding: Boone County Commission
 - Time Frame: Unknown
 - Locations: Various locations throughout Boone County
 13. Support the efforts of volunteer groups, state agencies, and other interested parties to clear stream banks, drainage ditches, and other areas of debris.
 - Responsibility: Local Government, Industry and the Public
 - Funding: Local Government, Industry and the Public
 14. Perform channel modifications to increase flow capacities of rivers and streams.
 - Responsibility: Boone County Commission, WV Soil Conservation, Army Corps of Engineers
 - Funding: WV Soil Conservation, Army Corps of Engineers
 - Time Frame: Unknown
 - Location: Little Coal River, Big Coal River
 15. Support legislation to fund studies that research and develop:
 - A means to render coal waste slurry environmentally safe.
 - Engineering studies that will examine different types of impoundment design that will result in smaller amounts of slurry being stored; i.e. a honey comb design.
 - Reports on the effectiveness of current laws regarding coal slurry impoundments.
 - Assessments of the current level of security of coal slurry impoundments as it relates to terrorism.
 - Responsibility: Local Government, Industry and the public
 - Funding: West Virginia Legislature
 - Time Frame: Unknown
 - Location: Unknown
 16. Work with the Board of Education to place pagers in each school that can be activated from the Emergency Operations Center to provide early warning to all schools.

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- Responsibility: Boone County OES, Boone County Board of Education
 - Funding: Boone County BOE, Boone County Commission
 - Time Frame: One year
 - Location: All public schools
17. Local Government, industry and the private sector will work to make available a low cost emergency alert radio that can be placed in all homes and businesses that can be activated from the Emergency Operations Center during emergencies.
- Responsibility: Boone County Commission, Boone County OES, National Weather Service
 - Funding: Boone County Commission, Public
 - Time Frame: Two years
 - Location: All homes and businesses in Boone County
18. Communicate to industry and private property owners the need to open private roads that lead to higher ground in an emergency to shorten evacuation routes.
- Responsibility: Boone County OES, Local Fire Departments
 - Funding: Private
 - Time Frame: Unknown
 - Location: Various locations throughout Boone County
19. Place signs marking such routes
- Responsibility: Boone County E-911
 - Funding: Boone County Commission
 - Time Frame: Unknown
 - Locations: Various locations throughout Boone County
20. Map routes and make maps available to public.
- Responsibility: Boone County E-911
 - Funding: Boone County Commission
 - Time Frame: Unknown
 - Locations: Various locations throughout Boone County
21. Hold evacuation drills to familiarize the public with proper procedures.
- Responsibility: Boone County OES, Local Fire Departments
 - Funding: Boone County Commission
 - Time Frame: Unknown
 - Locations: Various locations throughout Boone County
22. Deliver Public Service Announcements through local media, such as The Coal Valley News and WZAC
- Responsibility: Boone County OES
 - Funding: Boone County Commission
 - Time Frame: 1 year
23. Work with the Board of Education to place pagers in each school that can be activated from the Emergency Operations Center to provide early warning to all schools.
- Responsibility: Boone County OES, Boone County Board of Education
 - Funding: Boone County BOE, Boone County Commission
 - Time Frame: One year
 - Location: All public schools

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24. Local Government, industry and the private sector will work to make available a low cost emergency alert radio that can be placed in all homes and businesses that can be activated from the Emergency Operations Center during emergencies.
 - Responsibility: Boone County Commission, Boone County OES, National Weather Service
 - Funding: Boone County Commission, Public
 - Time Frame: Two years
 - Location: All homes and businesses in Boone County
25. Develop a proactive policy on issuing countywide burning bans during dry weather.
 - Responsibility: Boone County Commission
 - Funding: Boone County Commission
 - Time Frame: Immediately
 - Location: County Wide
26. Work with the Forestry Department to educate the public of the burning laws through Public Service Announcements in the Coal Valley News and WZAC radio.
 - Responsibility: Boone County OES, WV Division of Forestry
 - Funding: Boone County OES, WV Division of Forestry
 - Time Frame: Immediately
 - Location: County Wide
27. Increase public awareness of the arson problem in Boone County through public education programs in schools, churches and civic groups.
 - Responsibility: Boone County OES, WV State Fire Marshall, WV Division of Forestry
 - Time Frame: Immediately
 - Location: County Wide
28. Support the Forestry Department and State Fire Marshall's Office by increasing the reward offered for arsonists.
 - Responsibility: Boone County Commission
 - Funding: Boone County Commission
 - Time Frame: Immediately
 - Location: County Wide
29. Develop and informational package to give to applicants for development permits.
 - Responsibility: Boone County Permit Officer
 - Funding: Boone County Commission
 - Time Frame: 1 year
 - Location: County Wide
30. Advise the public to contact their insurance agent to confirm that they are covered for land subsidence.
 - Responsibility: Boone County Permit Officer
 - Funding: Boone County Commission
 - Time Frame: 1 year
 - Location: County Wide
31. Suggest to the public that they add the proper coverage to their insurance policies.

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- Responsibility: Boone County Permit Officer
 - Funding: Boone County Commission
 - Time Frame: 1 year
 - Location: County Wide
32. Develop an informational package to give to applicants for development permits.
- Responsibility: Boone County Permit Officer
 - Funding: Boone County Commission
 - Time Frame: 1 year
 - Location: County Wide
33. Advise the public to contact their insurance agent to confirm that they are covered for land subsidence.
- Responsibility: Boone County Permit Officer
 - Funding: Boone County Commission
 - Time Frame: 1 year
 - Location: County Wide
34. Suggest to the public that they add the proper coverage to their insurance policies.
- Responsibility: Boone County Permit Officer
 - Funding: Boone County Commission
 - Time Frame: 1 year
 - Location: County Wide

Clay County provided strategies that correspond with specific goals and objectives in their County Mitigation Plan. All the municipalities of Clay County have agreed and approved these mitigation actions and strategies for their jurisdiction.

Mitigation Actions and Strategies of Clay County

1. Purchase and distribute the booklet “Getting Ready: A Family Emergency Guide” prepared by the State of West Virginia. (7.2004)
 - Coordinating Agency: Clay County OES
 - Time Frame: Ongoing
 - Funding: Local
2. Publish timely articles in local newspapers about winter storms, tornadoes, floods, etc. to inform the public of what to do.
 - Coordinating Agency: Clay County OES
 - Time Frame: Ongoing
 - Funding: Local
3. Review and update floodplain ordinance to reduce development within the 100 year floodplain. Make sure contractors and mobile home dealers are aware of requirements of the ordinance.
 - Coordinating Agency: Clay County OES
 - Time Frame: Ongoing
 - Funding: Local

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4. Create a position of Floodplain Coordinator to assist citizens in complying with floodplain ordinance. (7.2004)
 - Coordinating Agency: Clay County OES
 - Time Frame: Ongoing
 - Funding: Local
5. Create a GIS data layer of flood maps on county mapping database to identify floodplain areas of Clay County
 - Coordinating Agency: Clay County OES
 - Time Frame: Done
 - Funding: Local
6. Institute a county wide permitting process that will require residents and/or developers to file a permit with the county before beginning any new construction as a means of regulating floodplain development
7. Institute county wide building codes that will regulate the number of buildings and the materials used in construction in a floodplain
 - Coordinating Agency: Clay County Commission
 - Time Frame: 2 years
 - Funding: None
8. Educate citizens to clear trash, vegetation, tree stumps from nearby creeks that impede water flow.
 - Coordinating Agency: WVDOH, WVOES, WVDEP, WV Division of Natural Resources, NRCS
 - Time Frame: 3 years
 - Funding: HMGP, WVDEP, WV Division of Natural Resources, NRCS Grants
9. Review existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas.
10. Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.
11. Review all capital improvement plans to ensure that infrastructure improvements are not directed toward hazardous areas.
 - Coordinating Agency: Floodplain Manager, OES
 - Time Frame: Ongoing
 - Funding: None
12. Work with the municipalities to update all floodplain ordinances adopted prior to 1987.
 - Coordinating Agency: Floodplain Manager, OES
 - Time Frame: Ongoing
 - Funding: None
13. Provide additional training to county and municipal development official on NFIP requirements.
 - Coordinating Agency: Clay County Commission, OES
 - Time Frame: 2 years
 - Funding: None

14. Coordinate with all county emergency services personnel to participate in exercises of simulated biological terrorist attacks to practice response efforts.

- Coordinating Agency: Office of Emergency Services
- Time Frame: 1 year

Funding: DOJ-ODP, PDM

Kanawha County has formed a core planning team that compiled an extensive list of mitigation projects. These projects have been reviewed by committee members, local government representatives, and the general public. All the municipalities of Kanawha County have agreed and approved these mitigation actions and strategies for their jurisdiction. The projects have been prioritized as the most beneficial to hazard mitigation in Kanawha County and the municipalities. Each project has a project number which corresponds to a specific goal and objective in their County Mitigation Plan. At the completion of this plan the status of *some* actions and strategies was unknown. Unless otherwise noted the timeframe for each project is on-going.

Mitigation Actions and Strategies of Kanawha County

- 1.1.1 Create displays for use at public events (eg. Health fair, public awareness day, county fair, etc.). (Completed)
- 1.1.2 Create materials that are targeted towards the tourist population.
- 1.1.3 Utilize the media for the distribution and publication of hazard information.
- 1.1.4 Create a public speaking series on hazard-related topics, such as what to do in the event of an emergency and who to contact. Timeframe: 2011
- 1.1.5 Ensure that the American Red Cross Citizen's Disaster Course is held on a frequent basis.
- 1.1.6 Update the Kanawha County website to provide hazard-related information that is easily accessible.
- 1.1.7 Continue to work with the Kanawha County School Board to promote hazard mitigation education and awareness and to discuss better ways to integrate mitigation into the curriculum, as well as using the school board as a means to distribute information to home via students.
- 1.1.8 Continue to work with non-governmental organizations (youth, service, professional, etc.) to promote mitigation education and awareness.
- 1.1.9 Distribute information on hazard related topics to local libraries, hospitals, city halls, insurance agencies, banks, and churches.
- 1.1.10 Work with the utility companies to insert emergency information into monthly bills.
- 1.2.1 Distribute letters to all property owners in Kanawha County regarding potential flood hazards as required for participation in the Community Rating System. Timeframe: 2011
- 1.2.2 Establish all-hazard resource centers to be located in the Kanawha County Courthouse and the municipalities in the county. The centers should act as a repository for information on local hazard identification, preparedness, and mitigation strategies for use by citizens, realtors, and lenders. Timeframe: 2013

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- 1.2.3 Continue to hold local courses on the National Flood Insurance Program for realtors, bankers, and insurers.
- 1.3.1 Ensure that all shelters have adequate emergency power resources.
- 1.3.2 Develop adequate emergency shelter and evacuation plans for animals (domestic pets, livestock, and wildlife). Timeframe: 2011
- 1.4.1 Teach Community Emergency Response Team (CERT) classes in Kanawha County.
- 1.4.2 Increase the number of trained citizen emergency responders.
- 1.4.3 Conduct annual disaster exercises with local law enforcement, emergency personnel, city and county officials, and other disaster response agencies.
- 1.4.4 Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders.
- 1.4.5 Conduct National Weather Service Storm Spotter classes. Timeframe: 2013
- 1.4.6 Promote awareness training for wind hazards to include training in standards and building codes.
- 1.5.1 Implement a Geographic Information System with an emphasis on hazard analysis. Timeframe: 2013
- 1.5.2 Join the National Weather Service's Storm Ready Community Timeframe: 2013
 - 2.1.1 Review existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas. (Completed)
 - 2.1.2 Review all comprehensive plans, cities and county, to ensure that designated growth areas are not in high hazard areas. Timeframe: 2011 (Completed)
 - 2.1.3 Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas. Timeframe: 2011
 - 2.2.1 Work with the municipalities to update all floodplain ordinances adopted prior to 1987. Timeframe: Every 5 years
 - 2.3.1 Provide additional training to county and municipal personnel responsible for the enforcement of the floodplain regulations.
 - 2.4.1 Participate in the Community Rating System (CRS). Timeframe: 2013
 - 2.5.1 Separate combined storm and sewer drain lines. Timeframe: 2013
 - 2.5.2 Create a storm water management plan. Timeframe: 2013
 - 2.5.3 Routinely remove trash and debris from stream beds, culverts, storm grates, and storm drains.
 - 2.5.4 Use flood mitigation grants to fund property buyouts in the lowest lying areas of Charleston. Timeframe: 5 years
 - 2.5.5 Support CAMC's Pre-Disaster Mitigation Grant application. Timeframe: 1 year
 - 2.5.6 Construct a new municipal building in Clendenin that is not located in a hazard area. Timeframe: 2013
- 3.1.1 Maintain information on the number and location of all repetitive loss properties throughout Kanawha County and the municipalities. (Completed)
- 3.1.2 Maintain a database of information on all repetitive loss properties, including maps.
- 3.1.3 Identify property owners of repetitive loss properties that may be willing to participate in future property acquisition projects.
- 3.1.4 Continue to update asset inventory data, to include interface with assets and compilation of asset-by-asset loss estimates. Timeframe: 2013

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- 4.1.1 Establish a formal process for the county and the park service to coordinate disaster-related efforts, which should include defining boundaries and establishing responsibilities.
- 4.1.2 Conduct training exercises that include representatives from the County and the Park Service to facilitate increased coordination.
- 4.2.1 Conduct a survey of all historic sites that are located in hazard-prone areas. Timeframe: 2013
- 4.2.2 Develop mitigation strategies to protect any at-risk historic properties.
- 5.1.1 Work with the West Virginia Department of Transportation to identify areas of frequent roadway flooding and develop mitigation strategies.
- 5.2.1 Upgrade and improve communications in the rural areas of the county by creating back-up communication lines.
- 6.1.1 Develop an information brochure to distribute to residents focusing on the benefits of conserving water.
- 6.1.2 Continue construction of public water systems to eliminate wells. Timeframe: 2013
- 6.2.1 Strengthen enforcement of burning bans with the U.S. Forestry Service Timeframe: 2013
- 6.2.2 Initiate fire department training programs to enhance response capabilities to wildfires.
- 6.2.3 Continue to educate the general public on risks during drought conditions.
- 7.1.1 Institute county-wide building codes that will regulate the intensity of use and materials used in construction. Timeframe: 2013
- 7.1.2 Apply for additional Abandoned Mine Lands funding to take care of existing problems. Timeframe: 2013
- 7.1.3 Shore up the north side of the Kanawha River from Patrick Street to the 35th Street Bridge. Timeframe: 2013
- 8.1.1 Continue to enforce International Building Codes and continue to update them as required. Timeframe: 2013
- 9.1.1 Participate in public awareness campaigns on the local television stations.
- 10.1.1 Assess high traffic intersections for potential problems.
- 10.1.2 Evaluate railroad crossings for appropriate warning systems. Timeframe: 5 years
- 10.1.3 Evaluate the locks on the Kanawha River to ensure necessary warning systems are in place.
- 10.2.1 Publicize evacuation plans in public places, such as libraries, schools, hospitals, the courthouse, city halls, banks, and churches.
- 10.2.2 Increase public awareness by upgrading the emergency information available in the phone directory. Timeframe: 2011

Putnam County formed a list of strategies and projects and ranked them as high, medium or low priority. All the municipalities of Putnam County have agreed and approved these mitigation actions and strategies for their jurisdiction. Each project number responds to a specific goal and objective listed in their County Mitigation Plan. At the completion of

this plan the status of *some* actions and strategies was unknown. The timeframe and status for each project is anytime or ongoing unless otherwise noted.

Mitigation Actions and Strategies of Putnam County

- 1.1.1. Continue to participate in the National Flood Insurance Program. Priority: High (Completed/On-going)
- 1.1.2. Continue to enforce current floodplain regulations. Priority: High (Completed/On-going)
- 1.1.3. Relocate or acquire and remove floodways. Priority: High
- 1.2.1. Work with the Board of Education to place pagers in each school that can be activated from the Emergency Operations Center to provide early warning to all schools. Priority: High
- 1.2.2. Local Government, industry and the private sector will work to make available a low cost emergency alert radio that can be placed in all homes and businesses that can be activated from the Emergency Operations Center during emergencies. Priority: Medium
- 1.2.3. Seek funding through state and federal resources to relocate the County Emergency Operations Center to a more secure location. Priority: Medium
- 1.2.4. Seek funding through state and federal resources to erect additional communications towers to improve radio coverage and add to the back-up capabilities of the Emergency Operations Center. Priority: Medium
- 1.2.5. Seek funding through state and federal resources to purchase equipment and locate communications towers to improve interoperability to other counties and state agencies. Priority: Medium
- 1.3.1. Communicate to industry and private property owners the need to open private roads that lead to higher ground in an emergency to shorten evacuation routes. Priority: High
- 1.3.2. Place signs marking such routes. Priority: High
- 1.3.3. Map routes and make maps available to public. Priority: High
- 1.3.4. Hold evacuation drills to familiarize the public with proper procedures. Twice per year Priority: Medium
- 1.4.1. Support the efforts of volunteer groups, state agencies and other interested parties to clear stream banks, drainage ditches and other areas of debris. Priority: High
- 1.4.2. Perform channel modifications to increase flow capacities of rivers and streams. When funds are available. Priority: Medium
- 2.1.1. To devise a storm water management plan that identifies areas that are affected by flooding and to assess homeowners a fee to construct additional storm sewers, catch basins and impoundment areas to alleviate flooding and storm water runoff. Timeframe: 2012 Priority: High
- 2.1.2. Map routes and make maps available to public. Priority: Medium
- 2.1.3. Hold informational meetings to explain the fee assessment to the affected public. Priority: Medium
- 3.1.1. Deliver Public Service Announcements through local media, such as Hurricane Breeze, Putnam Post, Charleston Newspapers and WSAZ, WCHS, WVAH, and WOWK and local radio stations. Priority: High

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- 3.2.1. Work with the Board of Education to place pagers in each school that can be activated from the Emergency Operations Center to provide early warning to all school. Priority: High
- 3.2.2. Local Government, industry and the private sector will work to make available a low cost emergency alert radio that can be placed in all homes and businesses that can be activated from the Emergency Operations Center during emergencies. Priority: High
- 4.1.1. Develop a proactive policy on issuing county wide burning bans during dry weather. Priority: High
- 4.1.2. Work with the Forestry Department to educate the public of the burning laws through Public Service Announcements in the Hurricane Breeze, Putnam Post, Charleston Newspapers and WSAZ, WCHS, WVAH, and WOWK and local radio stations. Priority: Medium
- 4.2.1. Increase public awareness of the arson problem in Putnam County through public education programs in schools, churches and civic groups. Priority: Medium
- 4.2.2. Support the Forestry Department and State Fire Marshall's Office by increasing the reward offered for arsonists. Priority: Low
- 5.1.1. Develop an informational package to give to applicants for development permits. Priority: Low
- 5.1.2. Advise the public to contact their insurance agent to confirm that they are covered for land subsidence. Priority: Low
- 5.1.3. Suggest to the public that they add the proper coverage to their insurance policies. Priority: Medium
- 6.1.1. Develop an informational package to give to applicants for development permits. Priority: Low
- 6.1.2. Advise the public to contact their insurance agent to confirm that they are covered for land subsidence. Priority: Low
- 6.1.3. Suggest to the public that they add the proper coverage to their insurance policies. Priority: Low

The Regional Intergovernmental Council has created a small project list intended to encourage, enforce and educate the counties and the municipalities in its jurisdiction. The municipalities' specific mitigation actions and strategies are covered under the respective county mitigation action and strategy list.

Multi-Jurisdictional Mitigation Actions and Strategies

- 1. Enforce floodplain regulations and discourage development within the 100-year floodplain.
 - a. With the use of the FEMA provided floodplain maps RIC will aid counties with the location of projects and their proximity to the floodplain.
- 2. Show higher priority to county projects involving NFIP.
- 3. Encourage and educate counties to create projects that are cost beneficial.
 - a. FEMA has developed a Benefit-Cost Analysis Software, training and use of this software will be greatly beneficial to all counties.

Implementation of National Flood Insurance Program (NFIP)

All communities in RIC are participants of the National Flood Insurance Program, and will continue to participate in this program. Throughout West Virginia flood insurance is required to receive financing if the structure is located in a floodplain. The following table shows the number of repetitive loss properties in each county and describes their participation in the NFIP. This data is from the 2008 West Virginia State All-Hazards Mitigation Plan.

NFIP Participation							
Counties	Repetitive Loss Properties	Annual Premium	Policies	Coverage x\$1,000	Number of Claims	Total Claim (\$)	Average Claim
Boone	50	\$400,198	634	\$56,407	411	\$2,258,745	\$5,496
Clay	1	\$37,514	63	\$6,575	21	\$85,778	\$4,085
Kanawha	170	\$1,901,510	3112	\$336,554	1521	\$14,914,743	\$9,806
Putnam	27	\$247,239	495	\$69,089	170	\$1,199,814	\$7,058

This table shows the number of policies for each municipality as of November 2010.

County/Municipality	Policies	County/Municipality	Policies
Boone County	472	Town of Glasgow	14
Town of Danville	53	Town of Handley	2
City of Madison	61	City of Marmet	9
Town of Sylvester	34	City of Nitro	187
Town of Whitesville	16	Town of Pratt	19
Clay County	82	City of St. Albans	76
Town of Clay	8	City of South Charleston	152
Kanawha County	1986	Putnam County	353
Town of Belle	31	Town of Bancroft	18
Town of Cedar Grove	16	Town of Buffalo	39
City of Charleston	602	Town of Eleanor	6
City of Chesapeake	36	City of Hurricane	15
Town of Clendednin	84	Town of Poca	20
City of Dunbar	340	Town of Winfield	38
Town of East Bank	19		

Repetitive Loss properties have two or more losses of at least \$1,000 each, and have been paid under the NFIP within 10 years since 1978.

Severe Repetitive Loss properties are residential properties covered by the NFIP and have received four or more claim payments each exceeding \$5,000 or the cumulative amount

of the claims payments exceed \$20,000. Or, at least two separate claims payments have been made with the cumulative amount exceeding the market value of the property.

Repetitive Loss Properties

Counties	Repetitive Loss	Severe Repetitive Loss
Boone	50	2
Clay	1	0
Kanawha	170	7
Putnam	27	0

FEMA has mitigation programs for Repetitive Loss Properties and Severe Repetitive Loss Properties. Normally a 75/25 cost share is in effect, if a mitigation strategy addressing repetitive loss, severe repetitive loss and other flood damaged structures is present in the mitigation plan each entity can apply for a 90/10 cost share. (WVDHSEM) In order to comply with the new guidelines RIC developed the following strategy.

- Encourage all municipalities to participate in the National Flood Insurance Program. Help all owners with property in the floodplain to participate in the NFIP. If a property is not a participant of the NFIP they will not be considered for grant application.
- Apply for grants with FEMA Hazard Mitigation Programs
 - Repetitive Loss Program:
 - Acquisition
 - Elevation
 - Relocation
 - Severe Repetitive Loss Program
 - Acquisition
 - Flood proofing Historic Structures
 - Elevation
 - Mitigation reconstruction
 - Minor localized flood reduction projects

Priority will go to acquisition projects and to flood proofing Historic Structures. Structures that have accumulated more monetary damage will be a higher priority.

Implementation of Mitigation Actions

Most communities in the RIC area have already identified flooding to be their greatest hazard. It has already been made apparent within this plan that flooding is the most costly and dangerous hazard affecting the RIC area, therefore reducing the risk of flooding is the highest priority in Boone, Clay, Kanawha and Putnam Counties. Most communities will focus all their efforts into reducing the risk of flooding by obtaining and acquiring repetitive loss and severe repetitive loss structures. All other Mitigation Actions will occur within the timeframe already documented or when funding is made available. Each

county or municipality has the ability of carrying out the Mitigation Actions listed above. Each county or municipality may, if they wish, perform acquisitions, demolitions or any other mitigation activities. Each county or municipality has an organization or individual person responsible for implementation listed above their Mitigation Actions. RIC is under the assumption that each action has already been through a benefit cost analysis and is prioritized to give the maximum benefit with minimal cost. It is RIC's intention to assist each county with additional benefit cost analysis and add action items as needed. Each project that has been completed is now listed as 'On-Going' in the Mitigation Actions section. For example, hazard mitigation literature has already been distributed to citizens, but the continued hazard education is important so this action item will remain and an ongoing effort.

Completed Mitigation Projects or Activities

It is necessary to note the past completion of FEMA funded mitigation activities within the past five years. Boone, Clay, and Putnam Counties have not completed any mitigation activities within the past five years although they have submitted several grant applications. Kanawha County has completed several acquisition projects resulting from federal granted funds after a disaster through the Hazard Mitigation Grant Program. Kanawha County provided a detailed list of each structure acquired and demolished, but it is necessary to note the number of structures and the corresponding disaster below.

FEMA DR-1522-WV-Hazard Mitigation Grant Program (HMGP) – 14 structures
FEMA DR-1558-WV-Hazard Mitigation Grant Program (HMGP) – 4 structures
FEMA DR-1474-WV-Hazard Mitigation Grant Program (HMGP) – 3 structures
FEMA DR-1696-WV-Hazard Mitigation Grant Program (HMGP) – 3 structures
FEMA DR-1500-WV-Hazard Mitigation Grant Program (HMGP) – 15 structures
FEMA DR-1838-WV-Hazard Mitigation Grant Program (HMGP) – 1 structure

Kanawha Count also acquired one structure through the Severe Repetitive Loss Program in 2009. In total, Kanawha effectively acquired 41 structures in the floodplain.

Plan Maintenance Process

Monitoring Evaluating and Updating the Plan

Clay County relies on the Clay County Local Emergency Planning Committee to review and update their county plan. This committee is also responsible for their projects.

Boone County's planning team is relying on the Boone County Local Emergency Planning Committee and the Boone County Office of Emergency Services. These groups are not assuming complete responsibility, but will provide their aide and expertise in hazard mitigation to monitor, evaluate and update the Hazard Mitigation Plan. After a declared disaster has occurred the plan will be reviewed. Each year a public meeting will be held to receive public input for updating the plan.

Kanawha County will be reviewing their plan at least every 5 years and after major disaster events. The review process will address the ease of implementation, cost effectiveness, social impacts, political impacts, economic impacts and overall positive impacts. Additionally Kanawha County and the City of Charleston will meet annually to develop an end of year report, analyzing the different aspects and the effectiveness of the plan.

Putnam County meets on a quarterly basis to track the progress of the projects in the plan. The Putnam County Office of Emergency Services takes the responsibility of tracking progress and submitting progress reports to the Putnam County Commission. The Putnam County Office of Emergency Services and the Putnam County Office of Planning and Infrastructure both ensure the Putnam County All-Hazards Mitigation Plan is followed.

RIC will perform updates and evaluations of the B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan as needed and when revised county plans are received. A major update will be performed every 5 years. RIC included the All-Hazards Mitigation Plan in the Regional Development plan during the most recent update, September 2010, in order to implement the plan with existing programs and plans. This specific plan, because this is the first regionalized plan for the Boone, Clay, Kanawha and Putnam County area, has not been included in any plans. In the future, when comprehensive plans are created or updated, this plan and all pertinent data will be readily available.

Plan Maintenance Process

Continued Public Involvement

To continue public involvement each county, as well as RIC, intends to hold public meetings to provide the public with an opportunity to discuss the plan with local officials. Each County Commission or County Office of Emergency Services should have a copy

B-C-K-P Regional Intergovernmental Council All-Hazards Mitigation Plan

of this plan and will be able to take comments from public reviewers at any time. Comments will be taken and implemented into the plan updates as needed.