Hazard Analysis

project impact of the roanoke valley

PROJECT IMPACT
ROANOKE VALLEY

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introduction

Disasters *can strike at any time, often without warning.*

In an area that is unprepared, the results can be devastating.

But the impact of a disaster on lives and property can be significantly reduced through advance preparation, citizen education, and a plan of action.

Project Impact of the Roanoke Valley, through its Hazard Analysis Workgroup, together with its partners from local businesses and community organizations, has set out to identify the most significant threats to the Roanoke Valley. Understanding the potential of these disasters can help our citizens develop an effective plan to counteract the effects. We can help the Roanoke Valley become a disaster-resistant community.

The Project Impact Hazard Analysis for the Roanoke Valley is the result of many months of in-depth study, research, and cooperation between Valley government agencies, federal agencies, regional businesses, and citizens. Through extensive study of past events impacting the Roanoke Valley, recurrent patterns, and related factors that might lead to a single event, the Hazard Analysis Workgroup has identified the four most likely types of disasters that severely impact the homes, businesses, and citizens of the Roanoke Valley. In the order of likelihood, those disasters are:

Flooding, Wildfires, Meteorological Events (Thunderstorms, Tornadoes and Winter Storms), and Hazardous Material (HAZMAT) Incidents.

This report addresses each of these potential threats and offers a plan to help insure survival, lessen property damage and personal injury, and reduce the overall impact of the event on the citizens of the Roanoke Valley.

When a crisis does strike in a disaster resistant community, knowledge replaces fear, advance planning dispels chaos, and awareness contributes to the ability to survive.

flooding & flash floods

flooding

The disaster hazard most likely to affect the citizens of the Roanoke Valley is widespread flooding or isolated flash flooding. Flooding is a long-term event and may last a week or more, depending upon a number of factors and the extent of the rains. An inevitable part of life along a river basin is the constant threat and potential for flooding. In the past, the Roanoke Valley has seen a number of significant floods, the most memorable of which occurred in November of 1985 when rains from Hurricane Juan caused the Roanoke River to rise and crest at a level of 23.4 feet from the bottom of the River, as measured from Walnut Street. The result of that single weather event created floodwaters in downtown Roanoke that rose over five feet inside some businesses. Ten lives were lost and damage to property cost $520,000,000 (source: The Roanoke Times, November, 1985).

While this was the Flood of Record, is not the only significant flood the Roanoke Valley has experienced over the past 100 years. On August 16th, 1928, the Roanoke River crested at 18.1 feet; twelve years later, on August 14th, 1940, the Valley's river crested at 18.3 feet. On June 21st, 1972, the Roanoke Valley was hit with the effects of Hurricane Agnes, causing the Roanoke River to crest at 19.6 feet. On April 22nd, 1992, the river once again exceeded its banks and spread floodwaters in the Valley when it crested at 18.1 for the second time during the century.

Most often, hurricanes or tropical storms occur when their track inland from the Atlantic or Gulf coast brings them over the mountains surrounding the Roanoke Valley. Rains cause rivers, creeks, streams, and even dry gulches in the area to overflow with deadly fast-moving water destined for the Roanoke River. The result of such storms has often proven catastrophic to lives and businesses in the Roanoke Valley.

Thunderstorms passing over already saturated ground are also extremely significant in the production of flooding. While thunderstorms may not produce the same amount of rainfall as a hurricane or tropical storm, they often create flash flooding in our area. Even during the severe drought of 1999, the area near Bent Mountain experienced a sudden flash flood. Several neighborhoods in the Roanoke Valley experience flash flooding every year due to the topography and development of the neighborhood and the presence of wet-weather springs. In some areas, residents stay awake on rainy nights to be ready to move cars or evacuate if necessary. In the effort to build a disaster resistant community, Project Impact of the Roanoke Valley has identified the creeks and streams in the Roanoke region that have historically proven susceptible to flooding. The main contributing factor to sustained flooding and flash flood is the intensity of the rainfall and its duration. The mountains surrounding our beautiful valley make the region prone to runoff from heavy rain. Much of this rainfall is absorbed into the ground, replenishing groundwater. Pavement, concrete, and buildings limit the amount of ground cover available for the absorption of water. Water runoff in urbanized areas is increased 2 to 6 times over what would occur in natural terrain. Streets can become dangerous rivers. Low-lying houses, streets and underpasses can quickly become instant death traps, even if they are not adjacent to streams. Water not absorbed by the soil will gather and flow into the watershed. The result is swollen streams overflowing their banks and ending with dangerous widespread flooding of the Roanoke Valley. Groundwater levels remain low, and streams tend to dry up between rainstorms.

Flooding causes damage in several ways: the quantity of the floodwater, its velocity, the sediment load (silt) that it carries, the toxins and pollution that it can carry (for example, oil washed off of roads, or 55-gallon drums of chemicals floating downstream) and microorganisms that it carries and that can cause illness as people contact puddles. Those living in urban areas provided with sewer systems have the additional concern of sewer overflow during floods. Runoff rushing into sewers often causes them to back up, flooding basements and streets. The force of this combined sewerage and rainwater can lift manhole covers off of sewer lines. Along with the danger of the flood is added the health concerns from this wastewater.

flash flooding

In the United States each year more people die from floods than from hurricanes or tornadoes. Roadways covered by floodwaters are deceptively hazardous! When rain falls even simple drainage easements in neighborhoods or beneath roadways become death traps when they fill with swiftly flowing runoff. Moving water 6 inches deep can lift a man off of his feet, and less than 18 inches of water can lift a car, quickly carrying it to deeper water. If a road is covered with shallow water you cannot see beneath it to be sure that the pavement has not been washed out or if the soil under the pavement has not washed away.

Flash flooding is typically caused by thunder-storms or heavy rains associated with hurricanes and tropical storms. The two main factors that lead to flash flooding are the intensity of rainfall and its duration.

Flash flooding can occur within minutes during a heavy rainfall. A dam failure or the sudden release of water held in an ice jam can also cause a flash flood. Rapidly rising waters can reach heights of more than 30 feet in only minutes. The force of those waters can roll boulders, uproot trees, destroy buildings and houses, scour new channels, and wash out bridges. Flash floods can trigger rock and mud slides causing highways to become blocked or structures in their path to be destroyed in seconds.

A *floodway* is the area where floodwaters are expected to be deepest and fastest. It should be kept free of obstructions to allow floodwaters to move downstream and minimize other flooding in the area.

A *watershed* is an area that contains all of the land that contributes flow to a stream or river. Runoff from anywhere in a watershed all flows to the same low area and either forms a pond or lake, or flows out of the watershed as a stream or river.

Floods are often categorized as 100-year, 20-year, etc. A *100-year flood* is the worst probable flood to occur in a hundred year period. Another way to say this is that each year there is a one percent chance that a 100-year flood will occur. Our last 100-year flood occurred in 1985. That does not mean that we will not see another flood as damaging for 85 years. Each year there is a five percent chance that a 20-year flood will occur. Because "worse" is a comparative term, a 100-year flood is worse than a 20-year flood is worse than a 10-year flood. A 2-year flood is very likely to occur (50% chance each year) and is a commonly seen flood.

If your home is in the 100-year flood plain, then, over a 30-year mortgage, you have a 26% chance that your home will be damaged by floods. That is 5 times higher than the chance that you will have a fire damage your home!

watersheds

Knowing the location of the areas most likely to flood and preparing individual plans of action are key to survival. When there is high water on the Roanoke River, the first place to flood in the Roanoke Valley is the Wiley Drive and Wasena Park area. This area begins to flood when waters of the Roanoke River reach 8 feet and it is generally closed off to access when the river is expected to reach 6 feet.

The official forecast and warning point for the Roanoke River in the City of Roanoke is the Walnut Street IFLOWS gauge (Integrated Flood Observing and Warning System). IFLOWS is an electronic monitoring system that gauges water depth at specific locations and that transmits a radio signal to emergency management computers across the Valley. The system reports in real-time, the depth of the water at these critical locations.

There are 16 significant watershed streams in the Roanoke Valley that contribute to local and area flooding during a major rain event. They are:

Back Creek
Barnhardt Creek
Butt Hollow Creek
Carvin Creek
Cole Hollow Branch
Dry Branch
Gish Branch
Glade Creek
Lick Run
Mason Creek
Mudlick Creek
Murray Run
Ore Branch
Peters Creek
Tinker Creek
Wolf Creek

Detailed maps of each of these watersheds are included at the back of this report.

back creek

Located in Southeast Roanoke County, the Back Creek watershed encompasses a 58.7 square mile drainage basin that originates in the Blue Ridge Mountains on Poor Mountain at an elevation of 3600 feet above sea level. It flows in a northeasterly direction for about 25 miles until it joins the Roanoke River near the borders of Roanoke, Bedford, and Franklin Counties. The southern watershed boundary of Back Creek serves as the political boundary between Roanoke and Franklin Counties for a portion of its length.

While most of the Back Creek watershed is undeveloped woods and agricultural areas, there are scattered single-family residences within its flood zone. In the sub basins closer to Roanoke City and along U.S. Routes 220 and 221, there is more residential development. The Blue Ridge Parkway also runs through the watershed.

On Back Creek, flooding occurs along the length of the stream. There are residential subdivisions and businesses located along Starkey Road within the reach of this stream. Two areas that experience house flooding are between Merriman Road and Coleman Road and between Cotton Hill Road and Old Mill Road. The tributaries to Back Creek consisting of Martins Creek, Little Back Creek, and Back Creek Tributaries A & B also experience scattered house flooding.

barnhardt creek

With an origin on Poor Mountain at 2700 feet above sea level, the Barnhardt Creek watershed is a 4.2 square mile drainage basin located in south central Roanoke County, southern Salem, and southwestern Roanoke City. For a portion of its length, Barnhardt Creek serves as the political boundary between the City of Roanoke, the City of Salem, and Roanoke County. The watershed has a length of about 4.5 miles and a maximum width of 1.5 miles near its center. The Barnhardt watershed is oblong in shape and flows in a northeasterly direction for about five miles to its confluence with the Roanoke River at the boundaries between the Cities of Salem and Roanoke.

The upper reaches of Barnhardt Creek are primarily undeveloped with scattered single-family residences along Route 686. The area downstream of Electric Road is more developed. There is some commercial development scattered along portions of this watershed.

The existing 100-year storm pattern floods about 30 homes along Barnhardt Creek. Of those 30, more than 20 homes are inundated by a 10-year storm. Upstream of Cravens Creek Road is one of the major flooding problem areas for Barnhardt Creek. The Farmingdale subdivision along Lakemont Drive upstream from Electric Road is another major flood area. The Meadow Creek subdivision experiences frequent house flooding.

butt hollow creek

Located wholly within central Roanoke County and the western portion of the City of Salem, Butt Hollow Creek watershed is a 2.7 square mile fan-shaped drainage basin. It has a length of approximately 3.5 miles and a maximum width of about 1.5 miles near its center. Butt Hollow Creek originates on Fort Lewis Mountain at an elevation of 3260 feet above sea level. It flows southeasterly for about 3 miles to its confluence with the Roanoke River.

For a portion of its length, Butt Hollow Creek serves as the political boundary between the City of Salem and Roanoke County. The upstream reaches of Butt Hollow Creek are largely undeveloped with scattered single-family residences along Alleghany Drive and Butt Hollow Road. The main stem areas of Butt Hollow Creek are mostly undeveloped until the Interstate 81 crossing. Downstream of Interstate 81, the stream is located in the City of Salem and development is primarily residential until the stream reaches West Main Street, where the development is primarily commercial.

The 100-year storm floods approximately 30 homes along Butt Hollow Creek. Among those, more than 10 are also inundated by a 10-year storm. The area along West Main Street and Butt Hollow Road is the major flooding problem for Butt Hollow Creek.

carvin creek

The Carvin Creek watershed originates on Tinker Mountain at an elevation of 3200 feet above sea level. It flows in a northeasterly direction for about 3 miles to the Carvin Cove Reservoir, which is a public drinking water supply for the City of Roanoke. Located in northeast Roanoke County, northern Roanoke City, and the northern portion of Botetourt County, the Carvin Creek watershed is a 28 square mile fan-shaped drainage basin. It has a length of about 9 miles and a maximum width of about 4.4 miles near its headwaters. From the Carvin Cove dam, the creek flows southeast for approximately 6 miles to its confluence with Tinker Creek. For a portion of its length, Carvin Creek serves as the political boundary between the City of Roanoke and Roanoke County. The upstream reaches of Carvin Creek are undeveloped and mainly wooded. An agricultural area lies along Carvin Creek immediately south of Interstate 81. Some commercial and residential development lies further downstream. In the area south of Route 11, development is primarily single-family residential. North of Hershberger Road, there is an area of commercial development. Two significant feeder streams, West Fork Carvin Creek and Deer Branch, meet Carvin Creek. West Fork Carvin Creek originates on Green Ridge Mountain and flows southeast to its confluence with Carvin Creek approximately 1.9 miles upstream from the confluence of Carvin Creek and Tinker Creek.

The West Fork Carvin Creek watershed is primarily undeveloped, but there are some developments consisting mainly of one-quarter acre residential lots and some commercial users. Deer Branch originates on Green Ridge Mountain and flows south approximately 2.3 miles. It is located in the central portion of the Carvin Creek watershed east of West Fork Carvin Creek. While some of the Deer Branch watershed is wooded, it is partly developed with one-quarter acre residential lots and some commercial users.

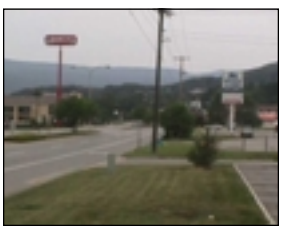
In 1980, a study by the U. S. Army Corps of Engineers found the average flood damage to the Sun Valley subdivision along Carvin Creek to be about $244,000 annually. The Sun Valley area is a major flooding problem in Roanoke County. Approximately 100 homes are located within the 100-year floodplain. More than 25 houses are flooded by 10-year storms. A portion of the Summerdean subdivision also floods along Carvin Creek. Often, debris blockage at Plantation Road and Peyton Street elevates flood levels enough to inundate several houses. Along West Fork Carvin Creek, the Captains Grove subdivision has 7 houses located within the 100-year floodplain. The worst flooding problem along Deer Branch is on Route 11 just upstream from the confluence of Deer Branch and West Fork Carvin Creek where approximately 1000 feet of roadway is flooded by the 2-year storm.

cole hollow brook

From 3020 feet above sea level on Fort Lewis Mountain, Cole Hollow Brook flows southwesterly and then southeasterly for about 4 miles until its confluence with the Roanoke River in Salem. The Cole Hollow Brook watershed is a 5.9 square mile drainage basin. This oblong watershed is located primarily in Roanoke County, but the southern portion is in the City of Salem. It has a length of about 3.5 miles and a maximum width of 2.5 miles near its center.

Located in the east central sector of the watershed, Cole Hollow Brook serves as the political boundary between the City of Salem and Roanoke County for a portion of its length. While the upstream reaches of Cole Hollow Brook are largely undeveloped and wooded, there are some scattered single-family residences along Route 619. Up to the Interstate 81 crossing, areas of Cole Hollow Brook are largely undeveloped. Downstream of Interstate 81, residential development is prevalent until the stream crosses Routes 11 and 460 where the land becomes more developed and includes some commercial areas in the City of Salem.

The 100-year storm floods about 45 buildings along Cole Hollow Brook. Of those, more than 10 are inundated by a 10-year storm. The area upstream of West Main Street is one of the major flooding problems area along Cole Hollow Brook. Downstream of Interstate 81 in the Mitchell subdivision along Windsor Avenue is another problem area.



dry branch

Lying within Roanoke County and the City of Salem, the Dry Branch watershed is a 4.5 square mile drainage basin located primarily in north central Roanoke County. The southern portion of the watershed is in northern Salem. With a width of about 2 miles near its center, the watershed is fan shaped and has a length of 4.5 miles. At an elevation of 2900 feet above sea level, the Dry Branch watershed originates on Fort Lewis Mountain and flows in a southeasterly direction for about 4 miles to its confluence with the Roanoke River.

The far upstream reaches of Dry Branch are undeveloped. Along Wildwood Road and Richland Hill Road there are some scattered single-family residences. To the Interstate 81 crossing, areas along Dry Branch are relatively undeveloped. Downstream of Interstate 81, the stream is in the developed areas of the City of Salem. That area of the watershed has a mixture of high-density residential and commercial development.

100-year floods along Dry Branch flood about 150 homes. Of those, more than 60 houses are inundated by the 10-year storm. The major flooding problems on Dry Branch are in the Hockman and Cameron Court subdivisions.

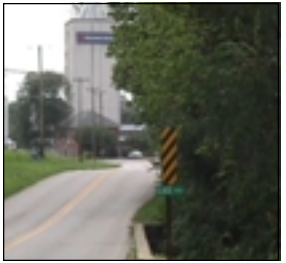
gish branch

Originating on Fort Lewis Mountain near the Lewis Radio Facility, the Gish Branch watershed descends from 3080 feet above sea level. It flows in a southeasterly direction for about 3.5 miles until its confluence with Mason Creek in Salem. Gish Branch lays wholly within north central Roanoke County and the north central portion of the City of Salem. The watershed is a 2 square mile drainage basin that is fan shaped with a length of about 3.5 miles and a maximum width of about 1.5 miles near its headwaters.

Gish Branch is a major tributary to Mason Creek. Upstream of North Mill Road the watershed is largely undeveloped and covered with forest. Downstream of North Mill Road, the Gish Branch watershed has commercial development and is in the City of Salem.

Along Gish Branch, 11 homes are situated within the 100-year floodplain. Of those, the 10-year flood inundates 8 homes. One of the major flooding problems for Gish Branch is upstream of Kessler Mill Road where several homes and commercial buildings are inundated by a 10-year storm.

glade creek



The Glade Creek watershed is a 33 square mile drainage basin located in northeast Roanoke County, northeast Roanoke City, and northwest Vinton with the northern portion of the watershed located in Botetourt County. Glade Creek originates in the Blue Ridge Mountains near Curry Gap at an elevation of 2500 feet above sea level. It flows in a southwesterly direction for about 11 miles to its confluence with Tinker Creek at the border of the City of Roanoke and Vinton. The watershed is fan shaped and has a maximum width of about 5.5 miles near its headwaters. For a portion of its length, Glade Creek serves as the political boundary between the City of Roanoke and Vinton. The upstream reaches of Glade Creek are mostly undeveloped, but there are some scattered single-family residences along major roads. Until the stream enters Vinton, the areas along Glade Creek are relatively undeveloped. Land use along most of Glade Creek is wooded or agricultural except within Vinton where the land use is mostly commercial.

Several significant streams drain the Glade Creek watershed including two, Laymantown Creek and Coyner Branch that lie in Botetourt County. Cook Creek lies in Roanoke and Botetourt Counties. Glade Creek Tributary A lies in Roanoke City and Roanoke County while Glade Creek Tributary B lies wholly in Roanoke County. Cook Creek lies in the western central portion of the Glade Creek watershed and is a major tributary of Glade Creek. It converges about 5 miles upstream from the confluence of Glade Creek and Tinker Creek. Most of the Cook Creek watershed is undeveloped. There are areas of development, especially in the downstream portion of the watershed. The developed areas include the subdivisions of Huntridge and Applewood.

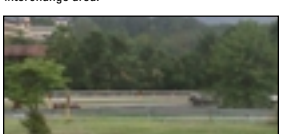
Glade Creek Tributary A lies along King Street in the City of Roanoke. It joins with Glade Creek near the Norfolk Southern Railroad crossing approximately 1 mile upstream of the confluence of Glade Creek and Tinker Creek. Some residential and industrial areas along Routes 221 and 460 lie within this watershed including the Idylwild Park and Brattonlawn subdivisions. Glade Creek Tributary B is southeast of Read Mountain north of the City of Roanoke. It is about 2 miles in length and joins Glade Creek approximately 3.8 miles upstream from the confluence of Glade Creek and Tinker Creek. Most of this watershed is mostly undeveloped forest, but some scattered residential development lies within its floodplain. Most of the major flooding problem on Glade Creek is in Vinton upstream of the confluence of Glade Creek with Tinker Creek. Just upstream of Gus W. Nicks Boulevard to the confluence, there are approximately 100 houses in the 100-year floodplain. Approximately 50 of those houses are inundated by the 10-year storm projection. The intersection of Walnut Avenue and Fifth Street located near the confluence of Glade Creek and Tinker Creek is the most severe flooding problem area in Vinton according to studies of the region.

lick run

The Lick Run watershed is located primarily in north central Roanoke City with the northern portion in north central Roanoke County. It is a 7.8 square mile drainage basin that is narrow and has a maximum width of about 2 miles near its mouth. It is approximately 5.5 miles long. Lick Run originates at the interchange of Interstate 81 and Route 11 at an elevation of approximately 1200 feet above sea level. Lick Run flows in a southeasterly direction for about 7.5 miles until its confluence with Tinker Creek.

The upstream reaches of the Lick Run watershed are primarily open space with some commercial and industrial development. The downstream portion of the watershed is developed with subdivisions, commercial and industrial users, and rail yards. Trout Run is a highly urbanized stream channel located in the southern part ofthe Lick Run watershed. It originates near Washington Heights in the City of Roanoke and flows southeast to its confluence with Lick Run that is 0.9 miles upstream of the confluence of Lick Run and Tinker Creek. The Trout Run watershed is mostly industrial development, one-quarter acre residential lots, and open space.

Much of the central business district of the City of Roanoke is subject to flooding by Lick Run. Historically, the Williamson Road area has exhibited the most severe and frequent flooding problem in the City of Roanoke. Areas upstream of Washington Park have also been subject to flooding. The major flooding problem in the Lick Run watershed is in where both streams are contained underground in the storm sewer system for the City of Roanoke. Overflow of the two streams flow together at the Williamson Road, Route 460, Norfolk Southern Railway interchange area.

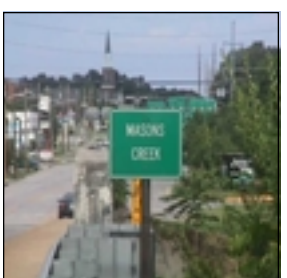


mason creek

Originating at an elevation of 3260 feet above sea level on Fort Lewis Mountain near Big Bear Rock Gap, the Mason Creek watershed is a 29.6 square mile drainage basin. It includes the Gish Branch watershed and is located in north central Roanoke County, eastern Salem, and western Roanoke City. The watershed is fan-shaped and has a length of about 8.5 miles and a maximum width of 9 miles near its headwaters. From Fort Lewis Mountain, Mason Creek flows northeasterly for about seven miles to Mason Cove where it turns and flows southeasterly 7.5 miles to its confluence with the Roanoke River in the City of Salem.

The upstream reaches of Mason Cove are largely undeveloped with some scattered single-family residences along Bradshaw Road. There is residential development in Mason Cove, north of the City of Salem. Downstream of Mason Cove to Interstate 81 there is scattered residential development along Catawba Valley Drive. Beyond Interstate 81, Mason Creek enters the City of Salem where there is more residential and commercial development.

Two significant streams drain the Mason Creek watershed, Gish Branch (described earlier in this section) and Jumping Run Creek. Jumping Run Creek lies entirely within Roanoke County. Jumping Run Creek originates on Catawba Mountain and flows southwest to its confluence with Mason Creek 7 miles upstream from where Mason Creek joins the Roanoke River. The watershed is mostly undeveloped with some scattered residential area of 2-acre lots along Carvin Cove Road. The major flooding problems for Mason Creek are downstream. Two trailer parks, Salem Village Trailer Park and a trailer park located on Schrader Street, are located in the floodplain. These trailer parks are subject to flooding in the 2-year storm assessment. Another recurring problem in the Mason Creek watershed is in the vicinity of East Main Street to Garst Street where several buildings and houses, including Lakeside Plaza, are inundated by a 10-year storm. The Schneider Drive Trailer Court is also inundated by the 10-year storm. Other areas subject to flooding include North Electric Road to Janee Drive, Janee Drive to Carvins Cove Road, Carvins Cove Road to Catawba Valley Road, and Catawba Valley Road to Plunkett Road.



mudlick creek

Originating on Long Ridge near Poor Mountain at an elevation of 2300 feet above sea level, the Mudlick Creek watershed is a 9.6 square mile drainage basin. It is located in east central Roanoke County and southeast Roanoke City. The watershed is fan shaped with a length of about 4.5 miles and a maximum width of 3.5 miles near its headwaters. Mudlick Creek flows northeasterly for about 4.5 miles until its confluence with the Roanoke River in Roanoke. For a portion of its length Mudlick Creek serves as the political boundary between the City of Roanoke and Roanoke County. The upstream reaches of Mudlick Creek are largely undeveloped with the exception of some scattered single-family residences along Route 689. Until the stream reaches Farmington Drive, Mudlick Creek is relatively undeveloped. Downstream of Farmington Drive, the land is primarily residential with some scattered commercial development.

Two significant streams, West Mudlick Creek and Murdock Creek, drain into Mudlick Creek. West Mudlick Creek lies entirely in Roanoke County while Murdock Creek is mostly in the City of Roanoke with its very upstream portion in Roanoke County. It converges with Mudlick Creek 1800 feet

downstream of Route 419. The upstream portion of West Mudlick Creek is largely undeveloped, but there is residential development in the downstream portion. An area of commercial development lies in the center of the watershed just upstream of Route 419.

Murdock Creek flows in the northwestern portion of the Mudlick Creek watershed. It converges with Mudlick Creek 2000 feet upstream of the confluence of Mudlick Creek with the Roanoke River. The Murdock Creek watershed is mostly residential with some commercial areas in the upstream portion of the watershed. Approximately 60 houses are located in the 100-year floodplain along Mudlick Creek. Of those, 40 are also inundated by 10-year storms. Some specific areas of concern are as follows:

- Norfolk Southern Railroad to Brandon Avenue
- Mudlick Road to Grandin Road in the Rosalind Hills/Westhampton subdivision
- Grandin Road to Garst Mill Road in the Windsor Park subdivision
- Garst Mill Road to South Park Circle
- South Park Circle in the Southwoods Subdivision
- South Park Circle to Halevan Road
- Halevan Road to Crest Hill Drive
- Crest Hill Drive to Electric Road
- McVitty Road to Farmington Drive
- Farmington Drive to Canter Road in the Canterbury Park subdivision

murray run

The Murray Run watershed lies wholly within Roanoke County and the City of Roanoke. It is an oblong shaped watershed consisting of a 2.9 square mile drainage basin located in south central Roanoke County and southeast Roanoke City. Murray Run watershed has a length of 4 miles and a maximum width of about 1 mile near its center. Originating from nearly 1400 feet above sea level just south of Roanoke and north of Starkey Road, Murray Run flows northeasterly for about four miles to its confluence with the Roanoke River in Roanoke.

Murray Run flows through Roanoke County until it reaches Ogden Road, where it enters the City of Roanoke. The Murray Run watershed is mostly developed with subdivisions. A few of the larger developed areas are: Alsom Park, Green Valley, Fralin Park, and Lakewood. In addition to the residential areas, there are some scattered woods and open spaces. Along Electric Road and Interstate 581 there is commercial development.

One of the major flooding problems on Murray Run is upstream of Brandon Avenue where 17 houses are in the 100-year floodplain. Of those, 13 are also inundated by 10-year storms. Another trouble spot is located in the Lakewood subdivision. There, 12 houses are in the 100-year floodplain including 10 that are also inundated by the 10-year storm. Upstream of Ogden Road, several of the Pebble Creek Apartments are in the 10-year floodplain. In the Green Valley subdivision, upstream of Crawford Road, there are 5 houses in the 100-year floodplain and 4 of these are also flooded by the 10-year storm.

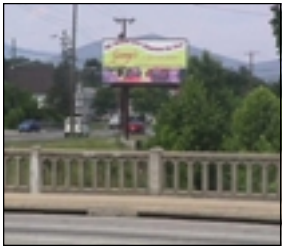
ore branch

With an origin near Chestnut Ridge south of Roanoke, the Ore Branch watershed begins at an elevation of almost 1700 feet above sea level. It is a 4.1 square miles drainage basin located in south central Roanoke County and south central Roanoke City. The Ore Branch watershed is fan shaped and has a length of about 3.5 miles and a maximum width of 2 miles near its center. From Chestnut Ridge, it flows northeasterly for about 2.5 miles to its confluence with the Roanoke River in Roanoke.

The Ore Branch watershed is a combination of woods, commercial development, and residential subdivisions of various densities. Ore Branch flows from south of the Tanglewood Mall northeast to the Roanoke River. Some of the subdivisions located in the Ore Branch watershed are Hunting Hills, Southern Hills, and Prospect Park. In the upstream portion, there are scattered wooded and open space areas. Along Electric Road and Interstate 581 there is commercial development.

The major flooding problem in the Ore Branch watershed is downstream of the recycling yard near the confluence of Ore Branch with the Roanoke River. This area is heavily developed with commercial and industrial buildings. Approximately 50 of the buildings in this area are flooded by the 100-year flood, 40 are also flooded by the 10-year storm, and 20 by a 2-year storm.

peters creek



The Peters Creek watershed originates at an elevation of 2380 feet above sea level on Brushy Mountain in Roanoke County. This 9 square mile drainage basin is located in central Roanoke County, northwest Roanoke City, and northeast Salem. The watershed has a length of about 6 miles and a maximum width of 2 miles near the center. From Brushy Mountain, it flows southeasterly for about 6 miles to its confluence with the Roanoke River in Roanoke.

The upstream reaches of Peters Creek are largely undeveloped, especially the area upstream of Interstate 81, with only scattered single-family residences and agricultural areas. In the sub basins closer to the City of Roanoke, there is more residential development. Downstream of Interstate 81, along Peters Creek Road and Melrose Avenue, there is a higher density of residential and commercial development. Three significant streams drain the Peters Creek watershed: Peters Creek Tributary A, B, and C. Peters Creek Tributaries A and B lie entirely within Roanoke County. Peters Creek Tributary C upstream of Green Ridge Road is in Roanoke County and downstream of Green Ridge Road the stream is in the City of Roanoke.

Peters Creek Tributary A is in the northwestern part of the Peters Creek watershed. It originates on Brushy Mountain and flows southeast to its confluence with Peters Creek Tributary B to form Peters Creek, which is 5 miles upstream from the confluence of Peters Creek with the Roanoke River. While the watershed is mostly wooded with some agricultural areas, there is an area of commercial development just upstream of Interstate 81. Peters Creek Tributary B is in the northeastern part of the Peters Creek watershed and just east of Peters Creek Tributary A. This watershed also originates on Brushy Mountain and flows southwest for 1 mile to its confluence with Peters Creek Tributary A. The watershed is mostly wooded with some agricultural area and one-quarter acre lots.

Peters Creek Tributary C is in the western part of the Peters Creek watershed south of Peters Creek Tributary A. Tributary C originates near Hanging Rock just north of the Interstate 81 and Electric Road interchange. It joins Peters Creek about 3.5 miles upstream from the confluence of Peters Creek with the Roanoke River. Because of its proximity to the City of Roanoke, this tributary is more developed than the other Peters Creek Tributaries. Development along Peters Creek Tributary C is mostly one-quarter acre residential lots joined with agricultural areas and woods. This watershed drains the Montclair Estates and Norwood Forest subdivisions. Two stormwater detention basins have been recently completed in these areas by Roanoke City, with the cooperation of Roanoke County.

Generally, the major flooding problems within the Peters Creek watershed are upstream of Westside Boulevard, upstream of Melrose Avenue, and in the vicinity of Northwood Drive. All of the Peters Creek watershed streams have adjacent scattered buildings and residences subject to flooding. Several specific areas for concern within the Peters Creek watershed are: Westside Boulevard to Shenandoah Avenue, Shenandoah Avenue to Salem Turnpike in the Washington Heights region, Salem Turnpike to Melrose Avenue, Melrose Avenue to Peters Creek Road, Peters Creek Road to Shenandoah Bible College Access Road, Shenandoah Bible College Access Road to Peach Tree Drive, Peach Tree Drive to Northwood Drive, and Northwood Drive to Green Ridge Road.

tinker creek

Located in northeast Roanoke County, northeast Roanoke City, northwest Vinton, and southeast Botetourt County, the Tinker Creek watershed is a 112 square mile drainage basin. Tinker Creek watershed originates at an elevation of 2400 feet above sea level on Tinker Mountain near Mt. Union, Virginia. It flows in a southerly direction about 11 miles until its confluence with the Roanoke River at the border between the City of Roanoke and Vinton. The watershed has a length of about 12 miles and a maximum width of 10 miles near its headwaters.

While the upstream reaches of Tinker Creek are primarily rural, the downstream portion of the watershed is mostly developed with some wooded areas, several subdivisions, and urban areas of the City of Roanoke. Downstream of Interstate 81 to the confluence of Carvin Creek, residential development increases and there are scattered commercial areas along Williamson Road. The watershed is primarily residential downstream of the confluence of Carvin Creek until it reaches Orange Avenue. A combination of residential and commercial development lies downstream of Orange Avenue until the confluence of Tinker Creek with the Roanoke River. Three significant streams drain the Tinker Creek watershed: Carvin Creek, Glade Creek and Lick Run with its tributary, Trout Run. Each has been previously discussed in this report. The major flooding area along Tinker Creek is located upstream of Dale Avenue near the

confluence with Glade Creek. A substantial number of houses and buildings lie within the Tinker Creek floodplain. Some areas of specific concern are: Mouth of Tinker Creek to Dale Avenue, Dale Avenue to Wise Avenue, Wise Avenue to Orange Avenue, Orange Avenue to 13th Street, 13th Street to Old Mountain Road, Old Mountain Road to Preston Avenue, Preston Avenue to Hollins Road, Hollins Road to Clearwater Avenue, Clearwater Avenue to Ardmore Avenue, and Ardmore Avenue to Williamson Road. In these areas, more than 100 structures are within the 100-year floodplain. Of those structures, more than 40 are also inundated by the 10-year storm.

wolf creek

Originating in the Blue Ridge Mountains at Stewart Knob at an elevation above sea level of 2435 feet, the Wolf Creek watershed is a 4.9 square mile drainage basin. It is located in eastern Roanoke County and east Vinton. Some of the headwaters extend into Bedford County. The watershed flows in a southeasterly direction for about 4 miles until its confluence with the Roanoke River in Vinton. The Wolf Creek basin is oblong and has a length of about 4 miles and a maximum width of 2 miles near its center. For a portion of its length, the main stem of Wolf Creek serves as the political boundary between Roanoke County and Vinton. The upstream reaches of Wolf Creek are largely undeveloped with some single-family residential areas off of the Blue Ridge Parkway. Residential development continues as the stream flows southwesterly to Stewartsville Road where there is an area of commercial development. Downstream of Stewartsville Road, there is increased residential development, but the areas immediately adjacent to the creek have not been developed and are mainly wooded.

Presently, the main risk associated with Wolf Creek is the overtopping of roadways by flood-waters. Three roadways are identified: Niagara Road is subject to 5-year storms, and Hardy Road and Mountain View Road are overtopped by 10-year storms. Flooding of these roadways prevents access to some residential areas.

wildfire

We are fortunate to have the protection and natural beauty of the mountains, but along with that comes the dangers associated with wild lands. With more residential development in forested areas, we are increasing the potential for wildfires. In the Roanoke Valley, wildfires are second only to flooding as the greatest hazard with the most potential danger facing homes and businesses.

At this writing, the most recent experience of a forest fire in our region occurred in November 1999. Fort Lewis Mountain in the western part of Roanoke County became an inferno that burned out of control for a week, destroying land and endangering numerous homes before fire fighters could finally extinguish the flames.

In years past, we have seen Read Mountain in the northern part of Roanoke County burn. Fort Lewis Mountain, Brushy Mountain, Poor Mountain, Twelve O'Clock Knob, Yellow Mountain, even portions of Mill Mountain in the heart of the city, have been subject to wildfires. While an awesome thing to witness, a wildfire is costly to the environment and to the agencies that work to suppress it.

Look up at the mountains around the Valley and you will see more areas cleared for development, new houses, and roads. Not long ago a nighttime view of the mountain tops showed only shadows and starlight. Light seen in the night sky now is more likely that of a new home. While the view from a mountainside home is beautiful, the dangers associated with living in a forested area must be recognized.

While humans cause most wildfires in Virginia, either deliberately or accidentally, many go unnoticed until they are out of control. Once started, a wildfire spreads quickly. A number of factors contribute to the extent of a wildfire. The topography of the land, the fuel available for the fire, and winds each affect how a wildfire will spread and the firefighter's ability to contain it.

Virginia has an average of 2,000 wildfires each year that consume between 8,000 and 10,000 acres. Most of the fires that destroy our forests and homes could be prevented by using common sense, following fire safety rules and laws, and practicing fire-wise construction and landscaping.

Protection of your home from wildfire is your responsibility.

To reduce the risks of forest living, evaluate the fire resistance of your home, the slope of your property and the vegetation close by. Project Impact of the Roanoke Valley, with the help of the Virginia Department of Forestry, has identified the wildfire threats to subdivisions in our area. There are many places in the Valley where one or a few homes could be affected by a wildfire, but the identifying process focused on areas with several homes believed to be at the greatest risk because of the slope of the land, house density, vegetation, and proximity to woodlands. Even if you your home is not in a forest or on a mountain, if you are near a patch of woods or other thick vegetation, you may still be at risk.

The point where wild lands meet civilization is called the Wildland-Urban Interface. That point can be an isolated cabin in the woods, a mobile home in the country, or a large residential development in a forested area. The Wildland-Urban Interface is the first point of danger in wooded natural surroundings.

by risk category

The following Roanoke area subdivisions are classified by the Virginia Department of Forestry as significantly AT RISK from the potential threat of wildfire. Included is the percentage of each subdivision not yet developed. Some of the areas identified have no additional building sites available, while others are in the early stages of development and as further construction takes place, the dollar value and the number of homes at risk will increase. This list of subdivisions is not intended to include all of the houses at risk in the Roanoke Valley.

very high risk

Approximately 725 Houses in the area fall within the Very High-Risk category. Total estimated value approaches 140 million dollars!

- Brandy Run
  9 Houses with 36% not developed
- Bear Creek
  4 Houses with 64% not developed
- Chestnut Mountain
  71 Houses with 22% not developed
- Fort Mason
  57 Houses with 78% not developed
- Hunting Hills
  416 Houses with 10% not developed
- Laurel Wood 1 & 2
  43 Houses with 33% not developed
- Mountain Top
  54 Houses with 36% not developed
- Skyview & Brushy Mountain
  71 Houses with 56% not developed

high risk

Approximately 151 Houses fall within the HIGH-RISK category. Their total estimated value is in excess of 25 million dollars.

- Chimney Hills/By Dance
  7 Houses with 72% not developed
- Falcon Ridge
  32 Houses with 14% not developed
- Forest Acre Trail
  13 Houses with 19% not developed
- Green Hill Heights
  25 Houses with 36% not developed
- Green Hill Terrace
  12 Houses with 20% not developed
- Wexford
  61 Houses with 28% not developed
- Winnbrook
  1 House currently with 92% not developed

medium risk

Approximately 851 Houses fall within the MEDIUM RISK category. The estimated value of these houses exceeds 131 million dollars.

- Autumn Park
  20 Houses with 29% not developed
- Barrester Estates
  6 Houses with 40% not developed

- Briar Ridge
  18 Houses with 22% not developed
- Bridlewood
  106 Houses 20% not developed
- Brookwood
  25 Houses - Fully Developed
- Campbell Hills
  41 Houses with 41% not developed
- Cherokee Hills
  161 Houses with 18% not developed
- Cotton Hill Estates
  28 Houses with 26% not developed
- Countrywood
  12 Houses with 33% not developed
- Falcon Crest
  32 Houses with 14% not developed
- Homewood
  85 Houses with 19% not developed
- Lost Mountain
  11 Houses with 58% not developed
- Poages Mill Estates
  36 Houses with 27% not developed
- Scenic Hills
  42 Houses with 21% not developed
- Smokey Ridge
  6 Houses with 33% not developed
- Steeplechase
  33 Houses with 21% not developed
- Strawberry Mountain
  37 Houses with 23% not developed
- Sugar Loaf Mountain Homes
  93 Houses with 8% not developed
- Suncrest Heights
  26 Houses with 26% not developed
- Tall Oak
  23 Houses with 42% not developed

the virginia department of forestry

fire hazard component rating system

The Virginia Department of Forestry utilizes a fire hazard analysis system that assigns a numerical value to each component of a potential fire threat. When a property or an area is inspected, all aspects are taken into account, such as available fuel to feed a fire, percentage of slope in the terrain, structure composition and exterior, safety zones around the structure as defensible space, emergency access, available water sources. Under the Virginia rating system, a total of 40 to 60 points indicates a High-Risk fire hazard.
The formula used is:

(F x L)+ T + Z + E + M = Fire Hazard Rating Number

where:

F = Fuel Hazard Rating Number:

Low Hazard Fuels	1 point
Medium Hazard Fuels	2-3 points
High Hazard Fuels	4-5 points

L = Slope Hazard Rating Number:

Mild (0-5%)	1 point
Moderate (6-15%)	2 points
Steep (16-25%)	3 points
Extreme (> 25%)	4 points

T = Structure Hazard Rating Number:

Roof and Siding Material	1-10 points

Z = Safety Zone Rating Number:

Percentage of Homes With Defensible Space	3-10 points

E = Emergency Access Rating Number:

Road width, dead ends, turnarounds and bridges	2-3 points

M = Other Factors Rating Number:

Marked Addresses street signage water sources power lines special circumstances	1-3 points

ignition sources

There are three potential ignition sources of concern for a structure located in a wildland environment. They are:
- Radiation
- Convection
- Firebrands

Structures can ignite by heat radiating from a wildland fire. The chances of a structure igniting from radiation heat increase as the size of the flames increase and as they get closer to the structure. The more structure area exposed to the flames and the longer the exposure, the more likely ignition will occur.

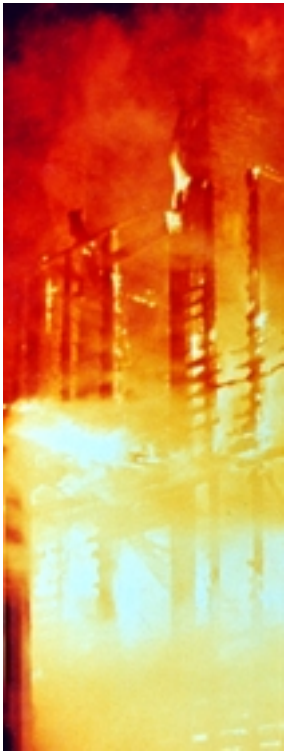
Be fire-wise know your wildfire risk.

Convection ignition requires the flames to come into direct contact with the surfaces of the structure. Contact with the convection column of a wildfire can also cause ignition, but the temperature of the column is generally not hot enough to immediately ignite a structure. To avoid convection ignition, an area of clear ground should be maintained between potential fire fuel sources and the structure. Wind and steep slopes also increase the chances of convection ignition because they focus the convection column uphill by tilting the flames, which in turn increases their size and reach. Structures that extend out over a slope have the greatest likelihood of ignition from convection. Due to the extreme potential for fire to spread on steep slopes and the natural rapid runoff of water from them, slopes greater than 16% are not recommended for building sites. Firebrands are pieces of burning materials that are blown away from a fire. Firebrands can travel a mile or more and ignite any flammable surface they land on. Severe wildland fires are capable of producing heavy firebrand showers. The chances of a structure being ignited by a firebrand depends on the size of the firebrand, how long it continues to burn after it makes contact with a structure's surface, the combustibility of the material upon which it lands, and the structure's design and construction. Most often, firebrands ignite the roof of the structure. A roof constructed of wood shakes is perhaps the most susceptible to firebrand ignition.

how to avoid or minimize wildfire damage

1. Create a 30-foot safety zone around the house.

Keep vegetation in this zone to a minimum! Some types of vegetation are more flammable than



others, but maintaining an area clear of potential fuel for a fire is your best protection. If your house is located on a hill, extend the zone on the downhill side. The steeper the slope around your house, the more open space you should allow to protect the structure.

- Remove vines or growth from the walls of the house
- Move shrubs and other landscaping away from the sides of the house
- Do Not use hardwood mulch up to the house. Once it becomes aged and dry, it is a sure fuel for fire
- Prune branches and shrubs within 15 feet of chimneys and stovepipes
- Remove tree limbs within 15 feet of the ground
- Remove ALL limbs that extend over the roof of your house
- Rid trees of moss, vines, abandoned nests, dead limbs, and other flammable material
- Thin a 15-foot space between tree crowns Replace highly flammable vegetation, such as pine and junipers, with lower growing and less flammable species. Hardwood trees tend to be less flammable than conifers. Local fire departments and garden stores can offer suggestions.
- Replace vegetation that has branches close to the ground. These branches act as ladder fuels for the approaching fire and can lead it straight into your house.
- Cut the lawn often
- Clear the area of leaves, brush, dead limbs and fallen trees
- Gas grills and propane tanks should be kept at least 15 feet from the house
- An area 15 feet in diameter around your grill should be cleared
- Place a 1/4-inch mesh screen over the grill
- Store firewood at least 100 feet and uphill from the house. Make sure that should it catch fire it will not roll downhill into the house

2. Create a Second Safety Zone at least 100 feet around the house

This Safety Zone should begin about 30 feet from the house and extend at least 100 feet. Within this area, either reduce or replace as much of the most flammable vegetation as reasonable and possible. If you live on a hill, you should extend this zone for several hundred feet in order to provide the desired level of protection.

3. Enclose under decks and porches

Porches, decks, or other overhangs with space beneath them provide excellent opportunity for an approaching fire. An overhang can ignite easily from firebrands and from the heat and fire that gets trapped underneath.

- Clear leaves, trash, or other combustible materials away from overhangs
- Enclose wooden stilts with noncombustible materials such as concrete, stucco, brick, concrete blocks, or 2-inch wire mesh
- Use non-combustible patio furniture–Build the structure to the ground where possible so there is no open space underneath

4. Enclose Eaves and Overhangs

Eaves and other overhangs trap heat rising along the exterior of the house and can aid ignition of the upper structure.

- Cover house vents to prevent firebrands from entering
- Cover all openings with wire mesh screen
- When designing louvers, place them in the vertical wall rather than the soffit of the overhang

5. Use Non-Combustible Roofing Materials

Firebrands can travel great distances and start a fire more than a mile away. The roof of your house is especially vulnerable to these airborne fire starters.

- Avoid flammable roofing materials such as wood, and replace with fiberglass, slate, metal or clay
- Clear gutters of leaves and debris. When it dries, it becomes excellent fuel for an airborne firebrand

6. Use Fire Resistant Siding

When you are constructing your home, use fire resistant siding materials such as brick, metal, stucco or rock. Wood siding can be treated with UL-approved fire retardant chemicals, but the protection is not permanent!

7. Use Appropriate Window Treatments to Reduce Combustion Risk

Radiated heat can pass through windows and ignite combustible materials inside your home! The larger the pane of glass, the more vulnerable it is to fire!

8. Provide Ample Outside Water Faucets

The availability of water is critical when a wildfire or any fire threatens your home. Place a faucet on each side of your home and near any outbuildings. Keep a coiled water hose near faucets on opposite sides of your home and have a ladder that will reach your roof.

Be fire-wise at home - Don't become a fire starter.

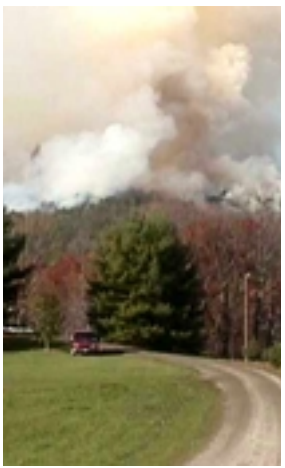
Many wildfires within the Wildland-Urban Interface are caused by the carelessness of homeowners. Something as innocent as a weekend cookout can become a disaster if you fail to practice safe fire procedures.

- Put fireplace or wood stove ashes ONLY in a metal container; Soak them with water and allow them to sit for at least 24 hours before dumping
- Store gasoline in approved containers and outside the house
- Use extreme care in refueling lawn appliances such as mowers, weed whackers, and chainsaws. Allow them to cool and never refuel while the appliance is hot!
- Fuel tanks near the house should be far enough from the structure to be shut off in case of fire
- Never put electrical cords under rugs
- Keep flammable liquids in a well-ventilated place away from heat sources such as wall heaters, wood stoves, or fireplaces
- Remove clutter from your attic and basement
- Be sure television antennas or satellite dishes are properly installed and grounded. Use lightning arrestors on incoming feed lines
- Have power company clear branches from electric lines

know and abide by local fire laws

Fire laws are for the protection of everyone and the environment. Learn what laws exist and obey them. A brief summary of Virginia's Burning Law, 10.1-1142 of the Code of Virginia, is as follows:

- No burning until after 4:00 P.M. from February 15th through April 30th of each year if the fire is within 300 feet of woodland, brushland, or a field containing dry grass or other flammable material
- The fire shall not be left unattended if within 150 feet of woodland or dry fuel
- No new fires shall be set or fuels added after midnight. The law provides for a penalty of up to a $500 fine, the payment of court costs, and the cost of fire suppression if the fire escapes!



meteorological events

thunderstorms, tornadoes & winter storms

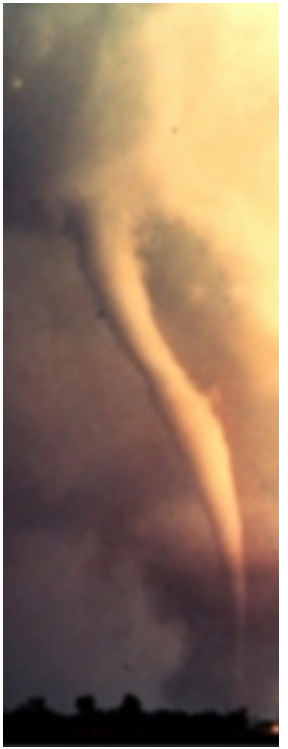
Floods are not the only weather related disasters threatening the Roanoke Valley. The Valley is frequently subjected to accumulating ice, snowfall, heavy thunderstorms, hurricane remnants and tropical storms, lightning, and an occasional tornado. The most common of these threats are intense thunderstorms. Most of the thunderstorms occurring in the Roanoke Valley track in from West Virginia, Tennessee, or occasionally from North Carolina. Thunderstorms are typically fast moving and often isolated rather than widespread, but they carry a tremendous amount of water, high winds and dangerous lightning. Thunderstorms affect relatively small areas, when compared to hurricanes and winter storms. The typical thunderstorm is about 15 miles in diameter and lasts an average of 30 minutes. According to the National Weather Service, nearly 1,800 thunderstorms are occurring at any moment around the world. That translates into 16 million storms each year! During a given year, approximately 100,000 thunderstorms occur in the United States.

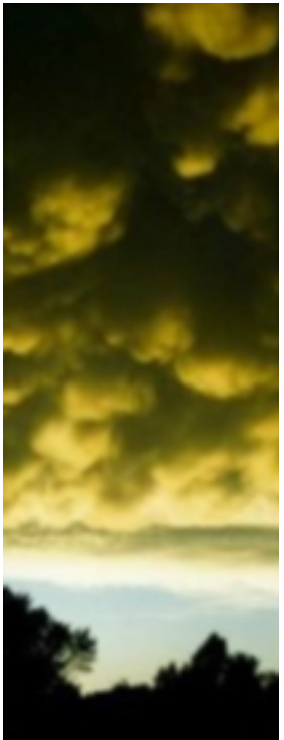
thunderstorms & tornadoes

All thunderstorms are dangerous! Each thunderstorm produces lightning, and lightning kills more people each year than tornadoes. Strong winds, hail, and tornadoes are often associated with thunderstorms. Driving rain from thunderstorms can lead to flash flooding. Deaths from floods are the number one disaster killer every year in the United States.

The National Weather Service considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, winds 58 miles per hour or higher, or tornadoes. Approximately 10 percent of the thunderstorms in the United States each year are classified as severe. That translates into 10,000 severe thunderstorms a year! The thunderstorm season in the Roanoke Valley is from spring to late fall, usually during the afternoon and evening, but a thunderstorm can occur year-round at any hour. Thunder and lightning occasionally accompany snow or freezing rain.

Straight-line winds are responsible for most thunderstorm damage. These winds can reach





speeds of more than 100 miles per hour and their force is capable of inflicting damage equal to that of a tornado to buildings, automobiles, and forests. Such winds are extremely dangerous to aviation when they create downbursts. One of the dangers of high winds of a thunderstorm is debris from damaged buildings, roofs, or items lifted from open areas and sent airborne. Severe thunderstorms can include large hail. While the frequency of extremely large hail is low in this region, it does occur. Hail can damage automobiles and crops. Often, the combination of high winds and hail inflicts damage to trees, which in turn can down power and telephone lines.

Severe thunderstorms can produce tornadoes. Tornadoes are nature's most violent storms, sometimes having winds in excess of 200 miles per hour. The last verified tornado in the Roanoke Valley occurred in 1974 in the vicinity of Hershberger and Cove Roads. A number of buildings, including William Fleming High School, suffered extensive damage. The National Weather Service classified that tornado as an "AF2" with winds in excess of 110 miles per hour. While the Hershberger Road tornado was the last confirmed in the Roanoke Valley, there has been evidence of tornado activity in backwoods areas of the region since. It is common for a funnel cloud to be sighted somewhere within the area during severe thunderstorm activity. Tracking tornadoes in this region is a problem since Weather Service Doppler radar is blind below 3000 feet. While conditions contributing to a tornado are usually visible with the radar, low-level storms can develop under the radar and cause damage before the automated systems can detect them.

During times of severe thunderstorm activity, the National Weather Service in Blacksburg will activate the SkyWarn system, which is comprised of citizens and amateur radio operators throughout the region. Reports of severe storm activity and damage are delivered directly to the SkyWarn amateur radio station inside the Weather Service office in Blacksburg. These reports offer eyewitness accounts by trained volunteers of severe weather activity and provide a crucial tool to weather warnings.

The National Weather Service in Blacksburg offers a SkyWarn class consisting of a Basic and Advanced course of instruction for those who might have an interest in learning more about severe weather and its effects. These valuable half-day classes are taught several times each year throughout the area at no charge.

How to keep safe during a thunderstorm

1.Find shelter.

- If you can hear thunder, you're close enough to a storm to be struck by lightning - Seek safe shelter immediately!
- If you're caught outside with no available shelter, find a low spot that isn't subject to flooding and is away from trees, fences, and metal poles.
- If you're in a wooded area, take cover beneath shorter trees.
- If you feel your skin tingle or your hair stand on end, lightning is about to strike. Squat low to the ground on the balls of your feet. Place your hands on your knees or over your ears. Make yourself the smallest possible target and minimize your contact with the ground.
- Move to a sturdy building or car. Small sheds, isolated trees, and convertible-top cars are not good shelter.
- Get out of boats and away from water. Water is an excellent conductor of electricity and you can be killed by a nearby lightning strike.

2. If you are in a building...

- Stay away from telephones and electrical appliances. Phone lines and metal pipes conduct electricity. A nearby strike could create enough electrical surge to kill if you're in contact with a phone line or metal pipe.
- Don't take a bath or shower. Metal pipes conduct electricity and create a path to ground for lightning within the general area.
- Turn off air conditioners. Lightning strikes on or near power lines can cause enough surge to damage or destroy compressors and electrical equipment.

If there is a tornado:

Go to the lowest level of the building and find a corner away from the projected pattern of the storm's approach.

- Lie down in a bathtub if no other shelter is available, and cover yourself with a mattress or heavy drape to get as much protection from flying debris as you can.
- Stay away from windows and doors!
- Get inside a closet built within a support wall if no other shelter is available.
- If outside, get beneath a bridge or overpass as near as you can to the top metal structure at the abutment and find something solid to hold on to.
- If no other shelter is available, lie facedown in a low ditch and cover your head.
- If a tornado impact is imminent and you're in an automobile, get out and seek other shelter! Cars and even large trucks are easily swept away by the force of a tornado.

winter storms

A typical Roanoke Valley winter is relatively mild, but Arctic blasts and Gulf moisture or coastal storms driven inland have historically combined to deliver serious winter weather on the region. There is potential for dangerous winter weather from November to as late as May. Severe winter weather might come in the form of snow, ice, sleet and freezing rain, or blustery cold temperatures and winds.

The Valley's greatest snowfall totals have occurred in January, February, and March. In January of 1966, the Valley received a total of 41.2 inches of snow. February of 1960 found the area blanketed with 27.6 inches and March delivered 30.3 inches that same year. "The Blizzard of '96" dropped 22.2 inches officially in 24 hours in early January of 1996 which is the current record 24-hour snowfall. Many areas of the Valley received more than 36 inches during the same period.

The second greatest official snow accumulation in a single 24-hour period occurred on February 11th and 12th of 1983 when 18.6 inches covered the region.

When heavy snow falls quickly on the Roanoke Valley, commuters are often stranded, the delivery of essential goods and supplies stopped, and emergency responses delayed. Heavy snow can

knock down trees, power and telephone lines, and collapse roofs. In rural areas of the Valley, livestock and pets can die while homes are isolated for days. Additionally, the costs of snow removal, damage repair, and lost business can have a serious economic impact. The dangers of winter are intensified when extremely cold temperatures accompany a winter storm. Extremely cold weather is most dangerous to infants and the elderly. Additionally, freezing temperatures can cause damage to vegetation, wildlife, pets, and even homes and businesses as pipes freeze and burst. Streams can freeze, creating ice jams that can cause flooding. When snow is driven on the wind, the result is blizzard conditions that are often blinding and deadly.

Winter ice storms are frequent in the Roanoke Valley. When rain falls onto a surface that is below freezing, it freezes to that surface. Anything the freezing rain contacts becomes glazed with accumulating ice. Even modest accumulations of ice can quickly down trees, electrical and telephone wires, communications towers and antennas critical for emergency communications. Repair of these utilities can take days, leaving citizens without power or telephone service. Light accumulations of ice are hazardous to motorists and pedestrians. Black ice, the glaze that forms on the surface of roadways in chilling temperatures, is almost invisible and can create very hazardous driving and walking conditions. A winter storm can be a deceptive killer. Deaths are indirectly related to winter storms. People die in traffic crashes on icy roads, suffer heart attacks while shoveling snow, fall on icy sidewalks, and succumb to hypothermia from prolonged exposure to the cold temperatures. About 70% of all deaths associated with ice and snow occur in automobiles while another 25% occur with people who are caught out in the storm without shelter. Wind chill is the calculated rate of heat loss from exposed skin caused by the combination of wind and cold. As the wind increases, heat is carried away from the body more quickly, causing the body temperature to drop. Moderate temperatures and high winds can create a significant wind chill. Low temperatures and moderate winds have the same effect. Knowing the warning signs of hypothermia and frostbite, and understanding the dangers of an intense winter storm, will help to lessen the impact on the people of the Roanoke Valley.

Effects of winter cold - the warning signs

- Frostbite results when body tissue is frozen. Indications of frostbite include a loss of feeling in extremities and a white, or pale, appearance of the superficial skin area. Fingers, toes, ear lobes, and the tip of the nose are especially at risk. If you notice these symptoms, seek medical attention immediately! If medical help is not immediately available, the frozen areas should be slowly warmed to thaw them.
- Hypothermia or low body temperature is an extremely dangerous condition brought on by prolonged exposure to extreme cold. Its warning signs include: uncontrollable shivering, memory loss, disorientation, slurred speech, and exhaustion after exposure to cold. If the person's temperature is below 95 degrees F (35C), seek immediate medical help! If medical assistance is not available, slowly warm the person. The body core should be warmed first! Do not warm extremities (arms and legs) first, as this drives cold blood toward the heart and could lead to a heart attack. If necessary, use your body heat to warm the affected person. A person suffering from hypothermia should not be given alcohol, drugs, or coffee. Warm broth is better if it is available. Slow warming is the key to survival from extreme hypothermia!

Hypothermia can occur very quickly after exposure to cold when wet. An example would be falling through the ice of a frozen lake. Hypothermia in such a situation can kill in minutes. Rapidly cooling perspiration from excessive activity such as shoveling snow, pushing a stuck car, or walking even short distances in heavy snow on a very cold day can also lead to hypothermia. Avoid overexertion! The strain imposed by hard work and the effects of the cold can also cause a heart attack!

Know the weather warnings

- Listen to NOAA Weather Radio or commercial radio or television for the latest weather information.
- *winter storm watch* - Weather conditions indicate a severe winter storm is possible within the next day or two. Heavy snow and ice is possible.
- *winter storm warning* - Severe winter weather conditions have started or are about to begin in the region.
- *blizzard warning* - Snow and strong winter winds will combine to produce blinding snow with near zero visibility, deep drifts, and life-threatening wind chill.
- *winter weather advisory* - Winter weather conditions are expected to cause significant inconveniences and may become hazardous. Motorists are usually at the greatest risk.
- *frost/freeze warning* - Below freezing temperatures are expected and may cause significant damage to plants.

What to do before a storm strikes

There is potential for loss of electrical power, heat, and telephones. Your clothing should be loose fitting, lightweight, warm, and worn in several layers. Air trapped between layers serves as insulation and layers can be removed to avoid perspiration and the resulting chill. Outer garments should be tightly woven, water repellent, and hooded, if possible. Always wear a hat as most of the heat lost from your body in the cold escapes from your head! Cover your mouth to protect your lungs from extremely cold air. Mittens with a snug wristband are better than gloves because they permit the fingers to exchange heat and stay warm.

Keep a flashlight and extra batteries readily available. Alternative light sources such as oil lamps or small propane lanterns are handy. Remember to use them in well-ventilated areas. If a cellular telephone with a charged extra battery handy. While telephone service might be lost where you are, the cellular system might still function. Keep extra food and water accessible, as you might not be able to get supplies for several days. High-energy foods such as dried fruit and candy, and foods that require no refrigeration or cooking are best. Keep an emergency supply of medicines and first-aid supplies.

- Have available, where possible and necessary, extra heating fuel. If you rely on heating oil or propane for heat, vendors might not be able to

Stay informed about approaching weather

Listen to *NOAA Weather Radio* or commercial radio or television for current forecasts, watches, and warnings.

A *watch* is issued when conditions are favorable for a severe thunderstorm to develop

A *warning* is issued for areas where severe weather is imminent

reach you for days if the storm is severe.
- Keep a well-maintained extra heating source such as a wood stove, fireplace, space heater, etc. Know how to properly use the device to prevent fire or suffocation. Maintain proper ventilation.
- Have a fire extinguisher available and functional smoke alarms installed.

A Winter Storm Survival Kit in your automobile may save your life. The kit should include blankets, a flashlight with extra batteries, first-aid kit, sharp knife, and non perishable food. You may also wish to have an extra change of clothing, a large empty can and plastic cover with tissues for personal sanitation, a small empty metal can, waterproof matches, and a small candle with protective holder to melt snow for drinking water, sand or kitty litter to help provide traction, a shovel, windshield scraper, tool kit, tow rope, and jumper cables. In addition, keep your gasoline tank near full to avoid ice in the fuel lines. Let others know your planned route and itinerary so they know where to look for you.

What to do if you are caught in a winter storm
If you are outside:
- Find shelter immediately and try to stay dry.
- If no shelter is available, make your own.
- Prepare a lean-to or snow cave for protection from the wind.
- Build a fire for heat and to attract attention to your location.
- Place rocks around the fire to absorb and reflect the heat.
- Do not eat snow as it will lower your body temperature. Melt it first!

If you are in an automobile:
- Stay inside your car. In wind-driven snow or heavy snow it is very easy to become disoriented.
- Run the vehicle's engine for about 10 minutes each hour for heat.
- Open a window for a little fresh air and to avoid carbon monoxide poisoning and make sure the exhaust pipe is not blocked!
- Make yourself visible to rescuers. Turn on the dome light at night when running the engine. If available, tie a colored cloth to your antenna or door. Raise your hood after snow has stopped to indicate trouble.
- Exercise by vigorously moving your arms, legs, fingers and toes to keep blood circulating and to help keep warm.

If you are in a building:
- Stay inside! If you have no heat, close off unused rooms, stuff towels into the crack under doors, and cover windows at night to preserve as much natural heat as possible.
- Eat and drink normally. Food provides energy for the body to produce heat. Keep your body replenished with fluids to prevent dehydration.
- Wear layers of loose-fitting lightweight clothing. Remove layers to avoid overheating and perspiration, which will result in chills.

hazardous materials

hazardous materials

Chemicals are an important part of our everyday life and help keep us healthy, our food fresh, our water drinkable, and our houses clean. Chemicals that are normally helpful when used properly in small amounts can become harmful if in large quantities or under certain conditions. Many can become poisonous; some can kill us almost instantly; still others can blind us, burn us, or contaminate us. People usually think of medications when the misuse of chemicals is discussed, but household items such as bleach and cleanser can also be extremely dangerous when misused.

Hazardous material (HAZMAT) accidents can occur anywhere and they can be detrimental to human life and the environment. Hazardous materials in the form of liquid, solid, and gas are transported across highways and railways and through our communities. Hazardous chemicals and materials are stored for use in manufacturing, water and sewage treatment, hospitals, in our homes, and at our businesses.

Project Impact of the Roanoke Valley has identified HAZMAT incidents to be the fourth most likely disaster to affect the Roanoke area. Our proximity to Interstate 81, the network of railroad tracks through the Valley, and the number of storage and manufacturing facilities all increase the potential for such a catastrophic event.

In 1986, Congress passed the Emergency Planning and Community Right-to-Know Act, also known as Title III of SARA. This act required each community to organize a Local Emergency Planning Committee (LEPC) to develop an emergency plan to react to releases of chemicals from storage facilities. Every business or other facility that stores a minimal amount of chemicals that are considered extremely hazardous must register with the LEPC and list the chemicals stored. In the event that a chemical is accidentally released off-site of the facility the emergency coordinator for that locality must be notified and the emergency plan activated. The LEPC reviews and updates the emergency plans annually. Their meetings are open to the public. For more information concerning the LEPC and the chemical storage facilities in your area contact your local emergency coordinator.

While strict regulations are in place and precautions are taken, accidents can occur. Whether an incident affects an entire community, or occurs in or around the home, the impact of a Hazardous Material event can be reduced through common sense procedures and preparation. Knowing what to do and what not to do could save your life and the lives of those around you. It is not possible to include every type of HAZMAT accident, the information presented here could save your life and minimize damage to your property and the environment.

exposure to chemicals

Many chemicals are colorless and odorless. Some have no taste. You may not know you have been exposed until the chemical causes a bodily reaction. You can be exposed to hazardous materials in three different ways:

- Breathing the chemical vapors or gas
- Touching the chemical, or coming into contact with clothing or objects that have touched the chemical
- Swallowing the substance or ingesting contaminated food, water, or medication

There are several symptoms of chemical poisoning whether the exposure has come from breathing, touching, or swallowing. They are skin reaction or burn, irritated eyes or throat, nausea, dizziness, stomach cramps, changes in skin color, headache, blurred visions, difficulty breathing, and lack of coordination.

If you have reason to believe you or someone near you has been exposed to a harmful chemical call 911 or the Poison Control Center immediately! Provide as much information to the answering operator as possible, such as the location of the emergency and how many people are involved. Stay on the phone until the operator tells you to hang up. If you see or smell something you think might be dangerous or if you find someone who has been overcome with toxic vapors, make sure you don't become a victim also. If you are also contaminated or unconscious, you will not help yourself or other victims. When in doubt, don't do it! If you are confident the area is safe and you are not in danger, check the victim for injuries and administer appropriate treatment.

chemical safety at home

The most common home chemical emergencies involve small children eating medicines, cosmetics, cleaning products, and other household chemicals. Removing chemicals in the home from the sight of small children could reduce the number of accidental poisonings by as much as 75 percent. If your child eats or drinks a non-food substance, find the container and take it to the phone with you. Call 911 or Poison Control Center and give the operator the information off of the label of the substance. Do not give anything by mouth to your child until instructed to do so.

Many home chemical accidents occur because we try to improve the way a product works by mixing chemicals, cleaning products, or medicines. Adding one substance to another can often create a dangerous and even deadly combination. For example: ammonia and bleach combine to produce toxic gases that can kill. To prevent home chemical accidents follow label directions, keep the product in its original container and store properly. Provide proper ventilation and wear suggested gloves and eye protection. Never smoke near chemicals and do not use hair spray, paints or cleaning solutions near an open flame. If you spill a chemical, clean it up immediately with rags being careful to protect your skin and eyes. Wrap the rags in old newspaper and place them in a sealed plastic bag and throw the bag into the trash. Always dispose of leftover chemicals carefully to protect your family and the environment.

what to do in a widespread or major hazardous material emergency

A major hazardous material emergency releases a dangerous amount of harmful material into the environment. Accidents can happen underground, on railroad tracks, highways, or at industrial or manufacturing plants. Sometimes these accidents will involve a fire or explosion, but it is not uncommon to be unable to see or smell anything unusual. The accident might involve a liquid spill, or a gas or particles released into the air. In this type of disaster, rapid response is critical to reduce the damage to the community. Authorities will notify you and it is very important that you exactly follow their instructions.

How You Might Be Notified:

- By telephone
- Emergency personnel drive by and issue instructions over a public address system
- To your door
- Radio and television emergency announcements

What You Will Be Told:

- The type of hazard
- The affected neighborhood
- Evacuation routes
- Shelter locations
- Type and location of emergency medical facilities
- Phone numbers to call if you need more help

shelter in place

During a widespread HAZMAT incident you may be told to shelter in place. This is a method to keep you as safe as possible when it is too dangerous to go outside your home. If you are instructed to Shelter In Place, get your children and pets indoors immediately. While outside gathering your family and pets, you can provide yourself some protection by covering your mouth and nose with a wet cloth (small hand towels work nicely). Once you have your family indoors follow these basic instructions:

- Close and lock all windows and doors
- Seal gaps under doors and windows with wet towels and tape
- Seal gaps around window air conditioners, exhaust fans, and vents with duct tape and plastic sheeting, wax paper, or aluminum foil
- Turn off fans, blowers, air conditioning systems, and all ventilation systems
- Close fireplace dampers
- Close off all nonessential rooms such as laundry rooms and extra bedrooms
- Use plastic wrap or garbage bags and duct or masking tape to seal off all heat or air conditioning registers
- Tape around doors and windows
- Immediately after you have been instructed to Shelter In Place, fill up bathtubs or large containers with water for an extra supply
- Turn off the water intake valve to the house
- Go to an aboveground room with the fewest windows and doors (not the basement)
- Stay away from windows and doors
- If you are told there is a danger of explosion, close the drapes and stay away from the windows
- If vapors have entered the house or building, take shallow breaths through a wet cloth or towel
- Avoid eating or drinking any food or water that could possibly be contaminated
- Stay calm and remain in your secure area and monitor the Emergency Broadcast System on radio or television until you are told all is safe or you are ordered to evacuate

evacuation

Authorities may decide to evacuate your area for your safety. This is decided primarily on the type and amount of the chemical released and the length of time it is expected to affect the area. The authorities will also consider the time of day, the time necessary to evacuate the area, and weather conditions. Follow all instructions exactly. Make sure the evacuation order applies to you and clearly understand if you should evacuate immediately or if you have time to pack essential items. Do not use your telephone! Take pre-assembled disaster supplies, necessary medications, eyeglasses, dentures, hearing aids, toothbrushes, toothpaste and infant supplies. If you have time, take along books and games for entertainment. Remember, a shelter isn't likely to have everything you need. They supply only the basics such as food, cots, and blankets. While traveling to the shelter, be sure car windows are rolled up and turn off heat, air conditioning, and ventilation in the automobile. Help your neighbors wherever possible — they might need special help with infants, the elderly, and the disabled. Some might need transportation — assist them if you can.

emergency procedures for school children

Disasters are never convenient and they can happen at any hour. Should a disaster occur during school hours and you have children in school, there are some guidelines you should follow. Remember, school personnel are trained professionals who care about your children. Trust them during an emergency. Perhaps the most important thing to remember is to not become part of the problem!

- Don't call the school. You could tie up phone lines needed for an emergency
- Don't go to the school unless instructed to do so. You could help create a dangerous traffic problem
- If your children are Sheltered In Place at school, remember that school personnel are trained to handle emergencies. Frantic, well-meaning parents, often make a bad situation worse
- Listen to the Emergency Broadcast System or local radio and television for information on when and where to pick up your children

after the evacuation - going home again

Depending upon the nature of the emergency, returning to your home can be as emotionally difficult as leaving it. In order to reduce the impact of returning to your home, follow these guidelines and obey any instructions given you by authorities.

- Return to your home only when authorities tell you it is safe
- Follow instructions concerning the safety of food and water supplies
- Clean up and dispose of residue very carefully
- Follow the clean-up methods and instructions given you by local authorities

The best way to keep safe is by planning ahead. Through the development of a plan, your family and employees will know what to do when a disaster strikes and that knowledge can save lives!

disaster plan

for family or business

disaster plan

While the information presented here will focus on a family disaster plan, much of the same instruction applies to businesses as well. Having a disaster plan in place will help family members and employees remain calm in an emergency.

There is no way to know where your family will be when a disaster strikes. The family could be divided in various activities or you could be forced to evacuate and become separated. Knowing how and where to find each other is important. During many disasters, you may lose basic services like water, and power and the ability to go to the store to pick up food and supplies. With a disaster plan in place and a disaster supplies kit or go-kit available, your can be independent. Take the time to plan ahead!

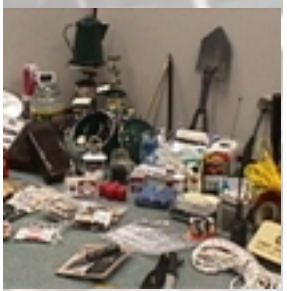
a family disaster supplies kit or go-kit

Every family should keep a Disaster Supplies Kit. Each family member should be involved so each will be familiar with what is in it and where it is stored. Prepare it for all hazards that might affect the area. Your Disaster Supplies Kit can use sturdy, portable containers like backpacks, or large gym bags. Large plastic containers with snap-on lids and built-in handles also work very nicely. They are usually affordable and reasonably waterproof. Be sure you use containers that will fit into your car and can be carried by one person in the event you must evacuate.

You may want to customize your Family Disaster Kit to include different items than those listed in this report, depending upon your individual needs. You should keep a small Go-Kit in your car. If you and your family can treat the emergency like an adventure and prepare as if you were going camping, the preparation would be easier.

A Disaster Supplies Kit or Go-Kit should include the following:

- 3-day minimum supply of water — 1 gallon per person per day (replace the water every 6 months)
- Food that won't spoil
- Food that does not need heating



- A manual can opener
- High-energy foods such as peanut butter, candy, dried fruits
- Meals Ready to Eat (MREs) available from surplus dealers. These are complete wholesome meals including desserts, condiments, beverage, and toiletry essentials in a sealed and waterproof heavy plastic envelope. They are easily prepared, tasty, and some come with their own heat source that requires you only add water. They have a long storage life
- Commercial freeze dried foods of the kind used by campers. These are available at many outdoors suppliers
- Powdered beverages: Kool-Aid, Tang, instant tea, instant coffee, powdered milk, granulated broth
- Zip-top plastic bags in several sizes. These are excellent for storing soiled and wet items as well as leftover food
- Plastic utensils and dishes
- Minimal cooking utensils like a mess kit or camp cook kit
- One complete change of clothing per person that includes hand, head, and footwear
- Rain clothing
- A sleeping bag or blanket and small pillow for each person
- First-Aid Kit that should include prescription medications required by family members. Don't forget sunscreen, aspirin, or other essential medications your family uses frequently
- Battery operated radio or television
- NOAA Weather Radio
- Flashlights with extra bulbs. Be sure you have the correct bulb for each flashlight, and keep several on hand.
- Plenty of extra batteries. Be sure you have ample extra batteries of the correct size for each electronic device in your kit.
- Folding shovel
- Small saw
- Length of durable rope
- Adjustable wrench, claw hammer, flat blade and Phillips screwdrivers, pliers
- Knife with at least a four-inch blade
- Kitchen matches in a waterproof container or waterproof matches
- A credit card or cash
- Rubber gloves and rubber boots, if available
- Special items for infants or small children, the elderly, or disabled family members
- Toilet tissue
- Paper towels
- Feminine personal hygiene items
- Wash cloth and small hand towel
- Soap, deodorant, toothpaste & toothbrushes

Depending upon your personal resources and location, these items are also helpful:

- A small single burner propane stove for minimal cooking and heating water; a small camp stove is ideal
- A propane lantern - many single mantel models are available at reasonable cost
- Extra bottles of propane
- Candles

basic steps for a family disaster plan

- Know in advance what to do in a particular kind of disaster
- Pick two places to meet in a disaster crisis: choose one place outside your home for household emergencies such as fire and choose a second place to meet away from your neighborhood in the event you must evacuate or you cannot get home
- Establish an out-of-state family check-in contact person; this is the person every family member should contact if the family gets separated in an emergency. Be sure each family member knows the telephone number and address of the out-of-state contact or that each family member carries the information with them at all times.
- Develop a plan of what you will do if you are advised to evacuate
- Be sure to take important family papers with you and keep them in a sealed waterproof container
- Know what you will do with pets. Remember, most shelters do not permit pets.
- Be sure each family member knows how to secure your house if it becomes necessary to evacuate
- Keep a regional and state map in each of your vehicles
- Post emergency numbers by all telephones in your home
- Install smoke alarms: Check each alarm monthly and replace batteries at least once a year
- Install fire extinguishers for Class A, B, & C fires. Follow manufacturer's recommendations on recharging and testing each fire extinguisher in your home. Teach each family member how to use them.
- Inspect your home for potential hazards
- Secure items that can move, fall, or easily catch fire
- Family members should learn CPR and First Aid
- Teach family members how to turn off the water, gas, fuel oil, and electricity
- Teach children, even very young ones, HOW and WHEN to call 911
- Conduct family drills. Make a game out of it. If there are young children in the house they'll enjoy it and learn from it
- To rotate your food stock in the Disaster Supplies Kit, make an evening meal from your stored supplies once every few months and then replace the stock you used
- Be Sure each family member learns and remembers: M-E-T-S: meeting places, escape routes, telephone numbers, safety rules

By learning about the hazards around us and preparing, you can do your part to help make the Roanoke Valley a Disaster Resistant Community.

maps

This section contains 52 detailed maps of the Roanoke Valley. Each map indicates flood plains and floodways, as well as areas having a significant threat of wildfire, roads, schools, fire stations, and other possible shelters.

The providers of these maps, including Project Impact of Roanoke Valley, the City of Roanoke, the City of Salem, the County of Roanoke, the Town of Vinton and their respective officers, employees, agents, and consultants (providers) disclaim any warranty of fittness for a particular purpose and implied warrant of marchantability. Providers do not guarantee the accuracy, completeness, or currency of the information shown on these maps. Persons using these maps are responsible for verifying any information contained on them. In addition, all persons should be aware that the evacuation routes shown on the map may not always be accessible.

Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center

Roads
Primary Road With Limited Access
Primary Road Without Limited Access
Secondary and Connecting Road
Local Road
Vehicular Trail
Interchange
Pedestrian Trail
Service Road
Railroad
Wildfire Hazard Area

Streams
Perennial
Intermittent
FEMA Floodway

FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain

Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map A-2


Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
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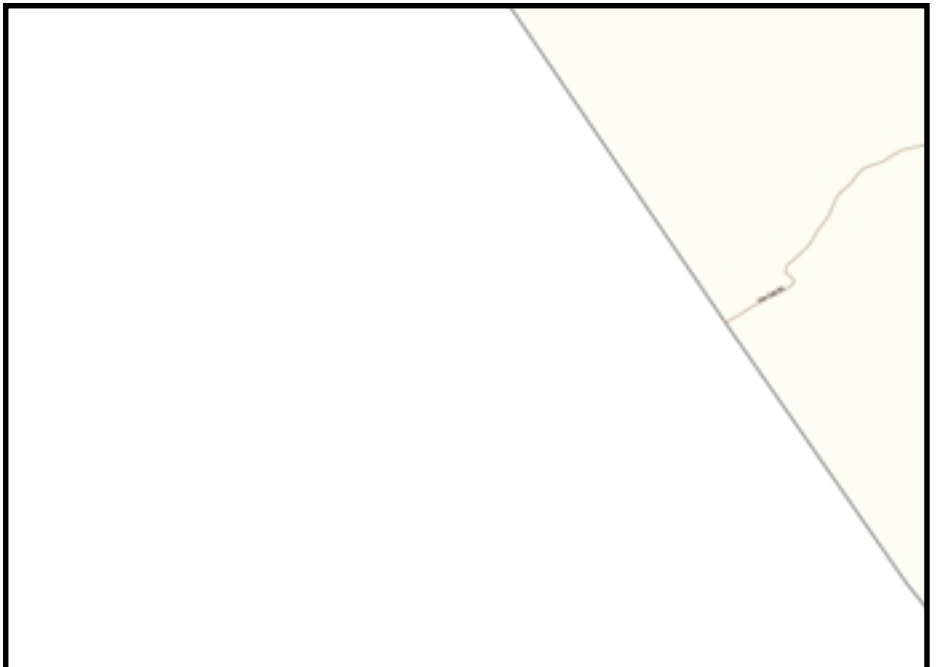
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map A-4


Watch Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
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Interchange
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100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map B-2


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Fire/Rescue
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Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
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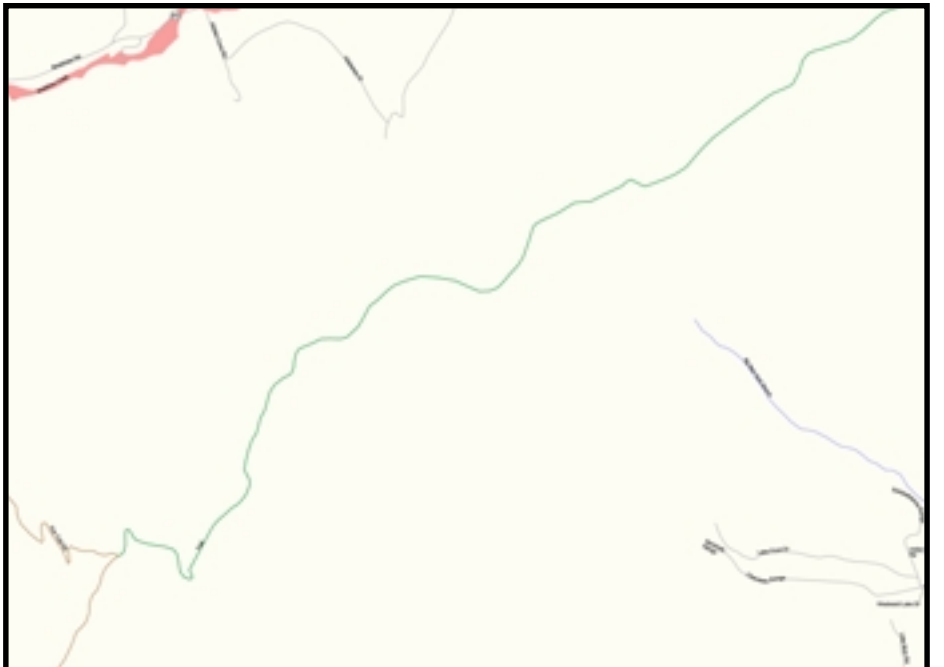
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map B-4




Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
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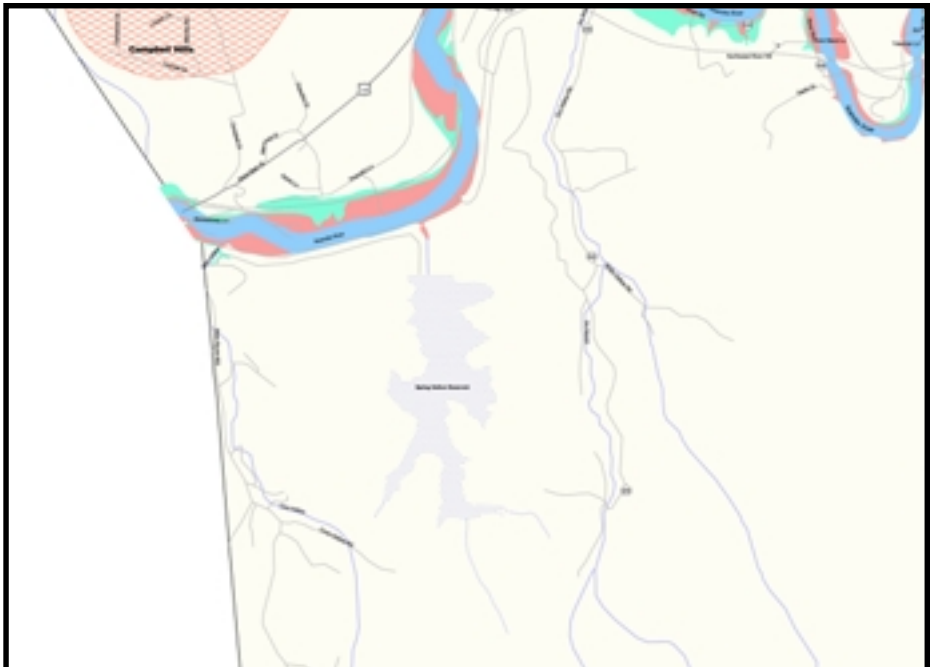
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map B-6




Match Line
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Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map B-8


Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
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Streams
Perennial
Intermittent
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map C-1


Watch Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
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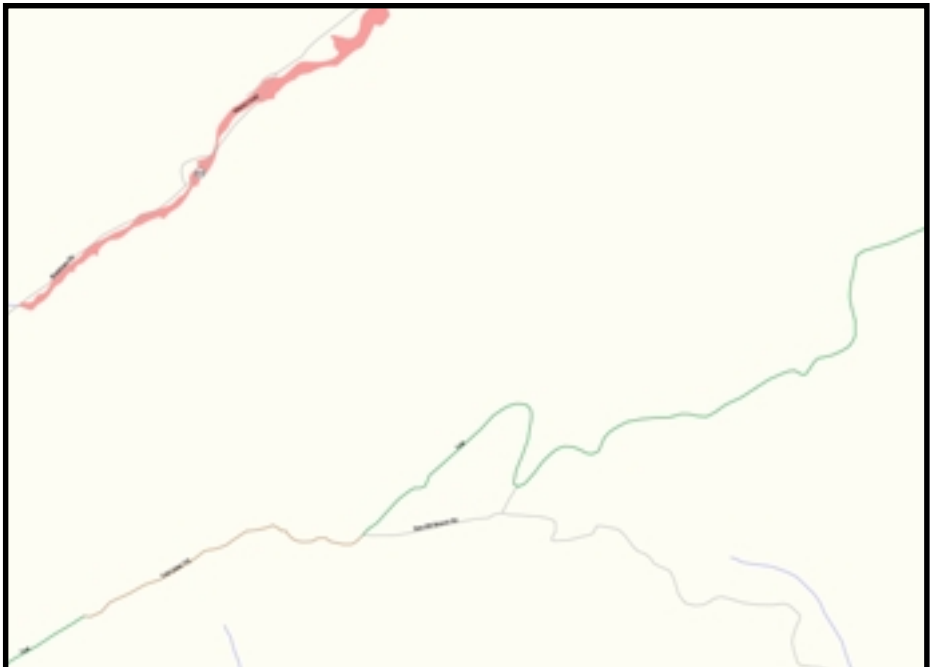
City of Salem
Town of Vinton
County of Roanoke

map C-3




Little Brushy Mountain
Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
Secondary and Connecting Road
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500-Year Floodplain
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City of Salem
Town of Vinton
County of Roanoke

map C-5


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Fire/Rescue
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College or University
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City of Salem
Town of Vinton
County of Roanoke

map C-7


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Hospital
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College or University
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Perennial
Intermittent
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map C-9


Watch Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
Secondary and Connecting Road
Local Road
Vehicular Trail
Interchange
Pedestrian Trail
Service Road
Railroad
Wildfire Hazard Area
Streams
Perennial
Intermittent
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map D-2


Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
Secondary and Connecting Road
Local Road
Vehicular Trail
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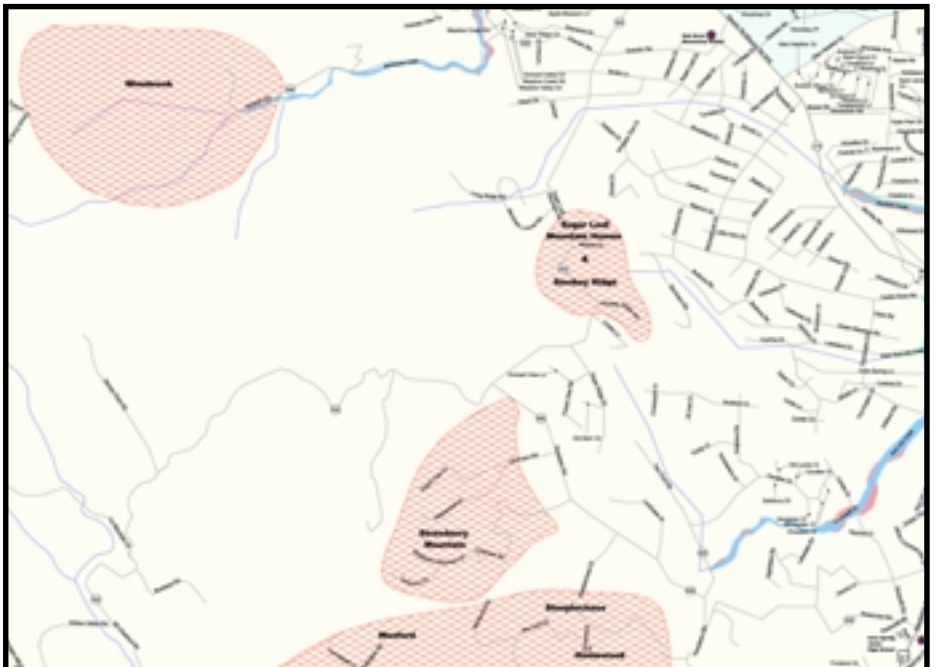
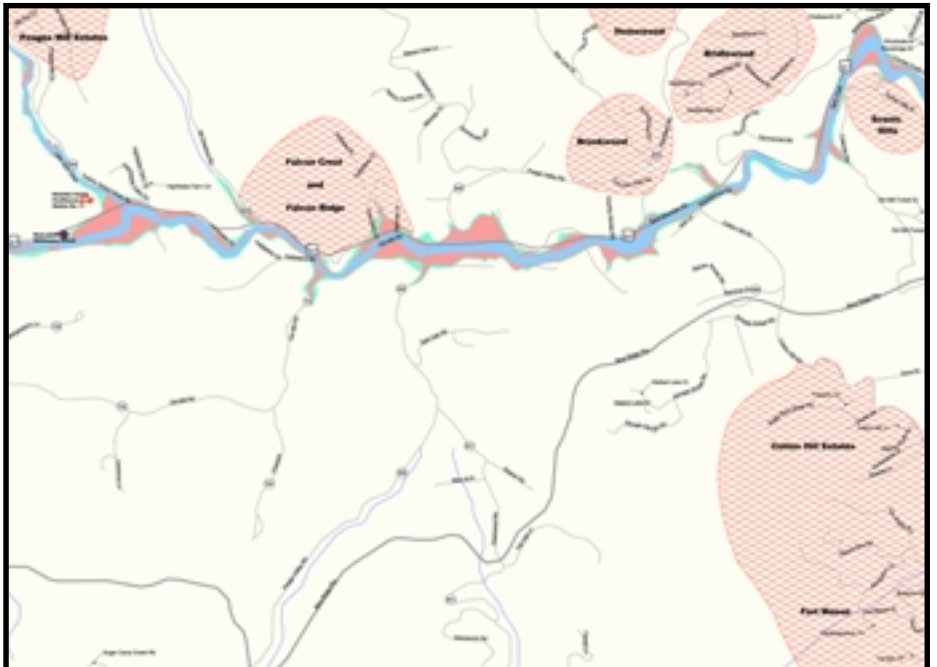
Service Road
Railroad
Wildfire Hazard Area
Streams
Perennial
Intermittent
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map D-4


Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
Primary Road Without Limited Access
Secondary and Connecting Road
Local Road
Vehicular Trail
Interchange
Pedestrian Trail
Service Road
Railroad
Wildfire Hazard Area
Streams
Perennial
Intermittent
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map D-6




Falcon Crest
and
Falcon Ridge
Watch Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center
Roads
Primary Road With Limited Access
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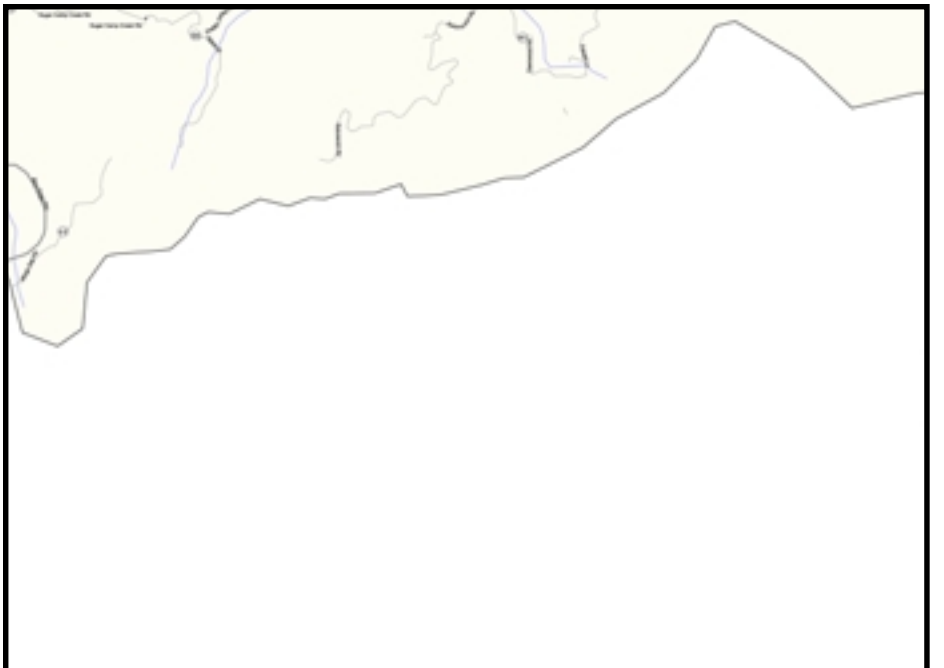
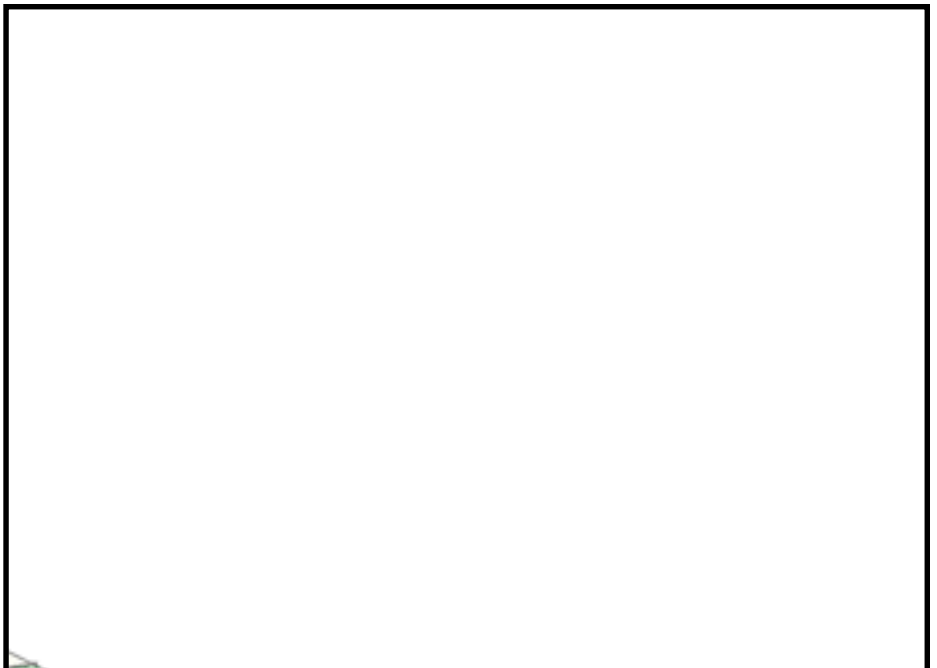
Railroad
Wildfire Hazard Area
Streams
Perennial
Intermittent
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map D-8





Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
Major Shopping Center

Roads
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Primary Road Without Limited Access
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Wildfire Hazard Area

Streams
Perennial
Intermittent

FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain

Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map E-2


Watch Line
Police
Fire/Rescue
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Hospital
School
College or University
Misc. Public Building
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FEMA Floodway
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100-Year Floodplain
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Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map E-4


Watch Line
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Fire/Rescue
Airport
Hospital
School
College or University
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Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map E-6


Match Line
Police
Fire/Rescue
Airport
Hospital
School
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Roads
Primary Road With Limited Access
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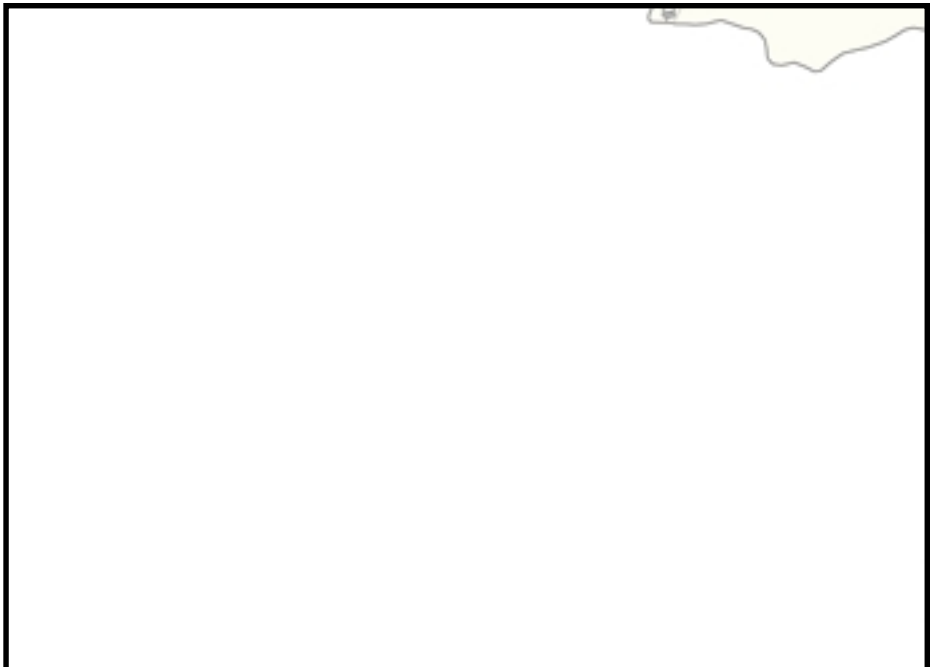
FEMA Floodway
FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map E-8


Match Line
Police
Fire/Rescue
Airport
Hospital
School
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Roads
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100-Year Floodplain
500-Year Floodplain
Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map F-2


Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
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Civic Center
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100-Year Floodplain
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Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map F-4


Match Line
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Fire/Rescue
Airport
Hospital
School
College or University
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Civic Center
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Roads
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Community
City of Roanoke
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County of Roanoke

map F-6


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Police
Fire/Rescue
Airport
Hospital
School
College or University
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100-Year Floodplain
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City of Roanoke
City of Salem
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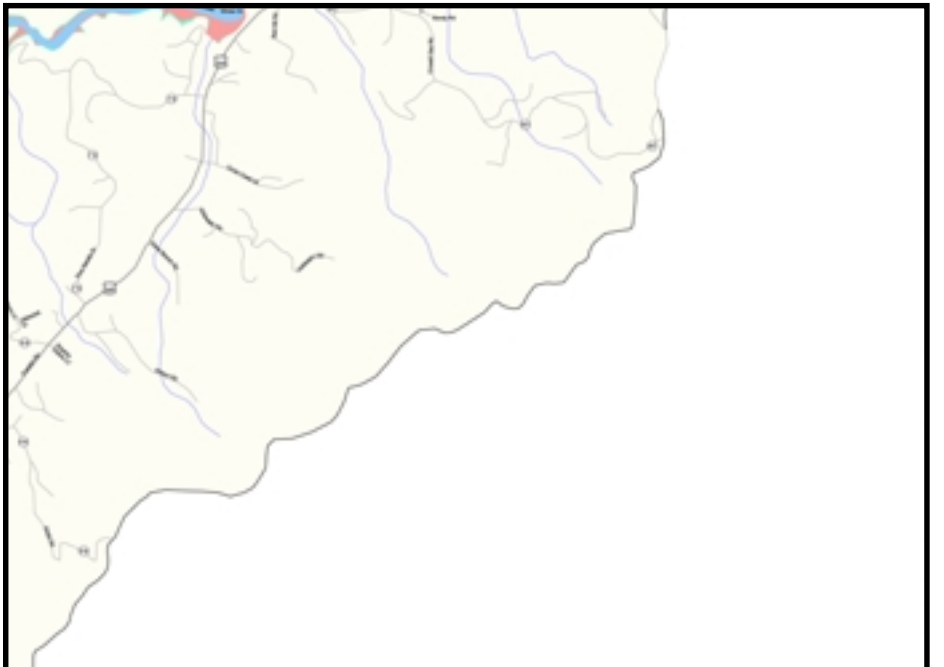
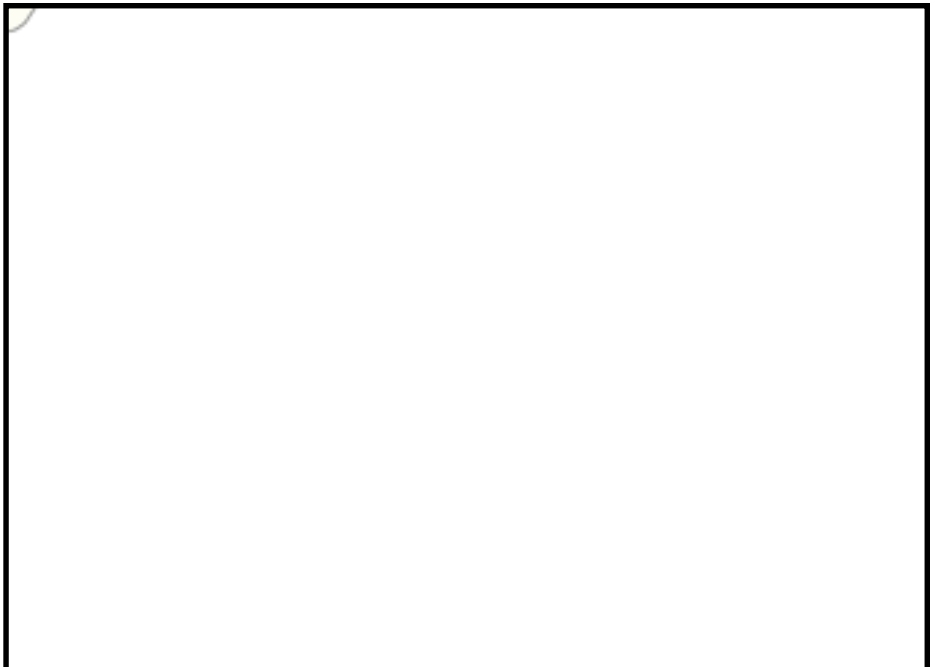
County of Roanoke

map F-8




Match Line
Police
Fire/Rescue
Airport
Hospital
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FEMA Floodway
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500-Year Floodplain
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City of Salem
Town of Vinton
County of Roanoke

map G-3


Watch Line
Police
Fire/Rescue
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Hospital
School
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Roads
Primary Road With Limited Access
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map G-5

Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
Misc. Public Building
Civic Center
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Roads
Primary Road With Limited Access
Primary Road Without Limited Access
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Wildfire Hazard Area

Streams
Perennial
Intermittent
FEMA Floodway

FEMA Special Flood Hazard Area
100-Year Floodplain
500-Year Floodplain

Community
City of Roanoke
City of Salem
Town of Vinton
County of Roanoke

map G-7


Match Line
Police
Fire/Rescue
Airport
Hospital
School
College or University
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Civic Center
Major Shopping Center
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Primary Road With Limited Access
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