8.15 Civil Disorder

This section has been removed for security purposes.

8.16 Coastal Flooding Mitigation

8.16.1 Description of Hazard

Coastal flooding refers to the inundation of land areas along the Chesapeake Bay coast caused by sea waters over and above normal tidal action. Winds generated from tropical storms and hurricanes or intense offshore low pressure systems can drive water inland — also known as storm surge — and cause significant flooding.

Loss of life and property, reduced recreation opportunities, loss of environmental quality, and alteration of traditional coastal uses are just a few of the detrimental impacts of shoreline erosion and coastal flooding. Major flooding can cause multiple deaths, completely shut down critical facilities and businesses. Coastal flooding occurs in seasonal patterns. Tropical storms tend to come together from June until October. Warning time for flooding is often minimal.

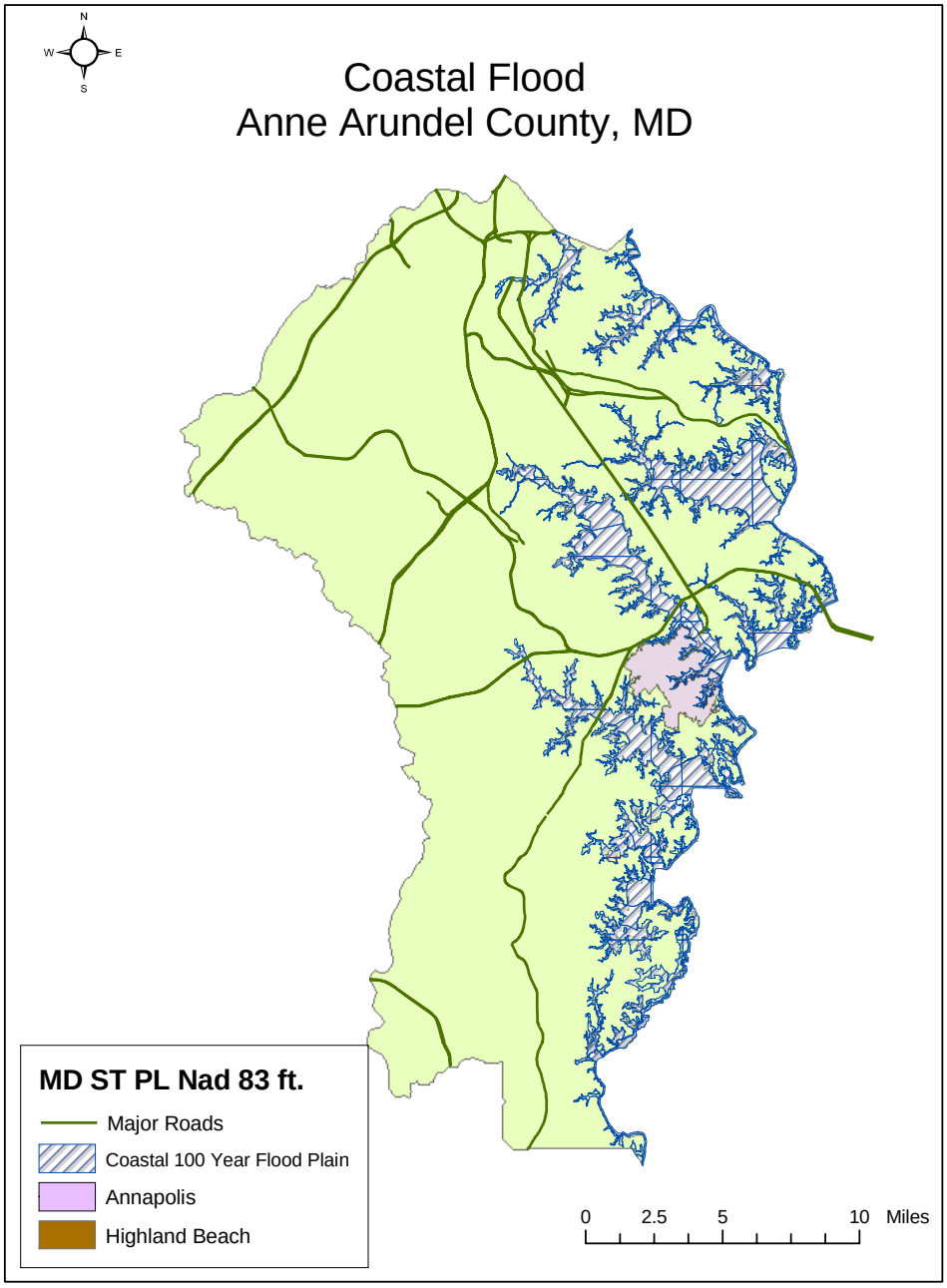
8.16.2 History

Within the past seven years, National Oceanic and Atmospheric Administration data identified six occurrences of coastal flooding that affected Anne Arundel County (see Appendix C for additional information).

8.16.3 Vulnerability

Persons and property located near the coast of the Chesapeake Bay are most vulnerable to coastal flooding in the County. Figure 8-10 depicts the County's coast. The Census Blocks that intersect the flood plain contain 111,003 people who will potentially be affected by this hazard. $4,730,000,000 in buildings and contents are exposed to this hazard. Two critical County infrastructure buildings are exposed to this hazard.

Figure 8-10. Coastal Flooding



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8.16.4 Impacts/Risk

Coastal flooding occurs with some degree of warning. The greatest impact would be in those areas of the County that are adjacent to the Chesapeake Bay. Since many of the County's residents live near the shore, there is the potential for considerable loss of human life and the economic effects would be felt throughout the County.

8.16.5 Coastal Flood Mitigation Actions

8.16.5.1 Mitigation Action CF-1:

Initiate a coastal flood public awareness and educational campaign under the County education and outreach program. Topics to be addressed include:

- Targeted messages designed for residents living in the flood plain
- Provide suggested forms of simple, cost-effective mitigation strategies
- Educate about the need for flood insurance
- Steps to take during an event

Estimated Cost: Costs will be covered as part of the County education and outreach initiative.

Benefits: This action will help ensure that County residents are aware of steps they can take to be better prepared in the event of a coastal flood to prevent injury, property damage, or death.

Responsible Organizations: Office of Emergency Management

Related Objectives: Objectives 1.1, 2.1, & 2.2

Priority: High

Potential Funding Sources: Grant, general revenue

8.16.5.2 Mitigation Action CF-2:

Continue acquisition of repetitively flooded structures in the floodplain. Activities include:

- Develop an action plan by 2005 to identify funding alternatives and to identify and prioritize structures for acquisition and removal.
- Leverage State and Federal funding sources to maximize the number of voluntary buyouts that can be accomplished.

Estimated Cost: $250,000 per residential structure

Benefits: Buildings that suffer repetitive flood losses are typically low in elevation and near the shoreline or other flooding source. Structural alternatives to prevent flood water from damaging the building are often physically unfeasible, usually more expensive, and almost always more environmentally damaging than alternatives to acquire the property at risk and remove it from the flooded area. Acquisition of repetitively flooded structures in the floodplain has added environmental benefits of reclaiming green space along the shoreline and avoiding the expense of construction and maintenance of structural flood controls. This action will help improve buyout planning, maximize outside sources of funding, and thus increase the number of voluntary buyouts that can be accomplished and increase the number of acres of floodplain converted to green space.

These mitigation actions will also help end the cycle of continuing disaster damage. It will reduce repetitive flood losses, including those to the National Flood Insurance Program. By removing these homes from the floodplain, it will return the land to its natural state, thereby protecting the natural and beneficial functions of the floodplain.

Responsible Organization: Office of Emergency Management, Central Services Real Estate Office

Implementation Schedule: Activity to commence in 2005

Related Objectives: Objectives 1.2, 5.2, 7.1, & 7.2

Priority: Low

Potential funding sources: General revenue, grants

8.17 Communication Failure Mitigation Actions

8.17.1 Description of Hazard

Communications interruptions and failures may occur throughout the County. These facilities are dispersed over a wide area with many located throughout the service area. These systems exist everywhere and are subject to damage from digging, fire, traffic accidents, and severe weather, including flooding and other

day-to-day events. Many communications facilities utilize emergency batteries or generators to provide back-up power for high priority equipment.

During a public emergency, communications may be compromised, in particular during a significant natural disaster, technological emergency, or other incident that causes extensive damage and results in a high volume of requests for service. First responders require accurate and timely information on which to base decisions and guide response actions. If commercial communications facilities have sustained widespread damage, the capability to acquire information may be seriously restricted or nonexistent. In such situations, all surviving communications assets of the various government agencies, augmented by extra assets, will be needed immediately to ensure a proper response to the needs of victims of the event.

8.17.2 History

Over the past three and a half years, there have been an average of two communications failures in Anne Arundel County, according to data from Baltimore Gas and Electric and Verizon (see Appendix C for additional information).

8.17.3 Vulnerability

This section has been removed for security purposes.

8.17.4 Impacts/Risk

Communication failures generally occur during times when the electric power has been interrupted; a communication failure may occur with limited warning and may have a detrimental effect on the ability of government to function and negatively affect the economy of the County.

8.17.5 Communication Failure Mitigation Actions

8.17.5.1 Mitigation Action CO-1:

Since most communication failures occur with a loss of power, Anne Arundel County will work with Baltimore Gas & Electric to assess ways to reduce power outages, improve reliability of the power grid supplying the County, and seek ways to minimize local service disruptions.

Estimated cost: To be determined.

Benefits: Increased reliance on communications technology to manage all parts of local government makes reducing power outages a goal for the entire work year, not just when the wind blows. Outages reduce worker productivity; therefore, reducing the likelihood and the extent of power outages will be very important for the County to be able to respond to and communicate during disasters in a timely and efficient manner.

Responsible Organization: Baltimore Gas & Electric

Implementation Schedule: Activity to begin in 2005.

Related Objectives: Objective 5.1 & 5.2

Funding Sources: Baltimore Gas & Electric

Priority: Medium

Prospective Funding Sources:

8.17.5.2 Mitigation Action CO-2:

Ensure that sufficient redundancy for E911 service is available at all times – in all components of the service, including the Verizon E911 call distribution and "central offices", as well as redundant call paths to the County Dispatch Center.

Estimated cost: To be determined.

Benefits: Verizon provides public E911 phone service. All E911 phone service is provided by Verizon; both from the perspective of a resident calling 911 and the County receiving said call. Additionally, Verizon provides maintenance on the Plant Vesta E911 telephone system used by the County fire and police departments. With the exception of "acts of God," these services need to be reliable and available at all times. Also, Verizon should be in a position to certify that the Plant Vesta E911 telephone system installed in both County fire and police headquarters is a fault tolerant and redundant system. Disruptions to the E911 system could cost lives and injuries.

Responsible Organization: Verizon, Office of Information Technology

Implementation Schedule: Activity to begin in 2004.

Related Objectives: Objective 4.3 & 5.2

Funding Sources: General Revenue, Verizon

Priority: Medium

8.17.5.3 Mitigation Action CO-3:

Implement a 100% 800 MHz radio system throughout the County. Provide redundancy and 24/7 system monitoring support.

Estimated cost: N/A (at this point)

Benefits: Increased reliance on communications technology to manage all parts of local government makes eliminating outages and ensuring that communication can take place a goal for the entire work year. The County has implemented 24/7 system monitoring services, provided by Motorola (from another state). When deviations occur, local technical and County staffs are notified for action.

Outages place both the public as well as County first responders such as fire and police officers at significant risk. Ensuring that these individuals can communicate with each other is one way to greatly reduce the risk to the public and the County employees.

Responsible Organization: Motorola, Wireless Communications, Wilmers

Implementation Schedule: Activity to begin in 2005.

Related Objectives: 1.4 & 4.3

Priority: Medium

Potential Funding Sources: Grants and general revenue

8.17.5.4 Mitigation Action CO-4:

Complete the installation of a 100% fiber optic network.

Estimated cost: To be determined.

Benefits: Increased reliance on communications technology to manage all parts of local government makes reducing network outages a goal for the entire work

year. Outages reduce worker productivity and inhibit data related traffic – as well as disable certain mission critical computer applications. Therefore, a reduction in network outages can reduce risk to the public, County employees, save lives, and eliminate injuries.

Responsible Organization: Comcast, Verizon

Implementation Schedule: Activity to begin in 2005

Priority: Low

Potential Funding Sources: Private industry, general revenues

8.18 Critical Fuel Shortage Mitigation Actions

8.18.1 Description of Hazard

Critical shortages are the lack or reduction of essential goods or services due to a disruption in their supply. They are distinguished from shortages due to local emergencies by being caused by events that occur elsewhere. These events could include embargoes, strikes, natural disasters, epidemics, crop failures, over exploitation of a natural resource, terrorist activities and political unrest.

A fuel shortage may involve any one or more of various types of energy resources. It might involve natural gas, heating oil, gasoline, coal, or electricity. No matter which type of resource is involved, it is the inability to produce or to transfer sufficient quantities of the resource at an acceptable cost to businesses, industry, and the public that creates the emergency. When this disrupts the normal day-to-day lives of the residents of the County, it can become an energy emergency. This is especially true during periods of inclement weather where heating is necessary for individual safety.

The primary types of energy usage are electrical, petroleum based distillates and natural gas. All areas of the County are susceptible to shortages. A power emergency can develop very quickly, as when a storm coats the power lines with ice, which then sag under the weight and break in numerous places throughout the County. The same can happen with windstorms, where fallen branches and trees are the culprits.

As in the case of the OPEC (Oil Producing and Exporting Countries) embargo during 1973, an energy emergency can develop over days or weeks. In that case it was gasoline, fuel oil, and other products derived from petroleum that were in short supply.

Demands for energy have grown throughout the County because of regional population and economic growth. This trend is not expected to stop. Population will continue to grow over time. All of this continues to leave us vulnerable to future energy emergencies.

8.18.2 History

Over the past 29 years, there have been two critical fuel shortages in Anne Arundel County, according to data from Anne Arundel County Central Services (see Appendix C for additional information).

8.18.3 Vulnerability

This section has been removed for security purposes.

8.18.4 Impacts/Risk

A critical fuel shortage would be expected to have a negative effect on the County's economy and the ability of the residents to travel about; no injuries or deaths are anticipated.

8.18.5 Critical Fuel Shortage Mitigation Actions

8.18.5.1 Mitigation Action CS-1:

Ensure adequate reserves of fuel are available for County response vehicles.

Estimated Cost: To be determined.

Benefits: Rising oil prices have made the cost of maintaining adequate reserves of fuel increasingly expensive. However, the public's reliance on the County to respond in the event of an emergency makes it essential that fuel is available for response vehicles to go where they are needed. Ensuring adequate fuel reserves permits County first responders to fulfill their mission of saving lives and preventing injury.

Responsible Organization: Central Services

Implementation Schedule: Ongoing activity.

Related Objectives: Objective 4.3

Priority: High

Funding Sources: General revenue

8.19 Cyber Crime Mitigation Actions

This section has been removed for security purposes.

8.20 Dam Failure and Release Mitigation Actions

8.20.1 Description of Hazard

Failure of a dam is an unlikely event. However, over the years dam failures have injured or killed thousands of people, and caused billions of dollars of property damage in the United States. A dam is defined by the National Dam Safety Act as an artificial barrier that impounds or diverts water and (1) is more than 6 feet high and stores 50 acre feet or more, or (2) is 25 feet or more high and stores more than 15 acre feet.

Based on this definition, there are over 80,000 dams in the United States. Over 95 percent of these dams are non-federal, with most being owned by state governments, municipalities, watershed districts, industries, lake associations, land developers, and private citizens. Dam owners have primary responsibility for the safe design, operation, and maintenance of their dams. They also have responsibility for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials.

Dams can fail for many reasons. The most common are as follows:

- Piping: Internal erosion caused by embankment leakage, foundation leakage and deterioration of pertinent structures appended to the dam
- Erosion: Inadequate spillway capacity causing overtopping of the dam, flow erosion, and inadequate slope protection
- Structural Failure: Caused by an earthquake, slope instability or faulty construction.

These three types of failures are often interrelated. For example, erosion, either on the surface or internal, may weaken the dam and lead to structural failure,

whereas a structural failure may shorten the seepage path and lead to a piping failure.

Flood-related dam failure would most likely occur in the spring or fall when floods are more likely.

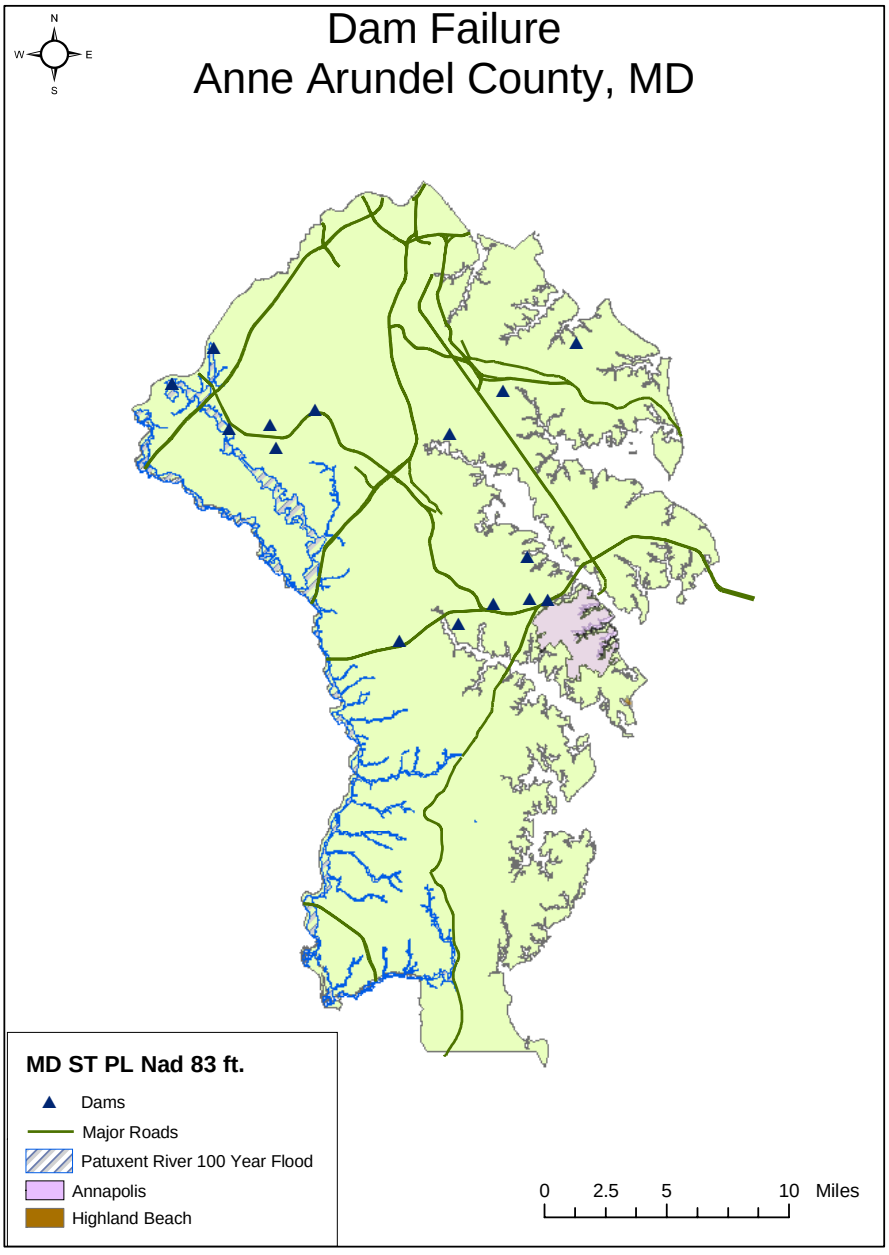
8.20.2 History

According to the Maryland Department of the Environment, there have been no releases from high hazard dams over the past 25 years (see Appendix C for additional information).

8.20.3 Vulnerability

Persons and property located in the watershed of the Patuxent River are most vulnerable to a dam failure at one of two high hazard dams, Brighton and T. Howard Duckett, upstream in Howard County. Figure 8-11 depicts the 100-year flood plain for the Patuxent River in Anne Arundel County. The Census Blocks that intersect the flood plain contain 30,886 people who will potentially be affected by this hazard. $1,950,000,000 in buildings and contents are exposed to this hazard. Zero critical County infrastructure buildings are exposed to this hazard.

Figure 8-11. Dam Failure



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8.20.4 Impacts/Risk

Dam failure at one of the irrigation dams in the County would cause minimal flooding and disruption; failure of one of the high-risk dams could create an opportunity for a good deal of property damage and potential injuries or loss of life.

8.20.5 Dam Failure and Release Mitigation Actions

8.20.5.1 Mitigation Action DF-1:

Have in place adequate plans, procedures, and capabilities to respond quickly and effectively to a dam failure and release.

Estimated Cost: To be determined

Benefits: This action will help ensure that the public, water supplies, and downstream structures are protected in the event of a dam failure and release. Responding quickly will ensure that potential injuries or deaths are minimized.

Responsible Organization: Anne Arundel County Fire Department

Implementation Schedule: This is an on-going activity starting in 2005.

Related Objectives: Objective 4.3

Priority: Low

Potential funding sources: General revenues, grants

8.21 Drought Mitigation Actions

8.21.1 Description of Hazard

The state of Maryland uses the U.S. Army Corps of Engineers' definition of drought, which states, "droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow." Droughts unfold at an almost imperceptible pace with beginning and ending times that are difficult to determine, and with effects that often are spread over vast regions. While maintaining water supplies for human use is an important

aspect of drought management, drought can also have many other dramatic and detrimental effects on the environment and wildlife.

In order to monitor potential drought conditions in a uniform manner, the state uses four indicators of water sufficiency. The indicators are based on the amount of precipitation and the effect of the precipitation (or lack of precipitation) to the hydrologic system. These indicators include:

- Precipitation levels,
- Stream flows,
- Ground water levels,
- Reservoir storage.

The indicators are used in conjunction with historic data to determine if a current deficit is within a commonly experienced range, or whether it is unusually large.

Precipitation amounts are evaluated based on the water year (beginning October 1). Water years are a natural dividing point for water supply as precipitation that falls in the first six months of a water year is analogous to putting money in the bank. A higher percentage of this rainfall or snowfall ends up recharging the ground water system, which sustains the stream flows and ground water levels during dry periods. Deficits during this time are more critical for later water levels than deficits during the growing season. If a precipitation deficit outside of the normal range exists at the end of a water year, the precipitation records will carry forward until a normal condition is reached. Because the significance of a precipitation deficit changes as the water year progresses, drought stages will trigger at different percentages of normal depending upon the date of evaluation. See Table 8-11 for the precipitation drought triggers.

Stream flow gages are used to measure stream flow. Using 7-day average flows, the median flow for an evaluation period is compared with low flows representing historical occurrence frequencies of 25%, 10% and 5% for the same date for the period of record. A 25% frequency equates to a one in four year occurrence, 10% frequency a one in 10 year occurrence and 5% frequency a one in 20 year occurrence.

Representative wells are used for monitoring ground water levels. Ground water conditions are evaluated on a monthly basis. The monthly levels are compared with values equivalent to the 25th, 10th, and 5th percentiles of historical records. Ground water levels in confined aquifers are responsive to pumping stresses at distances far removed from pumping centers. No baseline exists for measuring changes in water levels for confined systems. Therefore percentile frequencies

are not available for wells in these systems. Evaluation of drought impacts in these systems will be analyzed as a departure from the long-term downward trend in water levels.

Reservoirs are designed to provide adequate storage when demand exceeds reservoir inflow. As stream flows are lowest during the summer period and demand is also greatest, the most critical time begins at the onset of summer. Adequate storage is presumed to be enough to last for a four-month period or 120 days.

The state of Maryland uses a staged process for defining drought conditions. Drought indicators are monitored on an ongoing, year-round basis, and drought status is determined on a variable timeframe according to drought stage (See Tables 8-10 and 8-11 below).

The frequency of evaluation increases if the drought intensifies:

- Stage 1, Monthly
- Stage 2, Bi-weekly
- Stage 3, Weekly
- Stage 4, Weekly or as needed

Table 8-10. Drought Indicators

	Precipitation As Percent of Normal for Evaluation Period [1]	**Stream flow As Percentile of Normal[2]**	**Ground Water Levels As Percentile of Normal[2]**	**Reservoir Storage in days**
Stage 1 Normal	See Table 8-14	>25	>25	>120
Stage 2 Watch		25	25	120
Stage 3 Warning		10	10	90
Stage 4 Emergency		5	5	60

[1] These values vary depending of length of review period. For more detail see Table 7-10.
[2] At the 25th percentile, it means that historical stream flows or ground water levels are lower than this value only 25% of the time for the evaluation period. 10th and 5th percentiles represent increasingly lower stream flows or ground water levels and more severe drought events.

Source: Maryland Department of the Environment, http://www.mde.state.md.us/Water/Drought/assessing/index.asp

Table 8-11. Precipitation Triggers

Number of Months Analyzed	Normal (% of Normal Precipitation)	Watch (% of Normal Precipitation)	Warning (% of Normal Precipitation)	Emergency (% of Normal Precipitation)
3	>75.0	75.0	65.0	55.0
4	>80.0	80.0	70.0	60.0
5	>80.0	80.0	70.0	60.0
6	>80.0	80.0	70.0	60.0
7	>81.5	81.5	71.5	61.5
8	>82.5	82.5	72.5	62.5
9	>83.5	83.5	73.5	63.5
10	>85.0	85.0	75.0	65.0
11	>85.0	85.0	75.0	65.0
12	>85.0	85.0	75.0	65.0

Source: Maryland Department of the Environment, http://www.mde.state.md.us/Water/Drought/assessing/index.asp

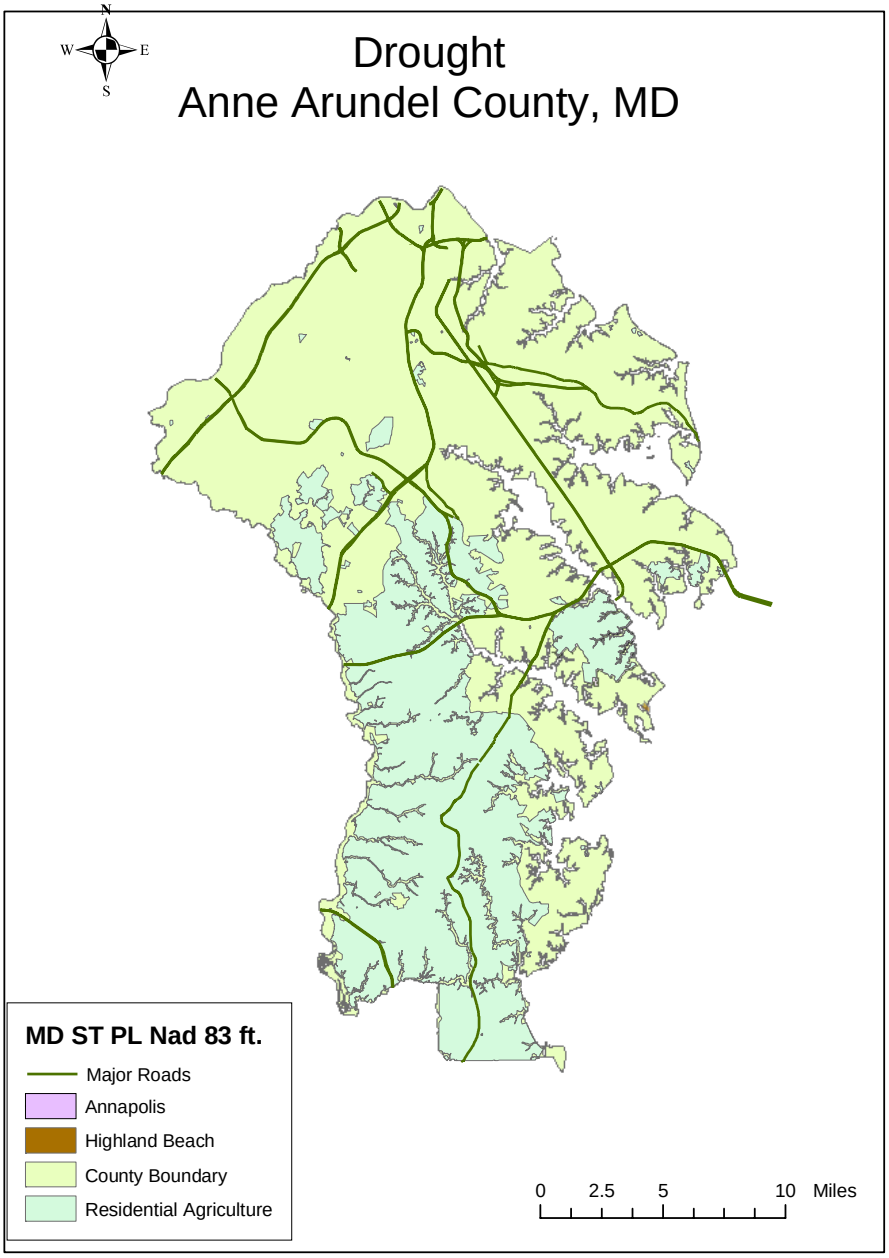
8.21.2 History

Over the past 73 years, Anne Arundel County has experienced four droughts, as reported by the Office of the Maryland State Climatologist (see Appendix C for additional information).

8.21.3 Vulnerability

Drought does not have particular impacts in any one geographical section of the county. However, this hazard would have the greatest impact on the agricultural community. Figure 8-12 depicts the areas of the County that are devoted to agricultural pursuits. These areas contain 74,857 people who will potentially be affected by this hazard. The economic impacts of this hazard cannot be evaluated geographically. Critical County infrastructure is unlikely to be affected by this hazard.

Figure 8-12.
Drought



8.21.4 Impacts/Risk

Drought occurs with a great deal of warning. Human lives may not be lost, but life styles could be dramatically altered and the economic effects felt Countywide.

8.21.5 Drought Mitigation Actions

8.21.5.1 Mitigation Action DR-1:

Initiate a drought awareness and water conservation education program. Topics to be addressed include:

- Selecting low-flow toilets and other efficient appliances during construction or remodeling.
- The selection of native and drought-tolerant landscape plants for reducing water demand outdoors.
- Weed and brush control to reduce the impact of drought and increase water yields from rainfall.
- Information to mitigate the effects of drought on wildlife such as installing wildlife watering systems and managing for habitat essential to wildlife.
- Partner with other agencies and piggyback on existing efforts in this area.

Estimated Cost: Costs will be covered as part of the County education and outreach initiative.

Benefits: This educational program is intended to make landscapes and urban homes and businesses more efficient in utilizing water and/or less prone to drought and heat stress. This will in turn reduce the likelihood of injury or death due to drought.

Responsible Organization: Office of Emergency Management, Health Department

Implementation Schedule: This activity will begin in 2005.

Related Objectives: Objectives 1.1, 2.1, 2.2, & 7.2

Priority: High

Potential Funding Sources: General revenues, grants

8.21.5.2 Mitigation Action DR-2:

Enhance water and energy conservation at County facilities.

Estimated Cost: To be determined

Benefits: County facilities can make an important contribution to water and energy conservation efforts by reducing water usage. Examples include retrofitting or installing low-flow toilets, planting native drought-resistance plants, or other water conservation measures. Reducing water consumption during a drought ensures there will be sufficient water to fight fires, water livestock, and prevent injury or death.

Responsible Organizations: All County Departments

Implementation Schedule: This is an on-going activity that will be implemented on new construction and retrofitting.

Related Objectives: Objectives 1.4 & 3.2

Priority: Low

Potential Funding Sources: General revenues

8.21.5.3 Mitigation Action DR-3:

Provide outreach to individuals in at risk areas about replacing or updating their wells so as to become more drought resistant.

Estimated Cost: To be determined

Benefits: Replacing or updating existing wells so that they are deeper and access a deeper aquifer will ensure that these wells will be more drought-resistant.

Responsible Organizations: Health Department

Implementation Schedule: This activity will begin in 2005.

Related Objectives: Objectives 1.2, 2.1, & 2.2

Priority: Low

Potential Funding Sources: General revenues, grants

8.22 Earthquake Mitigation Actions

8.22.1 Description of Hazard

Earthquakes are defined as shifts in the earth's crust that cause the surface to become unstable. This instability can manifest itself in intensity from slight tremors to large shocks that last from a few seconds up to 5 minutes. A period of tremors (and shocks) can last up to several months. The larger shocks can cause ground failure, landslides, liquefaction, uplifts, and sand blows.

Most earthquakes occur when great stresses building up within the earth are suddenly released. This sudden release of stored energy causes movement of the earth's crust along fractures, called faults, and generates shock waves. These shock waves, or seismic waves, radiate in all directions from the focus, much as ripples radiate outward in two dimensions when a pebble is dropped into a pond.

The two basic types of seismic waves are body waves, or primary waves, which travel through the interior of the earth, and surface waves, which travel along the earth's surface and are believed to be responsible for most earthquake damage (See Figure 8-13).

The theory of plate tectonics explains most earthquake occurrences. Ninety percent or more of all earthquakes occur along boundaries between large, slowly moving slabs, or plates, of the earth's crust and upper mantle, collectively called the lithosphere.