

UPPER SHENANDOAH RIVER BASIN  
Drought Preparedness and Response Plan

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*Prepared by*



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CSPDC

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Central Shenandoah Planning District Commission

*Updated*  
June 2012



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## **UPPER SHENANDOAH RIVER BASIN Drought Preparedness and Response Plan**

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### **1.0 Introduction**

Drought is a force of nature over which humankind has little, if any, control. Most parts of the United States, including Virginia, have experienced drought of varying degrees of severity over the last decade. Potential prolonged, dry climatic conditions, coupled with growing population and water demand, have increased the Shenandoah Valley's drought vulnerability. The need for drought preparedness has generated increased awareness and action on the part of state and local agencies that have public health and safety responsibilities. Water providers are responsible for providing reliable and safe drinking water supplies to their customers while maintaining adequate flows to meet pressure requirements in case of fire. During times of water shortage due to drought, strategic planning to minimize public health and safety impacts on the community is a critical obligation of water providers.

A water provider has a responsibility to prepare for drought by determining the potential impacts of drought conditions on its water supply system and the community it serves and by developing plans to minimize those impacts. Although development of the Upper Shenandoah Drought Preparedness and Response Plan (the Plan) is specifically in response to Virginia's Water Supply Planning legislation, many localities in the Upper Shenandoah River Basin currently have local drought response plans in place.

The Plan is being developed to guide communities in the Upper Shenandoah River Basin through instances when water shortages lead to drought conditions. The Plan, developed by the Central Shenandoah Planning District Commission (CSPDC) staff with input from the affected localities and the Virginia Department of Environmental Quality (DEQ), will complement localities' water conservation policies and ordinances, as well as water resource plans. During the early stages of the drought planning process, a Drought Task Force was formed and membership included representatives from each locality. This Drought Task Force has been the overseeing locality body during the development of this Drought Preparedness and Response Plan.

The Plan includes methods for localities and residential, commercial, and industrial customers to help reduce demand during times of an impending or actual shortage. In addition, this Plan is being developed because of the Local and Regional Water Supply Planning Regulation (9 VAC 25-780-120) (the Regulation) issued by the Virginia DEQ. The regulation requires that the Plan identify three graduated stages of response. This Plan is structured in accordance with this and other requirements of the regulation.

Drought indicators that aide in the selection of drought response stages, have been developed specifically with the individual characteristics of each water system in mind. These indicators are designed to help alert local decision-makers of the need to consider implementing additional water reduction measures as drought conditions worsen. Response measures specified in the Plan

are intended to supplement ongoing conservation programs and are designed to rapidly reduce water demand.

The Plan is intended to help locality staff implement these measures early to avoid the inevitable pitfalls of reactive, crisis-mode decision-making.

## **2.0 Historical Background**

As with most areas in the United States, the Upper Shenandoah River Basin area has a history of droughts that have ranged from moderate to severe. During the summer months of 1999, Northern Virginia and the Shenandoah Valley experienced one of the worst droughts of the 20<sup>th</sup> Century. Record low-stream flows were recorded on the Rappahannock River.

During the summer of 2002, Virginia experienced significant drought impacts due to precipitation deficits that dated to 1999 in most areas of the Commonwealth. While this drought did not reach the level of severity of the drought of record (1930-1932), increases in water demands when compared to the 1930s resulted in significant impacts to all sectors of Virginia's economy and society.

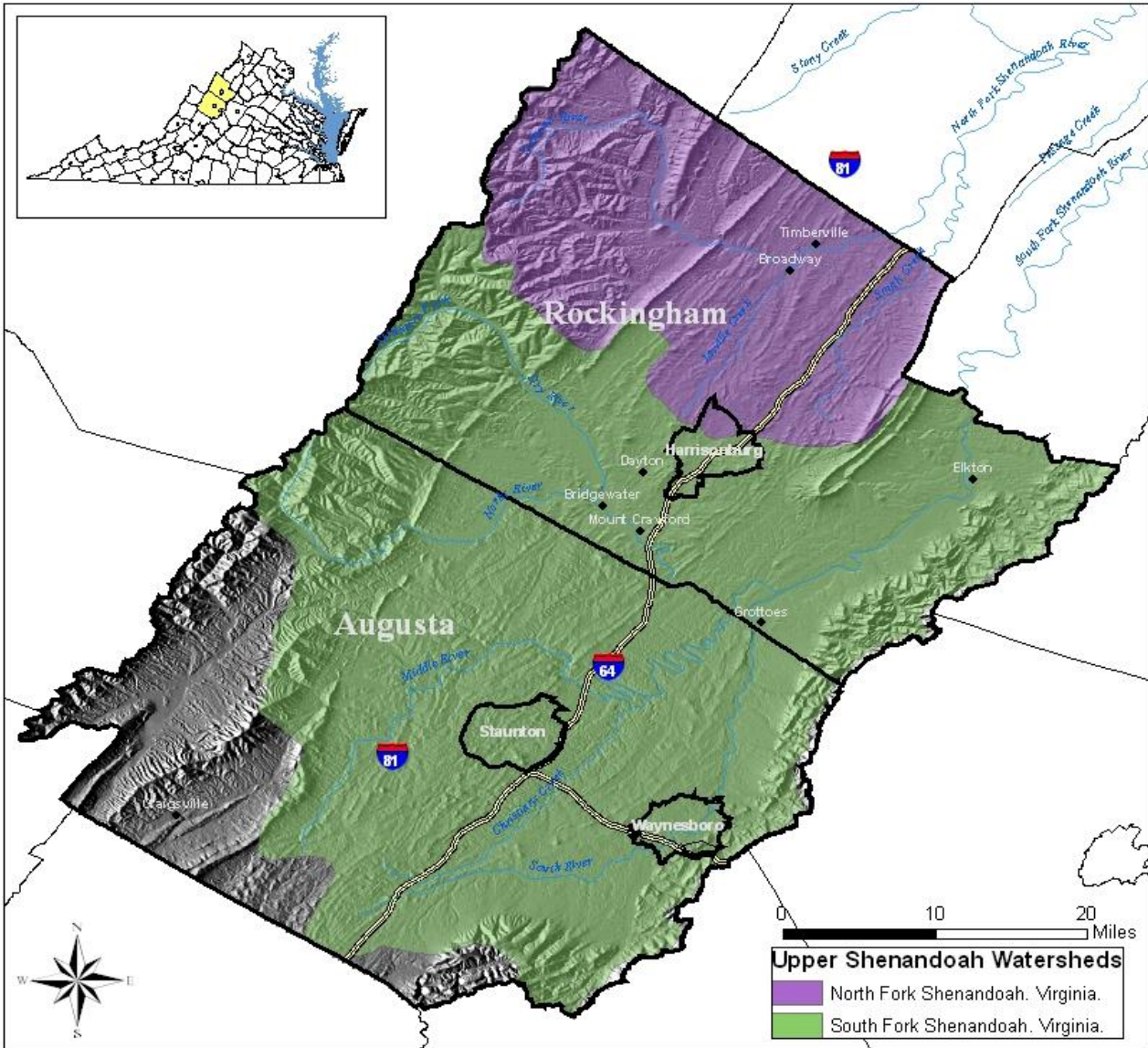
The intensity of these drought impacts peaked in late August 2002. Wildfire indices were at levels previously unrecorded in Virginia, the vast majority of Virginia agricultural counties had applied for Federal drought disaster designation, streamflows reached period of record lows, and thousands of individual private wells failed.

On August 30, 2002, Governor Warner took action of declaring a drought emergency in the majority of the Commonwealth by issuance of Executive Order #33. This Executive Order required the elimination of some non-essential water uses in large areas of the Commonwealth. In addition, this Executive Order named the Deputy Secretary of Natural Resources as the Commonwealth Drought Coordinator and charged him with the implementation of the water use restrictions. While these emergency actions were necessary in light of the drought impacts within the Commonwealth, they resulted in significant confusion and consternation among water users who were impacted.

On December 13, 2002, Governor Warner issued Executive Order #39, the Virginia Water Supply Initiative. This Executive Order requires the Commonwealth's Drought Coordinator to develop a formal drought assessment and response plan. In January 2003, the Deputy Secretary of Natural Resources invited a broad coalition of stakeholders to participate in a Drought Response Technical Advisory Committee chaired by the Virginia Department of Environmental Quality. This technical advisory committee was supported by the existing Virginia Drought Monitoring Task Force.

This Plan has been drafted in response to these Virginia state regulatory actions. It addresses the specific types of impacts and water resource issues that are relevant to the localities of the Upper Shenandoah Basin and outlines appropriate drought response measures.

**Figure 1: Localities in the Upper Shenandoah River Basin**



- Augusta County
- Rockingham County
- City of Harrisonburg
- City of Staunton
- City of Waynesboro
- Town of Bridgewater
- Town of Broadway
- Town of Craigsville
- Town of Dayton
- Town of Elkton
- Town of Grottoes
- Town of Mt. Crawford
- Town of Timberville

### **3.0 Drought Response Stage Declaration, Implementation and Response Measures**

The Upper Shenandoah Drought Preparedness and Response Plan provides guidelines for determining the current drought response stage, higher or lower drought response stages, termination of all drought response stage declarations, and the response measures suggested for implementation at each stage.

In general, the Plan provides both guidelines and “hard lines” to the locality when it becomes necessary to consider declaring a drought response stage and the implementation of drought response measures. Because individual locality system intakes include both local groundwater and surface water, the approach of providing guidelines will better serve the community rather than establishing rigid criteria that may not adequately reflect water supply availability or water distribution system conditions.

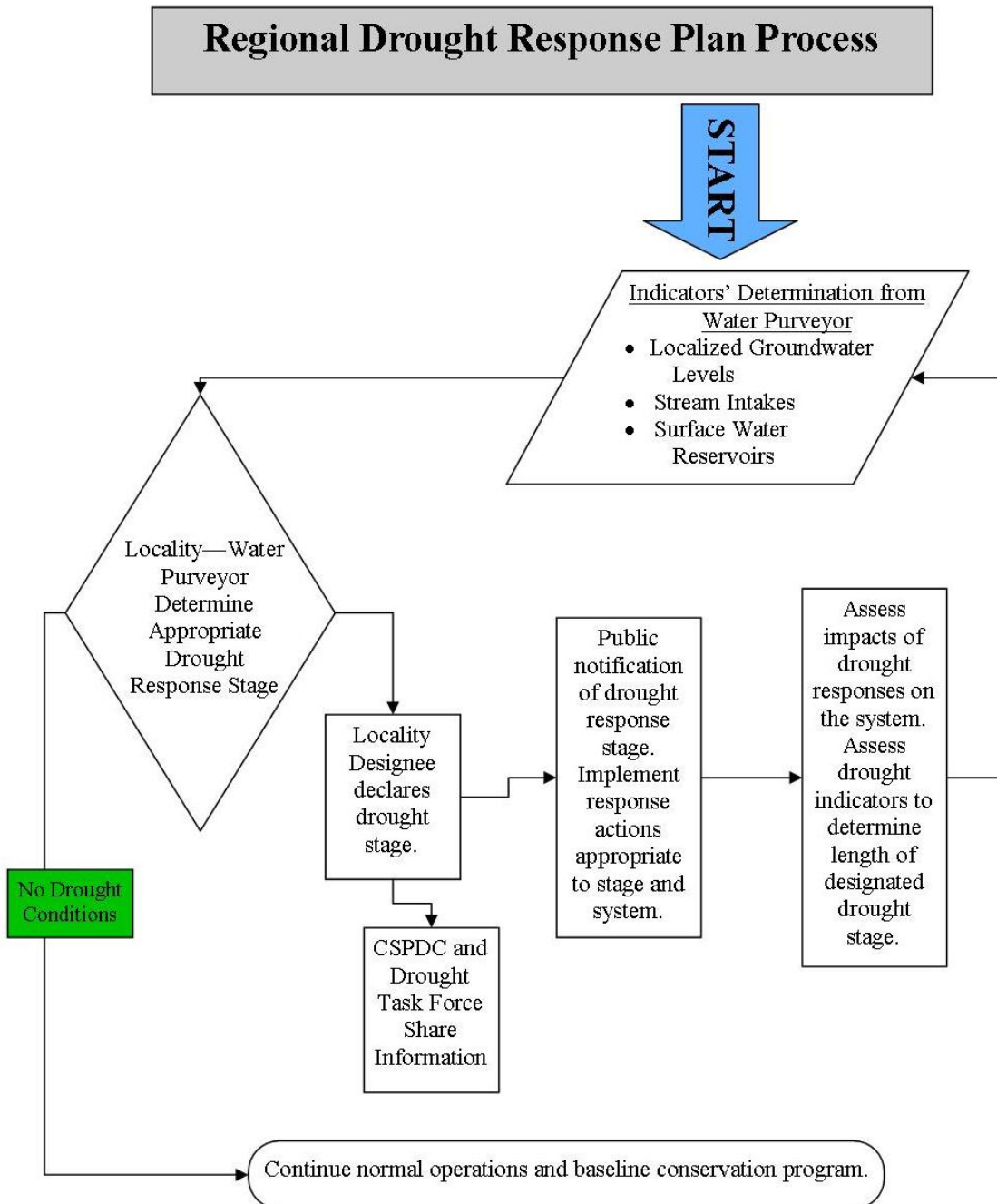
This Plan includes the three drought response stages of drought watch, drought warning, and drought emergency. A drought watch would be determined based on the localities’ specific indicators (see Appendix A for a complete listing of all indicators for each locality). If a drought watch is declared, a locality will progress through the drought warning and emergency stages if and when threats to the locality’s supplies warrant it.

Figure 2 is an overview of the drought preparedness and response plan process for the Upper Shenandoah River Basin. This diagram will serve as the guide to assist localities in the determination of the appropriate drought stage and which response measures are most suitable for that particular stage. This diagram also is an effort to further integrate this Plan within the broader perspective of the water supply planning effort from the Virginia DEQ.

Referring to Figure 2, each locality has a particular set of indicators which correlate with their source water for their water system. From the Virginia DEQ information, source waters are in one of three forms: groundwater intakes, stream intakes, or surface water reservoirs. On a regular basis, the CSPDC and the Drought Task Force will convene to discuss local and regional indicators to determine if a drought response stage is needed at that time. The CSPDC will serve as an information clearinghouse to disperse locality information to the Drought Task Force. In addition, the CSPDC will also serve the purpose of meeting facilitation. The Drought Task Force will serve as the decision making body for declaration of drought stages and implementation of response measures. If a drought watch, warning or emergency is declared, the appropriate response measures begin. Following a declaration, an interim review will take place by each locality to determine the effectiveness of the drought responses and assess the drought indicators.



**Figure 2: Regional Drought Preparedness and Response Plan Process**



## **Drought Declaration**

Following the declaration of a drought stage, the locality will implement appropriate response measures, including but not limited to various conservation measures. The locality will continually monitor drought conditions and based on the monitoring evaluation will decide if the drought stage increases if conditions worsen.

While actions on the State level are important for the purpose of alerting localities and citizens of the advance of drought impacts, actions by local governments, individual water suppliers, and individual citizens are much more important and effective in actually addressing the impacts of drought. Therefore, the declaration of local drought stages, adoption of emergency ordinances to address local emergencies, and implementation of those ordinances may occur prior to the declaration of a drought stage by the Governor of Virginia.

## **Drought Indicators**

The Central Shenandoah Planning District Commission (CSPDC), in cooperation with the Drought Task Force in the Upper Shenandoah River Basin, assigned both guidelines and, in some cases, actual values to the indicators that may be used to declare a drought stage. The localities will regularly monitor drought indicators. Appendix A provides detailed locality-specific indicators for all drought stages.

## **Drought Response Stages and Response Measures**

Detailed drought response measures for communities, individuals, and commercial entities are located in Appendices B, C, and D of this Plan. Drought response measures supplement rather than replace ongoing water conservation and education programs. One or more response measures may be implemented when a drought response stage is declared. Additional measures may be implemented if needed based on continual monitoring of local system indicators. Specific conservation measures were developed based on the following general principles:

1. Emphasize the need for visible leadership from locality-maintained facilities.
2. Reduce or restrict non-essential uses of water.
3. Avoid or minimize economic impacts to the community except under extreme conditions.
4. Work with large commercial water users to determine their own operational strategies for reducing water use well in advance of implementing advanced drought response stages.
5. Continue to proactively educate all customers on the importance of using water efficiently regardless of climatic conditions.
6. Ensure that any water restrictions do not impact community health and safety.

#### **4.0 Drought Response Stage Termination**

When the conditions warranting declaration of a drought stage no longer exist, the locality will advise that the drought response stage should be terminated or reduced. The Local Designee will declare the change or termination of the stage. Response measures will be reduced as drought response stages are terminated or reduced.

#### **5.0 Plan Revisions**

Even with built-in flexibility, the Upper Shenandoah Drought Preparedness and Response Plan will require occasional review and revision. Significant community investments in system reliability and use of renewable resources have enabled the localities' in the Upper Shenandoah River Basin to maintain a robust water system that has demonstrated little impact from drought to date. Because of that, the Plan is based on best available information and judgment, rather than on actual drought impact experience.

Over time, if drought conditions persist or become more severe, the Plan will likely require adjustments. Climatological studies indicate there may be long-term changes in store for global weather patterns and there is general consensus in the scientific community that average temperatures are increasing in the Eastern United States. It is unclear how these changes may impact precipitation patterns over the long term. However, changes in weather patterns will make forecasting more difficult and thorough planning more important. To ensure that the Plan remains an effective management tool, the CSPDC will review the Plan annually and recommend any necessary revisions or updates needed to meet the challenges of new or changing conditions.

Minor updates to the Plan will be approved by the Drought Task Force and be appended to the Drought Plan. The Plan will be formally reviewed no less than every five years in accordance with Virginia DEQ requirements.

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## **Appendix A**

### **Upper Shenandoah River Basin Locality Drought Watch, Warning and Emergency Indicators**

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**Appendix A**  
**Locality Drought Watch, Warning and Emergency Indicators**

The following is a list of drought warning and emergency indicators for each locality for consideration of drought watch declaration purposes:

<b>Locality</b>	<b>Drought Watch Indicators</b>	<b>Drought Warning Indicators</b>	<b>Drought Emergency Indicators</b>
Augusta County	<ul style="list-style-type: none"> <li>- Groundwater wells show a 5% decrease in well levels.</li> <li>- Reservoir level is less than 1,869' msl.</li> <li>- Evaluate delivery capacity, weekly WTP output, and weekly demand volume.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Groundwater wells show a 10% decrease in well levels.</li> <li>- Reservoir level is less than 1,869' msl.</li> <li>- Evaluate delivery capacity, weekly WTP output, and weekly demand volume.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Groundwater wells show a 15% decrease in well levels.</li> <li>- Reservoir level is less than 1,868,14' msl.</li> <li>- Evaluate delivery capacity, weekly WTP output, and weekly demand volume.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>
Bridgewater	<p>At least two indicators meet the following conditions:</p> <ul style="list-style-type: none"> <li>- Precipitation levels are between 21.75 inches and 21.45 inches on a rolling annual average.</li> <li>- North River flows as measured at the Burketown gauge drop between 35.2 MGD and 30.5 MGD for a two-week rolling average.</li> <li>-Bridgewater #2165045 well water draw-down is between 150 feet to 165 feet.</li> </ul>	<p>At least two indicators meet the following conditions:</p> <ul style="list-style-type: none"> <li>- Precipitation levels are between 21.45 inches and 18.15inches on a rolling annual average.</li> <li>- North River flows as measured at the Burketown gauge drop between 30.4 MGD and 25.8 MGD for a two-week rolling average.</li> <li>- Bridgewater #2165045 well water draw-down is between 166 feet to 190 feet.</li> </ul>	<p>At least two indicators meet the following conditions:</p> <ul style="list-style-type: none"> <li>- Precipitation levels are less than 18.15 inches on a rolling annual average.</li> <li>- North River flows as measured at the Burketown gauge drop below 25.6 MGD for a two-week rolling average.</li> <li>- Bridgewater #2165045 well water draw-down is greater than 191 feet.</li> </ul>
Broadway	<ul style="list-style-type: none"> <li>- Cootes Store USGS gauge between 10<sup>th</sup> and 25<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Cootes Store USGS gauge between 5<sup>th</sup> and 10<sup>th</sup> percentile, and USGS gauge at Smith Creek at or below 7Q10 Flow.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Cootes Store gauge at or below 5<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>



	<b>Drought Watch</b>	<b>Drought Warning</b>	<b>Drought Emergency</b>
<b>Locality</b>	<b>Indicators</b>	<b>Indicators</b>	<b>Indicators</b>
Craigsville	<ul style="list-style-type: none"> <li>- Precipitation levels are at or below the percent of normal precipitation for the time period in precipitation table.</li> <li>- 10-15% decrease in spring yield.</li> <li>- Ground water well levels decrease by 5-10%.</li> </ul>	<ul style="list-style-type: none"> <li>- Precipitation levels are at or below the percent of normal precipitation for the time period in precipitation table.</li> <li>- 20-30% decrease in spring yield.</li> <li>- Ground water well levels decrease by 10-15%.</li> </ul>	<ul style="list-style-type: none"> <li>- Precipitation levels are at or below the percent of normal precipitation for the time period in precipitation table.</li> <li>- 50% decrease in spring yield.</li> <li>- All ground water wells have to be in operation 80% to sustain water supply for storage facilities struggle to maintain full levels.</li> </ul>
Dayton	<ul style="list-style-type: none"> <li>- North River at Burkettown USGS gauge between 10<sup>th</sup> and 25<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>-North River at Burkettown USGS gauge between 5<sup>th</sup> and 10<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>-North River at Burkettown USGS gauge at or below the 5<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>
Elkton	<ul style="list-style-type: none"> <li>- South Fork Shenandoah River near Lynnwood USGS gauge between 10<sup>th</sup> and 25<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- South Fork Shenandoah River near Lynnwood USGS gauge between 5<sup>th</sup> and 10<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- South Fork Shenandoah River near Lynnwood USGS gauge at or below the 5<sup>th</sup> percentile.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>
Grottoes	<ul style="list-style-type: none"> <li>- Drought watch well setting = 50 feet.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Drought warning setting = 40 feet.</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Drought emergency setting = 30 feet</li> <li>- Reference state drought website, PDSI, streamflow, precipitation, groundwater.</li> </ul>
Harrisonburg	<ul style="list-style-type: none"> <li>- North River Key Performance Indicator (KPI) value, city withdraw divided by instream flowrate at Burkettown Gauge Station, is greater than 15%.</li> <li>- The South Fork Shenandoah KPI value, city withdraw divided by instream flowrate at Lynnwood Gauge Station, is greater than 8%.</li> <li>- The Dry River KPI value, equal to Switzer Dam Reserve volume greater than 400,000,000 gallons divided by the City withdraw rate from Dry River, is less than 30 days.</li> </ul>	<ul style="list-style-type: none"> <li>- North River KPI value, city withdraw divided by instream flowrate at Burkettown Gauge Station, is greater than 18%.</li> <li>- The South Fork Shenandoah KPI value, city withdraw divided by instream flowrate at Lynnwood Gauge Station, is greater than 9%.</li> <li>- The Dry River KPI value, equal to Switzer Dam Reserve volume greater than 400,000,000 gallons divided by the City withdraw rate from Dry River, is less than 14 days.</li> </ul>	<ul style="list-style-type: none"> <li>- North River KPI value, city withdraw divided by instream flowrate at Burkettown Gauge Station, is greater than 21%.</li> <li>- The South Fork Shenandoah KPI value, city withdraw divided by instream flowrate at Lynnwood Gauge Station, is greater than 11%.</li> <li>- The Dry River KPI value, equal to Switzer Dam Reserve volume greater than 400,000,000 gallons divided by the City withdraw rate from Dry River, is less than 7 days.</li> </ul>





	<b>Drought Watch</b>	<b>Drought Warning</b>	<b>Drought Emergency</b>
<b>Locality</b>	<b>Indicators</b>	<b>Indicators</b>	<b>Indicators</b>
Mt. Crawford	Follow Rockingham County.	Follow Rockingham County.	Follow Rockingham County.
Rockingham County	- From DEQ website, “SF Shenandoah near Luray, VA.” when “Flow” is in warning level.	- From DEQ website, “SF Shenandoah near Luray, VA.” when “Flow” is in warning level.	- Follow City of Harrisonburg emergency indicators.
City of Staunton	- A watch should be declared when North River flows decline or cease and Gardner Spring Pump Station wet well level drops below 8.0 feet. - When Staunton Dam is 15 feet below the crest of the spillway and Elkhorn Dam pool elevation is 39.0 feet. - When all of the conditions outlined above occur at the beginning of the dry season the alert phase could be implemented.	- An advisory should be declared when North River flows decline or cease and Gardner Spring Pump Station wet well level drops below 8.0 feet. - And when Staunton Dam is 15 feet below the crest of the spillway and Elkhorn Dam pool elevation is 39.0 feet. - When all of the conditions outlined above occur at the beginning of the dry season the alert phase could be implemented.	- Staunton Dam elevation is 19 feet below the crest of the spillway and Elkhorn Dam pool elevation is 38.5 feet. - Gardner Spring wet well level is 6.9 feet and supplementing from Middle River intake is necessary.
Town of Timberville	- Cootes Store USGS gauge between 10 <sup>th</sup> and 25 <sup>th</sup> percentile. - Reference state drought website, PDSI, streamflow, precipitation, groundwater.	- Cootes Store USGS gauge between 5 <sup>th</sup> and 10 <sup>th</sup> percentile, and USGS gauge at Smith Creek at or below 7Q10 Flow. - Reference state drought website, PDSI, streamflow, precipitation, groundwater.	- Cootes Store gauge at or below 5 <sup>th</sup> percentile. - Reference state drought website, PDSI, streamflow, precipitation, groundwater.
City of Waynesboro	- South River near Waynesboro USGS gauge between 10 <sup>th</sup> and 25 <sup>th</sup> percentile. - Reference state drought website, PDSI, streamflow, precipitation, groundwater.	- South River near Waynesboro USGS gauge between 5 <sup>th</sup> and 10 <sup>th</sup> percentile. - Reference state drought website, PDSI, streamflow, precipitation, groundwater.	- South River near Waynesboro at or below 5 <sup>th</sup> percentile. - Reference state drought website, PDSI, streamflow, precipitation, groundwater.

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## **Appendix B**

### **Upper Shenandoah River Basin Drought Watch Responses and Water Conservation Measures**

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## **Appendix B**

### **Upper Shenandoah River Basin**

#### **Drought Watch Responses and Water Conservation Measures**

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Upon entering into the Drought Watch stage, these are regional actions to be taken by the respective localities. At a minimum, the listed water conservation measures will be encouraged during periods of declared drought watch. These measures will be implemented on an individual locality basis when an Upper Shenandoah River Basin local government declares a drought watch stage. It is possible that the increased public awareness of water conservation activities during a drought watch may reduce water use up to 5%.

#### **Drought Watch Responses**

- A Drought Watch notification shall be publicized through the general news media or any other appropriate method for making such notification public.
- Localities will include water conservation information on their website.
- Localities will contact the Central Shenandoah Planning District Commission (CSPDC) office when a drought stage is implemented. The CSPDC will update the locality's drought status on the regional drought website.
- All citizens, including private well users, will be encouraged to begin voluntary water conservation measures (see below).
- Localities will review and/or update the regional Drought Preparedness and Response Plan.
- Public waterworks and self supplied water users who withdraw more than 10,000 gallons per day are asked to review and voluntarily implement existing drought water conservation methods as outlined in this plan.
- Locality staff will continue to monitor drought indicators on a monthly basis and report significant changes to local officials.
- Localities will increase water use efficiency and/or promote use reclaimed water for public facility landscaping.
- Localities may consider developing increased conservation rate charges or surcharges to respond to drought conditions.
- Continue conservation until water storage (source & distribution) is replenished.

#### **Individual Water Conservation Measures (Outdoor)**

- Use a broom instead of a hose to clean driveways, walks and patios.
- When swimming pools are not in use, reduce losses to evaporation by using a pool cover.
- Turn off ornamental fountains or other such structures, unless the water is recycled.
- Water the lawn at night or in the early morning to avoid evaporation.
- Mow lawns to two inches or more and leave the clippings. It will shade roots, provide nutrients and help retain moisture. Keep mower blades sharp to reduce water loss.
- Raise the lawn mower blade to at least three inches or to its highest level. A higher cut encourages grass roots to grow deeper, shades the root system, and holds soil moisture better than a closely clipped lawn.
- Use mulch around plants and other shrubbery to reduce evaporation. Mulch also helps control weeds that compete with landscape plants for water.

- Water slowly, deeply, thoroughly and infrequently to encourage root growth. Water deeply with a soil-soaker or drip irrigation.
- Remove weeds from vegetable and flower gardens to reduce competition for water.
- Water only when landscaping needs it. As a general rule, lawns only need one inch of water per week, less in the winter.
- Water trees and shrubs separately. Some only need to be watered once a month.
- Use a shut-off nozzle on hoses, which can be adjusted down to a fine spray so that water flows only as needed. When finished, turn it off at the faucet instead of at the nozzle to avoid leaks.
- Avoid over fertilizing lawns. Fertilizer applications increase the need for water. Apply fertilizers that contain slow-release, water-insoluble forms of nitrogen.
- Aerate regularly and use mulch to reduce evaporation.
- Plant native or drought-tolerant grass and plants.
- Check sprinkler systems in the spring to insure proper working order. Avoid watering walks, driveways, or the street.
- Check sprinkler systems regularly for leaks.
- Use a bucket to wash cars instead of a hose, or consider using a commercial car wash that recycles water.
- Place rain barrels under gutter downspouts. They can collect rainwater for plants, car washing or general cleaning projects.

### **Individual Water Conservation Measures (Indoor)**

- Verify that homes are leak free. Many homes have hidden water leaks. Read your water meter before and after a two-hour period when no water is being used. If the meter does not read exactly the same, there is a leak.
- Turn off the water while brushing teeth, washing your face or hands, and shaving.
- Replace old washing machines with a horizontal-axis machine that uses less water and energy. Wrap hot water heaters and pipes with insulating material.
- Avoid running the tap for a cold drink. Keep a pitcher of water in the refrigerator.
- Install faucet aerators, which reduce wastewater by mixing water and air.
- Take showers rather than baths.
- Limit showers to once a day for five minutes and do not fill bathtubs more than 1/3 full for baths.
- While showering, turn off the water when soaping up.
- Do not use your toilet as a trash can. Throw things away instead of flushing them down the drain.
- If your home is more than five years old, the chances are your toilet is using more water than necessary and could operate with less water. To lower the amount of water used for each flush, you need to displace water in the toilet tank. Two ways to displace water are listed below.
  - Place toilet dams in the tank. They hold back water and prevent it from leaving the tank. Dams can be purchased at your local hardware store.
  - Use pop bottles or a plastic jug to displace the water in your tank so that there is less water flowing into the bowl. Fill the bottle with water or place rocks in the bottom of the container for weight.

- Install a low-flow showerhead to reduce water use. To check the flow rate of your existing showerhead, turn the shower on all the way and see how long it takes to fill a one-gallon bucket. If your showerhead fills a one-gallon container in less than 15 seconds, it is using more than 4 gallons per minute (gpm) of water. When buying a showerhead, be sure that it delivers no more than 2½ gallons per minute; 1½ to 2 gpm is even better.
- Do not use a garbage disposal.
- Do not rinse dishes prior to putting them into an automatic dishwasher. Instead, wipe them with paper napkins from the meal or use a partially filled sink to do any necessary pre-washing.
- Run the dishwasher (and washing machine) only when they are full.
- If washing dishes by hand, rinse them in a half-full basin or pan instead of under running water.
- Dispose of paper and excess food in the garbage rather than the garbage disposal. Garbage disposals may add 50 percent to the volume of solids in a septic tank, which can lead to malfunctions and maintenance problems.
- Fill the washing machine with a full load of laundry. If your machine has a water level selector, make sure it is always set to match the amount of laundry being washed.

#### **Commercial Conservation Measures**

- Implement voluntary water reduction and conservation plans.
- Discontinue use of decorative fountains.
- Require commercial facilities with monthly demand exceeding a threshold limit to conduct a self-audit.

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## **Appendix C**

### **Upper Shenandoah River Basin Drought Warning Responses and Water Conservation Measures**

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## **Appendix C**

### **Upper Shenandoah River Basin**

### **Drought Warning Responses and Water Conservation Measures**

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Upon entering into the Drought Warning stage, these regional actions are to be taken by the respective localities. At a minimum, the listed water conservation measures will be encouraged during periods of declared Drought Warning. These measures will be implemented on an individual locality basis when an Upper Shenandoah River Basin local government declares a drought warning stage. It is intended that water conservation measures listed will generally result in reductions of water use of 5 to 10%.

#### **Drought Warning Responses**

- A Drought Warning notification shall be publicized through the general news media or any other appropriate method for making such notification public.
- Localities will include water conservation information on their website.
- Localities will contact the Central Shenandoah Planning District Commission (CSPDC) office when the Drought Warning stage is implemented. The CSPDC will update the locality's drought status on the regional drought website.
- All citizens, including private well users, will be encouraged to voluntarily reduce or eliminate non-essential water uses and follow the water conservation measures (Appendices C & D).
- Public waterworks and self supplied water users who withdraw more than 10,000 gallons per day will initiate voluntary water conservation measures (Appendices C & D).
- All local government offices and institutions will initiate the reduction or elimination of non-essential water uses with the goal of reducing water usage by 5% to 10%.
- Localities will be encouraged to review existing local ordinances requiring mandatory non-essential water use restrictions or adopt such ordinances.
- Locality staff will continue to monitor drought indicators on a monthly basis and report significant changes to local officials.
- Continue conservation until water storage (source & distribution) is replenished.

#### **Individual Water Conservation Measures**

- Reduce lawn watering to no more than 2 times a week, between the hours of 9:00 p.m. and 10:00 a.m.
- Reduce vegetable garden watering by watering only when needed, between the hours of 9:00 p.m. and 10:00 a.m.
- Apply water directly to plants by using soil-soakers or drip irrigation. Avoid use of sprinklers.
- Do not plant new landscaping or grass.

#### **Commercial Conservation Measures**

In addition to those measures listed under Appendix C:

- Implement water conservation plan.
- Implement interior retrofit for all high water use faucets and materials.

- Restrict washing of sidewalks, driveways, parking lots or any other paved surface except in the case of meeting health and safety standards.

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## **Appendix D**

### **Upper Shenandoah River Basin Drought Emergency Responses and Mandatory Non-Essential Uses of Water**

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## **Appendix D**

### **Upper Shenandoah River Basin**

#### **Drought Emergency Responses and Mandatory Non-Essential Uses of Water**

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Upon entering into the Drought Emergency stage, these regional actions are to be taken by the respective localities. At a minimum, the listed water conservation measures will be encouraged during periods of declared Drought Emergency. These measures will be implemented on an individual locality basis when an Upper Shenandoah River Basin local government declares a drought emergency stage. It is intended that water conservation measures listed will generally result in reductions of water use of 10 to 15%.

#### **Drought Emergency Responses (Locality, Commercial, Individual)**

- A Drought Emergency notification shall be publicized through the general news media or any other appropriate method for making such notification public.
- Localities will include water conservation information on their website.
- Localities will contact the Central Shenandoah Planning District Commission (CSPDC) office when the Drought Warning stage is implemented. The CSPDC will update the locality's drought status on the regional drought website.
- All citizens, including private well users, will initiate the mandatory non-essential water use restrictions listed below and follow the water conservation measures in Appendices C & D.
- Public waterworks and self supplied water users who withdraw more than 10,000 gallons per day will initiate the mandatory non-essential water use restrictions listed below and follow the water conservation measures in Appendices C & D.
- All local government offices and institutions will initiate the mandatory non-essential water use restrictions listed below with the goal of reducing water usage by 10 to 15%.
- Localities will be authorized to adopt local ordinances to enforce the mandatory non-essential water use restrictions listed below and to establish, collect, and retain fees for violations of these restrictions.
- Locality staff will continue to monitor drought indicators on a monthly basis and report significant changes to local officials.
- All users continue conservation until water storage (source & distribution) is replenished.
- Commercial customers are to follow the mandatory non-essential water use restrictions listed below, where appropriate.
- All other residential, business and industrial water users; whether supplied by public water supplies, self-supplied sources, or private water wells; who do not normally utilize water for any of the non-essential uses listed below are requested to voluntarily reduce water consumption by at least 10%. This reduction may be the result of elimination of other non-essential water uses, application of water conservation practices, or reduction in essential water uses.

#### **Non-Essential Water Uses**

The following non-essential water uses will be prohibited during periods of declared drought emergencies. Below each non-essential use is a list of exceptions. These prohibitions and exceptions will apply to uses from all sources of water and will only be effective on an



individual locality basis when an Upper Shenandoah River Basin local government declares a Drought Emergency. The conservation measures listed in Appendices C and D of the Upper Shenandoah River Basin Drought Preparedness and Response Plan become mandatory during the Drought Emergency stage.

Local governments and public waterworks may impose water use restrictions more or less stringent than the mandatory non-essential water use restrictions listed below consistent with local water supply conditions at any time. Nothing contained in this drought response plan should be construed to limit the powers of the local governments to adopt and enforce local emergency ordinances as necessary to protect the public welfare, safety, and health.

Water use restrictions shall not apply to the agricultural production of food or fiber, the maintenance of livestock including poultry, nor the commercial production of plant materials so long as best management practices are applied to assure the minimum amount of water is utilized.

## **1. Unrestricted non-commercial watering (public or private)**

### Lawn Irrigation Exceptions:

- Newly sodded and seeded areas may be irrigated to establish cover on bare ground at the minimum rate necessary for no more than a period of 60 days. Irrigation rates may not exceed one inch of applied water in any 7-day period. Consider delaying seeding or sodding of new lawns.
- Gardens, bedding plants, trees, shrubs and other landscape materials may be watered with hand held containers not exceeding three (3) gallons in capacity. Watering may be done between the hours of 9:00 p.m. and 10:00 a.m. to avoid the heat of the day. Do not use sprinklers.

### Golf Course Irrigation Exceptions:

- Tees and greens may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at the minimum rate necessary.
- Fairways may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at the minimum rate necessary not to exceed one inch of applied water in any ten-day period.
- All allowed golf course irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.

### Athletic Field Irrigation Exceptions:

- Athletic fields may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at a rate not to exceed one inch per application or more than a total of one inch in multiple applications during any ten-day period. All irrigation water must fall on playing surfaces with no outlying areas receiving irrigation water directly from irrigation heads.
- Athletic fields may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. during

necessary overseeding, sprigging or resodding operations at the minimum rate necessary for a period that does not exceed 60 days. Irrigation rates during this restoration period may not exceed one inch of applied water in any 7-day period.

- All allowed athletic field irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.
- Irrigation is prohibited on athletic fields that are not scheduled for use within the next 120-day period.

## **2. Use of Fire Hydrants**

Exceptions:

- Except for necessary governmental operations such as firefighting, health protection purposes, or certain testing and drills by the fire department as approved by the local government or waterworks operator

## **3. Washing of paved surfaces such as streets, roads, sidewalks, driveways, garages, parking areas, tennis courts, and patios; flushing of sewers and hydrants**

Exceptions:

- Surfaces may be washed with hand held containers not exceeding three (3) gallons in capacity. Washing should not occur during the heat of the day.
- As needed to ensure public health and safety, and approved by the local government or waterworks operator

## **4. Washing or cleaning of mobile equipment including automobiles, trucks, trailers, and boats**

Exceptions:

- Mobile equipment may be washed at car washes that utilize reclaimed water as part of the wash process or reduce water consumption by at least 10% when compared to a similar period when water use restrictions were not in effect. Any facility operating a reclaimed water system must prominently display, in public view, a sign stating that such a recycling system is in operation.
- Mobile equipment may be washed using hand held containers not exceeding three (3) gallons in capacity or hand held hoses equipped with automatic shutoff devices provided that no mobile equipment is washed more than once per calendar month and the minimum amount of water is utilized.
- Automobile dealers and rental agencies may wash cars that are in inventory no more than once per week utilizing hand held containers not exceeding three (3) gallons in capacity, hoses equipped with automatic shutoff devices, automated equipment that utilizes reclaimed water as part of the wash process, or automated equipment where water consumption is reduced by at least 10% when compared to a similar period when water use restrictions were not in effect.

## **5. Use of water for the operation of ornamental fountains, artificial waterfalls, misting machines, and reflecting pools**

Exceptions:

- Fountains and other means of aeration necessary to support aquatic life are permitted.

## 6. **Filling and topping off outdoor swimming pools**

Exceptions:

- Newly built or repaired pools may be filled to protect their structural integrity.
- Outdoor pools operated by commercial ventures, community associations, recreation associations, and similar institutions open to the public may be refilled as long as:
  - Levels are maintained at mid-skimmer depth or lower,
  - Any visible leaks are immediately repaired,
  - Backwashing occurs only when necessary to assure proper filter operation,
  - Deck areas are washed no more than once per calendar month (except where chemical spills or other health hazards occur),
  - All water features (other than slides) that increase losses due to evaporation are eliminated, and
  - Slides are turned off when the pool is not in operation.
- Swimming pools operated by health care facilities used in relation to patient care and rehabilitation may be filled or topped off.

## 7. **Serving of water in restaurants, clubs, or eating-places**

Exceptions:

- May only be allowed at the specific request of the customer.

### **Severe Drought Emergencies**

In some cases, the mandatory non-essential water use restrictions may not be sufficient to protect the supplies of an individual public waterworks. When an individual waterworks' sources are so depleted as to threaten public health and safety, it may become necessary to ration water within that system in order to assure that water is available to support essential uses. Rationing water is a more severe measure than merely banning nonessential uses of water. Under rationing, each customer is allotted a given amount of water, based on a method of allotment developed by the waterworks or local government. Generally it will be based on a percentage of previous usage or on a specific daily quantity per household. Rationing is more likely to have some effect on welfare than mandatory non-essential use restrictions, because industrial and commercial water uses may be curtailed or eliminated to assure an adequate supply is available for human consumptive uses.

The decision to ration water will typically be made by the local government or waterworks operator. Local government staff will work closely with any entity where water rationing is required to assure that all available State resources are effectively used to support these highly stressed water supply systems. The Virginia Department of Emergency Management (VDEM) is the first point of contact for waterworks or local governments who decide to ration water. VDEM will coordinate the Commonwealth's response and assistance to such entities.