OHIO SUGGESTED DROUGHT RESPONSE ACTIONS

To enhance the Ohio Drought Response Plan (ODRP) the Drought Assessment Committee (DAC) has prepared a listing of suggested water conservation actions for use by water systems in preparing drought response plans.

Although there is no universally accepted definition of water conservation, the U.S. Water Resource Council defines water conservation as “activities designed to (1) reduce the demand for water, (2) improve efficiency in use and reduce losses and waste of water, or (3) improve land management practices to conserve water.”

These suggestions provide information useful to utilities preparing for drought emergencies, as well as those implementing ongoing conservation programs to conserve resources and minimizing costs and investments. These suggestions are general in nature to allow for site specifics of each individual system. Attachments to this plan include “Suggested Actions for Effective Response at Each Drought Stage” and Suggested Measures for Conservation.

Any drought plan must be tailored to meet the needs and constraints of the specific community and water sources involved. The following suggestions have been compiled from existing drought plans from communities as well as regional, national and water industry guidance materials.

All water systems in Ohio should follow these suggestions. However, it is recognized that, for those systems regulated by the Public Utilities Commission of Ohio (PUCO), where rules, regulations, or guidelines established by the PUCO differ or conflict with this plan, the rules, regulations, or guidelines approved by the PUCO govern.

In order for a drought plan to be accepted, it needs to be as socio-economically fair as possible. Careful consideration must be given throughout development of your plan to ensure equitability across the entire user base. A local Water Management Task Force should be established to assist in making these decisions.

CRITERIA FOR INITIATING DROUGHT RESPONSE PHASES

General

The "Ohio Drought Response Plan" identifies four phases for drought response:

- **S** Normal Phase: Water supplies are adequate and climatological conditions are normal.

- **S** Alert Phase: Climatological data indicates above normal temperatures and below normal precipitation for an extended period. Streamflow, reservoir levels, and/or groundwater levels are below normal over an extended period of time. Water conservation measures are implemented.

- **S** Conservation Phase: Climatological conditions worsen and water levels continue to decline. Water conservation measures are increased.

- **S** Emergency Phase: Climatological conditions continue to worsen and water levels continue to diminish. Conservation measures have to be more stringent to ensure adequate water supply for health and sanitary purposes.

In the absence of monitoring information on your specific water source, the Palmer Drought Index for your region could be used to initiate drought response.

Palmer Drought Index levels are included in the "Ohio Drought Response Plan" as a guide to initiating and rescinding appropriate drought response phases on a statewide basis. Monitoring local conditions will provide much more accurate information on which to base such decisions. The following data and response criteria are suggested for various water sources. Once an adequate data base is obtained, reliable statistical criteria can be developed for your particular water sources.

Ground Water Systems

Normal Phase for well.

Static level, drawndown and discharge should be measured and recorded for each well monthly.

When to Declare an Alert for Wells

A water shortage Alert should be placed in effect when conditions indicate the potential for serious water supply shortages. A potential shortage in a well would be suspected when:

(1) drought conditions in the area have reached severe levels regardless of wellfield conditions; (2) when wells in another water system which draws from the same aquifer are showing signs of reduced supply or declining water levels (water systems may check with the Ohio Department of Natural Resources, Division of Water to determine if any observation wells are located near the wellfield or in the same aquifer to help evaluate water level conditions); (3) the pumping and non-pumping ground water levels or the ground water levels in an observation well in or near the well field are declining faster than historically normal for the season, or when declines occur during a time when recharge (rise in water levels) would normally be observed; (4) when abnormally low amounts of recharge (rise in water levels) occur in monitoring wells or the pumping wells during the normal recharge period (November through May).

When these conditions are observed, a Conservation Phase may be necessary, and a hydrogeologist should be consulted to evaluate wellfield and aquifer conditions.

When to Declare a Conservation Phase for Wells

The Conservation Phase should be implemented as soon as visible or measurable signs of abnormal decline in the pumping well not attributed to well maintenance needs are observed, when water levels in observation or monitoring wells continue to decline below normal levels. An additional sign of a shortage may be when projected pumping levels (at the current or expected rate of production) in the production well(s) will decline below critical levels before the beginning of the normal recharge season.

Abnormally large or rapid declines in the pumping water level or yield may constitute an Emergency and a hydrogeologist should be consulted to evaluate wellfield and aquifer conditions.

When to Declare an Emergency for Wells

An Emergency should be declared when any one of the following occur: (1) when the yield of the wellfield declines to 75 percent of normal; (2) when the projected pumping levels will reach critical levels within 45 days or less.

Unregulated Streams (Free-flowing, no flow control capabilities)

Normal Phase for unregulated streams.

Streamflow should be measured daily. Check with the Ohio Department of Natural Resources (ODNR) or the United States Geological Survey (USGS) to determine if there is a stream discharge gauge nearby. If there is not, one should be established and operated at the

withdrawal site by the water system or in cooperation with the ODNR/USGS stream discharge gauging program.

When to Declare an Alert for Unregulated Streams

A water shortage Alert should be placed in effect when conditions indicate the potential for serious water supply shortages.

A potential shortage would be suspected when flow is abnormally low in your area. An Alert would probably be appropriate for free-flowing streams when demand is 20 percent of streamflow. Measure streamflow daily.

Once in effect, an Alert should not be removed until demand is less than 10 percent of streamflow for a four week period.

When to Declare a Conservation Phase for Unregulated Streams

The water shortage Conservation Phase should be placed in effect as soon as there is visible or measurable signs that supplies are significantly lower than the seasonal norm and are diminishing.

Signs of abnormally low supply from a free-flowing stream can be determined by comparisons to historical records with adjustments for changes in use. If these are unavailable, the Conservation Phase should be declared when demand is 40 percent of streamflow. Measurements should be made daily.

Once in effect, the Conservation Phase should not be reduced to an Alert until demand is less than 20 percent of streamflow for four weeks.

When to Declare an Emergency for Unregulated Streams

A water shortage Emergency exists when a water utility is experiencing a water shortage.

If demand is 60 percent of streamflow, a water shortage Emergency should be declared. Measure flow daily.

Once in effect, an Emergency phase should not be reduced to the Conservation Phase until demand is less than 40 percent of streamflow for a four week period.

Regulated Streams (Streamflow controlled by i.e., Army Corp., or ODNR)

Normal Phase for regulated streams.

Streamflows should be measured daily. If no nearby gauging station has been established, the water system should establish its own. Daily data should be obtained from the upstream reservoir regulating the flow on reservoir level, storage and projected releases.

When to Declare an Alert for Regulated Streams

A water shortage Alert should be placed in effect when conditions indicate the potential for serious water supply shortages.

An Alert would probably be appropriate when levels are low in the reservoir behind the regulating dam, or when demand is 20 percent of streamflow. Measure upstream reservoir storage daily. Remove Alert when demand is less than 20 percent of streamflow for four weeks.

When to Declare a Conservation Phase for Regulated Streams

The water shortage Conservation Phase should be placed in effect as soon as there are visible or measurable signs that supplies are significantly lower than the seasonal norm and are diminishing.

Regulated streams should declare the Conservation Phase when the demand is 40 percent of streamflow.

Measure upstream reservoir level/shortage daily. Measure streamflow daily. Remove the Conservation Phase when demand is less than 40 percent of the streamflow for a four week period.

When to Declare an Emergency for Regulated Streams

A water shortage Emergency exists when a water utility is experiencing a water shortage.

A water shortage Emergency should be declared when the demand is more than 60 percent of the streamflow.

Measure upstream reservoir level/shortage daily. Measure streamflow daily. Remove Emergency phase when the demand is less than 60 percent of streamflow for a four week period.

Reservoirs and Impoundments

Normal Phase for reservoirs and impoundments.

Measure flow, outflow, level and storage daily. Estimate evaporation and seepage losses.

When to Declare and Alert for Reservoirs and Impoundments

The water shortage Alert should be placed in effect when conditions indicate the potential for serious water supply shortages.

A potential shortage would exist when there are less than 180 days supply left; or when projected shortage may not fully recover by the end of the next recharge period if conditions persist. In some systems, a water shortage conservation phase might be warranted with an even larger supply. Supply should be reassessed daily.

When to Declare a Conservation Phase for Reservoirs and Impoundments

The water shortage Conservation Phase should be placed in effect as soon as there are visible or measurable signs that supplies are significantly lower than the seasonal norm and are diminishing.

The water shortage Conservation Phase should be declared when there are less than 120 days supply in a reservoir; or when projected storage will not fully recover by the end of the next recharge period if conditions persist. Include incoming flow when making calculations. Supply should be reassessed on a daily basis.

When to Declare an Emergency for Reservoirs and Impoundments

A water shortage Emergency exists when a water utility is experiencing a water shortage.

A water shortage Emergency should be declared when there is less than 45 days available supply; or if projected storage will not last until the next recharge period if conditions persist. Include incoming flow when making calculations. Supply should be reassessed daily.

RETURN TO NORMAL

When water shortage conditions have abated and the water supply situation is returning to normal, water conservation measures employed during the Alert, Warning and Emergency phases should be decreased in reverse order of implementation. Permanent measures directed toward development of adequate water sources, long-term monitoring and conservation should be implemented or continued so that the community will be in a better position to prevent future shortages and respond to recurring water shortage conditions.

SUGGESTED RESPONSE ACTIONS

What to Do in a Phase 1 - Normal Conditions

For all systems:

Establish a Water Management Task Force to advise on preparing and/or revising the community water conservation plan and water shortage response ordinance and to meet as necessary during phases two through four to make decisions and implement community action. The Task Force should include representatives of major water users, officials responsible for county health and safety, and persons who can implement an effective public information and education program. The Task Force should be limited to from 7 to 15 members and should be selected from the following sources: boards of health and safety, sanitation departments, businesses, industries, chambers of commerce, city/county/school administrators, professional groups, legal and media representatives, conservation districts, disaster services agencies, fire and/or police chiefs, and water system personnel.

Prepare a written community water conservation plan outlining response to water shortages, for which this document could be used as a model.

Enact (or prepare for quick enactment when needed) a water shortage response ordinance providing local officials with the power to implement the water conservation plan to ensure that the use reduction goals can be met and that use restrictions are equitably distributed among user classes.

Establish a public information and education program to ensure consistent and timely reports to the public under phases two through four. Water users need to know why they are conserving: lack of supply or delivery system deficiencies. The type of measures and the education campaign for water losses below 10 percent.

Implement a supply-side water conservation program consisting of leak detection and repair and public use metering. Set a goal to keep unaccounted for water losses below 10 percent.

Determine the safe yield of the existing source and identify potential alternative sources and back up emergency supplies.

YIELD DETERMINATIONS

For systems utilizing ground-water sources:

Pre-drought data are critical to a successful ground water conservation plan. Systems should conduct the following procedures to obtain needed information on the wellfield and aquifer:

(1) A minimum 8-hour step test to establish well deficiency and specific capacity during normal climatic conditions. Periodic retests (every 2-5 years according to well construction and the type of aquifer) to determine the rate of decline in efficiency and the need for maintenance.

(2) A minimum 24-hour pumping test with continuous measurements in the pumping well and at least one observation well to determine hydraulic conductivity, transmissivity, and drawndown under normal climatic conditions. A pumping test will also help identify the size and extent of the cone of depression around the pumping well and the presence of recharge and impermeable boundaries.

(3) Develop and/or maintain at least one observation well for monitoring water levels in the aquifer in addition to monitoring water levels in the pumping well. The monitoring well could be an unused or back-up well in the wellfield. If the monitoring well is a well that has been abandoned in the wellfield due to a decline in yield, it is important to make sure the well being used to monitor water levels is in good hydraulic connection with the aquifer. It may be necessary to clean the monitoring well to ensure the collection of representative aquifer data.

(4) Measure critical pumping levels for each well. Typically this is the top of the screen in a sand and gravel well or, in some bedrock wells, it is where the specific capacity drops off suddenly.

(5) Obtain well logs for all wells in the system, and any additional well construction information. know the depth of pump settings. Maintain files of all maintenance records as well as historic pumping schedules for all wells.

(6) Collect the following information at least biweekly:

a. Ground water levels in the pumping well(s) with the pump running. This should be performed after the well has been pumping for an extended period of time or, if several wells in the system are cycled on and off, the measurement should be made just before turning off the well.

b. The static water level in the production well(s) with the pump not running. This should be done after the well has recovered for an extended period of time or just before the well is cycled on.

c. The static water level in all observation wells.

d. The total discharge from each well.

7. Conduct regular maintenance procedures for each pumping well to maximize yield and extend the life of the well. The following chart can be used as general guideline to determine the maintenance interval for wells completed in different aquifers:

Aquifer Type	Most Prevalent Well Problem	Major Maintenance Frequency Required
Alluvial (sand and gravel)	Clay, silt, sand intrusion, scale deposition, iron, biological fouling.	2 - 5 years
Sandstone	Fissure plugging by clay and silt, casing failure, corrosion salt water intrusion, sand production, biological fouling.	6 - 8 years
Limestone	Fissure plugging by clay, silt, carbonate scale, intrusion of poor quality water (upwelling).	5 - 10 years
Interbedded Sandstone and Shale	Low initial yields, plugging by clay and silt, limited recharge, casing failure, biological fouling.	4 - 7 years

For system utilizing surface-water sources:

Pre-drought data are also critical to successful surface water conservation plan. This situation is complicated by the need to preserve, to the extent practical, the multi-use nature of surface water bodies (i.e., recreation, fish & wildlife values). Systems should conduct the following procedures to obtain needed information on their stream or reservoir sources.

(1) Determine source yields for various duration and drought frequencies.

(2) Install/maintain stream reservoir gauges and monitor streamflow or reservoir levels at least weekly; and for reservoir systems,

(3) conduct reservoir sedimentation studies; and

(4) determine reservoir storage volumes at various reservoir elevations.

Under Phase 2 - Drought Alert

For all systems:

Implement system-wide voluntary water conservation measures, and establish a use reduction goal of 10 percent. Consider distributing household water conservation kits. Industrial and commercial users should be included in these conservation efforts. Monitor actual water use to assess the success of the voluntary conservation measures.

Accelerate supply-side water conservation efforts, and place use restrictions on certain public water uses.

Implement the public information and education program developed to coincide with this phase.

For systems utilizing ground-water sources:

With the onset of Alert conditions, each water system should develop a plan for optimizing the yield from the wellfield. The plan should include (1) identification of critical pumping levels; (2) the feasibility of lowering pumps in existing wells; (3) accelerated maintenance schedule for inefficient wells; (4) weekly measurements of pumping levels, static water levels, and discharge; (5) feasibility plans for drilling for a multi-well system.

Unusually low ground water levels in a production well only when the well is pumping may be an indication that the efficiency of the well has declined and the well is in need of maintenance.

For systems utilizing surface water sources:

Monitor streamflow of reservoir levels daily and reassess the supply situation weekly.

Under Phase 3 Conservation

For all systems:

Implement mandatory water conservation measures appropriate to this phase, and establish a use reduction goal of 20 percent. Monitor actual water use to assess the success of mandatory water conservation measures. Contact water users who have not reduced water usage appropriately.

Implement the public information and education program developed to coincide with this phase.

Mandatory restriction of lawn and garden watering should be enacted between specific hours on specified days.

Request that active conservation measures be practiced by all users. Individually contact industrial users to reduce water usage.

Notify consumers of impending reduction of water and pressure and distribute water conservation kits to all customers.

Filling of any new or existing pool should be restricted. Addition of makeup water would be prohibited if pool is not covered when not in use.

Discontinue flushing water lines, fire hydrants and distribution equipment.

System should be prepared to access alternative sources such as wells or interconnections if possible.

Initiate reductions in water use for agriculture especially golf course irrigation and encourage the use of treated wastewater for irrigation if applicable.

For systems utilizing ground-water:

The plan for optimizing the yield from the wellfield developed during the Alert phase should be implemented.

Measure pumping well discharged and water levels in the pumping and observation wells on a daily basis.

For system utilizing surface water:

Monitor streamflow or reservoir levels daily and reassess the supply situation daily.

Under Phase 4 - Emergency

For all systems:

Implement more stringent mandatory water conservation measures appropriate to this phase, and establish a use reduction goal of 30 percent.

Implement the public information and education program developed to coincide with this phase.

Implement back up and emergency supply sources.

SUGGESTED ACTIONS FOR EFFECTIVE RESPONSE AT EACH DROUGHT STAGE

Normal	Alert	Conservation	Emergency
Public Water Suppliers			
Develop and annually update drought plan as part of your required Emergency Contingency Plan.	Activate Water Conservation Plan		
Develop ordinances for enforcement.	Alert public of water shortage.	Increase public awareness interest.	Notify consumers of severity of water shortage.
Initiate broad based public education on water conservation.		Request and/or require that active conservation measures be practiced.	Ban water use of all non-essential domestic use.
Maintain accurate water monitoring and consumption records.	Activate water conservation measures.	Notify consumers of impending reduction of water and pressure.	Conduct field surveillance of abuses, leaks, etc.
Monitor water production on a daily basis and submit readings on a monthly basis to the State of Ohio.	Disseminate information on water conservation.	Individually contact industrial users to reduce water usage.	Execute enforcement of water conservation violators.
Establish cooperative agreements with other water suppliers for emergency connections.	Aggressively pursue leak detection surveys and repair programs.	Reduce water pressure to minimum possible/ available levels.	Activate distribution system interconnections as required.
Determine unaccounted for water loss. Implement leak detection and repair.	Reduce water usage for main flushing, street flushing and park irrigation.	Discontinue flushing water lines, fire hydrants and distribution equipment.	Verify availability of emergency water for maintenance of human life.
Develop meter installation replacement and calibration program.	Caution industrial users to reduce water usage.	Distribute water conservation kits to large volume customers.	
Develop plans for additional storage and treatment facility.			
Residential Water Use			
Repair leaks and drips.	Reduce lawn watering.	Restrict lawn watering, car washing and pool filling.	Eliminate all non-essential use.
Eliminate wasteful consumption habits	Restrict hours for car washing and pool filling to off peak hours. Require pools to be covered when not in use.	Install water conservation devices and monitor residential water use to meet daily consumption limit.	
Install water conserving fixtures during new construction and rehabilitation		Specific limits on non-essential water use will be stated in guidance furnished to domestic users.	

Normal	Alert	Conservation	Emergency
Industrial and Commercial Users			
Develop water emergency plan.	Activate water emergency plan.	Eliminate water for non-essential uses.	Reduce production levels.
Develop water shortage facilities such as on-site storage.	Activate conservation measures.	Access alternative sources, such as wells.	Activate arrangements to buy emergency water.
Develop water conservation measures.	Reduce water for non-essential uses.		Reduce hours of operation.
Identify water use priorities/ user hierarchy.	Water will be served in restaurants only when requested by customer.	Notify users of accepted hierarchy.	Request assistance from local governments.
Develop and implement a water recycling program.	Recycle water where appropriate (e.g., reuse cooling and processing water).		
Agricultural Users			
Identify major users and agencies to act as spokesperson and advocacy group to establish threshold levels of irrigation.	Notify critical users and encourage consultation with the State's Department of Agriculture.	Initiate reductions in water use for agriculture especially golf course irrigation.	Curtail agricultural irrigation uses to meet threshold use criteria.
	Irrigation of recreation areas and golf courses will be voluntarily reduced.	Irrigation should be conducted between 5:00 P.M. and 7:00 A.M.	
	Irrigation at nurseries, gardens, etc., should be voluntarily reduced.	Treated wastewater irrigation should be encouraged in accordance with discharger plans.	

ATTACHMENT

SUGGESTED MEASURES FOR CONSERVATION

Conservation Measures for Residential Users:

(1) Locate and repair all leaks in faucets, toilets, and water-using appliances.
(2) Adjust all water-using appliances to use the minimum amount of water in order to achieve the appliance's purpose.
(3) Use automatic washing machines and dishwashers only with full loads. Preferably, wash dishes by hand.
(4) Take shorter showers and shallower baths.
(5) Turn off faucets while brushing teeth, etc.
(6) Turn off shower while soaping up.
(7) Set temperature settings of hot water at least 10 degrees lower to discourage lengthy shower-taking.
(8) Where plumbing fixtures can accommodate them, install flow-restricting or other water-saving devices.
(9) Reduce the number of toilet flushes per day. Each flush uses about 5 gallons. Reduce water used per flush by installing toilet tank displacement inserts.
(10) Use sink and tub stoppers to avoid wasting water.
(11) Keep a bottle of chilled water in the refrigerator.

Conservation Measures for Non-Residential Users:

(1) Identify and repair all leaky fixtures and water-using equipment. Give special attention to equipment connected directly to water lines, such as processing machines, steam-using machines, washing machines, water-cooled air conditioners, and furnaces.
(2) Assure that valves and solenoids that control water flows are shut off completely when the water-using cycle is not engaged.
(3) Adjust water-using equipment to use the minimum amount of water required to achieve its stated purpose.
(4) Shorten rinse cycles for laundry machines as much as possible; implement lower water levels whenever possible.
(5) For processing, cooling and other uses where possible, either reuse water or use water from sources that would not adversely affect public water supplies.
(6) Advise employees, students, patients, customers, and other users not to flush toilets after every use. Install toilet tank displacement inserts; place flow restrictors in shower heads and faucets; close down automatic flushes overnight.
(7) Install automatic flushing valves and/or adjust to cycle at longer intervals.
(8) Place water-saving posters and literature where employees, students, patients, customers, etc. will have access to them.
(9) Check meters on a frequent basis to determine consumption patterns.
(10) Review usage patterns to see where other savings can be made.

Direct Hospitals and Health Care Facilities to Adopt the Following Conservation Measures:

(1) Reduce laundry usage or services by changing bed linen, etc., only where necessary to preserve the health of patients or residents.
(2) Use disposable food service items.
(3) Eliminate, postpone, or reduce, as may be appropriate, elective surgical procedures during the period of the emergency.