# DROUGHT TOOLKIT

## A planning guide for public health and emergency response professionals

**WISCONSIN CLIMATE AND HEALTH PROGRAM**
Bureau of Environmental and Occupational Health

www.dhs.wisconsin.gov/climate | dhsclimate@wi.gov

State of Wisconsin | Department of Health Services | Division of Public Health | P-00884 (Rev. 5/2019)

# CONTENTS



# ACKNOWLEDGEMENTS


The Wisconsin Drought Toolkit was made possible through funding from cooperative agreement 5UE1/EH001043-02 from the Centers for Disease Control and Prevention (CDC) and the commitment of many individuals at the Wisconsin Department of Health Services (DHS), Bureau of Environmental and Occupational Health (BEOH), who contributed their valuable time and knowledge to its development.

**Special thanks to:**

Jeffrey Phillips, RS, DHS
Megan Christenson, MS, MPH, DHS
Stephanie Krueger, CDC/DHS
Margaret Thelen, DHS
Margaret Rice, former DHS


**For more information, please contact:**


Climate and Health Program
Bureau of Environmental and Occupational Health
1 W. Wilson St., Room 150
Madison, WI 53703
DHSCLIMATE@dhs.wisconsin.gov
608-267-3732


# INTRODUCTION

## Purpose

The purpose of this drought toolkit is to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to drought events. The toolkit provides background information, practical guidance, strategies, media releases, talking points, definitions, and useful reference materials on this topic.

The guides in this toolkit may be copied onto your agency letterhead for distribution to residents and visitors affected by drought. Additional resources may be found in Appendix B.

## Background

Drought occurs when the levels of rainfall and other precipitation are lower than average for an extended period of time. Drought is a slowly progressing event that can affect any county throughout the United States, and can last from weeks to years in some parts of the country. Annually, drought conditions can occur even after a wet period in late winter and spring, when the summer and fall months contain an extended period of warming and drought.[1] These conditions may lead to reduced drinking water availability, food insecurity, and respiratory distress from dust, pollen, and airborne particulates.[2]

> When a drought becomes severe, there is an adverse effect on the state's economy.

Wisconsin is susceptible to drought, and has experienced severe drought during the summer months, most recently in 1988 and 2012. In the summer of 2012, 23 Wisconsin counties were declared natural disaster areas due to drought,[13] and many other Wisconsin counties were considered to be areas of great to severe drought. Wisconsin's economy has strong roots in agriculture and agriculture-based businesses. When a drought becomes severe, there is an adverse effect on the state's economy. In 2012, this prolonged period of drought and sustained heat resulted in crop loss, heat-related fatalities, and health concerns throughout Wisconsin.

## Climate Trends

Long-term trend analysis of Wisconsin's climate indicates that the state is becoming warmer. After analyzing historical climate data from 1950 to 2006 and developing downscaled local climate models, University of Wisconsin climate scientists created potential climate projections based on the historical trends and scientifically validated models.[3]

Climate projections appear to support the scenario of heavy, intense precipitation events in the late winter and spring, and then an extended period of warming and drought. Several of the modeled outcomes suggest that drought periods may become more likely and longer lasting in the future. Warmer temperatures are expected to lengthen the growing season, but yields of corn and soybeans may decrease due to heat stress and drought conditions in late summer and early fall.

## Health Impacts

Ongoing drought conditions will place a strain on human health. Drought conditions may lead to food insecurity resulting from crop failures or market demands driving up food costs, and respiratory distress from dust, pollen, and airborne particulates. Further, drought can potentially threaten drinking water quality and quantity for all water users. Residents depending on groundwater for drinking water may notice water with different tastes or odors due to changes in water chemistry, and may be at risk for consuming heavy metals, organics, and other groundwater contaminants.

Similar to the impacts of heat extremes, drought can negatively affect agriculture through crop failures, livestock water shortages, and the resulting economic losses to farmers, food processors, and the trucking industry. Drought conditions will also place a stronger demand on groundwater resources, as farmers look to irrigate valuable crops.

There is also a strong correlation between drought conditions and the occurrence of wildfires,[4] which are associated with injury or death, eye irritation, and exacerbation of asthma and other respiratory diseases.[2]

Emergency planning must consider drought-related needs and impacts on infrastructure, water conservation plans, agricultural impacts, and the economic and societal stresses caused by drought.

### Drought Response and Recovery Guidance

Under the Wisconsin "Home Rule" principle, drought preparedness and response are considered local activities. The local or county Emergency Management office, health agency, or police/fire first responders will be the lead agency during a drought event. However, when requested, state resources will be provided to assist and support the local response.

# DEFINITIONS

**Aquifer:** An area that contains large amounts of water under the surface of the earth.

**Drought:** A deficiency in precipitation over an extended period. Drought is a normal, recurrent feature of climate that occurs in virtually all climate zones.

> **Agricultural Drought:** A drought that is based on the impacts to agriculture by factors such as rainfall deficits, soil water deficits, reduced groundwater, or reduced reservoir levels due to the need for irrigation.
>
> **Hydrological Drought:** A drought that is based on the impact of rainfall deficits on the water supply such as reduced stream flow, lowered reservoir and lake levels, and groundwater table decline.
>
> **Meterological Drought:** A drought that is based on the degree of dryness (rainfall deficit) and the length of the dry period.
>
> **Socioeconomic Drought:** A drought that is based on the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods, and occurs when the demand for an economic good exceeds supply as a result of a weather-related deficit in water supply.

**Groundwater:** Water that is found underground in pore spaces in soil, sand, or rock fractures.

**Reservoirs:** Water collected and stored in natural or manmade lakes, or in other containment vessels.

**Runoff:** Water from rain, melting snow, or irrigation that flows over the land and into streams or other surface waters instead of being absorbed into the ground.

**Xeriscaping:** Landscaping that uses native plants with lower water requirements than exotic vegetation and turfgrass.

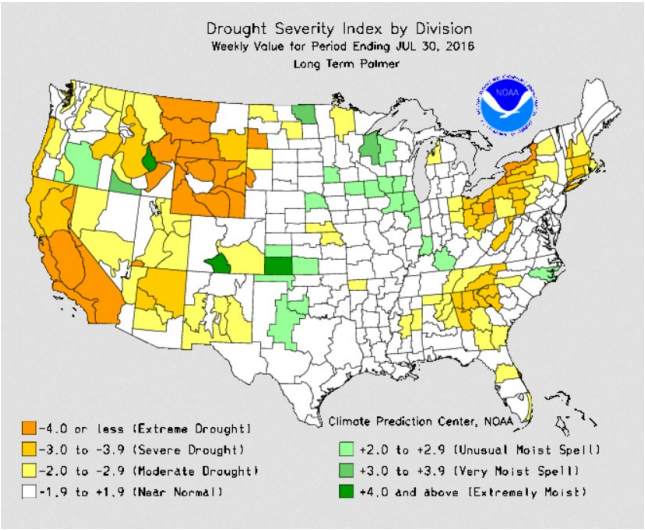
# Measuring Drought

Drought can be difficult to measure because of the many variables involved with the causes and the duration of drought. Several indices and measurements have been developed in order to gain a better picture of a drought's severity. [5]

## Palmer Drought Severity Index (PDSI)

The Palmer Drought Severity Index (PDSI) calculates its values using a supply and demand concept of the water balance equation, and factors temperature and precipitation into the equation to determine the soil moisture conditions of an area.

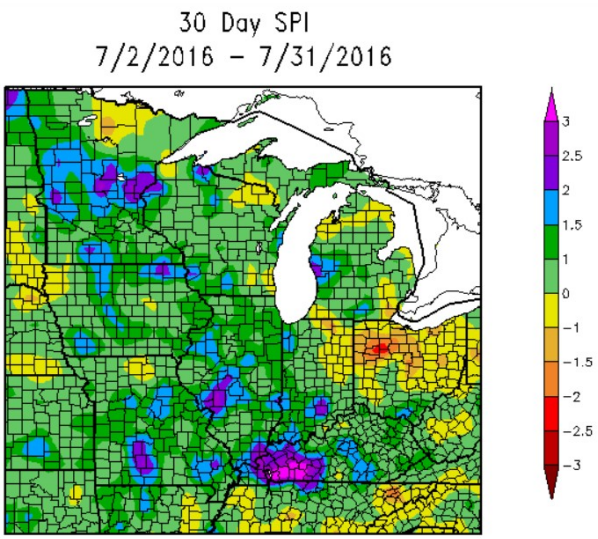
PDSI is the most widely used method of measurement. Its calculations run from +4 or more (extremely wet conditions) to -4 or less (extreme drought).




## Standard Precipitation Index (SPI)

The Standard Precipitation Index (SPI) considers precipitation only in its calculation. It is calculated based on the probability of precipitation for any time scale.

The numbers calculated represent whether there will be there will be wet or dry conditions. The index shows a negative number where drought conditions are present (redder colors, -3) and a positive value for wetter conditions (blue to purple colors, +3).



# Categories of Drought Safety

| Category | Description | Possible Impacts | Palmer Drought Severity Index | Standard Precipitation Index |
|---|---|---|---|---|
| **D0** | Abnormally Dry | Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered. | -1.0 to -1.9 | -0.5 to -0.7 |
| **D1** | Moderate Dry | Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested | -2.0 to -2.9 | -0.8 to -1.2 |
| **D2** | Severe Drought | Crop or pasture losses likely; water shortages common; water restrictions imposed | -3.0 to -3.9 | -1.3 to -1.5 |
| **D3** | Extreme Drought | Major crop/pasture losses; widespread water shortages or restrictions | -4.0 to -4.9 | -1.6 to -1.9 |
| **D4** | Exceptional Drought | Exceptional and widespread crop/ pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies. | -5.0 or less | -2.0 or less |

# Drought and Human Health

## Signs and Symptoms from Droughts

| Concern | Signs and Symptoms | Actions |
|---|---|---|
| Extreme heat | • Heat exhaustion<br>• Heat stroke | • Stay cool<br>• Stay hydrated<br>• Stay informed |
| Diminished food supply | • Drought-damaged crops<br>• Healthy foods not readily available or more expensive | • Maintain the healthiest diet possible<br>• Seek services of food banks or other resources if necessary |
| Poor air quality | • Breathing problems<br>• Worsening asthma or other respiratory conditions<br>• Fatigue with exertion | • Stay indoors<br>• Avoid strenuous outdoor activity<br>• Take prescribed medications<br>• Talk to your health care provider if symptoms worsen |
| Limited water supply | • Lower water levels in aquifers, which can affect private wells<br>• Public restrictions on water use<br>• Lower lake and river levels | • Listen for local government officials' directions on how to conserve water<br>• Continue practicing proper sanitation<br>• Use recycled water for non-sanitary purposes<br>• Avoid swimming in warm, shallow waters<br>***For private well users:***<br>Follow local, state and federal restrictions on water use |
| Mental health | • Stress and Anxiety<br>• Depression | Consult with a mental health provider and/or your doctor |

# Disease and Drought

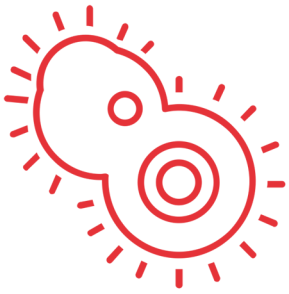
## Chronic Disease

Conditions associated with drought can adversely affect people with certain chronic health conditions such as asthma and some immune disorders. Drought-related changes in air can irritate eyes, lungs, and respiratory systems of individuals with chronic respiratory conditions. Changes in water quality can threaten people whose immune systems are compromised.[9]

## Diseases Transmitted by Insects and Animals

In periods of limited rainfall, both human and animal behavior can change in ways that increase the likelihood of human contact with wildlife, the insects they host, and the diseases they carry.

Drought reduces the size of water bodies and causes them to become stagnant. This provides additional breeding grounds for certain types of mosquitoes. Outbreaks of West Nile Virus have occurred under such conditions. Inadequate water supply can cause people to collect rainwater, leading to collections of stagnant water that can become manmade mosquito breeding areas.



## Infectious Disease

- **Viruses**, **protozoa**, and **bacteria** can pollute groundwater and surface water when rainfall decreases. People who get their drinking water from private wells may be at higher risk for drought-related infectious disease. Lowered groundwater levels can concentrate contaminants such as nitrates and arsenic.
- **Acute respiratory** and **gastrointestinal illnesses** are more easily spread from person to person when handwashing is compromised by a perceived or real lack of available water.
- ***E. coli*** and ***Salmonella*** are examples of bacteria that can more readily contaminate food and cause infectious disease.
- **Other infectious disease threats** arise when drought leads to the contamination of surface waters and other types of water that are used for recreational purposes.

# Water Conservation Tips

Efficient use of water, through behavioral, operational, or equipment changes, can help mitigate the effects of drought.[10,11]

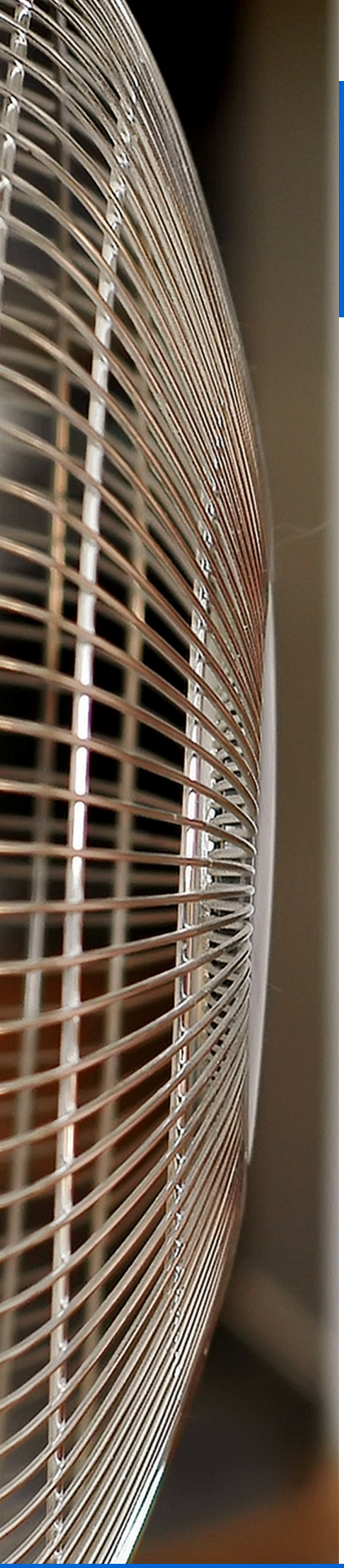
## Indoor Water Conservation Tips

- Turn off the waterwhile shaving or brushing teeth.
- Take short showers instead of tub baths. Turn off the water while soaping or shampooing.
- Keep drinking water in the refrigerator instead of running the faucet until the water's cold.
- Do not use water to defrost frozen foods; thaw in the refrigerator overnight.
- Scrape, rather than rinse, dishes before loading into the dishwasher; wash only full loads.
- Wash only full loads of laundry or use the appropriate water level or load size.
- Repair all leaks. To detect leaks in the toilet, add food coloring to the tank water. If the colored water appears in the bowl, the toilet is leaking.

## Outdoor Water Conservation Tips

- Detect and repair all leaks in irrigation system.
- Water the lawn or garden during the coolest part of the day (early morning is best). Do not water on windy days.
- Set sprinklers to water the lawn or garden only – not the street or sidewalk.
- Use a shut-off nozzle on your hose, so that water flows only as needed. When finished, turn it off at the faucet to avoid hose connection leaks.
- 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 roots and holds soil moisture.
- Use mulch around shrubs and garden plants to reduce evaporation from the soil surface and to cut down on weed growth.

**Wisconsin Department of Health Services**
Division of Public Health
Climate and Health Program
P-00884b (Rev. 05/2021)



# Heat Awareness Tips

## Never leave children, disabled persons, or pets in a parked car.

On an 80°F day, the temperature inside a car even with the windows cracked slightly can reach 100°F in less than 10 minutes!

## Keep your living space cool or seek shelter at a public space.

If you have an air conditioner, use it! If you don't have an air conditioner and the temperature is above 95°F, you should go to a community cooling center or public space because using a fan will no longer prevent heat related illnesses at this temperature.

## Slow down and limit physical activity.

Plan outings or exercise for the early morning or after dark, when temperatures are cooler.

## Drink plenty of water and eat lightly.

Don't wait for thirst, but instead drink plenty of water throughout the day. Avoid alcohol or caffeine and stay away from hot, heavy meals.

## Wear lightweight, loose-fitting, light-colored clothing.

Add a hat or umbrella to keep your head cool…and don't forget sunscreen!

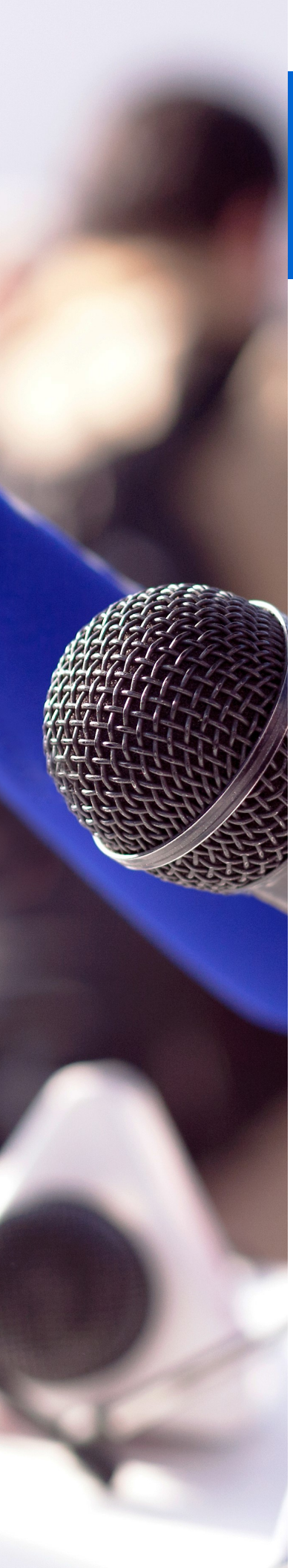
## Don't stop taking medication unless your doctor says you should.

Take extra care to stay cool, and ask your doctor or pharmacist for any special heat advice.

## Take a cool shower or bath to cool yourself down.

A cool shower or bath will actually work faster at reducing your body temperature than an air conditioner. Apply a cold, wet cloth to your head and neck to quickly cool down.

**Wisconsin Department of Health Services**
Division of Public Health
Climate and Health Program
P-00884d (Rev. 05/2021



# Talking Points for Drought

## Talking points and message maps for local health professionals

If you are approached by the media regarding a reported drought health risk in your jurisdiction, the following talking points may be used. Start with message A1 or A2, then follow the instructions within that box.

**A1**

We were notified by the Medical Examiner/Coroner about a fatality possibly due to extreme drought. Our condolences go out to the family.

**B1**

Out of respect for the family, we are unable to share any details.

**B2**

On [insert date], a [gender] ["____ years old" or "between the ages of ___ and ___"] died during the storm.

**A2**

We have *not* been notified of any recent fatalities linked to extreme drought conditions.

*Go to message C.*

**C**

Drought can be long lasting and result in many adverse health effects. People should remain safe by:

a. Monitoring drought and fire hazard conditions in your area.

b. Checking on family, friends and neighbors who do not have air conditioning, who spend much of their time alone or who are more likely to be affected by the heat and the drought.

c. Conserving water.

d. For more information visit *[insert relevant website].*

# MESSAGE MAPS ABOUT DROUGHT SAFETY

Message mapping is one of the most important risk communication tools that public health agencies can employ. The goal of a message map is to convey important information in a concise and easy-to-understand fashion.


## General Guidelines for Completing a Message Map

- Stick to three key messages or one key message with three parts for each underlying concern or specific question.
- Keep key messages brief. The reader should ideally spend less than 10 seconds per line.
- Develop messages that are easily understood by the target audience. (For communications with the general public, use a 6th to 8th grade readability level.)
- Place messages within a message set. The most important messages should occupy the first and last positions.
- Develop key messages that cite credible third parties.
- Use graphics and other visual aids to enhance key messages.
- Keep a positive tone. Messages should be solution oriented and constructive. Try to balance negative messages with positive ones.
- Avoid unnecessary use of “absolute” words, such as no, not, never, nothing, and none.[5]

The following message map can be used for outreach to the general public on drought safety.

| **Key Messages**<br>*Three key messages* | **Supporting Information**<br>*Three pieces of supporting information for each key message* |
|---|---|
| **Message 1**<br>Monitor drought conditions in your area. | **Supporting Info 1**<br>Wisconsin can experience drought. It most commonly occurs during late summer.<br>**Supporting Info 2**<br>Drought can be long-lasting or short-term. It is important to be prepared for drought of any duration.<br>**Supporting Info 3**<br>Heed drought warnings in your area and stay up to date on conditions with the U.S. Drought Monitor (wwwdroughtmonitor.unl.edu). |
| **Message 2**<br>Conserve your water supply during a drought. | **Supporting Info 1**<br>Be conscious of your water use. Limit the amount of water you use both inside and outside your home.<br>**Supporting Info 2**<br>Recycle/reuse water when you can. For example, use leftover drinking water to water plants.<br>**Supporting Info 3**<br>If there is a boil water notice, follow the guidelines for safe water practices and use your water only for approved purposes. |
| **Message 3**<br>If you must be out during the hottest times of the day during drought, be alert for signs of heat illness. | **Supporting Info 1**<br>Symptoms include feeling hot, weak, dizzy or faint, cramping and muscle spasms, nausea, or rapid pulse.<br>**Supporting Info 2**<br>Protect yourself by limiting physical activities, drinking plenty of water, and wearing light, loose-fitting clothing.<br>**Supporting Info 3**<br>Call 911 or seek medical attention if you or someone you know develops heat illness. |

# REFERENCES


1. Wisconsin Initiative on Climate Change Impacts (WICCI). Wisconsin's changing climate: impacts and adaptation. Nelson Institute for Environmental Studies, University of Wisconsin and Wisconsin Department of Natural Resources. 2011. Available at: http://www.wicci.wisc.edu/report/2011_WICCI-Report.pdf Accessed October 30, 2013.
2. Greenough G, McGeehin M, Bernard SM, Trtanj J, Riad J, Engleberg D. The potential impacts of climate variability and change on health impacts of extreme weather events in the United States. Environ. Health Perspect. 2001; 109:191-198.
3. Climate projections in this toolkit come from Wisconsin's Changing Climate: Impacts and Adaptation. 2011. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies. UW-Madison and Wisconsin Department of Natural Resources, Madison, WI.
4. Proano A, Harrington J. Center for Oceanic and Atmospheric Prediction Studies (COAPS) economic impact of wildfire forecast(s) in Florida. *COAPS*. 2006. Available at: www.cefa.fsu.edu/content/download/47233/327895/file/pdf. Accessed October 30, 2013.
5. National Drought Mitigation Center http://drought.unl.edu/Home.aspx
6. National Weather Service. Drought Fact Sheet. Accessed July 30, 2014, at http://www.nws.noaa.gov/om/csd/graphics/content/outreach/brochures/FactSheet_Drought.pdf
7. United States Drought Monitor. U.S. Drought Monitor Classification Scheme. Accessed July 30, 2014, at http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx
8. Centers for Disease Control and Prevention. Watch for Signs and Symptoms of Drought. Accessed July 30, 2014, at http://www.cdc.gov/nceh/drought/toolkit/signs.htm
9. Centers for Disease Control and Prevention. Drought and Health. Accessed July 30, 2014, at http://www.cdc.gov/nceh/drought/default.htm
10. Environmental Protection Agency. Using Water Efficiently: Ideas for Residences. Accessed July 30, 2014, at http://www.epa.gov/WaterSense/pubs/res.html
11. American Red Cross. "Drought Preparedness & Water Conservation," Accessed July 30, 2014, at http://www.redcross.org/prepare/disaster/drought
12. Wisconsin Department of Health Services. Fact Sheet for Private Residences. Accessed July 30, 2014 at http://www.dhs.wisconsin.gov/publications/P4/P44589.pdf
13. United States Small Business Administration. Disaster News. Accessed August 25, 2014 at http://ready.wi.gov/drought/docs/12-683_WI_13163.pdf
14. Icons from The Noun Project users To Uyen, BeaSR, and Antistatique

# RESOURCES

- **Wisconsin Department of Health Services (DHS)** www.dhs.wisconsin.gov/climate/drought/index.htm
- **Wisconsin Department of Natural Resources** www.dnr.wi.gov/topic/water.html
- **National Drought Mitigation Center** www.drought.unl.edu/Home.aspx
- **National Integrated Drought Information System** www.drought.gov
- **Ready Wisconsin** www.readywisconsin.wi.gov/drought
- **Environmental Protection Agency** www.epa.gov/naturaldisasters/drought.html
- **Centers for Disease Control and Prevention** www.cdc.gov/nceh/drought/default.htm
- **List of Wisconsin Local Health Departments** www.dhs.wisconsin.gov/lh-depts/counties.htm
- **List of Wisconsin Tribal Health Directors** www.dhs.wisconsin.gov/lh-depts/contacts/tribal-health-directors.pdf

## Agriculture and Drought Resources

Drought can have devastating consequences on Wisconsin's agricultural community. The following table is a list of resources for farmers to prepare for the possibility of drought and for those already impacted by drought.

### Disaster Assistance

- Access to disaster help and resources: www.disasterassistance.gov

### United States Department of Agriculture

- Emergency Conservation Program: www.fsa.usda.gov and search "Emergency Conservation"
- Livestock Forage Disaster Program: www.fsa.usda.gov and search "Livestock Forage"
- Noninsured Crop Disaster Assistance Program: www.fsa.usda.gov and search "Crop Disaster"
- Wisconsin Service Center Locator: www.offices.sc.egov.usda.gov/locator/app
- Emergency Haying and Grazing: www.fsa.usda.gov and search "Emergency Haying"

### USDA

- **National Agricultural Statistics Service:** Crop Progress and Condition Report: www.usda.gov and search "Crop Progress"
- **Natural Resources Conservation Service:** Drought Resources: www.usda.gov and search "Drought Resources"

### UW-Madison Extension

- Farmer to Farmer Pasture Rental: www.farmertofarmer.crowdmap.com
- Resources for farmers who are feeding with drought-stressed feed and for farmers who need to purchase feed: www.uwex.edu

### Wisconsin Office of the Commissioner of Insurance

- Crop Insurance: www.oci.wi.gov