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DEPARTMENT OF ENVIRONMENTAL PROTECTION

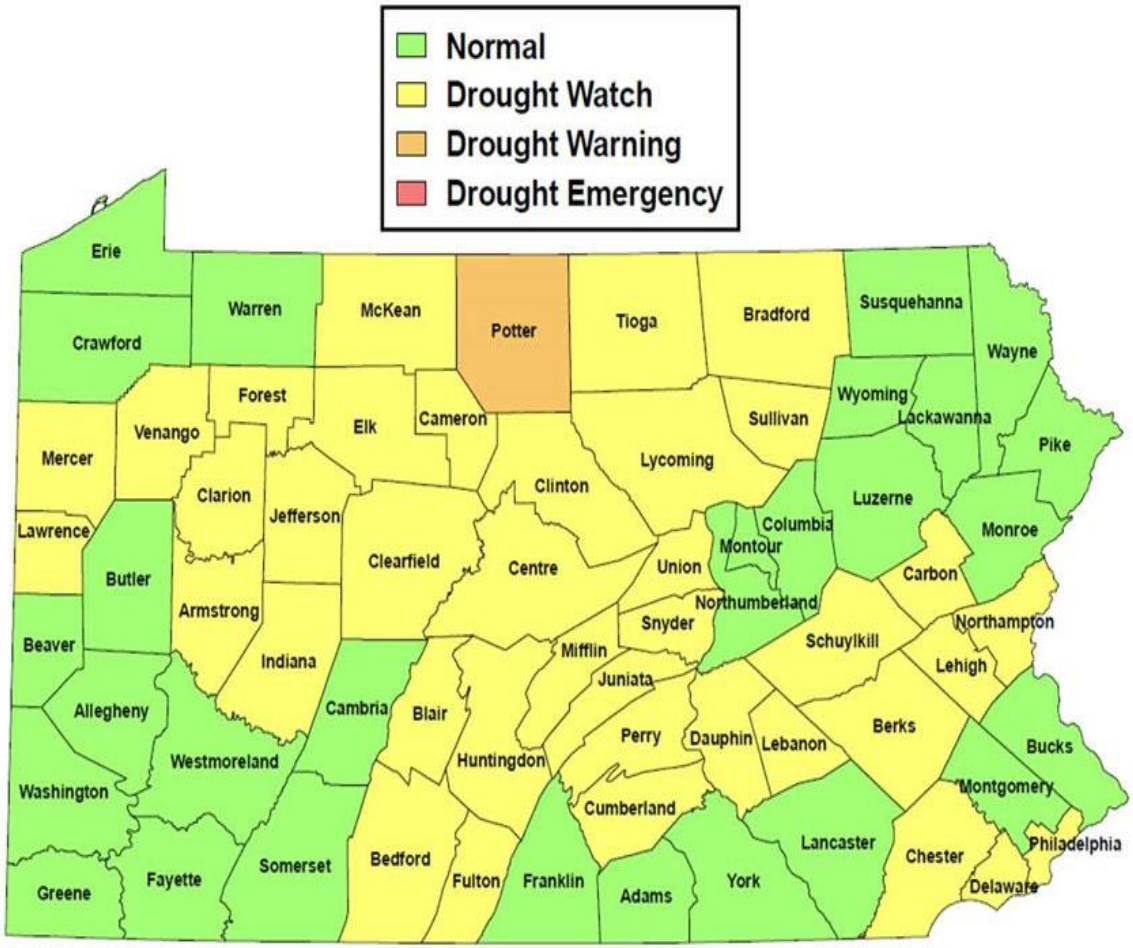
Drought Management in PA And Current Conditions

DRBC WMAC

October27, 2016

Hoss Liaghat, P.E.

Current Status (as of October 25, 2016)



Drought Management in PA

- To assure sufficient water is available to serve essential health, safety and economic needs

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Drought Management in PA

- Coordination efforts between agencies
- Three-Stage process excluding normal
- Statewide network to monitor hydrologic conditions
- Drought Emergency Regulations- Chapters 118 , 119 and 120

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Coordination Efforts

- PEMA responsible to manage Commonwealth's water resources during a drought emergency with coordination and support from DEP
- Commonwealth Drought Coordinator
  - **David B. Jostenski, P.E**
- Drought Task Force

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Drought Status/Declarations

- **Normal**
- **Watch**
  - DEP Secretary issues press release
  - Voluntary 5 % reduction
- **Warning**
  - DEP Secretary issues press release
  - Voluntary 10-15% reduction
- **Emergency**
  - Governor declares proclamation
  - Nonessential use bans
  - Local water rationing plans

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Hydrologic Conditions

- **Four hydrologic indicators**
  - **Precipitation** – 90-, 120-…365-day deficits
  - **Stream Flow** – moving 30-day average
  - **Ground Water** – moving 30-day average
  - **Soil Moisture** – Palmer Index

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Hydrologic Data Collection

- Stream flows and groundwater levels are collected through a cooperative program with United States Geologic Survey (USGS)

- National Weather Service (NWS) provides daily updates of precipitation data and weekly updates on the Palmer Drought-Severity Index

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Drought Monitoring Network

- County-based network, coverage of entire state
- Real-time display of stream flow and groundwater levels
- Degree of drought severity based upon long term records
- Designed to provide timely identification of developing drought conditions

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Drought Monitoring- PA Specific

- Four stages—**normal**, **watch**, **warning** **and** **emergency**
- Applied to historical data for each drought monitoring parameter
- Current condition is compared to the historical data in order to assess the monitoring data/parameters relative to drought conditions

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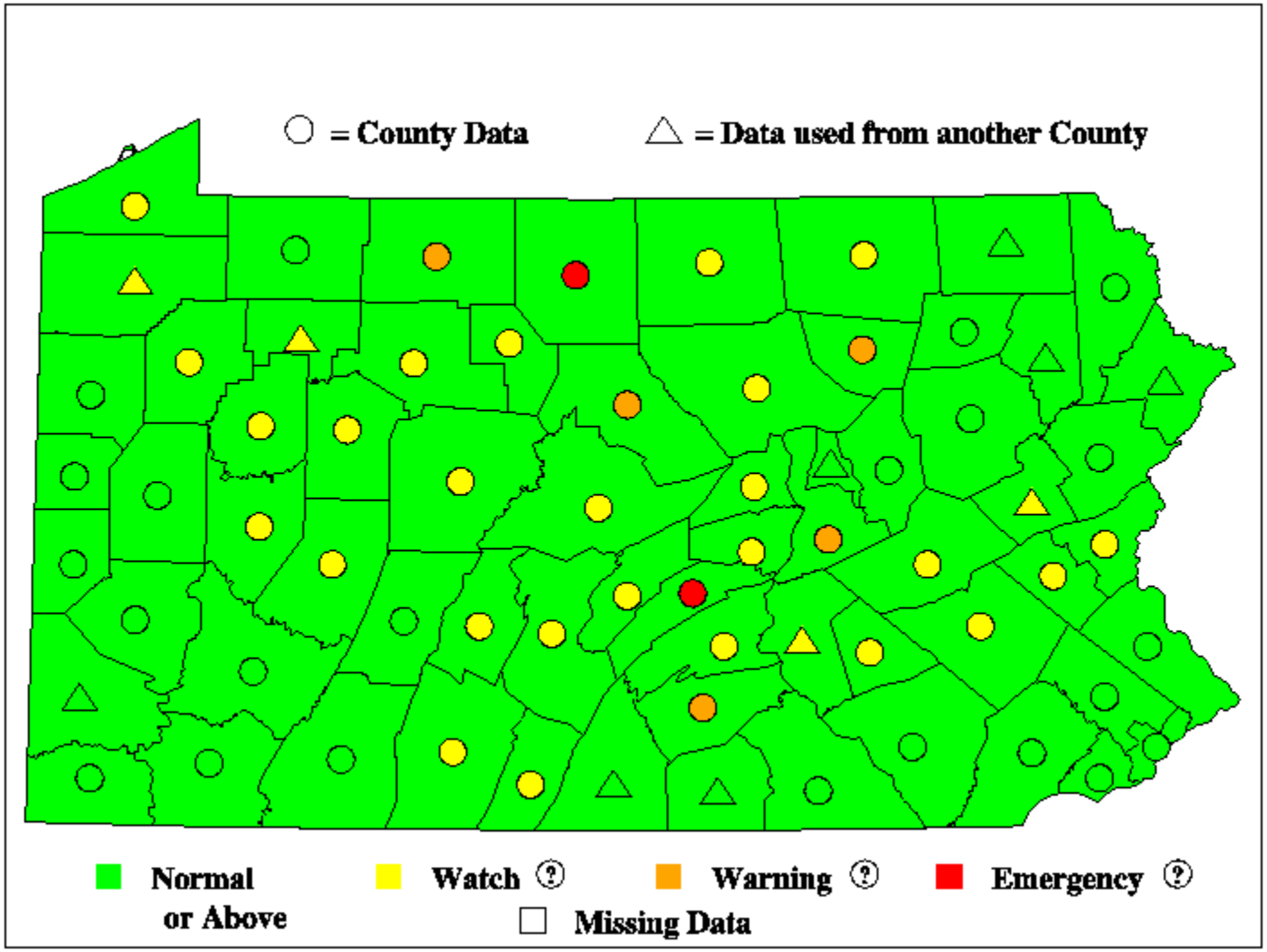
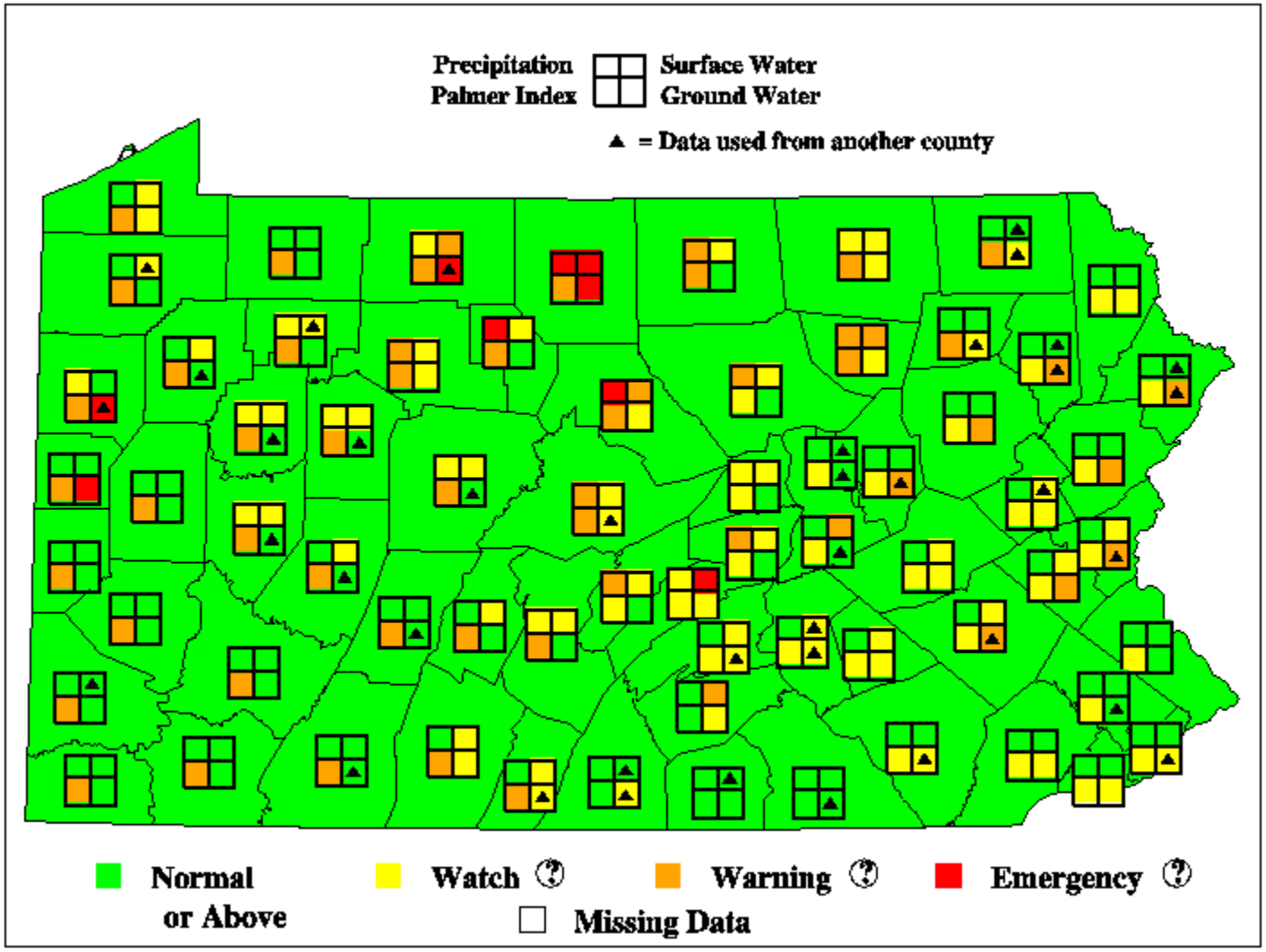
Surface Water Indicator Map (Based on 30-day Moving Average Stream Flow)

Aug 1, 2016

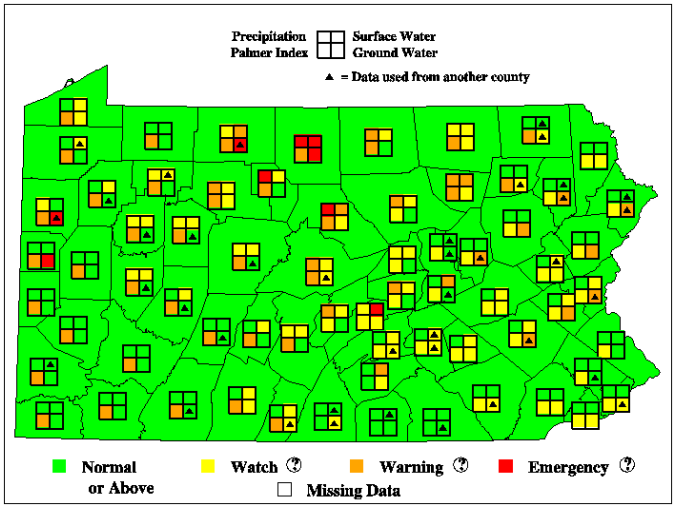


Composite Indicator Map (Precipitation Based on 90-day Departure)

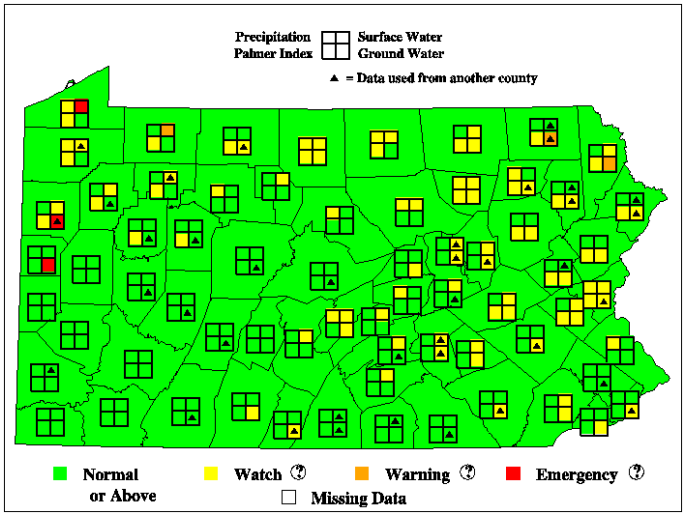
August 1, 2016



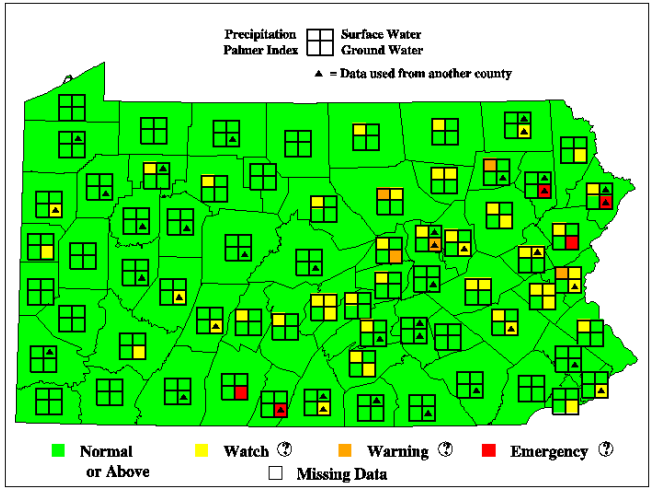
Composite Indicator Map (Precipitation Based on 90-day Departure)



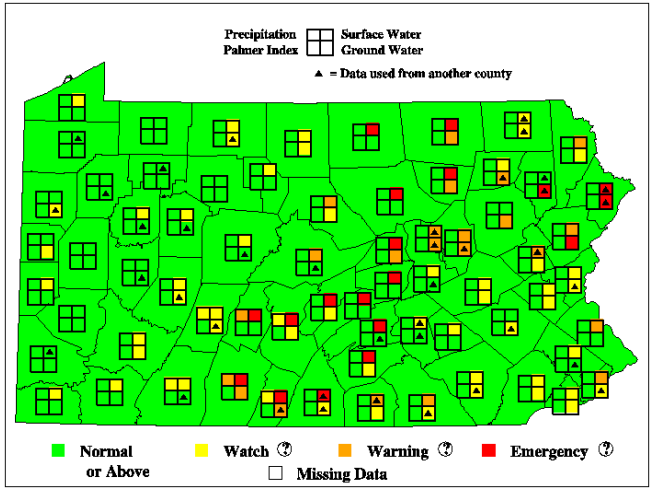
Aug 1, 2016



July 1, 2016



June 1, 2016



May 2, 2016

Precipitation

- Earliest indicators of a potential drought are precipitation deficits
- Precipitation is monitored in terms of departures (surpluses or deficits) from 30-year normal monthly precipitation quantities
- Droughts result from accumulations of precipitation deficits over periods of three or more months
- We closely follow the PPT forecast – NWS products

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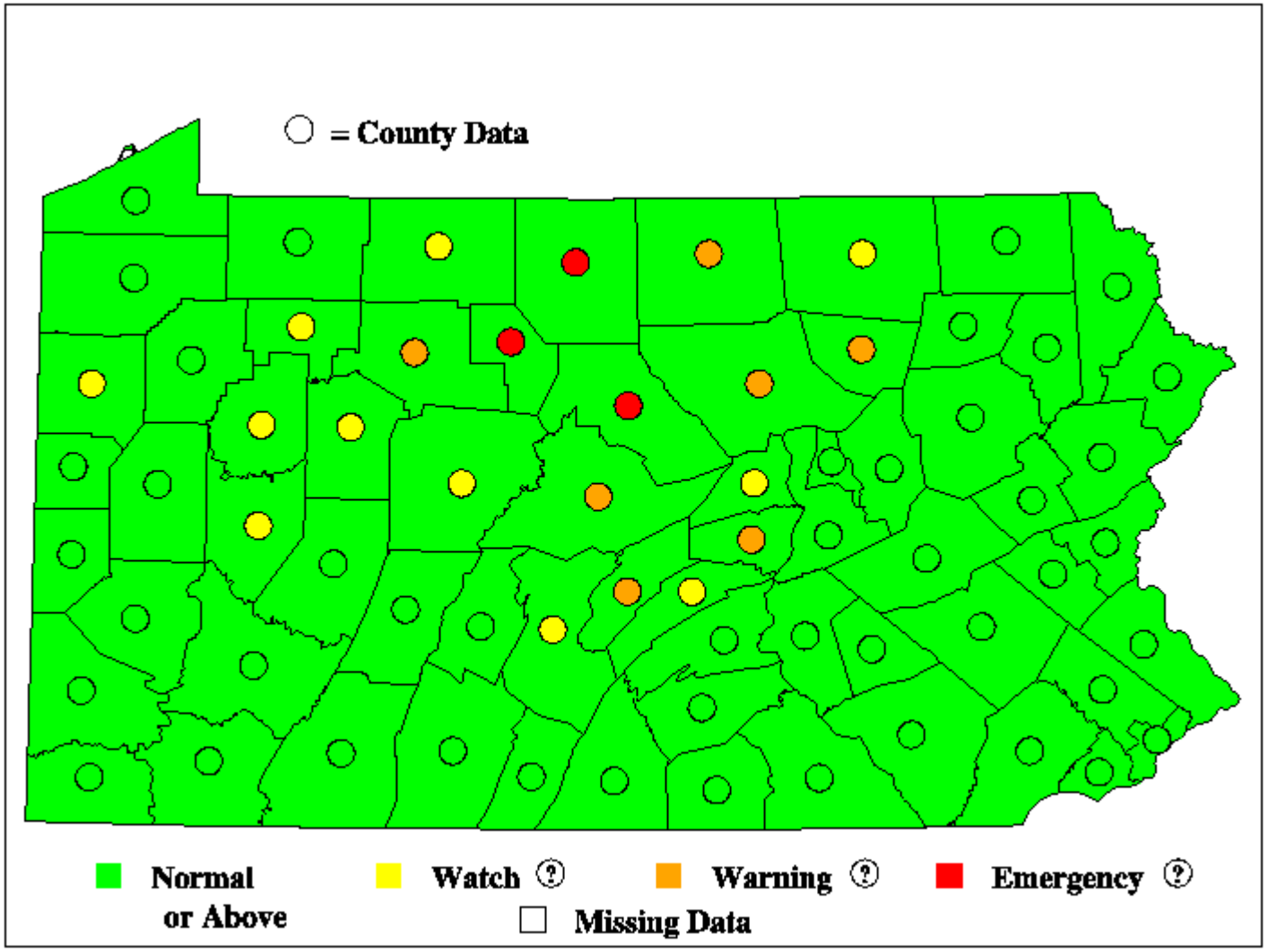
Precipitation Drought Monitoring Criteria

Duration of Deficit Accumulation (months)	*Drought Watch (deficit as % of normal precipitation)*	*Drought Warning (deficit as % of normal precipitation)*	*Drought Emergency (deficit as % of normal precipitation)*
3 (90 days)	25.0	35.0	45.0
4 (120 days)	20.0	30.0	40.0
6 (180 days)			
9			
12			

Precipitation Indicator Map (Precipitation Based on 90-day Departure)

Aug 1, 2016



Stream Flows (Surface Water)

- Streamflows typically lag one to two months behind precipitation in signaling a drought
- USGS stream-gage records are used to compute the 30-day moving average daily flow, which serves as a stream-flow indicator
- Stream-flow indicators compared with statistical flow values known as “percentiles” derived from historic stream-gage records

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Stream Flows (Surface Water)

- A flow percentile is a value on a scale from 0 to 100 that indicates the percent of the time on that given date throughout the gage period of record that flow has been equal to or below that value
- DEP has defined that an average flow over the last 30 days having a percentile range of:
  - **10 to 25 as entry into drought watch**
  - **5 to 10 as entry into drought warning**
  - **0 to 5 as entry into drought emergency**

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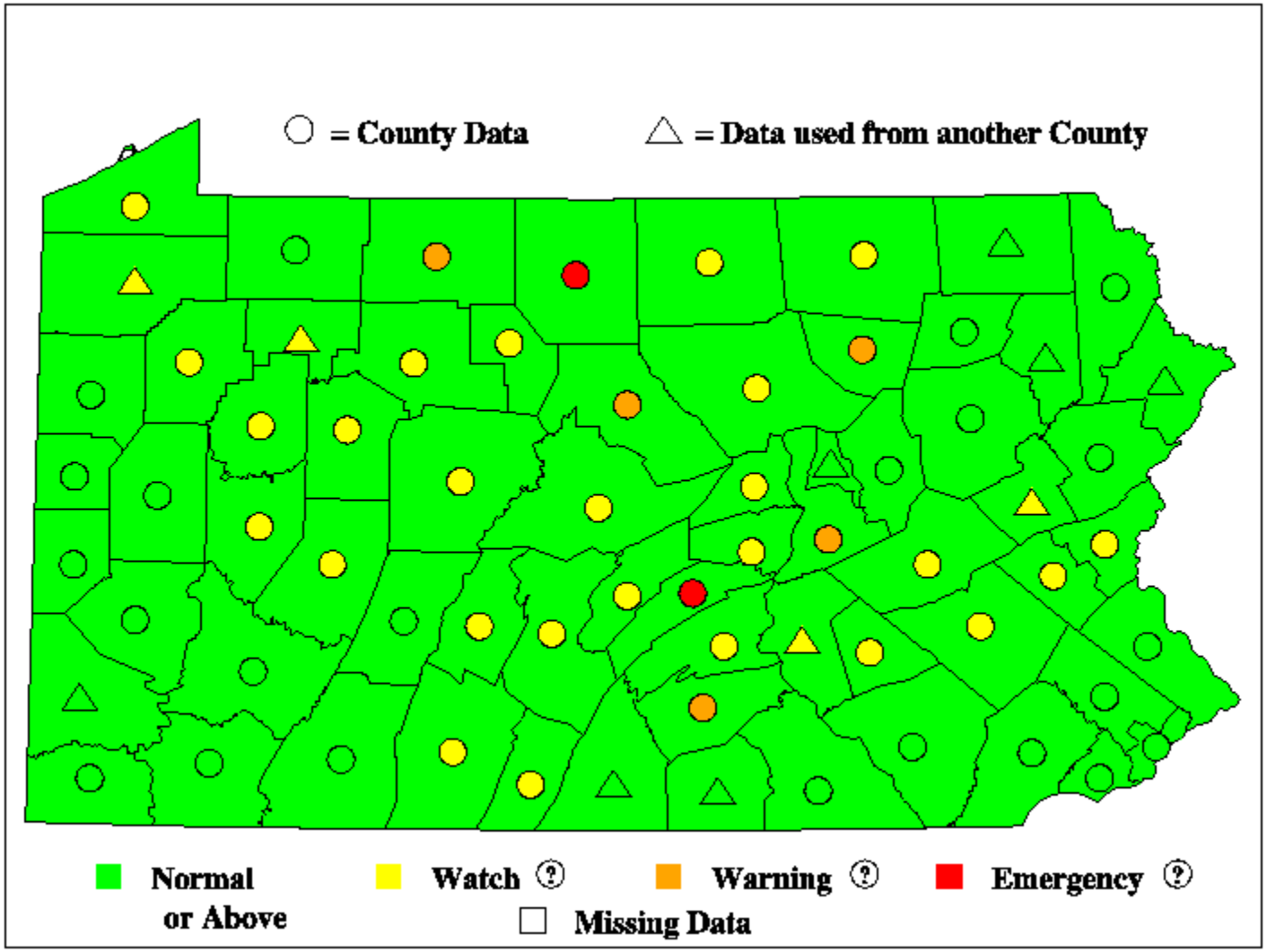
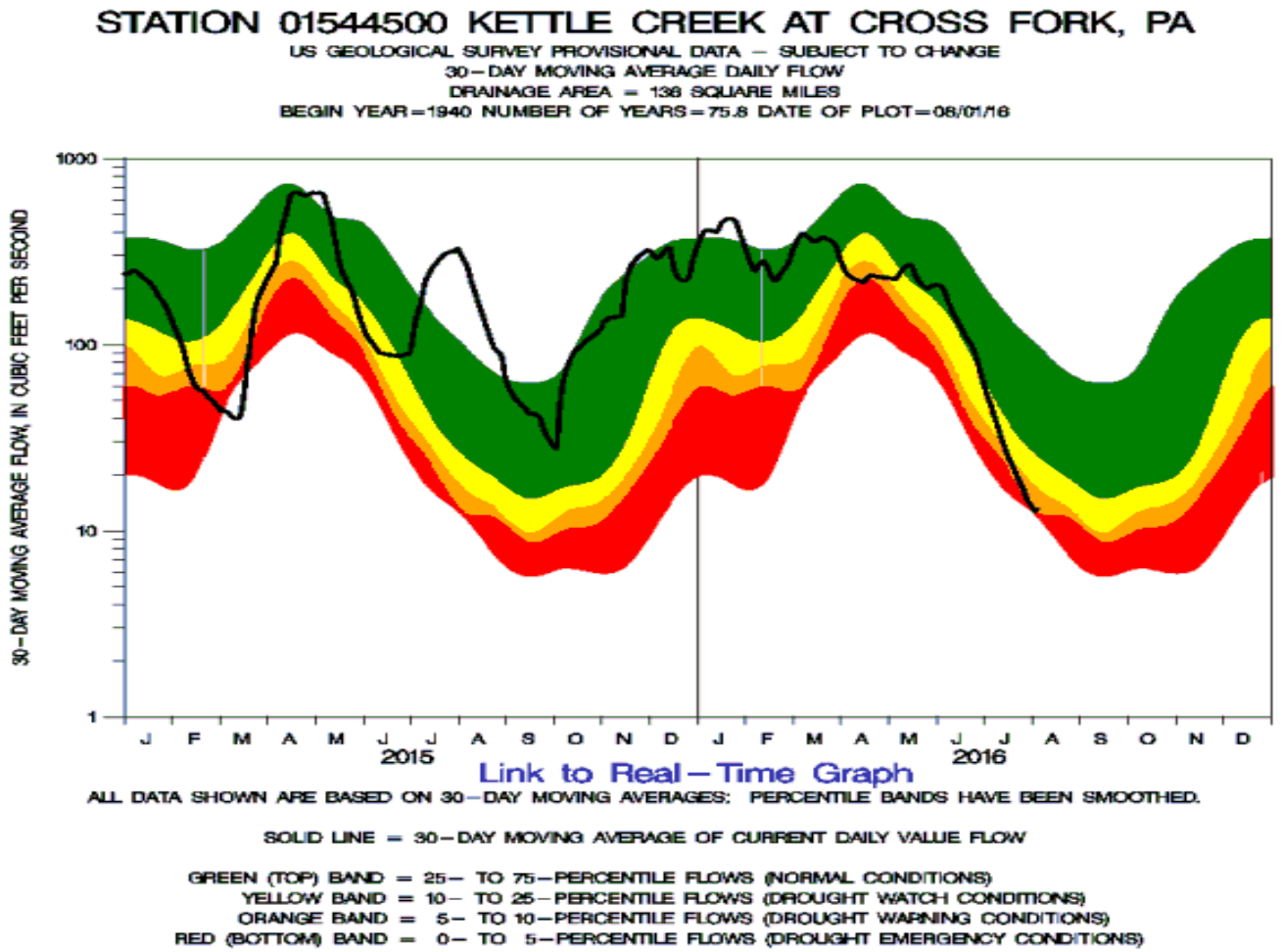
Surface Water Indicator Map (Based on 30-day Moving Average Stream Flow)

Aug 1, 2016



Potter County, Kettle Creek

Aug 1, 2016



Groundwater Levels

- Groundwater typically lags two to three months behind precipitation, largely because of the storage effect
- Groundwater levels are used to indicate drought status in a manner similar to stream flows
- Every day, groundwater levels in USGS observation wells are used to compute an average level of the last 30 days preceding that day (called the “30-day moving average groundwater level”), that serves as a ground water indicator

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Groundwater Levels

- The groundwater indicators are then compared with statistical groundwater-level values known as “percentiles” derived from historic observation-well records
- DEP has defined that groundwater percentile ranges of 10 to 25, 5 to 10, and 0 to 5 to represent entry into watch, warning and emergency, respectively

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Groundwater Indicator Map (Based on 30-day Moving Average Groundwater Level)

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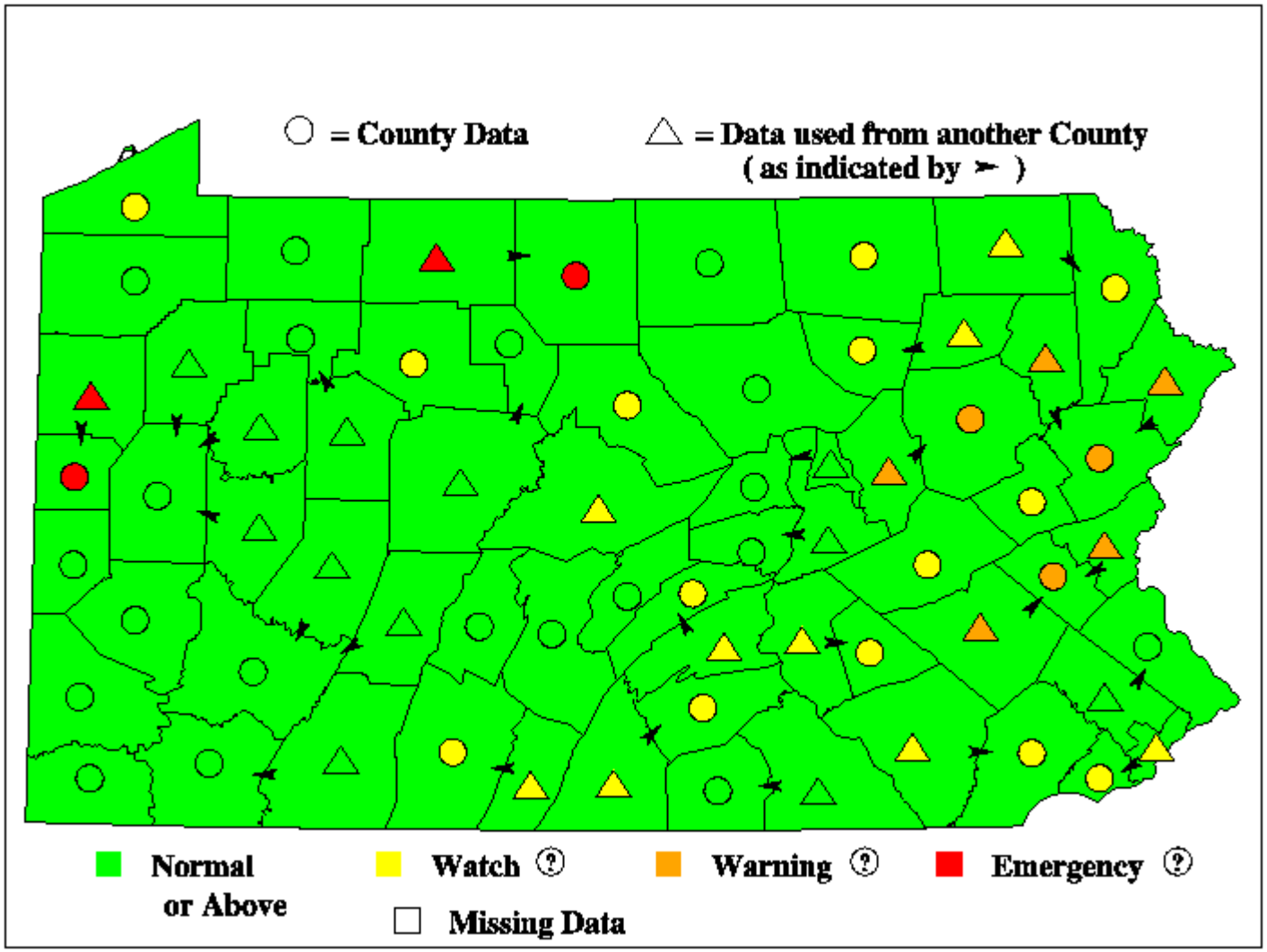
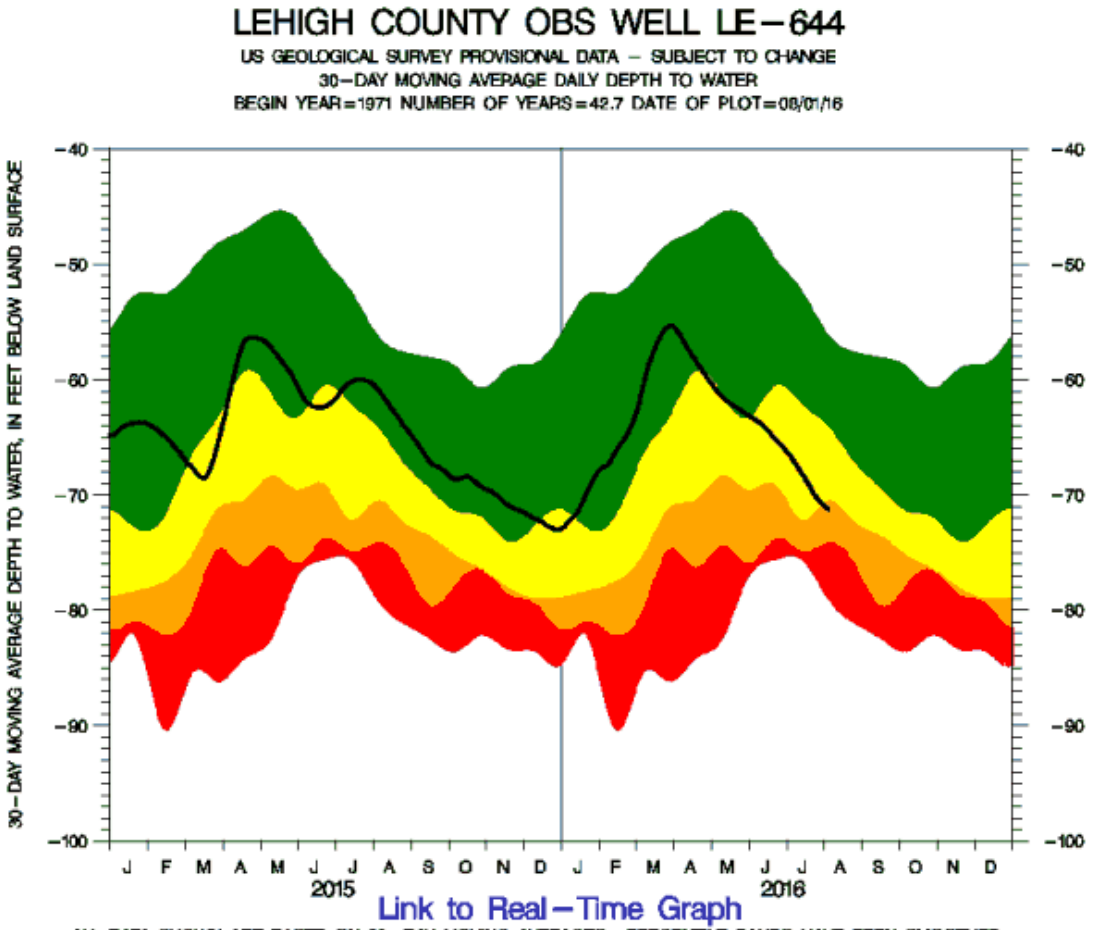


Lehigh County

Aug 1, 2016



Palmer Drought Severity Index

- The Palmer Drought Severity Index is a value computed as a function of both meteorological and hydrologic data to measure soil moisture conditions
- It is compiled weekly by the Climate Prediction Center of the U.S. National Weather Service for each of their climatological regions
- The computed value ranges from +6.0 to -6.0
- Pennsylvania uses values between -2.0 and --2.99 to indicate watch, between -3.0 and -3.99 to indicate warning and -4.0 or below to indicate emergency

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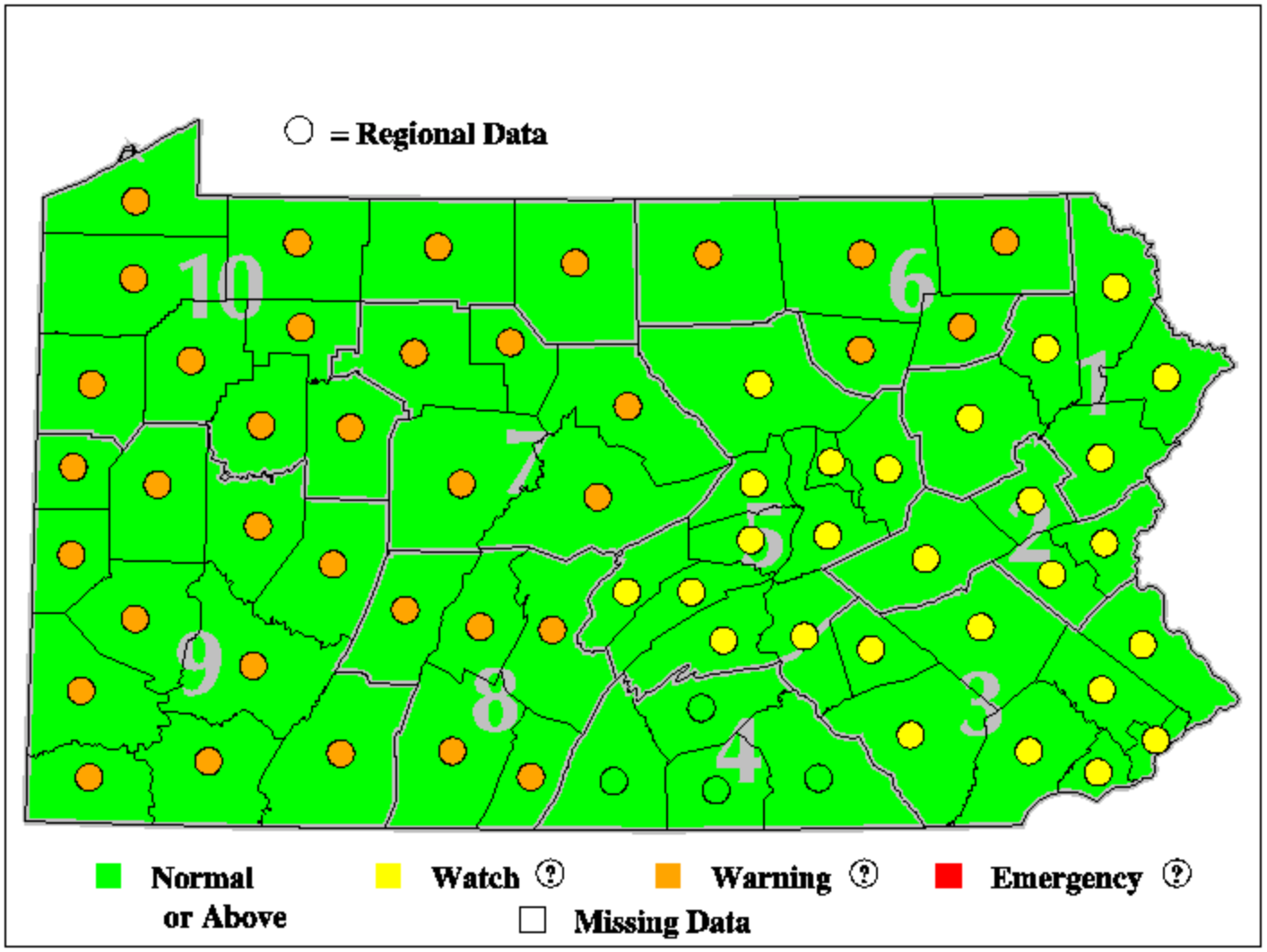
Palmer Indicator Map (Based on Weekly Palmer Drought Severity Index)

Aug 1, 2016



Drought Management Response Levels

- Drought Stages
  - ***Watch*** - public notice of possible development of a drought
    - DEP requests meeting of Drought Task Force
    - DEP issues press release
    - DEP notifies public water suppliers
    - 5% voluntary reductions in water use

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Response Levels cont.

- Drought Stages
  - ***Warning*** - impending drought emergency conditions
    - DEP issues press release
    - DEP notifies public water suppliers
    - 10-15% voluntary reductions in water use

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Response Levels cont.

- Drought Stages
  - ***Emergency*** - water shortages exist that threaten health, safety or welfare
    - Governor declares emergency - confirmed within 72 hours by Emergency Management Council
    - Drought Emergency Regulations Effective
      - Mandatory nonessential water use restrictions
      - Variances
      - Rationing

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Drought Emergency Regulations

(Emergency Management Services Code, 35 Pa.C.S. § § 7101-7707)

- **Chapter 118** Public Water Supply Agencies & Industrial Drought Contingency Plans
- **Chapter 119** Bans on Nonessential Uses
- **Chapter 120** Local Water Rationing Plans

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Drought Task Force

- Statewide internal group (PEMA, DEP, DCNR, PUC, PDA, DOH, PennVEST, PSP, NWS, USGS, USDA, SRBC, DRBC) whose operations/programs may be impacted by drought or drought management operations.

- Will meet when hydrologic conditions indicate the beginning of a drought period and throughout the drought period.

- Presentations from the NWS and DEP, discussion amongst Task Force members regarding appropriate actions necessary to address drought conditions.

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Chapter 118

Reductions of Major Water Use in a Commonwealth Basin Drought Emergency Area

Purpose: provide for the preparation and implementation of contingency plans by Public Water Supply Agencies to reduce water use in response to a state of drought or water shortage emergency.

Objective: conserve water, balance demand with limited available supplies and assure that sufficient water is available to serve essential health, safety and economic needs.

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Public Water Supply Agencies

- **Governor's Drought Emergency Declaration**
  - Prepare and submit a Drought Contingency Plan
  - May use previously approved plan if not more than 3 years old prior to Governor's proclamation
  - Implement approved DCP

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Chapter 119

Prohibition of Nonessential Water Uses in a Commonwealth Drought Emergency Area

- Watering grass, irrigating trees and landscaped areas
- Irrigating athletic fields and golf courses without an emergency operations plan
- Washing paved surfaces
- Using water for ornamental use
- Washing mobile equipment (e.g. cars)
- Serving water in restaurants except when requested
- Filling or topping off pools
- Using water from fire hydrants except to fight fires

(each has exceptions and there is a variance process)

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Chapter 120

Local Water Rationing Plans

Purpose: establish procedures for reviewing and approving plans by Public Water Supply Agencies or political subdivisions in response to a state of drought or water shortage emergency

Objective: balance the daily demands placed upon a public water supply agency with the requirement to maintain a sufficient water supply to meet the long term needs that may be placed upon the public water supply agency during a period of water shortage or drought emergency

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