

**CHAPTER THREE
SECTION 3.3
HAZARD PROFILE-DROUGHT**

AFFECTED JURISDICTIONS

COMMUNITIES

- Unincorporated Pottawatomie County
- Town of Asher
- Town of Bethel Acres
- Town of Brooksville
- Town of Earlsboro
- Town of Johnson
- City of Maud
- Town of Macomb
- City of McLoud
- Town of Pink
- City of Shawnee
- Town of St. Louis
- City of Tecumseh
- Town of Tribbey
- Town of Wanette

PUBLIC SCHOOL DISTRICTS

- Asher Public Schools
- Bethel Public Schools
- Dale Public Schools
- Earlsboro Public Schools
- Grove School
- Macomb Public Schools
- Maud Public Schools
- Macomb Public Schools
- McLoud Public Schools
- North Rock Creek School
- Shawnee Public Schools
- South Rock Creek School
- Tecumseh Public Schools

TECHNOLOGY CENTERS

- Gordon Cooper Technology Center

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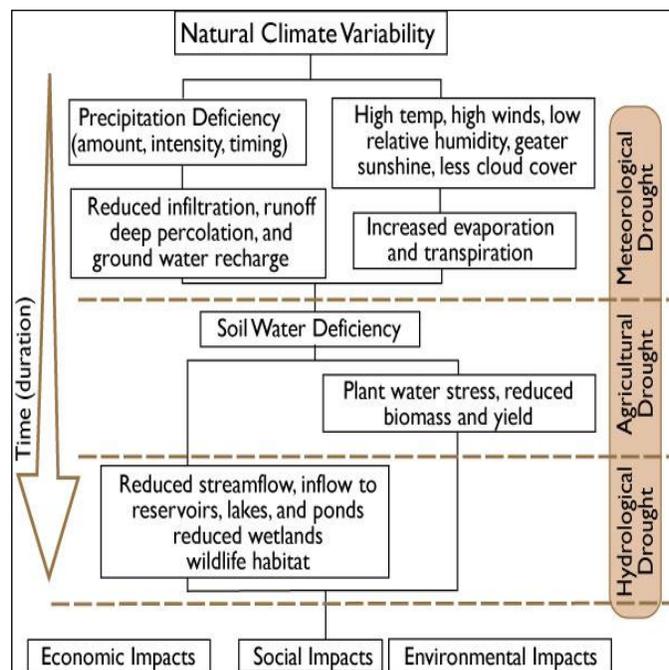
DROUGHT

Drought is a persistent and abnormal moisture deficiency having adverse impacts on vegetation, animals or people. Dozens of more specific drought definitions are used around the world based on the lack of rain over various time periods or measured impacts, such as, reservoir levels or crop losses. Because of the various ways people measure drought, no one has produced an objective drought definition upon which everyone can agree.

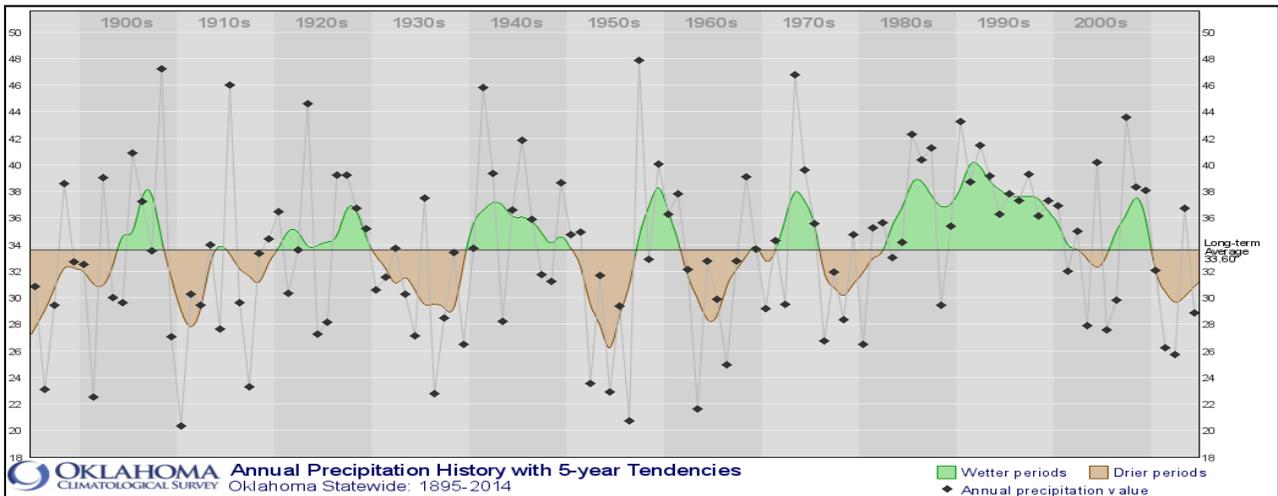
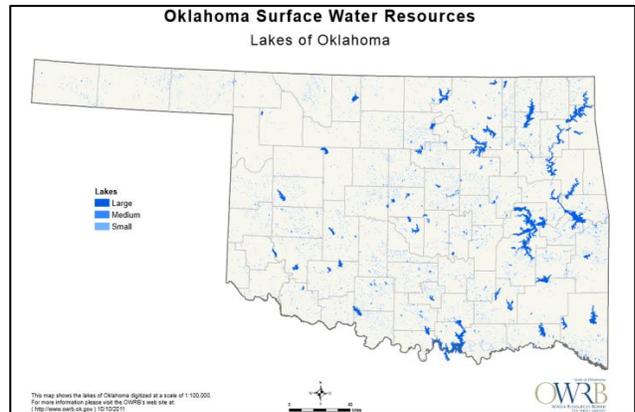
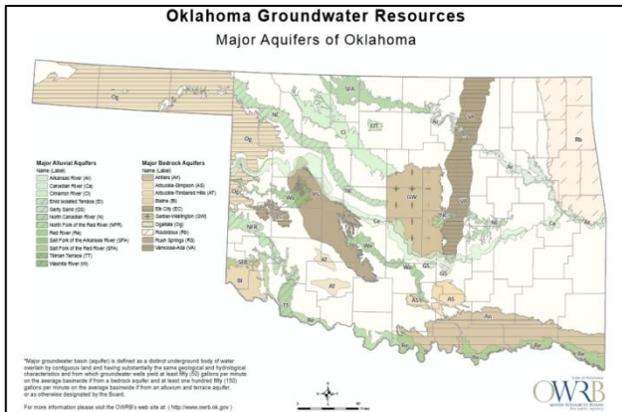


DROUGHT CONSIDERATION TYPES:

- **METEOROLOGICAL DROUGHT** is usually based on long-term precipitation departures from normal, though high temperatures often play a role.
- **HYDROLOGICAL DROUGHT** refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, and as lake, reservoir, and ground water levels.
- **AGRICULTURAL DROUGHT** occurs when soil moisture does not meet the needs of a particular crop at a particular time. Agricultural drought is typically evident after meteorological drought, but before a hydrological drought.



When little or no rain falls, soils dry out and plants die. The flow of streams and rivers declines when rainfall is less than normal for several weeks, months, or years; and water levels fall in lakes, reservoirs, and aquifers causing the depth of water in wells to decrease. If dry weather persists and water supply problems develop, rationing may be necessary. The first evidence of drought is usually seen in records of decreased rainfall.



LOCATION

All participating jurisdictions, school districts and Gordon Cooper Technology Center and the unincorporated area in Pottawatomie County are subject to drought conditions. (Refer to Table 1-1) During normal times, Shawnee Twin Lakes provide water to all of Shawnee and other communities in northern Pottawatomie County. Many rural

residences and businesses draw water from a well source. Fortunately Pottawatomie County is located over a satisfactory aquifer which provides a good water supply to many areas in the county, particularly in rural areas. Water from area lakes also provides water although during long term droughts, water from lakes can become a problem for communities.

EXTENT

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and particular application. Several indices developed by Wayne Palmer, as well as the Standard Precipitation Index, are useful for describing the many scales of drought.

Table 3-11 PALMER DROUGHT SEVERITY INDEX (PDSI) CLASSIFICATIONS FOR DRY AND WET PERIODS	
4.00 or more	Extremely wet
3.00 to 3.99	Very wet
2.00 to 2.99	Moderately wet
1.00 to 1.99	Slightly wet
0.50 to 0.99	Incipient wet spell
0.49 to - 0.49	Near normal
-0.50 to - 0.99	Incipient dry spell

Table 3-11 PALMER DROUGHT SEVERITY INDEX (PDSI) CLASSIFICATIONS FOR DRY AND WET PERIODS	
-1.00 to - 1.99	Mild drought
-2.00 to - 2.99	Moderate drought
-3.00 to - 3.99	Severe drought
-4.00 or less	Extreme drought

Common to all types of drought is the fact that they originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks to a couple of months), the drought is considered *short-term*.

If the weather or atmospheric circulation pattern becomes entrenched and the precipitation deficits last for several months to several years, the drought is considered to be a *long-term* drought. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-



term pattern that result in short-term wet spells. The **Palmer Drought Severity Index (PDSI)** has been widely used by the United States Department of Agriculture to determine when to grant emergency drought assistance, but the Palmer Index is best used when working with large areas of uniform topography. Officials consider Drought to be major when farmers and ranchers can no longer have adequate water for livestock or water in communities is restricted for use due to low supplies. The National Drought

Mitigation Center (NDMC) is using a newer index, the Standardized Precipitation Index (SPI), to monitor moisture supply conditions. Distinguishing traits of this index are that it identifies emerging droughts months sooner than the Palmer Index and that it is computed on various time scales.

Table 3-12 STANDARDIZED PRECIPITATION INDEX (SPI) VALUES	
2.0+	Extremely wet
1.5 to 1.9	Very wet
1.0 to 1.49	Moderately wet
-.99 to .99	Near normal
-1.0 to -1.49	Moderately dry
-1.5 to -1.99	Severely dry
-2.0 and less	Extremely dry

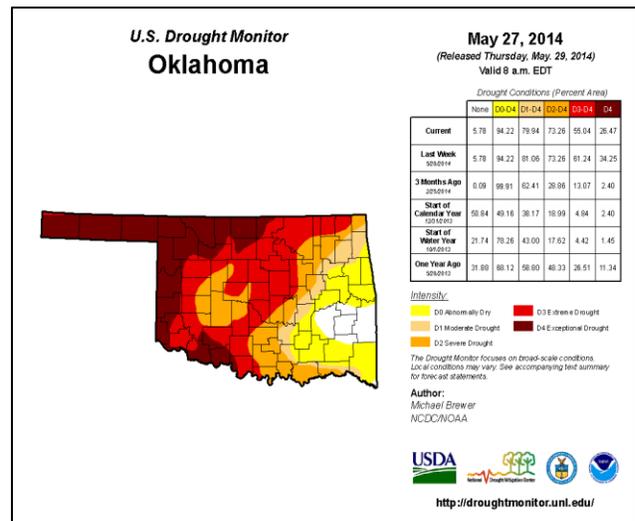
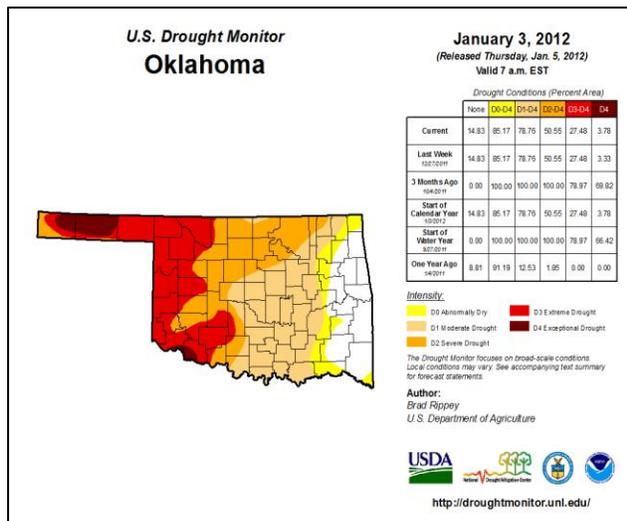
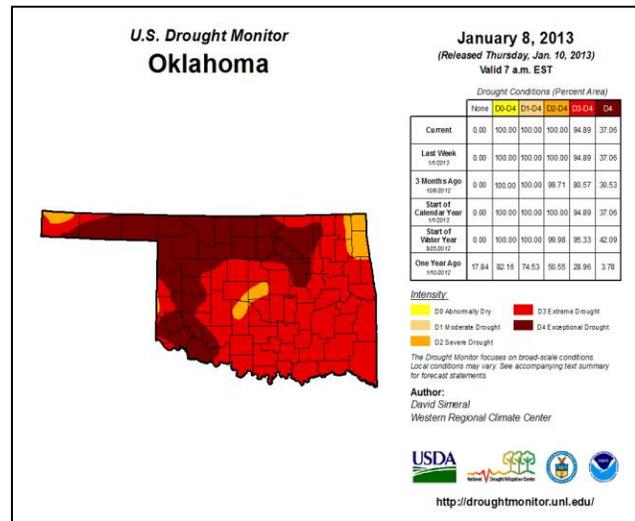
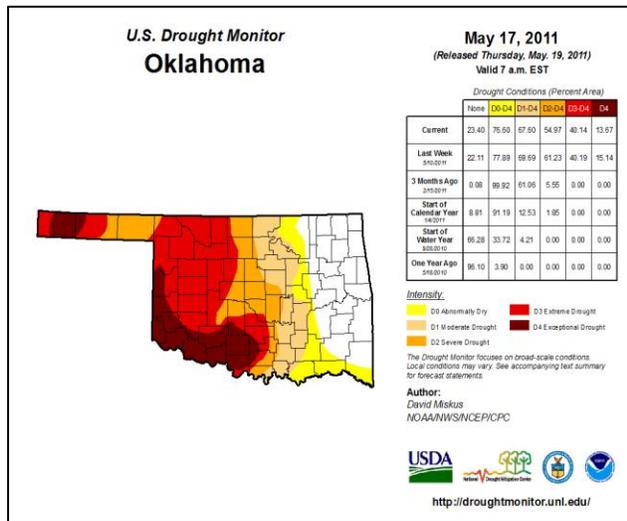
The **Standardized Precipitation Index (SPI)** is a way of measuring drought that is different from the Palmer Drought Severity Index (PDSI). Like the PDSI, this index is negative for drought and positive for wet conditions.

The SPI is a probability index that considers only precipitation, while Palmer’s indices are water balance indices that consider water supply (precipitation), return of moisture to the air (evapotranspiration) and loss (runoff).

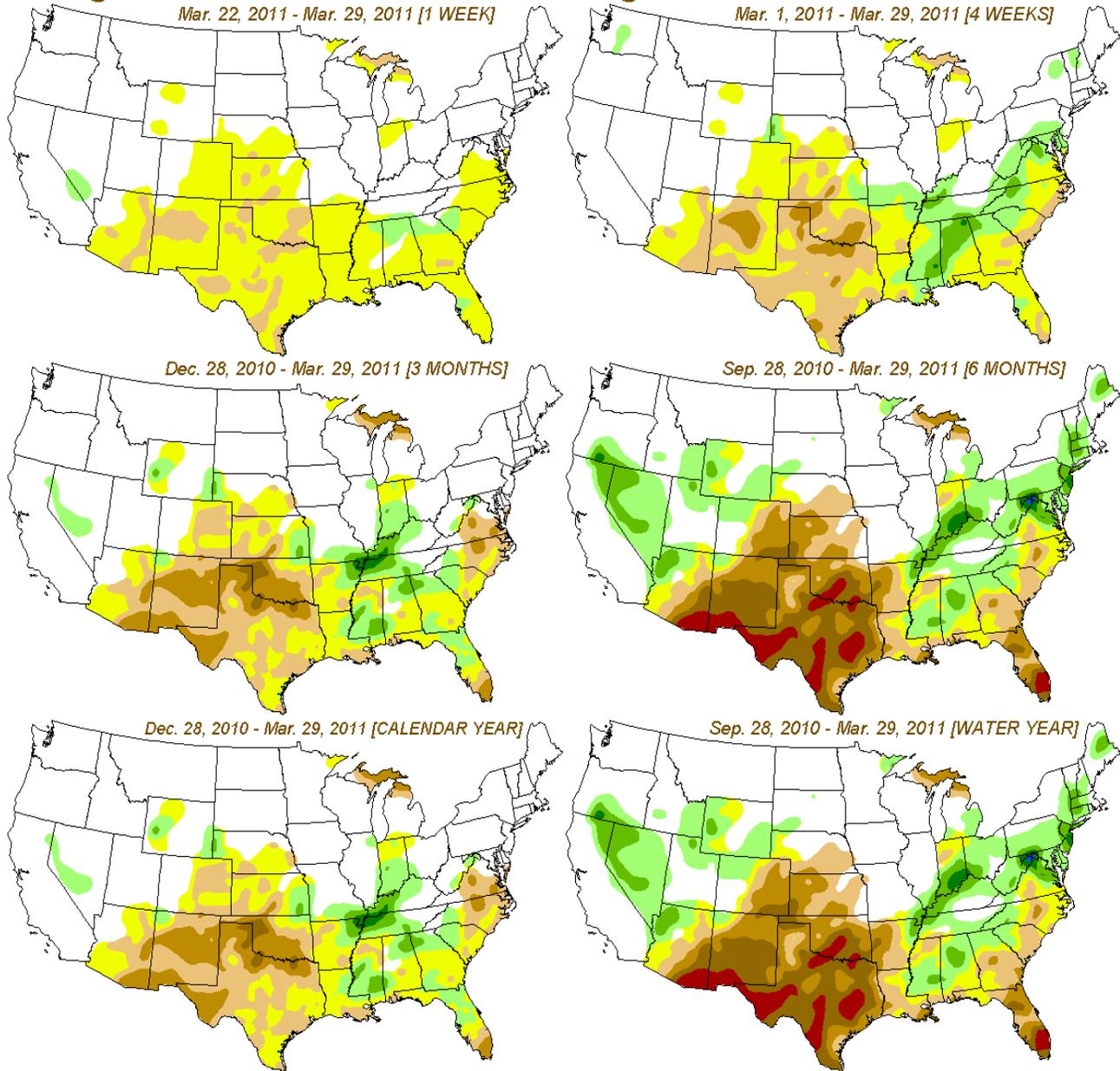
Pottawatomie County considers anything less than 1.5 on the SPI to be severe and reason to consider additional steps to reduce the effects on residents in the county, particularly roads and agriculture.

PREVIOUS OCCURRENCES

According to the National Climatic Data Center (NCDC), fifteen drought events affected Pottawatomie County from 2006 to December 2011; however the NCDC lists the droughts of 2006-2007 and 2011-2012 as separate events for each month, in actuality both droughts affected the county for the entire years.

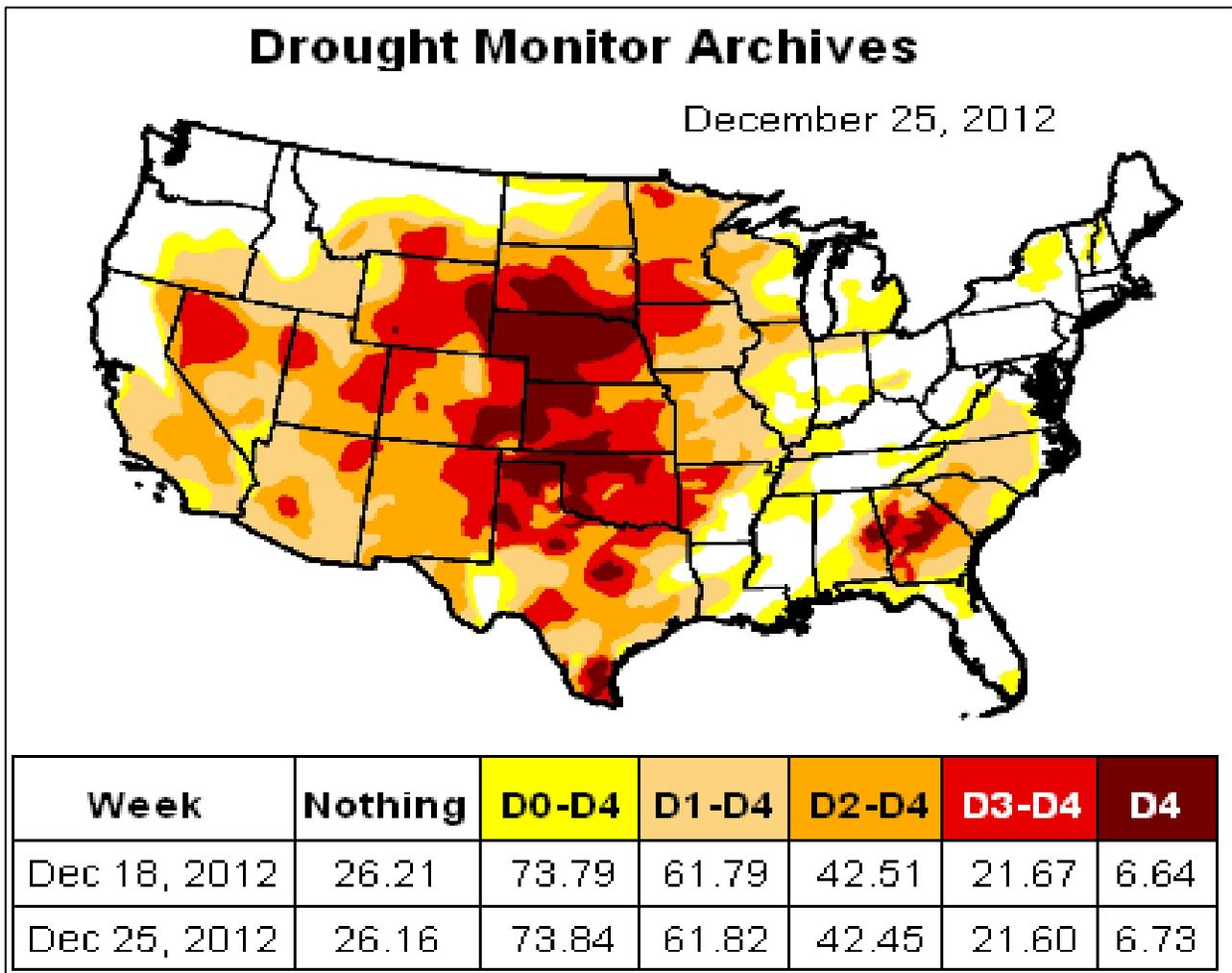


Drought Monitor Classification Changes for Selected Time Periods



These maps depict approximate changes in drought intensity from selected initial times to the current week, with no consideration given to intervening weeks. The difference calculations are based on interpolated 4 km grids of Drought Monitor classifications, and as a result, will be smoother than would similar products based directly on the published versions of the Drought Monitor.

Since 2004, Oklahoma and Pottawatomie County have been involved in a steady drought with a few periods of relief. The most severe was during early 2011 and 2012 when dry conditions caused by the drought resulted in numerous water shortages and wildfires statewide. Pottawatomie County is shown as extremely dry at the end of July 2012.



Drought conditions can change quickly. On August 8, 2006, Oklahoma was experiencing a D3- D4 (Extreme to Exceptional) drought as shown on the Drought Monitor map following. Pottawatomie County was in an Extreme drought condition. By September 5, 2006 the

drought in Pottawatomie County had lessened to a Moderate drought condition and by January 9, 2007 the county was Abnormally Dry. April 3, 2007 saw the drought completely gone from Pottawatomie County and most of Oklahoma.

But as is often seen in Oklahoma, during the summer of 2011 a new drought condition began and by August 2, 2011 most of Oklahoma including all of Pottawatomie County was in an Extreme drought condition even worse than the one in 2006. This drought lasted into the early part of 2013.

Table 3-13 POTTAWATOMIE COUNTY DROUGHT EVENTS 2006-2013 Data from the National Climatic Data Center (NCDC)	
Date	Description
Oct 2012- March 2013	Drought conditions continued over the southern Plains following a hot and very dry summer. A few beneficial rain events did occur during September, resulting in improving drought conditions in some areas. With lack of any appreciable rainfall during the month of October, drought conditions persisted and/or worsened during the month. Precipitation totals for March 2013 were below normal across most of central and western Oklahoma, resulting in a continuation of the long-term drought.
Jan 2011- Sept 2012	The drought conditions that had affected Pottawatomie County earlier in the year returned in late June and early July as little precipitation fell and excessive days of temperatures over 100 degrees dried out vegetation and water levels from lakes and ponds dropped. Numerous grass fires were reported causing fire department resources to spread out across the county. At the end of August all of Pottawatomie County was in a D3 (Extreme) drought and had been for over a month.

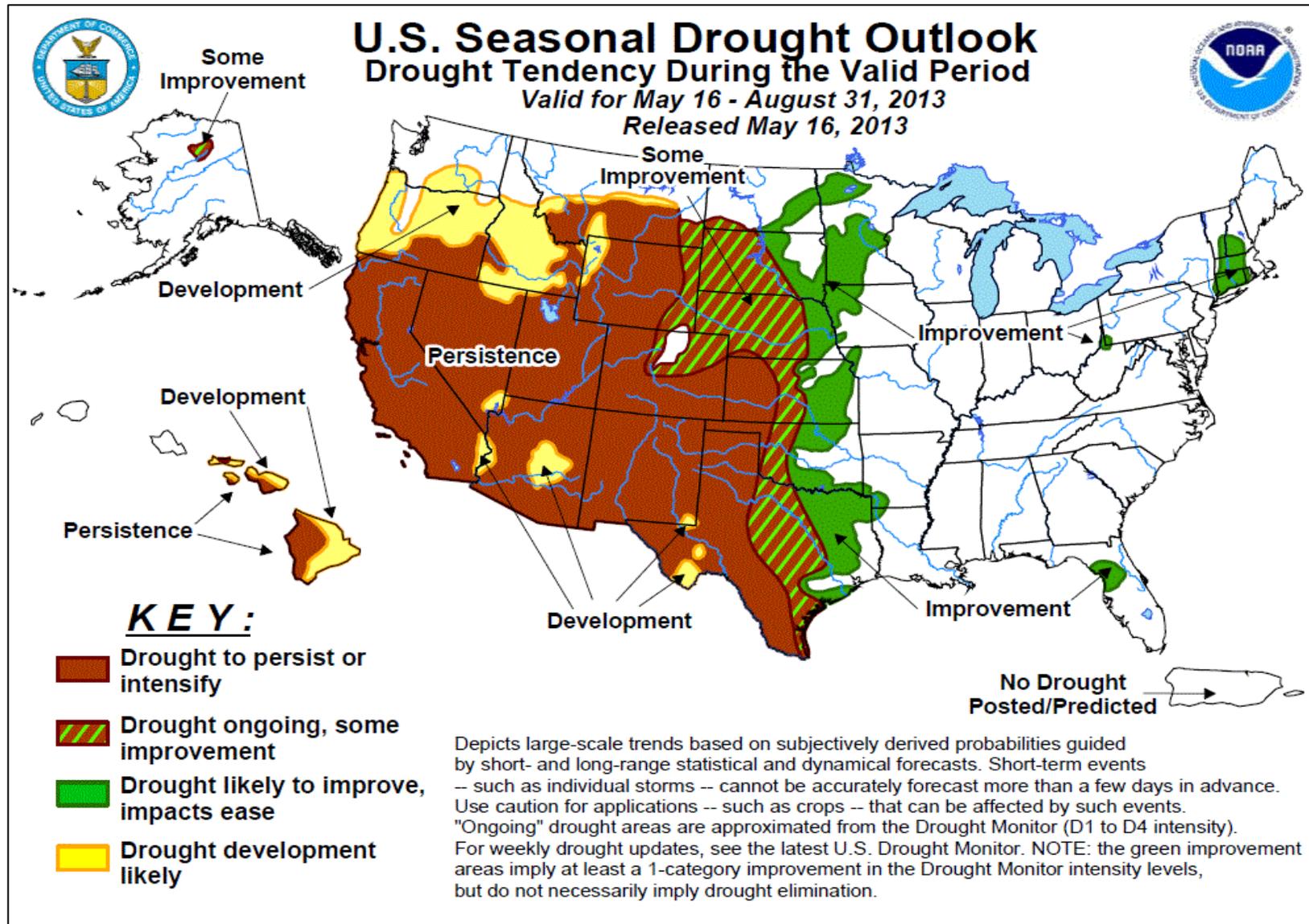
Table 3-13 POTTAWATOMIE COUNTY DROUGHT EVENTS 2006-2013 Data from the National Climatic Data Center (NCDC)	
Date	Description
Oct 2006- Jan 2007	Despite some rainfall the drought continued across much of western and central Oklahoma during October. The area was under severe to exceptional (D2-D4) drought conditions throughout the month. The worst conditions were in south central and southeast Oklahoma where drought conditions were in the extreme to exceptional (D3- D4) drought categories. Participation in January improved areas of the state and the moisture that saturated the ground ended the drought effects.

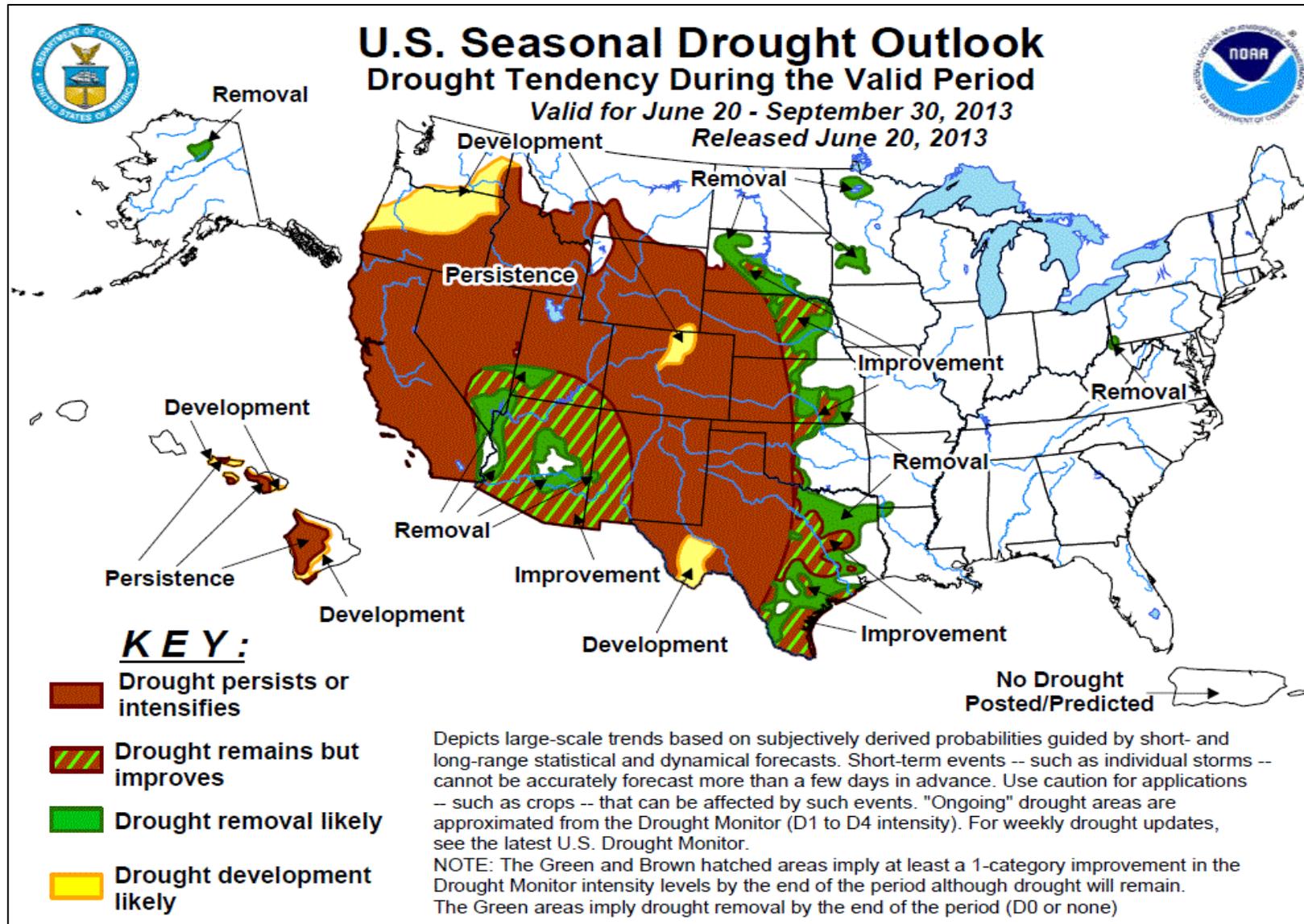
The effects of a drought on flow in streams and rivers, or on water levels in lakes and reservoirs, may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more after the drought begins due to aquifer availability but the results of a drought can be devastating particularly to farmers and ranchers in Pottawatomie County.

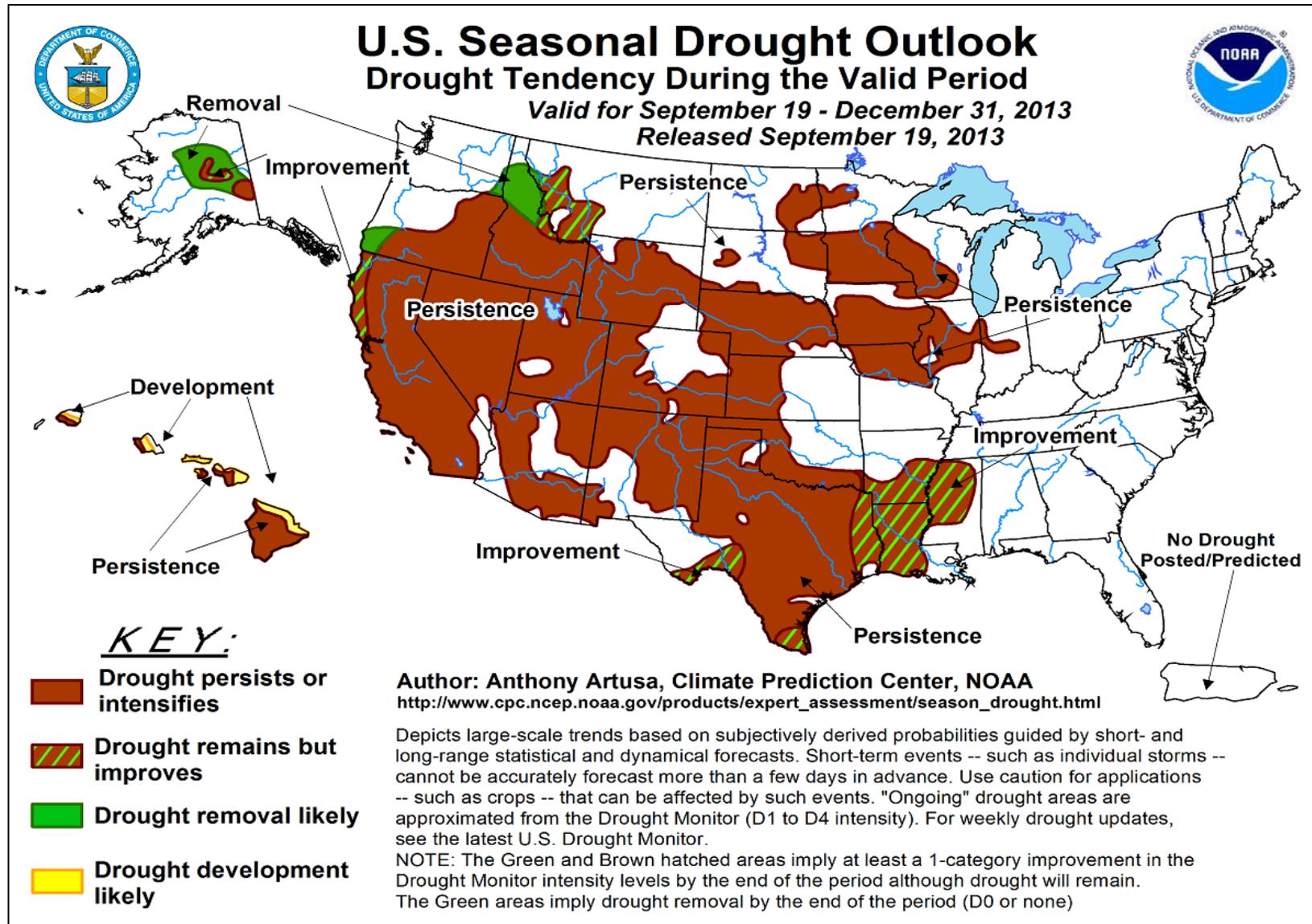
PROBABILITY OF FUTURE EVENTS

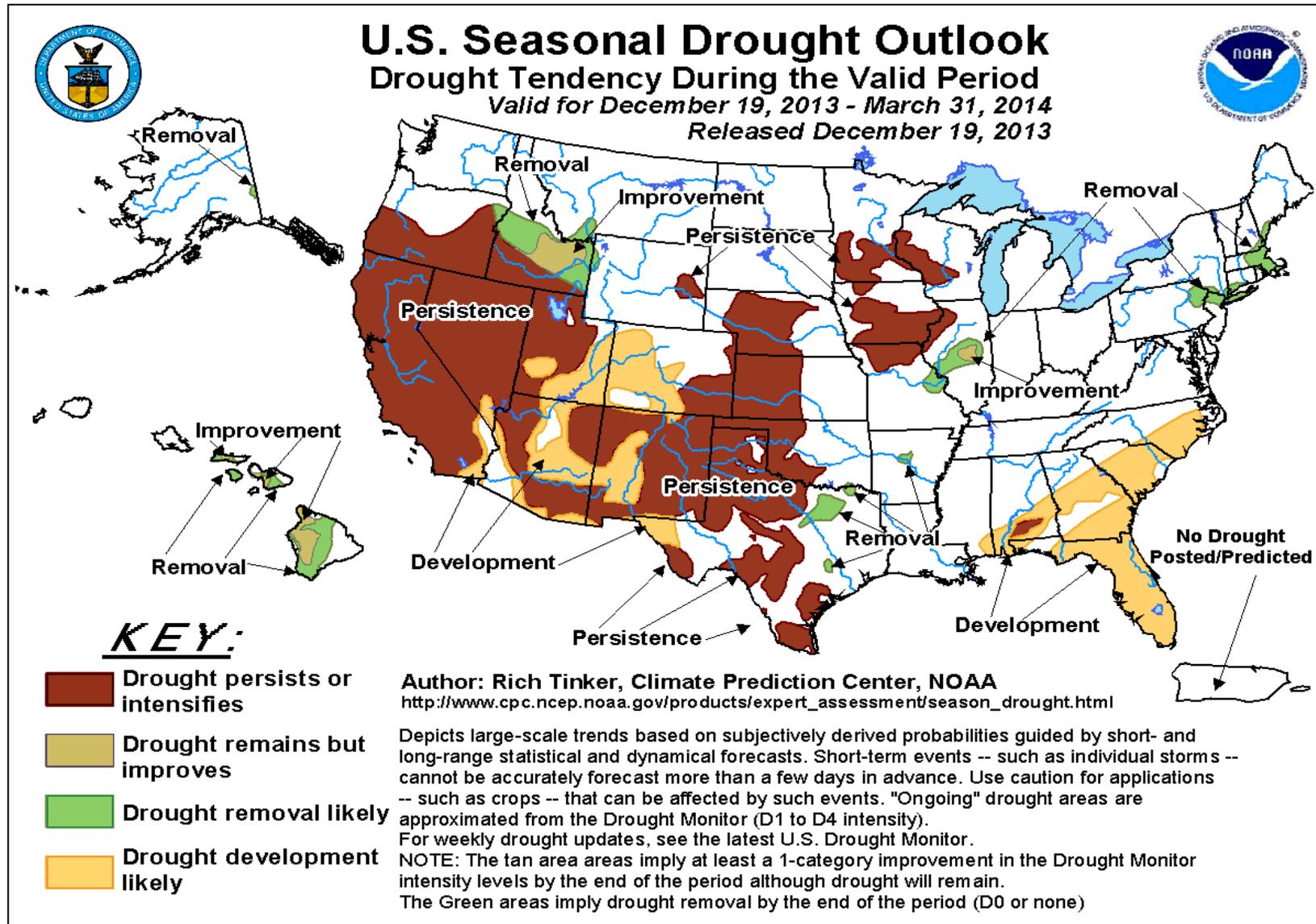
Based on recent history, the probability of future drought events occurring in Pottawatomie County is considered **“Likely”** for Pottawatomie County, all participating jurisdictions, school districts and Gordon Cooper Technology Center.

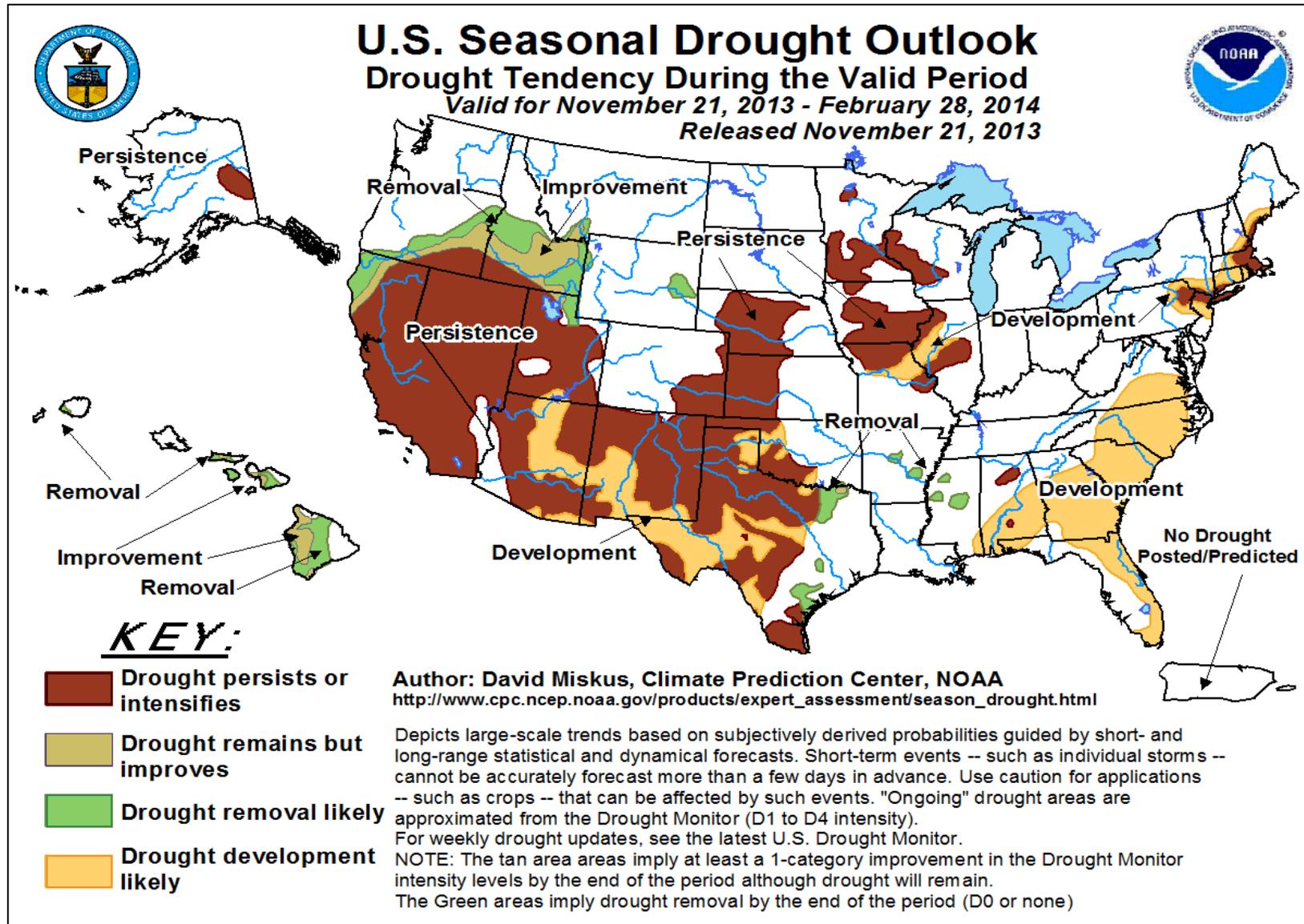


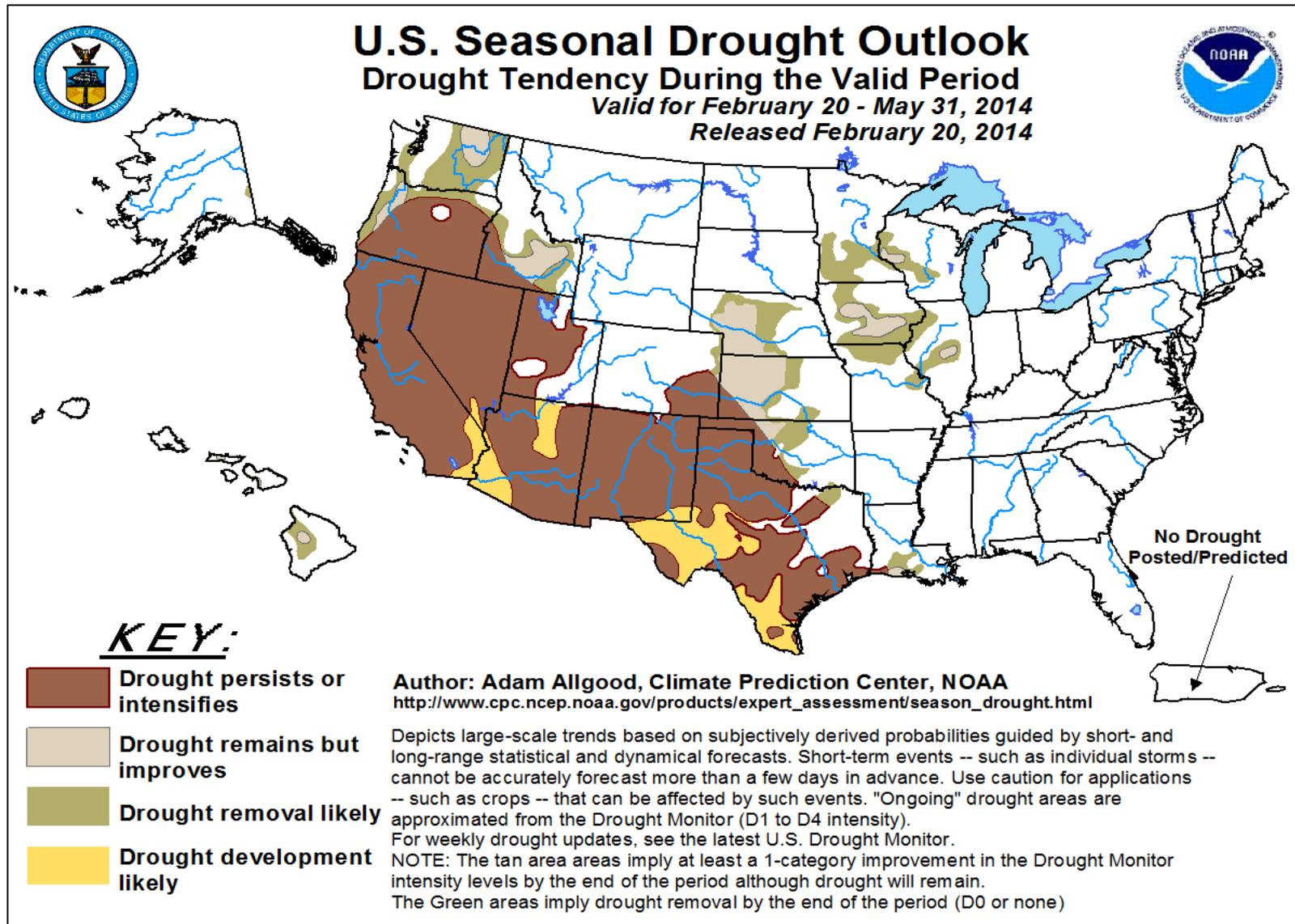


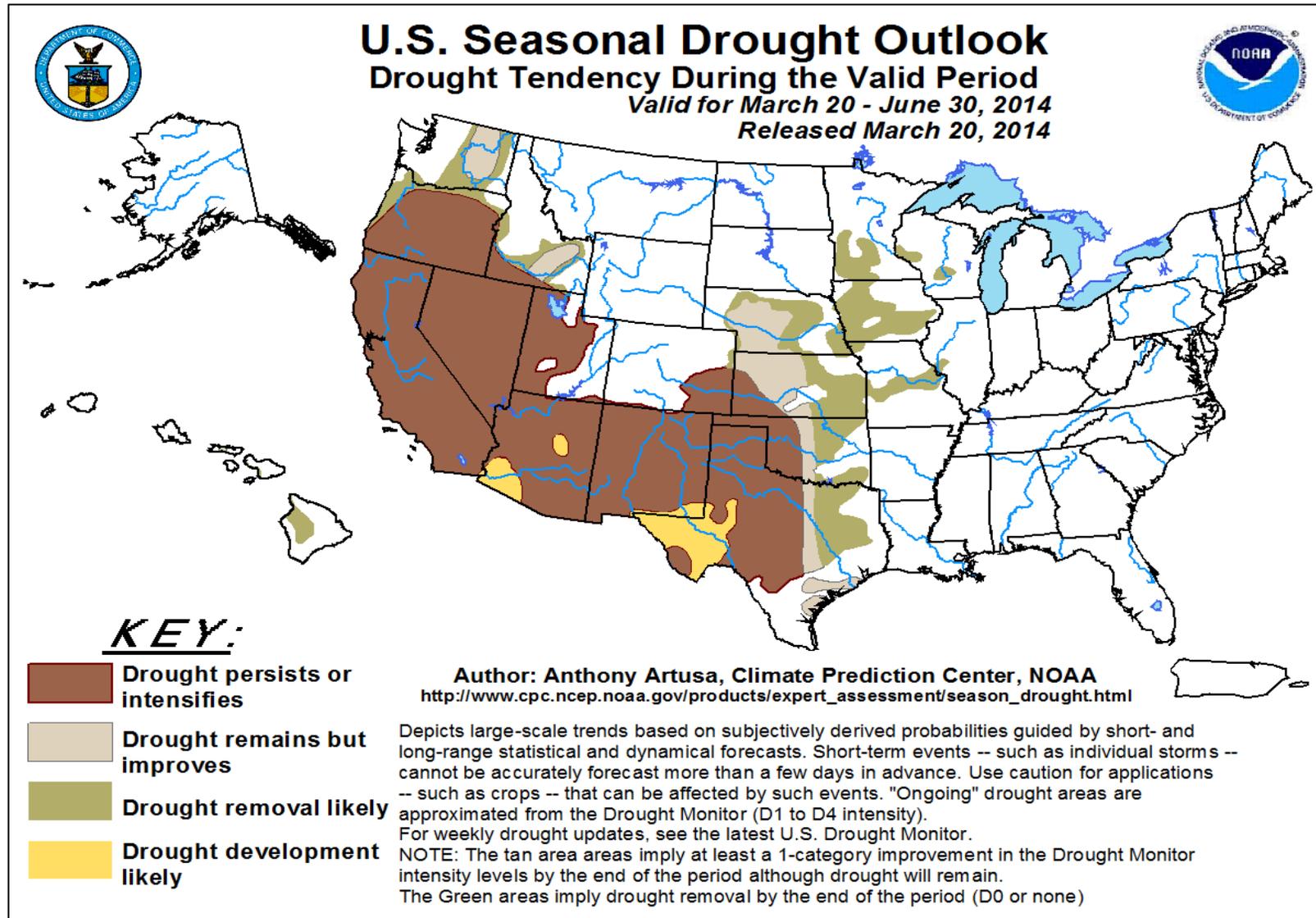


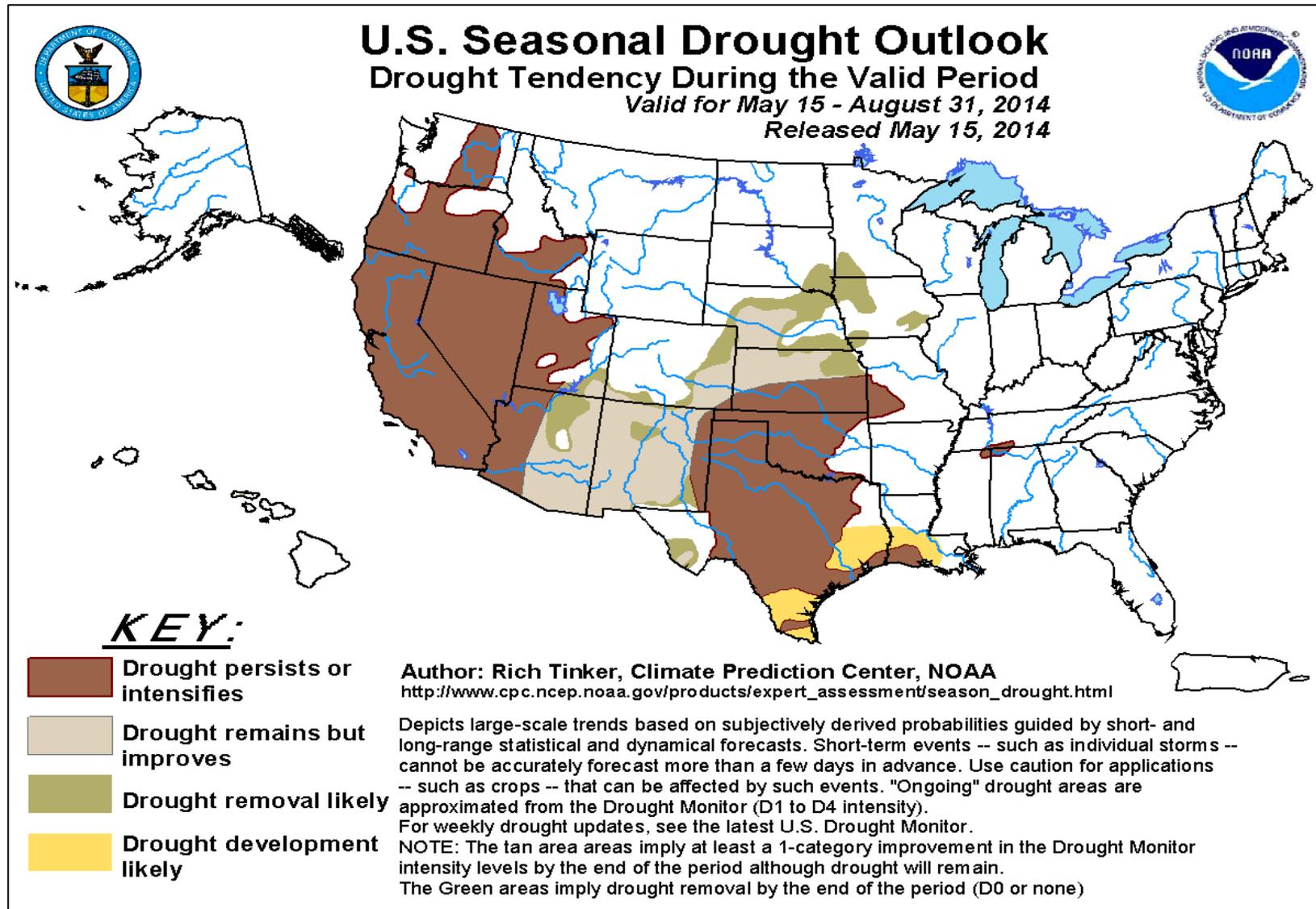


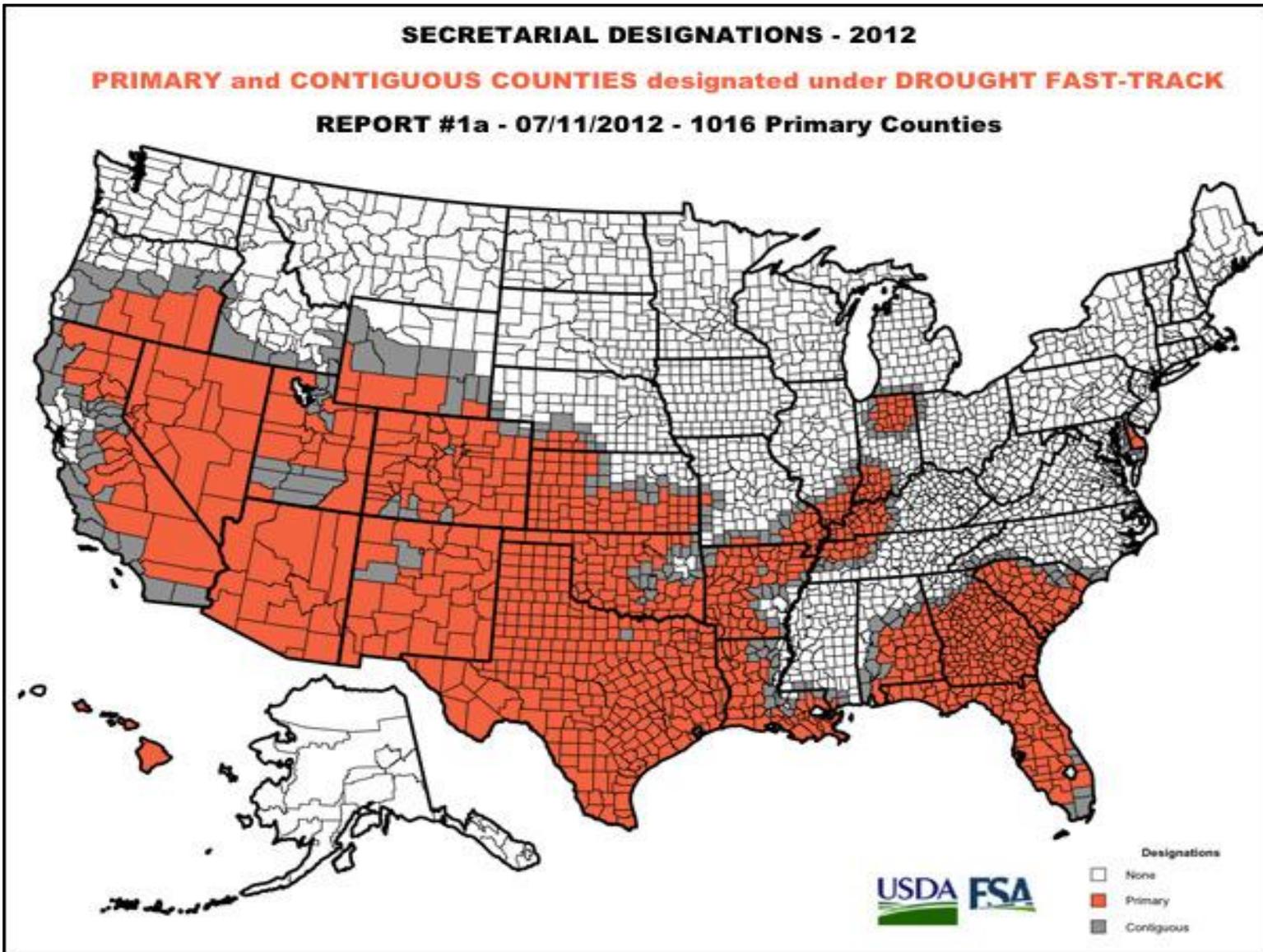












VULNERABILITY AND IMPACT

During the most recent droughts in Pottawatomie County, ponds and lakes lost large amounts of water threatening water supplies. Some businesses lost business due to the long drought period especially those with farm and ranch customers. These losses caused financial hardship and loss for those employers and employees in the areas affected.

The public school districts can also be affected by drought, although not as much as other parts (municipalities) of the county. The public schools with students in agricultural programs such as 4-H and FFA have to deal with drought situations through their student projects. Some projects may be lost or severely damaged due to lack of rain. School buildings are not typically affected by drought. Schools typically spend huge amounts of money manicuring their ball fields. A drought situation where watering is restricted or not allowed could become a very expensive loss for the school district.

Unincorporated and the smaller incorporated towns often make no special considerations unless their source of water is provided by larger jurisdictions. Some jurisdictions and the county may establish water restrictions during drought periods if conditions threaten the water supply for potable uses and fire protection.



Shawnee operates their own water department with water from Shawnee Twin Lakes and Wes Watkins reservoir. The map below shows those jurisdictions and the county area served by various rural water districts:

Tecumseh gets water from Tecumseh Lake, and Wes Watkins reservoir.

Earlsboro and **Johnson** get water from the Tri-County Rural Water District #2.

Maud has a public water system that has four wells. Individual wells are not permitted within Maud City limits.

St. Louis residents get their water through the St. Louis Utility Company Inc. and water wells.

Brooksville, Macomb, Pink, and Tribbey, get their water through individual water wells.

Asher residents get their water from the Asher Utility Development Authority through Rural Water District #3.

Wanette citizens receive their water from the Wanette Public Works Authority through and Rural Water District #3.

Small jurisdictions in Pottawatomie County can be hit especially hard, during a drought. Many depend on water wells from ground water and aquifers for their water or rural water districts. Even some rural water districts obtain their water through water wells which is then sold to their customers. During drought, those sources may become low in capacity. In some instances, potable water or bottled water may have to be brought in for use by residents.

There are additional effects that created dry vegetation resulting in wild land fires that caused major losses to both wild land and property in the county. During droughts, dry, cracking soil can also cause water lines to break causing additional unanticipated water shortages. Highway and road surfaces break or soften causing hazardous driving conditions and forcing people to find alternate routes as repairs are undertaken. In Pottawatomie County, the cross country commercial traffic could be severely affected by damaged roadways. School buses are often victims of these road failures. Water sources tend to dry up or become so low that water rationing or water hauling becomes necessary. Recreational facilities may be shut down due to low water causing loss of revenue.

CONCLUSION

Drought is a concern for Pottawatomie County due to the major agricultural activity and water availability in some rural areas. Water hauling could be necessary in Pottawatomie County during a prolonged drought condition or if a major water line from one of the lakes broke. The most vulnerable population in Pottawatomie County, in addition to agricultural and drinking water, are those that might require large volumes of water, such as industries, landscapers, fire fighters, and the people dependent upon them.



SOURCES

Local Emergency Management Records

National Climatic Data Center (NCDC)

www.ncdc.noaa.gov/stormevents/

US Drought Monitor Archives

www.droughtmonitor.unl.edu/archive.html

Climate Prediction Center

www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.htm

United States Department of Agriculture

<http://www.usda.gov/img/content/Disaster-Fast-Track.jpg>