

Drought Impacts and Responses

2015 Kansas Environmental Conference
August 19, 2015

- **Factors Contributing to Drought**
 - **Precipitation**
 - **Temperature**
 - **Time/Duration**

Drought

- Drought Types
- Drought Impacts
- Drought Activities
- Planning in Regard to Drought

Topics today

- **Meteorological** drought - a period of below average precipitation.
- **Agricultural** drought - inadequate water supply to meet the needs crops and other agricultural operations such as livestock.
- **Hydrological** drought - deficiencies in surface and subsurface water supplies, measured as streamflow and lake, reservoir, and groundwater levels.
- **Socioeconomic** drought - impacts health, well-being, and quality of life, or has an adverse economic impact on a region.

Drought types

U.S. Drought Monitor CONUS

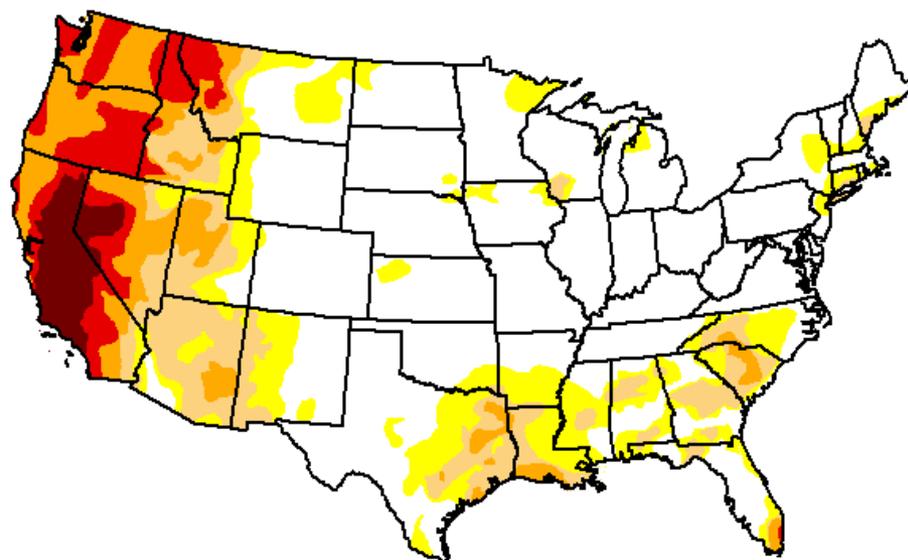
August 11, 2015

(Released Thursday, Aug. 13, 2015)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|-------|-------|-------|-------|-------|------|
| Current | 56.13 | 43.87 | 28.92 | 17.87 | 9.18 | 3.00 |
| Last Week 8/4/2015 | 57.71 | 42.29 | 27.13 | 17.44 | 8.79 | 2.83 |
| 3 Months Ago 5/12/2015 | 44.16 | 55.84 | 34.61 | 17.68 | 7.19 | 3.14 |
| Start of Calendar Year 12/31/2014 | 53.20 | 46.80 | 28.68 | 16.93 | 8.96 | 2.54 |
| Start of Water Year 9/30/2014 | 52.22 | 47.78 | 30.57 | 18.66 | 9.41 | 3.85 |
| One Year Ago 8/12/2014 | 52.81 | 47.19 | 33.61 | 22.03 | 10.24 | 3.79 |



Intensity:

| | |
|---|--|
|  D0 Abnormally Dry |  D3 Extreme Drought |
|  D1 Moderate Drought |  D4 Exceptional Drought |
|  D2 Severe Drought | |

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author(s):

Brian Fuchs

National Drought Mitigation Center



<http://droughtmonitor.unl.edu/>

U.S. Drought Monitor

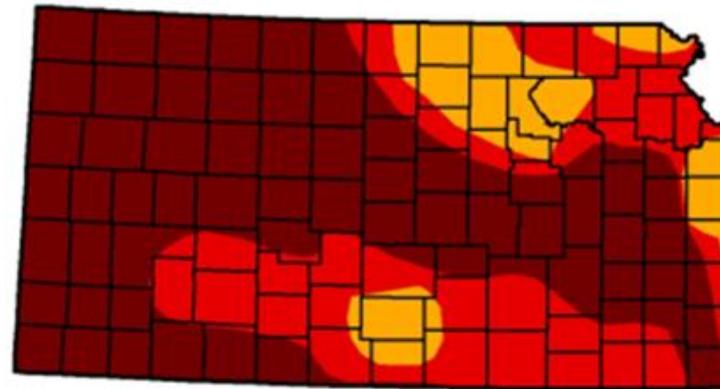
Kansas

September 4, 2012

Valid 7 a.m. EST

Drought Conditions (Percent Area)

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|-------|--------|--------|--------|-------|-------|
| Current | 0.00 | 100.00 | 100.00 | 100.00 | 88.34 | 60.61 |
| Last Week (08/28/2012 map) | 0.00 | 100.00 | 100.00 | 100.00 | 90.14 | 55.18 |
| 3 Months Ago (06/05/2012 map) | 13.24 | 86.76 | 57.99 | 8.77 | 0.03 | 0.00 |
| Start of Calendar Year (12/27/2011 map) | 42.48 | 57.52 | 47.15 | 23.21 | 12.79 | 0.22 |
| Start of Water Year (09/27/2011 map) | 16.39 | 83.61 | 66.03 | 48.78 | 28.54 | 17.63 |
| One Year Ago (08/30/2011 map) | 27.92 | 72.08 | 62.31 | 49.78 | 31.86 | 17.46 |



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

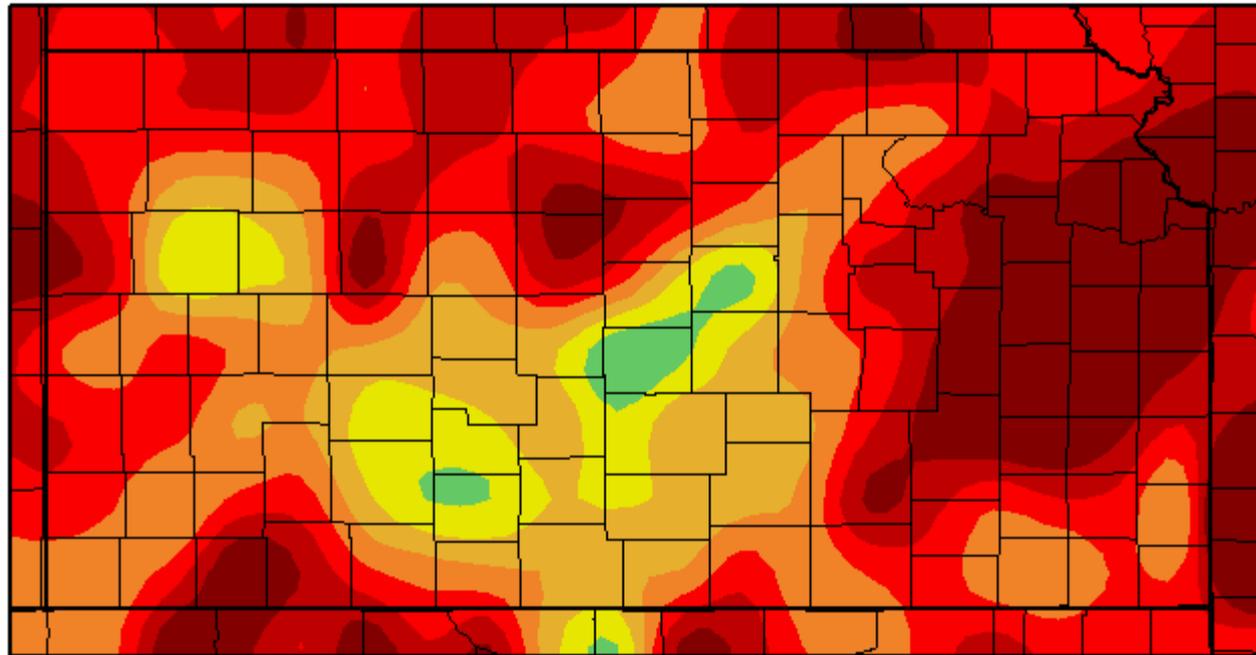
<http://droughtmonitor.unl.edu>



Released Thursday, September 6, 2012
 Brian Fuchs, National Drought Mitigation Center

Departure from Normal Precipitation (in)

8/1/2011 – 7/31/2014

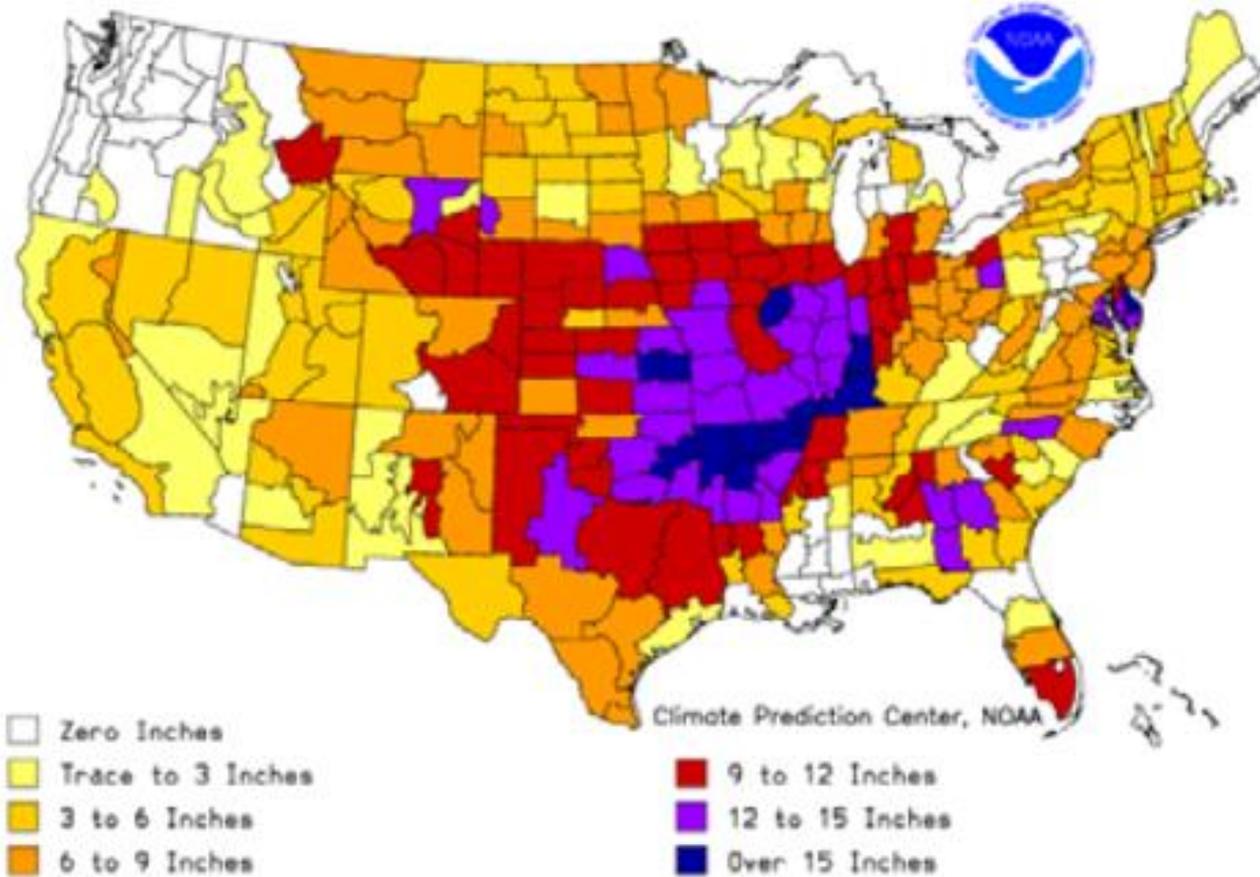


Generated 8/1/2014 at HPRCC using provisional data.

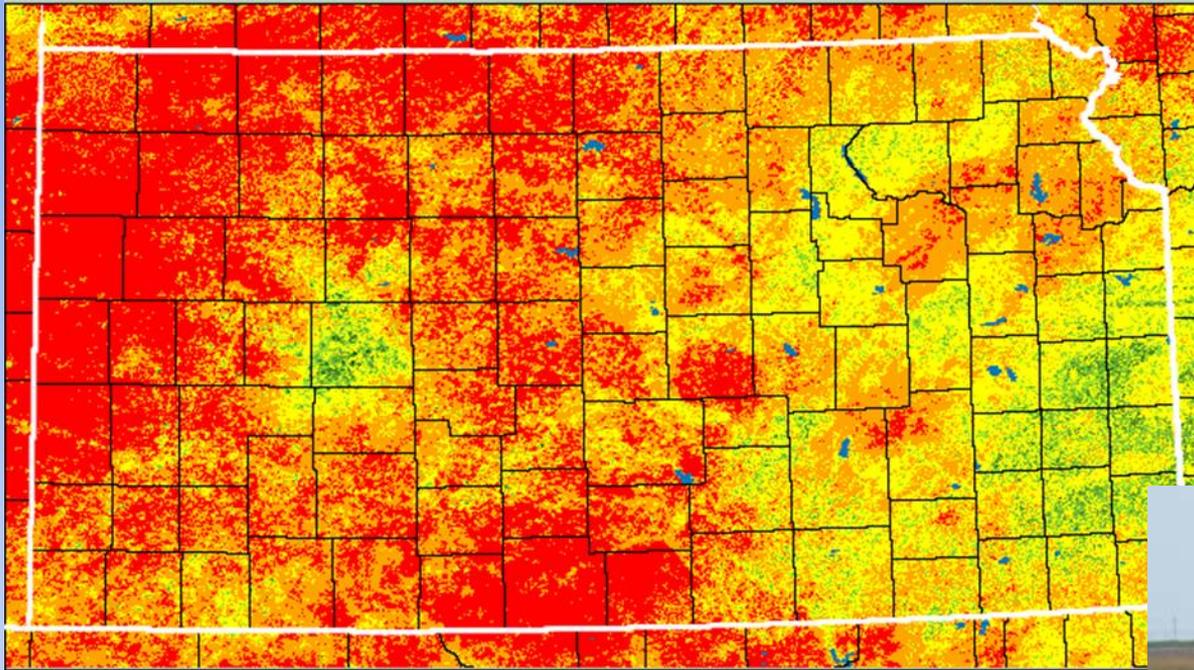
Regional Climate Centers

Meteorological drought

Additional Precip. Needed (In.) to Bring PDI to -0.5
Weekly Value for Period Ending AUG 4, 2012
Long Term Palmer Drought Severity Index (PDI)



Meteorological drought



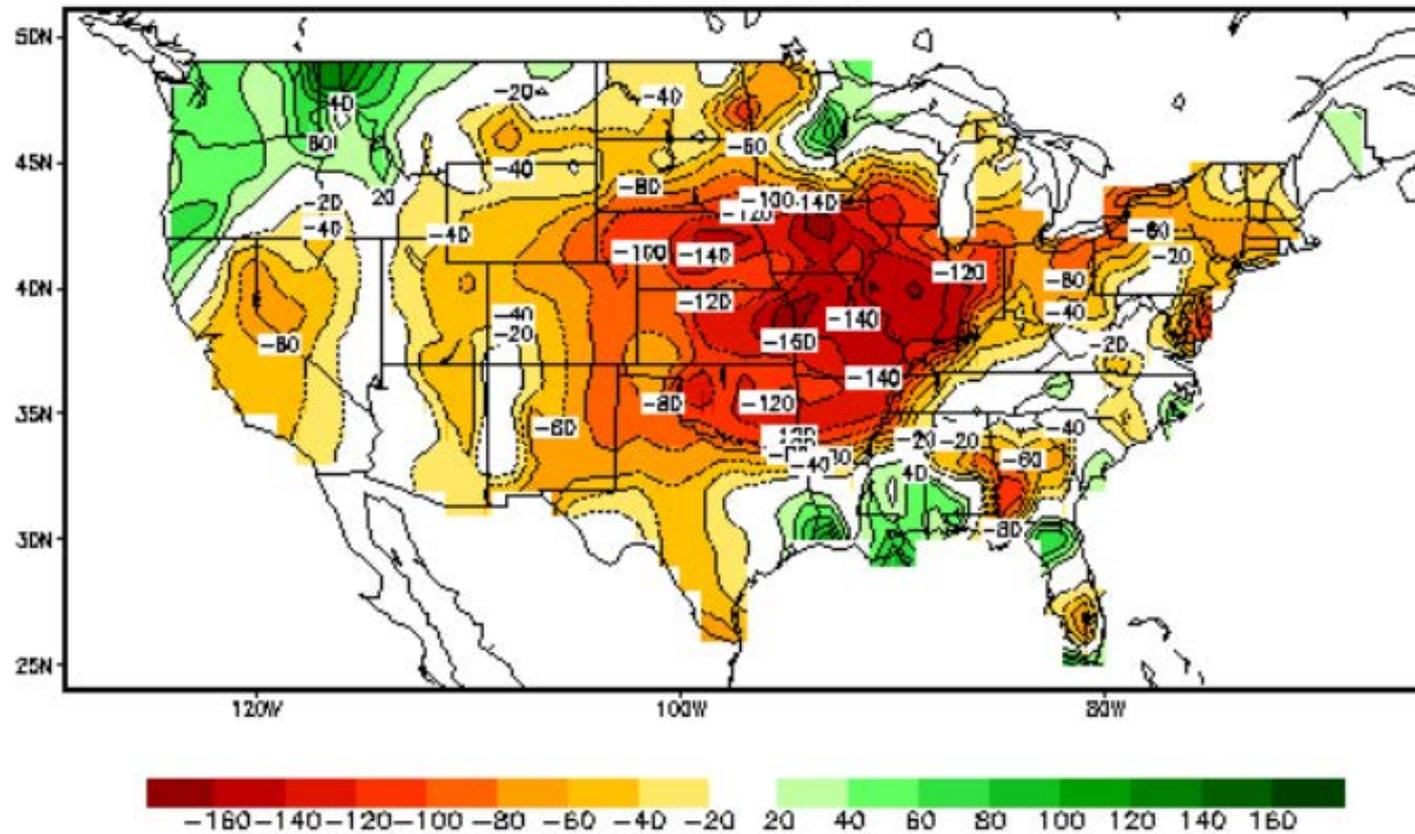
Emergency Warning Watch Fair Good Condition Water Snow/Cloud

  
Kansas Applied Remote Sensing Program The University of Kansas



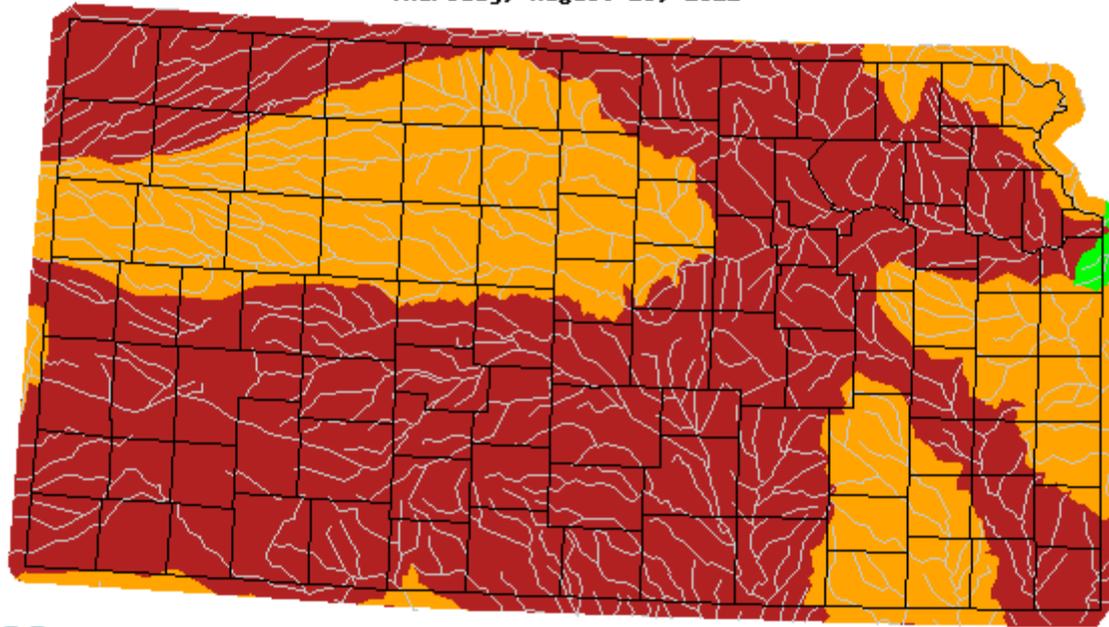
Agricultural

Calculated Soil Moisture Anomaly (mm) JUL 25, 2012



low soil moisture or low crop moisture

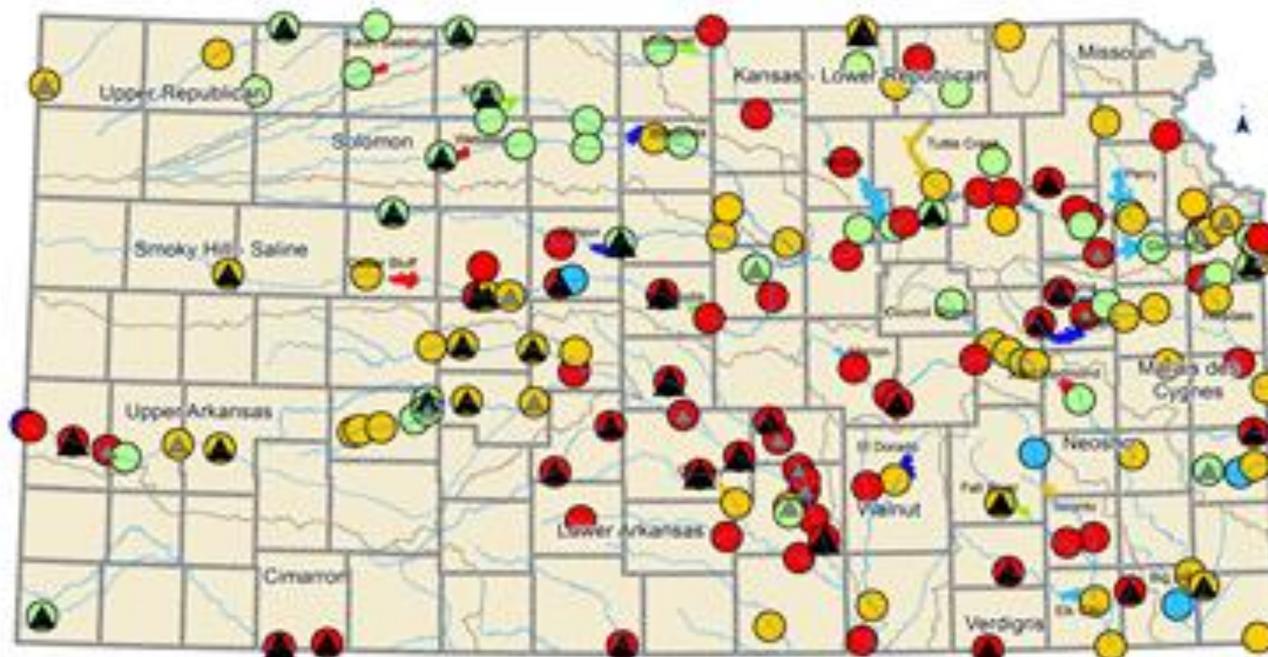
Thursday, August 23, 2012



| Explanation - Percentile classes | | | | | | | |
|----------------------------------|---|---|--|---|---|---|---|
| |  |  |  |  |  |  |  |
| Low | <10 | 10-24 | 25-75 | 76-90 | >90 | High | |
| | Much below normal | Below normal | Normal | Above normal | Much above normal | | |

Hydrological - streamflow

Kansas Historic Low Flows 2012



December 2012

2012 Historic Low Streamflows

▲ Record or tie low flow -10 to 30 year record ▲ Tie record low flow - 30 year record ▲ Record Low Flow -30 year record or more

Streamflow Percentile

● Much Below Normal ● Below Normal ● Normal ● Above Normal ● Much Above Normal

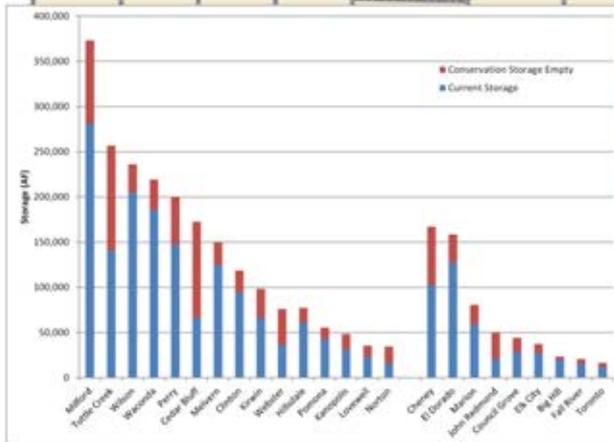
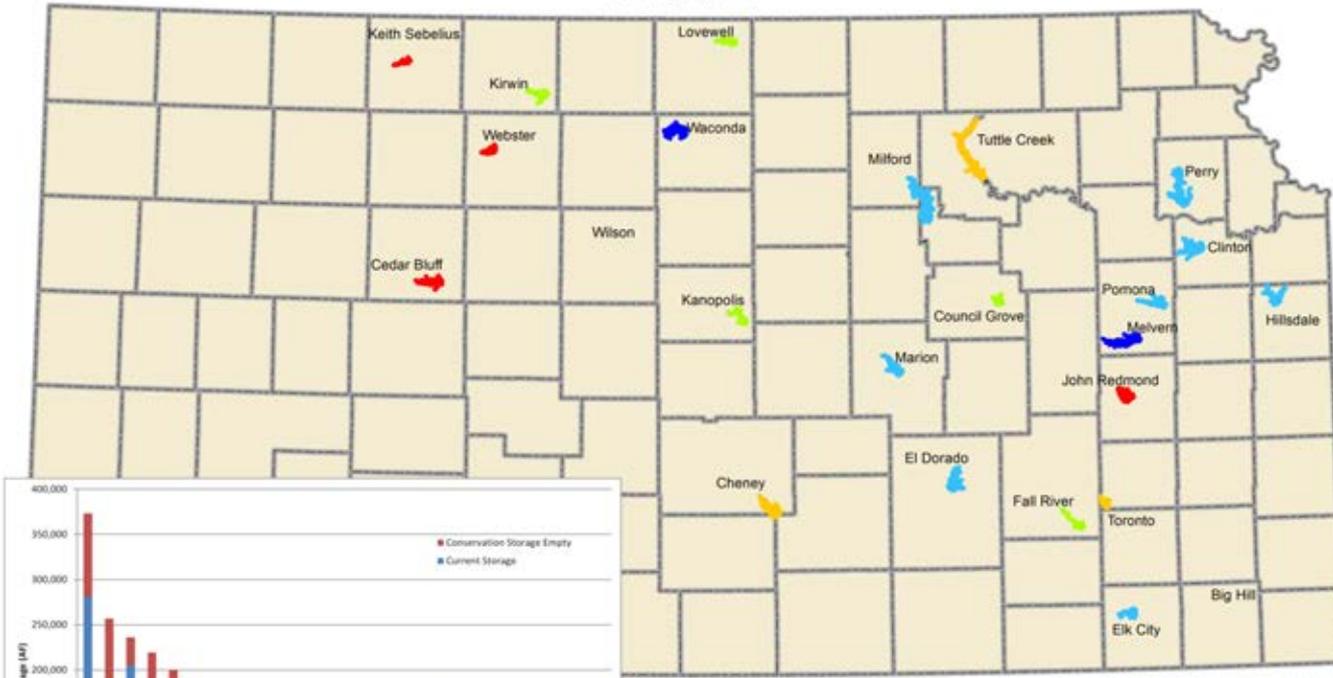
Reservoir Conservation Pool Percentage

■ 39 - 50 ■ 51 - 60 ■ 61 - 70 ■ 71 - 80 ■ 81 - 87



Federal Reservoir Status

January 8, 2013

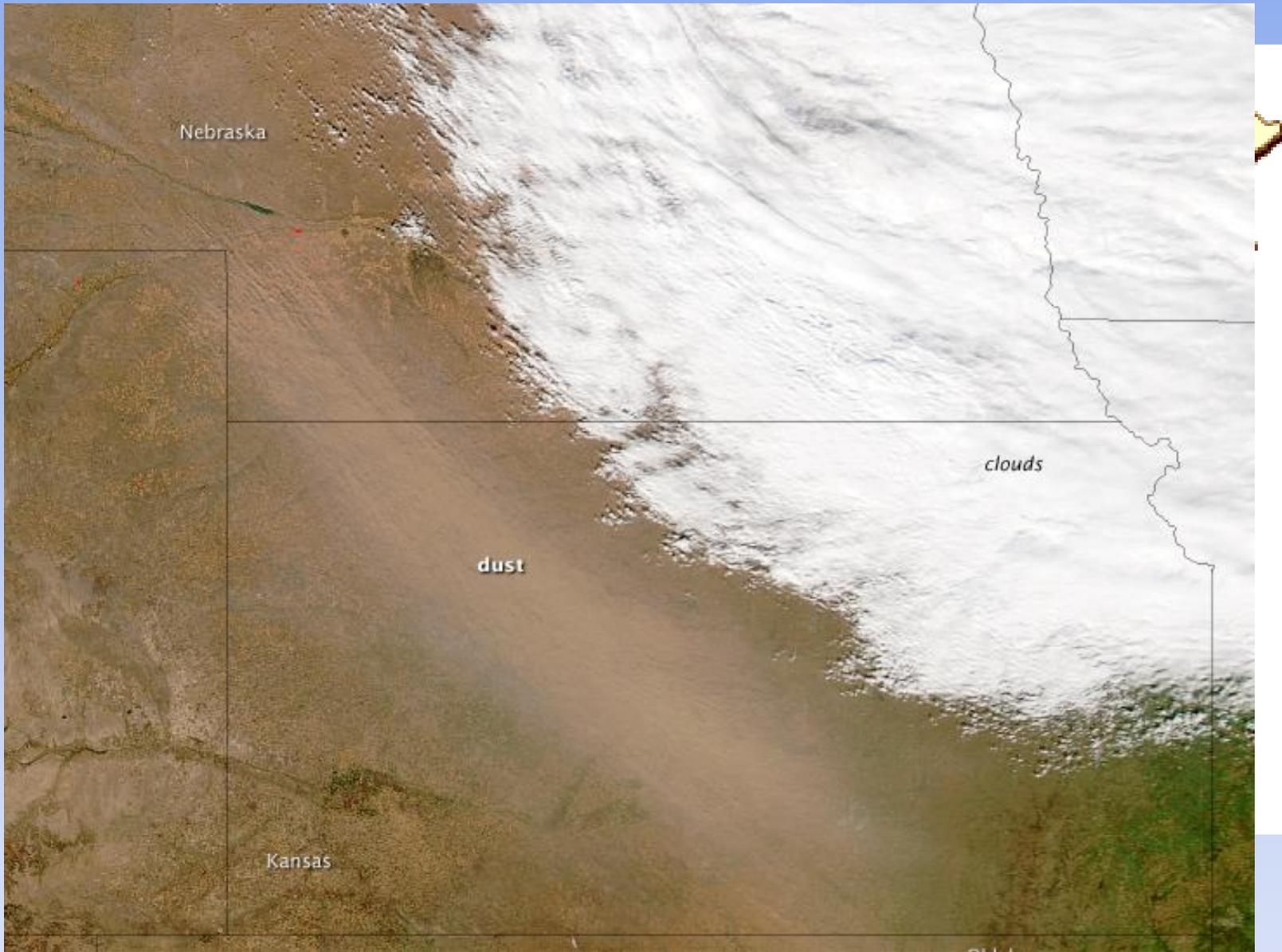


Percent of Conservation Pool



January 9, 2013 Kansas Water Office

Hydrological – reservoir levels



Source: Public Broadcasting System American Experience "Surviving the Dust Bowl"
www.pbs.org/wgbh/amex/dustbowl/maps/index.html

Drought affects

- **Wildlife habitat**
- **Aquatic habitat and water temperature**
- **Vegetation**
- **Wildfires – ozone, nitrogen oxides, VOCs**
- **Dust- visibility, air quality (breathing, heart and lung functions)**
- **Water resources for general life, oil and gas activities, food production, energy production**

- **Recreation**
- **Water quality deterioration**
- **Soil compaction, decreasing moisture absorption/increasing runoff and erosion, some soil types**
- **Crop production**
- **Livestock health and numbers**

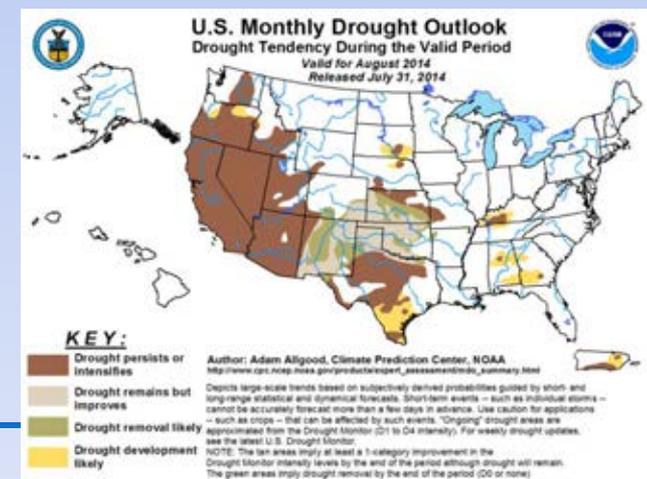
Drought affects

- Monitoring
- Actions
- Reactions - immediate
- Reactions - future

Drought activities

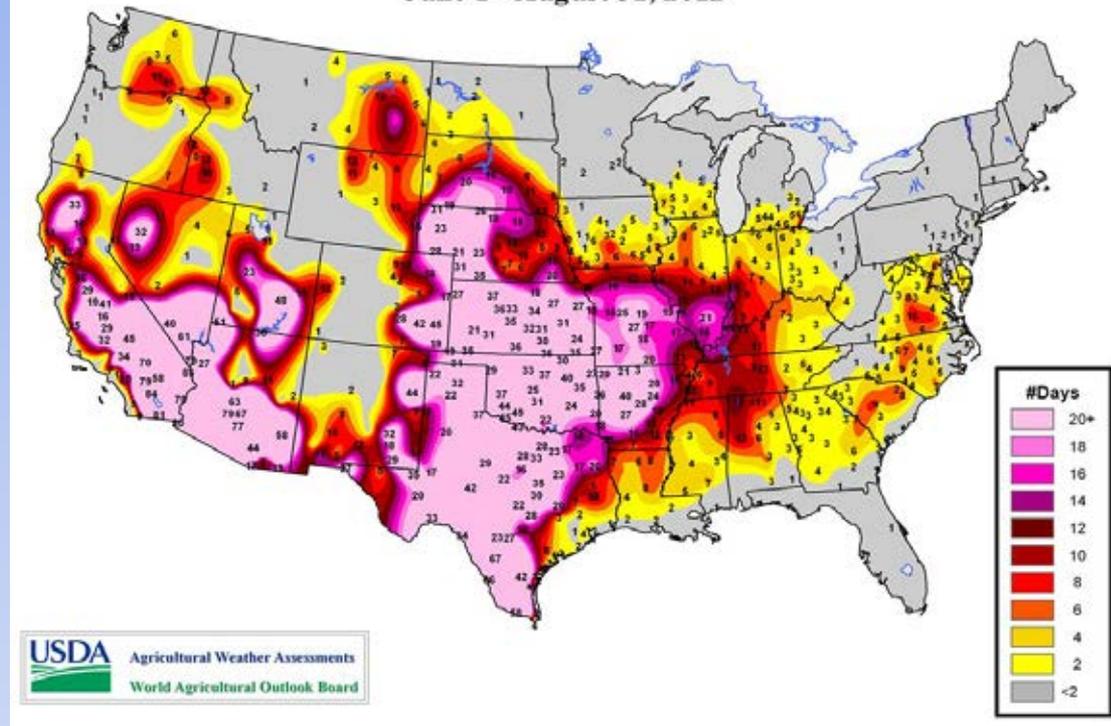
- Precipitation
- Streamflow including MDS administration
- Reservoir levels and storage
- Vegetative Health
- Soil Moisture
- U.S. Drought Monitor
- Other: PWS Conservation Measures, Wildfire, Burn Bans, Impacts
- Future Outlook

Drought monitoring



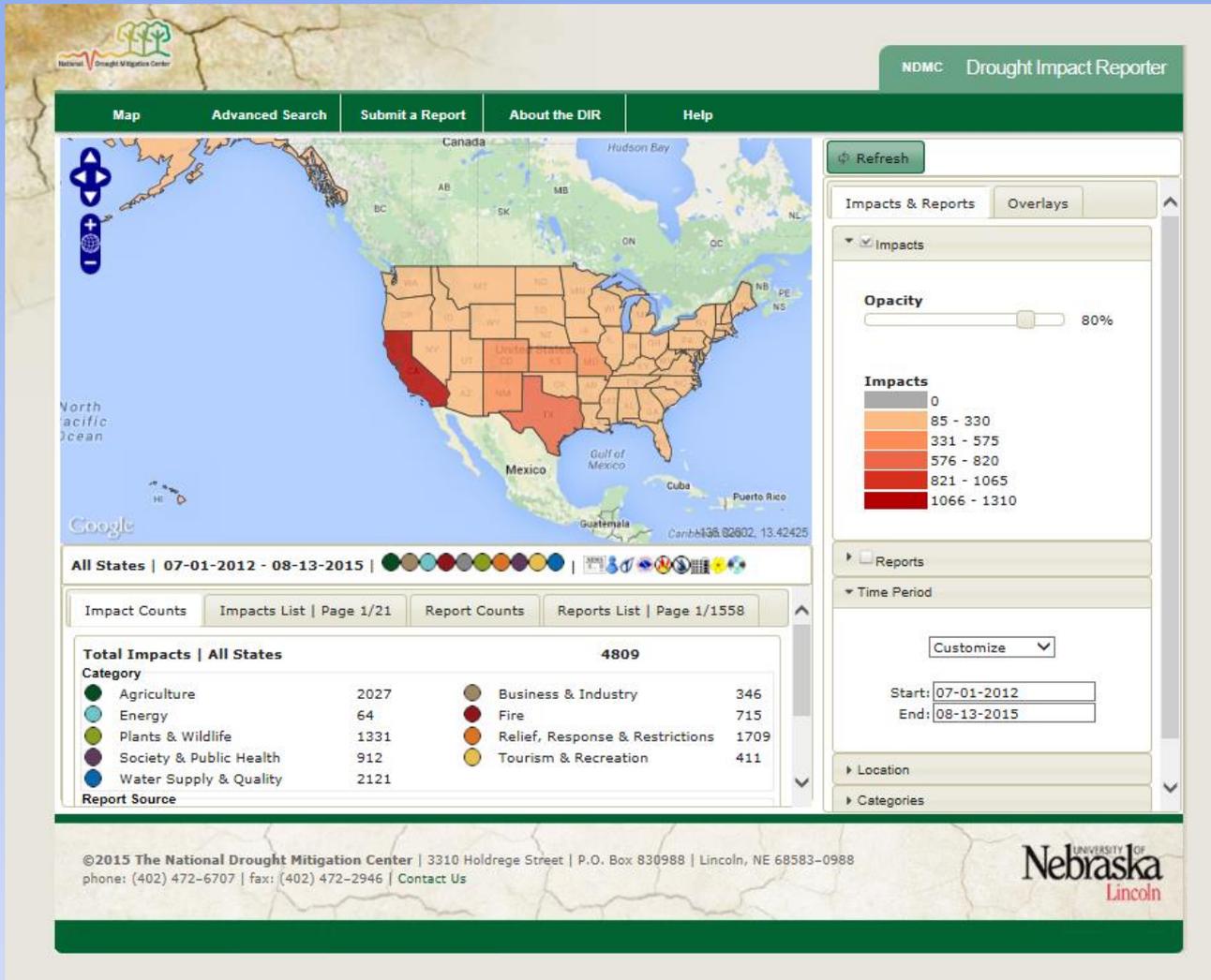
Number of Days $\geq 100^\circ\text{F}$

June 1 - August 31, 2012



- Intensity
- Duration
- Areal Extent

Drought Conditions



Drought Impacts

- No one definition of drought
- No one-size-fits-all drought index or indicator, or trigger

Drought indicators

- Monitoring **AND** Forecasting considered
- Access **timely** data (including *impacts*) and “value added” *information*
- **Analysis** of data to “trigger” set actions
- **Tool** for decision makers at local level
 - Drought risk assessment and **planning**
 - **Education** and Awareness

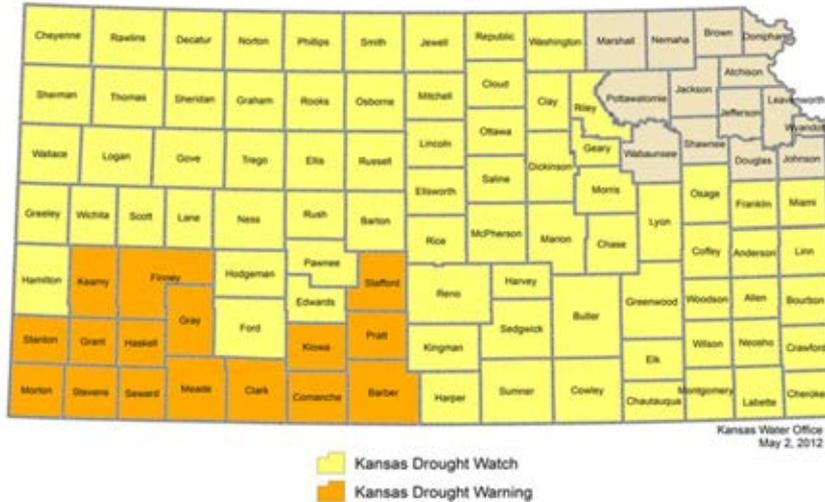
Drought determinations

- **Drought Watch: Moderate Drought**
- **Drought Warning: Severe Drought**
- **Drought Emergency: Extreme or Exceptional Drought**

- Issued by Governor's Executive Order by county
- These stages do not by themselves trigger specific response declaring opens up some mitigation
- Are indications to local and state responders

Response to conditions
Kansas drought stages

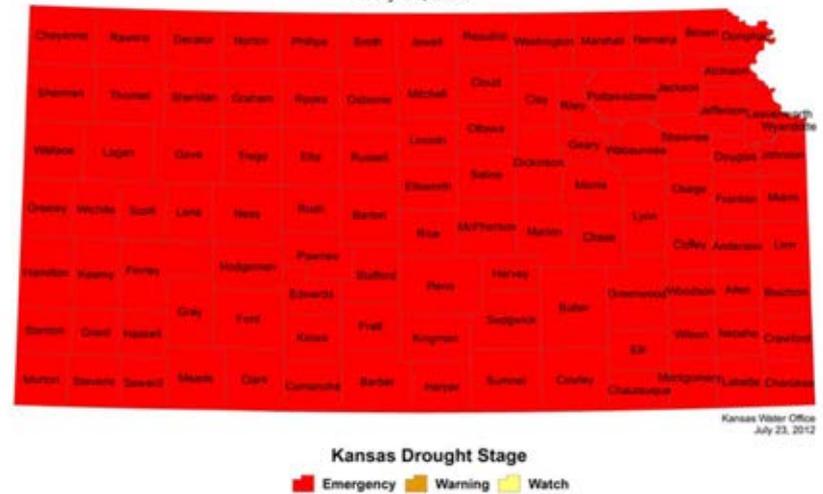
Kansas Drought Declarations
May 2012



Kansas Drought Declarations
July 2012

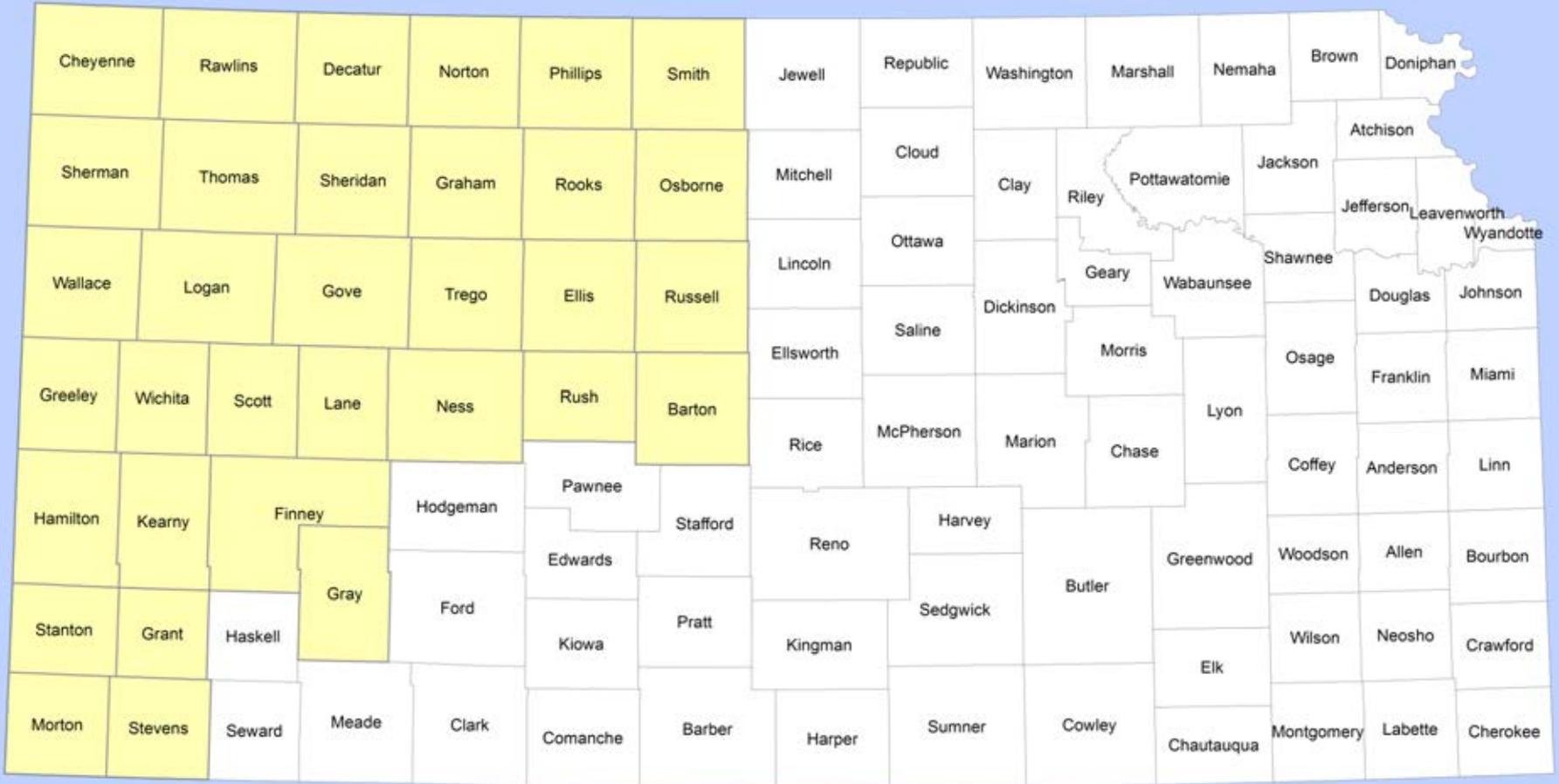


Kansas Drought Declarations
July 25, 2012



Kansas drought declarations

Kansas Drought Declarations June 30, 2015



Kansas Drought Stage

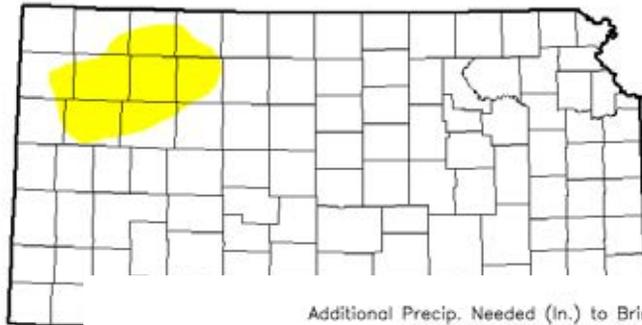
Watch

Kansas Water Office, June 18, 2015

U.S. Drought Monitor Kansas

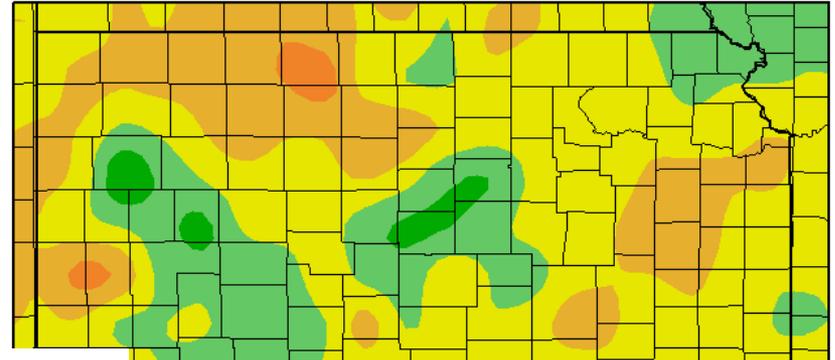
August 11, 2015
(Released Thursday, Aug. 13, 2015)
Valid 8 a.m. EDT

Percent of Normal Precipitation (%)
8/13/2012 – 8/12/2015

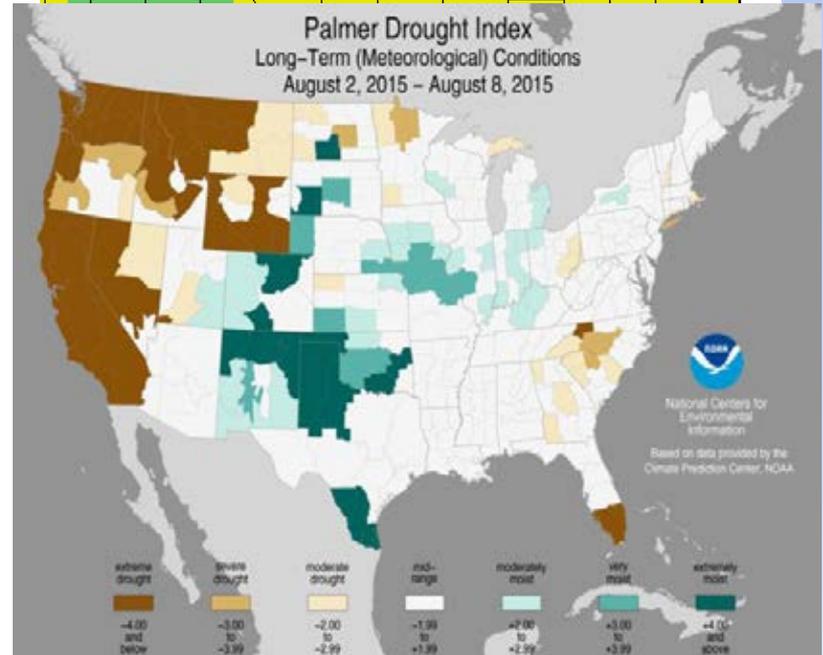
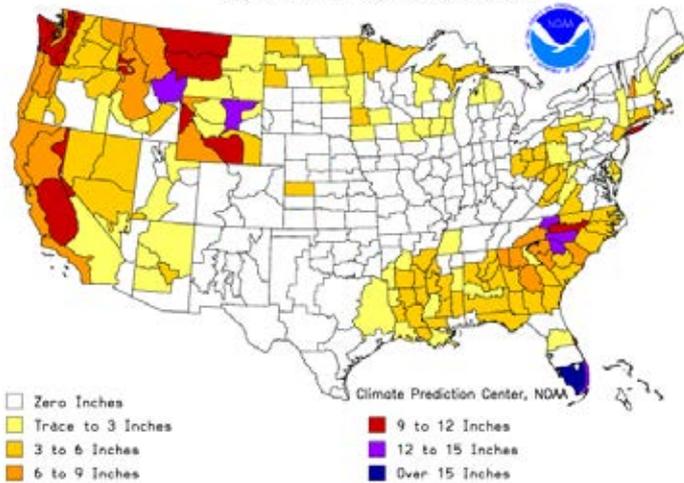


| |
|---|
| Current |
| Last Week 08/08/15 |
| 3 Months Ago 5/12/2015 |
| Start of Calendar Year 12/02/2014 |
| Start of Water Year 9/02/2014 |
| One Year Ago 8/12/2014 |

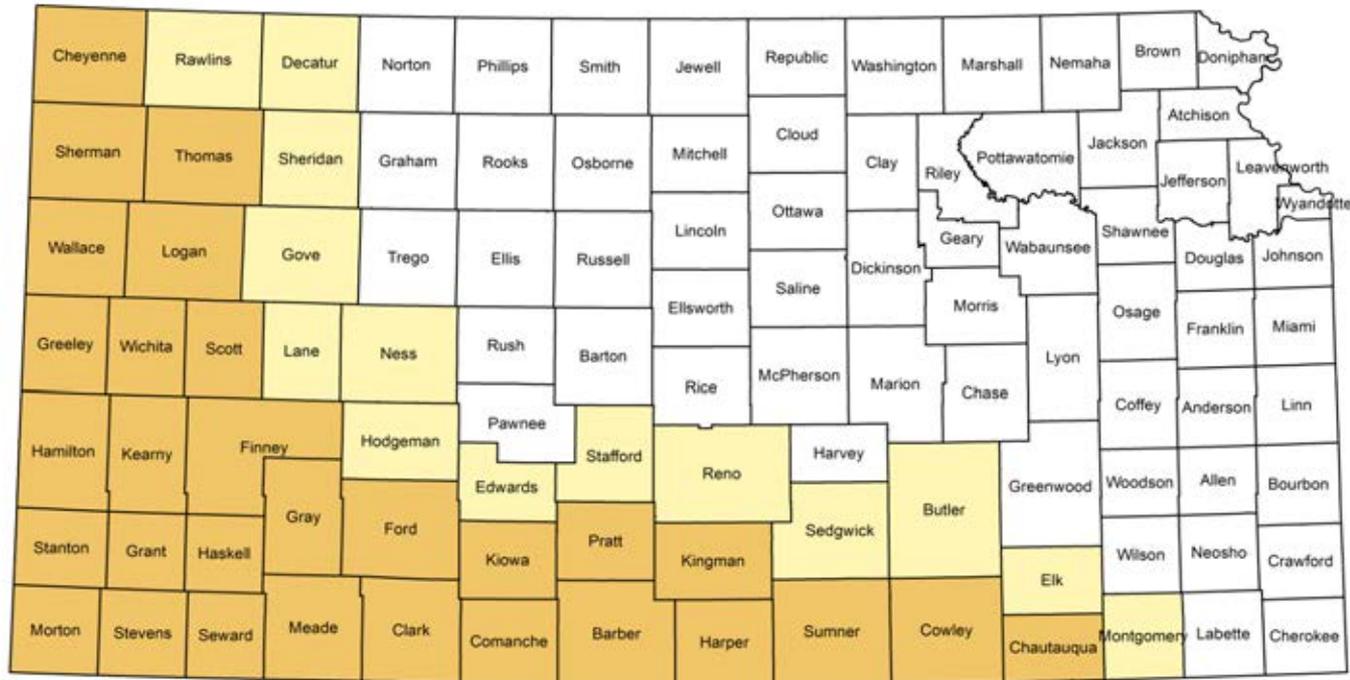
Intensity
 00 Abnol
 01 Mod
 02 Sevr
 The Drought M



Additional Precip. Needed (in.) to Bring PDI to -0.5
Weekly Value for Period Ending AUG 8, 2015
Long Term Palmer Drought Severity Index (PDI)



Federal Drought Disaster 2015



Kansas Water Office
June 26, 2015

USDA Designations

Primary (30)
 Contiguous (14)

2015 drought designations - USDA

- Kansas Water Plan
- Governor's Drought Operations Plan
- Local Water Conservation and Emergency Plans
- 50 Year Vision for Water In Kansas

Future planning for drought

**OCTOBER 2013 CALL TO ACTION:
PURPOSE AND NEED FOR A LONG-
TERM VISION FOR THE FUTURE OF
WATER SUPPLY IN KANSAS**

50 Year Vision for Water

VISION

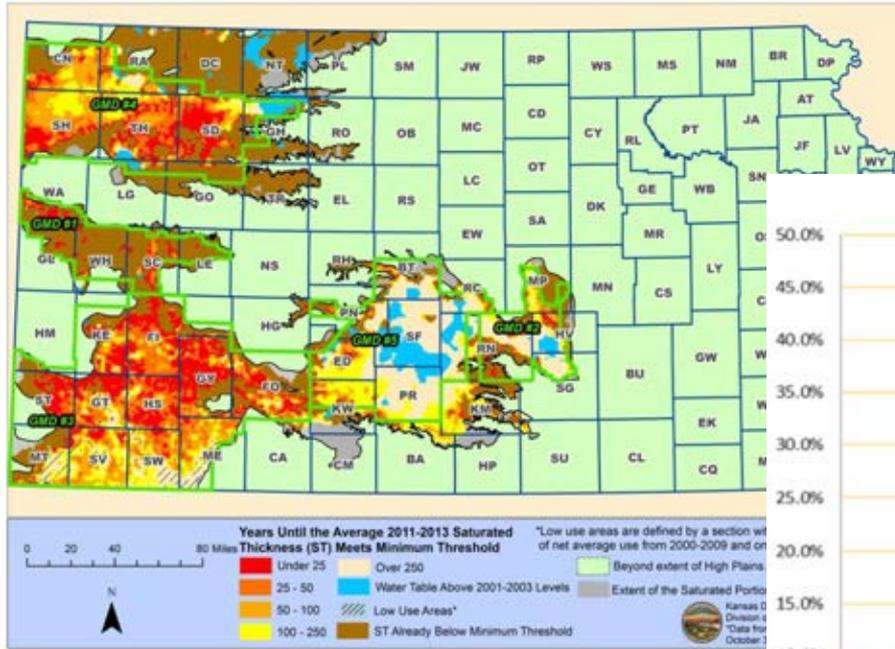
Kansans act on a shared commitment to have the water resources necessary to support the **state's social, economic and natural resource** needs for current and future generations.

MISSION

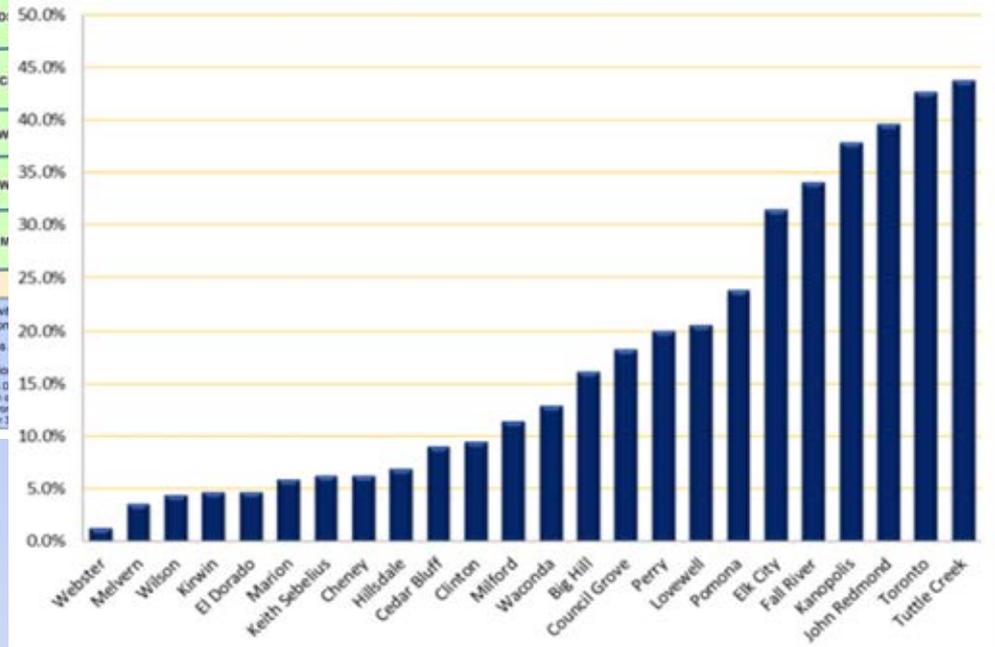
Provide Kansans with the framework, policy and tools, **developed in concert with stakeholders**, to manage, secure, and protect a reliable, long-term state-wide water supply while balancing conservation with economic growth.

Estimated Usable Lifetime for the High Plains Aquifer, Kansas*

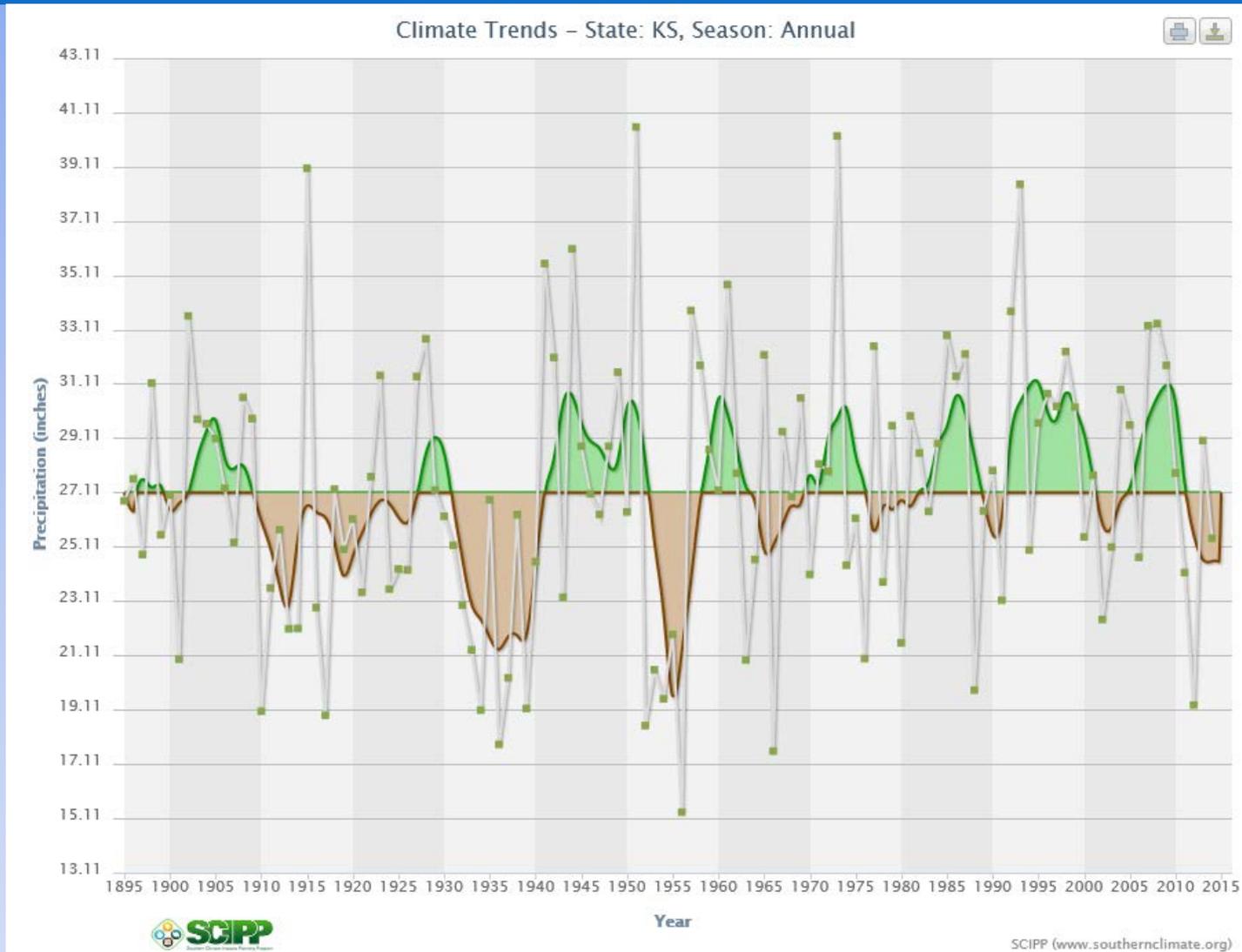
(Based on groundwater trends from 2001-2003 to 2011-2013 and the minimum saturated thickness required to support well yields at 400 gpm under a scenario of 90 days pumping with wells on 1/4 section)



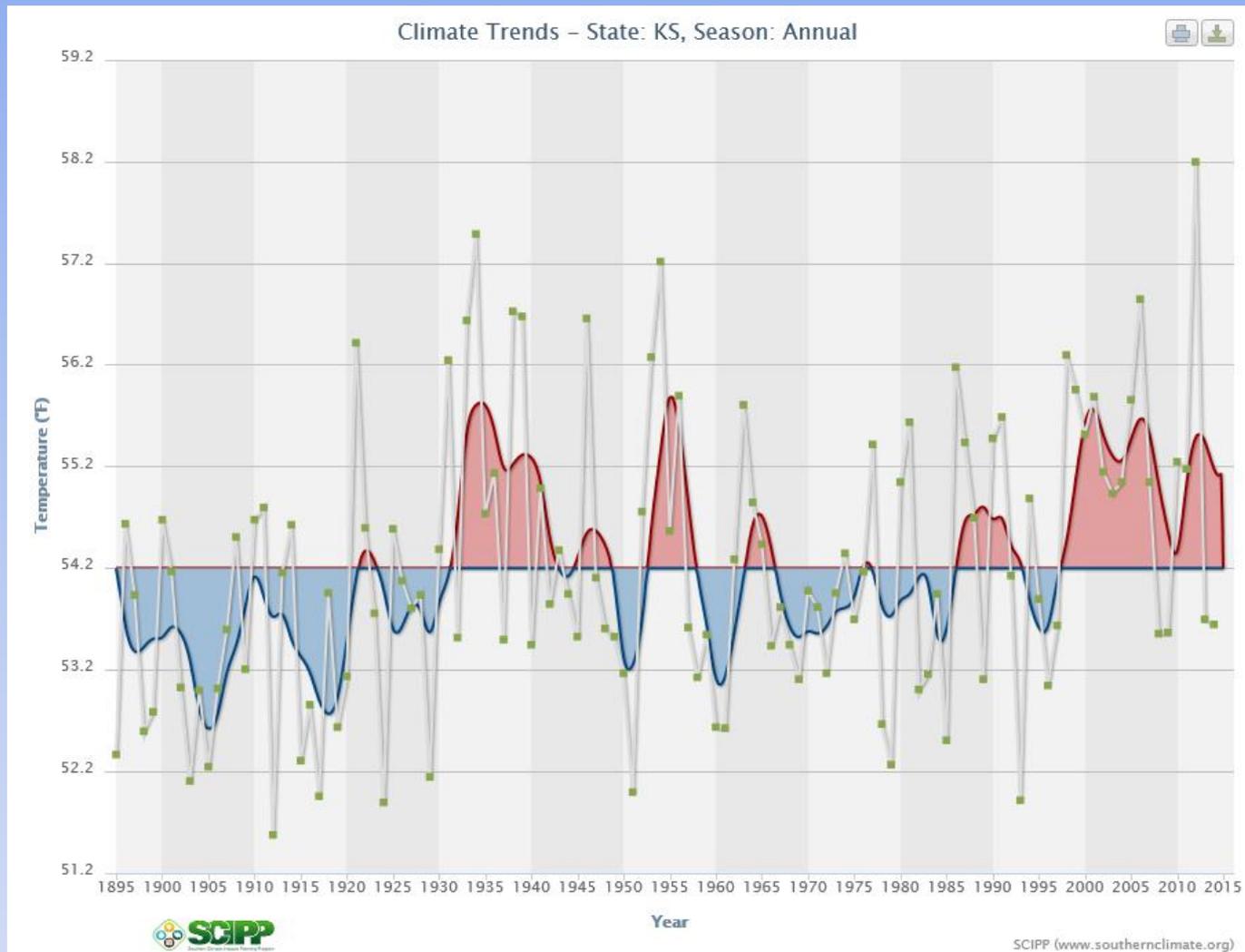
Loss of Storage Capacity



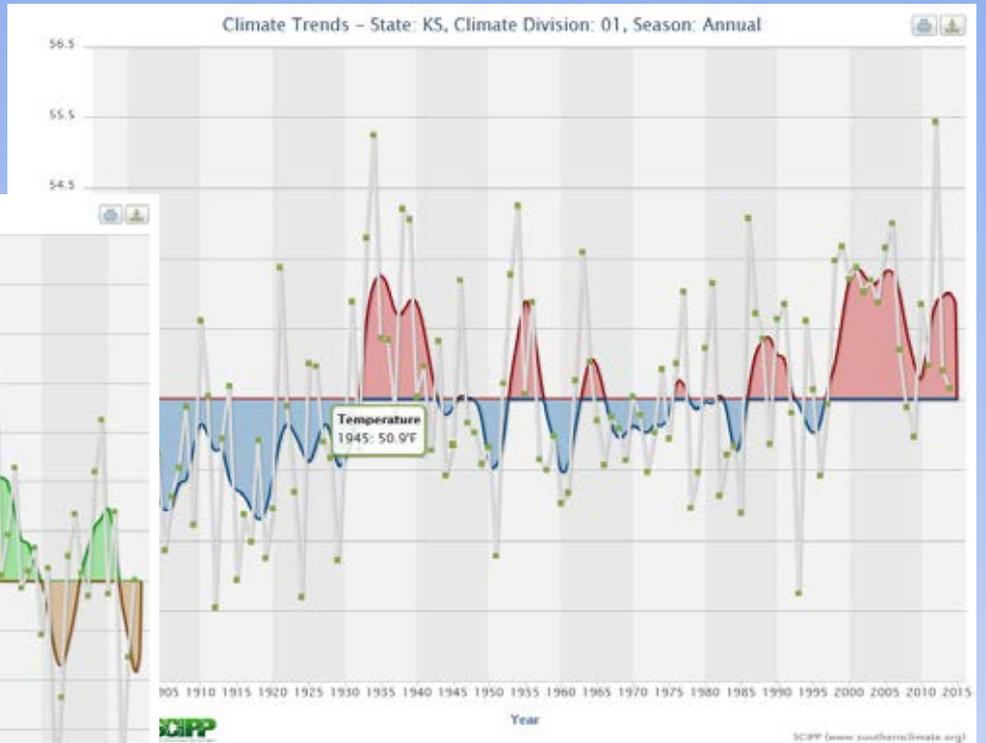
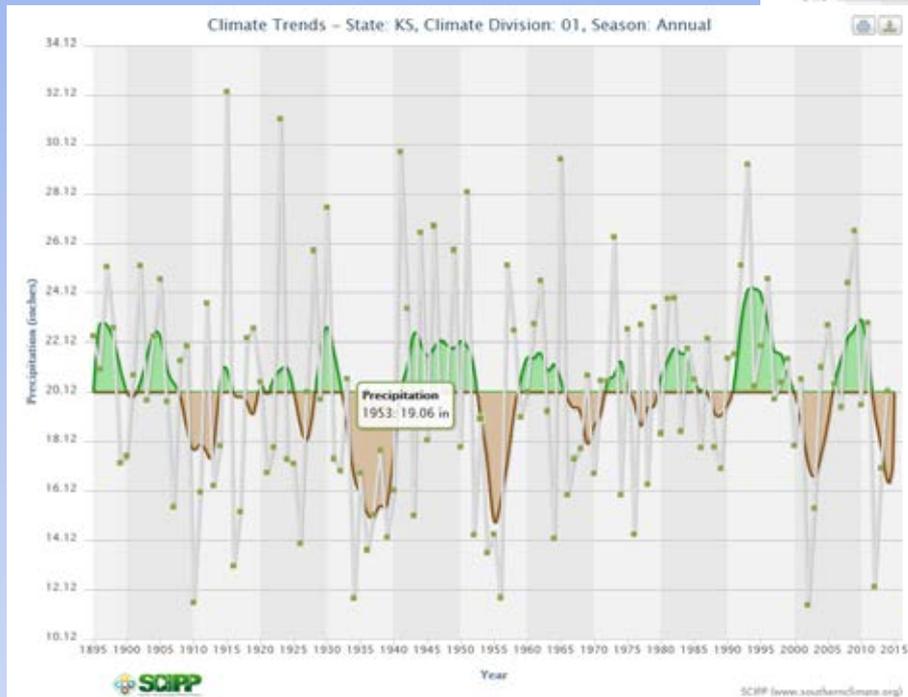
State of the Resource



Kansas annual statewide precipitation
Long-term



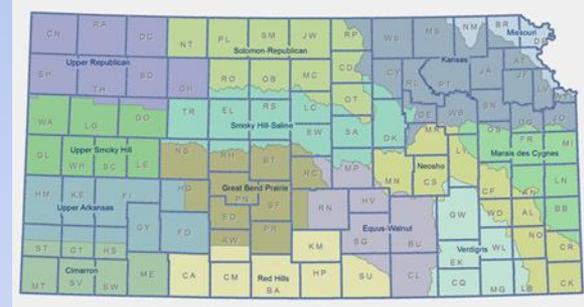
Kansas annual statewide temperatures
Long term



Northwest statewide temperatures and precipitation- long term

Water Conservation Water Management Technology & Crop Varieties Additional Sources of Supply

Planning Regions



50 Year Vision for Water in Kansas

Statewide Action Items – Phase I

Conduct drought simulation exercises to educate public and identify gaps in conservation efforts

Statewide Action Items – Phase II

Ensure agency coordination assists in the promotion of regional drought and water conservation planning and acknowledges the significance of sound planning for community and state resiliency to the impacts of climate variability

Partner with and support public and private entities focused on development of drought resistant corn and related advancements

Statewide Action Items - Phase III

Implement research in order to increase select pesticide resistance for sorghum and cotton along with drought resistant corn production

Drought and the Vision

National Integrated Drought Information System

- Drought Portal
- U.S. Drought Monitor
- Seasonal and Monthly Drought Outlooks
- Drought Impacts Reporter
- High Plains Regional Climate Center



National drought efforts

www.drought.gov

- USGS Drought Watch
- National Weather Service data & climate predictions
- Weekly Crop reports (USDA)
- Crop Moisture Index (Climate Prediction Center)
- Palmer Drought Severity Index (Climate Prediction Center)
- Remote Sensing (NOAA & NASA)
- El Nino status (Climate Prediction Center)
- Regional Climate Centers

National drought information tools
and collaborators

Western Governor's Association

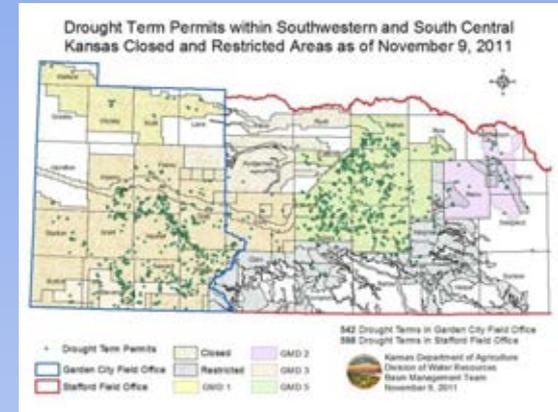
- Strategies for resilience to drought effects
- Compare state approaches to identify additional best practices
- Data collection and enhanced analyses
- Tools for drought management
- Policy

National drought efforts



Responses to Kansas Drought 2010-2015

- Temporary water appropriation permits for emergency use (DWR)
- Emergency withdrawals – US Army Corps reservoirs
- Emergency withdrawals – state fishing lakes (KDWP)
- Kansas Drought Emergency Stage Opens State up to Bureau of Reclamation Title 1 (mitigation) and Title 2 (planning) funds



Drought emergency

- **Operations of reservoirs/river systems**
- **Surplus water contracts**
- **Outreach to PWSs most likely to have shortages**
- **Assistance to PWS**
 - **Guidelines and example ordinances/resolutions**
 - **Drought Response Plans, Conservation Plans, Emergency Plans**
 - **Additional sources or infrastructure**

Ensuring water supply

- **Revised Kansas Drought Operations Plan**
- **Statutes to relax motor carrier rules for moving hay for drought declared counties**
- **Drought water right term permits- temporary program 2011**
- **Multi Year Flex Program for Water Rights – permanent program**
- **Update of 1986 agreements for emergency water supply US Army Corps of Engineers and KDWPT**
- **Updating of municipal water conservation plans, developing new**
- **Assistance to communities to find additional water supply and funding sources**
- **Development of water supply drought tool for Kansas by Bureau of Reclamation**
- **Citizen awareness – press releases, “drought” report**
- **Communication with national and regional drought programs**

Summary – Kansas response to drought

KWO Drought Report

http://www.kwo.org/reports_publications/Drought.htm

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Questions?
