ftn Associates Ltd.
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DROUGHT CONTINGENCY RESPONSE NETWORK REPORT

JUNE 5, 2018

DROUGHT CONTINGENCY RESPONSE NETWORK REPORT

Prepared for

Arkansas Natural Resources Commission
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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

1.0 EXECUTIVE SUMMARY

The 2014 Arkansas Water Plan Update (AWP) recommended the Arkansas Natural Resources Commission (ANRC), "Develop a coordinated drought contingency response [N]etwork among state, regional, local, and agencies with constitutional and statutory water management duties; federal agencies, drinking water utilities, organizations, and institutions; and the private sector for alerting the public about impending droughts, sharing consistent messages and information, and providing information on voluntary conservation measures to reduce water use."

To accomplish this recommendation, the following three goals are proposed, which correspond with suggestions for drought mitigation planning by the National Drought Mitigation Center at the University of Nebraska-Lincoln:

1. Identify and monitor drought indicators;
2. Assess and communicate potential risks of drought stages to various sectors; and
3. Provide a coordinated, consistent message on mitigation and response measures to these drought stages.

During two workshops (November 2017 and March 2018), participants were tasked with developing a coordinated response Network (Network) that could be used to achieve these three goals. Workshop participants represented over 30 federal, state, and local agencies, organizations, and utilities from a variety of areas including natural resources, agriculture, water supply, forestry, meteorology, water resources management, communication, and more. Recommendations from the workshops for how the Network will function included the following:

- The Arkansas Department of Emergency Management (ADEM) is the lead agency in a drought emergency. The Network should follow the guidelines as recommended in the AR All-Hazards Mitigation Plan (HMP).
- ANRC is the lead agency for water resources management in Arkansas. ANRC should lead drought mitigation, response and communication efforts related to water resources as part of the HMP.

- ANRC should consider forming a Drought Council with ADEM, National Weather Service (NWS), Arkansas Department of Health (ADH), the US Army Corps of Engineers (USACE), and the US Geological Survey (USGS) to assist in developing consistent, coordinated messages and mitigation and response efforts related to drought.
- Forming workgroups would assist the Drought Council in formulating and disseminating these messages. These work groups are: 1) Monitoring, Early Warning and Prediction; 2) Risk, Impact and Vulnerabilities; and 3) Mitigation and Response.
- Develop a coordinated Network for drought monitoring that incorporates data from local, regional, and state levels and use this data for risk analysis, impact and vulnerability assessments, and development of water use thresholds.
- Use this information to develop consistent and common language messages that can be easily understood by the public.
- Identify funding sources for both the Network moving forward and possible grant, loan, or cost-share programs for communities to implement mitigation actions.

Approaches for integration of workgroup input, internal communication, and coordination among Network members, and external communication with other organizations, agencies, utilities, and the public are discussed in this Drought Contingency Response Network Report in Section 4.

2.0 INTRODUCTION

Every sector in Arkansas – agriculture, industry, municipalities, tourism - is dependent upon water. Ensuring the readiness and preparedness of the state to manage water is of high importance. The 2014 AWP update noted a lack of coordination among agencies in how to respond to drought. The AWP update specifically recommended that the ANRC "Develop a coordinated drought contingency response [N]etwork among state, regional, local and agencies with constitutional and statutory water management duties; federal agencies, drinking water utilities, organizations and institutions; and the private sector for alerting the public about impending droughts, sharing consistent messages and information, and providing information on voluntary conservation measures to reduce water use." To address this recommendation, two workshops were held for these stakeholders to begin the process of forming such a Network.

This report outlines the steps needed for the formation of the Network and recommendations for how the Network should function moving forward. Recommendations made in this report are a direct result of discussions at the two planning workshops held in November 2017 and March 2018. A summary of those workshops can be found in Appendix A and Appendix B, respectively.

3.0 PURPOSE OF NETWORK

The purpose of this Network is to coordinate efforts among agencies, organizations, and the private sector to prepare for drought by alerting the public to impending drought, sharing consistent messages and information with the public, and providing information on conservation and mitigation actions that can be taken before a drought occurs. Workshop participants' input and suggestions from the National Drought Mitigation Center at the University of Nebraska-Lincoln, resulted in the recommendation of the following three goals to accomplish the Network purpose:

1. Identify and monitor drought indicators to be used in the development of early warning indicators and better drought condition predictions;
2. Assess the potential risks and impacts of drought within the State of Arkansas and identify vulnerabilities for the state; and
3. Provide coordinated consistent messages on risk mitigation and potential response measures to be taken before and during drought conditions.

4.0 INTEGRATION OF NETWORK

Network implementation is key in achieving its goals. The following section outlines how the Network might function and coordinate in achieving their goals.

4.1 Network Integration

The general outline for how the Network should function was developed through discussion at the two workshops. Participants agreed that a Network should be formed and should be comprised of members from across a wide spectrum of water stakeholders. Identifying champions from key organizations and agencies to the lead the Network would significantly

facilitate implementation of the Network. To ensure the Network can function efficiently, a leadership group, the Drought Council, should be formed that is limited to a set number of agencies that are most directly involved with water and emergency response in Arkansas. The recommended members of the Drought Council consist of the following:

- ADEM,
- ANRC,
- ADH,
- NWS,
- USACE, and
- USGS.

ANRC is responsible for management of surface water flows and water quantity for the State of Arkansas. However, the Network should look to ADEM, whose mission is directly tied to the mitigation, preparedness, and response to hazards and emergencies, for direction. ADEM has the resources and plans in place to address a drought emergency and currently outlines mitigation actions that should be undertaken in their All Hazard Mitigation Plan.

While the Drought Council is responsible for implementing measures to achieve its goals, coordination and communication with representatives from across many sectors, including government agencies, non-profit organizations, and private entities, is necessary for mitigating and responding to drought Therefore, it is recommended that a tiered approach be used so that the Network can function more efficiently and effectively. Tier 1 members would comprise the Drought Council and represent the six agencies listed above. These members will make the final decision upon actions to be taken by the group including messages to be delivered to constituents. Tier 2 members will be considered active participating members of the Network. They may participate in meetings but work primarily in a coordinated manner to achieve the goals of the Network. These members should work directly with the Drought Council in developing the messages that are delivered to the public. Tier 3 members are those who are key liaisons with the public and trusted in delivering the messages to the public. These members will be important in interacting with the public and providing valuable feedback to the Drought Council on how the messages are received. A Network schematic is shown in Figure 1.

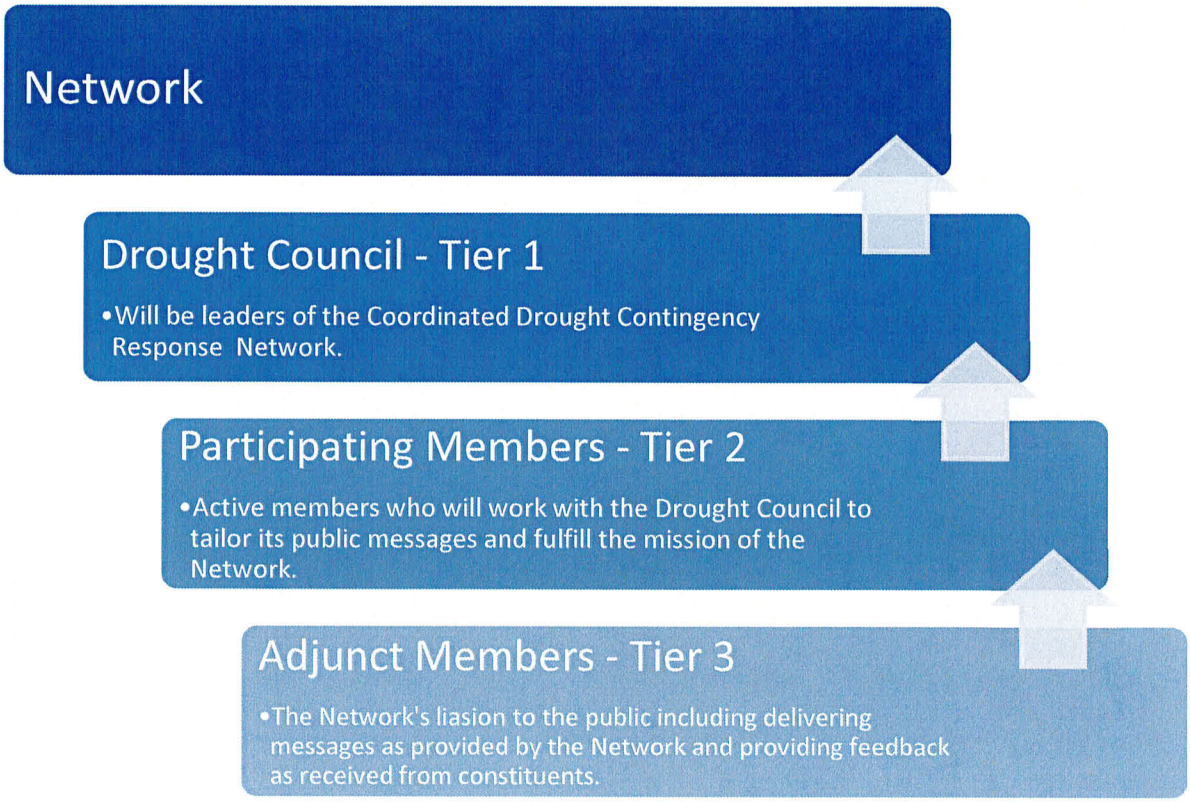

Figure 1. Network functionality flowchart

4.2 Network Members

The Network should be composed of members from all sectors, both public and private. As a way to address potential cascading risks of drought, the Network should include members who have or are able to reach large sectors of the population as well as provide meaningful input to the Network. Not all participants from the planning workshops have the time and resources available to contribute to the Network, but all members can make constructive contributions and are desired members of the Network. Recommendations for those agencies and organizations to be represented in the Network are shown in Figure 2.

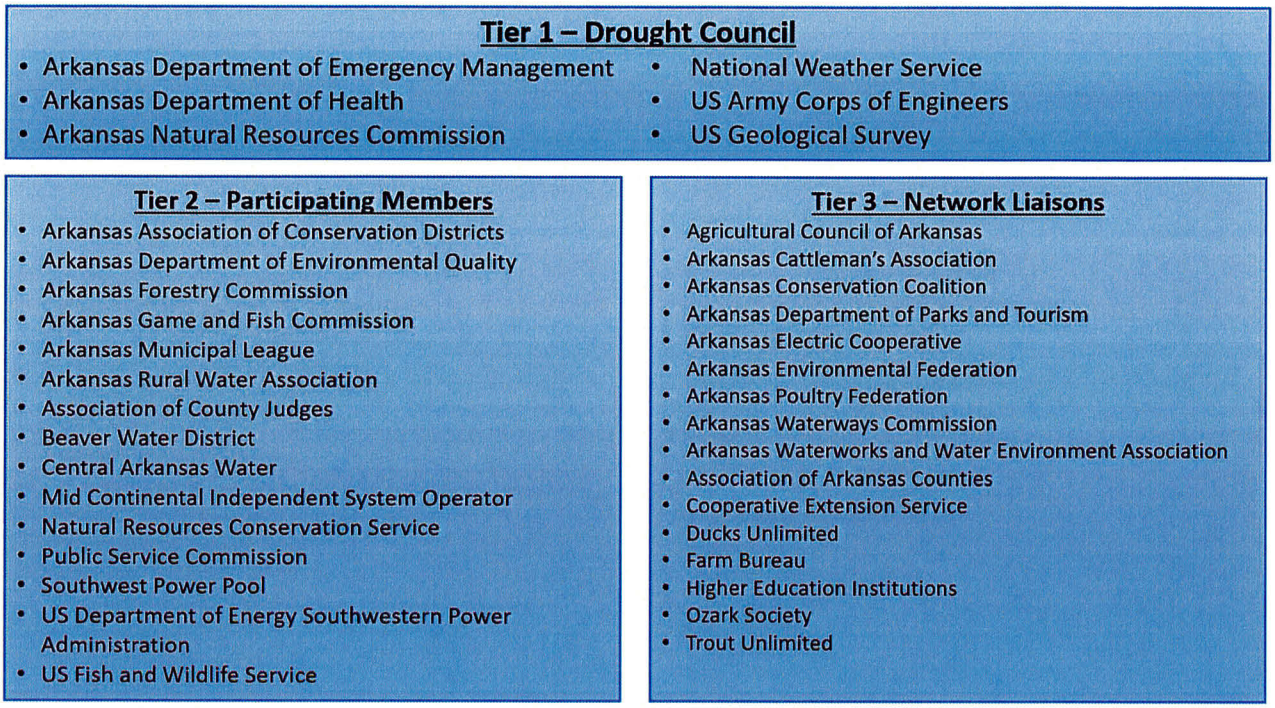

Figure 2. Recommended Network members.

4.3 Network Implementation

4.3.1 Network Workgroups

The National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln published a 10-Step Drought Planning Process in 1999 (Wilhite, et. al. 1999). In this plan, three working groups are recommended which should be considered for the Arkansas Drought Contingency Planning Network. Those workgroups are:

- Monitoring, Early Warning, and Prediction;
- Risk, Impacts, and Vulnerability; and
- Mitigation and Response.

These workgroups will each focus on a specific aspect of drought planning while also working with one another in developing a coordinated response. Each of these three workgroups has an important role to play in the drought planning process and each contributes to the

Network. In Figures 3a, 3b and 3c, the purposes of each workgroup are outlined. Many of these purposes or actions can be accomplished before drought occurs. By utilizing these workgroups, the Network can be more efficient and effective in responding to drought conditions when they do occur. More detailed discussion points on the workgroups can be found in the Workshop 1 Summary in Appendix A.

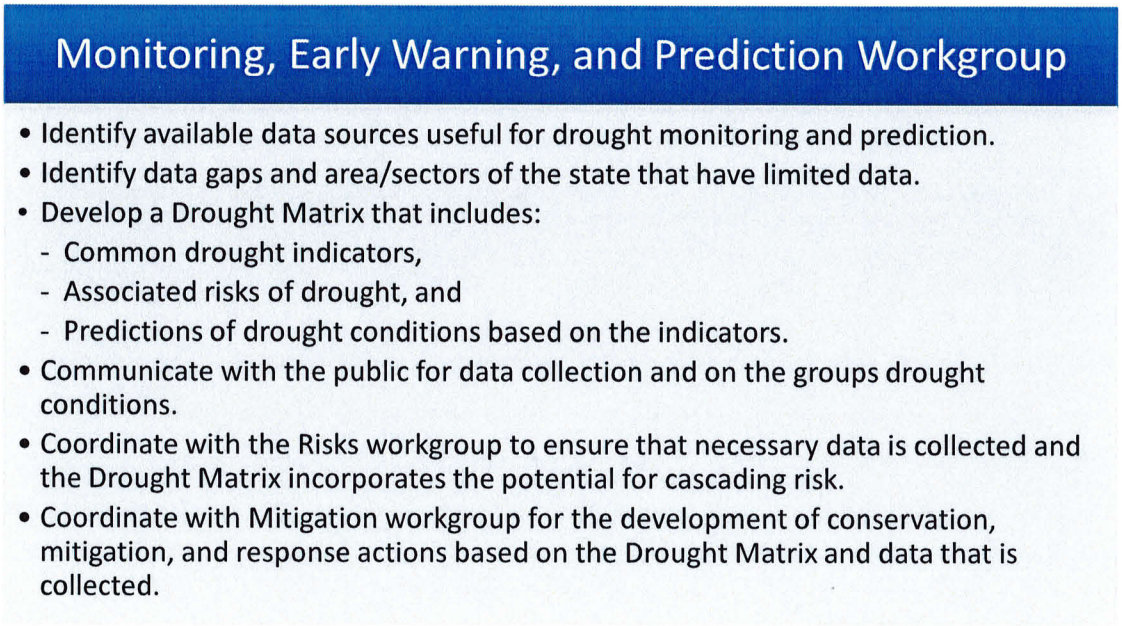

Figure 3a. Monitoring, early warning, and prediction workgroup.

Risks, Impacts, and Vulnerability Workgroup

- Perform assessments of the Risk, Impacts, and Vulnerabilities associated with droughts.
  - Assessments should consider all levels from local and regional to statewide and an assortment of sectors and uses including agriculture, environmental, industry, and drinking and waste water.
  - Assessments should consider the potential hazards of both short term and long-term droughts.
  - Consider the long term, post-drought impacts. Not all effects of drought are felt immediately and these should be incorporated into any assessment.
- Engage with the public to identify areas of higher vulnerability and work with communities in assessments.
- Coordinate with the Monitoring workgroup in the development of a Drought Matrix that connects drought indicators and levels with specific risks and vulnerabities.
- Coordinate with the Mitigation workgroup in creating appropriate response and mitigation actions that are tailored to specific regions or sectors based upon their risk and vulnerability.

Figure 3b. Risks, impacts, and vulnerability workgroup.

Mitigation and Response Workgroup

- Develop easy to implement mitigation measures including:
  - Direct resuse programs,
  - Implementation of stormwater collection in cities and mitigate towards reaching a basin wide or region wide water use balance,
  - Best management and conservation practices in new construction, and
  - Encourage low-flow plumbing upgrades.
- Create a water conservation/drought awareness campaign.
- Provide water use education program that can be used across all sectors and is specifically geared towards children.
- Identify funding sources for mitigation and response activities.
- Utilize all media sources to increase awareness, educate, and notify the public.
- Coordinate with the Monitoring and Risks workgroups to develop consistent messages that can be delivered on many different platforms and can be tailored to different regions and industry sectors.
- Coordinate with ADEM in creation of mitigation and response measures.

Figure 3c. Mitigation and response workgroup.

Workshop participants agree with the recommendation of forming these workgroups, which are also widely used in other state drought planning councils. Communication and coordination will be critical to the success of the Network and Figure 4 illustrates how this can be completed. Workgroups should work both independently as well as coordinate and work with other groups to compile and process necessary data, perform risk and vulnerability assessments, and generate mitigation and response actions that can then be delivered to the public. It is useful if members of the Drought Council participate in the workgroups along with the other members. Each workgroup should designate a representative that will lead the workgroup and report to the Drought Council and other workgroups to streamline communication and coordination.

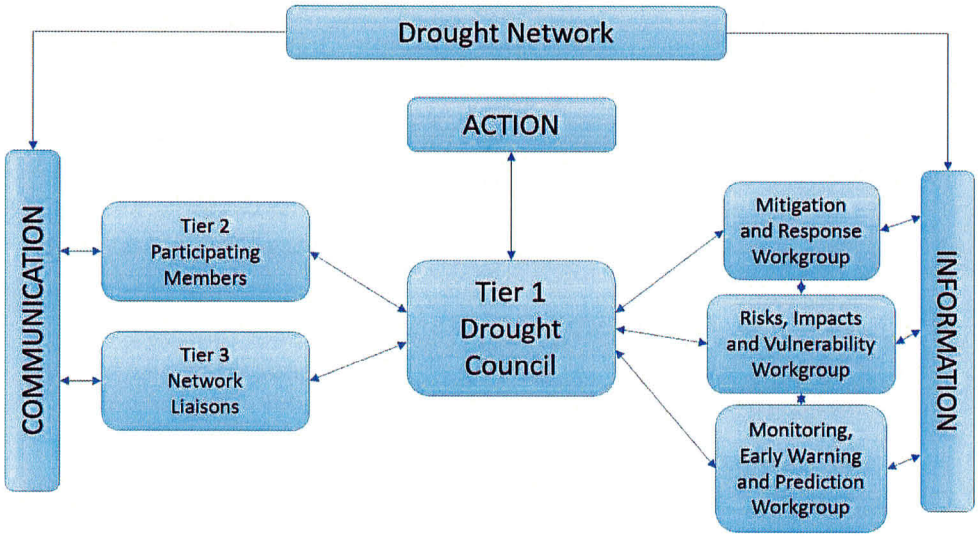

Figure 4. Network implementation flowchart.

4.3.2 Workgroup Members Recommendations

Consideration should be given to the representation in each workgroup. Coordination with ADEM on membership is needed, because these workgroups might function for mitigation and response to other possible drought effects beyond water resources (e.g., wildfires). Workgroup memberships are shown in Figure 5. This coordination, in conjunction with the Drought Council, is the responsibility of ANRC.

Monitoring, Early Warning, & Prediction	Risks, Impacts, & Vulnerability	Mitigation & Response
•Arkansas Association of Conservation Districts	•Arkansas Association of Conservation Districts	•Arkansas Association of Conservation Districts
•Arkansas Association of County Judges	•Arkansas Department of Emergency Management	•Arkansas Association of County Judges
•Arkansas Department of Environmental Quality	•Arkansas Department of Health	•Agricultural Council of Arkansas
•Arkansas Forestry Commission	•Arkansas Game and Fish Commission	•Arkansas Department of Health
•Arkansas Municipal League	•Arkansas Municipal League	•Arkansas Department of Parks and Tourism
•Arkansas Natural Resources Commission	•Arkansas Natural Resources Commission	•Arkansas Forestry Commission
•Arkansas Rural Water Assocation	•Mid Continental Independent System Operator	•Arkansas Municipal League
•Beaver Water District	•Natural Resources Conservation Service	•Arkansas Natural Resources Commission
•Central Arkansas Water	•Southwest Power Pool	•Arkansas Waterways Commission
•Cooperative Extension Services	•US Army Corps of Engineers	•Beaver Water District
•Higher Education Institutions	•US Department of Energy Southwestern Power Administration	•Central Arkansas Water
•National Weather Service	•US Geological Survey	•National Weather Service
•Natural Resources Conservation Service		•Public Service Comission
•US Army Corps of Engineers		•US Army Corps of Engineers
•US Geological Survey		•US Fish and WIldlife Service

Figure 5. Workgroup member recommendations.

4.4 Network Function

The Network has three core goals as outlined in Section 3 and requires a coordinated effort by all participants. During the planning workshops, a constant theme was using a bottom-up approach to increase awareness, buy-in, and participation at the local level. The Network Liaisons (Tier 3) are important when implementing the Network and interacting with the public. Those members of Tier 2 will be instrumental in ensuring that messages are clear, consistent, easily understood and are tailored to specific sectors at both a local and statewide level. The Network will function at its most efficient if it utilizes the three proposed workgroups and works cyclically as shown in Figure 6. This cycle takes the bottom-up approach of interacting with the public, utilizing their input in the work of each of the three workgroups to

develop clear, consistent messages and mitigation and response actions that are then delivered to the public.

Figure 6. Network function cycle.

4.5 Recommended Actions

For an efficient and smooth implementation of the Network, the following steps are recommended to be completed by the Network:

- Hold a kickoff meeting within 6 months of this publication. A meeting should be held in the near future so that the Network remains a priority for its members and the Network can more quickly begin coordinating and working towards accomplishing its goals.
- Confirm a Drought Council to lead the Network.
- Confirm Network membership.
- Refine the next steps or actions needed to move the Network forward.

- Set a regular meeting schedule for the Drought Council such as bi-annual meetings with the addition of conference calls as necessary to track progress.

5.0 MOVING FORWARD

The following section is an outline of the next steps to be taken by the Network and a directive of items that should be accomplished based on the recommendations made during the two planning workshops.

5.1 Next Steps

- Drought Council:
  - Hold a Drought Council Kickoff Meeting.
  - Initial communication with Network participants to describe roles and responsibilities and identify primary contact.
  - Set a meeting frequency such as a bi-annual meeting with additional conference calls when necessary.
  - Coordinate with the ADEM and work closely with the current HMP to develop:
    - Drought Mitigation Actions,
    - Workgroups, and
    - Drought Communication actions.
  - Review previous droughts in Arkansas and a Lessons Learned white paper that includes:
    - Severity and length of drought
    - Actions taken
    - What was successful? What was not?
  - Create a Drought Resource Portal or website that can be used to upload/download data, link to the USGS Drought Monitor, and act as a resource for drought planning in Arkansas.
  - Secure a source of funding for the Network.
  - Review neighboring states Drought Mitigation Plans and available resources.
    - Reach out to neighboring states to discuss how their drought mitigations plans were developed.

- What are some lessons learned?
- What data is available?
- How do they function before and during drought?

- Coordinate presentations on drought that will increase awareness, educate, and provide necessary data with professional or civic society organizations and trade group meetings.
- Utilize Liaison Members to engage with the public for feedback and on the ground drought condition reports.
- Initiate a project for the Network that relates to ongoing activities in Arkansas in regards to drought planning and mitigation.
  - Coordinate with USACE – Little Rock on ongoing project on the Little River for drought monitoring.

- Workgroup Directives:
  - Monitoring, Early Warning, and Prediciton
    - Define drought thresholds;
    - Identify drought indicators at a multi-sector level; and
    - Create a drought matrix based on drought indicators; and potential risks (See Appendix D for Reference).
  - Risks, Impacts, and Vulnerability
    - Identify potential risks on a multi-sector level;
    - Complete a state-wide risk, impact and vulnerability assessment on a multi-sector level; and
    - Identify and rank those sectors and regions that are most susceptible to drought.
  - Mitigation and Response
    - an outreach program to bring awareness of drought and water conservation and mitigation actions or practices;
    - Identify possible funding sources to be used for mitigation activities such as federal grants and cost-share programs; and
    - Identify preemptive mitigation actions that can be taken now and coordinate with Network and shareholders for an implementation plan.

5.2 Network Resources

It is recommended that the Network take advantage of the many useful resources available to them. The following is a list of selected references:

- (1999) Wilhite, D.A, et al. *The Basics of Drought Planning: A10-Step Drought Planning Process*, National Drought Mitigation Center
- (2006) *Texas State Drought Preparedness Plan*,Governor's Division of Emergency Management, Texas Department of Public Safety
- (2010) *Drought Management Plan*,Tennessee Department of Environment and Conservation
- (2013) *Arkansas All Hazards Mitigation Plan*, Arkansas Department of Emergency Management
- (2013) *Colorado Drought Mitigation and Response Plan*, Colorado Water Conservation Board. Department of Natural Resources
- (2014)*Arkansas Water Plan Update*, Arkansas Natural Resources Commission
- (2016) *Drought Annex to the State of Texas Emergency Management Plan*, Governor's Division of Emergency Management, Texas Department of Public Safety
- (2017)Kos, L. *Arkansas Drought Planning Workshop Summary Report*, Southern Climate Impacts Planning Program
- Oklahoma Drought Monitor Portalhttp://www.owrb.ok.gov/drought/index.php
- National Drought Mitigation Centerhttp://drought.unl.edu/

5.3 Conclusions

Every sector of Arkansas is dependent upon water. The formation of a Network will accomplish the recommendation of the 2014 AWP and improve the readiness of the State of Arkansas to mitigate, prepare for, and respond to a drought. The Network will be coordinated by ANRC.

Throughout this report, recommendations were made as to the functionality and implementation of the Network. These are taken from discussions by stakeholders at two Drought Contingency Planning Workshops. A Drought Council should be formed and will lead the Network moving forward. Workgroups within the Network will coordinate and work together to provide the information that is necessary for the Drought Council to create mitigation

and response actions and messages that are delivered to the public. Organizing and initiating the Network and Drought Council should satisfy both the intent and recommendation for a Drought Contingency Response Network included in the 2014 AWP update.

APPENDIX A

Workshop 1 Summary

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MEMORANDUM

DATE: <DATE>

TO: **Drought Contingency Response Network Planning Group**

FROM: **Linda Johnson**
FTN Associates, Ltd.

SUBJECT: Summary of Arkansas Drought Contingency Response Network Planning Workshop #1

In response to the 2014 Arkansas State Water Plan Update recommendation to develop a coordinated Drought Contingency Response Network, the Arkansas Natural Resources Commission (ANRC) contracted with FTN Associates, Ltd. (FTN) to facilitate two workshops to move this recommendation forward. The first workshop was held on November 28, 2017, at the Laman Library in North Little Rock, AR. The purposes of the meeting were:

- Review the recommendation from the State Water Plan Update;
- Summarize the results of the 2016 Drought Planning Workshop;
- Discuss and refine coordinated Drought Contingency Response Network goals;
- Identify key Network elements needed for effective and efficient communication;
- Discuss and refine responsibilities of Network work groups:
  - Monitoring, Early Warning, and Prediction
  - Risk, Impacts, and Vulnerabilities
  - Mitigation and Response
- Identify others that need to be part of the Network; and
- Determine need for follow-on workshop (See Workshop agenda – Attachment 1).

Below is an outline summary of the items discussed during the workshop, including a general discussion session, items discussed in the three work groups, and items identified during the follow-up discussion. A report summarizing the entire project will be completed following the second workshop.

Attached to this memo is a listing of the attendees by work group (Attachment 2).

2014 Arkansas Water Plan (AWP) Update Recommendation

One of the recommendations in the 2014 AWP Update was:

- *Develop a coordinated drought contingency response network among state, regional and local agencies with constitutional and statutory water management duties, federal agencies; drinking water utilities, organizations, and institutions; and the private sector for alerting the public about impending droughts, sharing consistent messages and information, and providing information on voluntary conservation measures to reduce water use.*

To accomplish this recommendation, three goals are proposed, which correspond with three work groups or subcommittees suggested in the 10 steps for drought mitigation planning by the National Drought Mitigation Center at the University of Nebraska-Lincoln:

1. Identify and monitor drought indicators;
2. Assess and communicate potential risks of drought stages to various sectors; and
3. Provide a coordinated, consistent message on mitigation and response measures to these drought stages.

Discussion of these proposed goals and recommendation centered around the following questions:

1. Is there utility or need for a coordinated drought contingency response network?
2. Are other goals warranted?
3. Are there additional elements needed for these three goals?
4. What are the key elements for effective and efficient communication?

General Discussion Comments

1. Yes there is a benefit to the coordinated Network as it should reduce redundancy.
2. A critical element is a common language for public consumption, that is:
   - Understandable and
   - minimal jargon.
3. Water is the focus, but other sector indicators provide important information across platforms.
4. Everyone is important in mitigating drought
5. Local, regional information is also important, not just statewide.
6. Action strategies include being proactive prior to drought, responsive during drought, with a post-event analysis to be prepared for subsequent droughts.

7. Interaction is needed between the different sectors.
8. Buy-in for the Network is needed from throughout the highest to lowest management levels.
9. Traditional outreach methods and media need to expand to include social media.
10. Historical analyses are also useful – lessons learned, by sectors, issues.
11. Drought response needs a geologic/geographic focus, because of different drivers, different conditions across the state.
12. Real-time data and information needs to be integrated in the analyses.
13. Infrastructure needs to mitigate drought should be included, particularly for at risk communities.
14. Projection of water needs were estimated in the AWP update, but only at the State and regional level. Local needs should also be considered.
15. Consider a One-stop website (TX,AL,CO) to:
    - Answer questions;
    - House data/information; and
    - Provide a Clearinghouse for Links to other agencies and information.
16. Funding/developing/responsible network
17. Definitions of a water shortage and threshold are needed by:
    - Sector
    - Region
18. Effects of other regions on droughts in Arkansas needed to be considered, including:
    - Federal
    - Other States
19. Water management responses need to consider both upstream and downstream areas.
    - Drainage Districts are an example of where upstream drainage district management can affect downstream drainage.
20. Start early with education – K-12.
21. Drought prone areas can affect economic development. Industry wants assurances of water availability.

22. Learn from other States
    - MI, TX (template);
    - Suggest local level drought management plans; and
    - Early warning communication for both conservation and mitigation is critical.

23. Drought recovery plans should be considered.

24. Agency drought plans should be recommended, both for
    - Internal communication and
    - Cross referenced with other agencies.

Break-Out Work Group Discussion

Three break-out groups corresponded with the three goals for a Drought Contingency Response Network. A bulleted summary of work group discussions are shown below:

Monitoring, Early Warning, Prediction Work Group

DATA SOURCES

1. What data is available and who has it?
    - Need to develop a matrix of the available data and determine who is the keeper of that data – temporal, spatial, and accuracy;
    - Identify lead agency for each type of data;
    - Identify data gaps;
    - Making existing sources of data useful for drought (presentation) interpretation for general public;
    - Input to National Drought Monitor; and
    - Make sure the DATA translates to useable information

INDICATORS

1. There needs to be interchange between the Risk, Impacts, and Vulnerabilities Group and the Monitoring, Early Warning, and Prediction Group:
    - What data does the Risk Group need?
    - Does the needed data already exist and is it in a form that is useable and understandable?

2. Need to identify the key drought indicators for sectors and regions (from the Risk, Impacts, and Vulnerabilities Group)

DROUGHT LEVELS

1. Define drought
    - List of indices – cover all sectors and regions and identify which indices are critical to each sector/region;
    - Define impacts for each level for sectors/regions;
    - Include duration and intensity in the drought definition;
    - Develop messaging that is targeted to the different sectors;
    - Keep it simple – use the same Drought definitions for Public/Technical use, as an example:
        - Advisory
        - Alert
        - Emergency
        - Rationing
    - Need to develop consistent outreach and education tools and materials to get the message out to the public.

PREDICTION

1. What kind of prediction is useful?
    - What is the best prediction method for Arkansas?
    - Need to consider the Duration/Intensity of the drought.
    - Need to consider the Start time of the drought.
2. Communicate what is needed for Recovery.
3. Identify and consider external inputs to Arkansas conditions (regionally and nationally).
4. How are needs changing?
    - Short term (e.g., seasonal trends) and
    - Long term (e.g.,urbanization, technology)
5. Early warning is important.

Risk, Impacts, and Vulnerability Work Group

RISK

1. There are cascading risks during drought.
    - For example, in 2005 – Charleston drinking water lakes went dry. Went to Ft. Chaffee to get water.
    - The primary risk was a shortage of drinking water.

- However, the town was then more vulnerable to fire, not just potable water.
- Schools couldn't function because there was no water for toilets, drinking, etc.
- 2nd and 3rd risks – schools, fires, industry.
- Need to consider these cascading risks in estimating impacts and vulnerabilities.

2. Look at regional resources – other sources and vulnerabilities.
3. Infrastructure impacts, vulnerability, and risk.
    - Particularly in small communities.
4. Must consider potential for multi-year droughts as they present different risks.
5. Climate is changing
    - More frequent flash droughts.
    - More intense rainfall.
6. Classification of risks, should consider:
    - Environmental
    - Socioeconomic
    - By sector
    - Statewide
    - Region
    - Local
    - There are classification models that could be modified for AR.
7. Rank and evaluate impacts, vulnerability, risks at various levels (Local, Region, State)
    - Contingency – cut off water to others?
    - Look at vulnerable, high risk areas, but also those areas that are at lower risk.
    - May be able to mitigate high risk areas or sectors with low risk areas or sectors.
8. Can do these risk analyses by drought stage, by high risk / low risk sectors and areas before drought occurs:
    - Move from reactive to proactive mode;
    - Compute frequency of droughts at different areas, scales;
    - Look at Colorado for good planning methods, approaches; and
    - Look at periods of rainfall, frequency, store, conserve.

9. Risks to sources is different at various scales:
    - Farm ponds;
    - Regional irrigation sources; and
    - Geographic.

10. Risks from current policies:
    - Irrigation water use and
    - Voluntary conservation

11. Risks, impacts, and vulnerabilities are also perceived, in the eye of the affected sector. This can lead to inflated estimates or risk or vulnerability.

12. Ecological flows at risk for:
    - Non-riparian transfers;
    - Riparian shortage;
    - Risks can change from upstream to downstream; and
    - The value of water also changes.

13. Endangered/Threatened Species
    - Undefined risks or flows;
    - Proactive approaches for protecting/restoring endangered species; and
    - Cascading factors –water levels decrease / temperature increases.

14. Pre-allocation studies might be considered to reduce risks, impacts. Currently only done for the White River

15. Minimize mitigation risks

16. Individual Sector Risk Analysis
    - Local
    - Regional
    - State
    - What metrics?
    - How – What guidance?
    - Who?
    - What Information needs?
    - Avoid inflated risks

17. Develop a Check List, template for risk analysis, impact assessment, vulnerability assessment.

18. Someone needs to be responsible for determining appropriate methods and approaches, including appropriate decision support tools.
    - Need to identify what data the group requires and what kind of analysis and
    - Need to determine Database structure.

19. What are risks of inadequate planning and policy/regulations? Need to provide a base for demonstrating the benefits of improved mitigation and response planning and management.

20. Vulnerability assessment needs to be from both the bottom up and top down.
    - GIS based models/analysis;
    - Build bottom up; look from top down;
    - Bottom up for analysis; and
    - Top down for resources, tools, etc.

21. Question was raised as to who has the final call on the assessment of risks, vulnerabilities and impacts (information to be provided to the Mitigation and Response Group).

22. Estimate risks, impacts, and vulnerabilities by drought stages.

23. Other groups to include in the Network:
    - USDA Forest Service
    - UA Pine Bluff
    - Arkansas State University
    - Poultry Federation
    - Farm Services Agency
    - USDA Rural Development

Mitigation and Response

1. Need to keep the process moving forward after meeting
2. Other groups or agencies that may need to be involved:
    - River Transport
    - Waterways Commission
    - Federal Highway Admin
    - ARDOT
    - City Representatives
    - Economists, Social Sciences
    - Nature Conservancy
    - Horticulture Organization
    - Extension Services

3. How do we get the message out?
    - Need to involve the media.
    - What other organizations can be used to get message out?

4. Need for Mitigation:
    - Begin the conservation earlier.
    - Need to determine the thresholds for water use.
    - Need a better understanding of Surface Water Storage capacity.
        - Current Assessments
        - Long-term Actions for improved Storage
    - Obtain and review records for storage, water use in reservoirs.

5. Need to optimize Conservation Measures:
    - Need to weigh benefit/costs of actions to find balance across all areas.

6. Education – Focus on 3rd, 4th, 5th grades
7. Funding for Mitigation Activities
    - Possible agency/organization partnerships
        - Federal Grants
        - Cost Shares

8. Utilize New Technology for Mitigation
9. Future Planning
    - ID Programs for Funding
    - Outreach
    - Longterm and Short Term efforts

10. Some possible mitigation actions:
    - Consideration for feasibitility of Direct Reuse
    - Balance Utility Needs – Rates/Use
    - Stormwater Collection
        - In what areas is this possible?
        - At the Local Level – Storage ponds
        - New Construction
        - Basin Wide Storage Balance
        - A the Region Level

- Encourage low flow plumbing updates
- Main campaign using "Water Peer Pressure"

11. Regional Use – Educate for the different uses and difference conservation actions
12. How do we get a consistent message out?
    - Social Media
      - Manage Message
      - Internally – What is Message? Make sure everyone is on same page
      - Example: Texas USGS
    - Regional/County/Municipal Meetings
      - Educate at Meetings
      - Mitigation Actions
    - Mailers from large organizations to stakeholders
    - Web Videos
    - Email Alerts/Newsletter
    - Newspaper/Local News
      - Looking for stories
    - Water Conferences
21. Who develops the Content/Message?
22. Who distributes?
    - Identify Media Contact for Agencies/Organizations to work together to create and distribute message.
23. How to gain awareness in general public?
24. Educate general public on the Definitions of Drought – keep the message simple.
25. Encourage Local Media Reporting similar to Burn Ban List.
26. Messaging – Drought/conditions Reporting:
    - Encourage local reporting on drought conditions similar to submitting rain gauge information or snow depth totals.
    - Rain Gauges – deployment and reporting.

Follow-up General Discussion

- Develop a drought app for smart phones similar to severe weather apps.
- Engage WalMart and other large corporations that have sustainability as a part of their planning and management activities.

- Formulate a Drought Council (the Network proposed in the AWP Update recommendation was intended to be this Drought Council).
- Engage Keep AR Beautiful and AR State Parks folks for ideas on outreach and communication.
- For subsequent meetings, include:
  - AR Agriculture Department in subsequent meetings
  - Include other Universities in addition to UA-Fayetteville
  - Farm Services Agency
  - USDA National Agricultural Statistics Service (NASS)
  - US Green Building Council – Green Building

Next Workshop

There is a need for a second workshop – tentatively scheduled for early March 2018.

We appreciate your attendance at this workshop and the opportunity to work with you on this project. If you have any questions or comments regarding this memorandum, please do not hesitate to contact:

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LSJ/dlc

Attachment: List of Attendees by work group

CC:

R:\PROJECTS\03015-0005-047\TECH\20171128 WORKSHOP 1 SUMMARY\REVISED DRAFT SUMMARY DROUGHT WORKSHOP 2017-12-1.DOCX

Name	Email	Phone	Organization	Workgroup #
Monitoring, Early Warning and Prediction Committee				
Trevor Timberlake	Trevor.W.Timberlake@usace.army.mil	501-324-5032	USACE - Little Rock	1
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Name	Email	Phone	Organization	Workgroup #
Risks, Impact and Vulnerabilities Committee				
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Name	Email	Phone	Organization	Workgroup #
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APPENDIX B

Workshop 2 Summary

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MEMORANDUM

DATE: April 11, 2018

TO: **Drought Contingency Response Network Planning Group**

FROM: **Linda Johnson, PE, CFM**
FTN Associates, Ltd.

SUBJECT: Summary of Arkansas Drought Contingency Response Network Planning Workshop #2
FTN No. R03015-0005-047

In response to the 2014 Arkansas State Water Plan Update recommendation to develop a coordinated Drought Contingency Response Network, the Arkansas Natural Resources Commission (ANRC) contracted with FTN Associates, Ltd. (FTN) to facilitate two workshops to move this recommendation forward. The second workshop was held on March 7, 2018, at the Laman Library in North Little Rock, AR. The purposes of the meeting were:

- Summarize the results from the 2017 Drought Contingency Response Workshop,
- Work through the process of implementing a coordinated Drought Contingency Response Network,
- Identify actions needed for implementation,
- Discuss next steps, and
- Move toward a coordinated Drought Contingency Response Network.

Below is an outline summary of the items discussed during the workshop, including a general discussion session, items discussed in the three work groups, and items identified during the follow-up discussion. A report summarizing the entire project will be completed following the second workshop.

Attached to this memo is a final listing of all invited participants as well as their workgroups (Attachment 1).

Summary of 2017 Drought Contingency Response Workshop

The workshop summary, prepared and distributed, for the first workshop conducted in November 2017 was briefly discussed.

Integrated Drought Contingency Response Network Premises

There was consensus at the first workshop that an Integrated Drought Contingency Response Network was needed. Given this decision, several premises for this Network were proposed, including:

- The Arkansas Department of Emergency Management (ADEM) All-Hazards Mitigation Plan (HMP) contains a drought component:
    - The ANRC led Drought network should be embedded into the HMP and ADEMs overall strategy.
- ANRC's responsibility and emphasis is on Water Resources.
- Three work groups should support Network deliberations. These work groups are:
    - Monitoring, Early Warning, and Prediction Work Group,
    - Risk, Impacts, and Vulnerabilities Work Group, and
    - Mitigation and Response Work Group.
- Three key areas that can provide a framework for the network moving forward might include:
    - Integration
        - Create drought sub-regions for state.
        - Decide on definitions and thresholds for drought stages, indicators, and notifications.
    - Coordination
        - Nest this in with the Arkansas HMP,
        - Use an integrated approach, and
        - Be proactive in scoring a risk, impact, and vulnerability template prior to droughts occurring for high risk communities and areas, and proactively promote mitigation actions.
    - Communication
        - Create a consistent message,
        - Use trusted sources, and
        - Communicate by using both traditional means and social media.
- Three Break-out Groups for the second meeting were:
    - Integration,
    - Internal Communication and Coordination, and
    - External Communication.

Three break-out groups were used to help develop a plan for the network moving forward. A bulleted summary of work group discussions is shown below:

Integration

A. Framework for workgroup

B. How should we define severity of a drought?

   a. Keep it simple
   b. Corresponds to Weather Advisory
   c. Should there be another level at emergency?
   d. Consider Drought Monitor

      1. Define a set of notifications

         a. How different from weather advisories
         b. Adjustment of terminology

c. How early in process does advisory come out?
d. How to connect prediction of drought to advisories
e. Prediction of droughts is tough. How long will drought conditions last?
f. Is advisory or watch strong enough to get public involved
g. Proposed set of notifications:

1. Advisory
2. Warning
3. Emergency

2. Define thresholds for notifications

a. CAW-Water supply for watershed
b. Sustainable forestry plan
c. Lake levels
d. Monthly rainfall
e. 15-year rainfall
f. Forestry Commission utilizes a drought index
g. USGS Drought monitor
h. Identify leading indicators from specific region of state
i. Are there common trends in watersheds?
j. Review the AG Report

1. Would predicted crop yield be good indicator

k. Consider an aggregate of indicators

1. Multi-parameter

l. Reference matrix of indicators from surrounding states

a. Many surrounding states use a multi-parameter system for defining drought thresholds. Use this matrix as an example of the types of parameters to use

m. Forestry Commission – uses NWS data
n. How should NWS define notifications and threshold?
o. Identify and consider visual indicators of drought conditions

C. Should the state be divided into regions?

a. How to break up state for drought
b. Drought vulnerability Map from HMP – Not as use friendly and doesn't capture actual conditions.
c. Major Surface-Water Watersheds map - least helpful and is too broad of a region
d. Water Plan regions – Good breakdown, but consider naming regions what they are locally called (ex. Delta instead of East Arkansas)
e. Climate regions – From NOAA. Can be divided into sub regions as necessary.
f. Consider breakdown into Economic regions (8 Economic Development regions)
g. Do we need Regions?

1. Can send notifications as need to specific areas

h. Collect best local data, then feed into drought monitor

1. State can then take the Drought Monitor data and move forward from there

i. Focus on external message based on data

D. Identify risks and hazards of drought conditions.

a. Water supply-long-term effects
b. Agriculture
c. Forestry
d. Tourism
e. Wildlife
f. River transportation
g. Economics

E. Identify possible mitigation actions

a. Find funding to improve water system redundancy
b. Create tools (best practice) for local level
c. Tools to ID vulnerabilities on local level

1. Should be easy to use
2. Identify resources
3. Create a checklist

d. Draft templates for communities

1. Conservation or drought ordinance
2. Emergency orders
3. Water system Interconnection agreements

F. Network Function moving forward

a. Keep it simple and don't get overly technical
b. Create a council with key players
c. Funding mechanism

Internal Communication and Coordination

A. Communication format

1. Email (ease of accessibility)

a. Limit the list to one person per agency
b. Periodic email to keep group engaged

2. Message specifics

a. Region – Which region is/may be impacted?
b. Severity – How bad is it?
c. Agency – Which agencies will be involved?
d. Keep the message short and simple
e. Subject line – Needs to be succinct, but informative

3. Website:

a. Should be a single source for information–(**EXTERNAL**) (similar to I-Drive AR)
b. Public information campaign
c. Regional selection of information
d. Links to other agency websites (e.g., Drought Monitor, NWS, Corps of Engineers, USGS)

4. Establish an executive committee to oversee coordination between groups
5. SMS option – text messaging option
6. Need a unique sign/symbol to "brand" the drought efforts
7. NWS may classify a particular condition as a D2 Drought
8. HMP- - Does the HMP provide a list of contacts at agencies?
9. ADEM has incident specific check lists
    a. Duty offices-501-683-6700
    b. They do not currently have a drought checklist
10. Need to identify at what level the agency directors need to be involved
11. ADEM/ANRC are the likely lead agencies
12. Public Notice: Level of drought
    a. Where – geographic area(s), streams, reservoirs?
    b. What do we/you need to do?
    c. What resources are affected?
    d. What are the other hazards?
    e. Communicate effects/responses to drought level
13. Drought means different things to different groups

B. Tools

1. Drought Council has a monthly conference call
2. How do we keep people engaged?
3. COE- has an internal drought contingency Plan developed in 1982; updates are being looked at
4. Interagency drought council
5. Verification of situation from multiple sources – needs to be credible
6. NEW-radar coverage input to drought monitor
    a. Don't know what impacts are from different levels of drought
    b. Feedback loop of info – need information from the public regarding how they are being affected by drought conditions
        1. Crop loss
        2. Fish kill
        3. Irrigation water is not available
        4. Water supply status

7. Do core agencies have a drought plan?
    a. AGFC - criteria for lake drawdown
    b. AFC – plan for dealing with burn bans
8. Need to encourage planning at local levels
    a. Water districts
    b. ADH Require redundancy for local water supply
    c. Small and large water utilities need to have drought plans
    d. Public education for water conservation
9. Other states
    a. North Texas-water restrictions
    b. Western States-water allocation/crop
10. Biggest impediment to awareness of drought planning – we have too much water (most of the time)
11. Need to develop consistent Messaging for public
    a. Have one place for data
    b. Glossary
    c. Level definitions
    d. Term definitions
12. Leaders – Need to have a Champion from each agency
    a. ANRC
    b. NWS
    c. US ACOE
    d. ADEM
    e. USGS
    f. ADH
    g. Municipal/local/county
    h. Forestry Commission
13. AWARN
    a. Public water/water industry
    b. Emergency assistance
14. Forecasting
    a. NWS forecasts out for a 2-week period
    b. General trends

15. Public affairs offices
    a. Need to have a consistent message being given to the public by all agencies
    b. Need to have a responsible party! Pay attention to this champion
    c. Target large water users
        1. Conserve
        2. Educate users and public
    d. AACD training for conservation at the county level
16. Large corporations need to be involved in conservation

External Communication

1. Regional areas- Yes, regional drought areas should be identified. Factors to consider include:
    a. Value of water
    b. Availability of water - For example, Crowley's Ridge. Groundwater is plentiful on one side of the Ridge and being depleted on the other side of the Ridge
    c. Climate regions
    d. Water planning regions* - These were used in the Arkansas Water Plan update and are a reasonable starting point
    e. ID triggers of how to down scale as drought progresses
    f. USGS low flow analyses for streams
    g. Health Department-distribution systems for local communities
    Secondary distribution systems might be more susceptible and therefore identified as hot spots in a region
    h. Historical commodity impacts from drought - agriculture
2. Proactive mitigation
    a. Start with children and saving water – don't run water when brushing teeth
    b. Wal-Mart sustainability study includes multiple approaches for reducing water consumption
    c. Flood awareness/drought awareness weeks – bring to people's attention
    d. Extension workshops/practices
    e. Conservation practices –different for:
        1. Rural
        2. Urban
    f. Messages and communication must be frequent and repeated! Must keep in forefront of people's minds
    g. Re-use/recycle options in addition to conservation
    h. Storage
        1. Rain barrels
        2. Irrigation reservoirs
    i. Target areas for initiation of mitigation practices
        1. 2nd distribution system
        2. Hi-resolution, hi-impact, highly vulnerable sectors

3. People/sectors lower on allocation schedule if get to response status

j. Add water (importance) to curriculum of schools

1. Currently, there is about one day a year to talk about water

3. Consistent messages

a. 1 consistent message

- Tailored for different delivery systems
- Tailored by sector

b. Different triggers based on advisory levels

4. Agency leads

a. State government message
b. NWS reports
c. AFC-Burn bans
d. Facebook-free consulting offered for government agencies. Facebook reaches multiple audiences
e. Social Media-can target specific households with specific messages that resonate with them
f. Need a common repository of info on drought by sector and region. One stop
g. Look at audience diversity and needs – more than white males
h. Focus on impacts & WIIFM (What's In It For Me?)
i. ADEM Networks in place – build on these

5. How does network move forward?

a. Implementable actions

1. Establish grassroots communication network – for Drought Monitor and for input on drought. Need 5-6 contacts per county
2. Find out who currently has info needed for the network
3. Define advisory stages and triggers

a. Start with drought monitor levels

4. Start targeting communication vehicles and media with appropriate target audiences
5. Couple the Arkansas Water Plan Recommendation for water utilities to develop sustainability water plan with drought planning-U of A-Other Universities have departments of sustainability and capstone project requirements. Match smaller utilities with graduate students to help develop these sustainability plans

b. Finances

1. How can this be financed? Always the ultimate question

c. Outreach to professional organization – most organizations looking for speakers

1. County judges' association
2. Municipal league
3. Farm Bureau
4. Continuing education requirements – satisfy through training on drought planning
5. AR Education Association

   a. Classes and class material
   b. Study/teaching plans for teachers on water, drought, and mitigation.
6. Rural Elec. Coop, etc.
7. Target specific organizations to begin process

Follow-up General Discussion

- Good discussion on whether dividing the state into regions for drought response is needed.
- Engage Wal-Mart and other large corporations that have sustainability as a part of their planning and management activities.
- Overall consensus that an executive committee should be formed to lead the Drought Contingency Response Network.

Next Steps

- We will be developing an overall workshop summary that outlines a path forward for the Drought Contingency Response Network.
- Network will be initiated and move forward from here.

We appreciate your attendance at this workshop and the opportunity to work with you on this project. If you have any questions or comments regarding this memorandum, please do not hesitate to contact:

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Attachment: List of Attendees by work group

R:\WP_FILES\03015-0005-047\SUMMARY DROUGHT WORKSHOP 2018-04-11\WORD\M-SUMMARY DROUGHT WORKSHOP 2018-04-11.DOCX

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Chris	Buonnano	chris.buonnano@noaa.gov		National Westher Service	YES	MITIGATION		
Cody	Burkham	cody@arbeef.org	870-703-1270	AR Cattlemen's Association			YES	EXTERNAL
Dennis	Cavanaugh	dennis.cavanaugh@noaa.gov	501-834-0308	National Weather Service			YES	INTERNAL
Marvin	Childers	marvin@thepoultryfederation.com	501-375-8131	AR Poultry Federation				
Jerry	Christie	jerrychristie123@yahoo.com	870-845-7778	AR Cattlemen's Association				
Brian	Clark	brclark@usgs.gov	479-442-4888	United States Geological Survey			YES	INTEGRATION
Tabitha	Clarke	tabitha.clarke@noaa.gov	501-834-0308	National Weather Service	YES	MONITORING	YES	EXTERNAL
Savanah	Connerly	Savannah.Connerly@adem.arkansas.gov	501-683-6700	Arkansas Department of Emergency Management	YES	MITIGATION	YES	INTERNAL
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Randy	Easley	randy.easley@carkw.com	501-210-4935	Central Arkansas Water	YES	MONITORING	YES	INTEGRATION
Song	Feng	songfeng@uark.edu	479-575-4748	University of Arkansas Department of Geosciences	YES	MONITORING	YES	INTEGRATION
Jim	Ferguson	jim.ferguson@carkw.com	501-377-1298	Central Arkansas Water				
Kent	Fonvielle	kfonvielle@misoenergy.org		Mid Continental Independent System Operator (MISO)				
Neil	Foreman	nforeman@arml.org	501-374-3484	Arkansas Municipal League			YES	INTEGRATION
Alan	Fortenberry	afortenberry@bwdh2o.org	479-756-3651	Beaver Lake Water District				
Bob	Fowler	bob.fowler@arkansas.gov	501-683-0577	Arkansas Natural Resources Commission				
Joe	Fox	joe.fox@arkansas.gov	501-296-1940	Arkansas Forestry Commission				
Jaysson	Funkhouser	jaysson.e.funkhouser@usace.army.mil	501-324-7342	USACE - Little Rock				
Colene	Gaston	cgaston@bwdh2o.org	479-756-3651	Beaver Water District	YES	MONITORING	YES	INTERNAL
Tyler	Gipson	Tyler.Gipson@swpa.gov	918-595-6685	U.S. Department of Energy Southwestern Power Administration			YES	INTEGRATION

First Name	Last Name	Email	Phone	Organization	First Meeting	First Meeting Group (Monitoring/Risks/Mitigation)	Second Meeting	Second Meeting Group (Integration/Internal/External)
Charles	Glover	glover152@rittermail.com	870-974-1346	Arkansas Association of Conservation Districts	YES	MITIGATION		
Lyle	Godfrey	Lyle.Godfrey@arkansas.gov	501-661-2032	Arkansas Health Department	YES	MITIGATION		
Andrew	Grobmyer	andrew.grobmyer@agcouncil.net	501-376-0455	Agricultural Council of Arkansas	YES	MITIGATION		
Cory	Hallmark	challmark@uaex.edu		University of Arkansas Cooperative Extension Service	YES	MITIGATION		
Mike	Hamilton	mkhamilton@uaex.edu	870-919-5061	UofA Extension Service/NRCS	YES	RISKS	YES	INTERNAL
Josh	Hankins			USA RICE	YES	RISKS		
Bradley	Hardin	behardin@aep.com	501-379-1127	SW Electric Power	YES	RISKS		
Jeremy	Huff	jeremy.huff@ar.usda.gov	479-646-8300 ext. 106	Natural Resource Conservation Service	YES	MONITORING		
Tracy	Johnson	qjohns6@entergy.com	501-377-4033	Entergy				
Gabe	Knight	gabriel.j.knight@usace.army.mil	501-324-6238	USACE - Little Rock	YES	MITIGATION	YES	INTERNAL
Larry	Lloyd	llloyd@bwdh2o.org	479-756-3651	Beaver Water District	YES	MITIGATION	YES	INTEGRATION
Melissa	Lombardi	melissa_lombardi@fws.gov	501-513-4488	US Fish and Wildlife Service	YES	MITIGATION	YES	INTERNAL
Martha	Manley	mdmanley71@gmail.com	870-295-6940	Arkansas Association of Conservation Districts	YES	RISKS		
Scott	Manley	Smanley@ducks.org	601-956-1936	Ducks Unlimited				
Steve	Martin	stevemartin@conwaycorp.net	501-908-5024	Arkansas Association of Conservation Districts				
Charles	Miller	cmiller@environmentark.org	501-374-0263	Arkansas Environmental Federation				
JW	Misenheimer	JW.Misenheimer@arkansas.gov	870-310-4768	Arkansas WaterWays Commission			YES	INTERNAL
Debbie	Moreland	debbie.morelandpr@gmail.com Debbiepinreal@aol.com	501-904-5575	Arkansas Association of Conservation Districts	YES	RISKS	YES	EXTERNAL
Fritha	Ohlson	Fritha.Ohlson@swpa.gov		U.S. Department of Energy Southwestern Power Administration				
Rebecca	Peak	rebecca_peak@fws.gov	501-513-4475	US Fish and Wildlife Service	YES	RISKS		
Jason	Phillips	jason_phillips@fws.gov	870-503-1101	USFWS White River	YES	MONITORING	YES	INTERNAL
David	Quattlebuam	arwadq@yahoo.com	501-676-2255	Arkansas Rural Water Association	YES	MONITORING		
Jeff	Quinn	jeff.quinn@agfc.state.ar.us	501-539-0892	Arkansas Game and Fish Commission	YES	RISKS	YES	INTERNAL
Tony	Ramick	tony.ramick@arkansas.gov	501-682-3914	Arkansas Natural Resources Commission			YES	INTERNAL
Lee	Riley	tlriley@uaex.edu		University of Arkansas Cooperative Extension Service	YES	RISKS	YES	EXTERNAL
Carol	Roth	cbroth@aep.com	(318) 673-3349	SW Electric Power Co.				
Casey	Shepard	casey.shepard@aecc.com	501-570-2102	Arkansas Electric Coop	YES	MITIGATION	YES	EXTERNAL
Brittney	Singleton	blsingleton@uaex.edu	501-671-2281	University of Arkansas Cooperative Extension Service				
Deidre	Smith	deidre.smith@arkansas.gov	501-682-1173	Arkansas WaterWays Commission				
Jeff	Stone	Jeffery.Stone@arkansas.gov	501-661-2032	Arkansas Health Department	YES	RISKS	YES	INTEGRATION
John	Sturgis	jdsflyfisher@gmail.com	479-236-6765	Trout Unlimited				
Edward	Swaim	edward.swaim@arkansas.gov	501-682-3979	Arkansas Natural Resources Commission	YES	MITIGATION	YES	INTERNAL
Trevor	Timberlake	Trevor.W.Timberlake@usace.army.mil	501-324-5032	USACE - Little Rock	YES	MONITORING	YES	INTEGRATION
Melvin	Tobin	melvin_tobin@fws.gov	501-513-4473	US Fish and Wildlife Service				
Chris	Villines	cvillines@arcounties.org	501-372-7550	Association of Arkansas Counties				
Andrew	Wargo	awargoiii@gmail.com	870-866-2803	Arkansas Association of Conservation Districts	YES	MONITORING	YES	INTERNAL
Kane	Webb	kane.webb@arkansas.gov	501-682-2535	Arkansas Parks and Tourism				
Drew	Westerman	dawester@usgs.gov	501-228-3643	United States Geological Survey	YES	MONITORING	YES	INTEGRATION
Brian	Westfall	brian.c.westfall@usace.army.mil	501-767-2108 EXT 73011	USACE - Vicksburg - Lake Quachita	YES	MONITORING	YES	EXTERNAL
Mark	Whitmore	mwhitmore@arcounties.org	501-372-7550	Association of County Judges				
Jim	Wise	wise@adeq.state.ar.us	(501) 682-0663	Arkansas Department of Environmental Quality	YES	MONITORING		
Bill	Wolfe	wjwolfe@usgs.gov	615-837-4756	United States Geological Survey				
Scott	Youngblood	scott.youngblood@arkansas.gov	501-679-5310	AR Forestry Commission	YES	MITIGATION		
Don	Zimmerman	daz@arml.org	501-374-3484	Arkansas Municipal League				

APPENDIX C

Participant Contact List

First Name	Last Name	Email	Phone	Organization	First Meeting	First Meeting Group (Monitoring/Risks/Mitigation)	Second Meeting	Second Meeting Group (Integration/Internal/External)
Chad	Allen	callen@misoenergy.org	501-244-1502	Mid Continental Independent System Operator (MISO)				
Jason	Allmon	jason.E.Allmon@us.army.mil	901-544-0766	USACE - Memphis				
Alice	Andrews	alice209ok@yahoo.com	501-219-4295	Ozark Society				
Adrian	Baber	adrian.baber@arkansas.gov	501-682-3967	Arkansas Natural Resources Commission	YES	MONITORING	YES	EXTERNAL
John	Bailey	john.bailey@arfb.com	501-228-1325	Farm Bureau				
Bill	Baldwin	bbaldwin@usgs.gov	501-228-3602	United States Geological Survey	YES	MONITORING	YES	INTERNAL
Chandler	Barton	Chandler.Barton@arkansas.gov	501-225-1598	Arkansas Forestry Commission	YES	MONITORING	YES	INTEGRATION
Jim	Battreal	jim.battreal@arkansas.gov	501-682-3904	Arkansas Natural Resources Commission	YES	MITIGATION	YES	INTEGRATION
Ryan	Benefield	ryan.benefield@arkansas.gov	501-682-3962	Arkansas Natural Resources Commission			YES	EXTERNAL
Mark	Bennett	mark.bennett@arkansas.gov	501-682-3978	Arkansas Natural Resources Commission	YES	MITIGATION	YES	INTERNAL
Aaron	Benzing	aaron.benzing@hawkins-weir.com	501-374-4846	Arkansas Water Works and Water Environment Association				
Mike	Bradley	mbradley@usgs.gov		United States Geological Survey	YES	RISKS		
Ken	Brazil	ken.brazil@arkansas.gov	501-682-3980	Arkansas Natural Resources Commission	YES	RISKS		
Brian	Breaker	Brian.K.Breaker@usace.army.mil	501-553-5867	USACE - Little Rock	YES	RISKS	YES	EXTERNAL
Ben	Bright	bbright@spp.org	501-614-3965	Southwest Power Pool				
Whitnee	Bullerwell	WBullerwell@arml.org	501-978-6105	Arkansas Municipal League			YES	INTERNAL
Chris	Buonnano	chris.buonnano@noaa.gov		National Westher Service	YES	MITIGATION		
Cody	Burkham	cody@arbeef.org	870-703-1270	AR Cattlemen's Association			YES	EXTERNAL
Dennis	Cavanaugh	dennis.cavanaugh@noaa.gov	501-834-0308	National Weather Service			YES	INTERNAL
Marvin	Childers	marvin@thepoultryfederation.com	501-375-8131	AR Poultry Federation				
Jerry	Christie	jerrychristie123@yahoo.com	870-845-7778	AR Cattlemen's Association				
Brian	Clark	brclark@usgs.gov	479-442-4888	United States Geological Survey			YES	INTEGRATION
Tabitha	Clarke	tabitha.clarke@noaa.gov	501-834-0308	National Weather Service	YES	MONITORING	YES	EXTERNAL
Savanah	Connerly	Savannah.Connerly@adem.arkansas.gov	501-683-6700	Arkansas Department of Emergency Management	YES	MITIGATION	YES	INTERNAL
Ashley	Corker	ashley.corker@swpa.gov	918-595-6682	U.S. Department of Energy Southwestern Power Administration	YES	RISKS		
Richie	Danahou	rsdonaho@uark.edu		University of Arkansas	YES	RISKS	YES	EXTERNAL
Dustin	Davis	dustin.davis@adem.arkansas.gov	501-683-6700	Arkansas Department of Emergency Management	YES	RISKS		
Walter	Delp	walter.delp@ar.usda.gov	501-301-3100	Natural Resource Conservation Service	YES	RISKS		
Helen	Denniston	helen.denniston@ar.usda.gov	501-301-3184	Natural Resource Conservation Service	YES	MITIGATION		
Michael	Denny	michael.denny@swpa.gov	918-595-6683	U.S. Department of Energy Southwestern Power Administration			YES	EXTERNAL
Debbie	Doss	ddoss@conwaycorp.net	501-472-6873	AR Conservation Coalition/Canoe Club				
Randy	Easley	randy.easley@carkw.com	501-210-4935	Central Arkansas Water	YES	MONITORING	YES	INTEGRATION
Song	Feng	songfeng@uark.edu	479-575-4748	University of Arkansas Department of Geosciences	YES	MONITORING	YES	INTEGRATION
Jim	Ferguson	jim.ferguson@carkw.com	501-377-1298	Central Arkansas Water				
Kent	Fonvielle	kfonvielle@misoenergy.org		Mid Continental Independent System Operator (MISO)				
Neil	Foreman	nforeman@arml.org	501-374-3484	Arkansas Municipal League			YES	INTEGRATION
Alan	Fortenberry	afortenberry@bwdh2o.org	479-756-3651	Beaver Lake Water District				
Bob	Fowler	bob.fowler@arkansas.gov	501-683-0577	Arkansas Natural Resources Commission				
Joe	Fox	joe.fox@arkansas.gov	501-296-1940	Arkansas Forestry Commission				
Jaysson	Funkhouser	jaysson.e.funkhouser@usace.army.mil	501-324-7342	USACE - Little Rock				
Colene	Gaston	cgaston@bwdh2o.org	479-756-3651	Beaver Water District	YES	MONITORING	YES	INTERNAL
Tyler	Gipson	Tyler.Gipson@swpa.gov	918-595-6685	U.S. Department of Energy Southwestern Power Administration			YES	INTEGRATION

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Charles	Glover	glover152@rittermail.com	870-974-1346	Arkansas Association of Conservation Districts	YES	MITIGATION		
Lyle	Godfrey	Lyle.Godfrey@arkansas.gov	501-661-2032	Arkansas Health Department	YES	MITIGATION		
Andrew	Grobmyer	andrew.grobmyer@agcouncil.net	501-376-0455	Agricultural Council of Arkansas	YES	MITIGATION		
Cory	Hallmark	challmark@uaex.edu		University of Arkansas Cooperative Extension Service	YES	MITIGATION		
Mike	Hamilton	mkhamilton@uaex.edu	870-919-5061	UofA Extension Service/NRCS	YES	RISKS	YES	INTERNAL
Josh	Hankins			USA RICE	YES	RISKS		
Bradley	Hardin	behardin@aep.com	501-379-1127	SW Electric Power	YES	RISKS		
Jeremy	Huff	jeremy.huff@ar.usda.gov	479-646-8300 ext. 106	Natural Resource Conservation Service	YES	MONITORING		
Tracy	Johnson	qjohns6@entergy.com	501-377-4033	Entergy				
Gabe	Knight	gabriel.j.knight@usace.army.mil	501-324-6238	USACE - Little Rock	YES	MITIGATION	YES	INTERNAL
Larry	Lloyd	llloyd@bwdh2o.org	479-756-3651	Beaver Water District	YES	MITIGATION	YES	INTEGRATION
Melissa	Lombardi	melissa_lombardi@fws.gov	501-513-4488	US Fish and Wildlife Service	YES	MITIGATION	YES	INTERNAL
Martha	Manley	mdmanley71@gmail.com	870-295-6940	Arkansas Association of Conservation Districts	YES	RISKS		
Scott	Manley	Smanley@ducks.org	601-956-1936	Ducks Unlimited				
Steve	Martin	stevemartin@conwaycorp.net	501-908-5024	Arkansas Association of Conservation Districts				
Charles	Miller	cmiller@environmentark.org	501-374-0263	Arkansas Environmental Federation				
JW	Misenheimer	JW.Misenheimer@arkansas.gov	870-310-4768	Arkansas WaterWays Commission			YES	INTERNAL
Debbie	Moreland	debbie.morelandpr@gmail.com Debbiepinreal@aol.com	501-904-5575	Arkansas Association of Conservation Districts	YES	RISKS	YES	EXTERNAL
Fritha	Ohlson	Fritha.Ohlson@swpa.gov		U.S. Department of Energy Southwestern Power Administration				
Rebecca	Peak	rebecca_peak@fws.gov	501-513-4475	US Fish and Wildlife Service	YES	RISKS		
Jason	Phillips	jason_phillips@fws.gov	870-503-1101	USFWS White River	YES	MONITORING	YES	INTERNAL
David	Quattlebuam	arwadq@yahoo.com	501-676-2255	Arkansas Rural Water Association	YES	MONITORING		
Jeff	Quinn	jeff.quinn@agfc.state.ar.us	501-539-0892	Arkansas Game and Fish Commission	YES	RISKS	YES	INTERNAL
Tony	Ramick	tony.ramick@arkansas.gov	501-682-3914	Arkansas Natural Resources Commission			YES	INTERNAL
Lee	Riley	tlriley@uaex.edu		University of Arkansas Cooperative Extension Service	YES	RISKS	YES	EXTERNAL
Carol	Roth	cbroth@aep.com	(318) 673-3349	SW Electric Power Co.				
Casey	Shepard	casey.shepard@aecc.com	501-570-2102	Arkansas Electric Coop	YES	MITIGATION	YES	EXTERNAL
Brittney	Singleton	blsingleton@uaex.edu	501-671-2281	University of Arkansas Cooperative Extension Service				
Deidre	Smith	deidre.smith@arkansas.gov	501-682-1173	Arkansas WaterWays Commission				
Jeff	Stone	Jeffery.Stone@arkansas.gov	501-661-2032	Arkansas Health Department	YES	RISKS	YES	INTEGRATION
John	Sturgis	jdsflyfisher@gmail.com	479-236-6765	Trout Unlimited				
Edward	Swaim	edward.swaim@arkansas.gov	501-682-3979	Arkansas Natural Resources Commission	YES	MITIGATION	YES	INTERNAL
Trevor	Timberlake	Trevor.W.Timberlake@usace.army.mil	501-324-5032	USACE - Little Rock	YES	MONITORING	YES	INTEGRATION
Melvin	Tobin	melvin_tobin@fws.gov	501-513-4473	US Fish and Wildlife Service				
Chris	Villines	cvillines@arcounties.org	501-372-7550	Association of Arkansas Counties				
Andrew	Wargo	awargoiii@gmail.com	870-866-2803	Arkansas Association of Conservation Districts	YES	MONITORING	YES	INTERNAL
Kane	Webb	kane.webb@arkansas.gov	501-682-2535	Arkansas Parks and Tourism				
Drew	Westerman	dawester@usgs.gov	501-228-3643	United States Geological Survey	YES	MONITORING	YES	INTEGRATION
Brian	Westfall	brian.c.westfall@usace.army.mil	501-767-2108 EXT 73011	USACE - Vicksburg - Lake Quachita	YES	MONITORING	YES	EXTERNAL
Mark	Whitmore	mwhitmore@arcounties.org	501-372-7550	Association of County Judges				
Jim	Wise	wise@adeq.state.ar.us	(501) 682-0663	Arkansas Department of Environmental Quality	YES	MONITORING		
Bill	Wolfe	wjwolfe@usgs.gov	615-837-4756	United States Geological Survey				
Scott	Youngblood	scott.youngblood@arkansas.gov	501-679-5310	AR Forestry Commission	YES	MITIGATION		
Don	Zimmerman	daz@arml.org	501-374-3484	Arkansas Municipal League				

APPENDIX D

Drought Links and Matrix

Drought Classification

http://droughtmonitor.unl.edu
US Drought Monitor homepage. From here, users can navigate to several graphical and tabular products regarding historic and current drought conditions.

http://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?AR
Map of current drought status for Arkansas from the US Drought Monitor

http://www.cpc.ncep.noaa.gov/products/Drought/

- US Monthly Drought Outlook
- US Seasonal Drought Outlook (3-Month)

http://drought.srcc.lsu.edu/
Southern Regional Climate Center's "Southern US Drought Tool", providing rainfall-based drought condition data by NOAA Climate Division for 30, 60, 90, 180, and 365 day windows.

http://droughtmonitor.unl.edu/fsa/Home.aspx
FSA Livestock Forage Disaster Program Eligibility Tool

http://www.cpc.ncep.noaa.gov/products/predictions/tools/edb/droughtblends.php
Experimental objective blends of drought indicators for short-term (several days to a few months) and long-term (several months to a few years).

https://www.drought.gov/drought/
Drought portal, from the National Integrated Drought Information System (NIDIS). Provides links to commonly-used national drought products

https://www.drought.gov/drought/calendar
Calendar that provides dates for updates to drought monitor, drought outlook, temperature/precip outlooks, etc.

Drought Impacts

http://droughtreporter.unl.edu/map/
National Drought Mitigation Center's Drought Impact Reporter. Database of drought impacts and reports from media and other sources, categorized by sector and impacted area (county, state, region, national).

Local and/or Historical Drought Information

http://www.weather.gov/lzk/drought.htm
NWS Little Rock drought page. Contains several references and narrative relative to monitoring drought in Arkansas

http://www.weather.gov/lzk/latetext.htm?lzkProd=DGTLZK
NWS Little Rock drought information statement. Issued after D2 drought level is designated in the US Drought Monitor for some portion of Arkansas.

https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp#
NCDC Climate Data Online. Allows for download of tabular data of historic monthly drought indices, such as temperature, precipitation, PDSI, and SPI for a 100+ year period of record.

http://www.weather.gov/lzk/drought2012yr.htm
NWS Little Rock summary of 2012 drought

Drought Indices

SPI
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/spi.shtml
Standardized Precipitation Index (SPI) Map of US for prior 3-month, 6-month, 12-month, and 24-month periods.

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/spi_outlooks.shtml
US map of SPI outlooks based on National Multi-Model Ensemble (NMME) for 3-month, 6-month, and 12-month periods.

PDSI
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif
US map of current weekly PDSI values by NOAA Climate Division.

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/addpcp.gif
US map of precip needed in upcoming 4 weeks to bring PDSI values to -0.5, by NOAA Climate Division.

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/
Tables of current and archived PDSI and Crop Moisture values by NOAA Climate Division

Integrated Drought Index
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/intd1.shtml
US Map of Integrated Drought Index for previous month, based on NLDAS

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/sri3.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/sri6.shtml
US Map of Standardized Runoff Index (SRI) for previous 3-month and 6-month periods, based on NLDAS. May want to put this under Runoff heading. Look up in UN document

Keetch-Byram Index

http://www.wfas.net/index.php/keetch-byram-index-moisture--drought-49
US map of Keetch-Byram index

Supporting Data

Weather Station Networks

https://www.wrh.noaa.gov/map/?obs=true&wfo=lzk
NWS weather and hazards data viewer. Provides map of weather stations in Arkansas via several networks (FAA, HADS, RAWS, ...)

http://170.94.200.138/intercept/map.html
http://170.94.200.136/weather/
Mapping and tabular data of Arkansas Plant Board weather stations. Consists of 50 stations, primarily in southern and eastern Arkansas, that monitor wind speed, wind gust, wind direction, temperature, relative humidity, dew point, 1-hr precip, 24-hr precip, and solar radiation.

Precipitation

http://water.weather.gov/precip/index.php
NOAA's Advanced Hydrologic Prediction Service (AHPS) Precipitation Analysis. US maps with options to view estimates of past rainfall for daily, monthly, and yearly time periods, with observed, normal, departure from normal, and percent of normal layers.

http://water.weather.gov/precip/index.php?offset_month=0&offset_year=0&analysis_date=1439856000&lat=34.5518120000&latLonPrecision=6&location_name=AR&location_type=state&lon=-92.1862790000&precip_layer=0.75&product=departure&recent_type=today&rfc_layer=-1&state_layer=0.75&hsa_layer=-1&county_layer=0.75&time_frame=month2date&time_type=recent&units=eng&newest_forecast=12&zoom=7
AHPS departure from normal precipitation for Arkansas, latest month

http://water.weather.gov/precip/index.php?offset_month=0&offset_year=0&analysis_date=1439856000&lat=34.5518120000&latLonPrecision=6&location_name=AR&location_type=state&lon=-92.1862790000&precip_layer=0.75&product=departure&recent_type=today&rfc_layer=-1&state_layer=0.75&hsa_layer=-1&county_layer=0.75&time_frame=year2date&time_type=recent&units=eng&newest_forecast=12&zoom=7
AHPS departure from normal precipitation for Arkansas, year to date

http://www.cpc.ncep.noaa.gov/products/Global_Monsoons/American_Monsoons/NAMS_precip_monitoring.shtml
US map of accumulated, gauge-based, daily precipitation for 7-day, 30-day, 90-day, and 180-day periods

https://www.ncdc.noaa.gov/temp-and-precip/drought/recovery/current
US maps of precipitation needed to ameliorate or terminate drought, by NOAA climatological division

https://www.cocorahs.org/state.aspx?state=ar
Arkansas map of daily precipitation readings from CoCoRAHS volunteer network, with 150-200 reporting stations during rainfall events.

http://prism.oregonstate.edu/comparisons/drought.php
National map of how precipitation over a selected window of time since 1990 deviated from long-term averages

Temperature

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/surface_temperature-max-min.php
US maps of 30-day mean of max and min temperatures and max and min temperature anomalies

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/surface_temperature-mean.php
US map of 30-day mean of mean temperature and mean temperature anomaly

Soil Moisture

https://www.wcc.nrcs.usda.gov/scan/
USDA NRCS map of Soil Climate Analysis Network (SCAN). 6 stations in Arkansas and several more in the delta region of Mississippi. Provides, soil moisture and temperature readings at various depths, along with temperature, precipitation, wind, humidity.

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/cmi.gif
US map of current weekly crop moisture index by NOAA Climate Division

http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/topsoil.shtml
Current Topsoil Moisture Monitoring maps of US, based on USDA

http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml
US map of Daily, Monthly, and Last Day of Month monitoring of soil moisture and soil moisture anomalies

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/smp.shtml
US Map of Soil Moisture Percentiles for previous month, based on NLDAS

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/

Tables of current and archived PDSI and Crop Moisture values by NOAA Climate Division (link is also included in PDSI section above)

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-total-SM-anom.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-total-SM-anom.shtml
US maps of weekly and monthly monitoring of total soil moisture anomaly

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-total-SM-change.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-total-SM-change.shtml
US maps of weekly and monthly monitoring of total soil moisture change

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-SM-mosaic.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-SM-mosaic.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-SM-noah.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-SM-noah.shtml
US maps of weekly and monthly monitoring of soil moisture anomaly based on MOSAIC and NOAH

Evaporation
http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Evap/Evaporation.shtml
US map of Model Calculated, 1-Month Averaged Evaporation and evaporation anomalies

http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-evap-anom.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-evap-anom.shtml
US maps of weekly and monthly monitoring of evaporation anomaly
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-EP-anom.shtml
http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-EP-anom.shtml
US maps of weekly and monthly monitoring of evaporation minus precipitation (E-P) anomaly

Runoff
http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Runoff/Runoff.shtml
US Map of Calculated Averaged Runoff and runoff anomalies

Streamflow
https://waterdata.usgs.gov/nwis/rt
https://waterdata.usgs.gov/ar/nwis/rt
US and Arkansas Maps of Daily Streamflow Conditions at USGS Gauges

Wildfire
http://www.arkfireinfo.org/index.php?do:showWildfires
Current wildfire danger map of Arkansas, by County
http://www.arkfireinfo.org/index.php?do:showBurnBans
Current burn ban map of Arkansas, by County

https://www.predictiveservices.nifc.gov/outlooks/monthly_seasonal_outlook.pdf
Monthly national significant wildland fire potential outlook

http://www.wfas.net/index.php/dead-fuel-moisture-moisture--drought-38
US Map of dead fuel moisture

Notes:
Some data were not listed if not deemed useful for Arkansas drought monitoring. For example, snow cover and snow water equivalent would rarely yield benefit for drought monitoring in Arkansas.

Category	Name & Link	Description	Spatial Resolution	Temporal Resolution
Drought Classification	http://droughtmonitor.unl.edu US Drought Monitor homepage	From here, users can navigate to several graphical and tabular products regarding historic and current drought conditions.	Varies; can view Drought Monitor from National to watershed scale	Weekly
Drought Classification	http://www.cpc.ncep.noaa.gov/products/Drought/ US Monthly Drought Outlook US Seasonal Drought Outlook (3-Month)	National drought outlooks from the NOAA Climate Prediction Center	National maps	Monthly and Seasonal (3-month)
Drought Indices	http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/spi.shtml CPC SPI Map	Standardized Precipitation Index (SPI) Map of US for prior 3-month to 2-year periods.	National maps	3-month, 6-month, 12-month, and 24-month periods
Drought Indices	http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif CPC Map of Current PDSI	US map of current weekly PDSI values by NOAA Climate Division.	National maps	Weekly
Supporting Data - Precipitation	http://water.weather.gov/precip/index.php NOAA's Advanced Hydrologic Prediction Service (AHPS) Precipitation Analysis		National map with data at 4kmx4km grid cells	Daily
Supporting Data – Soil Moisture	http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/weekly-total-SM-anom.shtml http://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/monthly-total-SM-anom.shtml CPC soil moisture anomaly maps	US maps of weekly and monthly monitoring of total soil moisture anomaly	National map	Weekly, monthly